California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

June 23, 2011

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This facility is accessible by public transit. For transit information, call (916) 321-BUSS, website: http://www.sacrt.com
(This facility is accessible to persons with disabilities.)

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:
http://www.arb.ca.gov/lispub/comm/bclist.php

June 23, 2011
9:00 a.m.

CONSENT CALENDAR:
All items on the consent calendar will be voted on by the Board immediately after the start of the public meeting. Any item may be removed from the consent calendar by a Board member or if someone in the audience wishes to speak on that item. The following items are on the consent calendar:

Consent Item #

11-4-1: Public Hearing to Consider the Adoption of a Particulate Matter Emissions Measurement Allowance for California's Heavy-Duty Diesel In-Use Compliance Regulation

The Board will consider the adoption of a particulate matter (PM) emissions measurement allowance for California's Heavy-Duty Diesel In-Use Compliance Regulation, adopted in September 2006. The regulation requires testing using portable emissions measurement systems during over-the-road vehicle operation. Emission measurement allowances are needed to account for variability associated with field testing. The Board adopted gaseous measurement allowances in December 2007 following the completion of a gaseous research study. The PM research study was completed in 2010 and the Air Resources Board, the United States Environmental Protection Agency, and the Engine Manufacturers Association have agreed on a PM measurement allowance value.

11-4-2: Public Hearing to Consider Proposed Amendments to the Area Designations for State Ambient Air Quality Standards

The Board will consider a proposal that Lassen, Modoc, and Siskiyou counties be designated as attainment for ozone, based on monitored air quality for 2007-2009. State law requires an annual update to area designations for State ambient air quality standards.

Attached are the Proposed Resolutions for the above consent items. Please go to http://www.arb.ca.gov/board/ma/2011/ma062311.htm for resolution attachments.

DISCUSSION ITEMS:

Note: The following agenda items may be heard in a different order at the Board meeting.

Agenda Item #

11-4-3: Hydrogen and Fuel Cell Showcase

Staff and invited guests will update the Board on the current status of technology and commercialization of Hydrogen and Fuel Cells.

11-4-4: Public Meeting to Report to the Board on Staff's Recommended Area Designation for the 2010 Federal Sulfur Dioxide Standard

Staff will present an informational item summarizing their recommended area designations for the 2010 sulfur dioxide federal 1-hour standard of 75 parts per million.

11-4-5: Public Hearing to Consider Amendments to the Regulations for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline

Staff will propose amendments to the Ocean-Going Vessel Clean Fuel Regulation for the Board's consideration. The primary purpose of the amendments is to adjust the offshore regulatory boundary in Southern California to lessen the potential for vessels to interfere with operations at the United States Navy's Point Mugu Sea Range and to re-establish the anticipated emission reductions from the regulation. In addition, amendments will be proposed to help facilitate a successful transition to very low sulfur fuels by aligning implementation dates more closely with recently approved federal requirements. Other minor amendments are also proposed.

CLOSED SESSION – LITIGATION

The Board will hold a closed session, as authorized by Government Code section 11126(e), to confer with, and receive advice from, its legal counsel regarding the following pending or potential litigation:

Pacific Merchant Shipping Association v. Goldstene, U.S. District Court (E.D. Cal. Sacramento), Case No. 2:09-CV-01151-MCE-EFB.

POET, LLC, et al. v. Goldstene, et al., Superior Court of California (Fresno County), Case No. 09CECG04850.

Rocky Mountain Farmers Union, et al. v. Goldstene, U.S. District Court (E.D. Cal. Fresno), Case No. 1:09-CV-02234-LJO-DLB.

National Petrochemical & Refiners Association, et al. v. Goldstene, et al., U.S. District Court (E.D. Cal. Fresno) Case No. 1:10-CV-00163-AWI-GSA.

Association of Irritated Residents, et al. v. California Air Resources Board, Superior Court of California (San Francisco County), Case No. CPF-09-509562.

Association of Irritated Residents, et al. v. U.S. E.P.A., 2011 WL 310357 (C.A.9), (Feb. 2, 2011).

California Dump Truck Owners Association v. California Air Resources Board, U.S. District Court (E.D. Cal. Sacramento) Case No. 2:11-CV-00384-MCE-GGH.

Engine Manufacturers Association v. California Air Resources Board, Sacramento Superior Court, Case No. 34-2010-00082774.

OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST

Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.

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NEW FEATURE

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IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CLERK OF THE BOARD:
OFFICE: (916) 322-5594
1001 I Street, Floor 23, Sacramento, California 95814
ARB Homepage: www.arb.ca.gov

SPECIAL ACCOMMODATION REQUEST

Special accommodation or language needs can be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format (i.e., Braille, large print, etc.) or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Comodidad especial o necesidad de otro idioma puede ser proveído para alguna de las siguientes:

- Un intérprete que esté disponible en la audiencia.
- Documentos disponibles en un formato alterno (por decir, sistema Braille, o en impresión grande) u otro idioma;
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

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TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PARTICULATE MATTER EMISSIONS MEASUREMENT ALLOWANCE FOR CALIFORNIA'S HEAVY-DUTY DIESEL IN-USE COMPLIANCE REGULATION

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider adoption of amendments to California's heavy-duty diesel engine (HDDE) test procedures. The proposed amendments would modify the measurement allowance for the regulated particulate matter emissions during heavy-duty diesel in-use compliance testing when using portable emissions measurement systems (PEMS). The proposed amendments are identical to the modifications already adopted by the United States Environmental Protection Agency (U.S. EPA) in November 2010.

DATE: June 23, 2011

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item may be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 23, 2011, and may continue at 8:30 a.m., on June 24, 2011. This item may not be considered until June 24, 2011. Please consult the agenda for the hearing, which will be available at least 10 days before June 23, 2011, to determine the day on which this item will be considered.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to section 1956.8, title 13, California Code of Regulations, and the following document incorporated by reference therein: "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as last amended September 27, 2010.

Background: Health and Safety Code section 43104 directs ARB to adopt test procedures to ensure compliance with emission standards for new heavy-duty motor vehicles. In 2006, ARB adopted a new in-use compliance test procedure that allows for a more efficient and cost-effective test method to conduct in-use compliance testing of

HDDEs. This new testing method requires manufacturers to emissions test a set number of selected heavy-duty trucks each year using PEMS. Because testing will be conducted in the field during normal day-to-day operation rather than in an environmentally controlled laboratory, ARB, U.S. EPA, and the impacted heavy-duty diesel engine manufacturers agreed to determine a "measurement allowance" for each pollutant to account for any potential difference in measurement accuracy. The Southwest Research Institute (SwRI), in San Antonio, Texas, and the University of California's (at Riverside) Center for Environmental Research and Technology (CE-CERT) were contracted to develop PEMS measurement allowances for gaseous and particulate matter emissions. This development work was performed under the direction of a measurement allowance steering committee comprised of members from ARB, U.S. EPA and the heavy-duty diesel engine manufacturers. After a successful completion of a test program to determine gaseous measurement allowances in 2007, the gaseous measurement allowances were adopted by the Board in December 2007.

Description of Proposed Regulatory Action: Following the December 2007 Board hearing, the development work with SwRI and CE-CERT focused on developing an appropriate measurement allowance for particulate matter. This development effort was successfully completed in November 2010. Staff is proposing that the Board adopt a particulate matter measurement allowance value of 0.006 grams per brake horsepower-hour, recommended by SwRI and agreed upon by ARB staff, U.S. EPA, and the heavy-duty diesel engine manufacturers. Staff is proposing the adoption of the particulate matter measurement allowance value through amendments to section 1956.8, title 13, California Code of Regulations, and the incorporated "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as last amended September 27, 2010.

Staff is also proposing other minor amendments to the above test procedures to correct an oversight in a previous rulemaking. Specifically, staff is proposing to add language to the test procedures for the exemption of armored vehicles and workover rigs from the engine shutdown system requirements. In December of 2008, the Board adopted these exemptions in the modification made to section 1956.8, title 13, California Code of Regulations. However, these changes were not included in the incorporated test procedures. The proposed action would rectify this oversight.

COMPARABLE FEDERAL REGULATIONS

Staff is proposing an amendment to adopt a new particulate matter measurement allowance to be used when conducting heavy-duty diesel in-use compliance testing using PEMS. U.S. EPA has already adopted the proposed particulate matter measurement allowance in November 2010, for its identical heavy-duty in-use compliance testing program (revisions to In-Use Testing for Heavy-Duty Diesel Engines and Vehicles; Emissions Measurement and Implementation; Not-to-Exceed Emission Standards; and Technical Amendments for Off-Highway engines; Direct Final Rule. 40 CFR Parts 86, 1033, 1039, 1042, 1045, 1054, and 1065. November 8, 2010).

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the environmental and economic impacts of the proposal. The report is entitled: "Staff Report: Initial Statement of Reasons for the Proposed Rulemaking – Public Hearing to Consider the Adoption of a Particulate Matter Emissions Measurement Allowance for California's Heavy-Duty Diesel In-Use Compliance Regulation."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, on May 5, 2011.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons: Mr. Stephan Lemieux, Manager, On-Road Heavy-Duty Diesel Section, at (626) 450-6162, or Mr. Dipak Bishnu, Air Resources Engineer, On-Road Heavy-Duty Diesel Section, at (626) 575-6696.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Ms. Lori Andreoni, Manager, Board Administration and Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at www.arb.ca.gov/regact/2011/hdiuc11/hdiuc11.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies, private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any

local agency or school district whether or not reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary cost or savings to state or local agencies. The proposed amendments do not affect State or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons and businesses. The ARB is not aware of any cost impacts that a representative private person would necessarily incur in reasonable compliance with the proposed action. The proposed amendments would not have economic impacts on the manufacturers of HDDEs as U.S. EPA has already adopted the proposed measurement allowance for particulate matter.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons. The amendments would apply to all manufacturers of HDDEs and make California requirements consistent with federal law. None of the manufacturers of HDDEs are located in California.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A more detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to title 1, California Code of Regulations, section 4, that the proposed regulatory action would not affect small businesses. There will be no incremental costs associated with staff's proposal in addition to those already needed to comply with the federal regulation.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and comments may be submitted by postal mail or by electronic submittal before the meeting. The public comment period for this regulatory action will begin on May 9, 2011. To be considered by the Board, written comments, not physically submitted at the meeting, must be submitted on or after May 9, 2011 and received **no later than 12:00 noon, June 22, 2011**, and must be addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

New Feature

You can now sign up online in advance to speak at the Board meeting when you submit an electronic board item comment. For more information go to: http://www.arb.ca.gov/board/online-signup.htm

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

ARB requests that written and email statements on this item be filed at least 10 days prior to the hearing so that ARB staff and Board members have additional time to consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

Additionally, the Board requests but does not require that persons who submit written comments to the Board reference the title of the proposal in their comments to facilitate review.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code sections 39600, 39601, 43013, 43018, 43100, 43101, 43104, 43105, and 43806; and Vehicle Code section 28114. This action is proposed to implement, interpret and make specific Health and Safety Code sections 39002, 39003, 39500, 43000, 43013, 43018, 43100, 43101, 43102, 43104, 43106, 43202, 43204, 43206, 43210, 43211, 43212, 43213, and 43806; and Vehicle Code section 28114.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with nonsubstantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15-days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California 95814, (916) 322-2990.

SPECIAL ACCOMMODATION REQUEST

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CALIFORNIA AIR RESOURCES BOARD

James N. Goldstene
Executive Officer

Date: April 26, 2011

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

California Environmental Protection Agency

Air Resources Board

STAFF REPORT: INITIAL STATEMENT OF REASONS

PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PARTICULATE MATTER EMISSIONS MEASUREMENT ALLOWANCE FOR CALIFORNIA'S HEAVY-DUTY DIESEL IN-USE COMPLIANCE REGULATION

Date of Release: May 5, 2011
Scheduled for Consideration: June 23, 2011

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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EXECUTIVE SUMMARY

In 2006, the Air Resources Board (ARB or Board) adopted a new in-use compliance program (ARB (2006)) that allows for a more efficient and cost-effective method to conduct in-use compliance testing of 2007 and newer heavy-duty diesel engines (HDDE). This new program, called the manufacturer-run heavy-duty diesel in-use testing (HDIUT) program, requires HDDE manufacturers to test a set number of their certified engine families each year using portable emission measurement systems (PEMS) installed on selected heavy-duty trucks. The HDIUT program evaluates HDDE compliance with the Not-to-Exceed (NTE) emission test limits for non-methane hydrocarbons, carbon monoxide, oxides of nitrogen, and particulate matter (PM). The NTE emissions test limits are part of the certification requirements for HDDE. The NTE test limits are not associated with a prescribed test cycle, but rather apply to a wide range of engine operation that can be expected to occur during normal highway operation. An engine family that exceeds the in-use NTE limits is subject to remedial action.

The adopted HDIUT program initially incorporated temporary gaseous and PM measurement allowances. Measurement allowances account for the difference between emission measurement error when tested utilizing PEMS and measurement error when tested with laboratory grade instruments in a laboratory setting. Prior to the adoption of the HDIUT rule, an agreement was made with ARB, the United States Environmental Protection Agency (U.S. EPA), and the Engine Manufacturers Association (EMA), along with individual HDDE manufacturers, to fund the development of measurement allowances through two comprehensive research studies: one for gaseous emissions, the other for PM emissions (ARB, U.S. EPA, EMA (2005a)). Accordingly, these research studies were initiated through the guidance of a Measurement Allowance Steering Committee comprised of members from ARB, U.S. EPA, and EMA (ARB, U.S. EPA, EMA (2005b), ARB, U.S. EPA, EMA (2010)). Extensive testing, statistical modeling, and model validation utilizing three different PEMS devices and test methodologies have been completed by the main contractor, Southwest Research Institute (SwRI), in San Antonio, Texas, with the help of the University of California's (at Riverside) Center for Environmental Research and Technology (CE-CERT).

The intent of the research studies was to develop a single set of measurement allowances that would replace the temporary allowances in the adopted rule. A set of gaseous measurement allowances was adopted by the Board in December 2007 after a successful conclusion of the gaseous research study.

A similar research study was initiated with both SwRI and CE-CERT in 2008 to develop a measurement allowance for PM emissions. The PM measurement allowance study was completed in November 2010 (SwRI (2010), CE-CERT (2010)). Based on the results of this study, ARB, U.S. EPA, and EMA agreed on setting a PM measurement allowance value at 0.006 grams per brake horsepower-hour for the HDIUT program.

If adopted, this PM measurement allowance would be added to the NTE PM emission limit to compensate for testing uncertainties when performing compliance testing using PEMS.

Economic and Air Quality Impacts

Staff's proposal would replace the current, temporary PM measurement allowance value with the PM measurement allowance value developed and validated through the extensive research study completed in November 2010 (SwRI (2010), CE-CERT (2010)). Although the proposed PM measurement allowance is more stringent than the temporary allowance previously adopted, U.S. EPA has already adopted the proposed amendment (U.S. EPA (2010)). Therefore, adoption of these proposed amendments would not result in any additional economic impacts from compliance. The impact on air quality is expected to be minimal. No impact on private businesses or persons is expected.

I. INTRODUCTION

This staff report with associated appendices represents the Initial Statement of Reasons (ISOR) for Proposed Rulemaking required by the California Administrative Procedures Act. In this report, the Air Resources Board (ARB or Board) staff presents the proposed adoption of a particulate matter (PM) emissions measurement allowance for California's Heavy-Duty Diesel In-Use Compliance Regulation through amendments to section 1956.8, title 13, California Code of Regulations and the incorporated "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles."[1]

The federal Clean Air Act grants California the authority to adopt and enforce rules to control mobile source emissions within California. In 2006, ARB adopted a new in-use compliance program (ARB (2006)) that allows for a more efficient and cost-effective test method to assess in-use compliance of heavy-duty diesel engines (HDDE). This new testing method, called the manufacturer-run heavy-duty diesel in-use testing (HDIUT) program, requires HDDE manufacturers to test a set number of their certified engine families each year using demonstrated and proven portable emission measurement systems (PEMS).[2] Based on the engine family to be evaluated, heavy-duty trucks are selected and then tested while operating in normal revenue service. An engine family that "fails," based on an established pass/fail protocol, is subject to remedial action. The previous method to conduct in-use compliance testing required the removal of an engine from a selected vehicle and installation of that engine on an engine dynamometer. Such a procedure is very costly and time consuming.

The adopted HDIUT program was developed through a collaborative effort with ARB, the United States Environmental Protection Agency (U.S. EPA), and the Engine Manufacturers Association (EMA), along with individual HDDE manufacturers (ARB, U.S. EPA, EMA (2003)). The success of this testing program primarily depends on ensuring that the PEMS can correctly measure the exhaust emissions from heavy-duty trucks in the field. Compared to a controlled laboratory setting, these in-field instruments can potentially be influenced by uncontrollable factors such as ambient conditions and mechanical vibration. Thus, to address this issue (as well as other testing/protocol issues), the HDIUT program called for a two-year manufacturer-run pilot program focusing on testing issues related to gaseous emissions, followed by another two-year manufacturer-run pilot program focusing on testing issues related to PM emissions. Specifically, the major objective of the pilot programs was to provide HDDE manufacturers time to work out the "bugs" before a fully enforceable in-use compliance program took effect.

To address the accuracy measurement uncertainties related to PEMS, two separate research studies were initiated to specifically determine measurement allowances for

[1] A complete set of the existing test procedures, as amended on September 27, 2010, is available at http://www.arb.ca.gov/msprog/onroadhd/hddtps_clean_warranty_12-10.pdf.

[2] PEMS units must meet the requirements of 40 CFR 1065 Subpart J.

each pollutant by accounting for any potential difference in measurement accuracy between PEMS and laboratory grade instruments (ARB, U.S. EPA, EMA (2005b), ARB, U.S. EPA, EMA (2010)). Under the pilot programs, temporary measurement allowances (in units of grams per brake horsepower-hour (g/bhp-hr)), were used as placeholders until the final measurement allowances were determined.[3] In 2007, the first research study completed its work on developing "final" gaseous measurement allowances.[4] The gaseous measurement allowances were subsequently adopted by the Board in December of that year (ARB (2007)). In 2010, the second research study completed its work on developing a "final" PM measurement allowance, a value of 0.006 g/bhp-hr. The U.S. EPA adopted this measurement allowance in their HDIUT program in November 2010 (U.S. EPA (2010)). ARB staff is now proposing to adopt this PM measurement allowance in its HDIUT program.

II. BACKGROUND

In January 2001, the U.S. EPA adopted new HDDE emission standards, along with the "Not-to-Exceed" (NTE) and other test requirements for 2007 and subsequent model year engines. In October 2001, ARB harmonized with the federal program by adopting identical requirements. The NTE requirement allows testing on an engine dynamometer, chassis dynamometer, or with PEMS during over-the-road operation. The maximum allowable NTE emissions, the NTE limits, when averaged over a minimum time of 30 seconds, must not exceed an emission limit that is a multiple of the Federal Test Procedure (FTP) emission standards. Specifically, the NTE limits apply to non-methane hydrocarbons, carbon monoxide, oxides of nitrogen, and PM. The test procedure for the NTE limits is different from all previous HDDE test procedures in that it is not based on any kind of test cycle, but instead allows testing over a wide range of engine and ambient conditions that can occur under any normal operating conditions. The NTE limits, as well as other provisions of the 2007 HDDE rule, were intended to ensure that engines and vehicles designed to meet the original laboratory-based FTP emission standards continued to effectively control emissions under all driving conditions reasonably expected to occur during normal vehicle use.

In late 2001, EMA challenged ARB's and U.S. EPA's adoption of the NTE limits. This led to lengthy negotiations with the HDDE manufacturers which ultimately resulted in an agreement to develop a manufacturer-run in-use compliance program. Consequently, on May 9, 2003, ARB, the U.S. EPA, and EMA mutually developed a detailed outline (ARB, U.S. EPA, EMA (2003)) for a future regulation for in-use testing of HDDEs. Based on this collaborative effort, U.S. EPA adopted the HDIUT program in June 2005, and, as previously discussed, in September 2006 ARB adopted an identical program (ARB (2006)). As part of this effort, ARB, the U.S. EPA, and EMA agreed to develop an improved set of measurement allowances (i.e., to replace the temporary measurement

[3] These temporary pilot program measurement allowances were adopted by the Board when it adopted the original heavy-duty in-use compliance regulations in 2006. They were: NMHC = 0.17 g/bhp-hr, NOx = 0.50 g/bhp-hr, CO = 0.60 g/bhp-hr, and PM = 0.10 gm/bhp-hr.

[4] The HDIUT program's final gaseous measurement allowances (replacing the temporary gaseous measurement allowances) are: NMHC = 0.01 g/bhp-hr, NOx = 0.15 g/bhp-hr, and CO = 0.25 g/bhp-hr.

allowances), and thus as a supplement to the manufacturer-run pilot programs, the research studies were soon initiated (ARB, U.S. EPA, EMA (2005a)).

In 2005, the gaseous emissions research study got underway through the guidance of a Measurement Allowance Steering Committee (MASC) comprised of members from ARB, U.S. EPA, and EMA (ARB, U.S. EPA, EMA (2005b)). Southwest Research Institute (SwRI) and the University of California's (at Riverside) Center for Environmental Research and Technology (CE-CERT) were selected to conduct the study. The gaseous emissions research study involved extensive engine and environmental testing, statistical modeling, and model validation utilizing three different PEMS devices and methods to determine the lowest measurement allowances. As previously mentioned, following the successful completion of this study, the Board adopted a set of gaseous measurement allowances for the HDIUT program in December 2007 (ARB (2007)).

A similar research study was initiated again with SwRI and CE-CERT in 2008 to develop a measurement allowance for PM emissions (ARB, U.S. EPA, EMA (2010)). This study also involved extensive engine and environmental testing, statistical modeling, and model validation utilizing three different PEMS devices and methods to determine the lowest measurement allowance. The PM measurement allowance study was completed in November 2010 (SwRI (2010), CE-CERT (2010)) and staff's current proposal requests that the Board adopt the PM measurement allowance derived from this study.

III. SUMMARY OF PROPOSAL

A. APPLICABILITY

The proposed amendments to the HDIUT program would apply to PM emissions on engine dynamometer certified 2011 and subsequent model year diesel engines installed in vehicles with gross vehicle weight ratings greater than 8,500 pounds.

B. MEASUREMENT ALLOWANCE

1. OVERVIEW

Under an agreement with ARB, U.S. EPA, and EMA, it was recognized that measurement allowances for each regulated pollutant would need to be developed before an enforceable HDIUT program could commence (ARB, U.S. EPA, EMA (2005a)). The measurement allowance represents the incremental error between measuring emissions under controlled conditions in a laboratory with lab-grade equipment, and measuring emissions in the field using PEMS. Thus, in practical terms, a measurement allowance of "X" would be added to the NTE emission limit plus the in-use compliance testing margin to calculate the

NTE threshold value against which all emission results are compared for compliance determination.

In early 2005, ARB, U.S. EPA, and EMA agreed to use a temporary PM measurement allowance value of 0.10 g/bhp-hr for the PM pilot program (ARB ISOR (2006)). It was also agreed that this value would be revised once the measurement allowance value was determined through a coordinated research study.

To this end, in 2008, ARB, U.S. EPA, and EMA, through the work of the MASC, implemented the PM measurement allowance research study (essentially a continuation of the previously completed gaseous measurement allowance study) with SwRI and CE-CERT (ARB, U.S. EPA, EMA (2010)). As previously mentioned, the research study evaluated three different PEMS devices and test methodologies. Specifically, the PEMS devices included Sensors' Portable Particulate Measuring Device, Horiba's Transient Real Time Particulate Matter Device, and AVL's Micro Soot Sensor. At the time only one of these PEMS devices, AVL's Micro Soot Sensor, successfully passed the model validation phase of the program. However, in parallel with this study, additional testing was conducted by CE-CERT that ultimately led to the validation of Sensors' Portable Particulate Measuring Device. Thus, both AVL's Micro Soot Sensor and Sensors' Portable Particulate Measuring Device are deemed acceptable for conducting PM testing under the HDIUT program.

2. STAFF'S PROPOSAL

Based on the successful completion of the PM measurement allowance research study and on the recommendation of the MASC, an agreement was reached among ARB, U.S. EPA, and EMA on a final PM measurement allowance value of 0.006 g/bhp-hr. The U.S. EPA adopted this PM measurement allowance value in their HDIUT regulation through a Direct Final Rule in November 2010 (U.S. EPA (2010)).

Since ARB's HDIUT program is essentially identical to the U.S. EPA's program, staff is proposing the adoption of a final PM measurement allowance value of 0.006 g/bhp-hr which would replace the temporary PM measurement allowance value (0.10 g/bhp-hr) adopted in the HDIUT program in 2006. The adoption of this final PM measurement value can be accomplished by amending the HDDE test procedures: "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as last amended September 27, 2010. Section 1956.8, title 13, California Code of Regulations, which incorporates the above HDDE test procedure, would also be amended to reflect the updated test procedures.

Staff is also proposing other minor amendments to the above test procedures to correct an oversight in a previous rulemaking. Specifically, staff is proposing to

add language to the test procedures for the exemption of armored vehicles and workover rigs from the engine shutdown system requirements. In December 2008, the Board adopted these exemptions in the modification made to section 1956.8, title 13, California Code of Regulations (ARB (2008)). However, staff did not include these changes to the incorporated test procedures. This proposed action would rectify this oversight.

The proposed PM measurement allowance used for measuring PM emissions is necessary for the successful implementation of California's heavy-duty diesel in-use compliance regulations. Specifically, the use of a PM measurement allowance when conducting in-use testing of 2011 and newer HDDEs will allow for an effective and enforceable in-use compliance program for HDDEs and ensure that the PM emission benefits expected from the adopted HDDE emission standards are realized.

IV. COMPARISON BETWEEN CALIFORNIA AND FEDERAL REGULATIONS

The U.S. EPA has already adopted staff's proposed PM measurement allowance in November 2010 through a Direct Final Rule (U.S. EPA (2010)). With regard to the HDIUT program in general, U.S. EPA's and ARB's programs are identical. Specifically, the engine family selection, test vehicle selection, testing protocol, test data collection and reporting (including gaseous and PM measurement allowances), pass/fail criteria, etc., are all identical to the U.S. EPA's rule. One difference in ARB's program is that ARB also has the authority to independently pursue remedial action on a non-complying engine family. This authority to enforce its own regulations is consistent with all ARB programs.

V. ECONOMIC IMPACTS

A. LEGAL REQUIREMENTS

The economic impacts analysis shown in this report was conducted to meet current legal requirements under the Administrative Procedures Act. Government Code section 11346.3 requires state agencies adopting and amending any administrative regulation to identify and assess any potential for adverse economic impacts on California businesses and individuals. State agencies are also required to estimate the cost or savings to any state or local agency and school districts. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with business in other states.

State agencies are also required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or

saving to the local agencies and the cost or saving in federal funding to the State. These issues are addressed below.

B. AFFECTED BUSINESSES

Because U.S. EPA has already adopted the proposed amendments (U.S. EPA (2010)) and HDDE manufacturers produce engines for a single, national market, there would be no additional or incremental costs associated with adopting these proposed amendments and no impact on private businesses or persons who purchase these engines is expected. Also, there is no impact expected on PEMS manufacturers.

C. POTENTIAL COSTS TO ENGINE MANUFACTURERS

As stated above, because U.S. EPA has already adopted this PM measurement allowance, staff expects no additional incremental costs on the HDDE manufacturers associated with ARB's adoption of the same PM measurement allowance value.

D. POTENTIAL IMPACTS ON BUSINESS COMPETITIVENESS

The proposed regulation amends an existing regulation by replacing a temporary measurement allowance and is not expected to adversely impact the ability of California businesses to compete with similar businesses in other states, due to similar federal regulation.

E. POTENTIAL IMPACTS ON JOBS AND BUSINESS CREATION, ELIMINATION, OR EXPANSION

The proposed regulation is not expected to significantly impact the creation, elimination or expansion of jobs and businesses in California beyond what is already covered by the adoption of the existing HDIUT program.

F. POTENTIAL COSTS TO LOCAL AND STATE AGENCIES

The proposed amendments to the procedure will not create costs or savings, as defined in Government Code Section 11346.5(a)(6), to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to Part 7 (commencing with Section 17500, Division 4, Title 2 of the Government Code), or other non-discretionary savings to local agencies. The staff has not encountered information that indicates that any of these impacts are to be expected.

No additional net costs for local and state agencies will be accrued as a result of the proposed regulation.

VI. ENVIRONMENTAL IMPACTS

A. AIR QUALITY IMPACTS

The California Environmental Quality Act and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Public Resources Code, Section 21080.5 allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report once the Secretary for Resources has determined that the agency meets the criteria for a Certified State Regulatory Program (Title 14, California Code of Regulations, section 15250). The Secretary for Resources has certified ARB's program for the adoption of regulations (Title 14, California Code of Regulations, section 15251(d)). This certification allows ARB to include an environmental analysis in the Initial Statement of Reasons for the adoption of the regulations, in lieu of preparing an environmental impact report or negative declaration. In addition, ARB will respond in writing to all significant comments that pertain to potential environmental impacts raised by the public during the public review period or at the Board hearing. These responses will be contained in the Final Statement of Reasons for the regulation.

Staff evaluated the potential environmental impacts from the proposed regulation and determined that no significant adverse environmental impacts are likely to result from the proposal. Further, staff has determined that adoption of the proposed regulation will not result in any significant adverse impacts on water quality, land, or biological resources.

This determination was made because the proposed regulation requires only the implementation of the adopted HDIUT program, which will ensure that the expected emission benefits of 2007 HDDE standards are realized. The HDIUT program will encourage HDDE manufacturers to design and build robust engines and emission control systems to comply with the emission requirements during their useful life in order to avoid failure of in-use compliance testing which could ultimately lead to costly recalls or extended parts warranties. These activities produce no adverse environmental impacts, and there may be slight improvement in air quality due to the adoption of a more stringent PM measurement allowance for the HDIUT program.

B. ENVIRONMENTAL JUSTICE

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Senate Bill 115, Solis; Stats 1999, Ch. 690; Government Code § 65040.12(c)). The Board approved Environmental Justice Policies and Actions on December 13, 2001, to establish a framework for incorporating environmental justice into ARB's programs consistent with the directives of State law. The

policies subsequently developed apply to all communities in California, but they recognize that environmental justice issues have been raised more in the context of low income and minority communities, which sometimes experience higher exposures to some pollutants as a result of their proximity to multiple sources of air pollutants.

Actions of the ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving the air quality in California. However, some communities continue to experience higher exposures than others because of the cumulative impacts of air pollution from multiple sources.

Adoption and implementation of this regulation will have no negative environmental impacts on environmental justice communities. The proposed regulation would benefit all Californians by ensuring that HDDEs comply with certification emission standards throughout their useful life. Communities located in proximity to ports, distribution centers, and other areas with high heavy-duty diesel vehicle activity would particularly benefit from the proposed regulation.

VII. REGULATORY ALTERNATIVES

No other alternatives to the proposed requirement have been evaluated since the proposed PM measurement allowance is necessary in order to effectively enforce the PM emission requirements of the adopted HDIUT program.

VIII. REMAINING, NON-CONTROVERSIAL ISSUES

There are no specific issues, controversial or otherwise, related to this proposal or its potential impact on the implementation of the adopted HDIUT program.

IX. SUMMARY AND RATIONALE FOR PROPOSED REGULATIONS

The proposed regulation, "Adoption of a Particulate Matter Emissions Measurement Allowance for California's Heavy-Duty Diesel In-Use Compliance Regulation," would allow for the enforcement of in-use compliance of heavy-duty diesel trucks under the HDIUT program. The proposed amendments would establish and finalize the PM measurement allowance for the HDIUT program adopted in 2006 and correct the test procedures to reflect exemptions adopted by the Board in December 2008.

Summary of Section 1956.8(b).

This provision sets forth the test procedures for determining compliance with HDDEs and vehicle standards. The proposed amendment to this provision

updates the date of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" to reflect the proposed amendments to those test procedures.

Rationale for Section 1956.8(b).

This provision is necessary to inform HDDE manufacturers which test procedures they must use to comply with the HDIUT regulations. The amendment to this provision is needed to ensure that HDDE manufacturers are utilizing the most recently adopted "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles."

X. STAFF RECOMMENDATIONS

The proposed PM measurement allowance used for measuring PM emissions is necessary for the successful implementation of California's heavy-duty diesel in-use compliance regulations. Specifically, the use of a PM measurement allowance when conducting in-use testing of 2011 and newer HDDEs would allow for an effective and enforceable in-use compliance program for HDDEs and ensure that the PM emission benefits expected from the adopted HDDE emission standards are realized.

Staff therefore recommends that the Board adopt the proposed PM measurement allowance for PM emissions, as set forth in the amendments to section 1956.8, title 13, California Code of Regulations, and the incorporated "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," attached hereto as Appendices A and B, respectively.

XI. REFERENCES

ARB, U.S. EPA, EMA (2003). Outline of Regulatory Proposal (NPRM) for Manufacturer-Run In-Use Heavy-Duty Vehicle NTE Testing Program, May 9, 2003. http://www.epa.gov/otaq/regs/hd-hwy/ncp/heavy-duty-outline-revised-final.pdf (accessed April 20, 2011).

ARB, U.S. EPA, EMA (2005a). Memorandum of Agreement, Program to Develop Emission Measurement Accuracy Margins for Heavy-Duty In-Use Testing, May 2005. http://www.epa.gov/otaq/regs/hd-hwy/inuse/moa.pdf (accessed April 20, 2011).

ARB, U.S. EPA, EMA (2005b). Test Plan to Determine PEMS Measurement Allowances for the Gaseous Emissions Regulated under the Manufacturer-Run Heavy-Duty Diesel Engine In-Use Testing Program, May, 2005. http://www.epa.gov/otaq/regs/hd-hwy/inuse/testplan.pdf (accessed April 20, 2011).

ARB (2006). (a) Air Resources Board Resolution 06-27, September 28, 2006. http://www.arb.ca.gov/regact/inuse06/res0627.pdf (accessed April 20, 2011); (b) Final Regulation Order, California's Heavy-Duty Diesel In-Use Compliance Regulation, California Code of Regulations, title 13, sections 1956.1 and 1956.8 (effective October 11, 2007). http://www.arb.ca.gov/regact/inuse06/fro.pdf (accessed April 20, 2011).

ARB ISOR (2006). Staff Report: Initial Statement of Reasons for Rulemaking. Public Hearing to Adopt California's Heavy Duty Diesel In-Use Compliance Regulation. California Air Resources Board. August 11, 2006. http://www.arb.ca.gov/regact/inuse06/isor.pdf (accessed April 20, 2011).

ARB (2007). (a) Air Resources Board Resolution 07-56, December 6, 2007. http://www.arb.ca.gov/regact/2007/hdiuc07/res0756.pdf (accessed April 20, 2011); (b) Final Regulation Order, Gaseous Pollutant Measurement Allowances for California's Heavy-Duty Diesel In-Use Compliance Regulation, California Code of Regulations, Title 13, section 1956.8 (effective December 31, 2008). http://www.arb.ca.gov/regact/2007/hdiuc07/hdiucfro07.pdf (accessed April 20, 2011).

ARB (2008). (a) Air Resources Board Resolution 08-43, December 12, 2008. http://www.arb.ca.gov/regact/2008/truckbus08/res0843.pdf (accessed April 20, 2011); (b) Final Regulation Order, Exhaust Emission Standards and Test Procedures – 1985 and Subsequent Model Heavy-Duty Engines and Vehicles, California Code of Regulations, Title 13, section 1956.8 (effective January 8, 2010). http://www.arb.ca.gov/regact/2008/truckbus08/regpart7.pdf (accessed April 20, 2011).

ARB, U.S. EPA, EMA (2010). Test Plan to Determine PEMS Measurement Allowances for the PM Emissions Regulated under the Manufacturer-Run Heavy-Duty Diesel Engine In-Use Testing Program, August 2010.

http://www.epa.gov/otaq/regs/hd-hwy/inuse/420b10901.pdf (accessed April 20, 2011).

CE-CERT (2010). Final Report, Validation Testing for PM-PEMS Measurement Allowance Program, November 2010.

SwRI (2010).. PM-PEMS Measurement Allowance Determination, Final Report, June 2010.
http://www.epa.gov/otaq/regs/hd-hwy/inuse/420r10902.pdf (accessed April 20, 2011).

U.S. EPA (2010). Revisions to In-Use Testing for Heavy-Duty Diesel Engines and Vehicles; Emissions Measurement and Instrumentation; Not To Exceed Emission Standards; and Technical Amendments for Off-Highway Engines, Direct Final Rule. 40 CFR Parts 86, 1033, 1039, 1042, 1045, 1054, and 1065. United States Environmental Protection Agency. November 8, 2010.
http://www.gpo.gov/fdsys/pkg/FR-2010-11-08/pdf/2010-27892.pdf (accessed April 20, 2011).

APPENDIX A

PROPOSED REGULATION ORDER

Amend the following section of title 13, California Code of Regulations, to read as set forth in the following pages:

§1956.8	Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Engines and Vehicles

PROPOSED REGULATION ORDER

Set forth below are the proposed amendments to title 13, of the California Code of Regulations. Proposed amendments are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Subsections for which no changes are proposed in this rulemaking are indicated with [No change].

Amend Division 3, Chapter 1, Article 2, section 1956.8, title 13, California Code of Regulations to read as follows:

§ 1956.8. Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Engines and Vehicles.

(a) [No change.]

(b) *Test Procedures.* The test procedures for determining compliance with standards applicable to 1985 and subsequent model heavy-duty diesel engines and vehicles and the requirements for participation in the averaging, banking and trading programs, are set forth in the "California Exhaust Emission Standards and Test Procedures for 1985 through 2003 Model Heavy-Duty Diesel Engines and Vehicles," adopted April 8, 1985, as last amended December 12, 2002, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," adopted December 12, 2002, as last amended ~~September 27, 2010~~ [insert date of amendment for this rulemaking], and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, which are incorporated by reference herein.

Sections (c) through (h). [No change.]

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 39002, 39003, 39500, 43000, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43106, 43202, 43204, 43205.5, 43206, 43210, 43211, 43212, 43213, and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

APPENDIX B

PROPOSED AMENDMENTS TO THE CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

PROPOSED

State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

Adopted:	December 12, 2002
Amended:	July 24, 2003
Amended:	September 1, 2006
Amended:	July 26, 2007
Adopted:	October 17, 2007
Amended:	October 14, 2008
Amended:	September 27, 2010
Amended:	(insert date of finalized amendment)

NOTE: The proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as last amended September 27, 2010. [No change] indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "* * * *". A complete set of the test procedures, as amended on September 27, 2010, is available at http://www.arb.ca.gov/msprog/onroadhd/hddtps_clean_warranty_12-10.pdf.

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

The following provisions of Subparts A, I, N, S, and T, Part 86, and of Subparts A through K, Part 1065, Title 40, Code of Federal Regulations, as adopted or amended by the U.S. Environmental Protection Agency on the date set forth next to the applicable section listed below, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty diesel engines and vehicles, are adopted and incorporated herein by this reference as the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," except as altered or replaced by the provisions set forth below.

PART 86 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS.

* * * * *

Subpart A - General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, Light-Duty Trucks, and Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy-Duty Vehicles.

1. General Applicability. [86.xxx-1]

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2. Definitions. [§86.xxx-2]

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B. California Provisions.

"Administrator" means the Executive Officer of the Air Resources Board.

"Certificate of Conformity" means "Executive Order" certifying vehicles for sale in California.

"Certification" means certification as defined in Section 39018 of the Health and Safety Code.

"EPA" shall also mean Air Resources Board or Executive Officer of the Air Resources Board.

"EPA Enforcement Officer" means the Executive Officer or his delegate.

"Measurement allowance" means accuracy margin.
"Medium-duty engine" means a heavy-duty engine that is used to propel a medium-duty vehicle.
"Medium-duty vehicle" means 2004 through 2006 model year heavy-duty low-emission vehicle, ultra-low-emission vehicle, super-ultra-low-emission vehicle or zero-emission vehicle certified to the standards in title 13, CCR, section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2004 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in title 13, CCR section 1956.8(h), having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.
"NTE standard" means NTE emission limit.
"**Warranty period**" [For guidance see title 13, CCR, §2036].

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11. Emission standards for diesel heavy-duty engines and vehicles. [§86.xxx-11]

A. Federal provisions.

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B. California provisions.

1. Urban Bus Standards.

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6. Heavy-Duty Diesel Engine Idling Requirements.

6.1 Engine Shutdown System. The requirements in this subsection apply to engine manufacturers and original equipment manufacturers, as applicable, that are responsible for the design and control of engine and/or vehicle idle controls.

* * * * *

6.2 Exempt Vehicles. Heavy-duty diesel engines to be used in buses as defined in California Vehicle Code §§ 233, 612 and 642, school buses as defined in California Vehicle Code § 545, recreational vehicles as defined in Health and Safety Code 18010, medium duty vehicles as defined in § 1900(b)(13) of title 13, California Code of Regulations (CCR), military tactical vehicles as defined in §1905 of title 13, CCR, ~~and~~ authorized emergency vehicles as defined in California Vehicle Code § 165, armored cars, as defined in California Vehicle Code § 115, and workover rigs, as defined in § 2449 of title 13, CCR are exempted from these requirements.

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II. TEST PROCEDURES

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Subpart N - Emission Regulations for New Otto-Cycle and Diesel Heavy-Duty Engines; Gaseous and Particulate Exhaust Test Procedures

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86.1370-2007 Not-To-Exceed Test Procedures. ~~July 13, 2005~~ November 8, 2010.

A. Federal Provisions.

* * * * *

4.1 Amend subparagraph (d)(1) as follows: Add the following introductory sentence to subparagraph (d)(1): When operated within the Not-To-Exceed Control Area defined in paragraph (b) of this section, diesel engine emissions shall not exceed the applicable Not-To-Exceed Limits specified below when averaged over any time period greater than or equal to 30 seconds, except where a longer minimum averaging period is required by paragraph (d)(2) of this section.

(i) The emission caps specified in this section shall be rounded to the same number of significant figures as the applicable standards in Part I.11 of these test procedures using ASTM E29-93a.

* * * * *

Subpart T - Manufacturer-Run In-Use Testing Program for Heavy-Duty Diesel Engines

86.1901 What testing requirements apply to my engines that have gone into service? ~~June 14, 2005~~. November 8, 2010.

86.1905 How does this program work? ~~March 13, 2008~~ November 8, 2010.

1. Subparagraphs (a) through (f). [No change.]

2. Amend subparagraph (g) as follows: For any communication related to this subpart, contact the On-Road Heavy-Duty Diesel Section Manager, Mobile Source Control Division, Air Resources Board, 9528 Telstar Avenue, El Monte, CA 91731.

* * * * *

86.1910 How must I prepare and test my in-use engines? ~~June 14, 2005~~ November 8, 2010.

86.1912 How do I determine whether an engine meets the vehicle-pass criteria? ~~March 13, 2008~~. November 8, 2010.

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86.1920 What in-use testing information must I report to EPA? ~~June 14, 2005~~ November 8, 2010.

1. Amend subparagraph (a) as follows: Send us electronic reports using an approved information format to Chief, Emission Research and Regulatory Development Branch, Mobile Source Control Division, Air Resources Board, 9528 Telstar Avenue, El Monte, California, 91731. If you want to use a different format, send us a written request with justification.

2. Subparagraphs (b) to (c). [No change.]

3. Amend subparagraph (d) as follows: Send us an electronic notification at inuse@arb.ca.gov describing any voluntary vehicle/engine emission evaluation test you intend to conduct ... [No change to remainder of paragraph.]

4. Amend subparagraph (e) as follows: Send us an electronic notification at inuse@arb.ca.gov within 15 days after your initial review of the test data for a selected engine family indicates that three engines in Phase 1 testing have failed to comply with the vehicle-pass criteria. [No change to remainder of paragraph.]

5. Subparagraphs (f) and (g). [No change.]

86.1930 What special provisions apply from 2005 through ~~2009~~ 2010? ~~March 13, 2008~~ November 8, 2010.

~~86.1935 What special provisions may apply as a consequence of a delay in the particulate matter accuracy margin report for portable emission measurement system? March 13, 2008~~

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PART 1065 – ENGINE-TESTING PROCEDURES.

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Subpart B – Equipment Specifications

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1065.140 Dilution for gases and PM constituents. ~~July 13, 2005~~, November 8, 2010.

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Subpart C – Measurement Instruments

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1065.260 Flame ionization detector. ~~July 13, 2005~~, November 8, 2010.

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1065.290 PM gravimetric balance. ~~July 13, 2005~~, November 8, 2010.
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1065.925 PEMS preparation for field testing. ~~July 13, 2005~~, November 8, 2010.

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TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED AMENDMENTS TO THE AREA DESIGNATIONS FOR STATE AMBIENT AIR QUALITY STANDARDS

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below, to consider adopting amendments to the regulations designating areas of California as attainment, nonattainment, nonattainment-transitional, or unclassified for pollutants with State ambient air quality standards set forth in section 70200 of title 17, California Code of Regulations.

DATE: June 23, 2011

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a one-day meeting of the Board, which will commence at 9:00 a.m., June 23, 2011. This item is scheduled to be heard on the Board's Consent Calendar. All items on the consent calendar will be voted on by the Board immediately after the start of the public meeting. An item will be removed from the consent calendar at the request of a Board member or if someone in the audience would like to speak on that item.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to title 17, California Code of Regulations (CCR), section 60201.

Background: The Board is charged with the responsibility of adopting ambient air quality standards for each air basin in consideration of the public health, safety, and welfare (Health and Safety Code (H&SC) § 39606). To date, the Board has adopted State ambient air quality standards (State Standards) for ten pollutants, set forth in CCR, title 17, section 70200. In addition, H&SC section 39607(e) requires the Board to establish designation criteria which provide the basis for designating areas of California as attainment or nonattainment with respect to the State standards. The designation criteria are set forth in CCR, title 17, sections 70300 through 70306, and appendices 1 through 3 thereof. Based on these designation criteria, H&SC section 39608 further requires ARB to establish and annually review area designations for State standards.

During the annual review, ARB determines whether changes to the existing area designations are warranted, based on an evaluation of recent air quality data.

This year's review of the area designations is based on air quality data from 2007 through 2009. The proposed amendments provide for one change for ozone, as summarized below:

- Designate the Northeast Plateau Air Basin as attainment for ozone. The Air Basin comprises three counties. Siskiyou County is currently designated as nonattainment-transitional, while Lassen and Modoc counties are currently designated as unclassified.

In addition, there are two changes for ozone that occur by operation of law. Under H&SC section 40925.5, changes for ozone between nonattainment and nonattainment-transitional or vice versa, occur by operation of law. While these changes do not require formal ARB action, ARB's designation criteria contain guidelines for confirming such changes. Therefore, staff is proposing that ARB confirm the changes below and modify the designation regulations to reflect these automatic changes.

- Confirm the change in designation for Lake Tahoe Air Basin from nonattainment to nonattainment-transitional.

- Confirm the change in designation for Glenn County in the Sacramento Valley Air Basin from nonattainment-transitional to nonattainment.

COMPARABLE FEDERAL REGULATIONS

There are no comparable federal or local regulations that address area designations for the State (California) standards.

AVAILABILITY OF DOCUMENTS AND CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The Staff Report is entitled: "Initial Statement of Reasons for Proposed Rulemaking: Proposed 2011 Amendments to the State Area Designations and Maps."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strike-out format to allow for comparison with the existing regulations, may be accessed on ARB's website, listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California 95814, (916) 322-2990, on May 5, 2011.

Upon its completion, the Final Statement of Reasons (FSOR) will be available, and copies may be requested from the agency contact persons in this notice, or may be accessed on ARB's website, listed below.

Inquires concerning the substance of the proposed regulations may be directed to the designated agency contact persons: Ms. Gayle Sweigert, Manager, Air Quality Analysis Section, (916) 322-6923, or Ms. Marcella Nystrom, Staff Air Pollution Specialist, Air Quality Analysis Section, at (916) 323-8543.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Ms. Lori Andreoni, Manager, Board Administration and Regulatory Coordination Unit, (916) 322-4011, or Ms. Trini Balcazar, Regulations Coordinator, (916) 445-9564. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB website for this rulemaking at http://www.arb.ca.gov/regact/2011/area11/area11.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

The proposed amendments to the area designation regulations do not contain any requirements for action. The area designations are simply labels that describe the healthfulness of the air quality in each area. Because these regulations by themselves contain no requirements for action, they have no direct economic impact, and the following general determinations are appropriate.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary savings to state or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to California Code of Regulations, title 1, section 4, that the proposed regulatory action would not affect small businesses because the proposed regulatory action does not contain any requirements for action.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and comments may be submitted by postal mail or by electronic submittal before the meeting. The public comment period for this regulatory action will begin on May 9, 2011. To be considered by the Board, written comments not physically submitted at the meeting must be submitted on or after May 9, 2011, and received **no later than 12:00 noon, June 22, 2011**, and must be addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

New Feature

You can now sign up online in advance to speak at the Board meeting when you submit an electronic board item comment. For more information go to: http://www.arb.ca.gov/board/online-signup.htm

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released

to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

ARB requests that written and email statements on this item be filed at least 10 days prior to the hearing so that ARB staff and Board members have additional time to consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

Additionally, the Board requests but does not require that persons who submit written comments to the Board reference the title of the proposal in their comments to facilitate review.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39600, 39601, 39607, 39608, and 40925.5. This action is proposed to implement, interpret, and make specific Health and Safety Code, sections 39607, 39608, and 40925.5.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California 95814, (916) 322-2990.

SPECIAL ACCOMMODATION REQUEST

Special accommodation or language needs can be provided for any of the following:

- An interpreter to be available at the hearing;
- Have documents available in an alternate format (i.e. Braille, large print, etc.) or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Comodidad especial o necesidad de otro idioma puede ser proveído para alguna de las siguientes:

- Un intérprete que esté disponible en la audiencia.
- Documentos disponibles en un formato alterno (por decir, sistema Braille, o en impresión grande) u otro idioma.
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

CALIFORNIA AIR RESOURCES BOARD

James N. Goldstene
Executive Officer

Date: April 26, 2011

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

California Environmental Protection Agency

Air Resources Board



PROPOSED AMENDMENTS TO STATE AREA DESIGNATIONS AND MAPS

2011

May 2011

Proposed 2011 Amendments to State Area Designations and Maps

STAFF REPORT:
Initial Statement of Reasons for Proposed Rulemaking

Release Date: May 5, 2011

California Environmental Protection Agency
Air Resources Board
Planning and Technical Support Division
P. O. Box 2815
Sacramento, California 95812

This document has been reviewed and approved by the staff of the California Environmental Protection Agency, Air Resources Board. Approval does not signify that the contents necessarily reflect the views and policies of the California Air Resources Board.

EXECUTIVE SUMMARY

The Air Resources Board (ARB or Board) has established State ambient air quality standards (State standards or standards) to protect public health and welfare. State law requires ARB to assess the air quality in each area of California and determine whether it meets State standards. These area designations are based on established criteria, ensuring they are made in a consistent manner. Currently, the ARB makes area designations for ten pollutants. ARB reviews the area designations annually, using the most currently available air quality data, thereby ensuring the designations reflect the healthfulness of air quality. Each area of the State is designated as one of four categories:

- ***Attainment*** – pollutant concentrations do not violate the State standard
- ***Nonattainment*** – pollutant concentrations violate the State standard
- ***Nonattainment-Transitional*** – pollutant concentrations violate the State standard, but air quality is improving
- ***Unclassified*** – insufficient data

Proposed Changes to the Area Designation Regulations

This annual review of the area designations is based on 2007 through 2009 air quality data. Based on these data, ARB staff is proposing the Northeast Plateau Air Basin be redesignated as attainment for ozone. Under State law, this is the only change that requires formal ARB action. In contrast, two additional changes occur by operation of law. These comprise one change from nonattainment to nonattainment-transitional and one change from nonattainment-transitional to nonattainment. ARB staff is proposing the Board confirm these two changes, so they can be reflected in the area designation regulations. All of the proposed changes are summarized in Table ES-1.

Other Information in this Staff Report

As required by State law, this staff report also includes maps and tables identifying the attainment status of each area of the State with respect to the State and national ambient air quality standards (national standards). These maps and tables are provided in Attachment C to this report. They reflect the proposed area designations for State standards that are summarized in this staff report and the current area designations for the national standards.

TABLE ES-1
PROPOSED AREA DESIGNATIONS FOR STATE STANDARDS
(Based on 2007-2009 data)

Pollutant	*Air Basin/County*	*Current Designation*	*Proposed Designation*
Ozone	**Northeast Plateau Air Basin**		
	Lassen County	U	A
	Modoc County	U	
	Siskiyou County	NA-T	
	Lake Tahoe Air Basin		
	Entire Air Basin	N	NA-T*
	Sacramento Valley Air Basin		
	Glenn County	NA-T	N*

Designation Categories:
A = Attainment; N = Nonattainment; NA-T = Nonattainment-Transitional; U = Unclassified.

* Changes in ozone designation from nonattainment to nonattainment-transitional or from nonattainment-transitional back to nonattainment occur by operation of law under Health and Safety Code section 40925.5.

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CHAPTER I

BACKGROUND

A. INTRODUCTION

This chapter provides background information on the differences between the State and national ambient air quality standards, the legal requirements for the State designation criteria and area designation regulations, the implications of the various designation categories, and the public process used in developing the proposed area designation amendments that are described in Chapter III.

B. STATE AND NATIONAL AMBIENT AIR QUALITY STANDARDS

California law requires the Board to establish State ambient air quality standards (State standards or standards) in consideration of public health, safety, and welfare. These standards define the maximum amount of pollutant that can be present in the ambient air. Currently, there are State standards for ten pollutants: ozone, suspended particulate matter (PM_{10}), fine suspended particulate matter ($PM_{2.5}$), carbon monoxide, nitrogen dioxide, sulfur dioxide, sulfates, lead, hydrogen sulfide, and visibility reducing particles. In addition to the State standards, the Federal Clean Air Act requires the United States Environmental Protection Agency (U.S. EPA) to establish national ambient air quality standards (national standards). In some cases, California's State standards are more health-protective than the corresponding national standards. Additionally, the Board has established State standards for pollutants not covered by national standards (for example, sulfates, hydrogen sulfide, and visibility reducing particles).

Both State and national standards are generally specified as a concentration averaged over a specific time period, such as 1-hour, 8-hours, 24-hours, or 1 year. The different averaging times and concentrations are meant to protect against different exposure impacts. Some ambient air quality standards are expressed as a concentration that is not to be exceeded, while others are expressed as a concentration that is not to be equaled or exceeded. The national standards are further categorized as primary standards (established to protect public health) and secondary standards (established to protect public welfare).

C. LEGAL REQUIREMENTS

Health and Safety Code (H&SC) section 39607(e) requires the Board to establish criteria for designating areas as attainment or nonattainment for the State standards and to periodically review these criteria to ensure their continued relevance. The criteria (summarized in Chapter II) describe the procedures that the Board must use in

determining area designations for State standards. The Board originally adopted the required designation criteria in June 1989 and has amended them several times since, most recently, in March 2010.

H&SC section 39608 requires the Board to use the designation criteria to designate areas of California as attainment, nonattainment, or unclassified for the State standards. In addition, HS&C section 40925.5 provides a mechanism for redesignating a nonattainment district as nonattainment-transitional for ozone. Finally, H&SC section 39608 requires the Board to conduct an annual review of the area designations and update them, as warranted. The area designations are made for each of the ten pollutants listed previously.

In addition to the designation criteria and area designation requirements, H&SC section 40718 requires the Board to publish maps showing the areas with one or more violations of any State or national standard. The maps and summary tables provided in Attachment C to this report fulfill this requirement by indicating the attainment status of each area of the State. The maps and tables for the State standards reflect the proposed area designation changes described in Chapter III of this report. The maps and tables for the national standards reflect the current federal area designations, as promulgated by U.S. EPA. Attachment C also contains a table listing the State and national standard levels, averaging times, and analytical measurement methods.

D. PUBLIC PROCESS

In order to facilitate public comment during the designation review process, ARB staff requested public input in a number of ways. After ARB staff's initial review of the 2007 through 2009 air quality data, staff noted potential changes to the existing area designations for ozone. Staff contacted the affected air pollution control and air quality management districts (districts) to discuss the results of the review and provide an opportunity for district input. Staff also maintained a web-based subscriber notification process or listserve. For those who subscribe, the listserve provides electronic updates related to area designation issues.

On March 1, 2011, staff announced a public workshop scheduled for March 16, 2011. Staff notified the affected districts, as well as subscribers to the designation listserve. The workshop announcement included a discussion of the staff's proposed amendments to the area designations based on the 2007 through 2009 air quality data. Approximately 15 people participated in the workshop. The proposed amendments described in this report incorporate comments received from the public. The Board is scheduled to consider these amendments at a public hearing on June 23, 2011.

CHAPTER II

AREA DESIGNATION CRITERIA

A. INTRODUCTION

This chapter provides a summary of the existing designation criteria. The following sections describe the general provisions of the criteria, the area designation categories, the data requirements, the size of the designated area, and the requirements for identifying highly irregular or infrequent events. Attachment A contains the full text of the designation criteria.

B. GENERAL PROVISIONS OF THE DESIGNATION CRITERIA

The designation criteria describe the procedures ARB must use in determining an area's designation status with respect to the State standards. In summary, the designation criteria specify:

- The requirements for each designation category
- The data to use in making area designations
- The procedure for excluding qualifying high concentrations
- The size of the designated area
- The requirement for an annual review of the area designations

C. DESIGNATION CATEGORIES

The designation criteria specify four designation categories: nonattainment, nonattainment-transitional, attainment, and unclassified. Determining which category is appropriate for an area is generally based on the number of violations in the area. Therefore, it is essential to understand the difference between an exceedance and a violation. An exceedance is any concentration that is higher than the level of the State standard. In contrast, violations are a subset of exceedances. A violation is an exceedance that is not affected by a highly irregular or infrequent event and therefore, cannot be excluded from the area designation process (refer to Section F, below).

Nonattainment. The Board designates an area as nonattainment for a pollutant if air quality data show a State standard for that pollutant was violated one or more times during the previous three calendar years.

Nonattainment-Transitional. The nonattainment-transitional category is a subcategory of nonattainment, and there are different requirements for ozone than there are for the other pollutants. For pollutants other than ozone, the Board designates an area as nonattainment-transitional if air quality data show a State standard for that pollutant was violated two or fewer times at each site in the area during the most recent calendar year. In contrast, the nonattainment-transitional requirements for ozone are specified in State law rather than in the designation criteria. Specifically, H&SC section 40925.5 specifies that a nonattainment district is designated as nonattainment-transitional for ozone if air quality data show three or fewer exceedances of the State standard at each site in the area during the most recent calendar year.

There are four key differences in the ozone nonattainment-transitional requirements, compared with those for the other pollutants. First, the designated area is always a district (or portion of a district within an air basin), rather than an air basin, county, or other geographic area. Second, the designation is based on exceedances, which means all air quality measurements are considered -- none are excluded. Third, only nonattainment districts may be designated as nonattainment-transitional for ozone. Finally, the ozone nonattainment-transitional designation occurs by operation of law. However, ARB confirms the change based on guidelines set forth in the designation criteria. ARB also amends the area designation regulations to reflect the change.

Attainment. In contrast to nonattainment and nonattainment-transitional, ARB designates an area as attainment for a pollutant if data show the State standard was not violated during the previous three calendar years. Data used for an attainment designation must be representative of the averaging time of the standard and complete for the time period evaluated.

Unclassified. Finally, ARB designates an area as unclassified for a pollutant if the available data are insufficient to support any other designation category.

D. DATA REQUIREMENTS

To the extent possible, the area designations are based on the most recent air quality data. These must be data for record, which means they satisfy specific siting and quality assurance procedures established by the U.S. EPA and ARB. Generally, data for record are those data collected by or under the direction of ARB or the local districts. Air quality data from other sources may also qualify as data for record, as long as the same requirements are met. For area designation purposes, air quality measurements and statistics are rounded to the precision of the State standard before being compared with the standard. The rounding convention is summarized in Attachment D.

When adequate and recent air quality data are not available, ARB may use other types of information to determine an appropriate area designation. These other types of information may include historical air quality data, emissions data, meteorological data, topographical data, and data relating to the characteristics of population or emissions.

E. SIZE OF DESIGNATED AREA

The size of the area designated for a pollutant varies, depending on the nature of the pollutant, the location of contributing emissions sources, meteorology, and topographic features. An air basin is the area generally designated for pollutants with a regional impact: ozone, nitrogen dioxide, sulfates, and visibility reducing particles. A county (or portion of a county located within an air basin) is generally the area designated for pollutants with a more localized impact: carbon monoxide, sulfur dioxide, lead, and hydrogen sulfide. Depending on the area and the characteristics of the emissions sources, PM_{10} and $PM_{2.5}$ may be considered to have either regional or localized impacts. In some cases, ARB may designate a smaller area if it finds that the smaller area has distinctly different air quality.

F. HIGHLY IRREGULAR OR INFREQUENT EVENTS

The designation criteria provide for excluding certain high air quality measurements from the area designation process. More specifically, the criteria provide for excluding exceedances affected by highly irregular or infrequent events, because it is not reasonable to mitigate these exceedances through the regulatory process. Appendix 2 to the designation criteria (refer to Attachment A) defines three types of highly irregular or infrequent events:

- Extreme concentration events
- Exceptional events
- Unusual concentration events

Extreme Concentration Event. An extreme concentration is identified using a statistical procedure. This procedure calculates a concentration that is not expected to be exceeded more than once per year, on average. The calculated value is commonly called the Expected Peak Day Concentration or EPDC. In practice, a pollutant-specific EPDC is calculated for each monitoring site, using air quality data measured at the site during the most recent three calendar years. The EPDC value is rounded to the precision of the State standard and then compared with air quality measurements for the same site, which are also rounded to the precision of the State standard. Measurements that exceed the State standard and are higher than the rounded EPDC are excluded from the area designation process; these exceedances are not considered violations of the standard. In contrast, measurements that exceed the State standard but are equal to or lower than the rounded EPDC are not excluded from the designation process; these values are considered violations of the State standard.

In cases where data are not complete for the three-year period being evaluated, the EPDC may not be valid for area designation purposes. If the EPDC is not valid, no measurements are excluded as extreme concentration events. Finally, an EPDC is calculated only for standards with an averaging time less than 24-hours.

Exceptional Event. In contrast to an extreme concentration event, an exceptional event is an exceedance of a State standard that is caused by a specific, identifiable event and is beyond reasonable regulatory control. An exceptional event may be caused by an act of nature (for example, a wildfire or severe windstorm) or it may be of human origin (for example, a chemical spill or industrial accident). Air quality measurements identified as exceptional events are not considered violations and are excluded from the designation process.

Unusual Concentration Event. An unusual concentration is an unexpected or atypical exceedance of a State standard that cannot be identified as an extreme concentration or an exceptional event. Unusual concentrations are identified only for areas already designated as attainment or unclassified. Generally, unusual concentrations are identified for sites with limited air quality data, and therefore, uncertainty as to the expected concentration levels. In identifying such events, the Executive Officer must make specific findings based on relevant information. An area may retain its attainment or unclassified designation based on the exclusion of unusual concentrations for up to three consecutive years. If an exceedance occurs during the fourth year, the area is redesignated as nonattainment, unless the exceedance can be excluded as an extreme concentration or an exceptional event.

CHAPTER III

PROPOSED AMENDMENTS TO THE AREA DESIGNATIONS

A. INTRODUCTION

This chapter describes the area designation process and the proposed changes to the area designation regulations. As required by H&SC section 39608, the area designations are reviewed and updated each year, based on air quality data from the most recent three calendar years. This year's review considered air quality data collected during 2007 through 2009. Based on these data, staff proposes several changes for ozone. These changes, listed below, amend the existing CCR, title 17, section 60201. The proposed change for the Northeast Plateau Air Basin requires ARB action and must be approved by the Office of Administrative Law. In contrast, the other two changes occurred by operation of law.

- *Redesignate the Northeast Plateau Air Basin as attainment*
- *Confirm the redesignation of Lake Tahoe Air Basin as nonattainment-transitional; this change occurred by operation of law*
- *Confirm the redesignation of Glenn County in the Sacramento Valley Air Basin as nonattainment; this change occurred by operation of law*

B. DESIGNATION PROCESS

The area designations are based on air quality data for record as defined in section 70301 of the designation criteria (refer to Chapter II Section D). The process used to designate an area is generally the same for each pollutant:

- Gather data for the three-year period for each site in the area
- Evaluate data representativeness and data completeness for each site
- Identify and exclude exceedances affected by highly irregular or infrequent events
- Tabulate the number of exceedances and violations by site
- Determine the designation value for each site
- Determine the designation value for the area
- Determine the appropriate designation category

Determining the designation value is the most critical part of the designation process because the designation value determines the designation category. More detail about the designation value and how it is determined, is found in the following section.

C. DESIGNATION VALUE

The designation value is the measured concentration that is used to determine the designation status of a given area. In practice, the designation value is the highest measured concentration in the three-year period that remains, after excluding concentrations affected by highly irregular or infrequent events.

A designation value is determined for each pollutant, for each monitoring site in an area. The highest designation value for any site in the area becomes the designation value for the area. When there is more than one standard for a single pollutant, a designation value is determined for each standard averaging time. For example, there is both a 1-hour and an 8-hour State standard for ozone. As a result, there is a 1-hour designation value, as well as an 8-hour designation value. The final area designation reflects the more stringent designation category for either of the two averaging periods. Using ozone as an example, consider an area with a 1-hour ozone designation value that is lower than the State standard, indicating attainment and an 8-hour designation value that is higher than the State standard, indicating nonattainment. In this case, the area would be designated as nonattainment for ozone, because that is the more stringent designation category.

D. OZONE

The State ozone standards are a 1-hour standard of 0.09 parts per million (ppm) and an 8-hour standard of 0.070 ppm, neither to be exceeded. To be attainment, the designation values for all sites in the area must be at or below both standards. Based on data collected during 2007 through 2009, the staff recommends a change in designation for three areas.

1. Northeast Plateau Air Basin

The staff recommends designating Northeast Plateau Air Basin as attainment for ozone. The Northeast Plateau Air Basin includes three counties: Siskiyou, Lassen, and Modoc. Currently, Siskiyou County is designated as nonattainment-transitional, while Lassen and Modoc counties are designated as unclassified. During 2007 through 2009, monitoring data are available for one site in the Air Basin, located at Yreka-Foothill Drive in Siskiyou County. Yreka represents the most urbanized portion of the Air Basin and reflects the highest ozone concentrations expected in the area. As a result, the site can be used to represent all three counties in the Northeast Plateau Air Basin.

An attainment designation must be based on representative and complete data. Although the ozone data collected at Yreka are representative, they are not available for all 36 months during the 2007 through 2009 time period. However, the data are complete for the ozone season during each of the three years. Based on these

complete data, ARB staff calculated an 8-hour EPDC value of 0.075 ppm for Yreka. This represents a very conservative value, because it is based only on data for the ozone season, when concentrations are highest. Thus, the approach is more stringent than what is required by the designation criteria.

Under the designation criteria, concentrations that are higher than the EPDC are excluded from the designation process as extreme concentrations. Between 2007 and 2009, only one exceedance of the State 8-hour ozone standard was recorded – a value of 0.076 ppm. This value is higher than the calculated EPDC value (0.075 ppm), and is, therefore, excluded. Based on the remaining data, the 8-hour designation value for the Yreka site is 0.067 ppm, which is below the level of the State 8-hour standard. Similarly, Yreka attains the State 1-hour ozone standard, as the highest measured value (0.08 ppm) is also below the level of the standard. Based on these values, Siskiyou County qualifies as attainment for ozone. Furthermore, because concentrations in the remaining portions of the Air Basin are expected to be lower, ARB staff recommends the entire Northeast Plateau Air Basin be designated as attainment for the State ozone standards.

2. Lake Tahoe Air Basin

The staff recommends confirming the change in designation for Lake Tahoe Air Basin to nonattainment-transitional and amending the area designation regulations to reflect this change that occurred by operation of law. Lake Tahoe Air Basin includes portions of El Dorado and Placer counties and is currently designated as nonattainment. During 2007 through 2009, monitoring data are available for one site, located in South Lake Tahoe. Data for the South Lake Tahoe-Airport site are both representative and complete, and they reflect a location expected to have the highest ozone concentrations in the Air Basin. The 8-hour designation value for the South Lake Tahoe-Airport site is 0.077 ppm, which is above the State 8-hour ozone standard. However, there was only one 8-hour exceedance during 2009. The 1-hour designation value is 0.09 ppm, which does not exceed the State 1-hour standard. Based on these values, the Air Basin meets the requirements for nonattainment-transitional.

As mentioned above, the change to nonattainment-transitional, which is a subcategory of nonattainment, occurred by operation of law, based on data collected during 2009. As of November 1, 2009, the South Lake Tahoe-Airport site closed, and ozone monitoring stopped. There are preliminary plans to establish and operate ozone monitoring sites in the Tahoe City and Kings Beach areas of the Air Basin. However, under section 70304 (d) of the designation criteria (refer to Attachment A), the area will continue to have a nonattainment designation until such time as another monitoring site is identified as having ozone concentrations equivalent to or higher than the South Lake Tahoe-Airport site.

3. Glenn County (Sacramento Valley Air Basin)

ARB staff recommends confirming the change in designation for Glenn County to nonattainment and amending the area designation regulations to reflect this change that occurred by operation of law. Glenn County is located in the Sacramento Valley Air Basin and is currently designated as nonattainment-transitional. During 2007 through 2009, monitoring data are available for a site located in Willows. Although measured concentrations do not exceed the State 1-hour ozone standard, concentrations exceed the 8-hour standard. The 8-hour designation value is 0.075 ppm, which is above the State 8-hour ozone standard, and there were four exceedance days during 2009. Therefore, Glenn County no longer qualifies as nonattainment-transitional and reverts to nonattainment by operation of law.

CHAPTER IV

ALTERNATIVES TO THE PROPOSED AMENDMENTS

State law (H&SC section 39607(e)) requires the Board to establish criteria for designating areas as attainment, nonattainment, or unclassified for the State standards. State law (H&SC section 39608(c)) further requires the Board to use the designation criteria in an annual review of the area designations.

ARB staff's proposed amendments to the area designations are described in Chapter III. The proposed amendments reflect the application of the designation criteria set forth in CCR, title 17, sections 70300 through 70306 and Appendices 1 through 3, thereof. Each proposed change is accompanied by a discussion of its basis and justification. ARB staff have considered the potential alternatives to the proposed amendments (namely, the no action alternative). However, based on the available data, ARB staff find the proposed amendments are more appropriate than the no action alternative because the no action alternative would not be consistent with State law. In addition, the no action alternative would not inform the public about the healthfulness of air quality, based on the most recent data.

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CHAPTER V

IMPACTS OF THE PROPOSED AMENDMENTS

A. ECONOMIC IMPACTS

ARB staff do not expect the proposed amendments to have any adverse impacts on California employment, business status, or competitiveness.

1. Legal Requirement

The Government Code requires State agencies proposing to adopt or amend any administrative regulation to assess the potential for adverse economic impact on California business enterprises and individuals. The assessment shall include consideration of the impact of the proposed regulatory amendments on California jobs, business expansion, elimination, or creation, and the ability of California businesses to compete in other states.

State agencies are also required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance. This estimate is to include non-discretionary costs or savings to local agencies and the costs or savings in federal funding to the State.

2. Potential Impact on Businesses, Business Competitiveness, Employment, and Business Creation, Elimination, or Expansion

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed amendments are presented below.

The proposed amendments to the area designation regulations do not contain any requirements for action. The area designations are simply labels that describe the healthfulness of the air quality in each area, although subsequent requirements for action may result after additional steps, such as plan preparation and approval, are taken. Because the area designation regulations by themselves contain no requirements for action, they have no direct economic impact, and the following general determinations are appropriate.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer also has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action will not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will not affect small businesses because the proposed regulatory action does not contain any requirements for action.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the agency, or that has otherwise been identified and brought to the attention of the agency, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action.

3. Potential Cost to Local and State Agencies

Similar to the previous discussion, the area designations do not contain any requirements for action, and these regulations have no direct economic impact. Therefore, pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State under Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code, or other nondiscretionary savings to State or local agencies.

Before taking final action on the proposed amendments to the regulations, the Board must determine that no alternative considered by the agency would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

CHAPTER VI

ENVIRONMENTAL IMPACTS AND ENVIRONMENTAL JUSTICE

A. INTRODUCTION

The intent of the proposed regulatory action is to identify areas with unhealthy ambient air quality. Adopting the proposed amendments to the area designations will not result in any direct impact on public health or the environment because the regulations do not contain any requirements for action. However, because State law specifies certain requirements based on an area's designation status, there may be indirect benefits based on the area designations.

B. AIR QUALITY AND ENVIRONMENTAL BENEFITS

The area designations do not contain any requirements for action, and therefore, they will not result in any air quality or environmental benefits. However, the area designations do label areas with respect to the healthfulness of their air quality. Based on these labels, certain planning requirements may come into play, thereby providing some indirect benefits to air quality and the environment.

The proposed amendments to the area designations would change the State ozone designations for three areas. Under State law, there are specific planning requirements for areas designated as nonattainment for ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide, or nonattainment-transitional for ozone and carbon monoxide. Furthermore, areas designated as attainment are required to adopt and implement rules and regulations necessary to maintain attainment status. The goal of these planning requirements is to bring the area into attainment as expeditiously as practicable. Therefore, these requirements will result in air quality and environmental benefits.

C. ENVIRONMENTAL JUSTICE

The Board is committed to evaluating community impacts of proposed regulations, including environmental justice concerns. Because some communities experience higher exposures to air pollutants, it is a priority of the Board to ensure that full protection is afforded to all Californians. The proposed amendments to the area designations do not contain any requirements for action. However, the area designations are designed to identify areas with unhealthful air quality, based on the most recently available data.

Based on an area's designation category, there may be specific planning requirements for improving the level of air quality. These requirements will result in reduced emissions for all nonattainment communities throughout the State. Furthermore,

although State law does not impose any specific planning requirements upon districts with areas designated as attainment or unclassified, State law does require districts and the Board to make a coordinated effort to protect and enhance the ambient air quality (H&SC sections 39001 through 39003). As part of this effort, the districts must adopt rules and regulations sufficiently effective to achieve and maintain the State standards (H&SC sections 40001 and 41500). These requirements will result in improved air quality in communities throughout the State, with associated lower potential health risks.

ATTACHMENT A

AREA DESIGNATION CRITERIA

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AREA DESIGNATION CRITERIA

CALIFORNIA CODE OF REGULATIONS, TITLE 17, DIVISION 3
CHAPTER 1. AIR RESOURCES BOARD
SUBCHAPTER 1.5. AIR BASINS AND AIR QUALITY STANDARDS
ARTICLE 3. CRITERIA FOR DETERMINING AREA DESIGNATIONS
SECTIONS 70300 THROUGH 70306, AND APPENDICES 1 THROUGH 3, THEREOF

§ 70300. General Statement of Purpose.

The objective of these criteria is to guide the Executive Officer or his or her delegate in making designations of areas as attainment, nonattainment, nonattainment-transitional, or unclassified for each of the pollutants for which state ambient air quality standards have been established in Section 70200.

NOTE: Authority cited: Sections 39600, 39601, 39607, 39608, and 40925.5, Health and Safety Code. Reference: Sections 39607, 39608, and 40925.5, Health and Safety Code.

§ 70301. Air Quality Data Used for Designations.

(a) Except as otherwise provided in this article, designations shall be based on "data for record."

(1) Data for record are those data collected by or under the auspices of the state board or the districts for the purpose of measuring ambient air quality, and which the Executive Officer or his or her delegate has determined comply with the siting and quality assurance procedures established in Part 58, Title 40, Code of Federal Regulations or other equivalent procedures.

(2) Any other data which are provided by a district or by any other person will be data for record if the Executive Officer or his or her delegate determines within 90 days of submittal of complete supporting documentation that the data comply with the siting and quality assurance procedures established in Part 58, Title 40, Code of Federal Regulations or other equivalent procedures. If the Executive Officer or his or her delegate finds there is good cause that 90 days is insufficient time to make a determination, he or she may after notification of the person requesting the data review extend the deadline for completion of the data review.

(b) Except as otherwise provided in this article, designations and reviews of designations will be based on data for record for the three calendar years prior to the year in which the designation is made or the annual review of the designation is conducted.

(c) Data as described in section 70301(a)(1) and (2) become data for record upon completion of the Executive Officer's or his or her delegate's review.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 39608, Health and Safety Code.

§ 70302. Geographic Extent of Designations.

(a) An air basin will be the area designated for ozone, nitrogen dioxide, suspended particulate matter (PM10), fine suspended particulate matter (PM2.5), sulfates, and visibility reducing particles. Provided, however, if the Executive Officer or his or her delegate finds (based on air quality data, meteorology, topography, or the distribution of population and emissions) that there are areas within an air basin with distinctly different air quality deriving from sources and conditions not affecting the entire air basin, the Executive Officer or his or her delegate may designate an area smaller than an air basin using political boundary lines to the extent practicable. In designating an area smaller than an air basin as nonattainment, the Executive Officer or his or her delegate will include within the area those sources whose emissions contribute to a violation of a state standard for that pollutant. Contiguous areas which would have the same designation within an air basin will be one designated area.

(b) A county or the portion of a county which is located within an air basin will be the area designated for carbon monoxide, sulfur dioxide, lead (particulate), and hydrogen sulfide. Provided, however, if the Executive Officer or his or her delegate finds (based on air quality data, meteorology, topography, or the distribution of population and emissions) that there are areas within the county with distinctly different air quality, it may designate a smaller area. In designating an area smaller than a county as nonattainment, the Executive Officer or his or her delegate will include within the area those sources whose emissions contribute to a violation of a state standard for that pollutant.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 38608, Health and Safety Code.

§ 70303. Criteria for Designating an Area as Nonattainment.

(a) The Executive Officer or his or her delegate will designate an area as nonattainment for a pollutant if:

(1) Data for record show at least one violation of a state standard for that pollutant in the area, and the measurement of the violation meets the representativeness criteria set forth in "Criteria for Determining Data Representativeness" contained in Appendix 1 to this article; or
(2) Limited or no air quality data were collected in the area, but the Executive Officer or his or her delegate finds, based on meteorology, topography, and air quality data for an adjacent nonattainment area, that there has been at least one violation of a state standard for that pollutant in the area being designated.

(b) An area will not be designated as nonattainment if the only recorded exceedance(s) of that state standard were based solely on data for record determined to be affected by a highly irregular or infrequent event. Data affected by a highly irregular or infrequent event will be identified as such by the Executive Officer or his or her delegate in accordance with the "Air Resources Board Procedure for Reviewing Air Quality Data Possibly Affected by a Highly Irregular or Infrequent Event," set forth in Appendix 2 to this article.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607, and 39608, Health and Safety Code.

§ 70303.1. Criteria for Designating an Area as Nonattainment-Transitional for Pollutants Other than Ozone.

(a) Nonattainment-transitional is a subcategory of the nonattainment designation. The Executive Officer or his or her delegate will identify that portion of a designated area within the district as nonattainment-transitional for a pollutant other than ozone with a state standard averaging time less than or equal to 24 hours and for which samples are routinely collected every day if it finds that:

(1) Data for record for the previous calendar year are consistent with the criteria established in section 70304(a)(2) and show two or fewer days at each site in the area with violations of a state standard for that pollutant (not including exceedances found to be affected by a highly irregular or infrequent event under the procedure set forth in Appendix 2 to this article);

(2) Evaluation of multi-year air quality, meteorological and emission data indicates that ambient air quality either has stabilized or is improving and that every site in the area is expected to reach attainment within three years; and

(3) The geographic extent of the area is consistent with the criteria established in section 70302.

(b) An area designated as nonattainment-transitional for a pollutant is close to attaining the state standard(s) for that pollutant. The nonattainment-transitional designation provides an opportunity for a district to review and potentially to modify its attainment plan. Any modification to an attainment plan must be consistent with state and federal regulations and statutes.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 39608, Health and Safety Code.

§ 70303.5. Requirements for Ozone Nonattainment-Transitional.

(a) If an area within an air basin is designated as nonattainment for ozone, that area is designated as nonattainment-transitional for ozone if the following conditions are met:

(1) The area is an entire district within an air basin, or the area is the entire portion of a district within an air basin consistent with the criteria established in section 70302(a);

(2) Data for record consistent with the criteria established in section 70304(a)(2) are used to determine the number of exceedances for the previous calendar year at each monitoring location in the area;

(3) All data collected during the previous calendar year are considered in the evaluation, including data possibly affected by a highly irregular or infrequent event under the procedure set forth in Appendix 2 to this article;

(4) Each day with concentration(s) that exceed the state ozone standard is counted as one exceedance day; and

(5) No monitoring location in the area has more than three exceedance days during the previous calendar year.

(b) If an area qualifies for designation as nonattainment-transitional for ozone for the previous calendar year under section 70303.5(a), and the Executive Officer or his or her delegate has determined that data for the current calendar year indicate more than three exceedance days at any one monitoring location, that area is designated as nonattainment.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 40925.5, Health and Safety Code. Reference: Sections 39607 and 40925.5, Health and Safety Code.

§ 70304. Criteria for Designating an Area as Attainment.

(a) The Executive Officer or his or her delegate will designate an area as attainment for a pollutant if:

(1) Data for record show that no state standard for that pollutant was violated at any site in the area; and

(2) Data for record meet representativeness and completeness criteria for a location at which the pollutant concentrations are expected to be high based on the spatial distribution of emission sources in the area and the relationship of emissions to air quality. Data representativeness criteria are set forth in "Criteria for Determining Data Representativeness" contained in Appendix 1 to this article. Data completeness criteria are set forth in "Criteria for Determining Data Completeness" contained in Appendix 3 to this article.

(b) Where there are limited or no air quality data for an area, the Executive Officer or his or her delegate will designate the area as attainment for a pollutant if it finds that no state standard for that pollutant has been violated in that area based on:

(1) Air quality data collected in the area during the most recent period since 1980 which meet the conditions in (a) above;

(2) Emissions of that pollutant or its precursors in the area have not increased since that period to a level at which the state standard might be exceeded; and

(3) Air quality data collected in the area since the time period in (1) above do not show a violation of the state standard.

(c) If an area is designated as attainment and now has limited or no air quality data for record for carbon monoxide, nitrogen dioxide, sulfur dioxide, sulfates, or lead (particulate), the Executive Officer or his or her delegate shall continue to designate that area attainment for the respective pollutant if:

(1) Emissions of that pollutant or its precursors in the area have not increased since the area was most recently designated as attainment to a level at which the state standard might be exceeded.

(d) A nonattainment area will not be redesignated as attainment for a pollutant if:

(1) Data for record for the monitoring site showing the greatest violation of a state standard for that pollutant no longer are available; and

(2) No other site has been identified as equivalent by the Executive Officer or his or her delegate.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 39608, Health and Safety Code.

§ 70305. Criteria for Designating an Area as Unclassified.

The Executive Officer or his or her delegate will designate an area as unclassified for a pollutant if it finds that, except as otherwise provided in this article, the data do not support a designation of attainment or nonattainment.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 39608, Health and Safety Code.

§ 70306. Annual Review of Designations.

(a) The Executive Officer or his or her delegate will conduct annual reviews of all designations and will hold a public hearing if requested pursuant to Government Code section 11346.8(a).

(b) Any request for a change in a designation and any submittal of information for purposes of the Executive Officer's or his or her delegate's consideration in the annual review of a designation shall be provided in writing to the Executive Officer no later than May 1 of each year.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 39608, Health and Safety Code.

Appendix 1

Criteria for Determining Data Representativeness

This Appendix describes the criteria to be used in determining the representativeness of individual air quality measurements and statistics for the purpose of designating areas as described in this article. Data representativeness, as that term is used herein, relates to the determination of whether the amount of data reflected in an individual air quality measurement or statistic is sufficient to characterize reliably air quality during the respective averaging time of a state standard. The criteria for determining data representativeness are summarized in the accompanying table and discussed further, below.

Air quality measurements and statistics are usually computed from short term observed values. If all the short term values for the statistical time period are available, the calculated statistic is representative. However, because all the short term values for a given period often are not available, a minimum number of observations are needed to provide reasonable assurance that the calculated measurement or statistic is a reliable estimate for the averaging time specified in the state standard.

In general, air quality measurements and statistics are considered representative if a minimum of 75 percent of all the potential short term values are included and are distributed throughout the entire statistical time period. This 75 percent criteria must be met from the averaging time of the initial measurement, up to and including, the final averaging time reflected by the air quality measurement or statistic. For example, a maximum daily statistic must meet the representativeness criteria specified for a "Day." Because a daily statistic reflects a single day, it does not need to meet the representativeness criteria for any other level (Month, Quarter, or Year). In evaluating data representativeness, all measurements are considered, including those identified as affected by a highly irregular or infrequent event under the "Air Resources Board Procedure for Reviewing Air Quality Data Possibly Affected by a Highly Irregular or Infrequent Event," set forth in Appendix 2 to this article.

Individual air quality measurements and statistics used for designating an area as attainment, nonattainment-transitional, or nonattainment must be representative. Furthermore, to ensure that the the group of air quality measurements or statistics used for designating an area as attainment or nonattainment-transitional reflect the time of day and the season of expected high concentrations, these data must also be complete under the "Criteria for Determining Data Completeness" set forth in Appendix 3 to this article. In contrast, the air quality measurements or statistics used for designating an area as nonattainment are not required to be complete.

Criteria for Representativeness of Air Quality Measurements and Statistics

Representative Calendar Statistic	Sampling Time Period	Basis of Statistic or Requirement	Number of Representative Periods Required
Year	Any		4 representative calendar quarters
Quarter	24-hour	Based on a daily sample	3 representative months
	<24-hours<	Based on a daily statistic; or	69 or more representative calendar days
		Based on hourly samples	1,643 or more hours
Month	24-hour	Based on infrequent sampling (1-in-6 day, 1-in-3 day, 1-in-2 day)	75% of all potential samples
	<24-hours<	Based on a daily statistic; or	23 or more representative calendar days
		Based on all hourly samples; or	548 or more hours
		Based on all 2-hour samples; or	274 or more 2-hour samples
		Based on all 3-hour samples	183 or more 3-hour samples
Day	1-hour		6 or more hours in each 1/3 day (hours 0 thru 7, 8 thru 15, 16 thru 23), & missing no more than 2 consecutive hourly samples
	2-hour	Based on all 2-hour samples	9 or more samples
	3-hour	Based on all 3-hour samples	6 or more samples
	24-hour	Based on daily sample	22 but not more than 26 hours of sampling

Mean of N Hour Period	N	Number of Samples Needed
	24	18 or more hourly samples
	8	6 or more hourly samples
	6	5 or more hourly samples
	4	3 hourly samples
	3	3 hourly samples
	2	2 hourly samples
	1	30 minutes or more of sampling

Appendix 2

Air Resources Board Procedure for Reviewing Air Quality Data Possibly Affected by a Highly Irregular or Infrequent Event

This Appendix describes the procedures that the Air Resources Board will use for reviewing air quality data possibly affected by a highly irregular or infrequent event with regard to the state ambient air quality standards. All decisions regarding the identification of data as being affected by a highly irregular or infrequent event will be made by the Executive Officer or his or her delegate.

The Executive Officer or his or her delegate will review air quality data for possible identification as affected by a highly irregular or infrequent event if the data are the only exceedances of a state ambient air quality standard in the area or if such identification would otherwise affect the designation of the area.

Three types of highly irregular or infrequent events may be identified:

1. Extreme Concentration Event.
2. Exceptional Event.
3. Unusual Concentration Event.

Extreme Concentration Events

An extreme concentration event is an event beyond reasonable regulatory control which causes an exceedance of a state standard. An extreme concentration event is based on a statistical procedure and may not always be linked to a specific identifiable cause. The causes of an extreme concentration event include but are not limited to unusual meteorology.

The steps for identifying an extreme concentration event are:

1. A district (or the Executive Officer or his or her delegate) identifies questionable data.

2. In evaluating a possible extreme concentration event, the Executive Officer or his or her delegate will use the data for the site at which the event is suspected to determine a limit for concentrations expected to recur no more frequently than once in one year. The limit will be determined using the "exponential tail method" described in Procedure for Computing the Values Used in Identifying Extreme Concentration Events (August 1998), which is incorporated by reference herein.

Using conventional rounding procedures, the limit will be consistent with the level of precision in which the state standard is expressed. If the possible extreme concentration exceeds the concentration expected to recur no more frequently than once in one year, the Executive Officer or his or her delegate will consult with the district in identifying the data as affected by an extreme concentration event.

3. When an extreme concentration event is identified, the Executive Officer or his or her delegate will review other information, including but not limited to meteorological data, to determine whether air quality data for other sites in the area were affected by the extreme concentration event.

Exceptional Events

An exceptional event is an event beyond reasonable regulatory control which causes an exceedance of a state standard. An exceptional event must be linked to a specific cause such as an act of nature or unusual human activity. The federal Environmental Protection Agency (EPA) has published guidelines and rules to assist the states in determining exceptional and natural events. These EPA guidelines and rules provide overall criteria for determining whether an event is exceptional with regard to the national standards. The Executive Officer or his or her delegate will use the EPA guidelines and rules as a general basis for reviewing ambient data, but will not be bound by the specific definitions in the EPA guidelines and rules for the various types of exceptional events because those definitions are made on a national basis. In addition, since what may be exceptional in one part of the state may be common in another, each possible event will be evaluated on a case-by-case basis.

The steps for identifying an exceptional event are:

1. A district (or the Executive Officer or his or her delegate) identifies questionable data.

2. If a known exceptional event has occurred, the district gathers relevant data to document the occurrence.

3. If an exceptional event is only suspected, the district investigates available data for the possible event.

4. The district submits to the Executive Officer or his or her delegate a request for identifying the data as affected by an exceptional event and also provides supporting documentation.

5. If the Executive Officer or his or her delegate concurs with the district, he or she will identify the data as affected by an exceptional event.

6. If the district's request for identifying data as affected by an exceptional event cannot be supported, the district will be notified of the reasons. The Executive Officer or his or her delegate will consider any additional data to support the request, but in the absence of any new evidence, will disapprove the request.

Unusual Concentration Events

An unusual concentration event is an event which causes an anomalous exceedance of a state standard and which does not qualify as an extreme concentration event or an exceptional event. An exceedance affected by an unusual concentration event may be identified only for an area designated as attainment or unclassified at the time of the exceedance.

The steps for identifying an unusual concentration event are:

1. A district (or the Executive Officer or his or her delegate) identifies a questionable exceedance(s).

2. If the exceedance(s) has not been identified as having been affected by an extreme concentration event or an exceptional event, and if the area was designated as attainment or unclassified at the time of the exceedance(s), the Executive Officer or his or her delegate will review the exceedance(s) to determine whether it was affected by an unusual concentration event.

3. In evaluating a possible unusual concentration event, the Executive Officer or his or her delegate will consider all relevant information, including but not limited to the amount and characteristics of air quality data, emission data, meteorological data, potential public health and welfare impacts, and any applicable state, district, and federal rules and regulations. To identify the exceedance(s) as affected by an unusual concentration event, the Executive Officer or his or her delegate must find, based on the relevant information, that the impact of the exceedance(s) is limited to the local area, the exceedance(s) is not expected to recur, and that the data do not support a nonattainment designation.

4. If the exceedance(s) qualifies as possibly affected by an unusual concentration event, the Executive Officer or his or her delegate will consult with the district in identifying the exceedance(s) as affected by an unusual concentration event.

5. An area may retain its attainment or unclassified designation based on the identification and exclusion of an exceedance(s) affected by an unusual concentration event for no more than three consecutive years. If the Executive Officer or his or her delegate identifies an exceedance(s) affected by an unusual concentration event in the area in the fourth consecutive year, the area will be redesignated as nonattainment.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 39608, Health and Safety Code.

Appendix 3

Criteria for Determining Data Completeness

This Appendix describes the criteria to be used in determining data completeness for the purpose of designating areas as described in this article. These Criteria for Determining Data Completeness (Completeness Criteria) apply only to air quality data used in designating an area as attainment or nonattainment-transitional. Air quality data used in designating an area as nonattainment do not need to be complete. The purpose of these Completeness Criteria is to specify the minimum amount of data deemed necessary to ensure that sampling occurred at times when a violation is most likely to occur.

After a set or group of air quality measurements or statistics are deemed representative under the Criteria for Determining Data Representativeness set forth in Appendix 1 to this article, they are then evaluated under these Completeness Criteria to ensure that the group of representative measurements or statistics reflect the time of day and the season of the year during which high concentrations are likely to occur.

Complete Data

Data for a site will be complete if there are representative data (as determined in accordance with the Representativeness Criteria in Appendix 1 to this article) during the required hours (see below) of the day during the required months (see below) for the required years (see below).

Required Hours

The hours of potentially high concentration must be included. Unless a detailed evaluation determines different hours to be appropriate for a specific site, these hours are:

Pollutant	*Hours (PST)*
Ozone	9 am - 5 pm
Carbon Monoxide	3 pm - 9 am (next day)
Nitrogen Dioxide	8 am - 8 pm
Visibility Reducing Particles	10 am - 6 pm
Other Pollutants	Throughout day

Required Months

The months of potentially high concentrations must be included. Unless a detailed evaluation determines different months to be appropriate for a specific site, these months are:

Pollutant	*Months*
Ozone	July - September
Carbon Monoxide	January, November - December
Sulfur Dioxide	September - December
Sulfates	January, June - December
Lead (Particulate)	January, November - December
Other Pollutants	January – December

Required Years for an Attainment Designation

The number of years to be included for an attainment designation is:

a) Three; or
b) Two, if during these years the maximum pollutant concentration (not including data found to be affected by a highly irregular or infrequent event under the procedure set forth in Appendix 2 to this article) is less than three-fourths the applicable state ambient air quality standard; or
c) One, if during this year the maximum pollutant concentration (not including data found to be affected by a highly irregular or infrequent event under the procedure set forth in Appendix 2 to this article) is less than one-half the applicable state ambient air quality standard.

NOTE: Authority cited: Sections 39600, 39601, 39607, and 39608, Health and Safety Code. Reference: Sections 39607 and 39608, Health and Safety Code.

ATTACHMENT B

PROPOSED 2011 AMENDMENTS TO
THE AREA DESIGNATIONS

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PROPOSED REGULATION ORDER

CALIFORNIA CODE OF REGULATIONS, TITLE 17, DIVISION 3
CHAPTER 1. AIR RESOURCES BOARD
SUBCHAPTER 1.5. AIR BASINS AND AIR QUALITY STANDARDS
ARTICLE 1.5N AREA POLLUTANT DESIGNATIONS
SECTION 60201

[Note: Additions are shown as *underline italics* and deletions as ~~strikeout~~.]

§ 60201. Table of Area Designations for Ozone.

Area	***Designation***
North Coast Air Basin	Attainment
San Francisco Bay Area Air Basin	Nonattainment
North Central Coast Air Basin	Nonattainment
South Central Coast Air Basin	Nonattainment
South Coast Air Basin	Nonattainment
San Diego Air Basin	Nonattainment
Northeast Plateau Air Basin	*Attainment*
~~Siskiyou County~~	~~Nonattainment-Transitional~~
~~Remainder of Air Basin~~	~~Unclassified~~
Sacramento Valley Air Basin	
~~Glenn County~~	~~Nonattainment-Transitional~~
Colusa, Sutter, and Yuba Counties	Nonattainment-Transitional
Butte, *Glenn,* Shasta, and Tehama Counties	Nonattainment
Placer, Sacramento, Solano, and Yolo Counties	Nonattainment
San Joaquin Valley Air Basin	Nonattainment
Great Basin Valleys Air Basin	
Alpine County	Unclassified
Inyo County	Nonattainment
Mono County	Nonattainment

§ 60201. Table of Area Designations for Ozone (continued)

Area	*Designation*
Mojave Desert Air Basin	Nonattainment
Salton Sea Air Basin	Nonattainment
Mountain Counties Air Basin	
Amador, Calaveras, El Dorado, Nevada, Placer, Mariposa, and Tuolumne Counties	Nonattainment
Plumas and Sierra Counties	Unclassified
Lake County Air Basin	Attainment
Lake Tahoe Air Basin	Nonattainment-*Transitional*

NOTE: Authority cited: Sections 39600, 39601, and 39608, Health and Safety Code. Reference: Sections 39608 and 40925.5, Health and Safety Code.

ATTACHMENT C

MAPS AND TABLES OF AREA DESIGNATIONS FOR STATE AND NATIONAL AMBIENT AIR QUALITY STANDARDS

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ATTACHMENT C

MAPS AND TABLES OF AREA DESIGNATIONS FOR STATE AND NATIONAL AMBIENT AIR QUALITY STANDARDS

This attachment fulfills the requirement of Health and Safety Code section 40718 for the Board to publish maps that identify areas where one or more violations of any State ambient air quality standard (State standard) or national ambient air quality standard (national standard) have been measured. The national standards are those promulgated under section 109 of the federal Clean Air Act (42 U.S.C. 7409).

This attachment is divided into three parts. The first part comprises a table showing the levels, averaging times, and measurement methods for each of the State and national standards. This is followed by a section containing maps and tables showing the 2011 area designations for each pollutant for which there is a State standard in the California Code of Regulations, title 17, section 70200. The last section contains maps and tables showing the most current area designations for the national standards for those pollutants with areas designated as nonattainment.

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15.0 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)	Gas Phase Chemiluminescence	53 ppb (100 µg/m^3) (see footnote 8)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m^3)		100 ppb (188 µg/m^3) (see footnote 8)	None	
Sulfur Dioxide (SO_2)	24 Hour	0.04 ppm (105 µg/m^3)	Ultraviolet Fluorescence	—	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)[9]
	3 Hour	—		—	0.5 ppm (1300 µg/m^3) (see footnote 9)	
	1 Hour	0.25 ppm (655 µg/m^3)		75 ppb (196 µg/m^3) (see footnote 9)	—	
Lead[10]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[11]	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990

California Air Resources Board (09/08/10)

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010). Note that the EPA standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

9. On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO_2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

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Area Designations for the State Ambient Air Quality Standards

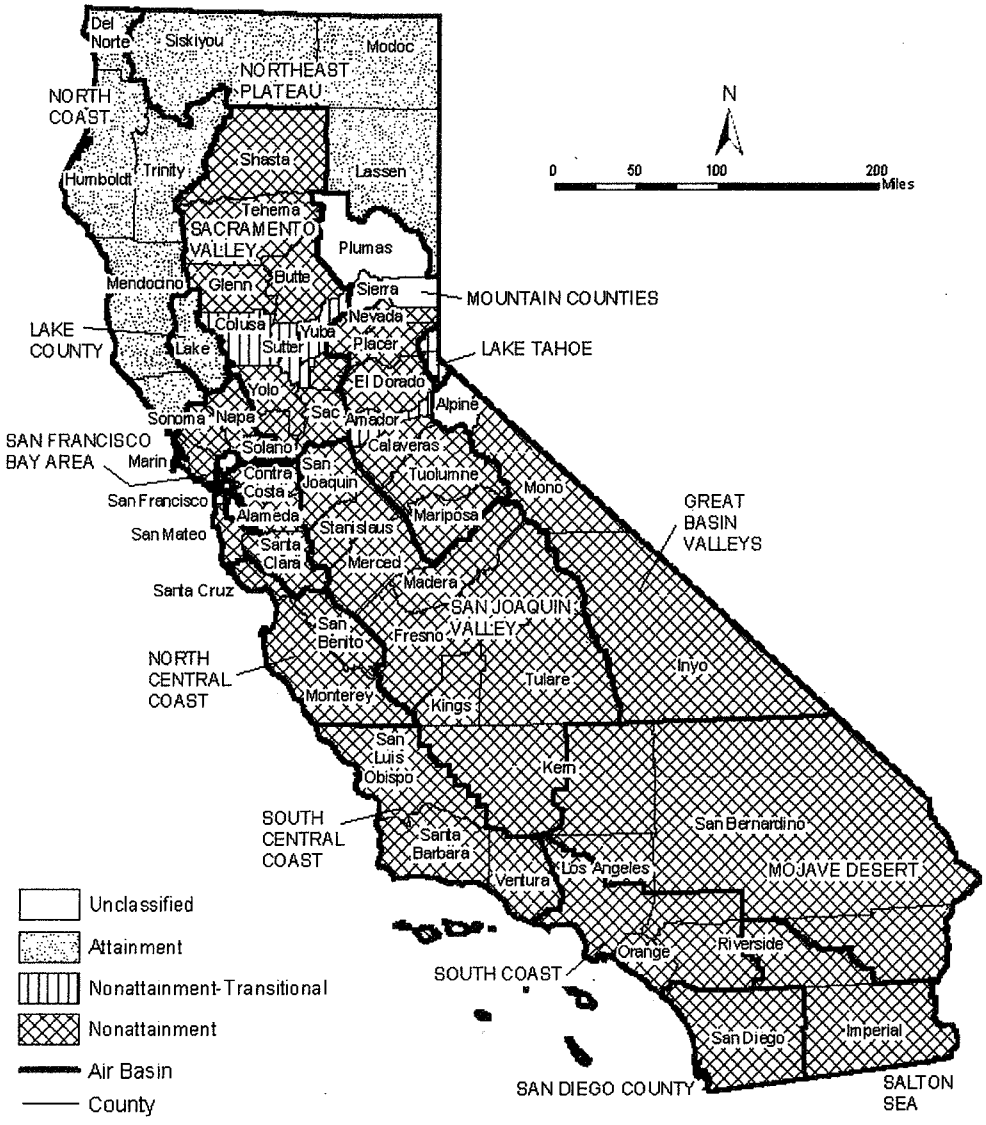
The following maps and tables show the area designations for each pollutant with a State standard set forth in the California Code of Regulations, title 17, section 60200. Each area is identified as attainment, nonattainment, nonattainment-transitional, or unclassified for each pollutant, as shown below:

Attainment	A
Nonattainment	N
Nonattainment-Transitional	NT
Unclassified	U

In general, the Board designates areas by air basin for pollutants with a regional impact and by county for pollutants with a more local impact. However, when there are areas within an air basin or county with distinctly different air quality deriving from sources and conditions not affecting the entire air basin or county, the Board may designate a smaller area. Generally, when boundaries of the designated area differ from the air basin or county boundaries, the description of the specific area is referenced at the bottom of the summary table.

FIGURE 1

2011
Area Designations for State Ambient Air Quality Standards
OZONE



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 1

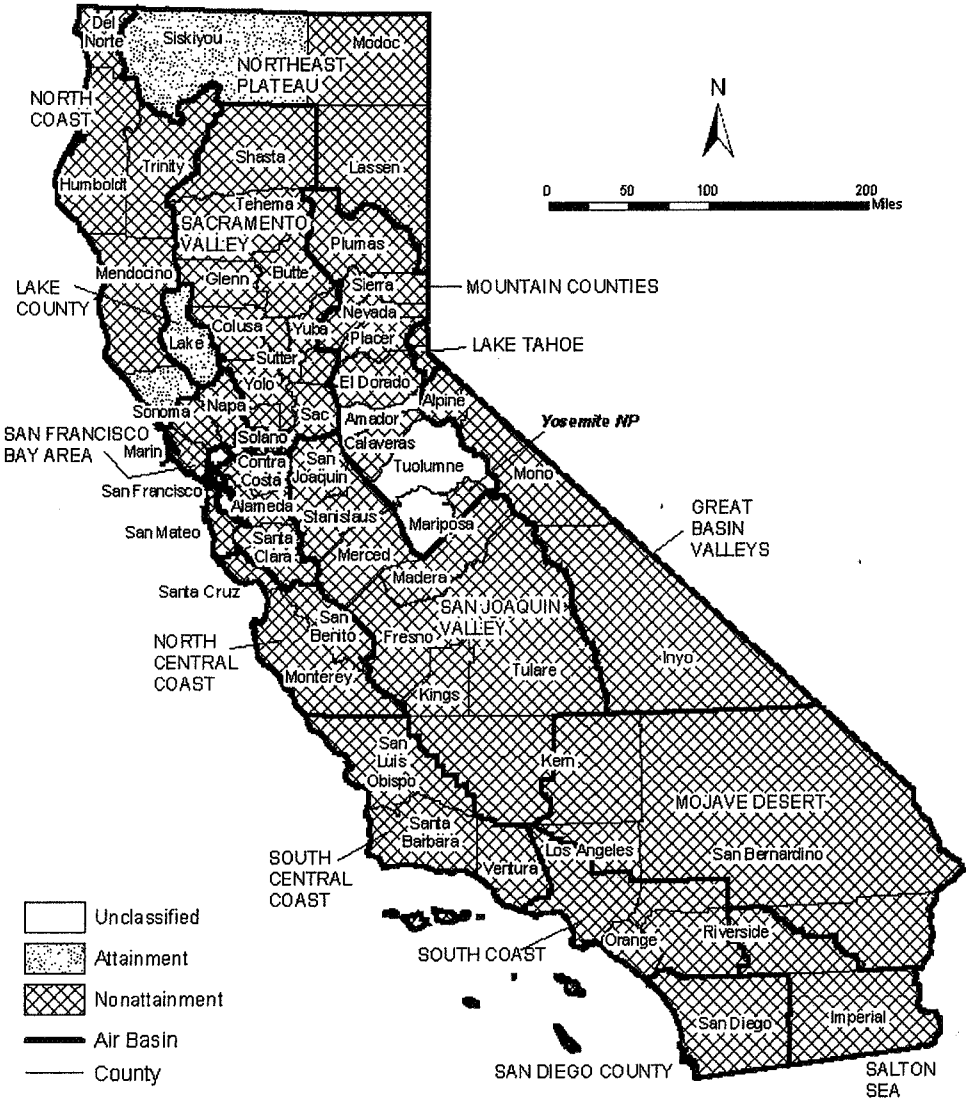
California Ambient Air Quality Standards
Area Designations for Ozone [1]

	N	NT	U	A		N	NT	U	A
GREAT BASIN VALLEYS AIR BASIN					NORTH COAST AIR BASIN				X
Alpine County			X		NORTHEAST PLATEAU AIR BASIN				X
Inyo County	X				SACRAMENTO VALLEY AIR BASIN				
Mono County	X				Colusa County		X		
LAKE COUNTY AIR BASIN				X	Sutter and Yuba Counties		X		
LAKE TAHOE AIR BASIN		X			Remainder of Air Basin	X			
MOJAVE DESERT AIR BASIN	X				SALTON SEA AIR BASIN	X			
MOUNTAIN COUNTIES AIR BASIN					SAN DIEGO AIR BASIN	X			
Amador County	X				SAN FRANCISCO BAY AREA AIR BASIN	X			
Calaveras County	X				SAN JOAQUIN VALLEY AIR BASIN	X			
El Dorado County (portion)	X				SOUTH CENTRAL COAST AIR BASIN	X			
Mariposa County	X				SOUTH COAST AIR BASIN	X			
Nevada County	X								
Placer County (portion)	X								
Plumas County			X						
Sierra County			X						
Tuolumne County	X								
NORTH CENTRAL COAST AIR BASIN	X								

(1) AB 3048 (Olberg) and AB 2525 (Miller) signed into law in 1996, made changes to Health and Safety Code, section 40925.5. One of the changes allows nonattainment districts to become nonattainment-transitional for ozone by operation of law. Similarly, nonattainment-transitional districts revert back to nonattainment by operation of law.

FIGURE 2

2011
Area Designations for State Ambient Air Quality Standards
PM10



Source Date:
February 2011
Air Quality Data Branch, PTSD

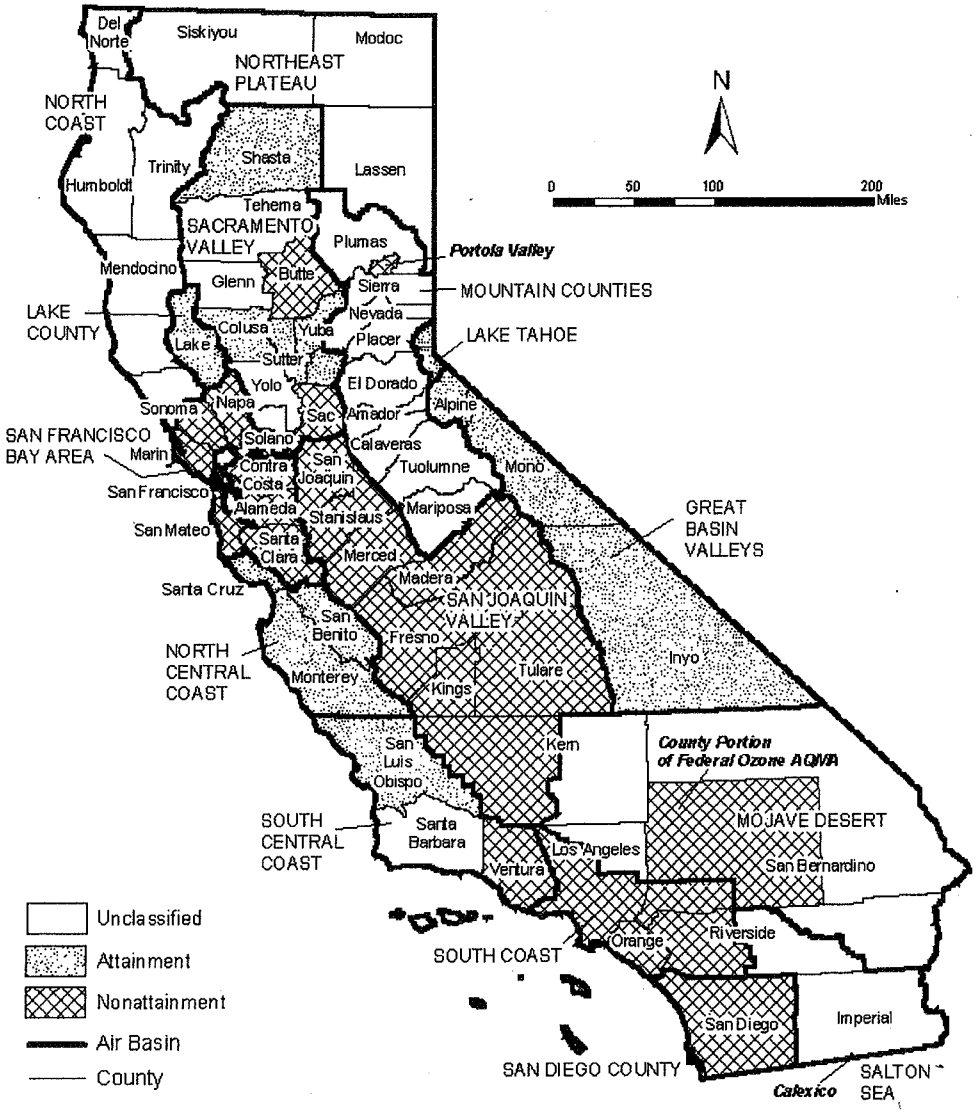
TABLE 2

California Ambient Air Quality Standards
Area Designation for Suspended Particulate Matter (PM10)

	N	U	A		N	U	A
GREAT BASIN VALLEYS AIR BASIN	X			NORTH CENTRAL COAST AIR BASIN	X		
LAKE COUNTY AIR BASIN			X	NORTH COAST AIR BASIN			
LAKE TAHOE AIR BASIN	X			Sonoma County (portion)			X
MOJAVE DESERT AIR BASIN	X			Remainder of Air Basin	X		
MOUNTAIN COUNTIES AIR BASIN				NORTHEAST PLATEAU AIR BASIN			
Amador County		X		Siskiyou County			X
Calaveras County	X			Remainder of Air Basin	X		
El Dorado County (portion)	X			SACRAMENTO VALLEY AIR BASIN	X		
Mariposa County				SALTON SEA AIR BASIN	X		
- Yosemite National Park	X			SAN DIEGO AIR BASIN	X		
- Remainder of County		X		SAN FRANCISCO BAY AREA AIR BASIN	X		
Nevada County	X			SAN JOAQUIN VALLEY AIR BASIN	X		
Placer County (portion)	X			SOUTH CENTRAL COAST AIR BASIN	X		
Plumas County	X			SOUTH COAST AIR BASIN	X		
Sierra County	X						
Tuolumne County		X					

FIGURE 3

2011
Area Designations for State Ambient Air Quality Standards
PM2.5



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 3

California Ambient Air Quality Standards
Area Designations for Fine Particulate Matter (PM2.5)

	N	U	A		N	U	A
GREAT BASIN VALLEYS AIR BASIN			X	SALTON SEA AIR BASIN			
LAKE COUNTY AIR BASIN			X	Imperial County			
LAKE TAHOE AIR BASIN			X	- City of Calexico (3)	X		
MOJAVE DESERT AIR BASIN				Remainder of Air Basin		X	
San Bernardino County				SAN DIEGO AIR BASIN	X		
- County portion of federal Southeast	X			SAN FRANCISCO BAY AREA AIR BASIN	X		
Desert Modified AQMA for Ozone (1)				SAN JOAQUIN VALLEY AIR BASIN	X		
Remainder of Air Basin		X		SOUTH CENTRAL COAST AIR BASIN			
MOUNTAIN COUNTIES AIR BASIN				San Luis Obispo County			X
Plumas County				Santa Barbara County		X	
- Portola Valley (2)	X			Ventura County	X		
Remainder of Air Basin		X		SOUTH COAST AIR BASIN	X		
NORTH CENTRAL COAST AIR BASIN			X				
NORTH COAST AIR BASIN		X					
NORTHEAST PLATEAU AIR BASIN		X					
SACRAMENTO VALLEY AIR BASIN							
Butte County	X						
Colusa County			X				
Placer County (portion)			X				
Sacramento County	X						
Shasta County			X				
Sutter and Yuba Counties			X				
Remainder of Air Basin		X					

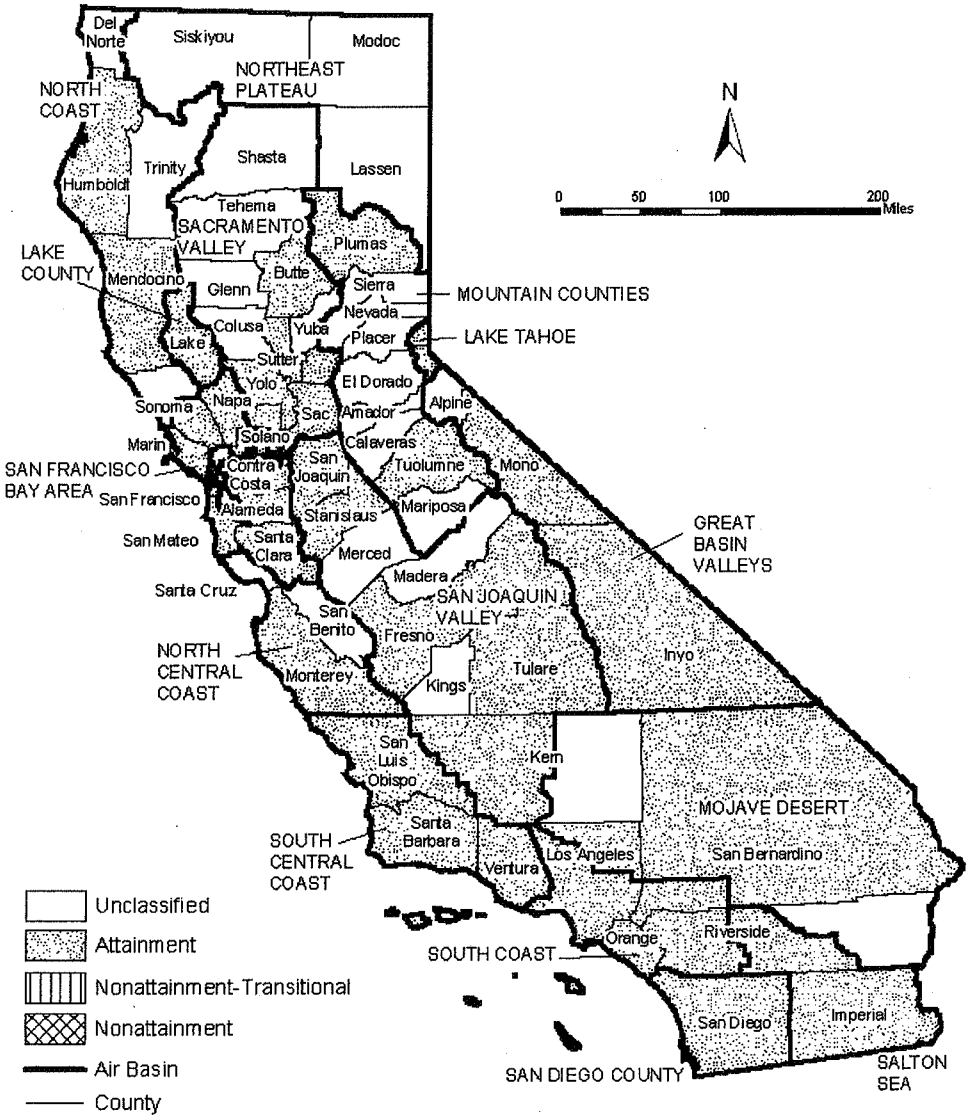
(1) California Code of Regulations, title 17, section 60200(b)

(2) California Code of Regulations, title 17, section 60200(c)

(3) California Code of Regulations, title 17, section 60200(a)

FIGURE 4

2011
Area Designations for State Ambient Air Quality Standards
CARBON MONOXIDE



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 4

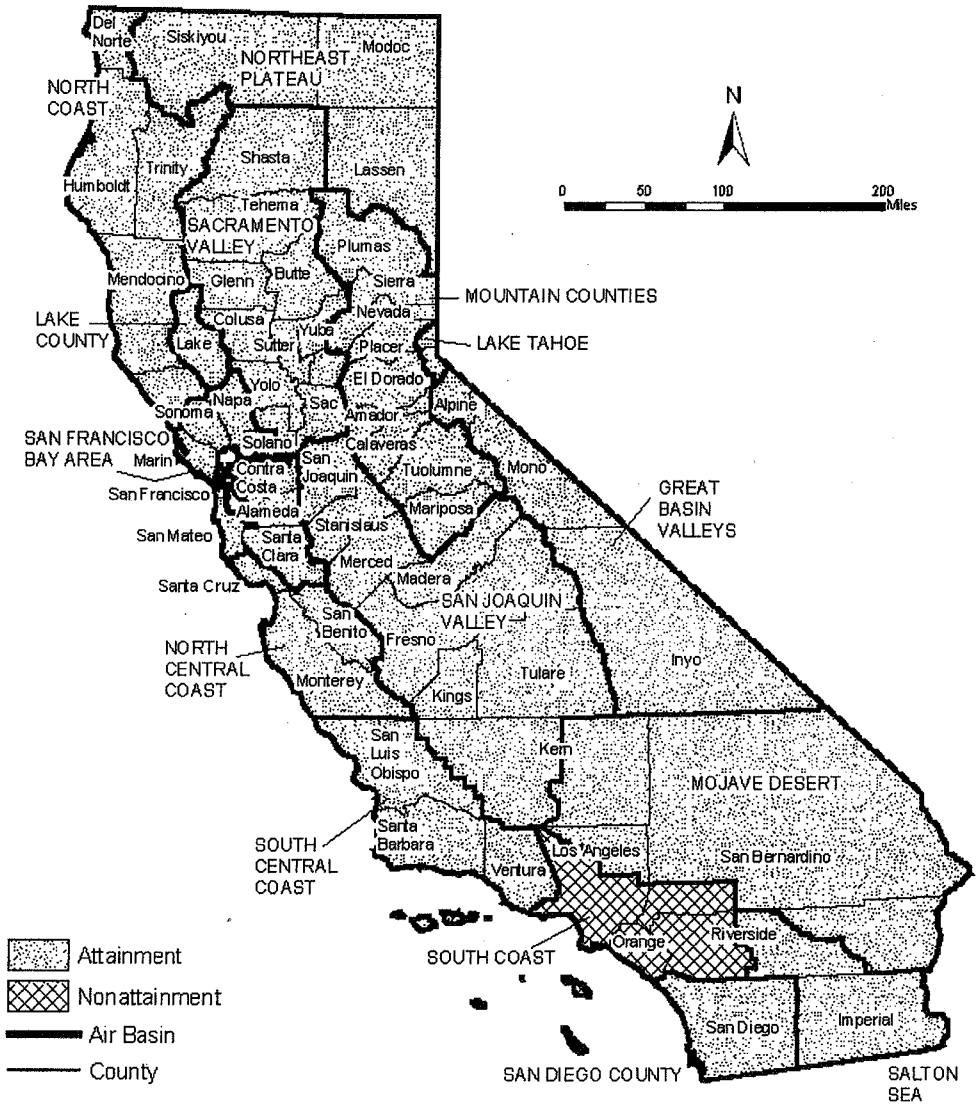
California Ambient Air Quality Standards
Area Designation for Carbon Monoxide*

	N	NT	U	A		N	NT	U	A
GREAT BASIN VALLEYS AIR BASIN					SACRAMENTO VALLEY AIR BASIN				
Alpine County			X		Butte County				X
Inyo County				X	Colusa County			X	
Mono County				X	Glenn County			X	
LAKE COUNTY AIR BASIN				X	Placer County (portion)				X
LAKE TAHOE AIR BASIN				X	Sacramento County				X
MOJAVE DESERT AIR BASIN					Shasta County			X	
Kern County (portion)			X		Solano County (portion)				X
Los Angeles County (portion)				X	Sutter County				X
Riverside County (portion)			X		Tehama County			X	
San Bernardino County (portion)				X	Yolo County				X
MOUNTAIN COUNTIES AIR BASIN					Yuba County			X	
Amador County			X		SALTON SEA AIR BASIN				
Calaveras County			X		Imperial County				X
El Dorado County (portion)			X		Riverside County (portion)				X
Mariposa County			X		SAN DIEGO AIR BASIN				X
Nevada County			X		SAN FRANCISCO BAY AREA AIR BASIN				X
Placer County (portion)			X		SAN JOAQUIN VALLEY AIR BASIN				
Plumas County				X	Fresno County				X
Sierra County			X		Kern County (portion)				X
Tuolumne County				X	Kings County			X	
NORTH CENTRAL COAST AIR BASIN					Madera County			X	
Monterey County				X	Merced County			X	
San Benito County			X		San Joaquin County				X
Santa Cruz County			X		Stanislaus County				X
NORTH COAST AIR BASIN					Tulare County				X
Del Norte County			X		SOUTH CENTRAL COAST AIR BASIN				X
Humboldt County				X	SOUTH COAST AIR BASIN				
Mendocino County				X	Los Angeles County (portion)				X
Sonoma County (portion)			X		Orange County				X
Trinity County			X		Riverside County (portion)				X
NORTHEAST PLATEAU AIR BASIN			X		San Bernardino County (portion)				X

* The area designated for carbon monoxide is a county or portion of a county

FIGURE 5

2011
Area Designations for State Ambient Air Quality Standards
NITROGEN DIOXIDE



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 5

California Ambient Air Quality Standards
Area Designation for Nitrogen Dioxide

	N	U	A		N	U	A
GREAT BASIN VALLEYS AIR BASIN			X	SACRAMENTO VALLEY AIR BASIN			X
LAKE COUNTY AIR BASIN			X	SALTON SEA AIR BASIN			X
LAKE TAHOE AIR BASIN			X	SAN DIEGO AIR BASIN			X
MOJAVE DESERT AIR BASIN			X	SAN FRANCISCO BAY AREA AIR BASIN			X
MOUNTAIN COUNTIES AIR BASIN			X	SAN JOAQUIN VALLEY AIR BASIN			X
NORTH CENTRAL COAST AIR BASIN			X	SOUTH CENTRAL COAST AIR BASIN			X
NORTH COAST AIR BASIN			X	SOUTH COAST AIR BASIN	X		
NORTHEAST PLATEAU AIR BASIN			X				

FIGURE 6

2011
Area Designations for State Ambient Air Quality Standards
SULFUR DIOXIDE



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 6

California Ambient Air Quality Standards
Area Designation for Sulfur Dioxide*

	N	U	A		N	U	A
GREAT BASIN VALLEYS AIR BASIN			X	SACRAMENTO VALLEY AIR BASIN			X
LAKE COUNTY AIR BASIN			X	SALTON SEA AIR BASIN			X
LAKE TAHOE AIR BASIN			X	SAN DIEGO AIR BASIN			X
MOJAVE DESERT AIR BASIN			X	SAN FRANCISCO BAY AREA AIR BASIN			X
MOUNTAIN COUNTIES AIR BASIN			X	SAN JOAQUIN VALLEY AIR BASIN			X
NORTH CENTRAL COAST AIR BASIN			X	SOUTH CENTRAL COAST AIR BASIN			X
NORTH COAST AIR BASIN			X	SOUTH COAST AIR BASIN			X
NORTHEAST PLATEAU AIR BASIN			X				

* The area designated for sulfur dioxide is a county or portion of a county

FIGURE 7

2011
Area Designations for State Ambient Air Quality Standards
SULFATES



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 7

California Ambient Air Quality Standards
Area Designation for Sulfates

	N	U	A		N	U	A
GREAT BASIN VALLEYS AIR BASIN			X	SACRAMENTO VALLEY AIR BASIN			X
LAKE COUNTY AIR BASIN			X	SALTON SEA AIR BASIN			X
LAKE TAHOE AIR BASIN			X	SAN DIEGO AIR BASIN			X
MOJAVE DESERT AIR BASIN			X	SAN FRANCISCO BAY AREA AIR BASIN			X
MOUNTAIN COUNTIES AIR BASIN			X	SAN JOAQUIN VALLEY AIR BASIN			X
NORTH CENTRAL COAST AIR BASIN			X	SOUTH CENTRAL COAST AIR BASIN			X
NORTH COAST AIR BASIN			X	SOUTH COAST AIR BASIN			X
NORTHEAST PLATEAU AIR BASIN			X				

FIGURE 8

2011
Area Designations for State Ambient Air Quality Standards
LEAD



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 8

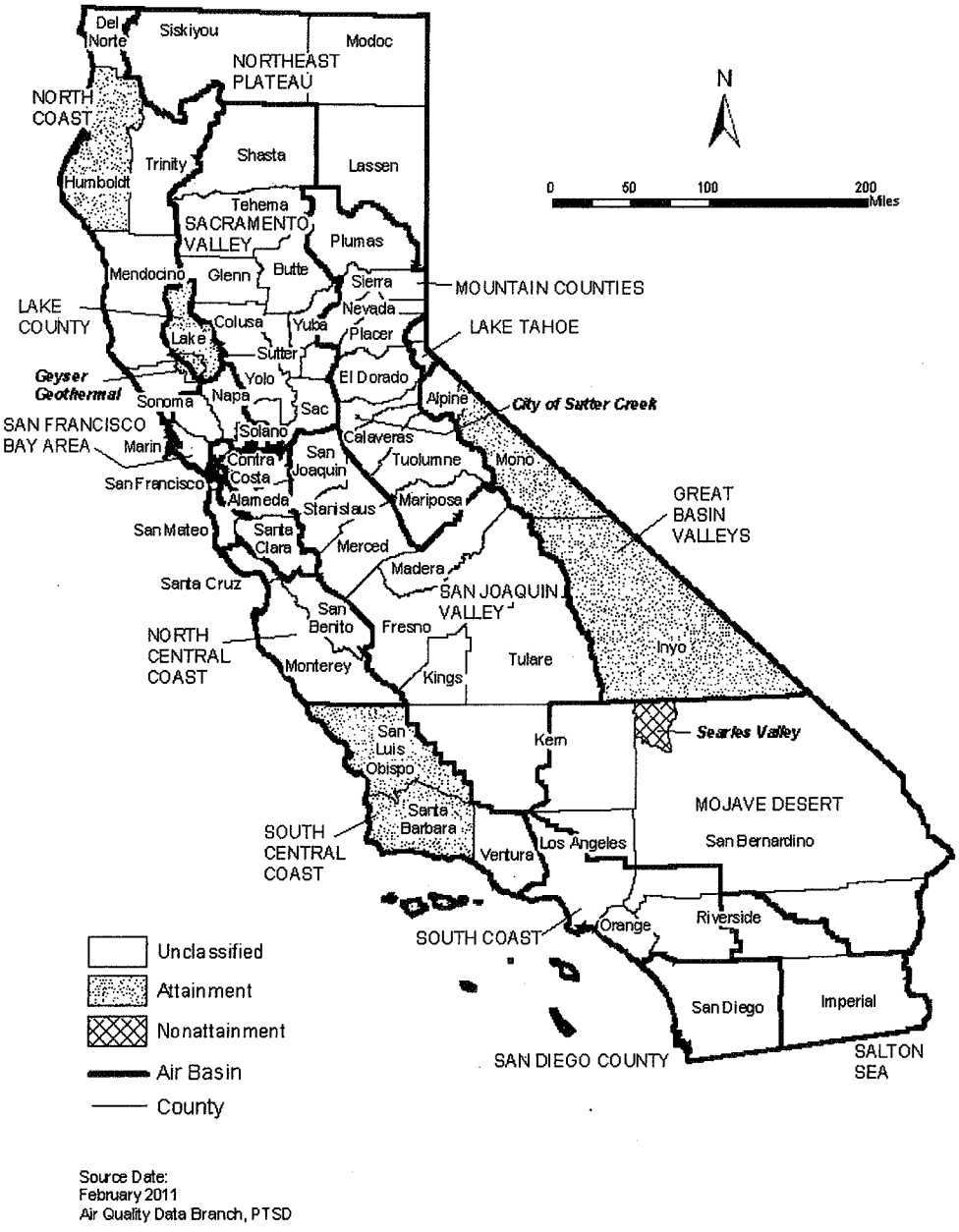
California Ambient Air Quality Standards
Area Designations for Lead (particulate)*

	N	U	A		N	U	A
GREAT BASIN VALLEYS AIR BASIN			X	SALTON SEA AIR BASIN			X
LAKE COUNTY AIR BASIN			X	SAN DIEGO AIR BASIN			X
LAKE TAHOE AIR BASIN			X	SAN FRANCISCO BAY AREA AIR BASIN			X
MOJAVE DESERT AIR BASIN			X	SAN JOAQUIN VALLEY AIR BASIN			X
MOUNTAIN COUNTIES AIR BASIN			X	SOUTH CENTRAL COAST AIR BASIN			X
NORTH CENTRAL COAST AIR BASIN			X	SOUTH COAST AIR BASIN			
NORTH COAST AIR BASIN			X	Los Angeles County	X		
NORTHEAST PLATEAU AIR BASIN			X	Remainder of Air Basin			X
SACRAMENTO VALLEY AIR BASIN			X				

* The area designated for lead is a county or portion of a county

FIGURE 9

2011
Area Designations for State Ambient Air Quality Standards
HYDROGEN SULFIDE



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 9

California Ambient Air Quality Standards
Area Designation for Hydrogen Sulfide*

	N	NT	U	A		N	NT	U	A
GREAT BASIN VALLEYS AIR BASIN					NORTH CENTRAL COAST AIR BASIN			X	
Alpine County			X		NORTH COAST AIR BASIN				
Inyo County				X	Del Norte County			X	
Mono County				X	Humboldt County				X
LAKE COUNTY AIR BASIN				X	Mendocino County			X	
LAKE TAHOE AIR BASIN			X		Sonoma County (portion)				
MOJAVE DESERT AIR BASIN					- Geyser Geothermal Area (2)				X
Kern County (portion)			X		- Remainder of County			X	
Los Angeles County (portion)			X		Trinity County			X	
Riverside County (portion)			X		NORTHEAST PLATEAU AIR BASIN			X	
San Bernardino County (portion)					SACRAMENTO VALLEY AIR BASIN			X	
- Searles Valley Planning Area (1)	X				SALTON SEA AIR BASIN			X	
- Remainder of County			X		SAN DIEGO AIR BASIN			X	
MOUNTAIN COUNTIES AIR BASIN					SAN FRANCISCO BAY AREA AIR BASIN			X	
Amador County					SAN JOAQUIN VALLEY AIR BASIN			X	
- City of Sutter Creek	X				SOUTH CENTRAL COAST AIR BASIN				
- Remainder of County			X		San Luis Obispo County				X
Calaveras County			X		Santa Barbara County				X
El Dorado County (portion)			X		Ventura County			X	
Mariposa County			X		SOUTH COAST AIR BASIN			X	
Nevada County			X						
Placer County (portion)			X						
Plumas County			X						
Sierra County			X						
Tuolumne County			X						

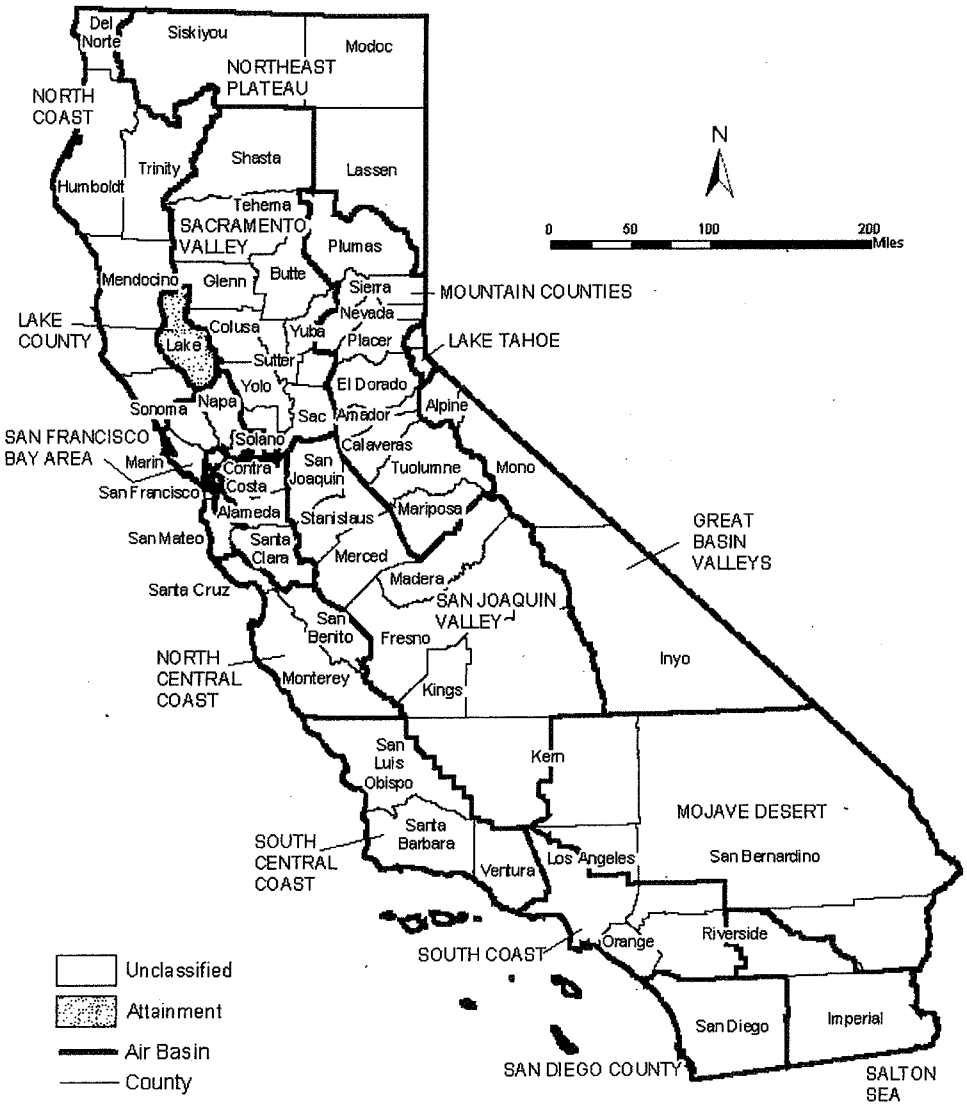
* The area designated for hydrogen sulfide is a county or portion of a county

(1) 52 Federal Register 29384 (August 7, 1987)

(2) California Code of Regulations, title 17, section 60200(d)

FIGURE 10

2011
Area Designations for State Ambient Air Quality Standards
VISIBILITY REDUCING PARTICLES



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 10

California Ambient Air Quality Standards
Area Designation for Visibility Reducing Particles

	N	NT	U	A		N	NT	U	A
GREAT BASIN VALLEYS AIR BASIN			X		SACRAMENTO VALLEY AIR BASIN			X	
LAKE COUNTY AIR BASIN				X	SALTON SEA AIR BASIN			X	
LAKE TAHOE AIR BASIN			X		SAN DIEGO AIR BASIN			X	
MOJAVE DESERT AIR BASIN			X		SAN FRANCISCO BAY AREA AIR BASIN			X	
MOUNTAIN COUNTIES AIR BASIN			X		SAN JOAQUIN VALLEY AIR BASIN			X	
NORTH CENTRAL COAST AIR BASIN			X		SOUTH CENTRAL COAST AIR BASIN			X	
NORTH COAST AIR BASIN			X		SOUTH COAST AIR BASIN			X	
NORTHEAST PLATEAU AIR BASIN			X						

Area Designations for the National Ambient Air Quality Standards

The following maps and tables show the area designations for each pollutant with a national ambient air quality standard for which at least one area in California is designated as nonattainment. These pollutants include ozone, PM10, PM2.5, and lead (particulate). Additional information about the federal area designations is available on the U.S. EPA website:

http://www.epa.gov/airprogm/oar/oaqps/greenbk

Over the last several years, U.S. EPA has been reviewing the levels of the various national standards. The agency has already promulgated new standard levels for some pollutants and is considering revising the levels for others. Information about the status of these reviews is available on the U.S. EPA website:

http://epa.gov/airquality/urbanair/

Designation Categories

Ozone and suspended particulate matter (PM10). The U.S. EPA uses three categories to designate areas with respect to ozone and PM10:

- Attainment
- Nonattainment
- Unclassifiable

The national 1-hour ozone standard was revoked effective June 15, 2005, and the current area designations reflect the national 8-hour ozone standard of 0.08 ppm. U.S. EPA is currently in the process of reconsidering the level of the 8-hour standard and is expected to propose a revised level during Summer 2011.

Fine suspended particulate matter (PM2.5). The U.S. EPA uses two categories to designate areas with respect to PM2.5:

- Nonattainment
- Unclassifiable/Attainment

New national area designations for PM2.5 became effective December 14, 2009. These designations reflect both the annual average standard of 15 $\mu g/m^3$ and the recently revised (December 2006) 24-hour standard of 35 $\mu g/m^3$.

Lead (particulate). The U.S. EPA promulgated a new lead standard in October 2008. The new level of 0.15 $\mu g/m^3$ for a 3-month average is ten times lower than the former lead standard. Effective December 31, 2010, several areas in the nation became nonattainment for lead, based on data collected during 2007 through 2009. All other areas were designated as unclassified. These unclassified designations will be resolved over the next several years, as data from a new, source-oriented monitoring network become available.

Designated Areas

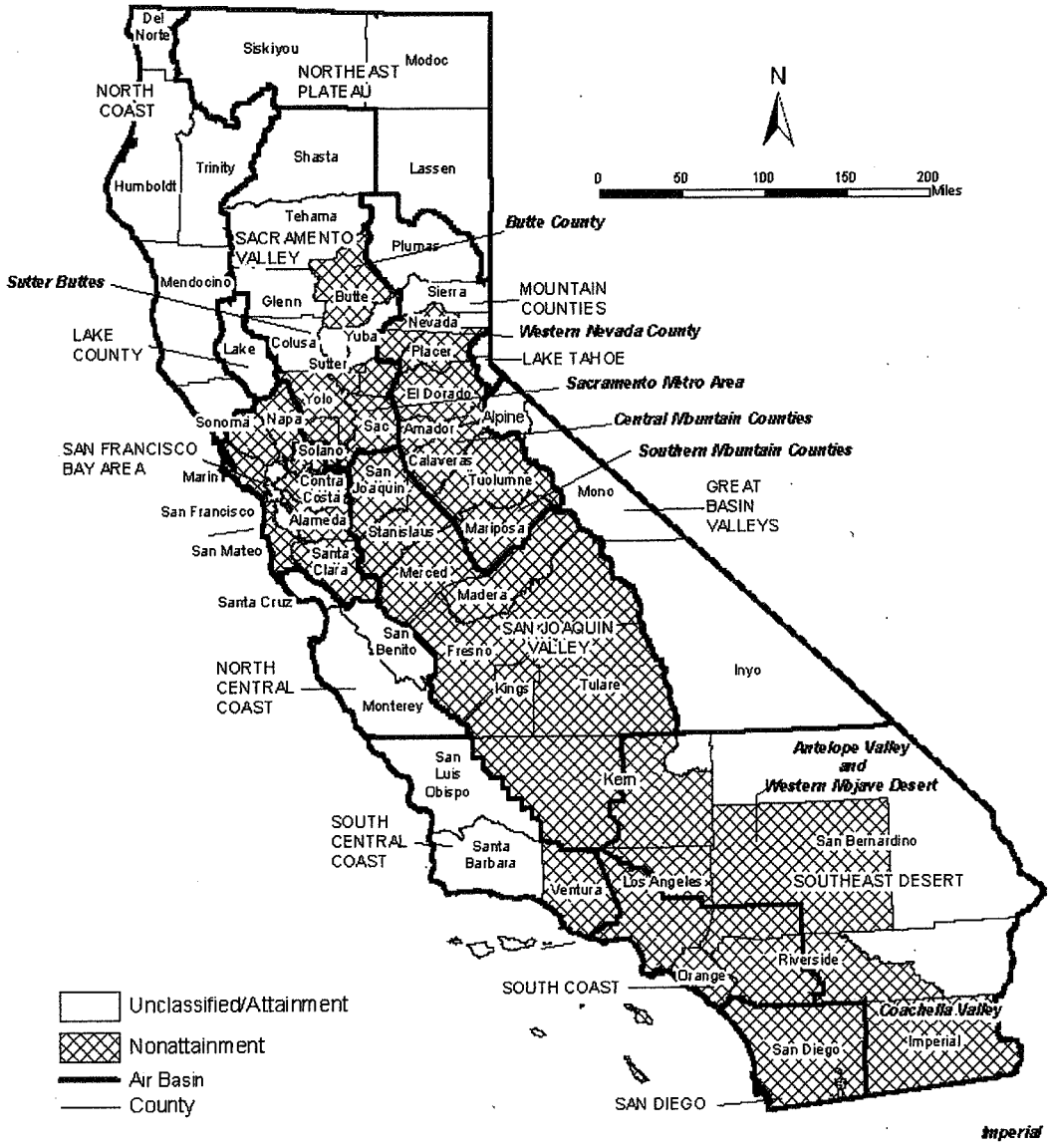
From time to time, the boundaries of the California air basins have been changed to facilitate the planning process. The Board generally initiates these changes, and they are not always reflected in the U.S. EPA's area designations. For purposes of consistency, the maps in this attachment reflect area designation boundaries and nomenclature as promulgated by the U.S. EPA. In some cases, these may not be the same as those adopted by the Board. For example, the national area designations reflect the former Southeast Desert Air Basin. In accordance with Health and Safety Code section 39606.1, the Board redefined this area in 1996 to be the Mojave Desert Air Basin and Salton Sea Air Basin. The definitions and boundaries for all areas designated for the national standards can be found in Title 40, Code of Federal Regulations (CFR), Chapter I, Part 81.305. They are available on the web at:

http://www.access.gpo.gov/nara/cfr/waisidx_05/40cfr81_05.html

Once at this website, scroll down to Part 81.305 to view the California area designations.

FIGURE 11

Area Designations for National Ambient Air Quality Standards 8-HOUR OZONE



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 11

National Ambient Air Quality Standards
Area Designations for 8-Hour Ozone*

	N	U/A		N	U/A
GREAT BASIN VALLEYS AIR BASIN		X	SACRAMENTO VALLEY AIR BASIN (cont.)		
LAKE COUNTY AIR BASIN		X	Sutter County		
LAKE TAHOE AIR BASIN		X	- Sutter County (Sutter Buttes)	X	
MOUNTAIN COUNTIES AIR BASIN			- Remainder of North Sutter County		X
Central Mountain Counties			Tehama County		X
- Amador County	X		Yolo County	X	
- Calaveras County	X		Yuba County		X
Southern Mountain Counties			SAN DIEGO COUNTY	X	
- Mariposa County	X		SAN FRANCISCO BAY AREA AIR BASIN	X	
- Tuolumne County	X		SAN JOAQUIN VALLEY AIR BASIN	X	
El Dorado County (portion) (2)	X		SOUTH CENTRAL COAST AIR BASIN		
Nevada County			San Luis Obispo County		X
- Western Nevada County	X		Santa Barbara County		X
- Remainder of County		X	Ventura County		
Placer County (portion) (2)	X		Area excluding Anacapa and San Nicolas Islands	X	
Plumas County		X	Channel Islands (1)		X
Sierra County		X	SOUTH COAST AIR BASIN (1)	X	
NORTH CENTRAL COAST AIR BASIN		X	SOUTHEAST DESERT AIR BASIN		
NORTH COAST AIR BASIN		X	Kern County (portion)	X	
NORTHEAST PLATEAU AIR BASIN		X	Imperial County	X	
SACRAMENTO VALLEY AIR BASIN			Los Angeles County (portion)	X	
Butte County	X		Riverside County (portion)		
Colusa County		X	- Coachella Valley	X	
Glenn County		X	- Non-AQMA portion		X
Sacramento Metro Area (2)	X		San Bernardino County		
Shasta County		X	- Western portion (AQMA)	X	
			- Eastern portion (non-AQMA)		X

* Definitions and references for all areas can be found in 40 CFR, Chapter I, Part 81.305.
Although U.S. EPA lowered the 8-hour national ozone standard to 0.075 ppm, current area designations reflect the 0.08 ppm standard.

(1) South Central Coast Air Basin Channel Islands:

Santa Barbara County includes Santa Cruz, San Miguel, Santa Rosa, and Santa Barbara Islands.

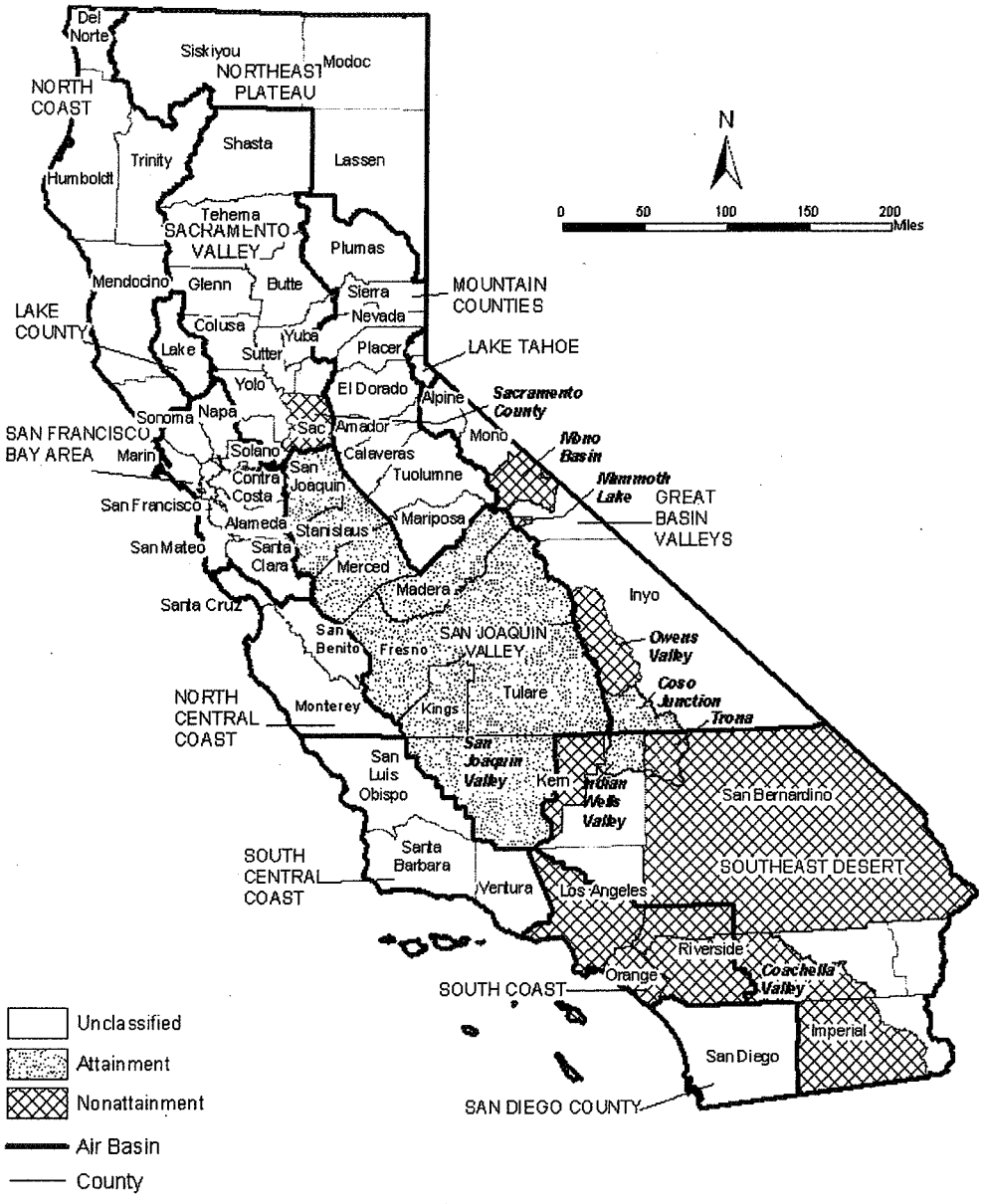
Ventura County includes Anacapa and San Nicolas Islands.

Note that the San Clemente and Santa Catalina Islands are considered part of Los Angeles County, and therefore, are included as part of the South Coast Air Basin.

(2) For this purpose, the Sacramento Metro Area comprises all of Sacramento and Yolo Counties, the Sacramento Valley Air Basin portion of Solano County, the southern portion of Sutter County, and the Sacramento Valley and Mountain Counties Air Basins portions of Placer and El Dorado counties.

FIGURE 12

Area Designations for National Ambient Air Quality Standards PM10



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 12

National Ambient Air Quality Standards
Area Designations for Suspended Particulate Matter (PM10)*

	N	U	A		N	U	A
GREAT BASIN VALLEYS AIR BASIN				SAN DIEGO COUNTY		X	
Alpine County		X		SAN FRANCISCO BAY AREA AIR BASIN		X	
Inyo County				SAN JOAQUIN VALLEY AIR BASIN			X
- Owens Valley Planning Area	X			SOUTH CENTRAL COAST AIR BASIN		X	
- Coso Junction			X	SOUTH COAST AIR BASIN (1)	X		
- Remainder of County		X		SOUTHEAST DESERT AIR BASIN			
Mono County				Eastern Kern County			
- Mammoth Lake Planning Area	X			- Indian Wells Valley			X
- Mono Lake Basin	X			- Portion within San Joaquin Valley Planning Area	X		
- Remainder of County		X		- Remainder of County		X	
LAKE COUNTY AIR BASIN		X		Imperial County			
LAKE TAHOE AIR BASIN		X		- Imperial Valley Planning Area	X		
MOUNTAIN COUNTIES AIR BASIN				- Remainder of County		X	
Placer County (portion) (2)		X		Los Angeles County (portion)		X	
Remainder of Air Basin		X		Riverside County (portion)			
NORTH CENTRAL COAST AIR BASIN		X		- Coachella Valley (1)	X		
NORTH COAST AIR BASIN		X		- Non-AQMA portion		X	
NORTHEAST PLATEAU AIR BASIN		X		San Bernardino County			
SACRAMENTO VALLEY AIR BASIN				- Trona	X		
Butte County		X		- Remainder of County	X		
Colusa County		X					
Glenn County		X					
Placer County (portion) (2)		X					
Sacramento County (1)	X						
Shasta County		X					
Solano County (portion)		X					
Sutter County		X					
Tehama County		X					
Yolo County		X					
Yuba County		X					

* Definitions and references for all areas can be found in 40 CFR, Chapter I, Part 81.305.
(1) Air quality in Sacramento, South Coast, and Coachella Valley meets the national PM10 standards. Requests for redesignation to attainment have been submitted to U.S. EPA

(2) U.S. EPA designation puts the Sacramento Valley Air Basin portion of Placer County in the Mountain Counties Air Basin.

FIGURE 13

Area Designations for National Ambient Air Quality Standards PM2.5



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 13

National Ambient Air Quality Standards
Area Designations for Fine Particulate Matter (PM2.5)*

	N	U/A		N	U/A
GREAT BASIN VALLEYS AIR BASIN		X	SAN DIEGO COUNTY		X
LAKE COUNTY AIR BASIN		X	SAN FRANCISCO BAY AREA AIR BASIN	X	
LAKE TAHOE AIR BASIN		X	SAN JOAQUIN VALLEY AIR BASIN	X	
MOUNTAIN COUNTIES AIR BASIN		X	SOUTH CENTRAL COAST AIR BASIN		X
NORTH CENTRAL COAST AIR BASIN		X	SOUTH COAST AIR BASIN (4)	X	
NORTH COAST AIR BASIN		X	SOUTHEAST DESERT AIR BASIN		
NORTHEAST PLATEAU AIR BASIN		X	Imperial County (portion) (5)	X	
SACRAMENTO VALLEY AIR BASIN			Remainder of Air Basin		X
Butte County (portion) (1)	X				
Sacramento Metro Area (2)	X				
Sutter County (3)	X				
Yuba County (portion) (3)	X				
Remainder of Air Basin		X			

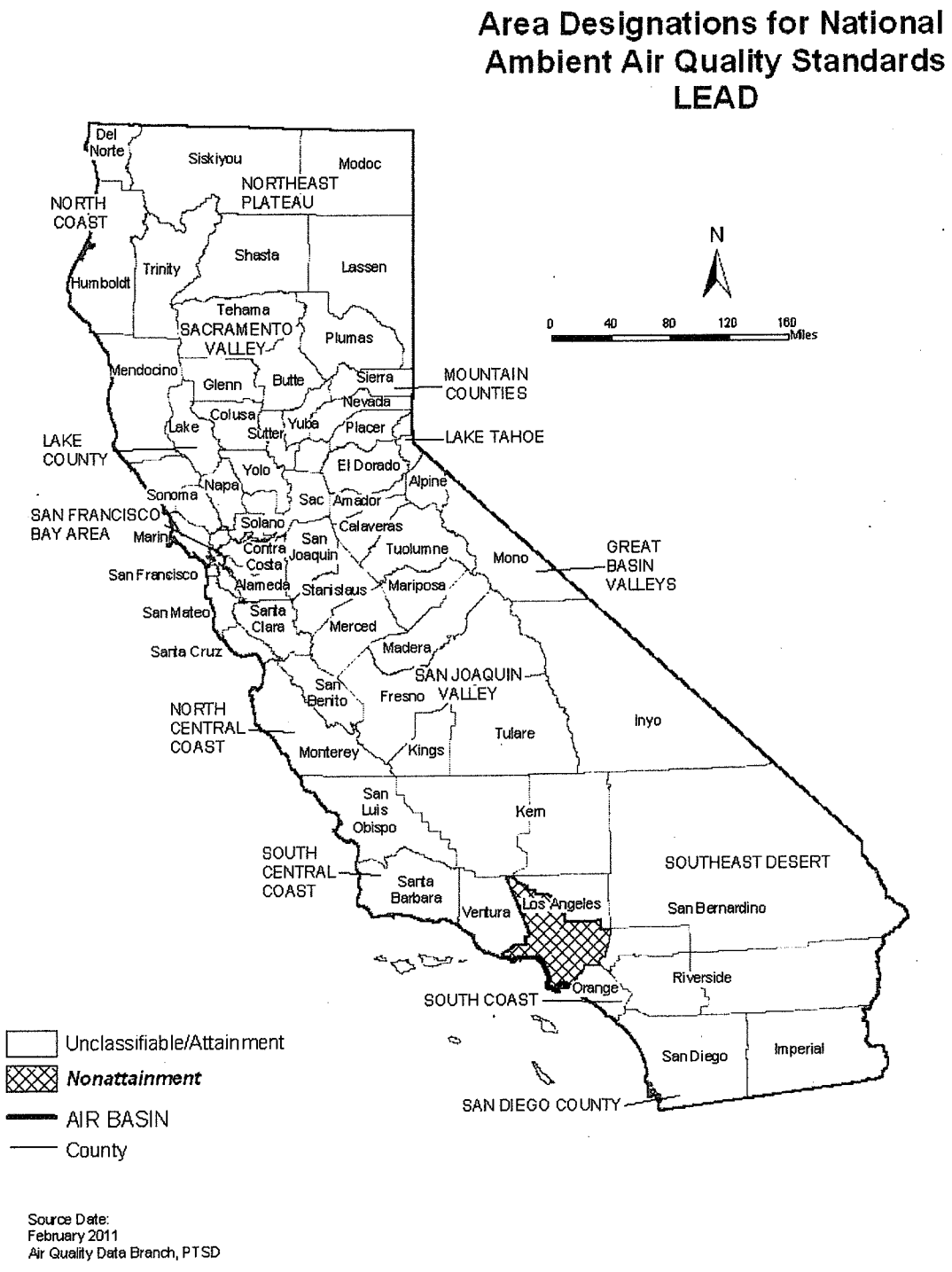
* Definitions and references for all areas can be found in 40 CFR, Chapter I, Part 81.305.

(1) City of Chico and surrounding areas
(2) For this purpose, Sacramento Metro Area comprises all of Sacramento and portions of El Dorado, Placer, Solano, and Yolo Counties.
(3) Comprises all of Sutter and western portion of Yuba County.

(4) Those lands of the Santa Rosa Band of Cahulla Mission Indians in Riverside County are designated Unclassifiable/Attainment.

(5) That portion of Imperial County encompassing the urban and surrounding areas of Brawley, Calexico, El Centro, Heber, Holtville, Imperial, Seeley, and Westmorland.

FIGURE 14



Source Date:
February 2011
Air Quality Data Branch, PTSD

TABLE 14

National Ambient Air Quality Standards
Area Designations for Lead (particulate)

	N	U/A		N	U/A
GREAT BASIN VALLEYS AIR BASIN		X	SAN DIEGO COUNTY		X
LAKE COUNTY AIR BASIN		X	SAN FRANCISCO BAY AREA AIR BASIN		X
LAKE TAHOE AIR BASIN		X	SAN JOAQUIN VALLEY AIR BASIN		X
MOUNTAIN COUNTIES AIR BASIN		X	SOUTH CENTRAL COAST AIR BASIN		X
NORTH CENTRAL COAST AIR BASIN		X	SOUTH COAST AIR BASIN		
NORTH COAST AIR BASIN		X	Los Angeles County (portion) (1)	X	
NORTHEAST PLATEAU AIR BASIN		X	Remainder of Air Basin		X
SACRAMENTO VALLEY AIR BASIN		X	SOUTHEAST DESERT AIR BASIN		X

(1) Portion of County in Air Basin, not including Channel Islands

ATTACHMENT D

CONVENTION FOR ROUNDING AMBIENT AIR QUALITY DATA

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ATTACHMENT D

CONVENTION FOR ROUNDING AMBIENT AIR QUALITY DATA

Before ambient air quality measurements are used in designating areas for State standards, they are rounded to the precision of the applicable State standard. In addition, the Expected Peak Day Concentration or EPDC is also rounded to the precision of the State standard before it is used to identify and exclude measurements affected by extreme concentration events. As described below, the same rounding convention is generally used in all cases.

All raw air quality data are stored in the Board's Aerometric Data Analysis and Management (ADAM) database, as they are reported. However, the reported values and the stored values can and do differ very slightly, because ADAM stores numbers in a floating-point format. For example, a number reported as 1.23 might actually be stored as 1.229999998 or as 1.2300000001. Nonetheless, great care is taken to ensure that these "slight" differences have no impact on calculated values used for area designations.

The precision or given number of decimal places varies for each State standard and depends on how the level of the standard is specified. The given number of decimal places for each State standard and averaging time are summarized in Table D-1.

TABLE D-1
Level and Precision of State Standards

Pollutant	*Averaging Time*	*Level of Standard*	*Given Number of Decimal Places*
Ozone	1-hour	0.09 ppm	2
	8-hour	0.070 ppm	3
Carbon Monoxide	1-hour	20 ppm	0
	8-hour (Lake Tahoe)	6 ppm	0
	8-hour (Rest of State)	9.0 ppm	1
PM10	24-hour	50 $\mu g/m^3$	0
	Annual	20 $\mu g/m^3$	0
PM2.5	Annual	12 $\mu g/m^3$	0
Nitrogen Dioxide	1-hour	0.18 ppm	2
	Annual	0.030 ppm	3
Sulfur Dioxide	1-hour	0.25 ppm	2
	24-hour	0.04 ppm	2
Lead	30-day	1.5 $\mu g/m^3$	1
Sulfates	24-hour	25 $\mu g/m^3$	0
Hydrogen Sulfide	1-hour	0.03 ppm	2

Individual air quality measurements and statistics (air quality values) are generally rounded up or down using the digit just beyond the given number of decimal places and according to standard rounding conventions -- values that are below 5 round down, while those that are equal to or greater than 5 round up. For example, if the given number of decimal places is 1, an air quality value of 2.34567 rounds to 2.3 because 0.04567 is less than 0.05. An air quality value of 2.35012 rounds to 2.4 because 0.05012 is greater than 0.05. Similarly, an air quality value of 2.35000 rounds to 2.4 because 0.05000 exactly equals 0.05.

The method used for determining area designation values is generally consistent across all pollutants. First, if there is a valid EPDC, the EPDC is rounded to the given number of decimal places (refer to Table D-1) for the applicable State standard (*note: an EPDC is calculated and used in the area designation process only if the averaging time of the standard is less than or equal to 24 hours*). Next, all air quality values for the three-year period used in area designations are rounded to the given number of decimal places. All rounded air quality values that are higher than the rounded EPDC are excluded as extreme concentration events and therefore, not considered in the area designation process. The air quality value used to designate an area (the designation value) is the highest rounded value for the previous three-year period that is less than or equal to the rounded EPDC. However, if this air quality value is identified as affected by an exceptional event or unusual concentration event, it is excluded from the area designation process, and the next highest air quality value becomes the designation value.

ATTACHMENT E

REFERENCES

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ATTACHMENT E

REFERENCES

The following is a list of documents, websites, and other resources used in developing the proposed amendments to the area designations for State standards documented in this staff report:

California Air Resources Board

- ***Air Quality Data***
  1. Ozone Air Quality Data from the California Air Resources Board's Aerometric Data Analysis and Management (ADAM) Database; Data last accessed November 23, 2010; Data in electronic format are available on request.

- ***Area Designations***
  2. Proposed 2010 Amendments to the State Area Designations, Criteria, and Maps; *http://www/arb/ca/govov/regact/2010/area10/area10.htm;* Page last reviewed January 25, 2011; Page last accessed April 1, 2011.

- ***Expected Peak Day Concentrations (EPDC)***
  3. Guidance for Using Air Quality-Related Indicators in Reporting Progress in Attaining the State Ambient Air Quality Standards; Report dated July 8, 1993; *http://www.arb.ca.gov/research/abstracts/93-49.htm*; Page last accessed April 1, 2011.

TITLES 13/17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE REGULATIONS FOR FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the Regulations for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline (section 2299.2, title 13, California Code of Regulations (CCR) and section 93118.2, title 17, CCR).

DATE: June 23, 2011

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item may be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 23, 2011, and may continue at 8:30 a.m., on June 24, 2011. This item may not be considered until June 24, 2011. Please consult the agenda for the hearing, which will be available at least 10 days before June 23, 2011, to determine the day on which this item will be considered.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to section 2299.2, title 13, CCR and title 17, CCR section 93118.2, the Regulations for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline (OGV Clean Fuel Regulation or regulation). The following documents would be incorporated in the regulations by reference: (1) International Standard ISO 8217, "Specification of Marine Fuels Requirements for Marine Residual Fuels," (as revised June 15, 2010); and (2) the National Oceanic and Atmospheric Administration (NOAA) Chart 18740, San Diego to Santa Rosa Island (March 2007).

Background:

The ARB adopted the OGV Clean Fuel Regulation in 2008. This regulation is one of many steps being taken to reduce emissions from goods movement activities. It also fulfills a key measure in meeting the goals of California's State Implementation Plan.

The OGV Clean Fuel Regulation requires operators of ocean-going vessels (OGVs) to use less polluting marine distillate fuels instead of heavy fuel oil in their diesel engines and auxiliary boilers while operating within approximately 24 nautical miles (nm) of the California coastline (Regulated California Waters). The fuel requirements are implemented in two phases. The Phase 1 fuel requirements, which began implementation on July 1, 2009, require the use of either marine gas oil (MGO) or marine diesel oil (MDO). Under the Phase 1 requirements, the MGO has a maximum sulfur limit of 1.5 percent (%), and the MDO has a maximum sulfur limit of 0.5%. The Phase 2 requirements, which are scheduled to begin on January 1, 2012, specify the use of either MGO or MDO at 0.1% sulfur.

The use of the marine distillate fuels instead of the heavy fuel oil typically used by OGV significantly reduces emissions of diesel particulate matter (PM), PM, sulfur oxides (SOx), oxides of nitrogen (NOx), and "secondarily" formed PM (PM formed in the atmosphere from NOx and SOx).

Prior to the implementation of the OGV Clean Fuel Regulation, the majority of OGVs going into and out of the Ports of Los Angeles and Long Beach traveled along the California coastline through the Santa Barbara Channel. In the Santa Barbara Channel, there is a traffic separation scheme established by the Commandant of the United States Coast Guard under the Ports and Waterways Safety Act and in accordance with international agreements. However, soon after the effective date of the OGV Clean Fuel Regulation, a large number of OGV operators chose to move from the traditional route through the Santa Barbara Channel, which lies within the zone covered by the OGV Clean Fuel Regulation, to a route on the Southern side of the Channel Islands, an area outside of the regulated zone. Because vessels on the Southern side of the Channel Islands do not have to use the cleaner marine distillate fuels required by the OGV Fuel Regulation, this change in routes has reduced the expected emissions reductions from the regulation. In addition, because this route on the Southern side of the Channel Islands goes through the United States Navy's (U.S. Navy) Point Mugu Sea Range, the U.S. Navy has raised concerns regarding the increased potential for vessels to interfere with military operations in the Point Mugu Sea Range.

ARB staff is proposing amendments to the OGV Clean Fuel Regulation. The purpose of the amendments is to adjust the offshore regulatory boundary in Southern California to lessen the potential for vessels to interfere with operations at the U.S Navy's Point Mugu Sea Range and to recapture lost emission reductions. In addition, amendments are proposed to help facilitate a successful transition to very low sulfur fuels by aligning implementation dates more closely with recently approved federal requirements. ARB staff is also taking this opportunity to propose other minor amendments. The proposed amendments are summarized below.

DESCRIPTION OF THE PROPOSED REGULATORY ACTION

ARB staff is proposing the following amendments to the OGV Clean Fuel Regulation. A more detailed description can be found in the Initial Statement of Reasons for Rulemaking at http://www.arb.ca.gov/ports/marinevess/ogv.htm.

Regulated California Waters: ARB staff is proposing to amend the regulatory boundary, by extending it further off shore by aligning it more closely in Southern California with the "Contiguous Zone," which is 24 nm from the California Baseline (shoreline), which includes offshore islands. In addition, we are proposing to exempt vessels from the Clean Fuel requirements when transiting a small "window" within the 24 nm boundary off Point Conception. This exemption window is being provided to encourage vessels to travel in the established shipping lanes in the Santa Barbara Channel when headed to or from the Ports of Los Angeles and Long Beach. These proposed changes in the boundary will lessen the economic incentive for OGVs to transit through the Point Mugu Sea Range instead of the Santa Barbara Channel and will help recapture lost emission reductions. No changes are being proposed to the Regulated California Waters in Northern California.

Phase 2 Implementation Date: The original regulation requires the use of Phase 2 0.1% sulfur distillate fuel beginning January 1, 2012. We are proposing to extend the deadline to use the Phase 2 fuel by two years to January 1, 2014. ARB staff believes this two-year delay will help facilitate a more successful transition to the 0.1% sulfur distillate fuels by more closely aligning California requirements with recently adopted federal requirements and providing OGV operators with more flexibility to acquire compliant fuels.

Noncompliance Fee Provision: ARB staff is proposing minor modifications to the "Noncompliance Fee Provision," which in certain specified situations allows the payment of fees in lieu of direct compliance with the rule through the use of cleaner fuels. This provision has been used five times since the OGV Clean Fuel Regulation began implementation. The proposed amendments are based on experience gained through implementation of the regulation to date, and focus primarily on the way fees are assessed. The proposed amendments include adjusting the fee schedule specified in the regulation, reducing the fees by half for vessel operators that purchase and use complying fuels after making a noncompliant port visit, and proposing that offshore anchorages made in conjunction with a port visit not be counted as a "port visit. We believe these changes will help to incentivize the use of the cleaner fuels as quickly as possible.

Other Proposed Amendments: ARB staff is proposing to amend the regulation to include a March 2007 update to the National Oceanic and Atmospheric Administration (NOAA) nautical chart 18740 covering California's coastline from San Diego to Santa Rosa Island. These charts are used to help define California Regulated Waters. In addition, ARB staff is proposing to amend the definitions of the fuels required under the

OGV Clean Fuel Regulation to reflect recent changes in how these fuels are specified under international standards.

COMPARABLE FEDERAL REGULATIONS

On March 26, 2010, the International Maritime Organization designated waters off North American coasts as an Emission Control Area (ECA), referred to as the North American ECA. The proposal for an ECA was introduced by the United States and Canada. In addition to establishing stringent engine exhaust standards that begin in 2016, the North American ECA requires the use of fuels with progressively lower sulfur levels. Under the approved North American ECA, which will be enforced by the federal government, OGVs traveling within a 200 nm zone off the North American coasts are required to use fuels with sulfur levels of 1% or less beginning in August 2012 and 0.1% sulfur in 2015. Until 2015, the ARB OGV Clean Fuel Regulation is more stringent than the North American ECA and is necessary to protect air quality and public health in California. However, the OGV Clean Fuel Regulation does include a "sunset" provision under which the requirements would cease to apply if it is determined by the Executive Officer that the United States Environmental Protection Agency adopts and enforces regulations that will achieve equivalent or greater emission reductions. This is expected to occur in 2015.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: *Proposed Amendments To The Regulation For Fuel Sulfur And Other Operational Requirements For Ocean-Going Vessels Within California Waters And 24 Nautical Miles Of The California Baseline.*

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, on Thursday, May 5, 2011.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Peggy Taricco, Manager of the Technical Analysis Section, at (916) 323-4882, or Bonnie Soriano, Air Resources Engineer, at (916) 327-6888.

Further, the agency representative and designated back-up contact persons, to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Lori Andreoni, Manager, Board Administration and Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at www.arb.ca.gov/regact/2011/ogv2011/ogv2011.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed amendments are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, except as discussed below, or other nondiscretionary savings to State or local agencies.

The estimated total costs associated with the proposed amendments are approximately $10 million annually in the years 2012 and 2013, and $47 million in 2014. These estimated annual costs represent the additional costs associated with the proposed amendments over and above compliance with the current regulation wherein the majority of vessels that historically transited through the Santa Barbara Channel are now transiting outside the regulatory zone. In other words, vessel operators will now incur the costs associated with using the more expensive cleaner marine distillate fuels that were originally attributed to the OGV Clean Fuel Regulation and that were avoided by transiting outside the existing regulatory zone in Southern California. In addition, the costs also reflect cost savings associated with the two-year delay of the Phase 2 requirements.

We estimate the overall total 2011 present value cost of the proposed amendments to be approximately $59 million dollars for the years 2012-2014, assuming the total annual costs mentioned above. The added cost to a typical ship operator is estimated to be about $20,000 in years 2012 and 2013, and about $90,000 in 2014. We expect these added costs can be absorbed by typical affected businesses without a significant adverse impact. The cost-effectiveness of the proposed amendments is estimated to be about $32,000 per ton or $16 per pound of diesel PM reduced (attributing all regulatory costs to diesel PM reductions). This compares favorably to other diesel PM regulations the Board has adopted previously, as well as to the original regulation.

The Executive Officer has determined that, because the added costs of the proposed regulatory actions are a small percentage of the overall operating costs, no significant impact on ship operators, businesses that import or export goods, California port competitiveness, or on individuals purchasing such goods is expected, even if all these costs were passed on to the consumer.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons. A number of businesses are integrally linked to the goods that travel through California ports. However, we do not believe that the added costs of the proposed regulatory action will result in vessel operators choosing alternative ports outside California.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed amendments will not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined that, pursuant to title 1, CCR, section 4, the proposed regulatory action will have no impact on small businesses because we do not believe that the ship operators subject to this proposal would qualify as small businesses due to the large capital and operating costs associated with vessel operation.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the proposed regulatory action will have no impact with regard to reporting requirements since no changes are proposed to the existing reporting provisions of the regulation.

In accordance with H&SC sections 43013(a) and (b), the Executive Officer has determined that the standards and other requirements in the proposed amendments are necessary, cost-effective, and technologically feasible for auxiliary diesel and diesel-electric engines main engines, and auxiliary boilers operated on ocean-going vessels within the regulated California waters.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the agency would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and comments may be submitted by postal mail or by electronic submittal before the meeting. The public comment period for this regulatory action will begin on May 9, 2011. To be considered by the Board, written comments, not physically submitted at the meeting, must be submitted on or after May 9, 2011 and received **no later than 12:00 noon on June 22, 2011**, and must be addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

New Feature

You can now sign up online in advance to speak at the Board meeting when you submit an electronic board item comment. For more information go to: http://www.arb.ca.gov/board/online-signup.htm

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

ARB requests that written and email statements on this item be filed at least 10 days prior to the hearing so that ARB staff and Board members have additional time to consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

Additionally, the Board requests but does not require that persons who submit written comments to the Board reference the title of the proposal in their comments to facilitate review.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted in Health and Safety Code sections 39600, 39601, 41510, 41511, 43013, and 43018; and Western Oil and Gas Ass'n v. Orange County Air Pollution Control District, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975). This action is proposed to implement, interpret, and make specific sections 39000, 39001, 39002, 39003, 39500, 39515, 39516, 41510, 41511, 43013, 43016, and 43018; and Western Oil and Gas Ass'n v. Orange County Air Pollution Control District, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975).

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice and that the regulatory language as modified could result from the proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15-days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

SPECIAL ACCOMMODATION REQUEST

Special accommodation or language needs can be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format (i.e., Braille, large print, etc.) or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at 916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Comodidad especial o necesidad de otro idioma puede ser proveído para alguna de las siguientes:

- Un intérprete que esté disponible en la audiencia
- Documentos disponibles en un formato alterno (por decir, sistema Braille, o en impresión grande) u otro idioma.
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

CALIFORNIA AIR RESOURCES BOARD

Robert Sletcher for

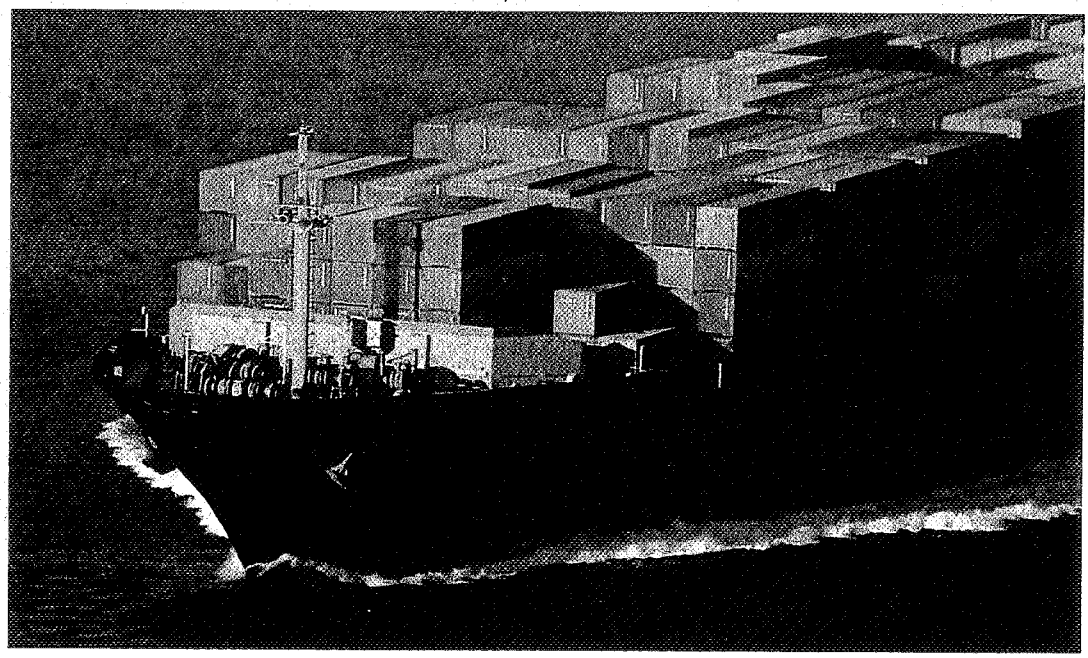
James N. Goldstene
Executive Officer

Date: April 26, 2011

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

California Environmental Protection Agency
AIR RESOURCES BOARD

INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING



PROPOSED AMENDMENTS TO THE REGULATIONS "FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE"

Stationary Source Division
Emissions Assessment Branch

May 2011

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

PROPOSED AMENDMENTS TO THE REGULATIONS FOR FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE

To be considered by the Air Resources Board on June 23-24, 2011, at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Byron Sher Auditorium
Sacramento, California

Stationary Source Division:
Richard Corey, Chief
Daniel Donohoue, Chief, Emissions Assessment Branch
Peggy Taricco, Manager, Technical Analysis Section

This report has been prepared by the staff of the Air Resources Board. Publication does not signify that the contents reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

State of California
AIR RESOURCES BOARD

PROPOSED AMENDMENTS TO THE REGULATIONS FOR FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE

Contributing Authors

Bonnie Soriano (Lead)
Paul Milkey
Ryan Huft
Layla Gonzalez
Andrew Alexis
Jin Lu
Steve Zelinka
Jeff Austin

Legal Counsel

Deborah Kerns, Office of Legal Affairs

Supporting Divisions

Planning and Technical Support Division
Research Division

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EXECUTIVE SUMMARY

The Air Resources Board (ARB or Board) staff is proposing amendments to the *Regulations for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline* (OGV Clean Fuel Regulation or regulation). The primary purpose of the amendments is to adjust the offshore regulatory boundary in Southern California to lessen the potential for vessels to interfere with operations at the United States Navy's Point Mugu Sea Range and to recapture emission reductions from the regulation. In addition, amendments are proposed to facilitate a successful transition to very low sulfur fuels by aligning implementation dates more closely with recently approved federal requirements.

Presented below is an overview that briefly discusses the information presented in this document.

When was the OGV Clean Fuel Regulation adopted and what does it require?

The ARB adopted the OGV Clean Fuel Regulation in 2008 (title 13, California Code of Regulation (CCR) section 2299.2 and title 17, CCR section 93118.2).[1] (ARB, 2008) This regulation is one of many steps being taken to reduce diesel particulate matter (PM) emissions from goods movement activities. It also is a key measure in meeting the goals of California's State Implementation Plan (SIP) and Goods Movement Emission Reduction Plan. (ARB, 2006)

The OGV Clean Fuel Regulation requires operators of ocean-going vessels (OGVs) to use less polluting marine distillate fuels instead of heavy fuel oil (HFO) in their diesel engines and auxiliary boilers while operating within approximately 24 nautical miles (nm) of the California coastline (Regulated California Waters or regulatory boundary or zone). The fuel requirements are implemented in two phases. The Phase 1 fuel requirements, which began implementation on July 1, 2009, require the use of either marine gas oil (MGO) or marine diesel oil (MDO). Under the Phase 1 requirements, the MGO has a maximum sulfur limit of 1.5 percent (%), and the MDO has a maximum sulfur limit of 0.5%. The Phase 2 requirements, which are scheduled to begin on January 1, 2012, specify the use of either MGO or MDO at 0.1% sulfur.

The regulation includes several exemptions to accommodate special circumstances or situations where it may not be feasible or practical to use the required fuel. For example, a safety exemption is included for situations where the master of the vessel determines that compliance would endanger the safety of the vessel, crew, cargo, or passengers. The regulation also includes a

[1] Two essentially identical regulations were adopted to reflect the authorities granted to the ARB in the California Health and Safety Code to regulate sources of toxic air contaminants and to regulate marine vessel emissions. Throughout this report the regulations are collectively referred to as "the OGV Clean Fuel Regulation" or "the regulation."

noncompliance fee provision that allows the operator to pay a fee in lieu of direct compliance with the regulation under special circumstances where direct compliance would be difficult. Finally, the regulation contains a "sunset" provision that would allow the fuel requirements to cease if the United States adopts and enforces requirements that will achieve equivalent emission reductions within the regulatory zone covered by the ARB regulation.

Emissions from OGVs are significant sources of air pollution and have an adverse impact on public health and air quality. Ocean-going vessels also contribute significantly to community health risks. The use of the marine distillate fuels instead of the heavy fuel oil typically used by OGVs significantly reduces emissions of diesel PM, PM, sulfur oxides (SOx), oxides of nitrogen (NOx), and "secondarily" formed PM (PM formed in the atmosphere from NOx and SOx).

What is the implementation status of the OGV Clean Fuel Regulation?

The Phase 1 fuel requirements began implementation on July 1, 2009 and have been in effect for over 20 months. ARB enforcement staff has actively enforced the regulation and have conducted over 450 vessel inspections. The compliance rate, as determined by ARB enforcement staff, is about 95%. Most violations are the result of fuel switching conducted in the wrong offshore location or recordkeeping violations. Enforcement staff report that the distillate fuels used are almost always within the sulfur content limits specified in the regulation, less than 1.5% sulfur for MGO, and less than 0.5% sulfur for MDO.

The information collected during the inspections is providing useful information on fuel qualities such as fuel sulfur content and viscosity as well as providing an indication of the types of fuels provided at ports throughout the world. The analysis of the collected fuel samples demonstrates that the fuels being used typically have much lower sulfur content than the Phase 1 fuel sulfur limits. Of the 444 fuel samples analyzed as of March 2011, the actual fuel sulfur content of the marine distillate fuels being used by OGV operators averages less than 0.3% sulfur.

Based on the data gathered to date, OGV operators have been able to obtain and operate on the Phase 1 fuels. Since the OGV Clean Fuel Regulation began implementation in July 2009, we estimate that there have been over 18,000 vessel visits to California ports. Complying fuel has proved to be readily available as evidenced by no OGV operators having to pay the noncompliance fee because they were not able to find compliant fuel. In addition, with few exceptions, almost all vessels have successfully switched to the cleaner marine distillate fuels prior to entering the regulated zone.

During the initial months of implementation, there was an increase in reported loss of propulsion (LOP)[2] incidents to the United States (U.S.) Coast Guard, some of which may be attributable to the use of the lower sulfur marine distillate fuels. However, over a period of six months, between July 2009 and December 2009, the frequency of LOP incidents related to the use of lower sulfur marine distillate fuels returned to pre-regulation levels. Out of the estimated 18,000 vessel visits to California ports between July 2009 and March 2011, there have been 37 LOP incidents that were attributable to the use of the low-sulfur distillate fuels. During that same time, there have also been 71 LOP incidents that have not been attributed to the use of low sulfur marine distillate fuels.

ARB staff has worked closely with the U.S. Coast Guard and ship operators to better understand any operational difficulties experienced by vessel operators while on the required fuels. In addition, the California Maritime Academy was brought under contract by ARB to help investigate the root causes of any LOP incidents related to the use of low sulfur marine distillate fuels. Preliminary findings from the study indicate that for vessels having low fuel pressure related problems, the reported fuel-related LOP incidents may be related to the condition of worn fuel injection pumps combined with the lower fuel viscosity. At this time, the U.S. Coast Guard is continuing to investigate LOP from all causes and considering if recommendations for best practices are needed.

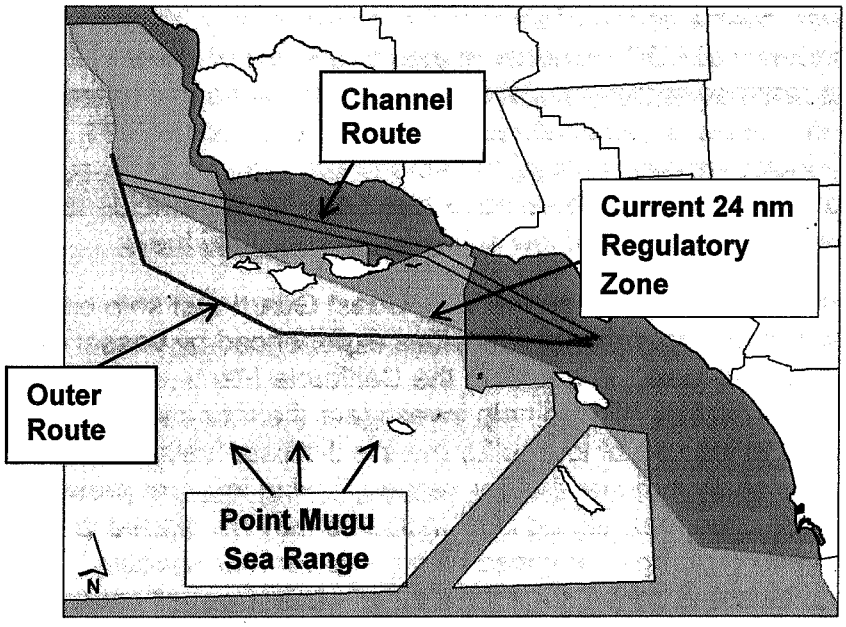
What has happened to vessel traffic patterns in Southern California since the OGV Clean Fuel Regulation began implementation?

Prior to the implementation of the OGV Clean Fuel Regulation, the majority of OGVs going into and out of the Port of Los Angeles (POLA) and Port of Long Beach (POLB) traveled along the California coastline through the Santa Barbara Channel. About 50% of the vessel visits to California come through these two ports. In the Santa Barbara Channel, there is a traffic separation scheme[3] established by the Commandant of the U.S. Coast Guard under the Ports and Waterways Safety Act and in accordance with international agreements. However, soon after the effective date of the OGV Clean Fuel Regulation, a large number of OGVs chose to move from the traditional route through the Santa Barbara Channel (Channel Route), which lies within the regulatory boundary of the OGV Clean Fuel Regulation, to a route (Outer Route) on the southern side of the Channel Islands, an area outside of the regulatory boundary and in the U.S. Navy's Point Mugu Sea Range (Sea Range). The vessel routes are shown in Figure ES-1.

[2] A reportable marine casualty, in accordance with 46 CFR 4.05-1(a)(3), includes a loss of main propulsion, primary steering, or any associated component or control system that reduces the maneuverability of the vessel.

[3] Traffic separation schemes are used to promote vessel safety by regulating the flow of traffic in busy or congested waterways.

Figure ES-1: Vessel Traffic Routes by the Channel Islands in Southern California



Data provided by the U.S. Navy demonstrate that prior to implementation of the regulation, about 30 ships per month, primarily tanker vessels, traveled through the Sea Range. Since implementation of the regulation began, there has been a steady increase with over 200 ships a month choosing to transit through the Sea Range in December 2010. (U.S. Navy, 2011) ARB staff estimates that approximately 50% of the vessel traffic in and out of the POLA and POLB that historically traveled through the Santa Barbara Channel is now transiting through the Sea Range on the southern side of the Channel Islands.

Why have vessel operators chosen to transit through the Sea Range instead of the established shipping lanes in the Santa Barbara Channel?

ARB staff believes the cost of the marine distillate fuel required by the OGV Clean Fuel Regulation has prompted the change in traffic patterns. Because vessels on the southern side of the Channel Islands do not have to use the cleaner marine distillate fuels required by the OGV Clean Fuel Regulation, it reduces the transit costs for the vessel operator on this segment of travel (Port Conception to the POLA and POLB) by about 20% relative to the costs that would be incurred transiting inside the Santa Barbara Channel. While the Outer Route is slightly longer than the Channel Route through the Santa Barbara Channel, resulting in a longer transit time, ship operators have weighed the added travel time and distance against the lower fuel costs and the majority of ship operators have chosen to use the Outer Route.

Table ES-1 presents a comparison between the fuel costs, time, and distance between the Channel Route and the Outer Route. As is shown, a one-way transit using the Outer Route is about 13 nm longer, saves approximately $2,750 dollars and takes about 1 hour longer relative to the Channel Route.

Table ES-1: Estimated Fuel Costs, Distance and Transit Time for Vessels Using the Santa Barbara Channel and the Outer Route

Route	Distance (nm)	Cost	Time (hrs)
Channel Route (150 nm)	MGO:150 nm	$14,390	9.6
Outer Route (163 nm)	MGO: 31 nm HFO: 132 nm	$11,640	10.5
Estimated Distance/Cost and Time Differential	13 nm	$2,750	0.9 (54 minutes)

Unfortunately, this change in routes has reduced the expected emissions reductions from the regulation. Statewide, ARB staff estimate that this change in vessel routing has resulted in about 3 tons per day (T/D) less diesel PM and 21 T/D less SOx emission reductions in 2010 than what could be realized if vessels used the Channel Route as originally anticipated when the regulation was adopted in 2008. It has also raised concerns for the U.S. Navy.

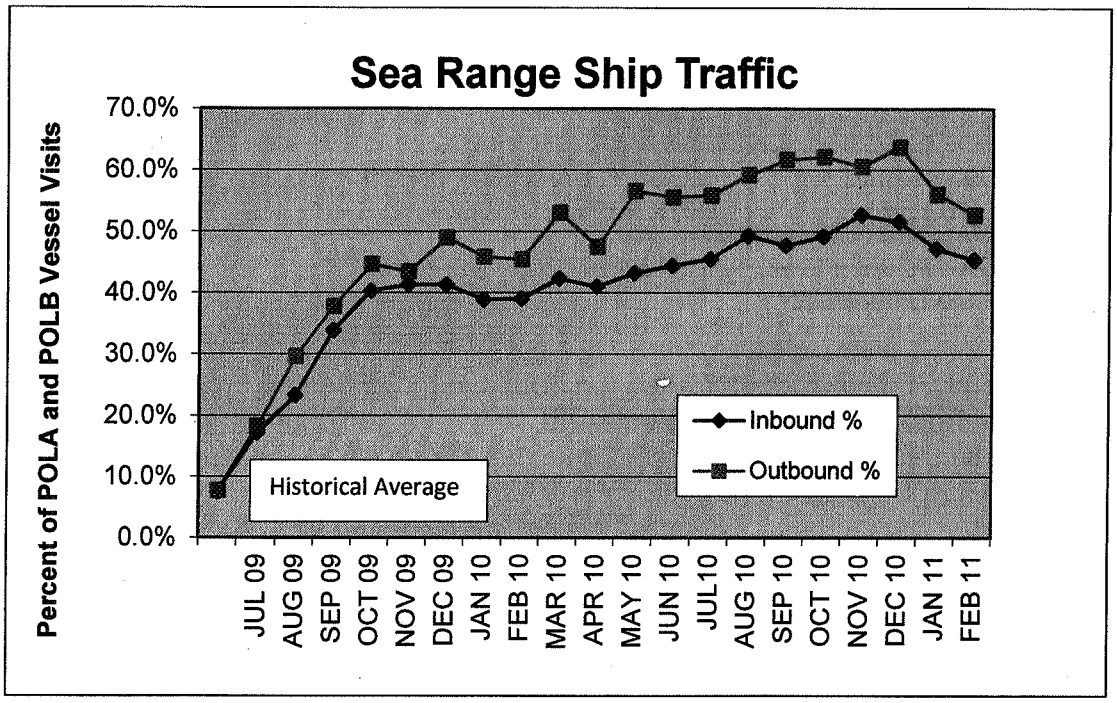
What are the U.S. Navy's concerns regarding the increased vessel traffic through the Point Mugu Sea Range?

During the development of the OGV Clean Fuel Regulation, U.S. Navy representatives expressed concerns about the potential for vessels to shift traffic patterns in Southern California and to transit through the Point Mugu Sea Range to avoid having to use the more expensive marine distillate fuels. At that time, ARB staff did not find sufficient evidence that there would be a significant shift in vessel traffic but agreed to monitor the situation and, at the Board's direction, return with amendments to address the issue if needed.

As noted above, shortly after implementation of the Phase 1 fuel requirements began, vessels began traveling on the southern side of the Channel Islands through the Point Mugu Sea Range instead of using the traffic separation scheme within the Santa Barbara Channel. The U.S. Navy provided ARB staff with vessel traffic data showing the percentage of vessels that are using the Outer Route compared to the total vessels visiting POLA and POLB. (U.S. Navy, 2011) Figure ES-2 shows both the percentage of vessels inbound and outbound from July, 2009 to February, 2011. The data indicate an increase in traffic using the Outer Route traffic from the historical average of about 7.5% (about 30 vessels per month) prior to July 2009 to about 53% (about 200 vessels

per month) inbound and 65% outbound by December 2010. In January and February 2011, there was a decrease in the percent of vessels using the Outer Route, possibly indicating that the percent of vessels using the Outer Route has stabilized.

Figure ES-2: Marine Exchange Vessel Traffic Data - Percent of POLA and POLB Vessel Traffic that use the Outer Route Through the Point Mugu Sea Range



U.S. Navy representatives and members of the Regional Defense Partnership for the 21st Century (RDP-21), a Ventura County non-profit community organization that works to preserve and enhance the military value of Naval Base Ventura County, have raised concerns about the increased ship traffic and the potential impacts it may have on the ability of the Sea Range to accomplish its primary mission. (RDP-21, 2010) (U.S. Navy, 2010)

What is the status of U.S. EPA's efforts to secure an Emission Control Area for the United States?

When the OGV Clean Fuel Regulation was originally approved in 2008, the International Maritime Organization (IMO) was considering amendments to MARPOL Annex VI (International Convention for the Prevention of Air Pollution from Ships) to further reduce air emissions from ships. In October, 2008, the IMO adopted the amendments, enacting more robust new international standards for marine diesel engines and their fuels. The amendments also allowed for creation of Emission Control Areas (ECA) by member states allowing them to implement more stringent requirements upon approval by the IMO.

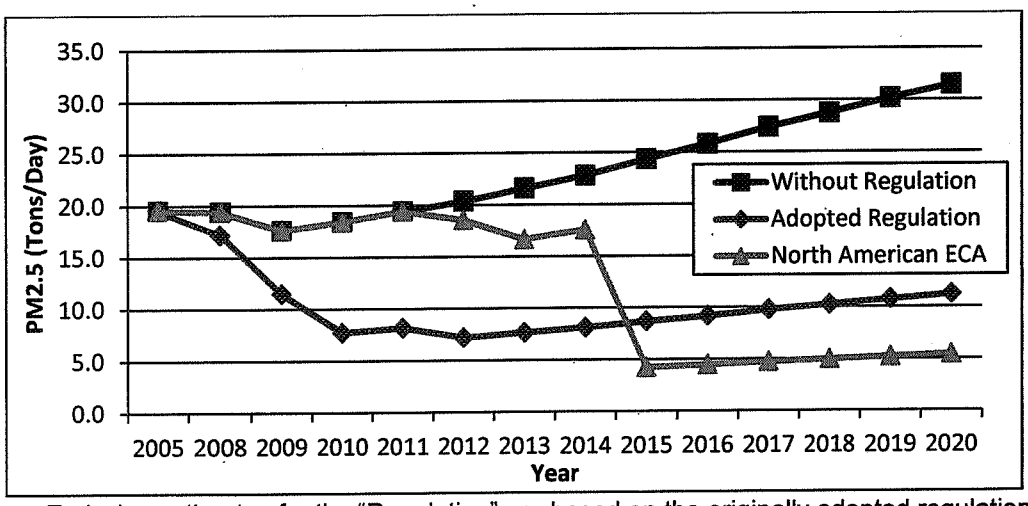
The United States and Canada jointly applied for an ECA designation in July, 2009. In the application for an ECA, the United States Environmental Protection Agency (U.S. EPA) provided extensive documentation on the air quality and public health impacts from the emissions of OGVs throughout the coastal and inland waters of the United States, including California. (U.S. EPA, 2009) On March 26, 2010, the IMO officially designated waters of the United States and Canadian coastlines as an ECA, referred to as the North American ECA. Under the North American ECA, OGVs traveling within a 200 nm zone of the North American coastline are required to use fuels with no more than 1% sulfur beginning in August 2012 and no more than 0.1% sulfur beginning in January 2015. There are also requirements for more stringent engine exhaust standards beginning in 2016. Below in Table ES-2, we provide a comparison between the fuel sulfur requirements in the OGV Clean Fuel Regulation and the North American ECA.

Table ES-2: Comparison of the Fuel Requirements for the OGV Clean Fuel Regulation and the North American ECA

ARB Requirements (24 nm zone)	July 1, 2009 (Phase 1)	Distillate fuel: MGO max 1.5% S MDO max 0.5% S
	Jan 1, 2012 (Phase 2)	Distillate fuel: MGO max 0.1% MDO max 0.1%
North American ECA (200 nm zone)	Aug 1, 2012 (Phase 1)	Fuel Sulfur max 1.0%
	Jan 1, 2015 (Phase 2)	Fuel Sulfur max 0.1%

As mentioned earlier, under the OGV Clean Fuel Regulation, the Executive Officer can "sunset" the OGV Clean Fuel Regulation when he or she determines that U.S. EPA enforces a measure that gets equivalent or greater emission reductions. With the North American ECA now approved, the OGV Clean Fuel Regulation should be able to "sunset" in 2015. However, it is important that the OGV Clean Fuel Regulation continue implementation until that time. As shown in Figure ES-3, the use of the marine distillate fuels required by the OGV Clean Fuel Regulation results in significantly more emissions reductions than the fuels with 1% sulfur limits that will be used to comply with the North American ECA beginning in August 2012. While the 1% sulfur requirement will provide some additional incremental benefit for California, it is not until the North American ECA's 0.1% sulfur requirement is implemented and enforced that we will achieve equivalent benefits to California's OGV Clean Fuel Regulation.

Figure ES-3: Comparison of Expected PM Emissions Reductions Between the Adopted OGV Clean Fuel Regulation and the North American ECA (100nm Zone)



Notes: Emission estimates for the "Regulation" are based on the originally adopted regulation that did not incorporate any loss of benefits due to unforeseen route changes in Southern California or incorporate additional reductions from the North American ECA.

Does ARB staff have any concerns regarding the transition to the Phase 2, 0.1% sulfur standard in 2012?

ARB staff is fully committed to reaching the Phase 2 limit of 0.1% sulfur fuel. The use of 0.1% sulfur marine distillate fuel is technologically and operationally feasible and is cost-effective. It is also consistent with the North American ECA Phase 2 limit which will come into effect in 2015. However, ARB staff does have concerns about the timing for implementation of the OGV Clean Fuel Regulation's Phase 2 requirement and we believe there are valid reasons to delay the implementation date by two years. ARB staff believes that providing a two-year delay will help to ensure the successful implementation of the North American ECA's Phase 1 fuel requirements and a successful transition to the 0.1% sulfur fuels. Below, we briefly discuss our rationale.

Under the OGV Clean Fuel Regulation, the Phase 2 sulfur requirement is scheduled to begin implementation on January 1, 2012. As can be seen in Table ES-2 above, later in that same year, the North American ECA's Phase 1 requirement to use 1% sulfur fuel begins implementation. Because of this, ARB staff believes it is appropriate to adjust the implementation timeline for the OGV Clean Fuel Regulation's Phase 2 requirements (0.1% sulfur beginning January 1, 2012) to more closely align with the Phase 2 North American ECA requirement (0.1% sulfur beginning January 1, 2015). In addition, by delaying the OGV Clean Fuel Regulation's Phase 2 implementation date we believe that shippers may be able to more easily locate fuels with higher viscosity levels

during the extension of the Phase 1 requirements. As alluded to earlier, for vessels that have experienced LOP incidents related to the use of low sulfur distillate fuels, on-board management of fuel viscosity is a very important parameter.

The majority of the emissions reductions from the OGV Clean Fuel Regulation, over 90%, are achieved with the Phase 1 requirements. While the use of the Phase 2 fuels will provide additional benefits, a two-year delay will not impact the significant reductions achieved with Phase 1 fuels. For all these reasons, ARB staff believes delaying implementation of the 0.1% sulfur limit by two years will provide more flexibility to acquire fuels with higher viscosity and may help lessen the probability of operational difficulties, while still maintaining over 90% of the emission reduction benefits from the OGV Clean Fuel Regulation.

Why is ARB staff proposing amendments?

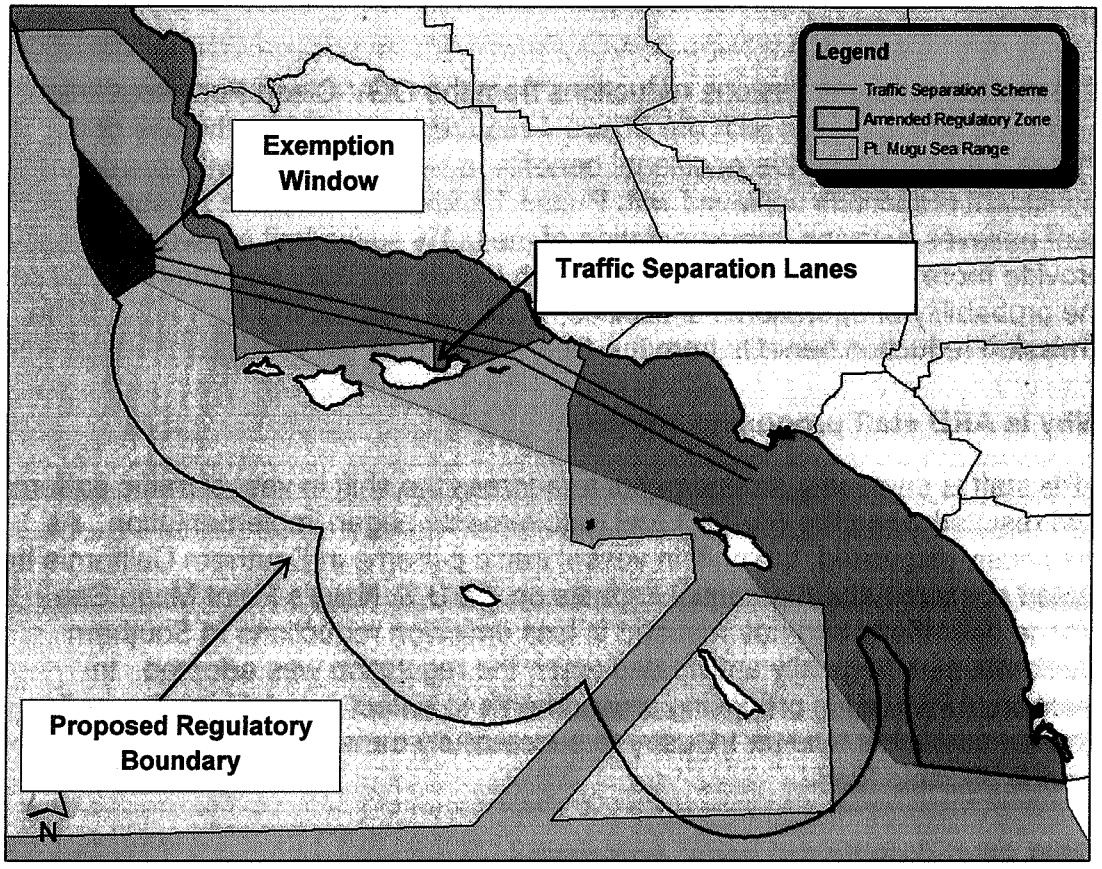
ARB staff is proposing amendments to address the shift in vessel traffic patterns that resulted when the Phase 1 fuel requirements began implementation. As previously discussed, the shift in vessel traffic patterns in Southern California has raised concerns about potential impacts on the U.S. Navy's Point Mugu Sea Range operations and has resulted in less emission reductions in Southern California than originally anticipated when the regulation was adopted. In addition, ARB staff is proposing amendments to reflect new information and provide additional time for industry to successfully transition to the 0.1% sulfur marine distillate fuels.

What amendments are being proposed?

ARB staff is proposing the following amendments to the OGV Clean Fuel Regulation. The strike-out/underline version of the proposed amendments to the regulation is provided in Appendix A.

Regulated California Waters: ARB staff is proposing to amend the regulatory boundary, by extending it further off shore by aligning it more closely in Southern California with the "Contiguous Zone," which is 24 nm from the California Baseline (shoreline), which includes offshore islands. In addition, we are proposing to exempt vessels from the clean fuel requirements when transiting a small region ("window") within the 24 nm boundary off Point Conception. This exemption window is being provided to encourage vessels to travel in the established shipping lanes in the Santa Barbara Channel when headed to or from the POLA and POLB. This proposed change in the boundary will lessen the economic incentive for OGVs to transit through the Point Mugu Sea Range instead of the Santa Barbara Channel and will help reestablish the emission reductions from the regulation. No changes are being proposed to the Regulated California Waters in Northern California. The proposed amended regulatory boundary is shown in Figure ES-4 below.

Figure ES-4: Proposed Amended Regulated California Waters in Southern California



Phase 2 Implementation Date: The original regulation requires the use of Phase 2 0.1% sulfur distillate fuel beginning January 1, 2012. We are proposing to extend the deadline to use the Phase 2 fuel by two years to January 1, 2014. As discussed above, ARB staff believes this two-year delay will help facilitate a more successful transition to the 0.1% sulfur distillate fuels.

Noncompliance Fee Provision: ARB staff is proposing some minor modifications to the "noncompliance fee provision," which in certain specified situations allows the payment of fees in lieu of direct compliance with the rule through the use of cleaner fuels. This provision has been used five times since the OGV Clean Fuel Regulation began implementation. The proposed amendments are based on experience gained through implementation of the regulation to date, and focus primarily on the way fees are assessed. The proposed amendments include adjusting the fee schedule specified in the regulation, reducing the fees by half for vessel operators that purchase and use complying fuels after arriving to a port on noncomplying fuel, and proposing that offshore anchorages made in conjunction with a port visit not be counted as a "port visit. We believe these changes will help to incentivize the use of the cleaner fuels as quickly as possible.

Other Proposed Amendments: ARB staff is proposing to amend the regulation to include a March 2007 update to the National Oceanic and Atmospheric Administration (NOAA) nautical chart 18740 covering California's coastline from San Diego to Santa Rosa Island. These charts are used to help define California Regulated Waters. In addition, ARB staff is proposing to amend the definitions of the fuels required under the OGV Clean Fuel Regulation to reflect recent changes in how these fuels are specified under international standards.

What are the environmental and public health impacts from the amendments?

The impacts from the proposed amendments on the statewide SOx and PM emissions from OGVs are shown in Figures ES-5 and ES-6.[4] As is shown, compared to the current regulation where about 50% the vessels traveling to and from the POLA and POLB are using the Outer Route, statewide emissions with the proposed amendments will continue to decline. Statewide, the proposed amendments also will result in lower SOx and PM emissions than with the current regulation. However, in the San Francisco Bay Area, the amendments will result in a small loss of future projected emission reductions of SOx (1.2 T/D in 2012 and 1.4 T/D in 2013) and PM2.5 (0.1 T/D in 2012 and 2013) relative to the projected future emissions under the current regulation. In the South Coast Air Basin, there is also a small loss in the projected future emission reductions of SOx (0.4 T/D in 2013) relative to the emissions projections under the current regulation. While the proposed amendments would not result in an increase in the emissions from what currently exists, the foregone emission reductions in future years in the San Francisco Bay Area and the South Coast Air Basin could be viewed as a potential adverse environmental impact. However, OGV emissions in all areas of the State, including the San Francisco Bay Area and the South Coast Air Basin, will continue to decline in future years and the remaining emissions are far lower than expected when the regulation was originally adopted. This is in part due to the recession which has had an impact on the activity of OGVs and the adoption of the North American ECA.

[4] In Figures ES-5 and ES-6, all the emissions trend lines are based on an updated 2011 OGV Emissions Inventory that reflects of the recession and assumes an average recession recovery scenario. This is discussed in more detail in Chapter IV and Appendix D.

Figure ES-5: Estimated Statewide OGV PM2.5 Emissions (100 nm)

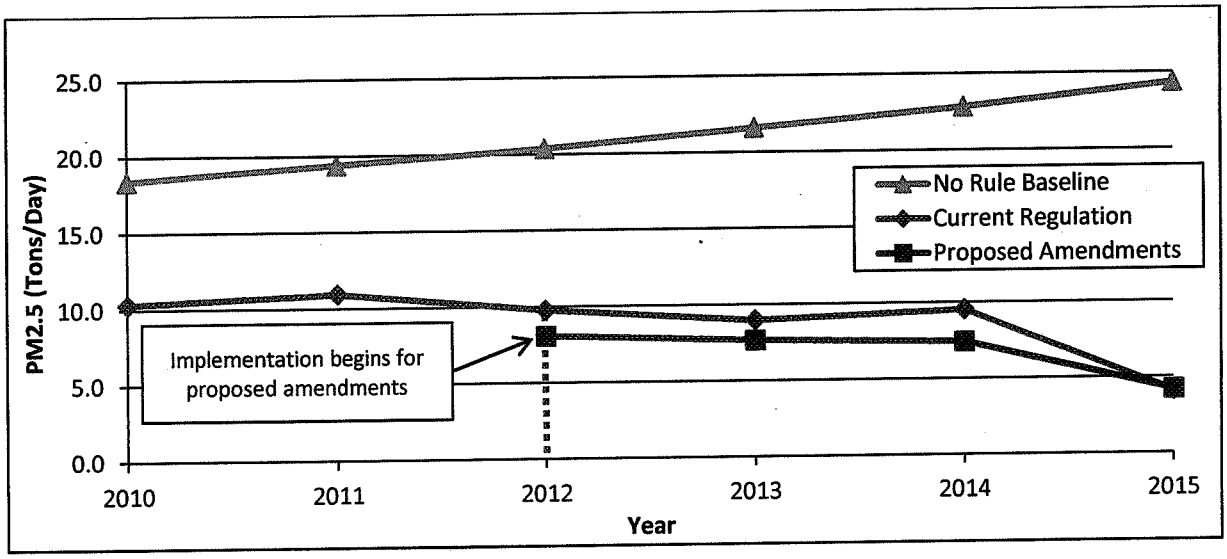
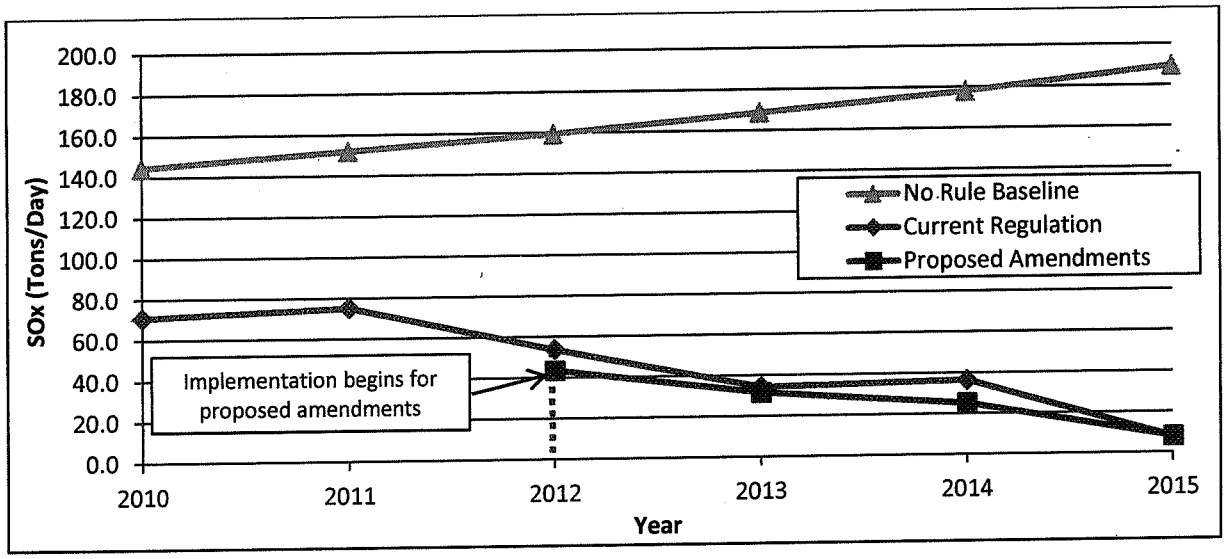


Figure ES-6: Estimated Statewide OGV SOx Emissions (100 nm)



With the proposed amendments, the OGV Clean Fuel Regulation will continue to provide significant health benefits by reducing premature mortality from PM2.5 exposure and localized potential cancer risk from diesel PM. Because the proposed amendments lower projected emissions to levels below the 2008 adopted regulation, the implementation of the proposed amendments will have similar public health benefits associated with the original OGV Clean Fuel Regulation. Extensive modeling was conducted when the OGV Clean Fuel Regulation was originally adopted and demonstrated that upon implementation, the regulation will avoid a significant number of premature deaths, about 3,600,

between 2009 and 2015 associated with the reduction in PM. (ARB, 2008) Since the baseline emissions have decreased due to recession related decrease in vessel calls, the magnitude of the premature deaths avoided that would be attributed to the adopted or proposed amended rule would not be as great as identified above. However, the avoided premature deaths due the adopted regulation with the proposed amendments will remain substantial. Moreover, as the economy rebounds, a greater percentage of the premature death avoided will be because of the rule, not the recession.

During the development of the OGV Clean Fuel Regulation, ARB staff worked with NOAA staff to investigate the potential impact on marine mammals if vessels chose to avoid the Santa Barbara Channel and instead transit on the southern side of the Channel Islands. At that time, based on the available data of densities of blue, fin, humpback, and sperm whales, the likelihood of ship strikes was similar or less if a ship did not use the Santa Barbara Channel. (ARB, 2009) Since that time, NOAA staff has been developing an analysis of the whale population densities in the Santa Barbara Channel and south of the islands and correlating this information with the vessel routes south of the Channel Islands.

Based on a preliminary analysis of whale population densities by NOAA, the data suggests that there is a decreased risk to fin whales, an increased risk to humpback whales, and there is an unclear impact to blue whales if vessels return to the Santa Barbara Channel. Humpback whales have large concentration on the north end of the entrance to the Santa Barbara Channel. However, whale densities shift from year-to-year and variations in the number of ship strikes can change annually depending on the concentrations of whales in a given year. (NOAA, 2010b) Based on this information, ARB staff believes that there is a potential for an adverse environmental impact to humpback whales from the proposed amendments.

What are the economic impacts?

The estimated total costs associated with the proposed amendments are approximately $10 million annually in 2012 and 2013, and $47 million in 2014. These estimated annual costs represent the net additional costs associated with the proposed amendments over and above compliance with the current regulation.

A number of factors affect these net added costs. First, the majority of vessels that historically transited through the Santa Barbara Channel are now transiting outside the regulatory zone via the Outer Route to reduce fuel costs. Under the proposed amendments, we predict that these vessel operators will return to Channel Route and incur the higher costs associated with using the more expensive cleaner marine distillate fuels. These costs were originally attributed to the OGV Clean Fuel Regulation and were avoided by transiting outside the existing regulatory zone in Southern California. These estimated annual costs also represent the added fuel costs for vessels that historically used the Outer Route, such as the tankers. It also represents the cost saving due to the two

year delay of the Phase 2 (0.1%) fuel sulfur limits. These estimated costs do not reflect the cost savings that vessels shifting to the Outer Route incurred from July 2009 until the effective date of proposed amendments. For perspective, the staff report for the original OGV Clean Fuel Regulation estimated the total cost to the industry at about $350 million annually for the years 2012 through 2014.

We estimate the overall total present value cost of the proposed amendments to be approximately $59 million dollars for the years 2012-2014, assuming the total annual costs mentioned above. The added cost to a typical ship operator is estimated to be about $20,000 in years 2012 and 2013, and about $90,000 in 2014. We expect these added costs can be absorbed by typical affected businesses without a significant adverse impact. The average cost-effectiveness of the proposed amendments is estimated to be about $16 per pound of diesel PM reduced over the three year life of the regulation assuming all of the regulatory costs are assigned to the diesel PM reductions. This compares favorably to other diesel PM regulations the Board has adopted previously, as well as to the original regulation.

How did staff develop the amendments?

ARB staff developed the proposed amendments to the OGV Clean Fuel Regulation through consultations with OGV operators and industry representatives, the U.S. Coast Guard, U.S. Navy, the California Office of Spill Prevention and Response, local Harbor Safety Committees, California's Attorney General's Office, and members of the public. Over the last year, the staff held two public workshops to discuss the proposed amendments. More than 2,500 companies, organizations, and individuals were notified of these public workshops through email notification. Workshop notices were posted to ARB's website and e-mailed to subscribers of the "maritime" electronic list serve. Individual meetings also were held with affected stakeholders.

What are the impacts on the SIP?

The federal Clean Air Act (CAA) requires U.S. EPA to establish National Ambient Air Quality Standards (standards) for pollutants considered harmful to public health, including PM2.5 and ozone. Areas in the State that exceed the national standards are required by federal law to develop SIPs describing how they will attain the standards by certain deadlines. Diesel PM, NOx and SOx emission reductions are needed because they contribute to ambient concentrations of PM2.5; NOx emission reductions are needed because NOx leads to formation in the atmosphere of both ozone and PM2.5; and SOx emission reductions are needed because SOx leads to the formation in the atmosphere of PM2.5.

The OGV Clean Fuel Regulation originally adopted by ARB in 2008 provided critical emission reductions needed by the South Coast Air Quality Management District (SCAQMD) to fulfill the SIP obligations and attain the PM2.5 standard in the South Coast Air Basin. The proposed rule amendments will reestablish the emission reductions anticipated from the OGV Clean Fuel Regulation originally

adopted by ARB in 2008. The South Coast Air Basin is required to attain the national standard for PM2.5 by April 5, 2015. Because attainment for the PM2.5 national standard is based on calendar year annual averages, all reductions needed to meet the standard must be in place by January 1, 2014.

What is the status of the lawsuit filed by the Pacific Merchant Shipping Association?

The Pacific Merchant Shipping Association (PMSA) filed a complaint on April 28, 2009, seeking to invalidate the OGV Clean Fuel Regulation. PMSA alleges the regulation conflicts with the Submerged Lands Act and also suggests it is preempted under the Commerce Clause. The lower court denied PMSA's motion for summary judgment on June 30, 2009. On December 11, 2009, the United States Court of Appeals, Ninth Circuit, granted PMSA's petition seeking permission to appeal immediately the lower court's order denying PMSA's motion for summary judgment. The United States Court of Appeals, Ninth Circuit, held oral argument on December 9, 2010, in San Francisco. On March 28, 2011, the Ninth Circuit upheld California's OGV Clean Fuel Regulation. The Court concluded that California can adopt reasonable regulations for air pollution that is emitted beyond our territorial boundaries (which generally are three miles out at sea) when the pollution has a substantial effect within the state and that California is not barred from combating the severe pollution caused by these vessels. (U.S. Court, 2011)

What is staff's recommendation?

We recommend that the Board approve the proposed amendments to the OGV Clean Fuel Regulation. ARB staff believes that the proposed amendments will help to restore the public health and air quality benefits that can be achieved by the regulation, eliminate the economic incentive to go through the Point Mugu Sea Range, will more closely align the OGV Clean Fuel Regulation's Phase 2 requirements with the North American ECA Phase 2 requirements for 0.1% sulfur fuels, and help facilitate a successful transition to the Phase 2 sulfur standards.

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I. INTRODUCTION

In this chapter, the Air Resources Board (ARB or Board) staff provides a brief description of ocean-going vessels (OGV or ships), an overview of the *Regulations for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline* (OGV Clean Fuel Regulation or regulation), and recently adopted international and federal programs for fuels. Also included in this chapter is information on the implementation status for the OGV Clean Fuel Regulation, why the OGV Clean Fuel Regulation was originally adopted, and why it is important to reduce the emissions from ships. This chapter concludes with a discussion of the regulatory process and actions the ARB undertook to engage stakeholders in this rulemaking process to propose amendments to the OGV Clean Fuel Regulation. Additional information on these topics can also be found in the Staff Report prepared for the adoption of the regulation in 2008. (ARB, 2008)

A. Description of Ocean-Going Vessels

Ocean-going vessels are very large vessels designed for deep water navigation. Ocean-going vessels include large cargo vessels such as container vessels, tankers, bulk carriers, and car carriers, as well as passenger cruise vessels. These vessels transport containerized cargo; bulk items such as vehicles, cement, and coke; liquids such as oil and petrochemicals; and passengers. Ocean-going vessels travel internationally and may be registered by the United States Coast Guard (U.S.-flagged), or under the flag of another country (foreign-flagged). The majority of vessels that visit California ports are foreign-flagged vessels.

Ocean-going vessels have both main propulsion (main engines) and auxiliary diesel engines. Most OGVs are propelled by a single large slow-speed two-stroke direct drive diesel engine, with smaller medium speed four stroke auxiliary engines providing electrical power for lighting, navigation equipment, and other ship-board uses. Diesel-electric vessels such as passenger cruise vessels use very large four-stroke medium speed engines coupled to generators to provide electrical power for both propulsion and ship-board electrical power.

Most OGVs also have auxiliary boilers that are fuel-fired combustion equipment designed primarily to produce steam for uses other than propulsion, such as heating of residual fuel and liquid cargo, heating of water for crew and passengers, powering steam turbine discharge pumps, freshwater generation, and space heating of cabins. Boilers used to provide propulsion (steam ships) are not included in the regulation or proposed amendments because there are very few steamships still in service.

Without regulatory requirements, the large main engine and boilers typically operate on heavy fuel oil (HFO), while the smaller auxiliary engines also typically

run on HFO but some operate on marine distillate fuels such as marine gas oil (MGO) or marine diesel oil (MDO). These vessels generally use HFO, although some have reported using marine distillate fuels close to shore to reduce their emissions. Under the requirements of the regulation and proposed amendments, the main engines, auxiliary engines, and auxiliary boilers are required to use cleaner MGO or MDO.

B. Regulatory Authority

Under State and federal law, ARB can regulate both criteria pollutants and toxic diesel particulate matter (PM) emissions from marine vessels. Health and Safety Code (H&S) sections 43013 and 43018 authorize ARB to regulate marine vessels to the extent such regulation is not preempted by federal law. Also, H&S section 39666 requires ARB to regulate emissions of toxic air contaminants (TAC) from nonvehicular sources, which include ocean-going vessels. The OGV Clean Fuel Regulation reduces emissions of diesel PM, which is both a TAC and criteria pollutant, and PM, oxides of nitrogen (NOx), oxides of sulfur (SOx), and "secondarily" formed PM (PM formed in the atmosphere from NOx and SOx) which are criteria pollutants.

The OGV Clean Fuel Regulation and the proposed amendments are neither preempted under federal law, nor do they violate the dormant Commerce Clause of the U.S. Constitution. Federal authorization under section 209(e) of the Clean Air Act (CAA) is required for regulating new nonroad engines and for requiring retrofits on existing engines. Ocean-going vessel engines fall within the category of nonroad engines. However, no federal authorization is required for implementing in-use operational requirements on existing marine vessels and their engines. The OGV Clean Fuel Regulation establishes an in-use operational requirement, rather than an emissions standard, because it does not apply a numerical emissions limit to be met (e.g., 10 grams NOx per brake horsepower-hour), does not require retrofits, or mandate design changes to the vessel. Rather, the regulation only requires that specified fuels be used on OGV engines and auxiliary boilers operating in Regulated California Waters. The proposed amendments to the OGV Clean Fuel Regulation do not change the existing in-use operational requirement.

In addition, the proposed amendments to the OGV Clean Fuel Regulation do not conflict with the Ports and Waterways Safety Act (PWSA) and U.S. Coast Guard regulations. As a nondiscriminatory regulation with substantial benefits, OGV Clean Fuel Regulation and the amendments being proposed do not violate the dormant Commerce Clause. And, federal and state cases support our assertion of authority to regulate both U.S. and foreign-flagged vessels within the regulated California waters. Therefore, federal law does not preempt or otherwise prohibit the OGV Clean Fuel Regulation and the proposed amendments and their application in the waters off California's coast. Further discussion on ARB's regulatory authority is provided in the Staff Report prepared for the adoption of the regulation in 2008. (ARB, 2008)

C. Ocean-going Vessel Clean Fuel Regulation

The OGV Clean Fuel Regulation was adopted by the ARB in 2008. The OGV Clean Fuel Regulation requires that operators of OGVs use marine distillate fuels in their diesel engines and auxiliary boilers while operating within approximately 24 nautical miles (nm) of the California coastline. Using cleaner burning marine distillate fuels significantly reduces PM, diesel PM, NOx, and SOx emissions. The fuel requirements are implemented in two phases. The Phase 1 fuel requirements, which began implementation on July 1, 2009, require the use of either MGO or MDO. Under the Phase 1 requirements, the MGO has a sulfur limit of 1.5%, and the MDO has a sulfur limit of 0.5%. The Phase 2 requirements, which are scheduled to begin on January 1, 2012, specify the use of either MGO or MDO at 0.1% sulfur.

The regulation includes several exemptions to accommodate special circumstances or situations where it may not be feasible or practical to use the required fuel. For example, a safety exemption is included for situations where the master of the vessel determines that compliance would endanger the safety of the vessel, crew, cargo, or passengers. Exemptions are also provided for vessels that use alternative fuels, for military vessels, and for vessels that are evaluating technologies that will advance the state of knowledge pertaining to exhaust control technology or emissions characterization.

In the event a vessel owner needs to undertake essential modifications to enable the vessel to use the low sulfur distillate fuel, the regulation includes a provision to grant an exemption from the fuel-use requirement provided certain criteria are met. The regulation also includes a noncompliance fee provision that allows the operator to pay a fee in lieu of direct compliance with the regulation under special circumstances where compliance would be difficult.

Finally, the regulation contains a "sunset" provision that would allow the fuel requirements to cease if the United States adopts and enforces requirements that will achieve equivalent emission reductions within the regulated zone covered by the ARB regulation.

D. Implementation Status

The Phase 1 fuel requirements began implementation on July 1, 2009 and have been in effect for over 20 months. ARB enforcement staff has actively enforced the regulation and have conducted over 450 vessel inspections. To enforce the regulation, ARB inspectors board vessels at dockside throughout California. Once on-board they collect fuel samples for testing and analysis and review records and fuel switching documentation. The compliance rate, as determined by ARB enforcement staff is about 95%. Most violations discovered by enforcement staff are the result of fuel switching conducted in the wrong offshore location or recordkeeping violations. Enforcement staff report that the distillate fuels used are almost always within the sulfur content limits specified in the regulation, less than 1.5% sulfur for MGO, and 0.5% sulfur for MDO.

The information collected during the inspections is providing useful data on fuel qualities such as fuel sulfur content and viscosity as well as providing an indication of the types of fuels provided at ports throughout the world. (ARB, 2011) The analysis of the collected fuel samples demonstrates that the fuels being used typically have much lower sulfur content than the Phase 1 fuel sulfur limits. Of the 444 fuel samples analyzed as of March 2011, the actual fuel sulfur content of the marine distillate fuels being used by OGV operators averages less than 0.3% sulfur. This is discussed further in Chapter II of this report. Based on the information data gathered to date, OGV operators have been able to obtain and operate on the Phase 1 fuels. Since the OGV Clean Fuel Regulation began implementation in July 2009, we estimate that there have been over 18,000 vessel visits to California ports. Below, we provide a summary of the use of the provisions in the OGV Clean Regulation that were incorporated to help manage implementation of the regulation.

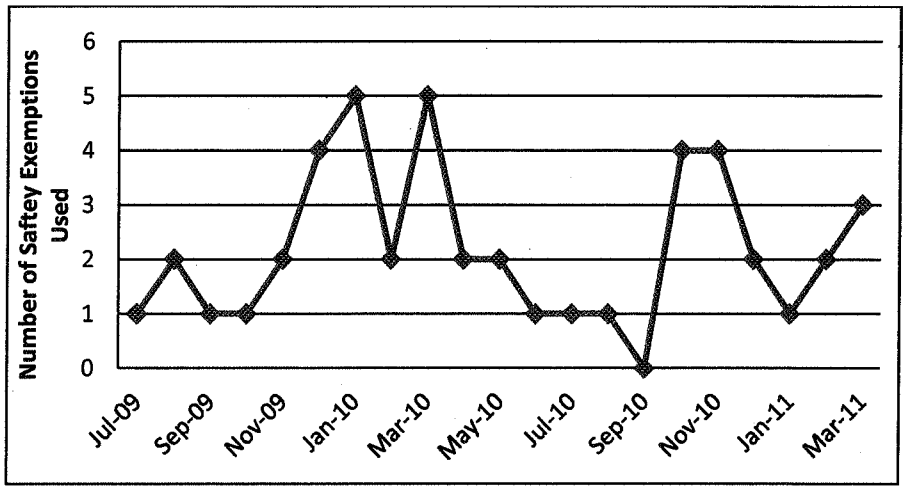
Essential Modifications Exemption

The "essential modifications" provision can provide vessel operators with an exemption from the fuel-use requirement provided they submit an application that demonstrates that the engine or boiler on board their vessel cannot use the low sulfur distillate fuel without making "essential" modifications. When an exemption is granted to the vessel operator, an Executive Order is issued specifying the specific vessels and equipment exempted, and other terms of the exemption. This provision has been used more frequently than anticipated for boilers. To date, over 400 vessels have been granted exemptions for some onboard equipment. Nearly all of the exemptions are for the large, steam-atomized boilers used on tanker vessels. Typically, the essential modifications necessary to these boilers includes installation of different burner equipment, flame detection sensors, and software modifications to adjust operation specific to the lighter distillate. Many of these vessel operators that have received these exemptions have committed to modify their equipment to use the distillate fuels. The Executive Orders that are issued for each essential modification exemption are posted on ARB's website at http://www.arb.ca.gov/ports/marinevess/ogv/ogveos.htm.

Safety Exemption

The safety exemption provides the master of the vessel with an exemption from the regulation in those unusual cases where compliance would endanger the safety of the vessel, crew, or cargo. As shown below in Figure I-1, the safety exemption has been used in a limited number of cases (at most 5 times per month). The exemption has been used for a variety of reasons including inclement weather and heavy seas, engine malfunctions, operational difficulties, mechanical problems, and out-of-specification fuels. ARB staff has worked closely with the U.S. Coast Guard to ensure that vessel operators are aware of the safety exemption provisions.

Figure I-1: Use of the OGV Clean Fuel Regulation Safety Exemption



Noncompliance Fee Provision

There have been five noncompliance fees paid since the regulation began implementation. Three vessel operators used the noncompliance fee provision because they had an unplanned redirection to a California port and did not have sufficient compliant fuel on-board, one vessel operator had defective fuel, and one vessel operator paid the noncompliance because they had plans to take the vessel out of service to perform modifications. No OGV operators have had to pay the noncompliance fee because they were not able to find compliant fuels.

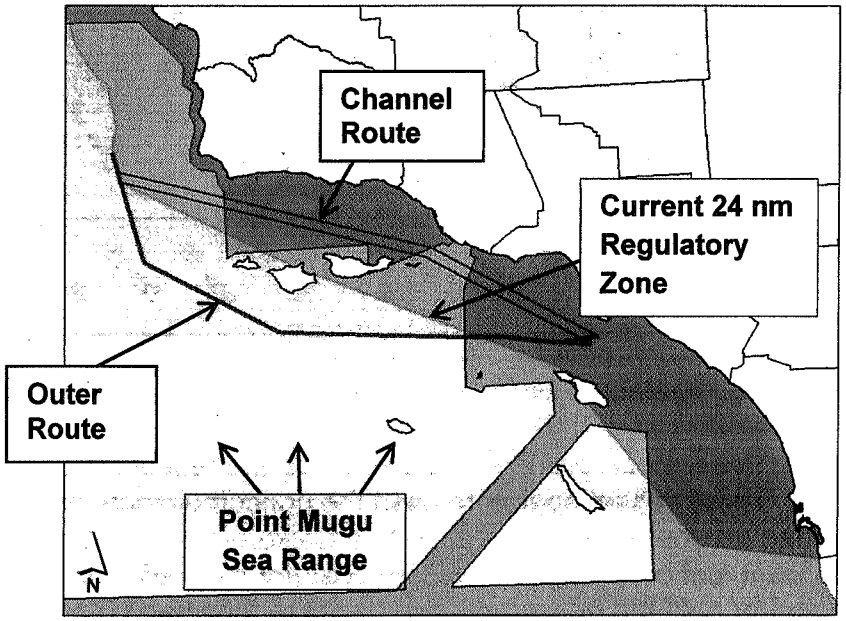
Since implementation of the OGV Clean Fuel Regulation began, there has been a change in vessel traffic patterns, primarily in Southern California. In addition, some vessels have experienced operational difficulties when operating on the required fuels. These are discussed briefly below and in more detail in Chapter II.

Vessel Traffic Patterns

Prior to the implementation of the OGV Clean Fuel Regulation, the majority of OGVs going into and out of the Ports of Los Angeles and Long Beach (POLA and POLB) traveled along the California coastline through the Santa Barbara Channel (the Channel Route). In the Santa Barbara Channel, there is a traffic separation scheme established by the Commandant of the U.S. Coast Guard under the Ports and Waterways Safety Act and in accordance with international agreements. However, soon after the effective date of the OGV Fuel Regulation, a large number of OGVs chose to move from the traditional route through the Santa Barbara Channel, which lies within the regulatory boundary of the OGV Clean Fuel Regulation, to an outer route (the Outer Route) on the southern side of the Channel Islands, an area outside of the regulatory boundary and in the

U.S. Navy's Point Mugu Sea Range (Sea Range). The vessel routes are shown in Figure I-2.[5]

Figure I-2: Vessel Traffic Routes by the Channel Islands in Southern California

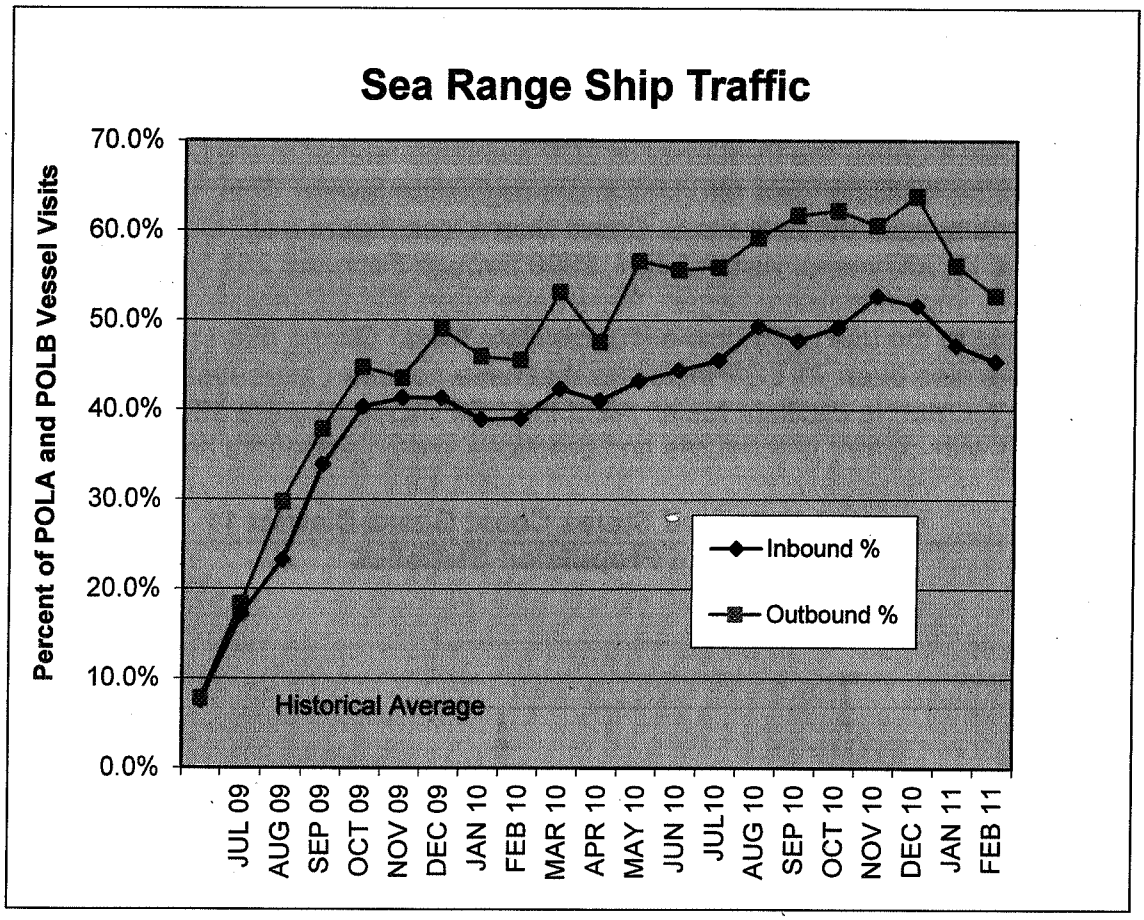


Because vessels on the southern side of the Channel Islands do not have to use the cleaner marine distillate fuels required by the OGV Clean Fuel Regulation, it reduces the transit costs for the vessel operator by about 20% relative to the costs that would be incurred transiting inside the Santa Barbara Channel. In addition, this change in routes has reduced the emissions reductions from the regulation. Statewide, ARB staff estimate that this change in vessel traffic to the Outer Route has resulted in about 3 tons per day (T/D) less diesel PM and 21 T/D less SOx emission reductions in 2010 than what could be realized if vessels used the Channel Route as originally anticipated when the regulation was adopted in 2008.

The loss in emission reductions is significant because a large percentage of vessels are using this Outer Route. Prior to the implementation of the regulation, it was generally only petroleum tankers that used the Outer Route, while now the majority of cargo vessels are using this route. Figure I-3 shows the growth in the use of the Outer Route since the regulation was implemented.

[5] After implementation of the OGV Clean Fuel Regulation began, vessels have also altered transit routes in Northern California choosing to transit further offshore, outside the 24 nm regulatory boundary which is consistent with the Contiguous Zone in this region. There is also a region offshore San Diego where AIS data indicates vessels altered routes to an area outside the 24 nm regulatory zone as they approach the POLA and POLB from the south.

Figure I-3: Marine Exchange Vessel Traffic Data – Percent of POLA and POLB Vessel Traffic that use the Outer Route Through the Point Mugu Sea Range



As noted above, vessels traveling on the southern side of the Channel Islands transit through the Point Mugu Sea Range. The data presented in Figure I-3 show that since the OGV Clean Fuel Regulation began implementation in July 2009, the percent of POLA and POLB vessel visits using the Outer Route has increased from the historical average of about 7.5% (about 30 vessels per month) to about 53% (about 200 vessels per month) inbound and 65% outbound by December 2010. In January and February 2011, there was a decrease in the percent of vessels using the Outer Route, possibly indicating that the percent of vessels using the Outer Route has stabilized.[6]

U.S. Navy representatives and members of the Regional Defense Partnership for the 21st Century (RDP-21), a Ventura County non-profit community organization that works to preserve and enhance the military value of Naval Base Ventura

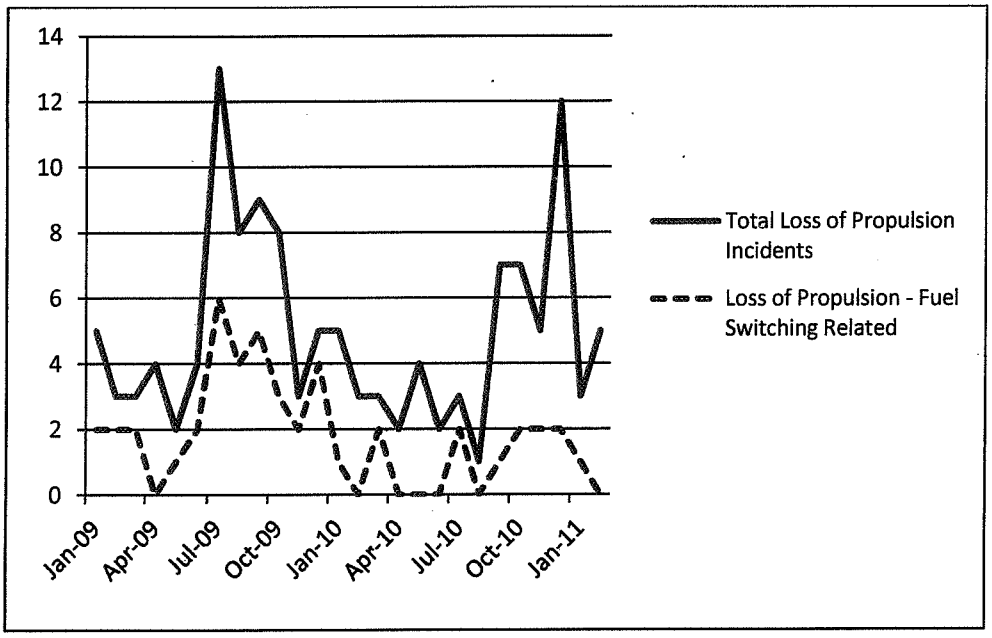
[6] 50 percent of the vessel traffic visiting the POLA and POLB corresponds to about 75% of the total vessel traffic that historically uses the Santa Barbara Channel.

County, have raised concerns about the increased ship traffic and the potential impacts it may have on the ability of the Sea Range to accomplish its primary mission. (RDP-21, 2010) (U.S. Navy, 2010)

Loss of Propulsion Incidents

During the initial months of implementation, there was an increase in reported loss of propulsion (LOP) incidents to the U.S. Coast Guard that may be attributable to the use of the lower sulfur marine distillate fuels. However, over a period of six months, the frequency of LOP incidents related to the use of lower sulfur marine distillate fuels returned to pre-regulation levels. This is shown in the LOP data reported by the U.S. Coast Guard (see Figure I-4). Out of the estimated 18,000 vessel visits (July 1, 2009 through February 2011) to California ports since implementation began, there have been 37 LOP incidents that were attributable to the use of the low-sulfur distillate fuels. During that same time, there have also been 71 LOP incidents that have not been attributed to the use of low sulfur marine distillate fuels. All of the LOP incidents were effectively managed with current procedures and practices and no accidents have occurred.

Figure I-4: United States Coast Guard District 11
Loss of Propulsion Statistics



ARB staff has worked closely with the U.S. Coast Guard and ship operators to better understand any operational difficulties experienced by vessel operators while on the required fuels. In the fall of 2009, the ARB conducted a survey of OGV vessel operators and vessel owners to collect information on operational experiences with the use of low sulfur distillate fuels. About 50 companies responded to the survey. In addition, the California Maritime Academy (CMA)

was brought under contract by ARB to help investigate any operational difficulties related to the use of low sulfur marine distillate fuels.

Specifically, CMA was asked to investigate the root causes of operational difficulties or LOP incidents that could be related to the use of low sulfur distillate fuel and identify strategies or lessons learned that have been used to address or avoid operational issues. Preliminary findings from the study were presented at a public meeting of the Maritime Air Quality Technical Working Group in April 2010. (MWG, 2010) To recap, the more commonly reported operational problems include:

- Fail to start – the main engine will not start on the marine distillate fuel.
- Unstable at dead slow – the main engine RPM varies or the engine stalls when running at dead slow, the engine runs reliably at higher speeds.
- Fail to reverse – main engine can run at low loads and does start normally. However it cannot start in the astern direction.
- External leakages – leaking o-rings on fuel injectors cause excessive fuel leakage and leakage on high-pressure manifolds.

CMA identified failure to maintain proper fuel viscosity as one of the key underlying issues in many of the operational problems. Low viscosity fuel can result in inadequate fuel injection pressures and incomplete combustion. Under these circumstances, LOP can result. Preliminary recommendations for improved practices to avoid operational issues include:

- Ensure fuel viscosity is above minimum levels per engine manufacturer. When sourcing fuels, specify and verify distillate fuel viscosity.
- Monitor fuel injection pump wear, check condition of o-rings and seals, and other fuel system components prior to using distillate fuel to avoid external leaks.
- Adjust preventative maintenance schedule of fuel system components as determined by operational experience.
- Perform test run on distillate prior to California port visit.
- Have written vessel-specific fuel changeover procedures and crew training.
- Transfer control from the Bridge to Engine Control Room if the engine is difficult to start.

It is expected that the final CMA report will be available in summer 2011.

ARB Staff Outreach and Coordination Efforts

ARB staff has conducted a number of activities to help vessel operators to comply with the regulation. ARB staff has issued six advisories providing guidance on complying with the general regulatory requirements, and on particular provisions in the regulation with regard to recordkeeping and the use of the safety exemption. These advisories are available on ARB's website at the following location: http://www.arb.ca.gov/ports/marinevess/ogv/ogvadvisories.htm

On April 28, 2010, ARB staff held a Maritime Working Group Meeting to discuss the status of the regulation after several months of implementation. The meeting included presentations by the following:

- California Maritime Academy on preliminary findings with regard to the ARB contract to investigate LOP incidents;
- Air Resources Board on the results of an ARB Survey of vessel operators' experiences with the use of low sulfur distillate fuel;
- U.S. Coast Guard on the LOP data and investigations;
- California Office of Spill Prevention and Response (OSPR)on their OSPR perspective on the implementation of the regulation; and
- Marine Engine Manufacturers (MAN Diesel and Wartsila) on technical issues and recommended practices when using low sulfur distillate fuel.

The meeting was coordinated with a similar meeting held the following day by the Society of Naval Architects and Marine Engineers (SNAME) that focused on fuel switching under national and international Emission Control Areas.

ARB staff also works closely with a number of key stakeholders regarding implementation of the regulation. ARB staff regularly attends meetings of the San Francisco Harbor Safety Committee, providing updates on the implementation of the regulation. ARB staff is in regular contact with the U.S. Coast Guard regarding LOP incidents that could be related to the use of the low sulfur fuel, and on uses of the safety exemption. ARB staff has also met with staff of the California Office of Spill Prevention and Response, the San Francisco Bar Pilots, and the manufacturers of marine engines.

E. International and Federal Actions

The staff report prepared for the original rule discussed the various international and federal regulations designed to reduce emissions from OGVs. (ARB, 2008). At the time, significant amendments to International Maritime Organization (IMO) regulations were under development, but had not yet been adopted. These amendments have since been adopted and are discussed below as the "2008 Amendments to Annex VI."

As discussed above, the California regulation includes a "sunset" provision under which the ARB would cease enforcement of the regulation if it is determined that the United States Environmental Protection Agency (U.S. EPA) adopts and

enforces regulations that will achieve equivalent or greater emission reductions. This is expected to occur in 2015. However, due to the significant public health impacts associated with these emissions, we believe it is appropriate to regulate these emissions at the state level until the U.S. EPA implements regulations that will achieve equivalent emission reductions.

2008 Amendments to Annex VI

For background, IMO Annex VI ("Regulations for the Prevention of Air Pollution from Ships") of the MARPOL Convention was adopted in 1997, and entered into force in May 2005. Annex VI established some relatively modest emission controls for OGVs. Specifically, Annex VI limited marine fuels to 4.5% fuel sulfur, and provided a process for the creation of sulfur emission control areas (SECAs), which require the use of 1.5% sulfur fuel (generally heavy fuel oil). Annex VI also established modest NOx standards for diesel engines greater than 130 kilowatts (kW) installed on vessels constructed on or after January 1, 2000. The United States ratified Annex VI on October 8, 2008, and it entered into force for the United States on January 8, 2009.

In October 2008, member states of the IMO adopted more robust new international standards for marine diesel engines and their fuels (2008 amendments to Annex VI) that apply globally as of July 1, 2010. The amendments include additional (Tier II and Tier III) new engine NOx standards, additional requirements for pre-2000 engines that were previously not controlled, and fuel sulfur limits.

New Engine NOx Standards

Table I-1 below lists the new engine NOx standards under amended Annex VI. The Tier II standards will achieve approximately a 20% reduction in NOx emissions compared to the existing Tier I standards, while the Tier III standards will achieve an 80% reduction from the Tier I emissions levels. The Tier II standards apply globally, while the Tier III standards would apply only in NOx emission control areas (ECAs), where it is envisioned that add-on emission controls such as selective catalytic reduction would be activated as needed. As discussed below, the United States was granted approval for an ECA designation and therefore the Tier III standards will apply in 2016.

Table I-1: New Engine NOx Emissions Limits Under IMO Annex VI

Emissions Tier	Date	NOx Limit (g/kW-hr)*		
		n <130	130 ≤ n <2000	n ≥ 2000
Tier I	2000	17	$45n^{-0.2}$	9.8
Tier II	2011	14.4	$44n^{-0.23}$	7.7
Tier III**	2016	3.4	$9n^{-0.2}$	2.0

* Where n is the rated engine rpm
** Tier III standards apply only within NOx Emission Control Areas.

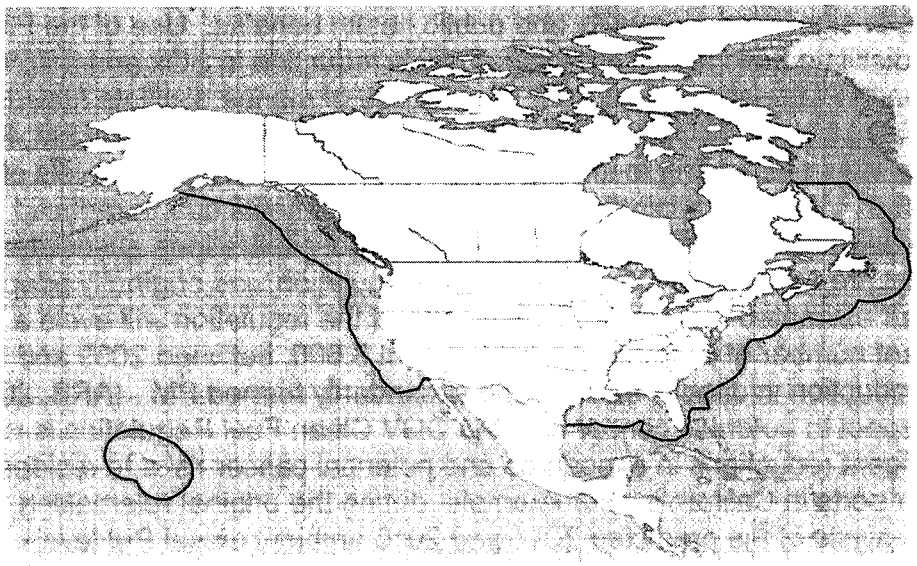
Amended Annex VI also specifies that the Tier I standards (previously applicable only to engines installed on ships beginning January 1, 2000) become applicable to existing engines installed on ships built between January 1, 1990 and December 31, 1999, for engines with a displacement greater than or equal to 90 liters per cylinder and a rated power output greater than or equal to 5,000 kW, subject to the availability of approved engine upgrade kits.

Fuel Sulfur Standards

The amended Annex VI requirements phase in progressively more stringent fuel sulfur limits to control emissions of SOx and PM. On a global basis, the fuel sulfur limit is reduced from the present 4.5% to 3.5% in 2012, and then to 0.5% in 2020, subject to a feasibility study to be performed in 2018 that could potentially delay the 0.5% sulfur standard until 2025.

Under the amendments to Annex VI, there are also special fuel sulfur limits for sensitive areas referred to as an "Emission Control Area" or ECA. Under the ECA, the sulfur level would drop from 1.5% sulfur in existing European ECAs to 1% sulfur in July 2010, and then 0.1% in January 2015. The United States and Canada jointly applied for an ECA designation covering SOx and NOx in July 2009. On March 26, 2010, the IMO officially designated waters of the United States and Canadian coastlines as an ECA referred to as the North American ECA. The region applies 200 nm offshore in the regions shown in Figure I-5 below. The North American ECA is expected to be implemented here starting in August 2012, when the 1% sulfur limit would apply. The United States is also applying for a treaty amendment that would extend this ECA to the Caribbean waters around Puerto Rico and the U.S. Virgin Islands. If the treaty amendment is adopted at the next Marine Environment Protection Committee in July 2011, then the requirements could be implemented by January 2014.

Figure I-5: North American Emission Control Area



F. Need for OGV Clean Fuel Regulation

Air pollution from shipping activities in California is a major public health concern at both regional and community levels. The diesel-powered vessels used to transport goods emit soot, or diesel PM, and other air pollutants that can increase health risks to nearby residents. Two health risk assessments by ARB staff have shown that diesel PM emissions from ocean-going vessels are one of the largest contributors of toxic pollutants and diesel PM in neighboring communities. (ARB, 2006) (ARB, 2008b) Shipping activities are also a significant source of PM, SOx and NOx which can contribute to the formation of regional smog and fine particulate matter. As part of the rulemaking packages for the OGV Clean Fuel Regulation and its predecessor, the Auxiliary Engine Regulation[7], ARB staff provided extensive analysis and documentation on the health effects of the emissions from OGVs and their impacts on air quality and public health in California. (ARB, 2005) (ARB, 2008) Since that time, U.S. EPA has completed Integrated Science Assessments for SOx and PM which provide new information on the adverse health impacts from exposure to these pollutants. (U.S. EPA, 2008) (U.S. EPA, 2009)

The OGV Clean Fuel Regulation is necessary to reduce the public's exposure to diesel PM, which is a component of ambient PM. In addition, the regulation is needed to reduce emissions of PM, NOx, and SOx. NOx is a precursor to the

[7] The Auxiliary Engine Regulation can be found at title 13, California code of Regulations (CCR) section 2299.1 "Emission Limits and Requirements for Auxiliary Diesel Engines and Diesel-Electric Engines Operated on Ocean-going Vessels within California Waters and 24 Nautical Miles of the California Baseline" and the identical section title 17, CCR, section 93118 "Airborne Toxic Control Measure for Auxiliary Diesel Engines and Diesel-Electric Engines Operated on Ocean-going Vessels within California Waters and 24 Nautical Miles of the California Baseline." Due to a successful legal challenge of the regulation, enforcement was suspended in May 2008.

formation of ozone, and both NOx and SOx contribute to secondarily formed PM in the lower atmosphere. Implementation of the OGV Clean Fuel Regulation is resulting in significant air quality and public health benefits. Use of the Phase 1 marine distillate fuels results in about an 80% reduction in SOx and a 75% reduction in PM relative to using HFO. The use of marine distillate fuels instead of HFO also reduces NOx by about 6%. These reductions in diesel PM, PM, NOx and SOx are helping to improve regional ambient air quality levels of PM and ozone. We also anticipate significant health benefits due to reduced incidences of cancer, premature mortality, and hospitalizations associated with PM exposure. When the OGV Clean Fuel Regulation was originally adopted, ARB staff estimated that the implementation of the regulation will avoid a significant number of premature deaths, about 3,600, between 2009 and 2015 due to reduction in directly emitted and secondarily formed PM . (ARB, 2008) With respect to potential cancer risk, the OGV Clean Fuel Regulation is resulting in significant reductions in exposures and potential cancer risks to residents that live near ports in California. For example, during the original rulemaking, based on an analysis of the predicted 2010 and 2015 ambient diesel PM levels statewide, we estimate that in 2010 there will be a 75% reduction in the population-weighted average risk relative to the predicted risk levels in 2010 from OGV diesel PM emissions and an 83% reduction in 2015. (ARB, 2008)

G. ARB Staff Actions and Process to Develop the Proposed Amendments

ARB staff developed the proposed amendments to the OGV Clean Fuel Regulation through consultations with OGV operators and industry representatives, the U.S. Coast Guard, U.S. Navy, the California Office of Spill Prevention and Response, local air pollution control agencies, local Harbor Safety Committees, California's Attorney General's Office, the Ports of Los Angeles and Long Beach, environmental group representatives, the U.S. EPA and members of the public. In addition to discussions with these stakeholders, over the last year, staff held two public workshops to discuss the proposed amendments. Notification for these workshops had been distributed to more than 2,500 companies, organizations, and individuals through ARBs email notification. Workshop notices as well as all meeting materials were posted to ARB's website and e-mailed to subscribers of the "maritime" electronic list serve.

REFERENCES

(ARB, 2005) State of California, Air Resources Board Staff Report: Initial Statement of Reasons for Proposed Rulemaking Proposed Regulation for Auxiliary Diesel Engines and Diesel-Electric Engines Operated On Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline, October 2005

(ARB, 2006) State of California, Air Resources Board, Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach, April 2006 at http://www.arb.ca.gov/regact/marine2005/portstudy0406.pdf

(ARB, 2008) State of California, Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking: Proposed Regulation for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline, June 2008.

(ARB, 2008b) State of California, Air Resources Board, Diesel Particulate Matter Health Risk Assessment for the West Oakland Community

(ARB, 2011) State of California, Air Resoruces Board, Database of OGV Clean Fuel Regulation Inspection Data July 2009 through January 2011

(MWG, 2010) Presentation by Robbie Jackson at the April 2010 Maritime Air Quality Technical Working Group Meeting, Oakland, CA, April 2010 at http://www.arb.ca.gov/ports/marinevess/meetings/042810/CMA_MWG_Presentation.pdf

(RDP-21, 2010) RDP-21 Position Paper presented at California Air Resources Board Public Workshop, Long Beach, CA, October 12, 2010

(U.S. EPA, 2008) U.S. Environmental Protection Agency, Integrated Science Assessment for Sulfur Oxides, September 2008 at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=198843

(U.S. EPA, 2009) U.S. Environmental Protection Agency, Integrated Science Assessment for Particulate Matter, December 2009 at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546

(U.S. Navy, 2010) Presentation by U.S. Navy at California Air Resources Board Public Workshop, Long Beach, CA, October 12, 2010

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II. NEED FOR AMENDMENTS

In this chapter, ARB staff provides a discussion on the events and information that have necessitated the proposed amendments to the OGV Clean Fuel Regulation. In addition, ARB staff provides the rationale for the amendments being considered.

A. Changes in Vessel Traffic Patterns in Southern California

As noted earlier, when the OGV Clean Fuel Regulation began implementation in 2009, many vessel operators adjusted vessel routes and began using the Outer Route outside the regulatory zone where vessels could use HFO. Below, ARB staff provides a more detailed discussion on this change in traffic patterns including the impacts on vessel operation, the Point Mugu Sea Range, emissions, and public health.

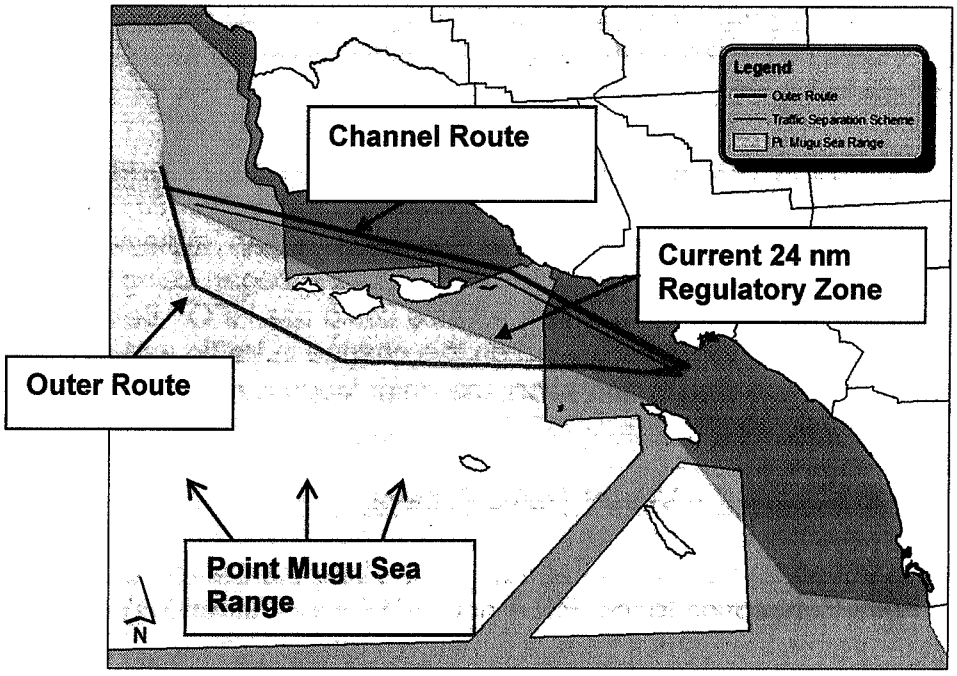
Description of the Change in Vessel Traffic Patterns

Vessels using the portion of the north-south route along the California coastline from about Point Conception to the POLA and POLB have historically used the Channel Route within the Santa Barbara Channel Traffic Separation Scheme (TSS) as shown in Figure II-1.[8]

The Channel Route is within the regulatory zone of the OGV Clean Fuel Regulation which is approximately 24 nm offshore of the of the California coastline. Vessels travelling to and from the POLA and POLB using the Channel Route travel over 150 nm (one-way) within the regulatory zone along the California coastline from Point Conception going to and leaving POLA and POLB. After implementation of the OGV Clean Fuel Regulation began in July 2009, increasing numbers of vessel operators chose to use the Outer Route which is outside the regulatory zone in this region.

[8] A TSS is a designated routing measure that reduces the risk of a collision by providing for the separation of arriving and departing traffic by the establishment of traffic lanes. The Santa Barbara TSS was established by the Commandant of the USCG under the Ports and Waterways Safety Act and in accordance with international agreements.

Figure II-1: Channel and Outer Vessel Routes to the Ports of Long Beach and Los Angeles



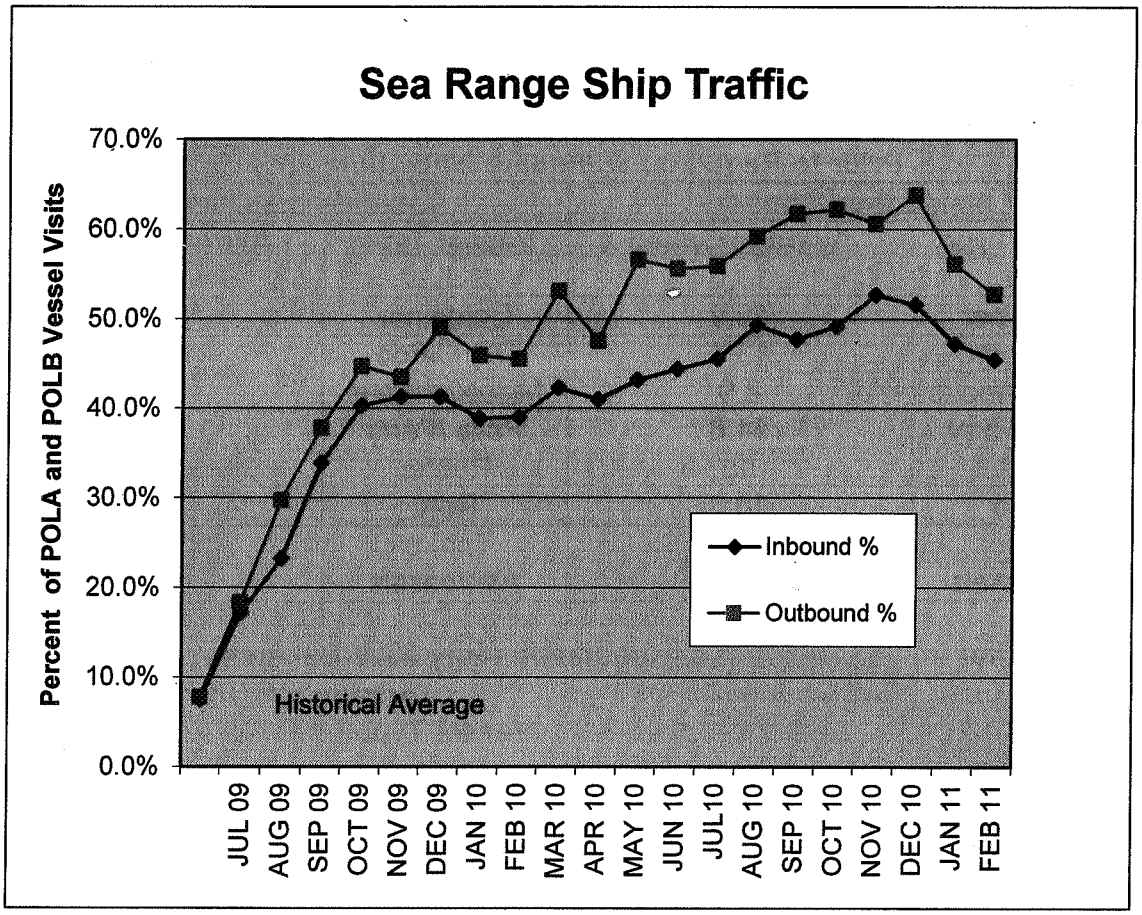
The Outer Route has a shorter portion within the regulatory zone, minimizing the amount of more expensive cleaner fuel used, and thereby reducing fuel costs. For example, vessels traveling to and from the POLA and POLB using the Outer Route will travel a total of about 163 nm, with about 132 nm on HFO outside the regulatory zone and about 31 nm on cleaner fuel within the regulatory zone. Vessels using the Channel Route would operate a total of about 150 nm within the regulatory zone on cleaner fuel. While ship operators typically weigh the added travel time and distance against the lower fuel costs, data collected from Automatic Identification System (AIS) vessel tracking reveals that the number of vessels that are using the Outer Route has increased since the OGV Regulation began implementation even though the Outer Route is longer.[9]

The U.S. Navy provided ARB staff with vessel traffic data showing the number of vessels that are using the Outer Route compared to the total vessels visiting POLA and POLB. (U.S. Navy, 2011) The vessel information was obtained from the Marine Exchange of Southern California. The Marine Exchange is a nonprofit organization that gathers and provides extensive information concerning vessel traffic in the POLA and POLB regions. Figure II-2 shows both

[9] AIS is an automated tracking system used on ships and by Vessel Traffic Services (VTS) for identifying and tracking vessels. AIS provides information concerning vessel identification, position, course, and speed.

the percentage and number of vessels inbound and outbound from July 2009 to February 2011. The data shows an increase in traffic using the Outer Route traffic from the historical average of about 7.5% prior to July 2009 to about 53% inbound and 65% outbound by December 2010. In January and February 2011, there was a decrease in the percent of vessels using the Outer Route, possibly indicating that the percent of vessels using the Outer Route has stabilized.

Figure II-2: Marine Exchange Vessel Traffic Data Listing Vessel Traffic using the Outer Route Through the Point Mugu Sea Range



The fuel cost differential between the Channel Route and the Outer Route may be a significant factor when the shippers chose to change routes. ARB staff performed a cost comparison between the two routes, with each route beginning near Point Conception and ending at POLA and POLB.

To estimate the fuel costs and travel time for each route, a number of inputs, such as vessel speed, fuel consumption rate, and fuel price are necessary. (ARB, 2008 Appendix D) Fuel costs are highly dependent on vessel speed since fuel consumption is proportional to the cube of the vessel speed. To estimate the fuel costs, ARB staff developed an average vessel speed for each of the routes.

ARB staff evaluated vessel speeds by analyzing vessel AIS telemetry data which provides vessel position and time information. The AIS data was evaluated by ship type and for two time periods, as listed in Table II-1. The first time period was January 2009 through June 2009 before the regulation was implemented and the second time period was July 2009 through December 2009, after implementation of the regulation. The data shows that vessels speeds vary somewhat by ship type and time period evaluated. However, the AIS data indicate that for the time period, after implementation of the regulation, the average vessel speeds are essentially the same for the Channel Route compared to the Outer Route (16 knots).

Table II-1: Average Speeds (knots) for Vessel Using the Channel Route and Outer Route Before and After Implementation of the Vessel Fuel Rule in 2009

Prior to Regulation (January 2009-June 2009)			
Inside the Channel		**Outside the Channel**	
Vessel Type	**Average Speed**	**Vessel Type**	**Average Speed**
Bulker	13.0	Bulker	13.5
Container	19.9	Container	21.1
Dry Cargo	13.4	Dry Cargo	11.5
Miscellaneous	8.9	Miscellaneous	11.5
Pass./Ferry	14.8	Pass./Ferry	18.2
Reefer	na	Reefer	na
Roro	16.3	Roro	18.0
Tanker	13.9	Tanker	13.5
All Vessels	17.7	All Vessels	14.9
After Implementation of Regulation (July 2009-December 2009)			
Inside the Channel		**Outside the Channel**	
Vessel Type	**Average Speed**	**Vessel Type**	**Average Speed**
Bulker	12.5	Bulker	13.4
Container	18.7	Container	19.3
Dry Cargo	12.8	Dry Cargo	13.5
Miscellaneous	7.8	Miscellaneous	8.4
Pass./Ferry	15.4	Pass./Ferry	17.1
Reefer	15.0	Reefer	16.0
Roro	14.8	Roro	15.8
Tanker	13.9	Tanker	12.6
All Vessels	16.2	All Vessels	16.1

Data Source: AIS telemetry data obtained from the University of California, San Diego and ARB's telemetry equipment located near Santa Barbara.

Therefore, while the speeds of individual ships may be different based on the route and type of fuel burned, on average, the speeds are similar for both routes after implementation of the OGV Clean Fuel Regulation in July 2009. In the

analysis of costs for the different routes, ARB staff used the same average transit speed of 16 knots for all of the routes.[10] For the portion of the route within the 20 nm voluntary POLA and POLB vessel speed reduction (VSR) zones, staff used an average of 12 knots, which is consistent with the requirement of the VSR program.

The results indicate that for this segment of travel (one-way from Point Conception to the Ports), the cost of using the Channel Route is about 20% higher than using the Outer Route, due to the higher cost of the compliant distillate fuel, as shown in Table II-2. (ARB, 2010) In addition, for the inbound portion of the Channel Route, there is a requirement for a marine oil spill contingency plan in the region where the ships travel within three miles of Anacapa Island. (OSPR, 2009) The cost per inbound vessel trip is approximately $500. (Roloff, 2010) However, this cost is not reflected in the fuel cost estimates listed in Table II-2.

Table II-2: Estimated Fuel Costs*, Route Distance and Transit Time for the Channel and Outer Route Through the Santa Barbara Channel Region with the 24 nm Regulatory Zone

Route	Distance (nm)	Cost	Time (hrs)
Channel Route (150 nm)	MGO:150 nm	$14,390	9.6
Outer Route (163 nm)	MGO: 31 nm HFO: 132 nm	$11,640	10.5
Estimated Distance/Cost/Time Differential	13 nm	$2,750	0.9 (54 minutes)

*Estimates include fuel costs only for a one way transit from Point conception to the POLA or POLB. The oil spill contingency plan cost is not included.

U.S. Navy Concerns and Request

The U.S. Navy test and training ranges occupy vast overwater regions extending well offshore along the California coast from San Luis Obispo in the north, to San Diego and into international waters off the coast of Mexico in the south. (CCC, 2001) This region is comprised of the Operating Area of Southern California Range Complex (SOCAL OPAREA), to the south of POLA and POLB, and the Point Mugu Sea Range, northwest of the POLA and POLB. According to the U.S. Navy, most of their operations on the Point Mugu Sea Range are

[10] Earlier cost estimates presented at the October 2010 public workshop had been based on a preliminary speed estimate of 17.4 knots. The average speed used in the analysis presented here has been adjusted to 16 knots to reflect the updated information as provided in Table II-1.

conducted in the area surrounding a portion of the Outer Route: south and west of the Northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz and Anacapa), and north and west of San Nicolas Island.

Point Mugu is one of two bases comprising Naval Base Ventura County (NBVC). The Sea Range is an integral and foundational asset of NBVC. A 2006 Economic Impact Study about NBVC, presented by the Workforce Investment Board of Ventura County, reported NBVC as the largest employer in the county, with over 19,000 personnel (military and civilian) working for, or stationed on the base in all categories, and contributing directly or indirectly to another 8,200 jobs throughout the county. (NBVC, 2006) NBVC contributes significantly to the economic health of the area, with an economic impact exceeding $1.2 billion in 2006 and is the fifth-largest base in the country. The U.S. Navy states that the work in electronic warfare, naval weapons systems, and testing and evaluation of a host of technologies have added immeasurably to our national defense. (Parisi, 2011) An additional description of the operational and economic importance of the Point Mugu Sea Range is provided in Appendix B.

According to U.S. Navy representatives, the Point Mugu Sea Range is utilized for military activities on a continual basis. The range is used by the Navy, Air Force, Coast Guard and other agencies and has approximately 17,000 events a year (ARB, 2009). Use is continuous throughout the year, but the intensity of use will vary based on the needs of the users. To ensure that all users meet their RDT&E, training, maintenance and operations requirements, access to the Point Mugu Sea Range must remain available throughout the year.

Oil tankers have travelled through the portion of the Point Mugu Sea Range that is of concern due to an agreement negotiated in the early 1990s to stay 50 nm off the California coastline to avoid oil spills reaching shore, in response to the Exxon Valdez spill. (ARB,2009) An average of two ships per day (one in each direction) travelled through the range. According to the U.S. Navy, these vessels avoided range operations when requested. U.S. Navy representatives said historical interference problems had been mainly with stray pleasure craft or commercial fishing boats.

During the development of the OGV Clean Fuel Regulation rulemaking materials, the U. S. Navy expressed concerns that the OGV Clean Fuel Regulation requirements, alone or combined with proposed or future efforts to reduce vessel speed in the Santa Barbara Channel would cause commercial shippers to abandon existing transit routes through the Santa Barbara Channel. Although laden tank vessels and fishing boats have historically traveled within these test ranges, the U.S. Navy expressed concerns that their weapons testing and training activities would be more difficult if there is a large increase in vessel traffic to the Outer Route. Additionally, the U.S. Navy provided both written and oral comments at the July 2008 Board meeting. (U.S. Navy, 2008) (ARB, 2008b)

At that time, ARB staff did not have sufficient information to find that a shift in traffic patterns would occur. However, in response to the U.S. Navy's concerns, ARB staff prepared a supplemental environmental impact report that evaluated the environmental impacts if vessels did change traffic patterns and made that report available for public comment. (ARB, 2009) In addition, at the public hearing to consider adoption of the OGV Clean Fuel Regulation the Board asked that staff return to them in the event vessels posed problems for U.S. Navy operations at the Point Mugu Sea Range. (ARB, 2008b)

As noted above, shortly after implementation of the Phase 1 fuel requirements began, vessels began traveling on the southern side of the Channel Islands through the Point Mugu Sea Range instead of using the traffic separation scheme within the Santa Barbara Channel. This change in vessel traffic patterns may potentially impact operations in the Point Mugu Sea Range. Both the U.S. Navy and members of the Regional Defense Partnership for the 21st Century (RDP-21), a Ventura County non-profit community organization that works to preserve and enhance the military value of Naval Base Ventura County, have raised concerns about the increased ship traffic and the potential impacts it may have on the ability of the Sea Range to accomplish its primary mission. (RDP-21, 2010) (U.S. Navy, 2010)

The U.S. Navy has a process in place to inform vessels of Point Mugu Sea Range activities such that operators of commercial and noncommercial vessels can plan for alternative routes or fishing locations to avoid military exercises. U.S. Navy representatives state that they publish a Notice to Mariners (NOTMARS) in the United States Coast Guard "Local Notice to Mariners" publications prior to test and training events and issue advisories to let the operators of tankers and other vessels know if the test range will be "active." For example, ship operators can contact a unit known as "PLEAD Control" if they are planning to enter the Sea Range. If PLEAD Control states that the Point Mugu Sea Range is active, ships have historically delayed their travel or taken a longer route avoiding the active area. If a ship does not respond to PLEAD requests, range clearance aircraft are deployed to get the attention of the ship's crew.

Since implementation of the Phase 1 fuel requirements, the Navy worked with the Marine Exchange of Southern California to provide additional information on Sea Range operations to ships. That enhanced communication has helped avoid impacts to operations. However, Navy representatives have indicated that this is only an interim solution and may not be sustainable.

Impacts on Anticipated Emission Reductions and Public Health

The historical Santa Barbara Channel shipping route was primarily chosen to minimize the overwater distances, travel time, and fuel use for the primary great circle route between Asia and Southern California. Because vessel operators have increasingly chosen the longer Outer Route which has a significant portion of the route where these vessels continue to use dirtier HFO, associated emissions have increased in this region, as shown in Table II-3, relative to the emissions that would have occurred if vessels had continued to use the Channel Route. The impact of the associated emissions increase will be mitigated to some extent by the fact that the emissions are occurring farther offshore. However, total emissions have increased by about 3 T/D for PM and 21 T/D for SOx as a result in the shift in vessel traffic to the Outer Route relative to what they could have been if the vessels continued to use the Channel Route.

Table II-3: Estimated OGV Statewide Emissions in Tons Per Day (100 nm SIP Zone, 2010)

	PM2.5 T/D	SOx T/D
Baseline-No Rule	18.4	145
OGV Clean Fuel Rule with Anticipated Traffic Pattern (most Vessels using Channel Route)	7.7	50
OGV Clean Fuel Rule with Current Traffic Pattern (50% of Vessels using Outer Route)	10.3	71

To evaluate the public health impacts, the cardiopulmonary mortality associated with PM was estimated for each route, relative to the Baseline Scenario. Additional details of the evaluation are provided in Appendix C.

Using the model-simulated results, estimates of avoided premature cardio-pulmonary mortality associated with changes in PM2.5 air quality for each route (i.e. relative to the no rule baseline) were generated. These results are presented in Table II-4 for the South Coast Ozone Study (SCOS) domain.

Table II-4: SCOS Domain-wide Annual Avoided Premature Mortality Estimates Due To OGV Clean Fuel Regulation

Scenario	Annual Cardiopulmonary Mortality Avoided*		
	Low	Mean	High
Channel Route-OGV Clean Fuel Rule with Anticipated Traffic Pattern (most Vessels using Channel Route)	540	700	850
Outer Route-OGV Clean Fuel Rule with Current Traffic Pattern (50% of Vessels using Outer Route)	500	650	790

*Compared to no-rule baseline

As can be seen in Table II-4, the cardio-pulmonary premature deaths avoided are significant for both vessel routes. However, there is a small difference in the mean values for the two routes, with the Channel Route scenario having a higher mean value for avoided mortality, compared to the Outer Route scenario.

Proposed Modifications to the Regulatory Zone to Reduce Impacts on the Point Mugu Sea Range

To address the impacts of the shift in vessel traffic on the Point Mugu Sea Range and the loss of emissions reductions, ARB staff is proposing modifications to the regulatory zone that would:

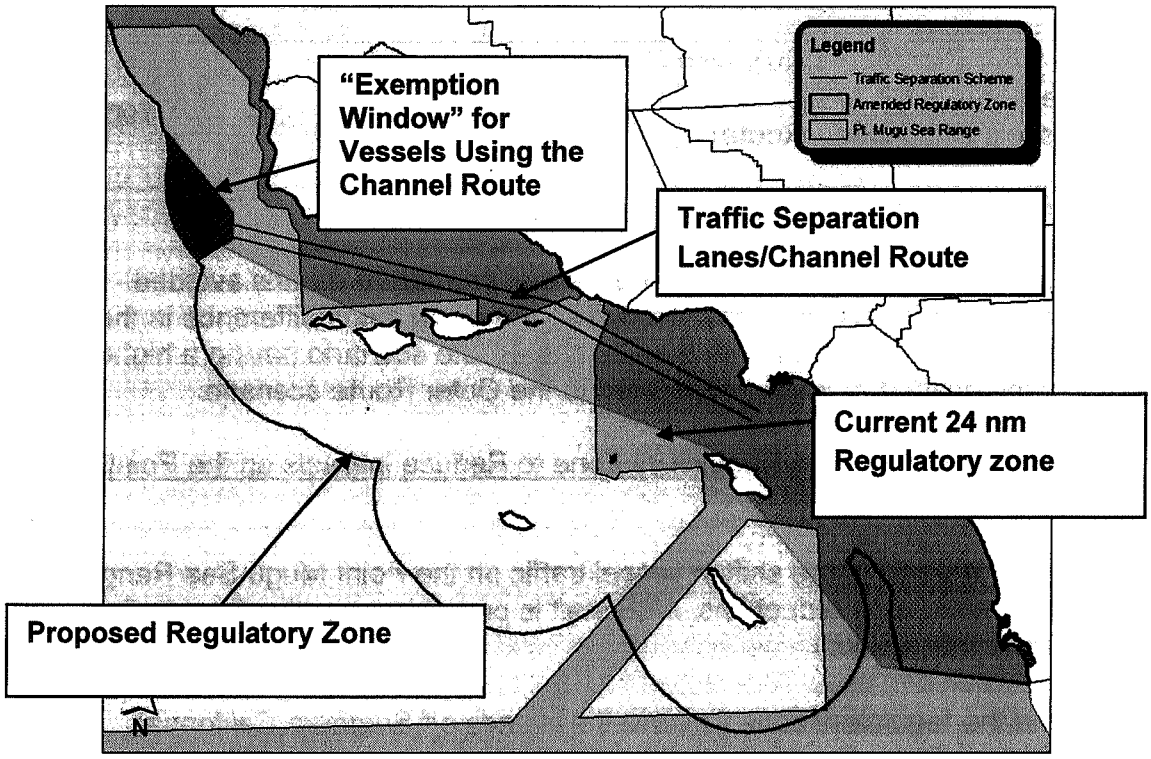
- extend the regulatory zone (around the islands off Southern California) beyond the Outer Route to require vessels operating in this area to comply with the OGV Clean Fuel Regulation requirements, and
- allow vessels accessing the Channel Route from the north and west to delay fuel switching so as to equalize the fuel costs for the Channel Route compared to the Outer Route.

The proposed changes to the regulatory zone are shown in Figure II-3. The proposed modifications include extending the regulatory zone in Southern California out beyond the Channel Islands and excluding a small area, a "window", near the north-western end of the Channel Route off Point Conception. As shown in Figure II-3, the modified zone is aligned with the Contiguous Zone except for the small window. The Contiguous Zone is a recognized NOAA maritime zone and is shown on many maritime charts. (NOAA, 2011)

The window was included to equalize the fuel costs for vessel owner/owner operators that use the Channel Route instead of the Outer Route. The window is located as far offshore as possible to ensure that vessels are not fuel switching

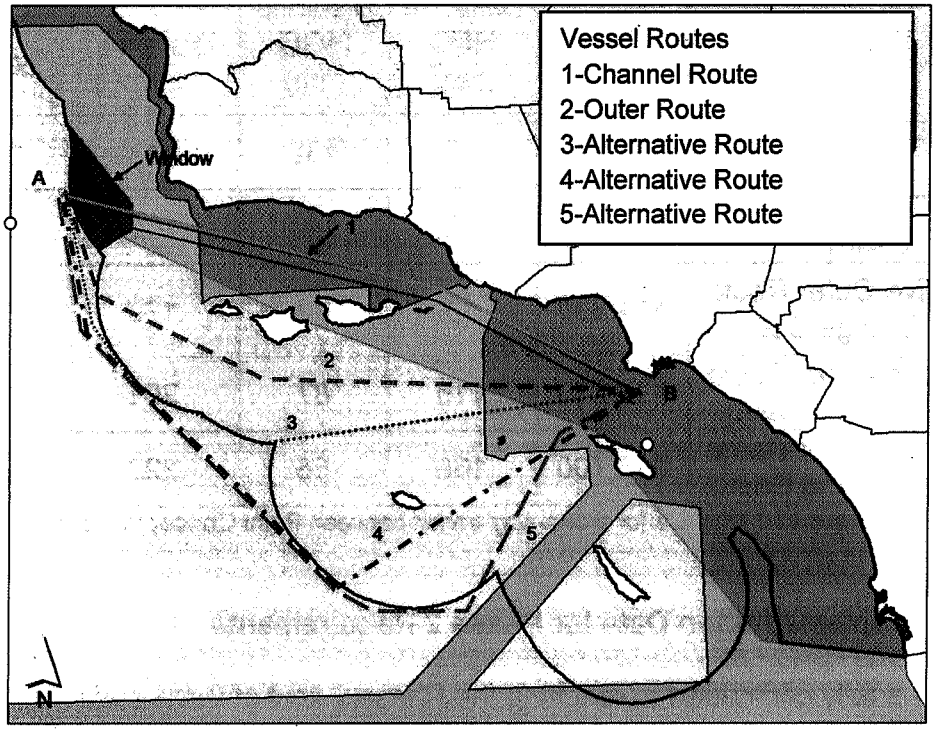
close to shore. Since the start of the Santa Barbara TSS is within the regulatory zone, vessels will have completed the fuel switch prior to entering the TSS and, therefore, will not be switching fuels in the TSS. Additionally, removing the economic advantage of using the Outer Route should promote the return of the vessel traffic to the established traffic separation lanes in the Santa Barbara Channel.

Figure II-3: Proposed Amended Zone in Southern California



To evaluate if there would be a cost incentive for vessel operators to shift to other, farther east, routes if the regulatory zone was extended, ARB staff evaluated the costs of three additional routes through the region (#'s 3, 4, and 5 on map),as shown in Figure II-4. These alternative outer routes maximize the portion of the route that is outside the regulatory zone.

Figure II-4: Channel, Outer, and Alternative Vessel Routes to the Ports of Long Beach and Los Angeles with the Proposed Amended Zone



Using the methodology described earlier in this chapter, ARB staff evaluated the costs, travel time, and distance associated with the Channel Route (#1 in Figure II-4), the Outer Route (#2 in Figure II-4) and each of the alternative routes (#'s 3, 4 and 5 in Figure II-4). As can be seen in Table II-5, the Outer Route and all of the alternative routes have higher costs, longer overall travel distance, and longer travel time compared to the Channel Route. Therefore, there is no cost or time benefit to using any of these outer routes unless ship owner/operators are trying to minimize the operation time or distance while using MGO or MDO.

Table II-5: Estimated Fuel Costs, Distance and Transit Time for Channel and Possible Amended Outer Routes through the Santa Barbara Channel Region with the Proposed Amended Zone

Route	Cost	Distance HFO (nm)	Distance MGO (nm)	Total Distance (nm)	Time (hours)
Channel Route (#1 Pink Line)[11]	$13,870	16	132	148	9.6
Outer Route (#2 Red Dash)	$14,140	19	143	162	10.5
Alternative Outer Route (#3, Orange Dot)	$14,330	83	90	173	11.1
Alternative Outer Route (#4, Black Dot Dash)	$16,210	115	87	201	12.9
Alternative Outer Route (#5, Green Long Dash)	$16,700	166	56	222	14.2

Fuel costs, distances and time are for a one-way transit between Point Conception and the POLA/POLB.

B. Implementation Date for Phase 2 Requirements

ARB staff is fully committed to reaching the Phase 2 limit of 0.1% sulfur fuel. The use of 0.1% sulfur marine distillate fuel is technologically and operationally feasible and is cost-effective. It is also consistent with the North American ECA Phase 2 limit which will come into effect in 2015. However, ARB staff does have concerns about the timing for implementation of the OGV Clean Fuel Regulation's Phase 2 requirement and we believe there are valid reasons to delay the implementation date by two years. Specifically, ARB staff believes that adjustments to the Phase 2 implementation date are necessary for the following reasons:

- better alignment with the North American ECA, and
- greater flexibility to find compliant fuels with higher viscosity.

Providing a two-year delay will help to ensure the successful implementation of the North American ECA's Phase 1 and a successful transition to the 0.1% sulfur fuels. Below, we briefly discuss our rationale.

[11] The estimated fuel cost of the Channel Route as listed in listed in Table II-5 is lower than the cost of the Channel Route as listed in Table II-2 due to the "window" area allowing the use of the lower cost HFO for that portion the Channel Route as listed in Table ii-5.

Better Alignment with the North American ECA

Shippers have voiced concerns about the operational and logistical complexity of having California and federal OGV fuel requirements implemented on differing schedules. Table II-6 provides a comparison between the OGV Clean Fuel Regulation fuel requirements and those of the North American ECA which was approved subsequent to adoption of the ARB regulation.

Table II-6: Fuel Requirements for the OGV Clean Fuel Rule and the North American ECA

ARB Requirements (24 nm zone)	July 1, 2009 (Phase 1)	Distillate fuel: MGO max 1.5% sulfur MDO max 0.5% sulfur
	Jan. 1, 2012 (Phase 2)	Distillate fuel: MGO max 0.1% sulfur MDO max 0.1% sulfur
North American ECA (200 nm zone)	Aug. 1, 2012 (Phase 1)	Fuel Sulfur max 1.0% sulfur
	Jan. 1, 2015 (Phase 2)	Fuel Sulfur max 0.1% sulfur

Additionally, delaying the ARB Phase 2 by two years provides additional flexibility when specifying and obtaining compliant fuel. We believe that shippers will be able to locate fuels with higher viscosity levels during the Phase 1 requirements since we are not excluding the use of MGO or MDO above 0.1% sulfur.

Flexibility to Find Compliant Fuels with Higher Viscosity

Operational challenges may stem from running main propulsion engines, designed to operate primarily on HFO, on a cleaner marine distillate that has very different physical properties than HFO. These differences may include lower viscosity of the distillate fuel compared to HFO. Low fuel pressure related operational problems, possibly related to the condition of fuel pumps or fuel viscosity, have been reported by industry. (MWG, 2010) ARB staff proposes to extend the Phase 1 period to help interim issues with locating compliant fuel that has higher viscosity. (Kjeldson, 2011) Although fuel viscosity is not a function of fuel sulfur content, having a less restrictive cap will provide shippers with more selection and supply to find compliant fuels with higher viscosity levels. Because the sulfur levels are not as restrictive in Phase 1 compared to Phase 2, the operators will have more flexibility in specifying viscosity levels when purchasing compliant fuel at ports throughout the world.

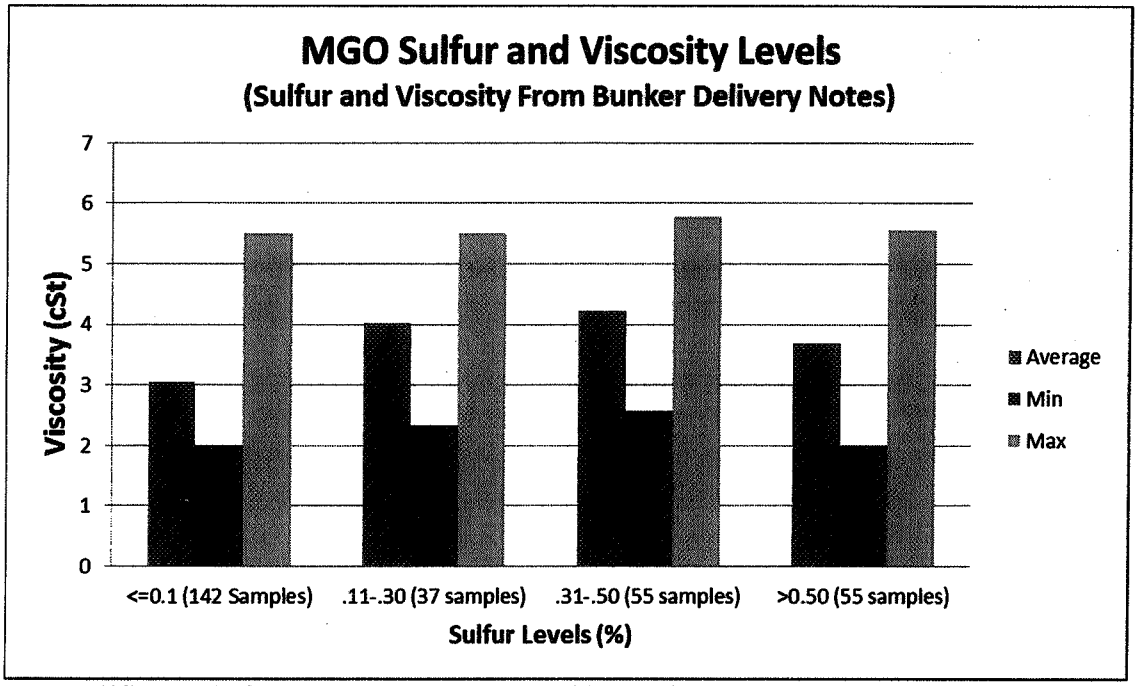
ARB staff evaluated fuel viscosity for MGO and MDO by analyzing bunker records obtained during ARB inspections. The information collected during the inspections provides useful information on fuel qualities such as fuel sulfur

content and viscosity as well as providing an indication of the types of fuels provided at ports throughout the world. ARB staff believes that the fuel properties identified from this data are representative of MGO and MDO fuels currently available to the global OGV fuel market. ARB staff compiled and evaluated the ARB Enforcement Division's records for inspections of vessels from July 2009 to January 2011. About 450 vessel inspections were conducted over this 19 month period. Fuel sulfur content, bunker location, and fuel viscosity were compiled from the fuel bunker delivery notes (BDN) obtained during the inspections. Additionally, as part of the inspection procedure, ARB obtained fuel samples from the vessel, which were typically a mixture of fuels from multiple fuel bunkers, and tested for actual fuel sulfur content per ISO 8217.

As shown in Table II-7, about 80 percent of the bunkered fuel came from six regions, USA-CA, Asia-Korea, Asia-China, Asia-Singapore, Northern Europe and USA-not including CA. The highest percentage of samples originated in California (22% percent), with an average bunkered fuel sulfur content of 0.03%. The next highest percentage of samples originated from Korea, at about 17%, with an average bunkered fuel sulfur content of 0.63%. The percent of samples originating from China and Japan were the third and fourth highest, with about 4% each and with an average bunkered fuel sulfur content of 0.28% and 0.4% respectively.

Fuel viscosity, as listed on the BDN, was evaluated by fuel sulfur content and by region. As shown in Figure II-5, the average fuel viscosity by sulfur content shows some variation between different fuel sulfur ranges. The fuels with sulfur levels in the range of 0.1 to 0.5% sulfur have a somewhat higher average fuel viscosity than those fuels with sulfur content below 0.1% sulfur.

Figure II-5: MGO Fuel Viscosity* Levels from Bunker Delivery Notes Obtained During Enforcement Activity between July 2009 through January 2011



*Kinematic fuel viscosity as measured in centistokes (cSt)

Additionally, there may be bunkering regions where higher viscosity fuel is more readily available. MGO purchased in California and other U.S. ports has average sulfur levels below the ARB 0.1% sulfur Phase 2 requirement; however, the average viscosity is much lower than the other four top bunkering regions. For example, samples from fuel bunkered in China and Singapore have higher average viscosities, 4.8 and 4.1 respectively, but the average sulfur levels do not meet the Phase 2 requirements. Samples from fuel bunkered in Korea have intermediate viscosity levels; however, the average fuel sulfur level is the highest of all the regions at 0.63%. This data indicates that, for the bunkering regions with higher viscosity, the average fuel sulfur is well above 0.1% sulfur that is required in Phase 2. Therefore, to provide shippers more flexibility in 2012 and 2013 to find fuels with higher viscosity, we propose to delay the 0.1% sulfur limit to January 1, 2014.

As a component of the original rulemaking process, ARB staff performed an extensive analysis of fuel availability for Phase 2 compliant fuel (0.1% sulfur MGO or MDO in 2012). The analysis indicated that in 2007, the average sulfur content of MGO and MDO at 25 of the 31 Pacific Rim ports exceeded the Phase 2 fuel sulfur requirements. Furthermore, findings indicated that it was unlikely that a sufficient supply of 0.1% sulfur fuel would be available prior to 2012 due to crude supply, refining capacity, and fueling infrastructure improvements that would have been necessary. However for 2012, these issues would be lessened

due to additional time available for fuel providers and suppliers to develop and implement the necessary fueling infrastructure.

As the 2012 ARB 0.1% sulfur Phase 2 requirement nears, ARB staff evaluated fuel sulfur information obtained from ARB inspection records described above. Although the inspection period aligns with Phase 1 of the rule, we believe that the information is representative of the sulfur content of MGO and MDO fuels currently provided to the global OGV market. About 450 vessel inspections were conducted over a 19 month period from July 2009 through January 2011. (ARB, 2011)

Fuel sulfur content, bunker location and fuel viscosity were compiled from the fuel bunker delivery notes obtained during the inspections. Additionally, as part of the inspection procedure, ARB obtained fuel samples from the vessel, which may be a mixture of fuels from multiple fuel bunkers, and tested for fuel sulfur content per ISO 8217. Based on the fuel sample sulfur test results, ARB has a sampling of the actual average fuel sulfur content, and bunkered sulfur content of the purchased fuel used to comply with the rule. The analysis of the collected fuel samples demonstrates that the fuels being burned typically have much lower sulfur content than the Phase 1 fuel sulfur limits. Of the 444 fuel samples analyzed as of March 2011, the actual fuel sulfur content of the marine distillate fuels being used by OGV operators averages less than 0.3% sulfur and 40% of all the samples were below 0.1% sulfur. In addition, the majority of fuel samples were MGO (402 samples MGO vs. 40 samples MDO).

These results indicate that on average, many of the most significant bunkering regions are providing fuel at or within a few tenths of a percent of 0.1% sulfur. The main exception is Korea, where the average sulfur content of the MGO is about 0.6%. While previous studies have found that the total quantity of fuel needed to meet the demands of this regulation are sufficient, there may be regional issues with the sulfur content of MGO or MDO in 2012.

Table II-7: MGO Bunkering Records by Region Obtained During Inspection Activity Between July 2009 through January 2011

Region	Count (1)	% of Total MGO Samples (1)	Average Reported Viscosity (cSt) (2)	Average Fuel Sulfur Content (%) (2)	Min Fuel Viscosity (cSt) (2)	Max Fuel Viscosity (cSt) (2)	Min Fuel Sulfur Content (%) (2)	Max Fuel Sulfur Content (%) (2)
USA-CA	102	25.4	2.71	0.03	2.00	3.70	0.00	0.74
Asia-Korea	75	18.7	3.55	0.63	2.20	5.56	0.01	1.28
Asia-China	65	16.2	4.78	0.28	2.34	5.50	0.00	0.51
Asia-Singapore	31	7.7	4.13	0.40	2.82	5.78	0.00	1.00
Northern Europe	26	6.5	3.80	0.13	2.00	5.50	0.01	0.95
USA-Not CA	22	5.5	2.76	0.03	2.00	3.60	0.00	0.17
Asia-Japan	18	4.5	3.94	0.14	3.04	5.32	0.00	0.93
Southern Europe	17	4.2	4.11	0.13	2.88	7.00	0.00	0.71
Central America	12	3.0	2.88	0.28	2.58	3.13	0.02	1.50
South America	9	2.2	3.16	0.21	2.68	4.26	0.00	1.50
Asia-other regions	8	2.0	3.35	0.13	2.80	4.34	0.03	0.39
Middle East	7	1.7	3.31	0.34	2.81	3.80	0.08	0.98
North America British Columbia	3	0.7	3.30	0.03	3.20	3.50	0.02	0.04
Australia	2	0.5	2.90	0.00	2.87	2.93	0.00	0.00
S. Africa	1	0.2	3.30	0.52	3.30	3.30	0.52	0.52

1. Only records for MGO are listed. Total of 402 samples, 4 samples did not have information on bunkering region.
2. Values reflect "as bunkered" fuel viscosity and fuel sulfur content as reported on fuel Bunker Delivery Notes

Based on reviewing the average and minimum fuel sulfur content regionally, ARB staff has concluded that 0.1% fuel sulfur MGO is currently provided in most of the Pacific Rim bunkering regions where fuel is being purchased to comply with the rule. However, there are a small number of bunkering regions, such as Korea, where the current fuel sulfur averages are significantly higher than 0.1%, indicating that most of the MGO provided in that region currently does not meet the 0.1% Phase 2 requirement. ARB staff believes that while there is sufficient global availability of the 0.1% sulfur fuels, there may be isolated situations regionally where the 0.1% sulfur fuel may not be provided in 2012. (ARB, 2008 Appendix F) By delaying the Phase 2 implementation to January 1, 2014, any isolated fuel sulfur issues should further decline as supply increases due to crude supply, refining capacity, fueling infrastructure improvements and demands of the North American ECA requirements in 2015.

Proposed Modifications for Phase 2 Implementation

Based on the fuel samples obtained and analyzed from OGV enforcement inspections as of January 2011, the actual fuel sulfur content of the marine distillate fuels being used by OGV operators averages less than 0.3% sulfur and 40% of all the samples were below 0.1% sulfur. This information indicates that about 40% of vessels are currently operating on 0.1% sulfur distillate and that the use of 0.1% sulfur marine distillate fuel is technologically and operationally feasible and is cost effective. However, ARB staff believes it is appropriate to adjust the implementation timeline for the OGV Clean Fuel Regulation's Phase 2 requirements (0.1% sulfur in January 1, 2012). Staff believes that adjustments to the Phase 2 implementation date are necessary for the following reasons:

- better alignment with the North American ECA,
- greater flexibility to find compliant fuels with higher viscosity, and
- additional time for the marine fuel industry to provide distillate fuels with properties that meet the enhanced specifications of the newly revised ISO 8217.

As discussed in the following section, the ISO 8217 marine fuels standard, which was recently revised in 2010, includes higher minimum fuel viscosity and newly added lubricity requirements. These revisions will take some time to be more widely integrated by industry, but should be more commonly applied as industry prepares for the demands of the Phase 2 ECA (0.1% sulfur fuel) in 2015. To provide better regulatory alignment, flexibility and additional time for industry's integration of newly revised fuel standards, providing a two-year delay will help to ensure the successful implementation of the North American ECA's Phase 1 and a successful transition to the 0.1% sulfur fuels.

While complete alignment with the North American ECA Phase 2 would suggest that the ARB 0.1% sulfur Phase 2 be delayed to January 1, 2015, ARB staff does not recommend the delay past January 1, 2014. Reductions that can only be achieved with the ARB 0.1% sulfur Phase 2 requirement are necessary in 2014 for both the SIP and POLA and POLB Clean Air Plan (CAP).

C. New Revisions to ISO 8217

The International Organization for Standardization (ISO) sets standards for marine fuels under International Standard ISO 8217, including MGO, designated as DMA, and MDO, designated as DMB. In the original rulemaking, both MDO and MGO were required to meet all the specifications in ISO 8217, as revised in 2005. The ISO 8217 standard has since been revised and staff proposes to modify the definition of both MGO and MDO.

The 2010 version has some additional specifications that will benefit the industry. A new distillate category designation DMZ has been added, due to the recent experiences with possible viscosity related operational issues. DMZ has increased minimum viscosity of 3 cSt at 40°C, but is otherwise identical to the DMA grade. Staff proposes to amend the definition of MGO to include both DMA and DMZ. In addition, the minimum viscosity of DMA has been raised to 2 cSt from 1.5 cSt in the 2005 version. In the 2005 version, DMB did not have a minimum viscosity, but this has been set to 2 cSt in the 2010 version.

A lubricity requirement has been included in the 2010 version and is applicable to all distillate grades with sulfur contents below 500 mg/kg (500 ppm or 0.05% sulfur). The lubricity limit is based on the existing wear testing requirements for high speed automotive and heavy duty industrial diesel engines (a maximum 520 micrometer wear scar diameter). The lubricity requirements reflect industry's concern of possible engine wear damage due to fuels without sufficient lubricity.

Staff evaluated the option of referencing only the latest 2010 standard, but found that the 2005 standard is still used widely by industry. Therefore, staff proposes to allow compliant fuel to meet either the 2005 or the 2010 version.

D. Noncompliance Fee Option

Vessels Using the Noncompliance Fee That Can Obtain and Subsequently Operate on Compliant Fuel During a California Visit

In the prior rulemaking, the noncompliance fee option was developed to address events where: (1) a vessel operator cannot obtain the required fuel prior to coming into California; (2) the vessel has an unplanned redirection and does not have the required fuel on-board; (3) a vessel operator inadvertently purchases defective fuel; or (4) the vessel is to be taken out of service for modifications. Our experience implementing this rule showed that very few vessel operators needed to use the noncompliance fee provision. Over the 21 months between July 2009 and March 2011, vessel operators paid a noncompliance fee only five times out of the estimated 18,000 vessel visits in California. In each case, the vessel operator was required to pay a fee of $45,500, which is about twice the cost of using the compliant fuel for a typical visit. However, in most of these uses of the noncompliance fee, the operators requested a reduction in the

fee if they were able to bunker the fuel at the earliest opportunity and operate on the compliant fuel for the remainder of the visit.

To address this issue and to encourage direct compliance with the rule where possible, ARB staff proposes to prorate the fee for these vessels. Since the vessel operators have indicated that they can typically bunker fuel at the first port or anchorage and switch to compliant fuel at the earliest safe opportunity, staff proposes to prorate the fee by half since the operators will use the compliant fuel for about half of the total visit. Compared to the cost of the fuel under direct compliance, the prorated fee is still about twice the cost of compliance because the distance travelled within the regulated zone on noncompliant fuel is about half of that for a round trip, while the fee is also halved. This will ensure that there is no cost advantage to using the noncompliance fee. Looked at another way, staff determined that a typical cargo vessel would have to travel about 300 nm within the regulatory zone a full cruising speed on noncompliant fuel to save $22,750 (one half the noncompliance fee). This compares with typical routes to or from the major California ports that range from about 40 to 150 nm within the regulatory zone.

Vessels that Anchor in Conjunction with a Noncompliant Port Visit.

Again, experience gained in implementing the rule showed that many times vessels, primarily tankers, may anchor prior to a port visit for such purposes as bunkering, waiting for a scheduled cargo discharge, or mandatory or voluntary inspection. In the prior rulemaking, except for mandatory inspections, the anchorage was considered a separate port visit for the noncompliance fee calculation. Staff proposes that when anchorage is made in conjunction with one or more noncompliant port visits, the anchorage is not included in calculating the noncompliance fee for the vessel visit. If, however, the vessel is only anchoring during the noncompliant visit, for example, waiting for redirection or tendering cruise passengers to shore, then the anchorage will be included in calculating the noncompliance fee.

Noncompliance Fee Schedule

The noncompliance fees were designed such that they do not confer an economic advantage to participants relative to vessel operators who use the specified low sulfur fuels. The noncompliance fee for the first port visit is about two times the average fuel differential cost for a complete vessel visit. The graduating structure, where the fee doubles for each additional port stop during a visit, was incorporated to discourage multiple uses of the noncompliance fee provision and encourage direct compliance. Because of the possibility of regional issues with availability of 0.1% sulfur MGO or MDO Phase 2 fuel, staff proposes to modify the noncompliance fee schedule, beginning the graduation of the fee structure after the second port visit as shown in Table II-8. We do not believe that this option will be used in the remainder of Phase 1, since the noncompliance fee provision has only been used a few times to date, and has not been used for more than one port visit. The proposed amendment to the fee schedule does

not provide an economic advantage to participants, but does reduce the graduated fees when using the provision for multiple visits or multiple port stops in a single visit.

Table II-8: Noncompliance Fee Schedule, Per Vessel

Port Visit	Per-Port Visit Fee
1st Port Visited	$45,500
2nd Port Visited	$45,500 ~~$91,000~~
3rd Port Visited	$91,000 ~~$136,500~~
4th Port Visited	$136,500 ~~$182,000~~
5th or more Port Visited	$182,000 ~~$227,500~~

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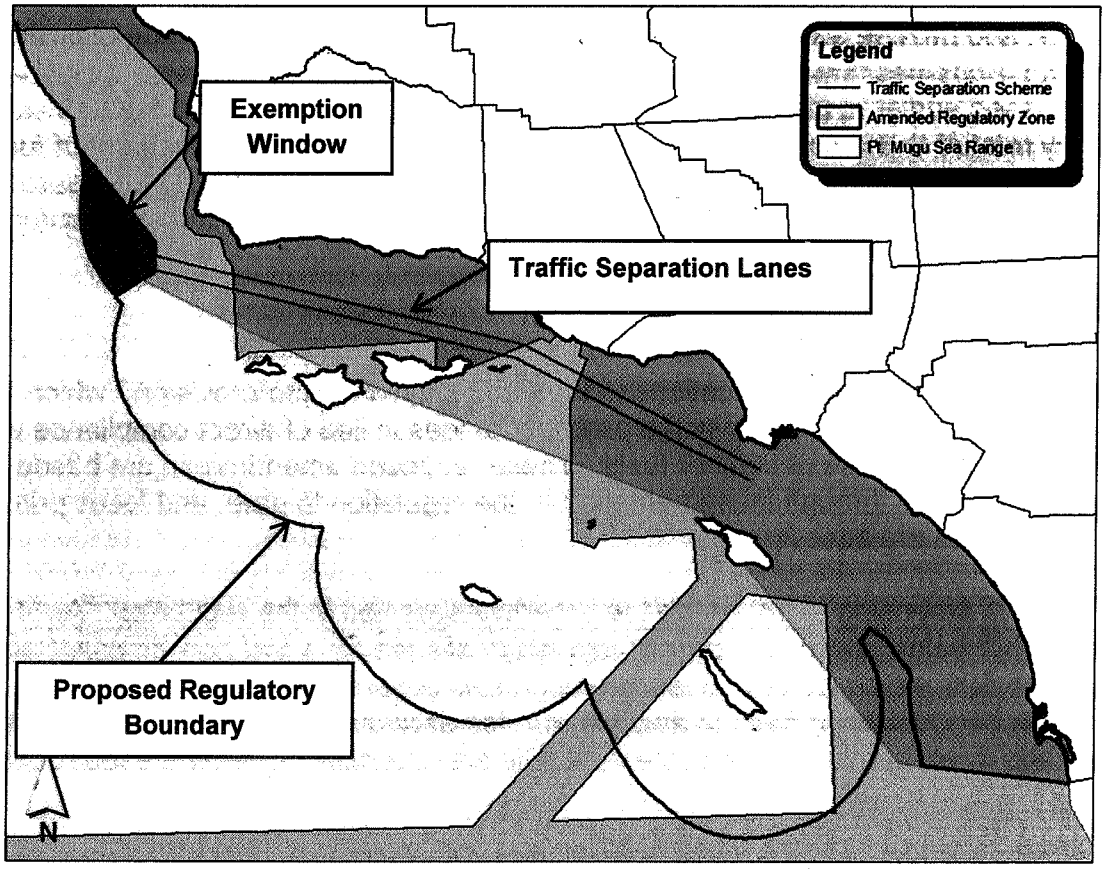
III. PROPOSED AMENDMENTS

In this chapter, we provide a plain English discussion of the key amendments we are proposing to the OGV Clean Fuel Regulation. For a discussion of the entire regulation, including the sections that we are not proposing to modify, please see the staff report for the original regulation. (ARB, 2008) This chapter is intended to satisfy the requirements of Government Code section 11346.2, which requires that a non-controlling "plain English" summary of the regulation be made available to the public.

A. Regulatory Boundary

As discussed previously, we are proposing to amend the regulatory boundary, referred to as "Regulated California Waters," to align more closely in Southern California with the "Contiguous Zone," which is 24 nautical miles from the California Baseline (shoreline), which includes offshore islands. The proposed amendments to the regulatory boundary are found in subsections (b), "Applicability," and (d) "Definitions." The proposed amended regulatory boundary is shown in Figure III-1 below.

Figure III-1: Proposed Amended Regulated California Waters in Southern California



In the original regulation, the regulatory boundary followed the Contiguous Zone in Northern California, but in Southern California it approximated a boundary 24nm from the mainland shore using two straight-line segments. This boundary was selected to maximize the emission reductions from the rule at the same time to lower the cost with the expectation that vessels would continue to use the Channel Route with the established TSS. The proposed amendments will follow the Contiguous Zone consistently throughout the length of California, including islands. The proposed amended regulatory boundary will extend farther offshore of the California mainland in Southern California because each of the Channel Islands has its own 24 nm boundary surrounding it.

In addition, we are proposing to exempt a small "window" within the 24 nm boundary to encourage vessels to travel in the established shipping lanes in the Santa Barbara Channel. This region falls within an area within the Contiguous Zone.[12]

B. Phase 2 Implementation Date

The existing OGV Clean Fuel Regulation requires the use of Phase 2 0.1% sulfur distillate fuel beginning January 1, 2012. We are proposing to extend the deadline to use the Phase 2 fuel by two years to January 1, 2014. ARB staff believes that adjustments to the Phase 2 implementation date are necessary to better align with the North American ECA, provide more flexibility to find compliant fuels with higher viscosity, and provide additional time for the marine fuel industry to provide distillate fuels with properties that meet enhanced specifications of the newly revised ISO 8217. As discussed earlier in the staff report, for vessels that have experienced LOP incidents possibly related to the use of low sulfur distillate fuels, on-board management of fuel viscosity is an important parameter. Providing a two-year delay will help to ensure the successful implementation of the North American ECA's Phase 1 and a successful transition to the 0.1% sulfur fuels.

C. Noncompliance Fee Provision

Staff is proposing minor modifications to the "noncompliance fee provision," which in certain specified situations allows the payment of fees in lieu of direct compliance with the rule through the use of cleaner fuels. These proposed amendments are based on experience gained through implementation of the regulation to date, and focus primarily on the way fees are assessed.

First, staff is proposing to adjust the fee schedule specified in the regulation. As shown in Table III-1 below, under the current regulation, the fee for a first noncompliant port visit is $45,500, which helps to offset the economic advantage gained by using the less expensive noncomplying fuel. In addition, the fee escalates for subsequent port visits to encourage direct compliance with the rule. We are proposing to allow the fee to stay at

[12] The Contiguous Zone is an internationally recognized over-water boundary that is adjacent to the Territorial Sea. The Territorial Sea extends 12 nm offshore of the California coastline, while the Contiguous Zone extends from the Territorial Sea to 24 nm offshore of the California coastline.

$45,500 for the second port visit to accommodate visiting vessels that may stop at two California ports in their voyage (e.g. visits to the ports of Los Angeles and Oakland). We have found the current fee to provide sufficient disincentive for ship operators to frequently use of the provision. It has only been used five times since the regulation began implementation in July, 2009.

Table III-1: Noncompliance Fee Schedule

Port Visit	Fee Under Current Regulation	Fee Under Proposed Amendments*
1	$45,500	$45,500
2	$91,000	$45,500
3	$136, 500	$91,000
4	$182,000	$136,500
5 or more	$227,500	$182,000

* Fees are halved if vessel operator purchases and uses compliant fuels as soon as possible.

In addition, staff is proposing that the applicable fees shown in Table III-1 be halved for vessel operators that purchase and use complying fuels after arriving to a port on noncomplying fuel. Under the current regulation, there is no incentive for vessel operators to purchase and use compliant fuels when using the noncompliance fee provision. In fact, there is a disincentive in that the noncompliant fuels are much less expensive, and there is no adjustment of the fees for operators to make the effort to come into compliance as soon as possible. The proposed modification would provide ship operators with the incentive to purchase and use compliant fuel in those situations where it is feasible.

Finally, for the purpose of assessing the applicable noncompliance fees, staff is proposing that offshore anchorages made in conjunction with a port visit not be counted as another "port visit." There are numerous situations where a vessel operator may conduct business at a port visit, but also conduct an offshore anchorage for secondary reasons. For example, the vessel operator may schedule a vessel inspection, take on fuel at anchorage, or perform other technical or logistical activities. In these situations, we believe that it is appropriate not to count this anchorage as a separate "port visit" for the purposes of calculating noncompliance fees.

D. Other Proposed Amendments

In addition to the proposed modification of "Regulated California Waters," staff is proposing to amend two additional definitions to reflect recent updates to nautical charts and fuel specifications, as discussed below.

California Baseline

The California coastline is defined in the regulation as the "baseline," the mean lower low water line along the California coast, as shown in seven NOAA nautical charts covering portions of California's coastline. These NOAA charts are periodically updated to reflect changes in the coastline that occur over time. Since the adoption of the regulation, one of the charts (the April 2005 version of Chart 18740 covering California's coastline from San Diego to Santa Rosa Island) was updated and we are proposing to include this updated (March 2007) chart in the amendments to the regulation.

Marine Fuels

Staff is proposing to amend the definitions of the fuels required under the ARB regulation to reflect recent changes in how these fuels are specified under international standards. For background, the regulation requires the use of either MGO or MDO. These fuels are defined in the regulation as specific grades of distillate fuels in the 2005 version of international standard ISO 8217 under the International Organization for Standardization. Under the current regulation, MGO is defined as any fuel meeting the 2005 ISO specifications for DMA or DMX fuel grades, and MDO is defined similarly as DMB grade fuel. However, since the adoption of the regulation, a new 2010 version of the ISO 8217 fuel specifications has been adopted. This new version was issued partly in response to the revised Annex VI fuel sulfur regulations under the International Maritime Organization. The new version includes some important changes to the specifications for distillate fuels, as well as a new grade of distillate fuel referred to as DMZ. The new specifications set higher minimum fuel viscosity levels, and a lubricity specification for distillate fuels with sulfur levels below 0.05%.

Staff is proposing to change the definitions of MGO and MDO in the regulation to allow fuels that meet the applicable grades of distillate fuel under either: (1) the older 2005 version of the ISO 8217 specifications; or (2) the new June 15, 2010 version of the ISO 8217 specifications, which staff is proposing to incorporate into the regulation by reference. While staff strongly encourages the use of fuels meeting the new 2010 ISO 8217 specifications, many fuel suppliers are not currently offering fuels meeting the new ISO 8217 specifications. Therefore, to ensure an adequate supply of the distillate fuels required under the regulation, staff is proposing to allow distillate fuels meeting either the 2005 or 2010 versions of the ISO 8217 standards.

E. Regulatory Alternatives

The Government Code section 11346.2 requires ARB to consider and evaluate reasonable alternatives to the proposed regulation and provide the reasons for rejecting those alternatives. ARB staff evaluated two alternative strategies to the proposed amendments. Based on the analysis, none of the alternative control strategies were considered more effective in reducing emissions than the proposed regulation. This section discusses each of the alternatives and provides reasons for rejecting those alternatives.

Alternative 1: Do Nothing/No Project (Do not amend the existing regulation)

This alternative would leave the situation as it currently exists. The existing OGV Clean Fuel Regulation would continue to be in effect. No action would be taken to address the loss in emission reductions anticipated by the original rule or the adverse impact on the U.S. Navy's Point Mugu Sea Range operations due to the shift in vessel traffic. Further, no action would be taken to provide better alignment of the ARB OGV Clean Fuel Regulation with the 2015 requirement for the North America ECA. The adverse impacts of this alternative would be that a majority (and potentially even a greater percentage in the future) of vessel traffic coming into the Ports of Los Angeles and Long Beach would use the Outer Route resulting in greater emissions and a significant adverse impact on Point Mugu Sea Range Operations. We would also miss an opportunity to make adjustments to the Phase 2 schedule that is appropriate given our experience in the implementing Phase 1. Based on the adverse impacts identified above and discussed in greater detail in Chapter V, staff rejected Alternative 1.

Alternative 2: Suspend the original regulation and rely on international and federal regulations

This alternative would have the Board suspend the current rule and instead rely on the North America ECA OGV fuel standards and schedule. Prior to 2015, relying only on international and federal regulations would result in substantial increases in PM and SOx emissions. This is because under IMO/U.S. EPA regulations (i.e. an ECA zone), ship operators would be not be required to use lower sulfur OGV fuel until August 2012 and the allowable fuel sulfur content would be 1% and most likely HFO. Under the ARB OGV Clean Fuel Regulation, Phase I fuel is currently averaging below 0.3% sulfur, and the Phase II fuel would be at or below 0.1% sulfur. In addition, the ARB rule specifies distillate fuels that burn cleaner than the HFO likely to be used to meet the 1% sulfur fuel, independent of sulfur levels. An emissions analysis prepared in the original staff report that compares the original regulation to the then pending ECA requirements shows the dramatic difference in emission reductions between these two options. This analysis would be very similar to the difference between the proposed amended regulation and the currently adopted North American ECA. (ARB, 2008)

The emission reductions that would be achieved under the proposed regulation are critical to reducing the cancer and non-cancer health risks to the public. They are also

necessary to make progress toward compliance with State and federal air quality standards for ozone and PM in nonattainment areas throughout the State. Finally, these reductions are an important element of California's Diesel Risk Reduction Plan, the California Goods Movement Emission Reduction Plan, and marine port clean air plans. For the above reasons, staff rejected Alternative 2.

F. Necessity of Proposed Amendments

The need and rationale for the proposed amendments were discussed extensively in Chapter II. In addition, in this chapter, ARB staff provides a plain English description of the proposed amendments to the OGV Clean Fuel Rule.

Pursuant to Government Code section 11349.1, Government Code section 11346.2(b)(1), and title 1, California Code of Regulations, section 10, ARB staff is providing a brief summary below that identifies each section in the regulation where amendments are proposed and describes the rationale for each proposed amendment.

California Code of Regulations, title 13, section 2299.2 and title 17, section 93118.2

Section 2299.2(b)(1) and Section 93118.2(b)(1). Applicability

Summary of Section 2299.2(b)(1) and Section 93118.2(b)(1)

These sections identify the OGV Clean Fuel Regulation boundary wherein vessels must use the specified fuel.

Rationale for Proposed Amendments to Section 2299.2(b)(1) and Section 93118.2(b)(1)

The proposed amendments revise the regulated zone farther offshore in Southern California to be consistent with the Contiguous Zone (i.e. include zone around the Channel Islands) and add a small exemption area i.e. exemption window, for ships using the Channel Route. With these changes, ARB staff believes vessel operators will choose to transit of the Channel Route instead of the Outer Route because it is less costly and is a shorter distance. If they do choose to continue to use the Outer Route, under the proposed amendments they would have to use the cleaner marine distillate fuels.

Section 2299.2(d)(18) and (19) and Section 93118.2(d)(18) and (19). Definitions

Summary of Section 2299.2(d)(18) and (19) and Section 93118.2(d)(18) and (19)

These sections define Marine Diesel Oil (MDO) and Marine Gas Oil (MGO) which are required by the regulation.

Rationale for Proposed Amendments to Section 2299.2(d)(18) and (19) and Section 93118.2(d)(18) and (19)

The proposed amendments will revise the definition of MGO and MDO to refer to both the 2005 version of the ISO 8217 fuel standard, which is still commonly used by industry, or the 2010 revision which includes a higher viscosity MGO "DMZ" grade.

Section 2299.2(e)(1)(A) and Section 93118.2(e)(1)(A). Operational Requirements

Summary of Section 2299.2(e)(1)(A) and Section 93118.2(e)(1)(A)

These sections describe the fuel requirements for vessels entering the regulated zone.

Rationale for Proposed Amendments to Section 2299.2(e)(1)(A) and Section 93118.2(e)(1)(A)

The proposed amendments will delay the Phase 2 (0.1% S) implementation by two years to January 1, 2014 to better align with the North American ECA and to provide more flexibility to vessel operators to find compliant fuels with higher viscosity.

Section 2299.2(h)(5) and Section 93118.2(h)(5). Noncompliance Fee in Lieu of Meeting Subsection (e)(1)

Summary of Section 2299.2(h)(5) and Section 93118.2(h)(5)

These sections describe a provision in the rule, the Noncompliance Fee Provision, which in certain specified situations allows the payment of fees in lieu of direct compliance with the regulation through the use of cleaner fuels.

Rationale for Proposed Amendments to 2299.2(h)(5) and Section 93118.2(h)(5)

The proposed amendments to these sections modify the fee structure to reduce the costs for vessel operators that purchase compliant fuel and use that fuel after arriving to a port on noncomplying fuel. This will help promote direct compliance with the regulations. The proposed amendments also adjust how the fee is assessed for vessels that bunker at anchorage prior to coming into a California port.

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(ARB, 2008) State of California, Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking: Proposed Regulation for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline, June 2008

IV. EMISSIONS AND ENVIRONMENTAL IMPACTS FROM THE PROPOSED AMENDMENTS

This chapter describes the potential environmental impacts of the proposed amendments to the OGV Clean Fuel Regulation. The impacts on statewide and regional emissions estimates are presented as well as impacts on air quality and public health. In addition, the potential biological impacts and impacts on greenhouse gas emissions are described.

A. Legal Requirements

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

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

- an analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- an analysis of reasonably foreseeable feasible mitigation measures; and
- an analysis of reasonably foreseeable alternative means of compliance with the control measure.

Compliance with the proposed amendments is expected to improve air quality overall and potentially affect other environmental media as well. A summary of the analysis of potential environmental impacts resulting of the methods of compliance are presented in the discussion below. Regarding reasonably foreseeable mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

The OGV Clean Fuel Regulation reduces the risk from exposures to diesel PM and helps to fulfill the goals of the Diesel Risk Reduction Plan, the State Implementation Plan, and the Goods Movement Emission Reduction Plan. Implementation of the OGV Clean Fuel Regulation is reducing emissions of directly-emitted diesel PM, NOx, SOx; and secondarily-formed PM from NOx and SOx. ARB staff is proposing amendments to the OGV Clean Fuel Regulation to adjust the offshore regulatory boundary in Southern California to lessen the potential for vessels to interfere with operations at the United States (U.S.) Navy's Point Mugu Sea Range. In addition, the proposed amendments

will help to reestablish the emission reductions from the regulation and help facilitate a successful transition to very low sulfur fuels by aligning implementation dates more closely with recently approved federal requirements. As indicated in the above paragraph, compliance with the proposed amendments may result in impacts to other environmental media, such as biological resources, and ARB is employing an adaptive management approach to mitigating impacts associated with potential adverse impacts. A more detailed discussion in included in this analysis in Section F.

CEQA also requires that a "No Project" Alternative be evaluated, which would mean that the proposed amendments would not be implemented. Alternatives to the proposed amendments, including a "No Project" alternative, were discussed previously in Chapter III of this report. Implementation of the "No Project" alternative was rejected because the adverse impacts of this alternative would be that a majority (and potentially even a greater percentage in the future) of vessel traffic coming into the POLA and POLB would use the Outer Route resulting in greater emissions and a significant adverse impact on Point Mugu Sea Range Operations. We would also miss an opportunity to make adjustments to the Phase 2 schedule that is appropriate given our experience in implementing Phase 1. Section G of this chapter presents three additional potential alternative compliance methods which are characterized as routing scenarios. ARB staff has concluded that there are no alternative means of compliance with the requirements of H&S section 39666 that would result in equivalent or greater diesel PM emission reductions at a lower cost.

B. Baseline

For the purposes of this environmental analysis, the physical environmental conditions that existed at the beginning of ARB's informal rulemaking process to develop the proposed amendments constitute the environmental setting or "baseline" for purposes of analyzing whether the proposed amendments will result in significant adverse environmental effects. Work on the proposed amendments began in 2010 so the environmental baseline for purposes of ARB's analysis are conditions as they existed in 2010. Based on data supplied by the U. S. Navy, by early 2010, approximately 50% of the vessel traffic going to and from the POLA and POLB that historically had travelled within the Santa Barbara Channel had relocated to the Outer Route which was described previously in Chapter II. (U.S. Navy, 2010) For the baseline, it is assumed that all the relocated vessel traffic and any vessels that travel outside the regulated zone uses HFO with 2.5% sulfur content. All other traffic within the 24 nm regulatory zone uses the marine distillate fuels as required by the OGV Clean Fuel Regulation. In the analysis of the proposed amendments, it is assumed that 100% of the vessels will move back into the Santa Barbara Channel when they visit the POLB and POLA because the amendments will remove the financial incentive to use the Outer Route.

C. Methodology of Estimating Emissions

To estimate the emissions from OGV, ARB staff relied upon the methodology developed during the initial rulemaking for the OGV Clean Fuel Regulation. However, the emission inventory has been adjusted since that time and the changes are reflected in the emission inventory used for the development of the proposed amendments to the OGV

Clean Fuel Regulation. The adjustments to the emissions inventory include a number of minor revisions and corrections. These are: recoding the model to increase calculation speed, updating auxiliary engine information, updating ship routing, adding an adjustment factor to estimate the effects of the recession, and making improvements in the user interface of the model. These changes to the emission inventory are briefly described below and discussed in more detail in Appendix D. The updated inventory and emissions model, Marine Emissions Model, is also posted on ARB's website at http://www.arb.ca.gov/ports/marinevess/ogv/ogv1085.htm. (ARB, 2011b)

Updated Auxiliary Engine Information

The inventory for the original OGV Clean Fuel Regulation rulemaking, referred to as the 2008 OGV Inventory, relied on the average auxiliary engine power from the 2005 ARB Ocean Going Vessel Survey for estimating the emissions for auxiliary engines. In the updated inventory, referred to as the 2011 OGV Inventory, ARB staff used additional sources of information for auxiliary engine power in the emissions estimates. Approximately 60% of ship auxiliary engine power ratings are now based on auxiliary power generation capacity from the Lloyds-Fairplay PC Register database (2007). Another 15% of ships have auxiliary engine power ratings from the POLA and POLB vessel boarding program, and the remaining ships utilize the average power ratings from the 2005 survey.

Updated Ship Routing

In both the 2008 OGV Inventory and the 2011 OGV Inventory, vessel routing between ports assumes that ships will take the shortest route between origin and destination on the vessel traffic network.

For the 2011 OGV Inventory, minor adjustments to the shipping lane network have been made to ensure that vessel routes conform to known transit routes, such as in the Santa Barbara Channel. Vessel routes were verified with automated instrumentation system (AIS) ship data to the extent possible. Additionally, in the 2011 OGV Inventory, tankers travelling to and from Northern and Southern California are routed further away from shore, to conform to existing practice.

Other Revisions and Corrections

The coding for the 2011 OGV Inventory was updated to improve performance and reduce processing time. A number of minor corrections and refinements were also made. These include calculating low load adjustment factors rather than using a lookup table, implementing Tier 1 IMO NOx standards for auxiliary and propulsion engines based on ship age, excluding cruise ships from low load adjustments, and an improved graphic user interface for the model. The emissions model was also updated to calculate the benefits of the San Pedro Bay Ports 20 and 40 nm vessel speed reduction (VSR) programs, including revised compliance rates for the years after 2006. Finally, the model was updated to account for the benefits of the North American ECA.

Recession Adjustment

The impact of the recession on net registered tonnage was estimated in August, 2009 from California port calls and Twenty-foot Equivalent Unit (TEU) data spanning January 1, 2006 through July 31, 2009. Partial year totals for 2009 were scaled to the whole year. These totals were checked in 2011 with the final totals for 2009 and 2010.

To forecast activity following the recession, staff developed three recovery scenarios to encompass the possible rate of growth ("fast", "slow", and "average"). The fast recovery scenario assumed that total activity would return to projected historically average levels in 2017 and then grow at the historical average rate. A return to trend by 2017 was based on the Congressional Budget Office forecast which indicated that real gross domestic product at a nationwide level will converge with potential gross domestic product trends no later than 2015. This forecast was modified with the assumption that California's recovery will lag the nation by several years, yielding the 2017 recovery date assumed for the fast recovery scenario. For the slow recovery scenario, staff assumed that activity would be permanently depressed relative to historical levels, but continue to grow at the growth rate in the 2009 San Pedro Bay Ports Forecast Update beginning in 2011. (San Pedro Bay, 2009) The average scenario is the average of the fast and slow scenarios.

The impact of the recession on net registered tonnage in 2009 was estimated from port call and TEU data spanning January 1, 2009 through July 31, 2009 and scaling the results to the entire year. These totals were then checked at the beginning of 2011 with the final totals from 2009 and 2010.

Given the uncertainty in forecasting emissions after such a deep recession, staff relied on the average recovery scenario. This scenario, for the years of interest for these regulatory amendments, is also supported by the most recent San Pedro Bay forecasts.

Comparison of Emissions Estimates

Table IV-1 and IV-2 provide a comparison between the 2008 OGV Emission Inventory and the 2011 OGV Emission Inventory for the years 2006, 2010, 2015, and 2020. To allow for comparison, the emission estimates in each table reflect the same assumptions for program implementation, in this case only the 2007 Shore Power Regulation and the 20 nm POLB and POLA VSR program at 2006 compliance levels are included in the projections.

Table IV-1: OGV Statewide Emission Inventory based on the 2008 OGV Emission Inventory Methodology

2008 Ocean Going Vessel Inventory (100 nm)						
Tons/Day						
Year	CO2	NOx	PM10	PM2.5	ROG	SOx
2006	10,140	230	21.1	20.6	9.0	160
2010	11,750	270	24.7	24.1	10.5	190
2015	13,870	330	29.6	28.9	12.7	225
2020	16,950	400	36.6	35.7	15.8	275

Table IV-2: OGV Statewide Emission Inventory based on the 2011 OGV Emission Inventory Methodology[13]

2011 Ocean Going Vessel Inventory (100 nm)						
Tons/Day						
Year	CO2	NOx	PM10	PM2.5	ROG	SOx
2006	10,530	230	21.8	21.2	9.6	170
2010	9,490	210	19.8	19.3	8.8	150
2015	12,400	290	26.4	25.6	11.8	200
2020	15,760	370	33.9	33.0	15.3	260

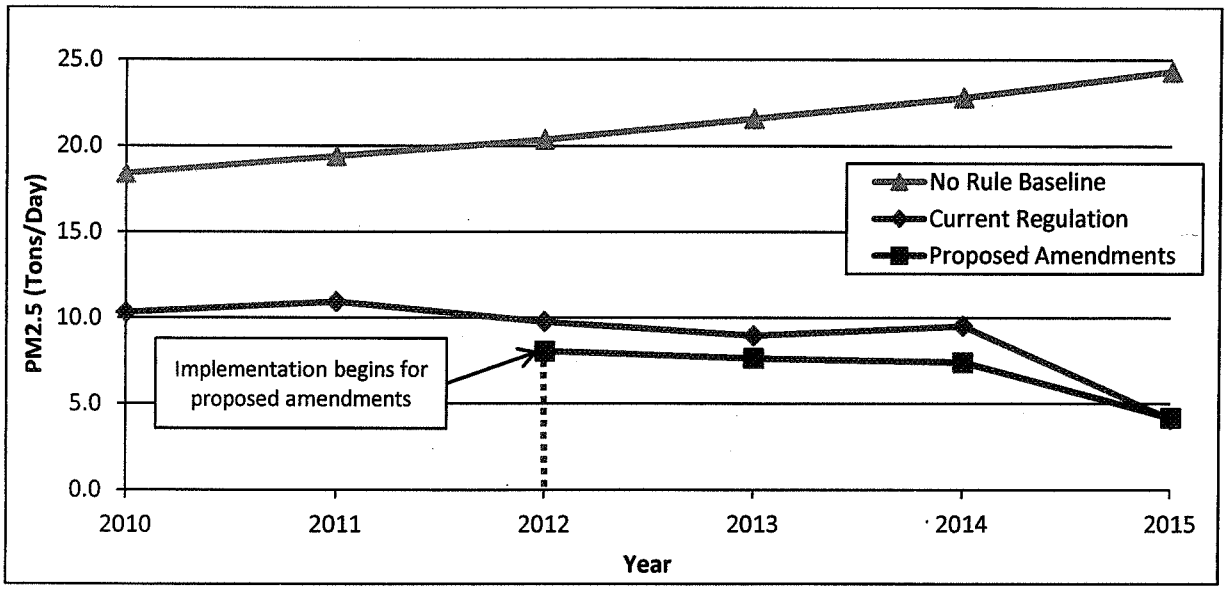
Because the recession did not officially begin until late 2007, a comparison between the emission inventories for 2006 provide an indication of the impacts of the updates to the ship routing, power assumptions for auxiliary engines, and the low load adjustment factor. As can be seen, these changes had a minor impact on the emissions estimates, in most cases the emissions increases are less than 5%. However, for the years 2010 through 2020, it is clear that the recession is having a significant impact on the projected emissions of OGV, reducing emissions by about 20% in 2010 and 10% in 2015 relative to what was expected in the 2008 OGV Emission Inventory.

D. Emission Impacts from the Proposed Amendments

With the proposed amendments, statewide emissions of PM and SOx from OGV will continue to decline and will be lower than what would be expected without the amendments. Statewide, the emissions of PM and SOx will decrease about 30% between 2012 and 2014. This is shown graphically in Figures IV-1 and IV-2 and numerically in Tables IV-3 and IV-4.

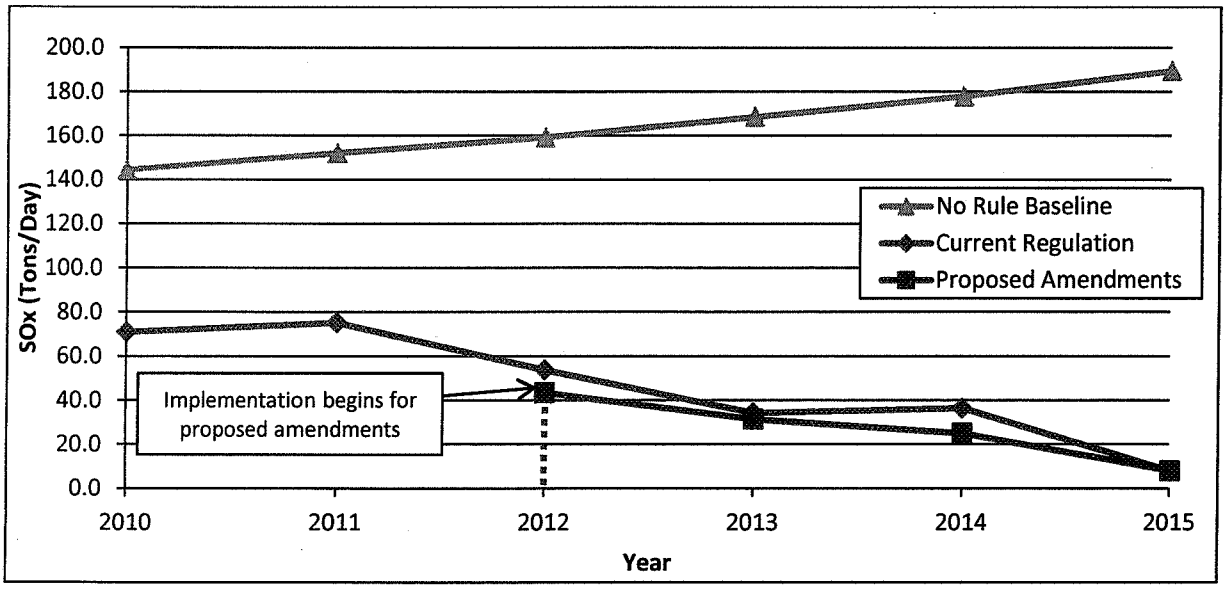
[13] The emissions estimates shown in Table IV-4 include the impacts of the 0 to 20 nm POLA and POLB VSR program, but do not include the impacts of the POLA and POLB 20 to 40 nm VSR program. Therefore, the estimates in Table IV-4 are higher than the estimates provided for 2010 in Table II-3 where the emission reducing impacts of both the 0 to 20 and the 20 to 40 nm VSR programs are included in the estimates.

Figure IV-1: Estimated Statewide OGV PM2.5 Emissions (100 nm)*



*All scenarios use the updated inventory to reflect the impacts of the recession. The current regulation and proposed amendments include impacts from the ECA.

Figure IV-2: Estimated Statewide OGV SO_x Emissions (100 nm)*



*All scenarios use the updated inventory to reflect the impacts of the recession. The current regulation and proposed amendments include impacts from the ECA.

Table IV-3: Estimated Statewide OGV Emissions (Tons/Day) with Current Regulation (100 nm)*

Pollutant	Year					
	2010	2011	2012	2013	2014	2015
SO_x	71	75	54	34	36	8
PM2.5	10.3	10.9	9.8	9.0	9.5	4.1
NO_x	198	209	215	228	241	257
CO_2	8,760	9,060	9,360	9,970	10,570	11,170

*Uses the updated inventory, assumes 0.5% sulfur distillate fuel until 2012 and 0.1% sulfur after 2012.

Table IV-4: Estimated Statewide OGV Emissions (Tons/Day) with Proposed Amendments (100 nm)*

Pollutant	Year					
	2010**	2011**	2012	2013	2014	2015
SO_x	--	--	44	32	25	8
PM2.5	--	--	8.1	7.6	7.4	4.1
NO_x	--	--	219	232	246	262
CO_2	--	--	9,360	9,970	10,570	11,170

*Uses the updated inventory, assumes 0.5% sulfur distillate fuel until 2012, 0.3% sulfur distillate fuel for 2012-2013 and 0.1% in 2014 and after.
**Implementation is anticipated to begin in 2012 for proposed amendments.

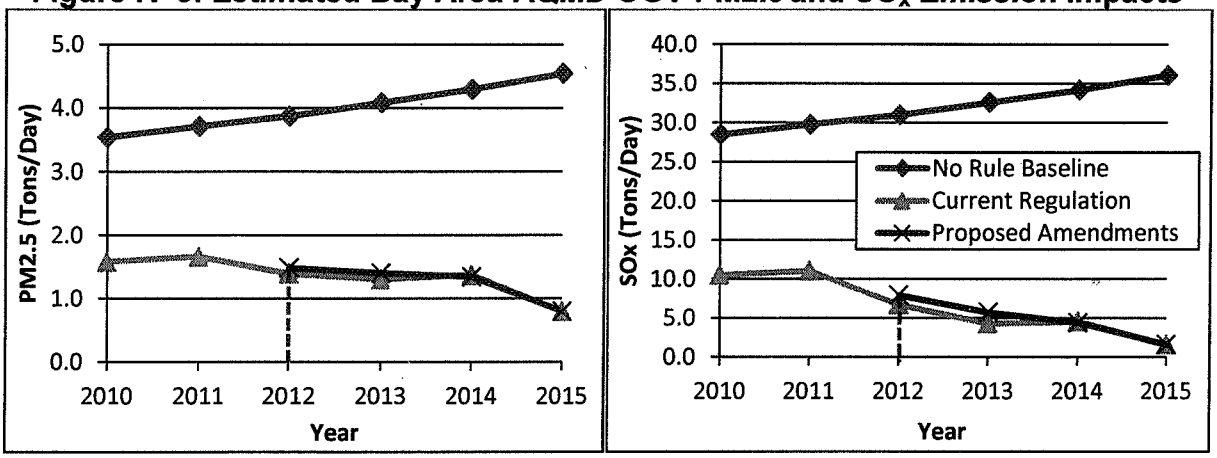
It should be noted that there is an anomaly in the emissions comparisons due to the 100 nm boundary for the inventory and the fact that when vessels use the Outer Route there is a small region where they travel outside the inventory boundary. In other words, when OGV use the Outer Route, the emissions associated with the route that occur outside the inventory boundary are not reflected in the inventory. Because the use of the marine distillate fuels result in only a 5-6% difference in NOx emissions, this anomaly is most apparent in the emissions for NOx. Hence, as can be seen in Tables IV-3 and IV-4, it would appear that there is actually an increase in NOx when the vessels use the Channel Route. However, if the emission inventory boundary were increased beyond 100 nm, the comparison between the current regulation and the proposed amendments would reflect a small decrease in NOx emissions with the proposed amendments.

Regional Emissions Impacts

ARB staff also investigated the impacts of the proposed amendments on the emissions in several coastal districts that are impacted by OGV emissions including the Bay Area Air Quality Management District (AQMD), the Ventura Air Pollution Control District (APCD), Santa Barbara APCD, San Diego APCD, and the South Coast AQMD. As shown in Figures IV-3 through IV-7, similar to the impacts Statewide, emissions of PM

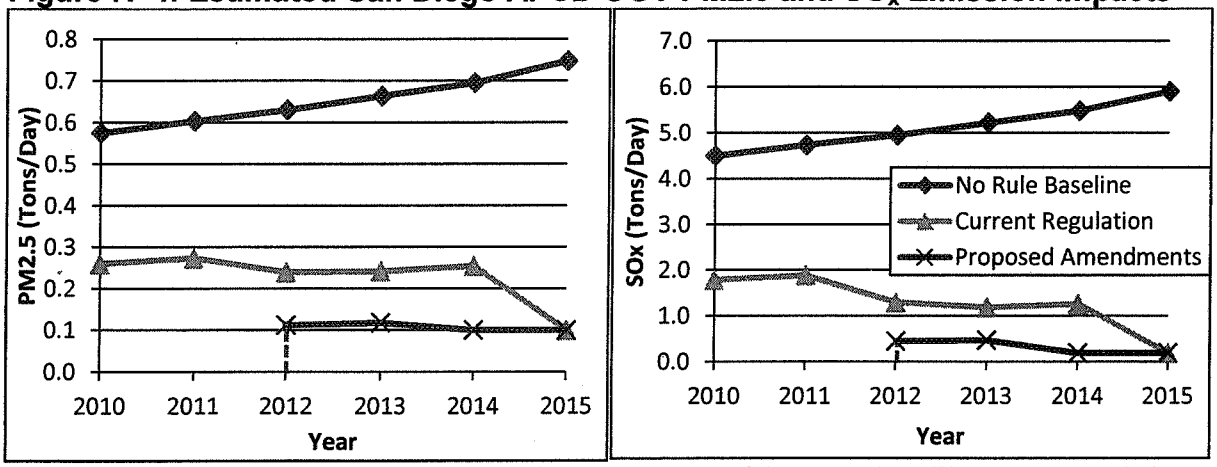
and SOx from OGVs will continue to decline over the next four years and in most all cases will be lower than what would be expected without the amendments. However, in the Bay Area AQMD there are two years, 2012 and 2013, where there is a small loss in projected PM2.5 and SO_x emission reductions with the proposed amendments when compared to the projected emissions under the current regulation. The same is true for the South Coast AQMD in 2013. In both regions, emissions continue to decline over time, however, under the proposed amendments they do not decrease as quickly as anticipated with the current regulation. This is discussed further after the figures below.

Figure IV-3: Estimated Bay Area AQMD OGV PM2.5 and SO_x Emission Impacts*



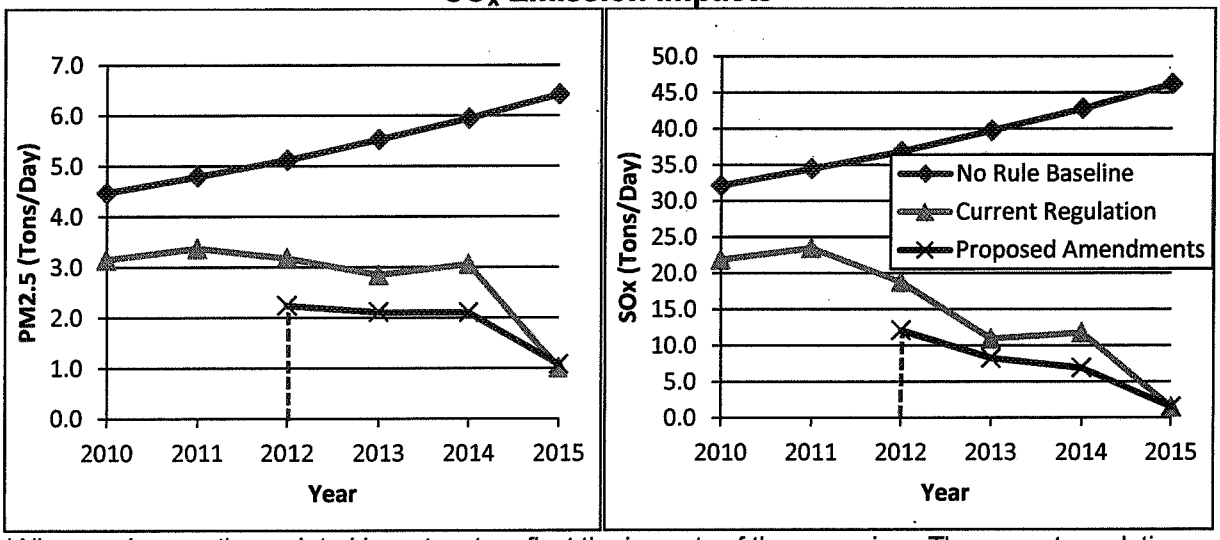
*All scenarios use the updated inventory to reflect the impacts of the recession. The current regulation and proposed amendments include impacts from the ECA. Implementation is anticipated to begin in 2012 for proposed amendments.

Figure IV-4: Estimated San Diego APCD OGV PM2.5 and SO_x Emission Impacts*



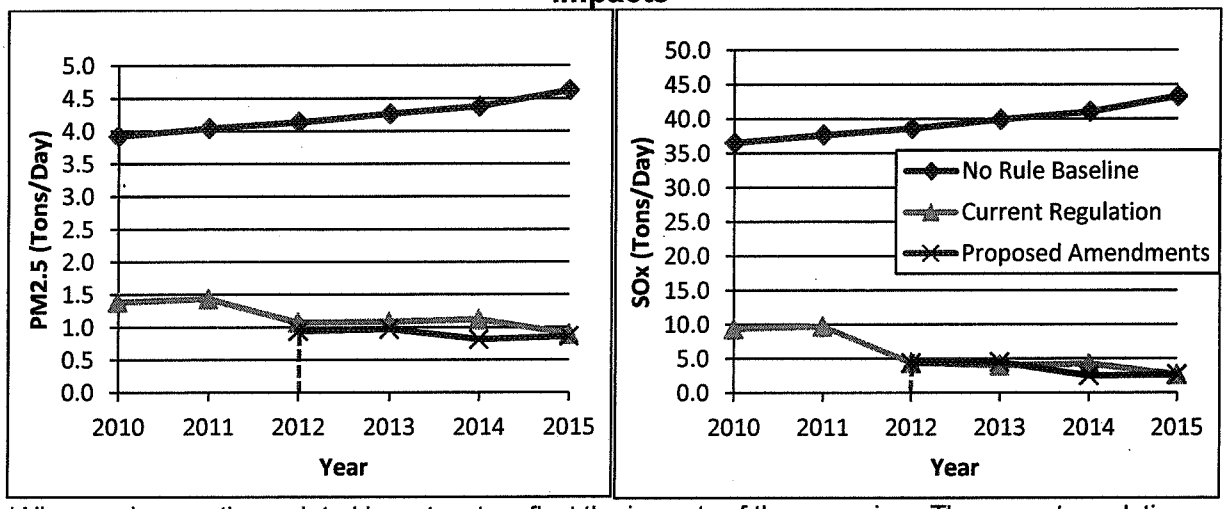
*All scenarios use the updated inventory to reflect the impacts of the recession. The current regulation and proposed amendments include impacts from the ECA. Implementation is anticipated to begin in 2012 for proposed amendments.

Figure IV-5: Estimated Santa Barbara County APCD OGV PM2.5 and SO_x Emission Impacts*



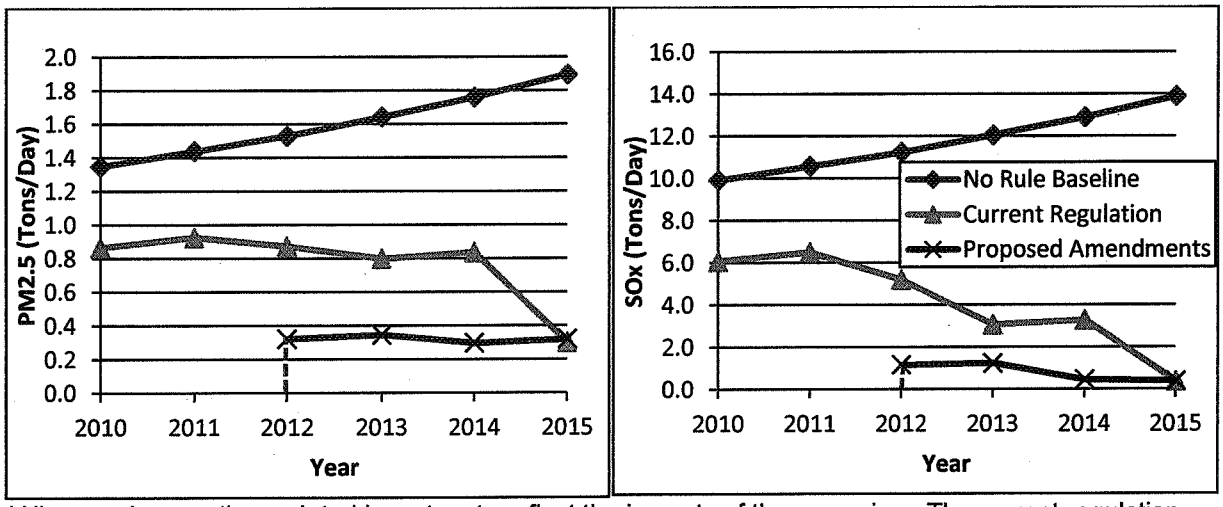
*All scenarios use the updated inventory to reflect the impacts of the recession. The current regulation and proposed amendments include impacts from the ECA. Implementation is anticipated to begin in 2012 for proposed amendments.

Figure IV-6: Estimated South Coast AQMD OGV PM2.5 and SO_x Emission Impacts*



*All scenarios use the updated inventory to reflect the impacts of the recession. The current regulation and proposed amendments include impacts from the ECA. Implementation is anticipated to begin in 2012 for proposed amendments.

Figure IV-7: Estimated Ventura AQMD OGV PM2.5 and SO_x Emission Impacts*



*All scenarios use the updated inventory to reflect the impacts of the recession. The current regulation and proposed amendments include impacts from the ECA. Implementation is anticipated to begin in 2012 for proposed amendments.

In both the South Coast AQMD and the Bay Area AQMD, emissions of SOx and PM2.5 from OGVs will continue to decline in future years with the proposed amendments. The resulting emissions in future years are far lower than what was originally anticipated when the OGV Clean Fuel Regulation was adopted in 2008 ensuring that the public health and air quality benefits originally anticipated are preserved. For the Bay Area AQMD, the projected SOx emissions with the proposed amendments are 30% lower in 2012 than originally anticipated and 50% lower in 2013. For PM2.5, the projected PM25 emissions are about 20% lower in 2012 and 30% lower in 2013. In the South Coast AQMD, the projected SOx emissions in 2013 are over 40% lower than anticipated. This is due in part to the recession which has significantly affected the activity of OGVs and the adoption of the North American ECA.

As noted earlier, the proposed amendments will result in a small loss of future projected PM2.5 and SOx emission reductions for the South Coast AQMD in 2013 and the Bay Area AQMD in 2013 and 2014. As is shown in Table IV-5, for the South Coast, the proposed amendments will result in the loss of about 0.4 T/D of projected SOx emission reductions in 2013. For the Bay Area, as shown in Table IV-6, the foregone emission reductions of SOx are about 1.4 T/D in 2012 and 1.6 T/D in 2013 and 0.1 T/D of PM2.5 in 2012 and 2013. While the proposed amendments would not result in an increase in the emissions that currently exist, the foregone emission reductions in 2012 and 2013 in the San Francisco Bay Area and 2013 in the South Coast will be treated as an adverse environmental impact for the purposes of this analysis. However, as noted above, because the emission are much lower today than originally anticipated when the current regulation was adopted in 2008, the potential adverse environmental impacts have been significantly lessened.

Table IV-5: Estimated Statewide OGV SO_x Emissions in the South Coast AQMD (Tons/Day)*

Scenario	2010	2011	2012	2013	2014	2015
Baseline Inventory	36.6	37.7	38.6	39.9	41.1	43.3
2008 Adopted Rule	13.3	13.7	7.7	8.0	8.4	8.8
Current Rule	9.4	9.8	4.5	4.1	4.3	2.7
Proposed Amendments	--**	--**	4.4	4.5	2.5	2.7
Foregone Emission Reductions	N/A	N/A	N/A	0.4	N/A	N/A

Table IV-6: Estimated Statewide OGV PM2.5 and SO_x Emissions in the Bay Area AQMD (Tons/Day)*

PM2.5						
Scenario	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Baseline Inventory	5.1	5.2	5.3	5.5	5.6	5.8
2008 Adopted Rule	2.1	2.2	1.9	2.0	2.1	2.1
Current Rule	1.6	1.7	1.4	1.3	1.4	0.8
Proposed Amendments	--**	--**	1.5	1.4	1.3	0.8
Foregone Emission Reductions	N/A	N/A	0.1	0.1	N/A	N/A
SOx						
Scenario	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Baseline Inventory	28.5	29.8	31.0	32.6	34.2	36.1
2008 Adopted Rule	14.5	14.9	10.5	10.9	11.3	11.7
Current Rule	10.5	11.0	6.7	4.3	4.6	1.6
Proposed Amendments	--**	--**	7.9	5.7	4.4	1.6
Foregone Emission Reductions	N/A	N/A	1.2	1.4	N/A	N/A

*All scenarios in Tables IV-5 and IV-6 use the 2011 inventory adjusted for the recession except for the 2008 Adopted Rule Scenario, which uses the 2008 inventory used in the original rulemaking. The Baseline Inventory and 2008 Adopted Rule scenarios do not account for the ECA.
**Implementation is anticipated to begin in 2012 for proposed amendments.

Potential Greenhouse Gas Impacts

In development of the original rulemaking, an in-depth analysis was done to determine the potential greenhouse gas (GHG) impacts from the OGV Clean Fuel Regulation. (ARB, 2008) ARB contracted with Dr. James Corbett and Dr. James Winebrake of Energy and Environmental Research Associates to do a study of the total fuel-cycle emissions. The study can be found in Appendix H of the 2008 Staff Report. Their analysis estimated the total fuel cycle for CO_2 and SO_x emissions associated with fuel extraction, fuel processing, fuel distribution, and fuel consumption. To estimate the emissions at each stage, they used a modification of the peer-reviewed Total Energy & Emissions Analysis for Marine Systems (TEAMS) model, which was originally based on Argonne National Laboratory's, GREET model (Greenhouse Gases, Regulated

Emissions, and Energy Use in Transportation). The TEAMS model was modified to allow analyses for the particular set of fuels under study.

Corbett and Winebrake estimated that requiring a switch from residual fuel to the distillate fuels specified in the regulation would correspond to a net increase in CO_2 emissions of approximately 1 to 2 percent over the total fuel cycle (and an 86 to 97 percent decrease in SO_x emissions). This slight increase in net fuel-cycle CO_2 emissions is primarily a function of the increased energy required at refineries that produce compliant distillate fuels. This offsets the localized decrease in CO_2 emissions from ship operations (fuel combustion) in California due to the higher energy content of the distillate fuel, as compared to HFO. But this study assumes that refineries will make no efforts to improve energy efficiency while maintaining, upgrading, or expanding their capacity to produce distillate fuels. This is unlikely given rising energy costs and global efforts to reduce GHG.

The proposed amendments will result in OGV using slightly more marine distillate fuels relative to what is being used now. However, as seen in Tables IV-3 and IV-4 this small change does not impact the OGV CO_2 emissions. As noted above, the net increase in GHG emissions attributed to the OGV Clean Fuel Regulation described in the previous paragraphs is largely attributed to the refining process. ARB staff believes the small increase in the use of marine distillate fuels under the proposed amendments will have a negligible impact on the production of fuel, thus the results of the study are still relevant. An increase of 1 to 2 percent over the total fuel cycle is still applicable to the proposed amendments.

E. Public Health Impacts

With the proposed amendments, the OGV Clean Fuel Regulation will continue to provide significant health benefits by reducing premature mortality from PM2.5 exposure and localized potential cancer risk from diesel PM. Because the proposed amendments reduce projected emissions to levels below the 2008 adopted regulation, the implementation of the proposed amendments will have similar public health benefits to the original rule. Extensive modeling was conducted when the OGV Clean Fuel Regulation was originally adopted and demonstrated that upon implementation, the OGV regulation will avoid about 3,600 premature deaths between 2009 and 2015 associated with the reduction in PM.[14] (ARB, 2008) Since the baseline emissions have decreased due to recession-related decreases in vessel calls, the magnitude of the premature deaths avoided that would be attributed to the adopted or proposed amended rule would not be as great as identified above. However, the avoided premature deaths due the adopted regulation with the proposed amendments will remain substantial. Moreover, as the economy rebounds, a greater percentage of the premature deaths avoided will be because of the rule, not the recession.

[14] The methodology for estimating premature deaths was updated since the release of the estimate made in 2008. The basis of the updated methodology is the same as that of the U.S. EPA (U.S. EPA, 2010) which relies on the study by Krewski et.al. (Krewski, 2009) The application of the U.S. EPA method to the proposed amendments would result in a small increase (approximately 3%) in the number of premature deaths avoided compared to the estimate made in 2008.

F. Other Environmental Impacts

In this section, ARB staff provides a discussion of other environmental impacts from the proposed amendments including potential impacts on water quality, biological impacts, and oil spills. Since the regulation relies on the existing infrastructure which is operating at a lower level than prior to the recession, no new facilities, expansion of existing facilities, or changes in operations from the status quo are likely to occur due to the proposed amendments. Therefore, ARB staff finds that there will be no adverse impacts on aesthetics, land-use/planning, population and housing, transportation, agricultural and forestry resources, cultural resources, hazards and hazardous materials, mineral resources, public services, utility and service systems, geology and soils, hydrology and water quality, or recreation.

Potential Water Quality Impacts

ARB staff does not expect these proposed amendments to have any adverse impacts on water quality. The proposed amendments to the OGV Clean Fuel Rule apply only to the fuel being used by the vessels. The proposed regulation's requirements, particularly the reduction in sulfur content of the engine fuels, should result in reduced formation of sulfuric acid, nitric acid and other harmful compounds to the extent the vessel emissions actually come into contact with ocean or inland waters. And because scrubbers and other exhaust treatment technologies are not allowable methods of compliance with this proposal, there are no impacts that might otherwise result from the byproducts of such methods (e.g., ash, salts, heavy metals from catalytic oxidizers, etc.).

Biological Impacts

The Southern California Bight (SCB) is a coastal region of unique oceanographic conditions, marine ecosystems, and biodiversity. The SCB extends from Point Conception in Southern California to Cabo Colonett and Bahia de San Quintin in Baja California. Habitats within Southern California's ocean ecosystem contain some of the most biologically diverse natural communities in the world. NOAA and other marine groups have carefully assessed the population of marine wildlife in Southern California.

The 2008 staff report provided an in depth analysis which examined, at length, biological impacts to marine mammals due to ship strikes, the acoustic impacts of vessels on marine mammals, and the changes in risks of oil spills. (ARB, 2008) In this report, only derivations from the discussion in the 2008 staff report due to vessels returning to the Channel Route in the Santa Barbara Channel will be discussed in the following sections.

Risk of Marine Mammal Ship Strikes

The highest risk of ship strikes is to large mammals that are too large to move out of the way of the vessels in time. There are at least 34 species of cetaceans (marine mammal) that have been identified in the Southern California Bight. The most common species of large whales found in the region are blue, fin, humpback, gray, and sperm whales. All of these species, except for gray whales, are listed as endangered under

the U.S. Endangered Species Act (ESA) (16 U.S.C S 1531). Additionally, all marine mammals are protected by the Marine Mammal Protection Act (MMPA 1972, amended 1994, 16 U.S.C. S 1431).

During the development of the OGV Clean Fuel Regulation, ARB staff worked with NOAA staff to investigate the potential impact on marine mammals if vessels chose to avoid the Santa Barbara Channel and instead transit on the Southern side of the Channel Islands. At that time, based on the available data of population densities of blue, fin, humpback and sperm whales, the likelihood of ship strikes was similar or less if a ship did not use the Santa Barbara Channel. (ARB, 2008) Since that time, NOAA staff has been developing an analysis of the whale densities in the Santa Barbara Channel and south of the islands and correlating this information with the vessel routes south of the Channel Islands. Based on a preliminary analysis by NOAA, the whale density data suggests that there is a potential decreased risk to fin whales, a potential increased risk to humpback whales, and there is an unclear impact to blue whales if vessels return to the Santa Barbara Channel. Humpback whales have large concentrations on the northern end of the entrance to the Santa Barbara Channel. However, whale population densities shift from year to year and variations in the number of ship strikes can change annually depending on the concentrations of whales of a given year. (NOAA, 2010b) Based on this information, ARB staff believes that there is a potential for an adverse environmental impact to humpback whales from the proposed amendments. However, this impact existed before the regulation was adopted and is basically returning vessel traffic to the pre-regulation routes.

Effects of Vessel Noise on Marine Mammals

In 2009, ARB published a Supplemental Environmental Analysis and the results of that study are still relevant to these amendments. It was found that ship noises, from container ships, tankers and other large OGVs, are the dominant source of underwater frequencies below 300 Hz and are pervasive in areas of high ship traffic. While the sound produced by ships is unlikely to cause direct acute physical harm (for example, to the ear or internal organs), it could cause disruption in diving patterns or cause hearing loss, and it may interfere with or mask important communication signals from marine mammals whose vocalizations are in the low frequency range. The impacts of shipping noise on marine mammals are not clearly understood and research is ongoing, but the impacts could result in stress or behavior pattern changes in the animals. However, NOAA staff believes that if there are impacts from vessel noise, it is likely to be related to cetacean population densities. Population densities of large whales can vary on an annual basis as migration patterns change. As a result, the impacts from vessel noise can change each year as the population densities of whales shift. Since, as shown earlier, the population densities of humpback whales are generally higher in the Santa Barbara Channel; this may create a potential adverse impact to humpback whales. However, with ships moving back into the Channel there would be a beneficial impact to fin whales.

Oil Spills Due to Ship Collisions or Groundings

Substantial volumes of petroleum products are transported off the California Coast from Alaska, foreign countries and between California production sources. POLA and POLB include some of the highest volume oil transfer facilities in the United States. Collisions or ship groundings can occur as a result vessels transiting to and from these facilities. While oil spills are disastrous any place that they occur, there are several programs and practices in place in the case of an oil spill in the Santa Barbara Channel. To prevent collision and potential spills, there are traffic separation lanes in the Santa Barbara Channel for northbound and southbound vessels to travel. This helps to organize vessels to ensure that there is less of a chance of collision or running aground. Vessels traveling southbound in the Channel will generally pass within three miles of the Santa Cruz and Anacapa Islands. Vessels must have a contingency plan in place providing for a response team being on the scene within six hours of a spill. Each contingency plan must be exercised and tested annually. (OSPR, 2009) There are no traffic lanes set up south of the Channel Islands. If a spill occurs, response time is longer because the vessels are farther out from the response facilities, and there is no requirement to have a contingency plan in place.

In 1992, major oil companies, members of the Western States Petroleum Association (WSPA), entered into a voluntary, non-binding agreement, with the guidance of Office of Spill Prevention and Response (OSPR) and the U.S. Coast Guard, to route all tankers carrying crude oil from Alaska to California ports at least 50 nm offshore. This agreement has resulted in approximately 90 percent of all tanker traffic transiting at least 25 nm offshore and approximately 50 percent transiting at least 50 nm offshore. As a result of this agreement, many of the tankers using the Ports of Los Angeles and Long Beach travel through the Point Mugu Sea Range in Southern California. (ARB, 2009) ARB does not expect the traffic patterns of oil tankers to change as a result of the amendments. Before the original implementation of the regulation, oil tankers traversed the Point Mugu Sea Range to stay as far out as long as possible. As a result, there should be no adverse environmental impacts from oil spills due to the proposed amendments.

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

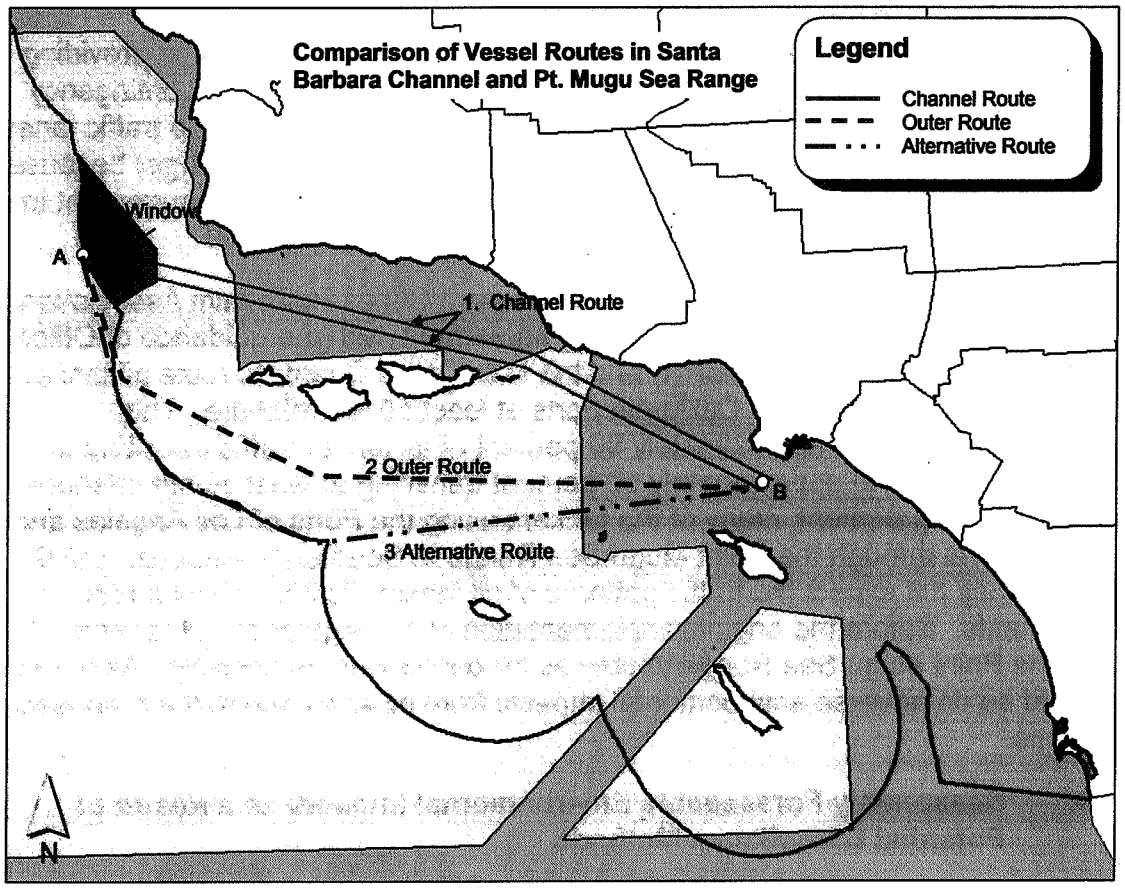
The goal of the proposed amendments is to remove the financial incentive for vessels to avoid using the Channel Route. Because of this, ARB staff believes that once the proposed amendments are implemented, OGV operators will return to using the Channel Route instead of the Outer Route. However, in the event this does not occur, ARB staff evaluated the environmental impacts of three possible alternative compliance methods. These include:

- 75% of the vessels transit in the Channel Route and 25% continue to transit in the Outer Route;
- 75% use the Channel Route and 25% of vessels use an alternative route (Alternative Route), further offshore to minimize the amount of marine distillate fuels required; and

- 100% of vessels use the Alternative Route.

The routes analyzed can be seen below in Figure IV-8. The Outer Route is shown as the dashed line and the Alternative Route is the dot and dashed line. Route #3 is a new Alternative Route that could be used if vessel operators want to minimize the time a vessel must operate on the marine distillate fuel. This route would follow the contour of the contiguous zone and ships would use HFO for as long as possible before they must switch to distillate fuel to transit the clean fuel zone. It is labeled as the Alternative Route in the following tables and charts.

Figure IV-8: Possible Southern California Shipping Routes



Using the methodology described earlier in Chapter II, ARB staff evaluated the costs, travel time, and distance associated with the Outer Route, Alternative Route and the Channel Route. As can be seen in Table IV-7, both the Outer Route and the Alternative Route have higher costs, longer overall travel distance, and longer travel time compared to the Channel Route. Therefore, there is no cost or time advantage to using either of these routes.

Table IV-7: Estimated Fuel Costs, Distance and Transit Time for Channel, Outer, and Alternative Routes through the Santa Barbara Channel Region with the Proposed Amended Zone

Route	Cost	Distance HFO (nm)	Distance MGO (nm)	Total Distance (nm)	Time (hours)
Channel Route (#1, Solid)	$13,870	16	132	148	9.6
Outer Route (#2, Dashed)	$14,140	19	143	162	10.5
Alternative Route (#3, Dot Dashed)	$14,330	83	90	173	11.1

Scenario #1: 75% of Vessels Use Channel Route, 25% Use Outer Route

Impact on Emissions: For this scenario, ARB staff assumes that 75% of the vessels will travel in the Channel Route but 25% will choose to transit further offshore in the Outer Route. The emissions impacts for this scenario are presented below in Table IV-8. Emissions of SOx and PM2.5 are essentially equivalent relative to the expected emissions if all vessels use Channel Route (presented previously in Table IV-4). NOx and CO2 emissions also remain unchanged.

Table IV-8: Estimated Statewide OGV Emissions (tons/day) with 25% Transit Along the Outer Route

	Year			
Pollutant	**2012**	**2013**	**2014**	**2015**
SO_x	44	31	25	8
$PM_{2.5}$	8.1	7.6	7.4	4.1
NO_x	216	229	242	259
CO_2	9,400	9,930	10,380	11,150

Impact on Marine Mammals: Using the whale density information from NOAA discussed in the previous section, the 25% of vessels choosing to use the Outer Route could potentially present an adverse environmental impact to fin whales south of the Channel Islands. This change in traffic could result in a decreased risk to humpback whales in the Santa Barbara Channel. There is little impact on blue whales.

Impact on Risk of Oil Spills: An analysis of the risk from oil spills was done in the 2009 EIR Study. In 2002, a taskforce sponsored in part by the U.S. Coast Guard and OSPR issued recommendations to reduce the risk of vessel collisions or drift groundings off the U.S. West Coast. The project addressed four risk factors most amenable to change, including vessel distance offshore. The recommendations regarding the

distance offshore risk factor indicated that higher risks were generally within 25 miles from land along the West Coast of California. The workgroup found that vessels transiting within the higher risk areas have a greater potential for grounding than if they transited further offshore. The workgroup also found that for consistency with existing agreements, where there are not other prevention agreements, tank ships laden with crude oil or other petroleum cargo, transiting coastwise should voluntarily stay within a minimum distance of 50 nm offshore. Based on this assessment, it can be determined that there is no adverse impact if vessels choose to use the Outer Route.

Scenario #2: 75% of Vessels Use Channel Route, 25% Use Alternative Route

For this scenario, ARB staff assumes that 75% of the vessels will travel in the Channel Route but 25% will choose to transit further offshore in the Alternative Route. Because a significant portion of the Alternative Route is outside the Contiguous Zone using this route would minimize the distance where the vessel would need to operate on marine distillate fuel. As shown in Table IV-7, while the Alternative Route is about 25 nm longer, vessels using the Alternative Route would operate on marine distillate fuels for about 90 nm whereas vessels using the Channel Route would operate on marine distillate fuels for about 130 nm. However, transiting this route would take approximately an hour and a half longer to traverse than the Channel Route.

Impact on Emissions: The emissions impacts for this scenario are presented in Table IV-9. A portion of the Alternative Route is located outside of the 100nm inventory zone. As a result, the emissions have to be adjusted to account for Scenario #2. ARB staff estimated that for this scenario there was approximately a 5% increase in emissions attributed to the portion outside of the inventory zone compared to Table IV-4.

Table IV-9: Estimated Statewide OGV Emissions (tons/day) with 25% Transit Along the Alternative Route

Pollutant	Year			
	2012	2013	2014	2015
SO_x	46	33	26	8
$PM_{2.5}$	8.4	8.0	7.8	4.3
NO_x	222	235	249	266
CO_2	9,690	10,240	10,700	11,380

Impact on Marine Mammals: Similar to the discussion for the first scenario, based on the whale density information from NOAA, the 25% of vessels choosing to use the Alternative Route could potentially present an adverse environmental impact to fin whales south of the Channel Islands. This change in traffic could also result in a decrease in risk to humpback whales. There is little impact on blue whales.

Impact on Risk of Oil Spills: As discussed in the previous section, when vessels move further out from shore it lowers the risk factor of vessels coming aground. The Alternative Route takes vessels further out than the Outer Route. As such, there would

be no harmful environmental impacts related to oil spills if ships choose to traverse the Alternative Route.

Scenario #3: 100% of Vessel Use Alternative Route

The third scenario evaluated assumed that all the vessels that historically used the Channel Route would choose to transit using the Alternative Route.

Impact on Emissions: The emissions impacts for this scenario are presented in Table IV-10. A portion of the Alternative Route is located outside of the 100nm inventory zone. As a result, the emissions have to be adjusted to account for this scenario. ARB staff estimated that for Scenario #3 there was approximately a 15% increase in emissions attributed to the portion outside of the inventory zone compared to Table IV-4.

Table IV-10: Estimated Statewide OGV Emissions (tons/day) with 100% Transit Along the Alternative Route

	Year			
Pollutant	**2012**	**2013**	**2014**	**2015**
SO_x	52	36	30	8
$PM_{2.5}$	9.3	8.6	8.5	4.4
NO_x	224	238	252	268
CO_2	9,960	10,520	10,970	11,660

Impact on Marine Mammals: Based on NOAA whale density data, this scenario could also potentially result in increased risks to fin whales south of the Channel Islands and decrease the risk to humpback whales. There is little impact on blue whales.

Impact on Risk of Oil Spills: As discussed in the previous section, when vessels move further out from shore it lowers the risk factor of vessels coming aground. The Alternative Route takes vessels further out than the Outer Route. As such, there would be no adverse environmental impacts related to oil spills if ships choose to traverse the Alternative Route.

Conclusions

The emissions impacts from scenario 1 are similar to the emissions when it is assumed the vessels use the Channel Route. For the other scenarios, in each case, the resultant emissions are higher than what would be projected if the vessels transited the Channel Route. However, in each case, the resultant emissions are less than the current and projected emissions for the OGV Clean Fuel Regulation without the proposed amendments (see Table IV-3). For these reasons, ARB staff does not expect any adverse environmental impacts from the emissions should vessel operators choose one of the alternative routes.

Based on the analysis presented above, if vessel operators choose to use either the Outer Route or the Alternative Route, ARB staff does not expect any adverse

environmental impacts related to oil spills. The use of the Alternative Route or the Outer Route may pose potential adverse environmental impacts to fin whales. In addition, the use of these routes could create operational issues for the U.S. Navy's Point Mugu Sea Range. However, ARB staff does not believe any of these alternative compliance methods will be attractive to vessel operators due to the higher costs and longer transit times. As previously shown in Table IV-7, transiting the Outer Route will cost approximately $270 more than the using the Channel Route and require an additional hour of travel time. Use of the Alternative Route will cost about $460 more and will take an hour and a half longer to travel. Because of this, ARB staff believes that transiting the Channel Route will be the preferred method of compliance.

H. Reasonably Foreseeable Mitigation Measures

In this section, ARB staff discusses reasonably foreseeable mitigation measures to address the potential adverse environmental impacts from the proposed amendments. As described earlier, with the proposed amendments statewide emissions of PM and SOx from OGV will continue to decline and also be lower than what would be expected without the amendments. However, the proposed amendments will result in a small loss of projected SOx emission reductions for the Bay Area AQMD and the South Coast AQMD. While the proposed amendments would not result in any adverse environmental impacts compared to the environmental conditions that currently exist, the foregone emission reductions in future years could be viewed as a significant adverse environmental impact. Additionally there is a potential for adverse impacts on humpback whales from potential vessel strikes when vessels transit the Channel Route instead of the Outer Route.

Potential Mitigation Measures for PM2.5 and SOx Emissions Adverse Environmental Impacts in the Bay Area AQMD and South Coast AQMD

The small foregone projected emission reductions in future years in the Bay Area AQMD and the South Coast AQMD are primarily due to the proposal to delay implementation of the Phase 2 requirements for two years. The only potential mitigation measure available to reduce the projected PM2.5 SOx emissions in the Bay Area AQMD and projected SOx emissions in South Coast AQMD is to implement the proposed amendments without the two year delay of Phase 2. However, ARB staff believes that the delay in the Phase 2 implementation date is necessary to provide:

- better alignment with the North American ECA,
- greater flexibility to find compliant fuels with higher viscosity, and
- additional time for the marine fuel industry to provide distillate fuels with properties that meet the enhanced specifications of the newly revised ISO 8217.

ARB staff believes that these considerations override any adverse environmental impacts that may result from the two-year implementation date delay.

Implement the proposed amendments, except keep the requirement to use the Phase 2 fuel in 2012

Under this mitigation measure, the proposed amendments would be implemented as proposed, except that the Phase 2 (0.1% sulfur) fuel would be implemented in 2012 rather than 2014. This option would result in additional reductions in PM and SOx in 2012 and 2013 compared to the proposal. However, as previously discussed in this staff report, ARB staff has concerns about the timing for implementation of the OGV Clean Fuel Regulation's Phase 2 requirement and believes there are valid reasons to delay the implementation date by two years. ARB staff believes that providing a two-year delay will help to ensure the successful implementation of the North American ECA's Phase 1 and a successful transition to the 0.1% sulfur fuels. This was discussed in detail in Chapter II and will be briefly summarized here.

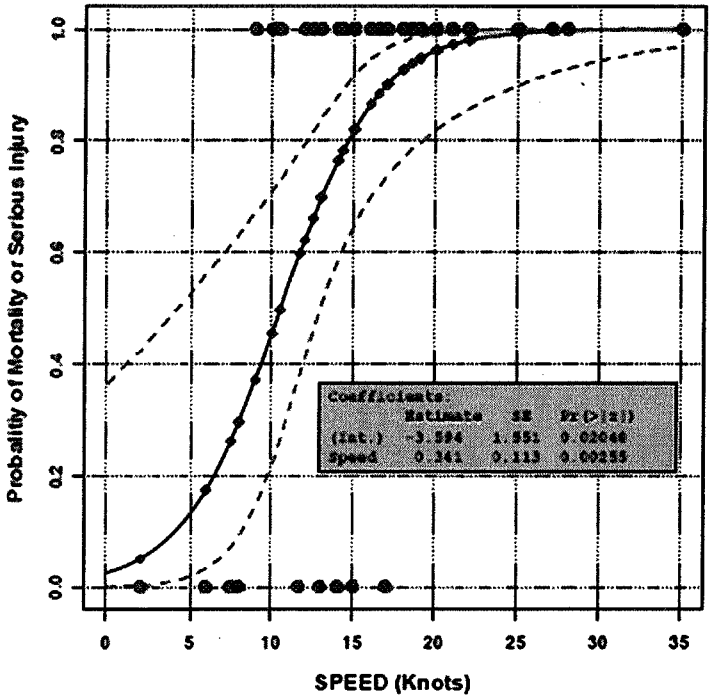
Under the OGV Clean Fuel Regulation, the Phase 2 (0.1%) sulfur requirement is scheduled to begin implementation on January 1, 2012. Later in that same year, the North American ECA's Phase 1 requirement to use 1% sulfur fuel begins implementation. Because of this, ARB staff believes it is appropriate to adjust the implementation timeline for the OGV Clean Fuel Regulation's Phase 2 requirements (0.1% sulfur beginning January 1, 2012) to more closely align with the Phase 2 North American ECA requirement (0.1% sulfur beginning January 1, 2015).

In addition, ARB staff believes that shippers may be able to more easily locate fuels with higher viscosity levels during the extension of the Phase 1 requirements. As alluded to earlier, for vessels that have experienced LOP incidents related to the use of low sulfur distillate fuels, on-board management of fuel viscosity is a very important parameter. Because of this, ARB staff believes delaying implementation of the 0.1% sulfur limit by two years will provide more flexibility to acquire fuels with higher viscosity may help lessen the probability of operational difficulties. For all of these reasons, ARB staff does not believe it is feasible or appropriate to implement this mitigation measure, and that these considerations override any potential environmental impacts that may occur.

Potential Mitigation Measures for Adverse Environmental Impact to Humpback Whales

There are multiple mitigation efforts already in place to help reduce the risk of ship strikes on humpback whales. Ship speed is an important factor when it comes to the lethality of ship strikes to whales. Figure IV-9 below shows the relationship of ship speed and the mortality of whale strikes. As shown, as the speed of vessels increases there is an increase in the mortality rate. NOAA recommends that vessels greater than 300 gross tons slow to 10 knots during periods of high whale concentrations to reduce the mortality rate of ship strikes. Inside of the Santa Barbara Channel there are groups dedicated to the research and monitoring of whales and how traffic affects them. The Sanctuary Aerial Monitoring and Spatial Analysis or (SAMSAP) monitoring and sightings database provides nine years of sightings data. (NOAA, 2010) This project helps to alert vessel owners to whale densities and migrating patterns. This information could be used to help owners know when it would be best to slow down their vessel to help mitigate the threat of a lethal impact on a whale.

Figure IV-9: Relationship Between Vessel Speed and Probability of Mortality for Whale Strikes (ARB, 2009)



The POLA and POLB also have voluntary vessel reduction programs in place to offer incentives to vessels coming into port. To comply with the local programs vessels must travel at or below 12 knots within 20 nm or 40 nm depending on which incentives they want to obtain. In 2010, the POLA saw a 90% and 61% compliance rate at 20nm and 40nm, respectively. (POLA, 2011) In 2010, the POLB saw a 96% and 74% compliance rate at 20nm and 40 nm, respectively. (POLB, 2011) To comply with the voluntary speed reduction programs, vessel operators must begin slowing their vessels down while they are in the Santa Barbara Channel such that they are at the required speed when they at the 40 nm or 20 nm mark. This reduction in ship speeds will help to mitigate the potential risk to humpback whales when OGV use the Channel Route.

NOAA is proactive about warning mariners about whales in the Santa Barbara Channel. They work with the U.S. Coast Guard to include whale sightings in the Notice to Mariners. These Notices can be found on the U.S. Coast Guards website and are updated weekly. Vessel operators who observe live, injured or dead whales are encouraged to immediately notify NOAA with the position and time of the encounter. NOAA has an updated website that provides information to vessel operators about how to avoid whale ship strikes as well as a listing of current sightings of whales. This information is available at http://channelislands.noaa.gov/focus/alert.html.

ARB will also use an adaptive management approach to ensure any potential adverse environmental impacts to fin or humpback whale are avoided or mitigated. Whale strike data is collected and monitored by NOAA. In the event that the data indicates that there

is an increase in strikes, ARB staff will work with NOAA, the U.S. Coast Guard, the shipping industry, and others to identify appropriate solutions that mitigate the impact.

I. Environmental Justice

The ARB is committed to evaluating community impacts of proposed regulations, including environmental justice concerns. As noted previously, many communities experience elevated exposures to toxic and criteria pollutants emitted from the regulated vessels. Because of this, it is a priority of ARB to ensure that full protection is afforded to all Californians. The proposed amendments to the OGV Clean Fuel Regulation are not expected to result in significant negative impacts in any community. Rather, with the proposed amendments the OGV Clean Fuel Regulation will continue to ensure that PM, SOx, and NOx emissions from OGV continue to decline in future years, resulting in decreased exposures to these pollutants and lowering their associated potential health risks for all communities, particularly those located near the ports.

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V. ECONOMIC IMPACTS

In this chapter, we present the estimated costs and economic impacts associated with implementation of the proposed amendments to the OGV Clean Fuel Regulation. The costs presented are the estimated *incremental* costs relative to the baseline, which is the cost of industry compliance with the current OGV Clean Fuel Regulation, using current vessel traffic patterns.

The cost analysis will present the total cost over the expected life of the regulation, total annual cost, and the cost-effectiveness of the proposed regulation. The economic impacts associated with the costs of the proposed amendments are also presented for typical businesses that operate OGVs.

It should be noted that much of the cost associated with the proposal was accounted for in the original rulemaking. This is because the estimated cost of the original regulation assumed that vessel operators traveling to and from the Ports of Los Angeles and Long Beach would stay in the Santa Barbara Channel Route where use of the cleaner, low sulfur marine distillate fuel is required. Since the implementation of the original rule, many vessel operators have decided to travel by an "Outer Route" south of the Santa Barbara Channel, and outside the 24 nm regulatory boundary. Using this route is less expensive because the complying fuel is not required for a large portion of the route. In other words, vessel operators are avoiding some of the costs that were attributed to the original rule. These cost savings to the shipping industry are significant because this is among the most heavily travelled route to and from California.

Because the new boundary in the proposed amendments will make "avoidance" of the OGV Clean Fuel Regulatory zone less attractive from a cost and time perspective, we believe that many vessel operators will elect to go back to the original Santa Barbara Channel route. As a result, the estimated cost of the regulation with the proposed amendments will be close to what we originally estimated for the OGV Clean Fuel Regulation rulemaking. However, for some vessels, such as those that historically transited on the southern side of the Channel Islands and those coming into the Ports of Los Angeles and Long Beach from the west will incur costs not anticipated in the original rulemaking due to the expanded regulatory boundary.

A. Summary

The estimated total annual cost associated with the proposed amendments is approximately $10 million annually in years 2012 and 2013, and about $47 million in 2014. These estimated annual costs represent the net additional costs associated with the proposed amendments over and above compliance with the current regulation.

A number of factors affect these net added costs. First, the majority of vessels that historically transited through the Santa Barbara Channel are now transiting outside the regulatory zone via the Outer Route to reduce fuel costs. Under the proposed amendments, we anticipate that these vessel operators would return to the Santa Barbara Channel Route and would incur the higher costs associated with using the

more expensive cleaner marine distillate fuels. These costs were originally attributed to the OGV Clean Fuel Regulation and were avoided by transiting outside the existing regulatory zone in Southern California. As discussed in Chapter II, on a per trip basis, the added cost of transiting through the Santa Barbara Channel is about $2,750 more than the Outer Route (one-way) for an average vessel. As discussed below in more detail, moving vessels back to their historical shipping lanes in the Santa Barbara Channel where the low sulfur fuel is required accounts for most of the added costs of the proposed amendments.

In addition, due to the larger regulated zone in the proposed amendments there are added costs for other vessel routes in Southern California. For example, vessels that visit the Ports of Los Angeles and Long Beach by a western route would travel a longer distance within the regulatory zone. Laden tankers, which travel to and from the Ports of Los Angeles and Long Beach by a route south of the Channel Islands in accordance with a voluntary agreement to stay 50 nm offshore of the coastline, would also incur higher costs.

Finally, the net cost estimates also reflect cost savings associated with the two-year delay of the Phase 2 fuel requirements. This accounts for the lower cost increases in years 2012 and 2013, relative to 2014.

We estimate the overall total present value ($2011) cost of the proposed amendments to be approximately $59 million dollars for the years 2012-2014, assuming the total annual costs mentioned above. For perspective, the staff report for the original OGV Clean Fuel Regulation estimated the total cost to the industry at about $350 million annually for the years 2012 through 2014. The added cost of the amendments to a typical ship operator is estimated to be about $20,000 in years 2012 and 2013, and about $90,000 in 2014. We expect these added costs can be absorbed by typical affected businesses without a significant adverse impact. The average cost-effectiveness of the proposed amendments over the three year life of the regulation is estimated to be about $32,000 per ton or $16 per pound of diesel PM reduced, assuming all the regulatory costs are attributed to the diesel PM emission reductions. This compares favorably to other diesel PM regulations the Board has adopted previously, as well as to the original regulation.

Impacts on Government Agencies and Business Competitiveness, Employment, Creation, Elimination or Expansion

We do not expect significant economic impacts to the industry based on the added costs of the proposed amendments. The added costs of the proposed amendments are relatively small compared to the overall operating expenses of the businesses which operate OGVs. Based on an analysis of the change in "return on owner's equity" (ROE) for typical businesses, the added costs of the proposed amendments would not result in a significant impact on profitability.

Because the proposed amendments would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California. We also do not

expect significant economic impacts on governmental agencies on the local, state, or federal level. Military and government owned or operated vessels, used for government non-commercial purposes, are exempt from the proposed regulation.

Impacts on Individuals

We do not expect significant impacts on the customers served by OGV operators, even assuming that all of the added costs of the proposed amendments are passed on to customers. We also expect that the value of health benefits will greatly outweigh the costs.

B. Legal Requirements

In this section, we will discuss the legal requirements that must be satisfied in analyzing the economic impacts of the proposal.

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with businesses in other states. This assessment is provided in subchapter F below.

State agencies are required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance (DOF). The estimate must include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State. This is discussed in subchapter G.

H&S section 57005 requires the ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding $10 million in any single year. The estimated cost of the proposed regulation exceeds $10 million in a single year, although much of the cost will be borne by businesses based outside of California. Nevertheless, we conducted the required economic impact analysis of submitted alternatives to the proposal.

In addition, the ARB is required under H&S section 43013(b) to adopt standards and regulations, consistent with H&S section 43013(a), for marine vessels to the extent permitted by federal law. Health and Safety Code section 43013(a) authorizes ARB to adopt and implement "motor vehicle emission standards, in-use performance standards, and motor vehicle fuel specifications...which the State board has found to be necessary, cost-effective, and technologically feasible..."

A literal reading of H&S section 43013(a) would lead one to conclude that the criteria "necessary, cost-effective, and technologically feasible" do not apply to a marine vessel

regulation because marine vessels are nonvehicular by definition.[15] However, because the Legislature placed the authorization to regulate marine vessels in H&S section 43013(b), we will infer a legislative intent to require ARB to determine that its proposed regulations on marine vessels are "necessary, cost-effective, and technologically feasible." The rulemaking for the original regulation extensively analyzed the necessity of the emission reductions and the technological feasibility of complying with the regulations (ARB, 2008). These analyses apply to the proposed amendments as well, which simply extend the regulatory boundary in Southern California, and delay the implementation of the Phase 2 fuel for two years. With regard to the cost-effectiveness of the proposed amendments, an analysis was performed below in subchapter H. The analysis estimates the average cost-effectiveness to be about $32,000 per ton ($16 per pound) of diesel PM reduced, assuming all costs are attributed to the PM reductions. This is lower than the cost-effectiveness of the original regulation and many other recent ARB rulemakings to control diesel PM emissions.

C. Methodology

In this section, ARB staff describes the methodology used to estimate the economic impacts from the proposed amendments. The methodology is based on essentially the same approach that was used when estimating the costs associated with the original 2008 rulemaking. That is, we estimated the fuel consumed by vessels within the regulatory zone, and compared the cost of using the more expensive low sulfur distillate fuel required by the regulation, to the less expensive standard HFO used prior to August, 2012, and the 1% sulfur HFO required under the newly established Emission Control Area) starting in August, 2012.

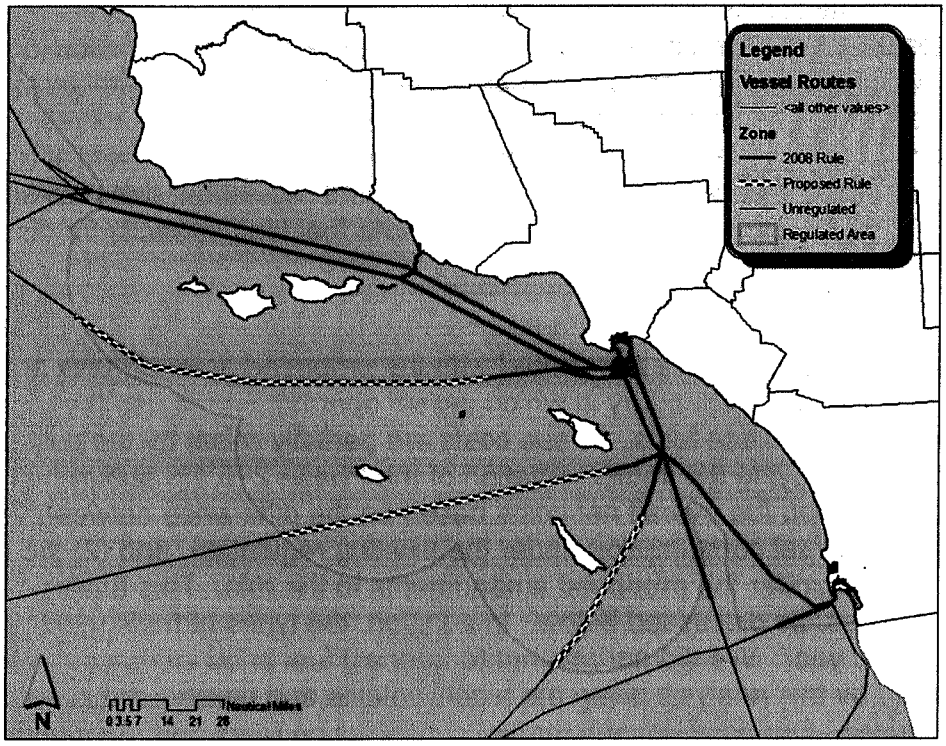
Under the proposed amendments to the OGV Clean Fuel Regulation, vessel operators would incur higher compliance costs on average due to the larger regulatory zone in Southern California. Due to this revised boundary, vessel operators would be required to use the more expensive distillate fuel for longer distances under the revised boundary of "Regulated California Waters." Figure V-1 shows some of the major vessel routes that would be affected by the proposed amendments. The heavy gray lines show the portions of the routes that are currently covered by the regulation, while the checkered portions show the additional distances that would be covered under the proposed amendments. As shown in Figure V-1, the distances traveled through the regulatory zone where the cleaner fuel is required would be longer.

However, it should be noted that the cost analysis for the original regulation assumed the vessels traveling to the Ports of Los Angeles and Long Beach would continue using the Santa Barbara Channel rather than the Outer Route that avoids the 24 nm regulatory zone. The proposed amendments seek to move vessels back to the established shipping lanes in the Santa Barbara, with costs similar to what was estimated for the original rule. This change would result in the majority of the costs estimated for the proposed amendments to the regulation, meaning that the regulatory cost of this proposal would be much lower otherwise. Specifically, to estimate the

[15] See H&S § 39039.

increased cost of the larger regulatory zone, less the costs associated with moving vessels back to the Santa Barbara Channel, staff compared the cost of: (1) complying with the current regulation with no vessel re-routing to avoid the Santa Barbara Channel; and (2) the proposed amendments. Comparing these two scenarios showed cost savings on the order of $35 million annually in 2012 and 2013, and similar costs in 2014. This compares to the much higher costs estimated in this chapter for the proposed amendments ($10 million in 2012 and 2013, and $47 million in 2014).

Figure V-1 – Major Shipping Routes in Southern California



The proposed amendments would also result in some cost savings that would offset the higher costs associated with the expansion of the boundary. Moving the implementation date of the Phase 2 (0.1% sulfur) fuel from 2012 to 2014 will result in significant savings during years 2012-2013, compared to what was estimated for the original rule.

We estimated the net costs of complying with the proposed amendments to the regulation only for years 2012 through 2014. It is possible that the proposed regulation will be implemented a few months earlier, in late 2011. However, we are not analyzing these potential costs because they are uncertain, and would add unnecessary complexity to the analysis. In addition, we are only analyzing the costs through the end of 2014 because in 2015 we expect federal regulations established under the International Maritime Organization to require equivalent emission reductions to the OGV Clean Fuel Regulation. As specified in the current regulation, when the Executive Officer of the ARB issues written findings that federal requirements are in place that will

achieve equivalent emission reductions in Regulated California Waters, then the fuel requirements in the ARB regulation shall cease to apply. In the following paragraphs, we provide a discussion on the expected capital and recurring costs associated with the proposed amendments.

Capital Costs

We expect that the proposed amendments will result in no significant capital costs to ship operators. While the extension of "Regulated California Waters" in southern California will require the use of the complying distillate fuel over somewhat longer distances for some routes to California ports, we expect that most vessels will have sufficient tank capacity for distillate fuel. In addition, the current regulation includes an "Essential Modifications Exemption" that provides vessel operators with an exemption from the fuel requirements if they submit an application to ARB demonstrating that modifications to the vessel (such as increasing tank capacity) are essential to their ability to comply with the regulation. Under the current regulation, this provision has been used in only a few cases based on inadequate fuel tank capacity for distillate.

Recurring Costs

The recurring (on-going) costs associated with the proposed amendments are due to the extended regulatory boundary in which vessel operators must use the more expensive marine distillate fuels. These costs are partially offset by the cost savings associated with delaying the implementation of the Phase 2 (0.1% sulfur) fuel until 2014. We calculated the overall net costs based on the difference between: (1) the current estimated fuel consumption under the existing regulation, and (2) the estimated fuel consumption under the proposed amendments to the rule. This analysis uses current fuel prices, as discussed below. In addition, the types of fuels used will vary with the specific year. We did not attempt to forecast fuel price increases over the three years covered by this analysis given the highly volatile and unpredictable nature of petroleum prices. Our assumptions for fuel consumption rates and the fuel prices are described below.

Fuel Consumption and Cost Estimates

The estimated fuel consumption and cost of the relevant fuels was calculated for two scenarios: (1) The baseline case under the current regulation with current traffic patterns and vessel routes, including 50% of vessels visiting the Ports of LA/LB routing outside the Santa Barbara Channel; and (2) the proposed amended regulation with predicted vessel routes, assuming vessels return to the Santa Barbara Channel.

These estimates were calculated within the 100 nm offshore boundary used for emissions inventory purposes. While this boundary extends beyond the regulatory boundaries used in the current regulation and under the proposed amendments, this is appropriate because some vessels are using alternative routes outside the relevant regulatory boundaries, and because the *difference* between consumption under the current regulation and the proposed amendments is needed to determine the added

cost of the proposed amendments. The estimated fuel consumption, in tonnes, was estimated based on the ARB's Emissions Inventory (ARB Marine Emissions Model, version 2.3g). The estimate is based on: (1) the estimated energy consumed by vessels using vessel specific information and shipping lane distances within the 100 nm boundary; (2) the appropriate brake specific fuel consumption figures for medium-speed, four-stroke auxiliary engines and slow-speed, two-stroke main engines; and (3) estimated average auxiliary boiler fuel consumption by vessel type. This analysis also accounts for the impact of the ARB Shore-side Power Regulation and the voluntary vessel speed reduction program at the Ports of Los Angeles and Long Beach.

For this analysis, we assume that all fuel used by main engines and auxiliary boilers outside the regulatory zone is HFO. This is based on the ARB's 2007 Ship Survey, which indicates that over 90 percent of main engines operate on HFO. For auxiliary engines outside the regulated zones, we assume that about 78 percent of the fuel used is HFO (ARB, 2007a). Regarding the use of HFO outside the California regulatory zone, we assume that standard heavy fuel oil (grade IFO 380) will be used prior to implementation of the North American ECA in August 2012, and that 1% sulfur HFO (grade IFO 380) will be used after the North American ECA is implemented.

Fuel prices were estimated as shown in Table V-1 using the average of data from the previous five months (November 2010 through March 2011) at five major bunker ports (Petromedia Corporation, 2011). For some ports, not all of the fuels were offered or the data were unavailable, so the estimated average prices reflect only the data from the remaining ports. For 0.1% sulfur MGO, the price was estimated using regular MGO and adding a $60 premium, which was the adjustment used in the cost analysis for the original regulation (ARB, 2008). The Port of Los Angeles generally offers MGO at or below 0.1% sulfur, so in this case the MGO fuel prices were used without adjustment.

Table V-1: Marine Fuel Prices ($/tonne)[1]

Fuel Type	Los Angeles	Rotterdam	Fujairah	Singapore	Houston	Average
Standard MGO	--	$831	$867	$828	--	$842
0.1% S MGO[2]	$862	$891	$927	$888	--	$892
IFO 380	$564	$527	$560	$555	$538	$549
1.0% IFO 380[3]	--	$548	--	$590	--	$569

1 Petromedia, 2011. Overall average fuel prices are based on the prices on Nov. 10, 2010, Dec. 10, 2010, Jan. 11, 2011, February 11, 2011, and March 11, 2011 at the listed ports, where available. (Petromedia, 2011).

2 A $60/ metric tonne premium was added for 0.1% sulfur distillate fuel compared to standard distillate based on the estimate used in the staff report for the original Ocean-Going Vessel Fuel Rule (ARB, 2008). For Los Angeles, the MGO is generally at or below 0.1% sulfur, so the MGO prices were used as is without adjustment.

3 It is uncertain which type of 1% sulfur fuel will be used by ship operators to meet the ECA in North America. We used readily available price data for ports that offer 1% sulfur heavy fuel oil (IFO 380 grade).

In Tables V-2 and V-3, we provide estimates of the fuel consumption and fuel cost within 100 nm of the California coastline for both the existing regulation and the proposed amended regulation. These estimates were made using the fuel price information from Table V-1. Note that the estimated fuel cost under the proposed amended regulation (Table V-3) is somewhat higher (about 1.5% higher in 2012 and 2013, and 6% higher in 2014) than the estimated fuel cost under the current regulation (Table V-2) due to the expanded regulatory boundary in which the cleaner fuel is required.

Table V-2: Total Statewide Annual Fuel Consumption and Cost (Current Regulation)*

	2012		2013		2014	
Fuel Type	Tonne	Cost ($)	Tonne	Cost ($)	Tonne	Cost ($)
Standard MGO	5,300	4,457,100	5,700	4,769,300	6,000	5,088,700
0.1% S MGO	501,400	447,345,200	524,800	468,233,700	547,200	488,261,100
IFO 380	233,200	127,937,300	0	0	0	0
1.0% S	166,600	94,791,700	428,500	243,855,200	458,000	260,623,600
Totals	906,500	674,531,300	959,000	716,858,200	1,011,200	753,973,400

*Includes the impact of 50% of vessels visiting the Ports of LA/LB rerouting to avoid the regulatory zone.

Table V-3: Total Statewide Annual Fuel Consumption and Cost (Proposed Amendments)*

	2012		2013		2014	
Fuel Type	Tonne	Cost ($)	Tonne	Cost ($)	Tonne	Cost ($)
Standard MGO	658,588	554,643,397	693,380.25	583,944,042	3,260	2,745,836
0.1% S MGO	0	0	0	0	724,229	646,178,728
IFO 380	136,479	74,877,964	0	0	0	0
1.0% S	97,485	55,478,807	250,096.39	142,329,857	266,558	151,697,959
Totals	892,553	685,000,167	943,476.64	726,273,898	994,047	800,622,523

*Assumes no vessel rerouting to avoid using the Santa Barbara Channel.

Total Annual Recurring (Fuel) Costs

The total annual recurring costs of the proposed amendments above the baseline costs of the existing regulation are presented in Table V-4 for years 2012 through 2014. These estimates are based on the differences in estimated fuel cost using our best estimates of the resulting shipping routes. As shown in Table V-4, the added annual fuel costs are estimated at about $10 million in years 2012 and 2013, and about $47 million in 2014. The added costs are due to the longer distances that ship operators will use the low sulfur distillate fuels in the expanded regulatory zone in Southern California. In years 2012 and 2013, the additional costs are lower because the proposed amendments would delay the requirement to use the Phase 2 fuel to 2014.

Table V-4: Estimated Additional Fuel Costs with the Proposed Amendments*

Year	Total Estimated Fuel Cost Under Proposed Amendments ($)	Total Estimated Fuel Cost Under Current Rule ($)	Incremental Fuel Cost Increase Under Proposed Amendments ($)
2012	$685,000,000	$674,531,000	$10,469,000
2013	$726,274,000	$716,900,000	$9,416,000
2014	$800,622,000	$754,000,000	$46,649,000

*Fuel cost figures for usage within 100 nm of California mainland shoreline.

Added costs of the proposed amendments that were already accounted for in the 2008 rulemaking for the original rule

The cost estimates above reflect the added cost of the proposed amendments over and above the actual baseline case, represented by vessels rerouting outside the regulated zone and reducing costs that were not accounted for in the original 2008 rulemaking. If vessels had continued to use the established shipping lanes in the Santa Barbara Channel as expected, the proposed amendments would have resulted in net cost savings in 2012 and 2013 compared to the existing rule due to the delay in the Phase 2 fuel standard, and similar costs in 2014.

D. Total Regulatory Costs

Total Industry Cost

We estimate the total statewide incremental additional cost of the proposed amendments to the regulation at about $59 million (2011 dollars). This estimated cost was derived from the 2011 present value of annual costs shown in Table V-4 for years 2012-2014. The total estimated industry cost is shown in Table V-5.

Table V-5: Estimated Total Cost (2011 Present Value)

Year	Future Cost ($)	Discount*	Present Value ($)
2012	10,469,000	0.952	9,970,000
2013	9,416,000	0.907	8,540,000
2014	46,649,000	0.863	40,300,000
Total	--	--	58,800,000

*Discount = 1/(1+i)^n, where i=5% and n=years

Total Annual Cost

The total annual cost of the proposed regulation is the same as the added fuel costs shown in Table V-5 because we estimate no significant capital costs.

Potential Additional Costs or Savings

There may be some other costs and potential cost savings that could be incurred under the proposed regulation, but data were not available to enable quantification of these possible impacts. Nevertheless, the net impact of these costs and savings is not expected to be significant. These are briefly described below.

Capital costs

We expect that the proposed amendments to the regulation will result in no significant capital costs. Any capital costs to the industry due to the use of distillate fuel would probably have already been incurred under the current regulation. In addition, the regulation contains an Essential Modifications Exemption that provides an exemption for equipment that cannot use the complying distillate fuel without modifications. Nevertheless, it is possible that some ship operators may undertake certain equipment changes in response to the increased use of distillate fuel under the proposed amendments, even if these changes are not essential. For example, it is possible that some vessels that travel frequently within the expanded region of Regulated California Waters in Southern California (e.g. to the Ports of Los Angeles and Long Beach) may choose to add tanks and piping to allow for more extensive use of distillate fuel. However, we estimate that capital costs would not increase the overall cost of the proposal by more than ten percent.

Greater Use of distillate fuel may result in lower or higher maintenance costs

As discussed in the staff report for the existing OGV Clean Fuel Regulation (ARB, 2008), the use of lower sulfur marine distillate fuel may result in a reduction in engine maintenance in some engines and boilers due to a reduction in deposit formation. On the other hand, the use of lower viscosity distillate fuel may lead to more frequent maintenance of fuel injection pumps, and may result in more leaks at pipe joints compared to the use of heavier fuels. Both of these effects, to the extent they occur, may be slightly more pronounced if vessels are operating for longer periods of time on the distillate fuels under the proposed amendments. ARB staff are not aware of any data to quantify these potential costs or savings.

E. Estimated Cost to Businesses

The proposed amendments would primarily impact businesses that operate large OGVs that visit Southern California ports. Most of these businesses are foreign-owned businesses, or domestic businesses located outside of California. The additional costs of the proposed amendments compared to the existing regulation are estimated below for typical (average) businesses. However, the cost to individual businesses will vary widely based on factors such as the following:

- number of vessels visiting California ports;
- number of California port visits per vessel;
- specific ports visited and the overwater route to these ports; and

- engine power and associated fuel consumption.

For example, since the proposed amendments extend the regulatory boundary only in Southern California, vessel operators that only visit Northern California ports would experience a net savings due to the delay of the Phase 2 0.1% sulfur fuel requirement until 2014. On the other hand, a vessel operator visiting the Ports of Los Angeles or Long Beach would incur additional costs due to the larger regulatory zone that may exceed the savings due to the extension of the Phase 2 fuel.

Table V-6 below shows the estimated average additional cost per port call. The average cost per call is estimated at about $1,100 in 2012, $1,000 in 2013, and $4,800 in 2014, when the Phase 2 (0.1% sulfur) fuel limit is proposed to be implemented. These costs per port call are estimated by dividing the total annual cost of the regulation by the estimated number of port visits.

The cost to an individual company will vary widely based on the number of California port calls they make. Most ship operators make less than 10 California port calls in a year, while only a very few make over 100 calls annually.

Table V-6: Estimated Average Cost per Port Call

Year	Total Annual Cost ($)	Total Annual Port Visits*	Average Cost/Port Call ($)
2012	$10,469,000	9,797	$1,100
2013	$9,416,000	9,797	$1,000
2014	$46,649,000	9,797	$4,800

*2009 California port visits. Assume no significant changes in 2012-2014.

We do not believe that the vessel operators affected by the proposed amendments to the OGV Clean Fuel regulation would qualify as small businesses due to the large capital and operating costs associated with vessel operation. Typical container vessels are estimated to cost on the order of $50 to $100 million (Mercator, 2005). In addition, Government Code section 11342.610 excludes businesses in transportation and warehousing with annual gross receipts exceeding one and a half million dollars from its definition of "small business." We believe that the annual gross receipts for a vessel owner or operator would far exceed this level in order to be profitable. For example, a single Asia to U.S. West Coast voyage for a typical container vessel costs about $2 to $3 million. (*Ibid*) Therefore, we do not believe there are any small businesses directly affected by the proposed regulation. As such, we have only included costs in this analysis for typical businesses.

The costs to typical businesses are discussed below. However, it should be noted that the total cost to a particular company will vary widely, as discussed above.

Recurring (Fuel) Costs to Typical Businesses

The recurring cost for a typical business is presented below. To determine the average annual recurring cost for a typical business, we divided the total annual recurring cost of the proposed regulation for all vessels by our estimate of the number of shipping companies that operate in California, based on port visit data compiled by the California

State Lands Commission (CSLC, 2011). As shown in Table V-7, the average cost per company ranged from about $20,000 to $90,000 annually.

Table V-7: Estimated Average Added Annual Fuel Costs per Company

Year	Total Annual Cost	Number of Operators*	Average Annual Cost Per Company
2012	$10,469,000	524	$20,000
2013	$9,416,000	524	$18,000
2014	$46,649,000	524	$89,000

* Based on California State Lands Commission port visit data.

F. Potential Business Impacts

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

This analysis is based on a comparison of the annual ROE for affected businesses before and after the inclusion of the costs associated with the proposed regulation. The analysis also compares the estimated added costs of the proposed regulation to the overall operating costs of these vessels

ARB staff does not have access to financial records for many of these companies. It should be noted that many of these businesses are not California-based businesses.

As stated in subchapter E above, we do not believe that the businesses subject to this proposed regulation would qualify as small businesses due to the large capital and operating costs associated with vessel operation.

Analysis of Return on Owner's Equity (ROE)

In this section, we evaluate the potential economic impact of the proposed regulation on California businesses as follows:

(1) Typical businesses affected by the proposed regulation are identified from port visit data from the California State Lands Commission. The Standard Industrial Classification (SIC) codes associated with these businesses are listed in Table V-9 below;

(2) The annual costs of the proposed regulation are estimated for each of these businesses based on the SIC code. For ranges in cost estimates, the high end of the range was used;
(3) The total annual cost for each business is adjusted for both federal and state taxes; and
(4) The adjusted costs are subtracted from net profit data and the results used to calculate the ROE. The resulting ROE is then compared with the ROE before the subtraction of the adjusted costs to determine the impact on the profitability of the businesses.

Using publicly available financial data from 2008 to 2010 for the representative businesses, staff calculated the ROEs, both before and after the subtraction of the adjusted annual costs, for the typical businesses from each industry category. These calculations were based on the following assumptions:

(1) All affected businesses are subject to federal and state tax rates of 35 percent and 9.3 percent, respectively; and
(2) Affected businesses neither increase the cost to their customers, nor lower their cost of doing business through cost-cutting measures due to the proposed regulation.

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

The results of the analysis are shown in Table V-8 below. Using the ROE to measure profitability, we found that the ROE range for typical businesses from all industry categories would have declined by less than one percent due to the proposed amendments. This represents a small decline in the average profitability of the affected businesses. Overall, most affected businesses will be able to absorb the costs of the proposed amendments to the OGV Clean Fuel Regulation with no significant impacts on their profitability.

Table V-8: Return on Owners Equity Analysis of Businesses

SIC Code	Description of SIC Code	Percent Change in ROE
4412	Deep Sea Foreign Transportation of Freight	-0.020
4424	Deep Sea Domestic Transportation of Freight	-0.357
4481	Deep Sea Passenger Transportation	-0.017
Average		-0.13

Potential Impact on Business Competitiveness

The proposed amendments would generally result in higher costs for vessel operators visiting ports in Southern California. However, ARB staff does not believe that the

added costs of the proposed amendments to the regulation are high enough for vessel operators to consider alternative ports in Northern California, or ports outside California. There are several reasons for this. First, many vessel operators utilize Southern California ports because there is already a local market for their goods in the greater Los Angeles area, or because California exporters choose to utilize Southern California ports to transport their goods overseas. Second, other vessel operators find that the overall cost of transporting goods to their final destination beyond California is lowest by using Southern California ports because of the ports' existing and well established infrastructure, including road and rail access. Third, in some cases, vessel operators would have to factor in the added costs of fuel and other costs of traveling greater distances to alternative ports, which may negate the cost savings in not purchasing the lower sulfur fuel. Finally, the added costs resulting from the proposed amendments to the regulation are a small fraction of the overall operating costs of these vessels, and these costs are not expected to result in a significant adverse impact on the profitability of typical companies.

Most of the affected businesses that operate vessels are large businesses and can either absorb or pass-through the increased costs associated with the proposed amendments with no significant impact on their ability to compete with non-California businesses. For these reasons, we do not believe the relatively low costs of this proposal are high enough to significantly affect the competitiveness of those businesses that are integrally linked to the movement of goods through Southern California ports.

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

The proposal is not expected to have a noticeable impact on employment, or business creation, elimination, or expansion. As stated above, the added costs of the proposed amendments are a small percentage of the overall operating costs for both cargo and cruise vessels. In addition, an analysis of the impact of the proposal on the profitability of typical businesses indicated no significant adverse impacts.

Potential Impacts on Individuals

We do not expect significant impacts on the customers served by OGV operators, even assuming that all of the added costs of the proposed amendments are passed on to customers. Under a typical scenario with the existing regulation, we estimated in the 2008 rulemaking that the added cost of the OGV Clean Fuel Regulation would add about $6 per shipping container for importers or exporters shipping containerized goods overseas (ARB, 2008). We estimated that this represents less than one percent of the shipping cost. For passenger cruise ships, we estimated the added cost of the OGV Clean Fuel Regulation for a typical Los Angeles to Mexico cruise would be about $15 per passenger, representing about a 3 to 4 percent fare increase. Under the proposed amendments, these costs would not change significantly.

In addition, the health benefits of implementing the original regulation were found to be substantial. The proposed amendments will achieve somewhat greater emission reductions than originally estimated for the rule, preserving and slightly increasing these benefits.

G. Potential Costs to Local, State, and Federal Agencies

Local Agencies

We do not expect any significant fiscal impacts on local agencies from the proposed amendments. We are not aware of any local government agency that operates an OGV as defined in the proposed regulation, and there is an exemption in the regulation for government-owned or operated vessels. However, some minor impacts are possible on ports, which in California are established by state government and are operated by entities such as port authorities and departments of municipal governments.

We do not expect significant fiscal impacts on local air pollution control agencies due to the proposed regulation because ARB intends to enforce the provisions of the proposal statewide.

State Agencies

We also do not expect any significant fiscal impacts on State agencies from the proposed amendments. Government owned or operated vessels are exempted from the regulation. In addition, ARB staff enforcement of the regulation will continue unchanged with implementation of the proposed amendments.

Federal Agencies

We are not aware of any fiscal impacts on federal funding of State programs.

H. Cost-Effectiveness

For the purposes of this section, cost-effectiveness is defined as the ratio of the cost of compliance per ton (or pound) of pollution reduced. Cost-effectiveness figures allow different regulations to be compared to determine the most economical way to reduce a given amount of emissions.

In this section, we calculate the cost-effectiveness in two ways. First, we attribute the total annual cost of the proposed amendments to diesel PM alone. This results in the highest cost-effectiveness, and may overestimate the overall cost-effectiveness of the proposed amendments. For example, a regulation that resulted in the same costs and diesel PM emission reductions, but no reductions in other pollutants, would have the same cost-effectiveness in terms of diesel PM as the proposed amendments (which also reduce NOx and SOx). Therefore, consistent with rulemaking efforts for other regulations that control multiple pollutants, we also calculate the cost-effectiveness by attributing half of the costs of the proposed amendments to diesel PM reductions.

Cost-Effectiveness of the Proposed Amendments: All Costs Attributed to Diesel PM Reductions

The estimated cost-effectiveness of the proposed regulation is shown in Table V-9 below. The cost-effectiveness is expressed in terms of dollars per ton of diesel PM,

with the total annual cost attributed to diesel PM alone. As shown, the average cost-effectiveness is estimated at about $16 per pound of PM reduced. The cost-effectiveness values are lower prior to 2014 because of the savings derived from the delay in the implementation of the more expensive Phase 2 fuel to 2014.

Table V-9: Cost-Effectiveness of the Proposed Amendments (Attributes All Costs to Diesel PM Reductions)

Year	Total Annual Cost (millions $)	Emission Reductions* (TPD)	Cost-Effectiveness ($/ton)	Cost-Effectiveness ($/lb)
2012	$10.5	1.7	$17,000	$8.50
2013	$9.4	1.4	$18,000	$9.00
2014	$46.6	2.1	$61,000	$30.50
Average Cost-Effectiveness			$32,000	$16

* The emission reductions are based on the ARB Marine Emissions Model, version 2.3g

Cost-Effectiveness of the Proposed Amendments: Half the Costs Attributed to PM

In Table V-10 below, we calculate the cost-effectiveness by attributing half of the costs of the proposed amendments to PM reductions. This may reflect the overall cost-effectiveness more accurately in that it accounts for the multiple benefits of the proposed regulation. As shown, the average cost-effectiveness is estimated at about $16,000 per ton (or $8.00/lb) of PM reduced.

Table V-10: Cost-Effectiveness of the Proposed Amendments (Attributes Half of the Costs to PM)

Year	Half of Total Annual Cost (millions $)	Emission Reductions* (tons per day)	Cost-Effectiveness ($/ton)	Cost-Effectiveness ($/lb)
2012	$5.2	1.7	$8,400	$4.20
2013	$4.7	1.4	$9,200	$4.50
2014	$23.3	2.1	$30,400	$15.00
Average Cost Effectiveness			$16,000	$8.00

* The emission reductions are based on the ARB Marine Emissions Model, version 2.3g.

As shown in Table V-11 below, the cost-effectiveness of the proposed amendments for PM (as presented in Table V-10) is on the low end compared to other regulations recently adopted by the Board. For comparison purposes, all cost-effectiveness

estimates shown attribute half of the costs to PM, except for the In-Use Off-road Diesel Vehicle Rule, as noted. Also note that the cost-effectiveness of the proposed amendments is significantly lower than that of the original regulation.

Table V-11: PM Cost-Effectiveness of the Proposal and Other Diesel Regulations (Attributes Half of All Costs to PM)

Regulation or Airborne Toxic Control Measure	PM Cost-Effectiveness		Source of Estimate
	Dollars/Ton	Dollars/pound	
Public Fleets Rule	$320,000	$160	ARB, 2005b
In-Use Off-road Diesel Vehicle Rule*	$80,000	$40	ARB, 2007b
Solid Waste Collection Vehicle Rule	$64,000	$32	ARB, 2003a
Cargo Handling ATCM	$42,000	$21	ARB, 2005c
OGV Clean Fuel Regulation (2008)	$31,300	$16	ARB, 2008
Ship Auxiliary Engine Regulation (2005)	$26,000	$13	ARB, 2005
Stationary Diesel Engine ATCM	$15,400	$7.70	ARB, 2003b
Proposed Amendments to OGV Clean Fuel Regulation (2011)	$16,000	$8.00	Staff Report

*Attributes all regulation costs associated with diesel emission controls to PM, and splits other regulation costs equally between PM and NOx.

I. Analysis of Alternatives

In this section, we compare the proposed amendments to four alternative control options: (1) Do nothing; (2) Repeal the existing regulation and rely on existing U.S. EPA and international regulations; (3) Implement the proposed amendments but also allow alternative emission control strategies to the use of the specified cleaner fuels; and (4) Implement the proposed amendments, except keep the requirement to use the Phase 2 fuel in 2012, rather than moving the implementation to 2014. We do not discuss the cost-effectiveness of the first two alternatives because there are no ARB imposed costs associated with them. We also do not discuss the cost-effectiveness of the third alternative because the cost of potential alternatives is unquantifiable, and we do not believe this option would be pursued to any significant extent during the 2012-2014 timeframe of this analysis.

Alternative 1: No Project (Do not amend the existing regulation)

As discussed in detail in Chapter III, the existing regulation is not achieving the emission reductions originally estimated by ARB staff, and the redirection of vessel traffic to stay out of Regulated California Waters has increased traffic through the U.S. Navy's Point Mugu Sea Range operations. The proposed amendments to the original regulation will regain the emission reductions originally expected from the regulation, and we expect it to significantly reduce vessel traffic through the Navy Sea Range. In addition, as discussed in this chapter, the amendments would be more cost-effective than anticipated in the original rule due to the delay of the Phase 2 (0.1% sulfur) fuel to 2014. For these reasons, staff rejected Alternative 1.

Alternative 2: Suspend the original regulation and rely on international and federal regulations

Prior to 2015, relying only on international and federal regulations would result in substantial increases in PM and SOx emissions. This is because under IMO/U.S. EPA regulations (i.e. an ECA zone), ship operators would be able to use higher 1% sulfur fuel (likely HFO). This compares to the Phase I and Phase II distillate fuel specified in the amended regulation. The Phase I fuel is currently averaging below 0.3% sulfur, and the Phase II fuel would be at or below 0.1% sulfur. In addition, the ARB rule specifies distillate fuels that burn cleaner than the HFO likely to be used to meet the 1% sulfur fuel, independent of sulfur levels. An emissions analysis prepared in the original staff report that compares the original regulation to the then pending ECA requirements shows the dramatic difference in emission reductions between these two options. This analysis would be very similar to the difference between the proposed amended regulation and the currently adopted North American ECA (ARB, 2008).

The emission reductions that would be achieved under the proposed regulation are critical to reducing the cancer and non-cancer health risks to the public. They are also necessary to make progress toward compliance with State and federal air quality standards for ozone and PM in nonattainment areas throughout the State. Finally, these reductions are an important element of California's Diesel Risk Reduction Plan, the California Goods Movement Emission Reduction Plan, and marine port clean air plans. For the above reasons, staff rejected Alternative 2.

Alternative 3: Implement the proposed amendments but also allow alternative emission control strategies to the use of the specified cleaner fuels

Under this alternative, the proposed amendments would be implemented, except that OGVs visiting California would also be allowed to use alternative emission control strategies to the use of the marine distillate fuels specified in the regulation. However, ARB staff does not believe that vessel operators would utilize alternative emission control strategies to any significant degree, meaning that the option would not significantly alter the cost-effectiveness of the proposed amendments (as estimated earlier in this chapter).

A similar OGV fuel regulation adopted by the Board in 2005 included the option to use alternatives to the distillate fuel. The regulation was implemented in 2007 and was in effect for 14 months until invalidated by a court ruling. During the 14 months the rule was in place, not a single ship operator opted to comply by alternative emission controls, despite a guidance document prepared by ARB staff to aid ship operators interested in using the option (ARB, 2006b). ARB staff believes that alternatives to the distillate fuel were not utilized due to uncertainty in their cost-effectiveness and technical feasibility on oceangoing vessels. In addition, the use of the cleaner fuels specified in the regulation results in dramatic reductions in diesel PM and SOx, as well as NOx reductions. It is difficult for any one technology to reduce all of these pollutants

combined to the same levels as the use of the cleaner fuels. This would likely result in the necessity to consider multiple alternative control strategies

In addition, even if we expected alternatives (or combinations of alternatives) to be utilized, it would be extremely difficult to accurately estimate their cost due to the emerging nature of these technologies, the array of possible alternatives, and the unique nature of OGVs, where retrofit installation costs of the same technology would vary significantly between two vessels based on available space, and other design features.

Finally, there are significant legal challenges to including an option to use alternative emission control options that achieve equivalent emission reductions. These challenges are discussed in detail in the staff report for the original regulation (ARB, 2008).

For the above reasons, staff rejected Alternative 3.

Alternative 4: Implement the proposed amendments, except keep the requirement to use the Phase 2 fuel in 2012

Under this alternative, the proposed amendments would be implemented as proposed, except that the Phase 2 (0.1% sulfur) fuel would be implemented in 2012 rather than 2014. As shown in Table V-12, this option would result in additional reductions in PM emissions in 2012 and 2013 compared to the proposal. However, the cost of Alternative 4 is also higher in 2012 and 2013 due to the added cost of the Phase 2 (0.1% sulfur fuel). Due to these added costs, Alternative 4 would have a significantly higher cost-effectiveness ratio in years 2012-2013. For this reason, as well as the other reasons discussed in Chapter II for extending the Phase II fuel requirement to 2014, staff rejected Alternative 4.

Table V-12: Diesel PM Cost-Effectiveness Comparison for Alternative 4 and the Proposed Amendments (Attributes All Costs to PM Reductions)

	Estimated Cost (millions $)		Estimated Reductions (tons/year)		Cost-Effectiveness ($/ton)	
Year	Alternative 4	Proposal	Alternative 4	Proposal	Alternative 4	Proposal
2012	43.3	10.5	2.4	1.7	$49,000	$17,000
2013	44.0	9.4	2.0	1.4	$60,000	$18,000
2014	46.6	46.6	2.1	2.1	$61,000	$61,000

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(ARB, 2005b) California Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Diesel Particulate Matter Control Measure for On-Road Heavy-Duty Diesel-Fueled Vehicles Owned or Operated by Public Agencies and Utilities, October, 2005

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(ARB, 2007a) California Air Resources Board, Ocean-Going Vessel Survey. February, 2007

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California Environmental Protection Agency
AIR RESOURCES BOARD

APPENDICES FOR THE INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

PROPOSED AMENDMENTS TO THE REGULATIONS "FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE"

Stationary Source Division
Emissions Assessment Branch

May 2011

State of California
AIR RESOURCES BOARD

APPENDICES FOR THE INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

PROPOSED AMENDMENTS TO THE REGULATIONS FOR FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE

To be considered by the Air Resources Board on June 23-24, 2011, at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Byron Sher Auditorium
Sacramento, California

Stationary Source Division:
Richard Corey, Chief
Daniel Donohoue, Chief, Emissions Assessment Branch
Peggy Taricco, Manager, Technical Analysis Section

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State of California
AIR RESOURCES BOARD

PROPOSED AMENDMENTS TO THE REGULATIONS FOR FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE

Contributing Authors

Bonnie Soriano (Lead)
Paul Milkey
Ryan Huft
Layla Gonzalez
Andrew Alexis
Jin Lu
Steve Zelinka
Jeff Austin

Legal Counsel

Deborah Kerns, Office of Legal Affairs

Supporting Divisions

Planning and Technical Support Division
Research Division

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Appendix A

Proposed Amendments to the Regulations for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 nautical Miles of the California Baseline

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Proposed Regulation Order

FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE

Note: Proposed amendments are shown in underline to indicate additions, and ~~strikeout~~ to indicate deletions, compared to the preexisting regulatory language. The symbol "*****" indicates sections of regulatory text that staff are not proposing to amend.

Amend section 2299.2, title 13, California Code of Regulations (CCR), to read as follows:

§2299.2. Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline.

(a) *Purpose.*

*****

(b) *Applicability.*

(1) Except as provided in subsection (c), this section applies to any person who owns, operates, charters, rents, or leases any ocean-going vessel that operates in any of the Regulated California Waters, which include all of the following:

(A) all California internal waters;
(B) all California estuarine waters;
(C) all California ports, roadsteads, and terminal facilities (collectively "ports");
(D) all waters within 3 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive;
(E) all waters within 12 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive; and
(F) all waters within 24 nautical miles of the California baseline, starting at the California-Oregon border ~~to 34.43 degrees North, 121.12 degrees West~~ and ending at the California-Mexico border at the Pacific Ocean, inclusive, except for the region within the area defined by 34.8 degrees North, 121.14 degrees West, thence to 34.46 degrees North, 120.82 degrees West, thence to 34.36 degrees North, 120.82 degrees West, thence to 34.29 degrees North, 120.99 degrees West, and following the boundary 24 nautical miles from the California baseline from 34.29 degrees North, 120.99 degrees West to 34.8 degrees North, 121.14 degrees West. ~~; and~~

~~(G) all waters within the area, not including islands, between the California baseline and a line starting at 34.43 degrees North, 121.12 degrees West; thence to 33.50 degrees North, 118.58 degrees West; thence to 32.65 degrees North, 117.81 degrees West, and ending at the California-Mexico border at the Pacific Ocean, inclusive.~~

(2) Except as provided in subsection (c), this section applies to ocean-going vessels that are flagged in, registered in, entitled to fly the flag of, or otherwise operating under the authority of the United States ("U.S.-flagged") or any other country ("foreign-flagged").

(3) Nothing in this section shall be construed to amend, repeal, modify, or change in any way any applicable U.S. Coast Guard requirements. Any person subject to this section shall be responsible for ensuring compliance with both U.S. Coast Guard regulations and the requirements of this section, including but not limited to, obtaining any necessary approvals, exemptions, or orders from the U.S. Coast Guard.

(c) *Exemptions.*

*****

(d) *Definitions.*

For purposes of this section, the following definitions apply:

(1) "Alternative fuel" means natural gas, propane, ethanol, methanol, hydrogen, electricity, or fuel cells. Alternative fuel also means any mixture that only contains these fuels.

(2) "ASTM" means ASTM International.

(3) "Auxiliary boiler" means any fuel-fired combustion equipment designed primarily to produce steam for uses other than propulsion, including, but not limited to, heating of residual fuel and liquid cargo, heating of water for crew and passengers, powering steam turbine discharge pumps, freshwater generation, and space heating of cabins. Exhaust gas economizers that exclusively use diesel engine exhaust as a heat source to produce steam are not auxiliary boilers.

(4) "Auxiliary engine" means a diesel engine on an ocean-going vessel designed primarily to provide power for uses other than propulsion or emergencies, except that all diesel-electric engines shall be considered "auxiliary diesel engines" for purposes of this section.

(5) "Baseline" means the mean lower low water line along the California coast, as shown on the following National Oceanic and Atmospheric Administration (NOAA) Nautical Charts as authored by the NOAA Office of Coast Survey, which are incorporated herein by reference:

(A) Chart 18600, Trinidad Head to Cape Blanco (January 2002);
(B) Chart 18620, Point Arena to Trinidad Head (June 2002);
(C) Chart 18640, San Francisco to Point Arena (August 2005);
(D) Chart 18680, Point Sur to San Francisco (June 2005);
(E) Chart 18700, Point Conception to Point Sur (July 2003);
(F) Chart 18720, Point Dume to Purisima Point (August 2008); and
(G) Chart 18740, San Diego to Santa Rosa Island (~~April 2005~~March 2007).

(6) "Diesel Engine" means an internal combustion, compression-ignition (CI) engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

(7) "Diesel Particulate Matter" means the particles found in the exhaust of diesel engines, which may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(8) "Diesel-electric engine" means a diesel engine connected to a generator that is used as a source of electricity for propulsion or other uses.

(9) "Emergency Generator" means a diesel-electric engine operated only during emergencies or to perform maintenance and testing necessary to ensure readiness for emergencies.

(10) "Essential Modification" means the addition of new equipment, or the replacement of existing components with modified components, that can be demonstrated to be necessary to comply with this regulation. Essential modifications do not include: (1) changes that are made for convenience or automation of fuel switching; or (2) replacement of components that would be replaced in the absence of this regulation, based on measured component wear, visual inspection, or expected service life, even if accelerated due to the fuel requirements. Additional tankage is considered essential only if existing available tankage has less than the capacity required for a complete voyage within Regulated California Waters.

(11) "Estuarine Waters" means an arm of the sea or ocean that extends inland to meet the mouth of a river.

(12) "Executive Officer" means the executive officer of the Air Resources Board (ARB), or his or her designee.

(13) "Hydrocarbon (HC)" means the sum of all hydrocarbon air pollutants.

(14) "Internal Waters" means any navigable river or waterway within the State of California.

(15) "IMO" means the International Maritime Organization.

(16) "ISO" means the International Organization for Standardization.

(17) "Main Engine" means a diesel engine on an ocean-going vessel designed primarily to provide propulsion, except that diesel-electric engines shall not be considered "main engines" for purposes of this section.

(18) "Marine Diesel Oil (MDO)" means any fuel that meets all the specifications for DMB grades as defined in Table I of International Standard ISO 8217, as revised in 2005, which is incorporated herein by reference~~.~~, or DMB grades as defined in Table I of International Standard ISO 8217, as revised on June 15, 2010, which is incorporated herein by reference.

(19) "Marine Gas Oil (MGO)" means any fuel that meets all the specifications for DMX or DMA grades as defined in Table I of International Standard ISO 8217, as revised in 2005, which is incorporated herein by reference~~.~~, or DMX, DMA, or DMZ grades as defined in Table I of International Standard ISO 8217, as revised on June 15, 2010, which is incorporated herein by reference.

(20) "Master" means the person who operates a vessel or is otherwise in charge of the vessel's operations.

(21) "Military Vessel" means any ship, boat, watercraft, or other contrivance used for any purpose on water, and owned or operated by the armed services.

(22) "Nitrogen Oxides (NOx)" means compounds of nitric oxide (NO), nitrogen dioxide (NO2), and other oxides of nitrogen, which are typically created during combustion processes and are major contributors to smog formation and acid deposition.

(23) "Non-Methane Hydrocarbons (NMHC)" means the sum of all hydrocarbon air pollutants except methane.

(24) "Ocean-going Vessel (OGV)" means a commercial, government, or military vessel meeting any one of the following criteria:

(A) a non-tanker vessel greater than or equal to 400 feet in length overall (LOA) as defined in 50 CFR § 679.2, as adopted June 19, 1996;

(B) a non-tanker vessel greater than or equal to 10,000 gross tons (GT ITC) per the convention measurement (international system) as defined in 46 CFR 69.51-.61, as adopted September 12, 1989;
(C) a non-tanker vessel propelled by a marine compression ignition engine with a per-cylinder displacement of greater than or equal to 30 liters; or
(D) a tanker that meets any one of the criteria in subsections (A)-(C).

For purposes of this section, "ocean-going vessel" does not include tugboats, towboats, or pushboats.

(25) "Operate" means steering or otherwise running the vessel or its functions while the vessel is underway, moored, anchored, or at dock.

(26) "Own" means having all the incidents of ownership, including the legal title, of a vessel whether or not that person lends, rents, or pledges the vessel; having or being entitled to the possession of a vessel as the purchaser under a conditional sale contract; or being the mortgagor of a vessel.

(27) "Particulate Matter" means any airborne finely divided material, except uncombined water, which exists as a liquid or solid at standard conditions (e.g., dust, smoke, mist, fumes or smog).

(28) "Person" includes all of the following:

(A) any person, firm, association, organization, partnership, business trust, corporation, limited liability company, or company;

(B) any state or local governmental agency or public district, or any officer or employee thereof;

(C) the United States or its agencies, to the extent authorized by federal law.

(29) "Port Visit" means any of the following:

(A) each separate and distinct entry of a vessel into a port, roadstead, or terminal facility (collectively "port") in Regulated California Waters that results in the vessel stopping, docking, mooring, or otherwise dropping anchor (collectively "stopping") at the port. The "port visit" continues if the vessel moves to a different berth within the same port, but the "port visit" ends when the vessel leaves for or is otherwise moved to another port within the same bay or any other port;

(B) except as provided in paragraph (C) below, each separate and distinct entry of a vessel into an offshore location in Regulated California Waters away from a port that results in the vessel stopping at that offshore location

(e.g., Catalina Island or off Monterey). The "port visit" ends when the vessel leaves for or is otherwise moved to a port or another offshore location; or

(C) each separate and distinct entry of a vessel into an offshore location in Regulated California Waters away from a port that results in the vessel stopping, followed by entry into that port, shall constitute one "port visit," provided the offshore stop was conducted solely because the port could not accept the vessel as scheduled due to reasons beyond the reasonable control of the vessel operator or master.

(30) "Regulated California Waters" means all of the following:

(A) all California internal waters;
(B) all California estuarine waters;
(C) all California ports, roadsteads, and terminal facilities (collectively "ports");
(D) all waters within 3 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive;
(E) all waters within 12 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive; and
(F) all waters within 24 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive, except for the region within the area defined by 34.8 degrees North, 121.14 degrees West, thence to 34.46 degrees North, 120.82 degrees West, thence to 34.36 degrees North, 120.82 degrees West, thence to 34.29 degrees North, 120.99 degrees West, and following the boundary 24 nautical miles from the California baseline from 34.29 degrees North, 120.99 degrees West to 34.8 degrees North, 121.14 degrees West. ~~to 34.43 degrees North, 121.12 degrees West, inclusive; and~~
~~(G) all waters within the area, not including any islands, between the California baseline and a line starting at 34.43 degrees North, 121.12 degrees West; thence to 33.50 degrees North, 118.58 degrees West; thence to 32.65 degrees North, 117.81 degrees West; and ending at the California-Mexico border at the Pacific Ocean, inclusive.~~

(31) "Roadstead" means any facility that is used for the loading, unloading, and anchoring of ships.

(32) "Steamship" means a self-propelled vessel in which the primary propulsion and electrical power are provided by steam boilers.

(33) "Slow Speed Engine" means an engine with a rated speed of 150 revolutions per minute or less.

(34) "Sulfur Oxides" means compounds of sulfur dioxide (SO_2), and other oxides of sulfur, which are typically created during combustion of sulfur containing fuels.

(35) "Tanker" means a self-propelled vessel constructed or adapted primarily to carry, or that carries, oil or hazardous material in bulk as cargo or cargo residue.

(36) "Two-stroke Engine" means an internal combustion engine which operates on a two stroke cycle where the cycle of operation completes in one revolution of the crankshaft.

(37) "Vessel" means any tugboat, tanker, freighter, passenger ship, barge, or other boat, ship, or watercraft, except those used primarily for recreation and any of the following:

(A) a seaplane on the water;
(B) a watercraft specifically designed to operate on a permanently fixed course, the movement of which is restricted to a fixed track or arm to which the watercraft is attached or by which the watercraft is controlled.

(38) "Voyage" means each separate and distinct journey that begins when a vessel reaches Regulated California Waters from a point beyond Regulated California Waters, includes at least one port visit, and ends when the vessel departs from Regulated California Waters.

(e) *Operational Requirements.*

(1) Fuel Sulfur Content Limits.

(A) Auxiliary Diesel Engines:

1. Except as provided in subsections (c) and (h), upon the effective date of this regulation as approved by the Office of Administrative Law, a person subject to this section shall operate any auxiliary diesel engine, while the vessel is operating in Regulated California Waters, with either marine gas oil (MGO), with a maximum of 1.5 percent sulfur by weight, or marine diesel oil (MDO), with a maximum of 0.5 percent sulfur by weight, rounded as specified in subsection (i)(3);

2. Except as provided in subsections (c) and (h), beginning January 1, 2014~~2~~, a person subject to this section shall operate any auxiliary diesel engine, while the vessel is operating in Regulated California Waters, with marine gas oil (MGO) with a maximum of 0.1% sulfur by weight or marine diesel oil (MDO) with a maximum of 0.1% sulfur by weight, rounded as specified in subsection (i)(3).

(B) Main Engines and Auxiliary Boilers

1. Except as provided in subsections (c) and (h), beginning July 1, 2009, a person subject to this section shall operate any main engine or auxiliary boiler, while the vessel is operating in Regulated California Waters, with either marine gas oil (MGO), with a maximum of 1.5 percent sulfur by weight, or marine diesel oil (MDO), with a maximum of 0.5 percent sulfur by weight, rounded as specified in subsection (i)(3);

2. Except as provided in subsections (c) and (h), beginning January 1, 201~~4~~2, a person subject to this section shall operate any main engine or auxiliary boiler, while the vessel is operating in Regulated California Waters, with marine gas oil (MGO) with a maximum of 0.1% sulfur by weight or marine diesel oil (MDO) with a maximum of 0.1% sulfur by weight, rounded as specified in subsection (i)(3).

(2) Recordkeeping, Reporting, and Monitoring Requirements.

(A) Recordkeeping

Upon the effective date of this regulation, any person subject to this section shall retain and maintain records in English that contain the following information for at least three years following the date when the records were made:

1. The date, local time, and position (longitude and latitude) of the vessel for each entry into Regulated California Waters from waters outside Regulated California Waters, and each departure from Regulated California Waters to waters outside Regulated California Waters;

2. The date, local time, and position (longitude and latitude) of the vessel at the initiation and completion of any fuel switching procedures used to comply with subsection (e)(1) prior to entry into Regulated California Waters from waters outside Regulated California Waters;

3. The date, local time, and position (longitude and latitude) of the vessel at the initiation and completion of any fuel switching procedures within Regulated California Waters; completion of fuel switching procedures occurs the moment all engines subject to this section have completely transitioned from operation on one fuel to another fuel;

4. The type of fuel used (e.g., marine gas oil, marine diesel oil or heavy fuel oil) in each auxiliary engine, main engine, and auxiliary boiler operated in Regulated California Waters; and

5. The types, amounts, and the actual percent by weight sulfur content of all fuels purchased for use on the vessel, as reported by the fuel supplier or a fuel testing firm.

(B) Documentation of Fuel Switch Over Procedures.

Any person subject to this section that complies with the fuel sulfur content limits by switching fuels shall retain and maintain records in English on-board ship that contain the following information for auxiliary engines, main engines and auxiliary boilers:

1. A fuel system diagram that shows all storage, service, and mixing tanks, fuel handling, pumping, and processing equipment, valves, and associated piping. The diagram or other documentation shall list the fuel tank capacities and locations, and the nominal fuel consumption rate of the machinery at rated power;

2. Description of the fuel switch over procedure with detailed instructions and clear identification of responsibilities; and

3. The make, model, rated power, and serial numbers of all main engines, and auxiliary engines and make, model, rated output, and serial numbers of all auxiliary boilers subject to subsection (e)(1).

(C) Reporting and Monitoring.

1. Any person subject to this section shall provide in writing the information specified in subsection (e)(2)(A) and (e)(2)(B) to the Executive Officer upon request, either within 24 hours or by a later date approved by the Executive Officer. To the extent the person already collects the information specified in subsections (e)(2)(A) and (e)(2)(B) in English to comply with other regulatory requirements or standard practices, the person may provide the requested information in a format consistent with those other regulatory requirements or standard practices.

2. Any person subject to this section shall provide to the Executive Officer upon request additional information the Executive Officer determines to be necessary to determine compliance with this section.

3. Any person subject to this section shall provide to the Executive Officer access to the vessel for the purpose of determining compliance with the this section, including but not limited to, access to and review of records and information required under subsections (e)(2)(A) and (e)(2)(B), and for the purpose of collecting fuel samples for testing and analysis.

(f) *Violations.*

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(g) *Noncompliance for Vessels Based on the Need for Essential Modifications.*

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(h) *Noncompliance Fee in Lieu of Meeting Subsection (e)(1).*

The Executive Officer may permit a person ("person") to pay noncompliance fees ("fees") in lieu of meeting the requirements of subsection (e)(1). Payment of the fees notwithstanding, all other provisions of this section shall continue to apply. No person shall be permitted to pay the fees unless the person meets the notification requirements in subsection (h)(1) and the requirements in either subsections (h)(2), (h)(3), or (h)(4), as specified below:

(1) Notification Requirements.

Before the person's vessel enters Regulated California Waters from waters outside Regulated California Waters, the Executive Officer must receive notice that the person will not meet the requirements of subsection (e)(1) while operating within Regulated California Waters, but the person will instead meet the requirements of this subsection (h). If the Executive Officer has not received such notice and the person enters Regulated California Waters, the person will be in violation of this section and will not be permitted to pay the fees in lieu of meeting the requirements of subsection (e)(1).

(2) Noncompliance for Reasons Beyond a Person's Reasonable Control.

Any person wishing to pay the fees under this subsection (h)(2) shall meet the following criteria:

(A) Demonstration of Need.

The person shall, through adequate documentation, demonstrate to the Executive Officer's satisfaction that the person's noncompliance with the requirements of subsection (e)(1) is beyond the person's reasonable control. For the purposes of this paragraph, "beyond the person's reasonable control" applies only when one or more of the following sets of circumstances (1, 2, or 3) applies:

1. Unplanned Redirection.

This provision applies only when all of the following criteria are met:

a. after leaving the last port of call, the person's vessel was redirected from his/her original, officially logged, non-California destination to a California port, roadstead, or terminal facility (collectively "port"); and

b. the vessel does not contain a quantity of fuel sufficient for the auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1).

2. Inadequate Fuel Supply.

This provision applies only when all of the following criteria are met:

a. the person made good faith efforts to acquire a quantity of fuel sufficient for the auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1); and

b. the person was unable to acquire fuel sufficient for auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1).

3. Inadvertent Purchase of Defective Fuel.

This provision applies only when all of the following criteria are met:

a. based on the fuel supplier's certification of the fuel specifications, the person reasonably believed, and relied on such belief, that the fuel the person purchased on the route from the vessel's home port to California would enable the auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1);

b. the person determined that the auxiliary engines, main engines, and auxiliary boilers in fact will not meet the requirements of subsection (e)(1) using any of the fuel purchased under paragraph 3.a; and

c. the vessel is already on its way to California, and there are no other ports of call on the vessel's route where fuel can be purchased sufficient to meet the requirements of subsection (e)(1).

(B) Payment of Fees.

Upon meeting the requirements of paragraph (A) in this subsection (h)(2), the person shall pay the fees for every port visit, as specified in subsection (h)(5) below.

(C) Executive Officer Review.

For the purposes of verifying the demonstration of need as specified in paragraph (A) above, the Executive Officer may consider and rely on any facts or circumstances the Executive Officer believes are appropriate, including but not limited to: the fuel supplier's ability or failure to provide adequate fuel ordered by the person; any material misrepresentation by the fuel supplier concerning the fuel specifications; the reasonableness of the person's reliance on fuel suppliers with a history of supplying fuel inadequate for meeting the requirements of subsection (e)(1); and force majeure.

(3) Noncompliance for Vessels to Be Taken Out of Service for Modifications.

If a person cannot meet the requirements of subsection (e)(1) without vessel modifications, and elects not to comply under section (g), and such modifications cannot be completed prior to the effective date of subsection (e)(1), the Executive Officer may permit the person to pay the fees as specified in this subsection. The vessel must be scheduled to complete the necessary modifications (e.g. during a dry dock operation) as soon as possible, but no later than December 31, 2014. For this provision to apply, the person shall meet all of the following criteria:

(A) Demonstration of Need.

The person shall provide the Executive Officer a Compliance Report, signed by the Chief Engineer of the person's vessel, which:

1. identifies the specific vessel modifications ("modifications") (e.g., installation of additional fuel tanks, fuel cooling systems) the person plans to use for meeting the requirements of subsection (e)(1);

2. identifies the specific date by which the modifications will be completed (i.e., while the vessel is in dry dock); and

3. demonstrates to the satisfaction of the Executive Officer that the modifications will be made at the earliest possible date (e.g., the vessel has been scheduled for the earliest available dry dock appointment).

(B) Payment of Fees.

Upon meeting the requirements of paragraph (A) in this subsection (h)(3), the person shall pay the fees for every port visit, as specified in subsection (h)(5) below.

(C) Proof of Modifications Actually Performed.

Within ten (10) business days after the scheduled or actual completion of the modifications, whichever occurs first, the person shall provide written certification to the Executive Officer that the modifications specified under this subsection (h)(3) have been completed. If the modifications have not been completed, the person shall certify which modifications have been completed, which have not, and the anticipated completion date for the remaining modifications. The notification requirement specified in this paragraph, the notification requirements in subsection (h)(1) above, and the fee provisions in subsection (h)(5) below shall apply until all the modifications have been completed.

(4) Noncompliance Based on Infrequent Visits and Need for Vessel Modifications.

If a person cannot meet the requirements of subsection (e)(1) without modifications for the vessel at issue, and elects not to comply under section (g), and that vessel will make no more than two California voyages per calendar year, and no more than 4 California voyages after the effective date of the regulation, during the life of the vessel, the Executive Officer may permit the person to pay the fees as specified in this subsection. This provision terminates on December 31, 2014.

(A) Demonstration of Need.

The person shall demonstrate to the satisfaction of the Executive Officer that modifications to the vessel are necessary to meet the requirements of subsection (e)(1), and that the vessel shall meet the visitation limits specified in this subsection (h)(4).

(B) Payment of Fees.

Upon meeting the requirements of paragraph (A) above, the person shall pay the fees for every port visit as specified in subsection (h)(5) below.

(5) Calculation and Payment of Fees.

Fees will be calculated based on the number of port visits made by a person using fuel that does not comply with subsection (e)(1). For each port visit, the person who elects to pay the fees pursuant to this subsection (h) shall pay the applicable fees shown in Table 1 prior to leaving the California port or by a later date approved by the Executive Officer. For persons that purchase fuels complying with subsection (e)(1) during their California port visit, and use these complying fuels during their port visit and upon departure, the fees specified in Table 1 shall be halved. The person shall deposit the fees in the port's Noncompliance Fee Settlement and Air Quality Mitigation Fund. If no such port fund exists, the person shall deposit the fees into the California Air Pollution

Control Fund, as directed by the Executive Officer. Port visits shall be cumulative for all non-compliant port visits over the life of the vessel. For the purposes of this paragraph, any port visit where the non-compliance fee is waived shall not be included in the cumulative total.

(A) Noncompliance Fee Schedule.

Table 1: Noncompliance Fee Schedule, Per Vessel

Port Visit	*Per-Port Visit Fee*
1st Port Visited	$45,500
2nd Port Visited	$45,500 ~~$91,000~~
3rd Port Visited	$91,000~~$136,500~~
4th Port Visited	$136,500 ~~$182,000~~
5th or more Port Visited	$182,000 ~~$227,500~~

(B) The fees shown in Table 1 shall be assessed by the Executive Officer at the time of the port visit. For the purposes of assessing fees under subsection (h), offshore anchorages made in conjunction with a port visit shall not be considered as a separate port visit.

(C) For subsection (h)(2), beginning January 1, 2014~~2~~, the fee will be waived once per vessel during each calendar year until December 31, 2014, when all of the following are met:

1. a person acquires fuel and meets the requirements of subsection (e)(1) prior to leaving the first port visited during the voyage and meets the requirements of (e)(1) for the remainder of the voyage; and

2. during any non-compliant portion of the voyage, a person operates each auxiliary engine, main engine, and auxiliary boiler with either marine gas oil (MGO), with a maximum of 1.5 percent sulfur by weight, or marine diesel oil (MDO), with a maximum of 0.5 percent sulfur by weight, rounded as specified in subsection (i)(3).

(D) The Executive Officer may enter into enforceable agreements with each port that will receive the fees. The agreements shall require that the fees be used by the ports only to fund projects that will substantially reduce emissions of diesel PM, NOx, and SOx from on-site sources, sources within 2 miles of port boundaries, or ocean-going vessels operated within the Regulated California Waters, except that the fees shall not be used to fund projects on vessels from which noncompliance fees were paid. Fees intended for ports that do not have such agreements at the time the fees are paid shall be deposited into the California Air Pollution Control Fund.

(E) If for any reason the person is not notified by the Executive Officer of the assessed fee by the end of the port visit, the person shall nevertheless be responsible for payment of the appropriate fee as specified in this subsection (h) prior to leaving the California port or by a later date approved by the Executive Officer.

(i) *Test Methods.*

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(j) *Sunset, Baseline, and Test Method Review.*

*****

(k) *Severability.*

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NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, and 41511, Health and Safety Code. Reference: Sections 39650, 39658, 39659, 39666, 41510, and 41511, Health and Safety Code.

Proposed Regulation Order

FUEL SULFUR AND OTHER OPERATIONAL REQUIREMENTS FOR OCEAN-GOING VESSELS WITHIN CALIFORNIA WATERS AND 24 NAUTICAL MILES OF THE CALIFORNIA BASELINE

Note: Proposed amendments are shown in underline to indicate additions, and ~~strikeout~~ to indicate deletions, compared to the preexisting regulatory language. The symbol "*****" indicates sections of regulatory text that staff are not proposing to amend.

Amend section 93118.2, title 17, California Code of Regulations (CCR), to read as follows:

§93118.2. Airborne Toxic Control Measure for Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline.

(a) *Purpose.*

*****

(b) *Applicability.*

(1) Except as provided in subsection (c), this section applies to any person who owns, operates, charters, rents, or leases any ocean-going vessel that operates in any of the Regulated California Waters, which include all of the following:

(A) all California internal waters;
(B) all California estuarine waters;
(C) all California ports, roadsteads, and terminal facilities (collectively "ports");
(D) all waters within 3 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive;
(E) all waters within 12 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive; and
(F) all waters within 24 nautical miles of the California baseline, starting at the California-Oregon border ~~to 34.43 degrees North, 121.12 degrees West~~ and ending at the California-Mexico border at the Pacific Ocean, inclusive, except for the region within the area defined by 34.8 degrees North, 121.14 degrees West, thence to 34.46 degrees North, 120.82 degrees West, thence to 34.36 degrees North, 120.82 degrees West, thence to 34.29 degrees North, 120.99 degrees West, and following the boundary 24 nautical miles from the California baseline from 34.29

degrees North, 120.99 degrees West to 34.8 degrees North, 121.14 degrees West. ; and

~~(G) all waters within the area, not including islands, between the California baseline and a line starting at 34.43 degrees North, 121.12 degrees West; thence to 33.50 degrees North, 118.58 degrees West; thence to 32.65 degrees North, 117.81 degrees West, and ending at the California-Mexico border at the Pacific Ocean, inclusive.~~

(2) Except as provided in subsection (c), this section applies to ocean-going vessels that are flagged in, registered in, entitled to fly the flag of, or otherwise operating under the authority of the United States ("U.S.-flagged") or any other country ("foreign-flagged").

(3) Nothing in this section shall be construed to amend, repeal, modify, or change in any way any applicable U.S. Coast Guard requirements. Any person subject to this section shall be responsible for ensuring compliance with both U.S. Coast Guard regulations and the requirements of this section, including but not limited to, obtaining any necessary approvals, exemptions, or orders from the U.S. Coast Guard.

(c) *Exemptions.*

*****

(d) *Definitions.*

For purposes of this section, the following definitions apply:

(1) "Alternative fuel" means natural gas, propane, ethanol, methanol, hydrogen, electricity, or fuel cells. Alternative fuel also means any mixture that only contains these fuels.

(2) "ASTM" means ASTM International.

(3) "Auxiliary boiler" means any fuel-fired combustion equipment designed primarily to produce steam for uses other than propulsion, including, but not limited to, heating of residual fuel and liquid cargo, heating of water for crew and passengers, powering steam turbine discharge pumps, freshwater generation, and space heating of cabins. Exhaust gas economizers that exclusively use diesel engine exhaust as a heat source to produce steam are not auxiliary boilers.

(4) "Auxiliary engine" means a diesel engine on an ocean-going vessel designed primarily to provide power for uses other than propulsion or emergencies, except

that all diesel-electric engines shall be considered "auxiliary diesel engines" for purposes of this section.

(5) "Baseline" means the mean lower low water line along the California coast, as shown on the following National Oceanic and Atmospheric Administration (NOAA) Nautical Charts as authored by the NOAA Office of Coast Survey, which are incorporated herein by reference:

(A) Chart 18600, Trinidad Head to Cape Blanco (January 2002);
(B) Chart 18620, Point Arena to Trinidad Head (June 2002);
(C) Chart 18640, San Francisco to Point Arena (August 2005);
(D) Chart 18680, Point Sur to San Francisco (June 2005);
(E) Chart 18700, Point Conception to Point Sur (July 2003);
(F) Chart 18720, Point Dume to Purisima Point (August 2008); and
(G) Chart 18740, San Diego to Santa Rosa Island (~~April 2005~~March 2007).

(6) "Diesel Engine" means an internal combustion, compression-ignition (CI) engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

(7) "Diesel Particulate Matter" means the particles found in the exhaust of diesel engines, which may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(8) "Diesel-electric engine" means a diesel engine connected to a generator that is used as a source of electricity for propulsion or other uses.

(9) "Emergency Generator" means a diesel-electric engine operated only during emergencies or to perform maintenance and testing necessary to ensure readiness for emergencies.

(10) "Essential Modification" means the addition of new equipment, or the replacement of existing components with modified components, that can be demonstrated to be necessary to comply with this regulation. Essential modifications do not include: (1) changes that are made for convenience or automation of fuel switching; or (2) replacement of components that would be replaced in the absence of this regulation, based on measured component wear, visual inspection, or expected service life, even if accelerated due to the fuel requirements. Additional tankage is considered essential only if existing available tankage has less than the capacity required for a complete voyage within Regulated California Waters.

(11) "Estuarine Waters" means an arm of the sea or ocean that extends inland to meet the mouth of a river.

(12) "Executive Officer" means the executive officer of the Air Resources Board (ARB), or his or her designee.

(13) "Hydrocarbon (HC)" means the sum of all hydrocarbon air pollutants.

(14) "Internal Waters" means any navigable river or waterway within the State of California.

(15) "IMO" means the International Maritime Organization.

(16) "ISO" means the International Organization for Standardization.

(17) "Main Engine" means a diesel engine on an ocean-going vessel designed primarily to provide propulsion, except that diesel-electric engines shall not be considered "main engines" for purposes of this section.

(18) "Marine Diesel Oil (MDO)" means any fuel that meets all the specifications for DMB grades as defined in Table I of International Standard ISO 8217, as revised in 2005, which is incorporated herein by reference~~.~~, or DMB grades as defined in Table I of International Standard ISO 8217, as revised on June 15, 2010, which is incorporated herein by reference.

(19) "Marine Gas Oil (MGO)" means any fuel that meets all the specifications for DMX or DMA grades as defined in Table I of International Standard ISO 8217, as revised in 2005, which is incorporated herein by reference~~.~~, or DMX, DMA, or DMZ grades as defined in Table I of International Standard ISO 8217, as revised on June 15, 2010, which is incorporated herein by reference.

(20) "Master" means the person who operates a vessel or is otherwise in charge of the vessel's operations.

(21) "Military Vessel" means any ship, boat, watercraft, or other contrivance used for any purpose on water, and owned or operated by the armed services.

(22) "Nitrogen Oxides (NOx)" means compounds of nitric oxide (NO), nitrogen dioxide (NO2), and other oxides of nitrogen, which are typically created during combustion processes and are major contributors to smog formation and acid deposition.

(23) "Non-Methane Hydrocarbons (NMHC)" means the sum of all hydrocarbon air pollutants except methane.

(24) "Ocean-going Vessel (OGV)" means a commercial, government, or military vessel meeting any one of the following criteria:

(A) a non-tanker vessel greater than or equal to 400 feet in length overall (LOA) as defined in 50 CFR § 679.2, as adopted June 19, 1996;
(B) a non-tanker vessel greater than or equal to 10,000 gross tons (GT ITC) per the convention measurement (international system) as defined in 46 CFR 69.51-.61, as adopted September 12, 1989;
(C) a non-tanker vessel propelled by a marine compression ignition engine with a per-cylinder displacement of greater than or equal to 30 liters; or
(D) a tanker that meets any one of the criteria in subsections (A)-(C).

For purposes of this section, "ocean-going vessel" does not include tugboats, towboats, or pushboats.

(25) "Operate" means steering or otherwise running the vessel or its functions while the vessel is underway, moored, anchored, or at dock.

(26) "Own" means having all the incidents of ownership, including the legal title, of a vessel whether or not that person lends, rents, or pledges the vessel; having or being entitled to the possession of a vessel as the purchaser under a conditional sale contract; or being the mortgagor of a vessel.

(27) "Particulate Matter" means any airborne finely divided material, except uncombined water, which exists as a liquid or solid at standard conditions (e.g., dust, smoke, mist, fumes or smog).

(28) "Person" includes all of the following:

(A) any person, firm, association, organization, partnership, business trust, corporation, limited liability company, or company;

(B) any state or local governmental agency or public district, or any officer or employee thereof;

(C) the United States or its agencies, to the extent authorized by federal law.

(29) "Port Visit" means any of the following:

(A) each separate and distinct entry of a vessel into a port, roadstead, or terminal facility (collectively "port") in Regulated California Waters that results in the vessel stopping, docking, mooring, or otherwise dropping anchor (collectively "stopping") at the port. The "port visit" continues if the vessel moves to a different berth within the same port, but the "port visit" ends when the vessel leaves for or is otherwise moved to another port within the same bay or any other port;

(B) except as provided in paragraph (C) below, each separate and distinct entry of a vessel into an offshore location in Regulated California Waters

away from a port that results in the vessel stopping at that offshore location (e.g., Catalina Island or off Monterey). The "port visit" ends when the vessel leaves for or is otherwise moved to a port or another offshore location; or

(C) each separate and distinct entry of a vessel into an offshore location in Regulated California Waters away from a port that results in the vessel stopping, followed by entry into that port, shall constitute one "port visit," provided the offshore stop was conducted solely because the port could not accept the vessel as scheduled due to reasons beyond the reasonable control of the vessel operator or master.

(30) "Regulated California Waters" means all of the following:

(A) all California internal waters;
(B) all California estuarine waters;
(C) all California ports, roadsteads, and terminal facilities (collectively "ports");
(D) all waters within 3 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive;
(E) all waters within 12 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive; and
(F) all waters within 24 nautical miles of the California baseline, starting at the California-Oregon border and ending at the California-Mexico border at the Pacific Ocean, inclusive, except for the region within the area defined by 34.8 degrees North, 121.14 degrees West, thence to 34.46 degrees North, 120.82 degrees West, thence to 34.36 degrees North, 120.82 degrees West, thence to 34.29 degrees North, 120.99 degrees West, and following the boundary 24 nautical miles from the California baseline from 34.29 degrees North, 120.99 degrees West to 34.8 degrees North, 121.14 degrees West. ~~to 34.43 degrees North, 121.12 degrees West, inclusive; and~~
(G) ~~all waters within the area, not including any islands, between the California baseline and a line starting at 34.43 degrees North, 121.12 degrees West; thence to 33.50 degrees North, 118.58 degrees West; thence to 32.65 degrees North, 117.81 degrees West; and ending at the California-Mexico border at the Pacific Ocean, inclusive.~~

(31) "Roadstead" means any facility that is used for the loading, unloading, and anchoring of ships.

(32) "Steamship" means a self-propelled vessel in which the primary propulsion and electrical power are provided by steam boilers.

(33) "Slow Speed Engine" means an engine with a rated speed of 150 revolutions per minute or less.

(34) "Sulfur Oxides" means compounds of sulfur dioxide (SO_2), and other oxides of sulfur, which are typically created during combustion of sulfur containing fuels.

(35) "Tanker" means a self-propelled vessel constructed or adapted primarily to carry, or that carries, oil or hazardous material in bulk as cargo or cargo residue.

(36) "Two-stroke Engine" means an internal combustion engine which operates on a two stroke cycle where the cycle of operation completes in one revolution of the crankshaft.

(37) "Vessel" means any tugboat, tanker, freighter, passenger ship, barge, or other boat, ship, or watercraft, except those used primarily for recreation and any of the following:

(A) a seaplane on the water;
(B) a watercraft specifically designed to operate on a permanently fixed course, the movement of which is restricted to a fixed track or arm to which the watercraft is attached or by which the watercraft is controlled.

(38) "Voyage" means each separate and distinct journey that begins when a vessel reaches Regulated California Waters from a point beyond Regulated California Waters, includes at least one port visit, and ends when the vessel departs from Regulated California Waters.

(e) *Operational Requirements.*

(1) Fuel Sulfur Content Limits.

(A) Auxiliary Diesel Engines:

1. Except as provided in subsections (c) and (h), upon the effective date of this regulation as approved by the Office of Administrative Law, a person subject to this section shall operate any auxiliary diesel engine, while the vessel is operating in Regulated California Waters, with either marine gas oil (MGO), with a maximum of 1.5 percent sulfur by weight, or marine diesel oil (MDO), with a maximum of 0.5 percent sulfur by weight, rounded as specified in subsection (i)(3);

2. Except as provided in subsections (c) and (h), beginning January 1, 2014~~2~~, a person subject to this section shall operate any auxiliary diesel engine, while the vessel is operating in Regulated California Waters, with marine gas oil (MGO) with a maximum of 0.1% sulfur

by weight or marine diesel oil (MDO) with a maximum of 0.1% sulfur by weight, rounded as specified in subsection (i)(3).

(B) Main Engines and Auxiliary Boilers

1. Except as provided in subsections (c) and (h), beginning July 1, 2009, a person subject to this section shall operate any main engine or auxiliary boiler, while the vessel is operating in Regulated California Waters, with either marine gas oil (MGO), with a maximum of 1.5 percent sulfur by weight, or marine diesel oil (MDO), with a maximum of 0.5 percent sulfur by weight, rounded as specified in subsection (i)(3);

2. Except as provided in subsections (c) and (h), beginning January 1, 2014~~2~~, a person subject to this section shall operate any main engine or auxiliary boiler, while the vessel is operating in Regulated California Waters, with marine gas oil (MGO) with a maximum of 0.1% sulfur by weight or marine diesel oil (MDO) with a maximum of 0.1% sulfur by weight, rounded as specified in subsection (i)(3).

(2) Recordkeeping, Reporting, and Monitoring Requirements.

(A) Recordkeeping.

Upon the effective date of this regulation, any person subject to this section shall retain and maintain records in English that contain the following information for at least three years following the date when the records were made:

1. The date, local time, and position (longitude and latitude) of the vessel for each entry into Regulated California Waters from waters outside Regulated California Waters, and each departure from Regulated California Waters to waters outside Regulated California Waters;

2. The date, local time, and position (longitude and latitude) of the vessel at the initiation and completion of any fuel switching procedures used to comply with subsection (e)(1) prior to entry into Regulated California Waters from waters outside Regulated California Waters;

3. The date, local time, and position (longitude and latitude) of the vessel at the initiation and completion of any fuel switching procedures within Regulated California Waters; completion of fuel switching procedures occurs the moment all engines subject to this section have completely transitioned from operation on one fuel to another fuel;

4. The type of fuel used (e.g., marine gas oil, marine diesel oil or heavy fuel oil) in each auxiliary engine, main engine, and auxiliary boiler operated in Regulated California Waters; and

5. The types, amounts, and the actual percent by weight sulfur content of all fuels purchased for use on the vessel, as reported by the fuel supplier or a fuel testing firm.

(B) Documentation of Fuel Switch Over Procedures.

Any person subject to this section that complies with the fuel sulfur content limits by switching fuels shall retain and maintain records in English on-board ship that contain the following information for auxiliary engines, main engines and auxiliary boilers:

1. A fuel system diagram that shows all storage, service, and mixing tanks, fuel handling, pumping, and processing equipment, valves, and associated piping. The diagram or other documentation shall list the fuel tank capacities and locations, and the nominal fuel consumption rate of the machinery at rated power;

2. Description of the fuel switch over procedure with detailed instructions and clear identification of responsibilities; and

3. The make, model, rated power, and serial numbers of all main engines, and auxiliary engines and make, model, rated output, and serial numbers of all auxiliary boilers subject to subsection (e)(1).

(C). Reporting and Monitoring.

1. Any person subject to this section shall provide in writing the information specified in subsection (e)(2)(A) and (e)(2)(B) to the Executive Officer upon request, either within 24 hours or by a later date approved by the Executive Officer. To the extent the person already collects the information specified in subsections (e)(2)(A) and (e)(2)(B) in English to comply with other regulatory requirements or standard practices, the person may provide the requested information in a format consistent with those other regulatory requirements or standard practices.

2. Any person subject to this section shall provide to the Executive Officer upon request additional information the Executive Officer determines to be necessary to determine compliance with this section.

3. Any person subject to this section shall provide to the Executive Officer access to the vessel for the purpose of determining compliance with the this section, including but not limited to, access to and review of records and information required under subsections (e)(2)(A) and (e)(2)(B), and for the purpose of collecting fuel samples for testing and analysis.

(f) *Violations.*

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(g) *Noncompliance for Vessels Based on the Need for Essential Modifications.*

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(h) *Noncompliance Fee in Lieu of Meeting Subsection (e)(1).*

The Executive Officer may permit a person ("person") to pay noncompliance fees ("fees") in lieu of meeting the requirements of subsection (e)(1). Payment of the fees notwithstanding, all other provisions of this section shall continue to apply. No person shall be permitted to pay the fees unless the person meets the notification requirements in subsection (h)(1) and the requirements in either subsections (h)(2), (h)(3), or (h)(4), as specified below:

(1) Notification Requirements.

Before the person's vessel enters Regulated California Waters from waters outside Regulated California Waters, the Executive Officer must receive notice that the person will not meet the requirements of subsection (e)(1) while operating within Regulated California Waters, but the person will instead meet the requirements of this subsection (h). If the Executive Officer has not received such notice and the person enters Regulated California Waters, the person will be in violation of this section and will not be permitted to pay the fees in lieu of meeting the requirements of subsection (e)(1).

(2) Noncompliance for Reasons Beyond a Person's Reasonable Control

Any person wishing to pay the fees under this subsection (h)(2) shall meet the following criteria:

(A) Demonstration of Need.

The person shall, through adequate documentation, demonstrate to the Executive Officer's satisfaction that the person's noncompliance with the requirements of subsection (e)(1) is beyond the person's reasonable control. For the purposes of this paragraph, "beyond the person's reasonable

control" applies only when one or more of the following sets of circumstances (1, 2, or 3) applies:

1. Unplanned Redirection.

   This provision applies only when all of the following criteria are met:

   a. after leaving the last port of call, the person's vessel was redirected from his/her original, officially logged, non-California destination to a California port, roadstead, or terminal facility (collectively "port"); and

   b. the vessel does not contain a quantity of fuel sufficient for the auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1).

2. Inadequate Fuel Supply.

   This provision applies only when all of the following criteria are met:

   a. the person made good faith efforts to acquire a quantity of fuel sufficient for the auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1); and

   b. the person was unable to acquire fuel sufficient for auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1).

3. Inadvertent Purchase of Defective Fuel.

   This provision applies only when all of the following criteria are met:

   a. based on the fuel supplier's certification of the fuel specifications, the person reasonably believed, and relied on such belief, that the fuel the person purchased on the route from the vessel's home port to California would enable the auxiliary engines, main engines, and auxiliary boilers to meet the requirements of subsection (e)(1);

   b. the person determined that the auxiliary engines, main engines, and auxiliary boilers in fact will not meet the requirements of subsection (e)(1) using any of the fuel purchased under paragraph 3.a; and

   c. the vessel is already on its way to California, and there are no other ports of call on the vessel's route where fuel can be purchased sufficient to meet the requirements of subsection (e)(1).

(B) Payment of Fees.

Upon meeting the requirements of paragraph (A) in this subsection (h)(2), the person shall pay the fees for every port visit, as specified in subsection (h)(5) below.

(C) Executive Officer Review.

For the purposes of verifying the demonstration of need as specified in paragraph (A) above, the Executive Officer may consider and rely on any facts or circumstances the Executive Officer believes are appropriate, including but not limited to: the fuel supplier's ability or failure to provide adequate fuel ordered by the person; any material misrepresentation by the fuel supplier concerning the fuel specifications; the reasonableness of the person's reliance on fuel suppliers with a history of supplying fuel inadequate for meeting the requirements of subsection (e)(1); and force majeure.

(3) Noncompliance for Vessels to Be Taken Out of Service for Modifications.

If a person cannot meet the requirements of subsection (e)(1) without vessel modifications, and elects not to comply under section (g), and such modifications cannot be completed prior to the effective date of subsection (e)(1), the Executive Officer may permit the person to pay the fees as specified in this subsection. The vessel must be scheduled to complete the necessary modifications (e.g. during a dry dock operation) as soon as possible, but no later than December 31, 2014. For this provision to apply, the person shall meet all of the following criteria:

(A) Demonstration of Need.

The person shall provide the Executive Officer a Compliance Report, signed by the Chief Engineer of the person's vessel, which:

1. identifies the specific vessel modifications ("modifications") (e.g., installation of additional fuel tanks, fuel cooling systems) the person plans to use for meeting the requirements of subsection (e)(1);

2. identifies the specific date by which the modifications will be completed (i.e., while the vessel is in dry dock); and

3. demonstrates to the satisfaction of the Executive Officer that the modifications will be made at the earliest possible date (e.g., the vessel has been scheduled for the earliest available dry dock appointment).

(B) Payment of Fees.

Upon meeting the requirements of paragraph (A) in this subsection (h)(3), the person shall pay the fees for every port visit, as specified in subsection (h)(5) below.

(C) Proof of Modifications Actually Performed.

Within ten (10) business days after the scheduled or actual completion of the modifications, whichever occurs first, the person shall provide written certification to the Executive Officer that the modifications specified under this subsection (h)(3) have been completed. If the modifications have not been completed, the person shall certify which modifications have been completed, which have not, and the anticipated completion date for the remaining modifications. The notification requirement specified in this paragraph, the notification requirements in subsection (h)(1) above, and the fee provisions in subsection (h)(5) below shall apply until all the modifications have been completed.

(4) Noncompliance Based on Infrequent Visits and Need for Vessel Modifications.

If a person cannot meet the requirements of subsection (e)(1) without modifications for the vessel at issue, and elects not to comply under section (g), and that vessel will make no more than two California voyages per calendar year, and no more than 4 California voyages after the effective date of the regulation, during the life of the vessel, the Executive Officer may permit the person to pay the fees as specified in this subsection. This provision terminates on December 31, 2014.

(A) Demonstration of Need.

The person shall demonstrate to the satisfaction of the Executive Officer that modifications to the vessel are necessary to meet the requirements of subsection (e)(1), and that the vessel shall meet the visitation limits specified in this subsection (h)(4).

(B) Payment of Fees.

Upon meeting the requirements of paragraph (A) above, the person shall pay the fees for every port visit as specified in subsection (h)(5) below.

(5) Calculation and Payment of Fees.

Fees will be calculated based on the number of port visits made by a person using fuel that does not comply with subsection (e)(1). For each port visit, the person who elects to pay the fees pursuant to this subsection (h) shall pay the applicable fees shown in Table 1 prior to leaving the California port or by a later date approved by the Executive Officer. For persons that purchase fuels

complying with subsection (e)(1) during their California port visit, and use these complying fuels during their port visit and upon departure, the fees specified in Table 1 shall be halved. The person shall deposit the fees in the port's Noncompliance Fee Settlement and Air Quality Mitigation Fund. If no such port fund exists, the person shall deposit the fees into the California Air Pollution Control Fund, as directed by the Executive Officer. Port visits shall be cumulative for all non-compliant port visits over the life of the vessel. For the purposes of this paragraph, any port visit where the non-compliance fee is waived shall not be included in the cumulative total.

(A) Noncompliance Fee Schedule.

Table 1: Noncompliance Fee Schedule, Per Vessel

Port Visit	*Per-Port Visit Fee*
1st Port Visited	$45,500
2nd Port Visited	$45,500 ~~$91,000~~
3rd Port Visited	$91,000~~$136,500~~
4th Port Visited	$136,500 ~~$182,000~~
5th or more Port Visited	$182,000 ~~$227,500~~

(B) The fees shown in Table 1 shall be assessed by the Executive Officer at the time of the port visit. For the purposes of assessing fees under subsection (h), offshore anchorages made in conjunction with a port visit shall not be considered as a separate port visit.

(C) For subsection (h)(2), beginning January 1, 2014~~2~~, the fee will be waived once per vessel during each calendar year until December 31, 2014, when all of the following are met:

1. a person acquires fuel and meets the requirements of subsection (e)(1) prior to leaving the first port visited during the voyage and meets the requirements of (e)(1) for the remainder of the voyage; and

2. during any non-compliant portion of the voyage, a person operates each auxiliary engine, main engine, and auxiliary boiler with either marine gas oil (MGO), with a maximum of 1.5 percent sulfur by weight, or marine diesel oil (MDO), with a maximum of 0.5 percent sulfur by weight, rounded as specified in subsection (i)(3).

(D) The Executive Officer may enter into enforceable agreements with each port that will receive the fees. The agreements shall require that the fees be used by the ports only to fund projects that will substantially reduce emissions of diesel PM, NOx, and SOx from on-site sources, sources within 2 miles of port boundaries, or ocean-going vessels operated within the Regulated California Waters, except that the fees shall not be used to fund

projects on vessels from which noncompliance fees were paid. Fees intended for ports that do not have such agreements at the time the fees are paid shall be deposited into the California Air Pollution Control Fund.

(E) If for any reason the person is not notified by the Executive Officer of the assessed fee by the end of the port visit, the person shall nevertheless be responsible for payment of the appropriate fee as specified in this subsection (h) prior to leaving the California port or by a later date approved by the Executive Officer.

(i) *Test Methods.*

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(j) *Sunset, Baseline, and Test Method Review.*

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(k) *Severability.*

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NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, and 41511, Health and Safety Code. Reference: Sections 39650, 39658, 39659, 39666, 41510, and 41511, Health and Safety Code.

Appendix B

Point Mugu Sea Range Overview

(Information Provided by the U.S. Navy)

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Point Mugu Sea Range

Overview

The Naval Air Warfare Center Weapons Division (NAWCWD), part of the Naval Air Systems Command (NAVAIR), is a multi-site organization that includes a land range and associated facilities at China Lake and Point Mugu, California. NAWCWD is the Navy's premier test, training, and experimentation center for weapons systems associated with air warfare, missiles and missile subsystems, aircraft weapons integration, and airborne electronic warfare systems. The NAWCWD role at Point Mugu is to provide a safe, operationally realistic, and thoroughly instrumented testing and training environment. During every United States military crises since World War II, work at China Lake and Point Mugu has played a significant role: developing and testing weapons and systems that work the first time, every time.

The Point Mugu Sea Range (Sea Range, Figure 1), managed by NAWCWD, is the cornerstone range resource of a national naval Research, Development, Testing, and Evaluation (RDT&E) capability. The Sea Range is the nation's largest and most capable instrumented RDT&E sea range. Adjacent to Naval Base Ventura County (NBVC), the Sea Range is comprised of ocean areas and airspace, and air, surface, and subsurface range areas covering 27,278 square nautical miles of ocean area and military Special Use Airspace (SUA). The Sea Range also includes extended range areas, covering approximately 221,000 square nautical miles, which are utilized for specialized RDT&E activities. As the Navy's primary sea range for RDT&E, the Sea Range directly supports Navy and Joint systems developmental and operational programs as well as RDT&E by other agencies such as the Missile Defense Agency (MDA) and space launch activity from nearby Vandenberg Air Force Base.

The Sea Range is an integral and foundational asset of NBVC. A 2006 NBVC Economic Impact Study, presented by the Workforce Investment Board of Ventura County, reported NBVC as the largest employer in the county, with over 19,000 personnel (military and civilian) working for, or stationed on the base in all categories, and contributing directly or indirectly to another 8,200 jobs throughout the county. NBVC contributes significantly to the economic health of the area, with an economic impact exceeding $1.2 billion in 2006. According to a statement by Bill Buratto, Ventura County Economic Development Association President and Chief Executive Officer, "NBVC is the fifth-largest base in the country. The work in electronic warfare, naval weapons systems, and testing and evaluation of a host of technologies have added immeasurably to our national defense. The employees and military personnel have enhanced our quality of life through their volunteerism and involvement in our community."

RDT&E activities are fundamental to ongoing Navy "transformation"; a continuous process of addressing how the Navy organizes, trains, and equips itself to meet current and future challenges. Transformation involves changing the tools (weapons and technology, organizational structures, or approaches to training) at the disposal of naval forces, or changing the way in which naval forces employ existing tools. Navy RDT&E plays a pivotal role in the transformation process as the fulcrum for the development and testing of weapons and technology at the disposal of naval forces.

The Sea Range is a unique national asset. Geographically, it is ideally situated to support its mission, with open sea space and dedicated airspace supported by natural features (San Nicolas Island, Laguna, Peak, Santa Cruz Island, and Naval Base Ventura County) to provide the required RDT&E infrastructure. That infrastructure is likewise unique. The range instrumentation, airfield and port facilities, and command and control facilities of the Sea Range combine with the location to create an unparalleled environment for sea-based RDT&E. The Sea Range is organized, managed, and equipped to support integrated RDT&E in four media—sea, air, space, and land. The Navy, Air Force, and other federal agencies such as NASA and the MDA need assured access to these resources on the Sea Range in order to accomplish RDT&E activities that are vital to national security, and warfighter training.

The Sea Range can support a broad array of testing and training scenarios, from routine one-on-one events to complex multi-participant, multi-target training or RDT&E in dense electronic combat environments. The Sea Range also supports portions of complex, full-battlegroup, Fleet exercises involving aircraft, surface ships, and submarines against a variety of air and sea targets and threats. RDT&E events are conducted in a realistic, controlled, open-air, open-ocean maritime environment.

During missile launches and other operations, the Navy may close portions of the Sea Range for safety and security. Mariners are advised to use caution and avoid the area. Commercial and other vessels transiting the area may result in delays and diversions of critical testing and training exercises. Vessels or aircraft that do not comply with closures may result in cancelation of exercises that take many years to plan and that cannot be rescheduled. If this happens, troops may be deployed at a reduced state of readiness and without the tools or training needed to perform their duties.

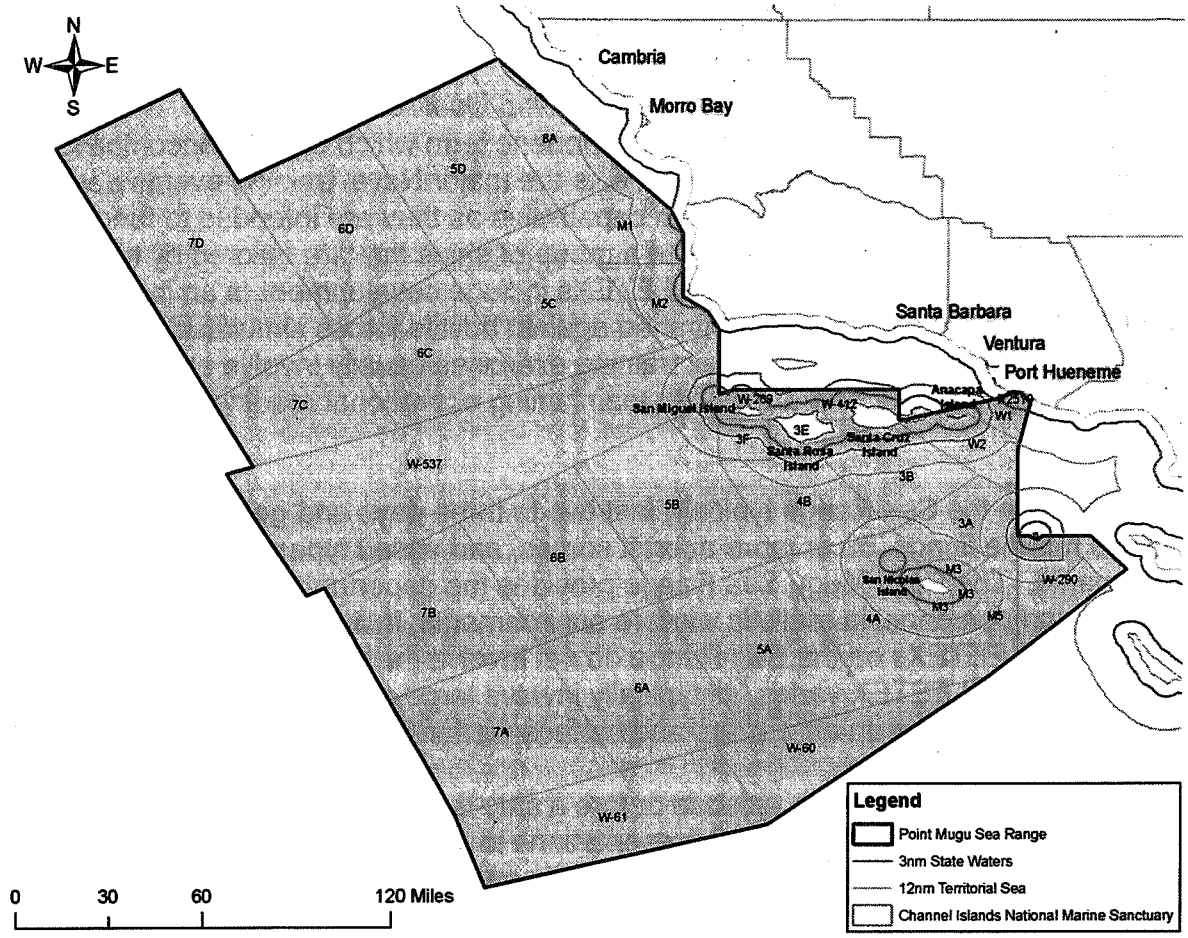


Figure 1. Pt. Mugu Sea Range

Critical Sea Range Operations

The Sea Range currently supports three general categories of training including: 1) Fleet training exercises (FLEETEX) and other training, 2) small-scale amphibious warfare training, and 3) special warfare training. The Sea Range also supports six general categories of tests to evaluate sea, land, and air weapons systems: 1) air-to-air tests, 2) air-to-surface tests, 3) surface-to-air tests, 4) surface-to-surface tests, 5) subsurface-to-surface tests, and 6) Theater Missile Defense (TMD) test and training activities. Not all of these require clearing large areas of sea and air space of non-participants, though any involving live-fire or potential for falling debris require area clearance for safety reasons.

The most time-critical of these exercises testing and training needed prior to deployment of troops or weapons. This includes Combat System Ship Qualification Trials (CSSQT) and Weapons System Upgrades both of which are highly time sensitive, generally cannot be rescheduled if delayed, and without which the overall state of

readiness is reduced. In the event that operations can be rescheduled the costs involved are significant, running into the millions of dollars for even a short delay.

Fleet Training Exercises and Combat System Ship Qualification Trials
A Fleet Training Exercises (FLEETEX) is a generic term which broadly encompasses a variety of Fleet training activities. FLEETEXs are major Naval training events designed to exercise a Battle Group's warfighting capabilities as they are intended to function in actual combat. A Battle Group refers to a group of ships that are tailored by size and type for specific warfare missions. FLEETEXs include development of an intelligence situation with the exercised units engaged against hostile forces simulated by other Naval units. These types of complex training exercises usually involve an entire Battle Group working together and are vital to maintaining operational readiness of U.S. Naval forces.

FLEETEXs on the Sea Range typically last two to three days and generally involve multiple missile firings, 50 or more aircraft sorties, and varied types of surface combatants. The Point Mugu Sea Range provides the opportunity to involve weapons systems and personnel in realistic warfare environments, including complex live-fire scenarios. FLEETEXs on the Sea Range do not involve the use of active sonar. Although each FLEETEX varies, all typically involve large numbers of ships and aircraft, usually with emphasis on air warfare and surface warfare training.

CSSQTs are the final training episode before a ship is deployed overseas. Normally this training involves multiple target presentations to test the ship's ability to defend itself. If the CSSQT is not fully completed, a ship must deploy at less than full readiness, thus jeopardizing the entire battle group.

Weapons System Upgrades
Weapon system upgrades may be requested by deployed forces. As weapon systems are used in the field, forward forces identify specific improvements necessary to address a specific shortcoming, or desired improvement, in weapons performance. These are time sensitive requests, and any delay to needed improvements places U.S. forces at increased risk.

Air-to-Air
Air-to-air testing involves the test and evaluation of an airborne weapon system (e.g., a test missile fired from a fighter aircraft against an airborne target). The test missiles are highly instrumented to record the intercept parameters and usually do not carry live warheads.

Air-to-Surface
Air-to-surface testing includes an aircraft weapon system using a missile, bomb, inert mine shape, or any other object released from an aircraft for attack of an enemy surface target. Free-fall bombs and mine shapes are usually inert, without fusing or explosives, and are used to test the accuracy of a weapon system. Targets for the air-to-surface

scenario are floating surface targets or a single target area on the western tip of San Nicolas Island.

Surface-to-Air
Surface-to-air testing involves ship's defensive weapons systems used for defense against an enemy airborne target or threat. Other surface-to-air scenarios include surface-launched weapons systems and airborne targets. The targets are similar to the air-to-air scenario and are air-launched or surface-launched.

Surface-to-Surface
Surface-to-surface testing involves a surface vessel firing a missile against a surface target, which is either another ship or a land target. This includes testing of a ship's weapon system using a cruise missile weapon to attack a surface target. The test article can be captive-carry using an inert missile, missile with telemetry and a live rocket, or the actual firing of a live missile. Air support is required from the range to provide chase aircraft and safety procedures are implemented to clear the target operational area.

Subsurface-to-Surface
Subsurface-to-surface testing involves testing a submarine's weapon system to attack a surface or land target. Missiles are fired from a submarine in the Sea Range at a surface target (hulk) on the Sea Range. The air support required from the range to clear the target operational area and provide chase aircraft is identical to the air-to-surface scenario.

Theater Missile Defense (TMD)
"TMD" is defined as the ability of the United States to defend its armed forces deployed abroad and its friends and allies against the threat of missile attack from both short- and long-range missiles in any theater of operations. The term TMD is used to describe a whole family of defensive missile programs and thus encompasses a wide variety of programs. Current testing includes Air- and Surface-carried laser systems intended to destroy a variety of missile targets.

Littoral Warfare Training and Small Scale Amphibious Warfare Training
Littoral warfare training is conducted by the Marine Corps and by Navy Special Warfare forces. Marine Corps amphibious warfare training involves operations on land and on sea. Amphibious operations include shore assault, boat raids, airfield seizure, humanitarian assistance, and light-armor reconnaissance. Amphibious landing training exercises are currently conducted about two times per year and traditionally consist of small-scale manned raids at pre-approved sites. These activities typically have occurred at San Nicolas Island when the schedule of operations and existing environmental restrictions allow.

Special Warfare Training
Special warfare training exercises are currently conducted about two times per year. Special warfare onshore operations generally involve human activities of individuals on

foot (less than ten personnel), group movement on foot (less than 30 personnel), group climbing, clandestine patrolling, laying-in (for observation), and communication by radio. No land vehicles are used except for safety purposes. Helicopters perform hovering and landing operations and are also used to conduct personnel and cargo parachute drops. Surface craft activities on beaches include the use of various small vessels.

Frequency of Operations on the Sea Range

Units and organizations of the Navy, as well as other services and agencies, and coalition partners, conduct approximately 17,000 events in a representative year on the Sea Range. Not all of these events require areas free of non-participating vessels and aircraft. One example is an aircraft flying on the range to test a new system that doesn't involve firing a weapon. However, test and training events that do involve firing weapons require areas clear of non-participating vessels or aircraft. Areas 3A, 3B, 4A, 4B and 5A on Figure 1 are the most used areas of the Sea Range. Hazardous operations are conducted in those areas approximately 200 days in a typical year. As noted above, commercial and other vessels transiting the area result in delays, diversions or cancellations of these types of critical testing and training exercises. Delays or diversions significantly increase the cost of an event and that cost is ultimately borne by the taxpayer. If an event is cancelled and cannot be rescheduled, troops may be deployed at a reduced state of readiness and without the training needed to perform their duties.

Appendix C

Air Quality Modeling to Determine the Impacts of OGV Clean Fuel Regulations and Potential Shipping Routes on South Coast Air Basin Air Quality and Public Health

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Air Quality Modeling to Determine the Impacts of OGV Clean Fuel Regulations and Potential Shipping Routes on South Coast Air Basin Air Quality and Public Health

Modeling and Meteorology Branch
Planning and Technical Support Division

and

Health and Exposure Assessment Branch
Research Division

Air Resources Board
California Environmental Protection Agency
Sacramento, California 95814

April 2011

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I. Introduction

A regional air quality model was used to simulate ozone (O_3) and fine particulate matter (PM2.5) concentrations within a Southern California modeling domain for six scenarios of ocean-going vessel (OGV) emissions. The six emission scenarios varied based on:

- shipping activity levels within transit routes;
- potential regulatory zone configurations around the transit routes; and
- fuel types used within the regulatory zones.

Detailed information on the emission inventories used can be found in the Emissions Inventory section. Also, Attachment C-2 provides a detailed spatial summary of the OGV emission inputs used for modeling.

The model-simulated impact of different OGV activity, transit routes, and corresponding fuel use on inland air quality and public health was estimated by analyzing the model-simulated concentration differences between each scenario and baseline conditions.

II. Model Application

Model Configuration

To simulate gaseous and PM2.5 concentrations, the Community Multi-scale Air Quality (CMAQ) model version 4.6 was exercised for the year 2005 (http://www.cmaq-model.org/). The CMAQ model was developed by the U.S. EPA, and has been used by ARB in previous regional air quality modeling analyses. The year 2005 was selected because it was also used as the base year for the South Coast Air Quality Management District's (SCAQMD) PM2.5 State Implementation Plan (SIP) development (SCAQMD, 2007).

For the analysis described herein, the Carbon Bond V (CB05) gas-phase chemical mechanism and the AERO4 aerosol modules are used. Within the CMAQ model, particulate matter is grouped into three log-normal modes that correspond to the ultrafine (aerodynamic diameter (D_p) < 0.1 μm), fine (0.1 μm < D_p < 2.5 μm), and coarse (D_p > 2.5 μm) particles sizes. Concentrations of PM2.5 are assumed to be the sum of all simulated particulate matter concentrations with D_p less than 2.5 μm.

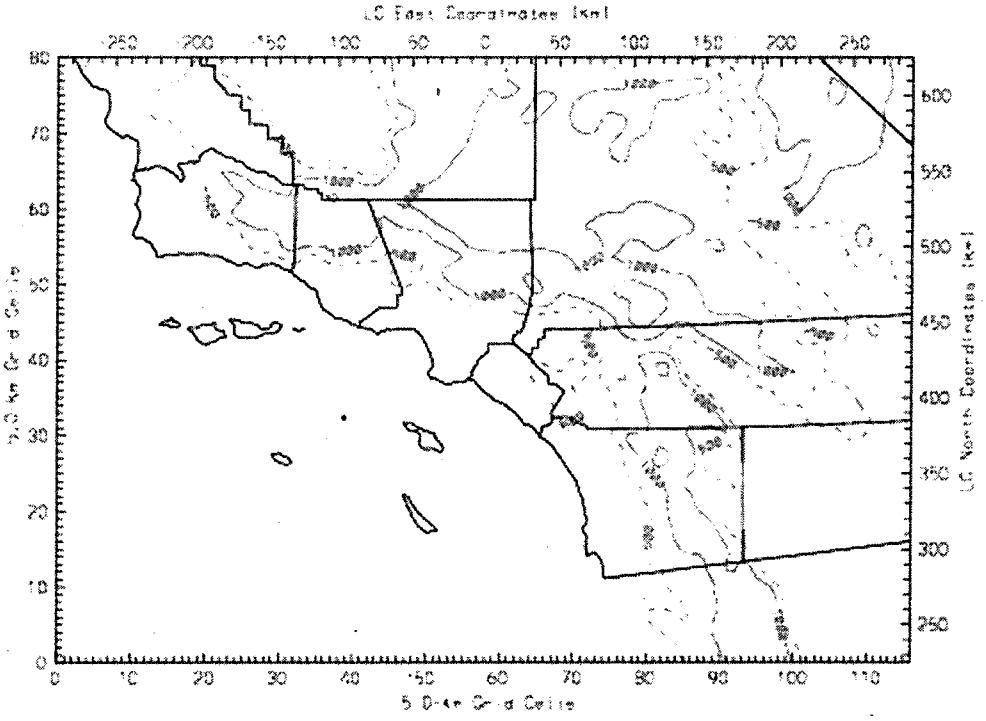
Domain Setup

The modeling system utilizes a domain comprised of a three-dimensional grid cell structure. The modeling domain covers the South Coast Air Basin (SCAB)

with 116 by 80 horizontal grid cells with sides 5 km in length (Figure C-1). The vertical structure of the air quality modeling domain was determined by the layer structure of the meteorological model. In this analysis, there are nine vertical layers extending to the top of the meteorological domain. The lowest eight layers extend to approximately 5 kilometers above the surface.

The meteorological input fields required by the air quality model were generated using the MM5 prognostic meteorological model (Grell *et al.*, 1994). The MM5 model is recommended by the U.S. EPA (EPA, 2007) for air quality modeling applications and has been used for preparing ozone and PM SIP analyses in Central and Southern California. The MM5 model was used to generate hourly meteorological fields for the year 2005 (the utilized fields were produced by the South Coast AQMD and used for their air quality management plan). The Meteorology-Chemistry Interface Processor (MCIP) version 3.2, which is part of the CMAQ software package, was used to generate model-ready meteorological inputs for the CMAQ model from the MM5 output files (http://www.cmascenter.org).

Figure C-1. The Southern California Ozone Study (SCOS) Modeling Domain Showing Terrain Contours



Initial and Boundary Conditions

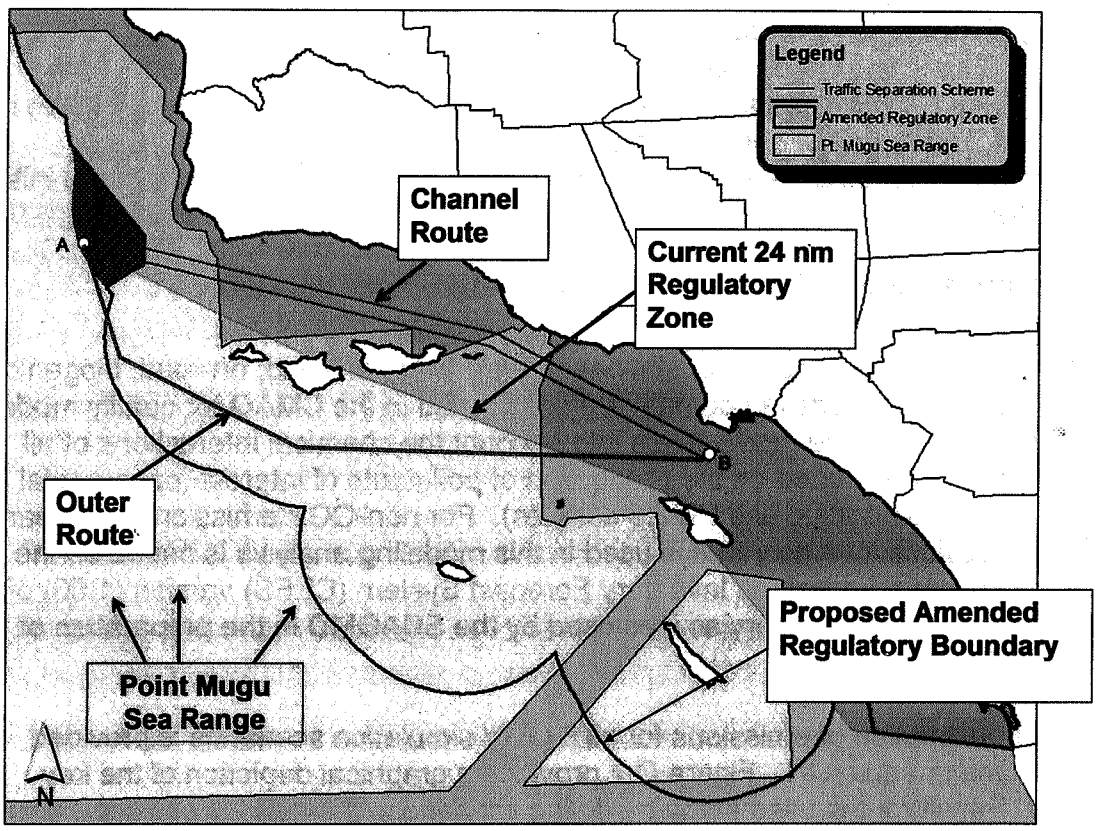
The boundary and initial gaseous and PM concentrations required for the air quality simulations were based on the U.S. EPA definition of "clean air" (EPA, 1991). Since the area of concern, the Santa Barbara Shipping Channel and Point Mugu Sea Range, is near the center of the simulation domain, as shown in Figure 1, the impact of boundary conditions (BC) should be minimal. Each simulation included a 10-day spin-up period to minimize the influence of the initial conditions.

Emissions Inventory

Emissions for all sources (e.g. stationary, area-wide, off-road, on-road, biogenic, and OGV) in the modeling domain are considered in the CMAQ air quality model simulations, since the model takes into account the chemical interactions of all pollutants in the airshed on the production of pollutants of interest (ozone, total PM2.5, PM2.5 nitrates, and PM2.5 sulfates). For non-OGV emissions, the year 2005 emissions inventory that is used in this modeling analysis is based on the same California Emissions Inventory Forecast System (CEFS) version (1.06) of ARB's Emissions Inventory as was used by the SCAQMD in the preparation of their PM2.5 SIP.

A brief description of emissions for all 6 OGV simulation scenarios is provided below and in Table C-1. Figure C-2 provides a graphical depiction of the key vessel transit routes used in the modeling scenarios.

Figure C-2: Vessel Traffic Routes by the Channel Islands in Southern California



MS1: No OGV Clean Fuel Regulation, vessels in pre-regulation traffic patterns and use pre-rule fuels, primarily HFO

In this scenario, the vessel traffic pattern was based on actual pre-rule vessel routes in the SCOS domain. Under this scenario, the vast majority of all the non-tanker vessels transiting north and southbound in the Santa Barbara Channel region used the existing traffic separation scheme inside the channel (Channel Route). It was assumed that all the vessels used dirty fuel (heavy fuel oil (HFO) at 2.5% S) at pre-regulation levels.

MS2: OGV Clean Fuel Regulation implemented, vessels in pre-regulation traffic patterns

In this scenario, the vessel traffic pattern is the same as that in MS1. It was assumed that all the vessels within the channel (and all other traffic within the 24 nm regulatory zone in the SCOS domain) used compliant clean distillate fuel (MGO at 0.1% S). It was assumed that all vessel activity outside the 24 nm regulatory zone in the SCOS domain used dirty fuel (HFO at 2.5% sulfur).

MS6: OGV Clean Fuel Regulation implemented, vessels in Outer Route pattern using clean fuel. OGV Clean Fuel Regulation implemented, 100% of vessels transit outside the Santa Barbara Channel and use marine distillate fuels

This scenario was included to address the request by the Santa Barbara Air Quality Management District concerning the comparisons between using clean fuel in the Channel Route compared to using clean fuel in the Outer Route. In this scenario, 100% of the vessel traffic within the Santa Barbara Channel was relocated to the route outside the channel (Outer Route). It was assumed that all the relocated vessel traffic used compliant clean distillate fuel although the route was outside the regulatory zone. All other OGV traffic within the SCOS domain had the same routing and fuel type as Scenario MS2.

MS1A: Vessels only subject to North American ECA Phase 1 requirements. ARB rule is forgone. Vessels in pre-regulation traffic patterns.

This scenario represents the condition where the ARB rule is forgone and air quality benefits depend solely on the North American Emission Control Area (ECA) 2012 Phase 1 requirements (assuming HFO fuel type at 1% sulfur). The vessel traffic pattern was based on actual pre-rule vessel routes.

MS5: OGV Clean Fuel Regulation implemented, 50%[1] of the vessels transit outside the Santa Barbara Channel and use HFO

This scenario reflects the current situation. 50% of the vessel traffic visiting the Ports of Los Angeles and Long Beach was relocated to the Outer Route. It was assumed that all the relocated vessel traffic used dirty fuel, as they were outside the regulatory zone. All other traffic within the 24 nm regulatory zone in the SCOS domain used clean fuel. All OGV traffic outside the 24 nm zone in the SCOS domain used dirty fuel.

MS4ws: OGV Clean Fuel Regulation implemented with proposed regulatory boundary change. Vessels in pre-regulation traffic patterns and all vessels within the proposed amended regulatory zone, including those in the Outer Route, use clean fuel

This scenario reflects what we anticipate will happen if the proposed regulatory boundary change is implemented. Under this scenario, the vast majority of all the non-tanker vessels transiting north and southbound in the Santa Barbara Channel region used the existing traffic separation scheme inside Channel Route. All vessels within the amended clean fuel zone used compliant clean distillate fuel (MGO at 0.1% S). Since the "window" is primarily outside the modeling domain, the emissions that occurred outside the SCOS domain were

[1] 50 percent of the vessel traffic visiting the Ports of LA and LB corresponds to about 75% of the total vessel traffic that historically uses the Santa Barbara Channel.

placed in grid cells inside the "window" to capture any impact that the window may have on the on-shore concentrations.

The 'baseline' OGV emissions inventory for year 2005 (scenario MS1) is version v2-3f of ARB's OGV inventory. This is a pre-regulatory 2005 inventory, where there is no OGV Clean Fuel Regulation in place. Emission scenario MS2 represents the anticipated emissions inventory from the original rule and was produced by making adjustments to the baseline inventory (MS1), where clean fuel is required for shipping activities within 24nm of the California coastline. .

It is assumed that ships transiting outside the regulatory boundary (i.e. requiring clean fuels) in the three scenarios emit pollutants at the same rate and at the same speed as they would travel inside of the regulatory zone without vessel speed restrictions or fuel sulfur restrictions.

Emission inputs of specific chemical species are required for modeling. These inputs are produced by applying the latest ARB speciation profiles (i.e. species fractions) to the scenario-specific TOG and PM emission estimates. In 2010, OGV PM speciation profiles were updated to reflect the most recent information. These profiles (Attachment C-1) were developed based on a series of tests conducted on OGV main engines (ME) and auxiliary engines (AE) operating on HFO and MDO with various sulfur contents (0.1% to 2.5%).

The gridded OGV emissions inventory was developed for a large statewide domain comprised of 4 km-by-4 km grid cells. For use in air quality modeling, these statewide OGV emissions were mapped into the smaller, Southern California domain for which meteorological inputs were readily available (described in the previous section). The air quality modeling domain has a different grid cell structure (5 km-by-5 km grid cells) and a different map projection than the domain on which the OGV emissions are produced (UTM versus Lambert Conformal, respectively).

A comparison of speciated, daily-averaged emission rates between OGV emissions for each of the six scenarios and the total emissions for the South Coast Air Basin is shown in Table C-2. The emissions in Table C-2 are summarized from the Southern California modeling domain (i.e. these totals reflect the emissions used in modeling).

Attachment C-2 provides illustrations of the emission differences among scenarios. These tabulated emission estimates are summarized from the OGV emission inventory on the large statewide domain prior to converting the information to modeling domain. Because of the differences in grid cell size and map projection along the boundaries of the region summarized, the summaries in Table C-2 and Attachment C-2 differ slightly.

OGV emissions are treated as an area-wide emission source, thus all of the OGV emissions are limited to the surface layer. The impact of OGV emission height

on air quality model performance is considered to be negligible, as was discussed previously in appendix E-2 of the OGV Fuel Rule Initial Statement of Reasons (ARB, 2008).

Table C-1. Summary of the Modeling Scenarios.

Scenario ID #	Scenario[3,4]	SB Channel Route Status	Rule Status[2]	ECA Status
MS1	**Baseline**	**Channel Route- (most Vessels using Channel Route)**	No rule	No ECA
MS2	**With rule**	**Channel Route- (most Vessels using Channel Route)**	With rule	No ECA
MS6	**SB 100% ships moved outside channel using clean fuel**	**100 percent of vessels using Outer Route**	using clean fuel for ships moved to outside channel	No ECA
MS1A	**Baseline**	**Channel Route- (most Vessels using Channel Route)**	No rule	With ECA at 1% Sulfur
MS4ws	**Amended Zone with Window**	**Channel Route- (most Vessels using Channel Route)**	With rule	No ECA
MS5	**With rule and 75% ships moved outside SB channel**	**Current Traffic Pattern (50% of Vessels using Outer Route)[5]**	With rule	No ECA

Table Notes:
1) In scenario MS1A, it is assumed under the ECA Phase 1, vessels use HFO fuel with 1% sulfur
2) Rule is assuming 0.1% distillate fuel
3) The 2005 emissions inventory used in the modeling analysis was generated using the ARB Emissions Inventory Forecast System and was consistent with that used by the SCAQMD in the preparation of their PM2.5 SIP
4) Inventory version v2-3f
5) 50 percent of the vessel traffic visiting the Ports of LA and LB corresponds to about 75% of the total vessel traffic that historically uses the Santa Barbara Channel

Table C-3. Comparison Between OGV Emissions for Each Scenario and Total Emissions from all Sources in the South Coast Air Basin.

Emission species	OGV Emissions (Tons/Day)						
	MS1	MS2	MS6	MS1A	MS4ws	MS5	SCAB Total Emission* (Tons/day)
NO_x	118.2	114.1	114.4	118.8	109.8	110.5	1205.6
SO_x	89	15.8	24	36.3	10.9	35.5	157.2
VOC	4.4	4.9	4.8	5	4.8	4.4	2463.6
PM2.5 SO_4	3.6	0.7	1	0.6	0.5	1.6	20.7
PM2.5 EC	0.1	0.1	0.1	0.4	0.1	0.1	19.6
Other PM2.5	7.4	2.6	3.2	7.2	1.9	3.8	197.5

*Total emission in South Coast Air Basin was calculated based on scenario MS1, which includes shipping emissions in scenario MS1 and all non-shipping emissions

III. Simulation Results

The CMAQ air quality model was run for calendar year 2005 for each scenario. Hourly gaseous and aerosol concentrations for each grid cell within the domain were calculated. The results from each simulation were used to calculate, by grid cell, the annual maximum 8-hour ozone (O3) concentration, and the annual average concentrations of PM2.5 total, PM2.5 sulfate (SO4), and PM2.5 nitrate (NO_3).

The difference in gaseous and particulate concentrations between the baseline scenario (MS1) and each of the other scenarios is used to illustrate the impact of each scenario on baseline air quality (i.e. where the baseline represents pre-clean-fuel-regulation conditions). Figures C-3 to C-7 provide a summary of the modeling results in the form of the percentage change in annual averaged PM2.5 concentration and annual maximum 8-hour Ozone concentration from the baseline scenario (MS1).

Air quality model performance was discussed previously in appendix E-2 of the OGV Fuel Rule Initial Statement of Reasons. (ARB, 2008)

Effects on PM2.5 Air Quality and Premature Cardiopulmonary Mortality

For annual average PM2.5 concentrations, all the scenarios show significant decreases in PM2.5 compared to the no-rule baseline MS1 (right panels in Figures C-3 through C-7). In addition, there are no on-shore areas of increased PM2.5 concentrations within the modeling domain for any of the scenarios. For all of the scenarios, the decreases in PM2.5 are the greatest around the Ports of Los Angeles and Long Beach and along the coastal regions. Although all scenarios show decreases in PM2.5, some of the scenarios, such as MS6 and MS4ws have large reductions over a wider geographic area.

To evaluate the public health impacts of the changes in PM2.5 concentrations, the model-simulated PM2.5 results were used to estimate impacts on annual cardiopulmonary mortality avoided for each scenario. The differences between the non-cancer health impacts for the scenario compared to the Baseline (MS1) provide a relative quantification of the public health impacts of each scenario. The results are summarized below in Table C-4.

Premature deaths from cardiopulmonary causes associated with exposure to PM2.5 were estimated using an approach based on a peer-reviewed methodology developed by the U.S. Environmental Protection Agency (EPA, 2010). Details of the approach and the key assumptions underlying it are described in Attachment C-3. Further details are supplied in a recent ARB staff report. (ARB, 2010)

To estimate premature deaths, staff developed population exposure estimates using the model-predicted concentrations of directly emitted diesel PM (primary diesel PM) and secondary PM within each modeling grid cell. The number of annual cases of death from cardiopulmonary causes associated with exposure to the PM2.5 was then estimated using a function relating PM2.5 exposure, the population affected, and the baseline incidence rates to cardiopulmonary mortality. Following the U.S. EPA's methodology, the PM2.5-mortality function used was from a recent, comprehensive nationwide study on the health effects of PM2.5 (Krewski et al., 2009). The populations within each grid cell were determined from U.S. Census Bureau year 2000 census data, projected to 2005. Mortality incidence rates were computed from California individual death records for 2005.

TableC-4: Annual Cardiopulmonary Mortality Compared to No Rule Baseline Scenario

Scenario Comparison	Description	Annual Cardiopulmonary Mortality		
		Low	Mean	High
MS2 vs MS1	Impacts of OGV Clean Fuel Regulation as originally anticipated when adopted-vessels continue to use the Channel Route and use clean fuels with in the 24 nm regulatory zone	540	700	850
MS6 vs MS1	Impacts if vessels use Outer Route and all use clean fuels	580	740	910
MS1A vs MS1	Impacts if only ECA Phase 1 ECA implemented, no ARB OGV Clean Fuel Regulation	280	360	440
MS4ws vs MS1	Impacts of proposed amendments – vessels return to pre-regulation traffic patterns and all vessels in the expanded regulatory zone use clean fuels	560	710	870
MS5 vs MS1	Current Situation – 75% of vessels that historically used Channel Route use Outer Route and HFO	500	650	790

As can be seen in Table C-4, there is considerable uncertainty associated with the methodology to estimate annual cardiopulmonary mortality, on the order of ± 25 percent. In all cases, the uncertainties for the scenarios overlap with each other and this needs to be taken into consideration when interpreting the values. However, comparing the mean values is helpful in providing a qualitative or directional indication of the relative differences between the impacts of the various scenarios such as:

- The cardiopulmonary premature deaths avoided are significant for all scenarios, greater than 350 premature deaths avoided annually for all scenarios.
- When comparing the impacts of vessels in the Channel Route using clean fuel and vessels in the Outer Route using HFO there is a small difference in the mean values (700 vs. 650) with the Outer Route having a slightly lower mean value. (MS2 vs. MS1) and (MS5 vs. MS1)
- Having vessels that use the Outer Route use the cleaner marine distillate fuels results in a small increase in the cardiopulmonary premature deaths avoided mean values (740 vs. 650) relative to not having them use the cleaner fuel. Comparison between (MS6 vs. MS1) and (MS5 vs. MS1)
- The OGV Clean Fuel Regulation is providing significant public health benefits prior to 2015 that are above and beyond what would be provided if only the North American ECA was implemented (650, 700 or 710 vs. 360) See comparison between (MS5, MS2 or MS4ws vs. MS1) and (MS1A vs. MS1)
- The proposed amendments to the OGV Clean Fuel Regulation will provide similar public health benefits to those anticipated when the regulation was

initially adopted (710 vs. 700). See comparison between (MS4ws vs. MS1) and (MS2 vs. MS1)

Ozone Air Quality

For most of the scenarios, there is very little difference in on-shore ozone concentrations relative to the baseline. As illustrated in the left panel of Figures 2 through 6, for the scenarios that do show ozone concentration changes in the figures, the differences are relatively small (+/-5%).

Attachment C-4 provides a summary of model-simulated percent changes in ozone concentrations applied to site-specific, 2005 ozone design values. Percentage changes from the modeling are calculated two ways: from the grid cell containing a specific monitoring station as well as for the 9 grid cells immediately surrounding the monitoring station. This information provides a scenario- and site-specific estimate of percentage change to ozone and how the respective level of changes might impact 2005 health-based ozone attainment levels (ARB does not currently estimate mortality impacts based on ozone). As with the small percent changes in the modeling results, the impact on design value concentrations is very minor.

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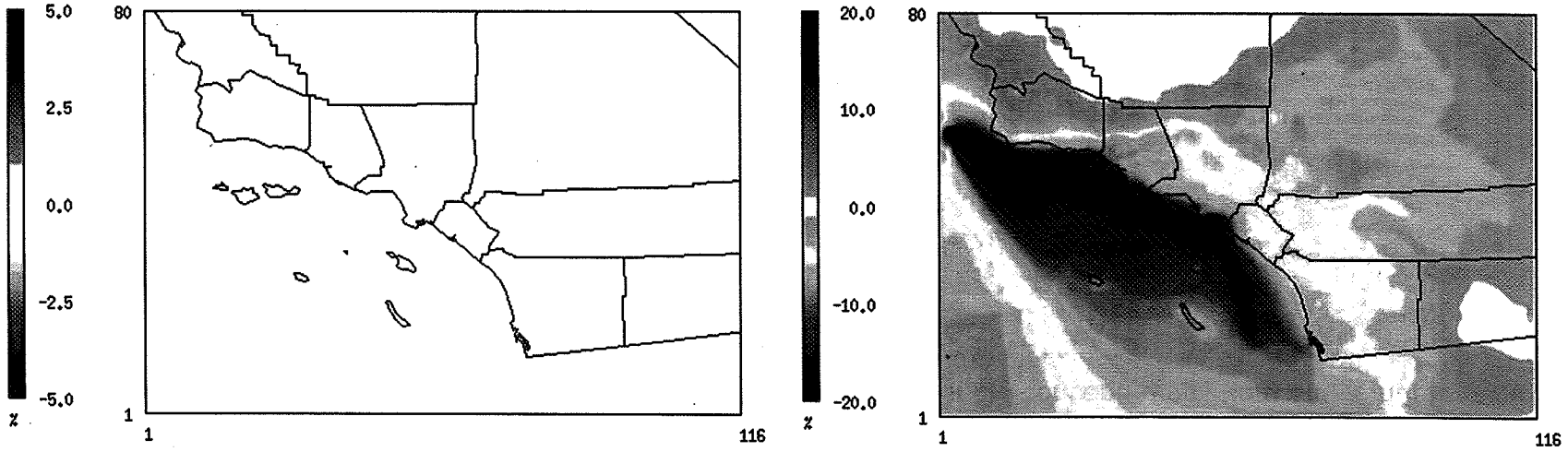


Figure C-3 (MS2 vs. MS1) The figures above illustrate model-simulated air quality benefits in the form of percentage decrease (i.e. a negative value is a decrease) in annual maximum 8-hour O3 concentrations (left) and annual average $PM_{2.5}$ concentrations (right). Only changes >1% and <-1% are shown in the plots.

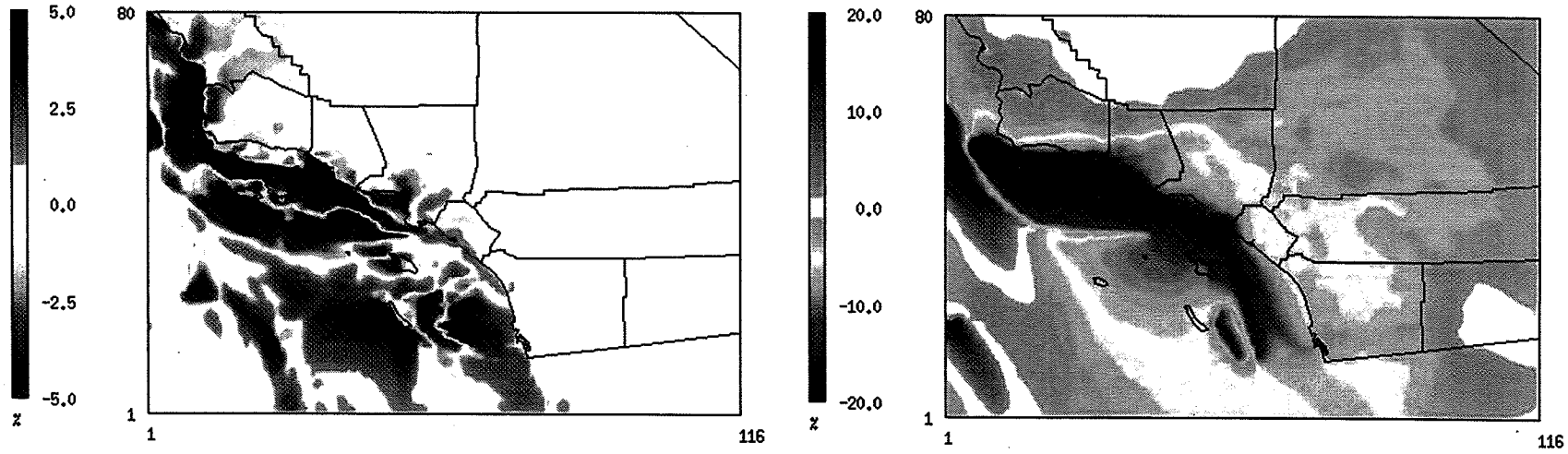


Figure C-4 (MS6 vs. MS1) The figures above illustrate model-simulated air quality benefits in the form of percentage decrease (i.e. a negative value is a decrease) in annual maximum 8-hour O3 concentrations (left) and annual average $PM_{2.5}$ concentrations (right). Only changes >1% and <-1% are shown in the plots.

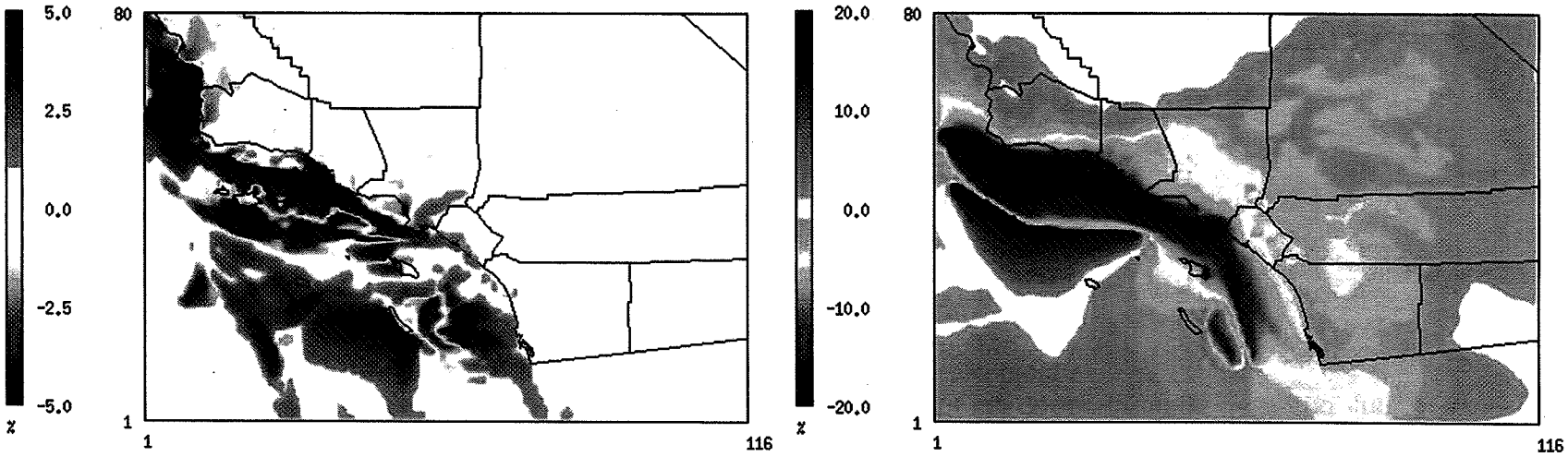


Figure C-5 (MS5 vs. MS1) The figures above illustrate model-simulated air quality benefits in the form of percentage decrease (i.e. a negative value is a decrease) in annual maximum 8-hour O3 concentrations (left) and annual average $PM_{2.5}$ concentrations (right). Only changes >1% and <-1% are shown in the plots.

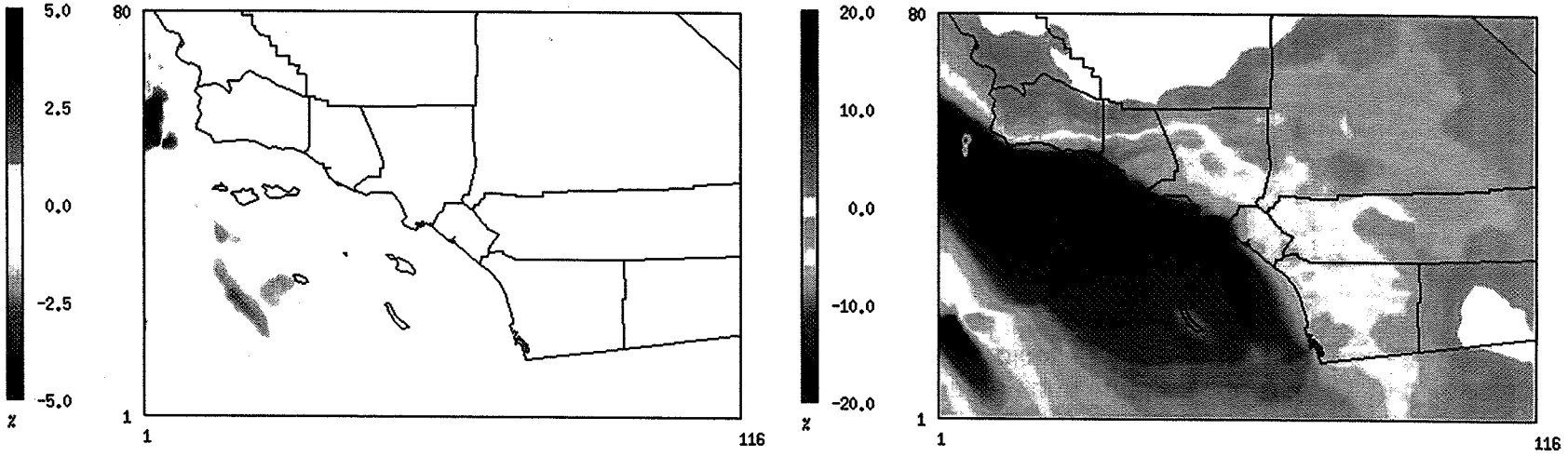
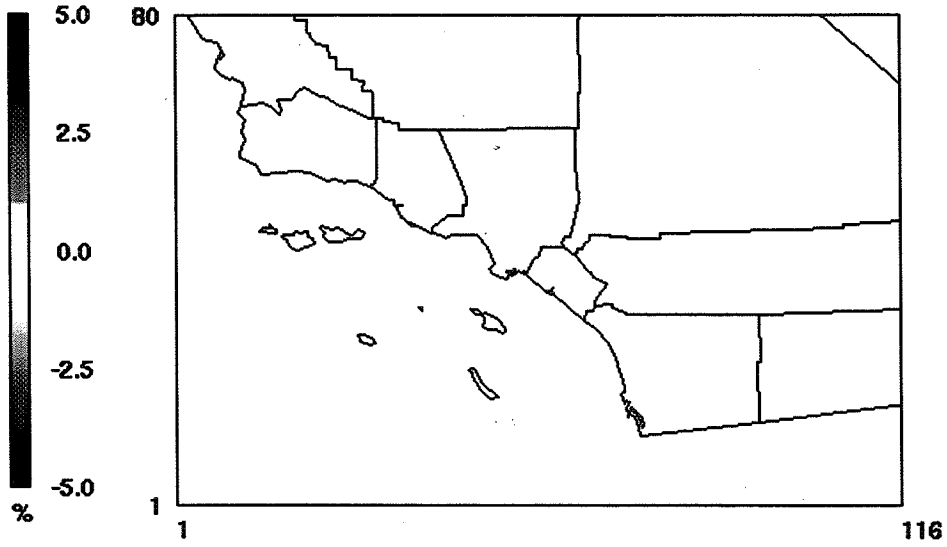


Figure C-6 (MS4ws vs. MS1) The figures above illustrate model-simulated air quality benefits in the form of percentage decrease (i.e. a negative value is a decrease) in annual maximum 8-hour O3 concentrations (left) and annual average $PM_{2.5}$ concentrations (right). Only changes >1% and <-1% are shown in the plots.



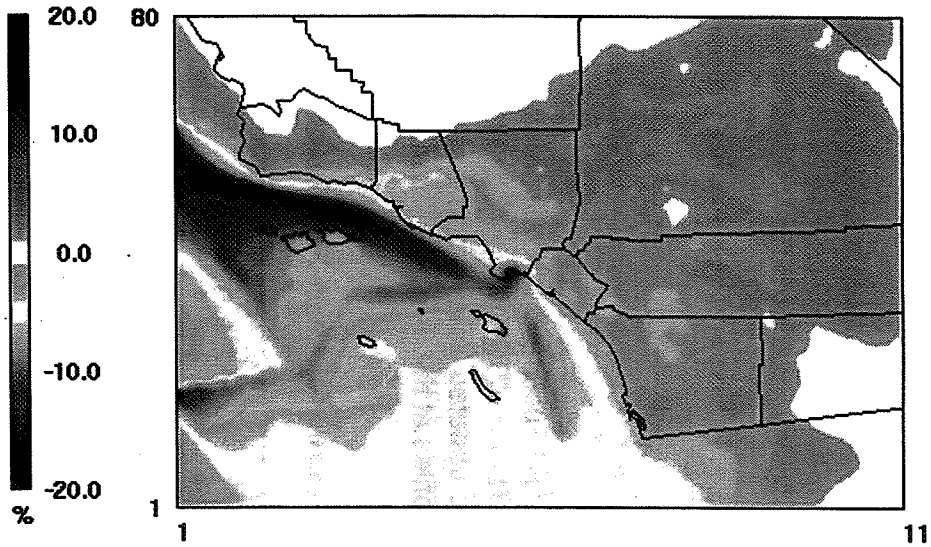


Figure C-7 (MS1A vs. MS1) The figures above illustrate model-simulated air quality benefits in the form of percentage decrease (i.e. a negative value is a decrease) in annual maximum 8-hour O3 concentrations (left) and annual average $PM_{2.5}$ concentrations (right). Only changes >1% and <-1% are shown in the plots.

Attachment C-1. Ocean-going Vessel (OGV) PM Speciation Profile Preparation

Background

PM speciation profiles 119 *(Marine Vessel-Liquid Fuel)* and 425 *(Diesel Vehicle Exhaust)*[1] were used for HFO (Heavy Fuel Oil) and MDO (Marine Diesel Oil) in the 2008 air quality modeling analysis because no updated OGV exhaust source testing data were available for creating speciation profiles at the time. A summary of these two profiles is as follows:

Table 1. PM Profiles 119 and 425 Used for 2008 Modeling Analysis

Size Fraction (by weight)	$PM_{2.5}$/TPM	PM_{10}/TPM
PM 119	0.937	0.96
PM 425	0.92	1.0

Weight Fraction (of PM mass)	$PM_{2.5}$				PM_{10}			
	EC	OC	SO_4^{2-}	others	EC	OC	SO_4^{2-}	others
PM 119	0.04	0	0.15	0.81	0.04	0	0.15	0.81
PM 425	0.264	0.694	0.0186	0.0235	0.261	0.689	0.0174	0.0328

In 2010, four new OGV PM speciation profiles were developed based on a series of newly conducted OGV exhaust source tests [2-5]. These profiles were prepared for OGV main engine (ME) and auxiliary engine (AE) operating on HFO, MDO, and blended fuel, with various sulfur contents (0.1% to 2.5%), which were involved in the air quality modeling scenarios. The four profiles include:

Profile Number	Profile Name
PM 1191	Ocean-Going Vessel Exhaust--HFO (2.5% Sulfur)
PM 1192	Ocean-Going Vessel Exhaust--HFO (1.0% Sulfur)
PM 1193	Ocean-Going Vessel Exhaust-- Blend (1.0% Sulfur)
PM 4251	Ocean-Going Vessel Exhaust-- MDO (0.1% Sulfur)

Methodology

- *PM 1191: Ocean-Going Vessel Exhaust--HFO (2.5% Sulfur)*

This profile was obtained by averaging the weight fractions of EC, OC and SO_4^{2-} in total PM mass from 18 source tests [2-5] of ME or AE running with HFO having sulfur contents ranging from 2.05% to 3.8%. Because the source tests were limited, it was assumed that the PM exhaust emitted from ME and AE have the same speciation composition for the same fuel. For each test, the weight fractions of EC, OC and SO_4^{2-} were calculated by dividing the emission factors of these species by the emission factor of the total PM mass.

Table 2. PM Profile 1191

HFO	Emission Factor (g/kW-hr)				Weight Fraction (of PM mass)		
	PM Mass	EC	OC	$H_2SO_4 \cdot 6.5H2O$	EC	OC	SO_4^{2-}
2.5% S	1.501 *(±0.881)**	0.015 *(±0.011)*	0.244 *(±0.112)*	1.080 *(±0.635)*	0.013 *(±0.012)*	0.212 *(±0.119)*	0.335 (±0.076)

* Average value (*±standard deviation*)

- *PM 1192: Ocean-Going Vessel Exhaust--HFO (1.0% Sulfur)*

The emission factors of EC and OC for OGV running with 1.0% sulfur HFO were assumed to be the same as those for OGV running with 2.5% sulfur HFO, which were calculated based on the 18 source tests mentioned previously. The emission factor of SO_4^{2-} was estimated by multiplying the fuel consumption rate (195 g/kW-hr)[6], fuel sulfur content (1.0%), conversion rate of fuel sulfur to SO_4^{2-} (3%)[6], and molecular weight ratio of SO_4^{2-} to sulfur. The weight fractions of EC, OC and SO_4^{2-} were then calculated from the emission factors.

Table 3. PM Profile 1192

HFO	Emission Factor (g/kW-hr)				Weight Fraction (of PM mass)		
	PM Mass	EC	OC	SO_4^{2-}	EC	OC	SO_4^{2-}
1.0% S	1.10[6]	0.015	0.244	0.176	0.014	0.222	0.160

- *PM 4251: Ocean-Going Vessel Exhaust-- MDO (0.1% Sulfur)*

This profile was obtained by averaging the weight fractions of EC, OC and SO_4^{2-} in total PM mass from 10 source tests [2, 3, 5] of ME or AE running with MDO with sulfur contents ranging from 0.05% to 0.2%. For each test, the weight fractions of EC, OC and SO_4^{2-}

were calculated by dividing the emission factors of these species by the emission factor of the total PM mass.

Table 4. PM Profile 4251

MDO	Emission Factor (g/kW-hr)				Weight Fraction (of PM mass)		
	PM Mass	EC	OC	$H_2SO_4 \cdot 6.5H2O$	EC	OC	SO_4^{2-}
0.1% S	0.338 *(±0.177)*	0.020 *(±0.019)*	0.111 *(±0.438)*	0.042 *(±0.014)*	0.052 *(±0.037)*	0.522 *(±0.114)*	0.080 *(±0.068)*

* Average value (±*standard deviation*)

- *PM 1193: Ocean-Going Vessel Exhaust--Blend (1.0% Sulfur)*

The emission factors of EC and OC for OGV running with 1.0% sulfur blend fuel were assumed to be the average values of those for HFO (2.5% S) and MDO (0.1% S). The emission factor of SO_4^{2-} was estimated by multiplying the fuel consumption rate (190 g/kW-hr)[6], fuel sulfur content (1.0%), conversion rate of fuel sulfur to SO_4^{2-} (3%) [6], and molecular weight ratio of SO_4^{2-} to sulfur. The weight fractions of EC, OC and SO_4^{2-} were then calculated from the known emission factors.

Table 5. PM Profile 1193

Blend	Emission Factor (g/kW-hr)				Weight Fraction (of PM mass)		
	PM Mass	EC	OC	SO_4^{2-}	EC	OC	SO_4^{2-}
1.0% S	0.80[6]	0.018	0.213	0.171	0.023	0.266	0.214

Summary

It should be noted that all of the source tests cited in this work were conducted for $PM_{2.5}$ only, and it was assumed that same speciation profiles can be used for PM_{10} and TPM for the same fuel. It was also assumed that PM 1191 and PM1192 have the same $PM_{2.5}$ and PM_{10} size fractions as PM 119; PM 4251 and PM 1193 have the same $PM_{2.5}$ and PM_{10} size fractions as PM 425. The size fractions, speciation profiles and factors used to convert profiles PM 119 and PM 425 to the updated profiles are summarized in the following tables.

Table 6. Size Fraction Summary of New OGV Profiles

Size Fraction (by weight)	$PM_{2.5}$/TPM	PM_{10}/TPM
PM 1191	0.937	0.96

PM 1192	0.937	0.96
PM 1193	0.92	1.0
PM 4251	0.92	1.0

Table 7. Speciation Summary of New OGV Profiles

Weigh Fraction (of PM mass)	$PM_{2.5}$ Fraction				PM_{10} Fraction			
	EC	OC	SO_4^{2-}	others	EC	OC	SO_4^{2-}	others
PM 1191	0.013	0.212	0.335	0.440	0.013	0.212	0.335	0.440
PM 1192	0.014	0.222	0.160	0.604	0.014	0.222	0.160	0.604
PM 1193	0.023	0.266	0.214	0.497	0.023	0.266	0.214	0.497
PM 4251	0.052	0.522	0.080	0.346	0.052	0.522	0.080	0.346

Table 8. Conversion Factors Used to Create New OGV Profiles from Old Profiles

Conversion Factor	$PM_{2.5}$ Fraction				PM_{10} Fraction			
	EC	OC	SO_4^{2-}	others	EC	OC	SO_4^{2-}	others
PM 1191/ PM 119	0.33		2.23	0.54	0.33		2.23	0.54
PM 1192/ PM 119	0.35		1.07	0.75	0.35		1.07	0.75
PM 1193/ PM 119	0.58		1.43	0.61	0.58		1.43	0.61
PM 4251/PM 425	0.20	0.75	4.29	14.74	0.20	0.76	4.59	10.56

*Note: there is no OC in PM 119, so no conversion factor can apply.

References for Appendix C Attachment C-1:

1. *California Air Resources Board Main Speciation Profiles*. California Air Resources Board: 2008; http://www.arb.ca.gov/ei/speciate/speciate.htm. Accessed July 7, 2010.
2. Miller, J. W.; Nigam, A.; Welch, W. A.; Cocker, D. R. *Measurement of Criteria and Greenhouse Gas Emissions from Auxiliary Engines on Ocean-Going Vessels Operating on Heavy Fuel Oil and Marine Diesel Oil*; Califorina Air Resources Board: 2009.
3. Miller, J. W.; Agrawal, H.; Welch, W. A. *Criteria Emissions from the Main Propulsion Engine of a Post-Panamax Class Container Vessel Using Distillate and Residual Fuels*; California Air Resources Board: 2009.
4. Miller, J. W.; Agrawal, H.; Welch, W. A. *Measurement of Emissions from the Main Propulsion Engine (MAN B&W 11K90MC-C) on a Panamax Class Container Ship.*; Califorina Air Resources Board: 2009.
5. Jayaram, V.; Miller, J. W.; Nigam, A.; Welch, W. A. *Effect of Selective Catalytic Reduction Unit on Emissions from an Auxiliary Engine on an Ocean-Going Vessel*; California Air Resources Board: 2009.

6. Soriano, B. L.; Milkey, P.; Alexis, A.; Di, P.; Du, S.; Lu, J.; Hand, R.; Houghton, M.; Komlenic, M.; Suer, C.; Williams, L.; Zuo, Y.-P. *Initial Statement of Reasons for Proposed Rulemaking: Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessel within California Waters and 24 Nautical Miles of the California Baseline*; California Air Resources Board: Sacramento, CA, June 2008.

Attachment C-2. Ocean-going Vessel (OGV) Gridded Emissions Inventory

The following plots show the spatial allocation of emissions in tons for NOx, PM25, and SOx by scenario. The accompanying tables give emission totals in tons for the entire domain (Total) and indicated sub-regions. *SCOS* refers to the SCOS domain only, *24nm* refers to the region within 24nm of the coastline, *SCOS 24nm* is the portion of the 24nm zone within the SCOS domain, and *SB Box* is an arbitrary region used to estimate emissions directly offshore of Santa Barbara County. Figure 1b visually identifies the sub-regions

Figure 1. NOx, PM25, and SOx emissions for Scenario MS1

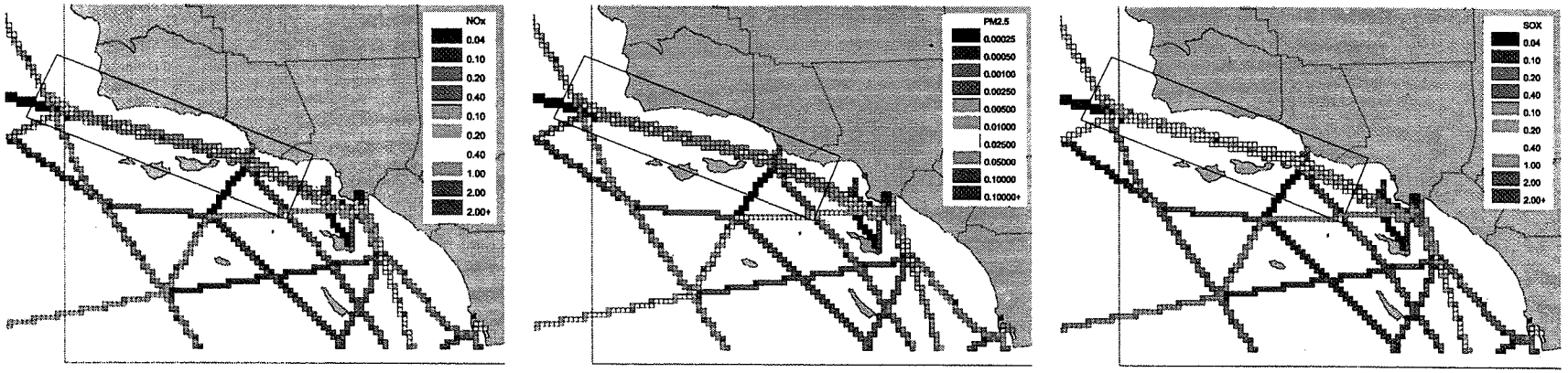


Table 1. Scenario MS1 NOx, PM25, and SOx emission totals by region

MS1	NOx	SOx	PM2.5
Total	297.1	202.2	26.1
SCOS	118.8	88.7	10.9
24nm	169.4	124.9	15.4
SCOS 24nm	99.3	76.7	9.2
SB Box	63.2	38.5	5.3

Figure 1b.

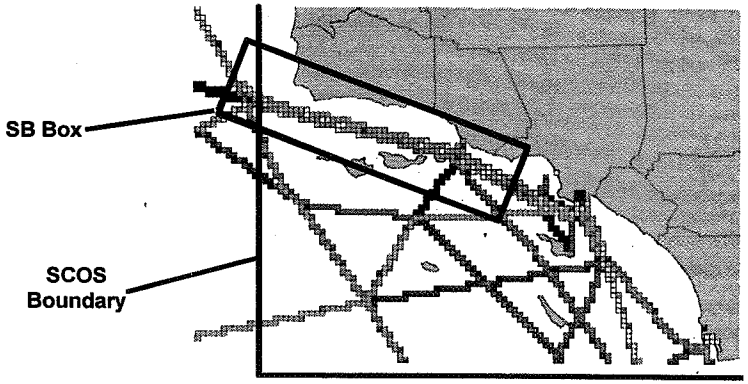


Figure 2. NOx, PM25, and SOx emissions for Scenario MS2

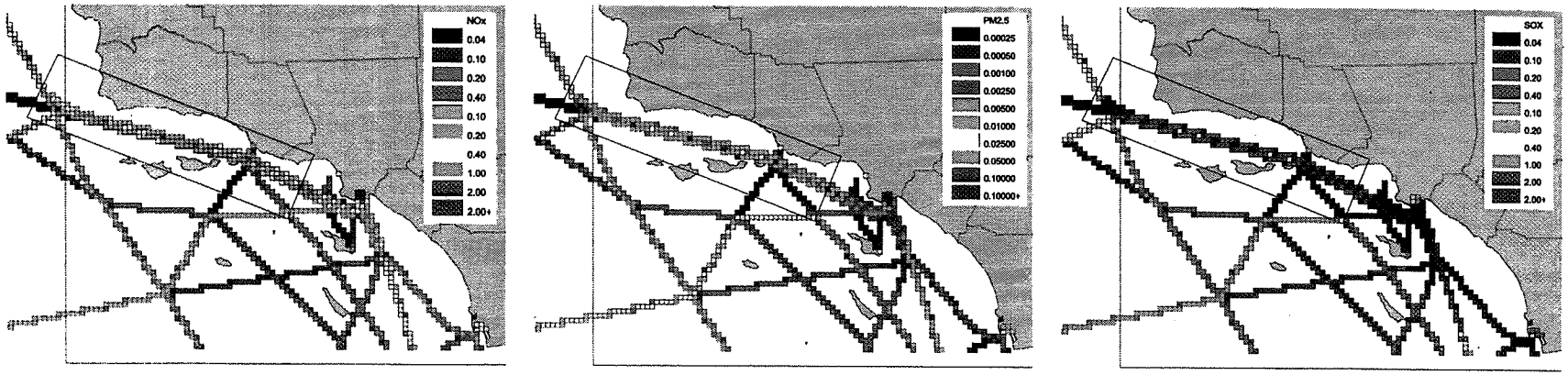


Table 2. Scenario MS2 NOx, PM25, and SOx emission totals by domain and differences from Scenario MS1

MS2	NOx	SOx	PM2.5
Total	289.0	83.0	12.8
SCOS	114.1	15.7	3.1
24nm	161.3	5.7	2.5
SCOS 24nm	94.6	3.7	1.5
SB Box	60.2	3.0	1.0

MS2 - MS1	NOx	SOx	PM2.5
Total	-8.1	-119.2	-13.3
SCOS	-4.7	-73.0	-7.7
24nm	-8.1	-119.2	-12.8
SCOS 24nm	-4.7	-73.0	-7.7
SB Box	-3.0	-35.5	-4.3

Figure 3. NOx, PM25, and SOx emissions for Scenario MS5

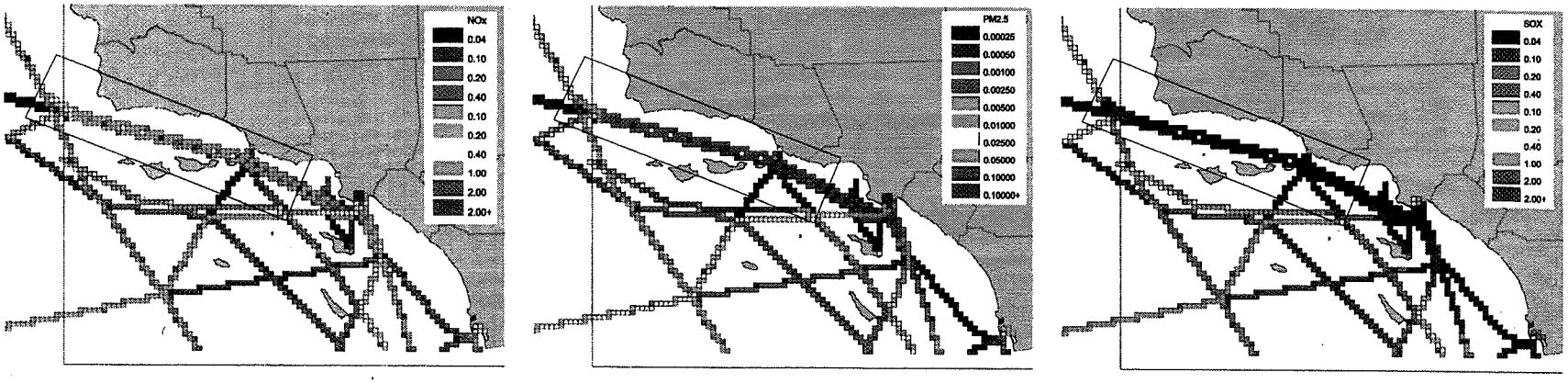


Table 3. Scenario MS5 NOx, PM25, and SOx emission totals by domain and differences from Scenario MS1 and Scenario MS2

MS5	NOx	SOx	PM2.5
Total	285.5	102.6	15.7
SCOS	110.6	35.2	5.5
24nm	124.4	4.9	2.1
SCOS 24nm	57.7	2.9	1.1
SB Box	27.8	3.1	0.7

MS5 - MS1	NOx	SOx	PM2.5
Total	-11.6	-99.6	-10.4
SCOS	-8.2	-53.5	-5.3
24nm	-45.0	-120.0	-13.3
SCOS 24nm	-41.6	-73.8	-8.2
SB Box	-35.4	-35.4	0.7

MS5 - MS2	NOx	SOx	PM2.5
Total	-3.5	19.5	2.8
SCOS	-3.5	19.5	2.4
24nm	-36.9	-0.8	-0.4
SCOS 24nm	-36.9	-0.8	-0.5
SB Box	-32.4	0.1	-0.3

Figure 4. NOx, PM25, and SOx emissions for Scenario MS6

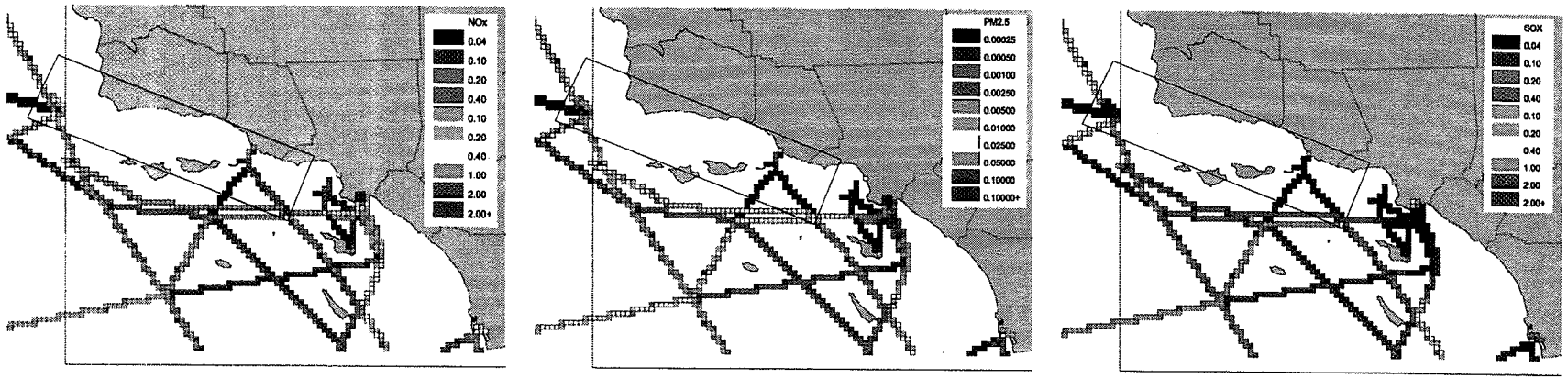


Table 4. Scenario MS6 NOx, PM25, and SOx emission totals by domain and differences from Scenario MS1 and Scenario MS2

MS6	NOx	SOx	PM2.5
Total	280.2	85.6	13.6
SCOS	114.5	23.8	4.2
24nm	110.0	4.6	1.9
SCOS 24nm	46.9	4.7	1.1
SB Box	14.8	2.0	0.4

MS6 - MS1	NOx	SOx	PM2.5
Total	-17.0	-116.6	-12.5
SCOS	-4.3	-64.9	-6.6
24nm	-59.4	-120.3	-13.5
SCOS 24nm	-52.4	-72.0	-8.1
SB Box	-48.4	-36.5	0.4

MS6 - MS2	NOx	SOx	PM2.5
Total	-8.8	2.6	0.8
SCOS	0.4	8.1	1.1
24nm	-51.3	-1.1	-0.6
SCOS 24nm	-47.7	1.1	-0.4
SB Box	-45.5	-1.0	-0.6

Figure 5. NOx, PM25, and SOx emissions for Scenario MS4ws

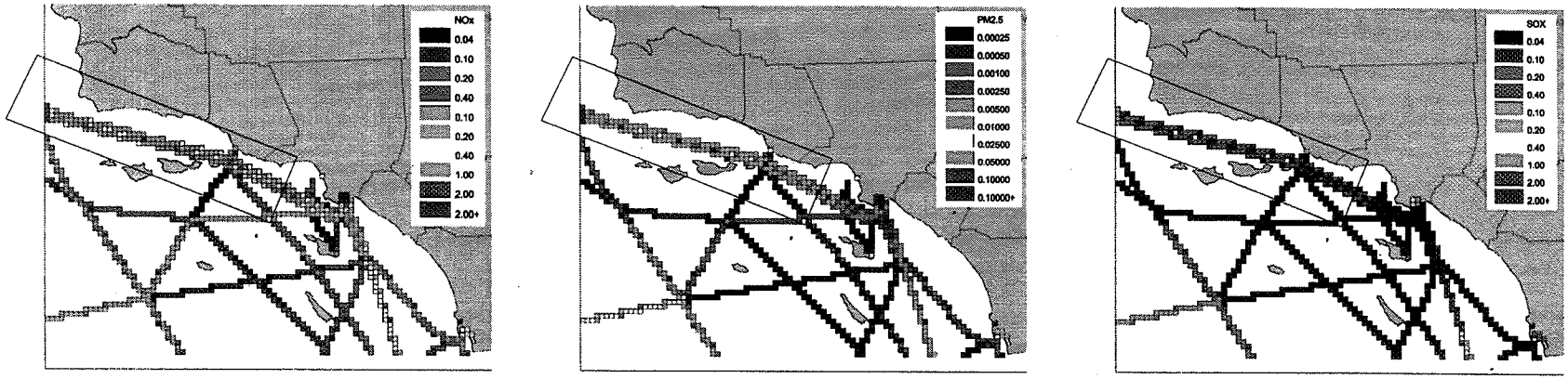


Table 5. Scenario 17ws NOx, PM25, and SOx emission totals by domain and differences from Scenario MS1 and Scenario MS2

MS4ws	NOx	SOx	PM2.5
Total	284.4	74.3	12.3
SCOS	109.8	10.9	2.6
24nm	163.0	9.1	3.1
SCOS 24nm	96.3	7.1	2.0
SB Box	59.1	4.3	1.2

MS4ws - MS1	NOx	SOx	PM2.5
Total	-12.7	-127.9	-13.8
SCOS	-9.0	-77.8	-8.2
24nm	-6.4	-115.8	-12.3
SCOS 24nm	-3.0	-69.6	-7.2
SB Box	-4.1	-34.2	0.4

MS4ws - MS2	NOx	SOx	PM2.5
Total	-4.6	-8.7	-0.5
SCOS	-4.3	-4.8	-0.5
24nm	1.7	3.4	0.6
SCOS 24nm	1.7	3.4	0.5
SB Box	-1.1	1.3	0.2

Figure 6. NOx, PM25, and SOx emissions for Scenario MS1A

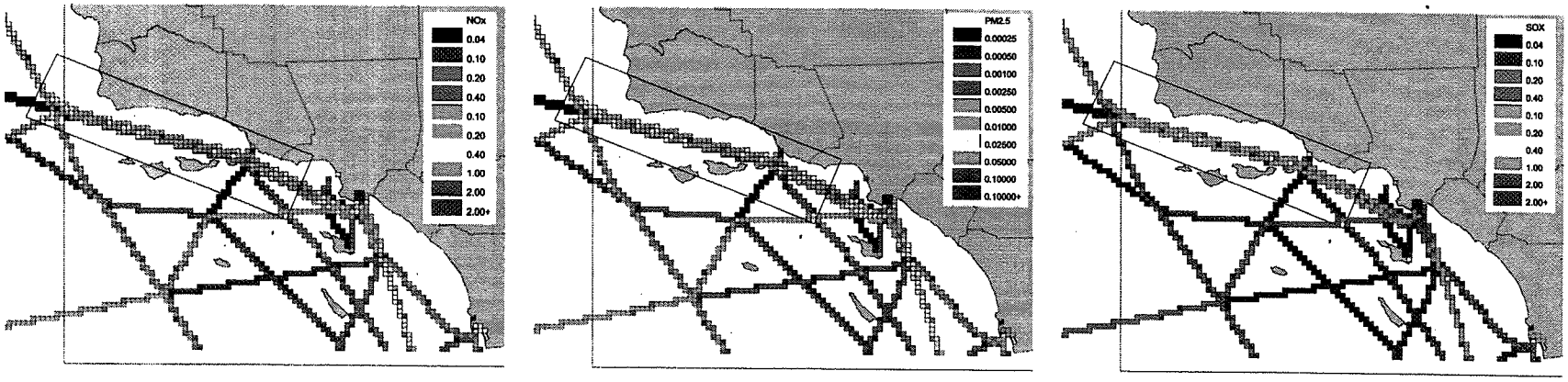


Table 6. Scenario MS1A NOx, PM25, and SOx emission totals by domain and differences from Scenario MS1 and Scenario MS2

MS1A	NOx	SOx	PM2.5
Total	297.1	81.7	19.1
SCOS	118.8	36.0	8.0
24nm	169.4	50.7	11.3
SCOS 24nm	99.3	31.2	6.8
SB Box	63.2	15.5	3.9

MS1A - MS1	NOx	SOx	PM2.5
Total	0.0	-120.5	-7.0
SCOS	0.0	-52.7	-2.9
24nm	0.0	-74.2	-4.1
SCOS 24nm	0.0	-45.5	-2.4
SB Box	0.0	-23.1	3.5

MS1A - MS2	NOx	SOx	PM2.5
Total	8.1	-1.3	6.3
SCOS	4.7	20.3	4.9
24nm	8.1	45.0	8.7
SCOS 24nm	4.7	27.5	5.2
SB Box	3.0	12.5	2.9

Attachment C-3: Health Benefits Associated with Reductions in PM Emissions from the OGV Regulation

Overview

The estimate of the number of PM2.5-associated premature deaths is based on a peer-reviewed methodology developed by the U.S. Environmental Protection Agency (U.S. EPA, 2010). Calculation of this estimate requires information on the concentration of PM2.5, the population exposed, the baseline incidence rates, and a concentration-response function relating changes in PM2.5 exposure to changes in mortality incidence. This information is available as part of the rulemaking package and can be found at the following link: http://www.arb.ca.gov/ports/marinevess/ogv/ogv1085.htm.

Estimating population exposure to PM2.5

PM2.5 concentrations were estimated for a domain covering southern California using the Community Multi-scale Air Quality model as described in this appendix. Primary and secondary PM2.5 concentrations were modeled for five scenarios of OGV emission controls, and a baseline scenario representing no emission controls.

Population at the Census Tract Level

Age-resolved population data at the census tract level, for the 2000 Census, were obtained from the United States Census Bureau (Census Bureau). These were projected to 2005 using age-resolved county population projections from the California Department of Finance (CDOF).

Age-specific population growth factors for each county, for each year, were computed from the CDOF projections by dividing each county population for 2005 by the county population for the year 2000. Since each census tract lies entirely in a county, these growth factors were applied to each census tract in the county, each age group separately. Population was projected for ten-year age groups 25-34 through 75-84, and for age 85 and older.

This method of projection reflects growth in overall county population, but does not model changes in population distribution within counties, such as expansion of urban areas into surrounding rural land.

Baseline Cardiopulmonary Mortality Incidence Rate

Baseline cardiopulmonary mortality incidence rates vary by age bracket. Incidence was estimated separately for ten-year age groups 25-34 through 75-84, and age 85 and older. Baseline incidence rates were estimated at the county level from individual death records for the year 2005, obtained from the California Department of Public Health (CDPH). Cardiopulmonary mortality was defined as ICD9 codes 161-187 and 192-214.

The county of residence of the decedent was generally not recorded. However, the Federal Information Processing Standards (FIPS) city code and the ZIP code were usually recorded. The FIPS city code unambiguously identifies the county, but was sometimes invalid, unrecorded, or recorded as "unknown". When the FIPS code was not available it was sometimes possible to identify the county from the ZIP code, but ZIP codes can overlap multiple counties. In cases where 90% or

more of the area of the decedent's zip code lay entirely within a county, the death was assigned to that county. A handful of records included invalid dates. The breakdown of records was as follows:

County identified by FIPS code	231,181	96.6%
County identified by ZIP code	4,196	1.8%
Unidentified or invalid data	3,851	1.6%

Because the county could not be determined for 1.6% of the records, the incidence is slightly underestimated. No adjustment was made to compensate for excluded records.

Concentration-Response Function

The concentration-response (C-R) function used in this analysis is from U.S. EPA Quantitative Health Risk Assessment (EPA, 2010). In their assessment, the U.S. EPA used the C-R function from a recent comprehensive epidemiological study of the health effects of PM2.5 (Krewski et al., 2009).

U.S. EPA chose Krewski et al. (2009) for quantifying PM2.5-related mortality from long-term PM2.5 exposure for several reasons. First, the cohort includes both men and women, and enrollment was not dependent on underlying health status. It includes data from cities from across the U.S. PM2.5 exposure was based on monitored data collected over two time periods (1979-1983 and 1999-2000); the effect estimates were presented both for each time period and as an average. The study was validated through extensive reanalysis that demonstrated the results to be robust. Extensive exploratory analysis of potential individual and ecologic covariates was conducted, and the results were adjusted for all covariates that influenced the model fit. Finally, spatial autocorrelation was evaluated and adjusted for in the ecologic covariates.

The C-R function employed in this analysis was the one developed for the 1999-2000 time period.

Aggregating results to county, air basin and state

To aggregate results from census tracts to larger geographical subdivisions such as counties or air basins, we used a GIS technique called areal interpolation. Areal interpolation is a procedure for translating spatial data from one set of geographical subdivisions to another when the boundaries do not exactly overlap. Numerous variants of the technique exist, but for the purpose of this analysis the simplest form, which uses area of polygon intersection, was employed (Goodchild and Lam, 1980; Flowerdew and Green, 1994).

The precision of areal interpolation based on area of intersection depends on the relative size of the geographical subdivisions and the homogeneity of the spatial distribution of the quantity being apportioned. In urban areas, where census tracts are small and population is distributed more evenly, areal interpolation to larger subdivisions such as air basins yields relatively precise estimates. In rural areas where the population is distributed unevenly over large census tracts, estimates are less precise.

Based on our analysis, we estimated the average numbers of cases per year for each of the six scenarios. The results of this analysis are provided in Table C-3-1 below.

Table C-3-1: Annual Cardiopulmonary Mortality Compared to No-rule Baseline Scenario

Scenario	Annual Cardiopulmonary Mortality		
	Low	**Mean**	**High**
MS2 vs MS1	540	700	850
MS6 vs MS1	580	740	910
MS1A vs MS1	280	360	440
MS4ws vs MS1	560	710	870
MS5 vs MS1	500	650	790

Attachment C-4. Ocean-going Vessel (OGV) Model-Adjusted 8 Hour Ozone Design Values

Background

The following tables show estimates of the potential effects of OGV scenarios on 2005 8-hr ozone design values for ozone montoring stations located in the domain. The tables include the original, observation-based design values ($DV_{current}$) and the model- adjusted design values ($DV_{adjusted}$). The model-adjusted DVs are calculated by applying the model-simulated percent difference calculated in the grid cell(s) containing or surrounding the monitoring station to the current DVs (where the percent difference is calculated between the specified modeling scenario and the baseline case, Scenario MS1). For example:

$$\text{Current DV} * (\text{Modeled Ozone}_{MS2} - \text{Modeled Ozone}_{MS1}) / \text{Modeled Ozone}_{MS1} = \text{Adjusted DV}$$

Model-adjusted DVs are provided for two cases: 1) for the single grid cell containing the monitoring site; and 2) the min, max and average for the 9-cells surrounding the monitoring site, including the cell within which the site is located.

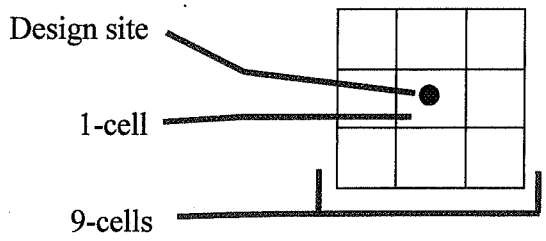


Table C-4-1. Current DVs ("Obs") and Adjusted DVs based on Modeled Percent Differences MS2 vs. MS1

Ozone (ppm)			MS2 vs MS1		Model Adjusted			
					1-Cell	9-Cell		
County	Basin	SiteID	Site Name	Obs	Adj	Min	Ave	Max
Imperial	SS	2551	El Centro-9th Street	0.084	0.084	0.084	0.084	0.084
	SS	2997	Calexico-Grant Street	0.069	0.069	0.069	0.069	0.069
	SS	3135	Calexico-Ethel Street	0.071	0.071	0.071	0.071	0.071
	SS	3143	Westmorland-W 1st Street	0.079	0.079	0.079	0.079	0.079
	SS	3173	Calexico-East	0.075	0.075	0.075	0.075	0.075
	SS	3186	Niland-English Road	0.072	0.072	0.072	0.072	0.072
Kern	SJV	2312	Edison	0.097	0.097	0.097	0.097	0.097
	SJV	2772	Oildale-3311 Manor Street	0.096	0.096	0.096	0.096	0.096
	SJV	2919	Maricopa-Stanislaus Street	0.091	0.091	0.091	0.091	0.091
	SJV	2941	Arvin-Bear Mountain Blvd	0.113	0.113	0.113	0.113	0.113
	SJV	2981	Shafter-Walker Street	0.090	0.090	0.090	0.090	0.090
	MD	3121	Mojave-923 Poole Street	0.090	0.090	0.090	0.090	0.090
	SJV	3145	Bakersfield-Golden State Highway	0.090	0.090	0.090	0.090	0.090
	SJV	3146	Bakersfield-5558 California Avenue	0.097	0.097	0.097	0.097	0.097
Los Angeles	SC	2160	Pasadena-S Wilson Avenue	0.093	0.093	0.093	0.093	0.093
	SC	2166	Pico Rivera	0.070	0.070	0.070	0.070	0.070
	SC	2420	Reseda	0.106	0.106	0.106	0.106	0.106
	SC	2429	North Long Beach	0.064	0.064	0.064	0.064	0.064
	SC	2484	Azusa	0.094	0.094	0.094	0.094	0.094
	SC	2492	Burbank-W Palm Avenue	0.089	0.089	0.089	0.089	0.089
	SC	2494	West Los Angeles-VA Hospital	0.078	0.078	0.078	0.078	0.078
	SC	2583	Lynwood	0.061	0.061	0.061	0.061	0.061
	SC	2849	Glendora-Laurel	0.105	0.105	0.105	0.105	0.105
	SC	2898	Pomona	0.100	0.100	0.100	0.100	0.100
	SC	2899	Los Angeles-North Main Street	0.076	0.076	0.076	0.076	0.076
	SC	3502	Santa Clarita	0.120	0.120	0.120	0.120	0.120
	MD	3658	Lancaster-43301 Division Street	0.098	0.098	0.098	0.098	0.098
Orange	SC	2249	La Habra	0.073	0.073	0.073	0.073	0.073
	SC	2937	Costa Mesa-Mesa Verde Drive	0.073	0.073	0.073	0.073	0.073
	SC	3265	Mission Viejo-26081 Via Pera	0.086	0.086	0.086	0.086	0.086
	SC	3674	Anaheim-Pampas Lane	0.081	0.081	0.081	0.081	0.081
Riverside	SS	2199	Palm Springs-Fire Station	0.104	0.104	0.104	0.104	0.104
	SC	2525	Perris	0.098	0.098	0.098	0.098	0.098
	SC	2596	Riverside-Rubidoux	0.112	0.112	0.112	0.112	0.112
	SS	2878	Indio-Jackson Street	0.095	0.095	0.095	0.095	0.095
	SC	2943	Lake Elsinore-W Flint Street	0.104	0.104	0.104	0.104	0.104
	SC	3168	Banning Airport	0.119	0.119	0.119	0.119	0.119

San Bernardino	SC	2077	Redlands-Dearborn	0.123	0.123	0.123	0.123	0.123
	SC	2221	San Bernardino-4th Street	0.116	0.116	0.116	0.116	0.116
	SC	2266	Fontana-Arrow Highway	0.118	0.118	0.118	0.118	0.118
	SC	2485	Upland	0.106	0.106	0.106	0.106	0.106
	SC	2499	Crestline	0.127	0.127	0.127	0.127	0.127
	MD	2650	Hesperia-Olive Street	0.104	0.104	0.104	0.104	0.104
	MD	2830	Phelan-Beekley Road and Phelan Road	0.100	0.100	0.100	0.100	0.100
	MD	2923	Barstow	0.085	0.085	0.085	0.085	0.085
	MD	3124	Twentynine Palms-Adobe Road #2	0.085	0.085	0.085	0.085	0.085
	MD	3152	Joshua Tree-National Monument	0.105	0.105	0.105	0.105	0.105
	MD	3500	Victorville-14306 Park Avenue	0.094	0.094	0.094	0.094	0.094
San Diego	SD	2040	San Diego-Overland Avenue	0.074	0.074	0.074	0.074	0.074
	SD	2263	Escondido-E Valley Parkway	0.073	0.073	0.073	0.073	0.073
	SD	2327	El Cajon-Redwood Avenue	0.070	0.070	0.070	0.070	0.070
	SD	2368	Del Mar-Mira Costa College	0.070	0.070	0.070	0.070	0.070
	SD	2460	Alpine-Victoria Drive	0.086	0.086	0.086	0.086	0.086
	SD	2589	Chula Vista	0.064	0.064	0.064	0.064	0.064
	SD	2933	Otay Mesa-Paseo International	0.065	0.065	0.065	0.065	0.065
	SD	2964	San Diego-12th Avenue	0.060	0.060	0.060	0.060	0.060
	SD	3198	Camp Pendleton	0.076	0.076	0.076	0.076	0.076
San Luis Obispo	SCC	2321	Morro Bay	0.056	0.056	0.056	0.056	0.056
	SCC	2671	Grover City-Lesage Drive	0.058	0.058	0.058	0.058	0.058
	SCC	2709	San Luis Obispo-Marsh Street	0.057	0.057	0.057	0.057	0.057
	SCC	2955	Paso Robles-Santa Fe Avenue	0.071	0.071	0.071	0.071	0.071
	SCC	2965	Atascadero-Lewis Avenue	0.068	0.068	0.068	0.068	0.068
	SCC	3251	Nipomo-Regional Park	0.064	0.064	0.064	0.064	0.064
Santa Barbara	SCC	2008	El Capitan Beach	0.067	0.067	0.067	0.067	0.067
	SCC	2360	Lompoc-S H Street	0.056	0.056	0.056	0.056	0.056
	SCC	2593	Santa Ynez-Airport Road	0.068	0.068	0.068	0.068	0.068
	SCC	2954	Gaviota-GTC Site B	0.060	0.060	0.060	0.060	0.060
	SCC	2957	Paradise Road-Los Padres National Forest	0.078	0.078	0.078	0.078	0.078
	SCC	2992	Lompoc-HSandP	0.070	0.070	0.070	0.070	0.070
	SCC	3003	Carpinteria-Gobernador Road	0.064	0.064	0.064	0.064	0.064
	SCC	3023	Vandenberg Air Force Base-STS Power	0.069	0.069	0.069	0.069	0.069
	SCC	3101	Las Flores Canyon #1	0.074	0.074	0.074	0.074	0.074
	SCC	3153	Goleta-Fairview	0.064	0.064	0.064	0.064	0.064
	SCC	3486	Santa Maria-906 S Broadway	0.053	0.053	0.053	0.053	0.053
	SCC	3665	Santa Barbara-700 East Canon Perdido	0.064	0.064	0.064	0.064	0.064
Ventura	SCC	2088	Ventura-Emma Wood State Beach	0.068	0.068	0.068	0.068	0.068
	SCC	2880	Simi Valley-Cochran Street	0.091	0.091	0.091	0.091	0.091
	SCC	2984	Thousand Oaks-Moorpark Road	0.083	0.083	0.083	0.083	0.083
	SCC	2991	El Rio-Rio Mesa School #2	0.066	0.066	0.066	0.066	0.066
	SCC	3172	Ojai-Ojai Avenue	0.090	0.090	0.090	0.090	0.090
	SCC	3505	Piru-3301 Pacific Avenue	0.087	0.087	0.087	0.087	0.087

Table C-4-2. Current DVs ("Obs") and Adjusted DVs based on Modeled Percent Differences MS5 vs. MS1

Ozone (ppm)			MS5 vs MS1		Model Adjusted			
					1-Cell	9-Cell		
County	Basin	SiteID	Site Name	Obs	Adj	Min	Ave	Max
Imperial	SS	2551	El Centro-9th Street	0.084	0.084	0.084	0.084	0.084
	SS	2997	Calexico-Grant Street	0.069	0.069	0.069	0.069	0.069
	SS	3135	Calexico-Ethel Street	0.071	0.071	0.071	0.071	0.071
	SS	3143	Westmorland-W 1st Street	0.079	0.079	0.079	0.079	0.079
	SS	3173	Calexico-East	0.075	0.075	0.075	0.075	0.075
	SS	3186	Niland-English Road	0.072	0.072	0.072	0.072	0.072
Kern	SJV	2312	Edison	0.097	0.097	0.097	0.097	0.097
	SJV	2772	Oildale-3311 Manor Street	0.096	0.096	0.096	0.096	0.096
	SJV	2919	Maricopa-Stanislaus Street	0.091	0.091	0.091	0.091	0.091
	SJV	2941	Arvin-Bear Mountain Blvd	0.113	0.113	0.113	0.113	0.113
	SJV	2981	Shafter-Walker Street	0.090	0.090	0.090	0.090	0.090
	MD	3121	Mojave-923 Poole Street	0.090	0.090	0.090	0.090	0.090
	SJV	3145	Bakersfield-Golden State Highway	0.090	0.090	0.090	0.090	0.090
	SJV	3146	Bakersfield-5558 California Avenue	0.097	0.097	0.097	0.097	0.097
Los Angeles	SC	2160	Pasadena-S Wilson Avenue	0.093	0.093	0.093	0.093	0.093
	SC	2166	Pico Rivera	0.070	0.071	0.070	0.071	0.071
	SC	2420	Reseda	0.106	0.105	0.104	0.105	0.106
	SC	2429	North Long Beach	0.064	0.065	0.064	0.065	0.065
	SC	2484	Azusa	0.094	0.095	0.094	0.095	0.095
	SC	2492	Burbank-W Palm Avenue	0.089	0.088	0.088	0.088	0.089
	SC	2494	West Los Angeles-VA Hospital	0.078	0.077	0.076	0.077	0.078
	SC	2583	Lynwood	0.061	0.062	0.061	0.062	0.062
	SC	2849	Glendora-Laurel	0.105	0.106	0.105	0.106	0.106
	SC	2898	Pomona	0.100	0.101	0.101	0.101	0.101
	SC	2899	Los Angeles-North Main Street	0.076	0.076	0.075	0.076	0.076
	SC	3502	Santa Clarita	0.120	0.120	0.120	0.120	0.120
	MD	3658	Lancaster-43301 Division Street	0.098	0.098	0.098	0.098	0.098
Orange	SC	2249	La Habra	0.073	0.074	0.073	0.074	0.074
	SC	2937	Costa Mesa-Mesa Verde Drive	0.073	0.074	0.073	0.074	0.074
	SC	3265	Mission Viejo-26081 Via Pera	0.086	0.086	0.085	0.086	0.087
	SC	3674	Anaheim-Pampas Lane	0.081	0.081	0.080	0.081	0.081
Riverside	SS	2199	Palm Springs-Fire Station	0.104	0.104	0.104	0.104	0.104
	SC	2525	Perris	0.098	0.098	0.098	0.098	0.098
	SC	2596	Riverside-Rubidoux	0.112	0.112	0.112	0.112	0.113
	SS	2878	Indio-Jackson Street	0.095	0.095	0.095	0.095	0.095
	SC	2943	Lake Elsinore-W Flint Street	0.104	0.104	0.104	0.104	0.104
	SC	3168	Banning Airport	0.119	0.119	0.118	0.119	0.120

San Bernardino	SC	2077	Redlands-Dearborn	0.123	0.123	0.123	0.123	0.123
	SC	2221	San Bernardino-4th Street	0.116	0.116	0.116	0.116	0.117
	SC	2266	Fontana-Arrow Highway	0.118	0.119	0.119	0.119	0.119
	SC	2485	Upland	0.106	0.107	0.107	0.107	0.107
	SC	2499	Crestline	0.127	0.127	0.127	0.127	0.127
	MD	2650	Hesperia-Olive Street	0.104	0.104	0.104	0.104	0.104
	MD	2830	Phelan-Beekley Road and Phelan Road	0.100	0.100	0.100	0.100	0.100
	MD	2923	Barstow	0.085	0.085	0.085	0.085	0.085
	MD	3124	Twentynine Palms-Adobe Road #2	0.085	0.085	0.085	0.085	0.085
	MD	3152	Joshua Tree-National Monument	0.105	0.105	0.105	0.105	0.105
	MD	3500	Victorville-14306 Park Avenue	0.094	0.094	0.094	0.094	0.094
San Diego	SD	2040	San Diego-Overland Avenue	0.074	0.074	0.074	0.074	0.074
	SD	2263	Escondido-E Valley Parkway	0.073	0.073	0.073	0.073	0.073
	SD	2327	El Cajon-Redwood Avenue	0.070	0.070	0.070	0.070	0.070
	SD	2368	Del Mar-Mira Costa College	0.070	0.071	0.070	0.070	0.071
	SD	2460	Alpine-Victoria Drive	0.086	0.086	0.086	0.086	0.086
	SD	2589	Chula Vista	0.064	0.064	0.063	0.064	0.064
	SD	2933	Otay Mesa-Paseo International	0.065	0.065	0.065	0.065	0.065
	SD	2964	San Diego-12th Avenue	0.060	0.060	0.060	0.060	0.060
	SD	3198	Camp Pendleton	0.076	0.076	0.076	0.076	0.077
San Luis Obispo	SCC	2321	Morro Bay	0.056	0.056	0.055	0.056	0.057
	SCC	2671	Grover City-Lesage Drive	0.058	0.059	0.057	0.059	0.061
	SCC	2709	San Luis Obispo-Marsh Street	0.057	0.056	0.055	0.056	0.056
	SCC	2955	Paso Robles-Santa Fe Avenue	0.071	0.070	0.069	0.070	0.071
	SCC	2965	Atascadero-Lewis Avenue	0.068	0.067	0.067	0.067	0.067
	SCC	3251	Nipomo-Regional Park	0.064	0.064	0.063	0.063	0.064
Santa Barbara	SCC	2008	El Capitan Beach	0.067	0.066	0.066	0.067	0.068
	SCC	2360	Lompoc-S H Street	0.056	0.056	0.054	0.055	0.056
	SCC	2593	Santa Ynez-Airport Road	0.068	0.068	0.067	0.068	0.068
	SCC	2954	Gaviota-GTC Site B	0.060	0.060	0.060	0.060	0.060
	SCC	2957	Paradise Road-Los Padres National Forest	0.078	0.077	0.077	0.078	0.078
	SCC	2992	Lompoc-HSandP	0.070	0.069	0.068	0.069	0.070
	SCC	3003	Carpinteria-Gobernador Road	0.064	0.064	0.064	0.065	0.066
	SCC	3023	Vandenberg Air Force Base-STS Power	0.069	0.071	0.067	0.070	0.072
	SCC	3101	Las Flores Canyon #1	0.074	0.073	0.073	0.073	0.074
	SCC	3153	Goleta-Fairview	0.064	0.064	0.064	0.064	0.064
	SCC	3486	Santa Maria-906 S Broadway	0.053	0.052	0.052	0.052	0.053
	SCC	3665	Santa Barbara-700 East Canon Perdido	0.064	0.064	0.064	0.064	0.065
Ventura	SCC	2088	Ventura-Emma Wood State Beach	0.068	0.069	0.067	0.070	0.074
	SCC	2880	Simi Valley-Cochran Street	0.091	0.091	0.091	0.091	0.092
	SCC	2984	Thousand Oaks-Moorpark Road	0.083	0.083	0.083	0.083	0.083
	SCC	2991	El Rio-Rio Mesa School #2	0.066	0.066	0.065	0.066	0.068
	SCC	3172	Ojai-Ojai Avenue	0.090	0.090	0.088	0.090	0.090
	SCC	3505	Piru-3301 Pacific Avenue	0.087	0.087	0.087	0.087	0.087

Table C-4-3 Current DVs ("Obs") and Adjusted DVs based on Modeled Percent Differences MS6 vs. MS1

Ozone (ppm)			MS6 vs MS1		Model Adjusted			
					1-Cell	9-Cell		
County	Basin	SiteID	Site Name	Obs	Adj	Min	Ave	Max
Imperial	SS	2551	El Centro-9th Street	0.084	0.084	0.084	0.084	0.084
	SS	2997	Calexico-Grant Street	0.069	0.069	0.069	0.069	0.069
	SS	3135	Calexico-Ethel Street	0.071	0.071	0.071	0.071	0.071
	SS	3143	Westmorland-W 1st Street	0.079	0.079	0.079	0.079	0.079
	SS	3173	Calexico-East	0.075	0.075	0.075	0.075	0.075
	SS	3186	Niland-English Road	0.072	0.072	0.072	0.072	0.072
Kern	SJV	2312	Edison	0.097	0.097	0.097	0.097	0.097
	SJV	2772	Oildale-3311 Manor Street	0.096	0.096	0.096	0.096	0.096
	SJV	2919	Maricopa-Stanislaus Street	0.091	0.091	0.091	0.091	0.091
	SJV	2941	Arvin-Bear Mountain Blvd	0.113	0.113	0.113	0.113	0.113
	SJV	2981	Shafter-Walker Street	0.090	0.090	0.090	0.090	0.090
	MD	3121	Mojave-923 Poole Street	0.090	0.090	0.090	0.090	0.090
	SJV	3145	Bakersfield-Golden State Highway	0.090	0.090	0.090	0.090	0.090
	SJV	3146	Bakersfield-5558 California Avenue	0.097	0.097	0.097	0.097	0.097
Los Angeles	SC	2160	Pasadena-S Wilson Avenue	0.093	0.092	0.092	0.092	0.092
	SC	2166	Pico Rivera	0.070	0.070	0.070	0.071	0.071
	SC	2420	Reseda	0.106	0.104	0.103	0.105	0.106
	SC	2429	North Long Beach	0.064	0.064	0.064	0.065	0.065
	SC	2484	Azusa	0.094	0.094	0.094	0.094	0.095
	SC	2492	Burbank-W Palm Avenue	0.089	0.088	0.087	0.088	0.089
	SC	2494	West Los Angeles-VA Hospital	0.078	0.076	0.075	0.076	0.077
	SC	2583	Lynwood	0.061	0.062	0.061	0.062	0.062
	SC	2849	Glendora-Laurel	0.105	0.105	0.105	0.105	0.106
	SC	2898	Pomona	0.100	0.101	0.101	0.101	0.101
	SC	2899	Los Angeles-North Main Street	0.076	0.075	0.074	0.075	0.076
	SC	3502	Santa Clarita	0.120	0.120	0.120	0.120	0.120
	MD	3658	Lancaster-43301 Division Street	0.098	0.098	0.097	0.098	0.098
Orange	SC	2249	La Habra	0.073	0.074	0.073	0.073	0.074
	SC	2937	Costa Mesa-Mesa Verde Drive	0.073	0.074	0.072	0.073	0.074
	SC	3265	Mission Viejo-26081 Via Pera	0.086	0.085	0.085	0.086	0.087
	SC	3674	Anaheim-Pampas Lane	0.081	0.080	0.080	0.080	0.081
Riverside	SS	2199	Palm Springs-Fire Station	0.104	0.104	0.104	0.104	0.104
	SC	2525	Perris	0.098	0.098	0.098	0.098	0.098
	SC	2596	Riverside-Rubidoux	0.112	0.112	0.112	0.112	0.113
	SS	2878	Indio-Jackson Street	0.095	0.095	0.095	0.095	0.095
	SC	2943	Lake Elsinore-W Flint Street	0.104	0.104	0.104	0.104	0.104
	SC	3168	Banning Airport	0.119	0.119	0.118	0.119	0.120

San Bernardino	SC	2077	Redlands-Dearborn	0.123	0.123	0.123	0.123	0.123
	SC	2221	San Bernardino-4th Street	0.116	0.116	0.116	0.116	0.117
	SC	2266	Fontana-Arrow Highway	0.118	0.119	0.119	0.119	0.119
	SC	2485	Upland	0.106	0.106	0.106	0.107	0.107
	SC	2499	Crestline	0.127	0.127	0.127	0.127	0.127
	MD	2650	Hesperia-Olive Street	0.104	0.104	0.104	0.104	0.104
	MD	2830	Phelan-Beekley Road and Phelan Road	0.100	0.100	0.100	0.100	0.100
	MD	2923	Barstow	0.085	0.085	0.085	0.085	0.085
	MD	3124	Twentynine Palms-Adobe Road #2	0.085	0.085	0.085	0.085	0.085
	MD	3152	Joshua Tree-National Monument	0.105	0.104	0.104	0.104	0.104
	MD	3500	Victorville-14306 Park Avenue	0.094	0.094	0.094	0.094	0.094
San Diego	SD	2040	San Diego-Overland Avenue	0.074	0.074	0.074	0.074	0.074
	SD	2263	Escondido-E Valley Parkway	0.073	0.073	0.073	0.073	0.073
	SD	2327	El Cajon-Redwood Avenue	0.070	0.070	0.069	0.070	0.070
	SD	2368	Del Mar-Mira Costa College	0.070	0.071	0.069	0.070	0.071
	SD	2460	Alpine-Victoria Drive	0.086	0.086	0.086	0.086	0.086
	SD	2589	Chula Vista	0.064	0.064	0.063	0.064	0.064
	SD	2933	Otay Mesa-Paseo International	0.065	0.065	0.065	0.065	0.065
	SD	2964	San Diego-12th Avenue	0.060	0.060	0.060	0.060	0.060
	SD	3198	Camp Pendleton	0.076	0.076	0.076	0.076	0.077
San Luis Obispo	SCC	2321	Morro Bay	0.056	0.056	0.055	0.056	0.057
	SCC	2671	Grover City-Lesage Drive	0.058	0.059	0.057	0.059	0.062
	SCC	2709	San Luis Obispo-Marsh Street	0.057	0.055	0.055	0.055	0.056
	SCC	2955	Paso Robles-Santa Fe Avenue	0.071	0.070	0.069	0.070	0.071
	SCC	2965	Atascadero-Lewis Avenue	0.068	0.066	0.066	0.066	0.067
	SCC	3251	Nipomo-Regional Park	0.064	0.063	0.063	0.063	0.064
Santa Barbara	SCC	2008	El Capitan Beach	0.067	0.066	0.066	0.066	0.067
	SCC	2360	Lompoc-S H Street	0.056	0.055	0.054	0.055	0.056
	SCC	2593	Santa Ynez-Airport Road	0.068	0.068	0.067	0.068	0.068
	SCC	2954	Gaviota-GTC Site B	0.060	0.060	0.059	0.059	0.060
	SCC	2957	Paradise Road-Los Padres National Forest	0.078	0.077	0.076	0.077	0.078
	SCC	2992	Lompoc-HSandP	0.070	0.068	0.068	0.068	0.069
	SCC	3003	Carpinteria-Gobernador Road	0.064	0.064	0.064	0.064	0.066
	SCC	3023	Vandenberg Air Force Base-STS Power	0.069	0.073	0.066	0.071	0.074
	SCC	3101	Las Flores Canyon #1	0.074	0.073	0.073	0.073	0.074
	SCC	3153	Goleta-Fairview	0.064	0.064	0.063	0.064	0.065
	SCC	3486	Santa Maria-906 S Broadway	0.053	0.052	0.051	0.052	0.053
	SCC	3665	Santa Barbara-700 East Canon Perdido	0.064	0.064	0.064	0.064	0.064
Ventura	SCC	2088	Ventura-Emma Wood State Beach	0.068	0.069	0.067	0.070	0.074
	SCC	2880	Simi Valley-Cochran Street	0.091	0.091	0.091	0.091	0.092
	SCC	2984	Thousand Oaks-Moorpark Road	0.083	0.082	0.082	0.083	0.083
	SCC	2991	El Rio-Rio Mesa School #2	0.066	0.066	0.064	0.065	0.068
	SCC	3172	Ojai-Ojai Avenue	0.090	0.090	0.088	0.089	0.090
	SCC	3505	Piru-3301 Pacific Avenue	0.087	0.087	0.087	0.087	0.087

Table C-4-4. Current DVs ("Obs") and Adjusted DVs based on Modeled Percent Differences MS4ws vs. MS1

Ozone (ppm)			MS4ws vs MS1		Model Adjusted			
					1-Cell	9-Cell		
County	Basin	SiteID	Site Name	Obs	Adj	Min	Ave	Max
Imperial	SS	2551	El Centro-9th Street	0.084	0.084	0.084	0.084	0.084
	SS	2997	Calexico-Grant Street	0.069	0.069	0.069	0.069	0.069
	SS	3135	Calexico-Ethel Street	0.071	0.071	0.071	0.071	0.071
	SS	3143	Westmorland-W 1st Street	0.079	0.079	0.079	0.079	0.079
	SS	3173	Calexico-East	0.075	0.075	0.075	0.075	0.075
	SS	3186	Niland-English Road	0.072	0.072	0.072	0.072	0.072
Kern	SJV	2312	Edison	0.097	0.097	0.097	0.097	0.097
	SJV	2772	Oildale-3311 Manor Street	0.096	0.096	0.096	0.096	0.096
	SJV	2919	Maricopa-Stanislaus Street	0.091	0.091	0.091	0.091	0.091
	SJV	2941	Arvin-Bear Mountain Blvd	0.113	0.113	0.113	0.113	0.113
	SJV	2981	Shafter-Walker Street	0.090	0.090	0.090	0.090	0.090
	MD	3121	Mojave-923 Poole Street	0.090	0.090	0.090	0.090	0.090
	SJV	3145	Bakersfield-Golden State Highway	0.090	0.090	0.090	0.090	0.090
	SJV	3146	Bakersfield-5558 California Avenue	0.097	0.097	0.097	0.097	0.097
Los Angeles	SC	2160	Pasadena-S Wilson Avenue	0.093	0.093	0.093	0.093	0.093
	SC	2166	Pico Rivera	0.070	0.070	0.070	0.070	0.070
	SC	2420	Reseda	0.106	0.106	0.106	0.106	0.106
	SC	2429	North Long Beach	0.064	0.064	0.064	0.064	0.064
	SC	2484	Azusa	0.094	0.094	0.094	0.094	0.094
	SC	2492	Burbank-W Palm Avenue	0.089	0.089	0.089	0.089	0.089
	SC	2494	West Los Angeles-VA Hospital	0.078	0.078	0.078	0.078	0.078
	SC	2583	Lynwood	0.061	0.061	0.061	0.061	0.061
	SC	2849	Glendora-Laurel	0.105	0.105	0.105	0.105	0.105
	SC	2898	Pomona	0.100	0.100	0.100	0.100	0.100
	SC	2899	Los Angeles-North Main Street	0.076	0.076	0.076	0.076	0.076
	SC	3502	Santa Clarita	0.120	0.120	0.120	0.120	0.120
	MD	3658	Lancaster-43301 Division Street	0.098	0.098	0.098	0.098	0.098
Orange	SC	2249	La Habra	0.073	0.073	0.073	0.073	0.073
	SC	2937	Costa Mesa-Mesa Verde Drive	0.073	0.073	0.073	0.073	0.073
	SC	3265	Mission Viejo-26081 Via Pera	0.086	0.086	0.086	0.086	0.086
	SC	3674	Anaheim-Pampas Lane	0.081	0.081	0.081	0.081	0.081
Riverside	SS	2199	Palm Springs-Fire Station	0.104	0.104	0.104	0.104	0.104
	SC	2525	Perris	0.098	0.098	0.098	0.098	0.098
	SC	2596	Riverside-Rubidoux	0.112	0.112	0.112	0.112	0.112
	SS	2878	Indio-Jackson Street	0.095	0.095	0.095	0.095	0.095
	SC	2943	Lake Elsinore-W Flint Street	0.104	0.104	0.104	0.104	0.104
	SC	3168	Banning Airport	0.119	0.119	0.119	0.119	0.119

San Bernardino	SC	2077	Redlands-Dearborn	0.123	0.123	0.123	0.123	0.123
	SC	2221	San Bernardino-4th Street	0.116	0.116	0.116	0.116	0.116
	SC	2266	Fontana-Arrow Highway	0.118	0.118	0.118	0.118	0.118
	SC	2485	Upland	0.106	0.106	0.106	0.106	0.106
	SC	2499	Crestline	0.127	0.127	0.127	0.127	0.127
	MD	2650	Hesperia-Olive Street	0.104	0.104	0.104	0.104	0.104
	MD	2830	Phelan-Beekley Road and Phelan Road	0.100	0.100	0.100	0.100	0.100
	MD	2923	Barstow	0.085	0.085	0.085	0.085	0.085
	MD	3124	Twentynine Palms-Adobe Road #2	0.085	0.085	0.085	0.085	0.085
	MD	3152	Joshua Tree-National Monument	0.105	0.105	0.105	0.105	0.105
	MD	3500	Victorville-14306 Park Avenue	0.094	0.094	0.094	0.094	0.094
San Diego	SD	2040	San Diego-Overland Avenue	0.074	0.074	0.074	0.074	0.074
	SD	2263	Escondido-E Valley Parkway	0.073	0.073	0.073	0.073	0.073
	SD	2327	El Cajon-Redwood Avenue	0.070	0.070	0.070	0.070	0.070
	SD	2368	Del Mar-Mira Costa College	0.070	0.070	0.070	0.070	0.070
	SD	2460	Alpine-Victoria Drive	0.086	0.086	0.086	0.086	0.086
	SD	2589	Chula Vista	0.064	0.064	0.064	0.064	0.064
	SD	2933	Otay Mesa-Paseo International	0.065	0.065	0.065	0.065	0.065
	SD	2964	San Diego-12th Avenue	0.060	0.060	0.060	0.060	0.060
	SD	3198	Camp Pendleton	0.076	0.076	0.076	0.076	0.076
San Luis Obispo	SCC	2321	Morro Bay	0.056	0.056	0.056	0.056	0.056
	SCC	2671	Grover City-Lesage Drive	0.058	0.058	0.058	0.058	0.058
	SCC	2709	San Luis Obispo-Marsh Street	0.057	0.057	0.057	0.057	0.057
	SCC	2955	Paso Robles-Santa Fe Avenue	0.071	0.071	0.071	0.071	0.071
	SCC	2965	Atascadero-Lewis Avenue	0.068	0.068	0.068	0.068	0.068
	SCC	3251	Nipomo-Regional Park	0.064	0.064	0.064	0.064	0.064
Santa Barbara	SCC	2008	El Capitan Beach	0.067	0.067	0.067	0.067	0.067
	SCC	2360	Lompoc-S H Street	0.056	0.056	0.056	0.056	0.056
	SCC	2593	Santa Ynez-Airport Road	0.068	0.068	0.068	0.068	0.068
	SCC	2954	Gaviota-GTC Site B	0.060	0.060	0.060	0.060	0.060
	SCC	2957	Paradise Road-Los Padres National Forest	0.078	0.078	0.078	0.078	0.078
	SCC	2992	Lompoc-HSandP	0.070	0.070	0.070	0.070	0.070
	SCC	3003	Carpinteria-Gobernador Road	0.064	0.064	0.064	0.064	0.064
	SCC	3023	Vandenberg Air Force Base-STS Power	0.069	0.068	0.068	0.068	0.069
	SCC	3101	Las Flores Canyon #1	0.074	0.074	0.074	0.074	0.074
	SCC	3153	Goleta-Fairview	0.064	0.064	0.064	0.064	0.064
	SCC	3486	Santa Maria-906 S Broadway	0.053	0.053	0.053	0.053	0.053
	SCC	3665	Santa Barbara-700 East Canon Perdido	0.064	0.064	0.064	0.064	0.064
Ventura	SCC	2088	Ventura-Emma Wood State Beach	0.068	0.068	0.068	0.068	0.068
	SCC	2880	Simi Valley-Cochran Street	0.091	0.091	0.091	0.091	0.091
	SCC	2984	Thousand Oaks-Moorpark Road	0.083	0.083	0.083	0.083	0.083
	SCC	2991	El Rio-Rio Mesa School #2	0.066	0.066	0.066	0.066	0.066
	SCC	3172	Ojai-Ojai Avenue	0.090	0.090	0.090	0.090	0.090
	SCC	3505	Piru-3301 Pacific Avenue	0.087	0.087	0.087	0.087	0.087

Table C-4-5. Current DVs ("Obs") and Adjusted DVs based on Modeled Percent Differences MS1A vs. MS1

Ozone (ppm)			MS1A vs MS1		Model Adjusted			
					1-Cell	9-Cell		
County	Basin	SiteID	Site Name	Obs	Adj	Min	Ave	Max
Imperial	SS	2551	El Centro-9th Street	0.084	0.084	0.084	0.084	0.084
	SS	2997	Calexico-Grant Street	0.069	0.069	0.069	0.069	0.069
	SS	3135	Calexico-Ethel Street	0.071	0.071	0.071	0.071	0.071
	SS	3143	Westmorland-W 1st Street	0.079	0.079	0.079	0.079	0.079
	SS	3173	Calexico-East	0.075	0.075	0.075	0.075	0.075
	SS	3186	Niland-English Road	0.072	0.072	0.072	0.072	0.072
Kern	SJV	2312	Edison	0.097	0.097	0.097	0.097	0.097
	SJV	2772	Oildale-3311 Manor Street	0.096	0.096	0.096	0.096	0.096
	SJV	2919	Maricopa-Stanislaus Street	0.091	0.091	0.091	0.091	0.091
	SJV	2941	Arvin-Bear Mountain Blvd	0.113	0.113	0.113	0.113	0.113
	SJV	2981	Shafter-Walker Street	0.090	0.090	0.090	0.090	0.090
	MD	3121	Mojave-923 Poole Street	0.090	0.090	0.090	0.090	0.090
	SJV	3145	Bakersfield-Golden State Highway	0.090	0.090	0.090	0.090	0.090
	SJV	3146	Bakersfield-5558 California Avenue	0.097	0.097	0.097	0.097	0.097
Los Angeles	SC	2160	Pasadena-S Wilson Avenue	0.093	0.093	0.093	0.093	0.093
	SC	2166	Pico Rivera	0.070	0.070	0.070	0.070	0.070
	SC	2420	Reseda	0.106	0.106	0.106	0.106	0.106
	SC	2429	North Long Beach	0.064	0.064	0.064	0.064	0.064
	SC	2484	Azusa	0.094	0.094	0.094	0.094	0.094
	SC	2492	Burbank-W Palm Avenue	0.089	0.089	0.089	0.089	0.089
	SC	2494	West Los Angeles-VA Hospital	0.078	0.078	0.078	0.078	0.078
	SC	2583	Lynwood	0.061	0.061	0.061	0.061	0.061
	SC	2849	Glendora-Laurel	0.105	0.105	0.105	0.105	0.105
	SC	2898	Pomona	0.100	0.100	0.100	0.100	0.100
	SC	2899	Los Angeles-North Main Street	0.076	0.076	0.076	0.076	0.076
	SC	3502	Santa Clarita	0.120	0.120	0.120	0.120	0.120
	MD	3658	Lancaster-43301 Division Street	0.098	0.098	0.098	0.098	0.098
Orange	SC	2249	La Habra	0.073	0.073	0.073	0.073	0.073
	SC	2937	Costa Mesa-Mesa Verde Drive	0.073	0.073	0.073	0.073	0.073
	SC	3265	Mission Viejo-26081 Via Pera	0.086	0.086	0.086	0.086	0.086
	SC	3674	Anaheim-Pampas Lane	0.081	0.081	0.081	0.081	0.081
Riverside	SS	2199	Palm Springs-Fire Station	0.104	0.104	0.104	0.104	0.104
	SC	2525	Perris	0.098	0.098	0.098	0.098	0.098
	SC	2596	Riverside-Rubidoux	0.112	0.112	0.112	0.112	0.112
	SS	2878	Indio-Jackson Street	0.095	0.095	0.095	0.095	0.095
	SC	2943	Lake Elsinore-W Flint Street	0.104	0.104	0.104	0.104	0.104
	SC	3168	Banning Airport	0.119	0.119	0.119	0.119	0.119

San Bernardino	SC	2077	Redlands-Dearborn	0.123	0.123	0.123	0.123	0.123
	SC	2221	San Bernardino-4th Street	0.116	0.116	0.116	0.116	0.116
	SC	2266	Fontana-Arrow Highway	0.118	0.118	0.118	0.118	0.118
	SC	2485	Upland	0.106	0.106	0.106	0.106	0.106
	SC	2499	Crestline	0.127	0.127	0.127	0.127	0.127
	MD	2650	Hesperia-Olive Street	0.104	0.104	0.104	0.104	0.104
	MD	2830	Phelan-Beekley Road and Phelan Road	0.100	0.100	0.100	0.100	0.100
	MD	2923	Barstow	0.085	0.085	0.085	0.085	0.085
	MD	3124	Twentynine Palms-Adobe Road #2	0.085	0.085	0.085	0.085	0.085
	MD	3152	Joshua Tree-National Monument	0.105	0.105	0.105	0.105	0.105
	MD	3500	Victorville-14306 Park Avenue	0.094	0.094	0.094	0.094	0.094
San Diego	SD	2040	San Diego-Overland Avenue	0.074	0.074	0.074	0.074	0.074
	SD	2263	Escondido-E Valley Parkway	0.073	0.073	0.073	0.073	0.073
	SD	2327	El Cajon-Redwood Avenue	0.070	0.070	0.070	0.070	0.070
	SD	2368	Del Mar-Mira Costa College	0.070	0.070	0.070	0.070	0.070
	SD	2460	Alpine-Victoria Drive	0.086	0.086	0.086	0.086	0.086
	SD	2589	Chula Vista	0.064	0.064	0.064	0.064	0.064
	SD	2933	Otay Mesa-Paseo International	0.065	0.065	0.065	0.065	0.065
	SD	2964	San Diego-12th Avenue	0.060	0.060	0.060	0.060	0.060
	SD	3198	Camp Pendleton	0.076	0.076	0.076	0.076	0.076
San Luis Obispo	SCC	2321	Morro Bay	0.056	0.056	0.056	0.056	0.056
	SCC	2671	Grover City-Lesage Drive	0.058	0.058	0.058	0.058	0.058
	SCC	2709	San Luis Obispo-Marsh Street	0.057	0.057	0.057	0.057	0.057
	SCC	2955	Paso Robles-Santa Fe Avenue	0.071	0.071	0.071	0.071	0.071
	SCC	2965	Atascadero-Lewis Avenue	0.068	0.068	0.068	0.068	0.068
	SCC	3251	Nipomo-Regional Park	0.064	0.064	0.064	0.064	0.064
Santa Barbara	SCC	2008	El Capitan Beach	0.067	0.067	0.067	0.067	0.067
	SCC	2360	Lompoc-S H Street	0.056	0.056	0.056	0.056	0.056
	SCC	2593	Santa Ynez-Airport Road	0.068	0.068	0.068	0.068	0.068
	SCC	2954	Gaviota-GTC Site B	0.060	0.060	0.060	0.060	0.060
	SCC	2957	Paradise Road-Los Padres National Forest	0.078	0.078	0.078	0.078	0.078
	SCC	2992	Lompoc-HSandP	0.070	0.070	0.070	0.070	0.070
	SCC	3003	Carpinteria-Gobernador Road	0.064	0.064	0.064	0.064	0.064
	SCC	3023	Vandenberg Air Force Base-STS Power	0.069	0.069	0.069	0.069	0.069
	SCC	3101	Las Flores Canyon #1	0.074	0.074	0.074	0.074	0.074
	SCC	3153	Goleta-Fairview	0.064	0.064	0.064	0.064	0.064
	SCC	3486	Santa Maria-906 S Broadway	0.053	0.053	0.053	0.053	0.053
	SCC	3665	Santa Barbara-700 East Canon Perdido	0.064	0.064	0.064	0.064	0.064
Ventura	SCC	2088	Ventura-Emma Wood State Beach	0.068	0.068	0.068	0.068	0.068
	SCC	2880	Simi Valley-Cochran Street	0.091	0.091	0.091	0.091	0.091
	SCC	2984	Thousand Oaks-Moorpark Road	0.083	0.083	0.083	0.083	0.083
	SCC	2991	El Rio-Rio Mesa School #2	0.066	0.066	0.066	0.066	0.066
	SCC	3172	Ojai-Ojai Avenue	0.090	0.090	0.090	0.090	0.090
	SCC	3505	Piru-3301 Pacific Avenue	0.087	0.087	0.087	0.087	0.087

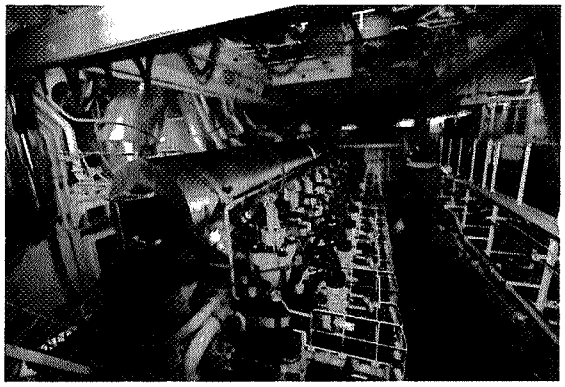
Appendix D

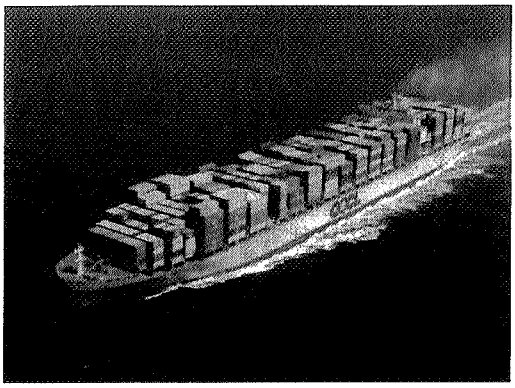
Emissions Estimation Methodology for Ocean-Going Vessels

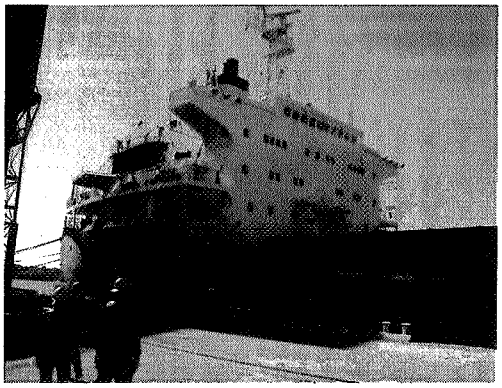
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Emissions Estimation Methodology for Ocean-Going Vessels

May 2011







California Air Resources Board
Planning and Technical Support Division

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Ocean-Going Vessel Emission Estimation Methodology

I. Executive Summary

Air Resources Board (ARB) staff have revised the methodology to calculate emissions from ocean-going vessels in California. This revised inventory will be used to support regulatory analysis of statewide regulations to reduce emissions from ocean-going vessels.

The inventory presented here is an update to those developed by staff in May, 2008 in support of a number of programs, including the Fuel Regulation for Ocean-Going Vessels and the 2007 Shore Power Regulation.

The update includes a number of minor revisions and corrections that include: recoding the model to increase calculation speed, updated auxiliary engine information, updated ship routing, revised vessel speed reduction compliance rates, an adjustment factor to estimate the effects of the recession and improvements in the user interface of the model.

Emissions are calculated by estimating ship emissions on a ship by ship and a port call by port call basis, using actual ship engine power estimates, speeds, and actual ship hoteling times where possible. Base year emissions were forecasted using a set of growth factors specific to each port and each ship type.

Emissions were calculated for the 100 nautical mile zone that is used for ARB's emissions inventory system. They include the benefits of the 2007 Shore Power Regulation, the benefits of the San Pedro Bay Ports voluntary vessel speed reduction program, the proposed benefits of the current proposal, the fuel-related benefits of the North American Environmental Control Area (ECA), but not the NOx benefits of IMO Tier 3 engine standards.

Using the proposed methodology, we estimate 2005 statewide emissions from ocean going vessels in the 100 nautical mile regulatory zone were over 14 tons per day of diesel PM, over 155 tons per day of oxides of nitrogen (NOx), and over 7,400 tons per day of carbon dioxide (CO2). Detailed emission estimates are presented in Table ES-1.

The emissions model that produced these estimates is publicly available in accordance with AB 1085 and is available at http://www.arb.ca.gov/ports/marinevess/ogv/ogv1085.htm.

Table ES-1 summarizes the emissions by district for the 100 nautical mile SIP zone. In 2005, emissions were almost evenly split between Southern and Northern California.

Table ES-1 2005 Ship Emissions by District (tons/day) in the 100 nm Zone

2005 Total Emissions in 100 nm Zone				
District	NOx	PM2.5	SOx	CO2
	tons/day			mmtCO2
Bay Area AQMD	44.3	4.0	32.3	0.7
Mendocino County AQMD	9.3	0.8	5.7	0.1
Monterey Bay Unified APCD	17.8	1.5	10.9	0.2
North Coast Unified APCD	14.0	1.2	8.6	0.2
Northern Sonoma County APCD	4.2	0.3	2.5	0.0
San Diego County APCD	5.1	0.5	3.8	0.1
San Joaquin Valley Unified APCD	0.1	0.0	0.1	0.0
San Luis Obispo County APCD	11.4	1.0	6.9	0.1
Santa Barbara County APCD	53.1	4.5	32.1	0.6
South Coast AQMD	44.8	4.6	42.8	0.9
Ventura County APCD	16.1	1.4	10.1	0.2
Yolo/Solano AQMD	0.2	0.0	0.2	0.0
Total	**220.2**	**19.6**	**155.8**	**3.2**

The following section provides background on the ship emissions inventory, the purpose and goals in preparing this emissions inventory, and a general overview of the methodology used to estimate emissions.

A. Background

For the purposes of this inventory, an ocean-going vessel (OGV) is a commercial vessel greater than or equal to 400 feet in length or 10,000 gross tons; or propelled by a marine compression ignition engine with a displacement of greater than or equal to 30 liters per cylinder.

The ARB California Emissions Inventory Data and Reporting System (CEIDARS) includes all OGV emissions occurring within 100 nautical miles of the California coastline. This zone is also used for State Implementation Plan (SIP) purposes. Figure 1 shows this zone, as well as the 24 nm regulatory zone used for the 2008 low sulfur fuel rule and the amended regulatory zone used in the current regulation.

OGV emissions occur during three distinct operating modes: transit (emissions from vessel operations between ports), maneuvering (slow speed vessel operations while in-port areas), and hoteling (also known as berthing; in-port emissions while moored to a dock).

Two types of engines are found on OGVs, main engines and auxiliary engines. The main engine is a very large diesel engine used primarily to propel the vessel at sea. Main engines are used during the transit and maneuvering modes. Auxiliary engines on OGVs provide power for uses other than propulsion (except

for diesel-electric vessels). Typically, an OGV will have a single, large main engine used for propulsion, and several smaller auxiliary "generator-set" engines. Auxiliary engines are used during all three operating modes. An exception to this configuration is diesel-electric vessels where diesel engine generator sets provide power for both propulsion and auxiliary power needs.

In addition to the engines, most ships have auxiliary boilers to provide steam heat for a variety of uses, including fuel heating and hot water. Some crude oil tankers also use boilers for moving crude oil product on and off the ship. Boilers are used during slow speed vessel operations or in port; at cruise speed, most vessels are equipped with an "economizer" at cruise speeds which uses exhaust gas to provide heat. Below certain engine loads, however, there is not sufficient waste heat available from the exhaust, and boilers are activated. For the purposes of this inventory, it is assumed that boilers are operated during maneuvering, hoteling, and during anchorage.

There are a number of types of ocean-going vessels including: auto carriers, bulk cargo carriers, container vessels, general cargo carriers and other miscellaneous vessels, passenger vessels, reefers (refrigerated vessels), roll-on-roll-off vessels (also known as a Ro-Ro: vessels in which vehicles can be driven on or off the vessel). A list of the different types of ocean-going vessels and a brief description of the goods transported by them presented in Table I-1.

Table I-1: Categories of Ocean-Going Vessels Included in the Emissions Inventory

Vessel Type	Description
Auto	Vessels designed to carry autos and trucks
Bulk Cargo	Bulk carriers are vessels used to transport bulk items such as mineral ore, fertilizer, wood chips, or grain.
Container	Container vessels are cargo vessels that carry standardized truck-sized containers.
General Cargo	Vessels designed to carry non-contaminated cargo such as steel, palletized goods, and heavy machinery.
Passenger	Passenger cruise vessels are passenger vessels used for pleasure voyages.
Reefers	Vessels used to transport perishable commodities which require temperature-controlled transportation, mostly fruits, meat, fish, vegetables, dairy products, and other foods.
Ro-Ro	A vessel designed to carry large wheeled cargo such as large off-road equipment, trailers or railway carriages. RORO is an acronym for "roll on/roll off".
Tankers	Vessels designed to transport liquids in bulk.

B. Purpose and Overview

The ARB is revising the emission inventory for ocean-going vessels to reflect new information and improved methodologies. The new information includes

updated activity data, additional sources of ship hoteling and anchorage information and ship-specific engine and speed data. Additionally, the growth assumptions were updated with additional years of trend data, the effects of the recession, and the benefits of recent regulations. This document describes the inventory methodology and data inputs that were developed in support of the shore power regulation and the proposed main engine regulation.

2005 was chosen as the base year; this year was chosen to be consistent with the modeling performed for the current regulation. Because gridded emissions are required for modeling, a gridded inventory developed for this document; grid cells were mapped to the appropriate zone to summarize the data. Base year emissions were forecasted by assessing trends in the growth of vessel net registered tonnage for the years 1994-2010. Net registered tonnage (NRT) is a measure of the volume of a ship's cargo capacity; the growth in NRT is directly proportional to the growth in installed power of a vessel's main propulsion engine. Controlled future year emissions for 2010 and 2015 were forecasted with the benefits of the 2007 shore power regulation, the expanded San Pedro Bay ports voluntary 40 nautical mile vessel speed reduction zone, and the benefits of the North American Environmental Control Area.

C. Public Process

Allowing stakeholders and the general public to review and comment on a product associated with a rulemaking process is a critical element of that rulemaking process. The following steps were taken to ensure interested parties could provide input.

Multiple public workshops or workgroups were held beginning in 2007 and continuing through 2010 that provided the stakeholders and the general public the opportunity to review and comment on the inventory. A number of teleconferences were conducted with port representatives and port consultants as well. We provided local air districts the opportunity to review, comment on the methodology and the inventory by conducting meetings and teleconferences. Comments obtained through these meetings, teleconferences and workshops were used to assess and modify the inventory.

II. EMISSION ESTIMATION METHODOLOGY

Ship emissions were calculated, to the extent possible, on a vessel and port call specific basis. Where possible, vessel specific power data was used, and port call specific hoteling times were used to calculate emissions.

A. Emission Inventory Inputs

Data needed for estimating ship emissions include:

- Base year vessel population
- Operating Mode specific activity hours
- Main engine, auxiliary engine, & auxiliary boiler power
- Vessel type and mode specific engine load
- Emission factors
- Vessel type and port growth rate
- Control measures

1. Base Year Vessel Population

There were several sources of activity data that were used for the inventory. First, vessel port calls were obtained from a database maintained by the California Lands Commission (SLC, 2007). This database includes vessel identification, port of arrival, previous port, next port, and date and time of arrival. The Lands Commission compiles this database from marine exchanges and port authorities statewide. 2005 was chosen as the base year for this inventory for consistency with the air quality modeling done for this regulation. Second, vessel specific hoteling times and berth locations were obtained from port officials responsible for ship docking, or Wharfingers, in Los Angeles, Long Beach, Oakland, San Diego, San Francisco and Hueneme. Data was obtained for 2004 through 2006, but only 2005 data was used for this inventory. These data were reconciled to the extent possible with the port call data from the Lands Commission (SLC, 2007); for all ports, approximately 94-98% of the port calls were reconciled between the two databases. The remaining port calls in the Lands Commission database which could not be reconciled were assigned the port average hoteling times by vessel type.

Table II-1 summarizes the number of port calls by ship type and by port.

Table II-1 2005 Port Calls in California

Arrival Port	Auto	Bulk	Container	Cruise	General & Miscellaneous	Reefer	Ro-ro	Tanker	Total
Avalon/Catalina				134				8	142
Carquinez	49	74		2	5			330	460
El Segundo								223	223
Humboldt					13				13
Long Beach	168	291	1385	148	181	38	82	532	2825
Los Angeles	61	152	1525	274	91	48	2	314	2467
Monterey				9	3				12
Oakland		16	1793		94		17		1920
Pacific Lightering Zone								132	132
Port Hueneme	211	1		3	9	155	11	13	403
Redwood		56			1			1	58
Richmond	55	42	9		4		9	333	452
Sacramento		19			38		1	5	63
San Diego	129	43	2	230	57	80	22	2	565
San Francisco		54	2	77	58		1	100	292
Stockton		94			23			50	167
Total	**673**	**842**	**4716**	**877**	**577**	**321**	**145**	**2043**	**10194**

2. Operating Mode Specific Activity Hours

Three operating modes are used to characterize OGV activity: transit (emissions from vessel operations between ports), maneuvering (slow speed vessel operations while in-ports), and hoteling (also known as berthing; in-port emissions while moored to a dock or at anchor). For regulatory purposes, hoteling emissions in this inventory will be termed "hoteling" for ships moored at dock, and "anchorage" for ship activity at anchor at or near a port, but not moored to a dock. Main engine emissions occur during transit and maneuvering modes. Auxiliary engine emissions occur during all modes. Auxiliary boilers are operated during maneuvering, hoteling, and anchorage. Separate emission factors have been developed for main engines in the transit and maneuvering modes. Main engines do not operate during hoteling except for the generator sets on diesel-electric vessels. For the purposes of this emissions inventory, all diesel-electric vessel emissions are reported as auxiliary engine emissions.

a. Transit Mode

Operating hours in transit mode is calculated as distance traveled divided by vessel speed. Distance traveled is determined by evaluating the route taken between ports by the vessel; speed is a function of both the speed of which a vessel is capable of and of any speed limitations in effect.

Distance Traveled: Vessel Traffic Lanes

The lanes used to estimate ship activity at sea were a composite of three sources. First, near-port vessel lanes were extracted from the Army Corps of Engineers (ACE) National Waterway Network (USACE, 2007). The portions of this network that reflect the vessel traffic patterns defined in navigational charts were used; other parts of the ACE network that did not reflect actual ship traffic patterns were not used. The vessel traffic separation scheme used in the Santa Barbara Channel, in which vessels traveling south travel further west than those going north, is an example of the ACE data that was used for the model. For vessel traffic further out at sea, the Ship Traffic, Energy and Environment Model

(STEEM) developed by Dr. Chengfeng Wang and Dr. James Corbett (Wang, 2007) was used to define traffic lanes. Third, automated instrumentation system (AIS) telemetry data collected during 2007 was used to define the traffic lanes that connect these two networks.

Figure 1 shows the vessel traffic lane network used for the inventory. Figures 2 and 3 show a close-up of the Northern California and Southern California portions of the network.

Vessel routing between ports for the 2008 and updated inventory was defined by the assumption that ships will take the shortest route between origin and destination on the vessel traffic network. The shortest path was calculated using Arc GIS Network Analyst.

Since the 2008 inventory, minor adjustments to the shipping lane network have been made to ensure that vessel routes conform to known transit routes, such as in the Santa Barbara Channel. Vessel routes were verified with automated instrumentation system (AIS) ship data to the extent possible. Additionally, the current inventory routes tankers travelling to and from Northern and Southern California further away from shore, to conform with existing practice.

Vessel traffic lane locations with respect to the main coastline of California were identified and cataloged to identify how far off the coastline ship activity occurred.

Figure 1
Vessel Traffic Lanes

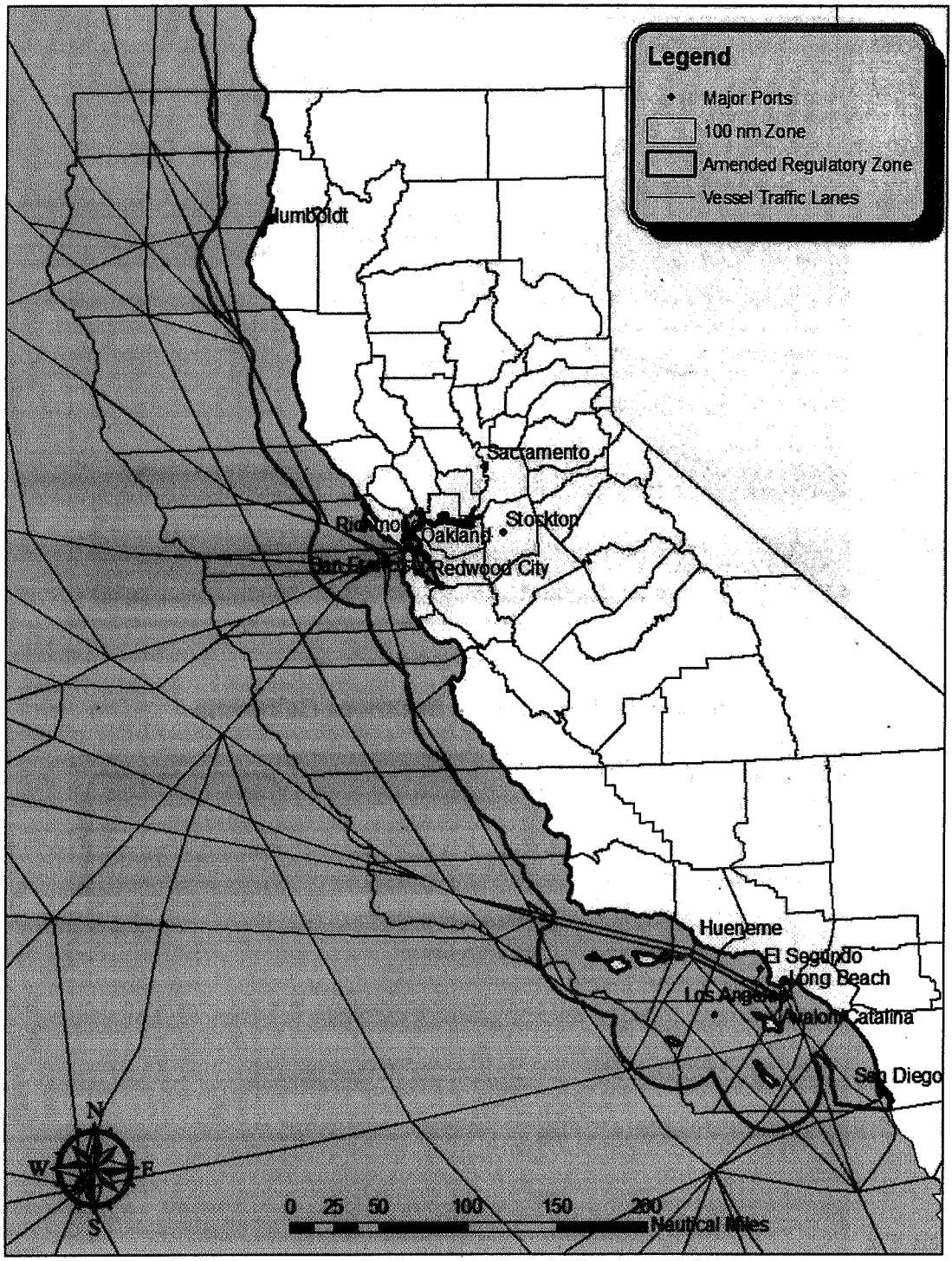


Figure 2

Vessel Traffic Lanes – Northern California

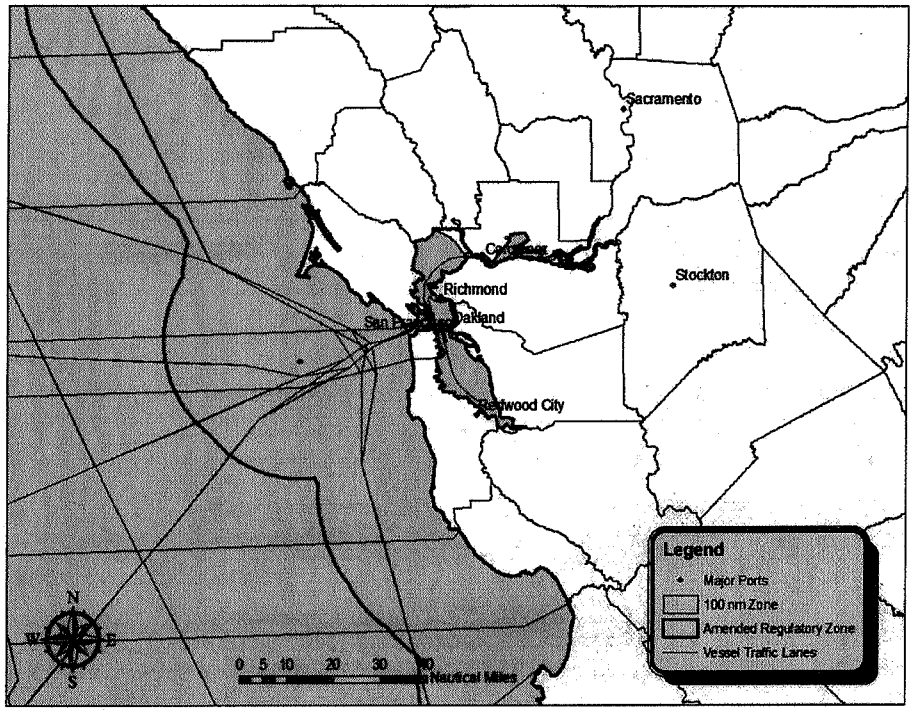
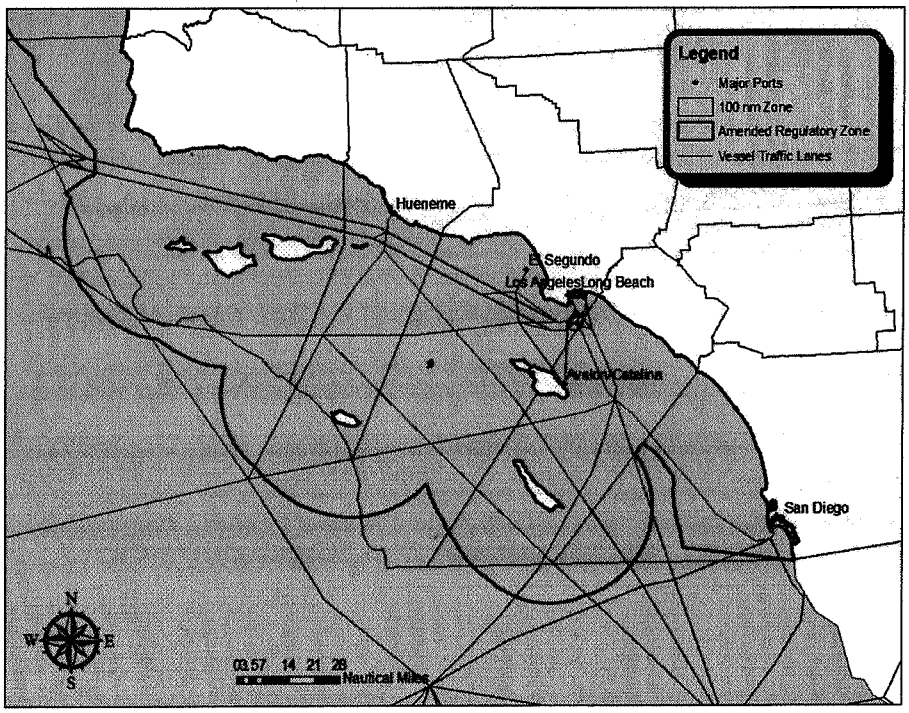


Figure 3

Vessel Traffic Lanes – Southern California



Vessel Speed

The maximum vessel speed was obtained from the 2007 version of Lloyds-Fairplay PC Register (Lloyds-Fairplay, 2007). The cruise speed was estimated to be 0.937 times the maximum speed, which results in a load factor of 0.823 during cruise mode. These figures were obtained from a survey performed for the Port of Los Angeles emission inventory (Starcrest, 2005 and 2007). It was assumed that vessels traveled at cruise speed in areas without specific speed restrictions.

Vessel speed restrictions for traffic lanes in various areas were determined from nautical charts. One such example is the precautionary zone in Los Angeles and Long Beach harbor, in which speed is restricted to either 11 or 9 knots depending on the type of ship. Vessel speeds within the Southern California voluntary vessel speed reduction zone were obtained from the Southern California Marine Exchange (MXSOCAL, 2007).

b. Maneuvering

Maneuvering time was calculated as the distance traveled during maneuvering divided by speed, plus 15 minutes for docking or undocking. For coastal ports, maneuvering was assumed to begin at the point where the pilot boarded the vessel and ended at the berth. For ports within the San Francisco Bay Area, maneuvering distances were estimated based on the Environ (Environ, 2007) Port of Oakland inventory, AIS data, or discussions with port officials. It was assumed that fast ships (container ships, cruise ships, reefers) maneuvered inbound at 7 knots and slow ships (all other types) at 5 knots; all outbound ships were assumed to maneuver at 8 knots.

c. Hoteling

Hoteling time can be defined as beginning when a ship ties up at a berth, and ends when it leaves that berth. Likewise, anchorage is defined as beginning when a ship drops anchor and ends when the anchor is raised and the ship begins moving again. During hoteling and anchorage, vessels use at least one of their auxiliary engines to generate electric power for the ship. Auxiliary boilers are also used. Some ships will shift berths during a given port call for various reasons; for the purpose of this inventory, the hoteling time used for calculations combines the total hoteling time for all berths visited during a given port call.

Hoteling times used for the inventory obtained were specific to individual port calls and were obtained from port Wharfingers. Port calls that could not be identified in Wharfinger data were assigned average hotelling times by port and by vessel type from the Wharfinger data that was available. Table II-2 summarizes the average hoteling times by vessel type for 2006.

Table II-2 2005 Hoteling Time Averages (hours per visit)

Arrival Port	Auto	Bulk	Container	Cruise	General & Miscellaneous	Reefer	Ro-ro	Tanker
Avalon/Catalina				13				34
Carquinez	18	65		13	43			34
El Segundo								34
Humboldt					61			
Long Beach	16	64	54	13	39	33	30	34
Los Angeles	21	73	50	12	53	42	36	36
Monterey				13	45			
Oakland		15	21		15		43	
Pacific Lightering Zone								34
Port Hueneme	16	12		7	61	71	11	21
Redwood		62			54			34
Richmond	19	64	32		61		32	34
Sacramento		57			49		32	34
San Diego	18	82	44	11	58	57	29	34
San Francisco		66	32	11	62		30	34
Stockton		61			42			34

Although the number of port calls by container ships to Oakland is roughly equivalent to the number of port calls at either Los Angeles or Long Beach, the hotelling time of these ships in Oakland is much shorter. Often, container ships will call on both Oakland and either Los Angeles or Long Beach; presumably, fewer containers are loaded or unloaded in Oakland than in southern California.

d. Anchorage

Ship and visit-specific anchorage data (ship identification, hours anchored, and anchorage location) was obtained from MXSOCAL in Southern California (MXSOCAL, 2007) and the US Coast Guard Vessel Traffic Service (USCG,

2007) in the San Francisco Bay Area. Table II-3 summarizes average anchorage times for ships that anchored. It was assumed that ship operations during anchorage were the same as during hoteling; that is, auxiliary engines and boilers operated at hoteling loads, and the main engine was not in operation.

Table II-3 2006 Average Anchorage Times (hours per visit)

Arrival Port	Auto	Bulk	Container	Cruise	General & Miscellaneous	Reefer	Ro-ro	Tanker
Carquinez	5	27			20			19
Long Beach	14	41	12		35	11	17	73
Los Angeles	9	30	12	2	31	16	5	32
Oakland		35	9		21			
Redwood		25			7			
Richmond	15	51			5			20
Sacramento		23			15			46
San Francisco		11	193	2	12			23
Stockton		52			38			29

3. Main engine, auxiliary engine, & auxiliary boiler power

The main source of engine power was the PC-Register commercial ship database obtained from Lloyds-Fairplay (Lloyds-Fairplay 2007). Information from this database that was used in the inventory included main engine power, auxiliary engine generation capacity, main engine speed, vessel type, date of build, cruise speed, and flag of vessel. This data was supplemented with data collected by Starcrest and the Ports of Los Angeles and Long Beach as part of their Vessel Boarding Program (Starcrest 2005, 2007a and 2007b). Current and former vessel names were also used to identify vessels in activity records that were lacking IMO (International Maritime Organization) ID numbers. Vessel averages by vessel type were used if data were missing; if main engine speed data were missing it was assumed that they were slow speed engines. Ship auxiliary boiler power ratings were assigned averages developed by Starcrest (Starcrest 2007a and 2007b) from the vessel boarding program.

The 2008 inventory used average auxiliary engine power from the 2005 ARB Ocean Going Vessel Survey. In the current inventory, approximately 60% of ship auxiliary engine power ratings are based on auxiliary power generation capacity from the Lloyds-Fairplay PC Register database (Lloyds-Fairplay, 2007). Another 15% of ships have auxiliary engine power ratings from the Port of Los Angeles/Port of Long Beach vessel boarding program, and the remaining ships utilize the average power ratings from the 2005 survey.

Table II-4 Average Vessel Characteristics

Vessel Type	Speed (knots)	Main Power	Auxiliary Power	Boiler Power
		(kilowatts)		
Auto	19	11593	2999	278
Bulk	15	7803	2459	82
Container	23	37265	8156	380
Cruise	21	0	44042	750
General	15	7580	1799	99
Reefer	20	11091	3605	348
Ro-ro	18	12181	2605	82
Tanker	15	13034	2339	1593

Table II-4 summarizes the average vessel speed and main engine, auxiliary engine, and boiler power by vessel type. For boilers, fuel use rates were converted to equivalent kilowatts.

4. Load Factor

a. Main Engines

At cruise speed, the main engine load is 82.5%; as has been previously described, this estimate was based on a vessel boarding program and survey done by Starcrest as part of the POLA and POLB inventories (Starcrest 2005, 2007a and 2007b). At higher loads, fuel consumption and engine maintenance costs go up dramatically, so vessel operators tend to operate at this level. At slower speeds, main engine load was calculated using the propeller law, which states that propulsion load varies by the cube of the vessel speed. Main engine load was calculated by dividing the actual vessel speed by the maximum vessel speed and cubing the result.

At main engine loads of less than 20%, engine emissions are multiplied by an adjustment factor which accounts for higher emission rates at low loads. The adjustment factor is calculated using an exponential equation developed by Sierra Research for the U.S. Environmental Protection Agency (USEPA, 2000).

b. Auxiliary Engines

The auxiliary engine load factor represents the actual engine power used divided by the total installed auxiliary engine power. Table II-5 shows the load factors, in percent, by vessel type.

The primary source of data on auxiliary engine load was the 2005 and 2007 ARB OGV surveys and the vessel boarding program done by Starcrest for the Port of Los Angeles and the Port of Long Beach emission inventories (Starcrest 2005, 2007a and 2007b).

Table II-5: OGV Auxiliary Engine Load Characteristics (percent load)

Vessel Type	Load Factor (%)		
	Hoteling	Maneuvering	Transit
Auto Carrier/Ro-Ro	26%	45%	15%
Bulk Carrier/General Cargo	10%	45%	17%
Container Ship	18%	50%	13%
Passenger	16%	64%	80%
Reefer	32%	45%	15%
Tanker	26%	33%	24%

5. Emission Factors

Emission factors for OGVs vary by pollutant, operating mode (transit, maneuvering, or hoteling), engine type (main engine/slow speed, main engine/medium speed, or auxiliary/medium speed), and fuel type (heavy fuel oil-HFO or marine distillate). Emission factors for diesel particulate matter (PM), oxides of nitrogen (NOx), sulfur dioxide (SO2), hydrocarbons (HC), carbon monoxide (CO), and carbon dioxide (CO2) were compiled. Emission factors for main and auxiliary engines of ocean-going vessels are expressed as grams of pollutant emitted per kilowatt-hour of energy (g/kW-h). Although emission factors for auxiliary boilers are usually expressed in terms of grams of pollutant emitted by metric tonne of fuel burned, they were converted to g/kW-h using a methodology defined by Starcrest (Starcrest, 2007a).

Tables II-6, II-7, and II-8 below present the emission factors used in the development of the ocean-going vessel emissions inventory. Table II-6 presents the emission factors for main engines during transit or high load operation while at sea. If data on main engine speed for a given vessel was not known, it was assumed the engine was slow speed.

Table II-6: Main Engine Emission Factors – Transit Mode (g/kW-hr)

Engine Speed	Fuel	CH_4	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	ROG	SO_x
Slow	Marine Distillate (0.1% S)	0.07	1.10	588	17.0	0.25	0.23	0.78	0.36
Slow	Marine Distillate (0.5% S)	0.07	1.10	588	17.0	0.38	0.35	0.78	1.90
Slow	Heavy Fuel Oil	0.08	1.38	620	18.1	1.50	1.46	0.69	10.50
Medium	Marine Distillate (0.1% S)	0.08	1.10	645	13.2	0.25	0.23	0.65	0.40
Medium	Marine Distillate (0.5% S)	0.08	1.10	645	13.2	0.38	0.35	0.65	2.08
Medium	Heavy Fuel Oil	0.09	1.10	677	14.0	1.50	1.46	0.57	11.50
High	Marine Distillate (0.1% S)	0.08	1.10	645	12.1	0.25	0.23	0.65	0.40
High	Marine Distillate (0.5% S)	0.08	1.10	645	12.1	0.38	0.35	0.65	2.08
High	Heavy Fuel Oil	0.09	1.10	645	12.7	1.50	1.46	0.23	11.50

Table II-7 presents the emission factors for main engines during maneuvering or low load operation near ports.

Table II-7: Main Engine Emission Factors –Maneuvering (g/kW-hr)

Engine Speed	Fuel	CH_4	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	ROG	SO_x
Slow	Marine Distillate (0.1% S)	0.07	1.10	588	17.0	0.25	0.23	0.78	0.36
Slow	Marine Distillate (0.5% S)	0.07	1.10	588	17.0	0.38	0.35	0.78	1.90
Slow	Heavy Fuel Oil	0.08	1.38	620	18.1	1.50	1.46	0.69	10.50
Medium	Marine Distillate (0.1% S)	0.08	1.10	645	13.2	0.25	0.23	0.65	0.40
Medium	Marine Distillate (0.5% S)	0.08	1.10	645	13.2	0.38	0.35	0.65	2.08
Medium	Heavy Fuel Oil	0.09	1.10	677	14.0	1.50	1.46	0.57	11.50
High	Marine Distillate (0.1% S)	0.08	1.10	645	12.1	0.25	0.23	0.65	0.40
High	Marine Distillate (0.5% S)	0.08	1.10	645	12.1	0.38	0.35	0.65	2.08
High	Heavy Fuel Oil	0.09	1.10	645	12.7	1.50	1.46	0.23	11.50

Table II-8 presents the emission factors for auxiliary engines, including diesel-electric vessels. As shown in the table, the emission factors for auxiliary engine vary depending on the type of fuel used.

Table II-9 presents the emission factors for auxiliary boilers, which use heavy fuel oil. These emission factors were converted to grams per kilowatt hour from grams per tonne of fuel using methodology developed by Starcrest (Starcrest, 2007a).

Table II-8: Auxiliary Engine Emission Factors – Transit, Maneuvering, and Hotelling (g/kW-hr)

Engine Speed	Fuel	CH_4	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	ROG	SO_x
Medium	Marine Distillate (0.1% S)	0.09	1.10	690	13.9	0.25	0.23	0.52	0.40
Medium	Marine Distillate (0.5% S)	0.09	1.10	690	13.9	0.38	0.35	0.52	2.10
Medium	Heavy Fuel Oil	0.09	1.10	722	14.7	1.50	1.46	0.46	11.10

Table II-9: Auxiliary Boiler Emission Factors (g/kW-hr)

Fuel	CH_4	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	ROG	SO_x
Heavy Fuel Oil	0.03	0.20	970	2.1	0.80	0.78	0.11	16.50

The emission factors for main engines, auxiliary engines and auxiliary boilers used by ARB staff are generally consistent with the emission factors used by Starcrest in developing the 2005 Port of Los Angeles emissions inventory and the updates done in 2007. The Starcrest emission factors were based on work done by Entec (Entec, 2002). The Entec emission factors were developed using Lloyd's of London and IVL Swedish Environmental Institute data that related emissions to engine speed and the type of fuel used.

ARB staff developed an alternate particulate matter emission factor for engines burning heavy fuel oil based upon an extensive review of emission tests described in scientific literature. This emission factor, set at 1.5 grams/kilowatt-hour, is based upon the use of HFO fuel with 2.5% sulfur content. The basis of this emission factor is fully described in a white paper written by ARB staff in 2007, which is available on the ARB web site (CARB, 2008).

For CO emissions from the main engines during transit, staff elected to use a U.S. EPA emission factor published in the Environ report (Environ, 2007). This emission factor is consistent with the CO emission factors used by Starcrest for the Port of Los Angeles emission inventory (Starcrest, 2005).

6. Fuel Consumption

It was assumed that all main engines and auxiliary boilers burned heavy fuel oil. The main engine assumption was based on the 2005 ARB OGV survey; the auxiliary boiler assumption was based on communications with boiler manufacturers. For auxiliary engines, it was assumed that 92% of cruise ships burned heavy fuel oil and 8% distillate. For all other ships, it was assumed that 71% use heavy fuel oil and 29% use distillate in their auxiliary engines. These data were obtained from the 2005 ARB OGV survey.

Table II-10 Fuel Consumption Rates (g/kW-hr)

Engine	Engine Speed	Mode	Fuel	Fuel Use Rate
Auxiliary	All	All	Marine Distillate	217
	All	All	Residual	227
Boiler	N. A.	All	Residual	305
Main	High	Transit	Residual	213
	Medium	Transit	Marine Distillate	203
	Slow	Transit	Marine Distillate	185
	Medium	Transit	Residual	213
	Slow	Transit	Residual	195
	High	Maneuvering	Residual	213
	Medium	Maneuvering	Marine Distillate	203
	Slow	Maneuvering	Marine Distillate	185
	Medium	Maneuvering	Residual	213
	Slow	Maneuvering	Residual	195

Fuel consumption rates were obtained from Entec (Entec, 2002) and vary by engine, engine speed, and mode of operation. Fuel use rates are expressed in the same units as emission factors; in grams per kilowatt hour. Table II-10 summarizes the fuel consumption rates used.

7. Growth rate

Growth rates were estimated by vessel type and by port. These growth rates were based upon an analysis of US Army Corps of Engineers vessel call data (USACE, 2006) between the years 1994-2005. The total net registered tonnage (NRT), a measure of the volume of cargo a ship can carry, was determined by vessel type and by port. Previous ARB OGV growth rates were based on total installed main engine power determined from vessel call data between the years 1997 and 2003. Growth in NRT is directly proportional to growth in installed power. NRT was used to estimate growth because it was not possible to determine main engine power for many of the records; in contrast, NRT data was available for almost 99% of the records analyzed. The growth rates selected are the midpoint between the best fit compounded annual growth rate in NRT between 1994 through 2005 and the best fit linear (arithmetic) growth rate in NRT for the same time period. The sum of growth of all California ports was set to equal to the statewide growth with the assumption that the ports will grow proportionally to their historical NRT growth between the years 1994-2005.

Growth rates developed using this methodology were checked and verified against other studies, including the Port of Los Angeles and Port of Long Beach emission inventory updates done in 2007 (Starcrest, 2007a and 2007b), the Port of San Diego emission inventory (Starcrest, 2007c), and the Port of Oakland emission inventory (Environ, 2007).

Table II-11 Growth Rates by Port and Vessel Type

Port	Auto	Bulk	Container	Cruise	General	Reefer	Roro	Tanker
Avalon/Catalina				3.9%				1.0%
Carquinez	-4.0%	-0.7%	-4.0%		0.3%		-4.0%	-0.9%
El Segundo								5.4%
Hueneme	5.9%	-27.0%	8.3%	7.3%	8.3%	1.4%	5.9%	5.0%
Humboldt		-13.4%		0.0%	-0.7%			
Los Angeles-Long Beach	1.4%	-2.3%	6.8%	3.9%	1.0%	-8.0%	1.4%	1.0%
Monterey				0.0%	0.0%			
Oakland		-3.8%	4.4%		4.4%		4.4%	
Pacific Lightering Zone								5.4%
Redwood		5.2%			5.2%			
Richmond	-1.4%	-3.8%	-5.4%		-5.4%		-1.4%	0.0%
Sacramento		-5.4%			-1.9%		-1.9%	-2.1%
San Diego	4.0%	1.5%	6.8%	8.7%	2.7%	7.0%	4.0%	5.0%
San Francisco	-0.9%	3.4%	-0.9%	5.3%	-0.9%	0.0%	0.0%	0.0%
Stockton		3.4%			1.9%	1.9%		5.3%

Table II-11 summarizes the growth rates by port and by vessel type. Growth rates are stated in this table as annual compound growth rates.

The economic recession that officially started in December of 2007 and ended in June 2009 was the most severe since the Great Depression, and had a severe impact on industries throughout California. In addition to the methodological improvements staff incorporated the impacts of the recession on OGV emissions.

To forecast activity following the recession, staff developed three recovery scenarios to encompass the possible rate of growth ("fast", "slow", and "average"). The fast recovery scenario assumed that total activity would return to projected historically average levels in 2017 and then grow at the historical average rate. A return to trend by 2017 was based on the Congressional Budget Office forecast which indicated that real gross domestic product at a nationwide level will converge with potential gross domestic product trends no later than 2015. This forecast was modified with the assumption that California's recovery will lag the nation by several years, yielding the 2017 recovery date assumed for the fast recovery scenario. For the slow recovery scenario, staff assumed that activity would be permanently depressed relative to historical levels, but continue to grow at the growth rate in the 2009 San Pedro Bay Ports Forecast Update beginning in 2011(Tioga, 2009). The average scenario is the average of the fast and slow scenarios.

The impact of the recession on net registered tonnage in 2009 was estimated from port call and TEU data spanning January 1, 2009 through July 31, 2009 and scaling the results to the entire year. These totals were then checked at the beginning of 2011 with the final totals from 2009 and 2010.

Given the uncertainty in forecasting emissions after such a deep recession, staff relied on the average recovery scenario. This scenario, for the years of interest

for these regulatory amendments, is also supported by the most recent San Pedro Bay forecasts.

8. Control Measures

There are several control measures built into the ship inventory:

- 1997 MARPOL Annex VI Emission Standards (IMO Tier 1)
- 2004 Los Angeles/Long Beach 20 nm Voluntary Speed Reduction Zone
- 2005 US EPA Category 3 Engine Standards (MARPOL Annex VI)
- 2005 Auxiliary Engine Regulation (not currently enforced)
- 2007 Shore Power Regulation
- 2009 Los Angeles/Long Beach 40 nm Voluntary Speed Reduction Zone
- 2012 North American Environmental Control Area

The 1997 MARPOL standards were established by the International Maritime Organization (IMO) at the International Convention on the Prevention of Pollution from Ships", known as MARPOL. It provides for limits on NOx emissions from ships, depending on engine speed. For slow speed engines, NOx is limited for ships built after 1999 to 17 gms/kw-hr, which is a six percent reduction.

The Los Angeles/Long Beach Voluntary Speed Reduction (VSR) Zone was established by the Southern California Marine Exchange (MXSOCAL) in 2004. This is a voluntary control measure which requests that ships not exceed a speed of 12 knots within 20 nautical miles of Point Fermin. In 2009, this zone was expanded to 40 nautical miles from Point Fermin. This inventory calculates the benefits of this control by the inclusion of ship and port call specific speed data obtained from the Southern California Marine Exchange. The approximate compliance rate for the 2006 base year was 65%. For forecasted years, it was assumed that full compliance would be attained by 2014.

	%Compliance	
Year	**0-20nm**	**20-40nm**
2005	48%	0
2006	65%	0%
2007	72%	0%
2008	81%	0%
2009	91%	48%
2010	100%	63%
2011	100%	70%
2012	100%	80%
2013	100%	90%
2014	**100%**	**100%**

The 2005 US EPA category 3 standards are an implementation of the International Maritime Organization (IMO) Tier 1 standards agreed to by 136 countries; the agreement is commonly known as MARPOL Annex VI (MARPOL stands for Marine Pollution). Ships built on or after 2000 are required to emit approximately 6-12% less NOx, depending on engine speed. In 2008, the IMO expanded the tier 1 standard to apply retroactively to ships built before 2000, and also added a Tier 2 standard which applies to ships built after 2010, and a Tier 3 standard which applies to post-2015 ships in environmental control areas (ECAs). IMO Tier 2 and Tier 3 standards are not included in this inventory in this document for consistency with the inventory used for modeling.

In 2005, the ARB approved a regulation which requires ship auxiliary engines to use 0.5% sulfur fuel on or after 2007, and 0.1% sulfur after 2010. The final rule was approved by the Office of Administrative Law in October, 2007. Enforcement of the regulation was suspended in 2008 due to a legal challenge. The regulation was enforced for 7 months in 2007, and for 116 days in 2008.

In 2007, the ARB approved a regulation which requires container ships, cruise ships, and reefer ships visiting five California ports to use shore power. Fleets with less than 25 visits per year are exempt; ships are permitted 3 hours of auxiliary engine use per visit after the regulation goes into effect. By 2014, fleets are required to use shore power for 50% of visits; by 2020, they are required to use shore power for 80% of visits.

In 2010, the International Maritime Organization officially accepted the North American Environmental Control Area (ECA), beginning in August, 2012. At that date, the sulfur content of fuel will be limited to 1% sulfur within 200 nautical miles of the coastline; in 2015, this limit will drop to 0.1% sulfur. Also, Tier III NOx emission standards, requiring advanced emission controls such as SCR systems, will have to be met in the ECA for ships built on or after 2016.

For standards based on age of the ship, it was assumed for forecasting purposes that the age profile by ship type will be the same as the average age profile for ships observed for the years 2004-2006. This assumption will be revisited as new data is received; the recession has delayed new ship orders and it is likely that compliance rates for the IMO NOx standards will be less since ship fleets will tend to be older.

B. Methodology

The basic equation used for estimating emissions from ocean-going vessels is:

$$E_{y,t,om,e} = \Sigma\, Pop_{t} * EF_{e,om,f} * Hrs_{om,t} * VP_{om,t} * \%Load_{om,t}$$

where

E = pollutant specific emissions (tons per year of NOx, HC, CO2, SO2, and diesel PM)
Pop = population of ocean-going vessels by vessel type
EF = emission factor by engine type, operating mode, and fuel (units of glkw-hr)
Hrs = average annual use in hours by operating mode and vessel type
VP = average power by operating mode and vessel type
% Load = average engine load by operating mode and vessel type
y = inventory year
om = operating mode (transit, maneuvering, hoteling)
t = vessel type (auto, container, bulk cargo, etc.)
f = fuel (HFO or MGO/MDO)
e = engine type

Each of these elements, and how they were incorporated into the ocean-going vessel emission estimates, are discussed below.

III. Results

A. Emissions in the 100 nautical mile CEIDARS zone

Ship emissions presented here include all emissions within the 100 nautical mile zone used for the CEIDARS database system and for State Implementation Plan (SIP) purposes. They include the benefits of the 2007 Shore Power Regulation, the benefits of the San Pedro Bay Ports voluntary vessel speed reduction program, the proposed benefits of the current proposal, the fuel-related benefits of the North American Environmental Control Area (ECA), but not the NOx benefits of IMO Tier 3 engine standards.

Emissions are presented for the years 2005, 2010, and 2015. Table III-1 summarizes ship emissions by district. It is important to note here that the assignment of emissions to districts is for comparison purposes only. The ARB California Emissions Inventory Data and Reporting System (CEIDARS) emission inventory database requires emissions occurring in the Outer Continental Shelf (OCS) Air Basin to be assigned to specific counties and specific air pollution control districts. It is important to note that meteorology defines how OCS emissions impact land; assignment of specific OCS areas to counties and districts is done for database reasons and for comparison, and not to indicate that a specific county or district is either responsible or impacted by a specific OCS area. There exists no official federal or state governmental assignment of OCS waters to specific counties, districts or air basins.

Table III-1
Total Emissions by District in 100 nm Regulatory Zone

2005 Total Emissions in 100 nm Zone				
District	NOx	PM2.5	SOx	CO2
	tons/day			mmtCO2
Bay Area AQMD	44.3	4.0	32.3	0.7
Mendocino County AQMD	9.3	0.8	5.7	0.1
Monterey Bay Unified APCD	17.8	1.5	10.9	0.2
North Coast Unified APCD	14.0	1.2	8.6	0.2
Northern Sonoma County APCD	4.2	0.3	2.5	0.0
San Diego County APCD	5.1	0.5	3.8	0.1
San Joaquin Valley Unified APCD	0.1	0.0	0.1	0.0
San Luis Obispo County APCD	11.4	1.0	6.9	0.1
Santa Barbara County APCD	53.1	4.5	32.1	0.6
South Coast AQMD	44.8	4.6	42.8	0.9
Ventura County APCD	16.1	1.4	10.1	0.2
Yolo/Solano AQMD	0.2	0.0	0.2	0.0
Total	**220.2**	**19.6**	**155.8**	**3.2**
2010 Total Emissions in 100 nm Zone				
District	NOx	PM2.5	SOx	CO2
	tons/day			mmtCO2
Bay Area AQMD	39.2	1.6	10.3	0.6
Mendocino County AQMD	8.2	0.3	1.8	0.1
Monterey Bay Unified APCD	16.7	1.2	8.1	0.2
North Coast Unified APCD	12.5	0.6	3.8	0.2
Northern Sonoma County APCD	3.8	0.1	0.5	0.0
San Diego County APCD	4.7	0.1	0.7	0.1
San Joaquin Valley Unified APCD	0.1	0.0	0.0	0.0
San Luis Obispo County APCD	10.8	0.8	5.9	0.1
Santa Barbara County APCD	51.5	2.2	14.4	0.6
South Coast AQMD	37.8	1.1	7.3	0.8
Ventura County APCD	15.1	0.3	1.8	0.2
Yolo/Solano AQMD	0.1	0.0	0.1	0.0
Total	**200.5**	**8.3**	**54.8**	**2.9**
2015 Total Emissions in 100 nm Zone				
District	NOx	PM2.5	SOx	CO2
	tons/day			mmtCO2
Bay Area AQMD	50.0	0.8	1.6	0.7
Mendocino County AQMD	10.9	0.2	0.2	0.1
Monterey Bay Unified APCD	21.9	0.3	0.5	0.3
North Coast Unified APCD	16.2	0.2	0.4	0.2
Northern Sonoma County APCD	4.9	0.1	0.1	0.1
San Diego County APCD	6.1	0.1	0.2	0.1
San Joaquin Valley Unified APCD	0.1	0.0	0.0	0.0
San Luis Obispo County APCD	14.1	0.2	0.3	0.2
Santa Barbara County APCD	72.8	1.1	1.6	0.9
South Coast AQMD	43.8	0.9	2.7	0.9
Ventura County APCD	21.2	0.3	0.5	0.3
Yolo/Solano AQMD	0.1	0.0	0.0	0.0
Total	**262.3**	**4.2**	**8.1**	**3.7**

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