CALIFORNIA INFRASTRUCTURE STATE IMPLEMENTATION PLAN (SIP) REVISION

CLEAN AIR ACT SECTION 110(a)(2)(D)

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California Environmental Protection Agency
Air Resources Board

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Executive Summary

The Federal Clean Air Act (CAA) contains provisions to protect downwind states from pollution that may originate in upwind states. These provisions are known as the "good neighbor" or "interstate transport" provisions. This State Implementation Plan (SIP) revision contains California's analysis of the interstate transport of several pollutants for which the United States Environmental Protection Agency (U.S. EPA) has implemented national ambient air quality standards (NAAQS or standard): fine particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), and ozone (O_3).

Exposure to these pollutants is associated with numerous effects on human health, including increased respiratory symptoms, hospitalizations, and premature death. U.S. EPA has strengthened the standards for these pollutants in recent years; the 35 micrograms per cubic meter ($\mu g/m^3$) 24-hour averaged $PM_{2.5}$ standard in 2006 (35 $\mu g/m^3$ $PM_{2.5}$ NAAQS); the 0.075 parts per million (ppm) 8-hour ozone standard in 2008 (0.075 ppm Ozone NAAQS); the 75 parts per billion (ppb) 1-hour SO_2 standard in 2010 (75 ppb SO_2 NAAQS); and in 2012, the 12.0 $\mu g/m^3$ annual $PM_{2.5}$ standard (12.0 $\mu g/m^3$ $PM_{2.5}$ NAAQS). These revised standards triggered the requirement to assess California's contributions to areas with standard violations in other states.

Regional pollutants such as ozone and $PM_{2.5}$ are derived from complex interactions of emissions from many sources. Regional pollutants can be readily entrained and transported, resulting in regional (or larger) scale pollution issues. For these pollutants, nonattainment and maintenance receptors in other states identified as a means to evaluate the impacts of particular source regions. The Air Resources Board (ARB) reviewed existing monitoring data, emissions inventories, topography and meteorology, technical support documents, available modeling results, and the latest design values to establish potential downwind receptors in other states.

In contrast, near-source pollutants such as SO_2 are mainly derived from a single source or group of sources, maximum concentrations are localized, and the scale of monitoring is relatively limited. For the analyses presented here, specific downwind receptor sites were not identified because SO_2 monitoring data from neighboring states is limited and concentrations are well below the federal 1-hour standard. Instead, this weight of evidence focuses on the location of facilities and the magnitude of their emissions, proximity of facilities to neighboring states, and air quality measured throughout California and neighboring states.

ARB staff concluded that SO_2 impacts are confined to local areas around the emission source. ARB staff found no evidence of significant transport of SO_2 across the state border and concluded that California sources do not contribute significantly to SO_2 pollution in any other state.

For $PM_{2.5}$, ARB staff concluded that most violations of either of the two $PM_{2.5}$ NAAQS were the result of wintertime stagnation events in combination with local sources, particularly residential wood combustion and motor vehicle emissions, or were directly attributable to wildfire activity in the western states, a natural event that could not be reasonably controlled or prevented. Other violations were the result of local sources impacting nearby monitors. ARB staff found no evidence of significant transport of $PM_{2.5}$ across the state border and concluded that California sources do not contribute significantly to $PM_{2.5}$ pollution in any other state.

For ozone, California's transport assessment included independent weight of evidence (WOE) analyses as well as a review of ozone transport modeling conducted by the U.S. EPA. Given the complexities of transport patterns in the West, uncertainties in modeling, and the impact of wildfires, the assessment demonstrates that California does not significantly impact ozone in downwind states. However, ARB welcomes an opportunity to continue to work with U.S. EPA and other western states to better refine future modeling and specifically the quantification of transport impacts. At the same time, ARB will continue to implement comprehensive emission control programs that will reduce California emissions on an ongoing basis.

I. Introduction

Sections 110(a)(1) and (2) of the CAA require states to submit SIPs that implement, maintain, and enforce a new or revised ambient air quality standard within three years following promulgation of the standard. Among the SIP elements identified in Section 110(a)(2) is the requirement to address transport of pollutants between states.

CAA Section 110(a)(2)(D) prohibits the transport of pollutants from one state to another, where the pollutant could contribute significantly to violations of a federal standard, interfere with maintenance of a federal standard, or contribute to reduced visibility.

This document specifically addresses the requirements specified in CAA Section 110(a)(2)(D)(i)(I) that a state SIP:

> *"contain adequate provisions ---*
>
> > *(i) prohibiting, consistent with the provisions of this subchapter, any source or other type of emissions activity within the State from emitting any air pollutant in amounts which will –*
> >
> > > *(I) contribute significantly to nonattainment in, or interfere with maintenance by, any other State with respect to any such national primary or secondary ambient air quality standard"*

These requirements are generally referred to as "Prong 1" (significant contribution to nonattainment) and "Prong 2" (interference with maintenance). ARB is addressing these prongs for the following federal standards: 0.075 ppm ozone NAAQS, 35 $\mu g/m^3$ and 12.0 $\mu g/m^3$ $PM_{2.5}$ NAAQS, and 75 ppb SO_2 NAAQS.

ARB previously addressed prongs 1 and 2 for the 0.080 ppm ozone standard and 65 $\mu g/m^3$ $PM_{2.5}$ and 15.0 $\mu g/m^3$ $PM_{2.5}$ NAAQS in its November 16, 2007, Infrastructure SIP submittal. U.S. EPA approved these elements on July 15, 2011 (76 FR 34872). In addition, ARB addressed prongs 1 and 2 for the 0.15 $\mu g/m^3$ lead NAAQS in its October 6, 2011, Infrastructure SIP submittal. This submittal has been deemed complete, but U.S. EPA has not yet finalized any actions. Because the impacts of lead are localized and lead sources in California are limited, transport is not an issue, and ARB is not providing any additional assessment as part of this submittal.

ARB also addressed prongs 1 and 2 relative to the 100 ppb 1-hour nitrogen dioxide (NO_2) NAAQS in its December 12, 2012, Infrastructure SIP submittal. This submittal has been deemed complete, but U.S. EPA has not yet finalized any actions. Updated information was provided in July 18, 2014, presenting additional evidence that NO_2 does not represent a transport issue relative to California emissions.

On September 13, 2013, U.S. EPA issued guidance for Infrastructure SIP elements, including interstate pollution transport. In accordance with that guidance, this document establishes that California meets the requirements of sections 110(a)(2)(D)(i)(I) of the CAA for the 0.075 ppm ozone NAAQS, the 35 $\mu g/m^3$ $PM_{2.5}$ NAAQS, the 12.0 $\mu g/m^3$ $PM_{2.5}$ NAAQS, and the 75 ppb SO_2 NAAQS.

In July 2015, U.S. EPA notified states of their failure to make the requirement SIP submission addressing interstate transport of pollutants related to the 0.075 ppm ozone NAAQS. This finding started a 24-month clock for U.S. EPA to issue a final Federal Implementation Plan (FIP) for any state that does not submit a plan within that time period.

In addition to California's responsibilities specified under CAA Section 110(a)(2)(D), CAA Section 126 allows other states to petition the U.S. EPA Administrator for a finding that any major source or group of stationary sources emits or would emit any air pollutant in violation of CAA Section 110(a)(2)(D)(ii). No such petitions have been filed for California. Under CAA Section 115, the Administrator may find that air pollutant(s) emitted in the United States cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare in a foreign country. The Administrator has not made any such findings for California.

II. Emission Limits and Other Applicable Control Measures

ARB and the California local air pollution control districts (APCDs) and air quality management districts (AQMDs) (local districts or districts) develop, implement, and enforce measures and programs aimed at controlling emissions, resulting in significant air quality improvements. Current monitoring data show that statewide air quality continues to move toward meeting the federal standards. With continued enforcement of existing control measures and the development and implementation of new measures, California will continue to progress toward attainment and maintenance of all federal standards, as well as ensure that it continues to reduce interstate pollutant contributions to any other state.

Prior to the 1970 CAA Amendments, Congress granted California the authority to adopt its own mobile source emission control standards in recognition of the fact that the State had the nation's most serious air pollution problems. ARB continues to implement stringent control measures aimed at reducing emissions from anthropogenic sources. California's air quality challenges have led the State and local air districts to advance ever-increasing levels of controls to ensure attainment deadlines are met.

California Health and Safety Code (H&SC) 39002 divides emission control activities into vehicular and non-vehicular sectors. ARB has authority to adopt and implement mobile source controls; an authority which extends to both on-road and off-road mobile sources, as well as to the fuels that power them (H&SC Section 39602.5). ARB also has authority to regulate consumer products, under H&SC Section 41712(b). California's consumer products program directly benefits air quality in other states in two ways. First, it reduces California emissions. Second, many products sold across the nation are formulated to meet California's more stringent limits.

Over time, California has developed and implemented one of the most comprehensive and stringent emission control programs in the nation. These controls limit the emission of all pollutants and their precursors subject to federal standards, and reflect the effective air quality partnership that exists at the State and local levels.

To expedite air quality benefits from mobile sources with harmonized California and national emission standards, California has adopted and implemented "fleet rules" for heavy-duty trucks, buses, and construction equipment. These rules accelerate deployment of the cleanest available emission control technologies, thereby bringing forward emission reductions sooner than they would have otherwise occurred. To support this effort, the State has funded incentive programs to further reduce emissions from the legacy fleet and has pursued numerous advanced mobile source technologies.

Over the last several decades, ARB has tightened motor vehicle and fuel standards, as well as adopting a Zero Emission Vehicle (ZEV) mandate, starting in 1990 with the Low

Emission Vehicle regulation and continuing with the current ZEV Action Plan.[1] In 2012, ARB adopted the Advanced Clean Car (ACC) rulemaking, a suite of regulations that ensure emissions from the State's light-duty vehicle fleet. One aspect of these regulations focuses on advanced technology development to ensure that electric drive technology is commercialized and brought to production scale in as short a time as possible. California has a long history of partnering with automotive manufacturers, energy providers, government, and non-governmental organizations that has resulted in the development of both cleaner vehicles and fuels and the infrastructure to support them.

California has also implemented a number of programs to reduce emissions from mobile sources already in use. The Smog Check program, for example, ensures that passenger vehicles continue to control emissions as they age and that on-board diagnostic systems identify smog control problems. Heavy-duty truck inspection programs help control smoke emissions and detect emission control mal-maintenance and tampering. Over the last decade, ARB adopted more than 20 in-use vehicle regulations, and emission standards for off-road sources, such as lawn and garden equipment, recreational vehicles and boats, and construction equipment.

In contrast, local districts have authority to adopt and implement stationary source controls. The stringency of these district rules can vary, depending on the nature and severity of the local air pollution problem.

California's 35 local districts have primary authority to control emissions from stationary sources and small local businesses. These controls are generally implemented through a combination of prohibitory rules that set emissions limits by facility type and facility permits that specify equipment use and other operating parameters, including accommodating industrial growth while mitigating environmental impacts. Many district rules reflect established emission control technologies, while others reflect some of the newest and state of the art technologies. In combination, district rules cover a wide range of sources including refineries, manufacturing facilities, cement plants, refinishing operations, electrical generation and biomass facilities, boilers, and generators, and are among the most stringent in the nation.

Table II.1 provides a small sampling of the State and district rules for $PM_{2.5}$, ozone, and SO_2 that have been adopted over the years and submitted as part of the California SIP. This table includes a brief description of the rule, the pollutant or precursors controlled, the California Code of Regulations (CCR) citation or air district rule number, and a citation for the Federal Register approval notice. A number of the measures listed are pollutant-specific, while others target multiple pollutants, thus maximizing the cost-benefit. The rules listed in Table II.1 demonstrate a small sampling of the actions taken by the State and districts to adopt and implement the control measures needed to attain

[1] Governor's Interagency Working Group on Zero-Emission Vehicles, April 2015 ZEV Action Plan http://gov.ca.gov/docs/DRAFT_2015_ZEV_Action_Plan_042415.pdf

and maintain the federal standards, as authorized in the H&SC. A complete list of ARB control measures since 1985 can be found in Appendix G.

In addition to regulating sources under State control, ARB has worked closely with U.S. EPA to regulate emissions where authority is split between California and the federal government. These efforts have impacted emissions from large diesel, gasoline, and liquid petroleum gas equipment and important emission benefits have resulted from new locomotive engines, which are now 50 to 60 percent cleaner. Regulations have been developed requiring cleaner fuels for ocean-going vessels within 24-miles of the California coast, as well as to reduce emissions from diesel auxiliary engines while ships are berthed in California ports. One key element outlined in ARB's discussion draft Mobile Source Strategy[2] released in October, 2015, calls for U.S. EPA to develop a national low-NOx standard for heavy-duty trucks. Timely action by U.S. EPA to implement a national low-NOx performance standard will pay dividends throughout the nation, including the other western states.

As noted above, California has longstanding programs to reduce pollutant and precursor emissions from all types of sources as part of the Statewide strategy to attain the federal standards. All told, California's programs, rules, and regulations, have resulted in significant emission reductions over the last decade, with further reductions projected into the future. As shown graphically in Figure II.1, these programs have reduced, and will continue to reduce the potential for interstate transport of emissions that would contribute to violations or interfere with maintenance of federal standards in other areas. In addition, California's draft Mobile Source Strategy was recently developed to assist in the continuing commitment to reduce emissions. The draft Mobile Source Strategy contains proposed measure concepts that would reduce NOx emissions in the South Coast 80 percent from today's levels by 2031.

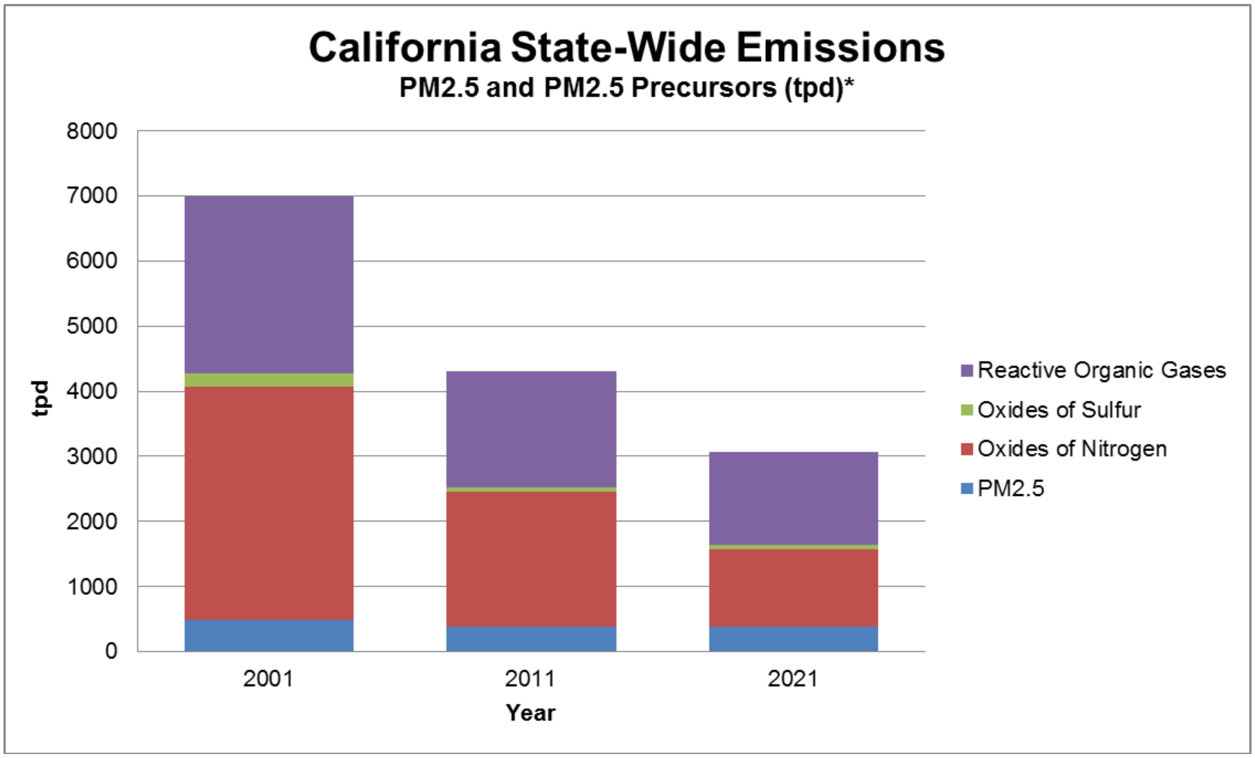
[2] ARB, California Mobile Source Strategy, Discussion Draft, October 2015, http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm, last accessed: November 13, 2015

Table II.1: Sample List of California State and Local Air District Rules

Rule Description	Pollutant or Precursor Emission Controlled*	Rule/Regulation Number**	Federal Register (FR) Citation
Exhaust Emissions Standards and Test Procedures – 1985 & Subsequent Model Heavy-Duty Engines and Vehicles	HC, NOx, PM, CO	State Regulation 13 CCR 1956.8	75 FR 26653
Exhaust Emissions Standards and Test Procedures – 2004 & Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles	HC, NOx, PM, CO	State Regulation 13 CCR 1961	75 FR 26653
In-Use Heavy-Duty Diesel-Fueled Truck and Bus Regulator and Drayage Truck Regulation	HC, NOx, PM, CO	State Regulation 13 CCR 2025	77 FR 20308
In-Use Off-Road Diesel Vehicles	HC, NOx, PM, CO	State Regulation 13 CCR 2449	78 FR 58090
California Reformulated Gasoline Regulations	HC, SOx	State Regulation 13 CCR 2250-2297	60 FR 43379, 75 FR 26653
Sulfur Content of Diesel	SOx	State Regulation 13 CCR 2281	75 FR 26653
Consumer Products	VOC	State Regulation 17 CCR Subchapter 8.5 Article 2	77 FR 7535
Open Burning	PM	South Coast AQMD Rule 1420.1 Imperial County APCD Rule 421	67 FR 16644 66 FR 36170
Agricultural Sources	PM	San Joaquin Valley APCD Rule 8081	71 FR 8461
Portland Cement Kilns	NOx	Mojave Desert AQMD Rule 1161	68 FR 9015
Fugitive Dust Control	PM	Mojave Desert AQMD Rule 403.1	74 FR 40750
Agricultural Burning	PM	Sacramento Metro AQMD Rule 501 Imperial County APCD Rule 701	49 FR 47490 68 FR 4929
Control of Fine Particulate Matter	PM	Imperial County APCD Rule 800	78 FR 23677

** HC = hydrocarbons; NOx = oxides of nitrogen; PM = particulate matter; CO = carbon monoxide; SOx = oxides of sulfur; VOC = volatile organic compounds*
*** CCR = California Code of Regulations; AQMD = Air Quality Management District; APCD = Air Pollution Control District*

Figure II.1: California State-Wide Emissions for $PM_{2.5}$ and $PM_{2.5}$ Precursors (2001 to 2021)



III. Transport Assessment Methodology

The methods used to identify potential downwind receptors vary based on the particular NAAQS. As modeling guidance was available only for the ozone NAAQS, $PM_{2.5}$ and SO_2 receptors were determined using methodology developed from U.S. EPA guidance as well as consultation with U.S. EPA Region 9 staff.

A receptor is defined as a downwind location that currently violates, has violated in the past, or is projected to violate in the future, any specific NAAQS. For all NAAQS, there are two types of receptors: nonattainment and maintenance, and the specifics regarding their determination are described in each subsection below.

Nonattainment receptors are evaluated to determine whether California has a potential to make a significant contribution to nonattainment in other states. Maintenance receptors are evaluated to determine if California has the potential to interfere with another state's maintenance of attainment.

Fine Particulate Matter ($PM_{2.5}$)

ARB staff used a WOE approach to examine the potential for directly emitted $PM_{2.5}$, as well as $PM_{2.5}$ precursor emissions, to contribute to nonattainment or interfere with maintenance of either of the $PM_{2.5}$ standards in both neighboring states and states further downwind.

The first step in this analysis was determination of the most current valid design value data. These data were obtained from U.S. EPA's Office of Air Quality Planning and Standards Air Trends website (http://www.epa.gov/airtrends/values.html). The three most recent consecutive three-year design value periods used for this analysis are 2010-2012, 2011-2013, and 2012-2014.

- A **nonattainment receptor** is defined as a receptor that is violating the NAAQS in the most recent three-year period (2012-2014).

- A **maintenance receptor** is defined as a receptor that shows attainment in the most recent three-year design value period (2012-2014) but violated the NAAQS in at least one of the previous two periods (2010-2012 and/or 2011-2013).

Consultation with U.S. EPA Region 9 staff resulted in final lists of both nonattainment and maintenance receptors; these lists may be found in Table III.1 and III.2 as well as Appendices A and B. In addition to the identification of these potential receptors, several other factors were used to evaluate the WOE, including information on

California emissions and emissions controls, ambient monitoring data, meteorological conditions, and local geography and topography.

Table III.1: Valid 2014 24-Hour $PM_{2.5}$ Design Values above the NAAQS in Neighboring and Nearby States

EPA Region	State	County	Site ID	2014 24-hour Design Values ($\mu g/m^3$)
09	Arizona	Pinal	04-021-3013	36
10	Idaho	Lemhi	16-059-0004	39
10	Idaho	Shoshone	16-079-0017	40
08	Montana	Ravalli	30-081-0007	61
08	Montana	Silver Bow	30-093-0005	37
10	Oregon	Crook	41-013-0100	42
10	Oregon	Jackson	41-029-0133	43
10	Oregon	Lake	41-037-0001	58
10	Oregon	Lane	41-039-2013	40
08	Utah	Box Elder	49-003-0003	37
08	Utah	Cache	49-005-0004	45
08	Utah	Davis	49-011-0004	38
08	Utah	Salt Lake	49-035-3006	43
08	Utah	Salt Lake	49-035-3010	42
08	Utah	Utah	49-049-0002	43
08	Utah	Utah	49-049-4001	42
08	Utah	Utah	49-049-5010	44

Table III.2: Valid 2014 Annual $PM_{2.5}$ Design Values above the NAAQS in Neighboring and Nearby States

EPA Region	State	County	Site ID	2014 Annual Design Values ($\mu g/m^3$)
10	Idaho	Lemhi	16-059-0004	12.1
10	Idaho	Shoshone	16-079-0017	13.1

The specific data that were considered by ARB staff in this WOE demonstration included:

- Attainment status in California and downwind states;
- California emission reduction rules, regulations, and strategies;
- Facility emissions in California;
- Local emission sources at or near potential receptor sites;

- Distance between California facilities and potential receptor sites;
- 2014 design values for monitoring sites in California and downwind states;
- Long-term $PM_{2.5}$ trends at potential receptor sites in downwind states
- Daily $PM_{2.5}$ data at potential receptor sites;
- Population and vehicle miles traveled (VMT) at or near potential receptor sites; and
- Technical support documents from U.S. EPA and downwind states.

ARB staff also analyzed $PM_{2.5}$ monitoring data at Interagency Monitoring of Protected Visual Environments (IMPROVE) sites located at National Parks and wilderness areas situated between California and outside receptors, or near the potential receptors. This data is provided in Appendix E to this report.

The transport assessment for the 35 $\mu g/m^3$ 24-hour $PM_{2.5}$ NAAQS can be found in Appendix A. The transport assessment for the 12.0 $\mu g/m^3$ annual $PM_{2.5}$ NAAQS can be found in Appendix B.

Sulfur Dioxide (SO_2)

U.S. EPA has identified SO_2 as a near-source pollutant. In the final rule for the 1-hour federal standard, published in the Federal Register in June 2010, U.S. EPA stated that:

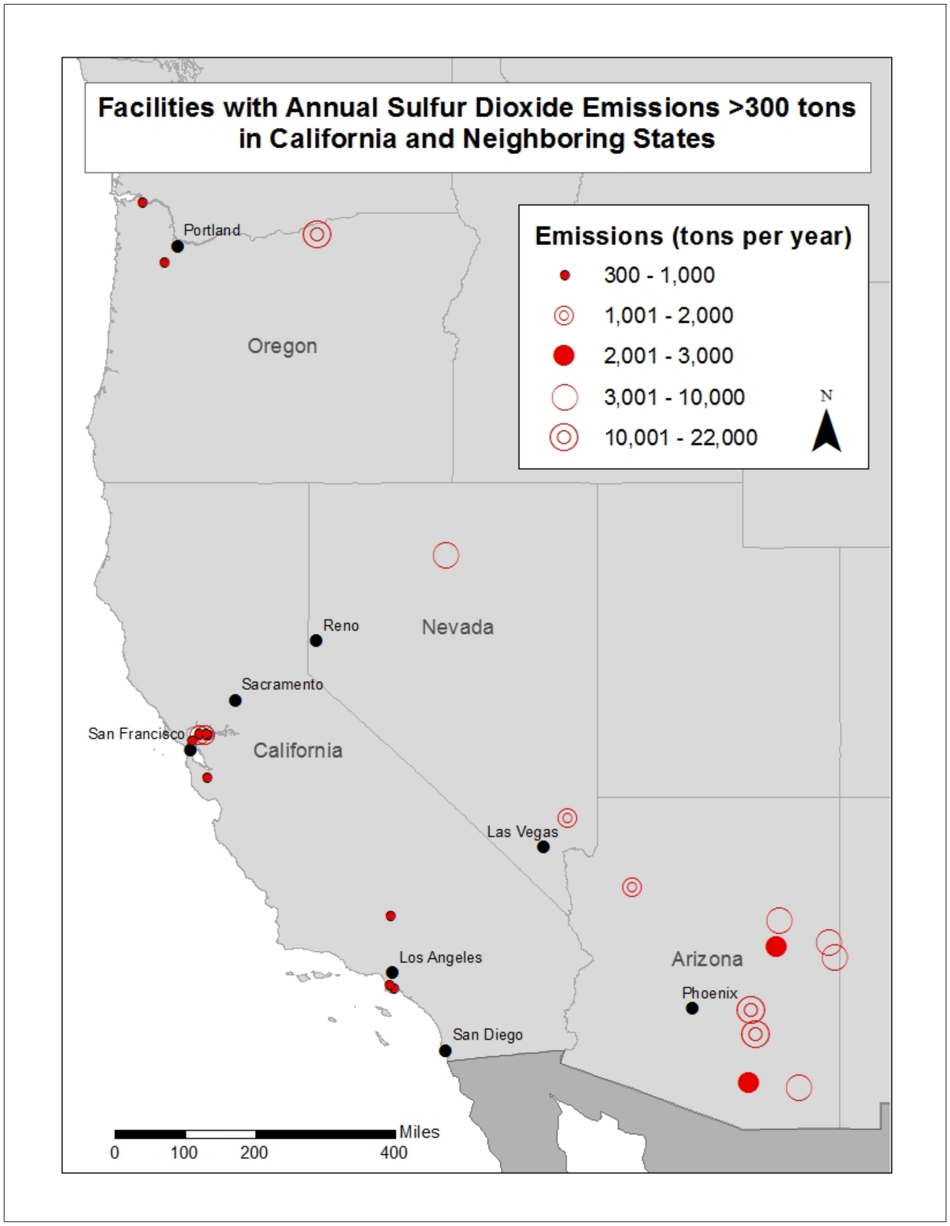
> *A significant fact for ambient SO_2 concentrations is that stationary sources are the predominant emission sources of SO_2 and the peak, maximum SO_2 concentrations that may occur are most likely to occur nearer the parent stationary source.* [3]

In this document, ARB staff used a WOE approach to examine the potential for SO_2 emissions from California to contribute to nonattainment or interfere with maintenance of the standard in neighboring states. As the federal 1-hour standard is considered a near-source standard, attainment strategies target emissions from large facilities. As illustrated in Figure III.1, all California facilities with SOx emissions exceeding 300 tons per year (tpy) are located within 100 miles of the Pacific Coast. None of the facilities located in California have emissions that exceed the 2,000 tpy threshold for large sources identified in U.S. EPA Data Requirements Rule. [4]

Given that SO_2 is a directly emitted pollutant with a short atmospheric residence time and U.S. EPA guidance indicates that maximum concentrations are expected to occur within one to two miles of most large sources, this assessment was limited to the three neighboring states that border California: Arizona, Nevada, and Oregon.

[3] Primary National Ambient Air Quality Standard for Sulfur Dioxide, 75 FR 35520, June 22, 2010
[4] Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS), 80 FR 51052, August 21, 2015

Figure III.1: Map of SO_2 Facilities in California and Neighboring States



Near-source pollutants, such as SO_2, are mainly derived from a single source or group of sources, maximum concentrations are localized, and the scale of monitoring is relatively limited. For the analyses presented here, specific downwind receptor sites were not identified because SO_2 monitoring data from neighboring states is limited and, with the exception of sites adjacent to large copper smelters in Arizona, concentrations are well below the federal 1-hour standard. Instead, this comprehensive weight of evidence focused on the location of facilities and the magnitude of their emissions, proximity of facilities to neighboring states, and air quality measured throughout California and neighboring states.

The specific data that were considered by ARB staff in this weight of evidence demonstration included:

- Attainment status in California and neighboring states;
- Facility emissions in California and neighboring states;
- 2014 design values for monitoring sites in California and neighboring states;
- Long-term SO_2 trends at key sites in California; and
- Distance between California facilities and neighboring states' borders.

The transport assessment for the 75 ppb 1-hour SO_2 NAAQS can be found in Appendix C.

Ozone (O_3)

Overview

ARB staff conducted a comprehensive WOE assessment to evaluate whether California impacted the maintenance or attainment of the 0.075 ppm 8-hour ozone standard in any other state as required by the CAA. U.S. EPA has directed states to base their evaluation on the maintenance and nonattainment receptors identified in the U.S. EPA photochemical modeling (released in July 2015).[5] This interstate transport ozone SIP relies on an extensive review of U.S EPA's photochemical modeling, air quality data, downwind receptor sites, and ARB's emission control programs as well a fundamental understanding of the science driving our understanding of the complex nature of transport among western states.

Specifically, ARB staff reviewed:

- U.S. EPA photochemical modeling results;
- Peer-reviewed literature related to modeling issues impacting western states;
- Determination of significant transport;
- Comparison of air quality data with modeling results; and
- California emission levels and control programs.

For those western states with nonattainment areas (Wyoming, Colorado and Arizona), ARB staff reviewed U.S. EPA draft interstate transport ozone modeling output. According to U.S. EPA modeling, Wyoming does not have any nonattainment or

[5] U.S. EPA, Transport for the 2008 Ozone NAAQS, http://www3.epa.gov/airtransport/ozonetransportNAAQS.html, last accessed: November 15, 2015

maintenance areas in 2017. Therefore, ARB's evaluation of California's impacts on other states focused on potential contributions to Colorado and Arizona identified by U.S. EPA's photochemical modeling. The transport analysis for the 0.075 ppm ozone NAAQS can be found in Appendix D.

Detailed analyses by ARB staff indicate that some limited degree of transport of ozone or ozone precursor emissions may be possible, given favorable meteorological patterns. However, significant uncertainties in modeling transport of photochemical pollutants in the western states, which have been well-documented in peer reviewed literature, persist.

ARB has provided comments[6] to this effect to the docket concerning the Notice of Data Availability for U.S. EPA's updated ozone transport modeling data for the 0.075 ppm 8-hour standard. It is ARB's intention to work collaboratively with U.S. EPA to clarify comments provided and assist with further refinements in future modeling efforts. In this SIP, ARB staff consider impacts of wildfires and meteorological model performance issues at five monitoring sites in Colorado and Arizona modeled to be above or near the standard in 2017. This SIP provides an assessment of wildfire impacts on ozone, design value trends, meteorological conditions favoring transport, and an overview of California's regulatory controls. ARB staff conclude that neither the modeling (if corrected to address wildfire and model performance concerns) nor WOE analyses indicate that California significantly contributes to nonattainment or interferes with maintenance in other states.

ARB continues to implement a comprehensive and aggressive emission control program. These emission control programs will continue to deliver emission benefits to California as well as other states.

Complexities

Modeling of interstate transport of ozone in the western states is challenging due to the widespread presence of complex terrain, impacts of wildfire contributions, as well as the limited availability of monitoring data to validate models.

Complex Terrain

The widespread presence of complex terrain significantly influences airflow patterns in the western states. Thus, in order to understand transport mechanisms in the western states, it is critical that we consider the many factors and the multiple scales of motion that can influence air flow patterns in complex terrain. The presence of complex terrain and associated surface roughness introduces a frictional force that can enhance vertical

[6] *Updated Ozone Transport Modeling Data for the 2008 Ozone National Ambient Air Quality Standard*, Comments submitted by Magliano, Karen, California Air Resources Board, October 23, 2015. http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2015-0500-0038,

air flow and promote entrainment of air from aloft into the mixed layer. Complex terrain can also serve as a barrier to the flow of air, limiting transport and enhancing accumulation of local emissions in basins and valleys under favorable meteorological conditions. Further, terrain forced flow patterns including up and down valley flow, as well as cross valley flow, can influence the movement of air in areas of complex terrain. More studies are needed in order to correctly understand transport among the western states and correctly model transport contributions.

Wildfires

The size and number of wildland fires occurring in the western states has increased significantly in recent decades. Although emissions generated by wildfires are episodic, numerous studies have reported that ozone concentrations can be enhanced significantly in areas adjacent to and upwind of wildfires. In addition, recent studies have shown that NOx emissions from fires can mix with regional emissions and further impact ozone concentrations downwind of the fire. Documentation provided in Appendix D supports the finding that the treatment of wildfire emissions in U.S. EPA's modeling has potential to increase future year predicted modeled design values above the level of the standard.

In addition, the inclusion of wildfires in base and future year modeling may also have the effect of reducing the modeled response to anthropogenic emission reductions in affected and upwind areas. Emissions from wildfires can be many times greater than anthropogenic emissions, which could lead to a significant underestimation when modeling the impact that anthropogenic emission reductions would have on ozone formation in wildfire impacted areas. Because of their episodic nature and the interannual variability in duration and intensity of wildfire seasons among the western states, it is very challenging to find a "one size fits all" approach to incorporating wildfire impacts into photochemical modeling for such a large domain containing 13 western states.

Regulatory Framework

Historically, interstate transport of emissions has been a significant concern for attainment of ozone standards in the eastern U.S. Rulemaking to address such concerns includes the NOx SIP Call of 1998[7] and the Clean Air Interstate Rule[8] (CAIR) of 2005. In a more recent effort to implement the requirements of the good neighbor provision, the U.S. EPA promulgated the Cross-State Air Pollution Rule[9] (CSAPR) in

[7] U.S. EPA, NOx Budget Trading Program, http://www2.epa.gov/airmarkets/nox-budget-trading-program#tab-2, last accessed: November 13, 2015
[8] U.S. EPA, Clean Air Interstate Rule, http://archive.epa.gov/airmarkets/programs/cair/web/html/index.html, last accessed: November 13, 2015
[9] U.S. EPA, Cross-State Air Pollution Rule (CSAPR), http://www3.epa.gov/airtransport/CSAPR/index.html, last accessed: November 13, 2015

2011. This rule addresses the 0.08 ppm 8-hour ozone standard. CSAPR targets upwind emissions of oxides of nitrogen (NOx) following the assumption that NOx emitted in upwind states can form ozone in downwind states.

These U.S. EPA interstate transport rulemakings focused solely on identifying linkages for eastern states. Only recently, and in consideration of attainment needs for the 0.075 ppm 8-hour ozone standard, has the CSAPR approach been applied to western states. A brief description of the CSAPR paradigm follows.

CSAPR employs a “two-step approach” to determine the extent to which a state must reduce its NOx emissions pursuant to the good neighbor provision. In the first step, U.S. EPA identifies upwind states that “contribute significantly” to one or more downwind state(s). If a downwind state’s receptor site is not in attainment and, if an upwind state contributes emissions equivalent to one percent of the 0.075 8-hour ozone NAAQS at that site, then that upwind state is deemed to have “contributed significantly” and thus has a linkage to the downwind receptor site. Any state that has at least one linkage is subject to CSAPR.

The states with a linkage identified are then subject to the second step of CSAPR. In the second step, U.S. EPA determines the emission reductions necessary for each upwind state with a linkage to comply with their good neighbor obligations to a level at which they are no longer making a significant contribution to a downwind receptor site. In response to linkages identified by the U.S. EPA following CSAPR, a state can either demonstrate that its actual contribution is below the screening threshold, or it could evaluate the scope of its transport obligation and identify measures to achieve any needed emission reductions.

U.S EPA Modeling Results for Western Receptor Sites

In August 2015, the U.S. EPA published air quality modeling results for the entire U.S. that projected average ozone design values from the year 2009-2013 at individual monitoring sites to the year 2017 and estimated upwind contributions to those 2017 design values for identified nonattainment and maintained receptors. The modeling guidance recommends using five-year weighted average ambient design values centered on the base modeling year as the starting point for projecting design values to the future. The 2017 date was selected by U.S. EPA because the 2017 ozone season is the attainment year deadline for areas designated “Moderate” for the 0.075 ppm 8-hour NAAQS. The approach for identifying nonattainment and maintenance sites and the methods for calculating upwind state contributions were consistent with the approach and methods used in the CSAPR.[10]

[10] Federal Implementation Plans: Interstate Transport of Fine Particulate Matter and Ozone and Correction of SIP Approvals, 76 FR 48208, August 8, 2011

Significance of Transport

U.S. EPA estimated each state's contribution to every other state and identified upwind states that made significant contributions to downwind nonattainment and maintenance areas using photochemical modeling analyses. An upwind state was linked to a downwind nonattainment or maintenance area if U.S. EPA's modeling projected that, absent reductions, the upwind state's contribution to the downwind receptor would exceed one percent of the 0.075 ppm 8-hour ozone standard. In its August 2015 modeling memo, U.S. EPA suggested that the one percent threshold be considered nationwide as a starting point for evaluation.

Transport relationships are fundamentally different between the eastern and western states. Transport relationships among CSAPR states are well understood and have been studied and managed over many years. In eastern states, transport contributions overwhelm local emission controls and there are often multiple upwind states impacting individual receptor sites.

In contrast, receptor sites in the western states are primarily impacted by local emissions and transport is responsible for a much smaller portion of total impact from all sources. Given the fundamental difference in the transport scenarios at play in each region of the country, as well as the uncertainties regarding complex terrain, long distances and other issues for western states documented in the staff report, there is a great deal of uncertainty quantitatively defining significant transport among western states.

U.S. EPA recognizes these fundamental differences. In a January 2015 memo, U.S. EPA stated that in contrast to CSAPR states, transport in the West would be addressed on a case-by-case basis. ARB welcomes the opportunity to work collaboratively with U.S. EPA and other western states on ways to appropriately conduct modeling in the West.

Results for Western Receptor Sites

U.S. EPA's draft modeling indicates that Colorado will have two monitors in the Denver-Boulder-Greeley-Ft Collins-Loveland nonattainment area (Denver nonattainment area) that are projected to violate the standard in 2017, and another two that will be close to the standard or maintenance receptors. For these projected nonattainment and maintenance monitors, U.S. EPA's draft modeling showed a contribution from California that, while small, was greater than 0.00075 parts per million (or 0.75 parts per billion) ozone. That level is one percent of the ozone standard, which for interstate transport purposes in eastern states (CSAPR) is considered a significant impact when the downwind monitor is projected to be nonattainment or maintenance.

While all monitors in the Phoenix-Mesa, Arizona nonattainment area are projected to meet the standard in 2017, U.S. EPA's draft modeling[11] indicates one will be close to the standard, a maintenance receptor. Draft modeling for this maintenance monitor attributes ozone contributions from California at levels in excess of one percent of the ozone standard.

ARB's evaluation of California's impacts on other states therefore focused on potential contributions to Colorado and Arizona. Table III.3 and Figure III.2 identify the receptors and estimated California contribution from U.S. EPA's photochemical modeling assessment.

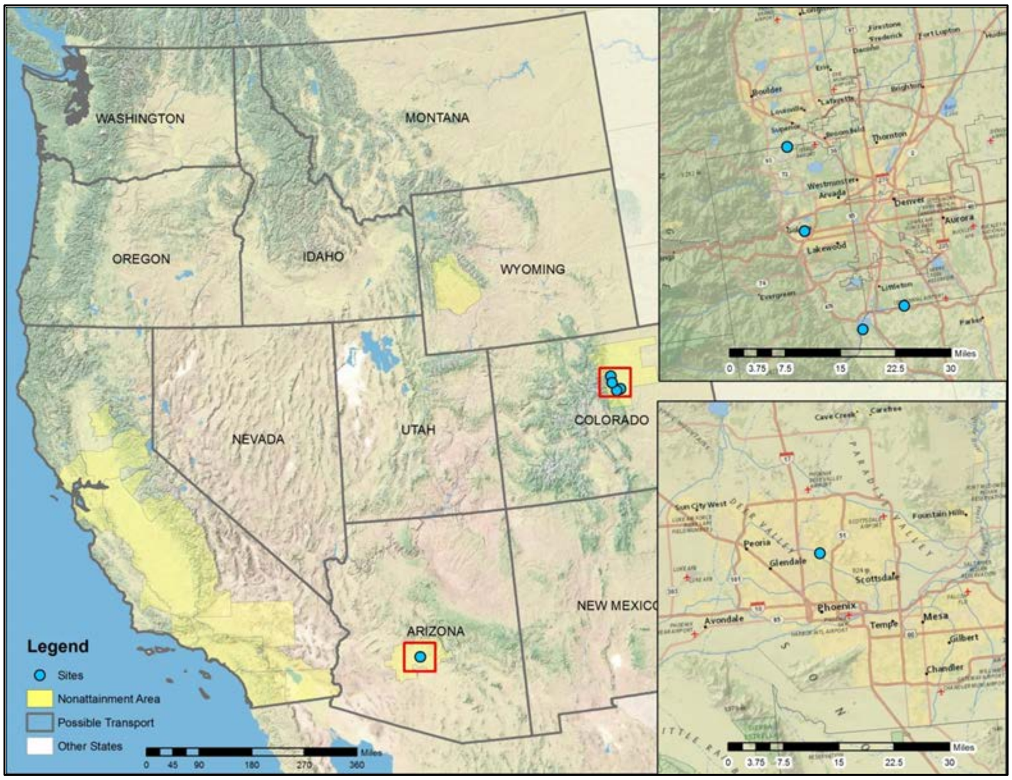
Table III.3: List of Western Counties with Identified Receptor Sites

Status	Site Name	State	County	2014 Design Value	2017 Projected		
					Average Design Value (ppb)	Maximum Design Value (ppb)	California Contribution (ppb)
Maintenance	North Phoenix	AZ	Maricopa	80.0	75.0	76.2	3.44
NA	Chatfield	CO	Douglas	81.0	76.0	78.1	1.23
NA	Rocky Flats-North	CO	Jefferson	82.0	76.3	78.8	1.75
Maintenance	Highland Reservoir	CO	Arapahoe	-	74.4	76.6	1.16
Maintenance	National Renewable Energy Labs	CO	Jefferson	80.0	75.8	78.9	1.93

ARB staff has reviewed modeling performed by U.S. EPA for the western states and has provided comments to U.S. EPA's docket. In these comments, ARB staff noted topics needing further attention, including treatment of wildfires and model performance issues.

[11] Page, Stephen D., U.S. EPA, Memorandum to Regional Air Directors, January 22, 2015, http://www3.epa.gov/airtransport/GoodNeighborProvision2008NAAQS.pdf

Figure III.2: State of California and Location of Nonattainment and Maintenance Receptors for 0.075 ppm Ozone NAAQS



One concern raised was that U.S. EPA's inclusion of wildfire emissions in modeling for 2011 and 2017 would result in underestimated benefits of anthropogenic emission reductions. Also, the modeling methodology should be strengthened to remove artifacts from wildfires in years not modeled, but represented in the modeled base year design value. This could be accomplished by adjusting the relative weighting of years. Doing so would ensure that years with documented wildfire impacts on measured ozone levels do not bias modeled projections for future year design values. Another key comment related to model performance addressed the steps taken to ensure that design value type days were modeled with representative meteorological conditions because such days (when local emissions typically dominate in large metropolitan areas) would improve modeled estimates of contributions from other states at downwind receptors.

IV. Environmental Analysis

Introduction

This section provides the basis for ARB's determination that the proposed California Infrastructure SIP is exempt from the requirements of the California Environmental Air Quality Act (CEQA). A brief explanation of this determination is provided below. ARB's regulatory program, which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality, has been certified by the California Secretary for Natural Resources under Public Resources Code section 21080.5 of the CEQA (14 CCR 15251(d)). Public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to, preparing environmental impact reports, negative declarations, and initial studies. ARB, as a lead agency, prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the Staff Report prepared for a proposed action to comply with CEQA (17 CCR 60000-60008). If the SIP is finalized, a Notice of Exemption will be filed with the State Clearinghouse for public inspection.

Analysis

ARB has determined that the proposed California Infrastructure SIP is exempt from CEQA under the "general rule" or "common sense" exemption (14 CCR 15061(b)(3)). The common sense exemption states a project is exempt from CEQA if "the activity is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." The proposed SIP revision will not result in a significant adverse impact on the environment since it is limited to describing authorities, resources, and programs California has in place to implement, maintain, and enforce the federal NAAQS and does not contain any proposals for emission control measures or other actions that could result in adverse impacts to the environment. Based on ARB's review it can be seen with certainty that there is no possibility that the proposed SIP may result in a significant adverse impact on the environment; therefore, this activity is exempt from CEQA.

V. Conclusions

35 $\mu g/m^3$ $PM_{2.5}$ NAAQS

This element of the Infrastructure SIP, as detailed in Appendix A, employed a WOE approach, which demonstrates that California does not contribute to nonattainment nor does it interfere with maintenance of the 35 $\mu g/m^3$ $PM_{2.5}$ NAAQS in downwind states. This standard is considered a local, as well as a regional standard and attainment strategies focus on emissions from a variety of sources. U.S. EPA technical documents indicate that the majority of exceedances at these receptor sites are due to emissions from local sources, particularly during periods of wintertime meteorological inversions which trap pollutants and allow for the buildup of $PM_{2.5}$. Stationary sources in California are subject to strict emissions controls for primary or directly emitted $PM_{2.5}$ as well as $PM_{2.5}$ precursors, such as sulfur and nitrogen oxides, that can combine with other gases in the atmosphere to form secondary $PM_{2.5}$. In addition, California has a long history of reducing emissions through improved motor vehicle[12] and fuel standards.

At regulatory monitoring sites in California, 2014 24-hour $PM_{2.5}$ design values ranged from 12 to 71 $\mu g/m^3$, with the majority of the State well below the standard of 35 $\mu g/m^3$. Valid design values in nearby states are also well below the standard, with the exception of those few monitors previously listed in Table III.1. The assessment in Appendix A demonstrates that $PM_{2.5}$ emissions from California do not contribute to nonattainment, or interfere with maintenance of the 35 $\mu g/m^3$ $PM_{2.5}$ NAAQS in either neighboring or other nearby states.

12.0 $\mu g/m^3$ $PM_{2.5}$ NAAQS

This element of the Infrastructure SIP is detailed in Appendix B and employed a WOE approach, which demonstrates that California does not contribute to nonattainment or interfere with maintenance of the 12.0 $\mu g/m^3$ $PM_{2.5}$ NAAQS in neighboring states. This standard is considered a local, as well as a regional, standard and attainment strategies focus on emissions from a variety of sources. U.S. EPA technical documents indicate that the majority of high $PM_{2.5}$ concentrations are due to emissions from local sources, particularly during periods of wintertime meteorological inversions which trap pollutants and allow for the buildup of $PM_{2.5}$. Stationary sources in California are subject to strict emissions controls for primary or directly emitted $PM_{2.5}$ as well as $PM_{2.5}$ precursors, such as sulfur and nitrogen oxides, that can combine with other gases in the

[12] ARB, Mobile Sources Program Portal: http://www.arb.ca.gov/msprog/msprog.htm, last accessed: November 13, 2015

atmosphere to form secondary $PM_{2.5}$. In addition, California has a long history of reducing emissions through improved motor vehicle[13] and fuel standards.

At regulatory monitoring sites in California, 2014 annual $PM_{2.5}$ design values ranged from 3.9 to 19.7 $\mu g/m^3$, with the majority of the State well below the standard of 12.0 $\mu g/m^3$. Valid design values in nearby states are also well below the standard, with the exception of those few monitors previously listed in Table III.2. This assessment demonstrates that $PM_{2.5}$ emissions from California do not contribute to nonattainment, or interfere with maintenance of the 12.0 $\mu g/m^3$ $PM_{2.5}$ NAAQS in either neighboring or other nearby states.

75 ppb SO_2 NAAQS

This element of the Infrastructure SIP is detailed in Appendix C and employed a WOE approach, which demonstrates that California does not contribute to nonattainment or interfere with maintenance of the 75 ppb SO_2 standard in neighboring states. The standard is considered source-oriented and attainment strategies focus on emissions from large stationary sources. U.S. EPA guidance has indicated that maximum concentrations are expected to be observed within one to two miles of most large stationary sources. No facilities in California exceed the threshold of 2,000 tpy established by U.S. EPA to characterize large emission sources. All California facilities with SOx emissions greater than 300 tpy are located more than 140 miles from the nearest state border, which is well beyond the one-to-two mile threshold where maximum concentrations are expected to be observed.

At regulatory monitoring sites in California, 2014 1-hour SO_2 design values ranged from 1 to 39 ppb, well below the standard of 75 ppb. Design values in neighboring states were also well below the standard with the exception of the two areas of Arizona that are currently designated nonattainment. The comprehensive assessment presented in Appendix C demonstrates that SO_2 emissions from California do not contribute to nonattainment of the SO_2 standard in neighboring states.

0.075 ppm Ozone NAAQS

This element of the Infrastructure SIP is detailed in Appendix D and employed both a WOE approach, which demonstrates that California does not significantly contribute to nonattainment or interfere with maintenance of the 0.075 ppm ozone standard in neighboring states. This is based on the following analysis:

- ARB staff analysis did not demonstrate the occurrence of long-range transport from California emission source areas to Colorado using trajectory analysis

[13] Ibid

(discussed in detail in Appendix D). Given the distance (over 800 miles), complex terrain, and entrainment of ozone and precursors from other source regions along trajectory paths, there would be significant physical and chemical processing of transported air masses during transit. Thus, considerable multi-faceted analyses would be needed in the future to more accurately and confidently quantify California's contribution to ozone concentrations measured in Colorado, or other far removed western states, especially on exceedance days.

- While the distances in play make transport to Arizona a possible scenario, local contributions are the predominant contributor on high ozone days in Phoenix. Further, Phoenix is a maintenance receptor and ARB's ongoing control programs will ensure that emissions from California will not interfere with maintenance of the standard.

- The latest peer-reviewed scientific research has pointed to the need for further studies and data in order to effectively use photochemical modeling to quantify transport for the large western state modeling domain. These issues are related to the episodic and increasing frequency of wildfires, and achieving a fundamental understanding transport pathways and frequency across the vast and complex terrain of the western states.

- There are uncertainties in U.S. EPA's draft modeling for western states and their representation of transport taking place within the western U.S. involving complicated meteorology, complex terrain, and large distances between sources and receptors. Model performance issues may result in modeling not appropriately reflecting the contribution of California emissions on days that comprise the design value. Also, wildfire emissions have the potential to increase the design values used for modeling and also to underestimate the modeled impacts of anthropogenic controls. As a result of these uncertainties, ozone transport in western states may not be adequately captured in current draft modeling—especially in terms of characterizing an appropriate threshold of significance and exceeding it.

- There is a difference in transport regimes between the western states and CSAPR states. Quantification of significance and regulatory programs need to recognize and address these fundamental differences. In the CSAPR states where transport dominates the ozone problem, there are multiple upwind states and there is a decade long history of understanding transport relationships. This is in contrast to the west, where local emissions dominate ozone air quality problems and there is currently greater uncertainty on transport contributions

- California has responded to each successive new or revised ozone air quality standard by undertaking new rounds of increasingly stringent control measures. Attainment dates in the coming years dictate the pace and stringency of new control measures. Ongoing emission reductions will continue to benefit downwind states to the extent that transport occurs.