AIR POLLUTION CONTROL DISTRICT

IMPERIAL COUNTY
2018 ANNUAL PARTICULATE MATTER LESS THAN 2.5 MICRONS IN DIAMETER STATE IMPLEMENTATION PLAN

April 2018

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Abbreviations and Acronyms

ACT	Alternative Control Technique
AERR	Air Emissions Reporting Requirements
ANP	Annual Network Plan
AQTF	Air Quality Task Force
AQI	air quality index
AQS	Air Quality System
APCD	Air Pollution Control District
AVTD	Average Vehicle Trips per Day
BACM	Best Available Control Measure
BACT	Best Available Control Technology
BAM(s)	Beta Attenuation Monitor(s)
BECC	Border Environmental Cooperation Commission
BP	barometric pressure
CAA	Federal Clean Air Act
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CaRFG	California's Reformulated Gasoline program
CBP	U.S. Customs and Border Protection
CEC	California Energy Commission
CEIDARS	California Emission Inventory Development and Reporting System
CEPAM	California Emission Projection Analysis Model
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CMP	Conservation Management Practice (agriculture)
CO	carbon monoxide
COBACH	Colegio de Bachilleres-High School
CONALEP	Colegio Nacional de Educación Profesional Técnica
CTG	Control Technique Guidelines
D.C.	District of Columbia
DM	*de minimis*
DMV	Department of Motor Vehicles
DOF	State of California Department of Finance
DPR	Department of Pesticide Regulation
DRI	Desert Research Institute
DTIM	Direct Travel Impact Model
EMFAC	EMission FACtors model
FAF	Freight Analysis Framework
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GIS	Geographical Information System
hp	horsepower
HWS	horizontal wind speed

ICAPCD	Imperial County Air Pollution Control District
ICPWD	Imperial County Public Works Department
IID	Imperial Irrigation District
IRP	International Registration Plan
LCAF(s)	Large Confined Animal Facility(ies)
LEV II	Low Emission Vehicle Program
MMBtu/hr	million British thermal units per hour
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
NEAP	Natural Events Action Plan
NH_3	ammonia
NH_4	ammonium
NO_3	nitrate
NOx	oxides of nitrogen
NSPS	New Source Performance Standards
NSR	New Source Review
OT	Outside temperature
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter
PM25PRI	primary $PM_{2.5}$
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
PM10FIL	filterable PM_{10}
PMCON	condensable PM_{10}
PMPRI	primary PM_{10}
POE	ports of entry
ppm	parts per million
QA/QC	quality assurance and quality control
RACM	Reasonably Available Control Measure
RACT	Reasonably Available Control Technology
REMI	Regional Economic Models, Inc.
RFP	Reasonable Further Progress
RH	relative humidity
ROG	reactive organic gases
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCC	source classification code
SEMARNAT	Secretariat of Environment and Natural Resources
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SJVAPCD	San Joaquin Valley Air Pollution Control District
SLAMS	state or local air monitoring stations
SO_2	sulfur dioxide
SO_4	sulfate
SO_X	oxides of sulfur

SPM	Special Purpose Monitor
SR	solar radiation
SSI	Size Selective Inlet
TPA	Regional Transportation Planning Agency
tpd	tons per day
tpy	tons per year
UABC	Universidad Autónoma de Baja California
UC	University of California
UPBC	Universidad Tecnologica de Baja California
U.S.	United States
USEPA	United States Environmental Protection Agency
VDT	Vehicle daily trips
VDE	Visible Dust Emissions
VOC(s)	volatile organic compound(s)
WD	wind direction
WESTAR	Western States Air Resources Council
WRAP	Western Regional Air Partnership
$\mu g/m^3$	micrograms per cubic meter
µm	micron or micrometer
ZEV	Zero Emission Vehicle

1 Introduction and Background

1.1 Introduction

This document presents the required elements of the State Implementation Plan (SIP) for the 2012 National Ambient Air Quality Standard (NAAQS) for annual concentrations of fine particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$) for the Imperial County $PM_{2.5}$ Nonattainment Area. This chapter provides an overview of particulate matter (PM) as an air pollutant, a brief description of the Imperial County area, and a discussion of the purpose, regulatory background, and regulatory agencies with responsibilities for this Imperial County Annual $PM_{2.5}$ Nonattainment Area SIP ("SIP" or "Annual $PM_{2.5}$ SIP").

As discussed below in Sections 1.2 and 1.3, the United States Environmental Protection Agency (USEPA) has currently established NAAQS for annual $PM_{2.5}$, 24-hour $PM_{2.5}$, and 24-hour PM_{10} (particulate matter less than 10 microns in aerodynamic diameter, which includes $PM_{2.5}$-sized particles). Because of the different regulatory timelines for these NAAQS, separate SIP submittals are prepared for each one. Imperial County's most recent SIP submittals regarding particulate matter include:

- 2013 SIP for the 2006 24-Hour $PM_{2.5}$ Moderate Nonattainment Area (adopted by the Imperial County Air Quality Control District [ICAPCD] in December 2014);[1]
- 2018 SIP for the Annual $PM_{2.5}$ Nonattainment Area (**this SIP document**); and
- 2018 SIP for the 24-Hour PM_{10} Nonattainment Area (a separate document, in preparation as of March 2018).

1.2 Federal $PM_{2.5}$ Standards and Implementation

The USEPA is required under Section 108 of the Clean Air Act (CAA) to periodically review and establish health-based air quality NAAQS for pollutants which "may reasonably be anticipated to endanger public health and welfare".[2] Section 109 of the CAA directs the Administrator to propose and promulgate "primary" and "secondary" NAAQS for those pollutants identified under Section 108.

On July 18, 1997, USEPA issued its final rule revising the PM NAAQS by adding two new $PM_{2.5}$ standards to the existing 24-hour average PM_{10} standard. USEPA's decision to revise the PM NAAQS was informed by available scientific evidence linking exposures to ambient PM to adverse health and welfare effects at levels allowed by the then current PM standard. Particular attention was given to several size-specific classes of particles which included $PM_{2.5}$. The two new $PM_{2.5}$ standards were an annual standard set at 15 micrograms per cubic meter ($\mu g/m^3$) based on the 3-year average of the annual arithmetic mean and a 24-hour standard of 65 $\mu g/m^3$ based on the

[1] Available at: https://www.arb.ca.gov/planning/sip/planarea/imperial/Final_PM2.5_SIP_%28Dec_2,_2014%29_Approved.pdf. Accessed: November 2017.

[2] USEPA. 1997. *National Ambient Air Quality Standards for Particulate Matter; Final Rule*. Federal Register. Vol. 62. No. 138. July 18, 1997. p. 38652.

3-year average of the 98th percentile 24-hour average. In 2005, Imperial County was designated as an attainment area meeting the 1997 $PM_{2.5}$ NAAQS.

On October 17, 2006,[3] USEPA strengthened the primary and secondary 24-hour $PM_{2.5}$ NAAQS from 65 µg/m^3 to 35 µg/m^3. Section 107(d)(1)(A)(i) of the CAA defines a nonattainment area as any area that does not meet an ambient air quality standard, or that contributes to ambient air quality in a nearby area that does not meet the standard. USEPA designated Imperial County as a nonattainment area for the 2006 24-hour $PM_{2.5}$ standard, effective December 14, 2009.[4] At that time, the USEPA required $PM_{2.5}$ nonattainment areas to implement Subpart 1 provisions from Part D of the CAA. Imperial County received a partial nonattainment designation for the 2006 24-hour $PM_{2.5}$ standard which includes the majority of the populated area in the county. Specifically, the $PM_{2.5}$ nonattainment area includes the portion of Imperial County that lies within the area described as follows: (San Bernardino Baseline and Meridian) beginning at the intersection of the United States-Mexico Border and the southeast corner of T17S R11E, then north along the range line of the eastern edge of range R11E, then east along the township line of the southern edge of T12S to the northeast corner of T13S R15E, then south along the range line common to R15E and R16E, to the United States-Mexico Border. The boundaries of the $PM_{2.5}$ nonattainment area are presented in Figure 1-1.

On December 14, 2012, USEPA issued a final rule revising the $PM_{2.5}$ NAAQS by lowering the primary annual $PM_{2.5}$ standard from 15 µg/m^3 to 12 µg/m^3 to provide increased protection against health effects associated with long- and short-term fine particle exposures.[5] The USEPA retained the primary 24-hour $PM_{2.5}$ standard of 35 µg/m^3 and the existing secondary (welfare-based) annual $PM_{2.5}$ standard of 15 µg/m^3. In April 2015, Imperial County was classified as a Moderate $PM_{2.5}$ nonattainment area for the annual $PM_{2.5}$ primary standard of 12 µg/m^3.[6] The $PM_{2.5}$ nonattainment area for the 2012 Annual $PM_{2.5}$ NAAQS includes the same area covered under the 2006 24-hour $PM_{2.5}$ Moderate nonattainment area, which is presented in Figure 1-1. Under the Moderate $PM_{2.5}$ nonattainment area classification, Imperial County was required to produce an Annual $PM_{2.5}$ SIP by October 2016 (18 months from the date of designation). This 2018 Annual $PM_{2.5}$ SIP demonstrates attainment of the 2012 Annual $PM_{2.5}$ NAAQS "but for" transport of international emissions from Mexico. In accordance with Section 179(B) of the CAA, the 2018 Annual $PM_{2.5}$ SIP satisfies the attainment demonstration requirement and other provisions of Subpart 1 and Subpart 4 of Part D of the CAA.

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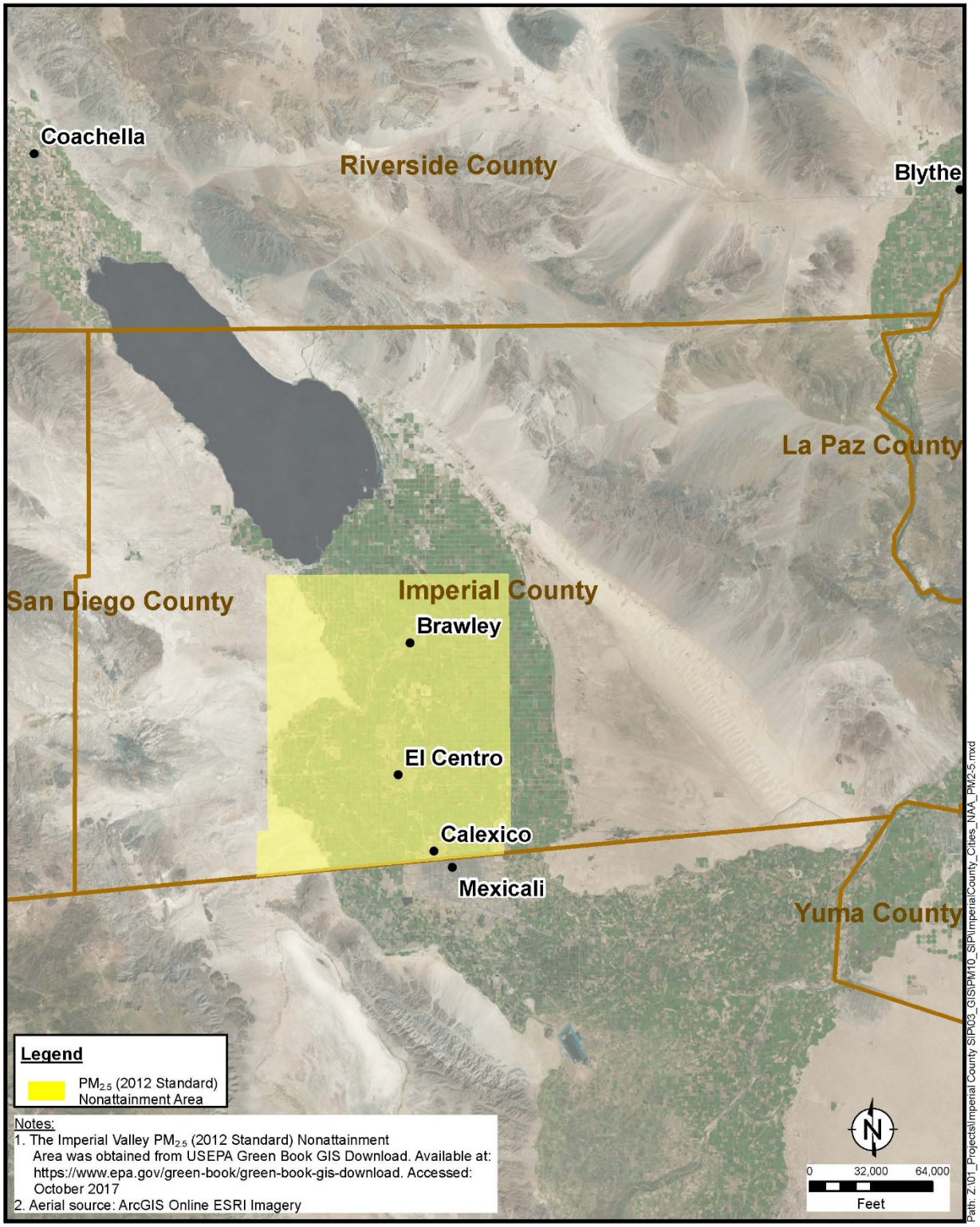
[3] USEPA. 2006. *National Ambient Air Quality Standards for Particulate Matter; Final Rule*. Federal Register. Vol. 71. No. 200. October 17, 2006. p. 61144.

[4] USEPA. 2009. *Air Quality Designations for the 2006 24-Hour Final Particle ($PM_{2.5}$) National Ambient Air Quality Standards; Final Rule*. Federal Register. Vol. 74. No. 218. November 13, 2009. p. 58688.

[5] USEPA. 2013. *National Ambient Air Quality Standards for Particulate Matter; Final Rule.* Federal Register. Vol. 78. No. 10. January 15, 2013. p. 3086.

[6] USEPA. 2015. *Air Quality Designations for the 2012 Primary Annual Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS); Final Rule*. Federal Register. Vol. 80. No. 10. January 15, 2015. p. 2206

Figure 1-1. Imperial County $PM_{2.5}$ Nonattainment Area



On January 4, 2013, the United States Court of Appeals for the District of Columbia (D.C.) Circuit held that the USEPA had incorrectly interpreted the CAA with respect to statutory requirements for the implementation of the 1997 $PM_{2.5}$ NAAQS. The D.C. Circuit remanded the final "Clean Air Fine Particle Implementation Rule"[7] and the "Implementation of the New Source Review (NSR) Program for Particulate Matter Less than 2.5 micrometers ($PM_{2.5}$)" final rule[8] with instructions to "repromulgate" these rules pursuant to Subpart 4 of Part D of the CAA. The Court's reasoning explained that the plain meaning of the CAA required implementation of the 1997 $PM_{2.5}$ NAAQS under Subpart 4 because $PM_{2.5}$ particles fall within the statutory definition of PM_{10} and are thus subject to the same statutory requirements. As a result, the USEPA instructed states to implement Subpart 1 and Subpart 4 provisions as a part of the $PM_{2.5}$ SIP development process. Under Subpart 4 provisions, Imperial County was classified as a Moderate $PM_{2.5}$ nonattainment area in accordance to CAA Section 188(a).

One of Imperial County's unique features is also its greatest challenge when trying to improve air quality. Imperial County is one of California's international gateways. In particular, the city of Calexico shares a border with the densely populated city of Mexicali, Mexico. The primary reason for elevated $PM_{2.5}$ levels in Imperial County is emissions transport from Mexico. On December 2, 2014, Imperial County adopted the Imperial County 2013 SIP for the 2006 24-hour $PM_{2.5}$ Moderate Non-Attainment Area ("2013 $PM_{2.5}$ SIP"). The 2013 $PM_{2.5}$ SIP demonstrated attainment of the 2006 24-hour $PM_{2.5}$ NAAQS "but for" transport of international emissions from Mexico. In accordance with Section 179(B) of the CAA, the 2013 $PM_{2.5}$ SIP satisfied the attainment demonstration requirement satisfying the provisions of Subpart 1 and Subpart 4 of Part D of the CAA.

The Role of Mexico Emissions

Historical measurements and previous SIP submittals, such as the 2013 24-Hour $PM_{2.5}$ SIP, show that emissions from Mexico can dominate local $PM_{2.5}$ concentrations, particularly near the border. The CAA allows for a demonstration of attainment 'but for' international emission transport, but the local area must still meet many CAA requirements, as shown in this SIP.

Elements in this revision to the SIP for the Imperial County $PM_{2.5}$ nonattainment area consist of the following:

- Base year emission inventories and future year forecasts for manmade sources of directly emitted $PM_{2.5}$ and $PM_{2.5}$ precursors;
- A comprehensive precursor demonstration;

[7] USEPA. 2007. *Clean Air Fine Particulate Implementation Rule; Final Rule.* Federal Register. Vol. 72. No. 79. April 25, 2007. p. 20586.

[8] USEPA. 2008. *Implementation of the New Source Review (NSR) Program for Particulate Matter Less than 2.5 micrometers ($PM_{2.5}$); Final Rule.* Federal Register. Vol. 73. No. 96. May 16, 2008. p. 28321.

- An attainment demonstration;
- Demonstration that control measures meet Reasonably Available Control Technology (RACT), Reasonably Available Control Measures (RACM), and Additional Reasonable Measures (ARM) requirements, as applicable;
- Requirements for Reasonable Further Progress (RFP);
- Contingency measures for RFP;
- Quantitative milestones; and
- Transportation conformity emission budgets to ensure transportation projects are consistent with the SIP.

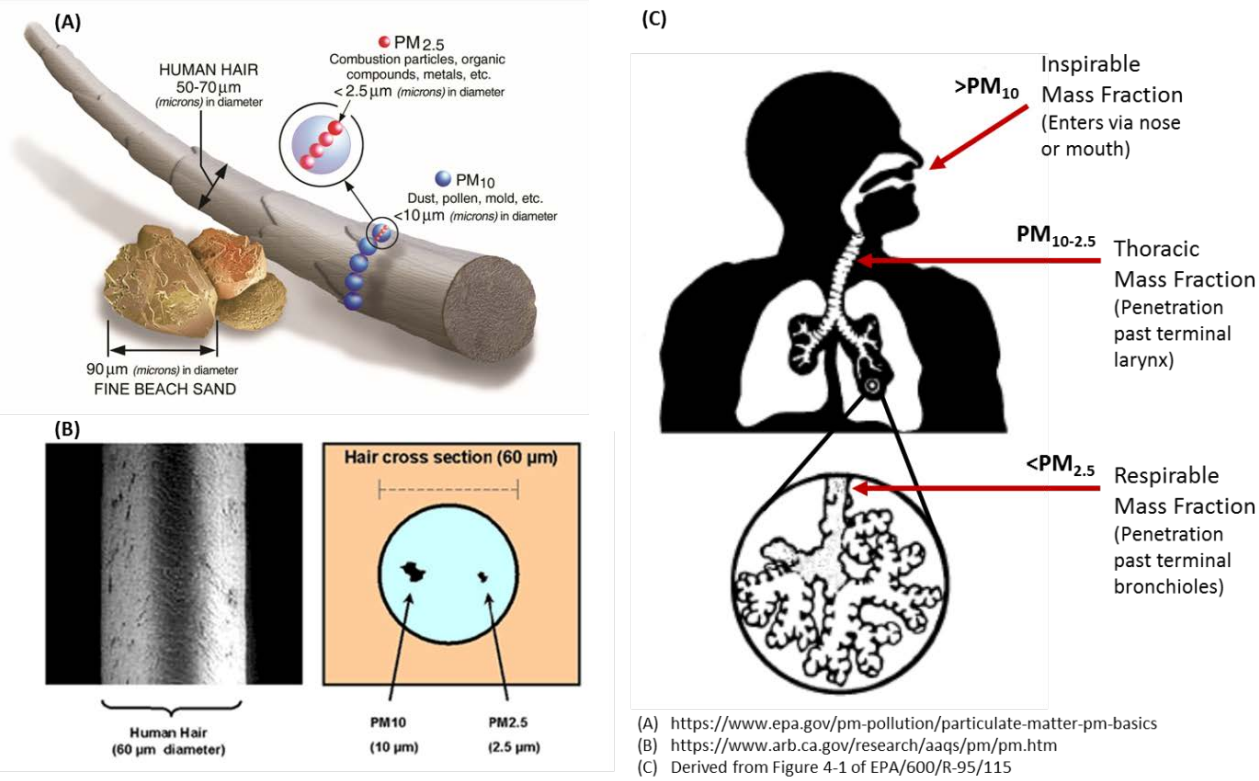
1.3 Particulate Matter Air Pollution and Health Effects

Particulate matter is a general term used to describe a complex group of airborne solid, liquid, and semi-volatile materials of various sizes and compositions. Primary PM is emitted directly into the atmosphere by both human activities (including agricultural operations, industrial processes, construction and demolition activities, and entrainment of road dust into the air) and non-anthropogenic activities (such as windblown dust and ash resulting from forest fires). Secondary PM is formed in the atmosphere from predominantly gaseous combustion by-product precursors, such as sulfur and nitrogen oxides (SO_X and NO_X), and volatile organic compounds (VOCs). The relative proportion of primary and secondary PM in a given geographic area can vary widely depending upon such factors as the mix of sources in the area, the mix of PM precursors, and local meteorology. In addition, PM and its precursors can be transported hundreds or thousands of miles while suspended in the atmosphere.[9] Consequently, ambient PM in an area may be the combination of primary and secondary particles that result from the emissions from both local and remote sources.

Federal and state regulators have established both PM_{10} and $PM_{2.5}$ as separate criteria pollutants based, in part, on how the human body reacts to the particles of different sizes. Figure 1-2 shows the relative sizes of PM_{10} and $PM_{2.5}$, as well as how far they travel into the human body.

[9] National Research Council. 2010. *Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States*. Washington, DC: The National Academies Press. Available at: https://doi.org/10.17226/12743. Accessed: January 2018.

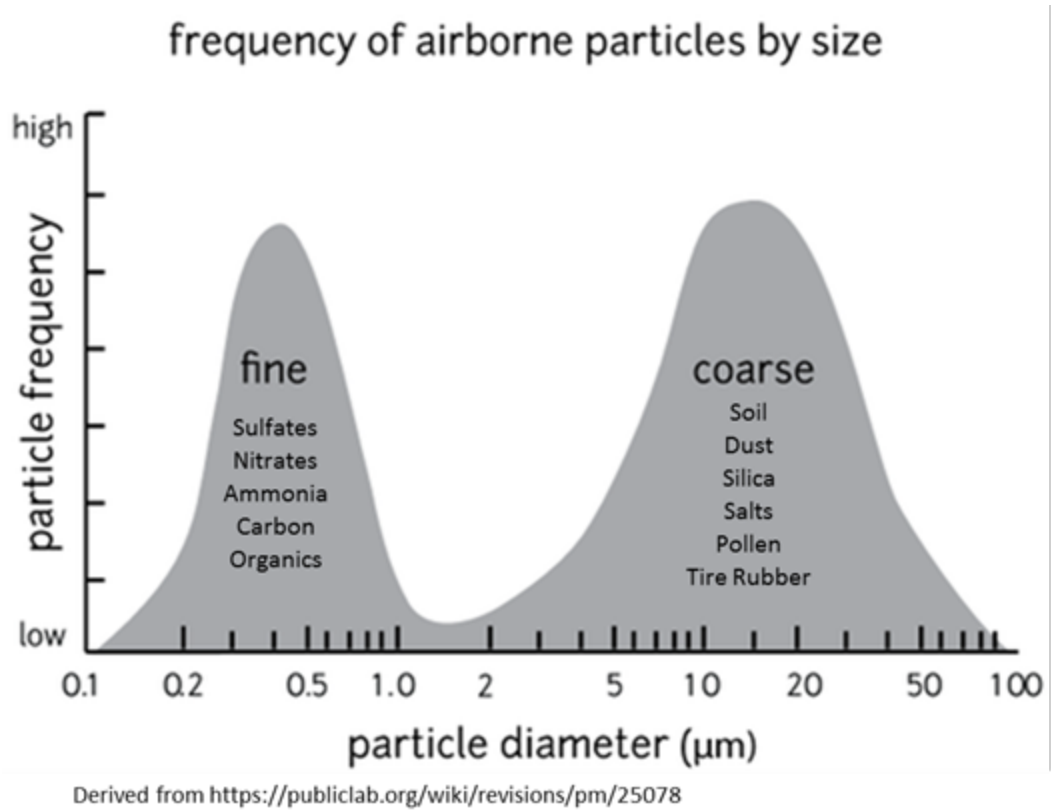
Figure 1-2. $PM_{2.5}$ and PM_{10} Relative Sizes and Health Impact Pathways



(A) https://www.epa.gov/pm-pollution/particulate-matter-pm-basics
(B) https://www.arb.ca.gov/research/aaqs/pm/pm.htm
(C) Derived from Figure 4-1 of EPA/600/R-95/115

Classification of particulate matter as PM_{10} and $PM_{2.5}$ is based on the size of the particulates; however, they also have different components. Although PM_{10} includes all "fine" $PM_{2.5}$-sized particulates, it also includes "coarse" primary particulates such as dust resulting from both activities (e.g., construction, mining, etc.) and entrainment from soil surfaces by the wind. Figure 1-3 is a general schematic of the components in fine and coarse PM; the relative contribution depends on how the different sources are represented in a given area.

Figure 1-3. Properties and Sources of $PM_{2.5}$ and PM_{10}



Common constituents of ambient $PM_{2.5}$ include: sulfate (SO_4^{2-}), nitrate (NO_3^-), ammonium (NH_4^+), elemental carbon, a variety of organic compounds, and inorganic materials (including metals, dust, sea salt, and other trace elements), which often are referred to as "crustal" materials. These $PM_{2.5}$ species, or chemical compounds, are summarized in Table 1-1.

Table 1-1. Primary $PM_{2.5}$ Species

Species	Description
Organic Carbon	Directly emitted, primarily from combustion sources (e.g., residential wood combustion). Also, smaller amounts attached to geological material and road dust. May also be emitted directly by natural sources (biogenic).
Elemental Carbon	Also called soot or black carbon; incomplete combustion (e.g., diesel engines).
Geologic Material	Road dust and soil dust that are entrained in the air from activity, such as soil disturbance or airflow from traffic.
Trace Metals	Identified as components from soil emissions or found in other particulates having been emitted in connection with combustion from engine wear, brake wear, and similar processes. Can also be emitted from fireworks.
Sea Salt	Sodium chloride in sea spray where sea air is transported inland.

Table 1-1. Primary $PM_{2.5}$ Species	
Species	**Description**
Secondary Organic Carbon	Secondary particulates formed from photochemical reactions of organic carbon.
Ammonium Nitrate	Reaction of ammonia and nitric acid, in which the nitric acid is formed from nitrogen oxide emissions via photochemical processes or during night-time reactions with ozone.
Ammonium Sulfate	Reaction of ammonia and sulfuric acid, in which the sulfuric acid is formed primarily from sulfur oxide emissions via photochemical processes, with smaller amounts forming from direct emissions of sulfur.
Combined Water	A water molecule attached to one of the above molecules.

1.3.1 $PM_{2.5}$ Air Pollution and Health Effects

$PM_{2.5}$ is an extremely small airborne particle and can penetrate deeply into the lungs of people who inhale it, where it can accumulate, react, or be absorbed into the body. Epidemiological studies have shown a significant association between elevated $PM_{2.5}$ levels and a number of serious health effects, including premature mortality, aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days), lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to $PM_{2.5}$ exposure include older adults, people with heart or lung disease, and children.

$PM_{2.5}$ has undesirable and detrimental environmental effects on vegetation, both directly (e.g., deposition of nitrates and sulfates may cause direct foliar damage) and indirectly (e.g., coating of plants upon gravitational settling reduces light absorption). $PM_{2.5}$ also accumulates to form regional haze, which reduces visibility due to scattering of light. Agencies concerned with haze include the National Park Service, the United States Forest Service, the Western Regional Air Partnership (WRAP), and the Western States Air Resources Council (WESTAR).

1.4 Imperial County

1.4.1 Geography, Population, and Land Use

Imperial County extends over 4,284 square miles[10] in the southeastern portion of California, bordering Mexico to the south, Riverside County to the north, San Diego County to the west, and the State of Arizona to the east. The Imperial Valley runs approximately north-to-south through the center of the county and extends into Mexico. The terrain elevation varies from as low as

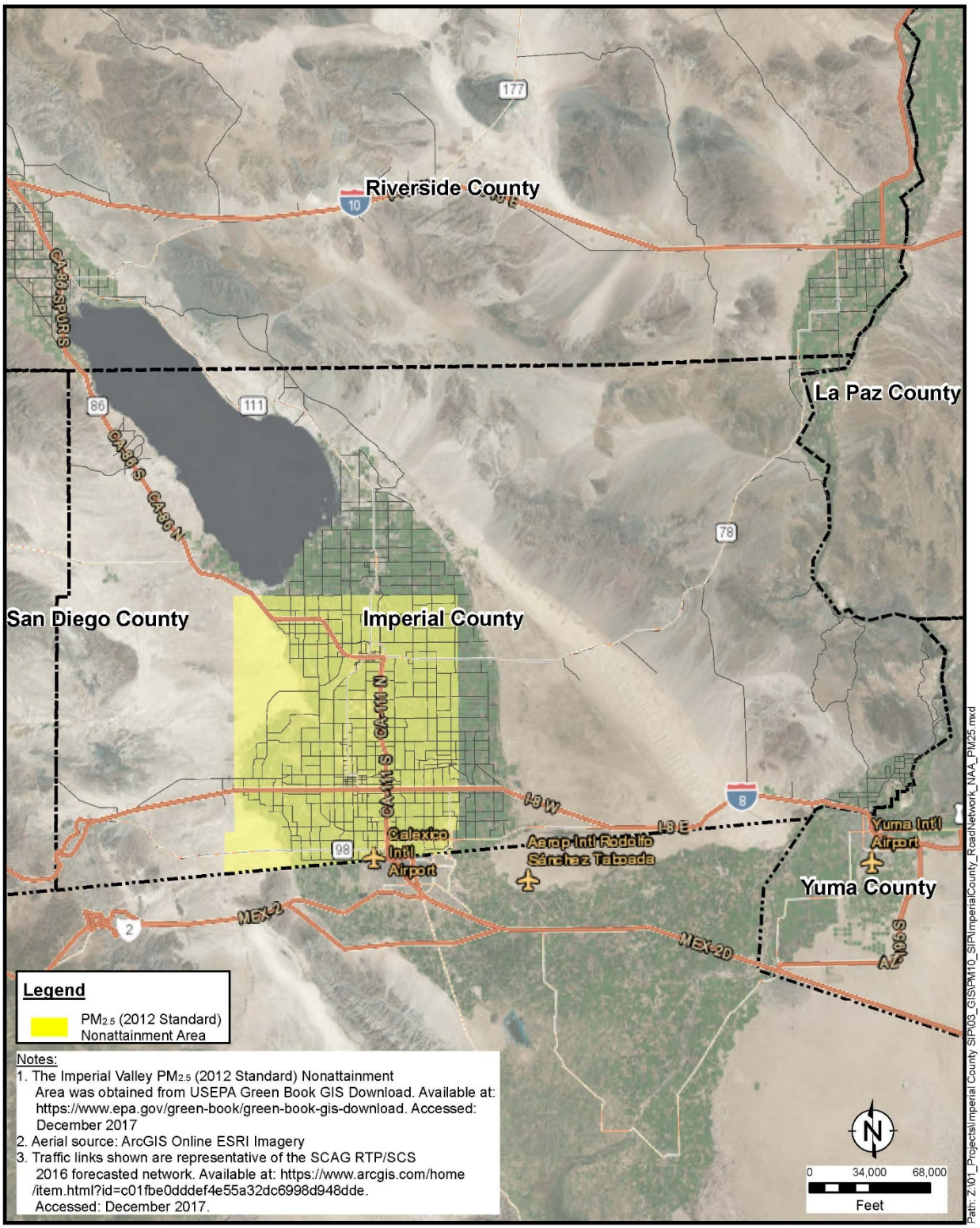
[10] Official website of Imperial County, http://www.co.imperial.ca.us/.

230 feet below sea level at the Salton Sea to the north to more than 2,800 feet above sea level at the mountain summits to the east.

As of July 1, 2016, Imperial County's population is approximately 180,883 people[11] and its principal industries are farming and retail trade. Most of the population, farming, and retail trade exists in a band of land that, on average, comprises less than one-fourth the width of the County, stretching from the south shore of the Salton Sea to the United States-Mexico border. The road network is densest within this strip, as shown in Figure 1-4. It also connects the three most populated cities in the county, which are Brawley, El Centro, and Calexico. Their populations are about 26,500, 45,000, and 38,500, respectively. The rest of Imperial County is the Salton Sea and mostly dry, barren desert areas with little to no human population.

[11] U.S. Census Bureau Quick Facts 2016, https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia

Figure 1-4. Road Map of Imperial County



The area contains relatively few major $PM_{2.5}$ emission sources, but can experience significant vehicular traffic, particularly near Calexico, given its proximity to an international port of entry into the United States. Other significant sources of direct $PM_{2.5}$ in the region are unpaved road dust, fugitive windblown dust, farming operations, managed burning and disposal, and aircraft.

1.5 Regulatory Responsibility

Federal, state, and local agencies participate in the planning process for attaining air quality in compliance with the NAAQS. The roles of the multiple agencies involved are outlined in this section.

1.5.1 United States Environmental Protection Agency

The USEPA administers the provisions of the federal CAA and other legislation related to air quality. A principal function of the USEPA is to set the NAAQS and promulgate new regulations based on the scientific evidence of the health and environmental effects of pollutants. In addition, the USEPA establishes national emission limits for major sources of air pollution, regulates emissions from locomotives, aircraft, and other mobile sources most effectively controlled at the national level, inspects and monitors emission sources, and provides financial and technical support for air quality research and development programs.

The USEPA enforces federal air quality laws. Under the CAA, the USEPA is authorized to require states to prepare plans to attain the NAAQS by deadlines specified in the CAA. SIPs, which are intended to outline specific pollution control strategies for each federal nonattainment area within a state, are prepared by regional and county air pollution control districts in collaboration with state agencies and with the USEPA, who is ultimately responsible for the SIP final review and approval.

Under the CAA, the USEPA also has authority to impose sanctions for failure to submit a plan or failure to carry out commitments in a plan. Sanctions include increased emissions offsets requirements for major stationary sources and withholding of federal highway funds.

1.5.2 California Air Resources Board

The California Air Resources Board (CARB) is the state agency responsible for the coordination and administration of both state and federal air pollution control programs in California. CARB undertakes research, sets state ambient air quality standards as well as emission standards for motor vehicles, provides technical assistance to local districts, compiles emission inventories, provides modeling of air pollution, develops suggested control measures, and provides oversight of district control programs. An important function of CARB is to coordinate and guide regional and local air quality planning efforts required by the California Clean Air Act, and to prepare and submit air quality management plans to the USEPA.

1.5.3 Imperial County Air Pollution Control District

The Imperial County Air Pollution Control District (ICAPCD or “District”) shares responsibility with CARB for ensuring that all state and federal ambient air quality standards are achieved and maintained within the County. The ICAPCD is responsible for monitoring ambient air quality and has authority to regulate stationary sources and some area sources of emissions. The ICAPCD

is responsible for developing the overall attainment strategy for Imperial County, and therefore, is responsible for planning activities involving the development of emission inventories, quantification of emission reductions, and comparison of emission reduction strategies.

Air districts in state nonattainment areas are also responsible for developing and implementing transportation control measures necessary to locally achieve ambient air quality standards. In doing so, air districts cooperate with local transportation commissions and Regional Transportation Planning Agencies (RTPAs) in the development of the transportation control measures adopted within a SIP. Under the conformity requirements of the CAA (1977, 1990), Imperial County's TPAs cannot approve any Regional Transportation Plan[12] or Transportation Improvement Program[13] that does not conform to the SIP's purpose of expeditiously bringing the area into attainment of the NAAQS.

[12] A Regional Transportation Plan is a county's master plan outlining policies, actions, and financial projections to guide investment decisions over a 20-year horizon.

[13] A Transportation Improvement Program specifies all highway and transit projects spanning a multi-year period, that are either regionally significant or that require federal funding or approval.

2 Ambient and Air Quality Data

2.1 Introduction

Air quality is a function of both the rate and location of pollutant emissions under the influence of meteorological conditions and topographic features. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients, along with local topography, influence the movement and dispersal of pollutants and thereby provide the link between air pollutant emissions and air quality.

This chapter provides an overview of the impact of climate and meteorology on the dispersion of particulate matter, a description of the local air monitoring network, and an overview of $PM_{2.5}$ data collected and its temporal and spatial patterns within Imperial County.

2.2 Climate and Meteorology

Climatic conditions in Imperial County are governed by the large-scale sinking and warming of air in the semi-permanent tropical high pressure center of the Pacific Ocean. The high pressure ridge blocks out most mid-latitude storms except in winter when it is weakest and farthest south. The coastal mountains prevent the intrusion of any cool, damp air found in California coastal environments. Because of the weakened storms and barrier, Imperial County experiences clear skies, extremely hot summers, mild winters, and little rainfall. The flat terrain of the valley and the strong temperature differentials created by intense solar heating produce moderate winds and deep thermal convection.

Winters are mild and dry with daily average temperature ranges between 65 and 75ºF (18-24ºC). During winter months it is not uncommon to record maximum temperatures of up to 80ºF. Summers are extremely hot with daily average temperatures ranging between 104 and 115ºF (40-46ºC). It is not uncommon during summer months to record maximum temperatures of 120ºF. The annual rainfall is just over 3 inches (7.5 cm) with most of it coming in late summer or midwinter.

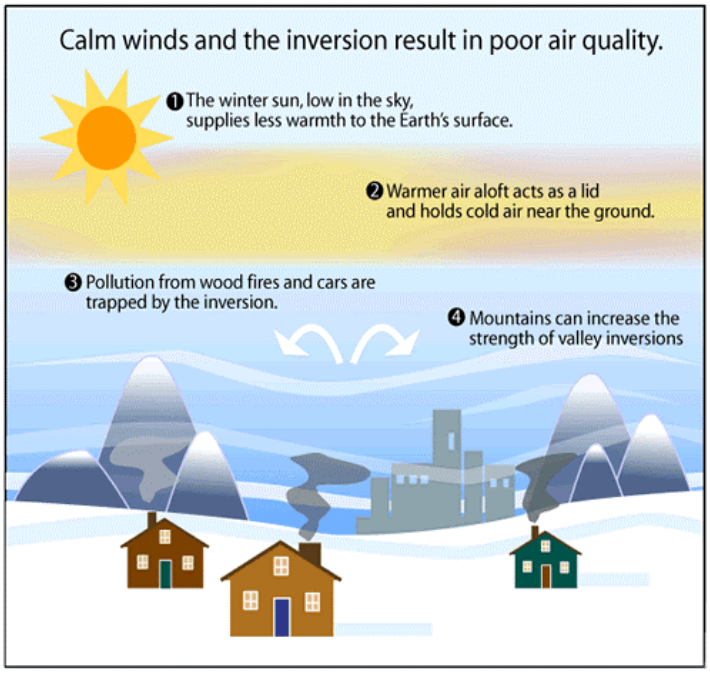
Humidity is low throughout the year, ranging from 28 percent in summer to 52 percent in winter. The large daily oscillation of temperature produces a corresponding large variation in the daily relative humidity. Nocturnal humidity rises to 50-60 percent, but drops to about 10 percent during the day. Summer weather patterns are dominated by intense heat induced by low-pressure areas that form over the interior desert.

The predominant wind patterns in the border region are from the northwest during the fall through spring and southeast during the summer. Under stagnant conditions, pollutants within the Calexico-Mexicali air shed tend to accumulate. The greatest numbers of low wind speed episodes occur October through February. Occasionally, Imperial County experiences periods of extremely high wind speeds. Wind speeds can exceed 30 miles per hour (mph), occurring most frequently during the months of April and May. However, speeds of less than 6.8 mph account for more than half of all the observed wind measurements.

2.2.1 Atmospheric Stability and Dispersion

Air pollutant concentrations are primarily determined by the amount of pollutant emissions in an area and the degree to which these pollutants are dispersed in the atmosphere. The stability of the atmosphere is one of the key factors affecting pollutant dispersion. Atmospheric stability regulates the amount of vertical and horizontal air exchange, or mixing, that can occur within a given air basin. Restricted mixing and low wind speeds are generally associated with a high degree of stability in the atmosphere. These conditions are characteristic of temperature inversions. A temperature inversion is simply a layer of cool air trapped below a warmer layer of air, whereby the normal gradient of air temperature with increasing altitude is reversed. Figure 2-1 shows that this reversal of the normal pattern impedes the upward flow of air, causes poor dispersion, and traps pollutants near the surface. Imperial County experiences surface inversions almost every day of the year, caused by cooling of the air layer in contact with the cold surface of the earth (due to radiational cooling) at night. Because of strong surface heating during the day, these inversions are usually broken, allowing pollutants to disperse more easily. However, the presence of the North Pacific High pressure cell can cause the air to warm to a temperature higher than the air below. This highly stable atmospheric condition, termed a subsidence inversion, can act as a nearly impenetrable lid to the vertical mixing of pollutants. The strength of these inversions makes them difficult to disrupt. Consequently, they can persist for one or more days, causing air stagnation and the build-up of pollutants. This frequently leads to elevated concentrations of pollutants developing near the densely populated city of Mexicali, Mexico and then transporting north to impact the border city of Calexico and other areas of the County.

Figure 2-1. Example of a Temperature Inversion[14]



[14] Figure is from https://www.epa.gov/sites/production/files/2017-01/air-quality-inversion-diagram.gif. Accessed: November 2017.

2.3 Imperial County Air Monitoring Network

Imperial County began its ambient air quality monitoring program in 1976. Since that time, federal regulatory ambient air monitoring in Imperial County has been a collaborative effort between the ICAPCD and CARB. The primary purpose of any ambient air monitoring is to protect public health and welfare.

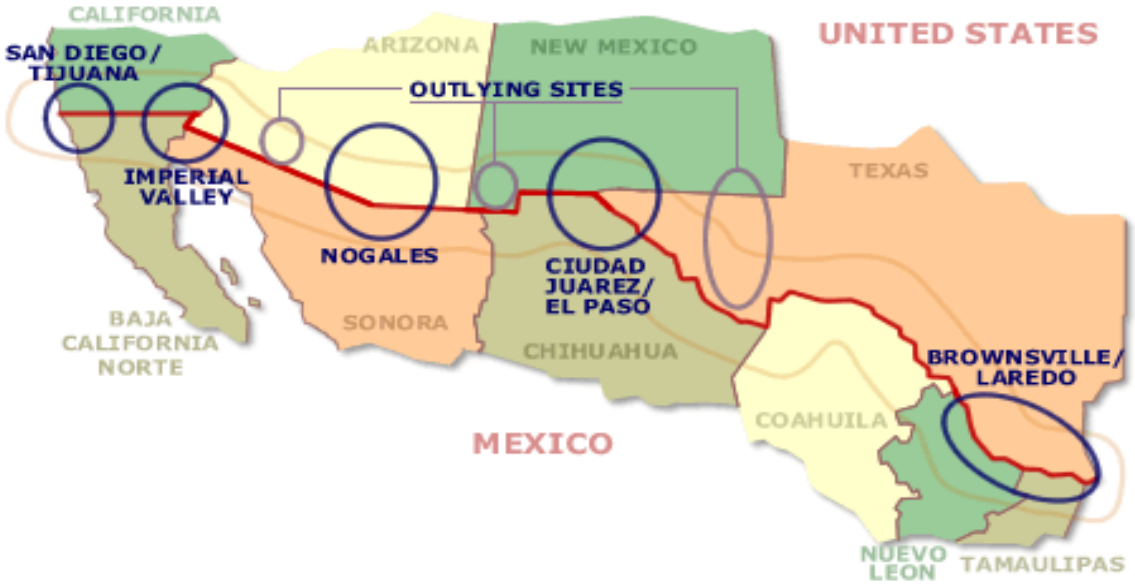
Depending on the purpose and air quality designation of an area, the monitoring stations present may be of many different types. In Imperial County, all monitoring stations are designated as state or local air monitoring stations (SLAMS). Per the Code of Federal Regulations (CFR), all SLAMS are ambient air quality monitoring sites that are primarily used for comparison to the NAAQS. There are two types of NAAQS that an air district must consider: the primary standard which provides for the protection of public health and the secondary standard which provides for the protection of public welfare which includes protection against decreased visibility and damage to animals, crops, vegetation and buildings. Therefore, the placement of any ambient air monitor is essential for meeting that monitor's objective. Objectives are determined after evaluation of spatial scales of representativeness, levels of concentration, and purpose. In particular, the spatial scale of representativeness defines the distance over which pollutant concentrations are expected to be the same, given similar emission sources and meteorological conditions. A properly established monitor should target the key data collection need identified by the monitoring objective and spatial scale of the site. Therefore, the physical placement of the ambient air monitor varies depending on the evaluated monitoring objective.

Table 2-1 below is a representation of the existing $PM_{2.5}$ monitors established at the Brawley, El Centro, and Calexico stations. The Calexico station is located approximately 1 mile north of the International Border with Mexico. Because of Calexico's close proximity to the international border, there exists a common air shed between Calexico and Mexicali. Having a shared international air shed supports the recognition of international impacts within the border region and is evident in plans and efforts such as the Border 2020 Program.[15] Figure 2-2 is a depiction of the air sheds and areas that are providing monitoring data along the United States-Mexico border.

[15] More information available at: https://www.epa.gov/border2020. Accessed: October 2017.

Table 2-1. $PM_{2.5}$ Network Monitoring Equipment (2012-2015)	
Station	**2012 - 2015**
Brawley	R&P 2025 FRM
El Centro	R&P 2025 FRM
Calexico	2 – R&P 2025 FRM 1 – Thermo 2025 FRM 2 – Thermo 2025i FRM 2 – Met One BAM 1020 FEM 2 – Speciation (SASS and URG)
Abbreviations: BAM - Beta Attenuation Monitor FEM - Federal Equivalent Method FRM - Federal Reference Method R&P- Pupprecht & Patashnick Co, Inc. SASS - Speciation Air Sampling System Thermo - ThermoFisher Scientific URG - URG Corporation	

Figure 2-2. Air Sheds and Areas along the US-Mexico Border[16]



[16] Fig. 2-2 from http://www.epa.gov/ttn/catc/cica/geosel_e.html.

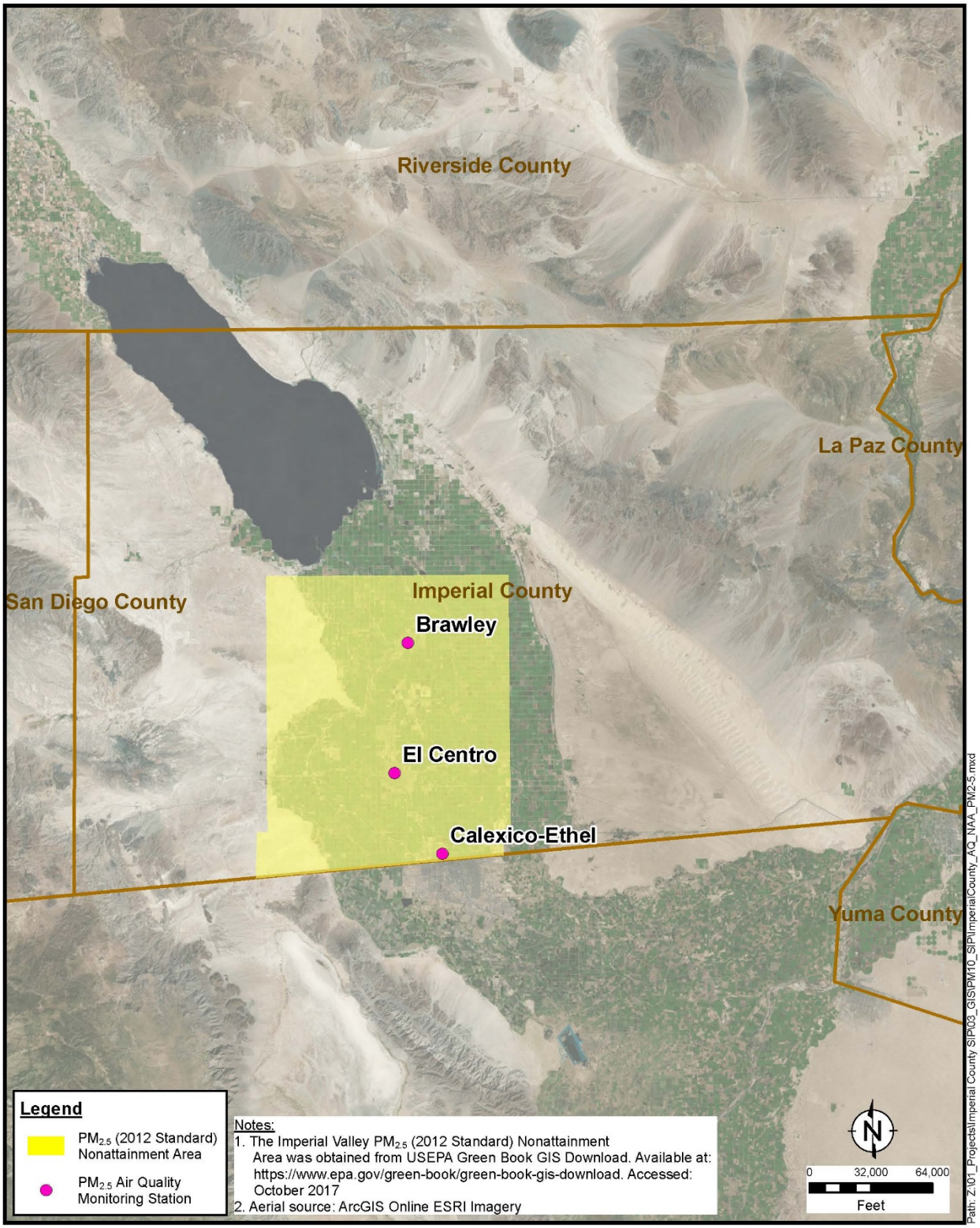
Analysis of data from the Calexico station indicates that along with capturing emissions within the localized area, the monitors are downwind recipients of concentrations from international sources and therefore their measurements incorporate emission sources from outside the United States.

2.3.1 $PM_{2.5}$ Monitoring Stations in Imperial County

In Imperial County there are three $PM_{2.5}$ air monitoring stations located within the populated cities of Brawley, El Centro, and Calexico (Figure 2-3). In addition to running USEPA-approved Federal Reference Method (FRM) $PM_{2.5}$ monitors, these stations measure meteorological parameters such as horizontal wind speed (HWS), wind direction (WD), outside temperature (OT), relative humidity (RH), barometric pressure (BP), and solar radiation (SR). The 2015 Annual Network Plan for Imperial County (ANP) describes the cities of Brawley, El Centro, and Calexico as homogeneous, urban sub-regions with similar land use and land surface characteristics.[17] Because of this, it is appropriate to compare the $PM_{2.5}$ concentrations and meteorological data from all three stations. It is, however, important to note that the 2015 ANP identifies the Calexico station as consistently recording the highest concentrations of $PM_{2.5}$. Appendix A provides additional data comparisons and analyses between the stations located in Calexico, El Centro, and Brawley.

[17] CARB. 2015. Annual Monitoring Network Report for Twenty-Five Districts in California. Volumes 1 and 2. June. Available at: http://www.co.imperial.ca.us/AirPollution/index.asp?fileinc=airmonitoring. Accessed: February 2018.

Figure 2-3. Ambient Air Monitoring Stations in the Imperial County $PM_{2.5}$ Nonattainment Area

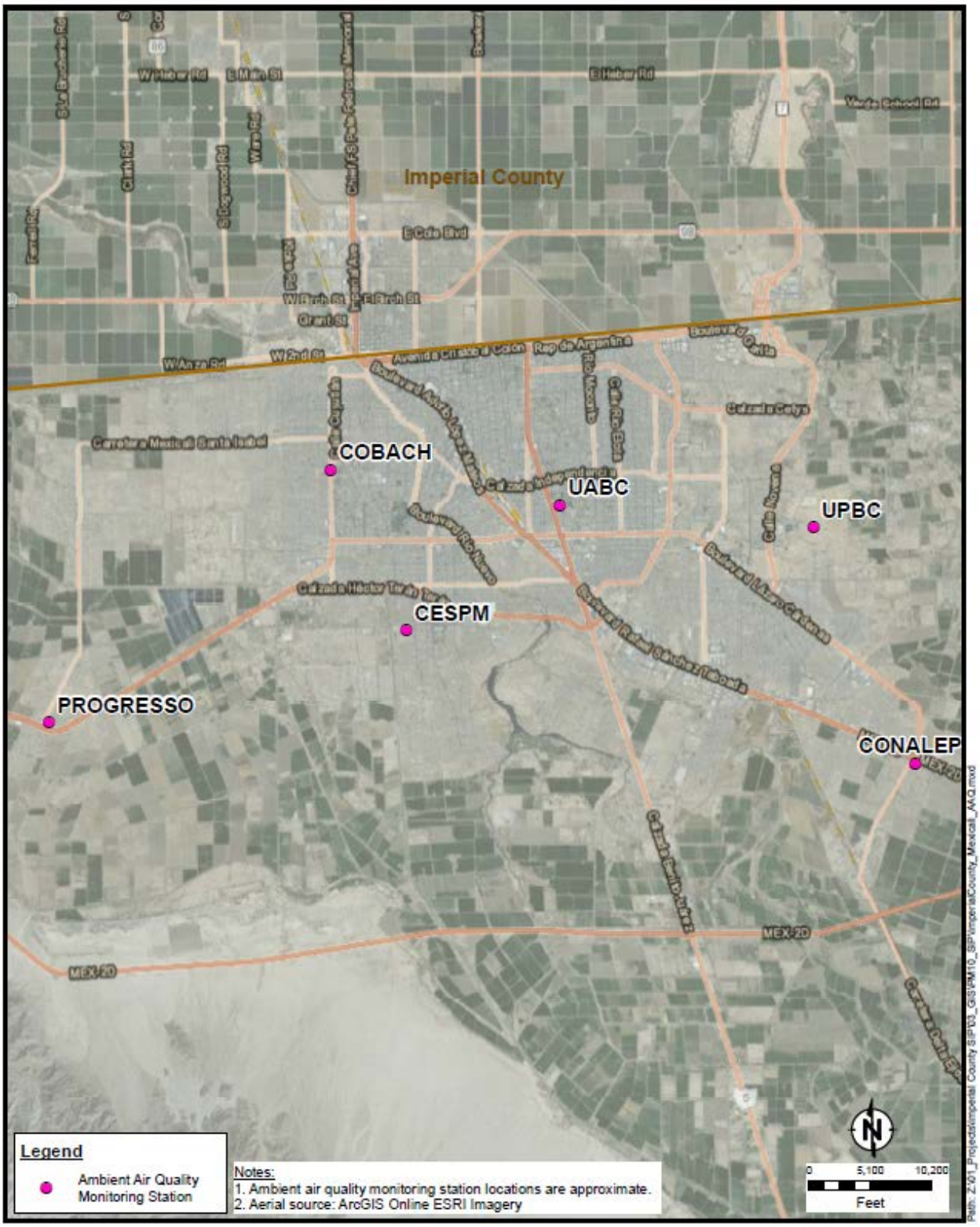


2.3.2 $PM_{2.5}$ Monitoring Stations in Mexicali, Mexico

The ambient air monitoring network in Mexicali began installing, configuring, and testing monitors in July 1996. Through an initial collaborative effort between the USEPA and CARB, and with the participation of the Secretaría de Medio Ambiente y Recursos Naturales (Mexico's federal environmental agency and USEPA counterpart, also known as SEMARNAT), the air monitoring network in Mexicali began operation in January 1997. The network was composed of six stations, four of which monitored continuously for ozone, NO_X, carbon monoxide (CO), SO_2, and $PM_{2.5}$, while the remaining two stations monitored PM_{10} using high volumetric samplers. Additionally, these stations measured certain meteorological parameters, such as temperature, humidity, and wind speed and direction. Figure 2-4 shows the following established stations: Universidad Autónoma de Baja California (UABC), Colegio de Bachilleres-High School (COBACH), Universidad Tecnológica de Baja California (UPBC), CESPM Xochmilco, Colegio Nacional de Educación Profesional Técnica (CONALEP), and Progresso. UABC and COBACH are located in the urban center of Mexicali near the border, approximately 2.6 and 2 miles from the Calexico-Ethel Station, respectively. Both of these stations monitor continuously for $PM_{2.5}$ using Beta Attenuation Monitors (BAMs).

Unfortunately, since 1997, monitored data from the Mexicali ambient air monitoring network has been inconsistent, with large gaps occurring regularly. For this reason, a contract was put in place to improve the reliability of air quality monitoring data at two sites in Mexicali to better understand the current sources as well as the temporal profile of the $PM_{2.5}$ in the area. In 2016, USEPA funded a contract with SCS Tracer to provide monitoring in Mexicali. The purpose of this project is to collect a two-year data set of $PM_{2.5}$ and meteorology at two existing monitoring sites in Mexicali. The $PM_{2.5}$ data set will include continuous $PM_{2.5}$ as well as discrete samples that will be analyzed for certain chemical species. Monitoring data began being collected in April 2016 and will run through April 2018. The contractor is running an hourly $PM_{2.5}$ BAM, a wind and temperature sensor, $PM_{2.5}$ speciation, and carbon sampling at the UABC site. In addition, the contractor is running an hourly $PM_{2.5}$ BAM, as well as a wind and temperature sensor at the COBACH monitoring site. This data set will assist in the determination of the extent that $PM_{2.5}$ emissions in Mexicali have on air quality in Calexico.

Figure 2-4. Mexicali Ambient Air Monitoring Network



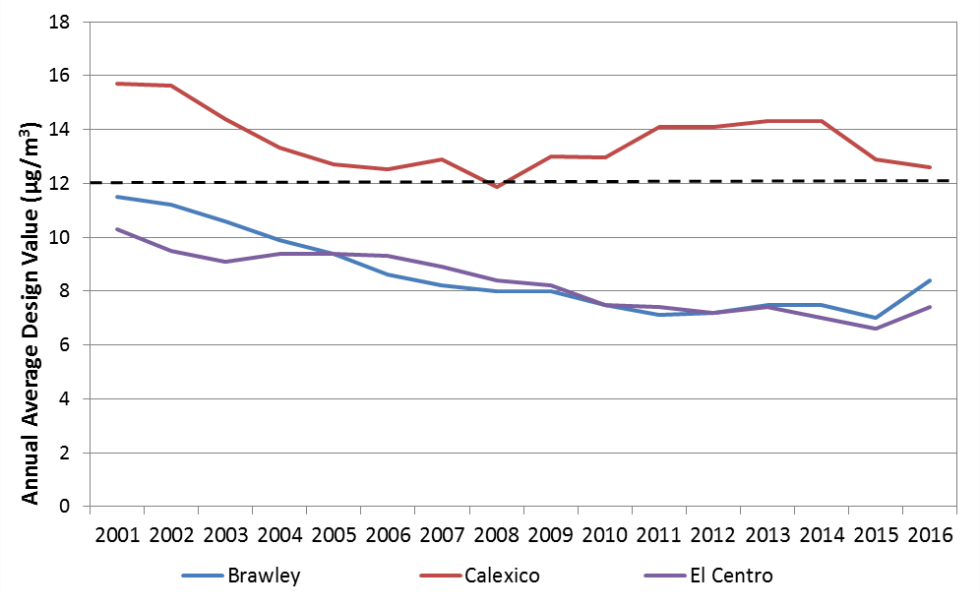
2.4 Ambient Air Quality Data

The 2012 $PM_{2.5}$ NAAQS of 12 µg/m³ is based on the three-year average of the annual arithmetic mean. According to the CAA, the assessment of an area's air quality for the preparation of a SIP is based on the most recent three years of complete data. Air quality data of importance in the preparation of Imperial County's $PM_{2.5}$ SIP corresponds to the years 2012-2014. However, 2015 and 2016 data were included for analysis and are subsequently presented and included in the discussion below.

2.4.1 Imperial County $PM_{2.5}$ Air Quality

Border communities such as Calexico are unique areas where many different people come together and cross geopolitical boundaries. Residents on both sides of the border share a common environment and have similar exposures to pollutants. Observed traffic and commuting patterns within the Calexico/Mexicali border area are typically home-to-work and work-to-home. While it would seem that the most evident exposure along the Calexico/Mexicali border relates to traffic emissions, there are emissions from other sources such as electrical generation, other industrial sources, unpaved roads, and to some extent, cultural practices. Despite the challenges of geography, climate, and proximity to Mexico, air quality in Imperial County has improved except for in the border area. The annual design values for Calexico, El Centro, and Brawley (Figure 2-5) illustrate how different Calexico air quality is from both El Centro and Brawley. Figure 2-5 shows that the air quality in Brawley and El Centro has improved with a general reduction in the annual average design value since 2001. However, in Calexico, air quality has not improved as much and remains above the federal annual average $PM_{2.5}$ standard of 12 µg/m³.

Figure 2-5. 2001-2016 Average Annual Design Values for Calexico, El Centro, and Brawley



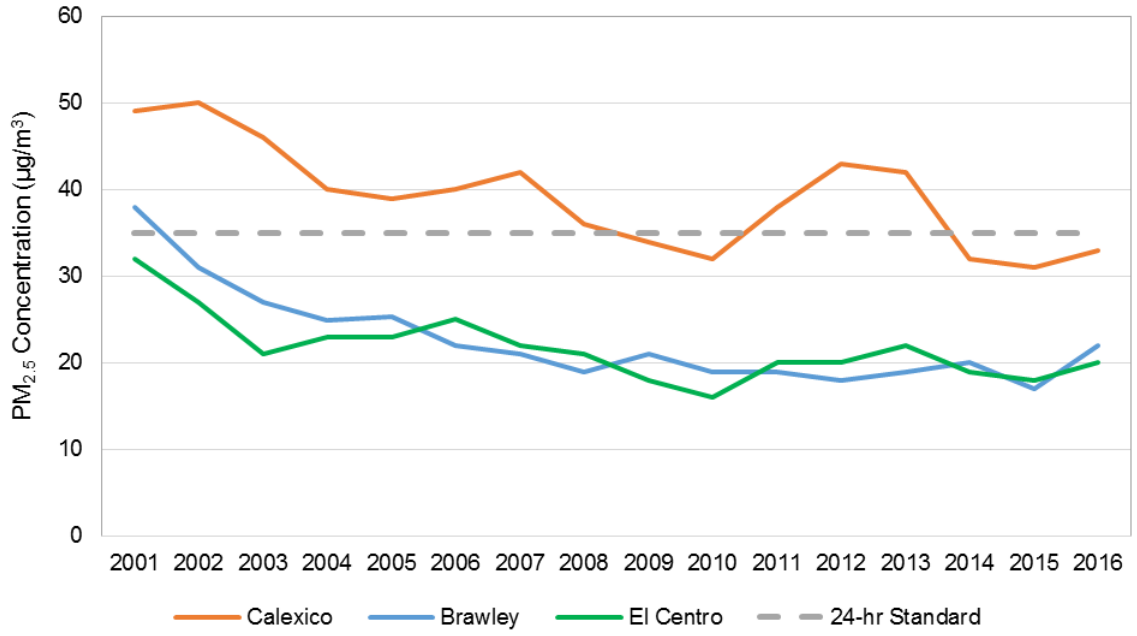
** The 2015 design value shown above is 12.9 µg/m³ and does not include data from the Special Purpose Monitor (SPM) that was included in 2015 at Calexico. USEPA's Air Quality System (AQS) includes data from the SPM in quarters 1 and 4 of 2015, which results in a design value of 13.1 µg/m³.*

The CAA 179(B) Analysis (Appendix A) discusses in detail the chemical mass balance speciated data which indicates that the Calexico $PM_{2.5}$ is comprised primarily of carbonaceous aerosols (organic matter [OM] plus elemental carbon [EC]). The analysis further identifies that the carbonaceous aerosol particles are a significant contributor to elevated $PM_{2.5}$ levels throughout the year, peaking during the winter months. Known carbonaceous aerosol sources in urban areas include burning, cooking, and motor vehicle exhaust.

The speciation discussion in the 179(B) Analysis also indicates that geological dust is the second highest contributor to $PM_{2.5}$ at Calexico and is largely due to the surrounding large expanses of desert and arid regions in the air shed. The geological component remains fairly constant throughout the months, with slight increases in the fall and early winter months.

The previously mentioned indications lend evidence that Calexico is impacted by transport of pollution from Mexicali. To add further evidence, Figure 2-6 shows that the 24-hour design values have hovered at or above the 24-hour standard of 35 µg/m³ at the Calexico-Ethel station. By contrast, the 24-hour design values for El Centro and Brawley have generally stayed below the 24-hour standard for the same period of time. These observations indicate that the further the station is from the border region, the less impact it has on the monitor's measurements.

Figure 2-6. 24-Hr $PM_{2.5}$ Design Value Trends (FRM Data)



3 Emissions Inventory

3.1 Introduction

Emissions inventories are one of the fundamental building blocks in the development of a SIP. In simple terms, an emissions inventory is a systematic listing of the sources of air pollution along with the amount of pollution emitted from each source or category over a given time period. This Chapter describes the emissions inventory for the Imperial County $PM_{2.5}$ Nonattainment Area.

CARB and the District have developed a comprehensive, accurate, and current emissions inventory consistent with the requirements set forth in Section 182(a)(1) of the CAA. CARB and District staff conducted a thorough review of the inventory to ensure that the emission estimates reflect accurate emission reports for point sources, and that estimates for mobile and areawide sources are based on the most recent models and methodologies.

CARB also reviewed the growth profiles for point and areawide source categories and updated them as necessary to ensure that the emission projections are based on data that reflect historical trends, current conditions, and recent economic and demographic forecasts. Growth forecasts for most point and areawide sources were developed either by CARB or by the Southern California Association of Governments (SCAG) and provided to CARB through the South Coast Air Quality Management District (SCAQMD). SCAG is the metropolitan planning organization (MPO) representing Imperial County, along with five other counties in Southern California.

3.2 Emissions Inventory Overview

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by industrial facilities, mobile sources, and areawide sources such as consumer products and paint. They are fundamental components of an air quality plan, and serve critical functions such as:

1) the primary input to air quality modeling used in attainment demonstrations;
2) the emissions data used for developing control strategies; and
3) a means to track progress in meeting the emission reduction commitments.

USEPA regulations require that the emissions inventory for a $PM_{2.5}$ SIP contain emissions data for directly emitted $PM_{2.5}$ and its precursors: NO_X, SO_X, VOCs, and NH_3. The inventory included in this Plan substitutes VOC with reactive organic gases (ROG), which in general represent a slightly broader group of compounds than those in USEPA's list of VOCs.

3.3 Agency Responsibilities

CARB and District staff worked jointly to develop the emissions inventory for Imperial County and the Imperial $PM_{2.5}$ Nonattainment Area. The District worked closely with operators of major stationary facilities in their jurisdiction to develop the point source emission estimates. CARB staff developed the emission inventory for mobile sources, both on-road and off-road. The District and CARB shared responsibility for developing estimates for the nonpoint (areawide) sources such as paved road dust and agricultural burning. CARB worked with several State and local agencies such as the Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), the Department of Pesticide Regulation (DPR), and the California Energy Commission (CEC) to

assemble activity information necessary to develop the mobile and areawide source emission estimates.

3.4 Inventory Base Year

The base year inventory forms the basis for all future year projections and also establishes the emission levels against which progress in emission reductions will be measured. USEPA regulations establish that the base year inventory should be preferably consistent with the triennial reporting schedule required under the Air Emissions Reporting Requirements (AERR) rule. However, USEPA allows a different year to be selected if justified by the state. CARB worked with the local air districts to determine the base year that should be used across the State. Since the SCAQMD typically aligns their base year inventory with the data collection period for their Multiple Air Toxics Exposure Study, which was last conducted in 2012, CARB selected 2012 as the base year to maintain consistency across the various plans being developed in the State.

3.5 Forecasted Inventories

In addition to a base year inventory, USEPA regulations also require future year inventory projections for specific milestone years. Forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each source category and emission reductions due to adopted control measures. CARB develops emission forecasts by applying growth and control profiles to the base year inventory.

Growth profiles for point and areawide sources are derived from surrogates such as economic activity, fuel usage, population, housing units, etc., that best reflect the expected growth trends for each specific source category. Growth projections were obtained primarily from government entities with expertise in developing forecasts for specific sectors, or in some cases, from econometric models. Control profiles, which account for emission reductions resulting from adopted rules and regulations, are derived from data provided by the regulatory agencies responsible for the affected emission categories.

Projections for mobile source emissions are generated by models that predict activity rates and vehicle fleet turnover by vehicle model year. As with stationary sources, the mobile source models include control algorithms that account for all adopted regulatory actions.

3.6 Temporal Resolution

Planning inventories typically include annual as well as seasonal (summer and winter) emission estimates. Annual emission inventories represent the total emissions over an entire year (tons per year), or the daily emissions produced on an average day (tons per day). Seasonal inventories account for temporal activity variations throughout the year, as determined by category-specific temporal profiles. Since this Plan reflects an annual $PM_{2.5}$ standard, the emission inventory used in the Plan is an annual inventory.

3.7 Geographical Scope

The inventories presented in this Plan consist of emissions for the Imperial $PM_{2.5}$ Nonattainment Area, which represents a portion of Imperial County. Typically, emission inventories are developed at a county-level geographical resolution. The county level emissions were allocated to the nonattainment area using the approach described below.

- **Stationary Sources.** Emissions from stationary sources were designated as being inside or outside the nonattainment area based on a Geographical Information System (GIS) analysis of each facility's geographical coordinates (latitude and longitude) overlaid on a digitized map of the nonattainment area.
- **Areawide Sources.** District staff conducted a thorough review of the areawide categories to determine those that actually occur in the nonattainment area, and their emissions were allocated based on spatial surrogates (e.g., paved road miles, forest land acreage, human population, etc.) that best reflect the expected distribution of these sources. In assigning the spatial surrogates, CARB staff prioritized the source categories based on their NOx, SOx and direct $PM_{2.5}$ emissions, and selected those above a threshold level of 0.1 tons per day for further review. Human population was set as the default surrogate, but more precise, category-specific surrogates were selected when data were available. Categories below the 0.1 ton per day threshold were assigned human population as the spatial surrogate.
- **On-Road Mobile Sources.** For this Plan, a pre-existing spatial surrogate was used to distribute emissions to the nonattainment area based on EMFAC2011/Direct Travel Impact Model (DTIM) gridded NOx outputs. This gridded spatial surrogate was originally used to distribute EMFAC2011[18] emissions among grid cells inside and outside the nonattainment area for the original Imperial 2012 $PM_{2.5}$ Plan. This NOx surrogate was used to distribute emissions for all pollutants. This same spatial surrogate was used to distribute updated EMFAC2014 emissions to the nonattainment area for this Plan.
- **Off-Road Mobile Sources.** As with areawide sources, District staff were consulted to determine the extent of emission activity occurring in the nonattainment area. Of these categories, aircraft emissions occurred fully in the nonattainment area and all other sources were allocated based on human population.

The emission inventory allocation methods are summarized in Table 3-1 below.

[18] EMission FACtors, CARB's on-road mobile sources model: https://www.arb.ca.gov/msei/categories.htm.

Table 3-1. Methods for the Spatial Allocation of Emissions to the Imperial $PM_{2.5}$ Nonattainment Area

Source Category	Allocation Method
Stationary Point Sources	GIS Analysis
Areawide Sources:	
I.C. Reciprocating Engines	Human Population/Industrial Employment
Agricultural Irrigation I.C. Engines	Irrigated Cropland Acreage
Residential Fuel Combustion	Human Population
Farming Operations – Tilling Dust	Human Population
Farming Operations – Feedlot Cattle	Average monthly cattle head counts in NA
Construction and Demolition	Human Population
Paved Road Dust	Human Population
Unpaved Road Dust	Human Population
Fugitive Windblown Dust	GIS Analysis
Agricultural Burning	Percent of Agricultural Cropland in NA
On-Road Mobile Sources	Direct Travel Impact Model Analysis
Off-Road Mobile Sources:	
Aircraft	100% in Nonattainment Area
Other than Aircraft	Human Population

3.8 Quality Assurance and Quality Control

CARB has established a quality assurance and quality control (QA/QC) process involving CARB and District staff to ensure the integrity and accuracy of the emissions inventories used in the development of air quality plans. QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). CARB inventory staff works with District staff, who are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Areawide source emission estimates are reviewed by CARB and District staff before their inclusion in the emission inventory. Additionally, CEIDARS is designed with automatic system checks to prevent errors such as double counting of emission sources. The system also makes various reports available to assist staff in their efforts to identify and reconcile anomalous emissions.

Future year emissions are estimated using the California Emission Projection Analysis Model (CEPAM), 2016 SIP Baseline Emission Projections, Version 1.05. Growth and control factors are

reviewed for each category and year along with the resulting emission projections. Year to year trends are compared to similar and past datasets to ensure general consistency. Emissions for specific categories are checked to confirm they reflect the anticipated effects of applicable control measures. Mobile categories are verified with mobile source staff for consistency with the on-road and off-road emission models.

A summary of the information supporting the Imperial $PM_{2.5}$ Nonattainment Area SIP emissions inventory is presented in the sections below.

3.9 Point Sources

The nonattainment area contains only a limited number of facilities that generate direct $PM_{2.5}$ emissions or other $PM_{2.5}$ precursors such as NOx, SOx, ROG, and ammonia. The inventory reflects actual emissions from industrial point sources reported to the District by the facility operators through calendar year 2012, in accordance with the requirements set forth in USEPA's AERR rule. The data elements in the 2012 baseline inventory are consistent with the data elements required by the AERR rule. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations.

The point source categories that occur in the $PM_{2.5}$ nonattainment area are listed below in Table 3-2.

Table 3-2. Point Source Categories

Source Category	Subcategory
Fuel Combustion	Electrical Utilities
	Cogeneration
	Manufacturing and Industrial
	Food and Agricultural Processing
	Service and Commercial
	Other (I.C. Reciprocating Engines)
Waste Disposal	Sewage Treatment
	Landfills
	Other
Cleaning and Surface Coatings	Laundering
	Degreasing
	Coatings and Thinners
	Adhesives and Sealants

Table 3-2. Point Source Categories	
Source Category	**Subcategory**
Petroleum Production and Marketing	Petroleum Refining
	Petroleum Marketing
	Other (Petroleum Production & Marketing)
Industrial Processes	Food and Agriculture
	Mineral Processes

The point source inventory includes emissions from stationary area sources, which are categories such as internal combustion engines and gasoline dispensing facilities that are not inventoried individually, but are estimated as a group and reported as an aggregated total. Estimates for the following categories were developed by CARB:

3.9.1 Stationary Nonagricultural Diesel Engines

This category includes emissions from backup and prime generators and pumps, air compressors, and other miscellaneous stationary diesel engines that are widely used throughout the industrial, service, institutional, and commercial sectors. The emission estimates, including emission forecasts, are based on a 2003 CARB methodology derived from the OFFROAD model. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/FULLPDF/FULL1-2.pdf.

3.9.2 Agricultural Diesel Irrigation Pumps

This category includes emissions from the operation of diesel-fueled stationary and mobile agricultural irrigation pumps. The emission estimates are based on a 2003 CARB methodology using statewide population and include replacements due to the Carl Moyer Program. Emissions are grown based on projected acreage for irrigated farmland. Additional information on this category is available at: https://www.arb.ca.gov/ei/areasrc/arbfuelcombagric.htm.

3.9.3 Waste Disposal, Composting Facilities

This category includes emissions from composting facilities that process organic materials via an open windrow composting or aerated static pile processes. The emission estimates are based on a 2015 CARB methodology using facility specific emissions testing or an emission factor derived from testing at composting facilities. No growth is assumed for future years. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/index2.htm.

3.9.4 Laundering

This category includes emissions from perchloroethylene (perc) dry cleaning establishments. The emission estimates are based on a 2002 CARB methodology that used nationwide perc consumption rates allocated to the county level based on population and an emission factor of 10.125 pounds per gallon used. Emissions were grown from the original estimates to 2012 using

human population growth trends from SCAG. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/onehtm/one3-1.htm.

3.9.5 Degreasing

This category includes emissions from solvents in degreasing operations in the manufacturing and maintenance industries. The emissions estimates are based on a 2000 CARB methodology using survey and industry data, activity factors, emission factors and a user's fraction. Growth for this category is based on CARB/Regional Economic Models, Inc. (REMI) industry-specific economic output. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbcleandegreas.htm.

3.9.6 Coatings and Thinners

This category includes emissions from coatings and related process solvents. Auto refinishing emissions estimates are based on a 1990 CARB methodology using production data and a composite emission factor derived from surveys. Growth is based on projected vehicle miles traveled (VMT) provided by SCAG. Estimates for industrial coatings emissions are based on a 1990 CARB methodology using production and survey data, and emission factors derived from surveys. Estimates for thinning and cleaning solvents are based on a 1991 CARB methodology, census data and a default emission factor developed by CARB. Growth for these categories is projected using CARB/REMI industry-specific economic output and employment. Additional information on these methodologies is available at: https://www.arb.ca.gov/ei/areasrc/arbcleancoatreproc.htm.

3.9.7 Adhesives and Sealants

This category includes emissions from solvent-based and water-based solvents contained in adhesives and sealants. Emissions are estimated based on a 1990 CARB methodology using production data and default emission factors. Growth for this category is based on CARB/REMI industry-specific economic output. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbcleanadhseal.htm.

3.9.8 Gasoline Dispensing Facilities

CARB staff developed an updated methodology to estimate emissions from fuel transfer and storage operations at gasoline dispensing facilities (GDFs). The methodology addresses emissions from underground storage tanks, vapor displacement during vehicle refueling, customer spillage, and hose permeation. The updated methodology uses emission factors developed by CARB staff that reflect more current in-use test data and also accounts for the emission reduction benefits of onboard refueling vapor recovery (ORVR) systems. The emission estimates are based on the 2012 statewide gasoline sales data from the California Board of Equalization that were apportioned to the county level using fuel consumption estimates from EMFAC. Additional information on this category is available at: https://www.arb.ca.gov/ei/areasrc/arbpetprodmarkpm.htm.

3.10 Areawide Sources

Areawide sources are categories such as consumer products, unpaved road dust, fireplaces, and prescribed burning for which emissions occur over a wide geographic area. Emissions for these categories are estimated by both CARB and the local air districts using various models and methodologies. The areawide sources are listed below in Table 3-3.

Table 3-3. Areawide Sources

Source Category	Subcategory
Solvent Evaporation	Consumer Products
	Architectural Coatings and Related Solvents
	Pesticides/Fertilizers
	Asphalt Paving and Roofing
Miscellaneous Processes	Residential Fuel Combustion
	Farming Operations
	Construction And Demolition
	Paved Road Dust
	Unpaved Road Dust
	Fugitive Windblown Dust
	Fires
	Managed Burning and Disposal
	Cooking
	Other (Miscellaneous Processes)

A summary of the areawide methodologies is presented below:

3.10.1 Ammonia Emissions from Publicly Owned Treatment Works, Landfills, Composting, Fertilizer Application, Domestic Activity, Native Animals, and Native Soils

CARB staff updated the ammonia emissions inventory methodology for publicly owned treatment works, landfills, composting, fertilizer application, domestic activity, native animals, and native soils. Revisions for these categories consist primarily of updated activity data for the 2008 calendar year. Emission factors were revised only for fertilizer application.

3.10.2 Ammonia Emissions, Miscellaneous Sources

Ammonia emissions from miscellaneous domestic processes (human respiration and perspiration, smoking, pets, untreated human waste, etc.) were grown from a 2005 CARB

estimate using State of California Department of Finance (DOF) population projections. Ammonia emissions for other categories such as residential wood combustion, livestock husbandry, managed burning, and on-road motor vehicles, were estimated as part of the methodologies for those specific area source categories.

3.10.3 Consumer Products

The consumer products category reflects the four most recent surveys conducted by CARB staff for the years 2003, 2006, 2008, and 2010. Together these surveys collected updated product information and ingredient information for approximately 350 product categories. Based on the survey data, CARB staff determined the total product sales and total VOC emissions for the various product categories. The growth trend for most consumer product subcategories is based on the latest SCAG human population growth projections, except for aerosol coatings. Staff determined that a no-growth profile would be more appropriate for aerosol coatings based on survey data that show relatively flat sales of these products over the last decade. Additional information on CARB's consumer products surveys is available at: https://www.arb.ca.gov/consprod/survey/survey.htm.

3.10.4 Architectural Coatings

The architectural coatings category reflects emission estimates based on a comprehensive CARB survey for the 2004 calendar year. The emission estimates include benefits of the 2000 and 2007 CARB Suggested Control Measures. These emissions are grown based on SCAG projections for number of households. Additional information about CARB's architectural coatings program is available at: https://www.arb.ca.gov/coatings/arch/arch.htm.

3.10.5 Pesticides

DPR develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticide Use Report, which provides updated information from 1990 to the most current data year available. The inventory includes estimates through the 2014 calendar year. Emission forecasts for years 2015 and beyond are based on the average of the most recent five years. Growth for agricultural pesticides is based on CARB projections of harvested acreage provided by the U.S. Department of Agriculture (USDA). Growth for structural pesticides is based on CARB projections of housing expenditures.

3.10.6 Asphalt Paving/Roofing

Asphalt paving emissions for 2012 were estimated using a District methodology, and asphalt roofing emissions were grown from a 2005 estimate. Emissions are estimated based on tons of asphalt applied and a default emission factor for each type of asphalt operation. The growth profile for both categories is based on construction employment from the CARB/REMI forecasting model. Additional information on the District's methodology is available at: https://www.arb.ca.gov/ei/areasrc/distsolevapasphpav.htm.

3.10.7 Residential Wood Combustion

CARB staff updated the methodology to reflect 2005 fuel use, and more recent emission factors and calculation approaches. The emission estimates reflect emission factors from USEPA's

National Emission Inventory. No growth is assumed for future years. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocresfuelcom.htm.

3.10.8 Farming Operations

CARB staff updated the inventory based on CARB methodologies for Agricultural Land Preparation and Agricultural Harvest Operations to reflect 2012 harvested crop acreage from the USDA's National Agricultural Statistics Service (NASS). NASS data are based on reports compiled by County Agricultural Commissioner staff. Emissions reflect crop and operation specific emission factors. Temporal profiles were updated based on crop specific activity profiles. In addition, the inventory reflects the emission reductions from District Rule 806. Growth is based on projected harvested acreage. The methodologies are available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocresfarmop.htm.

CARB staff updated the Livestock Husbandry methodology to reflect livestock population data based on the USDA's 2007 Census of Agriculture, and ammonia emission factors for dairy support cattle. A seasonal adjustment was added to account for the suppression of dust emissions in months in which rainfall occurs. Animal populations and emission factors for feedlots and dairies were updated for 2012 based on District data and California specific testing. CARB projects growth for feedlot cattle based on county livestock report data. Based on an analysis of livestock population trends, no growth is assumed for other livestock categories. In addition, the inventory reflects emission reductions from District Rules 420 and 217. Additional information on CARB's methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscproclivestock.htm. Additional information on the District's update is available here: https://www.arb.ca.gov/ei/areasrc/districtmeth/imperial/2016mar16_dairyfeedlotops.pdf.

3.10.9 Construction and Demolition

Emission estimates for building construction and road construction were grown from CARB estimates developed in 2002 and 1997, respectively. The growth profile for both categories is based on construction employment from the CARB/REMI forecasting model. In addition, the inventory reflects emission reductions from District Rules 801, 802 and 805. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocconstdem.htm.

3.10.10 Paved Road Dust

Paved road dust emissions for 2012 were estimated using a CARB methodology consistent with the current USEPA method (AP-42). The emission estimates are based on VMT provided by SCAG, California-specific silt loading values, VMT distribution (travel fractions) for various paved road categories, and an Imperial County specific rain adjustment. Emissions were grown using VMT projections from SCAG. The inventory also reflects the emission reductions from District Rules 803 and 805. Additional information is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocpaverddst.htm.

3.10.11 Unpaved Road Dust – Farm Roads

Emissions for unpaved farm roads were updated based on CARB's methodology and 2012 harvested crop acreage from NASS. Emissions reflect crop specific VMT factors and an emission

factor based on California test data conducted by the University of California, Davis (UC Davis), and the Desert Research Institute (DRI). Temporal profiles were updated based on crop specific activity profiles. Growth for this category is based on harvested acreage. In addition, the inventory reflects the emission reductions from District Rule 806. The methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm.

3.10.12 Unpaved Nonfarm Road Dust

Emissions from unpaved nonfarm roads were estimated from 2008 unpaved road data collected from the California Statewide Local Streets and Roads Needs Assessment, Caltrans, and local agencies. Dust emissions were calculated using an emission factor derived from tests conducted by UC Davis and DRI. In addition, a rainfall adjustment factor was applied. Staff assumed no growth for this category based on the assumption that existing unpaved roads tend to get paved as vehicle traffic on them increases, which counteracts any additional emissions from new unpaved roads. The inventory also reflects the emission reductions from District Rule 805. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm.

3.10.12.1 Fugitive Windblown Dust from Open Areas and Non-pasture Agriculture Lands

The District provided estimates of windblown fugitive dust derived from a model developed by Ramboll Environ under a contract with the District. The model assesses emission characteristics, hourly emission factors and hourly meteorological data for each land parcel within the modeling domain, and applies correction terms based on vegetative cover, as well as non-climatic corrections for agricultural lands. Based on these inputs, the model was used to estimate fugitive windblown dust emission from open areas and non-pasture agriculture lands in the Imperial County $PM_{2.5}$ Nonattainment Area. Growth for agricultural lands is based on projected acreage from the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP). No growth is assumed for non-agricultural lands. The inventory also reflects the emission reductions from District Rules 804 and 806. Additional information about CARB's methodology is available at:
https://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm.

3.10.13 Windblown Dust from Unpaved Roads

Emissions for this source category were estimated based on a 1997 CARB methodology reflecting unpaved road mileage and local parameters that affect wind erosion. The estimates assume no growth. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm.

3.10.14 Fires

Emissions from structural and automobile fires were estimated based on a 1999 CARB methodology using the number of fires and the associated emission factors. Estimates for structural fires are calculated using the amount of the structure that is burned, the amount and content of the material burned, and emission factors derived from test data. Estimates for automobile fires are calculated using the weight of the car and components and composite emission factors derived from AP-42 emission factors. No growth is assumed for this category.

Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfires.htm.

3.10.15 Managed Burning & Disposal

CARB updated the emissions inventory to reflect burn data reported by District staff for 2012. Emissions are calculated using crop specific emission factors and fuel loadings. Temporal profiles reflect monthly burn activity. Growth for agricultural burning is based on projected harvested acreage. No growth is assumed for burning associated with weed abatement. CARB's methodology for managed burning is available at: https://www.arb.ca.gov/ei/areasrc/distmiscprocwstburndis.htm. Additional background information is available here: https://www.arb.ca.gov/ei/see/see.htm.

3.10.16 Commercial Cooking

Commercial cooking emissions were grown from a 2005 estimate. The emissions estimates were developed from the number of restaurants, the number and types of cooking equipment, the food type, and default emission factors. The growth profile reflects the latest population projections provided by SCAG.

3.11 Point and Areawide Source Emissions Forecasting

Emission forecasts (2013 and subsequent years) are based on growth profiles that in many cases incorporate historical trends up to the base year or beyond. The growth surrogates used to forecast the emissions from these categories are presented below in Table 3-4.

Table 3-4. Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Fuel Combustion	Electric Utilities	SoCAL Gas Company (SCG) 2014 report
	Cogeneration	ARB/REMI industry-specific economic output
	Manufacturing and Industrial Area Source/Natural Gas	SCG 2014 report
	Manufacturing and Industrial Others	ARB/REMI industry-specific economic output
	Food and Agricultural Processing Ag Irrigation I.C. Engines	Modeled estimate
	Food and Agricultural Processing Point Sources	ARB/REMI industry-specific economic output
	Service and Commercial Natural Gas	SCG 2014 Report
	Service and Commercial Other Fuels	CARB/REMI industry-specific employment
	Other, Diesel	CARB EMFAC model for fuel consumption
	Other Fuels	CARB/REMI industry specific economic output/employment
Waste Disposal	Sewage Treatment	SCAG population
	Landfills	SCAG population
	Other (Composting)	No growth
Laundering	Dry Cleaning	SCAG population
Degreasing	All	CARB/REMI industry-specific economic output
Coatings & Thinners	Auto Refinishing	SCAG Vehicle Miles Traveled (VMT)
	Others	CARB/REMI industry specific economic output/employment
Adhesives & Sealants	All	CARB/REMI industry-specific economic output

Table 3-4. Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Petroleum Refining	All	CARB EMFAC model fuel consumption
Petroleum Marketing	All	CARB EMFAC model fuel consumption
Petroleum Production & Marketing	All	CARB/REMI industry-specific economic output
Food & Agriculture	All	CARB/REMI industry specific economic output
Mineral Processes	All	CARB/REMI industry-specific economic output/employment
Other Industrial Processes	Electrical Power Generation	SCG 2014 report
	Others	CARB/REMI industry-specific economic output
Consumer Products	Consumer Products	SCAG population
	Aerosol Coatings	No growth
Architectural Coatings and Related Process Solvents	All	SCAG households
Pesticides/Fertilizers	Agricultural Pesticides	Harvested acreage
	Structural Pesticides	CARB housing expenditure
Asphalt Paving/Roofing	All	CARB/REMI industry-specific employment
Residential Fuel Combustion	Natural Gas	SCG 2014 report
	Woodstoves & Fireplaces - Wood	No growth
	Water Heating	SCAG households
	Cooking	SCAG households
	Other	SCAG households
Farming Operations	Tilling & Harvest Operations	Harvested acreage
	Livestock / Feedlot Cattle	County livestock report data/ARB
	Livestock / Others	No growth
Construction & Demolition	All	CARB/REMI industry-specific employment

Table 3-4. Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Paved Road Dust	All	SCAG VMT
Unpaved Road Dust	Farm Roads	Harvested acreage
	Others	No growth
Fugitive Windblown Dust	Agricultural & Pasture Lands	CARB FMMP data
	Others	No growth
Fires	All	No growth
Managed Burning & Disposal	Agricultural Burning, Prunings & Field Crops	Harvested acreage
	Weed Abatement	No growth
Cooking	All	SCAG population
Other (Miscellaneous Processes)	All	SCAG population

3.12 Stationary Source Control Profiles

The emissions inventory reflects emission reductions from point and areawide sources subject to District rules and CARB regulations. The rules and regulations reflected in the inventory are listed below in Table 3-5.

Table 3-5. District and CARB Stationary Source Control Rules and Regulations Included in the Inventory

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
District	217	Large Confined Animal Facilities (LCAF) Permits Required	Livestock Husbandry
District	420	Beef Feedlots	Livestock Operations
District	801	Construction and Earthmoving Activities	Construction and Demolition
District	802	Bulk Materials	Point Sources
District	803	Carry-Out and Track-Out	Paved Roads
District	804	Open Areas	Windblown Dust
District	805	Paved and Unpaved Roads	Paved and Unpaved Non-farm Roads

Table 3-5. District and CARB Stationary Source Control Rules and Regulations Included in the Inventory

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
District	806	Conservation Management Practices	Tilling and Harvesting Operations, Windblown Dust, Unpaved Farm Roads
CARB	AC_SCM2007	Architectural Coatings 2007 SCM	Architectural coatings
CARB	ARCH_SCM	Architectural Coatings 2000 SCM	Architectural coatings
CARB	CARB_R003	Consumer Product Regulations & Amendments	Consumer products
CARB	CARB_R003_A	Consumer Product Regulations & Amendments	Consumer products
CARB	CARB_R007	Aerosol Coating Regulation	Consumer products / Aerosol coatings
CARB	GDF_HOSREG	Gasoline Dispensing Facilities - Hose Permeation	Petroleum marketing
CARB	ORVR	Fueling emissions from ORVR vehicles	Petroleum marketing

3.13 Mobile Sources

CARB uses the EMFAC model to assess emissions from on-road vehicles. Off-road mobile source emissions are estimated using a new modular approach for different source categories. On-road and off-road models account for the effects of various adopted regulations, technology types, and seasonal conditions on emissions.

3.13.1 On-Road Mobile Sources

Emissions from on-road mobile sources, which include passenger vehicles, buses, and trucks, were estimated using outputs from CARB's EMFAC2014 model. The on-road emissions were calculated by applying EMFAC2014 emission factors to the transportation activity data provided by SCAG from their 2016 adopted Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS).

EMFAC2014 includes data on California's car and truck fleets and travel activity. Light-duty motor vehicle fleet age, vehicle type, and vehicle population were updated based on 2012 DMV data. The model also reflects the emissions benefits of CARB's recent rulemakings such as the Pavley Standards and Advanced Clean Cars Program, and includes the emissions benefits of CARB's Truck and Bus Rule and previously adopted rules for other on-road diesel fleets.

EMFAC2014 utilizes a socio-econometric regression modeling approach to forecast new vehicle sales and to estimate future fleet mix. Light-duty passenger vehicle population includes 2012 DMV registration data along with updates to mileage accrual using Smog Check data. Updates to heavy-duty trucks include model year specific emission factors based on new test data, and

population estimates using DMV data for in-state trucks and International Registration Plan (IRP) data for out-of-state trucks.

Additional information and documentation on the EMFAC2014 model is available at: https://www.arb.ca.gov/msei/categories.htm#emfac2014.

3.13.2 Off-Road Mobile Sources

Emissions from off-road sources were estimated using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Many of the newer models were developed to support recent regulations, including in-use off-road equipment, ocean-going vessels and others. The sections below summarize the updates made to specific off-road categories.

Cargo Handling Equipment (CHE)

The emissions inventory for the Cargo Handling Equipment category has been updated to reflect new information on equipment population, activity, recessionary impacts on growth, and engine load. The new information includes regulatory reporting data which provide an accounting of all the cargo handling equipment in the State including their model year, horsepower and activity. Background and supporting documents for the Cargo Handling Equipment Regulation are available here: https://www.arb.ca.gov/ports/cargo/cheamd2011.htm

Pleasure Craft and Recreational Vehicles

A new model was developed in 2011 to estimate emissions from pleasure craft and recreational vehicles. In both cases, population, activity, and emission factors were re-assessed using new surveys, registration information, and emissions testing. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

In-Use Off-Road Equipment

CARB developed this model in 2010 to support the analysis for amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation. Staff updated the underlying activity forecast to reflect more recent economic forecast data, which suggests a slower rate of recovery through 2024 than previously anticipated. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

Locomotives

In 2016, CARB updated California's Class I and Class II line-haul locomotive model. The new model provides the following updates: age and model year distribution based on 2011 and 2014 rail company data, activity based on Freight Analysis Framework (FAF) data, fuel growth based on Board of Equalization historical rail data, and new locomotive populations, survival rates, and Tier distributions. To estimate emissions, CARB used duty cycle, fuel consumption and activity data reported by the rail lines in 2011. These results were combined with the Class III locomotive emissions inventory from previous SIPS, that were incorporated in the 2006 locomotive inventory, to create an overall California line-haul locomotive emissions inventory for the SIP. More information may be found at https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

Transport Refrigeration Units (TRU)

This model reflects updates to activity, population, growth and turn-over data, and emission factors developed to support the 2011 amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

Fuel Storage and Handling

Emissions for fuel storage and handling were estimated using the OFFROAD2007 model. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

Diesel Agricultural Equipment

The inventory for agricultural diesel equipment (such as tractors, harvesters, combines, sprayers and others) was revised based on a 2008 survey of thousands of farmers, custom operators, and first processors. The survey data, along with information from the 2007 USDA Farm Census, was used to revise almost every aspect of the agricultural inventory, including population, activity, age distribution, fuel use, and allocation. This updated inventory replaces general information on farm equipment in the United States with one specific to California farms and practices. The updated inventory was compared against other available data sources such as Board of Equalization fuel reports, USDA tractor populations and age, and Eastern Research Group tractor ages and activity, to ensure the results were reasonable and compared well against outside data sources. Agricultural growth rates through 2050 were developed through a contract with URS Corp and UC Davis. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

Military Aircraft

Baseline emission estimates were developed for the El Centro Naval Air Facility by El Centro staff based on actual operational data and were submitted by the District.

3.14 Mobile Source Forecasting

Table 3-6 summarizes the data and methods used to forecast future-year mobile source emissions by broad source category groupings.

Table 3-6. Growth Surrogates for Mobile Sources

Category	Growth Methodology
On-Road Sources	
All	Match total VMT projections provided by SCAG
Off-Road Gasoline Fueled Equipment	
Lawn & Garden	Household growth projection
Off-Road Equipment	Employment growth projection
Recreational Boats	Housing starts (short-term) and human population growth (long-term)
Recreational Vehicles	Housing starts (short-term) and human population growth (long-term)
Off-Road Diesel-Fueled Equipment	
Construction and Mining	California construction employment data from U.S. Bureau of Labor Statistics
Farm Equipment	2011 study of forecasted growth by URS Corp.
Industrial Equipment	California construction employment data from Bureau of Labor Statistics
Trains (line haul)	FAF 2015 growth projections and historical Bureau of Transportation Statistics locomotive fuel trends (1990-2013 data)
Transport Refrigeration Units	Projection of historical Truck/Trailer TRU sales from ACT Research, adjusted for recession.
Off-Road Equipment (Other Fuels)	
Military Aircraft	The growth for military aircraft are based on estimates from El Centro Naval Air Facility staff that facilitate the fielding of new weapons systems, potentially expanding operations that accommodate all activities necessary to continue the national security mission.

3.15 Condensable Particulate Matter

3.15.1 Background

Condensable PM is "material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack."[19] Condensable PM is a component of primary PM, which is the sum of condensable and filterable PM. Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions."[20] All condensable PM is assumed to be smaller than 2.5 microns (µm) in diameter; therefore, $PM_{2.5}$ primary is the sum of condensable PM and filterable PM less than 2.5 µm, while PM_{10} primary is the sum of condensable PM and filterable PM less than 10 µm.

The AERR requires states to report annual emissions of filterable and condensable components of $PM_{2.5}$ and PM_{10}, "as applicable," for large sources every inventory year and for all sources every third inventory year, beginning with 2011.[21] Subsequent emissions inventory guidance[22] from the USEPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR." These source types are stationary point and nonpoint combustion sources that are expected to generate condensable PM and include, for instance, commercial cooking, fuel combustion at electric generating utilities, industrial processes like cement or chemical manufacturing, and flares or incinerators associated with waste disposal. The District reports condensable PM from stationary and area sources using the methodology outlined below.

Mobile sources emit PM in both filterable and condensable form; however, the AERR does not require states to report filterable and condensable PM separately for mobile sources. Emissions from mobile sources are reported in the emissions inventory in Section 3.16 and Appendix B as primary PM, e.g. the sum of filterable and condensable PM.

3.15.2 Methodology

For the current inventory, the District has collected data on primary PM only, containing both filterable and condensable components without distinguishing between the two. Consequently, to be able to report emissions of the condensable component of $PM_{2.5}$ separately as required by the AERR, the District must use conversion factors to convert primary $PM_{2.5}$ to condensable PM.

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[19] 40 CFR §51.50

[20] Ibid.

[21] 40 CFR §51.15(a)(1) and §51.30(b)(1)

[22] USEPA. 2017. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. May. Available at: https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf. Accessed: March 2018.

USEPA has published an augmentation tool[23] which contains conversion factors for each source classification code (SCC) to convert filterable PM_{10} (PM10FIL) to condensable PM (PMCON). In this form, these conversion factors ($CF_{PM10FIL \rightarrow PMCON}$) are not useful because the District does not directly collect PM10FIL data. But, the following formula adjusts USEPA's existing conversion factors to obtain new conversion factors for each SCC that convert from primary PM_{10} (PM10PRI)—data which the District does collect—to condensable PM ($CF_{PM10PRI \rightarrow PMCON}$):

$$CF_{PM10PRI \rightarrow PMCON} = \frac{CF_{\mathrm{PM10FIL \rightarrow PMCON}}}{(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})}$$

The formula was derived as follows:

$$PM10PRI = PM10FIL + PMCON$$

and

$$PMCON = PM10FIL\ (CF_{\mathrm{PM10FIL \rightarrow PMCON}})$$

and

$$PMCON = PM10PRI(CF_{\mathrm{PM10PRI \rightarrow PMCON}})$$

$$\therefore \quad PM10PRI = PM10FIL + PM10FIL\ (CF_{\mathrm{PM10FIL \rightarrow PMCON}}) = PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})$$

and

$$CF_{\mathrm{PM10PRI \rightarrow PMCON}} = \frac{PMCON}{PM10PRI} = \frac{PMCON}{PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})}$$

$$= \frac{PM10FIL\ (CF_{\mathrm{PM10FIL \rightarrow PMCON}})}{PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})} = \frac{CF_{\mathrm{PM10FIL \rightarrow PMCON}}}{(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})}$$

Since condensable PM is typically smaller than 2.5µm, a 1:1 ratio between PM_{10} and $PM_{2.5}$ may be assumed, and the same conversion factors can likewise be applied to convert primary $PM_{2.5}$ (PM25PRI) to condensable PM using the same method. That is, $CF_{PM10PRI \rightarrow PMCON} = CF_{PM25PRI \rightarrow PMCON}$ where $CF_{PM25PRI \rightarrow PMCON}$ represents the conversion factors that convert from primary $PM_{2.5}$—again, data the District does collect—to condensable PM.

These calculated conversion factors ($CF_{PM25PRI \rightarrow PMCON}$), derived from the USEPA conversion factors and presented in Table 3-7 below, are used to determine the condensable PM component of primary $PM_{2.5}$ for applicable source types located in the District (see Section 3.16 and Appendix B).

[23] USEPA. 2016. PM Augmentation. Air Emissions Inventories. May 20. Available at: https://www.epa.gov/air-emissions-inventories/pm-augmentation. Accessed: March 2018.

Table 3-7. Calculated Primary $PM_{2.5}$ to Condensable $PM_{2.5}$ Conversion Factors

Source Classification Code	Source Classification Code Description				$PM_{2.5}$ to $PM_{condensable}$ Conversion Factor
	First Digit	First 3 Digits	First 6 Digits	First 8 Digits	
10100601	External Combustion Boiler	Electricity Generation	Natural Gas	>100 MMBtu/hr	0.6154
10200601	External Combustion Boiler	Industrial	Natural Gas	>100 MMBtu/hr	0.6154
10200604	External Combustion Boiler	Industrial	Natural Gas	Cogeneration	0.6154
10300603	External Combustion Boiler	Commercial/Institutional	Natural Gas	<10 MMBtu/hr	0.6154
20100102	Internal Combustion	Electricity Generation	Distillate Oil/Diesel	Reciprocating	0.0703
20100201	Internal Combustion	Electricity Generation	Natural Gas	Turbine	0.4505
20100301	Internal Combustion	Electricity Generation	Diesel	Reciprocating	0.4505
20300301	Internal Combustion	Commercial/Institutional	Gasoline	Reciprocating	0.0672
30200104	Food/Agriculture	Alfalfa Dehydration	Pellet Cooler	Cyclone	0.1311
30200199	Food/Agriculture	Alfalfa Dehydration	Not Classified	Other	0
30200832	Food/Agriculture	Feed Manufacture	Other Grain Feed	Handling & Transferring	0
30201412	Food/Agriculture	Starch Manufacture	Combined Operations	Unmodified Flash Dryers	0.4004
30203801	Food/Agriculture	Animal/Poultry	Rendering	General	0
30500201	Petroleum Industry	Asphalt Concrete	Rotary Dryer	Conventional Plant	0.1660
30500204	Petroleum Industry	Asphalt Concrete	Cold Aggregate Handling	--	0
30500205	Petroleum Industry	Asphalt Concrete	Drum Dryer	Hot Asphalt Plant	0
30501106	Mineral Products	Concrete Batching	Sand/Aggregate	Transfer to Bins	0
30501603	Mineral Products	Lime Manufacture	Calcining	Vertical Kiln	0.2304
30502503	Mining Operations	Nonmetallic Mineral	Sand/Gravel	Transfer Station	0
39000889	Industrial Process	Industrial Process Fuel	Coke	Not Classified	0
2302002100[a]	Cooking	Commercial	Charbroiling	--	0.9968

Notes:

[a] USEPA developed a separate augmentation tool specifically for commercial cooking, containing updated conversion factors from PM25PRI to PMCON for four commercial cooking source types.

3.16 Emission Inventories

Tables 3-8a through 3-11b present the 2012, 2019, 2021, and 2022 direct (or primary) $PM_{2.5}$, condensable $PM_{2.5}$, filterable $PM_{2.5}$, and $PM_{2.5}$ precursors annual emission inventories (averaged to the day) for the Imperial County $PM_{2.5}$ Nonattainment Area by major source category. These inventories were developed from CARB's CEPAM, Version 1.05, which utilizes the data and methodologies outlined in Sections 3.1 through 3.14. More detailed inventories are provided in Appendix B.

Figure 3-1 shows the trends in primary $PM_{2.5}$ emissions during these key years. Imperial County primary $PM_{2.5}$ emissions show modest reductions between the base year (2012) and 2022. Appendix A discusses these emissions in the context of the greater regional emissions, including those from sources in Mexicali, Mexico.

Figure 3-1. Trends in Primary $PM_{2.5}$ Annual Emissions for the Imperial County $PM_{2.5}$ Nonattainment Area

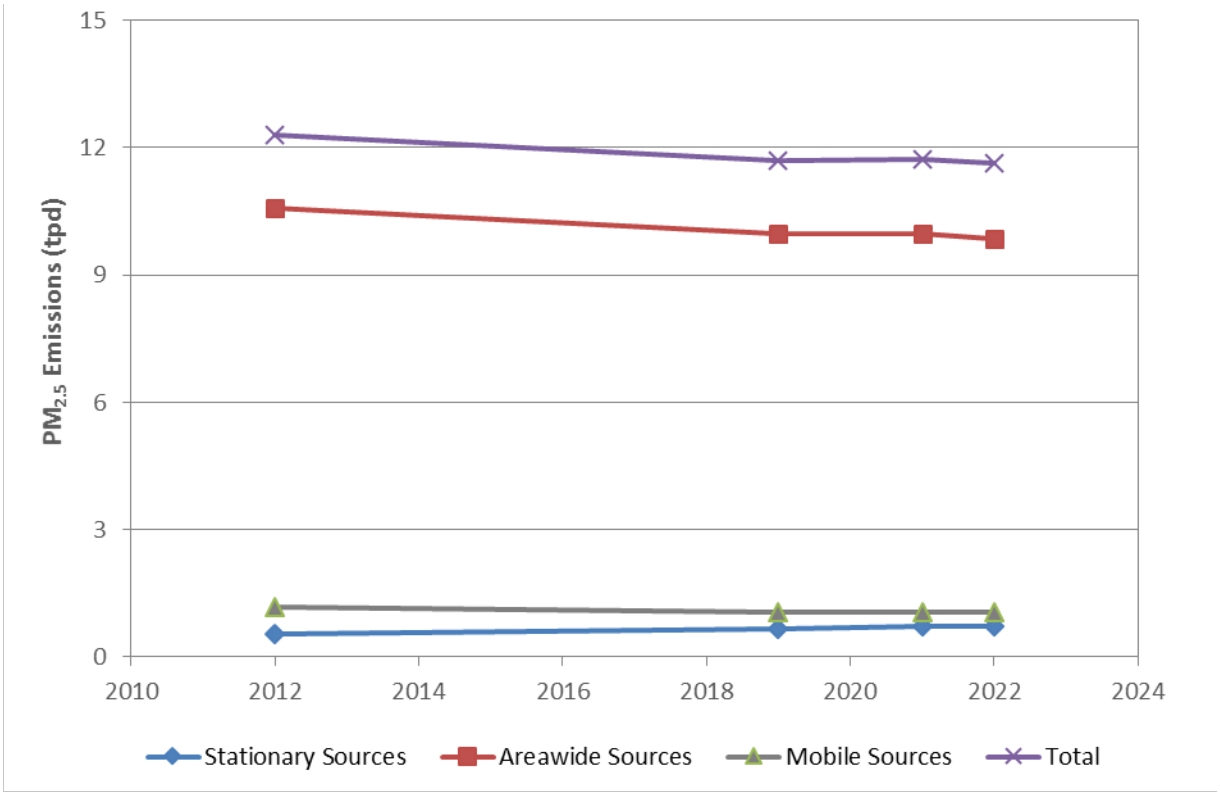


Table 3-8a. Direct $PM_{2.5}$ and $PM_{2.5}$ Precursor Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2012 (Annual)

Source Category	$PM_{2.5}$ (tons/day)	% Total	NH_3 (tons/day)	% Total	NO_X (tons/day)	% Total	SO_X (tons/day)	% Total	ROG (tons/day)	% Total
Stationary Sources										
Fuel Combustion	0.13	1.08%	0.00	0.00%	1.52	10.71%	0.00	1.74%	0.05	0.44%
Waste Disposal	0.00	0.00%	1.19	5.13%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Cleaning and Surface Coatings	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.41	3.44%
Petroleum Production and Marketing	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.50	4.17%
Industrial Processes	0.41	3.37%	0.00	0.00%	0.02	0.15%	0.00	0.00%	0.00	0.01%
Total Stationary Sources	**0.55**	**4.45%**	**1.19**	**5.13%**	**1.54**	**10.85%**	**0.00**	**1.74%**	**0.96**	**8.06%**
Areawide Sources										
Solvent Evaporation	0.00	0.00%	12.87	55.37%	0.00	0.00%	0.00	0.00%	3.01	25.35%
Farming Operations	0.91	7.36%	8.68	37.34%	0.00	0.00%	0.00	0.00%	1.48	12.47%
Unpaved Road Dust	4.76	38.73%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Fugitive Windblown Dust	3.69	30.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Managed Burning and Disposal	0.82	6.70%	0.13	0.54%	0.29	2.05%	0.05	18.11%	0.60	5.04%
Other Processes	0.40	3.21%	0.26	1.13%	0.08	0.56%	0.00	0.74%	0.04	0.36%
Total Areawide Sources	**10.58**	**86.01%**	**21.94**	**94.37%**	**0.37**	**2.62%**	**0.05**	**18.86%**	**5.14**	**43.22%**
Mobile Sources										
On-Road Vehicles	0.19	1.55%	0.11	0.49%	5.31	37.38%	0.02	5.85%	1.77	14.86%
Off-Road Vehicles	0.98	7.99%	0.00	0.01%	6.98	49.15%	0.21	73.56%	4.03	33.86%
Total Mobile Sources	**1.17**	**9.54%**	**0.12**	**0.50%**	**12.28**	**86.53%**	**0.22**	**79.40%**	**5.79**	**48.71%**
Total for Imperial County	**12.30**	**100%**	**23.24**	**100%**	**14.19**	**100%**	**0.28**	**100%**	**11.89**	**100%**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table 3-8b. Condensable and Filterable $PM_{2.5}$ Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2012 (Annual)

Source Category	Total $PM_{2.5}$ (tons/day)	Condensable $PM_{2.5}$ (tons/day)	Filterable $PM_{2.5}$ (tons/day)
Stationary Sources			
Fuel Combustion	0.133	0.030	0.103
Waste Disposal	0	0	0
Cleaning and Surface Coatings	0	0	0
Petroleum Production and Marketing	0	0	0
Industrial Processes	0.415	0.009	0.406
Total Stationary Sources	**0.548**	**0.039**	**0.509**
Areawide Sources			
Solvent Evaporation	0	0	0
Farming Operations	0.906	0	0.906
Unpaved Road Dust	4.762	0	4.762
Fugitive Windblown Dust	3.689	0	3.689
Managed Burning and Disposal	0.824	0	0.824
Other Processes	0.395	0.056	0.340
Total Areawide Sources	**10.576**	**0.056**	**10.520**
Mobile Sources			
On-Road Vehicles	0.191	--	--
Off-Road Vehicles	0.982	--	--
Total Mobile Sources	**1.173**	--	--
Total for Imperial County	**12.297**	**--**	**--**

Notes:
Totals may not add up due to rounding.
"--" indicates that the portion of condensable/filterable $PM_{2.5}$ is unknown or unmeasurable.

Table 3-9a. Direct $PM_{2.5}$ and $PM_{2.5}$ Precursor Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2019 (Annual)

Source Category	$PM_{2.5}$ (tons/day)	% Total	NH_3 (tons/day)	% Total	NO_X (tons/day)	% Total	SO_X (tons/day)	% Total	ROG (tons/day)	% Total
Stationary Sources										
Fuel Combustion	0.11	0.97%	0.00	0.00%	1.33	13.03%	0.00	1.65%	0.04	0.40%
Waste Disposal	0.00	0.00%	1.21	5.39%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Cleaning and Surface Coatings	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.49	4.56%
Petroleum Production and Marketing	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.45	4.15%
Industrial Processes	0.55	4.71%	0.00	0.00%	0.02	0.22%	0.00	0.00%	0.00	0.02%
Total Stationary Sources	**0.66**	**5.68%**	**1.21**	**5.39%**	**1.35**	**13.24%**	**0.00**	**1.65%**	**0.98**	**9.13%**
Areawide Sources										
Solvent Evaporation	0.00	0.00%	12.00	53.68%	0.00	0.00%	0.00	0.00%	2.93	27.17%
Farming Operations	0.85	7.31%	8.60	38.49%	0.00	0.00%	0.00	0.00%	1.47	13.64%
Unpaved Road Dust	4.18	35.74%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Fugitive Windblown Dust	3.69	31.54%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Managed Burning and Disposal	0.72	6.18%	0.11	0.49%	0.26	2.50%	0.04	15.02%	0.53	4.88%
Other Processes	0.53	4.56%	0.33	1.49%	0.07	0.69%	0.00	0.81%	0.05	0.42%
Total Areawide Sources	**9.97**	**85.32%**	**21.05**	**94.15%**	**0.33**	**3.19%**	**0.05**	**15.83%**	**4.97**	**46.11%**
Mobile Sources										
On-Road Vehicles	0.09	0.80%	0.10	0.45%	2.86	28.03%	0.02	5.91%	1.17	10.83%
Off-Road Vehicles	0.96	8.20%	0.00	0.01%	5.67	55.54%	0.23	76.61%	3.65	33.93%
Total Mobile Sources	**1.05**	**9.00%**	**0.10**	**0.46%**	**8.54**	**83.57%**	**0.25**	**82.53%**	**4.82**	**44.76%**
Total for Imperial County	**11.69**	**100%**	**22.35**	**100%**	**10.22**	**100%**	**0.30**	**100%**	**10.77**	**100%**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table 3-9b. Condensable and Filterable $PM_{2.5}$ Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2019 (Annual)

Source Category	Total $PM_{2.5}$ (tons/day)	Condensable $PM_{2.5}$ (tons/day)	Filterable $PM_{2.5}$ (tons/day)
Stationary Sources			
Fuel Combustion	0.114	0.024	0.089
Waste Disposal	0	0	0
Cleaning and Surface Coatings	0	0	0
Petroleum Production and Marketing	0	0	0
Industrial Processes	0.551	0.010	0.541
Total Stationary Sources	**0.664**	**0.034**	**0.630**
Areawide Sources			
Solvent Evaporation	0	0	0
Farming Operations	0.854	0	0.854
Unpaved Road Dust	4.177	0	4.177
Fugitive Windblown Dust	3.686	0	3.686
Managed Burning and Disposal	0.722	0	0.722
Other Processes	0.533	0.070	0.463
Total Areawide Sources	**9.972**	**0.070**	**9.901**
Mobile Sources			
On-Road Vehicles	0.093	--	--
Off-Road Vehicles	0.958	--	--
Total Mobile Sources	**1.052**	--	--
Total for Imperial County	**11.687**	**--**	**--**

Notes:
Totals may not add up due to rounding.
"--" indicates that the portion of condensable/filterable $PM_{2.5}$ is unknown or unmeasurable.

Table 3-10a. Direct $PM_{2.5}$ and $PM_{2.5}$ Precursor Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2021 (Annual)

Source Category	$PM_{2.5}$ (tons/day)	% Total	NH_3 (tons/day)	% Total	NO_X (tons/day)	% Total	SO_X (tons/day)	% Total	ROG (tons/day)	% Total
Stationary Sources										
Fuel Combustion	0.12	1.03%	0.00	0.00%	1.42	14.85%	0.01	1.78%	0.05	0.42%
Waste Disposal	0.00	0.00%	1.21	5.45%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Cleaning and Surface Coatings	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.51	4.77%
Petroleum Production and Marketing	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.43	4.01%
Industrial Processes	0.59	5.00%	0.00	0.00%	0.02	0.24%	0.00	0.00%	0.00	0.02%
Total Stationary Sources	**0.71**	**6.03%**	**1.21**	**5.45%**	**1.45**	**15.09%**	**0.01**	**1.78%**	**0.98**	**9.22%**
Areawide Sources										
Solvent Evaporation	0.00	0.00%	11.82	53.27%	0.00	0.00%	0.00	0.00%	2.97	27.89%
Farming Operations	0.84	7.19%	8.60	38.78%	0.00	0.00%	0.00	0.00%	1.47	13.78%
Unpaved Road Dust	4.17	35.58%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Fugitive Windblown Dust	3.68	31.41%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Managed Burning and Disposal	0.71	6.05%	0.11	0.49%	0.25	2.62%	0.04	14.76%	0.52	4.84%
Other Processes	0.56	4.76%	0.35	1.56%	0.07	0.74%	0.00	0.84%	0.05	0.43%
Total Areawide Sources	**9.97**	**84.99%**	**20.88**	**94.10%**	**0.32**	**3.36%**	**0.05**	**15.60%**	**5.01**	**46.94%**
Mobile Sources										
On-Road Vehicles	0.09	0.79%	0.10	0.44%	2.56	26.73%	0.02	5.99%	1.08	10.09%
Off-Road Vehicles	0.96	8.19%	0.00	0.01%	5.26	54.83%	0.23	76.63%	3.60	33.76%
Total Mobile Sources	**1.05**	**8.98%**	**0.10**	**0.45%**	**7.82**	**81.55%**	**0.25**	**82.62%**	**4.68**	**43.85%**
Total for Imperial County	**11.73**	**100%**	**22.19**	**100%**	**9.59**	**100%**	**0.30**	**100%**	**10.67**	**100%**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table 3-10b. Condensable and Filterable $PM_{2.5}$ Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2021 (Annual)

Source Category	Total $PM_{2.5}$ (tons/day)	Condensable $PM_{2.5}$ (tons/day)	Filterable $PM_{2.5}$ (tons/day)
Stationary Sources			
Fuel Combustion	0.121	0.025	0.096
Waste Disposal	0	0	0
Cleaning and Surface Coatings	0	0	0
Petroleum Production and Marketing	0	0	0
Industrial Processes	0.586	0.010	0.576
Total Stationary Sources	**0.707**	**0.035**	**0.672**
Areawide Sources			
Solvent Evaporation	0	0	0
Farming Operations	0.844	0	0.844
Unpaved Road Dust	4.175	0	4.175
Fugitive Windblown Dust	3.685	0	3.685
Managed Burning and Disposal	0.710	0	0.710
Other Processes	0.559	0.073	0.485
Total Areawide Sources	**9.972**	**0.073**	**9.899**
Mobile Sources			
On-Road Vehicles	0.093	--	--
Off-Road Vehicles	0.961	--	--
Total Mobile Sources	**1.053**	--	--
Total for Imperial County	**11.733**	**--**	**--**

Notes:
Totals may not add up due to rounding.
"--" indicates that the portion of condensable/filterable $PM_{2.5}$ is unknown or unmeasurable.

Table 3-11a. Direct $PM_{2.5}$ and $PM_{2.5}$ Precursor Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2022 (Annual)

Source Category	$PM_{2.5}$ (tons/day)	% Total	NH_3 (tons/day)	% Total	NO_X (tons/day)	% Total	SO_X (tons/day)	% Total	ROG (tons/day)	% Total
Stationary Sources										
Fuel Combustion	0.12	1.04%	0.00	0.00%	1.42	15.47%	0.01	1.78%	0.05	0.42%
Waste Disposal	0.00	0.00%	1.21	5.46%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Cleaning and Surface Coatings	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.52	4.90%
Petroleum Production and Marketing	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.42	3.90%
Industrial Processes	0.60	5.18%	0.00	0.00%	0.02	0.25%	0.00	0.00%	0.00	0.02%
Total Stationary Sources	**0.72**	**6.23%**	**1.21**	**5.46%**	**1.45**	**15.72%**	**0.01**	**1.78%**	**0.99**	**9.25%**
Areawide Sources										
Solvent Evaporation	0.00	0.00%	11.76	53.13%	0.00	0.00%	0.00	0.00%	2.99	28.00%
Farming Operations	0.84	7.22%	8.60	38.87%	0.00	0.00%	0.00	0.00%	1.47	13.77%
Unpaved Road Dust	4.05	34.78%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Fugitive Windblown Dust	3.68	31.68%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Managed Burning and Disposal	0.71	6.07%	0.11	0.48%	0.25	2.71%	0.04	14.68%	0.51	4.81%
Other Processes	0.57	4.94%	0.35	1.58%	0.07	0.77%	0.00	0.84%	0.05	0.43%
Total Areawide Sources	**9.85**	**84.68%**	**20.82**	**94.07%**	**0.32**	**3.48%**	**0.05**	**15.52%**	**5.02**	**47.00%**
Mobile Sources										
On-Road Vehicles	0.10	0.83%	0.10	0.46%	2.41	26.18%	0.02	6.15%	1.08	10.15%
Off-Road Vehicles	0.96	8.26%	0.00	0.01%	5.03	54.62%	0.23	76.55%	3.59	33.61%
Total Mobile Sources	**1.06**	**9.09%**	**0.10**	**0.47%**	**7.44**	**80.80%**	**0.25**	**82.70%**	**4.67**	**43.75%**
Total for Imperial County	**11.63**	**100%**	**22.14**	**100%**	**9.21**	**100%**	**0.30**	**100%**	**10.67**	**100%**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table 3-11b. Condensable and Filterable $PM_{2.5}$ Emissions by Major Source Category in the Imperial County $PM_{2.5}$ Nonattainment Area, 2022 (Annual)

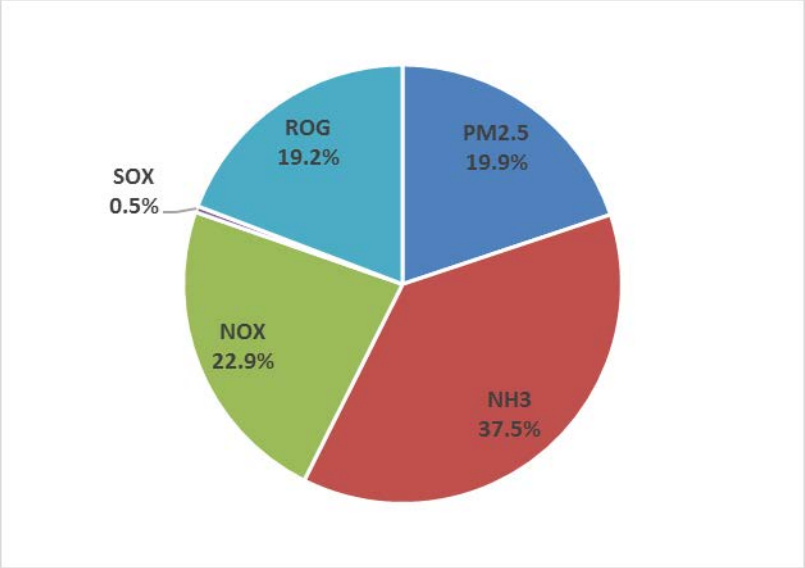
Source Category	Total $PM_{2.5}$ (tons/day)	Condensable $PM_{2.5}$ (tons/day)	Filterable $PM_{2.5}$ (tons/day)
Stationary Sources			
Fuel Combustion	0.121	0.026	0.096
Waste Disposal	0	0	0
Cleaning and Surface Coatings	0	0	0
Petroleum Production and Marketing	0	0	0
Industrial Processes	0.603	0.010	0.593
Total Stationary Sources	**0.725**	**0.036**	**0.689**
Areawide Sources			
Solvent Evaporation	0	0	0
Farming Operations	0.840	0	0.840
Unpaved Road Dust	4.046	0	4.046
Fugitive Windblown Dust	3.685	0	3.685
Managed Burning and Disposal	0.706	0	0.706
Other Processes	0.574	0.074	0.500
Total Areawide Sources	**9.850**	**0.074**	**9.776**
Mobile Sources			
On-Road Vehicles	0.096	--	--
Off-Road Vehicles	0.961	--	--
Total Mobile Sources	**1.057**	--	--
Total for Imperial County	**11.632**	**--**	**--**

Notes:
Totals may not add up due to rounding.
"--" indicates that the portion of condensable/filterable $PM_{2.5}$ is unknown or unmeasurable.

3.17 Evaluation of Significant Precursors

In addition to direct emissions, particulate matter is formed in the atmosphere from precursors. SO_X, NO_X, VOCs, and NH_3 all contribute to the formation of particulate matter. For this Annual $PM_{2.5}$ SIP, CARB staff evaluated $PM_{2.5}$ precursors consistent with the 2016 $PM_{2.5}$ NAAQS Implementation Final Rule ("2016 $PM_{2.5}$ Implementation Rule").[24] Specifically, CARB staff developed a technical demonstration indicating whether emissions of a particular precursor significantly contribute to $PM_{2.5}$ levels in the Imperial County $PM_{2.5}$ Nonattainment Area. USEPA's Draft $PM_{2.5}$ Precursor Demonstration Guidance[25] document states that a precursor may be excluded from control requirements if the analysis shows that the air quality contribution of the precursor to $PM_{2.5}$ does not exceed the recommended contribution threshold of 0.2 µg/m^3 for the annual $PM_{2.5}$ standard. The 2016 $PM_{2.5}$ Implementation Rule recommends evaluating chemical speciation data and emissions inventories. In the case of Calexico, evaluation of the relative contributions to the emission inventories does not appropriately characterize main contributors to the $PM_{2.5}$ problem. As illustrated in Figure 3-2, emissions of directly emitted $PM_{2.5}$ are lower than emissions of NH_3 and NO_X (detailed inventory numbers are provided in Section 3.16).

Figure 3-2. Composition of 2012 Imperial County $PM_{2.5}$ Nonattainment Area Baseline Emissions (Annual)



The emission inventory suggests that $PM_{2.5}$ precursors, particularly ROG, NO_X, and NH_3 are important contributors to the total emissions; however, chemical composition data indicates otherwise. Figure 3-2, for example, shows that more than three quarters of the emissions are from

[24] USEPA. 2016. *Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule.* Federal Register. Vol. 81. No. 164. August 24, 2016. p. 58010.

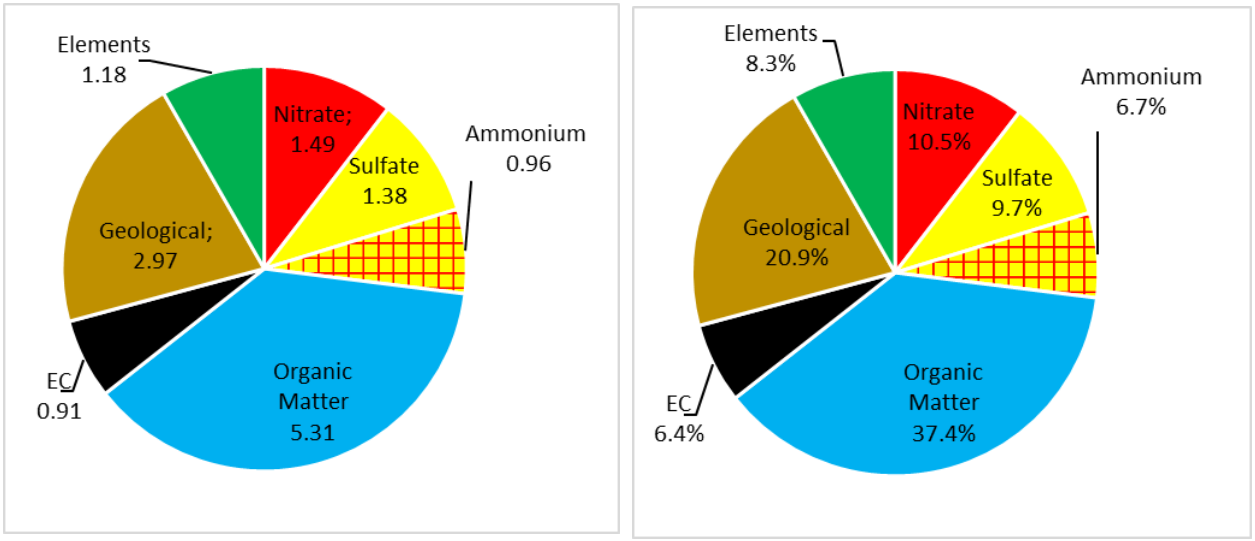
[25] USEPA. 2016. Draft $PM_{2.5}$ Precursor Demonstration Guidance. EPA-454/P-16-001. November. Available at: https://www.epa.gov/sites/production/files/2016-11/documents/transmittal_memo_and_draft_pm25_precursor_demo_guidance_11_17_16.pdf. Accessed: January 2018.

precursors, but chemical composition data illustrated in Figure 3-3 indicates that 27 percent of the mass is from secondary formation and the remaining 73 percent is from direct $PM_{2.5}$ emissions. This apparent inconsistency is the result of meteorological conditions which favor accumulation of direct $PM_{2.5}$ over secondary aerosol formation.

3.17.1 Concentration-Based Contribution Analysis

Chemical speciation data for 2015-2016 was utilized to demonstrate contribution of individual precursors to the 2014 modeled design value of 14.2 µg/m^3. Figure 3-3 shows the average chemical composition at Calexico in the 2015-2016 time period. As discussed previously, directly emitted $PM_{2.5}$ (organic matter, elemental carbon, geological material, and elements) contributes 73 percent of the $PM_{2.5}$ mass.

Figure 3-3. 2015-2016 Annual Average Composition (Micrograms per Cubic Meter) and Percentage to $PM_{2.5}$ Mass



The Draft $PM_{2.5}$ Precursor Demonstration Guidance[26] provides a brief discussion of precursor formation which is summarized below.

SO_X

Since sulfate can exist in the atmosphere in the form of sulfuric acid if it is not neutralized by ammonia, the SO_X contribution to the $PM_{2.5}$ design value is evaluated by estimating the sulfate contribution to the design value. Sulfate contributes 1.38 µg/m^3 or 9.7 percent of the modeled $PM_{2.5}$ annual design value.

[26] Ibid.

NO_X

Since the nitrate ion cannot exist in the atmosphere as a particle without being neutralized by ammonia the ammonium portion of ammonium nitrate should be counted toward the NO_X contribution to the $PM_{2.5}$ mass. NO_X contributes directly to ammonium nitrate formation. Its impact on the $PM_{2.5}$ design value was evaluated by estimating the ammonium nitrate contribution. Ammonium nitrate contributes 2.45 µg/m^3 or about 17.3 percent to the modeled $PM_{2.5}$ annual design value.

Ammonia

As mentioned above, the default recommendation for assigning $PM_{2.5}$ precursors to $PM_{2.5}$ species is to associate all measured ammonium to ammonia as well as all of the nitrate ion mass. As a result, the ammonia contribution to the $PM_{2.5}$ design value is calculated from all measured ammonium plus the nitrate ion. The two components together contribute 2.45 µg/m^3 or about 17.3 percent to the modeled $PM_{2.5}$ annual design value.

VOC

There are two routes by which VOC can contribute to ambient $PM_{2.5}$. The first is through various chemical reactions leading to the formation of Secondary Organic Aerosols (SOAs). The second is through photochemical reactions that create oxidants such as ozone and hydroxyl radicals, which in turn oxidize NO_X emissions leading to the formation of particulate ammonium nitrate. If there is any contribution of SOAs to ambient $PM_{2.5}$ levels, it would be primarily from biogenic emissions and mainly formed during summer when temperatures are warmer and concentrations are lowest. Man-made sources of SOA precursors include solvents, catalyst gasoline engines, wood smoke, and non-catalytic gasoline engines. Due to the lack of SOA data specific to Calexico, the precursor significance analysis completed in the modeling was used to determine significance. The analysis showed that a 70 percent reduction in VOC emissions in the Imperial County $PM_{2.5}$ Nonattainment Area reduced the design value by 0.03 µg/m^3, substantially lower than the level of significance suggested by USEPA (0.2 µg/m^3).

Table 3-12 below is an overview of the percent that each precursor pollutant contributes to the total emission inventory and average speciation for $PM_{2.5}$ and all precursors in the Imperial County $PM_{2.5}$ Nonattainment Area. The percent contribution for each species is then applied to the modeling design value in 2014 to determine if the precursor exceeds the significance threshold that the USEPA has recommended.

Table 3-12. Precursor Contribution and Relation to the Modeling Design Value

$PM_{2.5}$ Precursors	Emissions %	Speciation %	Contribution to Modeling Design Value in 2014 (14.2 µg/m^3)
SO_X	0.5%	9.7%	1.38 µg/m^3
NO_X	22.9%	17.3%	2.45 µg/m^3
Ammonia	37.5%	17.3%	2.45 µg/m^3

This comprehensive analysis of emissions and precursor contribution demonstrates that SO_X, NO_X, and ammonia are significant at Calexico when compared with directly emitted $PM_{2.5}$. For this reason, a sensitivity-based contribution analysis via modeling was done to further explore whether a reduction in these precursors would have an impact on Calexico's design value and attainment.

3.17.2 Modeling-Based Precursor Sensitivity Analysis

To evaluate the impact of reducing emissions of different $PM_{2.5}$ precursors on the base year $PM_{2.5}$ design values, a series of model sensitivity simulations were conducted, where emissions of the precursor species in Imperial County were reduced by 70% from the base year (2012) emissions. The 70% level was chosen as the high end of the recommended range of reductions by the USEPA. Mexico emissions were included in the simulations, but were not reduced as part of the sensitivity analysis. Specifically, the effect of reductions in the following $PM_{2.5}$ precursors was investigated: direct $PM_{2.5}$ (or primary $PM_{2.5}$), NO_X, SO_X, NH_3, and VOCs. For each precursor, only anthropogenic emissions in Imperial County were adjusted. Natural emissions and emissions outside of Imperial County (e.g., Mexico, other counties in California) were not changed.

Table 3-13 shows the change in base year design value at each site from a 70% reduction of controllable direct $PM_{2.5}$, NO_X, VOCs, SO_X, and NH_3 emissions. The design value change is calculated as the difference in the projected base year design value from the 70% reduction case minus the base year design value with Mexico emissions from Table 11 in the Modeling Assessment (Appendix D to Appendix A). As shown in Table 3-13, direct $PM_{2.5}$ reductions had the largest impact on the design value, with all sites exhibiting a reduction in design value greater than 1.8 $\mu g/m^3$. All $PM_{2.5}$ precursors exhibited a much smaller response, with the largest change being a 0.06 $\mu g/m^3$ decrease in design value at the Brawley monitors due to NO_x reductions. USEPA precursor sensitivity guidance defines a precursor to be insignificant if the annual design value change is less than 0.2 $\mu g/m^3$ when that precursor is reduced by 30-70%. Based on this definition, all $PM_{2.5}$ precursors are considered insignificant.

Given that a 70% perturbation in the emissions could be considered excessive, an additional sensitivity simulation for direct $PM_{2.5}$ was conducted, where emissions were reduced by 30%. When direct $PM_{2.5}$ emissions in Imperial County were reduced by 30%, the design value was reduced by 1.1 $\mu g/m^3$, 1.0 $\mu g/m^3$, and 0.8 $\mu g/m^3$ at the Calexico, El Centro, and Brawley monitors, respectively. Therefore, even with a much smaller 30% reduction, direct $PM_{2.5}$ is still deemed as not insignificant.

Table 3-13. Change of Base Year (2012) Design Value at Sites in Imperial County due to County Wide 70% Reduction of Anthropogenic Precursors[1,2]

Site	DV2012 (µg/m^3)	DV2012 (µg/m^3) with 70% reduction of anthropogenic precursor				
		$PM_{2.5}$	NO_X	ROG	SO_X	NH_3
Calexico	14.23	11.55	14.18	14.2	14.23	14.22
		-2.68	-0.05	-0.03	0	-0.01
El Centro	7.26	4.94	7.24	7.24	7.26	7.26
		-2.32	-0.02	-0.02	0	0
Brawley	7.38	5.53	7.32	7.36	7.38	7.37
		-1.85	-0.06	-0.02	0	-0.01

Notes:

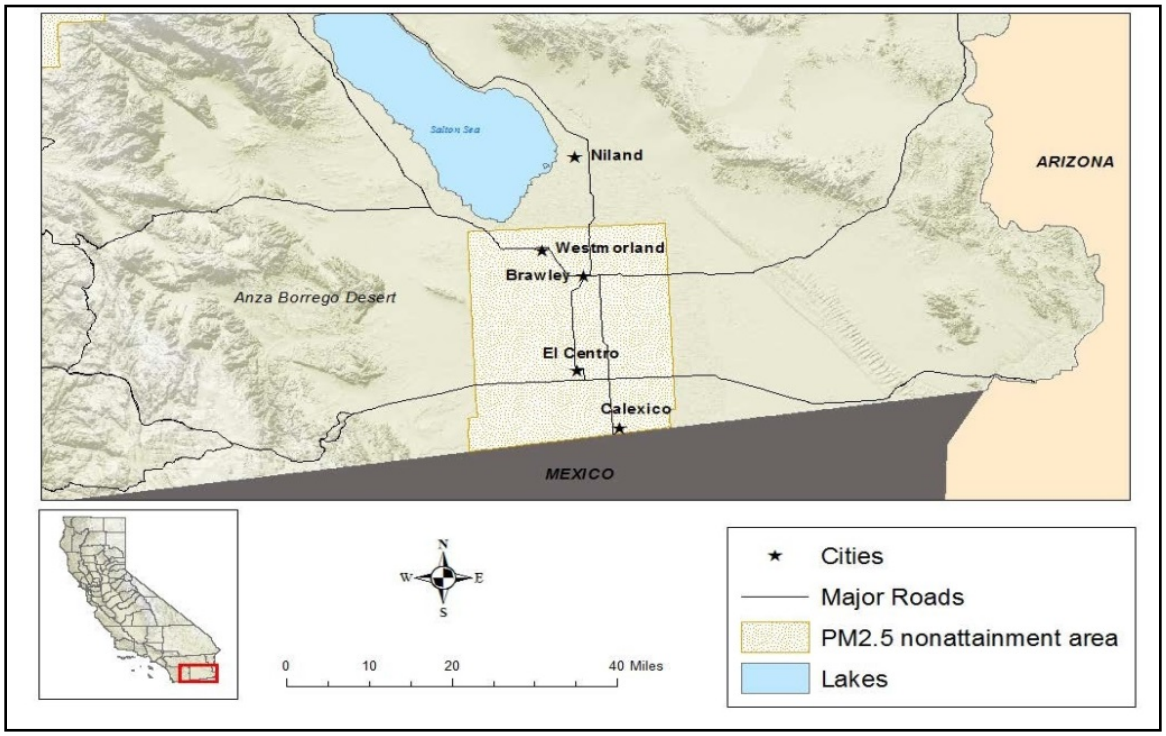
[1] Numbers in shaded rows are the reduction of design values (µg/m^3) due to precursor reductions respectively.

[2] To highlight the differences, 2 decimal points in the design value are shown, rather than the single decimal point required by the SIP guidance.

4 Attainment Demonstration

On December 18, 2014, the USEPA designated the Imperial County $PM_{2.5}$ Nonattainment Area as nonattainment for the 12 µg/m^3 annual $PM_{2.5}$ standard based on air quality data collected adjacent to the Mexico international border. The Imperial County $PM_{2.5}$ Nonattainment Area is located in the southeast corner of California, which shares its southern border with Mexicali, Mexico (Figure 4-1). The Imperial County $PM_{2.5}$ Nonattainment Area includes three $PM_{2.5}$ monitoring sites, located in the cities of Calexico, El Centro, and Brawley (south to north). These three cities are about the same size and, in general, have similar emission sources. In theory, these $PM_{2.5}$ monitors should record similar $PM_{2.5}$ levels. Calexico is the only violating $PM_{2.5}$ monitor in the Imperial County $PM_{2.5}$ Nonattainment Area, with a $PM_{2.5}$ design value almost twice that of the other two monitors.

Figure 4-1. Imperial County PM2.5 Nonattainment Area



Measured $PM_{2.5}$ concentrations at sites in the Imperial County $PM_{2.5}$ Nonattainment Area may be attributed to emissions originating from one or more of the following sources: emissions generated locally within Imperial County, emissions generated outside the U.S. and transported across the international border, and emissions generated in the U.S. and transported within California or across state lines. From an air quality perspective, Calexico and the Mexicali Metropolitan Area share a common air shed. Since the topography does not restrict air flow from either side of the border and both areas experience similar meteorology, emissions from Mexicali can impact $PM_{2.5}$ levels in Calexico. The Calexico site is less than one mile from the international border and, applying USEPA monitor siting criteria, is representative of air pollution from Calexico and Mexicali.

The Mexicali Metropolitan Area has a population of close to 1,000,000 people as compared to the significantly smaller city of Calexico which has a population of 38,572 people (2010 U.S. Census). Figure 4-2 shows a night-time aerial view of Calexico and Mexicali which highlights the large difference in size and population. Because of these differences, Mexicali emission sources on a daily basis can impact Calexico ambient $PM_{2.5}$ concentrations. Emission inventory data for Mexicali shows that Mexicali emissions are magnitudes higher than the emissions in the Imperial County $PM_{2.5}$ Nonattainment Area.

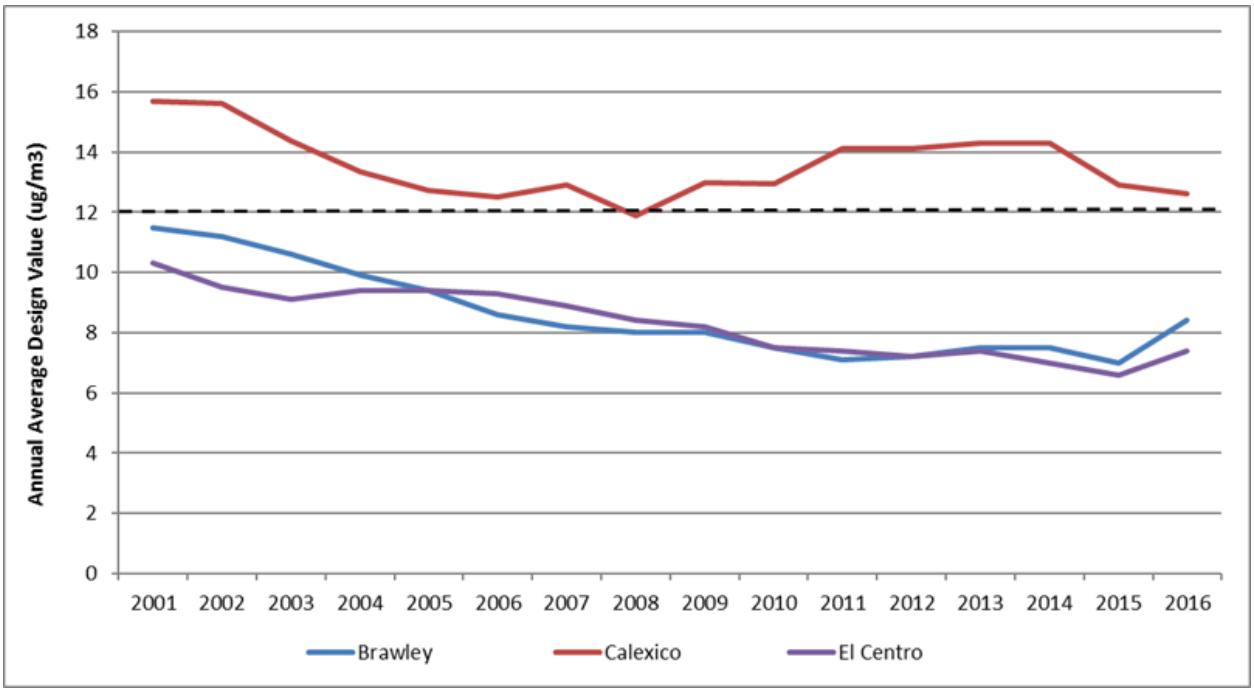
Figure 4-2. Mexicali and Calexico

With the exception of the border area represented by the Calexico monitor, time series plots of air quality data in the Imperial County $PM_{2.5}$ Nonattainment Area generally show improvement over the last 18 years. The trend in annual design values for Calexico, El Centro, and Brawley illustrate the extent to which the Brawley and El Centro annual average design values track over time, while design values for Calexico over the same period differ in both magnitude and direction (Figure 4-3). Figure 4-3 below demonstrates that the Imperial County $PM_{2.5}$ Nonattainment Area is nearing the level of the annual standard and exceeds the annual $PM_{2.5}$ standard by 5 percent.

Technical analyses conducted for the Imperial County SIP for the 24-hour $PM_{2.5}$ standard support the supposition that stagnant meteorological conditions impede dispersion and facilitate the build-up of $PM_{2.5}$ concentrations in the Calexico-Mexicali air shed, particularly during the winter months

of November through January.[27] These meteorological conditions, coupled with emissions of local and international origin, impact the area's annual design value as well. While Brawley and El Centro have responded similarly to California's emission control programs with a resulting improvement in air quality, Calexico's $PM_{2.5}$ air quality remains above the standard.

Figure 4-3. 2001-2016 Annual Average PM2.5 Design Values



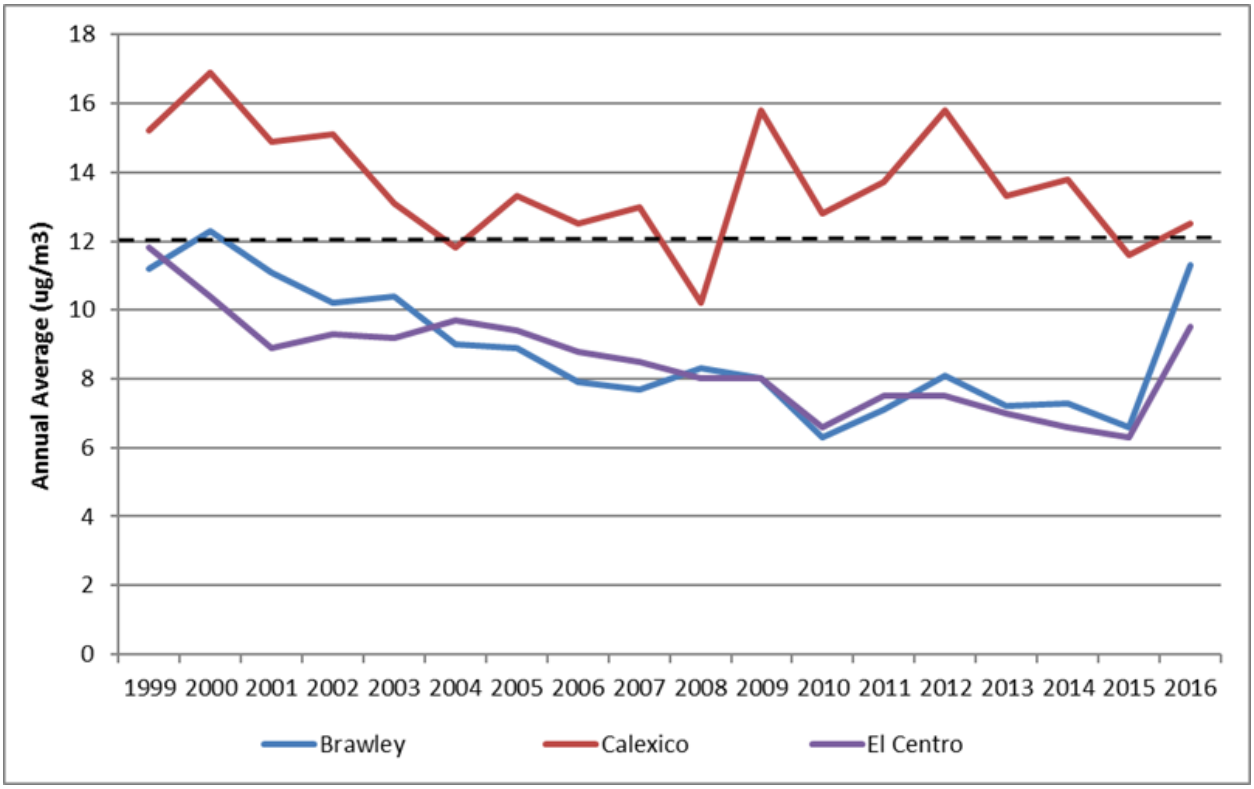
** $PM_{2.5}$ monitoring began in Imperial County in 1999; 2001 reflects the 1999-2001 design value year.*

*** The 2015 design value shown above is 12.9 µg/m^3 and does not include data from the SPM that was included in 2015 at Calexico. AQS includes data from the SPM in quarters 1 and 4 of 2015, which results in a design value of 13.1 µg/m^3.*

The trend in the annual average $PM_{2.5}$ at Calexico has improved significantly over the past few years. In 2014, the annual average at the Calexico monitor was 13.8 µg/m^3. In 2016, the annual average at Calexico decreased 10 percent to 12.5 µg/m^3. Although El Centro and Brawley annual averages did increase in 2016, they are still under the level of the annual standard. Analysis provided by CARB indicates that Calexico's high $PM_{2.5}$ levels occur mostly in the winter when winds are stagnant and $PM_{2.5}$ pollution increases. Figure 4-4 below shows the $PM_{2.5}$ annual average trend for the three stations located within the Imperial County $PM_{2.5}$ Nonattainment Area from 1999-2016.

[27] California Air Resources Board, Staff Report: Imperial County 2013 State Implementation Plan for the 2006 24-hour $PM_{2.5}$ Moderate Nonattainment Area; December 8, 2014 release date.

Figure 4-4. $PM_{2.5}$ Annual Average Trends for the Imperial County $PM_{2.5}$ Nonattainment Area (1999-2016)



**The observed increase between 2008 and 2009 is primarily the result of a reduced number of samples during that period coupled with high wintertime levels. Note that $PM_{2.5}$ samples collected at Calexico between November 5, 2008, and June 17, 2009 were invalidated due to failed sampler leak checks.*

***The annual average trend at Brawley and El Centro increased between 2015 and 2016 due to atypical $PM_{2.5}$ values recorded in the spring and summer. These values have been flagged as PM_{10} exceptional events in AQS.*

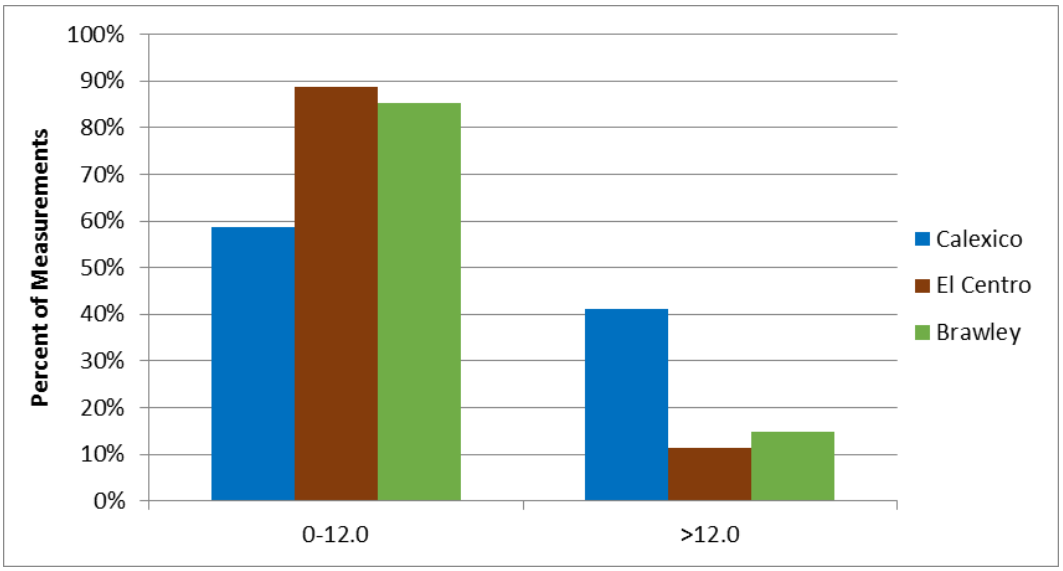
****2008, 2009, 2011, and 2012 annual average data were incomplete at Calexico.*

*****The annual average for 2015 shown above is 11.6 µg/m^3 and does not include data from the Special Purpose Monitor (SPM) at Calexico. AQS includes data from the SPM in quarters 1 and 4, which results in an annual average of 12.2 µg/m^3.*

To better assess $PM_{2.5}$ air quality in the Imperial County $PM_{2.5}$ Nonattainment Area over multiple years, daily $PM_{2.5}$ concentration values recorded at Calexico, El Centro, and Brawley between 2014 and 2016 were analyzed in relation to the 12.0 µg/m^3 $PM_{2.5}$ standard. The histogram in Figure 4-5 categorizes $PM_{2.5}$ data measured at the three Imperial County $PM_{2.5}$ Nonattainment Area sites between 2014 and 2016 into two bins with the upper end value of the first bin equal to the level of the annual $PM_{2.5}$ standard. The data show the percentage of measurements with concentrations within the annual $PM_{2.5}$ standard range and above the annual standard. Between 2014 and 2016, more than 40 percent of the $PM_{2.5}$ concentrations recorded at the Calexico monitoring site were over the annual standard of 12.0 µg/m^3, while El Centro and Brawley experienced concentrations over 12.0 µg/m^3 on approximately 10 percent of the days.

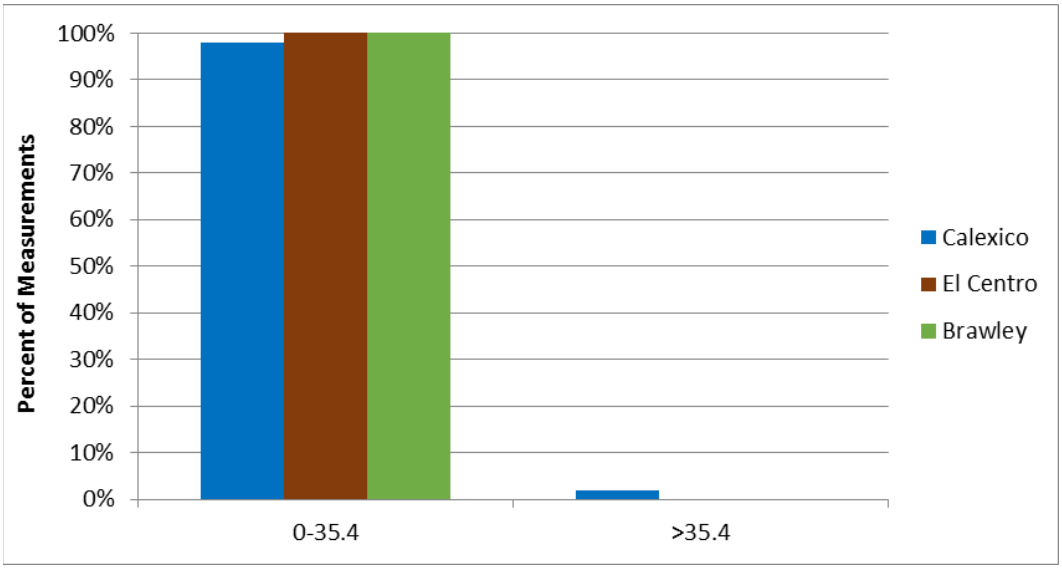
The data indicate that $PM_{2.5}$ concentrations measured at Calexico are above the annual standard at a higher frequency than other $PM_{2.5}$ sites in the Imperial County $PM_{2.5}$ Nonattainment Area. The El Centro and Brawley sites show a similar pattern with the majority of samples collected reflecting measured $PM_{2.5}$ values equal to or below the annual standard. While the cause for this difference is not evident from these data alone, the pattern suggests emission activities influencing Calexico are not regularly impacting monitoring sites farther to the north.

Figure 4-5. Percentage of $PM_{2.5}$ Values Relative to the Annual Standard: Calexico, El Centro, and Brawley (2014-2016)



A similar plot of $PM_{2.5}$ concentrations above the 35 µg/m^3 24-hour standard indicates that a greater number of values over the 24-hour standard occurred at the Calexico site than at either of the other sites (Figure 4-6). Because the annual standard is lower than the 24-hour standard, more values over 12.0 µg/m^3 at each site are expected. The larger difference between values above the annual standard recorded at Calexico and sites farther from the border versus those differences associated with the 24-hour standard suggests that Calexico is experiencing a year-round influence of cross-border emissions resulting in exceedances of the annual standard.

Figure 4-6. Percentage of $PM_{2.5}$ Values Relative to the 24-Hour Standard: Calexico, El Centro, and Brawley (2014-2016)



To evaluate the temporal distribution of $PM_{2.5}$ concentrations above the standard, data plots were constructed using the average monthly concentration measured at Calexico, El Centro, and Brawley from 2014 through 2016 (Figure 4-7). In addition, time series plots were developed using the coincident $PM_{2.5}$ concentration data collected at Calexico, El Centro, and Brawley from 2014 through 2016 (Figure 4-8). For both data sets, only $PM_{2.5}$ FRM data were used for comparison purposes. Similar to the temporal pattern observed in the analysis conducted for the 24-hour Plan, the majority of days with higher $PM_{2.5}$ concentrations at Calexico occur during the winter months.[28]

[28] California Air Resources Board, Staff Report: Imperial County 2013 State Implementation Plan for the 2006 24-hour $PM_{2.5}$ Moderate Nonattainment Area; December 8, 2014 release date.

Figure 4-7. Average $PM_{2.5}$ FRM Concentration by Month from Monitoring Sites in Calexico, El Centro, and Brawley (2014 - 2016)

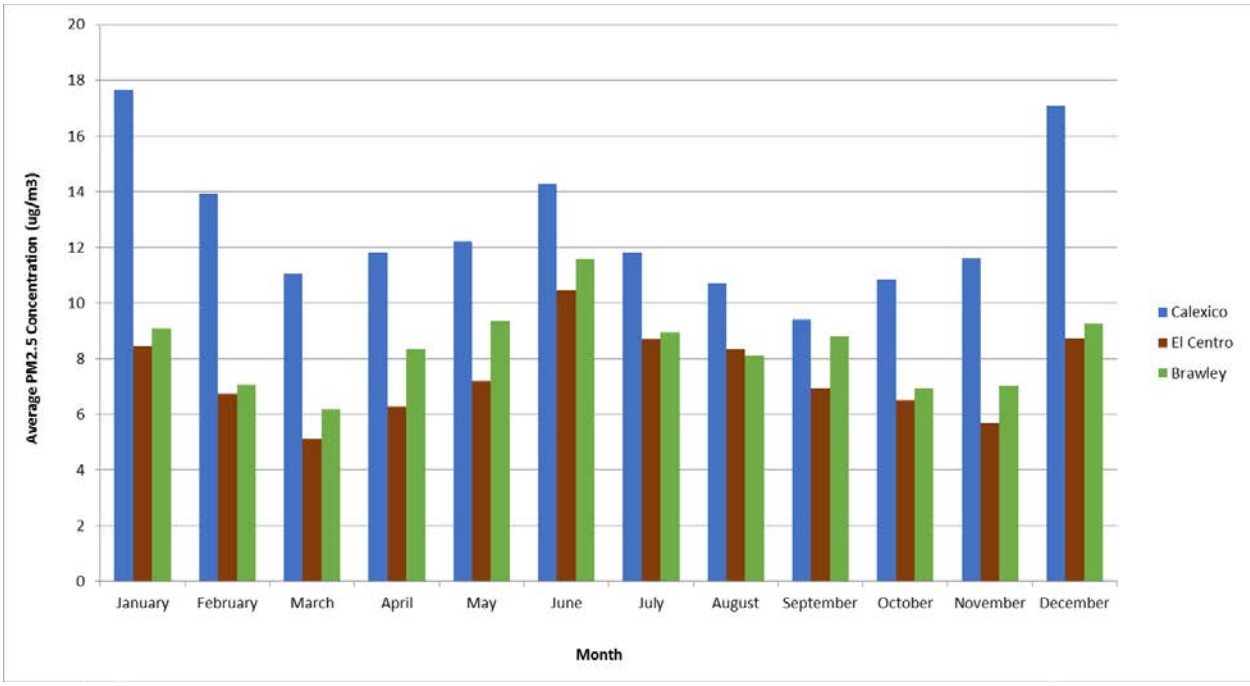
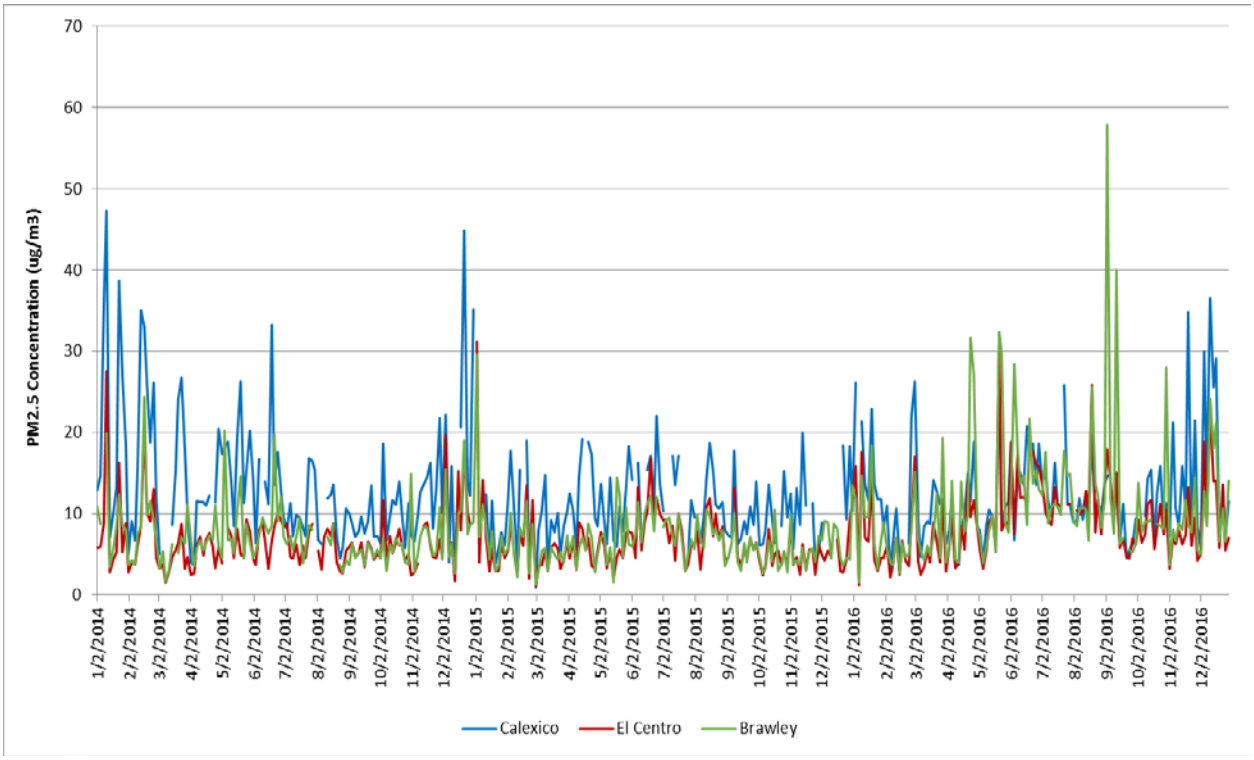


Figure 4-8. Coincident $PM_{2.5}$ FRM Values at Imperial County $PM_{2.5}$ Monitoring Sites (2014 - 2016)



Appendix A provides technical documentation that in 2021 the Imperial County $PM_{2.5}$ Nonattainment Area will not attain the annual $PM_{2.5}$ standard of 12.0 µg/m^3 when Mexico anthropogenic emissions are included and reasonable controls are in place in Imperial County. The CAA contains a specific provision in Section 179(B) for areas that are affected by the international cross-border transport of pollutants. Exceedances that occur due to international transport may cause violations of the standard; however, the CAA recognizes that an area might not be able to demonstrate attainment due to cross-border transport and thus contains provisions to ensure an area is taking appropriate actions and implementing local controls to decrease the impact of local emissions to protect public health.

Section 179(B) of the CAA for international border areas indicates that a SIP: "…shall be approved by the Administrator if—(1) [the implementation plan meets all applicable requirements other than the attainment demonstration requirement], and (2) the submitting state establishes…that the implementation plan…would be adequate to attain and maintain the…national ambient air quality standards (NAAQS) by the attainment date, but for emissions emanating from outside of the United States."[29] USEPA guidance issued in 1994 therefore indicated that those border areas that provide a technical justification of attainment but for emissions from foreign sources are relieved of certain planning requirements including the development of an attainment demonstration.[30] USEPA guidelines on demonstrating that an area is in attainment but for emissions emanating from outside the United States identify the types of information that may be used in evaluating the impact of emissions from outside the U.S. on nonattainment areas. States may use one or more of the approaches based on the specific circumstances and the data available.

Appendix A uses methods mentioned in the guidance to evaluate the potential impact of Mexicali emissions on the Calexico $PM_{2.5}$ monitor. Staff conducted various analyses using the monitoring data, meteorological conditions, and the emissions in the border region to evaluate the impacts of emissions emanating from Mexicali on attainment of the $PM_{2.5}$ annual standard. Staff also assessed Calexico speciation data and conducted a source apportionment analysis which tied speciation data to sources that are present in both the Imperial County $PM_{2.5}$ Nonattainment Area and Mexicali, Mexico. This apportionment method enabled a hypothetical calculation of the annual $PM_{2.5}$ design value if sources (specifically sources present in Mexicali) were excluded from consideration.

The main conclusions that were drawn from the 179(B) technical demonstration in Appendix A are summarized as follows:

1) Calexico is the only monitor in the Imperial County $PM_{2.5}$ Nonattainment Area that has a design value over the annual $PM_{2.5}$ standard. Design values at the northern nonattainment area sites are below the annual standard and almost half the level of Calexico.

2) $PM_{2.5}$ concentrations above the level of the annual standard occur throughout the year at Calexico, El Centro, and Brawley, although they are much less frequent at El Centro and Brawley.

[29] Clean Air Act Amendments of 1990: Public Law 101-549.
[30] See 59 FR 42000-42002 (August 16, 1994).

3) A gradient in $PM_{2.5}$ mass data is evident with the highest mass measurements recorded at the Calexico site and decreasing with increasing distance north of the border. Between 2012 and 2015, more than half of the $PM_{2.5}$ concentrations recorded at the Calexico monitoring site were over the annual standard of 12.0 µg/m^3, while less than 10 percent of the days at El Centro and Brawley exceeded 12.0 µg/m^3.

4) A comparison of the most recent comparable Imperial County $PM_{2.5}$ Nonattainment Area and Mexicali emission inventories for direct $PM_{2.5}$ and precursors estimates suggests a split in total $PM_{2.5}$ emissions with approximately 40 percent attributable to the Imperial County $PM_{2.5}$ Nonattainment Area and 60 percent attributable to Mexicali. Despite uncertainties associated with the Mexicali inventory, the magnitude of the difference between the Imperial County $PM_{2.5}$ Nonattainment Area and Mexicali emission inventories, combined with corresponding air quality differences, implies that the border region and the monitoring site in Calexico are heavily impacted by emissions transported across the border.

5) $PM_{2.5}$ levels measured at monitoring sites in the Imperial County $PM_{2.5}$ Nonattainment Area are affected by the distribution of wind direction. Aggregating hourly $PM_{2.5}$ concentrations with wind direction indicated that that while winds from the south occurred only 23 percent of the time, their contribution to the Calexico design value was 4.5 µg/m^3. Without the influence of southern winds and the corresponding Mexicali emissions, the Calexico monitoring site would be in attainment of the annual 12.0 µg/m^3 $PM_{2.5}$ standard.

6) Chemically speciated $PM_{2.5}$ data collected from the Calexico monitoring station show a seasonal pattern in $PM_{2.5}$ mass components with the highest concentrations of organic matter, elemental carbon, and ammonium nitrate occurring in winter. Geological dust is the second highest contributor to $PM_{2.5}$ at Calexico and remains fairly constant throughout the year, with slight increases in the fall and early winter months.

7) X-Ray Fluorescence analysis results indicate that elemental species concentrations increased with proximity to the border. The lowest values were observed at Brawley, about 22 miles north of the border, where the average concentration of non-geologic elements was 0.37 µg/m^3. Concentrations were twice as high at El Centro, about 9 miles north of the border, with an average of 0.63 µg/m^3. The non-geologic element concentrations reached a maximum at Calexico where the average sum of non-geologic elements was about 2.1 µg/m^3.

8) The gravimetric and speciation analyses show that $PM_{2.5}$ samples collected in Calexico differ substantially in chemical composition from samples collected at other locations around the state, implicating Mexicali as the source of a large portion of the emissions impacting the Calexico monitor.

9) An emissions density analysis was used to estimate the annual average $PM_{2.5}$ concentration that would exist at the Calexico station if the emission activities surrounding the station were the same as those to the north of the international border in the absence of Mexicali emission sources. The analysis showed that while the emission densities of Calexico, El Centro, and Brawley are essentially the same, $PM_{2.5}$ air quality at the Calexico station is substantially different than the two northern sites and that the difference is most likely due to impacts from Mexicali emission sources.

10) Source apportionment and source direction analyses indicated that refuse burning and certain industrial sources, contributing 15 percent of the total $PM_{2.5}$ mass in Calexico, originated from activities that are unknown in Imperial County. Source direction analyses showed the possibility that both industrial emissions and secondary sulfate precursor emissions originated from the same facilities.

11) Controls on industrial sources, refuse burning, and secondary sulfate could lower the 2014 design value at the Calexico monitoring site to 10.0 $\mu g/m^3$.

12) Modeling results show that in the absence of anthropogenic emissions in Mexico, the annual $PM_{2.5}$ design value for the Calexico monitor in 2021 will be below the annual standard at 11.7 $\mu g/m^3$.

Air quality modeling demonstrated what the annual average $PM_{2.5}$ design value would be at the Calexico $PM_{2.5}$ monitor in 2021 if emissions from Mexicali were reduced or eliminated completely. Considered together with air quality data and meteorological influences, the analyses in Appendix A demonstrate that in 2021, the Imperial County $PM_{2.5}$ Nonattainment Area would attain the annual $PM_{2.5}$ standard of 12.0 $\mu g/m^3$ in the absence of emissions from Mexico.

5 District Control Strategy

This chapter presents Imperial County's control strategy analysis for the 2012 $PM_{2.5}$ annual standard including a RACT/RACM assessment of current stationary, area, and mobile sources, other measures for consideration, and a SIP control strategy summary. As discussed in Section 3.17, CARB performed a comprehensive precursor demonstration to determine whether emissions of particular $PM_{2.5}$ precursors significantly contribute to $PM_{2.5}$ levels in the Imperial County $PM_{2.5}$ Nonattainment Area. Ultimately, the modeling component of this demonstration showed that none of the four $PM_{2.5}$ precursors significantly contribute to $PM_{2.5}$ levels in Imperial County. Therefore, the District is not required to address these precursors in its control measure analysis nor in its discussions regarding RFP, quantitative milestones, contingency measures, or transportation conformity, per the 2016 $PM_{2.5}$ Implementation Rule. This chapter and Chapter 6 predominantly focus on how the District addresses these various CAA requirements in the context of direct $PM_{2.5}$.

5.1 Control Measure Analysis Overview

Under Subpart 4, RACM and RACT are those measures that can and must be implemented within four years of an area's designation as nonattainment (pursuant to CAA Section 189(a)(1)(C)). USEPA has interpreted the RACM and RACT requirement in the CAA as requiring implementation of all reasonable controls as needed for expeditious attainment. USEPA recognizes that other, similarly reasonable emission reduction measures could be implemented after this four-year period, and as late as the end of the sixth calendar year following designation, to help an area attain as expeditiously as practicable. The 2016 $PM_{2.5}$ Implementation Rule terms those technologically and economically feasible control measures that could not be implemented within the four-year period after designation, but could be implemented starting any time after that four-year period through the end of the sixth calendar year after designation, as "additional reasonable measures" or ARM.

As discussed in the subsequent sections, with the exception of control measures addressing wood burning devices, the District's current rules along with state rules continue to satisfy RACT/RACM for the annual $PM_{2.5}$ standard. Therefore, Sections 5.3.2 and 5.5.1, present new control measures proposed by the District for the control of wood burning devices, one of which qualifies as RACM and the other ARM. In addition, the District has identified additional ARM (see Section 5.5) that would predominately affect NO_X and ammonia emissions. Even though Section 3.17 has demonstrated that these precursors do not contribute significantly to $PM_{2.5}$ levels in Imperial County, in the interest of completeness and given that the NO_X measures may affect ozone, they have been included in this SIP even though they would not appreciably affect $PM_{2.5}$ levels.

The 2016 $PM_{2.5}$ Implementation Rule notes the terms RACM and RACT are not defined within Subpart 4, nor do the provisions of Subpart 4 specify how states are to meet the RACM and RACT requirements. However, USEPA's longstanding guidance describes, in detail, considerations for determining what control measures constitute RACM and RACT for purposes of Subpart 4.

The 2016 $PM_{2.5}$ Implementation Rule requires states to include the following steps for identifying RACT/RACM. The District has followed this process and notes specific decisions made where flexibility was provided:

1. Identify all sources of emissions of direct $PM_{2.5}$, including major stationary sources as point sources, nonpoint sources (as defined by 40 CFR 51.50) including non-major point sources, and mobile sources.

2. Consider a variety of measures because RACT/RACM applies to stationary, mobile, and area sources. USEPA requires an air district to include a list of those control measures and technologies that are being implemented or will be implemented due to adopted regulations.

   USEPA notes that reducing air emissions may not justify adversely affecting other resources, for example, by increasing pollution in bodies of water, creating additional solid waste disposal problems, or creating excessive energy demands. Air districts are to provide reasoned judgment for such decisions in their SIPs.

3. Determine if the identified control measures or technologies are technologically feasible.

   USEPA reiterates its interpretation that technological feasibility includes consideration of factors such as a source's processes and operating procedures, materials, physical plant layout, and potential environmental impacts such as increased water pollution, waste disposal, and energy requirements. In regard to area and mobile sources, a state may consider relevant local factors in conducting its analysis, such as the condition and extent of needed infrastructure, population size, or workforce type and habits, which may prohibit certain potential control measures from being implementable.

4. Determine if any of the identified technologically feasible control measures and technologies are economically feasible. USEPA proposed the use of their longstanding interpretation of the term ''economic feasibility'', which involves considering the cost of reducing emissions and the difference between the cost of an emissions reduction measure at a particular source and the cost of emissions reduction measures that have been implemented at other similar sources in the same or other areas.

   Specifically, an evaluation of the economic feasibility of the control measure through consideration of the capital costs, operating and maintenance costs, and cost effectiveness (i.e., cost per ton of pollutant reduced by that measure or technology) associated with such measure or control must occur.

5. Determine which technologically and economically feasible measures can be implemented within four years from the date of designation and which can be implemented by the end of the sixth calendar year following designation.

   According to USEPA, the term ''implemented'' means that a control measure or technology has not only been submitted to USEPA for approval as part of a SIP, but has also been built, installed and/or otherwise physically manifested and is achieving the intended emissions reductions. However, USEPA recognizes that a state may be able to implement a given

control measure only partially within four years after designation, and therefore requires a state to adopt as RACM or RACT that portion of a control measure or technology that can feasibly be implemented within four years of the effective date of designation.

6. Perform an analysis to determine the earliest practicable attainment date for the area and identify the control measures and control technologies that would be needed to achieve attainment by the demonstrated attainment date and to meet statutory control requirements.

   The statutory attainment date for Moderate nonattainment areas is as expeditiously as practicable, but no later than the end of the sixth calendar year after designation of the area as nonattainment (i.e., by the end of 2021). In the case of Moderate areas that can reach attainment by the statutory attainment date, and consistent with existing policies, states would be required to evaluate the combined effects of RACM that are not necessary to demonstrate attainment within the maximum statutory timeframe to determine whether implementation of the remaining measures could advance the attainment date by at least one year. USEPA has long applied this particular method to see if RACM that were not necessary to demonstrate attainment within the maximum statutory timeframe can collectively advance an area's applicable attainment date by at least one year, to satisfy provisions related to an area demonstrating attainment ''as expeditiously as practicable.'' In the case of Moderate areas that cannot practicably attain by the statutory attainment date, states would be required to implement all RACM and RACT, together with any ARM on sources in the nonattainment area.

5.2 Stationary Source RACM/RACT Analysis

There are currently no major stationary sources of $PM_{2.5}$ in the Imperial County $PM_{2.5}$ Nonattainment Area. However, at the suggestion of the USEPA, the District evaluated the emissions from the top $PM_{2.5}$ stationary sources in the region and assessed RACM/RACT for them. To do this, the District used CARB's emission inventory tool[31] to query the most recent emissions data (2015). As shown in Table 5-1, the top ten stationary sources of $PM_{2.5}$ in Imperial County had $PM_{2.5}$ emissions ranging from 118.01 tons per year (tpy) to 0.8 tpy. Six of these facilities, including the one with the highest emissions in 2015, are outside of the nonattainment area.

The remaining facilities include the Imperial Irrigation District (IID) El Centro facility, the Planters Hay Brawley facility, the Spreckels Sugar Brawley facility, and the Val-Rock Seeley facility. The District confirmed that the $PM_{2.5}$ emissions from the IID facility are primarily from natural gas combustion from turbines, which is considered Best Available Control Technology (BACT) for PM for turbines. For the Planters Hay facility, the District found that the $PM_{2.5}$ emissions are fugitive emissions from the hay compress operation. While this process is currently uncontrolled and a search of the USEPA RACT/BACT/LAER Clearinghouse and non-attainment area rules did not identify RACT for this process, the facility is regulated under ICAPCD Rule 207, the District's NSR rule (see Section 5.2.1). Were the facility to undergo a major modification, this rule would require BACT for emission units emitting 25 pounds per day or more of any nonattainment pollutants,

[31] CARB. Facility Search Engine. Available at: https://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php. Accessed: January 2018.

including $PM_{2.5}$. For the Spreckels Sugar facility, the District found that the majority of the $PM_{2.5}$ emissions (3.6 tpy out of 3.9 tpy) are from the facility's natural gas boilers (which are BACT for PM). The remainder of the $PM_{2.5}$ emissions are from the facility's lime kiln (<0.3 tpy), which is controlled by a baghouse. Lastly, the District confirmed that the $PM_{2.5}$ emissions from the Val-Rock Seeley facility were from the asphalt operation, but that this facility closed in late 2016.

Table 5-1. Top $PM_{2.5}$ Stationary Sources in Imperial County

Facility Name	Facility City	2015 $PM_{2.5}$ Emissions (tpy) [a]	Inside $PM_{2.5}$ NA?	% of 2012 $PM_{2.5}$ NA Emission Inventory
Wester Mesquite Mines, Inc.	Brawley	83.68[b]	No	N/A
CalEnergy Operating Company Region 1	Calipatria	12.3	No	N/A
Imperial Irrigation District	**El Centro**	**11.3**	**Yes**	**0.25%**
U.S. Gypsum Company Quarry	Ocotillo Wells	6	No	N/A
Planters Hay, Inc.	**Brawley**	**5.7**	**Yes**	**0.13%**
A.W. Hoch	Calipatria	4.9	No	N/A
U.S. Gypsum Plaster City	Plaster City	4.1	No	N/A
Spreckels Sugar Co	**Brawley**	**3.9[c]**	**Yes**	**0.09%**
Val-Rock, Inc.	**Seeley**	**3.5**	**Yes**	**0.08%**
Ryerson Concrete	Niland	0.8	No	N/A

Notes:

[a] Values queried from CARB's Facility Search Engine. Available at: https://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php. Accessed: January 2018.

[b] CARB indicated that the $PM_{2.5}$ value reported by the CARB Facility Search Engine is inaccurate. Revised value was provided by Elizabeth Melgoza (CARB) on 2/1/2018 via email and is included in this table.

[c] The District found that the $PM_{2.5}$ value reported by the CARB Facility Search Engine did not take into account the control provided by a dust collector installed on the facility's lime kiln. Revised value was provided by Reyes Romero (ICAPCD) on 2/7/2018 via email and is included in this table.

Abbreviations:

Inc. - incorporated

NA – nonattainment area

N/A – not applicable

$PM_{2.5}$ – particulate matter less than 2.5 microns in diameter

tpy – tons per year

U.S. – United States

For non-major stationary sources, RACT can be further assessed through a review of Control Technique Guidelines (CTG) and Alternative Control Technique (ACT) documents published by the USEPA.[32] CTG documents represent a presumption that RACT is met when existing rules meet the minimum emissions limitations given for a particular source category. ACT documents describe available control technologies and their respective cost effectiveness. There is currently only one CTG/ACT document that addresses particulate matter: Alternative Control Technique Document: Surface Coating Operations at Shipbuilding and Ship Repair Facilities. Because no such sources exist in Imperial County, the District made a negative declaration for this source category as part of its RACT assessment for the 2017 State Implementation Plan for the 2008 8-Hour Ozone Standard.[33] The District reaffirms this negative declaration for this Plan and concludes that the District's rules pertaining to direct $PM_{2.5}$ emissions satisfy RACT requirements for the annual $PM_{2.5}$ standard.

5.2.1 New Source Review (NSR)

There are other ICAPCD stationary source programs, such as NSR, that implement regulations on existing point sources. NSR is a permitting process required by the CAA to help ensure that any new or modified equipment or facilities (i.e., boilers, turbines, crude oil storage tanks, power plants, and factories) do not significantly degrade air quality or slow progress towards clean air. The District rule which dictates the CAA NSR requirements is Rule 207, *New and Modified Stationary Source Review*. There are two primary components of NSR: the application of BACT and the requirement for emission offsets. BACT plays a very important role in helping the District to meet the "no net increase" in emissions required by the CAA by acting as a limitation on pollutants emitted from or resulting from any new or modified stationary source. Emission reduction credits (ERCs) are credits which are issued to sources that have reduced their emissions in excess of what is required by law. ERCs must be permanent, real, enforceable, quantifiable, and surplus. ERCs are banked and made available for offsetting emission growth from new or modified emission units.

BACT is currently required for all new or modified emission units which have the potential to emit 25 pounds per day or more of any nonattainment pollutants, including $PM_{2.5}$. Sources are required to offset emission increases for each nonattainment pollutant (including $PM_{2.5}$) that results from a new major stationary source or major modification.

The NSR permit program in Imperial County currently enforces two versions of Rule 207. The first is a more recent version adopted as an amendment by the District Board of Directors on October 22, 2013 and the second is the SIP-approved rule version of Rule 207, Standards for Permit to Construct (except paragraph C.4), approved on November 10, 1980. On September 5, 2017, USEPA conditionally approved Rule 207, finding that the rule satisfies the statutory and

[32] CTG and ACT documents can be found at: https://www.epa.gov/ozone-pollution/control-techniques-guidelines-and-alternative-control-techniques-documents-reducing. Accessed: November 2017.

[33] Available at: https://www.arb.ca.gov/planning/sip/planarea/imperial/2017O3sip_final.pdf. Accessed: November 2017.

regulatory requirements for a general NSR permit program as set forth in CAA Section 110(a)(2)(c) and 40 CFR 51.160 – 51.164. However, USEPA determined that the rule does not regulate ammonia as a $PM_{2.5}$ precursor, which is a requirement under 40 CFR 51.165(a)(13). The District and the State have committed to revising Rule 207 to correct the deficiency and based on that assertion, USEPA has conditionally approved the rule.[34]

5.3 Area Source Analysis

The District evaluated the adequacy of its control measures on area (i.e., non-point) sources of direct $PM_{2.5}$ by reviewing the USEPA Office of Air Quality Planning and Standards' Menu of Control Measures (MCM),[35] a list that provides a broad set of emission reduction measures for different pollutants and source types. A summary of this evaluation is presented in Appendix C, which features a table that specifically lists each control measure in the MCM that pertains to area sources of PM. Each control measure was then evaluated against existing ICAPCD rules that address the same source(s). Several of the control measures were found to address sources already regulated by ICAPCD Regulation VIII rules, which have been recognized by the USEPA as meeting best available control measure (BACM) requirements for PM_{10}.[36] If a source type did not exist in Imperial County, it was noted in the table. From this analysis, it was determined that the District needed to implement control measures for residential wood combustion. Thus, new measures addressing this source are proposed as part of this SIP. See Sections 5.3.2 and 5.5.1 for additional discussion on these measures.

5.3.1 Agricultural Burning Rule Analysis

While the USEPA MCM includes a recommended control measure for open burning, that measure does not address agricultural burning, which historically has been a significant source of direct $PM_{2.5}$ in Imperial County. Imperial County currently controls agricultural burning through Rule 701. Rule 701 prohibits agricultural burning, except with a permit which is only valid for days on which burning is not prohibited by CARB, the fire control agency, or the air pollution control officer (APCO). Under this rule, the type of waste material that is allowed for burning is specified, along with appropriate drying times and the hours by which burning must cease. The rule was adopted prior to 1979, revised on August 13, 2002, and approved into the California SIP as RACM on January 31, 2003.[37]

Agricultural burning is further regulated under the Imperial County Smoke Management Plan (SMP), adopted in 2001 and revised in 2010. The SMP serves to control excessive smoke production that results from large-scale burning of crops. Since Imperial County includes large

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[34] USEPA. 2017. *Revisions to the California State Implementation Plan; Imperial County Air Pollution Control District; Stationary Sources Permits; Final Rule*. Federal Register. Vol. 82. No. 170. September 5, 2017. p. 41895.

[35] USEPA. 2012. Menu of Control Measures for NAAQS Implementation. April 12. Available at: https://www.epa.gov/criteria-air-pollutants/menu-control-measures-naaqs-implementation. Accessed: November 2017.

[36] USEPA. 2013. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final Rule.* Federal Register. Vol. 78. No. 77. April 22, 2013. p. 23677.

[37] USEPA. 2003. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District and Monterey Bay Unified Air Pollution Control District; Direct Final Rule*. Federal Register. Vol. 68. No. 21. January 31, 2003. p. 4929.

swaths of cropland, many of which are burned regularly after harvest to prepare the fields for the next round of crops, the SMP is necessary to protect public health, ensure compliance with all ICAPCD rules, policies, and procedures, and ultimately maintain levels of ambient particulate matter below the applicable air quality standards. The SMP is enforced by ICAPCD and CARB staff who utilize meteorological and air monitoring resources to track smoke levels, air quality, and local conditions in order to determine the optimal hours for burning. From there, each day is officially declared as a "Permissive Burn Day", "Marginal Burn Day", or "No Burn Day". Special consideration is given to burning activities near sensitive areas, such as residences and schools, and an inspector must be present at the time of ignition of these burns in order to make an assessment of the local conditions and grant approval for the burn. Finally, the SMP requires that ICAPCD staff maintain a daily burn log database and use it to submit an annual report of agricultural burning to CARB at the end of every calendar year.

Open burning in Imperial County has reduced over the last ten years not only in quantity but also in the number of types of crops burned. Specifically, Imperial County has successfully managed to curtail burning from a total of 40,221 acres of mixed crops in 2003 to 17,647 acres of field crops in 2016, primarily consisting of grass crops (e.g., Klein, Bermuda). This represents an approximate 56 percent reduction in agricultural burning since 2003. In support of the Imperial County 2013 SIP for the 2006 24-hour $PM_{2.5}$ standard, the District reviewed several managed burning and disposal rules promulgated by other agencies to determine if there were other measures that would enhance the current trend of reductions in agricultural burning in the County.[38] In particular, the following rules were reviewed:

- Monterey Bay Unified APCD - Rule 438: Open Outdoor Fires; revised February 19, 2014;
- South Coast AQMD - Rule 444: Open Burning; revised July 12, 2013;
- Placer County APCD - Rule 302: Agricultural Waste Burning Smoke Management; revised February 9, 2012;
- San Joaquin Valley APCD - Rule 4103: Open Burning; revised April 15, 2010.

In this analysis, the District found Rule 701 to be comparably stringent to the other rules. Furthermore, none of the other rules have been revised since the prior analysis. Therefore, no revisions to Rule 701 are being proposed as a part of this Plan. This rule comparison is organized into a table provided in Appendix E.

[38] See Attachment B at the following: https://www.arb.ca.gov/planning/sip/planarea/imperial/Final_PM2.5_SIP_%28Dec_2,_2014%29_Approved.pdf. Accessed: November 2017.

5.3.2 Control Measure: Wood Burning Fireplaces and Wood Burning Heaters – New Source Performance Standard Certification

The District is proposing a new rule that would achieve $PM_{2.5}$ emission reductions through the regulation of new wood burning fireplaces and wood burning heaters. The proposed rule would require new wood burning fireplaces (including fireplace inserts) and wood burning heaters in the Imperial County $PM_{2.5}$ Nonattainment Area to comply with New Source Performance Standard (NSPS) certification requirements in effect at the time of installation. This rule would be adopted in or before December 2018 and implementation would begin prior to April 15, 2019.

Control Measure Emission Reductions

District staff estimated the current $PM_{2.5}$ emissions related to residential wood combustion using the "Residential Wood Combustion" emission estimation methodology promulgated by CARB.[39] The District then calculated that with the implementation of this control measure through a rule, a 30 percent $PM_{2.5}$ emissions reduction would be achieved for residential wood stoves (Emission Inventory Category: 610-600-0230-0000), while a 20 percent $PM_{2.5}$ emissions reduction would be achieved for residential fireplaces (Emission Inventory Category: 610-602-0230-0000). Furthermore, it was assumed that these reductions would take place linearly over the course of ten years. Tables 5-2 and 5-3 indicate the current and estimated (i.e., with the new rule in place) residential wood combustion emissions for the Imperial County $PM_{2.5}$ Nonattainment Area.

[39] Available at: https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-1_2011.pdf. Accessed: November 2017.

Table 5-2. Control Measure: Residential Wood Combustion $PM_{2.5}$ Emissions with NSPS Certification – $PM_{2.5}$ Nonattainment Area (tons per day) (Annual)										
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Wood Stoves (610-600-0230-0000)										
Current	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
With Control	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003
Reduction	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**
Fireplaces (610-602-0230-0000)										
Current	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
With Control	0.027	0.027	0.026	0.026	0.025	0.025	0.024	0.024	0.023	0.022
Reduction	**0.001**	**0.001**	**0.002**	**0.002**	**0.003**	**0.003**	**0.004**	**0.004**	**0.005**	**0.006**
Combined Reduction	**0.001**	**0.001**	**0.002**	**0.003**	**0.003**	**0.004**	**0.005**	**0.005**	**0.006**	**0.007**
Notes: Totals may not add up due to rounding.										

Table 5-3. Control Measure: Residential Wood Combustion $PM_{2.5}$ Emissions with NSPS Certification – $PM_{2.5}$ Nonattainment Area (tons per year)										
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Wood Stoves (610-600-0230-0000)										
Current	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46
With Control	1.416	1.372	1.329	1.285	1.241	1.197	1.153	1.11	1.066	1.022
Reduction	**0.044**	**0.088**	**0.131**	**0.175**	**0.219**	**0.263**	**0.307**	**0.350**	**0.394**	**0.438**
Fireplaces (610-602-0230-0000)										
Current	10.22	10.22	10.22	10.22	10.22	10.22	10.22	10.22	10.22	10.22
With Control	10.016	9.811	9.607	9.402	9.198	8.994	8.789	8.585	8.380	8.176
Reduction	**0.204**	**0.409**	**0.613**	**0.818**	**1.022**	**1.226**	**1.431**	**1.635**	**1.840**	**2.044**
Combined Reduction	**0.248**	**0.496**	**0.745**	**0.993**	**1.241**	**1.489**	**1.737**	**1.986**	**2.234**	**2.482**
Notes: Totals may not add up due to rounding.										

5.4 State Mobile Source Program RACM Analysis

5.4.1 Overview

To fulfill CAA control measure requirements for Moderate $PM_{2.5}$ nonattainment areas, an assessment of control measures in the SIP must be performed. For Moderate nonattainment areas, the control measures must be shown to be RACM. Since CARB is responsible for measures to reduce emissions from mobile sources needed to attain the NAAQS, this section will discuss how California's mobile source measures meet RACM.

Given the severity of California's air quality challenges, CARB has implemented the most stringent mobile source emissions control program in the nation. CARB's comprehensive strategy to reduce emissions from mobile sources includes stringent emissions standards for new vehicles, in-use programs to reduce emissions from existing vehicle and equipment fleets, and cleaner fuels that minimize emissions. Taken together, California's mobile program meets RACM requirements in the context of $PM_{2.5}$ nonattainment.

5.4.2 RACM Requirements

Subpart 4, Section 189 (a)(1)(C) of the CAA requires SIPs to provide for the implementation of RACM within four years of nonattainment designation. CARB developed its State SIP Strategy through a multi-step measure development process, including extensive public consultation to develop and evaluate potential strategies for mobile source categories under CARB's regulatory authority that could contribute to expeditious attainment of the standard. First, CARB developed a series of technology assessments for heavy-duty mobile source applications and the fuels necessary to power them,[40] along with an ongoing review of advanced vehicle technologies for the light-duty sector in collaboration with USEPA and the National Highway Traffic Safety Administration. CARB staff then used a scenario planning tool to examine the magnitude of technology penetration necessary, as well as how quickly technologies need to be introduced to meet attainment of the standard.

CARB staff released a discussion draft Mobile Source Strategy[41] for public comment in October 2015. This strategy specifically outlined a coordinated suite of proposed actions to not only meet federal air quality standards, but also achieve greenhouse gas emission reduction targets, reduce petroleum consumption, and decrease health risks from transportation emissions over the next 15 years. CARB staff held a public workshop on October 16, 2015 in Sacramento and on October 22, 2015, CARB held a public Board meeting to update the Board and solicit public comment on the Mobile Source Strategy in Diamond Bar, California.

Staff continued to work with stakeholders to refine the measure concepts for incorporation into related planning efforts including the 75 ppb 8-hour ozone SIPs. In May 2016, CARB released an updated Mobile Source Strategy. On May 17, 2016, CARB released the proposed State SIP

[40] Technology and fuel assessment information available at: http://www.arb.ca.gov/msprog/tech/tech.htm. Accessed: November 2017.

[41] CARB 2016 Mobile Source Strategy available at: http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm. Accessed: November 2017.

strategy for a 45-day public comment period and held a workshop on September 1, 2016. The measure concepts have implementation schedules beyond four years. The Mobile Source Strategy was adopted by CARB in March 2017. During the public process, no measures were identified that could be implemented within the four year timeframe. Therefore, the current mobile source program is considered at a minimum RACM for Moderate $PM_{2.5}$ nonattainment areas.

5.4.3 Waiver Approvals

While the Act preempts most states from adopting emission standards and other emission-related requirements for new motor vehicles and engines, it allows California to seek a waiver or authorization from the federal preemption to enact emission standards and other emission-related requirements for new motor vehicles and engines and new and in-use off-road vehicles and engines that are at least as protective as applicable federal standards, except for locomotives and engines used in farm and construction equipment which are less than 175 horsepower (hp).

Over the years, California has received waivers and authorizations for over 100 regulations. The most recent California standards and regulations that have received waivers and authorizations are Advanced Clean Cars (including zero-emission vehicles [ZEV] and low-emission vehicles [LEV] III) for light-duty vehicles and On-Board Diagnostics, Heavy-Duty Idling, Malfunction and Diagnostics System, In-Use Off-Road Diesel Fleets, Large Spark Ignition Fleet, and Mobile Cargo Handling Equipment for heavy-duty engines. Other authorizations include Off-Highway Recreational Vehicles and the Portable Equipment Registration Program.

Finally, CARB obtained an authorization from USEPA to enforce adopted emission standards for off-road engines used in yard trucks and two-engine sweepers. CARB adopted the off-road emission standards as part of its “Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from In-Use Heavy-Duty Diesel-Fueled Vehicles,” (Truck and Bus Regulation). The bulk of the regulation applies to in-use heavy-duty diesel on-road motor vehicles with a gross vehicle weight rating in excess of 14,000 pounds, which are not subject to preemption under section 209(a) of the CAA and do not require a waiver under section 209(b).

5.4.4 Light and Medium Duty Vehicles

Light- and medium-duty vehicles are currently regulated under California’s Advanced Clean Cars program including the LEV III and ZEV programs. Other California programs, such as the 2012 Governor Brown Executive Order to put 1.5 million zero-emission vehicles on the road by 2025 and California’s Reformulated Gasoline program (CaRFG) will produce substantial and cost-effective emission reductions from gasoline-powered vehicles.

Taken together, California’s emission standards and fuel specifications for on-road light- and medium-duty vehicles represent all measures that are technologically and economically feasible in the context of a RACM assessment.

5.4.5 Heavy Duty Vehicles

California’s heavy-duty vehicle emissions control program includes requirements for increasingly tighter new engine standards and addresses vehicle idling, certification procedures, on-board

diagnostics, emissions control device verification, and in-use vehicles. This program is designed to achieve an on-road heavy-duty diesel fleet with 2010 engines emitting 98 percent less NO_X and $PM_{2.5}$ than trucks sold in 1986.

Most recently, in the ongoing efforts to go beyond federal standards and achieve further reductions, CARB adopted the Optional Reduced Emissions Standards for Heavy-Duty Engines regulation in 2014 that establishes the new generation of optional NO_X emission standards for heavy-duty engines.

The recent in-use control measures include On-Road Heavy-Duty Diesel Vehicle (In-Use) Regulation, Drayage (Port or Rail Yard) Regulation, Public Agency and Utilities Regulation, Solid Waste Collection Vehicle Regulation, Heavy-Duty (Tractor-Trailer) Greenhouse Gas Regulation, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, Heavy-Duty Diesel Vehicle Inspection Program, Periodic Smoke Inspection Program, Fleet Rule for Transit Agencies, Lower-Emission School Bus Program, and Heavy-Duty Truck Idling Requirements.

Taken together, California's emission standards and fuel specifications for heavy-duty vehicles represent all measures that are technologically and economically feasible in the context of a RACM assessment.

5.4.6 Off-Road Vehicles and Engines

California regulations for off-road equipment include not only increasingly stringent standards for new off-road diesel engines, but also in-use requirements and idling restrictions. The Off-Road Regulation is an extensive program designed to accelerate the penetration of the cleanest equipment into California's fleets and impose idling limits on off-road diesel vehicles. The program goes beyond emission standards for new engines through comprehensive in-use requirements for legacy fleets.

Taken together, California's comprehensive suite of emission standards and fuel specifications for off-road vehicles and engines represent all measures that are technologically and economically feasible in the context of a RACM assessment.

5.4.7 Other Sources and Fuels

The emission limits established for other mobile source categories, coupled with USEPA waivers and authorization of preemption, establish that California's programs for motorcycles, recreational boats, off-road recreational vehicles, cargo handling equipment, and commercial harbor craft sources meet the requirements for RACM.

Cleaner burning fuels also play an important role in reducing emissions from motor vehicles and engines as CARB has adopted a number of more stringent standards for fuels sold in California, including the Reformulated Gasoline program, low-sulfur diesel requirements, and the Low Carbon Fuel Standard. These fuel standards, in combination with engine technology requirements, ensure that California's transportation system achieves the most effective emission reductions possible.

Taken together, California's emission standards and fuel specifications for other mobile sources and fuels represent all measures that are technologically and economically feasible in the context of a RACM assessment.

5.4.8 Mobile Source RACM Summary

California's long history of comprehensive and innovative emissions control has resulted in the most stringent mobile source control program in the nation. USEPA has previously acknowledged the strength of the program in their approval of CARB's regulations and through the waiver process. Since then, CARB has continued to substantially enhance and accelerate reductions from the state's mobile source control programs through the implementation of more stringent engine emissions standards, in-use requirements, and other policies and initiatives as described in the preceding sections.

The CARB process for developing the proposed state measures included an extensive public process and was consistent with USEPA RACM guidance. Through this process, CARB found that there are no additional RACM that would advance attainment of the 12 $\mu g/m^3$ $PM_{2.5}$ standard in the Imperial County Nonattainment Area from emissions reductions associated with unused regulatory control measures. As a result, California's mobile source control programs fully meet the requirements for RACM.

5.5 Additional Reasonable Measures (ARM)

As mentioned in previous sections of this Chapter, controls that are technologically and economically feasible that cannot be implemented within the four-year period after designation, but could be implemented starting any time after that four-year period through the end of the sixth calendar year after designation, are termed "additional reasonable measures", or ARM.

Through the area source analysis described in in Section 5.3, the District identified control measures related to residential wood combustion that would qualify as RACM and ARM. Apart from that analysis, the District identified ARM related to sources of NO_X and NH_3. While the modeling component of the comprehensive precursor demonstration (discussed in Section 3.17) has indicated that $PM_{2.5}$ precursors do not have a significant impact on $PM_{2.5}$ levels causing nonattainment, the District is committed to the continued improvement of air quality in the region and thus is presenting additional control measures related to these sources as part of this SIP.

The following is a list of the $PM_{2.5}$, NO_X, and NH_3 sources in Imperial County that have been identified for ARM:

- Wood burning fireplaces and wood burning heaters (curtailment);
- Boilers, steam generators, and process heaters;
- Biosolids, animal manure, and poultry litter composting operations; and
- Residential water heaters.

The following sections discuss the rules that would implement the ARM related to these sources.

5.5.1 Control Measure: Wood Burning Fireplaces and Wood Burning Heaters– Curtailment

The District is proposing a new rule to implement a control measure that would prohibit/curtail the combustion of wood or solid-fuel products in any wood-burning device in the city of Calexico during a curtailment period (areas outside of Calexico have historically not exceeded either the 24-hour average or annual average $PM_{2.5}$ standards). The curtailment period would be defined as any period so declared to the public by the APCO when $PM_{2.5}$ levels are forecast to exceed 35 µg/m^3 at the Calexico monitor. Similar rules have been adopted by other Air Quality Management Districts (AQMDs), including the Bay Area AQMD (Regulation 6, Rule 3), Sacramento Metropolitan AQMD (Rule 421), and South Coast AQMD (Rule 445). This rule would be adopted in or before December 2018 and implementation would begin in 2020. Implementation would be delayed one year to allow the District to develop and identify a source of funding for an incentive program for Calexico residents to purchase devices that may operate during mandated curtailment, such as gaseous-fueled devices. Delayed implementation would also provide the District with a winter period in which they could educate the populace regarding the concept of curtailment, possibly with voluntary curtailment campaigns, and thus ensure successful implementation of the control measure in 2020 when mandated curtailment provisions are in place.

Control Measure Emission Reductions

Potential reductions from implementation of this control measure through this rule were evaluated by analyzing the three most recent years of 24-hour $PM_{2.5}$ data from the primary Calexico monitor (2014-2016). From the data it was determined that there would be on average six curtailment days per year in the winter months (defined as November-February) with a curtailment threshold of 35 µg/m^3. Emission reductions were estimated by adjusting the average daily winter $PM_{2.5}$ emissions for Imperial County for the estimated reductions due to occur from the NSPS Certification Rule (described in Section 5.3.2). The adjusted value was then scaled down by population fraction to reflect the proportion of emissions attributable to Calexico. It was then assumed that there would be a 75 percent compliance rate with the curtailment order. The resulting daily emissions estimate was multiplied by six to determine the total reductions for the year. Estimated reductions by year are shown in Table 5-4. More detailed calculations are presented in Appendix D.

Table 5-4. Control Measure: Residential Wood Combustion $PM_{2.5}$ Emission Reductions with Curtailment			
Year	**2020**	**2021**	**2022**
Reduction (tpd)	0.00019	0.00018	0.00018
Reduction (tpy)	0.068	0.067	0.066
Abbreviations: tpd – tons per day tpy – tons per year			

5.5.2 Control Measure: Boilers, Steam Generators, and Process Heaters

To implement this control measure, the District is proposing a new rule that will limit NO_X emissions from boilers, steam generators, and process heaters rated 0.075 million British thermal units per hour (MMBtu/hr) to less than 5.0 MMBtu/hr. The new rule would affect emissions under the Manufacturing and Industrial (Emission Inventory Category: 050-995-0110-0000) and Service and Commercial (Emission Inventory Category: 060-995-0110-0000) subcategories under the Fuel Combustion Category of the Imperial County $PM_{2.5}$ Nonattainment Area emissions inventory. Similar rules have been adopted by SCAQMD (Rules 1146.1 and 1146.2), SJVAPCD (Rules 4307 and 4308), and Ventura County APCD (Rules 74.11.1 and 74.15.1).

The new proposed Boiler, Steam Generators, and Process Heaters Rule will limit NO_X emissions to less than or equal to 20 parts per million (ppm) of NO_X emissions (at 3 percent oxygen [O_2] dry). The limit will apply to new and replacement units rated 0.075 MMBtu/hr to less than 5.0 MMBtu/hr. It is estimated the rule would be adopted in or before December 2019 and implemented in 2020.

Control Measure Emissions Reductions

Based on the District's knowledge of the current population of boilers, steam generators, and process heaters in the 0.075 to 5.0 MMBtu/hr range, District staff assumes that 15 percent of NO_X emissions from the Manufacturing and Industrial subcategory and 84 percent of NO_X emissions under the Service and Commercial subcategory will be affected by the new rule. The District also assumes all of the equipment will be replaced within 20 years, which is assumed to be the useful life of the equipment. It is also assumed that the current equipment has a NO_X emission factor of 55 ppm NO_X emissions (at 3 percent O_2 dry) and would eventually have to comply with a NO_X emission limit of 20 ppm per joule of heat input which calculates to a 50 percent reduction in NO_X emissions. It is assumed that the emissions reductions will take place linearly over the course of the 20 years. This will result in an estimated total NO_X emission reduction of 7.5 percent for Manufacturing and Industrial natural gas combustion and a 42 percent reduction for Service and Commercial natural gas combustion. Tables 5-5 and 5-6 present the current and estimated (i.e., with the new rule in place) emissions for the Imperial County $PM_{2.5}$ Nonattainment Area.

Table 5-5. Control Measure: Industrial and Commercial Natural Gas Combustion with Boilers, Steam Generators and Water Heaters NO_X Emissions – $PM_{2.5}$ Nonattainment Area (tons per day) (Annual)																	
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Manufacturing and Industrial (050-995-0110-0000)																	
Current	0.347	0.382	0.377	0.373	0.368	0.365	0.361	0.358	0.354	0.351	0.349	0.347	0.346	0.345	0.344	0.342	0.390
With Control	0.347	0.381	0.374	0.369	0.362	0.358	0.353	0.348	0.343	0.339	0.336	0.333	0.330	0.328	0.326	0.323	0.367
Reduction	**0.000**	**0.001**	**0.003**	**0.004**	**0.005**	**0.007**	**0.008**	**0.010**	**0.011**	**0.012**	**0.013**	**0.015**	**0.016**	**0.017**	**0.018**	**0.019**	**0.024**
Service and Commercial (060-995-0110-0000)																	
Current	0.539	0.597	0.592	0.587	0.582	0.578	0.575	0.572	0.570	0.569	0.570	0.572	0.572	0.574	0.575	0.576	0.661
With Control	0.539	0.584	0.567	0.550	0.533	0.517	0.502	0.488	0.474	0.461	0.450	0.440	0.428	0.417	0.406	0.395	0.439
Reduction	**0.000**	**0.013**	**0.025**	**0.037**	**0.049**	**0.061**	**0.073**	**0.084**	**0.096**	**0.108**	**0.120**	**0.132**	**0.144**	**0.157**	**0.169**	**0.181**	**0.222**
Combined Reduction	**0.000**	**0.014**	**0.028**	**0.041**	**0.055**	**0.068**	**0.081**	**0.093**	**0.106**	**0.119**	**0.133**	**0.147**	**0.160**	**0.173**	**0.187**	**0.201**	**0.245**

Notes:
Totals may not add up due to rounding.

Table 5-6. Control Measure: Industrial and Commercial Natural Gas Combustion with Boilers, Steam Generators and Water Heaters NO_X Emissions – $PM_{2.5}$ Nonattainment Area (tons per year)

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Manufacturing and Industrial (050-995-0110-0000)																	
Current	126.7	139.4	137.6	136.1	134.3	133.2	131.8	130.7	129.2	128.1	127.4	126.7	126.3	125.9	125.6	124.8	142.4
With Control	126.7	138.9	136.6	134.6	132.3	130.7	128.8	127.2	125.3	123.8	122.6	121.4	120.6	119.8	119	117.8	133.8
Reduction	**0**	**0.5**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**3.9**	**4.3**	**4.8**	**5.3**	**5.7**	**6.1**	**6.6**	**7**	**8.6**
Service and Commercial (060-995-0110-0000)																	
Current	196.7	217.9	216.1	214.3	212.4	211	209.9	208.8	208.1	207.7	208.1	208.8	208.8	209.5	209.9	210.2	241.3
With Control	196.7	213.3	207	200.8	194.6	188.8	183.4	178.1	173.1	168.4	164.4	160.6	156.2	152.3	148.2	144	160.2
Reduction	**0**	**4.6**	**9.1**	**13.5**	**17.8**	**22.2**	**26.5**	**30.7**	**35**	**39.3**	**43.7**	**48.2**	**52.6**	**57.2**	**61.7**	**66.2**	**81.1**
Combined Reduction	**0.0**	**5.1**	**10.1**	**15.0**	**19.9**	**24.7**	**29.4**	**34.1**	**38.8**	**43.6**	**48.5**	**53.5**	**58.3**	**63.3**	**68.3**	**73.2**	**89.6**

Notes:
Totals may not add up due to rounding.

5.5.3 Control Measure: Biosolids, Animal Manure, and Poultry Litter Composting Operations

To implement this measure, the District is proposing a new rule that would regulate biosolids, animal manure, and poultry litter composting operations. Specifically, facilities would be required to follow certain management procedures to control ammonia emissions. The new rule would affect emissions under the Composting Solid Waste category (Emission Inventory Category: 199-170-0240-0000) of the emissions inventory. The new rule would be similar to SJVAPCD's Biosolids, Animal Manure, and Poultry Litter Operations Rule (Rule 4565). Imperial County composting operations largely involve the composting of animal manure, which comes from the County's large confined feedlot operations. It is estimated the rule would be adopted in or before December 2019 and implementation would begin in 2020.

Control Measure Emissions Reductions:

The District conducted the ammonia emissions reduction analysis by following CARB's Emissions Inventory Methodology for Composting Facilities.[42] Reductions were calculated assuming that facilities would implement water management practices to control ammonia emissions. Based on Table III-3 Control Techniques for Composting Operations, implementing water management practices corresponds to a 19 percent reduction in ammonia emissions. Note, CARB's Emissions Inventory Methodology is geared towards facilities with a high volume of greenwaste in their compost mixtures. More research may need to be done to determine the final reductions in ammonia emissions expected to occur due to this rule. Tables 5-7 and 5-8 indicate current and proposed emissions under the Solid Waste Composting emissions category for the Imperial County $PM_{2.5}$ Nonattainment Area. It is assumed the reductions will begin to take place in the year 2020.

Table 5-7. Control Measure: Solid Waste Composting NH_3 Emissions – $PM_{2.5}$ Nonattainment Area (tons per day) (Annual)

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Current	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
With Control	1.14	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Reduction	**0**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**

[42] CARB. 2015. ARB Emissions Inventory Methodology for Composting Facilities. March 2. Available at: https://www.arb.ca.gov/ei/areasrc/Composting%20Emissions%20Inventory%20Methodology%20Final%20Combined.pdf. Accessed: November 2017.

Table 5-8. Control Measure: Solid Waste Composting NH_3 Emissions – $PM_{2.5}$ Nonattainment Area (tons per year)											
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Current	416.8	416.8	416.8	416.8	416.8	416.8	416.8	416.8	416.8	416.8	416.8
With Control	416.8	337.6	337.6	337.6	337.6	337.6	337.6	337.6	337.6	337.6	337.6
Reduction	**0**	**79.2**	**79.2**	**79.2**	**79.2**	**79.2**	**79.2**	**79.2**	**79.2**	**79.2**	**79.2**

5.5.4 Control Measure: Residential Water Heaters

To implement this measure, the District is proposing a new rule that would limit NO_X emission rates from new residential water heaters rated less than 75,000 Btu/hr. Specifically, the proposed rule would limit NO_X emissions to 15 ppm (at 3 percent O_2 dry). The new rule would affect emissions classified under the category known as Residential Fuel Combustion – Natural Gas – Water Heater (Emission Inventory Category: 610-608-0110-0000). This new rule would be similar to SJVAPCD's Rule 4902, SCAQMD's Rule 1121, and Ventura County APCD's Rule 74.11. It is estimated the rule would be adopted in or before 2019 and implemented in 2020.

Control Measure Emission Reductions

The District conducted a survey of local home improvement stores and determined that the residential water heaters currently being sold within the county are certified to meet a limit of 55 ppm of NO_X emissions (at 3 percent O_2 dry). Adopting the new rule will lead to new residential water heaters with the updated NO_X emission limits replacing existing heaters in upcoming years. A reduction from a limit of 55 ppm NO_X to 15 ppm corresponds to an approximate 75 percent reduction in emissions. Assuming this reduction takes place over the course of 10 years as old water heaters are replaced, an incremental rate of 7.5 percent reduction of the total annual emissions will occur each year. Tables 5-9 and 5-10 indicate the current and estimated NO_X emissions through 2035 for the Imperial County $PM_{2.5}$ Nonattainment Area.

Table 5-9. Control Measure: Residential Water Heater NO_X Emissions – $PM_{2.5}$ Nonattainment Area (tons per day) (Annual)																	
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Current	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
With Control	0.022	0.021	0.019	0.017	0.015	0.014	0.012	0.010	0.009	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Reduction	**0**	**0.002**	**0.003**	**0.005**	**0.007**	**0.008**	**0.010**	**0.012**	**0.013**	**0.015**	**0.016**	**0.016**	**0.016**	**0.016**	**0.016**	**0.016**	**0.016**

Table 5-10. Control Measure: Residential Water Heater NO_X Emissions – $PM_{2.5}$ Nonattainment Area (tons per year)																	
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Current	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03
With Control	8.03	7.765	6.826	6.223	5.621	5.019	4.417	3.814	3.212	2.61	2.008	2.008	2.008	2.008	2.008	2.008	2.008
Reduction	**0**	**0.63**	**1.204**	**1.807**	**2.409**	**3.011**	**3.613**	**4.216**	**4.818**	**5.42**	**6.022**	**6.022**	**6.022**	**6.022**	**6.022**	**6.022**	**6.022**

5.6 Incentive Programs

The majority of the new measures in the California state mobile source strategy encompass in-use measures which have traditionally resulted in flexible regulation, allowing cost-effective methods to be used by those having to meet emissions requirements. Therefore, to accomplish early retirement of older, more polluting engines, the use of funding programs, such as the Enhanced Fleet Modernization Program, the Clean Vehicle Rebate Project, the Air Quality Improvement Program, and the Carl Moyer Program, plays an important role in achieving additional emission reductions for Imperial County.

For example, the Carl Moyer Program encourages the early introduction of clean air technologies into the on-road and off-road vehicle fleets by providing grants that local air districts can administer to help with the purchase of new vehicles or new engines (repowers) or for the installation of retrofit units on older engines. A variety of vehicle classes and types are funded under the Carl Moyer Program. In particular, this funding provides the technologies that reduce NO_X and PM emissions caused by the combustion of diesel powered engines. In Imperial County, projects funded under the Carl Moyer Program have historically included retrofits and replacement of portable engines such as dirty burning irrigation pumps, agricultural drain cleaners, and tractors. In total, 195 projects have been funded since the funding cycle year 3.

This SIP does not include any emission reductions associated with incentive programs in the emission inventories or the attainment demonstration.

5.7 Control Strategy Summary

The control strategy consists of adopted measures summarized in sections 5.2 through 5.6, the new RACM control measure for primary $PM_{2.5}$ emissions, as well as the new ARM control measures for $PM_{2.5}$, NO_X, and ammonia emissions. The new control measures being proposed with this Plan are summarized in Table 5-11.

Table 5-11. ICAPCD Proposed Control Measures for the 2012 Annual $PM_{2.5}$ Standard

Measure Type	Measure Title	Adoption Year / Implementation Year	Pollutant	Implementing Agency	Reductions (Annual tpd) (2019 / 2022)[a]
RACM	Wood Burning Fireplaces and Wood Burning Heaters – NSPS Certification	2018 / 2019[b]	$PM_{2.5}$	ICAPCD	0.00068/0.0027
ARM	Wood Burning Fireplaces and Wood Burning Heaters– Curtailment	2018 / 2020	$PM_{2.5}$	ICAPCD	0/0.00018
ARM	Boilers, Steam Generators, and Process Heaters	2019 / 2020	NO_X	ICAPCD	0/0.041
ARM	Biosolids, Animal Manure, and Poultry Litter Composting Operations	2019 / 2020	NH_3	ICAPCD	0/0.22
ARM	Residential Water Heaters	2019 / 2020	NO_X	ICAPCD	0/0.005

Notes:

[a] The reductions in this table focus on the years 2019 and 2022, as those are milestone years.

[b] The District intends to implement this control measure prior to April 15, 2019.

Abbreviations:

ARM – additional reasonable measures

ICAPCD – Imperial County Air Pollution Control District

NH_3 - ammonia

NO_X – oxides of nitrogen

NSPS – New Source Performance Standard

$PM_{2.5}$ – particulate matter less than 2.5 microns in diameter

RACM – reasonably available control measures

tpd – tons per day

USEPA – United States Environmental Protection Agency

6 Other Clean Air Act Requirements

This chapter describes how Imperial County fulfils the CAA requirements for RFP, quantitative milestones, contingency measures, and transportation conformity.

6.1 Reasonable Further Progress (RFP)

Chapter 5 discusses how the District's control strategy meets the RACT, RACM, and ARM requirements of the CAA and presents the implementation schedule for newly proposed control measures. CAA Sections 172(c)(2) and 189(c) require attainment plans to demonstrate that an area's control strategy provides for reasonable further progress towards attainment of the NAAQS. The intent of this requirement is to ensure that areas will not delay implementation of emission control programs until immediately before the attainment deadline.

Per the 2016 $PM_{2.5}$ Implementation Rule, a Moderate nonattainment area demonstrates RFP by first projecting the emissions by pollutant (i.e., direct $PM_{2.5}$ and significant $PM_{2.5}$ precursors) that are expected to be achieved after the control measures have been implemented within the nonattainment area. At a minimum, these emissions need to be estimated for each quantitative milestone year. For Moderate areas, these quantitative milestones occur at 4.5 years and 7.5 years after the designation of the area. Since Imperial County was designated Moderate nonattainment in April 2015, its milestones occur in October 2019 and 2022. As shown previously, Table 5-11 summarizes key elements pertinent to an RFP analysis including the schedule for adoption and implementation of RACM and ARM, the affected pollutants, implementing agency, and the expected emission reductions from each measure in each quantitative milestone year.

One way Moderate nonattainment areas seeking approval under CAA Section 179(B) can demonstrate RFP is by showing generally linear emission reductions towards the full amount of reductions that will be achieved by the attainment year (i.e., the amount that reflects implementation of all of the control measures identified as RACT, RACM, and ARM for the entire period of the applicable attainment plan). This can be demonstrated by comparing the projected emissions at the milestone years against a linear interpolation of the emissions reductions between the baseline year (2012) and the attainment year (2021). This analysis, limited to direct $PM_{2.5}$[43] is tabulated in Table 6-1 and depicted graphically in Figure 6-1, and demonstrates that the projected emissions in the milestone years are below the linear trend line. This analysis combined with the information presented in Table 5-11 demonstrates that the Imperial County $PM_{2.5}$ Nonattainment Area meets the RFP requirements of the CAA as interpreted by the 2016 $PM_{2.5}$ Implementation Rule.

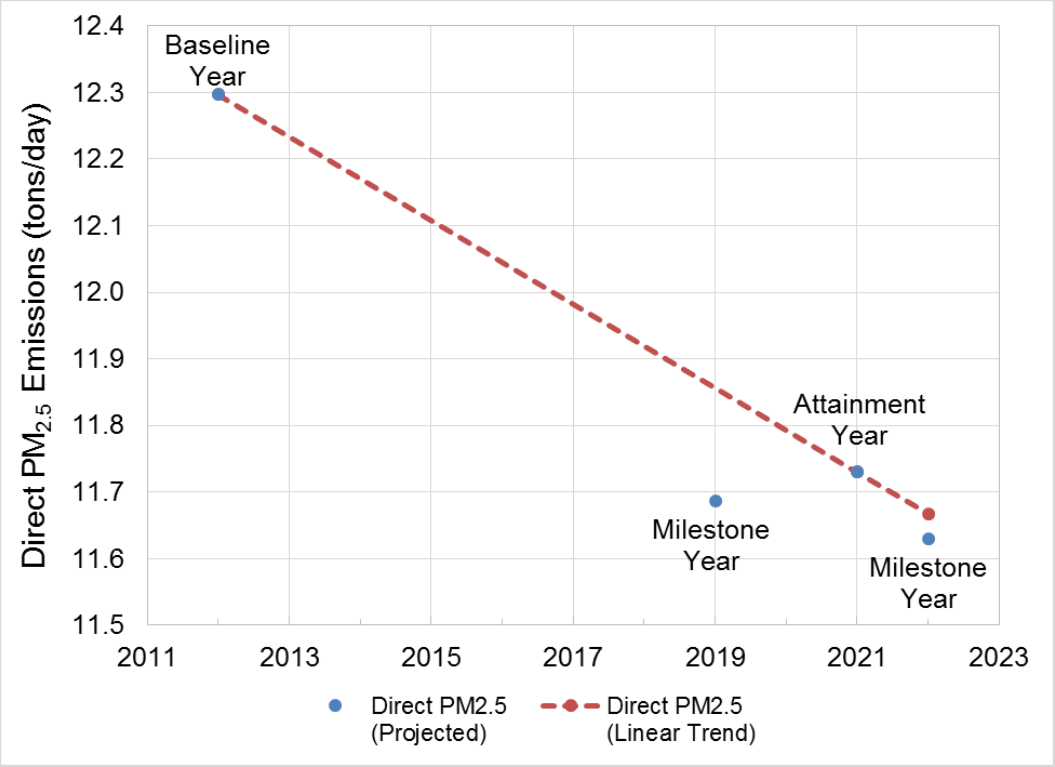
[43] As discussed in Section 3.17, CARB performed a comprehensive precursor demonstration to determine whether emissions of a particular $PM_{2.5}$ precursor significantly contribute to $PM_{2.5}$ levels in the Imperial County $PM_{2.5}$ Nonattainment Area. Ultimately, this demonstration showed that none of the four $PM_{2.5}$ precursors significantly contribute to $PM_{2.5}$ levels in Imperial County; therefore, the District isn't required to assess these pollutants for RFP.

Table 6-1. Reasonable Further Progress Demonstration for the Imperial County $PM_{2.5}$ Nonattainment Area (Annual Emissions Inventory, Tons per Day)

	2012	2019	2021	2022
	Baseline Year	**Milestone Year**	**Attainment Year**	**Milestone Year**
Direct $PM_{2.5}$ (Projected) [1]	12.2967	11.6866	11.7303	11.6292
Direct $PM_{2.5}$ (Base Inventory) [2]	*12.2967*	*11.6873*	*11.7325*	*11.6321*
Direct $PM_{2.5}$ (Condensable) [2,3]	*0.0947*	*0.1045*	*0.1086*	*0.1100*
Direct $PM_{2.5}$ (Filterable) [2,3]	*11.0289*	*10.5312*	*10.5705*	*10.4647*
Direct $PM_{2.5}$ RACM Reductions[4]	*0.0000*	*0.0007*	*0.0020*	*0.0027*
Direct $PM_{2.5}$ ARM Reductions[5]	*0.0000*	*0.0000*	*0.0002*	*0.0002*
Direct $PM_{2.5}$ (Linear Trend)[6]	12.2967	11.8561	11.7303	11.6673
Difference	--	- 0.1695	--	- 0.0381
Milestone Met?	--	Yes	--	Yes

Notes:
Values may not add up due to rounding.
[1] Projected values represent the base inventory values with the reductions from RACM and ARM incorporated.
[2] Inventory values taken from Tables 3-8a through 3-11b.
[3] Filterable and condensable emissions are a subset of the total $PM_{2.5}$ base inventory. Note, the breakdown of filterable and condensable components is not available for all source categories.
[4] RACM reductions are equivalent to the estimated reductions from the NSPS Certification wood burning fireplaces and wood burning heaters rule (see Table 5-2).
[5] ARM reductions are equivalent to the estimated reductions from the wood burning fireplaces and wood burning heaters curtailment rule (see Table 5-4).
[6] Values in 2019 and 2022 were linearly interpolated and extrapolated (respectively) from the projected $PM_{2.5}$ values in 2012 and 2021.

Figure 6-1. Reasonable Further Progress Demonstration for the Imperial County $PM_{2.5}$ Nonattainment Area (Annual Emissions Inventory, Tons per Day)



6.2 Quantitative Milestones

As part of the RFP demonstration, plans for Moderate nonattainment areas must include a set of quantitative milestones in order to maintain compliance with Section 189(c)(1) of the CAA. These demonstrations are to be completed by specific dates occurring in what are known as "milestone years". As discussed in Section 6.1, for Imperial County these milestones occur in October 2019 and 2022.

The quantitative milestones for this Plan involve two new Imperial County rules designed to implement control measures and reduce emissions of $PM_{2.5}$. The following is a description of these proposed rules, which are currently being developed by ICAPCD:

- Proposed Wood Burning Fireplace and Wood Burning Heaters Rule - NSPS Certification - requires new wood burning fireplaces and wood burning heaters to comply with NSPS certification requirements in effect at the time of installation.
- Proposed Wood Burning Fireplace and Wood Burning Heaters Rule - Curtailment - prohibits residential wood burning combustion in the city of Calexico on days forecasted to exceed 35 $\mu g/m^3$ at the Calexico monitor.

Once implemented, these rules will lead to reductions of $PM_{2.5}$, eventually resulting in lower ambient $PM_{2.5}$ concentrations. Together with inventory reporting, demonstration of the adoption and implementation of these rules serves as a quantifiable way for measuring progress towards

attainment of the $PM_{2.5}$ NAAQS. Each of these rules is scheduled to be adopted in 2018, with implementation beginning in 2019 for the NSPS Certification Rule and 2020 for the Curtailment Rule.

The first quantitative milestone will involve the adoption and implementation of the NSPS Certification Rule and adoption of the Curtailment Rule. The District will report on this milestone in a document which it will submit to the USEPA prior to January 15, 2020 (i.e., within 90 days of the first milestone date, October 15, 2019). The District will have achieved the first quantitative milestone if it can report that it adopted the two rules in or before December 2018 and implemented the NSPS Certification Rule prior to April 15, 2019.

The second quantitative milestone will involve the implementation of the Curtailment Rule. The District will report on this milestone in a document which it will submit to the USEPA prior to January 15, 2023 (i.e., within 90 days of the second milestone date, October 15, 2022). The District will have achieved the second quantitative milestone if it can report that implementation of the Curtailment Rule began in 2020, as described in the control measures.

6.3 Contingency Measures

CAA Section 172(c)(9) requires an available set of contingency measures in the event that a nonattainment area fails to meet RFP or fails to make attainment. For the Imperial County $PM_{2.5}$ Nonattainment Area, an attainment contingency is not required because the area is seeking approval under CAA Section 179(B). Furthermore, it is important to note that because the County is submitting a comprehensive precursor demonstration showing that precursor emissions do not significantly contribute to $PM_{2.5}$ levels that exceed the standard in the area, the County is not required to develop contingency measures pertaining to those precursors.

The 2016 $PM_{2.5}$ Implementation Rule presents the various requirements for RFP contingency measures. Per the 2016 $PM_{2.5}$ Implementation Rule, if triggered, contingency measures must be able to be implemented without further action by the County, State, or USEPA. To ensure this, the contingency measures must be approved and fully adopted as part of an area's attainment plan submission. Moreover, the submission must contain trigger mechanisms for the contingency measures and must demonstrate the schedule for implementation. For this Plan, the contingency provisions will be triggered within 60 days following a determination by the Administrator that the area has failed to:

1) Meet a RFP requirement in this Plan;

2) Meet a quantitative milestone in this Plan; or

3) Submit a quantitative milestone report.

In addition, approximately one year's worth of reductions must be provided with the submitted contingency measures. This reduction is determined by the overall level of reductions needed to demonstrate attainment divided by the number of years from the baseline year to the attainment year. Alternately, in Imperial County's case, the reduction must be equal to one year's worth of emission reductions proportional to the overall amount of emission reductions that are to be

achieved between the baseline and attainment years as part of RFP and shown in Table 6-1. The total amount of emission reductions between these years is 0.57 tons/day. When divided by the nine years between the baseline year and attainment year, the result is 0.063 tons/day or 22.3 tons/year. This is the amount Imperial County must meet for RFP contingency.

The RFP contingency measures must all be technologically and economically feasible to determine that they are reasonable measures for sources in the area, ideally exceeding the RACM/RACT control measure criteria. To provide for an approximate equivalent of one year's worth of emissions reductions or air quality improvement, an area may combine several measures, such as placing reasonable controls on sources outside the nonattainment area and implementing BACM/BACT early on select sources inside the area, along with adopting other identified measures.

To satisfy the SIP requirement for RFP contingency, the District explored various options for measures to implement in order to achieve direct $PM_{2.5}$ emissions reductions. After performing thorough research and calculations for reduction estimates for potential contingency measures with CARB and USEPA staff, the District identified a measure that meets all contingency measure requirements and would achieve at least one year's worth of reductions if implemented. For this contingency measure, the District proposes to amend Rule 804, *Open Areas,* to include a provision that would expand the rule's applicability criteria if contingency conditions are triggered under this Plan. Rule 804 regulates fugitive dust emissions by requiring landowners of open areas to implement BACM or Alternative BACM on plots exceeding 3.0 acres for rural areas or 0.5 acres for urban areas and containing at least 1,000 square feet of disturbed surface area. Since areas subject to Rule 804 are presumably already controlled to BACM levels, one way to effect further reductions is by expanding the applicability criteria. Under this contingency measure, the District would expand Rule 804 applicability to include all rural open areas containing at least 1,000 square feet of disturbed surface area.

The District performed an analysis to estimate what magnitude of reductions would be possible if this contingency measure were implemented. Using land parcel size data obtained from the Imperial County Assessor's Office, the total acreage of vacant rural parcels less than 3.0 acres in size in the $PM_{2.5}$ nonattainment area was estimated to be 529 acres. With this acreage the District estimated the potential $PM_{2.5}$ emissions from these areas using a method derived from CARB's *Windblown Dust - Unpaved Roads* guidance.[44] This method includes an equation with various input parameters, such as soil erodibility and surface roughness, which calculates a dust emission factor. This factor is then applied to the acreage of disturbed surfaces to estimate the total emissions of windblown dust. The potential reductions to be achieved through the expansion of Rule 804 applicability were estimated using the previous composite control factor of 70 percent.[45] This analysis found that this contingency measure would result in emission reductions of at least

[44] CARB. 1997. Windblown Dust – Unpaved Roads. Section 7.13. Updated August 1997. Available at: https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-13.pdf. Accessed: March 2018.

[45] The 70 percent composite control factor is from the "Final BACM Technological and Economic Feasibility Analysis" portion of the 2003 San Joaquin Valley APCD PM_{10} SIP and was used in ICAPCD's 2005 BACM Report titled, "Draft Final Technical Memorandum – Regulation VIII BACM Analysis" as well as ICAPCD's 2009 PM_{10} SIP.

0.088 tons $PM_{2.5}$ per day. This estimate exceeds the required one year of emission reductions (0.063 tons per day), thus satisfying contingency measure requirements. The details regarding this analysis as well as the sources used to support it are provided in Appendix D.

To further bolster the contingency strategy in this Plan, the District identified an additional contingency measure that would involve lowering the curtailment threshold for the Wood Burning Fireplaces and Wood Burning Heaters Curtailment Rule**.** As discussed previously in Chapter 5, Imperial County is proposing a new rule as ARM that will prohibit/curtail the combustion of wood or solid-fuel products in any wood-burning device in the city of Calexico during a curtailment period. Under the rule, the curtailment period would be defined as any period when $PM_{2.5}$ levels are forecast to exceed 35 $\mu g/m^3$ at the Calexico monitor. The District is proposing to include a provision in the rule that if contingency conditions are triggered, the curtailment threshold would be lowered to 30 $\mu g/m^3$ and the curtailment area would expand to include the entire County. The District estimates that an additional 0.0011 tons per day may be reduced when this contingency measure is implemented (see Table D-2a in Appendix D).

The District decided to pursue this additional contingency measure because additional wood burning curtailment would prove beneficial to the air quality in and around Calexico if contingency measures become necessary. Due to its proximity to the international border with Mexico, the southern part of Imperial County can be adversely influenced by the transport of $PM_{2.5}$ emissions across the border, resulting in exceedances caused by international transport. This is especially true for the city of Calexico as it borders the large metropolis of Mexicali, Mexico. During the colder winter months, biomass burning by the larger Mexicali population (and smaller Calexico-area population) is particularly pronounced, and the wood burning curtailment contingency measure would work to reduce this localized impact. Together with the Rule 804 contingency measure, reductions are estimated to equal at least 0.089 tons per day.

6.4 Transportation Conformity

Section 176(c) of the CAA establishes transportation conformity requirements that are intended to ensure that transportation activities do not interfere with air quality progress. The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals *conform to* applicable SIPs before being approved by a Metropolitan Planning Organization (MPO). Conformity to a SIP means that proposed activities must not:

1) Cause or contribute to any new violation of any standard,

2) Increase the frequency or severity of any existing violation of any standard in any area, or

3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

A SIP analyzes the region's total emissions inventory from all sources for purposes of demonstrating RFP, attainment, or maintenance. The portion of the total emissions inventory from on-road highway and transit vehicles in these analyses becomes the "motor vehicle emissions

budget." 46 Motor vehicle emissions budgets are the mechanism for ensuring that transportation planning activities conform to the SIP. Budgets are set for each criteria pollutant or its precursors, and it is set for each RFP milestone year and the attainment year. Subsequent transportation plans and programs produced by transportation planning agencies are required to conform to the SIP by demonstrating that the emissions from the proposed plan, program, or project do not exceed the budget levels established in the applicable SIP.

6.4.1 Significance of $PM_{2.5}$ Precursors and Components for Transportation Conformity

USEPA has promulgated rules in 40 CFR Part 93 that implement the conformity section of the CAA. Section 93.102(b) of the conformity rule identifies the pollutants/precursors that in the budget setting process are presumed to be significant for a particular NAAQS and must be addressed. Pollutants and/or precursors presumed insignificant only need to be addressed in the budget process when the SIP finds them significant. For $PM_{2.5}$, the only pollutants/precursors presumed significant are directly emitted $PM_{2.5}$ (exhaust, tire and brake wear), and NO_X from on road motor vehicles.

Section 93.102(b)(2)(v) of the conformity rule identifies VOC, SO_X, and NH_3 as $PM_{2.5}$ precursor pollutants that are presumed insignificant unless the SIP makes a finding that the precursor is significant. In addition, Section 93.102(b)(3) identifies re-entrained road dust from paved and unpaved roads as $PM_{2.5}$ emissions that are presumed insignificant unless the SIP makes a finding of significance. While the applicability section of the rule does not address fugitive dust from road construction specifically, Section 93.122(f) of the rule does indicate that the interagency consultation process should be used during the development of $PM_{2.5}$ SIPs to determine when construction emissions are a significant contributor.

6.4.2 Determining the Need for Motor Vehicle Emissions Budgets for On-Road NOx Emissions

Section 93.102(b)(2)(iv) allows the USEPA Regional Administrator and the director of the state air agency to make a finding if transportation related emissions of NO_X are a significant contributor to the $PM_{2.5}$ nonattainment area problem, and thus, if NO_X motor vehicle emissions budgets should be established. This Plan finds that NO_X emissions are an insignificant contributor to $PM_{2.5}$ air quality in the Imperial County $PM_{2.5}$ Nonattainment Area. This finding of insignificance for NO_X is supported by the sensitivity analysis conducted through modeling found in Section 3.17 of this Plan.

In 2012, the base year of the attainment plan, emissions of NO_X from on road motor vehicles contribute 5.3 tons per day (tpd) or about 37 percent of the region's NO_X inventory. In the

[46] Federal transportation conformity regulations are found in 40 CFR Part 51, Subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws. Part 93, Subpart A of this chapter was revised by the USEPA in the August 15, 1997 Federal Register.

attainment year of 2021, the contribution of on road NO_X is reduced to 2.6 tpd or about 27 percent. Table 1 below summarizes the projected trends in NOx emissions and the projected contribution of on road motor vehicles to the nonattainment area's emissions inventory.

Table 6-2. 2012-2022 Mobile Source NO_X Emissions and Contribution to Total NO_X in the Imperial County $PM_{2.5}$ Nonattainment Area (tons per day) (Annual)

Source	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total NOX	14.2	13.4	12.5	12.0	11.7	11.3	10.8	10.2	10.0	9.6	9.2
On-Road NOX	5.3	4.8	4.2	3.9	3.7	3.4	3.2	2.9	2.8	2.6	2.4
Percent Contribution of On-Road	37%	36%	34%	32%	31%	30%	30%	28%	28%	27%	26%

Source: CEPAM v1.05

Although Table 6-2 suggests that on-road emissions of NO_X are significant, the precursor sensitivity analysis in Section 3.17 demonstrates that NO_X is not a significant contributor to $PM_{2.5}$ air quality in the Imperial County $PM_{2.5}$ Nonattainment Area.

To evaluate the impact of reducing emissions of different $PM_{2.5}$ precursors on the base year (2012) $PM_{2.5}$ design value, a series of model sensitivity simulations were conducted, where emissions of the precursor species in Imperial County were reduced by 70 percent from the base year emissions. The precursor analysis found that a 70 percent decrease in NO_X only reduced the 2012 annual design value at Calexico 0.05 $\mu g/m^3$. For this reason, attainment of the NAAQS is not dependent on any NO_X controls in this Plan. Therefore, the sensitivity analysis demonstrates that NO_X is an insignificant precursor in the Imperial County $PM_{2.5}$ Nonattainment Area for the annual $PM_{2.5}$ NAAQS and this Plan does not set NO_X emissions budgets for transportation conformity. More detail regarding the insignificance of NO_X can be found in Section 3.17.

6.4.3 Significance of Fugitive Emissions of $PM_{2.5}$

As mentioned earlier, Section 93.102(b)(3) identifies re-entrained road dust from paved and unpaved roads as $PM_{2.5}$ emissions that are presumed insignificant unless the SIP makes a finding of significance. While the applicability section of the rule does not address fugitive dust from road construction specifically, Section 93.122(f) of the rule does indicate that if the $PM_{2.5}$ SIP determines that all construction emissions are a significant contributor that fugitive dust from road and transit construction should be included in the conformity analysis, thus be included in the area's Motor Vehicle Emissions Budget.

This Plan makes no finding of significance for fugitive road construction dust; however does find that re-entrained dust from roads are significant (see Table 6-3).

Table 6-3. Mobile $PM_{2.5}$ Dust Categories Contribution to Total $PM_{2.5}$ Emissions (tons per day) (Annual)

Category	2012	% of PM2.5	2021	% of PM2.5
Paved Road Dust	0.12	1%	0.16	1%
Road Construction Dust	0.03	0%	0.05	0%
Tire Wear, Break Wear, Exhaust	0.32	3%	0.11	1%
Unpaved Road Dust-City/County	2.06	17%	1.48	13%

Source: CEPAM v1.05

6.4.4 Re-entrained Road Dust

Re-entrained road dust emissions from roads are deemed significant in the Imperial County $PM_{2.5}$ Nonattainment Area based on the $PM_{2.5}$ emissions contribution from roads, which comprise almost 18 percent of the $PM_{2.5}$ emissions in the region in 2012, or 2.18 tpd. Furthermore, because this Plan incorporates control measures for fugitive emissions from roads and the contribution of this category contributes a large share of to the $PM_{2.5}$ inventory in the region, re-entrained dust from roads is considered significant for conformity purposes. Therefore, this Plan establishes transportation conformity emissions budgets for direct $PM_{2.5}$ from tire wear, brake wear and exhaust, and paved and unpaved road dust in the Imperial County $PM_{2.5}$ Nonattainment Area. Table 6-4 below shows the trend for direct $PM_{2.5}$ from tire wear, brake wear and exhaust, and paved and unpaved road dust in the Imperial County $PM_{2.5}$ Nonattainment Area for 2012, 2019, and 2022.

Table 6-4. 2012, 2019, and 2022 $PM_{2.5}$ Emission Inventory Trend for Roads in the Imperial $PM_{2.5}$ Nonattainment Area (tons per day) (Annual)

Category	2012	2019	2022
Paved Road Dust	0.12	0.15	0.17
Unpaved City-County Road Dust	2.06	1.48	1.35
Tire Wear, Brake Wear, and Exhaust	0.32	0.11	0.11

Source: CEPAM v.1.05

6.4.5 Motor Vehicle Emission Budgets

Based on the findings above, this Plan makes no findings of significance for NO_X, VOC, SO_X, NH_3 or fugitive road construction dust; however does find that re-entrained road dust is significant. Conformity budgets are being established for $PM_{2.5}$ for the years 2019 and 2022 (Table 6-5). The $PM_{2.5}$ budget includes direct $PM_{2.5}$ from tire wear, brake wear and exhaust, and paved and unpaved road dust from the $PM_{2.5}$ emissions inventory. It is important to note that the regional road dust controls (Rules 800, 803, 804, and 805) will continue to provide additional emission reductions into the future.

Table 6-5. Transportation Conformity Budgets ($PM_{2.5}$ tons per day) (Annual)

2012	2019	2022
2.6	1.8	1.7

Source: CEPAM v.1.05

7 Border Strategic Concepts

7.1 Introduction

This chapter discusses the ICAPCD's overall involvement in working cooperatively with counterparts from Mexico to develop emission reductions strategies and projects for air quality improvement at the border and to provide public information and education and a forum to border residents. In August 2012, the U.S. and Mexico signed the U.S.-Mexico Environmental Program Border 2020. Border 2020 is a cooperative effort between the USEPA, Mexico's SEMARNAT, the four U.S. border states (Texas, New Mexico, Arizona, and California), and the six Mexican border states (Tamaulipas, Nuevo León, Coahuila, Chihuahua, Sonora, and Baja California), plus 26 U.S. border tribes. The initiative is to improve the environment by focusing on cleaning the air, providing safe drinking water, reducing the risk of exposure to hazardous waste, and ensuring emergency preparedness along the U.S.-Mexico border. By improving the environment, both countries seek to protect the health of the people who live along the international border.

The two countries strive to achieve these goals through local input from states, local governments, and citizens. Within the Mexicali and Imperial Valley area, the Air Quality Task Force (AQTF) has been organized to address those issues unique to the border region known as the Mexicali/Imperial air shed. The AQTF membership includes representatives from federal, state and local governments from both sides of the border, as well as representatives from academia, environmental organizations, and the general public. This group was created to promote regional efforts to improve the air quality monitoring network, emission inventories and air pollution transport modeling development, as well as the creation of programs and strategies to improve air quality. Air quality improvement programs are used as a valuable resource by the local environmental managers to determine connections between air quality, land use, communications infrastructure, and economic development issues.

Following is a brief summary of some of the projects in which the ICAPCD, in conjunction with the AQTF, CARB and USEPA, participates to address or evaluate emissions at the border and educate the communities on the impact of air pollution in this region.

7.1.1 Web-Based Air Quality and Health Information Center

ICAPCD and CARB, in cooperation with the USEPA, operate a web-based air quality and health information center for Imperial County (available at: http://www.imperialvalleyair.org/). Through this project, the community is able to take advantage of the real-time data collected by the CARB- and ICAPCD-operated monitoring stations, including data for ozone and particulate matter (i.e., $PM_{2.5}$ and PM_{10}). The website allows residents to sign up to receive email, text, or push notifications (via the Imperial Valley Air Quality mobile app) when air quality in the region reaches unhealthy levels. Features of the mobile app include a forecast discussion with related weather information, an explanation of the Air Quality Index (AQI), a "locate me" GPS based notification, and an identification of the cities where air monitoring stations are located. The overall purpose of this project is to enable schools and after-school programs, as well as others in the county, to make informed choices to reduce their exposure to air pollutants and to be prepared to use prescribed treatments, such as inhalers, when air pollution reaches levels that could adversely affect their asthma or other respiratory ailments.

7.1.2 AQI Advertisement

Asthma is a common health issue in Imperial County. Education in daily air quality conditions is a great need for the community. In order to promote air quality awareness and protection, the ICAPCD established an AQI Advertisement Campaign with the purpose of educating and alerting the community of the daily particulate risk levels. The campaign serves as a visual communication method by utilizing a marquee at a highly trafficked area of the county as well as a local radio and television station which includes website displays of AQI alerts. The advertisement is based on AQI colors that are easily understood by all ages. Overall, the goal of the program is to alert the community of daily air quality conditions to protect children and adults prone to asthma.

AQI Marquee at Imperial Valley Mall is an electronic billboard that features advertising displays to the north and south. The billboard system allows for the customer to change the advertisement to display real-time data, if need be. For example, this system has the capability to display the AQI and can be used to display an AQI alert. In addition, the marquee may be modified any time of the day to provide other air quality information to residents in Imperial County and Mexicali who visit the Imperial Valley Mall. Such notifications may include ICAPCD board hearings, workshops, and incentive programs as well as AQTF events.

AQI Media Advertisements include a one-year advertisement agreement with Entravision/Univision, a local high–rated and frequently-viewed television station. Viewers will be informed of the air quality forecast, the current AQI, and the AQI website, while the sponsorship logo (i.e., the USEPA), telephone, and website will be displayed throughout the segment which occurs twice a day during the morning and evening news. The AQI Media Advertisements also include a one-year agreement with high-rated radio station which will announce the AQI, air quality forecast, and Imperial County AQI website[47] three times a day for 30 seconds. This package deal also includes a one-year advertisement on three local radio and television websites.

7.1.3 Mexicali and Imperial County Educational Media Campaign

As stated in Appendix A, the majority of violations of the $PM_{2.5}$ NAAQS occurring at the Calexico monitoring station occur during the months of December and January. It is during these months when continual stagnant conditions with light winds predominate in this region. These conditions, coupled with the tradition in Mexicali of burning wood, tires, etc. for warmth during cold nights, lead to violations of the PM_{10} and $PM_{2.5}$ standards in Calexico. Uncontrolled open burning in Mexicali is primarily a cultural problem. Also, it is a tradition to use fireworks during the winter holidays in Mexico, which exacerbates the air pollution problem in this area.

Since this problem is primarily cultural, it is imperative that all members of Mexicali's community, in particular children and young adults, learn about the consequences of open burning of tires, wood, fireworks, etc. to instil a change of attitude in the community with respect to this subject. This is expected to be accomplished through an ongoing educational media campaign targeting

[47] http://www.imperialvalleyair.org/

the city of Mexicali, so that all age groups can understand the air quality problem and be informed of how they can help prevent or minimize air pollution in the Mexicali region.

Therefore, through a collaborative and cooperative effort between the Border 2020 program, the USEPA, and the Border Environmental Cooperation Commission (BECC), the ICAPCD and the Imperial Valley-Mexicali AQTF through the Border 2020 program have been funding a "no burn" radio and television Environmental Educational Media Campaign ("Campaign") to help educate the Mexicali community concerning the impacts from open burning upon the regional air quality. The Campaign encourages a "no burn" mentality and promotes awareness for the wellbeing of the region's health and environment. Community education and awareness on the management and prevention of burning is a shared public-private responsibility. As such, ICAPCD is the lead agency for this Campaign, and the Secretariat of the State of Baja California is focused on the media portion of the project. The radio and television Campaign objectives are the following:

- Educate the community regarding the status of the air quality in the region and the consequences of open burning of tires, wood, fireworks, etc.;
- Educate young adults with the goal to create environmental advocates who care for and respect the environment;
- Raise public awareness around the serious consequences of open burning of tires, wood, fireworks, etc. on regional air quality;
- Work towards creating a "no burn" mentality; and
- Improve community leadership involvement.

The media slogan, ***"Because the future is in your hands: Ambientalizate! (Environmentalize)"*** is the dominant element of the Campaign. The Campaign is focused on days that are likely to violate the federal health standard for air quality, traditionally during the holiday season in December and January. Therefore, the media transmissions are aired in phases to capture the period of most pollution. There are three audience profiles the Campaign targets: children in kindergarten to sixth grade, young adults in junior high to high school and the general public.

The first step of the Campaign targeted the education of the health and air quality impacts resulting from the burning of fireworks, tires, and wood. Because of the deeply entrenched cultural tradition behind the practice of open burning and the use of fireworks during holiday celebrations, expectations are that a "no burn" mentality will be difficult to achieve. However, again, there is a need to disseminate a complete awareness to the affected community of the health and air quality impacts that occur as a result of current cultural traditional practices. The affected community, in turn, can then understand the long-term harm that will continue should these cultural traditional practices not change.

The ICAPCD started implementing this Campaign in 2011. The Campaign media advertisements have a series of five 20-second television and radio spots that are geared towards the "no burn" mentality. For example, one spot emphasizes the health impacts caused from the burning of wood and tires. Similarly, another spot emphasizes the health impacts caused by fireworks. The ICAPCD is committed to yearly implementation of the Environmental Educational Media

Campaign, as funding allows. The Campaign has opened many avenues of communication with Mexicali's community and it carries tremendous power to educate all audiences.

7.1.4 Vehicle Idling Emissions Study at Calexico East and Calexico West Ports of Entry (POE)

Reducing emissions of PM and NO_X from idling vehicles at ports of entry is one of the most important air quality challenges facing the Imperial County and Mexicali region. Even with standards taking effect over the next decade for idling vehicles, millions of vehicles will continue to emit large amounts of NO_X, PM, and air toxics, which contribute to serious public health problems.

It is important to understand the impacts and to evaluate the amount of air emissions generated by idling vehicles at the Calexico East and Calexico West ports of entry (POE). On behalf of the AQTF, in 2014, the ICAPCD was selected as a grantee by BECC to study border idling. The ICAPCD hired a consulting firm to develop an analysis with two essential elements. The first element was to determine the vehicle idling impacts at both POE. The second element, crucial to any air quality improvement, was the identification of emission reduction strategies that U.S.-Mexican planning agencies could implement at both POE to reduce impacts on the general population. Estimating emissions from idling vehicles and identifying potential control strategies can be helpful in securing organizational support for federal, state, and local governments on both sides of the border. Overall, this project estimated PM and NO_X emissions from northbound idling vehicles waiting at two POE and identified emission reduction strategies (with accompanying PM and NO_X reductions) that U.S. and Mexican planning agencies could implement at the POE.

7.1.4.1 Results

The first phase of this study focused on the collection of real-world data to better characterize and understand the emissions and causes of delay at the POE. The second and third phases of this study focused on estimating seasonal emissions of $PM_{2.5}$, ROG, and NO_X at the POE under existing (2014) conditions and with several strategies to reduce those emissions. In addition, to analyze existing conditions and an idealized no POE delay scenario, seven emission reduction scenarios were studied:

- Phase 1 of the Calexico West POE reconstruction project;
- Phase 2 of the Calexico West POE reconstruction project;
- Use of California fuel in Mexicali;
- A reduction in empty general-purpose truck trips;
- Replacing 10 percent of general-purpose truck trips to FAST truck trips;
- Streamlining commercial crossing by combining the Aduanas and U.S. Customs and Border Protection (CBP) primary inspections; and
- The Section 559 Proposal to expand the Calexico East POE.

Table 7-1. POE Study Results Summary

Best Management Practice – Emission Reduction Strategy	Number of Privately Owned Vehicles That Would Need to be Removed or Subjected to a Scrappage Program to Achieve Similar Emission Reductions			Control Strategy Rank by Pollutant	
	NOx	$PM_{2.5}$	ROG	NOx and $PM_{2.5}$	ROG
Calexico East Section 559 Proposal, with Calexico West Phase 1 POE Project	634 vehicles	469 vehicles	1371 vehicles	1	2
Combine Aduanas and CBP Primary	469 vehicles	366 vehicles	90 vehicles	2	5
Calexico West Phase 1 and 2 POE Project	315 vehicles	229 vehicles	1310 vehicles	3	3
Calexico West Phase 1 POE Project	98 vehicles	68 vehicles	681 vehicles	4	4
Shift 10 percent of Commercial General-Purpose to FAST	80 vehicles	68 vehicles	19 vehicles	5	6
Reduction in Empty Commercial General-Purpose Volume	33 vehicles	26 vehicles	6 vehicles	6	7
California Fuel in Mexicali	0 vehicles	0 vehicles	1638 vehicles	7	1

The results indicate that border delay accounts for about 63 percent of the ROG emissions, 46 percent of the NO_X emissions, and 53 percent of the $PM_{2.5}$ emissions from northbound vehicles crossing into the United States on an annual basis. The emissions associated with border delay are equivalent to the TOG emissions from 2,700 passenger vehicles in Imperial County, the NO_X emissions from 4,400 passenger vehicles in Imperial County, and the $PM_{2.5}$ emissions from 3,450 passenger vehicles in Imperial County. The results above are shown as the equivalent number of privately owned vehicles in Imperial County that would need to be removed from the vehicle fleet to achieve the same air quality emissions benefit.

7.1.5 Program to Improve Air Quality in Mexicali 2011-2020

The Mexican government has developed ProAire, a very ambitious program to reduce air emissions in Mexicali. Reducing $PM_{2.5}$ emissions in Mexicali is crucial to the reduction of the transport of air emissions into Imperial County. The reduction of such transport of air emissions will greatly reduce the impact of poor air quality in both air sheds. The ICAPCD actively participated during the development of the air program for Mexicali, as an expert air quality agency, by reviewing and providing constructive comments through bi-national meetings such as the AQTF. It is worthy to note that neither ICAPCD, CARB, nor the USEPA has any jurisdictional

authority over emission sources in Mexico. This program includes actions to reduce air emissions from different source categories.

The ProAire program represents a collaborative effort between the federal, state, and municipal governments, along with industry and the community to improve the quality of life in the Mexicali community and to reduce the risk of exposure to air pollution. This program identifies agricultural burning, paved and unpaved roads, and power generation as the main sources of direct $PM_{2.5}$ emissions in Mexicali. The program includes actions to reduce air emissions from these source categories, as follows:

- Regulating agricultural burning and developing a diagnosis of the current state of agricultural burning in Mexicali in order to establish the meteorological and size conditions under which agricultural burning can be allowed. In addition, establishing a model to incentivize reduction of agricultural burning and identifying other alternatives to agricultural burning. This program is projected to be implemented in 2019.
- Developing a strategy to reduce particulate emissions from paved and unpaved roads. This would involve evaluating potential sustainable paving techniques as well as identifying financial sources to implement and incentivize road paving programs. This program is projected to be implemented in 2020.
- Establishing agreements with power generation facilities to evaluate the significance of their air emissions on air quality and public health and to identify new actions to reduce and control their air emissions. The goal would be to implement these actions for every power generation facility in the Mexicali area. The ProAire program would also look to promote and develop renewable energy projects. This program is projected to be implemented in 2020.

8 Conclusion and SIP Checklist

8.1 Checklist of SIP Requirements and Conclusions

A checklist of the 2012 $PM_{2.5}$ NAAQS requirements pertinent to the 2018 Annual $PM_{2.5}$ SIP (as outlined both in the CAA Part D, Subpart 1, Section 172, Nonattainment Plan Provisions, and Subpart 4, Section 189, Plan Provisions and Schedules for Plan Submission) for Moderate nonattainment areas is presented in Table 8-1. As documented in Table 8-1, all SIP requirements applicable to the 2018 Annual $PM_{2.5}$ SIP have been successfully addressed.

Table 8-1. Clean Air Act Regulatory Requirements

General Requirements	CAA Citation	Description	2018 Annual $PM_{2.5}$ SIP
RACT/RACM	**172(c)(1) and 189(a)(1)(C)**	**SIP provisions should provide for the implementation of reasonably available control measures (RACM), including at a minimum, reasonably available control technologies (RACT).**	**Chapter 5**
RFP	**172(c)(2)**	**SIP provisions should provide for reasonable further progress (RFP).**	**Section 6.1**
Quantitative Milestones	**189(c)(1)**	**SIP provisions should include quantitative milestones which are to be achieved every 3 years until the area is redesignated attainment and which demonstrate reasonable further progress.**	**Section 6.2**
Contingency Measures	**172(c)(9)**	**The SIP must contain contingency measures that must be implemented (without the need of additional rulemaking actions) in the event that the area fails to make reasonable further progress or to attain the NAAQS by the attainment date.**	**Section 6.3; attainment contingency not required for areas seeking approval under CAA Section 179(B).**

Table 8-1. Clean Air Act Regulatory Requirements

General Requirements	CAA Citation	Description	2018 Annual $PM_{2.5}$ SIP
Emissions Inventory	**172(c)(3)**	**The SIP must include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutants in the area.**	**Chapter 3 presents $PM_{2.5}$ and $PM_{2.5}$ precursor inventories for the baseline year (2012), attainment year (2021), and two milestone years (2019 and 2022). Chapter 3 also includes a breakdown of condensable versus filterable $PM_{2.5}$ emissions.**
NSR	**172(c)(4-5) and 189(a)(1)(A)**	**The SIP must identify and quantify the emissions of pollutants with Section 173(a)(1)(B), from the construction and operation of major new or modified stationary sources in the area. The SIP must require permits for new or modified stationary sources.**	**Section 5.2.1**
Attainment Demonstration	**179(B)(a) and 189(a)(1)(B)**	**CAA provides the State with an option to demonstrate that a nonattainment area would meet the NAAQS "but for" emissions emanating from outside of the United States.**	**Chapter 4 and Appendix A demonstrates the Imperial County nonattainment area would be in attainment "but for" emissions from Mexico.**

9 References

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APPENDIX A
CLEAN AIR ACT SECTION 179(B) TECHNICAL DEMONSTRATION

APPENDIX B
$PM_{2.5}$ AND $PM_{2.5}$ PRECURSOR EMISSION INVENTORIES FOR THE IMPERIAL COUNTY $PM_{2.5}$ NONATTAINMENT AREA

APPENDIX C
REASONABLY AVAILABLE CONTROL MEASURE ANALYSIS FOR AREA SOURCE CONTROL MEASURES

APPENDIX D
SUPPORTING RULE AND CONTINGENCY EMISSIONS CALCULATIONS

APPENDIX E
AGRICULTURAL AND OPEN BURNING RULE COMPARISON