Staff Report

CARB Review of the Eastern Kern Air Pollution Control District 2017 Ozone Attainment Plan for 2008 Federal 75 ppb 8-Hour Ozone Standard

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California Environmental Protection Agency
Air Resources Board

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EXECUTIVE SUMMARY

This report presents the California Air Resources Board (CARB or Board) staff's assessment of the 2017 Ozone Attainment Plan (2017 Plan) prepared by the Eastern Kern Air Pollution Control District (District.) CARB staff has concluded that the 2017 Plan meets the State Implementation Plan (SIP) planning requirements of the federal Clean Air Act (Act), including attainment demonstration, reasonably available control measure demonstration, reasonable further progress demonstration, contingency measures for progress and attainment, and transportation conformity budgets. The Board is scheduled to consider the 2017 Plan on September 28, 2017. If adopted, CARB will submit the 2017 Plan to the U.S. Environmental Protection Agency (U.S. EPA) as a revision to the California SIP, and will request U.S. EPA classify the Eastern Kern Nonattainment Area (Eastern Kern) as Serious with an attainment date of July 20, 2021.

The Act requires U.S. EPA to set air quality standards and periodically review the latest health research to ensure that standards remain protective of public health. Based on research demonstrating adverse health effects at lower exposure levels, U.S. EPA has set a series of increasingly health protective ozone standards, beginning with a 1-hour ozone standard in 1979. Subsequent health studies demonstrated the greater effects of exposure to ozone over longer time periods, resulting in U.S. EPA establishing an 8-hour ozone standard of 80 parts per billion (ppb) in 1997, and the 75 ppb standard in 2008. CARB and the District have developed a series of SIPs defining actions needed to meet these standards, with each SIP and the corresponding control programs providing the foundation for subsequent planning efforts. The SIP process established under the Act has been an important driver for air quality progress in Eastern Kern.

The 2017 Plan addresses the 2008 federal 8-hour ozone standard of 75 ppb, representing the next building block in planning efforts to meet increasingly health protective air quality standards. The District's ozone strategy has relied on concurrent reductions of oxides of nitrogen (NOx) and reactive organic gases (ROG) emitted by stationary and mobile sources. The ROG emissions (also called volatile organic carbons or VOCs in the 2017 Plan) react with NOx gases to form ozone.

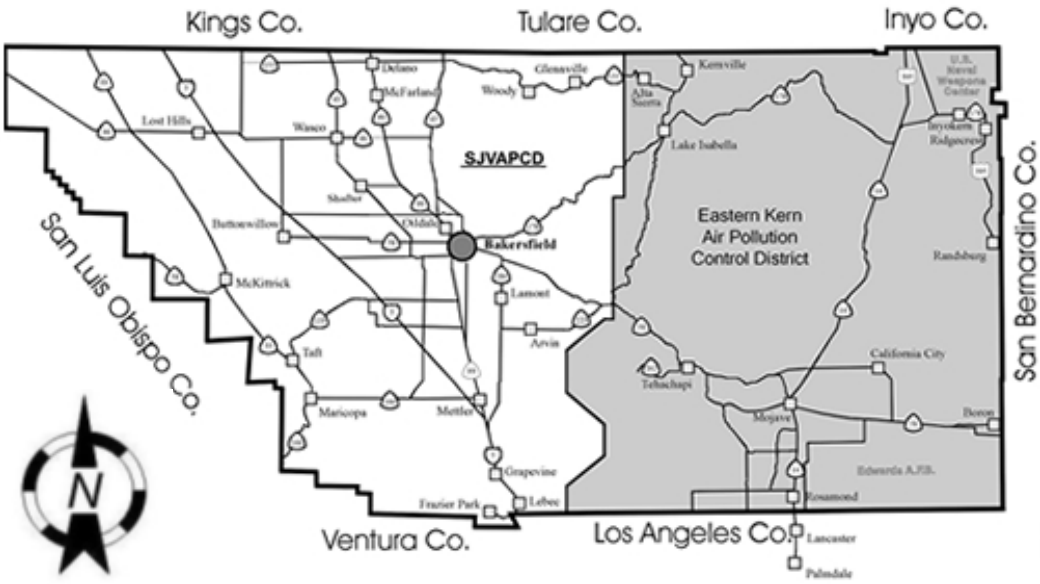
Over the past decade ozone levels in Eastern Kern have shown measurable improvement in response to reductions in emissions of NOx and ROG from current control programs, despite an almost 10 percent increase in population for the nonattainment area (2008-2017). Most of these reductions come from on-road mobile sources. CARB's comprehensive strategy to reduce emissions from mobile sources consists of emission standards for new vehicles, in-use program to reduce emissions from existing vehicles and equipment fleets, cleaner fuels, and incentive programs to accelerate market penetration of the cleanest vehicles beyond what is achieved by regulations alone. These programs will provide 21 percent reductions in NOx and 26 percent reductions in ROG over the proposed planning period (2008-2020) to achieve attainment of the standard by the Serious attainment deadline of 2021.

I. BACKGROUND

The Act requires U.S. EPA to set air quality standards and periodically review the latest health research to ensure that standards remain protective of public health. Based on research demonstrating adverse health effects at lower exposure levels, U.S. EPA has set a series of increasingly health protective ozone standards, beginning with a 1-hour ozone standard in 1979. Subsequent health studies demonstrated the greater effects of exposure to ozone over longer time periods, resulting in U.S. EPA establishing an 8-hour ozone standard of 80 ppb in 1997, the 75 ppb standard in 2008 and more recently, the 70 ppb standard in 2015.

The District covers the eastern half of Kern County, shown in Figure 1. It is rural, with an estimated 2017 population of 138,699 in 3,792 square miles, bounded by mountains on the north and west that descend to the western edge of the Mojave Desert. These mountains include the southern end of the Sierra Nevada Range where it joins the Tehachapi Mountains to the southwest and the El Paso Mountains running northeast to the Searles Valley. A small portion of the District, corresponding to the Indian Wells hydrologic unit in the northeastern corner of the District, meets the 75 ppb 8-hour ozone standard.

Figure 1. Eastern Kern County Air Pollution Control District

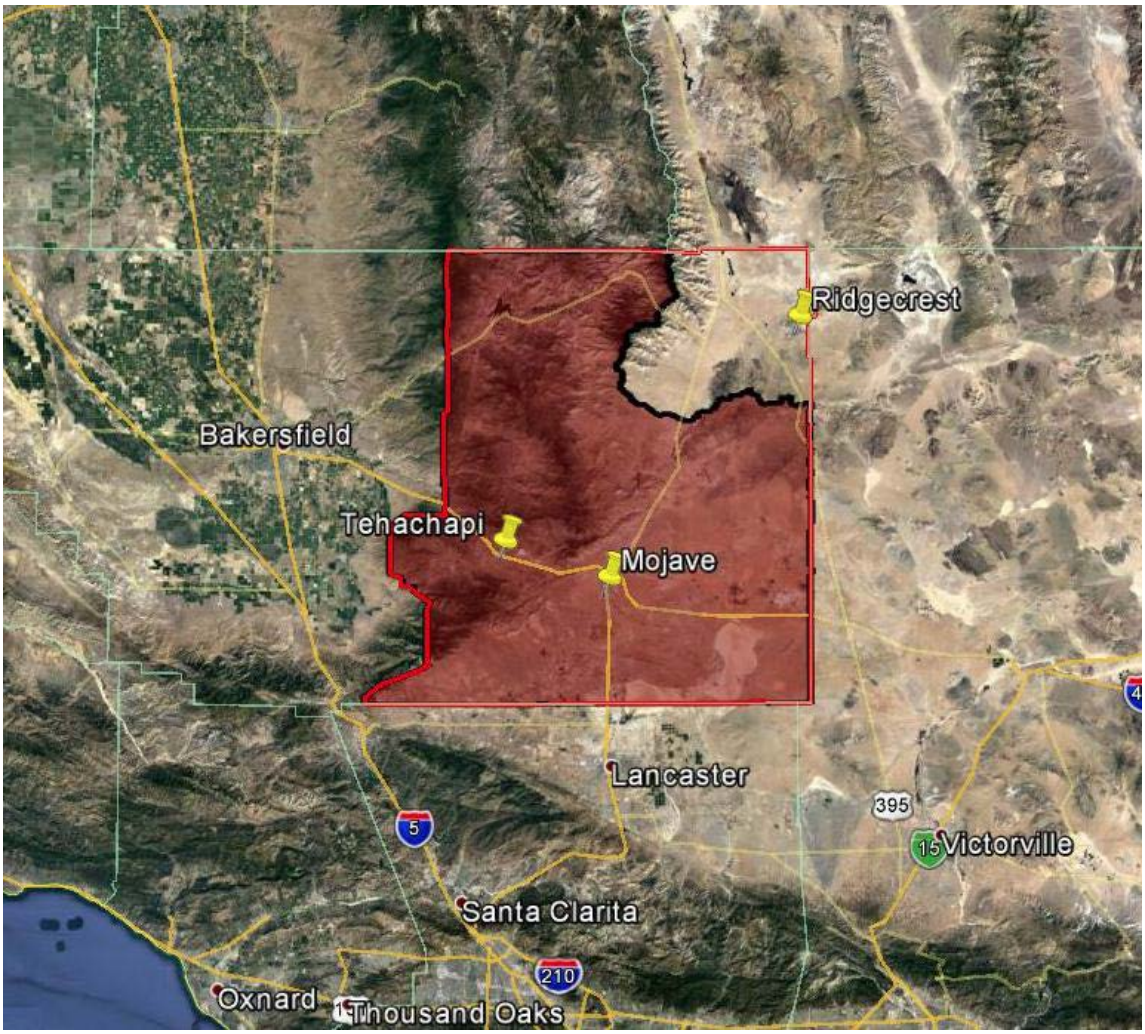


The balance of the District, shaded red in Figure 2, does not currently meet the 75 ppb 8-hour ozone standard and is named the Eastern Kern nonattainment area (Eastern Kern.) Effective June 3, 2016,[1] U.S. EPA classified Eastern Kern as Moderate with a July 20, 2018 attainment date. Eastern Kern includes a portion of the southern end of the Sierra Nevada at the Tulare County border on the north. The nonattainment

[1] 81 Federal Register 26697; May 4, 2016

area includes much of the Tehachapi Mountains, which form a geographic, watershed, habitat, and rain shadow divide separating the San Joaquin Valley to the northwest and the desert chaparral landscape of the Mojave Desert to the southeast. Eastern Kern is bounded on the east by San Bernardino County and to the south by the Antelope Valley in Los Angeles County.

Figure 2. Eastern Kern Non-Attainment Area



Source: Figure 3 from 2017 Plan, showing attainment and nonattainment areas.

The design site for Eastern Kern is in Mojave, shown in Figure 3, which is impacted by transport of ozone from upwind nonattainment areas outside of the District. Despite reductions in ozone precursor emissions in Eastern Kern, preliminary monitoring data indicates that the 2017 Design Value (DV) for Mojave will be above the 75 ppb 8-hour ozone standard. Modeling demonstrates that the area will attain the standard by 2021, based on continuous emissions reductions in upwind areas which have later attainment dates. This timing fits the attainment date for a Serious classification.

The District requests that Eastern Kern be classified as Serious for the 75 ppb 8-hour ozone standard. On July 27, 2017, the District adopted the 2017 Plan with the demonstration that Eastern Kern will attain the standard by 2021. The 2017 Plan also addresses Act requirements applicable to a Serious 8-hour ozone nonattainment area, consistent with U.S. EPA's 2015 Implementation Rule for the 75 ppb 8-hour ozone standard (Implementation Rule).[2]

II. NATURE OF THE OZONE PROBLEM IN EASTERN KERN

Eastern Kern is sparsely populated with a few small cities around the intersections of state roads and interstate highways. Edwards Air Force Base is in the southeast corner of Eastern Kern. Eastern Kern is separated by several mountain ranges from populated valleys and coastal areas with other nonattainment areas to the west and south. Passes through surrounding mountain ranges serve as "transport corridors" for ozone to Eastern Kern. The Tehachapis' crest line varies in height from approximately 4,000-8,000 feet with a pass through which runs Route 58 and a major freight rail corridor connecting the San Joaquin Valley and the Mojave Desert at a lower 2000-3000 feet in elevation. The Soledad Pass and Cajon Passes, west and east of the San Gabriel Mountains to the south of the District, connect the South Coast Air Basin with the Antelope Valley. Eastern Kern is influenced primarily by transport through the Tehachapi Pass corridor with some potential influence through Soledad Pass, as shown in Figure 3. Soledad Pass and Cajon Pass mainly influence air quality in the eastern Mojave Desert due to prevailing wind directions, but can transport pollutants to the District's southeast corner near the Edwards Air Force Base.

The 2017 Plan states that meteorological data in and near Eastern Kern shows relative humidity in eastern Kern to be low in the summer with an average humidity below ten percent during the hottest part of the day.[3,4] Temperatures can be in excess of 95° Fahrenheit between the months of May and September, with almost no rainfall. This combination of dry, hot, clear days results in intense solar radiation that is instrumental in formation of photochemical ozone. Elevated ozone levels occur during the late spring through early fall, when high temperatures and stable atmospheric conditions favor ozone formation. These concurrent meteorological conditions[5] are favorable to ozone formation in upwind non-attainment areas also. Ozone generally reaches peak levels by mid-afternoon, such that ozone and ozone precursors are often transported towards Eastern Kern via the passes on prevailing winds, causing exceedances in Eastern Kern, beyond what ozone is attributable to Eastern Kern emissions alone.

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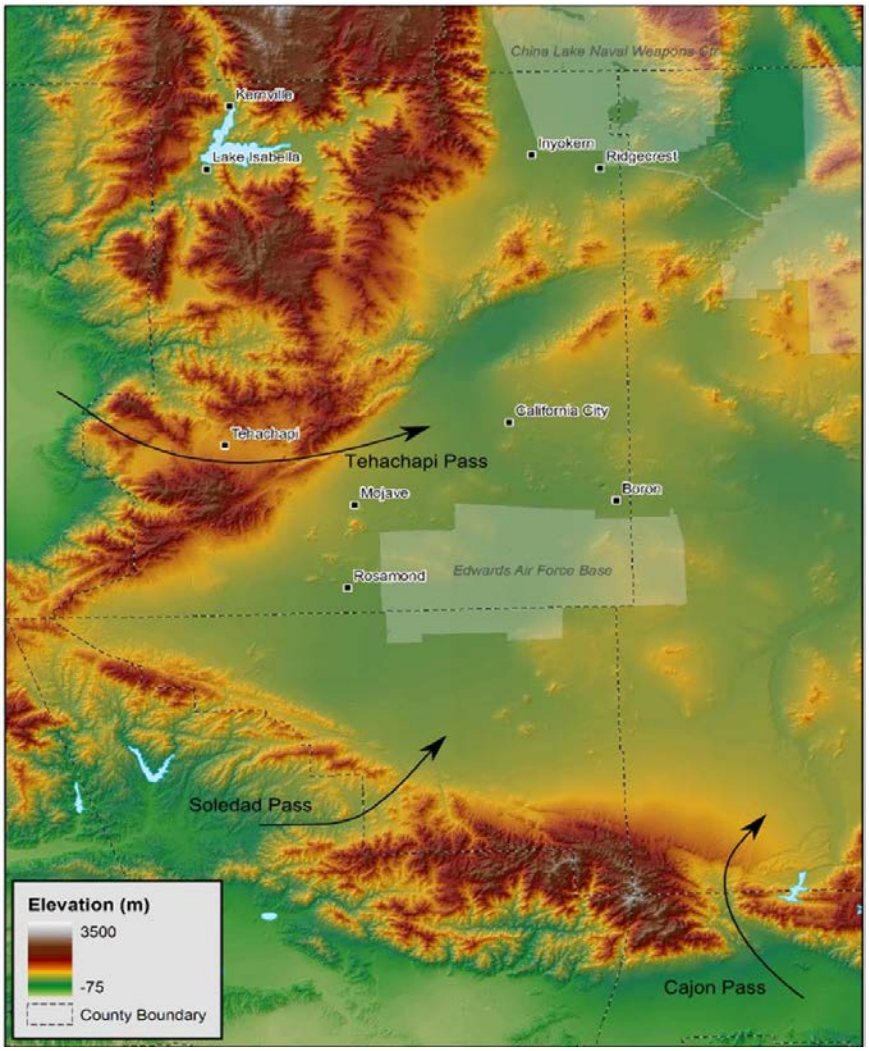
[2] 80 Federal Register 12264, March 6, 2015

[3] Ambient air monitoring data was collected at air monitoring stations in Mojave (Eastern Kern APCD), Bakersfield, Edison, Oildale, and Arvin (SJVAPCD); Lancaster (SCAQMD), and Barstow and Trona (MDAQMD)

[4] Meteorological data was obtained from the following airports: Mojave Airport, Edwards Air Force Base, Meadows Field, Naval Air Weapons Station, Lancaster, Ontario, San Bernardino, and Daggett.

[5] The following components were analyzed: surface winds, winds aloft, estimated transport time, daily streamlines, surface airflow types, air parcel trajectories and daily maximum temperature.

Figure 3. Ozone Transport Corridors



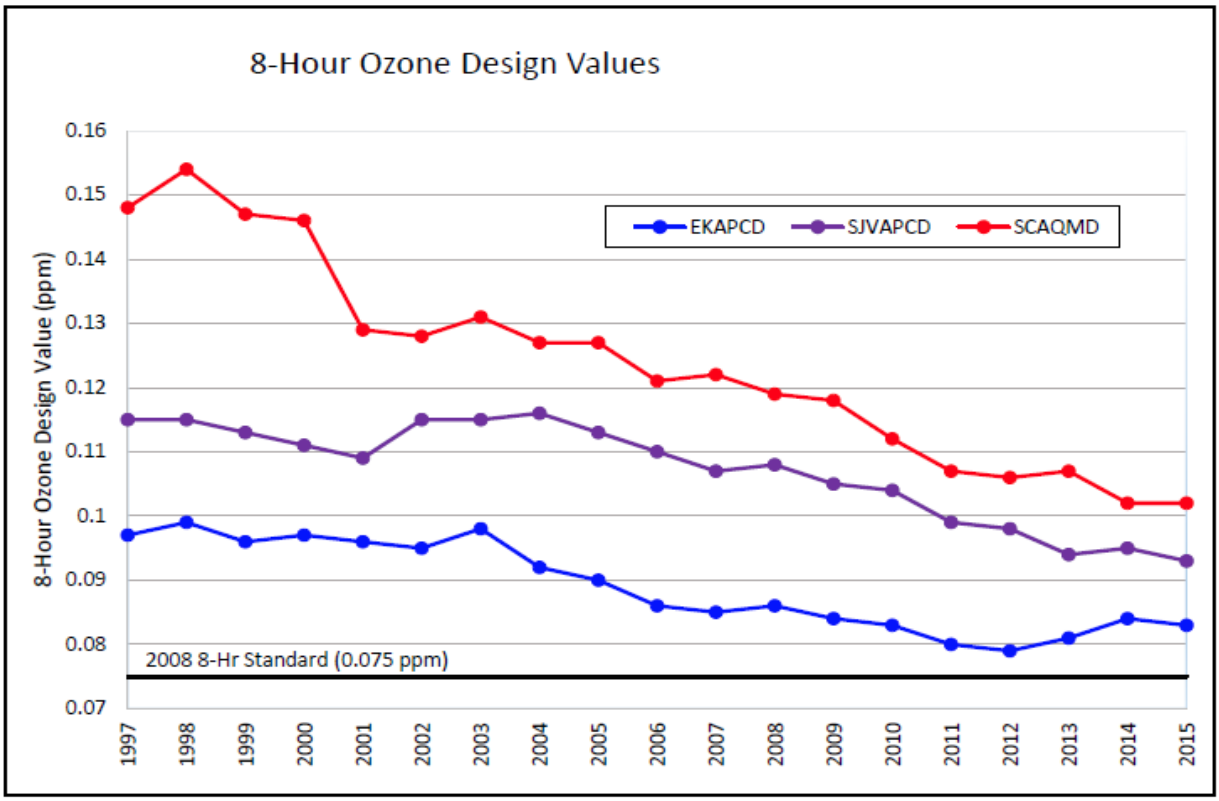
Source: *"Eastern Kern Air Pollution Control District Reasonably Available Control Technology (RACT) State Implementation Plan (SIP) for the 2008 Ozone National Ambient Air Quality Standards (NAAQS)"* adopted by the District Board on May 11, 2017.

Much of Eastern Kern is open space and undeveloped, which limits ozone precursor emissions from existing sources in the nonattainment area. Prevailing winds through the Tehachapi Pass are suitable for supporting extensive wind farms in Eastern Kern. Other land uses include mineral mining, cement plants, aeronautic- and aerospace-related industries, utility-scale solar panel arrays, and residential development for employees at the air base and other industries. Ranching and agriculture occurs along the tributaries to the Kern River flowing from the Sierra Nevada into the San Joaquin Valley, but agricultural activities are limited in the desert portion of Eastern Kern. Biogenic emissions of ROG are considerably higher in Eastern Kern than man-made emissions, which may also affect the photochemical reactions with NOx generated in Eastern Kern and transported from elsewhere, as discussed in "Section III. Attainment Demonstration" and Appendix F of the 2017 Plan.

Air quality in Eastern Kern has improved since 2000. Between 2000 and 2015, NOx and ROG emissions were reduced by 37 and 38 percent, respectively. Effective January 3, 2013, the entire District was deemed to have "clean data" with respect to the 80 ppb 8-hour ozone standard.[6] Eastern Kern is also making steady progress towards the 75 ppb 8-hour ozone standard. Between 2000 and 2015, the DV decreased by 14 percent and the number of exceedance days declined by 74 percent.

Design Values are used to demonstrate an area's ozone compliance status in relation to the standard. The DV is the 4th high, 8-hour ozone value averaged over three years. Figure 4 shows the DV concentrations at the Mojave monitoring site from 2000 to 2015, compared with upwind nonattainment areas. Improvements over the long-term were slower in recent years with slight increases in 2014 and 2015 coincident with increases in DVs in two upwind nonattainment areas, the San Joaquin Valley Air Basin and the South Coast Air Basin. The coincident higher ozone DVs in 2013 and 2014 in Eastern Kern, perhaps indicate regional meteorological and transport influences.

Figure 4. Comparison of Regional Ozone Design Value Trends



Source: Figure 6 from the 2017 District Plan, showing Federal 8-Hour Ozone Design Value Trends

[6] 77 Federal Register 71551, December 3, 2012

III. DEMONSTRATING ATTAINMENT

SIPs must identify both the magnitude of emission reductions needed and the actions necessary to achieve those reductions as part of demonstrating attainment of the standard. The District has prepared an attainment demonstration that addresses expeditious attainment of the 75 ppb 8-hour ozone standard. The attainment demonstration takes into account: (1) the emissions reductions within Eastern Kern; (2) the influence of transport from upwind source regions, including the San Joaquin Valley Air Basin and the South Coast Air Basin on Eastern Kern ozone levels; and (3) recent monitoring measurements. Given these inputs, the attainment demonstration includes an assessment of achieving the standard by the mandated Moderate and the Serious attainment deadlines. The demonstration concludes that attaining the standard by the Serious area deadline of July 20, 2021 is achievable. This timeline accommodates the pace of reductions expected from the upwind nonattainment areas with longer attainment schedules.

The Act requires the use of air quality modeling to relate ozone levels to emissions in a region and simulate future air quality based on changes in emissions. The modeled attainment demonstration in this plan was prepared using photochemical dispersion and meteorological modeling tools developed in response to U.S. EPA modeling guidelines,[7] and recommendations from air quality modeling experts. The modeling uses emission inventories, with measurements of meteorology and air quality, to establish the relationship between emissions and air quality. Additional information and a detailed description of the procedures employed in this modeling are available in Appendices F through I of the 2017 Plan.

Eastern Kern is located within the Mojave Desert Air Basin, but is subject to transport from both the San Joaquin Valley Air Basin and the South Coast Air Basin. The photochemical modeling domain used in the 2017 Plan covers all of California, with a smaller Northern California nested domain of 4 kilometer grids which includes the Eastern Kern nonattainment area in its entirety. The modeling effort has been performed as a joint project by all of the air districts in the region.

The year 2012 was chosen as the baseline (also called reference year or base year) for attainment modeling. As recommended in the U.S. EPA modeling guidelines, the baseline DV was based on DVs from three design value periods, which included the base year. For this plan, an average DV from 2013, 2014, and 2015, was used as the anchor point to predict future DVs. These years were chosen to better account for the recent shift in Eastern Kern's DV trend after 2012, and to assess its impact on the timeframe for attainment of the 75 ppb 8-hour ozone standard. Two future years (2017 and 2020) were modeled as these are the mandated attainment deadline years for Moderate and Serious ozone nonattainment areas, respectively.

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[7] U.S. EPA, 2014, Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5 and Regional Haze, available at https://www.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf

The attainment demonstration modeling included the benefits of CARB's mobile source control program and District regulations submitted through December 2015. These measures provide the necessary control strategy, demonstrating that Eastern Kern will meet the 75 ppb 8-hour ozone standard in 2020, by the July 21, 2021 attainment date. Table 1 summarizes the 2012, 2017, and 2020 emissions modeled in the attainment demonstration. Emissions of NOx are predicted to decline by 5 percent and ROG by 18 percent, between 2012 and 2020, with the largest reductions coming from on-road mobile sources. These values are consistent with information in the planning emissions inventory in Appendix A of the 2017 Plan.

Table 1. Modeling Inventory for Eastern Kern Base Year and Attainment Years

Summer Inventory (in Tons per Day)	NOx			ROG		
Source Category	**2012**	**2017**	**2020**	**2012**	**2017**	**2020**
Stationary	16.7	18.7	19.5	0.9	1.0	1.0
Areawide	0.12	0.13	0.14	1.12	1.13	1.18
On-Road Mobile	7.0	3.7	2.9	2.2	1.2	0.9
Off-Road Mobile	6.1	6.3	5.8	4.0	3.7	3.6
TOTAL	29.9	28.7	28.4	8.2	7.0	6.7

Source: CEPAM Inventory East Kern v1.03, used for attainment modeling

Biogenic emissions used in the photochemical modeling for the summer ozone season, from May through September, were averaged at 169 tons per day (tpd) of ROG for 2012. There are no biogenic emissions of NOx. The use of biogenic emissions in modeling is discussed in Appendices K through I of the 2017 Plan.

Results of the attainment demonstration modeling are shown in Table 2. The Mojave site is projected to have a future DV of 77 ppb in 2017 and 74 ppb in 2020, which supports attainment of the 75 ppb 8-hour ozone standard by 2020.

Table 2. Future Year Design Values at Mojave Monitor

Baseline Average Design Value (ppb)	Future Year 2017		Future Year 2020	
	Relative Response Factor (RRF)	Average Design Value (ppb)	Relative Response Factor (RRF)	Average Design Value (ppb)
82.7	0.9309	77	0.9034	74

Source: Table 15, Baseline Design Value, modeled RRF, and projected future year (2017 & 2020), from the 2017 Plan

U.S. EPA modeling guidance requires that modeled attainment demonstrations be accompanied by a weight of evidence analysis (WOE) to provide a set of complementary analyses. Examining an air quality problem in a variety of ways provides a more informed basis for the attainment strategy as well as better understanding of the overall problem and the level and mix of emissions controls needed for attainment. CARB staff prepared the WOE, which is provided in Appendix A

of this Staff Report. WOE analyses include assessment of trends in ozone air quality, ozone precursor emission trends, meteorology impacts on ozone air quality trends, and summary of corroborating analyses. The WOE indicates that Eastern Kern is on track to attain the 75 ppb 8-hour ozone standard by July 21, 2021, which is consistent with DV projections derived from the regional photochemical modeling assessment.

IV. CONTROL STRATEGY

The ongoing emission reductions from continued implementation of CARB and District control strategies developed to meet prior standards provide the attainment control strategy for the 2017 Plan. The following sections highlight ongoing CARB control programs and District measures that provide the emission reductions included in the attainment demonstration.

A. CARB Control Program

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 consists of emissions standards for new vehicles, in-use programs to reduce emissions from existing vehicle and equipment fleets, cleaner fuels, and incentive programs to accelerate the penetration of the cleanest vehicles beyond that achieved by regulations alone. A detailed description of the mobile source control programs and a comprehensive list of CARB regulations are included in Appendices B and C of the 2017 Plan.

B. District Control Program

Consistent with its regulatory authority, the District has adopted rules for reducing emissions from a broad scope of stationary and area sources. These already adopted rules are enforced to maintain controls on existing sources and to specify the limits on future new sources or modifications to existing sources. The District's stationary source NOx and ROG prohibitory rules were fully addressed in the *"Eastern Kern Air Pollution Control District Reasonably Available Control Technology (RACT) State Implementation Plan (SIP) for the 2008 Ozone National Ambient Air Quality Standards (NAAQS)"* adopted by the District Board on May 11, 2017. The RACT SIP analysis followed RACT requirements for major sources with a potential to emit (PTE) 50 tons per year (TPY) or greater of ROG or NOx, the threshold for Serious attainment areas.

As part of the 2017 RACT SIP review of current rules, the District identified three rules needing amendment. These revisions to existing District rules will provide additional emission reductions beyond those in the attainment demonstration. Rule actions in Table 3 are expected to have a positive effect in reducing ozone precursor emissions, but they have not yet been quantified and will not be implemented in time to advance attainment by a year.

Table 3: Planned Rule Amendments

Existing Rule Title	Amendment Purpose	Adoption Date
425 – Cogeneration Gas Turbine Engines	Federal RACT	2017
425.2 – Boilers, Steam Generators, and Process Heaters	Federal RACT	2017
425.3 – Portland Cement Kilns	Federal RACT	2017

The District's Rule 210.1, New and Modified Stationary Source Review, meets the Serious nonattainment area threshold of 50 TPY applied to new sources and modifications to existing sources with an offset ratio of 1.2-to-1. Although the key regulatory components of Rule 210.1 currently satisfy the NOx and ROG applicability threshold and offset ratio for Serious nonattainment areas, the District plans to amend Rule 210.1 in the near future to include new and revised terms and definitions along with additional U.S. EPA requirements.

V. CLEAN AIR ACT REQUIREMENTS

In addition to the elements related to the attainment demonstration, the Act also requires SIPs for Serious ozone nonattainment areas to address the following elements:

- Base year emission inventories and future year forecasts for manmade sources of ozone precursors;
- Demonstration that control measures meet reasonably available control measures (RACM) level;
- Provisions that demonstrate reasonable further progress (RFP);
- Provisions for sufficient contingency measures for RFP and attainment; and
- Transportation conformity emission budgets to ensure transportation projects are consistent with the SIP.

A. Emission Inventory

An emissions inventory is a critical tool used to evaluate, control, and mitigate air pollution. At its core, an emissions inventory is a systematic listing of the sources of air pollutants along with the amount of pollutants emitted from each source or category over a given time period. The planning emissions inventory is divided into three major categories: stationary, area-wide, and mobile sources. The summer season inventory is used for ozone planning because it reflects the activity levels and conditions presented when higher ozone levels occur in California.

The 2017 Plan uses a 2012 base year inventory. The inventory uses 2012 emissions and activity levels; inventories for other years are backcast or forecast from that base inventory. On-road motor vehicle emissions were generated using CARB's mobile source emissions model, EMFAC2014. On-road motor vehicle activity data reflect

projections provided by the Kern County Council of Governments (COG) from their Federal State Transportation Improvement Program (FSTIP) adopted September 2016. Off-road mobile source emissions were generated using CARB's OFFROAD model. Both models were developed for use in the most recent SIP revisions, and represent significant improvements over models used in prior SIP updates.

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 emissions forecasts by applying growth and control profiles to the base year inventory. Point-source emissions in the backcast years are figures reported by the District for those years. Stationary aggregated and areawide emissions for backcast years are estimated in the same way as the forecast, by applying growth parameters and control profiles to 2012 emissions. All of CARB's growth parameters and control profiles run back to 2000. Mobile source emissions are estimated in the backcast years with the same models that were used for the forecast years.

The forecasted and backcasted inventories reflect values that are derived from the base year emissions; thereby, the 2008 inventory is consistent with the 2012 inventory. As required, the planning inventory year of 2008 is consistent with the baseline year for the RFP demonstration. Table 4 shows the trends in man-made source category emissions from 2008, the first year benchmark for the reasonable progress demonstration, and 2020, the year modeled to demonstrate the attainment for a Serious classification. The 2012 base year inventory is included since it was used for backcasts and forecasts, with adjustments made for changes in economic production and population growth.

Table 4. Emissions Source Categories in Eastern Kern

EMISSIONS (tons per day)	2008 Baseline Planning Emissions		2012 Base Year Inventory Emissions		2020 Attainment Year Emissions	
	ROG	NOx	ROG	NOx	ROG	NOx
Stationary (Point)	1.111	19.286	0.943	16.674	1.015	19.387
Areawide	1.205	0.123	1.117	0.122	1.223	0.136
Mobile (On-Road)	2.896	9.987	2.415	7.608	1.052	3.361
Mobile (Off-Road)	4.134	7.08	3.906	6.096	3.625	5.83
TOTAL (rounded)	9.35	36.48	8.38	30.50	6.92	28.71

Source: Appendix A of the 2017 Plan (ROG is labeled VOC in the 2017 Plan)

Federal New Source Review (NSR) rules require new and modified major stationary sources that increase emissions in amounts exceeding specified thresholds to provide emission reduction offsets to mitigate the emissions growth. Emission reduction offsets represent either on-site emission reductions or the use of banked emission reduction credits (ERCs). ERCs are voluntary, surplus emission reductions, which are registered, or banked, with the District for future use as offsets to permitted emissions growth.

Per U.S. EPA policy, ERCs banked before the emission inventory base year (2012 for this plan) must be explicitly treated as emissions in the air. Table 5 shows the ERCs registered with the District for future use as offsets. Further detail on ERCs is provided in "Section VII.C. Banked Emission Reduction Credits" and Appendix D of the 2017 Plan. All ERCs were added to the 2017 and the 2020 forecast inventories for the reasonable further progress demonstration.

Table 5. Eastern Kern Emission Reduction Credits (ERC)
(Balance as of June 2017)

Pollutant	ERC Total in Tons per Day
NOx	0.12
ROG	0.04

Source: 2017 Plan, Appendix D

The Act requires ozone nonattainment areas to have an Emissions Statement program that mandates stationary sources with emissions over 25 TPY of NOx or ROG report and certify the accuracy of NOx and ROG emissions annually. The District's Rule 108.2 - Emissions Statement Requirements, addresses this requirement as explained in "Section VIII. Emission Statement Certification" of the 2017 Plan.

B. Reasonably Available Control Measures Demonstration

As specified in the Act, the SIP shall provide for the implementation of RACM as expeditiously as practicable to provide for attainment of the ozone standard. RACM must also include emission reductions from existing sources that may be obtained through the adoption, at a minimum, of reasonably available control technology (RACT). The U.S. EPA has interpreted RACM as those emission control measures that are technologically and economically feasible and when considered in aggregate, would advance the attainment date by at least one year. The 2017 Plan contains a RACM analysis that demonstrates no new measures were identified that would advance attainment from 2020 to 2019. The discussion is in "Section XI. Reasonable Available Control Measures Demonstration" of the 2017 Plan. Further details regarding reductions from statewide programs specific to Eastern Kern are contained in Appendix E and J of the 2017 Plan.

C. Reasonable Further Progress Demonstration

The Act and the Implementation Rule specify that each ozone nonattainment area must demonstrate ongoing emission reductions relative to the planning inventory base year. Eastern Kern used 2008 as the planning inventory base year in order to show the large reductions in emissions from programs implemented in the years immediately following promulgation of the 2008 8-hour ozone standard, as permitted in the Implementation Rule. Federal law requires a three percent per year reduction in ROG emissions. Where both ROG and NOx emissions have been shown to contribute to high ozone

levels, the Act allows NOx emission reductions to augment ROG emission reductions in order to demonstrate reasonable further progress (RFP.)

The 2017 Plan includes an RFP demonstration that meets the Act's requirements. The analysis indicates that the adopted measures from CARB's mobile source program will provide emissions reductions beyond those needed for Eastern Kern's RFP demonstration. As discussed below, an additional three percent of NOx reductions for ROG substitution are set aside for RFP contingency purposes. Further information on the RFP demonstration can be found in "Section XII. Reasonable Further Progress (RFP)" of the 2017 Plan.

D. Contingency Measures

The Act requires contingency measures to provide additional emission reductions in the event a nonattainment area fails to achieve RFP targets or attain by the deadline (Act sections 172(c)(9), 182(c)(9).) A recent Ninth Circuit decision, Bahr v. U.S. EPA, (9th Cir. 2016) 836 F.3d 1218, found that U.S. EPA approval of certain types of contingency measures in an Arizona particulate matter SIP were not consistent with the Act's contingency requirements.

ARB staff expects that U.S. EPA will revise its guidance on contingency requirements in light of the Bahr decision. The contingency measure described above meets U.S. EPA's existing guidance. ARB staff will work with the District and the U.S. EPA to provide any additional documentation or develop any needed SIP revisions to support U.S. EPA approval of the 2017 Plan.

For RFP contingency, U.S. EPA has interpreted this requirement to represent one year's worth of RFP, amounting to three percent of reductions from measures that are already in place or that would take effect without further rulemaking action. Eastern Kern meets the RFP targets in the milestone years of 2014, 2017, and the attainment year of 2020 with a three percent contingency set aside in 2014 and carried through to 2020 per the requirements of the Implementation Rule.

To meet the three percent emission reduction for attainment contingency, the 2017 Plan relies on additional reductions occurring between 2020 and 2021 from continued implementation of the control program, including the turnover in the mobile source fleet. CARB's ongoing mobile source control program will provide emission reductions beyond a 2020 attainment year for Eastern Kern's pending Serious classification as newer vehicles enter the fleet due to continued implementation of the mobile source programs. The 2017 Plan relies on these continuing emission reductions to fulfill the contingency requirements, should Eastern Kern fail to attain the ozone NAAQS in 2020. This is discussed in "Section XIV. Contingency Measures" of the 2017 Plan and summarized in Table 6.

Table 6. Eastern Kern Mobile Source Emissions (Tons per Day)

Source Category	ROG		NOx	
	2020	2021	2020	2021
On-Road Mobile	1.052	0.986	3.361	3.046
Off-Road Mobile	3.625	3.607	5.830	5.679
Total	4.677	4.593	9.191	8.725
Percent Reduction:	1.80 % ROG plus 5.07 % NOx reductions			

Source: Table 16 Projected VOC and NOx Emissions from 2020 to 2021 from 2017 Plan (ROG and VOC are consistent for inventory purposes)

E. Transportation Conformity Budgets

Under section 176(c) of the Act, transportation plans, programs, and projects that receive federal funding or approval must be fully consistent with the SIP before being approved by a Metropolitan Planning Organization (MPO). U.S. EPA's transportation conformity rule[8] details requirements for establishing motor vehicle emission budgets (budgets) in SIPs for the purpose of ensuring the conformity of transportation plans and programs with the SIP.

The 2017 Plan establishes on-road motor vehicle emission budgets for each RFP milestone year, as well as for the attainment year. Table 7 summarizes the motor vehicle emissions budget for transportation conformity purposes under a Serious federal 8-hour ozone classification. The emission budgets will apply to all subsequent transportation conformity years, per the federal transportation conformity regulation. Emission budgets for NOx and ROG were calculated using EMFAC2014, with Kern County COG 2016 Regional Transportation Plan (RTP) activity, and reflect summer average emissions. Once U.S. EPA approves the emission budgets established in the 2017 Plan, it will serve as the conformity emissions budgets for future transportation conformity determinations in Eastern Kern. Additional details on the on-road motor vehicle emission budgets can be found in "Section VII. Transportation Conformity Budgets" of the 2017 Plan.

Table 7. Eastern Kern Transportation Conformity Budgets
(Summer Planning Inventory in Tons per Day)

Eastern Kern	2017		2020	
	ROG	NOx	ROG	NOx
Baseline Emissions	1.35	4.23	1.05	3.36
Total	1.35	4.23	1.05	3.36
Conformity Budget*	2	5	2	4

*Budgets are rounded up to the nearest ton.

[8] 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 EPA in the August 15, 1997 Federal Register.

VI. ENVIRONMENTAL IMPACTS

The California Environmental Quality Act (CEQA) requires that State and local agency projects be assessed for potential environmental impacts. An air quality plan is a "project" that is potentially subject to CEQA requirements. The District found that the 2017 Plan will not result in any potentially significant adverse effects on the environment and is exempt from the provisions of CEQA under section 15061 (b)(3) (the general rule that CEQA only applies to projects which have the potential for causing a significant effect on the environment) and section 15308 (actions taken by a regulatory agency for protection of the environment) of the CEQA Guidelines. The District posted a Notice of Exemption on August 3, 2017.

CARB has determined that its review and approval of the 2017 Plan submitted by the District for inclusion in the California State Implementation Plan (SIP) is a ministerial activity by CARB for purposes of CEQA (14 CCR § 15268). A "ministerial" decision is one that involves fixed standards or objective measurements, and the agency has no discretion to shape the activity in response to environmental concerns.[9]

CARB's review of the 2017 Plan is limited to determining if it meets all the requirements of the Act. CARB is prohibited from approving the 2017 Plan or changing it unless CARB finds that it does not comply with the Act (Health and Safety Code § 41650 and 41652). Since CARB lacks authority to not adopt the plan, or modify it, in response to environmental concerns raised through the CEQA process, CARB's action on the plan is ministerial for purposes of CEQA.

VII. STAFF RECOMMENDATION

CARB staff recommends that the Board:

1. Adopt the 2017 Plan, including the emission inventories, attainment demonstration, RACM demonstration, RFP demonstration, contingency measures, and transportation conformity budgets, as a revision to the California SIP.

2. Direct the Executive Officer to submit the 2017 Plan to U.S. EPA as a revision to the California SIP, with a request to classify the Eastern Kern nonattainment area as Serious for the 75 ppb 8-hour ozone standard with an attainment date of July 20, 2021.

[9] (14 CCR § 15369; San Diego Navy Broadway Complex Coalition v. City of San Diego (2010) 185 Cal.App.4th 924, 934.)

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APPENDIX A

WEIGHT OF EVIDENCE

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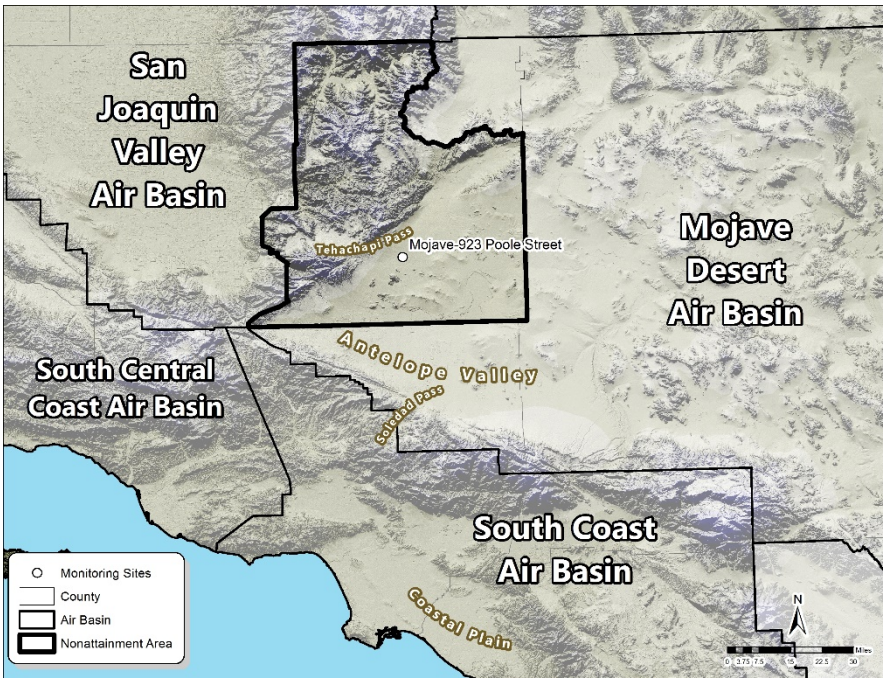
Eastern Kern Weight of Evidence

Introduction

The Eastern Kern 8-Hour Ozone Nonattainment Area (Eastern Kern) includes the eastern portion of Kern County that lies outside of the San Joaquin Valley Air Basin and is under the jurisdiction of the Eastern Kern Air Pollution Control District (District). The northeast corner of Kern County, as outlined by the watershed boundary and containing the China Lake Naval Air Weapons Station, is not included in Eastern Kern. Eastern Kern is currently classified as a moderate nonattainment area for the 2008 federal ozone standard of 0.075 parts per million (ppm) with an attainment deadline of 2017. For areas classified as moderate nonattainment or above, photochemical modeling is a required element of the State Implementation Plan (SIP) to ensure that existing and proposed control strategies provide the reductions needed to meet the federal standard by the attainment deadline.

Figure 1: Area Map of Eastern Kern and Surrounding Areas



To address the uncertainties inherent to photochemical modeling assessments, U.S. Environmental Protection Agency (U.S. EPA) guidance, *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze,* recommends that supplemental analyses accompany all modeled attainment demonstrations. To complement regional photochemical modeling analyses included in the Eastern Kern SIP, the following Weight of Evidence (WOE) demonstration includes detailed analyses of ambient ozone data and trends, transport impacts, precursor

emission trends and reductions, population exposure trends, and a discussion of conditions that contribute to exceedances of the 0.075 ppm federal ozone standard. All analysis methods have inherent strengths and weaknesses; therefore, examining an air quality problem in a variety of ways helps offset the limitations and uncertainties associated with any one approach.

The impact of emissions generated in the upwind San Joaquin Valley Air Basin (San Joaquin Valley), which is classified as an extreme ozone nonattainment area, has a significant impact on air quality in Eastern Kern. Ozone air quality data, along with photochemical modeling results, show that while Eastern Kern has made progress, the magnitude of emission reductions in the upwind area that are necessary to provide for attainment will not occur by the 2017 attainment date. As shown in Table 1, the most recent design value for the site is 12 percent above the level of the standard. The following sections of this WOE provide the documentation to support the District's reclassification as a serious nonattainment area, with an attainment deadline of 2020.

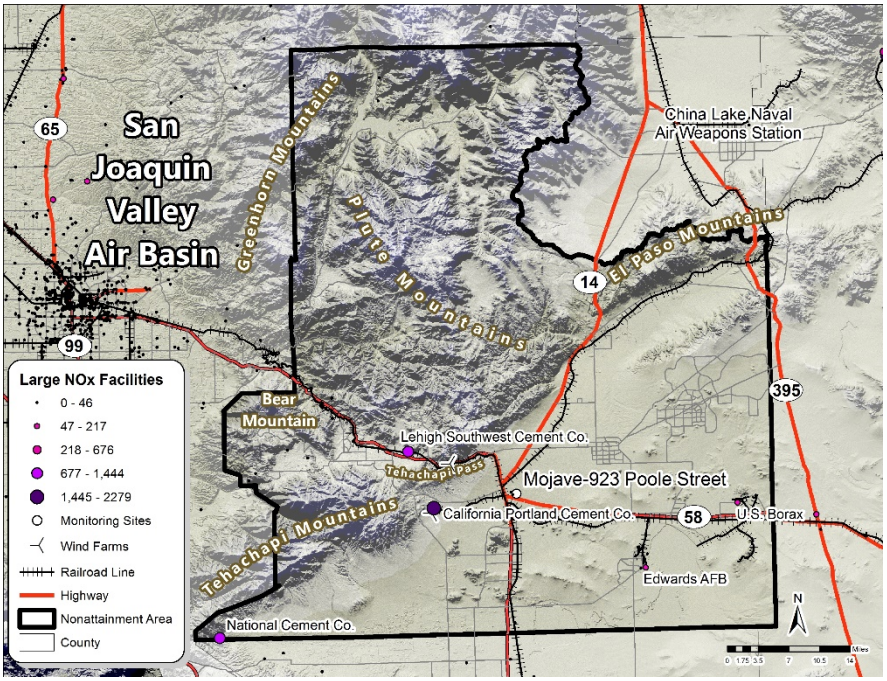
Table 1: Ozone Design Values at the Western Mojave Monitoring Site

				% Above
Mojave-923 Poole Street	060290011	0.083	0.084	**12%**

Area Description

Eastern Kern comprises the portion of Kern County located in the northwestern corner of the Mojave Desert Air Basin, in California's high desert, as shown in Figure 2. Eastern Kern, to the south, is separated from the South Coast Air Basin (extreme nonattainment area) by the Antelope Valley (severe nonattainment area) and San Gabriel Mountains. The Tehachapi and the Sierra Nevada Mountains separate Eastern Kern from the San Joaquin Valley (extreme nonattainment area), to the west and north. Directly to the east is San Bernardino County. The northeast portion of Kern County, where the China Lake Naval Air Weapons Station is located, in not included in Eastern Kern.

Figure 2: Area Map of Eastern Kern



Eastern Kern's population of 90,366 (Census, 2010) resides primarily in and around the major towns of Rosamond, Tehachapi, California City, and Mojave. Major highways serving Eastern Kern are U.S. Highways 58, 14, and 395. Eastern Kern is home to two large wind farms, one of which is the third largest onshore wind energy project in the world with a current capacity of over 1,500 megawatts and a planned future capacity of 3,000 megawatts by 2040. There are also two large cement facilities within 14 miles of the monitoring site, as is the Mojave Air and Space Port. A third large cement facility and California's largest open pit mine located in Boron, where borax is mined, are within 38 miles of the monitor.

Within Eastern Kern, there is one long-term monitoring site located in the town of Mojave. In addition to the long-term site, two special study sites were operated in 1995 at Boron-26965 Cote Street and Tehachapi-Jameson Road. However, because data for these sites are only for that single year, they are not included in this evaluation.

Conceptual Model

Weather in Eastern Kern is dominated by mostly sunny days, low humidity, and warm to hot temperatures during the spring and summer months. These conditions are conducive to the formation and buildup of ozone. However, limited local emissions sources, relative to the two neighboring extreme ozone nonattainment areas to the west/northwest and south of Eastern Kern, are not sufficient to produce the magnitude

of peak ozone concentrations and the quantity of ozone exceedance days observed in the area. The transport of emissions from the San Joaquin Valley, and to a lesser extent the South Coast, is the predominant cause of high ozone concentrations and exceedances in Eastern Kern. The terrain, meteorology, regional transport, and distribution of emissions are important considerations for understanding the ozone challenges facing the Eastern Kern Nonattainment Area.

Terrain and Meteorology

The nonattainment area includes the eastern half of Kern County and is located on the western edge of the Mojave Desert. Eastern Kern is separated from populated areas to the west and south by several mountain ranges and is considered high desert. The mountainous area of the County ranges between 2,000-7,000 feet above sea level. The town of Mojave is also elevated, with the flat, plateau area generally around 2,500-3,000 feet above sea level.

The mountains surrounding Eastern Kern contain a limited number of passes that act as conduits for transport from the neighboring San Joaquin Valley and South Coast air basins. The Tehachapi Pass, at around 4,000 feet above sea level, connects the Bakersfield area in the southern San Joaquin Valley and Eastern Kern. This pass provides the primary outlet for air from the San Joaquin Valley to overflow into Eastern Kern.

During the summer months, air frequently flows in a southwesterly direction in the San Joaquin Valley, from the delta region in the north towards the Tehachapi Mountains in the south. Some of this air and the pollutants it contains move through the Tehachapi Pass and into the Mojave Desert (see multiple citations from p16, ARB, 1996 Triennial Assessment Report). It was first noted as far back as 1982 that the Tehachapi Pass does not pose a significant barrier to transport due to its elevation of 4000 feet (Reible et al, 1982) compared to the rest of the southern Sierra Nevada Mountain range, which is generally much higher in altitude. From the south, the Soledad Pass allows air to flow from the South Coast into the Antelope Valley and then northeastward into the eastern portion of Eastern Kern.

Airflow from the San Joaquin Valley through the Tehachapi Pass to the west is dominant on many more days than airflow from the South Coast through the Soledad Pass to the south. Past ARB transport analyses of hourly surface winds documented that winds blow through the Tehachapi Pass from the San Joaquin Valley to the Mojave Desert on most days during the summer ozone season of April through October. Based on the high frequency and magnitude of this airflow, along with other in-depth transport analyses, ARB identified the San Joaquin Valley as an overwhelming transport contributor to State ozone exceedances in East Kern.

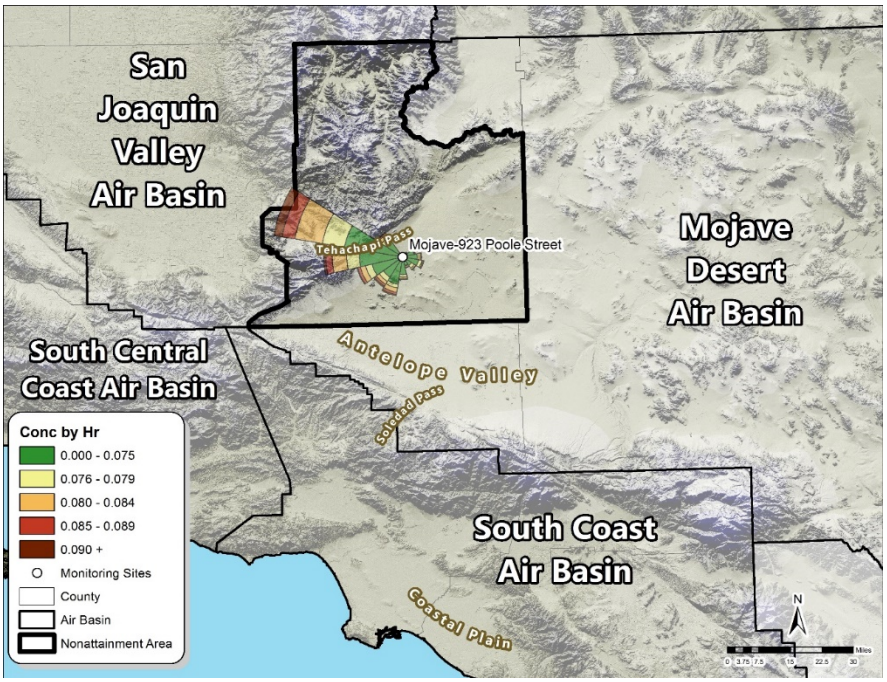
The close proximity of the Mojave-923 Poole Street monitor to the Tehachapi Pass allows it to capture ozone transported into Eastern Kern. However, due to the complexity of the terrain and variations in large-scale weather patterns, there are occasional periods when airflow from the South Coast could influence Eastern Kern. A previous ARB review of Edwards Air Force Base wind data indicated that during the summer months, a convergence of air from the Soledad Pass to the south and air parcels exiting the Tehachapi Pass to the west could occur in the eastern portion of the nonattainment area, potentially resulting in some surface or upper air transport impacts.

The frequency of transport from the San Joaquin Valley to East Kern is evident in the evaluation of pollution roses. Figure 3 shows hourly measurements of ozone concentration and coincident resultant wind direction on all federal 8-hour exceedance days (2014-2016) on a relief map. This map provides a visual representation of the dominance of transport from the San Joaquin Valley through the Tehachapi pass as compared to the South Coast. These data are from the ARB Air Quality and Meteorological Information System (AQMIS) for the ozone monitor wind instruments at the Mojave-923 Poole Street monitoring site.

Exceedance days in Eastern Kern that are attributable to San Joaquin Valley emissions are generally characterized by afternoon surface winds from the west/northwest, resulting from strong temperature differences between the San Joaquin Valley and the desert. The pollution/wind rose in Figure 3 shows that the majority of the wind flow on exceedance days is coming from the direction of the southern part of the San Joaquin Valley, giving a clear indication of ozone or ozone precursors transported from the San Joaquin Valley to Eastern Kern through the Tehachapi Pass. Figure 3 also shows that the winds can be from the southwest during periods of higher ozone concentrations, indicating that the South Coast Air Basin may be an ozone source region at times; however, the frequency of winds from this direction is much lower than the San Joaquin Valley (from west and northwest directions).

Figure 3: Exceedance Day Pollution Roses for the

Mojave-923 Poole Street Monitor for 2014-2016



Wind roses represent hourly concentrations on 8-hour ozone exceedance days. Hourly measurements on exceedance days can include both values above and below the standard.

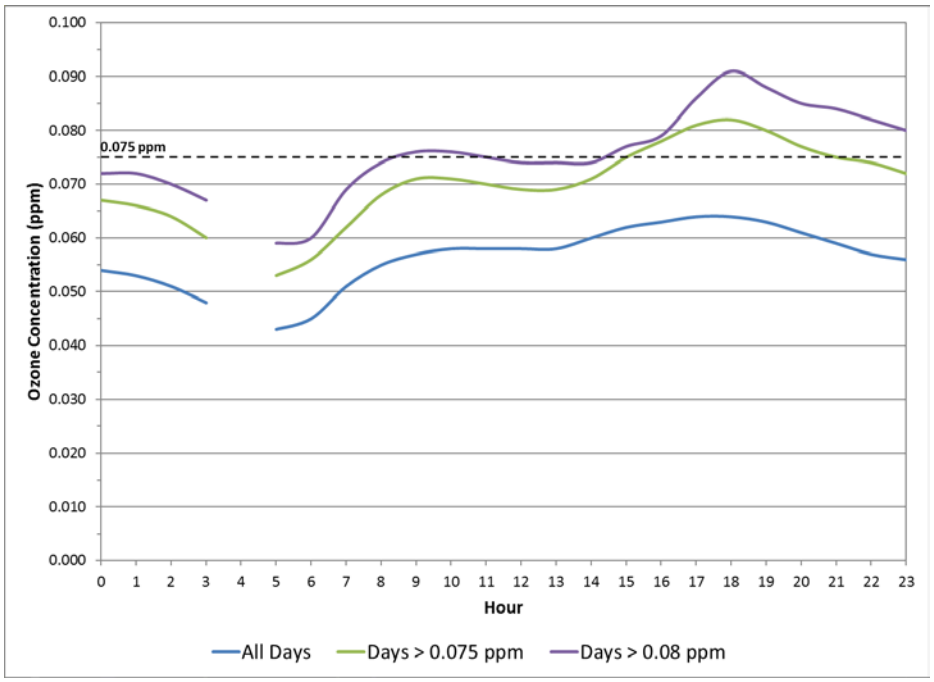
In addition, research has shown that the air masses moving through mountain gaps and passes in Southern California contain multiple, distinct pollutant layers at various altitudes (Smith and Edinger, 1983). As air moves through these gaps and passes at various altitudes, it warms and accelerates. Upon exiting the gaps and passes, the accumulated momentum is depleted causing air masses to slow and disperse. As these layers disperse, transported pollution may become entrained in the near-surface air of downwind areas. Alternatively, air masses can be lofted and transported over mountain peaks into the high desert (VanCuren 2015).

Regional Transport

Areas impacted by transport generally show ozone concentrations peaking in the late afternoon or evening. Figure 4 shows the average diurnal pattern for 1-hour ozone concentrations from May-September on all days and days when 8-hour ozone concentration were above 0.075 ppm and 0.08 ppm. The diurnal patterns for all three data sets show the same pattern of a modest morning peak and then a higher peak occurring in the late afternoon/evening. This is unlike typical patterns for photochemical production of ozone from local sources which have one bell curve-shaped peak in the early afternoon.

Figure 4: Average Hourly Ozone Concentrations at Mojave-923 Poole Street

(May - Sept; 2011-2015)



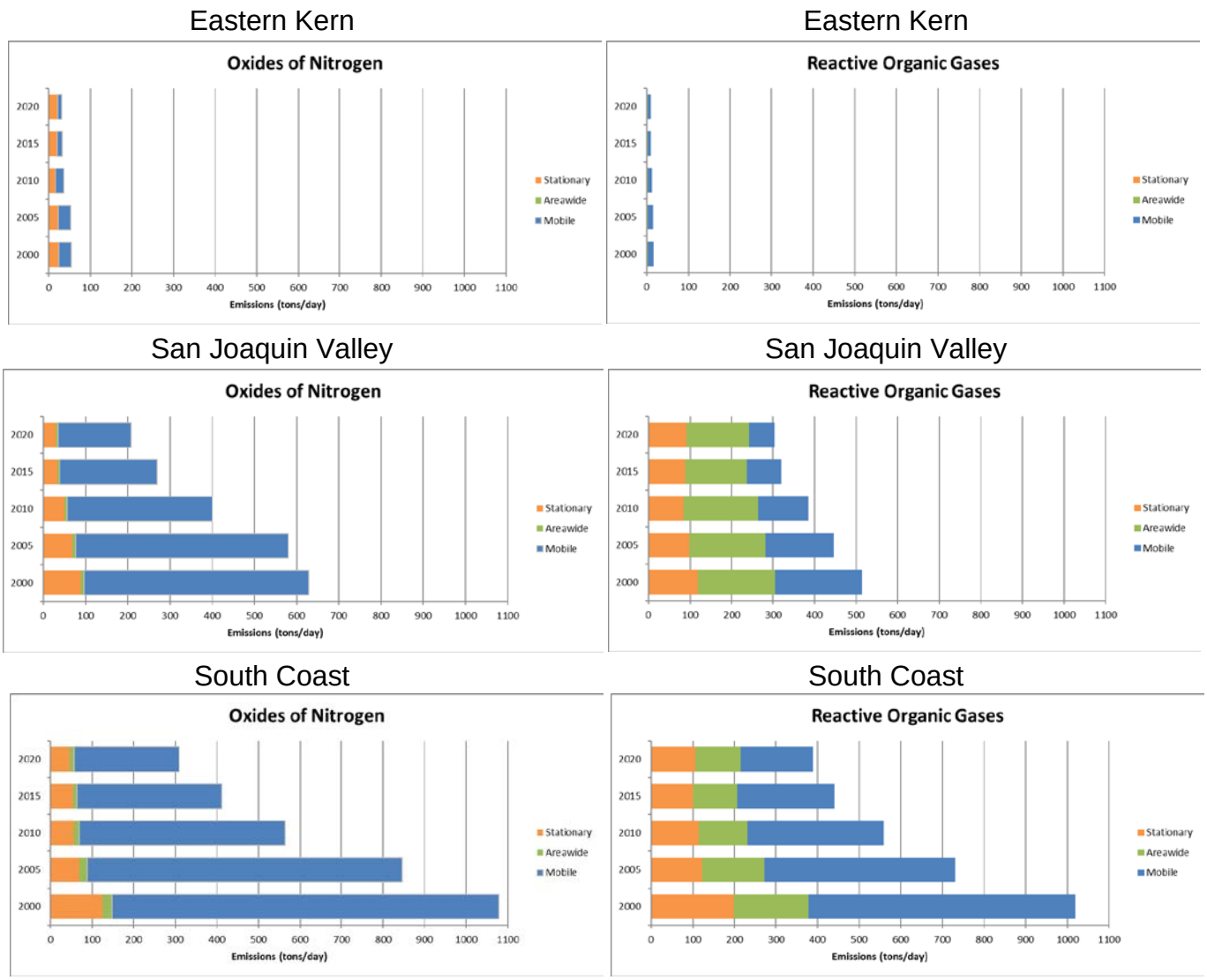
The profiles at Mojave are indicative of rural, transport-dominated monitoring sites where pollutants transported into the area the previous evening remain in place during the morning, leading to ozone formation under a shallow temperature inversion. As the temperatures quickly rise, the mixing depth increases and ozone concentrations remain level or even drop. However, as the heating induces low-level winds to develop, transport from neighboring nonattainment areas move into Eastern Kern producing the second and more significant ozone peak a few hours later.

Another factor leading to persistently elevated ozone concentrations at the Mojave-923 Poole Street monitor is the lack of widespread combustion emissions, which would otherwise tend to break down ozone during the nighttime hours when sunlight is not available to drive ozone formation process. Without the continuous influx of fresh emissions that are emitted in metropolitan areas, ozone concentrations remain high overnight, requiring fewer hours to reach higher concentrations the following day. Because locally generated emissions in Eastern Kern are lower than in neighboring metropolitan areas, the morning peak and early afternoon ozone concentrations at the Mojave monitor are lower than they would be in the metropolitan areas.

Regional Distribution of Precursor Emissions

Precursor emissions generated in the San Joaquin Valley overshadow those from Eastern Kern. The emissions inventory, summarized in Figure 5, indicates that the emissions of oxides of nitrogen (NOx) and reactive organic gases (ROG) in Eastern Kern are a fraction of emissions generated in the San Joaquin Valley. Eastern Kern's NOx and ROG emissions amounted to only 12 and 3 percent, respectively, of San Joaquin Valley emissions. Additionally, the South Coast surpasses both the San Joaquin Valley and Eastern Kern in terms of emissions. While more transport days are shown to come from the San Joaquin Valley, it is clear that on the minority of days showing transport from the South Coast that this transport comes from an area with higher emissions levels. The difference in emissions between these areas helps explain the important role of transport in Eastern Kern's ozone air quality.

Figure 5: Inventory of Eastern Kern, San Joaquin Valley, and South Coast Emissions by Source Category



Data source: ARB 2016 Ozone SIP Inventory for summer (Version 1.05 with approved external adjustments)

The connection between ozone, a secondary pollutant, and emissions of ozone precursor compounds is characterized by considerable temporal and spatial variability. In general, as air masses travel downwind, entrainment of fresh emissions, atmospheric reactions, depositional processes, and dilution increase the VOC/NOx ratio. As a result, ozone formation in suburban and rural areas downwind of major urban areas is generally regarded as NOx limited (cf. Finlayson-Pitts and Pitts, 1993; Finlayson-Pitts and Pitts, 2000). Given Eastern Kern's location, downwind of the only extreme nonattainment areas in the U.S., ozone formation would be expected to be limited by available NOx. The demonstrated role of transport indicates that a substantial portion of ozone measured in Eastern Kern is derived from precursor emissions in upwind areas. Thus, attainment in Eastern Kern is directly linked to emission reduction strategies upwind in the San Joaquin Valley and to a lesser extent the South Coast.

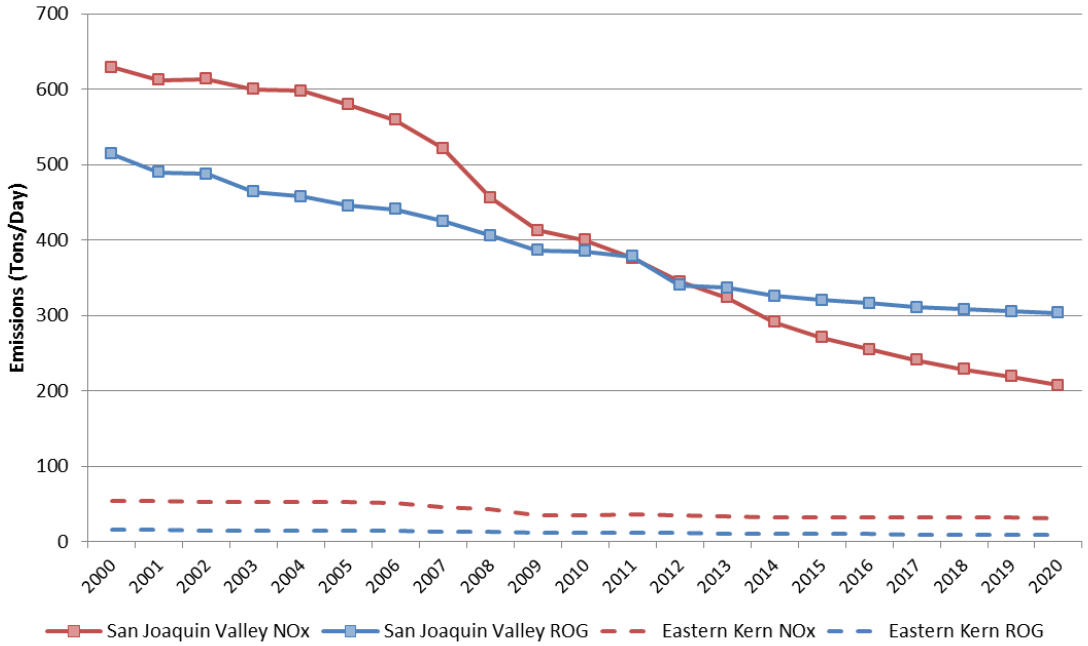
Anthropogenic Emission Trends

In 2016, NOx summer emissions generated within Eastern Kern were dominated by mineral processes (which includes cement manufacturing), trains, and aircraft. The primary contributing categories of ROG summer emissions within Eastern Kern were aircraft, consumer products, degreasing, and off-road equipment. As previously discussed and shown in Figure 6, emissions in Eastern Kern are a fraction of those in the San Joaquin Valley. By comparison, the San Joaquin Valley NOx and ROG emissions are, respectively, 8 and 32 times those in Eastern Kern. It is important to note that a substantial portion of the San Joaquin Valley (69 to 82 percent) and Eastern Kern (88 to 95 percent) ROG emissions come from biogenics and when included in comparisons can mask the reductions attributable to emission control programs. As such, statistics in this section only represent anthropogenic sources of precursor emissions.

Figure 6 shows the estimated trend in Eastern Kern and San Joaquin Valley precursor emissions from 2000 to 2016. Throughout the San Joaquin Valley, emissions controls have substantially reduced the amounts of both ROG and NOx emitted by various sources. Since 2000, there has been a significant reduction in ozone precursor emissions:

- Total NOx emissions declined by 59 percent, and
- Total ROG emissions declined by 38 percent.

Figure 6: Eastern Kern and San Joaquin Valley Estimated NOx and ROG Emissions 2000 to 2015 (without biogenics)



In Eastern Kern, NOx and ROG emissions show a slightly downward trend respectively, over the entire period. In terms of change in Eastern Kern, there has been a reduction in ozone precursor emissions:

- Total NOx emissions declined by 39 percent, and
- Total ROG emissions declined by 37 percent.

However, it is important to keep in mind that estimates for 2016 show NOx and ROG emissions for Eastern Kern as only 12 and 3 percent, respectively, of the NOx and ROG emissions totals for the San Joaquin Valley.

Local sources of ozone precursor emissions in Eastern Kern have historically been dominated by stationary and mobile sources (see Table 2). These include passenger vehicles, trains, and heavy heavy-duty trucks. However, as federal and state mobile source control programs have been implemented, stationary sources are emerging as an increasingly significant portion of NOx emissions in Eastern Kern. While San Joaquin Valley emissions continue to overwhelm the area, it is important to keep local emission sources and reductions in mind to ensure continued progress. Currently, the District is updating three RACT rules covering gas turbines, boilers, and cement kilns. Although emission reductions are not yet quantified, it is anticipated that this will help to reduce local ozone precursor emissions.

Table 2: Eastern Kern Emissions Totals in tons/day (2000-2020)

	2000	2005	2010	2015	2020
NOx					
Stationary	23.632	22.633	15.887	19.621	21.376
Areawide	0.152	0.194	0.171	0.172	0.181
Mobile	29.444	29.229	19.161	12.628	9.611
Total	**53.228**	**52.056**	**35.22**	**32.421**	**31.167**
ROG					
Stationary	1.526	1.215	1.379	1.244	1.3
Areawide	1.719	1.764	1.464	1.507	1.631
Mobile	12.337	11.101	9.137	7.237	6.309
Total	**15.583**	**14.08**	**11.979**	**9.988**	**9.24**

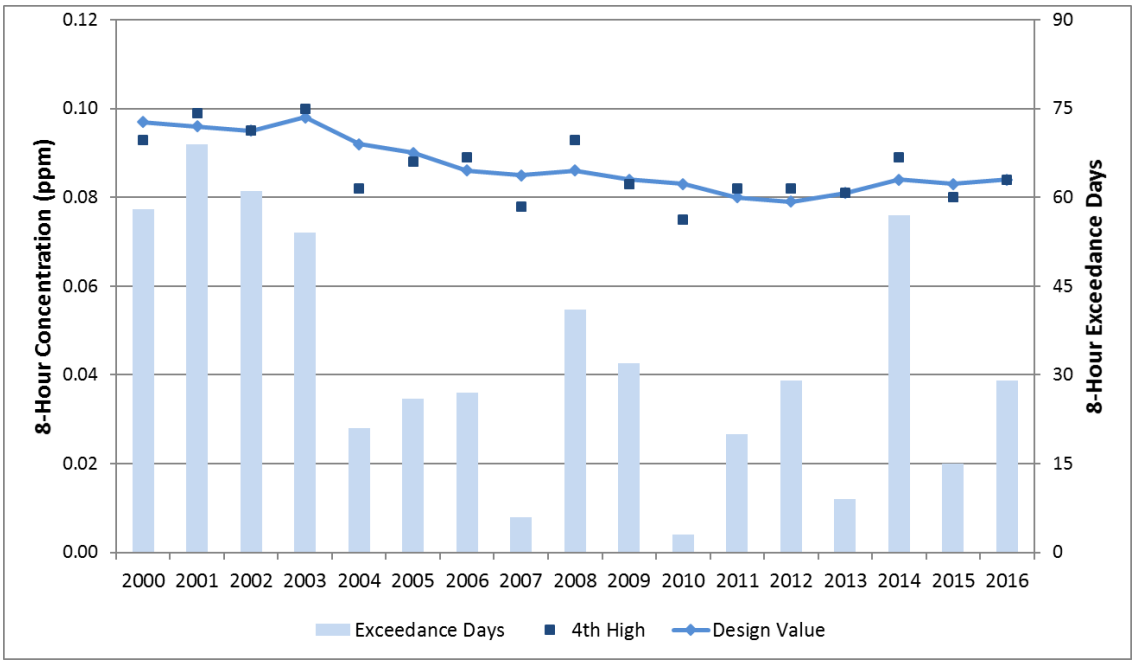
* Data from CEPAM: California 2016 Ozone SIP Baseline Emission Projections -

Version 1.05 Eastern Kern Nonattainment Area Tool

Ozone Air Quality

Long-term ozone trends from 2000 to 2016 indicate progress has been achieved in Eastern Kern. The 2016 design value of 0.084 ppm is about 12 percent above the level of the federal 8-hour ozone standard. By comparison, the 2000 design value (0.097 ppm) was over 29 percent above the standard. As shown in Figure 7, design values have declined by 13 percent from 0.097 ppm in 2000 to 0.084 ppm in 2016. During this same period, the 4th highest concentration has also declined by 9 percent.

Figure 7: Eastern Kern NA Ozone Statistics 2006 to 2016



The number of exceedance days show considerable variability during this period, ranging from 3 days to 69 days. This interannual variability may represent year-to-year changes in meteorological conditions. Comparing three-year averages helps to smooth out this variability and evaluate long-term progress. The three-year average of exceedance days in 2000-2002 was 62, compared with the three-year average in 2014-2016 of 33. The average number of exceedance days has been cut in half over this 16 year period, delivering a real improvement in air quality for the area.

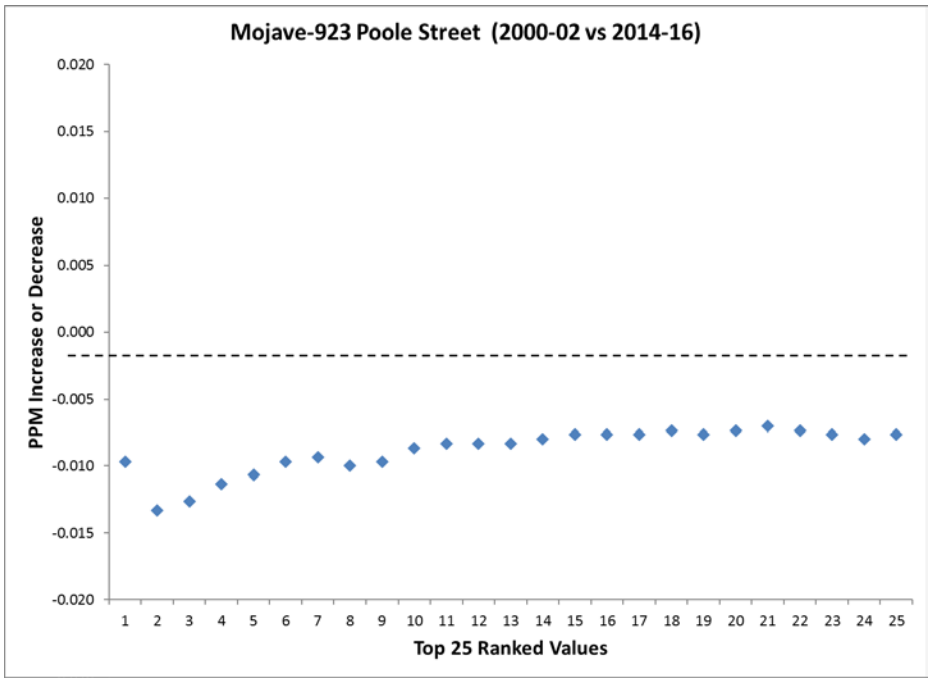
Top 25 Analysis

To complement the design value and exceedance day analyses which indicate an improvement in air quality from 2000 and 2016, the Top 25 daily maximum 8-hour average ozone concentrations in 2014-2016 were ranked and compared to those measured in 2000-2002.

The comparison of ranked values provides insight as to the extent to which the highest ozone concentrations are responding to control measures over time without relying on any assumptions regarding the distribution of the data. In Figure 8, markers below the line indicate that 2014-16 ranked concentrations were lower than the corresponding 2000-02 ranked concentrations. Analyses indicate that concentrations across the range saw decreases in 2014-2016 as compared to 2000-2002.

It is important to keep in mind that while the data does indicate that the top 25 values in 2014-2016 were consistently lower than the 2000-2002 average, there were only a handful of concentrations that fell below the standard for the six years analyzed.

Figure 8: Comparison of Top 25 days in 2000-02 and 2014-16
Eastern Kern NA

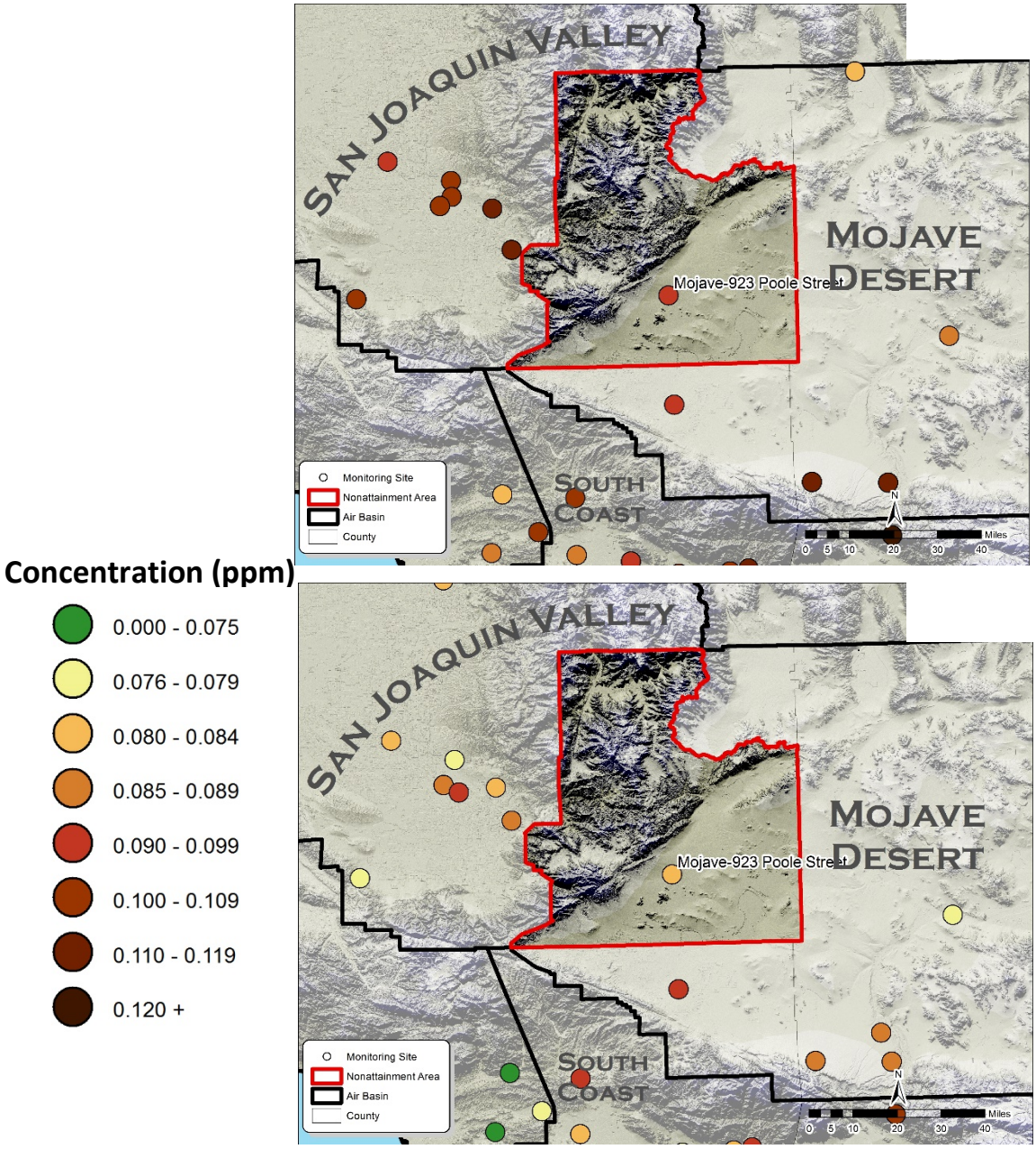


Spatial Distribution of Concentrations

To evaluate changes in distribution of ozone, spatial analysis tools were used to plot design values by year to determine trends in Eastern Kern and surrounding areas. These analyses (Figure 9) show that between 2000 and 2015, the concentrations within Eastern Kern and in the surrounding areas, which are the primary transport contributors (San Joaquin Valley and South Coast), decreased significantly. Eastern Kern has seen a reduction in their design value between 2000 and 2016 of 13 percent, during this same time the San Joaquin Valley has seen a 15 percent reduction and the South Coast has seen a 26 percent reduction. The progress in these upwind areas continues to be integral to the continuing progress in areas downwind of their transport.

However, despite the clear improvements in ozone concentrations, the nonattainment area continues to exceed the 0.075 ppm 8-hour ozone standard. These maps highlight the challenge of transport from the San Joaquin Valley and South Coast as well as the infeasibility of attaining the standard in 2017.

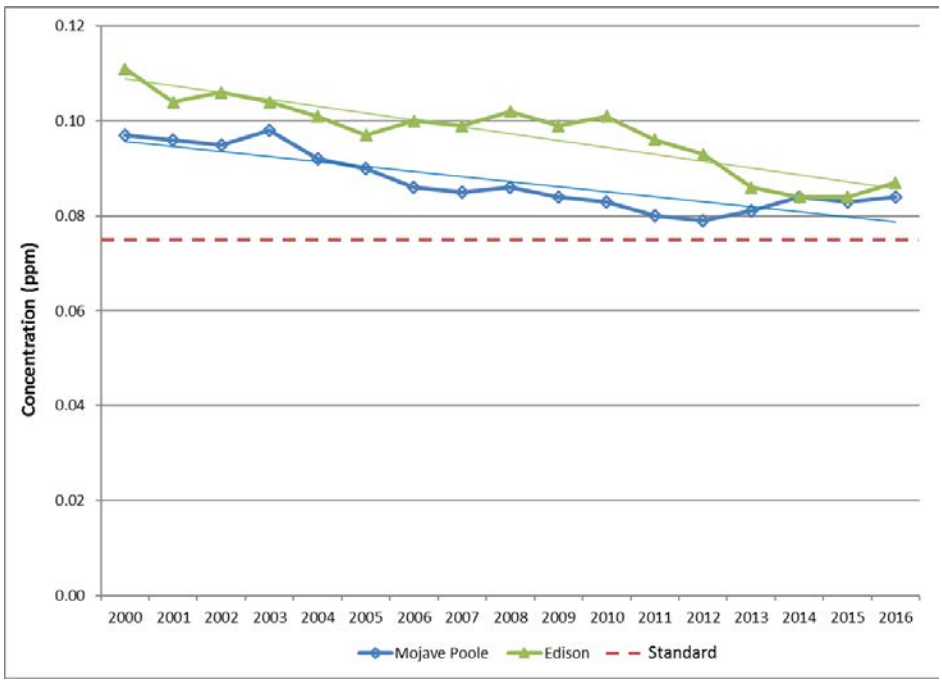
Figure 9: Concentration Dot Maps Representing the Spatial Distribution of Ozone Air Quality in Eastern Kern and Surrounding Areas (2000 & 2015)



Upwind and Downwind Trends

Design values were compared between upwind and downwind sites to confirm that progress in the San Joaquin Valley was translating to similar progress in Eastern Kern. Figure 10 shows the design value trends and linear trend lines for Edison in the San Joaquin Valley and Mojave-Poole in Eastern Kern. As shown, overall the linear trend for both sites shows a similar path towards the standard. Design values at the two sites generally track each other over time given the complex nature of the ozone problem and potential for transport contributions from the South Coast.

Figure 10: Ozone Design Value Trends in Edison and Mojave Poole
8-hour Ozone Design Values 2000 – 2016



A notable difference between sites is that the Edison site saw a reduction in the design value of 21 percent over 16 years, as compared to 13 percent for Mojave. While the Edison site did have a larger decrease in design value concentrations, this might reflect its position as an upwind site in a key ozone precursor area in an extreme ozone nonattainment area as well as having higher ozone concentrations in 2000 (compared to Mojave Poole).

Ozone Air Quality Summary

Based on ozone air quality trends, there has been measurable progress towards meeting the federal 8-hour ozone standard. Eastern Kern's future progress towards the federal 8-hour ozone standard is linked to the upwind areas surrounding it and their progress in making significant reductions and ensuring Eastern Kern has a path towards attaining the standard. Recent design values for 2015 and 2016 are more than 12 percent above the standard (0.083 in 2015 and 0.084 in 2016) and the magnitude of exceedance days (29) represents a challenge that cannot be addressed in a one year time period.

The District is requesting as a part of the SIP that U.S. EPA reclassify Eastern Kern to a serous classification with a 2020 attainment deadline. An analysis of photochemical modeling, discussed later in this document, combined with ozone air quality data demonstrates that attainment by 2020 is feasible.

Attainment Projections

Currently, Eastern Kern has an attainment deadline of 2017. However, when given the previous design values listed in Table 1 for 2015 and 2016 (0.083, 0.084), Eastern Kern would need to measure a fourth high 8-hour ozone value of no more than 0.063 ppm in 2017. To date, the lowest fourth high in Eastern Kern in over 20 years of monitoring was 0.075 ppm in 2010. This scenario, combined with the additional air quality analysis discussed earlier, demonstrate that attainment this year by the 2017 deadline is not feasible. In addition, preliminary data for 2017 shows a current fourth high 8-hour ozone value of 0.080 ppm as of July 2017.

After reviewing air quality trends, it appeared that given recent measurements, a 2017 attainment would be very unlikely and that a 2020 attainment date would be much more feasible. ARB modeling (see Table 3) shows that attainment by 2020 is achievable. ARB modeling used a weighted 2015 design value, based on data from 2011-2015. This modeling projected a 0.077 ppm 2017 design value and a 0.074 ppm 2020 design value.

Table 3: ARB Modeling Design Value Projections

Site Name	ARB Modeling 2017 (ppm)	ARB Modeling 2020 (ppm)
Mojave-923 Poole Street	0.077	0.074

Summary

This Weight of Evidence evaluation comprises a set of analyses that provide support for attainment. Modeling and air quality analyses in this WOE has demonstrated that the standard would not be attained in 2017. The District has requested to be reclassified by the U.S. EPA as a serious nonattainment area for the federal 8-hour ozone standard, with an attainment deadline of 2020.

Ozone concentrations in Eastern Kern are overwhelmed by the transport of pollutants and precursor emissions, primarily from the San Joaquin Valley. Therefore, attainment in Eastern Kern relies primarily on emission reductions occurring from statewide measures, as well as local measures in the upwind areas.

Based on the supporting analyses completed as part of this WOE evaluation, attainment by 2020 can be supported due to the following factors:

- Eastern Kern is bordered by two extreme nonattainment areas: the San Joaquin Valley and the South Coast. Complex terrain, the regional distribution of emissions, and persistent summertime winds blowing from the San Joaquin Valley into Eastern Kern, via the Tehachapi Pass, result in transport playing a fundamental role both in Eastern Kern's ozone problem and its attainment strategy. Transport from the South Coast, through the Soledad Pass, can also contribute to the ozone problem in Eastern Kern. However, only a limited quantity of the overall emissions produced in the South Coast Air Basin flow through this pass. Past and current analyses show that transport from the San Joaquin Valley is dominant on many more days than that from the South Coast.

- Local emissions of ozone precursors declined significantly between 2000 and 2016. Total ROG emissions declined by 37 percent and NOx emissions by 39 percent. Local emissions, however, are much lower than emissions in the upwind San Joaquin Valley and South Coast. ROG and NOx emissions in comparison with Eastern Kern are eight percent of San Joaquin Valley emissions and five percent of South Coast emissions.

- Long-term trends demonstrate that ozone air quality has improved in Eastern Kern. Between 2000 and 2016, the design value decreased by 13 percent, the fourth high concentration by 9 percent, and average exceedance days were cut in half, declining from 62 to 33. Average peak concentrations are lower in 2016 when compared to the year 2000.

- Air quality progress to date, however, is not sufficient to attain the standard by 2017. The 2016 design value was 12 percent above the standard and the magnitude of exceedance days indicate that attainment in 2017 is not achievable. In addition, although peak concentrations have declined since 2000, the majority of these concentrations are still greater than 0.075 ppm, adding even greater challenge. Finally, the 4th highest concentration so far this year is still above the level of the standard at 0.080 ppm.

- ARB modeling results also demonstrate that the most reasonable option points to a 2020 attainment date with an 8-hour ozone design value of 0.074 ppm. These results are consistent with the air quality trends.

- The San Joaquin Valley is the primary transport contributor to Eastern Kern. An analysis of design value trends in the upwind San Joaquin Valley and Eastern Kern indicates that progress in Eastern Kern is tracking with progress in the San Joaquin Valley.

- Significant further emission reductions in the San Joaquin Valley are projected to provide for attainment in this region by 2031. These emissions reductions will also help with attainment in downwind areas including Eastern Kern. Because ozone levels in Eastern Kern are not as high as those in the San Joaquin Valley, the quantity of emissions reductions needed for attainment in the Eastern Kern Planning Area is not as great. Therefore, attainment in Eastern Kern is expected by an earlier date.

Taken together, the results from all of these analyses indicate that the Eastern Kern Nonattainment Area can expect to show attainment by 2020, the required attainment date for serious nonattainment areas.

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