

San Joaquin Valley  
Air Pollution Control District

APR 1925  
Policy for District Rule 2201 AAQA Modeling

Approved By:

  
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**I. Purpose**

The purpose of this policy is to provide guidance for the performance of an Ambient Air Quality Analysis (AAQA) pursuant to District Rule 2201.

**II. Definitions**

Affected Pollutants: defined per District Rule 2201 as those pollutants for which an Ambient Air Quality Standard has been established by the EPA or by the California Air Resources Board, (ARB), and the precursors to such pollutants, and those pollutants regulated by the EPA under the Federal Clean Air Act or by the ARB under the Health and Safety Code including, but not limited to, VOC, NO<sub>x</sub>, SO<sub>x</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, CO, and those pollutants which the EPA, after due process, or the ARB or the APCO, after public hearing, determine may have a significant adverse effect on the environment, public health, or public welfare.

Ambient Air: that portion of the atmosphere to which the general public has reasonable access. Does not include the atmosphere over land owned or controlled by the source and to which there is no reasonable public access.

Ambient Air Quality Standards: include State and National Ambient Air Quality Standards for affected pollutants.

Facility/Site Boundary: the outer perimeter of any physical property, or contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control including leased property where the lease is for a term of 15 or more years.

General Public: anyone who is not employed by or under control of the facility, but, more specifically, persons who do not require the facility's permission to be on the property.

Reasonable Access: any property owned and/or controlled, including property that is not fenced in, by a source is considered not to be areas of reasonable access as long as the appropriate and legal posting prohibiting public access are provided. This posting would

provide the legal means by which a source would ensure that persons would not be allowed on said property and provide the means by which said persons would be removed. The issue becomes complicated where onsite housing is present on a facility. If the tenants pay rent, or if minors are present, the housing is considered to provide reasonable access to the public. If the housing is only occupied by employees of the facility, no children are present, and the housing is provided by the facility without cost to the employee, then no reasonable public access is said to exist. All other areas not owned or controlled by the source are considered areas of reasonable access for the purposes of Rule 2201.

Significant Impact Level: a concentration threshold used to determine whether a proposed source's emissions will have a "significant" impact on air quality in an area.

### III. Background

Ambient Air Quality Standards (AAQS) are established to protect the public and the environment. An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to public health, vegetation or wildlife. The Clean Air Act, which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (40 CFR part 50) for pollutants considered harmful to public health and the environment. At present, EPA has set National Ambient Air Quality Standards for the following principal pollutants, which are called "criteria" pollutants:

- Ozone (O<sub>3</sub>)
- Nitrogen Dioxide (NO<sub>2</sub>)
- Sulfur Dioxide (SO<sub>2</sub>)
- Respirable particulate matter having an aerodynamic diameter smaller than or equal to 10 microns (PM<sub>10</sub>)
- Fine particulate matter having an aerodynamic diameter smaller than or equal to 2.5 microns (PM<sub>2.5</sub>)
- Carbon Monoxide (CO)
- Lead (Pb)

The National Ambient Air Quality Standards contain primary and secondary standards for each of the criteria pollutants. If a primary standard is exceeded, the public is considered at risk. If a secondary standard is exceeded, then crops, trees and buildings may be damaged. Air quality standards are based on a particular exposure period (averaging period) and concentration (average, maximum, or other statistical measure) during that period. A violation occurs if the observed concentration is greater than the standard during the specified averaging period.

The Clean Air Act also permits states to adopt additional or more protective air quality standards if needed. California law authorizes the Air Resources Board (ARB) to set ambient (outdoor) air pollution standards in consideration of public health, safety and welfare. California has set standards for certain pollutants, such as particulate matter and ozone, which are more protective of public health than respective federal standards. California has also set standards for some pollutants that are not addressed by federal standards, including the following:

- Visibility Reducing Particles
- Hydrogen Sulfide (H<sub>2</sub>S)
- Vinyl Chloride

Both state and federal regulations require ambient air quality standards to be reviewed periodically, or whenever substantial new information becomes available.

The District ensures new and modified emissions sources do not cause or contribute to an exceedance of an ambient air quality standard through the implementation of District Rule 2201. This rule requires that an Ambient Air Quality Analysis be conducted for a new stationary source, or for a modification to an existing stationary source that results in a Public Notification and Publication Requirement, most commonly when the Potential to Emit is greater than 100 pounds during any one day for any one affected pollutant. The determination of whether or not an AAQA is required is made by the project lead.

#### **IV. Overview of Ambient Air Quality Analysis (AAQA)**

For the purposes of District Rule 2201, an Ambient Air Quality Analysis (AAQA) requires the use of EPA's preferred air dispersion model along with actual meteorological data to perform the air dispersion modeling. Information necessary to perform dispersion modeling includes the coordinates of the sources of emissions and the plant/facility boundary. Also required are the stack/modeling parameters for all emissions sources involved in the project.

The District has developed a progressive three level approach to performing AAQAs, with each level consisting of two steps. The following sections provide further information and requirements for each level of analysis.

##### **A. Level 1 AAQA Analysis**

Assessment begins with the Level 1 approach, and only proceeds to the next level if necessary. In a Level 1 AAQA analysis, for each averaging period, the maximum modeled concentration for each source and receptor combination is summed to produce a worst-case concentration. Please note that the maximum modeled concentrations for each pollutant/averaging period at each receptor are the sum of the maximum concentrations from each source without respect to the time of occurrence.

**Requirements.** In a Level 1 AAQA analysis, all required criteria pollutants are modeled together, with a normalized emission rate (1 gram/second) for each source. The use of normalized emission rates enables the modeling run to be used for multiple analyses. A modeling run for a Level 1 AAQA is similar to a typical modeling run performed for a

Risk Management Review (RMR) or Health Risk Analysis (HRA). The main differences are in the required averaging periods and the receptors used. These differences are described below:

- **Averaging Periods:** For all AAQA analyses, the appropriate averaging periods must be selected for all project pollutants with known ambient air quality standards. It is recommended that the 1, 3, 8, 24, and Period averaging periods be selected at a minimum.
- **Receptors:** A telescoping grid of receptors should be used around the plant/facility boundary such that the maximum concentration would be expected to be contained within the grid system. The following grid spacing is recommended:
  - 25 m spacing on the facility boundary
  - 25 m spacing from facility boundary to 100 m
  - 50 m spacing from 100 m to 250 m
  - 100 m spacing from 250 m to 500 m
  - 250 m spacing from 500 m to 1000 m
  - 500 m spacing from 1000 m to 2000 m

Facilities with large boundaries may use alternate gridding systems, due to the time that may be necessary in order to model very large receptor grids. Seek approval of any alternative receptor grid systems from the reviewing agency.

**Process.** Once all necessary information for the modeling run has been entered, plot files are generated for each averaging period and source combination. The District has developed a system for absorbing these plot files and combining them with actual project emissions to calculate the maximum modeled concentrations for each pollutant and averaging period combination.

### **1. Level 1 AAQA Analysis - Step 1**

Step 1 requires that the background concentrations for each pollutant and averaging period combination be added to the corresponding maximum modeled concentrations. The sum of these values is then compared to the corresponding ambient air quality standard. If the project does not cause an exceedance of any ambient air quality standard then the analysis is complete and no further action is required. If the project causes an exceedance of an ambient air quality standard, then analysis should proceed to Step 2.

### **2. Level 1 AAQA Analysis - Step 2**

Step 2 is similar to a Step 1 with one major difference. For this step, the maximum modeled concentration of each pollutant and averaging period combination is compared to a corresponding Significant Impact Level (SIL). If the project does not exceed the corresponding SIL, then the analysis is complete for that pollutant and no further action is required. If the modeled concentration exceeds the SIL, then the analysis should proceed to the next level (Level 2 AAQA analysis).

## B. Level 2 AAQA Analysis

A Level 2 AAQA analysis is similar to a Level 1 analysis with several differences. Unlike a Level 1 analysis, pollutants in a Level 2 analysis are not modeled together. Instead, each pollutant is modeled separately using their permitted emission rates rather than normalized emission rates. For a Level 2 analysis, the modeled concentrations for each pollutant/averaging period at each receptor are the sum of the contributions from each source calculated using the source group all (SRCGROUP ALL) option in AERMOD. From these, the maximum is selected as the modeled concentration. The modeling of some pollutants have additional requirements, which are described below.

**SO<sub>2</sub>, PM<sub>10</sub>, and CO Modeling.** SO<sub>2</sub>, PM<sub>10</sub>, and CO emissions are modeled with no additional requirements beyond those previously mentioned (i.e. pollutants must be run individually and using permitted emission rates).

**PM<sub>2.5</sub> Modeling.** PM<sub>2.5</sub> emissions may be reported as both primary and secondary PM<sub>2.5</sub> emissions. If the project facility is a minor PM<sub>2.5</sub> source, model only primary (directly emitted) PM<sub>2.5</sub> emissions. If the project facility is a major PM<sub>2.5</sub> source, model both the primary and secondary PM<sub>2.5</sub> emissions. Secondary PM<sub>2.5</sub> emissions require additional evaluation/modeling of NO<sub>x</sub> and SO<sub>x</sub>.

**NO<sub>2</sub> Modeling.** A Level 2 analysis of NO<sub>2</sub> emissions implements either the Ozone Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM). In addition to the information required for a Level 1 analysis, modeling NO<sub>2</sub> for a Level 2 analysis requires the following:

- Single NO<sub>2</sub> background value
- Single ozone background value
- In-Stack NO<sub>2</sub>/NO<sub>x</sub> ratios for each source in the project (if unavailable, the District default value is 0.5)
- Modeled concentration is the 8<sup>th</sup> highest value
- Create maximum daily contribution file (MAXDCONT)

**Process.** Unlike a Level 1 analysis, there is no need to use the District system for absorbing the plot files and project emissions. Instead, the summed maximum modeled concentrations of all sources for each pollutant and averaging period combination are obtained directly from the model itself.

### 1. Level 2 AAQA Analysis - Step 1

The maximum modeled concentrations for each pollutant and averaging period combination are summed with their corresponding background values and compared against the corresponding ambient air quality standard. If the project does not cause an exceedance of any ambient air quality standard, then no further evaluation is required. If the project causes an exceedance of an ambient air quality standard, then proceed to the next step in this level.

## 2. Level 2 AAQA Analysis - Step 2

Compare the modeled concentrations for each pollutant and averaging period with the corresponding SIL. If the project does not cause an exceedance of any SIL threshold, then no further evaluation is required. If the project causes an exceedance of a SIL threshold, then proceed to a Level 3 analysis for NO<sub>2</sub> or proceed to Section V (What to Do When an AAQA Fails).

### C. Level 3 AAQA Analysis (For NO<sub>2</sub> Only)

This level of analysis is applicable only for NO<sub>2</sub> analyses. The approach used is similar to a Level 2 analysis, with the differences described below.

**Requirements.** Similar to a Level 2 analysis, a level 3 analysis implements the Ozone Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM) for modeling NO<sub>2</sub> emissions. The "All" source group should also be used again. In addition, the following information must also be obtained:

- Yearly Ozone background dataset(s) (must match the years being modeled)
- In-Stack NO<sub>2</sub>/NO<sub>x</sub> ratios for each source in the project
- Yearly NO<sub>2</sub> background dataset(s) (must match the years being modeled)
- Modeled concentration is the 8<sup>th</sup> highest value
- Create maximum daily contribution file (MAXDCONT)

**Process.** Just as in a Level 2 AAQA analysis, there is no need to use the District system for absorbing the plot files and project emissions. Instead, the summed maximum modeled concentrations of all sources for each pollutant and averaging period combination are obtained directly from the model itself.

#### 1. Level 3 AAQA Analysis - Step 1

The maximum modeled concentrations for each pollutant and averaging period combination are summed with their corresponding background values and compared against the corresponding ambient air quality standard. If the project does not cause an exceedance of any ambient air quality standard, then no further evaluation is required. If the project causes an exceedance of an ambient air quality standard, then proceed to the next step in this level.

#### 2. Level 3 AAQA Analysis - Step 2

Compare the maximum modeled concentrations from each pollutant and averaging period combination with the corresponding SIL. If the project does not cause an exceedance of any SIL threshold, then no further evaluation is required. If the project causes an exceedance of a SIL threshold, then proceed to Section V (What to Do When an AAQA Fails).

## **V. What to Do When an AAQA Fails**

If, after performing all necessary levels analysis an AAQS/SIL is still exceeded, the project engineer can explore options with the applicant to limit the exceedance including the following:

- Insure that facility boundaries and emission sources are accurately represented spatially.
- Refine emissions estimates by using the most accurate and project specific emission factors other than those used in the preliminary modeling analysis.
- Limiting operational hours or process throughputs.
- Work with the applicant to assess the feasibility of changing stack parameters for better pollutant dispersion (such as raise stack heights, increase exhaust airflows etc.), subject to EPA restrictions on prohibited dispersion techniques.
- Work with the applicant to assess the feasibility to relocate sources within the facility.
- Source test to refine emissions estimates.
- Work with the applicant to assess the feasibility to install additional pollution controls.
- Require project proponent to surrender Emission Reduction Credits (ERC). In this case, project emissions must be fully offset to zero for each pollutant exceeding an AAQS/SIL.

Note that the EPA's "prohibited dispersion techniques" as defined in 40 CFR 51.100 (hh)(1)(i)-(iii) should not be used. All of the above changes except purchasing offsets will require that the project be re-modeled.

## **VI. Attachments**

Attachment A. Ambient Air Quality Standards

Attachment B. Significance Impact Levels

**Attachment A. Ambient Air Quality Standards (11/5/2013)**

<b>Ambient Air Quality Standards</b>						
<b>Pollutant</b>	<b>Averaging Time</b>	<b>California Standards<sup>1</sup></b>		<b>National Standards<sup>2</sup></b>		
		<b>Concentration<sup>3</sup></b>	<b>Method<sup>4</sup></b>	<b>Primary<sup>3,5</sup></b>	<b>Secondary<sup>3,6</sup></b>	<b>Method<sup>7</sup></b>
<b>Ozone (O<sub>3</sub>)</b>	1 Hour	0.09 ppm (180 µg/m <sup>3</sup> )	Ultraviolet Photometry	--	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m <sup>3</sup> )		0.075 ppm (147 µg/m <sup>3</sup> )		
<b>Respirable Particulate Matter (PM<sub>10</sub>)</b>	24 Hour	50 µg/m <sup>3</sup>	Gravimetric or Beta Attenuation	150 µg/m <sup>3</sup>	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m <sup>3</sup>		--		
<b>Fine Particulate Matter (PM<sub>2.5</sub>)</b>	24 Hour	--	Gravimetric or Beta Attenuation	35 µg/m <sup>3</sup>	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m <sup>3</sup>		15 µg/m <sup>3</sup>		
<b>Carbon Monoxide (CO)</b>	1 Hour	20 ppm (23 mg/m <sup>3</sup> )	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m <sup>3</sup> )	--	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m <sup>3</sup> )		9 ppm (10 mg/m <sup>3</sup> )	--	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m <sup>3</sup> )		--	--	
<b>Nitrogen Dioxide (NO<sub>2</sub>)<sup>8</sup></b>	1 Hour	0.18 ppm (339 µg/m <sup>3</sup> )	Gas Phase Chemiluminescence	100 ppb (188 µg/m <sup>3</sup> )	--	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m <sup>3</sup> )		53 ppb (100 µg/m <sup>3</sup> )	Same as Primary Standard	
<b>Sulfur Dioxide (SO<sub>2</sub>)<sup>9</sup></b>	1 Hour	0.25 ppm (655 µg/m <sup>3</sup> )	Ultraviolet Fluorescence	75 ppb (196 µg/m <sup>3</sup> )	0.5 ppm (1300 µg/m <sup>3</sup> )	Ultraviolet Fluorescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	--		--		
	24 Hour	0.04 ppm (105 µg/m <sup>3</sup> )		0.14 ppm (for certain areas) <sup>9</sup>		
	Annual Arithmetic Mean	--		0.030 ppm (for certain areas) <sup>9</sup>		
<b>Lead<sup>10,11</sup></b>	30 Day Average	1.5 µg/m <sup>3</sup>	Atomic Absorption	--	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Calendar Quarter	--		1.5 µg/m <sup>3</sup> (for certain areas) <sup>11</sup>		
	Rolling 3-Month Average	--		0.15 µg/m <sup>3</sup>		
<b>Visibility Reducing Particles<sup>12</sup></b>	8 Hour	See footnote 12	Beta Attenuation and Transmittance through Filter Tape	<b>No National Standard</b>		
<b>Sulfates</b>	24 Hour	25 µg/m <sup>3</sup>	Ion Chromatography			
<b>Hydrogen Sulfide</b>	1 Hour	0.03 ppm (42 µg/m <sup>3</sup> )	Ultraviolet Fluorescence			
<b>Vinyl Chloride<sup>10</sup></b>	24 Hour	0.01 ppm (26 µg/m <sup>3</sup> )	Gas Chromatography			



1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
  2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM<sub>10</sub>, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m<sup>3</sup> is equal to or less than one. For PM<sub>2.5</sub>, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.
  3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
  4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.
  5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
  6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
  7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.
  8. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.
  9. On June 2, 2010, a new 1-hour SO<sub>2</sub> standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO<sub>2</sub> national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.
- Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.
10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
  11. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 µg/m<sup>3</sup> as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
  12. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

## Attachment B. Significance Impact Levels

The SILs that are used for District AAQA analyses may be found in the table below. Please note that only Class II SILs are applicable for District use. The Class I and Class III SILs are being displayed strictly for informational purposes only.

SIL Threshold Values				
Pollutant	Averaging Period	SILs ( $\mu\text{g}/\text{m}^3$ )		
		Class I	Class II	Class III
PM <sub>2.5</sub>	Annual	0.05	0.2	0.2
	24-Hour	0.27	1.2	1.2
Fugitive PM <sub>2.5</sub>	Annual		0.63	
	24-Hour		2.5	
PM <sub>10</sub>	Annual	0.32	1	
	24-Hour	0.2	5	
Fugitive PM <sub>10</sub>	Annual		2.08	
	24-Hour		10.4	
Carbon Monoxide (CO)	8-Hour		500	
	1-Hour		2000	
Nitrogen Oxide (NO <sub>2</sub> )	Annual	0.1	1	
	1-Hour	--	7.5	
Sulfur Dioxide (SO <sub>2</sub> )	Annual	0.08	1	
	24-Hour	0.2	5	
	3-Hour	1	25	
	1-Hour		7.8	