UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

OFFICE OF THE
REGIONAL ADMINISTRATOR

August 21, 2008

Glenda Nelson
Chairperson
Enterprise Rancheria
3690 Olive Highway
Oroville, CA 95966

Dear Chairperson Nelson:

This letter provides information on the status of fine particle ($PM_{2.5}$) air pollution in the area where your reservation is located. $PM_{2.5}$ pollution represents one of the most significant barriers to clean air facing us today. Health studies link these tiny particles – about $1/30^{th}$ the diameter of a human hair – to serious human health problems including aggravated asthma, increased respiratory symptoms such as coughing and difficult or painful breathing, chronic bronchitis, decreased lung function, and even premature death in people with heart and lung disease. $PM_{2.5}$ pollution can remain suspended in the air for long periods of time and create public health problems far away from emission sources. Reducing levels of $PM_{2.5}$ pollution is an important part of our commitment to clean, healthy air.

Your reservation is located in an area that EPA is proposing to designate as nonattainment for the 2006 $PM_{2.5}$ air quality standard. Consistent with section 107(d) (1) of the Clean Air Act, this letter is to inform you that EPA intends to designate your reservation as nonattainment for the 2006 $PM_{2.5}$ health standard. We also intend to provide copies of this letter to Tribal Environmental Directors along with a copy of our supporting analysis for your reference. This analysis describes EPA's review of the air quality data, emissions data, and other related information for the area surrounding your reservation. If you would like to provide additional information about the $PM_{2.5}$ status of your reservation or adjoining areas for our consideration, please send it to us by October 20, 2008.

EPA has taken steps to reduce fine particle pollution across the country, such as implementing the Clean Diesel Program, which has reduced emissions from highway, non-road and stationary diesel engines. In addition, implementation plans developed by the state to attain the 1997 $PM_{2.5}$ standards will also help reduce unhealthy levels of fine particle pollution.

We intend to make final designation decisions for the 2006 24-hour $PM_{2.5}$ standards by December 18, 2008. If you have any questions, please do not hesitate to have your staff contact Colleen McKaughan at 520-498-0118. We look forward to a continued dialogue with you as we work together to implement the $PM_{2.5}$ standards.

Sincerely,

Wayne Nastri
Regional Administrator

Enclosure

cc: Ren Reynolds, Environmental Contact

Attachment 1

CALIFORNIA
Area Designations For the
24-Hour Fine Particle National Ambient Air Quality Standard

The table below identifies the counties in California that EPA intends to designate as not attaining the 2006 24-hour fine particle ($PM_{2.5}$) standard.[1] A county will be designated as nonattainment if it has an air quality monitor that is violating the standard or if the county is determined to be contributing to the violation of the standard.

Area	California Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties
Butte County	Butte County - Partial	Butte County
Imperial County	Imperial County - Partial	Imperial County
Sacramento County	Sacramento County	Sacramento County Yolo County Placer County – Partial El Dorado County – Partial Solano County - Partial
San Francisco Bay Area	Sonoma County – Partial Napa County Marin County San Francisco County Contra Costa County Alameda County Santa Clara County San Mateo County Solano County - Partial	Sonoma County – Partial Napa County Marin County San Francisco County Contra Costa County Alameda County Santa Clara County San Mateo County Solano County - Partial
San Joaquin Valley Air Basin	San Joaquin County Stanislaus County Merced County Madera County Fresno County Kings County Tulare County Kern County - Partial	San Joaquin County Stanislaus County Merced County Madera County Fresno County Kings County Tulare County Kern County - Partial
South Coast Air Basin	Los Angeles County – Partial San Bernardino County Partial Riverside County – Partial Orange County	Los Angeles County – Partial San Bernardino County Partial Riverside County – Partial Orange County
Yuba County Sutter County	Yuba County – Partial Sutter County - Partial	Yuba County Sutter County

EPA intends to designate the remaining counties in the state as attainment/unclassifiable.

[1] EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour $PM_{2.5}$ standard was revised from 65 micrograms per cubic meter (average of 98th percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the annual standard for PM2.5 remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).

EPA Technical Analysis for Butte County

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for Butte County identifies the monitor that violates the 24-hour $PM_{2.5}$ standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Butte County, CA

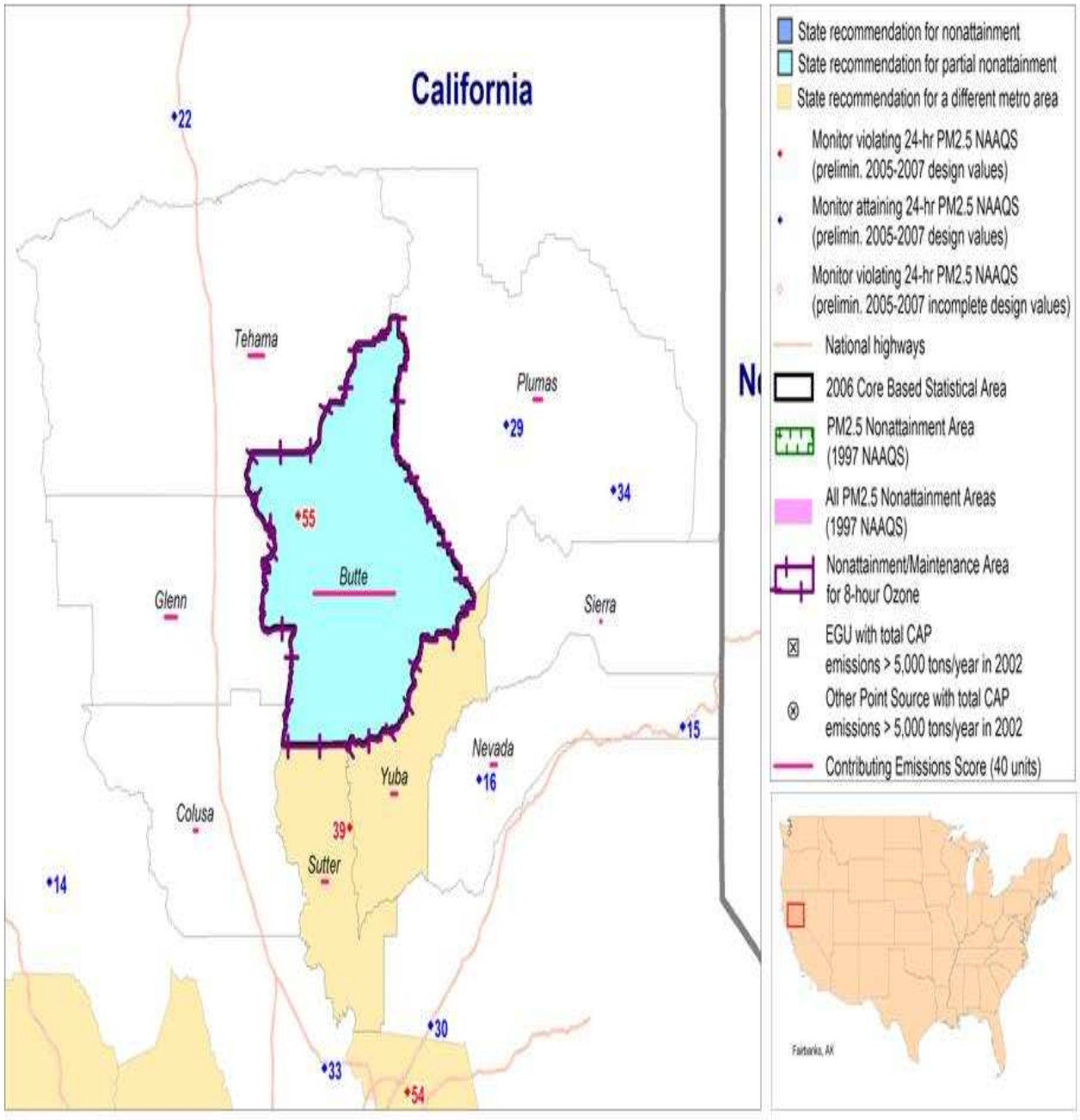


Figure 1

Counties labeled in bold reflect NAAs under 1997 NAAQS

The California Air Resources Board (CARB), sent a letter to EPA, dated December 17, 2007, recommending that the City of Chico in Butte County be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on the most recent three years of air quality data that were available in December 2007. These data are from a Federal Reference Method (FRM) monitor located in Chico, California.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network, as well as from the Chico monitoring site. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the cold season, and the average chemical composition of the highest days is characterized by high levels of organic carbon (e.g., 75%).

Based on EPA's 9-factor analysis described below, EPA believes that Butte County should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard, based on currently available information.

Area	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
City of Chico	Butte County (P)	Butte County

P= partial

Several factors led EPA to recommend a larger $PM_{2.5}$ nonattainment area than recommended by California. The most important reason was to ensure that all of the urban population in Butte County was included in the nonattainment area because the urban areas are most affected by wood smoke, which is one of the primary sources of $PM_{2.5}$ for Butte County. The recommended boundary does not include the entire population that would be exposed to high levels of $PM_{2.5}$ represented by the Chico design value, nor does it address transport that can occur from traffic and other sources within the relatively flat, valley floor of the Sacramento Valley.

Another significant consideration in expanding the nonattainment area recommended by California was that the State relied on future mobile source controls at a statewide level to address NOx emissions and, therefore, discounted mobile sources as an important consideration in their analysis. EPA believes that there is a significant contribution from mobile sources, both commuting and commercial truck traffic, in Butte County.

The following is a summary of the 9-factor analysis for Butte County.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown on the template or data spreadsheet as separate

items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in attachment 2, and a more detailed description can be found at: http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Butte County area. Counties are listed in descending order by CES.

Table 1. Related Emissions (tons per year) and Contributing Emission Score

County	State Recommended Nonattainment?	CES	$PM_{2.5}$ total	SOx	NOx	Carbon $PM_{2.5}$	$PM_{2.5}$ other	VOCs	NH_3
Butte	Yes (P)	100	2,974	2,115	8,486	1,513	1,461	9,754	1,757
Tehama	No	19	1,443	2,087	3,936	823	620	4,150	782
Glenn	No	14	1,851	1,347	3,882	833	1,017	4,392	2,139

P = partial

Additional data considered in EPA's analysis of this factor are summarized in the following table derived from the California Air Resources Board Almanac of Emissions and Air Quality Data (http://www.arb.ca.gov/Aqd/almanac/almanac.htm). The following table further defines, in tons per day, the type of area sources contributing to $PM_{2.5}$ emissions in Butte County. Area sources include residential fuel combustion, farming operations, construction/demolition, paved road dust, unpaved road dust, fugitive windblown dust, fires, managed burning and disposal and cooking. As is indicated, area sources represent the largest percentage of primary $PM_{2.5}$ emissions (approximately 70%) and the balance is divided between stationary and mobile sources.

Table 2. Area Source Emission (tons per day)	
SOURCE	**$PM_{2.5}$**
Residential Fuel Combustion	2.65
Farming Operations	0.82
Construction/Demolition	0.11
Paved Road Dust	0.53
Unpaved Road Dust	0.76
Fugitive Windblown Dust	0.04
Fires	0.01
Managed Burning & Disposal	1.4
Cooking	0.07
Total Area Wide	6.4
Area Wide percent of total	68%
Total All	9.9
Source: ARB Almanac website (2006) http://www.arb.ca.gov/ei/maps/statemap/cntymap.htm	

Given the significance of NOx emissions in the formation of the $PM_{2.5}$, EPA also considered emissions provided in the CARB Recommendation letter under this factor, along with the NOx data from NEI summarized in Table 1. Table 3 summarizes NOx emissions from stationary, area, and mobile source categories for 2006, 2010, and 2020.

Table 3. NOx Winter Emissions for Butte County (tons per day)			
Source Category	**2006**	**2010**	**2020**
Stationary Sources	1.4	1.4	1.4
Area Sources	1.7	1.7	1.7
Mobile Sources	23.3	19.9	11.3
Source: California Air Resources Board in their letter of December 17, 2007 Note: Although provided by CARB, the 2010 and 2020 data was not relied on for this analysis.			

Finally, speciation data from the Chico air monitoring station was considered in evaluating this factor as a way to link emission sources to high $PM_{2.5}$ levels. As shown in the pie chart below, the chemical makeup of $PM_{2.5}$ in Chico is dominated by organic carbon and ammonium nitrate when the highest concentrations occur, which is during the winter months (i.e., November through February).

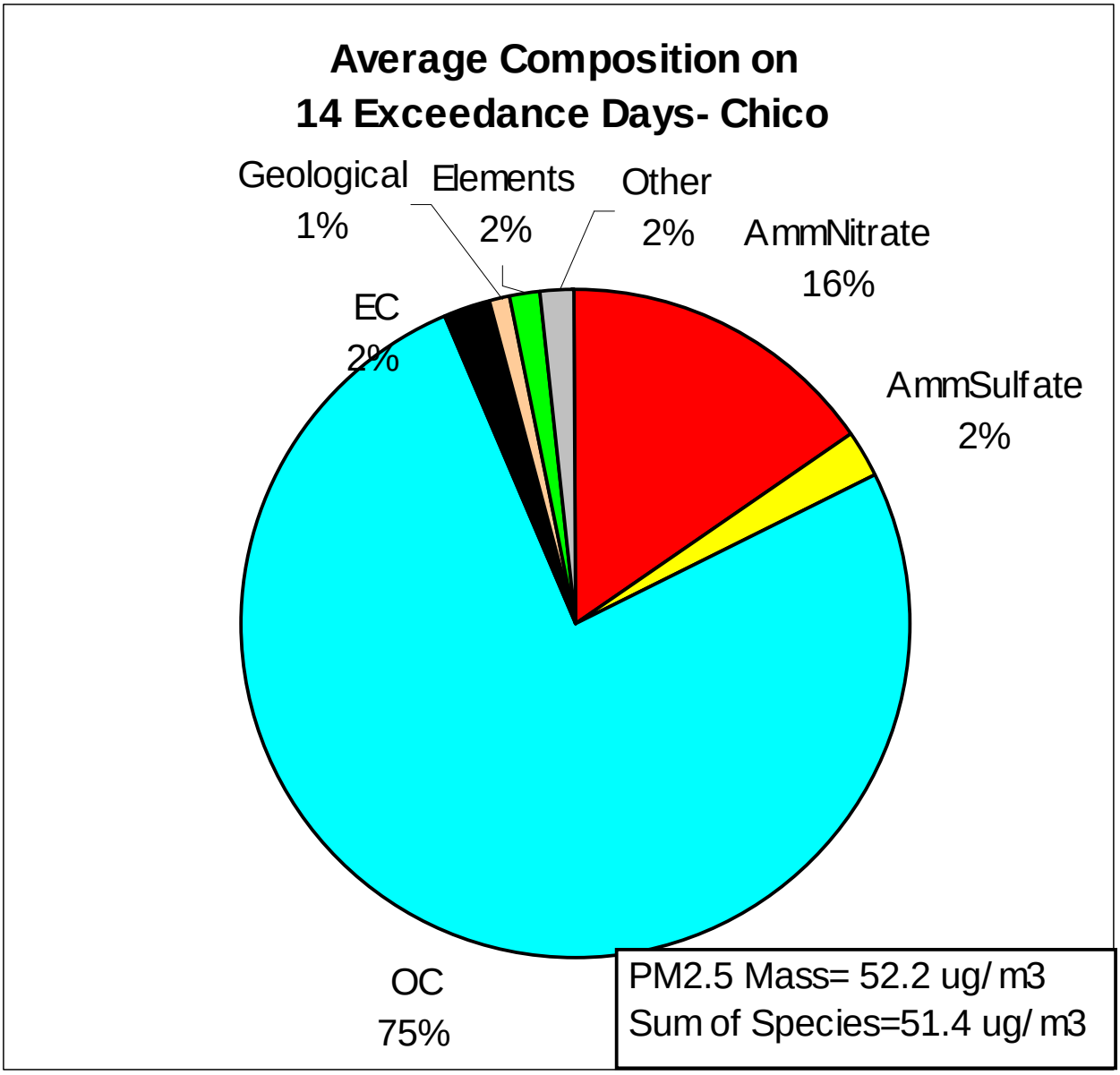


Figure 2: Average $PM_{2.5}$ Composition - Chico

The CES shown in Table 1 describe the relative contribution of emissions from surrounding counties to the high emission days based on a broad analysis of NOAA HYSPLIT trajectories linking county-wide emissions from Butte and the surrounding counties and speciated air monitoring data on high days. With respect to this factor, the CES clearly demonstrates a connection between pollution levels in Chico and sources throughout Butte County. The CES shows less of a link between $PM_{2.5}$ levels in Chico and neighboring Tehama and Glenn County.

With respect to primary $PM_{2.5}$ emissions, area sources represent the dominant source category in Butte County. Based on Table 2, within the area source category, residential wood burning is the dominant source of $PM_{2.5}$. This corresponds with the speciation data summarized in Figure 2

which shows that as much as 75% of the $PM_{2.5}$ makeup is carbon which can be attributed to residential wood burning during the winter months.

Finally, NOx emissions were considered. According to the speciation data in Figure 2, as much as 16% of the $PM_{2.5}$ composition can be nitrates, and thereby related to NOx sources in the winter. Both Table 1 and 3 describe NOx emissions data for Butte County and, as shown in Table 3, mobile sources are the dominant source of NOx emissions. In light of the commuting patterns discussed under Factor 4 and illustrated in Figure 3, there appears to be a clear link between mobile source emissions in Butte County and the $PM_{2.5}$ exceedances measured in Chico.

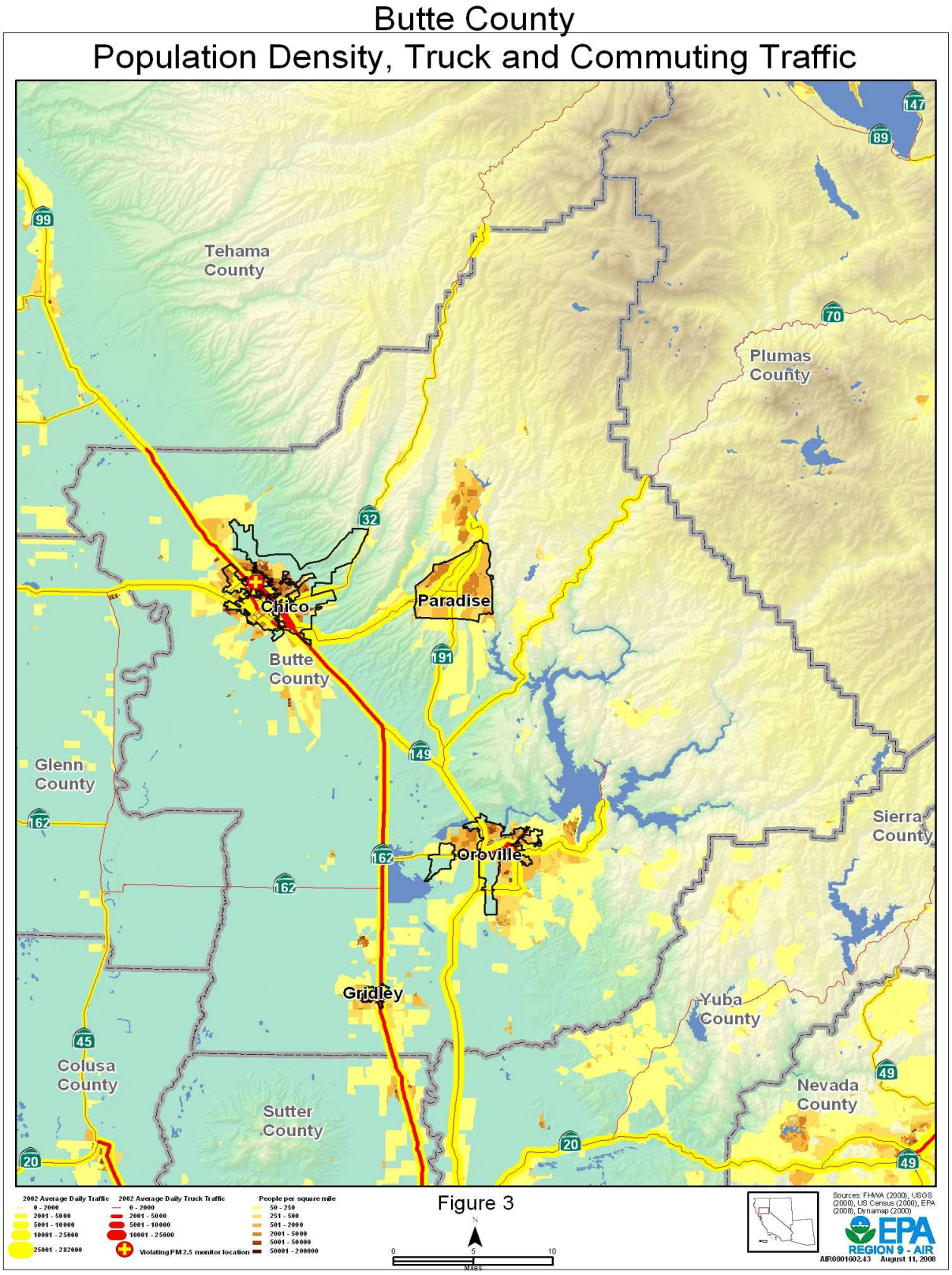


Figure 3

Figure 3

In summary, $PM_{2.5}$ exceedances most often occur in Chico during the winter months and speciation data suggest that residential wood burning and mobile source emissions are the most important sources. Area source data show that residential wood burning is the dominant source of $PM_{2.5}$ and thereby, could be linked to $PM_{2.5}$ exceedances measured in Chico. With respect to mobile sources, Butte County has significant mobile source emissions which, combined with the commuting patterns, suggest a link between exceedances in Chico and emissions within Butte County.

Based on emission levels and CES values, Butte County in California is a candidate for a 24-hour $PM_{2.5}$ nonattainment designation. However, it does not appear that the surrounding counties are significantly contributing to the pollution levels in Butte County.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values in micrograms per cubic meter ($\mu g/m^3$) for air quality monitors in Butte County based on data for the 2004-2006 and 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for Butte County and neighboring Plumas County are shown in Table 4. Monitors for $PM_{2.5}$ are not located in Tehama and Glenn Counties.

Table 4. Air Quality Data

County/ City	State Recommended Nonattainment ?	24-hour $PM_{2.5}$ Design Values 2004-06 ($\mu g/m^3$)	24-hour $PM_{2.5}$ Design Values 2005-07 ($\mu g/m^3$)
Butte County, CA City of Chico	Yes	56	55
Plumas County CA	No	30	34

The violating monitor for 2004–2006 and 2005-2007 is located in the City of Chico in Butte County. Therefore, Butte County is a candidate for designation as a nonattainment area. Tehama and Glenn counties have no data showing violations. Plumas County has a design value for 2005–2007 that is just below the $PM_{2.5}$ standard (at 34 $\mu g/m^3$). Given the air quality data, including consideration of CES values, and the State's recommendations, Plumas, Tehama and Glenn Counties were not further considered as nonattainment areas.

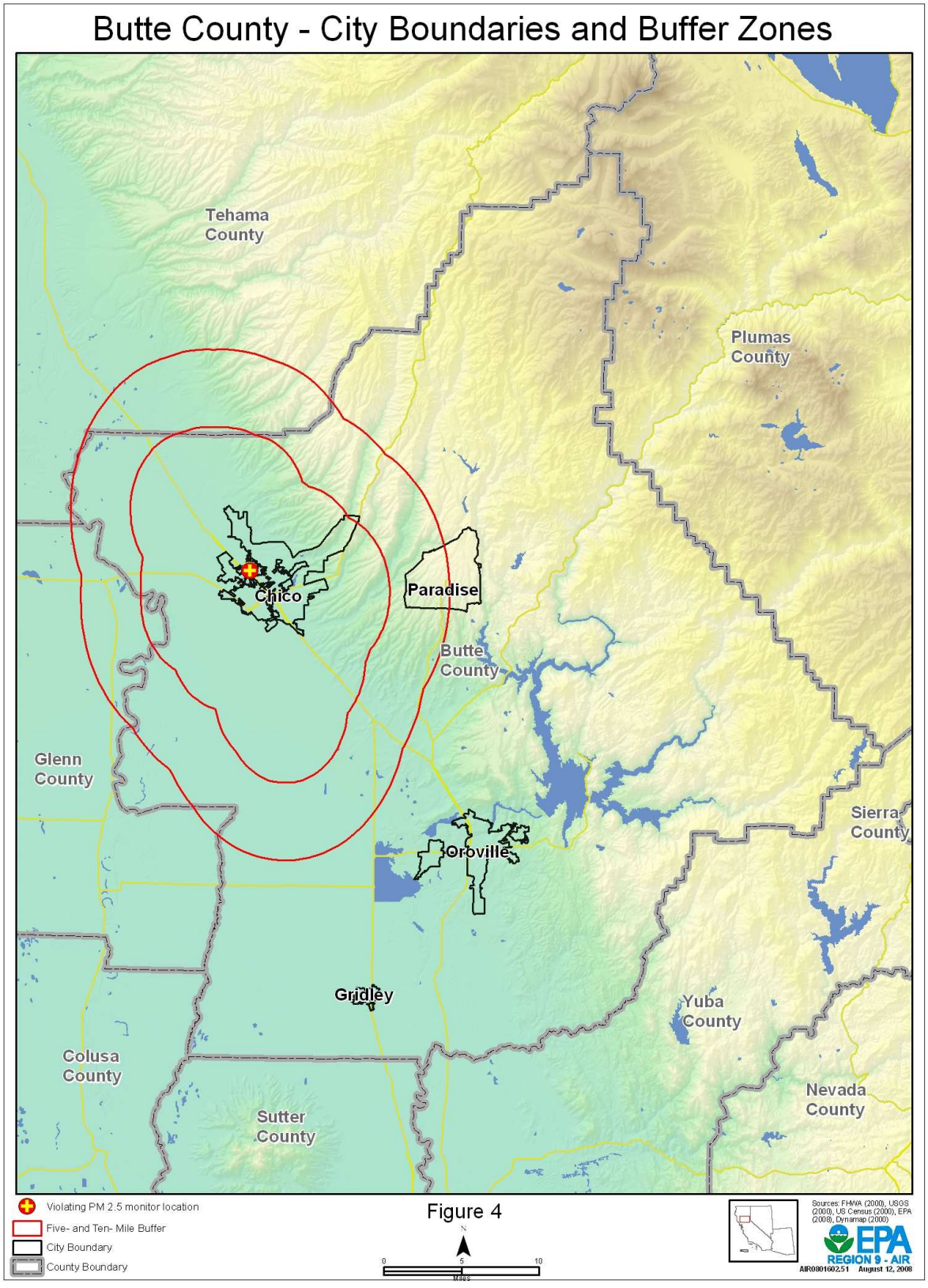
In addition to considering design values, EPA also considered information supplied in the CARB recommendation letter regarding the area represented by $PM_{2.5}$ air monitoring data. Two studies cited by CARB support nonattainment area boundaries larger than the areas that they recommended. The studies were both based on data collected during the 2000 California Regional $PM_{10}/PM_{2.5}$ Air Quality Study (CRPAQS). These studies focused on the San Joaquin

Valley which, together with the Sacramento Valley to the north, comprises California's Central Valley situated between the Sierra Nevada and the coastal mountain ranges. CARB cited the studies as showing that the organic carbon portion of $PM_{2.5}$ is largely urban rather than rural, because of the limited range of influence of $PM_{2.5}$ monitors (which are in urban areas). While it is likely true that organic carbon concentrations are higher in urban than in rural areas, this does not in itself support nonattainment areas limited to city boundaries.

Range of influence (or zone or radius of representation) can be defined in various ways. In the 2006 Chow study cited by CARB, zone of representation is defined as the area over which the average concentration differs less than 10% from the monitored value and this area was estimated based on concentration differences between monitors. A rapid concentration drop from one monitor to another nearby monitor would show a small zone of representation while a slow concentration drop between distant monitors would show a large zone. The study found the radius of representation to range from 3 km to 21 km (2 mi to 13 mi) and averaging 13 km (8 mi). This study included monitoring locations in the Sacramento Valley locations which were intended to describe the spatial distribution of concentrations and not to set boundaries for planning purposes. However, they do give a rough sense of the size of the area that is represented by a $PM_{2.5}$ air monitor.

In a second study using CRPAQS data, MacDonald et al. defined "zone of influence" as the distance at which CALPUFF-modeled concentrations fell to 1/10 of the urban maximum. This analysis showed larger regions of influence in the Sacramento area, 15-100 km (9-60 mi), than in the San Joaquin Valley, 15-50 km (9-30 mi).

Considering the results from these studies, EPA used buffer zones of 5 and 10 miles around city boundaries to approximate the area which could be influenced by $PM_{2.5}$ measurements in Chico. These boundaries are shown in Figure 4.


Butte County - City Boundaries and Buffer Zones
Tehama County
Plumas County
Chico
Paradise
Butte County
Glenn County
Oroville
Sierra County
Gridley
Yuba County
Colusa County
Nevada County
Sutter County
Violating PM 2.5 monitor location
Five- and Ten- Mile Buffer
City Boundary
County Boundary
Figure 4
Miles
Sources: FHWA (2000), USGS (2000), US Census (2000), EPA (2008), Dynamap (2000)
EPA
REGION 9 - AIR
AIR080160251 August 12, 2008

Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Population data are relevant in defining the boundaries of the $PM_{2.5}$ nonattainment area given the correlation between population and the emission sources contributing to $PM_{2.5}$ exceedances (i.e., residential wood burning and mobile sources), as well as the population exposed to high $PM_{2.5}$ levels. Table 5 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Table 5. Population

County	State Recommended Nonattainment?	2005 Population	2005 Population Density (pop/sq mi)
Butte	Yes (P)	214,153	128
Plumas County	No	21,409	8
Tehama	No	60,932	21
Glenn	No	27,683	21

P= partial

According to Table 5, Butte County has the highest population and population density. Tehama County has the next highest population of the adjacent counties, but significantly below Butte (also in terms of population density). Population centers in Butte County include Chico (population of 59,444 per 2000 US Census), Paradise (population of 26408 per 2000 US Census) and Oroville (population of 13004 per 2000 US Census). Tehama and Glenn County have the same population density of 21 pop/sq mi, compared to Butte County at 128. Both Butte and Glenn counties experienced a 5% population growth from 2000-2005, while Plumas and Tehama counties saw slightly higher growth at 8%. However, the small populations and moderate growth in Plumas, Tehama, and Glenn counties further supports elimination of these counties from consideration as nonattainment areas. The presence of population centers outside of Chico supports EPA's recommendation to expand the nonattainment area to capture these other population centers.

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to Butte County, the percent of total commuters in each county who commute to Butte County, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 6). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area. Such an area could be an appropriate county for implementing mobile source emission control strategies, thus warranting inclusion in the nonattainment area.

Table 6. Traffic and Commuting Patterns

County	State Recommended Nonattainment?	2005 VMT (1000s mi)	Number Commuting to any violating county	Percent Commuting to any violating county
Butte County	Yes (P)	2,078	75,510	92%
Plumas County	No	231	50	1%
Tehama County,	No	599	1,170	6%
Glenn County	No	330	1,770	17%

P = partial

According to the data in Table 6, Butte County has a significantly larger number of commuters commuting into the violating area, 75,510 or 92%. Butte County has a large number of commuters traveling to and from Chico, the location of the violating monitor. There is also significant traffic into and out of Chico from the Cities of Paradise (on Highway 91) and to Oroville (on Highway 149).

In addition to the contribution of Butte County to traffic levels in the City of Chico, average daily truck traffic on Highway 162 is in the range of 5001 to 10,000 trucks. This highway extends from Sutter County to Butte County beyond the city limits of Chico. The daily car and truck traffic from Chico to Paradise, and from Chico to Oroville is much lower, in the range of 0 to 2000 vehicles, but does shows a daily traffic pattern.

Based on Factor 4, Tehama, Plumas and Glenn Counties can be eliminated from consideration as nonattainment areas. However, Butte County has significant commuter and truck traffic which argues for including Butte County as a nonattainment area. Figure 3 shows the traffic patterns in and around Chico.

The 2005 VMT data used for Tables 6 and 7 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: atftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version

_3_report_092807.pdf. The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for Butte County and the surrounding counties, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 7 below shows population, population growth, VMT and VMT growth for counties that are in the area adjacent to Butte County. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 7. Population and VMT Growth and Percent Change

County	Population (2005)	Population Density	Population % change (2000 - 2005)	2005 VMT (millions mi)	% VMT change (from 1996-2005
Butte	214,153	128	5%	2,078	61%
Plumas	21,409	8	3%	253	57%
Tehama	60,932	21	8%	485	(41)%
Glenn	27,683	21	5%	253	(40)%

According to Table 7, Butte County has the highest population and population density. Tehama County has the next highest population of the adjacent counties, but significantly below Butte (also in terms of population density). Tehama and Glenn County have the same population density of 21 pop/sq mi, compared to Butte County at 128. Both Butte and Glenn counties experienced a 5% population growth from 2000-2005, while Plumas and Tehama counties also saw slightly higher growth at 8%.

Glenn and Tehama Counties, while having a relatively small increase in population from 2000 to 2005, also experienced a decline in VMT growth from 1996 to 2005. Plumas County, with the smallest total population of these counties, also had the lowest growth in population from 2000 to 2005, but relatively large growth in VMT for part of the same period.

Based on the analysis under Factor 5, Tehama and Glenn Counties, while experiencing modest growth in population, also had significant decreases in VMT which further supports elimination of these counties from consideration as nonattainment areas. Plumas County also had slight growth in population, but saw increased VMT. However, the total numbers for Plumas are still very low further supporting its elimination from consideration as a nonattainment area. Butte County has the largest population, by far, and also the most significant growth in VMT.

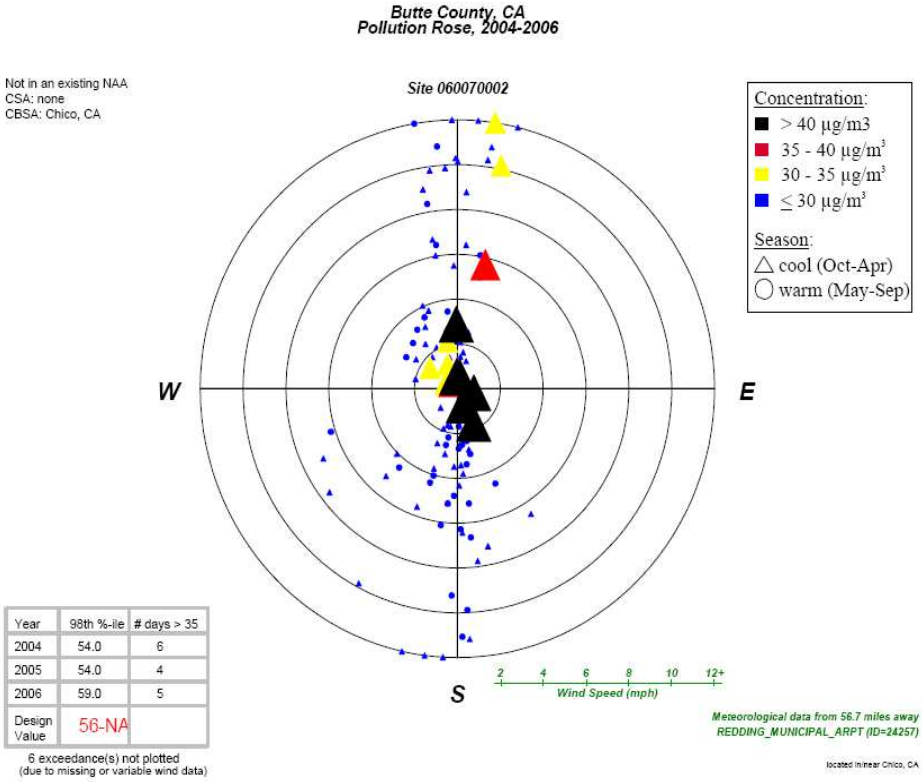
Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September

"warm" season). These high days are defined as days where any FRM or Federal Equivalent Method (FEM) air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values, or were 24-hr values exceeded 35.1 µg/m^3.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. Figure 5 identifies 24-hour $PM_{2.5}$ values by color; days exceeding 35 µg/m^3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

The pollution rose for Butte County, shown below, indicates that the elevated levels of the $PM_{2.5}$ 24-hour values for the Chico monitoring site occur primarily when the wind is from the south, and occasionally when the wind is from the north. The pollutant rose for Butte County also indicates that elevated $PM_{2.5}$ 24-hour values occur during the cool season, during time periods of low wind speeds.



These data are consistent with the analysis provided by California, and may also support the CARB position that the organic carbon portion of the particulate matter problem is localized. However, as discussed in Factor 2: Air Quality, above, the buffer zones of 5 and 10 miles around city boundaries approximate the area which could be influenced by $PM_{2.5}$ measurements in Chico. Therefore, the presumptive boundary of the City of Chico appears to be inappropriately small for taking into account the area influenced by the $PM_{2.5}$ measurements in Chico.

This factor, together with Factor 2, supports the EPA proposal that all of Butte County, California be considered for designation as a nonattainment area for the 24-hour $PM_{2.5}$ air-quality standard.

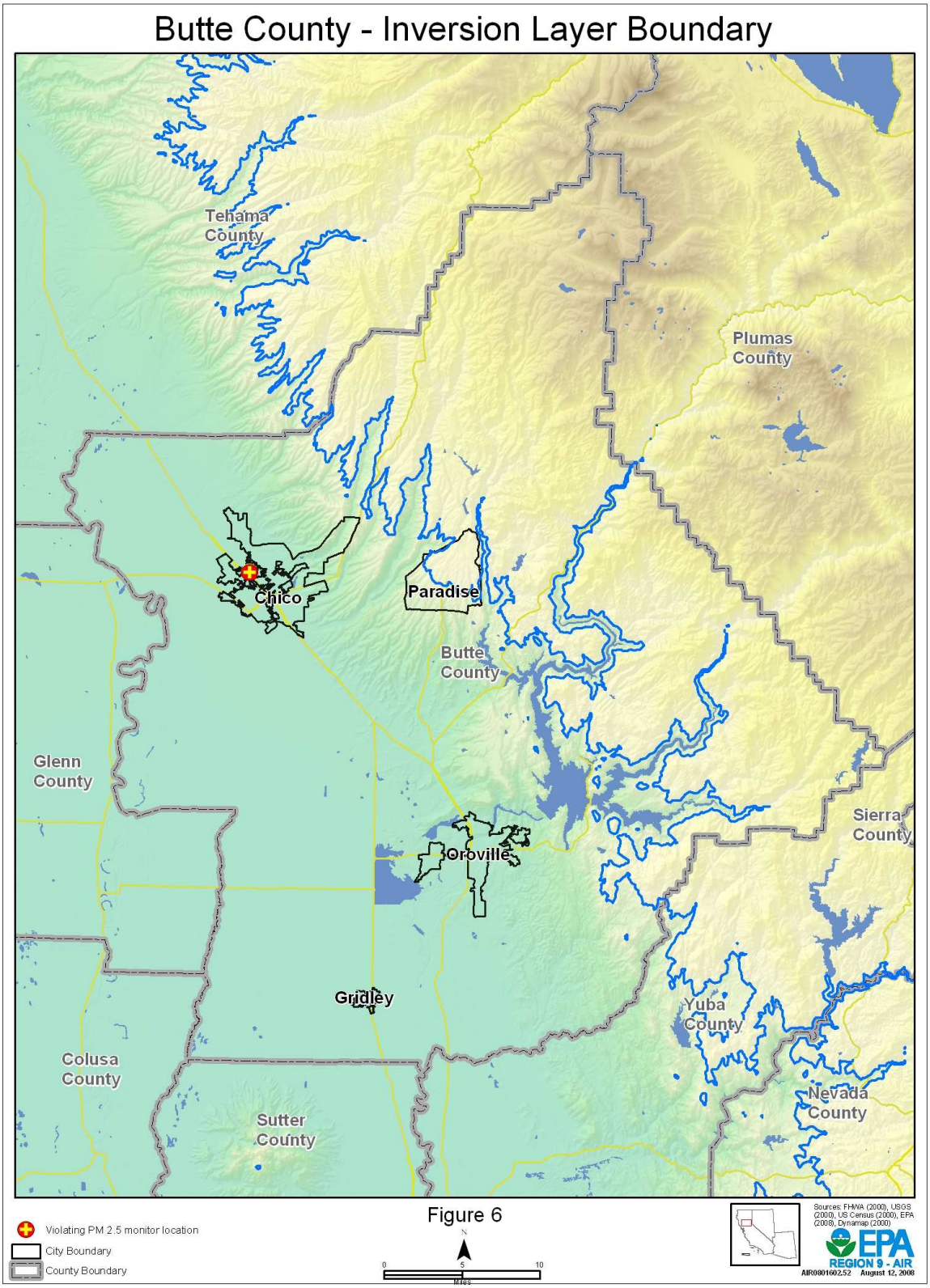
The meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the airshed and, therefore, on the distribution of $PM_{2.5}$ within Butte County.

Butte County is part of the larger Northern Sacramento Valley Air Basin (NSVAB), which includes the counties of Butte, Colusa, Glenn, Shasta, and Tehama. The NSVAB is bounded on north and west by the Coastal Mountain Range and on the east by the southern portion of the Cascade Mountain Range and the northern portion of the Sierra Nevada Mountains. These mountain ranges reach heights in excess of 6,000 feet with peaks rising much higher. This provides a substantial physical barrier to locally created pollution.

Because the Butte area has topographical features higher than the typical daytime height of the inversion layer, EPA considered the inversion height, as well as the using the top of the mountain or ridgeline, to estimate the size of the area likely to have similar pollution conditions, and to determine an appropriate eastern boundary. To get a sense of the eastern edge of area in which pollution could be confined, EPA examined the Sierra foothills elevation contour that is 1500 feet. This contour is represented in Figure 6.


Butte County - Inversion Layer Boundary
Tehama County
Plumas County
Chico
Paradise
Butte County
Glenn County
Oroville
Sierra County
Gridley
Yuba County
Colusa County
Nevada County
Sutter County
Violating PM 2.5 monitor location
City Boundary
County Boundary
Figure 6
Sources: FHWA (2000), USGS (2000), US Census (2000), EPA (2008), Dynamap (2000)
EPA
REGION 9 - AIR
AIR0801602.52 August 12, 2008

For the areas under consideration, high $PM_{2.5}$ concentrations mostly occur during stagnant conditions during winter, with radiant inversions. The cooling of the ground, as heat is radiated away, creates an inversion, since air near the ground is cooler than that above. This inhibits mixing and confines pollutants to a relatively shallow layer near the ground. Ferreria and Shipp examined the meteorology of San Joaquin Valley $PM_{2.5}$ and PM_{10} episodes, including inversion heights, typically based on aircraft temperature soundings. (During CRPAQS, radio acoustic sounding system (RASS) data were also available.) A typical value for maximum mixing height during high $PM_{2.5}$ conditions is 500 meters and a minimum mixing height can be 100 meters or less.

EPA recognizes that an inversion height is not a rigid boundary extending through a fixed elevation. In reality the inversion would be partly terrain-following, and the degree of stagnation would be subject to additional influences at the foothill edges, such as strong diurnal slope flows. In any case, the mixing heights vary substantially by site and date, so any single height can provide only a scale for comparison, not a definitive value. Nevertheless, this contour gives a rough sense of the area over which inversions may be enhancing pollution concentrations.

In summary, topography is considered to be an important factor given that inversion layers during the winter, when $PM_{2.5}$ exceedances typically occur, can contribute to higher pollution levels in the Sacramento Valley. In addition to affecting the City of Chico, these conditions are expected to create similar pollution conditions throughout Butte County and, thereby, provides further reason to expand the nonattainment boundary beyond the City of Chico. Tehama and Glenn County are also within the Sacramento Valley but, given the analysis in the preceding factors, we continue to support excluding them from the nonattainment area. Plumas County is not in the Sacramento Valley and, therefore, is not influenced by the same inversion conditions.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g. for $PM_{2.5}$ or 8-hour ozone standard) represent important boundaries for state air quality planning.

The analysis of jurisdictional boundaries considered the planning and organizational structure of the City of Chico in Butte County to determine if the implementation of controls in a potential nonattainment area can be carried out in a cohesive manner.

Tehama County is within the jurisdiction of the Tehama County Air Pollution Control District, and Plumas County is within the jurisdiction of the Northern Sierra Air Quality Management District. A goal in designating $PM_{2.5}$ nonattainment areas is to achieve a degree of consistency with ozone nonattainment areas. Butte County is currently a nonattainment area for the 8- hour ozone standard. Tehama, Glenn and Plumas are not currently designated nonattainment for 8-hour ozone.

All of Butte County, including the City of Chico, is within the jurisdiction of the Butte County Air Management District. Therefore, a Butte County $PM_{2.5}$ nonattainment area that relies on the county boundaries would provide a single management boundary for both 8-hour ozone and $PM_{2.5}$ planning, and would include the three cities of major population within Butte County. In addition, the Butte County boundary also encompasses the 5-mile buffer zone that EPA identified for the City of Chico. All of these factors argue for the inclusion of Butte County as a nonattainment area.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in Butte County.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by Butte County area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

Attachment 2

Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact $PM_{2.5}$ transport:

- Major $PM_{2.5}$ components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO_2, NO_x, and inorganic particles (crustal).
- $PM_{2.5}$ emissions for the highest (generally top 5%) $PM_{2.5}$ emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban $PM_{2.5}$ concentration that is in addition to a regional background $PM_{2.5}$ concentration, determined for each $PM_{2.5}$ component
- Distance from each potentially contributing county to a violating county or counties

A more detailed description of the CES can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.