

**Network Assessment
of the
Santa Barbara Air Pollution Control
District
Ambient Air Monitoring Network**



July 1, 2015

**Prepared by the
Santa Barbara County
Air Pollution Control District**

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1.0 Introduction

This report was prepared by the Santa Barbara County Air Pollution Control District (SBCAPCD) as an assessment of the air quality surveillance system in Santa Barbara County. Title 40, Part 58, Section 10 of the Code of Federal Regulations (40 CFR 58.10) requires that an assessment be performed every 5 years to determine if the network meets the monitoring objectives of this title. There are three basic monitoring objectives:

1. Provide air pollution data to the general public in a timely manner.
2. Support compliance with ambient air quality standards and emissions strategy development.
3. Support for air pollution research studies.

A variety of sites with different purposes are utilized to meet these goals. Typical site types are listed below:

- a) Sites located to determine the highest concentrations expected to occur in the area covered by the network.
- b) Sites located to measure typical concentrations in areas of high population density.
- c) Sites located to determine the impact of significant sources or source categories on air quality.
- d) Sites located to determine general background concentration levels.
- e) Sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards.
- f) Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

The assessment is also required to help determine if new sites are needed or existing sites can be terminated and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The current SBCAPCD air monitoring network meets or exceeds the minimum monitoring requirements as set forth in 40 CFR 58 Appendix D. Details of these minimum monitoring requirements are discussed in the Santa Barbara County Air Pollution Control District 2015 Network Plan.

2.0 Santa Barbara County Setting

Santa Barbara County is located on the Pacific coast of California bordered to the north by San Luis Obispo County and to the east by Ventura County. The Pacific Ocean forms the west and southern borders of the county. The Santa Ynez mountain range, which runs east/west parallel to the southern coast of the county is one of the predominate land features of the county which serves as a dividing feature between the northern and southern portions of the county.

Local air quality is highly dependent upon the climate and meteorology of the area because meteorological conditions control the transport and diffusion of emitted pollutants. Climate is a long term average of daily and seasonal weather conditions while meteorology deals with the day by day and hour by hour specific weather conditions. Understanding the climate of Santa Barbara County helps to explain annual cycles of local air quality. Understanding the meteorology of Santa Barbara County helps to explain shorter term variations in local air quality.

2.1 Climate of Santa Barbara County

Santa Barbara County has a Mediterranean climate characterized by warm, dry summers, and cooler, relatively damp winters. Mild temperatures occur throughout the year, particularly near the coastline. Maximum summer temperatures average 70 degrees Fahrenheit near the coast and in the high 80s to low 90s inland. During winter, average minimum temperatures range from the 40s along the coast to the 30s inland.

The climate of Santa Barbara is strongly influenced by a persistent high pressure area which lies off the Pacific Coast. As a result, sunny skies are common throughout most of the area. Rain storms periodically occur, mostly from October to April. Annual rainfall amounts range from 10 to 18 inches along the coast, with more substantial amounts in the higher elevations. On occasion, tropical air masses produce rainfall during the summer months.

Cool, humid, marine air causes frequent fog and low clouds along the coast, generally during the night and morning hours in the late spring and early summer months. The fog and low clouds can persist for several days at a time until broken up by a change in the weather pattern.

2.2 Meteorology of Santa Barbara County

Meteorology deals with shorter time periods and smaller spatial scales than climate. Understanding the interaction between local meteorology and emitted pollutants is essential in understanding how elevated levels of pollutants can occur in the atmosphere. This relationship between local meteorology and elevated pollutant levels is necessary in evaluating the design of an ambient air monitoring network.

2.2.1 Surface Winds

The airflow around the county plays an important role in the movement of pollutants. In northern Santa Barbara County (north of the ridgeline of the Santa Ynez Mountains), the sea breeze (from sea to land) is typically northwesterly throughout the year. During summer months, these northwesterly winds are stronger and persist later into the night. At night, the sea breeze dies, and as air adjacent to the surface cools, it descends down the coastal mountain and mountain valleys resulting in light land breezes (from land to sea). This land/sea breeze cycle combined with local topography greatly influence the direction and speed of the winds throughout the county. In addition, the alternation of the land-sea breeze cycle can sometimes produce a "sloshing" effect, where pollutants are swept offshore at night and subsequently carried back onshore during the day. This effect is exacerbated during periods when wind speeds are low.

Topography plays another role in wind patterns experienced in the county. The terrain around Point Conception, combined with the change in orientation of the coastline from north-south north of Pt. Conception to east-west south of Pt. Conception can cause counter-clockwise circulations (eddies) to form east of the Point. These eddies fluctuate from time-to-time and place-to-place often leading to highly variable winds along the southern coastal strip. Point Conception also marks the change in the prevailing surface winds from northwesterly north of Pt. Conception to southwesterly south of Pt. Conception.

Another type of wind regime that influences air quality in Santa Barbara is the "Santa Ana" wind condition. Santa Ana winds are dry northeasterly winds that occur primarily during the fall and winter months. These are warm, dry winds which descend down the slopes of a mountain range. Wind speeds associated with Santa Ana are generally 15-20 mph, though they can reach speeds in excess of 60 mph. During Santa Ana conditions, pollutants emitted in Santa Barbara, Ventura County, and the South Coast Air Basin (the Los Angeles region) are moved out to sea. These pollutants can then be moved back onshore into Santa Barbara County (via the Santa Barbara Channel) in what is called a "post Santa Ana condition." The effects of the post Santa Ana can be experienced throughout the county. However, not all post Santa Ana conditions lead to high pollutant concentrations.

2.2.2 Upper Level Wind and Temperature

Upper-level winds in the atmosphere are also critical to the air quality of Santa Barbara County. The winds at 1,000 feet and 3,000 feet are generally from the north or northwest throughout the year. Occurrences of southerly and easterly winds are most frequent in winter, especially in the morning. Upper-level winds from the southeast are infrequent during the summer months, though they are usually associated with periods of high ozone levels. As with the surface winds, upper level winds can move pollutants that originate in other areas into the county.

Another factor that affects the concentrations of pollutants in the air is the stability of the atmosphere. Atmospheric stability regulates the amount of air exchange (referred to as mixing) both horizontally and vertically. Restricted mixing (a high degree of stability)

and low wind speeds are generally associated with higher pollutant concentrations. These conditions are typically related to temperature inversions (temperature increase with height) which cap the pollutants that are emitted below or within them.

Surface inversions (0-500 ft.), as measured at Vandenberg Air Force Base, are most frequent during the winter, and subsidence inversions (1000-2000 ft.) are most frequent during the summer. Generally, the lower the inversion base height and the greater the rate of temperature increase from the base to the top, the more pronounced effect the inversion will have on inhibiting dispersion. The subsidence inversion is very common along the California coast and is one of the principle causes of air stagnation.

Poor air quality is often associated with "air stagnation" (high stability/restricted air movement). Therefore, it is reasonable to expect a higher frequency of pollution events in the southern portion of the county where light winds are frequently observed, as opposed to the North County where the prevailing winds are strong and persistent.

2.3 Santa Barbara County Population Distribution

The 2014 population of Santa Barbara County is estimated to be 440,668 according to the U. S. Census. This is a 3.9 percent increase from the year 2010 Census count of 423,895. The distribution of population by race and age (from 2010 census) is presented in Table 2-1 below.

Table 2-1 Santa Barbara County Distribution of Population by Race and Age

Santa Barbara County Population Distribution by Race						
White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races
69.6%	2.0%	1.3%	4.9%	0.2%	17.4%	4.6%

Santa Barbara County Population Distribution by Age					
Age <14	Age 15-24	Age 25-54	Age 55-64	Age 65-74	Age >75
18.9%	19.5%	37.7%	10.8%	6.6%	6.5%

The population is concentrated in the areas surrounding the cities of the south coast, Lompoc, Santa Maria, and Santa Ynez/Solvang. The remaining areas of the county are very scarcely populated, especially the large area of National Forest in the northeastern area of the county. Most of the forecasted growth in the next five years is predicted to occur in the north county: Buellton and Santa Maria. The Goleta valley area of the south coast is also predicted to see significant population growth.

3.0 Air Monitoring Network

The SBCAPCD and the California Air Resources Board (CARB) began monitoring air quality within the populated urban areas of Santa Barbara County in the early to mid-1970, as required under the 1970 federal Clean Air Act. Between the mid-1970 and the mid-1980, the number and location of monitoring stations did not change. No new large industrial sources of air pollution were permitted in the county during this period.

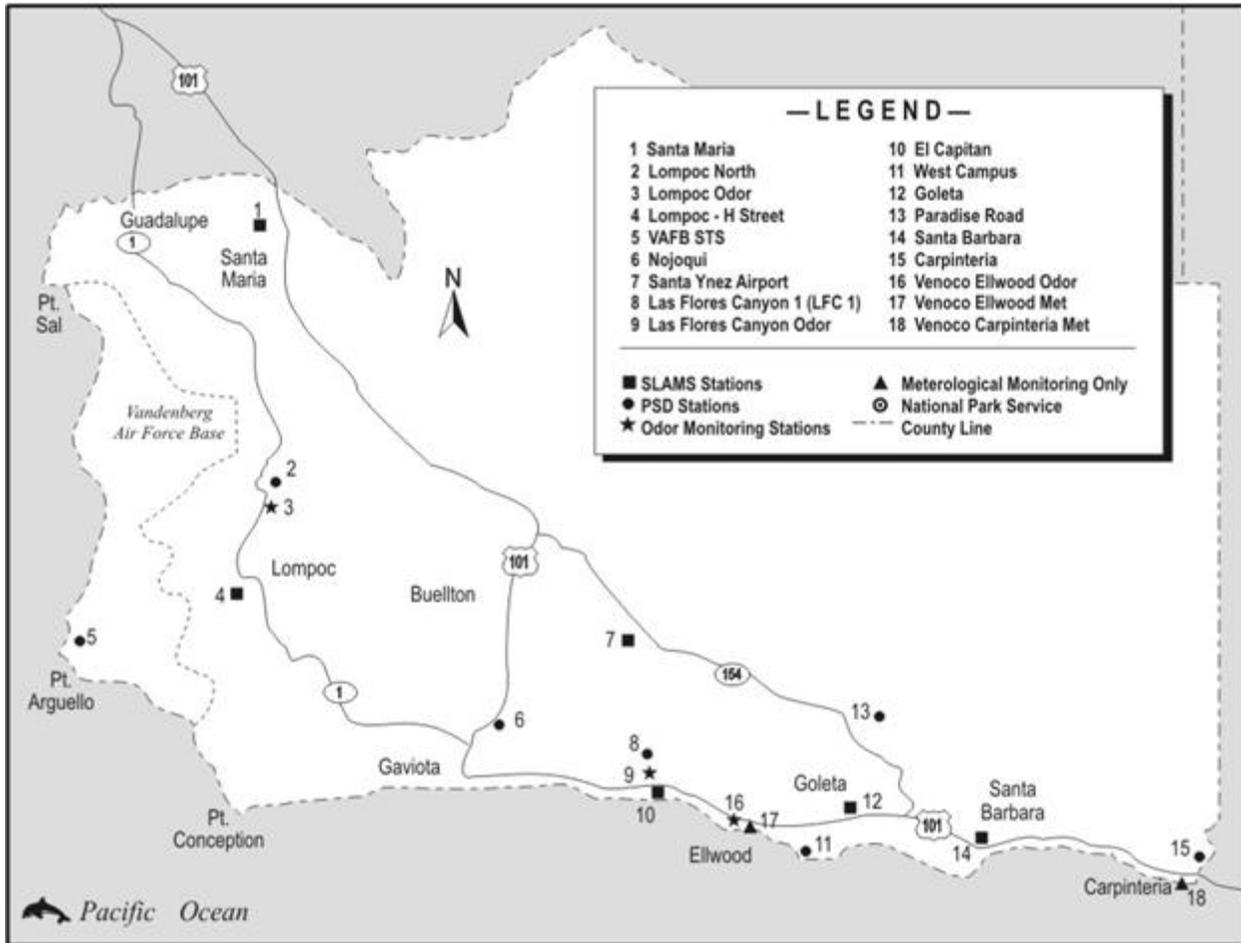
A number of changes occurred in the early to mid-1980 which resulted in an expansion of the monitoring network. First, Santa Barbara County adopted its New Source Review/Prevention of Significant Deterioration Rule, as required by the federal Clean Air Act Amendments of 1977, Part D. This rule guides all aspects of the SBCAPCD's air quality permitting program and includes federal requirements for air monitoring.

At the same time, a number of oil companies requested development permits from the County and the SBCAPCD for major onshore industrial facilities associated with large-scale offshore oil development projects. This triggered monitoring requirements as part of the Prevention of Significant Deterioration (PSD) program which requires major industrial pollution sources to conduct air monitoring for various purposes. Prior to constructing the facilities, air monitoring is used to determine baseline conditions and to provide input to computer models used to estimate air quality impacts. After construction, air monitoring is used to determine the impacts that facility operations may have on overall air quality and to validate the assumptions used for issuing the permit. The primary purpose of all these requirements is to protect public health and welfare.

The next change came in the early 1990s when these major facilities were at peak operational capacity and reducing operations. The sites operating under the PSD program were evaluated and a number of them were allowed to shut down because there was enough data to characterize the emissions around the facilities.

Currently, there are 18 ambient air quality monitoring stations in operation within Santa Barbara County (Figure 3-1). The network consists of state and local air monitoring stations (SLAMS) and special purpose monitors (SPM). The sites are operated by the SBCAPCD, CARB or private contractors. The SPMs can be subdivided into PSD monitors (source specific monitors and regional air quality monitors), research, and safety monitors

Figure 3-1 – 2015 Map of Monitoring Network



The SLAMS sites were set up to monitor air quality in populated urban areas. The PSD stations monitor local impacts of specific industrial facilities. Regional PSD stations were also established to monitor cumulative impacts of large facilities on regional air quality in the county. A particular monitoring station can serve a dual purpose when its location satisfies the objectives of more than one classification, or for more than one facility. Many of the county's large industrial facilities, however, are located in areas of complex topography with complex meteorological conditions, for example, in separate canyons along the coast between Goleta and Gaviota, limiting the ability of a single station to represent multiple facilities.

3.1 SLAMS Sites

There are six SLAMS monitoring stations in operation within Santa Barbara County. They are located in Santa Barbara, Goleta, Lompoc, Santa Maria, El Capitan State Park, and at the Santa Ynez Airport. The CARB operates the downtown Santa Barbara and Santa Maria stations, while the SBCAPCD is responsible for the operation of the remaining sites. These sites have been operating in these areas since the late 70's or early 80's which have provided long term air quality trend data.

3.2 PSD Monitoring Sites

There are seven PSD sites which are set up to measure maximum pollutant concentrations, regional air quality, background levels or transport emissions. All of these sites are required to be operated by various permit to operate conditions.

The Paradise Road site is located downwind of the populated areas of northern Santa Barbara County. It is sited to measure the maximum ozone levels of the county. Las Flores Canyon site 1 (LFC1) is located in the foothills on the south side of the Santa Ynez Mountains and records maximum ozone levels in the southern section of the county.

Two sites were setup to measure the impacts from transport. Carpinteria is located in the southeastern portion of the county which measures transported pollutants from the Los Angeles basin. Nojoqui is located at the top of the Gaviota pass and is designed to measure the transport of pollutants between northern and southern portions of the county.

LFC1, Lompoc HS&P, and VAFB are three which serve dual purposes. They are sited downwind of major facilities to measure the impacts of those facilities on the local environment. However, ozone is also measured at these sites as part of the regional ozone monitoring network.

The West Campus site is set up to measure the impacts from oil storage tanks and barge loading/unloading activities. The data from this site is also used by UCSB researchers for various studies.

3.3 Odor Sites

There are three sites set up to measure odorous compounds which could potentially be emitted from certain oil and gas facilities. These sites typically measure hydrogen sulfide, and total reduced sulfur, wind and temperature. These three sites are LFC Odor, Ellwood Odor, and Lompoc Odor. These sites are required by permit to operate conditions for these facilities.

3.4 Meteorological Sites

Two sites are set up specifically for monitoring meteorological conditions. These two sites are Venoco Ellwood Met and Venoco Carpinteria Met. These sites measure wind speed, wind direction and temperature. The data from these sites are used to characterize where emissions from these facilities will be dispersed.

4.0 Pollutants Monitored and Analysis of Data

EPA has established a set of air quality standards known as the National Ambient Air Quality Standards or NAAQS. The standards were established to protect human health and welfare. They include: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate less than 10 microns and particulate less than 2.5 microns. The SBCAPCD monitors these pollutants at a number of locations to determine if we meet the standards. Other pollutants are also monitored in the county. Some are monitored for state air quality standards, some for safety and others for research. These pollutants include: hydrogen sulfide, total reduced sulfur, and total hydrocarbons. Wind speed/direction and temperature are also measured at each site to help characterize the source of the measured pollutants. This report is only evaluating the pollutants measured for comparison with the NAAQS.

4.1 Ozone Monitors

Ozone is monitored at twelve locations in the county. Santa Barbara, Goleta, Lompoc H Street, Santa Maria, Santa Ynez are located in the major populated areas of the county for population exposure. Paradise Road, LFC1, Lompoc HS&P, Nojoqui, Carpinteria, VAFBSTS and El Capitan were sited as part of a regional network. Carpinteria, Paradise Road and LFC1 have consistently measured the highest concentrations of ozone in the county. Paradise Road is north of the Santa Ynez mountain range and represents air in the north county while LFC1 and Carpinteria are south of the Santa Ynez mountain range and is representative of the foothill region of the south county.

4.1.1 Analysis of Ozone Measurements

Summary statistics were compiled for these sites and summarized in Table 4-1. The fourth highest eight hour ozone value was determined for each year from 2012 through 2014. These fourth highest values were averaged for each site and compared with the NAAQS standard of 0.075 ppm. The sites were ranked based on the percent of the standard.

Table 4-1
Ozone Summary

AQS #	STREET_ADDRESS	2012	2013	2014	3 year	% of	Rank
		4th Max ppm	4th Max ppm	4th Max ppm	Average ppm	Std 0.075 ppm	
06-083-1021	Carpinteria	0.063	0.065	0.076	0.068	91%	1
06-083-1025	Las Flores Canyon #1	0.07	0.059	0.07	0.066	88%	2
06-083-1014	Paradise Road	0.067	0.065	0.065	0.065	87%	3
06-083-4003	VAFB STS	0.058	0.058	0.069	0.061	81%	4
06-083-2011	Goleta	0.051	0.059	0.069	0.059	79%	5
06-083-3001	Santa Ynez Airport	0.056	0.057	0.063	0.058	77%	6
06-083-0011	Santa Barbara	0.054	0.055	0.066	0.058	77%	7
06-083-0008	El Capitan	0.054	0.057	0.065	0.058	77%	8
06-083-1018	Nojoqui	0.056	0.056	0.064	0.058	77%	9
06-083-1013	Lompoc HS&P	0.053	0.054	0.063	0.056	75%	10
06-083-2004	Lompoc H Street	0.053	0.054	0.063	0.056	75%	11
06-083-1008	Santa Maria	0.049	0.048	0.058	0.051	68%	12

There were no sites that exceeded the standard for the 2012-2014 period examined. The Carpinteria monitor was the highest with 91% of the current ozone standard. Overall, four stations were within 20% of the current ozone standard.

The EPA has announced a plan to revise the current ozone NAAQS in October 2015 with the new standard that is expected to be in a range of 0.070 ppm to 0.065 ppm. If it is lowered to 0.065 ppm, there would be up to three sites at 100 percent of the standard or above.

4.1.2 Correlation Analysis of Ozone Measurements

Correlation analysis compares the measurements from nearby sites to determine if concentrations correlate temporally. Figure 4-1 below presents a graphic representation of the correlation between ozone sites in Santa Barbara County and two sites in adjacent counties. The two sites from adjacent counties are Nipomo Regional Park (06-079-4002) in southern San Luis Obispo County, and Maricopa School (06-029-0008) in southwestern Kern County. These two sites are included in this analysis due to their close proximity to Santa Barbara County.

Monitor pairs with Pearson correlation values near one (strait line) are highly correlated, while monitor pairs with Pearson correlation values near zero (circle) have no correlation. Monitors that do not correlate well with other monitors exhibit unique temporal concentration variation relative to other monitors and are likely to be important

for assessing local emissions, transport and spatial coverage. Monitor pairs with high Pearson correlation values (e.g., $r > 0.75$) exhibit similar temporal concentrations. Monitor pairs with low average relative difference (white or light yellow color) measure similar ozone concentrations, while monitors with high average relative differences (red to blue color) measure significantly different ozone concentrations.

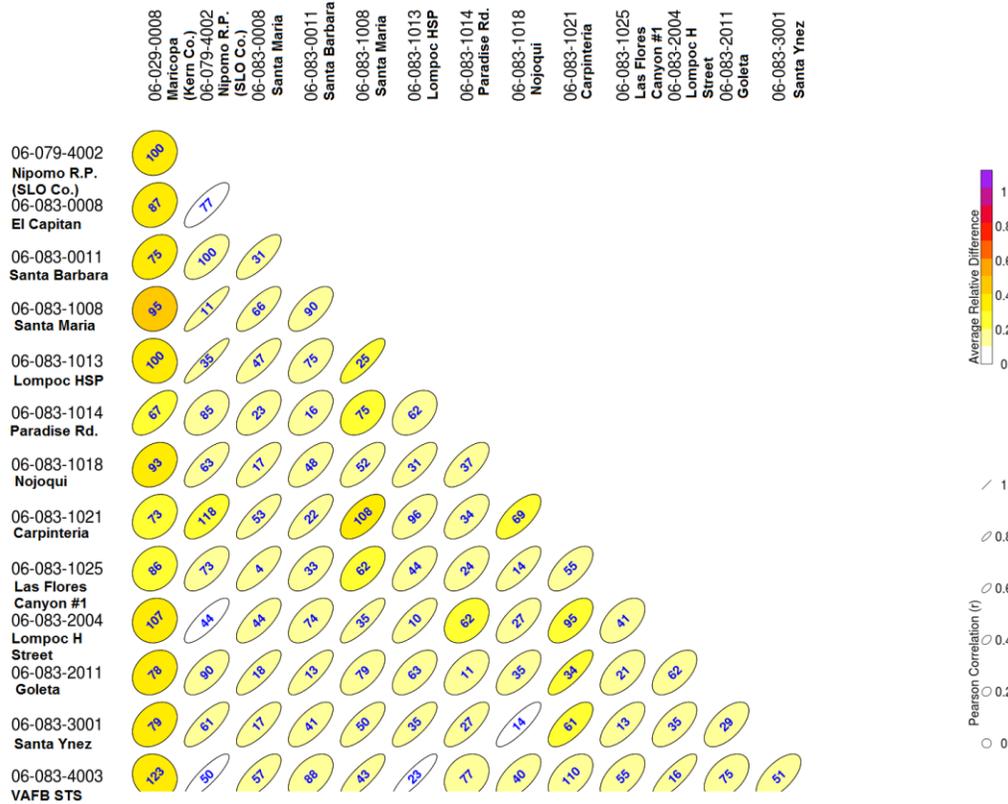
Possible redundant sites would exhibit fairly high correlations consistently across all of their pairings and would have low average relative difference despite the distance. Usually, it is expected that correlation between sites will decrease as distance increases. However, for a regional air pollutant such as ozone, sites in the same air shed can have very similar concentrations and be highly correlated. More unique sites would exhibit the opposite characteristics. They would not be very well correlated with other sites and their relative difference would be higher than other site to site pairs.

The site pairs with high correlation and low average difference and therefore potentially redundant are:

El Capitan/Nipomo R. P. (SLO County)
Lompoc H Street/Nipomo R. P. (SLO County)
Vandenberg STS/Nipomo R. P. (SLO County)
Vandenberg STS/Lompoc HSP
Santa Ynez/Nojoqui

The Maricopa monitor in southwest Kern County shows low correlation and relatively high average difference, indicating that the measurements at Maricopa are distinctly different than any ozone measurements in Santa Barbara County.

8-Hour Daily Max Ozone Correlation Matrix - All Valid Pairs



values in ellipse = distance in kilometers

Figure 4-1 Ozone Correlation Analysis

4.1.3 Ozone Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine if new sites are needed. In order to make that decision, it is helpful to have some estimation of the extreme pollution levels in areas where no monitors currently exist. To assist in understanding the probability of exceedances occurring in areas where no monitors exist, surface probability maps were generated. These maps were generated by calculating estimates of ground level ozone for the centroid of each census tract. These are statistical estimates from “fusing” photochemical modeling data and ambient monitoring data using Bayesian space-time methods.

This map is intended to be used as a spatial comparison and not for probability estimates for a single geographic point or area. The probability estimates displayed on the map alone should not be used to justify a new monitor. The maps should be used in conjunction with existing monitoring data. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. Figure 4-2 plots the probability of exceeding the current 8 hour ozone standard of 75ppb. This analysis shows low probability of exceeding the current ozone

standard in the western coastal region of Santa Barbara County, with moderate probability on the southern coastal and interior regions of Santa Barbara County. This analysis methodology has limited capabilities to correctly predict measured concentrations as it does not distinguish the higher concentrations measured at LFC#1 from significantly lower measurements at El Capitan and the higher concentrations at Carpinteria from the Santa Barbara site.

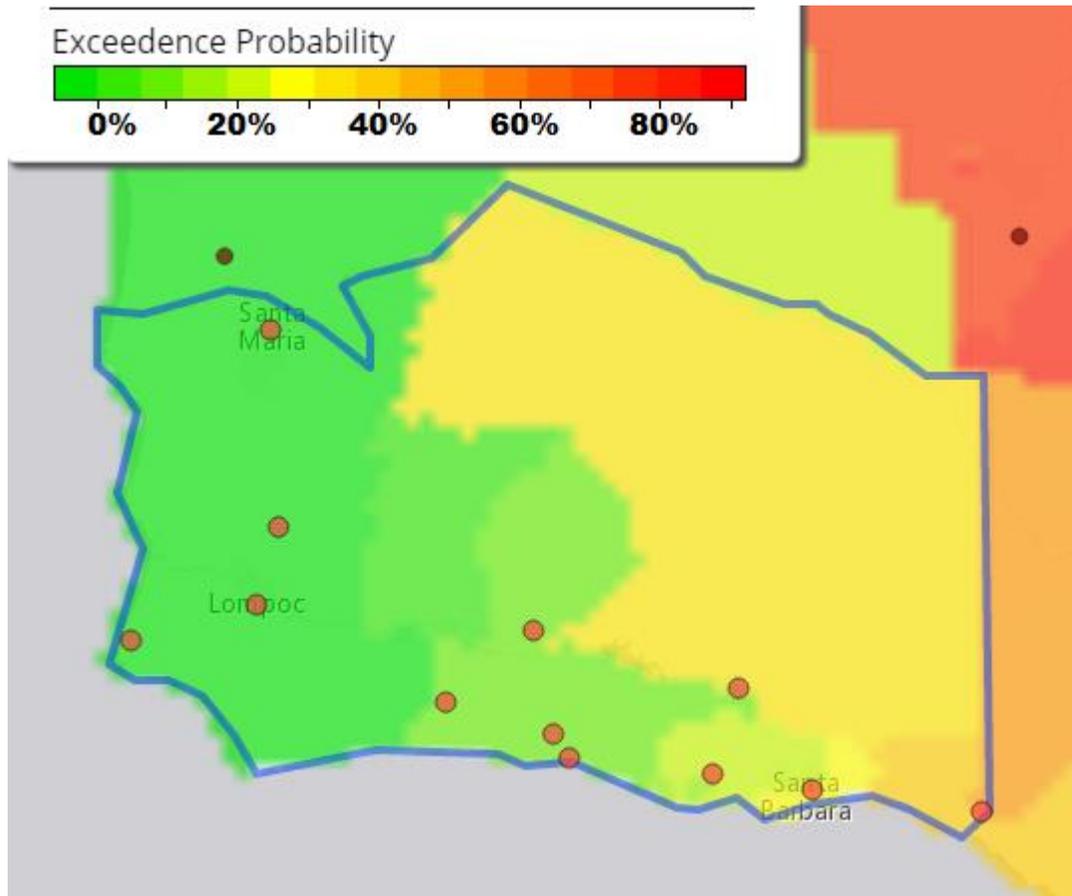


Figure 4-2 Surface Probability Plot for Exceeding the Existing Ozone Standard of 75ppb

EPA announced in November 2014 plans to lower the ozone standard from the current 75ppb level to between 65ppb and 70ppb, also with an 8 hour averaging period by October 2015. For comparison, Figure 4-3 plots the probability of exceeding a standard set at 65ppb for an 8 hour average. This analysis confirms the ozone measurement analysis finding that multiple sites will likely exceed a new standard set at 65 ppb. These exceeding sites will be located along the southern coast and interior of Santa Barbara County.

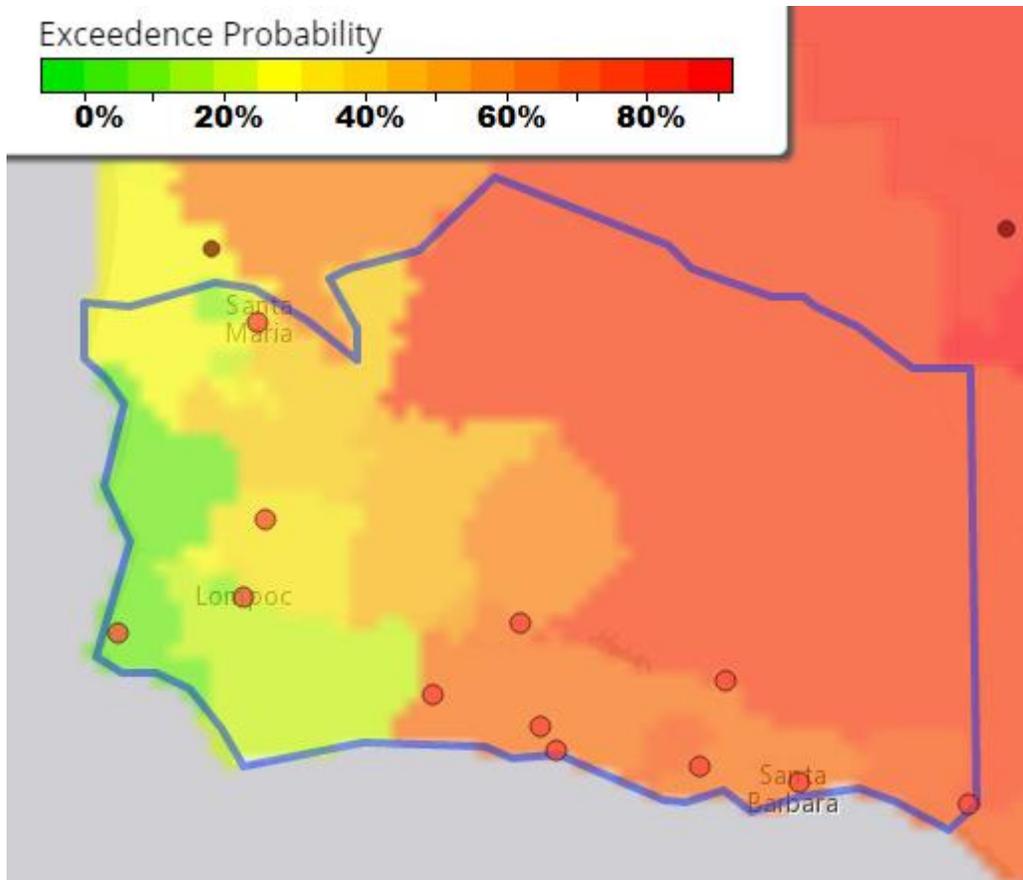
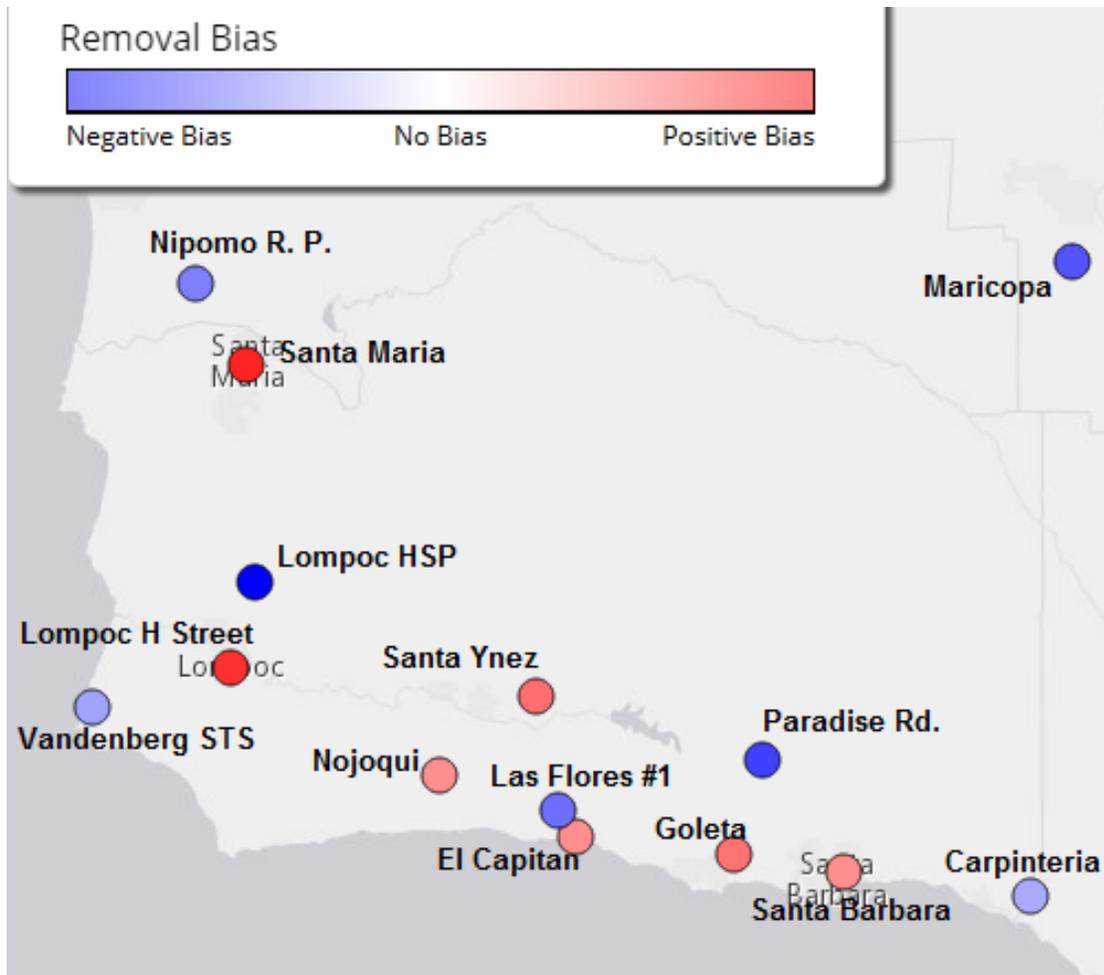


Figure 4-3 Surface Probability Plot for Exceeding an Ozone Standard of 65ppb

4.1.4 Ozone Removal Bias Analysis

The removal bias analysis is a tool used in determining possible redundant sites. The bias estimation uses the nearest neighbors to each site to estimate the concentration at the location of the site if the site had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting on concentrations at sites located closer to the site being examined. The bias was calculated for each day at each site by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the site being examined was removed, the neighboring sites would indicate that the estimated concentration would be larger than the measured concentration. Likewise, a negative average bias would suggest that the estimated concentration at the location of the site is smaller than the actual measured concentration. A site with no bias, indicates that the estimated concentration at the location of the site matches the actual measured concentration. Sites with little to no bias are sites where removal could be considered. However, the analysis results indicate that using estimates from nearby sites in lieu of any existing site would introduce significant bias.



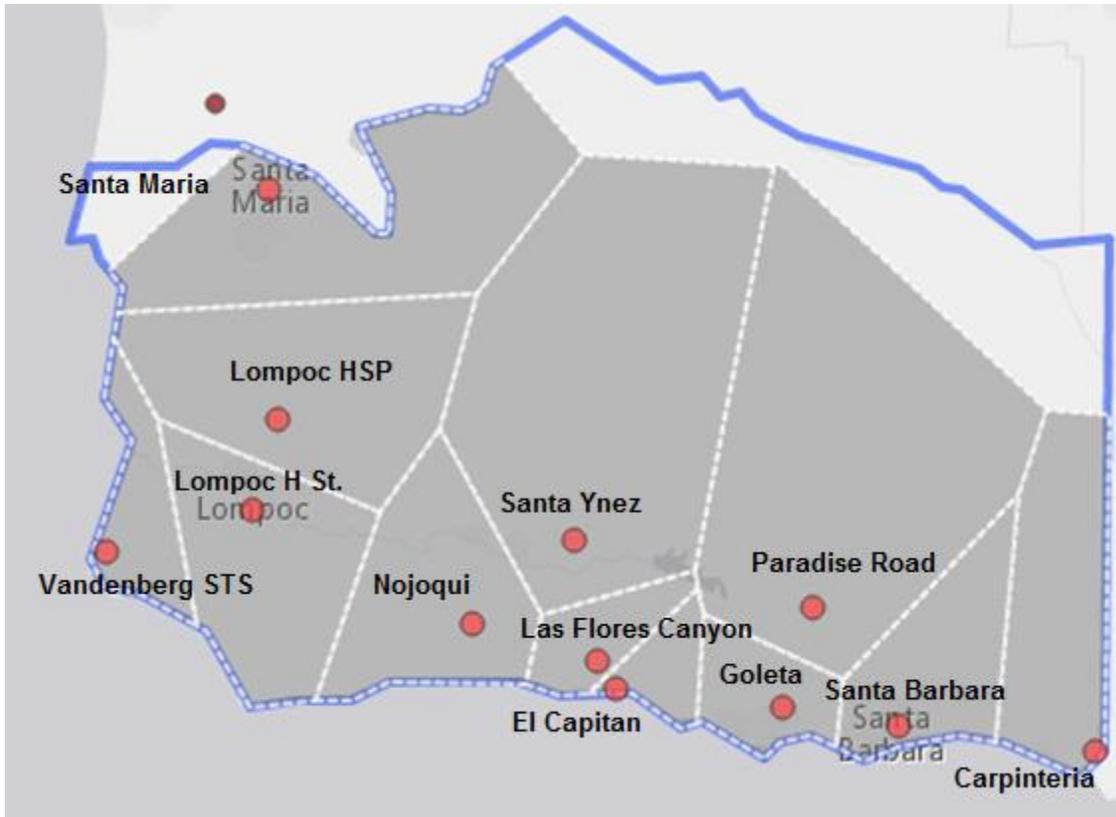
Site	Neighbors Included	Mean Relative Removal Bias (%)	Min Relative Removal Bias (%)	Max Relative Removal Bias (%)
Maricopa	8	-7	-45	51
Nipomo R. P.	4	-9	-43	25
El Capitan	7	8	-29	97
Santa Barbara	4	10	-20	156
Santa Maria	5	18	-7	98
Lompoc HSP	5	-15	-56	8
Paradise Rd.	8	-10	-50	45
Nojoqui	6	9	-36	71
Carpinteria	5	-4	-44	71
Las Flores Canyon #1	4	-8	-48	41
Lompoc H Street	3	16	-10	211
Goleta	4	12	-29	126
Santa Ynez	6	12	-28	181
Vandenberg STS	13	-5	-46	43

Figure 4-4 Removal Bias Analysis

4.1.5 Ozone Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can be helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-5, represent the results of this analysis for ozone. Overall, most sites racial and gender proportions mirror the overall county demographics (See table 2-1). The Lompoc H Street and Santa Maria sites serve a slightly higher proportion of "Other" (mostly Hispanic) and the Lompoc H Street site serves a slightly higher proportion of black residents than the overall County demographics. Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Paradise Road serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spatial Scale of Monitor	
El Capitan	Demographic Data Unavailable											89	Regional
Santa Barbara	96059	77.0%	1.4%	1.0%	3.2%	0.1%	13.5%	3.7%	49.4%	50.6%	296	Urban	
Santa Maria	132726	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	50.2%	49.8%	703	Urban	
Lompoc HSP	11541	76.6%	3.4%	1.3%	4.7%	0.6%	8.1%	5.2%	49.6%	50.4%	606	Regional	
Paradise Road	4441	88.4%	0.3%	0.7%	3.2%	0.1%	4.8%	2.6%	50.1%	49.9%	1228	Regional	
Nojoqui	Demographic Data Unavailable											404	Regional
Carpinteria	17718	75.8%	0.7%	0.9%	2.4%	0.1%	16.4%	3.6%	49.2%	50.8%	389	Regional	
Las Flores Canyon#1	8369	83.5%	0.4%	3.1%	2.2%	0.1%	7.3%	3.5%	50.9%	49.1%	128	Regional	
Lompoc H Street	46201	62.1%	5.9%	1.7%	3.8%	0.5%	20.0%	6.1%	53.5%	46.5%	436	Neighborhood	
Goleta	78588	70.8%	1.8%	0.8%	9.4%	0.1%	12.4%	4.7%	49.7%	50.3%	158	Urban	
Santa Ynez	16800	84.3%	0.7%	1.0%	2.0%	0.1%	8.7%	3.1%	49.1%	50.9%	1227	Urban	
Vandenberg STS	Demographic Data Unavailable											163	Regional

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
El Capitan	Demographic Data Unavailable					
Santa Barbara	15.1%	15.1%	34.6%	19.9%	7.3%	7.9%
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Lompoc HSP	18.7%	12.8%	29.7%	20.7%	8.9%	9.1%
Paradise Road	17.1%	10.1%	26.3%	25.7%	10.7%	10.1%
Nojoqui	Demographic Data Unavailable					
Carpinteria	16.5%	13.1%	31.9%	23.2%	8.1%	7.2%
Las Flores Canyon#1	16.2%	12.9%	28.9%	25.4%	9.6%	7.0%
Lompoc H Street	22.6%	15.5%	36.8%	15.7%	5.0%	4.4%
Goleta	12.4%	35.6%	25.7%	14.3%	5.6%	6.3%
Santa Ynez	17.8%	13.0%	29.4%	23.4%	8.8%	7.7%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-5 Ozone Area Served Analysis

4.2 Nitrogen Dioxide Monitors

Nitrogen Dioxide (NO₂) is monitored at 11 locations in the county, every site that measures ozone except Santa Ynez. NO₂ is sited in conjunction with the ozone monitors to characterize the precursors to ozone.

In February of 2010, a new 1 hour NAAQS was set at 100 ppb for NO₂. The form of the standard is based on the three year average of the 98th percentile of the daily maximum 1-hour average.

4.2.1 Analysis of Nitrogen Dioxide Measurements

Table 4-2 shows the summary of the county's NO₂ concentrations from 2012 – 2014 compared with this new standard. No sites in the county exceed the standard. Santa Barbara, Santa Maria and Goleta measure the highest concentrations. They are located in urban areas and are influenced by exhaust from automobile traffic.

Table 4-2
Nitrogen Dioxide Summary

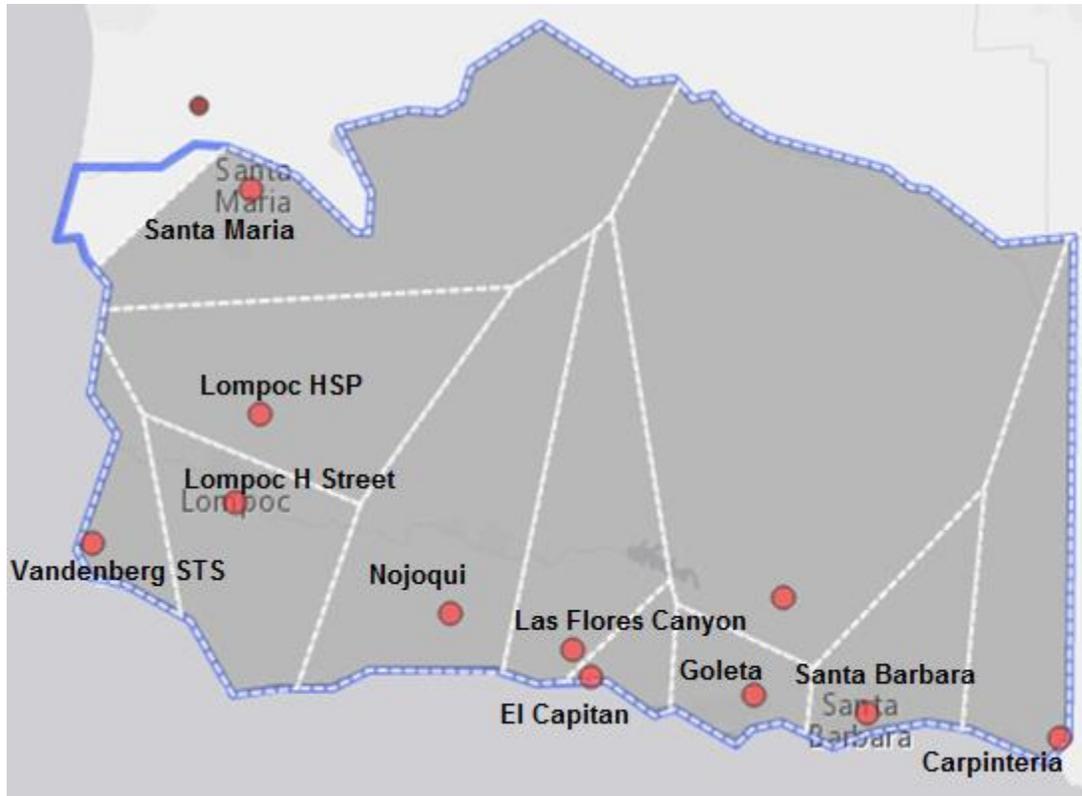
AQS #	STREET_ADDRESS	2012	2013	2014	3 Yr Avg	% of Std	Rank
		98th ppb	98th ppb	98th ppb	98th ppb	100 %	
06-083-0011	Santa Barbara	43	42	43	43	43%	1
06-083-1008	Santa Maria	33.4	37	34	35	35%	2
06-083-2011	Goleta	32	32	33	32	32%	3
06-083-2004	Lompoc H Street	26	26	23	25	25%	4
06-083-0008	El Capitan	23	21	25	23	23%	5
06-083-1018	Nojoqui	18	19	22	20	20%	6
06-083-1021	Carpinteria	12	12	18	14	14%	7
06-083-1025	Las Flores Canyon #1	15	13	11	13	13%	8
06-083-1013	Lompoc HS&P	8	10	8	9	9%	9
06-083-4003	VAFB STS	4	5	8	6	6%	10
06-083-1014	Paradise Road	5	4	6	5	5%	11

Lompoc H Street is the 4th highest followed by El Capitan and Nojoqui. El Capitan is located south of the 101 freeway and train track. Lompoc H Street is located in an urban area and Nojoqui is located near the 101 freeway at the top of a grade separating the North and South County. LFC1, Lompoc HS&P, VAFB STS and Paradise Road are located in rural settings which are sited as part of permit required regional network.

4.2.2 Nitrogen Dioxide Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, it is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can be helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-6, represent the results of this analysis for nitrogen dioxide. Because the nitrogen dioxide network of monitors is almost exactly the same as the ozone network, the area served analysis shows the same pattern. With the Lompoc H Street and Santa Maria sites serving a slightly higher proportion of "Other" (mostly Hispanic) and the Lompoc H Street site serving a slightly higher proportion of black residents than the overall County demographics. Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Paradise Road and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spatial Scale of Monitor
El Capitan	Demographic Data Unavailable										89	Regional
Santa Barbara	96059	77.0%	1.4%	1.0%	3.2%	0.1%	13.5%	3.7%	49.4%	50.6%	296	Neighborhood
Santa Maria	132726	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	50.2%	49.8%	1019	Urban
Lompoc HSP	11541	76.6%	3.4%	1.3%	4.7%	0.6%	8.1%	5.2%	49.6%	50.4%	653	Neighborhood
Paradise Road	4441	88.4%	0.3%	0.7%	3.2%	0.1%	4.8%	2.6%	50.1%	49.9%	2030	Regional
Nojoqui	13569	83.0%	0.7%	1.2%	1.9%	0.1%	9.8%	3.3%	48.9%	51.1%	750	Regional
Carpinteria	17718	75.8%	0.7%	0.9%	2.4%	0.1%	16.4%	3.6%	49.2%	50.8%	458	Regional
Las Flores Canyon#1	11600	85.2%	0.5%	2.4%	2.3%	0.1%	6.4%	3.1%	50.6%	49.4%	491	Neighborhood
Lompoc H Street	46201	62.1%	5.9%	1.7%	3.8%	0.5%	20.0%	6.1%	53.5%	46.5%	436	Neighborhood
Goleta	78588	70.8%	1.8%	0.8%	9.4%	0.1%	12.4%	4.7%	49.7%	50.3%	158	Urban
Vandenberg STS	Demographic Data Unavailable										163	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
El Capitan	Demographic Data Unavailable					
Santa Barbara	15.1%	15.1%	34.6%	19.9%	7.3%	7.9%
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Lompoc HSP	18.7%	12.8%	29.7%	20.7%	8.9%	9.1%
Paradise Road	17.1%	10.1%	26.3%	25.7%	10.7%	10.1%
Nojoqui	18.7%	12.3%	30.7%	22.4%	8.2%	7.7%
Carpinteria	16.5%	13.1%	31.9%	23.2%	8.1%	7.2%
Las Flores Canyon#1	15.6%	13.6%	27.6%	26.0%	10.1%	7.1%
Lompoc H Street	22.6%	15.5%	36.8%	15.7%	5.0%	4.4%
Goleta	12.4%	35.6%	25.7%	14.3%	5.6%	6.3%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-6 NO2 Area Served Analysis

4.3 Sulfur Dioxide Monitors

Sulfur Dioxide (SO₂) is measured at six locations in the county. Lompoc H is located in an urban area (but nearby a potential sulfur dioxide source) while the other five sites are located in more rural settings which are installed as part of permit conditions for major oil and gas sources.

In June 2010, EPA established a new 1-hour NAAQS standard of 75 ppb for SO₂. The standard is in the form of the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations.

SBCAPCD is not impacted by the SO₂ Data Requirements Rule proposed on May 13, 2014 because emissions in Santa Barbara County are not sufficient to trigger this requirement.

4.3.1 Analysis of Sulfur Dioxide Measurements

Table 4-3 compares the county concentrations from 2012 – 2014 with this new standard. All of the sites are below the standard. All of the sites are located in areas near potential SO₂ sources.

Table 4-3
Sulfur Dioxide Summary

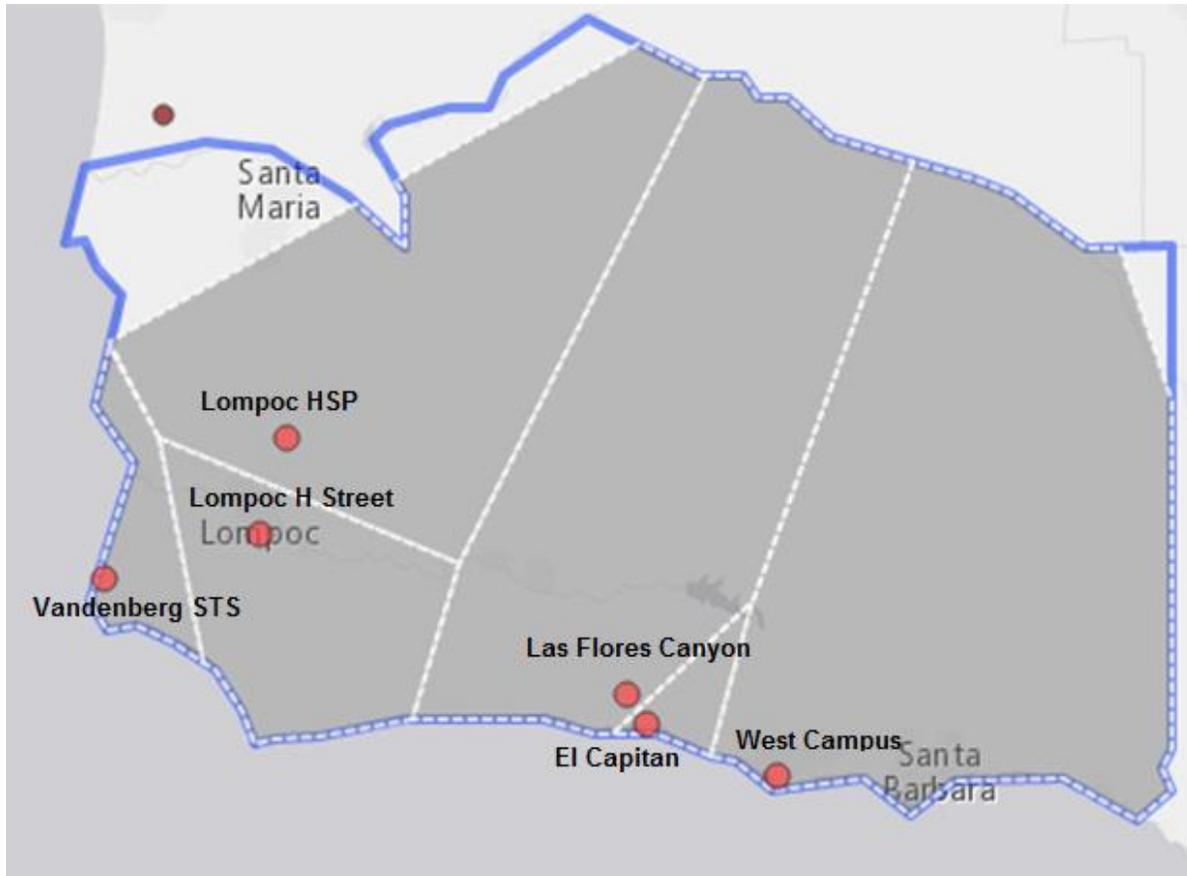
AQS #	STREET_ADDRESS	2012 99th ppb	2013 99th ppb	2014 99th ppb	3 Yr Avg ppb	% ofStd 75 %	Rank
06-083-1025	Las Flores Canyon #1	63	7	5	25	33%	1
06-083-2004	Lompoc H Street	3	4	3	3	4%	2
06-083-1020	West Campus	2	2	4	3	4%	3
06-083-4003	VAFB STS	4	3	2	3	4%	4
06-083-0008	El Capitan	2	2	1	2	3%	5
06-083-1013	Lompoc HS&P	2	2	2	2	3%	6

4.3.2 Sulfur Dioxide Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, it is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can be helpful in ensuring that a monitor is not removed that serves a

historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-7, represent the results of this analysis for sulfur dioxide. The analyses shows that Lompoc H Street serves a slightly higher proportion of “other” and black residents than the overall racial demographics of the county. Additionally, Lompoc H Street serve a slightly higher percentage of children and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spatial Scale of Monitor
El Capitan	Demographic Data Unavailable										80	Regional
Lompoc HSP	46978	80.7%	1.7%	1.2%	3.8%	0.3%	7.6%	4.6%	49.4%	50.6%	1456	Neighborhood
West Campus	200902	74.8%	1.5%	0.9%	5.6%	0.1%	12.9%	4.1%	49.5%	50.5%	2225	Neighborhood
Las Flores Canyon#1	17364	84.7%	0.6%	2.0%	2.0%	0.1%	7.8%	2.9%	49.8%	50.2%	1723	Neighborhood
Lompoc H Street	46201	62.1%	5.9%	1.7%	3.8%	0.5%	20.0%	6.1%	53.5%	46.5%	574	Neighborhood
Vandenberg STS	Demographic Data Unavailable										166	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
El Capitan	Demographic Data Unavailable					
Lompoc HSP	19.1%	13.3%	29.7%	21.3%	8.3%	8.3%
West Campus	14.2%	23.0%	30.7%	18.1%	6.8%	7.3%
Las Flores Canyon#1	15.9%	12.9%	27.9%	25.0%	10.0%	8.3%
Lompoc H Street	22.6%	15.5%	36.8%	15.7%	5.0%	4.4%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-7 SO2 Area Served Analysis

4.4 Carbon Monoxide Monitors

Carbon Monoxide (CO) is measured at six locations in the county. Santa Barbara, Lompoc H Street, Santa Maria, and Goleta are located in the major urban areas in the county. LFC1 and VAFB STS are sited at part of permit conditions for major sources.

4.4.1 Analysis of Carbon Monoxide Measurements

Table 4-4 compares the county concentrations from 2012 – 2014 with the 1 hour standard for CO that is set at 35 ppm. The form of the standard is not to exceed more than once per year. Table 4.4 compares the 2nd maximum daily hourly maximum value for years 2012 – 2014. No site exceeds the standard with the highest reading being 6.6% of the standard at Santa Barbara.

Table 4-4
Carbon Monoxide Summary

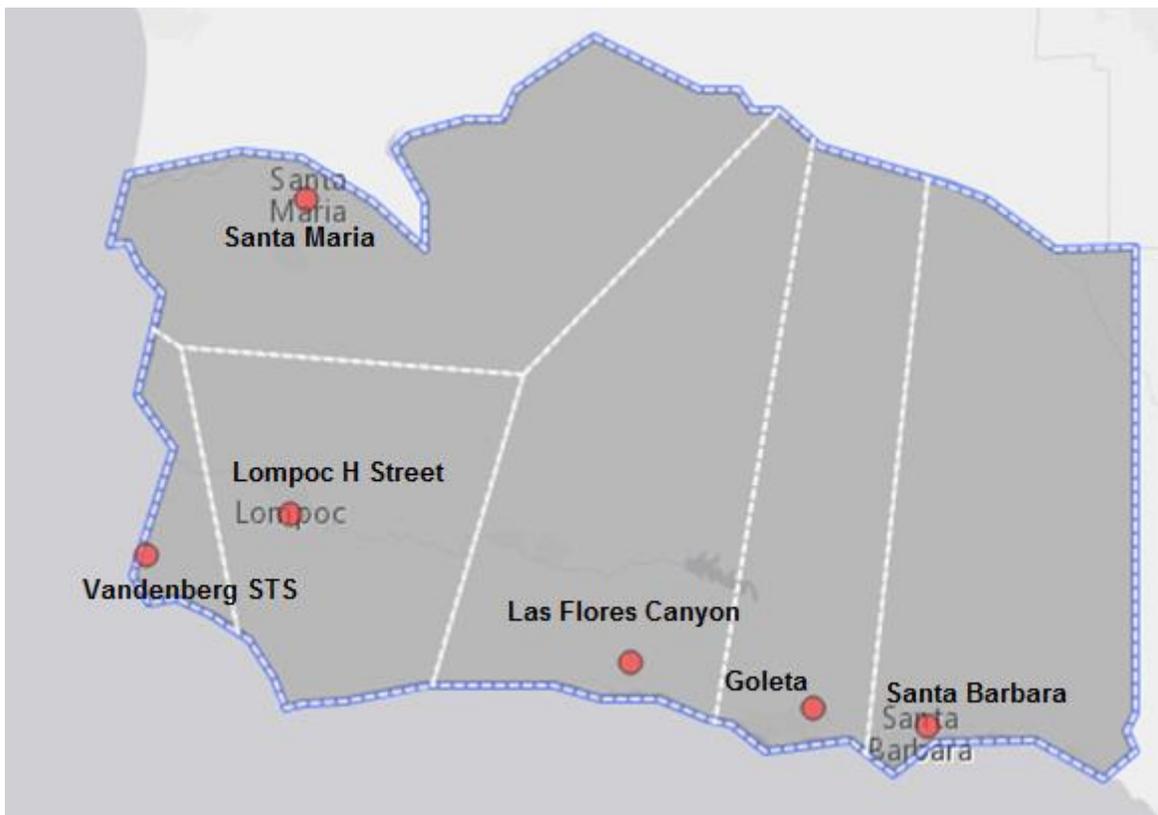
AQS #	STREET_ADDRESS	2012	2013	2014	3 Year Avg	% of Std	Rank
		2nd Max ppm	2nd Max ppm	2nd Max ppm	2nd Max ppm	35 %	
06-083-0011	Santa Barbara	1.9	2.5	2.5	2.30	6.6%	1
06-083-1008	Santa Maria	1.9	1.6	1.6	1.70	4.9%	2
06-083-2004	Lompoc H Street	1.3	1.4	1.9	1.53	4.4%	3
06-083-2011	Goleta	1.2	1	0.8	1.00	2.9%	4
06-083-4003	VAFB STS	0.5	0.9	1.5	0.97	2.8%	5
06-083-1025	Las Flores Canyon #1	0.6	0.5	0.5	0.53	1.5%	6

4.4.2 Carbon Monoxide Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a

particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, it is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can be helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-8, represent the results of this analysis for carbon monoxide. The analyses shows that most sites represent the same racial proportions as the county, with the Lompoc H Street site serving a slightly higher proportion of "other". Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spatial Scale of Monitor
Santa Barbara	117873	77.0%	1.3%	1.0%	3.2%	0.1%	13.6%	3.7%	49.4%	50.6%	1548	Middle Scale
Santa Maria	140071	61.4%	1.6%	1.7%	4.7%	0.2%	25.5%	5.0%	50.2%	49.8%	1449	Middle Scale
Las Flores Canyon#1	17364	84.7%	0.6%	2.0%	2.0%	0.1%	7.8%	2.9%	49.8%	50.2%	1503	Neighborhood
Lompoc H Street	65547	67.1%	4.8%	1.6%	3.8%	0.4%	16.6%	5.6%	52.3%	47.7%	1049	Neighborhood
Goleta	83029	71.7%	1.8%	0.7%	9.1%	0.1%	11.9%	4.6%	49.7%	50.3%	964	Neighborhood
Vandenberg STS	Demographic Data Unavailable										182	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Barbara	15.3%	15.0%	34.1%	20.4%	7.4%	7.8%
Santa Maria	24.8%	16.4%	33.1%	14.5%	5.4%	5.8%
Las Flores Canyon#1	15.9%	12.9%	27.9%	25.0%	10.0%	8.3%
Lompoc H Street	21.6%	14.7%	35.0%	17.3%	5.9%	5.3%
Goleta	12.7%	34.3%	25.7%	14.9%	5.9%	6.5%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-8 CO Area Served Analysis

4.5 Particulate (< 10 Microns)

Particulate less than 10 microns in diameter (PM10) is currently being measured in standard conditions at six locations in the county. The monitoring method at some of the sites was changed from a manual one in six day sampling method to continuous every day sampling during the period evaluated. Additionally, new continuous samplers at Santa Barbara and Santa Maria were initially configured to only produce data under local conditions, which do not allow comparisons to the Federal NAQQS PM10 standard that is based on standard conditions. These monitors at Santa Barbara and Santa Maria were later configured to also record data in standard conditions in mid-2013.

4.5.1 Analysis of PM10 Measurements

The standard for PM10 is based on the daily averages. The maximum daily concentration shall not exceed 150 ug/m3 more than once per year measured in standard conditions. Table 4-5 compares the PM10 data collected from 2012 – 2014 in the county. All sites are below the standard. Santa Maria is the highest where the concentrations are 46 percent of the standard.

Table 4-5
Particulate < 10 Microns Summary

AQS #	STREET_ADDRESS	2012 2nd Max ug/m3	2013 2nd Max ug/m3	2014 2nd Max ug/m3	3 Year Avg ug/m3	% of Std 150	Rank
06-083-1008	Santa Maria		68**	69	69	46%	1
06-083-0008	El Capitan	35*	51	91	59	39%	2
06-083-4003	VAFB STS	39*	55	65	53	35%	3

06-083-0011	Santa Barbara		52**	54	53	35%	4
06-083-2004	Lompoc H Street	50	48	59	52	35%	5
06-083-2011	Goleta	44	42	41	42	28%	6
06-083-1025	Las Flores Canyon #1	31*	45	43	40	26%	7

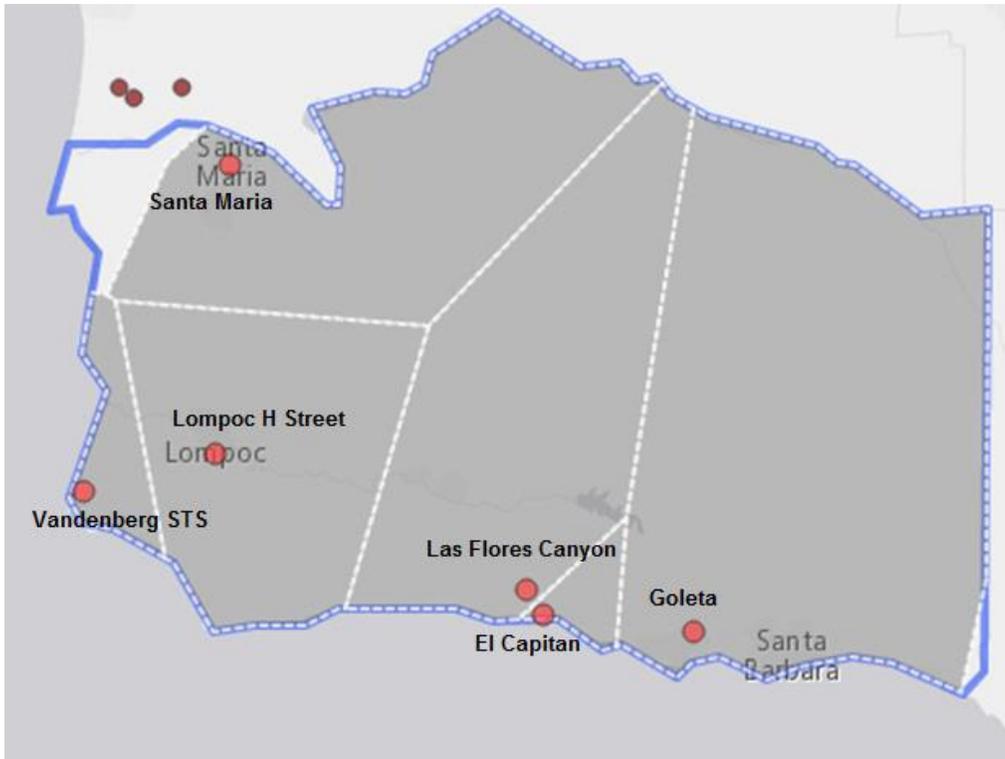
* Denotes one in six day sampling

** Denotes data completeness for the year was not met.

4.5.2 PM10 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, it is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can be helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-9, represent the results of this analysis for PM10. The analyses shows that most sites represent the same racial proportions as the county, with the Santa Maria site serving a slightly higher proportion of "other". Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spatial Scale of Monitor	
El Capitan	Demographic Data Unavailable											93	Neighborhood
Santa Maria	132726	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	50.2%	49.8%	1279	Neighborhood	
Las Flores Canyon#1	17364	84.7%	0.6%	2.0%	2.0%	0.1%	7.8%	2.9%	49.8%	50.2%	1422	Neighborhood	
Lompoc H Street	65547	67.1%	4.8%	1.6%	3.8%	0.4%	16.6%	5.6%	52.3%	47.7%	1049	Middle Scale	
Goleta	200902	74.8%	1.5%	0.9%	5.6%	0.1%	12.9%	4.1%	49.5%	50.5%	2482	Neighborhood	
Vandenberg STS	Demographic Data Unavailable											181	Neighborhood
Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75							
El Capitan	Demographic Data Unavailable												
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%							
Las Flores Canyon#1	15.9%	12.9%	27.9%	25.0%	10.0%	8.3%							
Lompoc H Street	21.6%	14.7%	35.0%	17.3%	5.9%	5.3%							
Goleta	14.2%	23.0%	30.7%	18.1%	6.8%	7.3%							
Vandenberg STS	Demographic Data Unavailable												

Figure 4-9 PM10 Area Served Analysis

4.6 Particulate (< 2.5 Microns)

Particulate less than 2.5 microns in diameter (PM2.5) is currently measured at four locations. All locations currently utilize continuous PM2.5 monitors. Prior to 2014 Goleta and Lompoc H Street PM2.5 monitors were both non-FEM monitors that could not be utilized for comparisons to the federal NAQSS PM2.5 standard. In 2014 the Lompoc H Street sampler was upgraded to a monitor with FEM status and in 2015 the Goleta sampler was upgraded to a monitor with FEM status. Santa Barbara County has requested from EPA these changes from non-FEM to FEM status.

4.6.1 Analysis of PM2.5 Measurements

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 of 35 ug/m3. Table 4-6 compares the concentrations from 2012 – 2014 to this standard. Santa Barbara is the highest site with 49 percent of the standard.

Table 4-6
Particulate < 2.5 Microns Summary

AQS #	STREET_ADDRESS	2012 98th ug/m3	2013 98th ug/m3	2014 98th ug/m3	3 YEAR AVG. 98% ug/m3	% of Std 35	Rank
06-083-0011	Santa Barbara	17.1	16	17.2	17	49%	1
06-083-1008	Santa Maria	16.8	15.9	15.2	16	46%	2
06-083-2004	Lompoc H Street			15.9	16	46%	3

4.6.2 Correlation Analysis of PM2.5 Measurements

Correlation analysis compares the measurements from nearby sites to determine if concentrations correlate temporally. Figure 4-10 below presents a graphic representation of the correlation between PM2.5 sites in Santa Barbara County and two sites in San Luis Obispo County. The two sites in San Luis Obispo County are Mesa2 (06-079-2004) and CDF (06-079-2007). Both of these sites are located to measure a significant source of windblown dust from the dunes upwind in Oceano. These two sites in San Luis Obispo County are included in this analysis due to their close proximity to Santa Barbara County.

Monitor pairs with Pearson correlation values near one (strait line) are highly correlated, while monitor pairs with Pearson correlation values near zero (circle) have no correlation. Monitors that do not correlate well with other monitors exhibit unique temporal concentration variation relative to other monitors and are likely to be important for assessing local emissions, transport and spatial coverage. Monitor pairs with high Pearson correlation values (e.g., $r > 0.75$) exhibit similar temporal concentrations. Monitor pairs with low average relative difference (white or light yellow color) measure similar ozone concentrations, while monitors with high average relative differences (red to blue color) measure significantly different ozone concentrations.

Possible redundant sites would exhibit fairly high correlations consistently across all of their pairings and would have low average relative difference despite the distance. More unique sites would exhibit the opposite characteristics. They would not be very well correlated with other sites and their relative difference would be higher than other site to site pairs.

The Mesa2 and CDF sites in San Luis Obispo County show a high correlation with a relatively high average difference. This is not surprising as both monitors are sited to measure the same source of windblown dust. The other pairings in this analysis show

significant relative difference and a low degree of correlation. Note that the Lompoc H Street and Goleta monitors are not included in this analysis due to their recent addition to the PM2.5 FEM network.



Figure 4-10 PM2.5 Correlation Analysis

4.6.3 PM2.5 Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine if new sites are needed. In order to make that decision, it is helpful to have some estimation of the extreme pollution levels in areas where no monitors currently exist. To assist in understanding the probability of exceedances occurring in areas where no monitors exist, surface probability maps were generated. These maps were generated by calculating estimates of PM2.5 for the centroid of each census tract. These are statistical estimates from “fusing” photochemical modeling data and ambient monitoring data using Bayesian space-time methods.

This map is intended to be used as a spatial comparison and not for probability estimates for a single geographic point or area. The probability estimates displayed on the map alone should not be used to justify a new monitor. The maps should be used in conjunction with existing monitoring data. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. Figure 4-11 plots the probability of exceeding the PM2.5 daily standard of 35ug/m3.

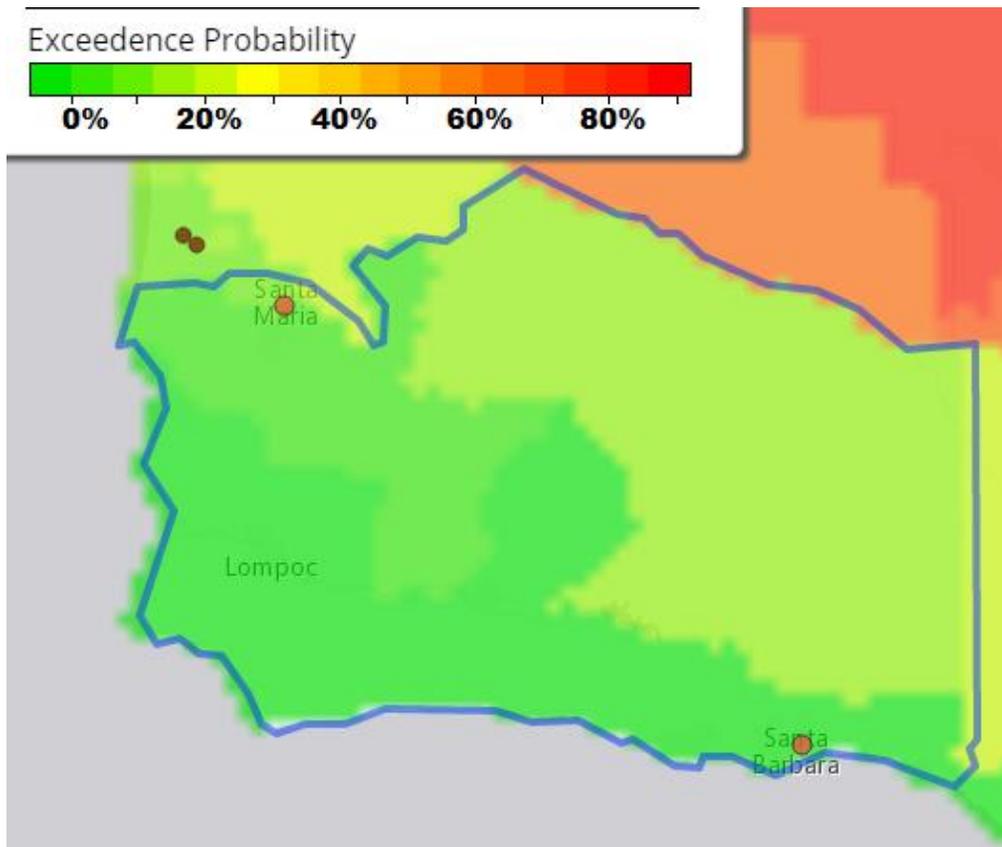


Figure 4-11 PM2.5 Exceedence Probability Map

4.6.4 PM2.5 Removal Bias Analysis

The removal bias analysis is a tool used in determining possible redundant sites. The bias estimation uses the nearest neighbors to each site to estimate the concentration at the location of the site if the site had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting on concentrations at sites located closer to the site being examined. The bias was calculated for each day at each site by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the site being examined was removed, the neighboring sites would indicate that the estimated concentration would

be larger than the measured concentration. Likewise, a negative average bias would suggest that the estimated concentration at the location of the site is smaller than the actual measured concentration. A site with no bias, indicates that the estimated concentration at the location of the site matches the actual measured concentration. Sites with little to no bias are sites where removal could be considered. Figure 4-12 presents the removal bias analysis for PM2.5. Note that the Goleta and Lompoc-H monitors are not included in this analysis due to their recent addition to the PM2.5 FEM network. While the relative bias statistics for this analysis show a large removal bias for each site analyzed, due to the relatively low concentrations, the actual removal bias is low for Santa Barbara, indicating that if the Santa Barbara PM2.5 monitor was removed, estimates of exposure based on nearby monitors for that area would show little bias relative to the concentrations measured in Santa Barbara.

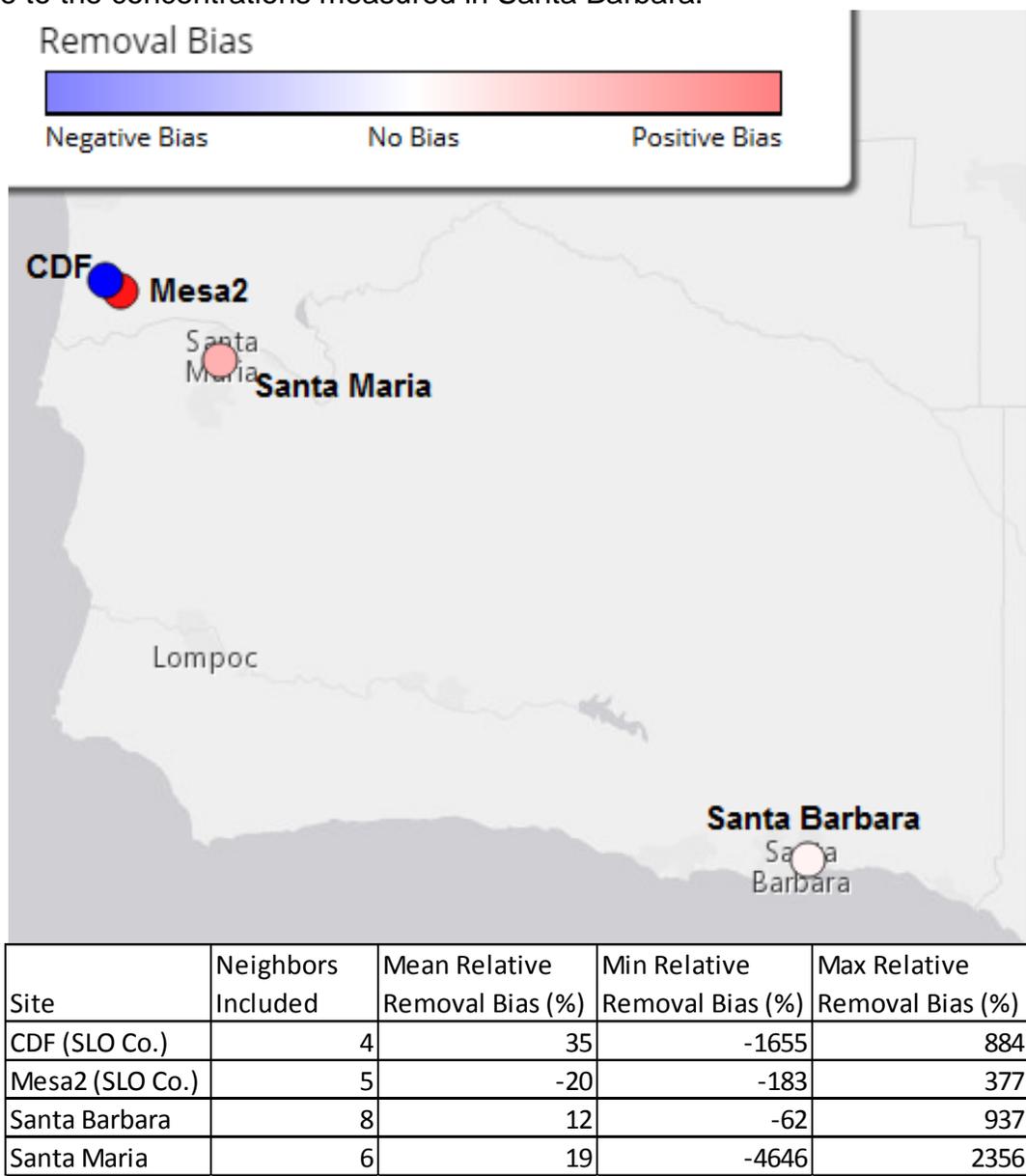


Figure 4-12 PM2.5 Removal Bias Analysis

4.6.5 PM2.5 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, it is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can be helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-13, represent the results of this analysis for PM2.5. The analyses shows that both sites serve demographic similar to the overall county, with the Santa Maria monitor serving a slightly higher proportion of "other". Additionally, Santa Maria serve a slightly higher percentage of children than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spatial Scale of Monitor
Santa Barbara	208406	75.2%	1.5%	1.0%	5.4%	0.1%	12.7%	4.0%	49.6%	50.4%	3196	Neighborhood
Santa Maria	204037	64.4%	2.6%	1.6%	4.3%	0.3%	21.7%	5.1%	50.8%	49.2%	3164	Neighborhood
Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75						
Santa Barbara	14.3%	22.5%	30.5%	18.5%	7.0%	7.2%						
Santa Maria	23.5%	15.7%	33.6%	15.7%	5.7%	5.8%						

Figure 4-13 PM2.5 Area Served Analysis

5.0 Data Users

Data is collected from all of the monitoring sites and stored in a data base by a central data acquisition system (DAS) located at the SBCAPCD office. Internet connections were added to all 18 sites to allow the DAS to poll data every minute. This data is screened for outliers before being reported to the public and other end users of the air quality data.

Every hour, data is sent to several outside agencies. Some data is used for reporting air quality data to the public and some data is used by researchers and scientists. Ozone, PM10, PM2.5, wind and temperature data are posted to the SBCAPCD website hourly. This data is posted as AQI values and engineering units. Ozone and PM2.5 data are also sent to the AIRNOW system hourly for AQI reporting on a national scale. All hourly values are sent to CARB's AQMIS system for reporting data on a state wide level. Wind and temperature data are sent to the national weather service and naval weapons group.

On a monthly basis a quality assurance review is performed on the data. The final data are then submitted to the AQS data base for compliance with the NAAQS. CARB retrieves data from the AQS to determine compliance with State of California standards which are typically more protective than the NAAQS. Periodically throughout the year, the SBCAPCD will receive various data requests. A UCSB researcher is using hydrocarbon and wind data to study oil and gas seeps in the ocean off of our coast. Other researchers will use wind data to study beach erosion or sand migrations. Other data users are National Weather Service, US Fish and Game, and private consultants.

6.0 Conclusions and Future Changes

The air monitoring network in Santa Barbara County meets the objectives discussed at the beginning of this report. Air quality data is reported to several end users on an hourly basis. Quality assured data is submitted for compliance purposes and data is readily available and utilized for research and or general air quality purposes.

The analysis in this report for the ozone network shows all monitors measured concentrations are currently below the existing ozone NAQQS standard. However, with pending revisions to the standard, many of these sites measurements will be near or above the standard as demonstrated by the exceedance probabilities analysis. The correlation analysis showed that the Nipomo Regional Park site in southern San Luis Obispo County could be used to represent the measurements from El Capitan, Lompoc H Street, and Vandenberg STS sites. Additionally, the correlation analysis suggested that the Vandenberg STS/Lompoc HSP and Santa Ynez/Nojoqui site pairs have some redundancy. The removal bias analysis showed that estimates of ozone based on neighboring sites in lieu of continued measurement could include significant bias in these estimates.

Based on the overall analysis of the ozone monitoring network, no new sites appear warranted at this time. While this analysis suggests removal of some ozone monitors might be accomplished without seriously impacting the ability to meet the network goals outlined in Section 1 of this document, from a practical standpoint the disadvantages appear to outweigh the benefits at this time. Some complicating factors are that some of these monitors are a required permit condition and would require re-evaluation of the source permit to allow removal of a monitor, and some monitors are operated by CARB who would be responsible for decisions on discontinuing monitoring. However, should lack of resources require removal of some portion of the ozone network, the analysis in this report suggests the following list (in order of elimination) of monitors could be considered for removal:

- 1) Santa Maria
- 2) Nojoqui
- 3) Lompoc H Street
- 4) El Capitan

The nitrogen dioxide network meets to network goals outlined in Section 1. These monitors measure concentrations significantly below the NAQQS standard at all stations. However, these monitors were sited with ozone monitors to provide measurement of ozone precursors for any future research and modeling efforts, so removal of any nitrogen dioxide monitors is not being considered at this time. Should an ozone monitor be removed from the ozone network, the corresponding nitrogen dioxide monitor could also be considered for removal.

The sulfur dioxide network meets the network goals outlined in Section 1. All sites in the sulfur dioxide network measure concentrations significantly below the NAAQS, but

are sited for surveillance of nearby potential sulfur dioxide sources. Therefore, no reductions to the sulfur dioxide network are proposed at this time.

The carbon monoxide network meets the network goals outlined in Section 1. All monitors measure significantly below the NAAQS. The Vandenberg STS and Las Flores Canyon #1 monitors are part of a permit condition for a major source and are useful surveillance tools. While reductions to the carbon monoxide network are not being considered at this time, should resource restraints require a reduction, the Lompoc H Street and Goleta monitors could be considered for elimination.

Both the PM10 and PM2.5 particulate monitoring networks meet the network goals outlined in Section 1. No new sites are considered at this time as both networks measurements are well below the NAAQS and the PM2.5 exceedance probability analysis demonstrate a low probability for other locations measurements exceeding the NAAQS. Reductions to the networks are not being considered as both networks provide very valuable information to the public during wildfires that occur increasingly in Santa Barbara County.

Analysis of demographic data served by each monitor showed most monitors served a demographic distribution of race and age similar to the overall county distributions. However, Santa Maria, Lompoc H Street monitors do serve a slightly higher proportion of children and Paradise Road and Las Flores Canyon #1 serve a slightly higher proportion of elderly. As children and elderly have been shown to be more sensitive to poor air quality, any future consideration of removal of these sites needs to take into consideration that these sites serve a higher proportion of the sensitive population.