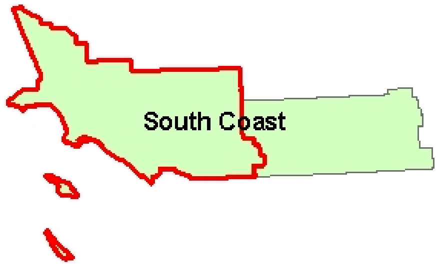
O. South Coast Air Basin (South Coast AQMD)



The South Coast Air Basin is comprised of a single air district, the South Coast AQMD, and consists of Orange County, the western portion of Los Angeles County, the southwestern portion of San Bernardino County, and the western portion of Riverside County. The entire air basin currently exceeds both the 24-hour and the annual State PM10 standards, as well as the national 24-hour and annual PM10 standards The air basin also exceeds the State annual PM2.5 and the national 24-hour and annual PM2.5 standards.

Figure O-1 shows the PM10 (a) and PM2.5 (b) monitoring site locations throughout the South Coast Air Basin.

Figure O-1. PM10 and PM2.5 Monitoring Sites throughout the Air Basin.

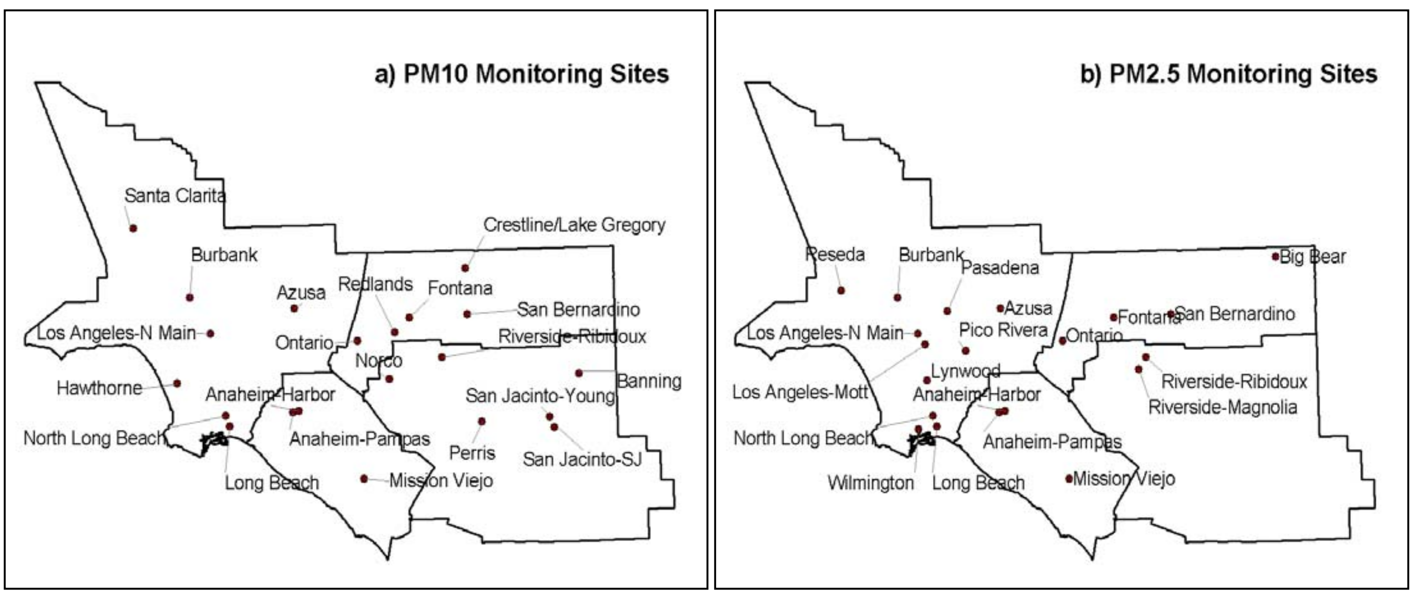


Table O-1 provides information on yearly variations in the highest PM10 and PM2.5 concentrations recorded across the South Coast AQMD in 2001 through 2003. During this period, we estimate that particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ seven hundred and two times. PM10 levels consistently exceeded the State 24-hour standard of 50 $\mu g/m^3$ and the annual standard of 20 $\mu g/m^3$. PM10 levels also exceeded the national 24-hour standard of 150 $\mu g/m^3$ and the annual standard of 50 $\mu g/m^3$. PM2.5 levels exceeded the State annual standard of 12 $\mu g/m^3$, the national 24-hour standard of 65 $\mu g/m^3$, and the national annual standard of 15 $\mu g/m^3$.

Table O-1. PM10 and PM2.5 Air Quality in the South Coast AQMD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour*	Max Annual Average (Std.=12)
2001	240	219**	63	104	25
2002	251	130	58	82	26
2003	211	164**	57	121**	25

* The maximum 24-hour PM2.5 values are provided for information only.
**These values were excluded for determining attainment status. See text.

Table O-2 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. For example, the high 24-hour PM10 concentration in 2001 shown in Table O-1 was identified as an extreme concentration event, and the high 24-hour PM10 and PM2.5 concentrations in 2003 were due to wildfires. These values were therefore excluded in determining the designation values shown in Table O-2. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the South Coast AQMD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is also designated as nonattainment for the State annual PM2.5 standard.

Table O-2. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	120	63	26

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table O-3 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. Particulate levels exceeded both State PM10 standards as well as the annual PM2.5 standard consistently across the air district. Highest concentrations occurred at Riverside, Norco, Perris, Ontario, and San Bernadino in the eastern portion of the air basin.

Table O-3. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Azusa	106	44	Incomplete Data
Burbank	86	41	25
Hawthorne	75	37	No Monitor
Los Angeles-Mott	No Monitor	No Monitor	Incomplete Data
Long Beach	75	Incomplete Data	Incomplete Data
Los Angeles North Main	97	44	Incomplete Data
Lynwood	No Monitor	No Monitor	24
North Long Beach	74	37	20
Santa Clarita	72	33	
Pasadena	No Monitor	No Monitor	20
Pico Rivera	No Monitor	No Monitor	Incomplete Data
Reseda	No Monitor	No Monitor	19
Wilmington	No Monitor	No Monitor	Incomplete Data
Anaheim	96	34	Incomplete Data
Mission Viejo	64	31	15
Banning	79	29	No Monitor
Norco	109	40	No Monitor
Perris	116	45	No Monitor
Riverside-Magnolia	No Monitor	No Monitor	23
Riverside-Rubidoux	136	63	25
San Jacinto	Incomplete Data	Incomplete Data	No Monitor
Big Bear	No Monitor	No Monitor	Incomplete Data
Fontana	106	50	25
Lake Gregory	74	Incomplete Data	No Monitor
Ontario	120	52	24
Redlands	102	Incomplete Data	No Monitor
San Bernardino	106	52	26

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure O-2 illustrates variation in PM10 and PM2.5 levels throughout 2002 at North Long Beach (a); Mission Viejo (b); Burbank (c); Los Angeles (d); Riverside-Rubidoux (e); and San Bernardino (f). The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. PM10 and PM2.5 levels recorded at monitoring sites in the western part of the district show a slightly seasonal pattern. For example, PM10 and PM2.5 concentrations were highest during the November through February period at Long Beach (a) and Mission Viejo (b). Moving eastward, at Burbank (c) and Downtown Los Angeles (d) the seasonal variation in PM levels becomes less pronounced, but higher PM10 and PM2.5 levels were still recorded during the winter and spring at both sites, with high PM10 levels also occurring in the fall at Los Angeles. At the Riverside (e) and San Bernardino (f) monitoring sites located in the eastern portion of the air district, both PM10 and PM2.5 exhibit no distinct seasonal pattern.

Figure O-2 (a-d). Seasonal Variation in PM10 and PM2.5 Concentrations.

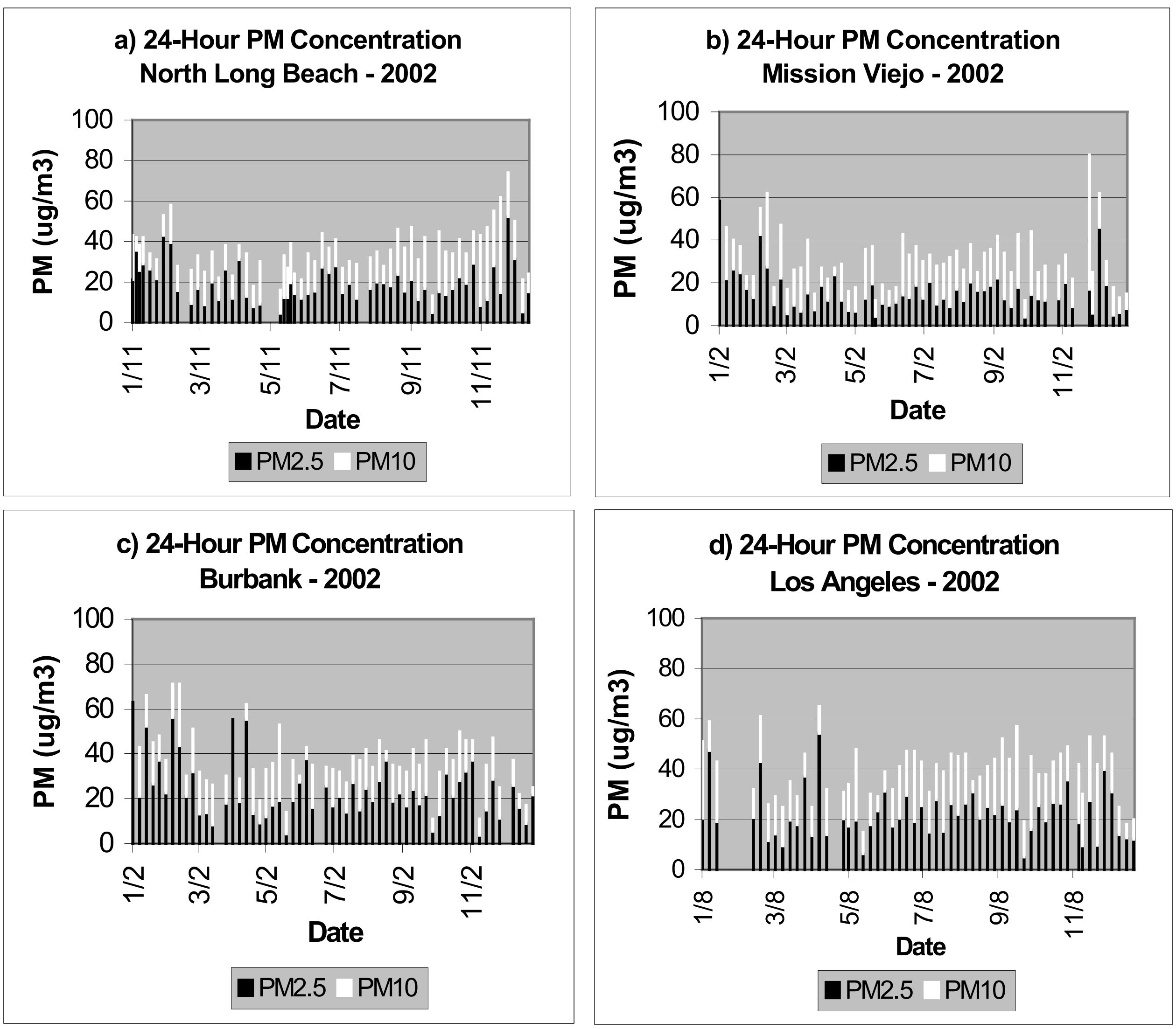
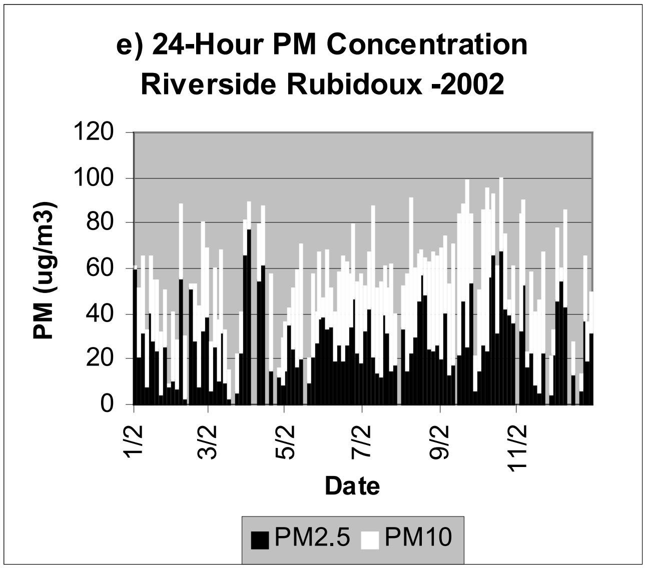
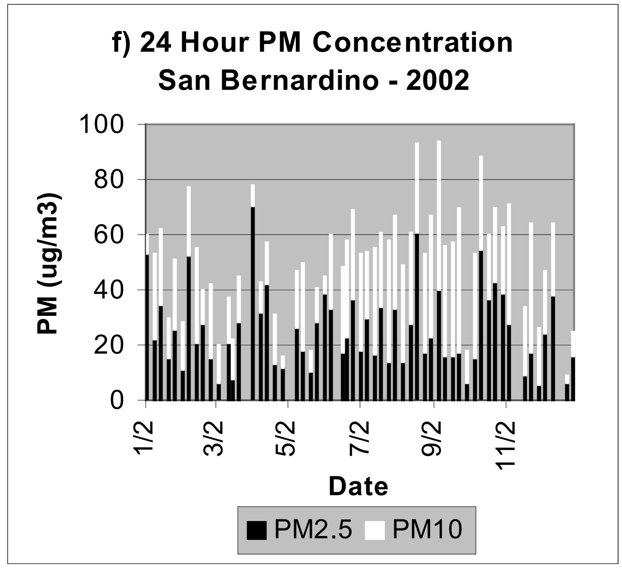


Figure O-2 (e-f). Seasonal Variation in PM10 and PM2.5 Concentrations.





On an annual average, based on 2000-2003 monitoring data throughout the air district, we estimate that PM2.5 comprises approximately 52 percent of PM10, with a higher PM2.5 fraction at Burbank (61 percent) and Los Angeles (56 percent) and a lower fraction at Riverside-Rubidoux (47 percent).

Figure O-3 (a). Hourly Variation in PM2.5 Concentrations.

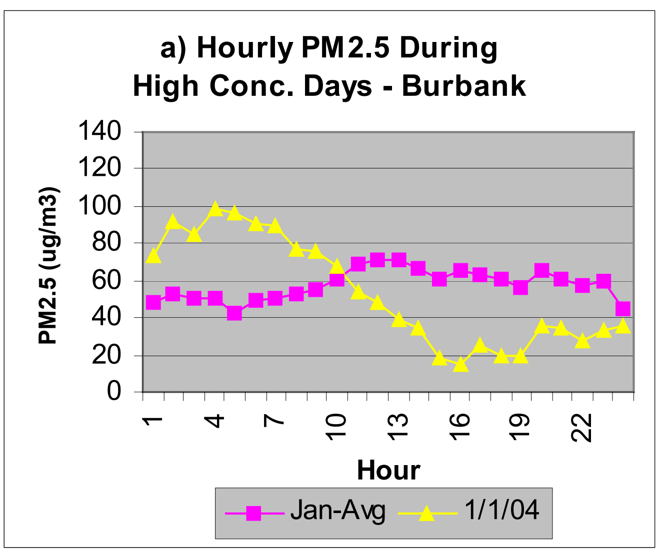
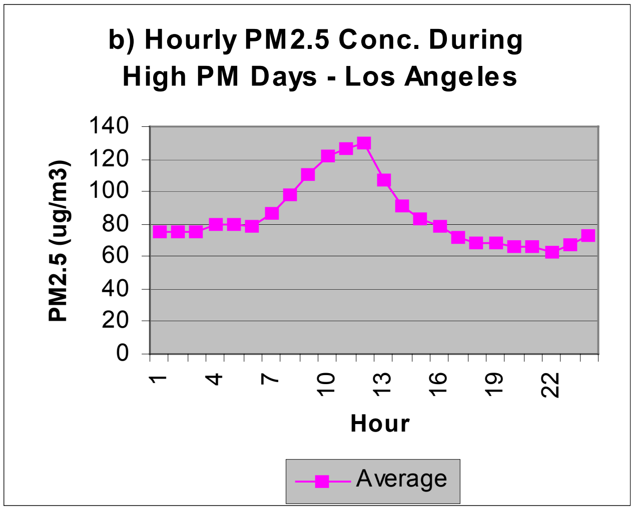
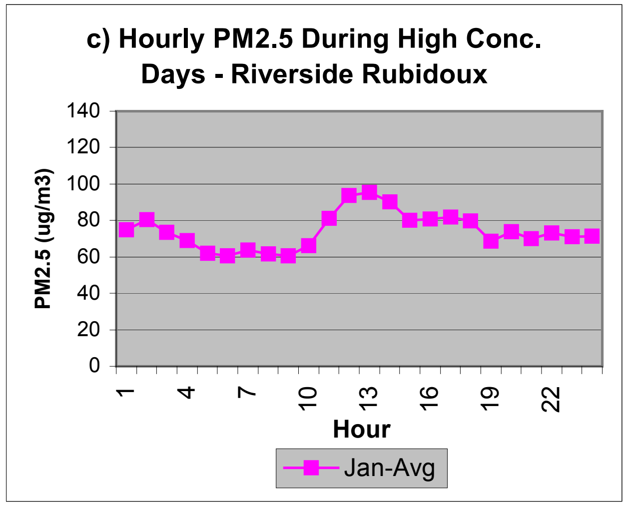


Figure O-3 presents the average hourly variation in PM2.5 levels at Burbank (a), Los Angeles (b), and Riverside-Rubidoux (c) for the days within the year with the highest PM2.5 concentrations. In January, the hourly variation pattern in PM2.5 levels is similar at Burbank and Riverside, although more pronounced at Riverside. Peak PM2.5 concentrations occur from mid-morning through the evening. At Los Angeles, a narrower peak of PM2.5 levels occurred at mid-day. Broad mid-day peaks in PM2.5 levels can often reflect the influence of daytime secondary PM formation. On New Years Day at Burbank, PM2.5 levels were highest at nighttime and may reflect increased residential wood combustion activity.

Figure O-3 (b and c). Hourly Variation in PM2.5 Concentrations.

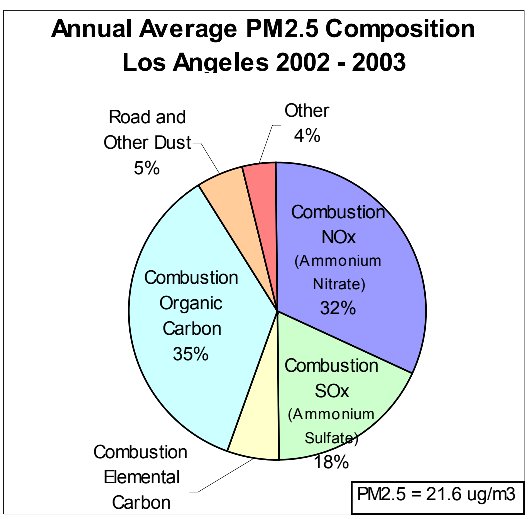




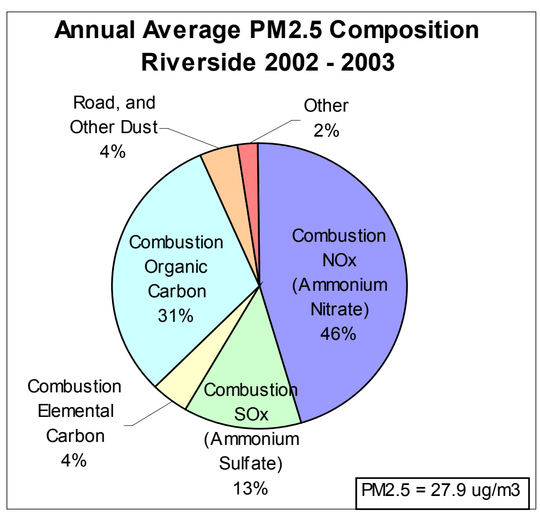
Data for Figures O-4, O-5, and O-6 are from analysis of ambient PM2.5 data collected at Los Angeles and Riverside-Rubidoux from the State's PM2.5 speciation network. Chemical components have been associated with possible emission sources based on emission inventory information. On an annual average basis the major components of PM2.5 are ammonium nitrate (30 to 45 percent) and organic carbon (30 to 35 percent). Ammonium nitrate is formed in the atmosphere from chemical reactions of NOx from vehicle exhaust and stationary combustion sources. The majority of organic carbon is suspected to be due to directly emitted carbon from combustion sources. Key sources include vehicles, agricultural and prescribed burning, residential wood combustion, and stationary combustion sources. However, a fraction may be due to secondary organic aerosol formation from anthropogenic and biogenic VOC.

Figure O-4. Annual Average Composition of PM2.5 and Link to Emission Source type.

a) Los Angeles



b) Riverside



The ammonium nitrate component is higher in Riverside than in Los Angeles. Ammonium sulfate - formed in the atmosphere from chemical reactions of SOx from mobile and stationary combustion sources - also contributes significantly to ambient PM2.5. Dust from roads and other dust producing activities and elemental carbon from combustion processes contribute to a lesser extent.

Figures O-5 and O-6 illustrate the quarterly variation in PM2.5 levels and its chemical components expressed in $\mu g/m^3$ (a) and as percent of PM2.5 (b) at Los Angeles and at Riverside based on 2002-2003 monitoring data. As in the previous figures, chemical components have been associated with possible emission sources based on emission inventory information. At Los Angeles (Figure O-5), higher PM2.5 concentrations occurred during the 3rd and 4th quarters. During the 3rd quarter, an increase in the ammonium sulfate component caused elevated PM2.5 levels, while during the 4th quarter, the organic carbon component was higher than on the 3rd quarter. At Riverside (Figure O-6), higher PM2.5 levels occurred during the spring, summer, and fall quarters. As was the case in Los Angeles, during the spring and summer, an increase in the ammonium sulfate component caused elevated PM2.5 levels, while during the fall the organic carbon component was higher. Sunnier, warmer conditions during the spring and summer favor the formation of ammonium sulfate. The ammonium nitrate contribution to ambient PM2.5 does not change much on a seasonal basis, but is significant throughout the year.

Figure O-5 (a). Average Quarterly Chemical Composition of PM2.5 and Link to Emission Source Type.

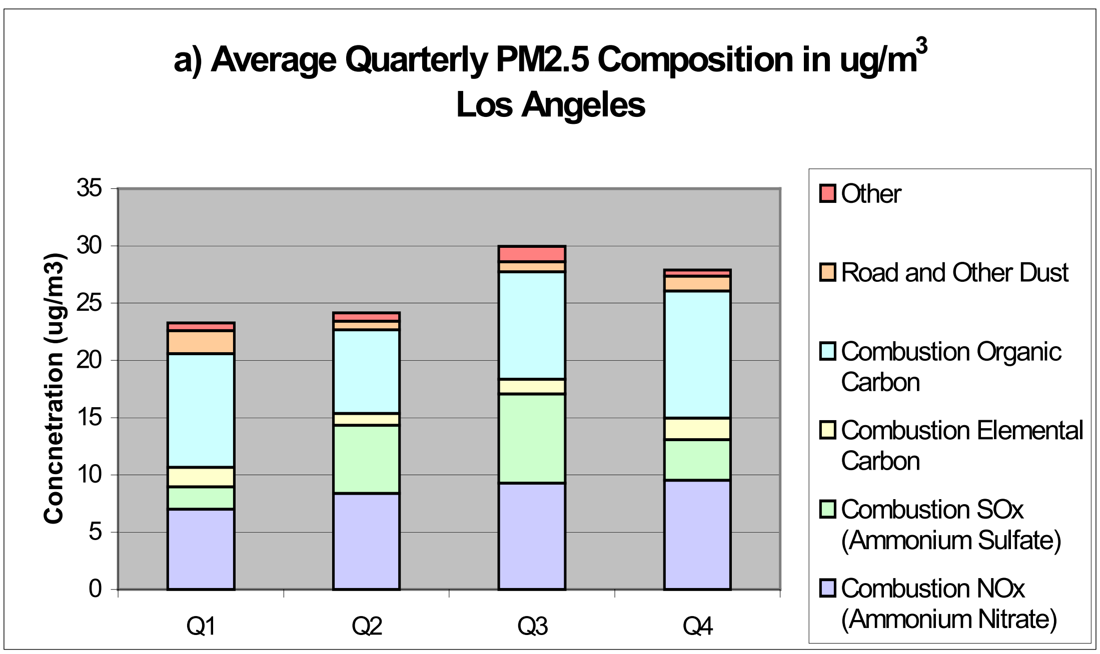


Figure O-5 (b). Average Quarterly Chemical Composition of PM2.5 and Link to Emission Source Type.

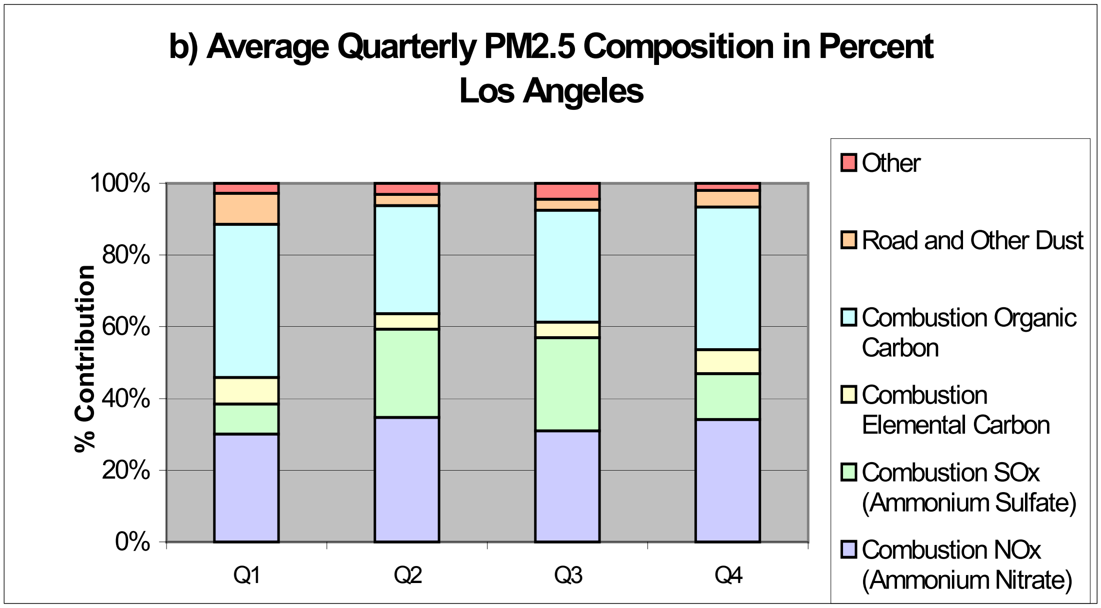


Figure O-6 (a). Average Quarterly Chemical Composition of PM2.5 and Link to Emission Source Type.

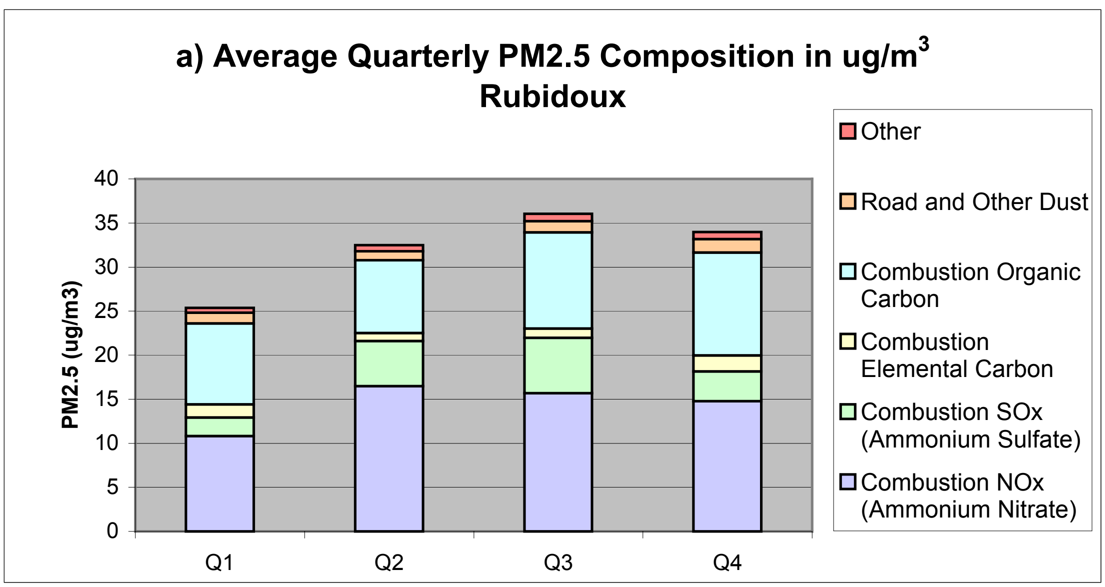


Figure O-6 (b). Average Quarterly Chemical Composition of PM2.5 and Link to Emission Source Type.

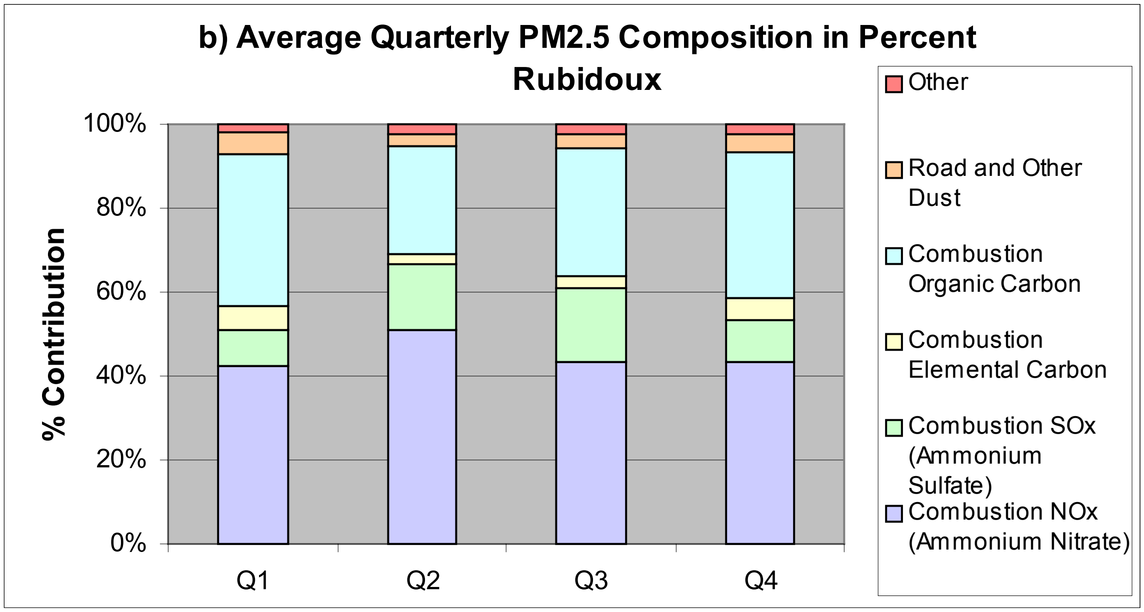
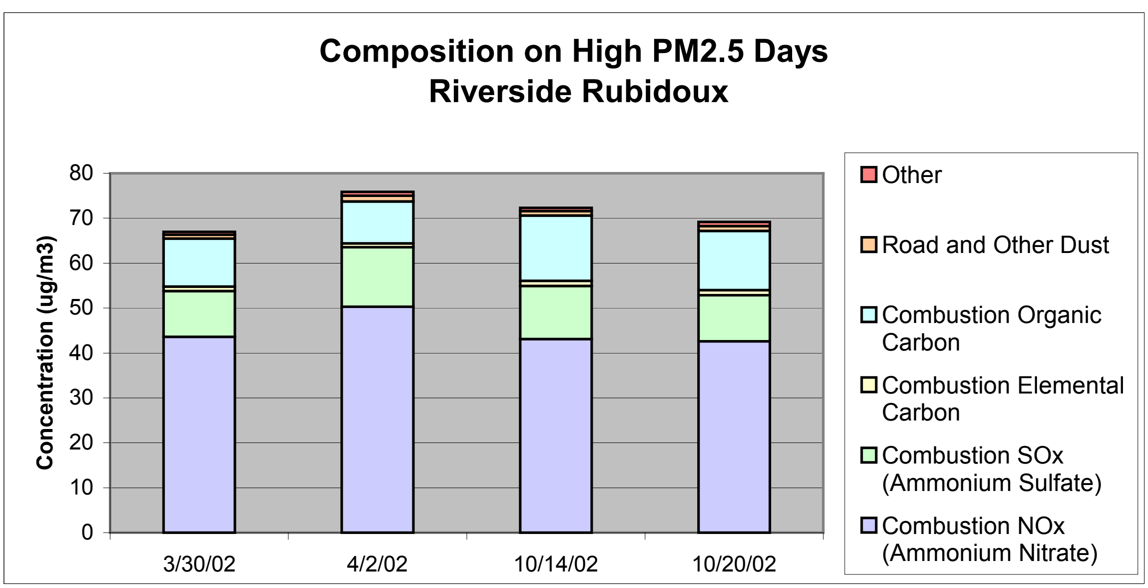


Figure O-7 presents the chemical composition of PM2.5 and associated emission sources on days when PM2.5 levels exceeded 50 $\mu g/m^3$ during the spring and winter at Riverside. On all four days days, the major component of ambient PM2.5 is ammonium nitrate, contributing approximately 60 percent to PM2.5. Organic carbon and ammonium sulfate also contribute significantly to PM2.5. Organic carbon is a slightly higher contributor during the October days as compared to the March and April days.

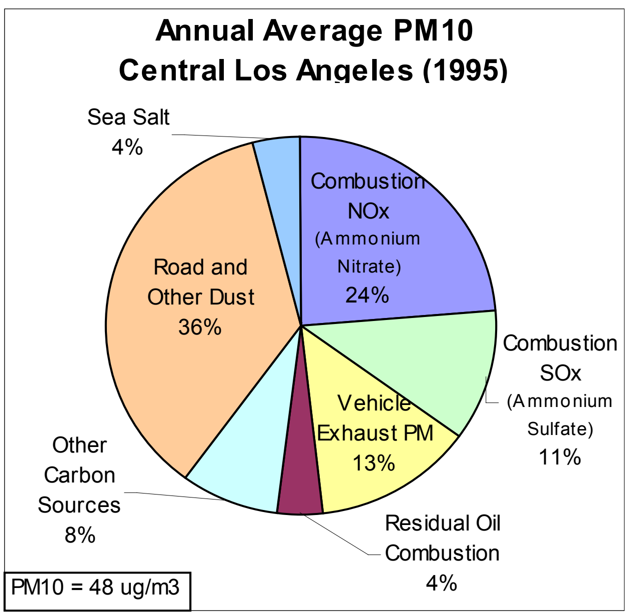
Figure O-7. Chemical Composition of PM2.5 on High Concentration Days.



Figures O-8 and O-9 present the results of a chemical mass balance modeling performed using ambient PM10 data collected at Central Los Angeles (a) and Riverside (b) during a one-year study conducted from January 1995 to February 1996 as part of the PM10 Technical Enhancement Program (PTEP) (SCAQMD. 1996). The chemical mass balance modeling provides further resolution on the sources of organic and elemental carbon. Figure O-8 shows that on an annual average basis ammonium nitrate contributes most significantly to PM10. Directly emitted particles from vehicle exhaust are also a major contributor. Road dust and dust from other sources is another major contributor to ambient PM10, but not to the PM2.5 fraction. Figure O-9 shows the results for November 17, 1995, when maximum PM10 levels were recorded. On peak days, ammonium nitrate increases, and becomes the major contributor to ambient PM10 levels at both sites (approximately 50 to 55 percent). Directly emitted particles from vehicle exhaust, and ammonium sulfate also contribute approximately 5 to 10 percent. Colder, more stagnant conditions during this time of the year are conducive to the buildup of ammonium nitrate.

Figure O-8. Source Apportionment of Annual Average PM10 Using Chemical Mass Balance.

a) Los Angeles



b) Riverside

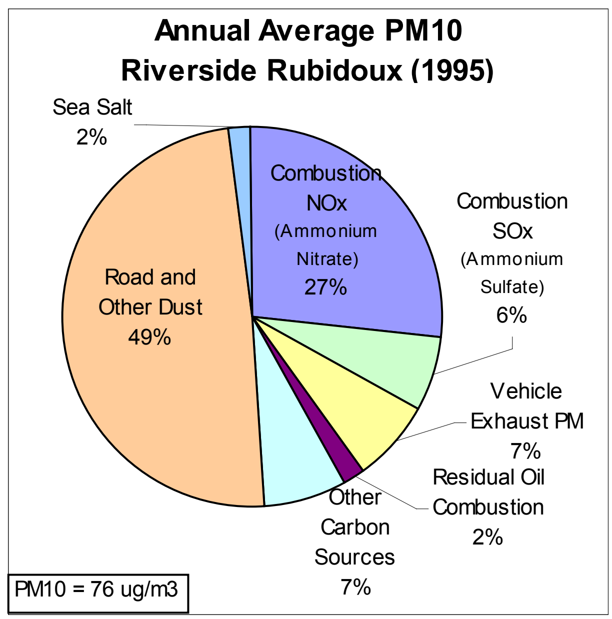
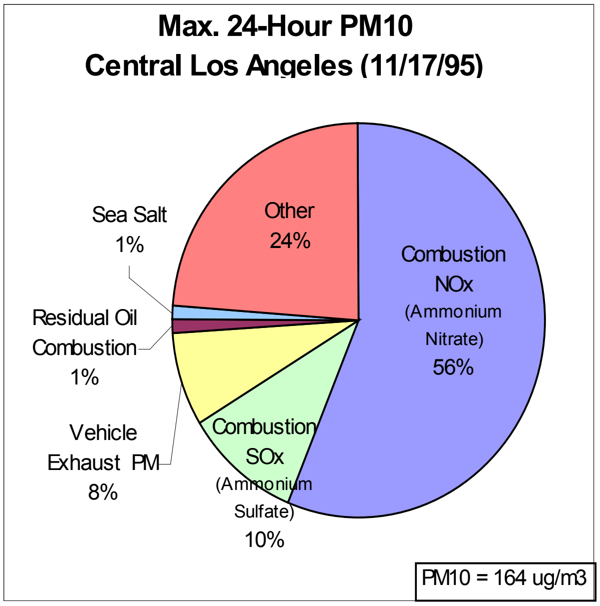


Figure O-9. Source Apportionment of PM10 on the Maximum Concentration Day in 1995 Using Chemical Mass Balance.

a) Los Angeles



b) Riverside