City Heights CO and PM2.5 Data Analysis Report

by

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The successful monitoring of carbon monoxide and PM2.5 in City Heights was accomplished by the efforts of numerous organizations and individuals. The District acknowledges the efforts of the following individuals (and all others who participated and the author failed to acknowledge).

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EXECUTIVE SUMMARY

At the request of the community of City Heights, measurements of carbon monoxide (CO) and fine particulate matter (PM2.5) were made at several locations between November 2008 and February 2009. The study found that CO and PM2.5 levels exhibit similar patterns to other locations in the County, and that the measured concentrations fall mid-range to other sites for both pollutants.

Carbon monoxide concentrations were well below all air quality standards during the entire study. The measured CO concentrations in close proximity and on both sides of SR-15 were less than other areas of the County where population density, traffic, topography, and meteorology result in higher concentrations. City Heights is in an area with adequate ventilation and without deep pockets for cold air to settle and trap pollutants in the surface layer. This combination of meteorology and geography contributes to good air quality in City Heights.

The PM2.5 data collected in City Heights exhibit similar patterns to other locations in the County, with the highest concentrations in City Heights mirrored by higher concentrations in other locales. This indicates a strong correlation to atmospheric conditions and regional air quality patterns; not a locally-based problem.

Similar to other locations in San Diego County, the daily PM2.5 average levels in City Heights are strongly affected by night and morning concentrations, where atmospheric stability plays an important role in surface concentrations. During the day, when local traffic, and therefore emissions, is highest, surface concentrations tend to be at their low point in the diurnal cycle.

The PM2.5 measurements in City Heights are consistent with longer-term measurements from other monitoring sites in San Diego County, falling mid-range between other locations. City Heights therefore meets the federal air quality standards for PM2.5, along with the rest of San Diego County.

Based upon the results of this study, no further air quality monitoring is warranted in City Heights.

PROJECT DESCRIPTION

Early in 2008, the San Diego Air Pollution Control District (District) was contacted by a member of County Board of Supervisors Ron Roberts' (District 4) staff regarding air pollution concerns in City Heights. This air pollution concern stemmed from the completion of State Route 15 (SR-15) through the City Heights area many years ago, and the creation of Teralta Park, which spans over SR-15.

A previous agreement with the community of City Heights and the California Department of Transportation (CALTRANS) called for carbon monoxide (CO) monitoring at Teralta Park following completion of the park over SR-15. The City Heights community wanted this monitoring to ensure that there were no health issues related to SR-15 at Teralta Park. CO was chosen as the pollutant to monitor as it is a relatively direct measure of pollutants emitted from vehicles, and therefore would show potential impacts from traffic on SR-15 (based on various study documents from the 1970s, 1980s, and 1990s).

The District has been monitoring CO in populated areas of San Diego County since the early 1970s. With the exception of the wildfires of 2003, San Diego has not violated federal air quality standards for CO since 1990 or the state standards since 1991.

CALTRANS retained a local consulting firm, CH2M Hill, to conduct the CO monitoring at Teralta Park. CH2M Hill set up and operated the CO analyzer, and the District provided quality assurance/quality control (QA/QC) calibrations, weekly checks, and audits of the CO monitoring equipment during the project. The CO monitoring project is described in more detail in reports provided to CALTRANS by CH2M Hill.

In the years following completion of SR-15 through City Heights and the creation of Teralta Park, health studies have shown that particulate matter of 2.5 microns and less in diameter (known as PM2.5) has become a pollutant of concern. The community therefore wanted the CO monitoring at Teralta Park combined with PM2.5 monitoring at Central Elementary School. The District was tasked with providing PM2.5 monitoring support for this project.

As details of the monitoring program were worked out with the community group, it became clear that the CO and PM2.5 monitoring should be conducted during winter months in order to measure the maximum air quality impact from SR-15 on the local community. The monitoring project was therefore scheduled for November 2008 through January 2009. With community input it was also decided to split the CO monitoring between Teralta Park (southwest corner) and Central Elementary School (southeast corner of the park) in order to see if there were any differences on the west and east sides of SR-15.

The postponement of monitoring also allowed the District to obtain two, real-time PM2.5 monitors (known as EBAM) and one filter-based, Federal Reference Method (FRM) PM2.5 analyzer to provide more definitive measurements of PM2.5 in the community of City Heights. The Central Elementary School location was chosen as the location for one EBAM unit as well as the FRM. Wilson Middle School, a few blocks to the northwest, was chosen as the location for the second EBAM unit. The placement of these analyzers allowed for

simultaneous measurements upwind and downwind of SR-15, and the FRM unit provided a form of data quality control. A map showing the locations of the monitoring locations relative to Teralta Park and SR-15 is shown in Figure 1.

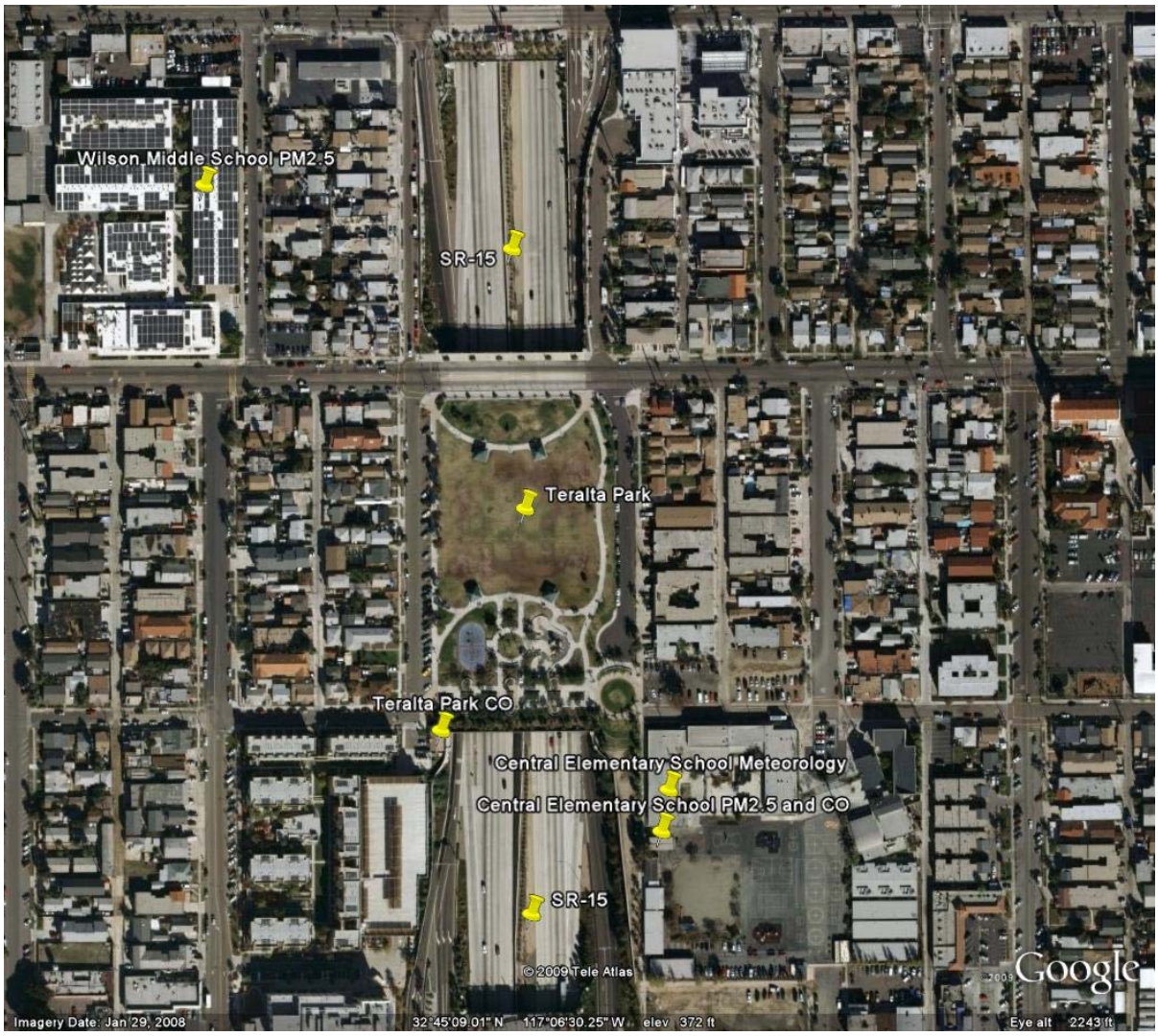

Figure 1. Map showing CO, PM2.5, and meteorology monitoring locations relative to Teralta Park and SR-15.

Information about the monitoring locations and dates of data collection are provided in Table 1. Detailed location information is presented in Table 2.

Parameter	Location	Start Date	End Date	Comments
CO	SW Corner Teralta Park	November 1, 2008	December 13, 2008	
CO	Central Elementary	December 22, 2008	January 30, 2009	
PM2.5 (EBAM)	Central Elementary	December 18, 2008	February 4, 2009	
PM2.5 (EBAM)	Wilson Middle School	December 16, 2008	February 4, 2009	
PM2.5 (FRM)	Central Elementary	December 20, 2008	January 29, 2009	January 13 Missing
Meteorology	Central Elementary	November 19, 2008	February 4, 2009	

Table 1. Air quality monitoring parameters, locations, and monitoring dates for the Teralta Park project.

Location	Latitude	Longitude	Elevation (ft MSL)
SW Corner Teralta Park CO	32° 45’ 05” N	117° 06’ 33” W	369
Central Elementary CO	32° 45’ 03” N	117° 06’ 29” W	367
Central Elementary PM2.5 (EBAM and FRM)	32° 45’ 03” N	117° 06’ 29” W	367
Wilson Middle School PM2.5 (EBAM)	32° 45’ 15” N	117° 06’ 39” W	375
Central Elementary Meteorological Station	32° 45’ 04” N	117° 06’ 29” W	368

Table 2. Air quality monitoring project location names, latitudes, longitudes, and elevations for the Teralta Park project.

RESULTS

Meteorology

Meteorological data were measured by the District to document wind patterns during the study. During the project a self-contained, portable meteorological measurement system was placed on the roof, just to the north of the PM2.5 and CO sampling locations at Central Elementary School. Meteorological observations were collected on an hourly basis using a Campbell Scientific RAWS-F Remote Automated Weather Station for Fire Weather and were recorded by a Campbell Scientific CR1000 Datalogger (within the RAWS-F station). This system measured hourly averages of wind speed and direction, temperature, humidity, solar radiation, and barometric pressure, as well as hourly total rainfall.

Figure 2 shows a wind rose for all wind observations collected between November 19, 2008, and February 4, 2009. A wind rose is a graphical chart showing the percentage of time that the wind blows from a particular direction. The wind roses presented in this document include color-coding to represent the wind speed ranges along with the wind direction. The wind rose in Figure 2 shows that northeasterly winds were the predominant direction during the project. However, these winds were mostly light; with wind speeds of 1 to 4 knots (one knot is equal to 1.15 mph). Light, offshore winds are expected to occur most frequently at night at this location. The stronger winds (4 to 7 knots, and 7 to 11 knot ranges) occurred most often with westerly winds, typical of daytime winds. The average wind speed during the entire project was 2.7 knots.

A wind rose for morning (midnight to 0700 PST) winds is shown in Figure 3. This figure shows that morning winds are predominately out of the northeast and are mostly in the 1 to 4 knot range, with a small percentage of wind speeds in the 4 to 7 mph range. The average wind speed during morning hours for the entire project was 2.2 knots.

The wind rose for daytime (0800 to 1600 PST) winds is shown in Figure 4. Daytime winds in City Heights are predominately from the west-northwest and northwest, with another peak direction of south-southwest, associated with coastal eddies and stormy conditions (a small percentage of winds in the 11 to 17 knot range). Therefore, under most conditions, daytime winds at Central Elementary School will pass over SR-15. Documenting daytime air quality measurements at Central Elementary School was a primary goal of this project. The average daytime wind speed over the entire project was 3.3 knots.

The evening hour (1700 to 2300 PST) wind rose shows winds all over the wind circle (see Figure 5), indicating a transition between the daytime westerly and the nighttime northeasterly wind regimes. The average evening wind speed for the entire project was 2.5 knots.

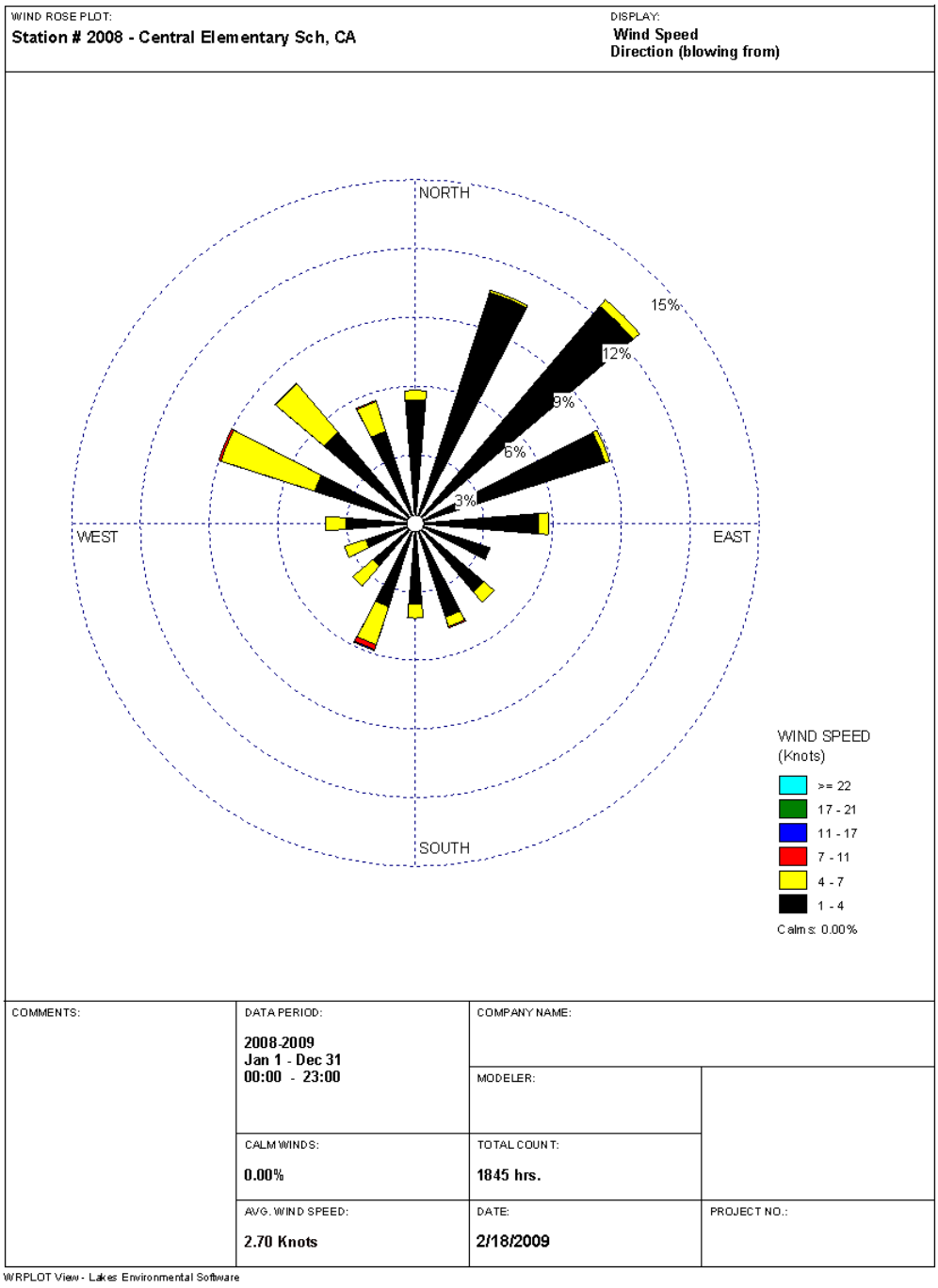

Figure 2. Wind rose for meteorological data collected at Central Elementary School – all hours for November 19, 2008, through February 4, 2009 (dates noted in wind rose result from the computer program, not the actual dates used in generating the plot).

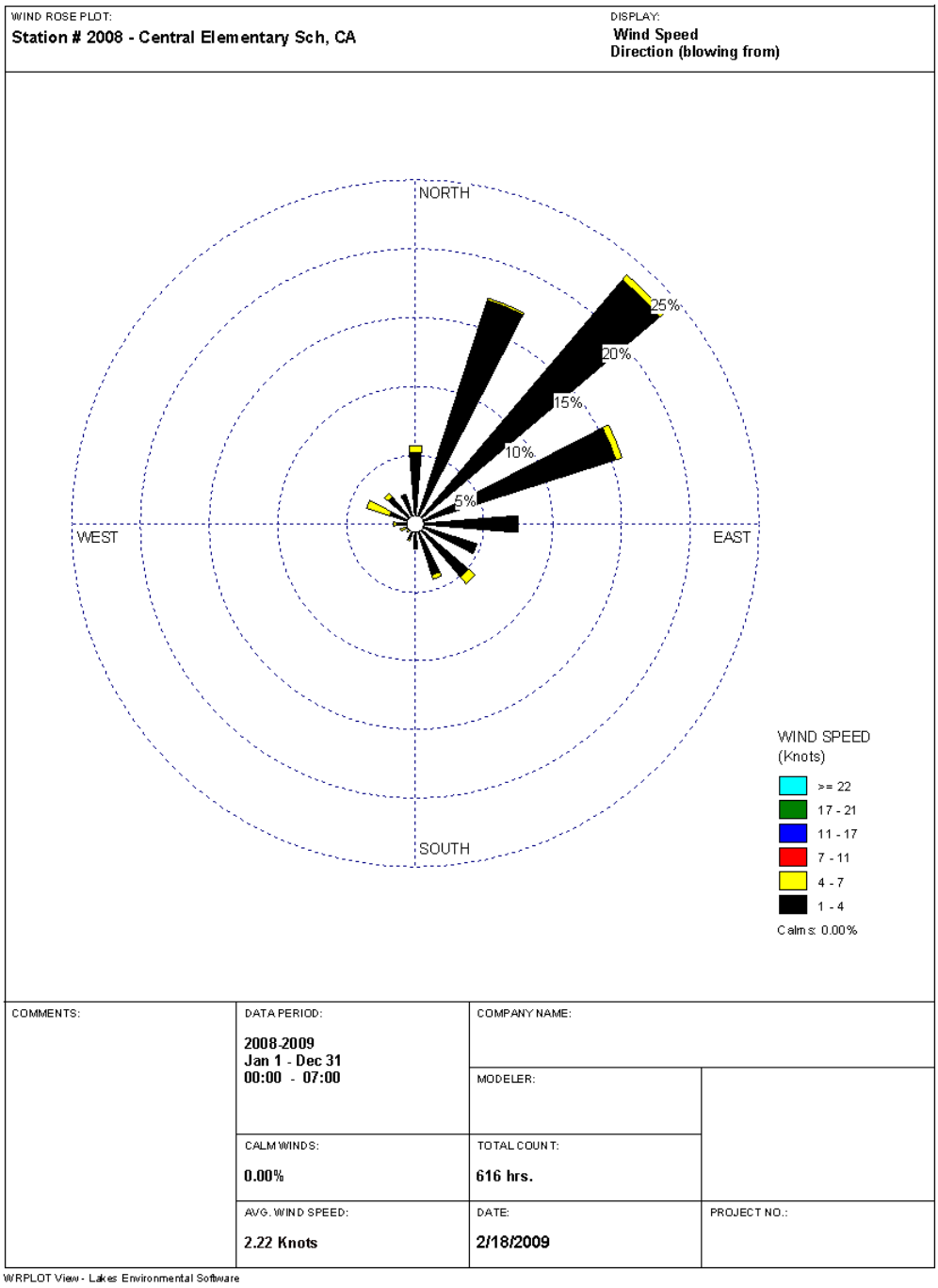

Figure 3. Morning wind rose for meteorological data collected at Central Elementary School – midnight through 0700 PST for November 19, 2008, through February 4, 2009.

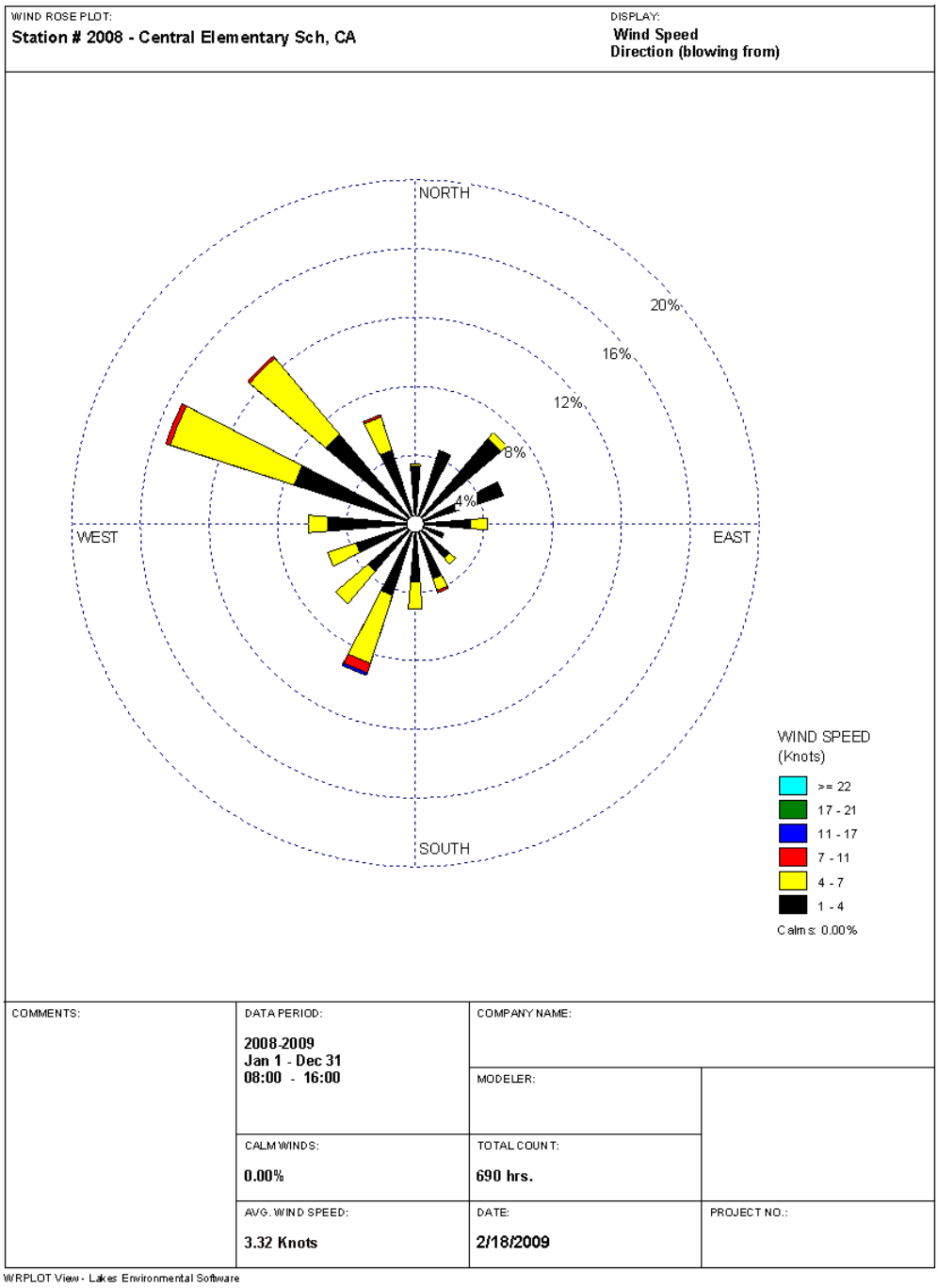

Figure 4. Daytime wind rose for meteorological data collected at Central Elementary School – 0800 through 1600 PST for November 19, 2008, through February 4, 2009.

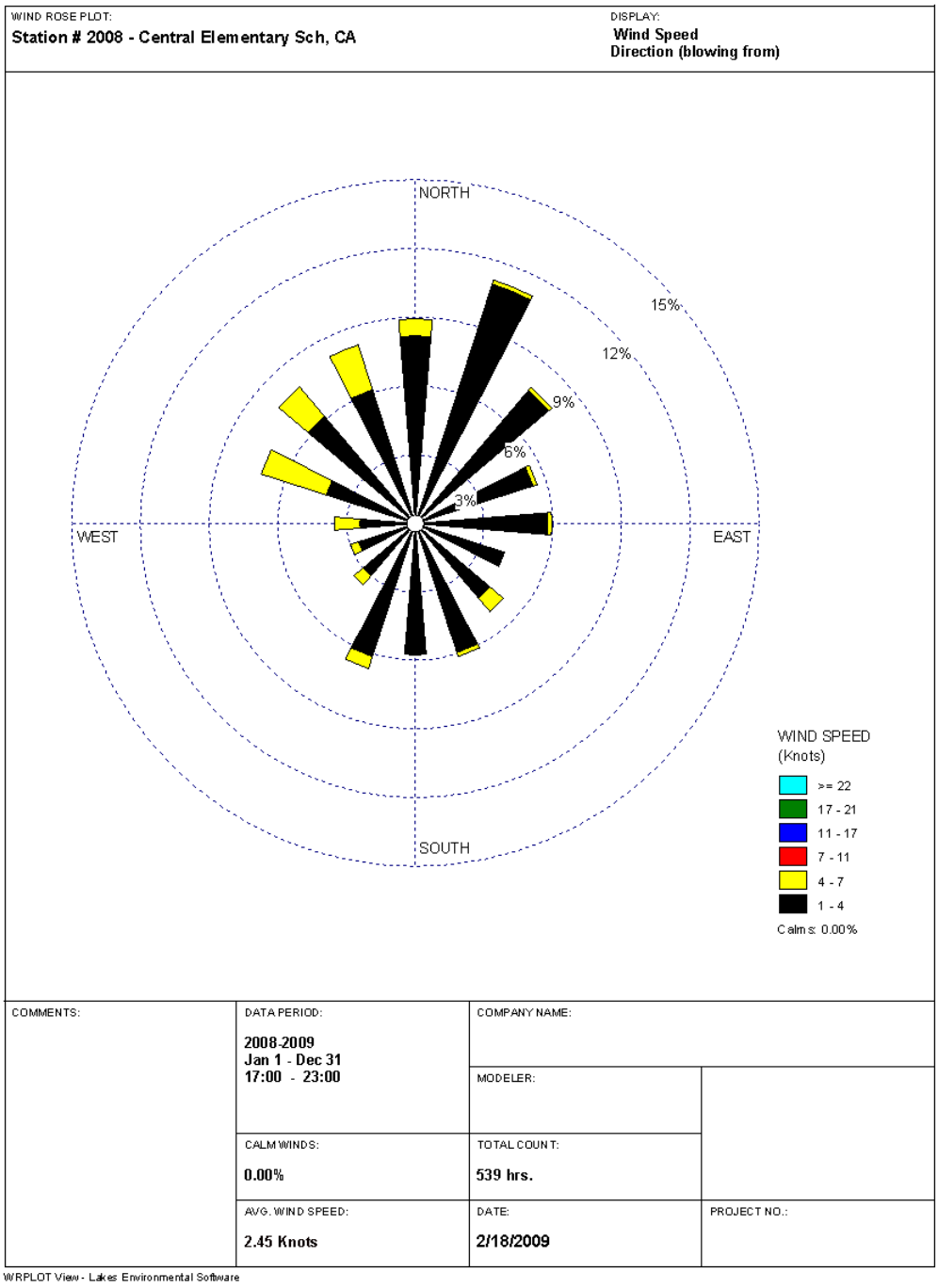

Figure 5. Evening wind rose for meteorological data collected at Central Elementary School – 1700 through 2300 PST for November 19, 2008, through February 4, 2009.

Carbon Monoxide (CO)

Community concerns about the CO concentrations in the Teralta Park area were the impetus for this monitoring project in City Heights. As stated previously in the Project Description, San Diego County is in attainment of all state and federal air quality standards for CO. These standards are presented in Table 3.

Carbon Monoxide Standards

	California Standards	Federal Standards
1-Hour	20 ppm	35 ppm
8-Hour	9.0 ppm	9 ppm

Table 3. State and federal 1-hour and 8-hour ambient air quality standards for carbon monoxide (CO) in parts per million (ppm).

During the entire CO monitoring period the maximum 1-hour CO concentration measured at the Teralta Park/Central Elementary School sites was 3.1 ppm (January 18, 2009, at 0000 PST). The highest CO measured at all San Diego monitoring sites during the entire project, 4.6 ppm, was measured at the District's Otay Mesa site (twice, November 13, 2008, at 2300 PST; and January 1, 2009, at 0400 PST).

Figure 6 shows the hourly CO concentrations for all monitoring sites in San Diego County for January 18, 2009 (date of highest CO in City Heights for the entire project). The data shown in this graph are for the District's monitoring sites in Chula Vista (CVA), Downtown San Diego (DTN – aka Perkins Elementary School), Escondido (ESC), Otay Mesa (OTM), and Teralta Park/Central Elementary School (TEP/CES). Although this graph shows the highest CO readings for the entire project at City Heights, these data are significantly less than measurements at the Downtown San Diego site. This graph also shows the CO in City Heights to be significantly less than at the Escondido site during the morning commute time (although the commute on a Sunday is very different than on weekdays).

All health-based air quality standards for CO are met in City Heights (and elsewhere in San Diego County). Table 4 presents the maximum 1-hour and project average concentrations for the entire monitoring period for this project. This table shows that the City Heights area has lower CO concentrations than Downtown San Diego, Escondido, and Otay Mesa, and slightly higher concentrations than Chula Vista.

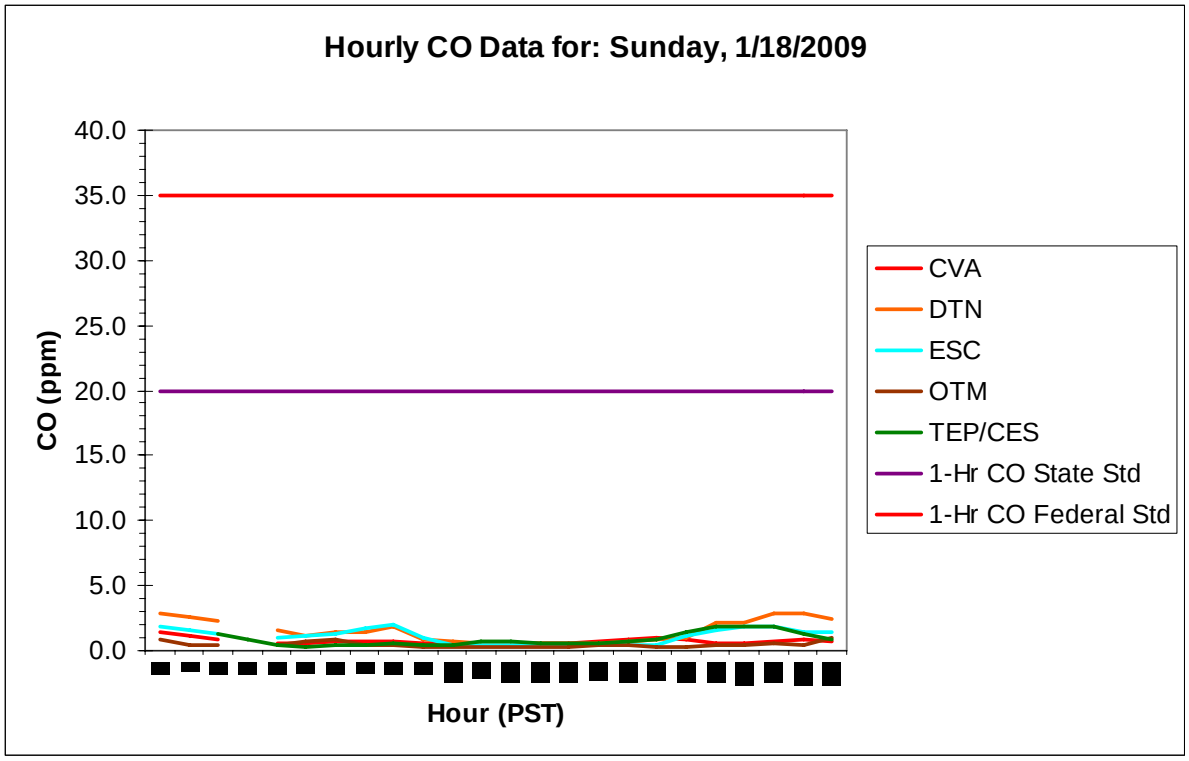

Figure 6. Hourly CO concentrations for Sunday, January 18, 2009 (date of maximum 1-hour CO concentration measured in City Heights during the entire project). This graph shows that the maximum CO concentrations measured in City Heights were well below State and Federal standards. Data gaps shown in the plot are due to nightly zero/span checks.

Carbon Monoxide Statistics

	CVA	DTN	ESC	OTM	TEP/CES
1-hour Maximum (ppm)	2.5	4.0	4.4	4.6	3.1
Average (ppm)	0.7	1.0	0.9	0.9	0.8

Table 4. The maximum 1-hour CO concentration measured at each monitoring site in San Diego County during this project along with the average concentration.

Although it is not necessary to further compare the data against air quality standards, it can be instructive to look further at the data collected to understand air quality conditions in City Heights. All future CO plots in this report will be shown with a maximum plot value of 5.0 ppm or less (without the standard) in order to show better detail of CO concentrations. Plots of each day's CO concentrations can be found in Appendix A.

A plot of hourly averaged CO data for the entire project period is shown in Figure 7. This graph shows how morning commutes increase ambient CO concentrations throughout San Diego County. The morning peaks are then followed by daily minimum values in the

daytime as surface heating helps to vertically disperse surface concentrations. Evening values show a shallower increase in CO values as there is greater vertical dispersion from the warm ground early in the evening commute hours. Additionally, the evening commute traffic is more spread out as compared to the morning commute. The graph for all sites shows increases in CO concentrations as contributions from home residences (e.g., furnaces and water heaters) are added to the atmosphere that is undergoing increased atmospheric stability after sunset (surface cooling).

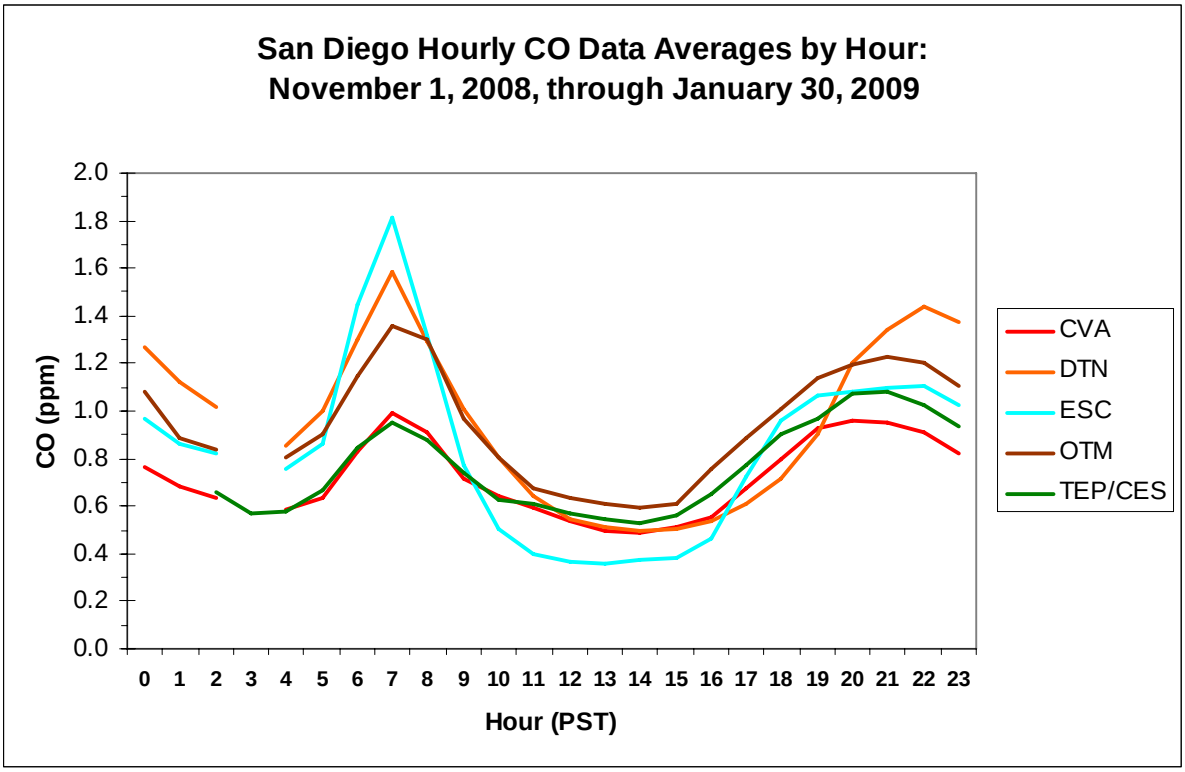

Figure 7. Graph of hourly averaged CO data for the entire project period.

The data for the project period when the CO analyzer in City Heights was located at the southwest corner of Teralta Park (TEP) is shown in Figure 8. This graph shows similar diurnal patterns at all sites in San Diego County.

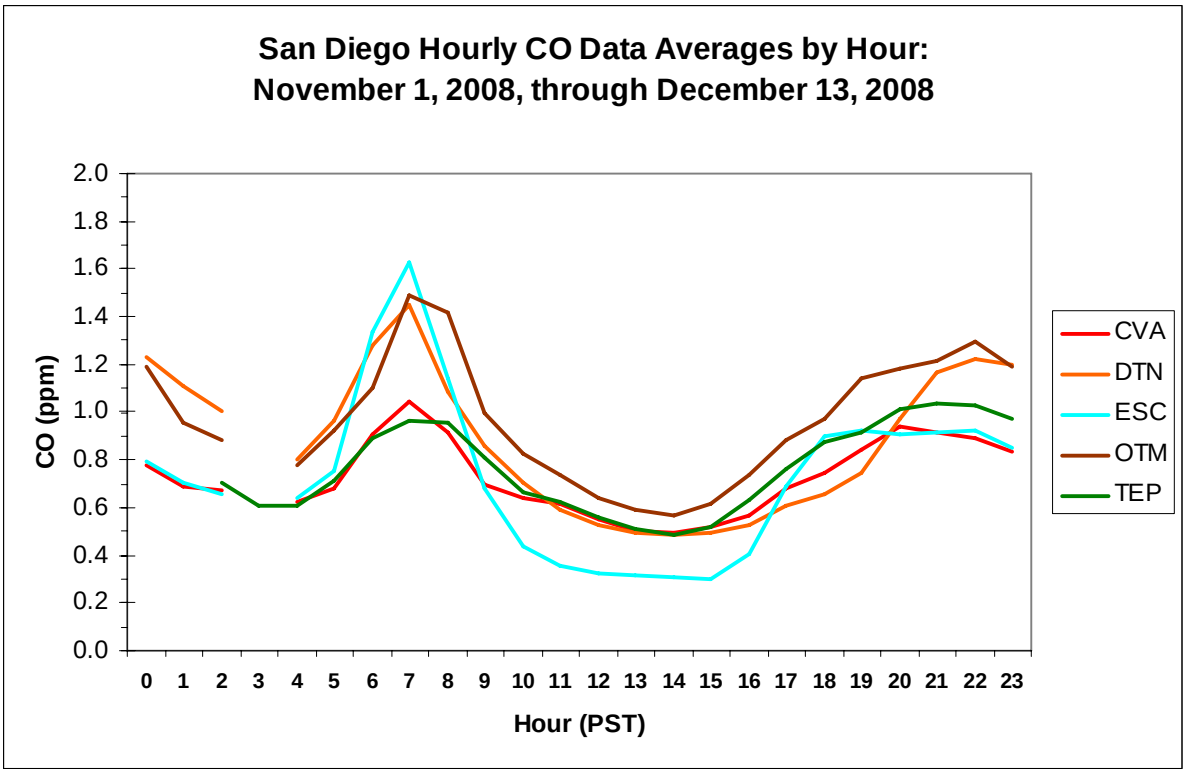

Figure 8. Graph of hourly averaged CO data for the Teralta Park (TEP) portion of the project.

The data for the project period when the CO analyzer in City Heights was located at the southwest corner of Central Elementary School (CES) is shown in Figure 9. Although this graph is similar to the earlier time period (Figure 8), the Otay Mesa site (OTM) shows lower CO concentrations. This is most likely due to lower border traffic volume during the Christmas holiday period.

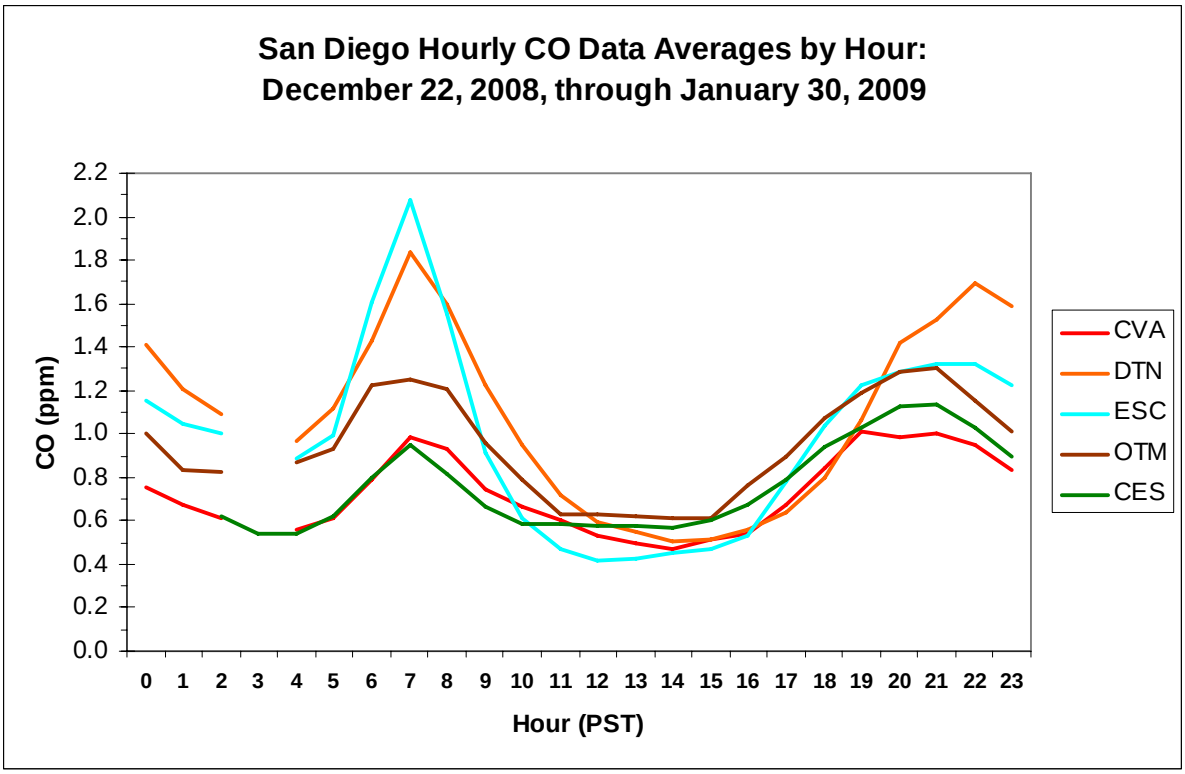

Figure 9. Graph of hourly averaged CO data for the Central Elementary School (CES) portion of the project.

The hourly averaged CO data for the Teralta Park (TEP) and Central Elementary School (CES) portions of the project are shown together in Figure 10. This graph shows that two sites are nearly identical in their diurnal patterns and overall concentrations. Minor differences are most likely due to the different meteorological patterns during these short monitoring periods.

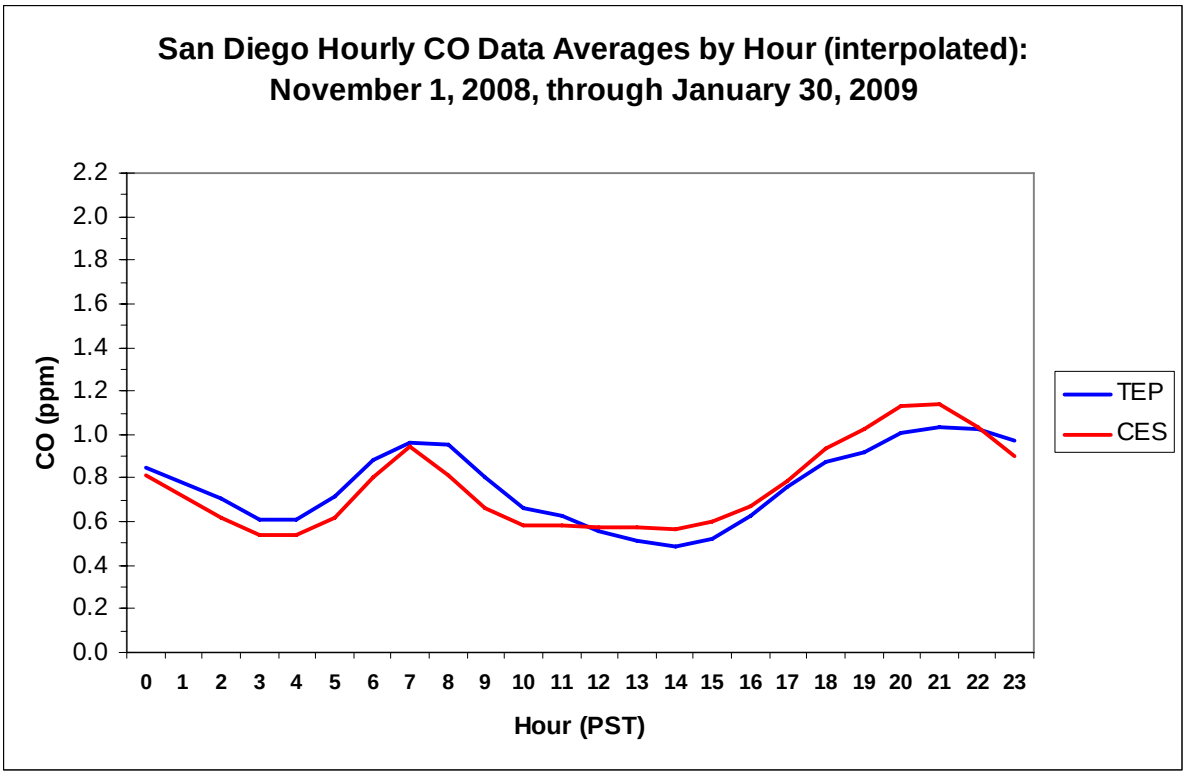

Figure 10. Graph of hourly averaged CO data for the Teralta Park (TEP) and Central Elementary School (CES) portions of the project (interpolated mode to show data for hour 0).

The data from New Year's Eve and New Year's Day show how changes in daily patterns of human activity can impact ambient air quality concentrations. Figure 11 shows the hourly CO concentrations for New Year's Eve (Wednesday, December 31, 2008). CO concentrations reflect the typical morning commute, with the highest concentrations measured at the District's Downtown San Diego (DTN) and Escondido (ESC) monitoring stations. The normal afternoon pattern is followed by a later than usual afternoon increase in CO concentrations. The Escondido monitoring station data show a continuous increase in evening and late night concentrations as people continue to drive their cars and home heating systems and fireplaces operate at later than normal hours. The later than normal peak in CO concentrations is seen at the Central Elementary School (TEP/CES) site as well. This peak comes from local activities as well as traffic on SR-15. The traffic on SR-15 would be composed mainly of passenger car traffic at this time, with very limited truck traffic.

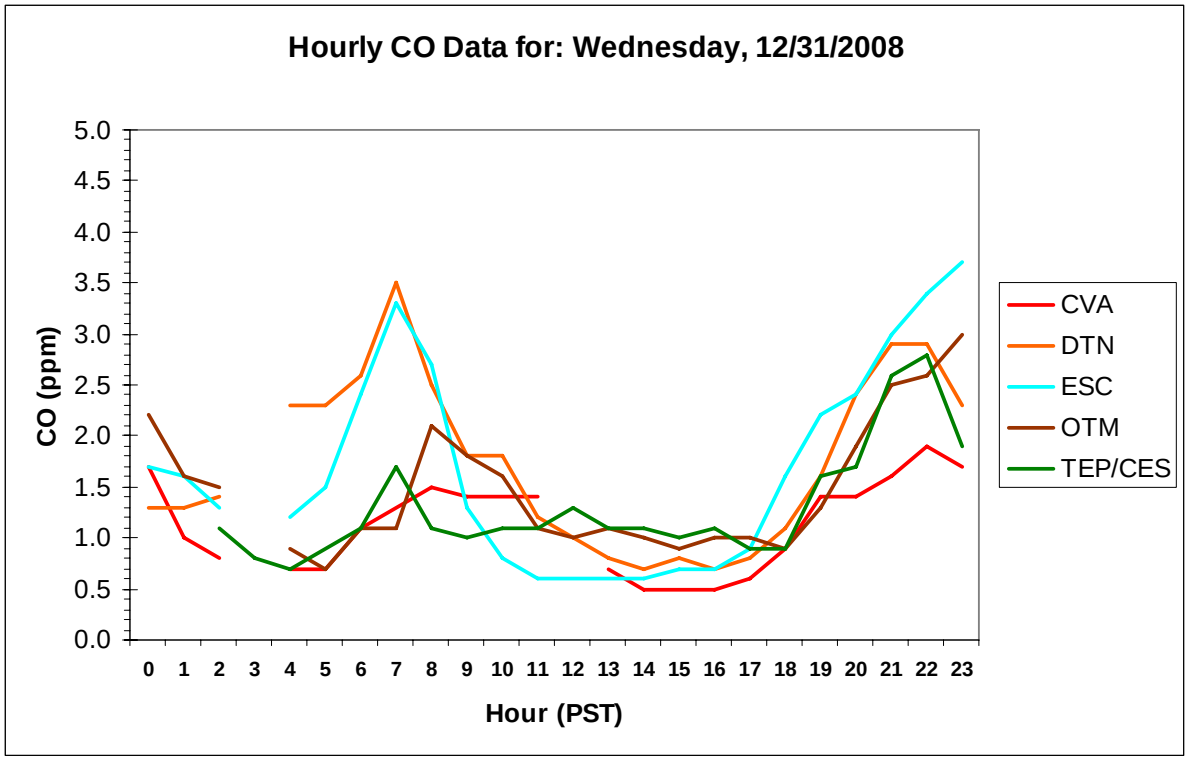

Figure 11. Graph of hourly CO concentrations for New Year's Eve, Wednesday, December 31, 2008.

Hourly CO concentrations for New Year's Day (Thursday, January 1, 2009) are shown in Figure 12. This graph shows the highest values in the early morning hours, as late night revelers return home in their vehicles and home heating systems remain set at higher temperatures as people are still awake during normal sleeping hours. Again, emissions are almost entirely from personal vehicles and home-based activities, with very limited truck traffic. The daytime and evening CO concentrations are uncharacteristically flat as normal commute patterns and weekday activities were altered for the holiday.

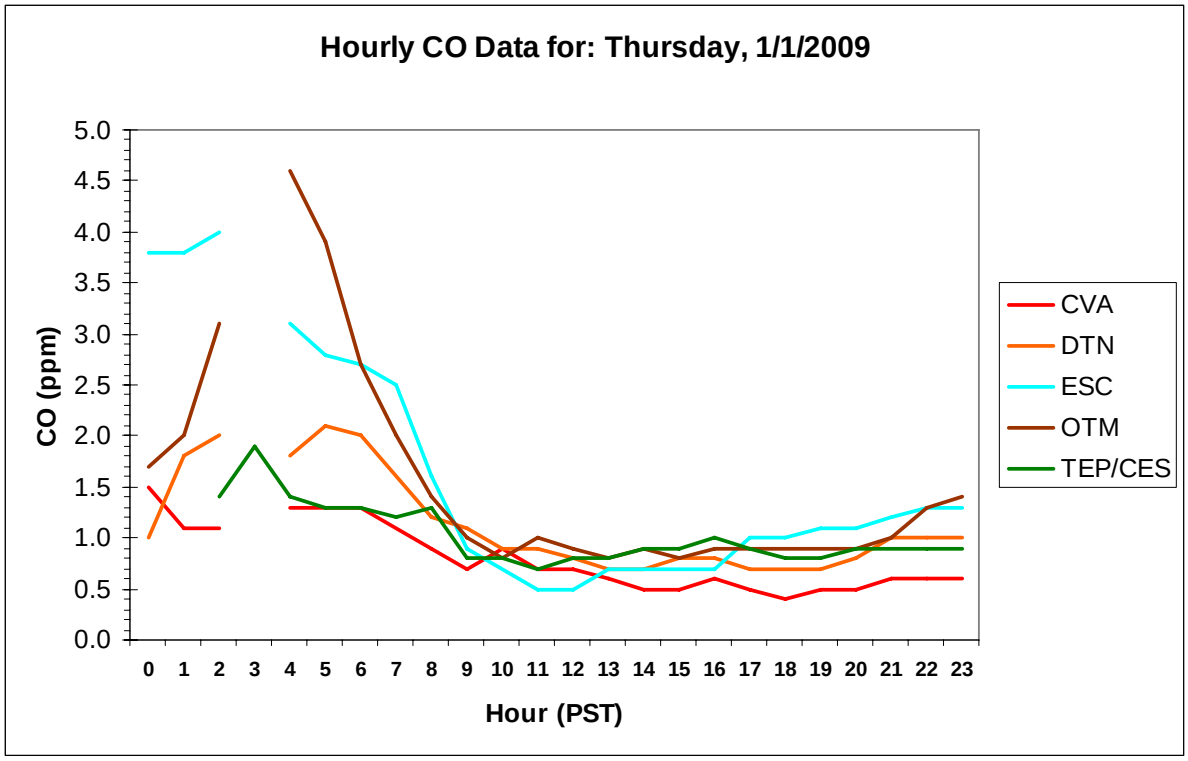

Figure 12. Graph of hourly CO concentrations for New Year's Day, Thursday, January 1, 2009.

The above examples of holiday emissions show how human activities in San Diego County affect air quality concentrations. In can also be educational to look at air quality patterns as they relate to human activities throughout an average week. A graph of hourly averaged CO concentrations based on the day of the week for the Teralta Park (TEP) and Central Elementary School (CES) sites is shown in Figure 13. This graph shows that the weekday morning commutes peak at 0700 PST while the weekend morning commutes peak lower and at 0800 PST. The lowest morning commute peak is on Sunday mornings. Daytime concentrations are also lowest on Sundays, with day of week differences relatively small. The evening patterns show that Friday nights had the highest concentrations and Saturday nights the lowest concentrations.

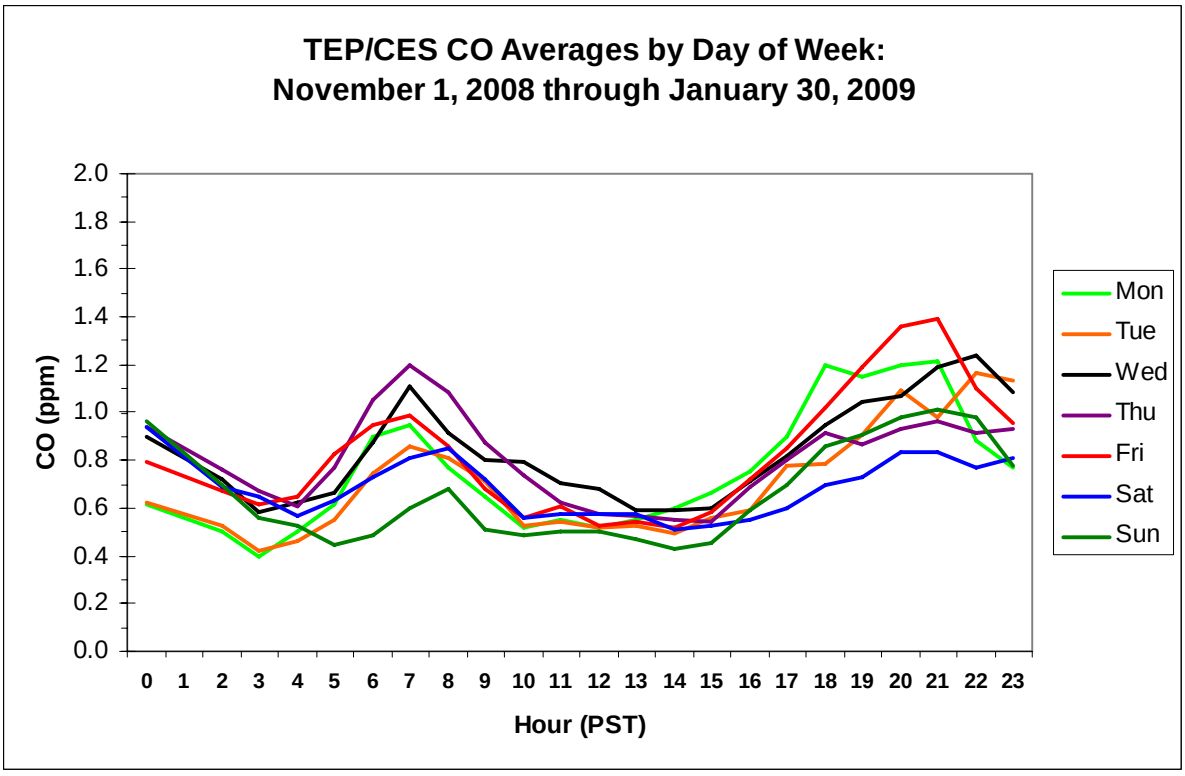

Figure 13. Graph of hourly CO concentrations by day of week measured over the entire monitoring project.

The day of week pattern is a little clearer when New Year's Eve and New Year's Day are excluded from the hourly averaging, as shown in Figure 14. This graph continues to show the highest morning commute concentrations as occurring on Wednesday and Thursday, consistent with high levels of human activity during the middle of the week, and the highest nighttime concentrations on Friday nights, as people start their weekends and commute in and out of town.

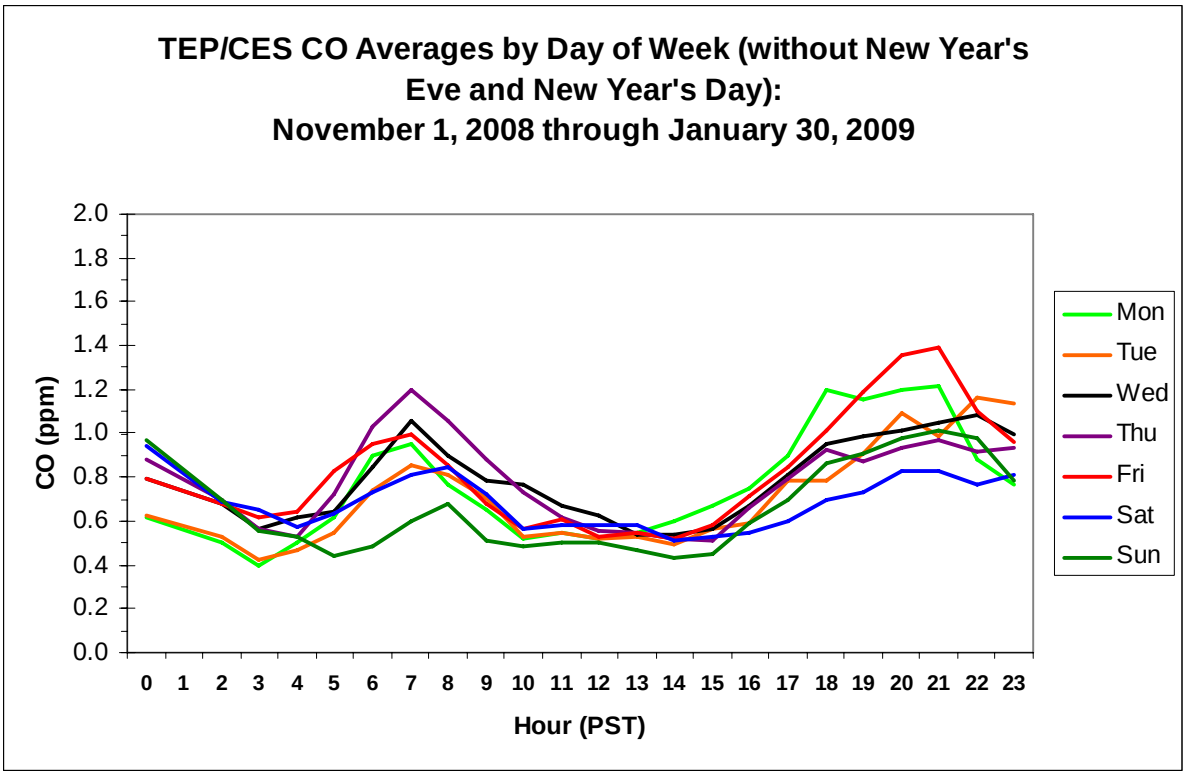

Figure 14. Graph of hourly CO concentrations by day of week measured over the entire monitoring project, excluding New Year's Eve (a Wednesday) and New Year's Day (a Thursday).

Fine Particulate Matter (PM2.5)

An additional concern of the City Heights community is the concentration of fine particulate matter of 2.5 microns and less in diameter (known as PM2.5). The District proposed to measure PM2.5 at two sites using two different sampling methods. The official method for measuring PM2.5 is a filter-based system (the Federal Reference Method, or FRM). This system measures PM2.5 concentrations over 24-hour periods, with the resulting data reported in micrograms per cubic meter (µg/m3).

Although this system is very accurate, the sample is an integrated sample, collected over the entire 24-hour period. Therefore, this measurement does not provide any information on diurnal emission patterns. To address this issue, the District proposed using an instrument known as an EBAM. The EBAM measures hourly concentrations of PM2.5, providing information on diurnal patterns and concentrations.

The District installed two EBAMs for this project. One EBAM was collocated with the FRM sampler at Central Elementary School. The second unit was located at Wilson Middle School; a few blocks to the northwest (see Figure 1).

The resulting data are then compared to the Federal 24-hour standard for PM2.5 (there is no separate state standard for 24-hour periods (see Table 5). The 24-hour PM2.5 standard is met if the 98th percentile of all samples is below the standard, averaged over three years.

PM2.5 Standards

	California Standards	Federal Standards
24-Hour	No separate State Standard	35 µg/m3
Annual Arithmetic Mean	12 µg/m3	15.0 µg/m3

Table 5. State and federal 24-hour and annual ambient air quality standards for PM2.5.

This study relies heavily on the continuous data collected by the EBAM units to better understand air quality conditions in City Heights. It is therefore important to know how the EBAM data compare to the official FRM data (the filter-based method).

The daily FRM PM2.5 concentrations are plotted along with the EBAM-derived PM2.5 concentrations in Figure 15. This graph shows that, overall, the two methods compared well. In general, the EBAM reported higher concentrations than the FRM, especially when concentrations were elevated to near or above the 24-hour standard.

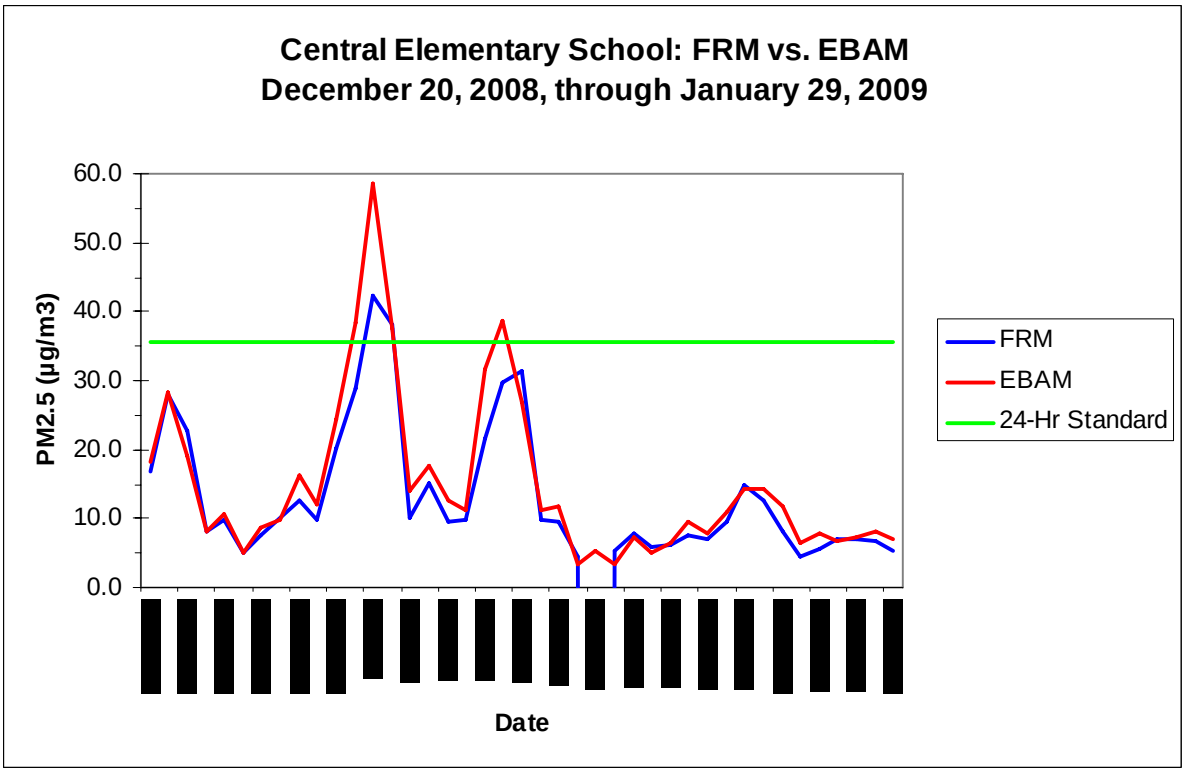

Figure 15. Graph showing the 24-hour PM2.5 concentrations collected by the FRM and the EBAM at Central Elementary School from December 20, 2008, through January 29, 2009.

The numerical values that generated Figure 15 are shown in Table 6 (the EBAM data for Wilson Middle School are shown in Table 6 for comparison). The official, FRM data from Central Elementary exceeded the federal 24-hour standard on two days during the project. These exceedances occurred on January 1, and January 2, 2009 (42.4 µg/m3 and 38.1 µg/m3, respectively).

Date	CES FRM	CES EBAM		WMS EBAM
12/20/2008	16.7	18.1		17.1
12/21/2008	27.9	28.4		30.2
12/22/2008	22.6	19.1		27.1
12/23/2008	8.2	8.1		8.4
12/24/2008	9.8	10.7		11.6
12/25/2008	5.1	5.0		7.7
12/26/2008	7.7	8.6		8.9
12/27/2008	10.1	9.7		10.2
12/28/2008	12.6	16.3		16.1
12/29/2008	9.7	12.0		14.2
12/30/2008	20.1	24.5		19.5
12/31/2008	29.0	38.3		32.0
1/1/2009	42.4	58.5		45.3
1/2/2009	38.1	37.7		30.9
1/3/2009	10.2	14.1		8.1
1/4/2009	15.2	17.6		15.2
1/5/2009	9.6	12.7		10.6
1/6/2009	9.9	11.1		9.6
1/7/2009	21.5	31.8		37.4
1/8/2009	29.7	38.7		35.8
1/9/2009	31.3	27.0		23.4
1/10/2009	9.8	11.3		7.9
1/11/2009	9.4	11.9		9.7
1/12/2009	4.6	3.5		3.2
1/13/2009	-999.0	5.3		13.7
1/14/2009	5.2	3.4		4.8
1/15/2009	7.8	7.2		9.2
1/16/2009	5.9	5.0		5.5
1/17/2009	6.2	6.4		6.4
1/18/2009	7.7	9.5		6.6
1/19/2009	6.9	7.8		6.0
1/20/2009	9.6	11.0		12.5
1/21/2009	14.8	14.2		13.7
1/22/2009	12.5	14.2		13.5
1/23/2009	8.1	11.7		10.3
1/24/2009	4.5	6.4		6.4
1/25/2009	5.5	7.9		7.3
1/26/2009	7.0	6.6		7.5
1/27/2009	7.0	7.2		9.1
1/28/2009	6.7	8.2		8.5
1/29/2009	5.4	7.1		5.2

Table 6. PM2.5 data (FRM and EBAM) collected at Central Elementary School (CES) for 41 consecutive days during the project (-999 represents missing data). Wilson Middle School (WMS) EBAM data are included for comparison.

The District operates five BAM units at San Diego County monitoring stations in order to get real-time, hourly PM2.5 data (BAM units are for more permanent operations). The daily average PM2.5 from the various BAM and EBAM units is shown in Figure 16. This graph shows that elevated concentrations of PM2.5 occur simultaneously throughout the County, indicating periods of high atmospheric stability (usually associated with nights with clear skies, dry air, and light winds), or higher than normal emissions (such as New Year's Eve and New Year's Day). Daily graphs of BAM and EBAM data are available in Appendix B.

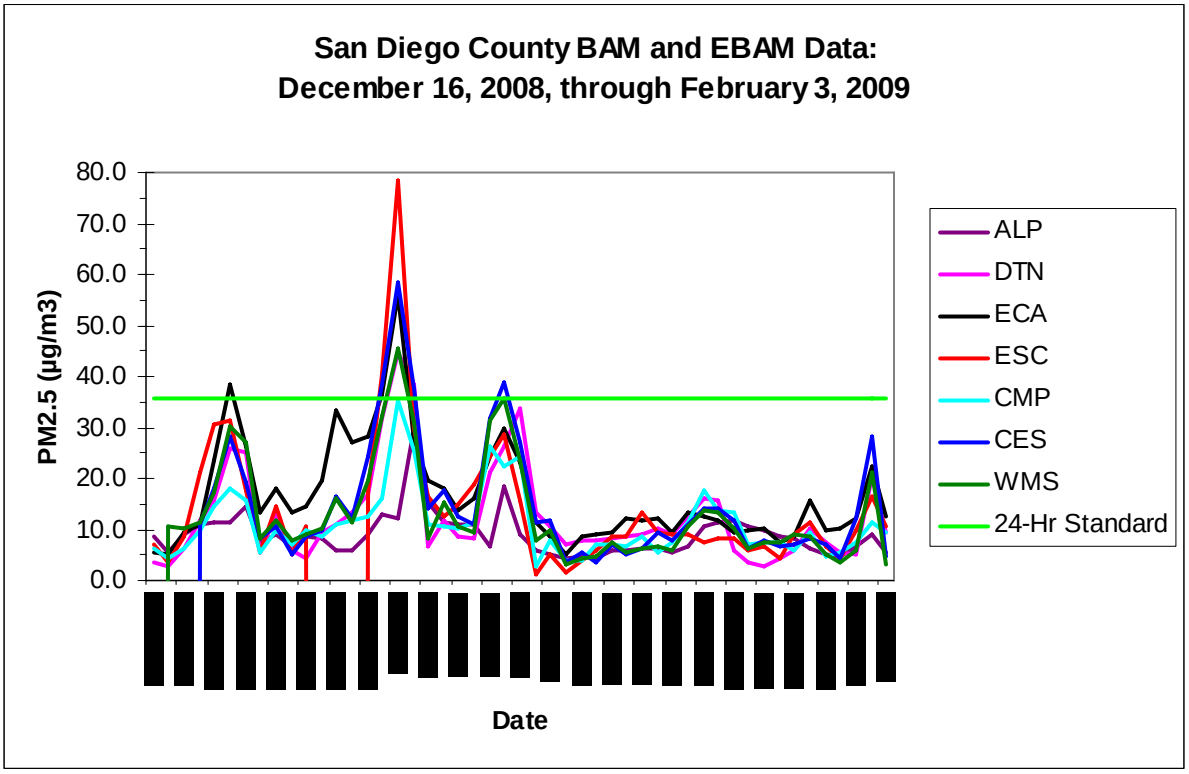

Figure 16. Graph showing the 24-hour PM2.5 concentrations collected by the BAMs and the EBAMs in San Diego County from December 16, 2008, through February 3, 2009. The BAM units were located at Alpine (ALP), Downtown San Diego (DTN), El Cajon (ECA), Escondido (ESC), and Camp Pendleton (CMP), and the EBAM units were located at Central Elementary School (CES) and Wilson Middle School (WMS).

BAM and EBAM data averages for the entire period from December 16, 2008, through February 3, 2009, are shown in Table 7.

PM2.5 Averages

	ALP BAM	DTN BAM	ECA BAM	ESC BAM	CMP BAM	CES EBAM	WMS EBAM
Average	8.9	12.5	16.4	13.7*	10.8	14.4	12.9

Table 7. PM2.5 (BAM and EBAM) averages for all hourly data collected from December 16, 2008, through February 3, 2009. * The Escondido (ESC) average is biased downward since the BAM unit lost data for December 26 – 29, 2008.

The data plotted in Figure 17 show the hourly averaged data for Central Elementary School and Wilson Middle School for the entire project period. This graph shows that the two locations are very similar in the early morning hours. During the late morning and early afternoon hours, Central Elementary School is at its lowest for the day, while Wilson Middle School shows a small peak between 1000 and 1100 am PST. Since this is at a time when the winds are normally from the west, it appears that there is a local source to the west of Wilson Middle School – possibly on the school grounds themselves, since the particulates are not evident in the data from Central Elementary. In the evening hours, particulate levels at Central Elementary School are consistently higher than Wilson Middle School. With variable winds at this time of night, this indicates that SR-15 is not the only contributor to these higher concentrations.

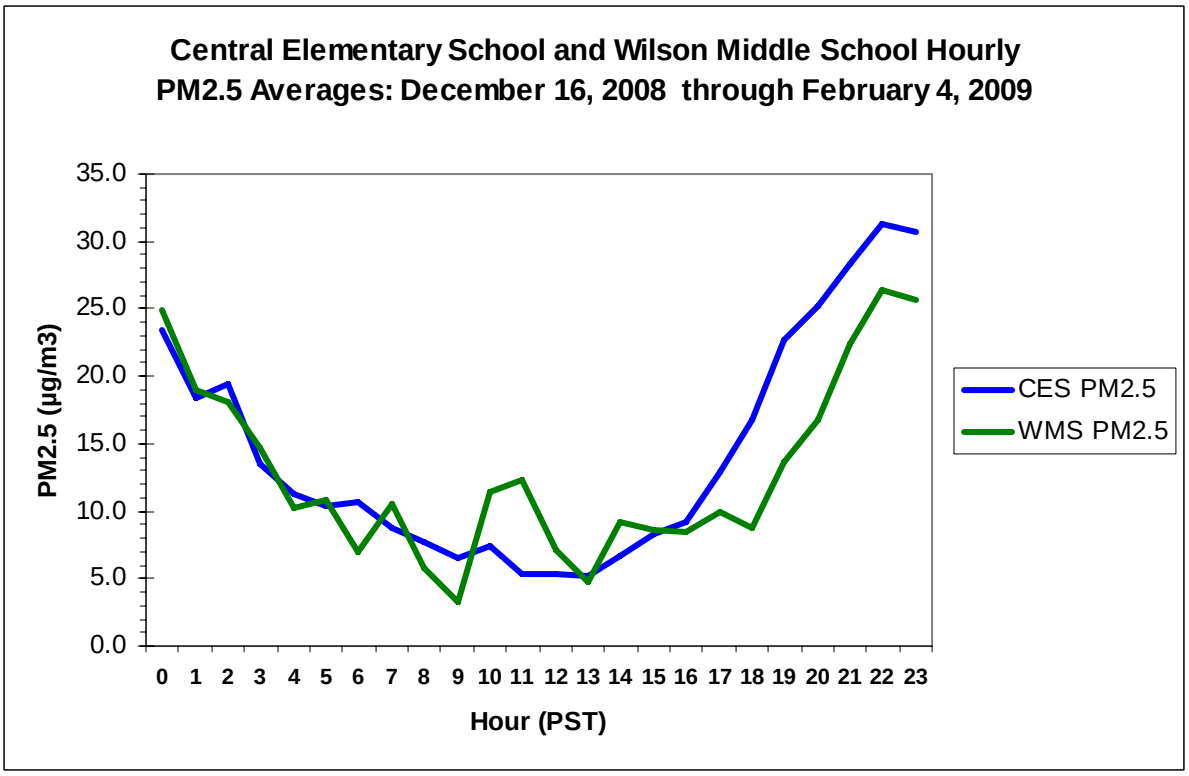

Figure 17. Graph showing the hourly averaged EBAM PM2.5 concentrations for Central Elementary School and Wilson Middle School from December 16, 2008, through February 4, 2009.

CONCLUSIONS

This study measured carbon monoxide (CO) and fine particulate matter (PM2.5) at several locations in the community of City Heights during winter months, when both pollutants typically reach their annual peak concentrations. The study found that CO and PM2.5 exhibit similar patterns to other locations in the County, and that the measured concentrations fall mid-range to other San Diego sites for both pollutants.

CO levels at all monitoring sites in San Diego, including City Heights, meet all state and federal air quality standards. In fact, measured levels were well below the standards. The CO measurements, in close proximity and on both sides of SR-15, found concentrations that were less than other areas of the County where population density, traffic, topography, and meteorology result in higher concentrations. City Heights is in an area with adequate ventilation and without topography for cold air to settle and trap pollutants in the surface layer. This combination of meteorology and geography contributes to good air quality in City Heights.

Based upon the official FRM sampling, the 24-hour PM2.5 standard was exceeded in City Heights on two days during the study (New Year's Day and the following day, when the highest particulate concentrations are frequently measured in the County). City Heights had the lowest PM2.5 concentration of all monitoring sites on New Year's Day, when all sites in San Diego County exceeded the 24-hour standard (see Figure 18 and Table 8).

The PM2.5 data collected at the City Heights' locations exhibit similar patterns to other areas of the County, with concentrations in City Heights mirrored by concentrations in other locales. This indicates a strong correlation to atmospheric conditions and regional air quality patterns; not a locally-based problem.

Similar to other locations in San Diego County, the daily PM2.5 averages in City Heights are strongly influenced by night and morning concentrations, where atmospheric stability plays an important role in surface concentrations. During the day, when local traffic, and therefore emissions, is highest, surface concentrations tend to be at their low point in the diurnal cycle.

The PM2.5 measurements in City Heights are consistent with longer-term measurements in other monitoring sites in San Diego County, falling mid-range between other locations. Along with the rest of San Diego County, City Heights meets the federal air quality standards for PM2.5.

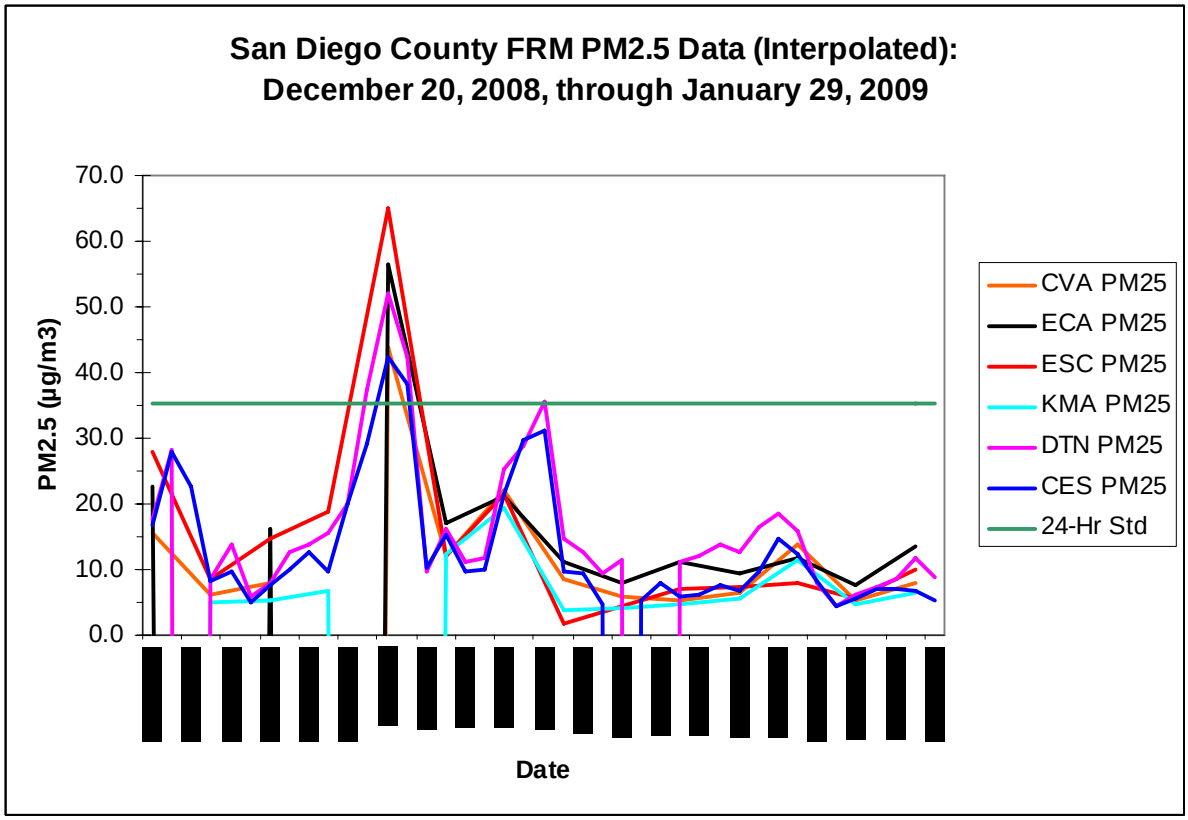

Figure 18. Graph showing the daily PM2.5 concentrations measured by Federal Reference Method (FRM) from December 20, 2008, through January 29, 2009 (data are shown in "interpolation" mode so that data for sites on 3-day sampling cycle will be shown).

Date	CVA PM25	ECA PM25	ESC PM25	KMA PM25	DTN PM25	CES PM25
12/20/2008	15.7	22.6	27.9	-980.0	17.6	16.7
12/21/2008					28.3	27.9
12/22/2008					-973.0	22.6
12/23/2008	6.1	-973.0	8.4	5.0	8.4	8.2
12/24/2008					13.7	9.8
12/25/2008					6.0	5.1
12/26/2008	8.0	16.2	14.7	5.4	8.0	7.7
12/27/2008					12.7	10.1
12/28/2008					13.7	12.6
12/29/2008	-999.0	-999.0	18.7	6.8	15.5	9.7
12/30/2008					19.9	20.1
12/31/2008					37.4	29.0
1/1/2009	43.7	56.5	64.9	-999.0	52.1	42.4
1/2/2009					42.4	38.1
1/3/2009					9.6	10.2
1/4/2009	12.0	17.2	12.0	12.5	16.2	15.2
1/5/2009					11.2	9.6
1/6/2009					11.7	9.9
1/7/2009	22.2	21.2	21.5	19.5	25.2	21.5
1/8/2009					28.9	29.7
1/9/2009					35.7	31.3
1/10/2009	8.6	11.2	1.9	3.8	14.8	9.8
1/11/2009					12.6	9.4
1/12/2009					9.5	4.6
1/13/2009	5.9	7.8	4.5	4.2	11.4	-999.0
1/14/2009					-999.0	5.2
1/15/2009					-999.0	7.8
1/16/2009	5.4	11.3	7.0	4.7	11.2	5.9
1/17/2009					12.2	6.2
1/18/2009					13.9	7.7
1/19/2009	6.4	9.4	7.5	5.5	12.6	6.9
1/20/2009					16.4	9.6
1/21/2009					18.6	14.8
1/22/2009	13.9	11.9	8.0	11.4	15.8	12.5
1/23/2009					7.9	8.1
1/24/2009					4.4	4.5
1/25/2009	5.4	7.7	5.6	4.8	6.2	5.5
1/26/2009					7.4	7.0
1/27/2009					8.6	7.0
1/28/2009	8.0	13.4	9.9	6.5	11.7	6.7
1/29/2009					8.7	5.4

Table 8. FRM PM2.5 concentrations for December 20, 2008, through January 29, 2009 (graph shown in Figure 18). [-900 series data represent missing samples.]