

Air Quality Monitoring Program at the Port of Los Angeles Summary of Data Collected During the Fifth Year - May 2009 - April 2010



Prepared For:



Port of Los Angeles
Environmental Management Division
425 South Palos Verdes Street
San Pedro, California 90733-0151

September 2010

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Air Quality Monitoring Program at the Port of Los Angeles

Annual Report

1.0 EXECUTIVE SUMMARY

This report provides a summary of the data collected by the Port of Los Angeles (Port or POLA) Air Quality Monitoring Program during the most recent reporting year; May 2009 through April 2010. There are four gaseous criteria air pollutants measured on a continuous basis under this program: carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and ozone (O₃). Particulate matter is measured at the 10 micron and 2.5 microns size thresholds (PM₁₀ and PM_{2.5}, respectively) using two methods: (a) traditional filter-based samplers, and (b) on a continuous basis using beta attenuation monitors (BAM). Two additional pollutant parameters have been measured in this network, polycyclic aromatic hydrocarbons (PAHs) and ultrafine particulates, but they are not included in this report. In addition, meteorological parameters are continuously measured. Preliminary real-time data from the program are available for public review at the San Pedro Bay Ports Clean Air Action Plan website: <http://www.cleanairactionplan.org>. Historical filter-based data are available for public review on the Port's website: http://portoflosangeles.org/environment/air_quality.asp.

The data collected at the Port's monitoring stations during this reporting year were averaged and compared to the National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) established for each pollutant on the applicable averaging periods. While such comparisons are presented, this report does not make any representations as to compliance with NAAQS or CAAQS and the information presented herein should not be construed to the contrary. NAAQS compliance determinations are made by the U.S. Environmental Protection Agency (USEPA) with input from state and regional air agencies. CAAQS compliance determinations are made by the California Air Resources Board (CARB). For the South Coast Air Basin (SoCAB), which includes the Los Angeles metropolitan region, the South Coast Air Quality Management District (SCAQMD) is responsible for operating the air quality monitoring stations which are used for those demonstrations. While the Port's monitoring stations are operated in accordance with the same federal and state regulations and guidelines, the Port's stations are outside the official monitoring network and are not used in those determinations.

Ambient air pollution levels near the San Pedro Bay are influenced by a number of factors including local pollutant emissions, regional air pollution levels, and meteorology. Several important criteria air pollutants (i.e., ozone, PM_{2.5}) are created (at least in part) by chemical reactions which occur after the release of emissions into the atmosphere. As such, concentrations from these pollutants are expected to be more regional. Other pollutants, like SO₂, are more localized in nature.

Emissions from goods movement are an important contributor to air pollution levels in the SoCAB region. DPM emissions, an important air toxic, are a contributor to PM_{2.5} concentrations. Port-related mobile source emissions are estimated to contribute about 4% of regional NO_x emissions and 5% of regional DPM emissions in CY2009. Port-related air pollutant emissions were lower in CY2009 compared to prior years.¹ This decline was due to a number of factors including the successful implementation of control measures under the San Pedro Bay Ports Clean Air Action Plan (CAAP). Those measures have significantly reduced emissions rates from goods movement sources such as heavy duty trucks, ocean going vessels, and cargo handling equipment. The decrease in Port-related emissions was also affected in part by a sharp decline in goods movement activity at the San Pedro Bay ports. Container throughput at the Port experienced a significant drop due to the economic recession of 2008-2009, with traffic approximately 30% lower in CY2009 as compared to CY2007.

In addition, meteorology can have a significant influence on regional air pollution levels from one year to the next. So while CAAP measures have improved air emissions levels, the amount of any decrease (or increase) in Port ambient air pollutant concentrations attributed to goods movement-focused measures under the CAAP cannot be quantified solely through air quality monitoring.

The data collected during this period has been averaged and compared to the various NAAQS and CAAQS established for each pollutant. During this period, no NAAQS were exceeded, but several CAAQS were exceeded: the 1-hr CAAQS for ozone; and the annual and 24-hr CAAQS for PM₁₀. This is relatively consistent with data collected at the North Long Beach (NLB) station operated by the SCAQMD and the attainment status of the entire SoCAB region, which is designated as nonattainment for ozone, PM_{2.5}, and PM₁₀.

There were no exceedances of the annual PM_{2.5} NAAQS (15 µg/m³) or CAAQS (12 µg/m³) at any of the Port stations, nor of the 24-hour PM_{2.5} NAAQS (35 µg/m³) measured in the Port monitoring network.

The annual PM₁₀ CAAQS (20 µg/m³) was exceeded at the Wilmington Community station (23.5 µg/m³) and at the Coastal Boundary Station (24.0 µg/m³). There were also two exceedances of the 24-hour PM₁₀ CAAQS (50 µg/m³) recorded at these two stations during the 2009-2010 year. The highest measured PM₁₀ concentration was 71.0 µg/m³ on May 16, 2009, at the Wilmington Community Station. That sampling date occurred during the annual weekend "festival" held on the grounds of the Sts. Peter & Paul School (location of the Wilmington Community station).

There are four gaseous criteria pollutants measured on a real-time basis in this program: carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and ozone (O₃). With the exception of ozone, all of these pollutants were below the NAAQS and CAAQS during this 12-month period. There were no recorded exceedances of either the 8-hour NAAQS (0.075 ppm) or CAAQS (0.070 ppm) for O₃, but there were two recorded exceedances of the 1-hour O₃ CAAQS (0.09 ppm, one each at the Coastal Boundary and Source-Dominated Stations, which occurred on different days during the summer.

¹ Port of Los Angeles Inventory of Air Emissions CY 2009. Starcrest Consulting Group LLC. (<http://www.portoflosangeles.org>). June, 2010.

The particulate filters exposed in the Port's network are routinely analyzed for elemental and organic carbon (EC/OC). EC in particular is of interest, because it has been used as an indicator of diesel particulate matter (DPM). Although the EC data are analyzed and presented in this report, there are no NAAQS or CAAQS associated with that parameter.

The POLA air monitoring network now has a five-year data record for particulate matter that can be used to determine trends in the data over this period. The annual average concentrations of particulate-related pollutants (PM_{2.5}, PM₁₀, and EC) were consistently found to be highest during the second year of monitoring (May 2006 to April 2007), with the exception of the annual average PM₁₀ concentrations, which were flat over the first three years of record. The lowest annual average concentrations of these pollutants were measured during the most recent reporting year (May 2009 to April 2010), with the exception of the annual average PM₁₀ concentration measured at the Coastal Boundary station, which was affected by major construction activity in the vicinity.

Averaged across the network, the annual average PM_{2.5} concentrations decreased by 30.5 percent from 2006-2007 to 2009-2010; the annual average PM₁₀ concentrations decreased by 17.8 percent; and the annual average EC concentrations decreased by 48.6 percent. Figures ES-1 through ES-3 present the annual average PM_{2.5}, PM₁₀, and EC concentrations measured in the Port air monitoring network over the period of record.

Figure ES-1

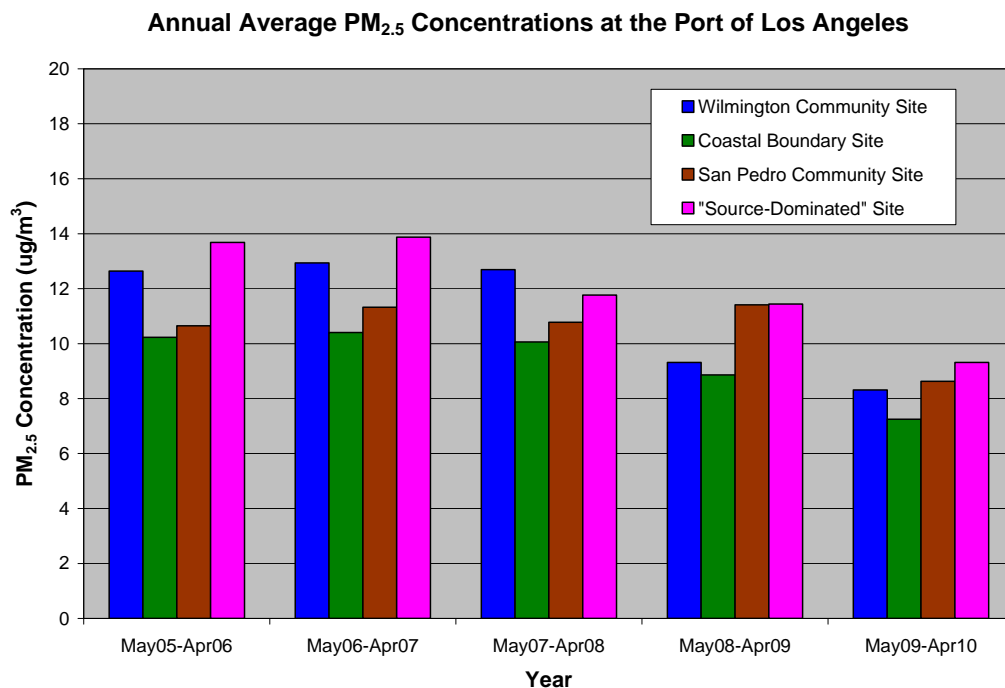


Figure ES-2

Annual Average PM₁₀ Concentrations at the Port of Los Angeles

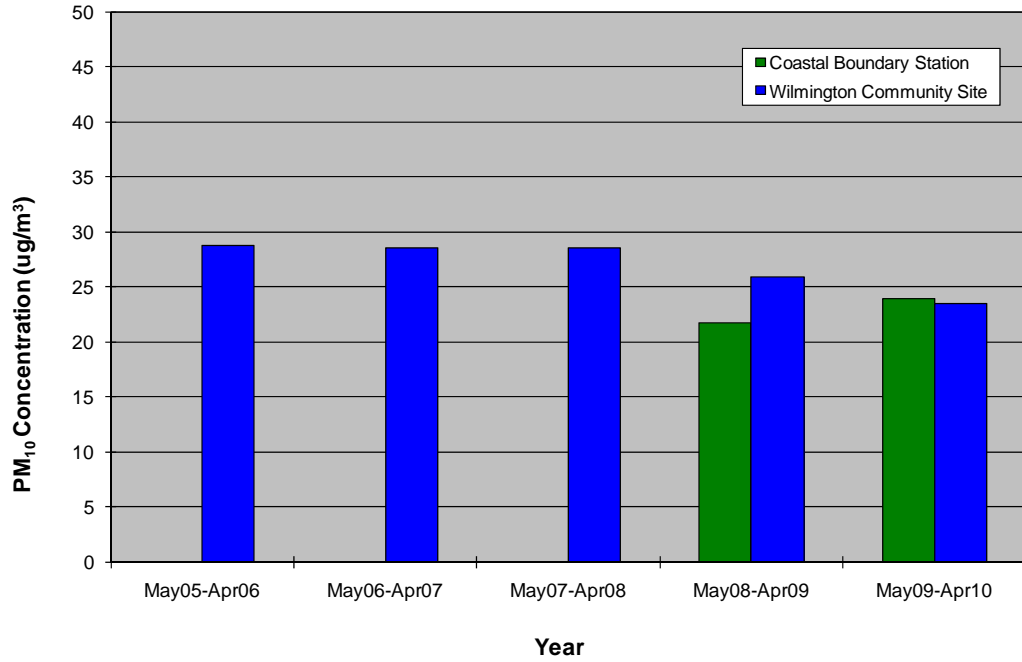
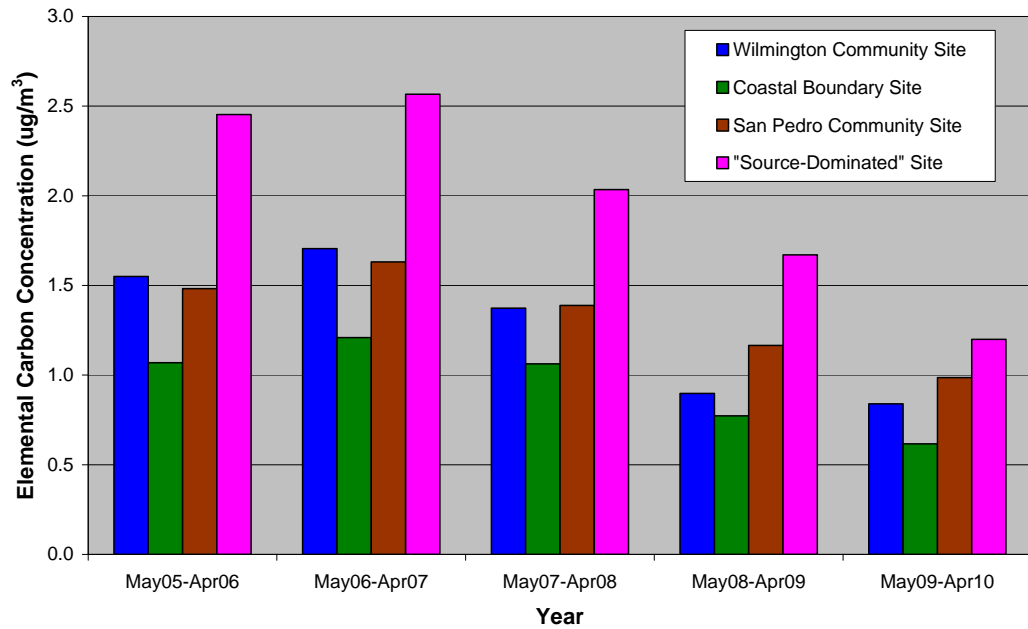


Figure ES-3

Annual Average Elemental Carbon Concentrations at the Port of Los Angeles



2.0 INTRODUCTION

The Port began its air quality monitoring program in February 2005. Under the initial program, representative ambient particulate matter (PM) and meteorological data were collected within the Port's operational region of influence (ROI). These PM data included two sizes of particulate matter: (1) "inhalable" PM less than 10 microns in diameter (PM₁₀) and (2) fine PM less than 2.5 microns in diameter (PM_{2.5}). In 2007 and 2008, the Port completed an expansion of the program to include continuous monitoring of four gaseous criteria air pollutants [ozone (O₃), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and carbon monoxide (CO)], and particulates [PM_{2.5} and PM₁₀, ultrafine particles, and polycyclic aromatic hydrocarbons (PAH)].

The driver of this program was the increased concern over health effects from diesel particulate matter (DPM). Further, the expanded monitoring program provides additional data to determine compliance with air quality standards, access to real-time data and presentation of that data for public review on a website, and the opportunity to conduct additional detailed analyses and an enhanced evaluation of source-receptor relationships.

The monitoring program consists of a network of four stations located in the vicinity of the Port of Los Angeles: one each in San Pedro and Wilmington, the two communities adjacent to the Port; one near the southern coastal boundary of the Port; and one on Terminal Island, near the operational center of the Port.

The design of the network was developed during 2003 and 2004. During this process, the Port held extensive discussions with the Port Community Advisory Committee (PCAC) and their technical consultants to finalize the details of the monitoring program. In addition, the draft monitoring work plan was presented at a meeting in 2003 with the South Coast Air Quality Management District (SCAQMD) and the California Air Resources Board (CARB). The monitoring work plan was revised to address comments from these groups. In 2008, the work plan was further revised to reflect additions made to the air monitoring program.²

2.1 SITING OF THE MONITORING STATIONS

After the basic design of the network had been established in late 2003, monitoring locations were selected to be representative of ambient air quality conditions within the Port and the adjacent communities of San Pedro and Wilmington. Working with the PCAC's air quality consultants, short-term "validation" studies were conducted in both communities in 2004 to ensure that the best available sites were chosen. The sites selected for inclusion in the validation study were selected based on the following factors: (1) sites that met EPA criteria for locating monitoring stations (particularly unobstructed exposure to the local air flow), (2) site availability, and (3) site security.

² *The Port of Los Angeles Air Quality Monitoring Program Maintenance Plan*, Port of Los Angeles, 2008.

The validation study was conducted first in San Pedro and then in Wilmington.³ A total of five sites were included in the validation study conducted in San Pedro: four locations in a north-south direction along the main ship channel; and one further to the west on higher ground, to determine whether elevated vessel plumes caused greater impacts. MiniVol (Airmetrics, Inc.) portable monitors were used at each site to collect simultaneous PM_{2.5} samples at all of the sites. These samples were subsequently sent to a laboratory to be analyzed for PM_{2.5} and elemental carbon (EC), a surrogate for DPM.

For the Wilmington-based validation study, three sites were selected in an east-west line that was approximately parallel to the northern boundary of the Port. Fewer sites were used in the Wilmington study due to relatively flat terrain with less prominent topographic features than in San Pedro, and there were less acceptable candidate locations.

The final selected monitoring locations had the highest average measured PM_{2.5} impacts in the validation program and are centrally located within the section of the communities closest to the Port operations. In addition, the Wilmington site is located at an elementary school, which is a sensitive receptor.

The air monitoring program was expanded to include real-time monitoring of gaseous criteria pollutants and particulates, starting in late 2007. During the planning stage of this expansion, it was discovered that two of the existing stations would have to be moved, because the rooftop locations at those sites could not support the shelters required to house the real-time monitoring instruments. The details of these moves are discussed below:

- Promenade Station (“San Pedro Community Station”) - The original location of the San Pedro Community monitoring station was on the roof of the Liberty Hill Plaza (LHP) Building. After an extended search, an alternate location was selected across Harbor Drive, approximately 100 yards to the northeast of the LHP site. The new site was named the Promenade location, because of the promenade walkway along Harbor Drive that passes near that site. A short-term validation study, with simultaneous PM_{2.5} and EC measurements at the LHP and Promenade locations, was conducted similar to the earlier validation studies discussed above, to ensure that data from the new Promenade location would produce representative measurements in the San Pedro Community. In addition, an extended validation study was conducted to confirm the selection of the new Promenade site. This study showed that data collected at both sites were similar.
- Terminal Island Treatment Plant Station (“Source-Dominated Station”) – The former location of the Terminal Island Treatment Plant station was on the roof of the Effluent Pump Building. The expanded monitoring station was relocated approximately 100 feet to the northwest, which was not expected to affect the measurement. A short-term validation study was completed by taking simultaneous PM_{2.5} and EC measurements, which showed that data collected at both sites were similar.

³ *Final Air Quality Monitoring Work Plan for the Port of Los Angeles – Addendum. Supplemental Validation Air Monitoring Study at Wilmington, California, August-October 2004. Port of Los Angeles, 2005.*

2.2 DESIGN OF THE MONITORING PROGRAM

The main objective of the air monitoring program is to estimate ambient levels of DPM in proximity to the Port that are due to Port operational activities. A secondary program objective is to estimate ambient gaseous pollutants and PM levels due to Port emissions within adjacent communities. Both of these objectives were addressed in the following ways:

1. PM_{2.5} monitors were placed at each of the four stations, with a PM₁₀ monitor at the primary station in Wilmington and at the Coastal Boundary station at Berth 47. The monitors at these stations provide PM data to evaluate compliance with the National and California Ambient Air Quality Standards (NAAQS and CAAQS, respectively) for PM.
2. Each station has two PM_{2.5} Sequential Filter Samplers (SFS), fabricated by the Desert Research Institute (DRI), which have the capability of collecting simultaneous samples on two filter media (Teflon and quartz). This permits the following analyses of the filters:
 - a. Mass concentration, by gravimetric analysis.
 - b. Elemental and organic carbon (EC and OC), by carbon analysis.
 - c. In addition, detailed chemical analysis of the filters can be conducted to determine concentrations of elements, soluble nitrates and organics, as needed.
3. The SFS monitors were run according to EPA standard sampling protocol for a 24-hour period. As part of this protocol, ambient PM samples were collected at each site within the network every third day, following EPA's nationwide schedule. This allows direct comparison of the data collected within the network and at other stations in the vicinity.
4. In addition to PM filter-based samples that are collected every third day, the Port's expanded program also collects hourly PM samples [using Beta Attenuation Mass (BAM) monitors] at each station within the network. This provides near real-time data to supplement the integrated 24-hour PM averages provided by the filter-based monitors.
5. As part of the expanded monitoring program, each station is also monitoring ambient levels of the gaseous criteria pollutants (i.e., CO, NO₂, SO₂ and O₃). These data will be used to further identify the source/receptor relationships present in the Port's ROI.
6. A sampling protocol was developed for use in the operation of the monitoring network.⁴ This protocol was reviewed by the PCAC consultants and revised to address their comments. This sampling protocol specifies the detailed operation of the monitoring network and is used by the monitoring team to ensure the proper operation and documentation of the monitoring program.

⁴ Port of Los Angeles Air Quality Monitoring Protocol. Port of Los Angeles, 2005.

3.0 DESCRIPTION OF THE AIR MONITORING PROGRAM

The following discussion presents a summary of the Port's air monitoring network.

3.1 LOCATIONS OF THE MONITORING NETWORK

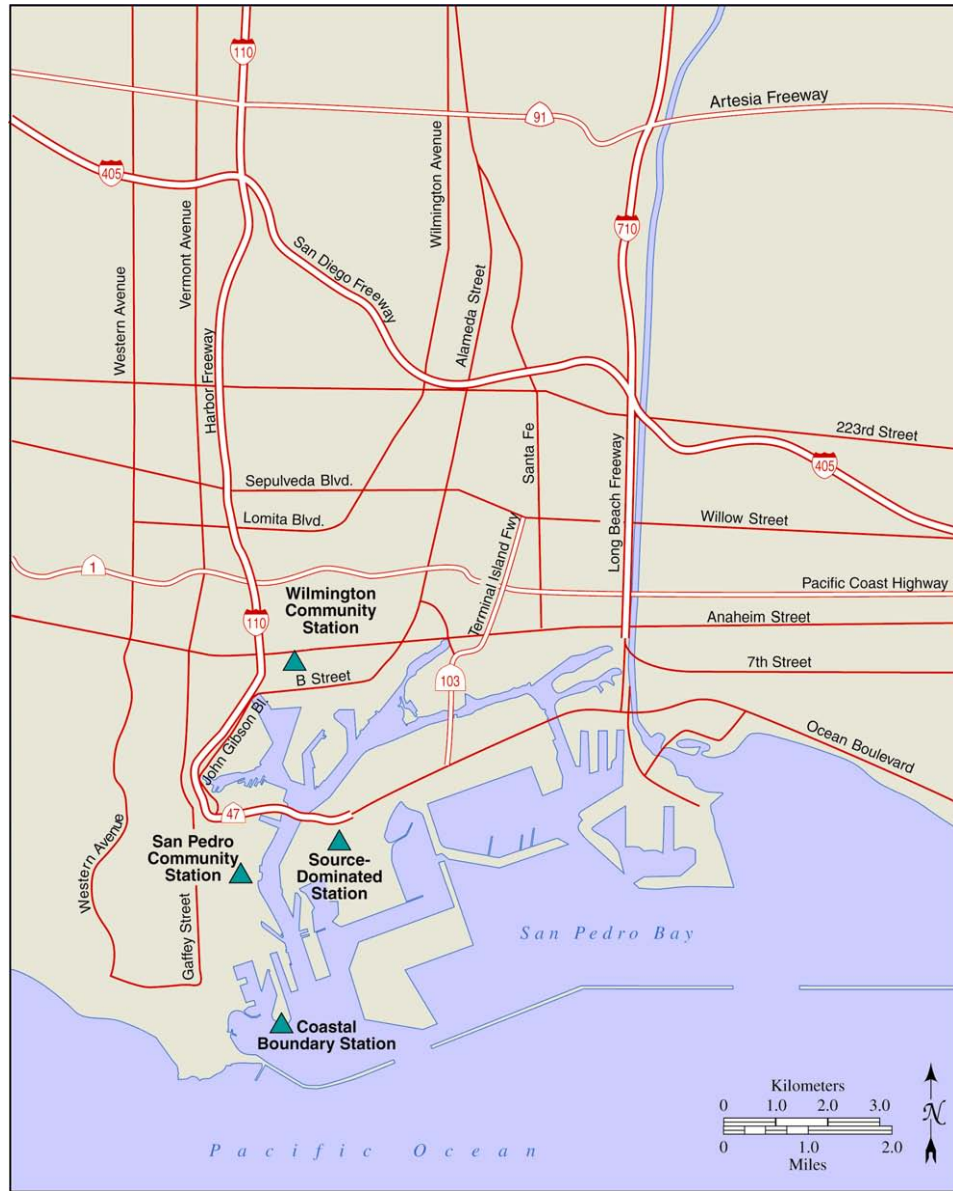
The locations of the four stations in the air monitoring network are shown in Figure 1 and include the following stations:

- *Wilmington Community Monitoring Station* (33° 46' 43.79" N, 118° 16' 10.56" W) – This station is located at the Saints Peter and Paul Elementary School (SPPS) in the City of Wilmington. This station is designed to collect air quality data that are representative of the residential areas of Wilmington, and is centrally located approximately 0.5 miles north of Port operations.
- *San Pedro Community Monitoring Station* (33° 44' 27.54" N, 118° 16' 48.25" W) This station is located adjacent to the Promenade walkway along Harbor Drive, across the street from the intersection of Harbor Boulevard and West 3rd Street. This station is designed to collect air quality data that are representative of the residential areas of San Pedro, and is centrally located approximately 0.1 mile west of the main ship channel.
- *Coastal Boundary Station* (33° 42' 50.58" N, 118° 16' 27.07" W) – A third station is located at Berth 47 (Berth 47 station) in the Port Outer Harbor. This location has the least direct exposure to emissions from Port operations.
- *Terminal Island Treatment Plant Station* (33° 44' 41.03" N, 118° 15' 40.13" W) – A fourth station is located on Pier 300, at the Terminal Island Treatment Plant (TITP) on Ferry Street. This station is expected to have the highest exposure to emissions from Port operations, as it is in direct proximity to terminal operations which use a large number of diesel engine sources (trucks, trains, ships, and cargo handling equipment). It is also referred to as the "source-dominated" station, because of the predominance of on-road and off-road diesel emission sources in the area.

3.2 THE MONITORING NETWORK

All four stations have the same instrumentation, which collect a comprehensive set of integrated 24-hour average PM_{2.5} and PM₁₀ samples, and real-time data measuring gaseous criteria pollutants, PM_{2.5} and PM₁₀, PAH, ultrafine particle, and meteorological data. The Wilmington community station includes additional supplemental instruments, as discussed below.

Figure 1. Locations of the Port Air Monitoring Network Stations



The Four Stations in the Network

All four stations in the Ports network have the following components:

- *Detailed 24-hour sampling for PM_{2.5}* – Each station is equipped with a multi-port PM_{2.5} “sequential filter sampler” (SFS) monitor that simultaneously collects samples on a 24-hour basis on two different filter media (Teflon and quartz). This allows for the analysis of samples for mass (Teflon filters) and detailed chemical speciation (quartz filters), including carbon fractions (elemental carbon/organic carbon), metals, and soluble ions.
- *Continuous Gaseous Pollutant Monitoring* – Each station is equipped with analyzers to determine real-time air pollutant concentrations for the gaseous

pollutants (i.e. NO-NO₂-NO_x, O₃, CO, and SO₂). These analyzers are FRM- or FEM-designated monitors and include the following:

- Pulsed Fluorescence SO₂ Analyzer
 - Chemiluminescent NO-NO₂-NO_x Analyzer
 - Gas Filter Correlation CO Analyzer
 - U.V. Photometric Ozone (O₃) Analyzer
- *Additional monitoring parameters* – Additional instruments were added to the network during the transformation to real-time monitoring, including ultrafine particle counters (TSI model 3781) and PAH analyzers (EcoChem PAS 2000).
 - *Detailed 24-hour sampling for PM₁₀* - At the primary Wilmington Community station and at the Coastal Boundary station at Berth 47, there are also SFS monitors equipped with a PM₁₀ inlet. This allows the collection of simultaneous samples of PM₁₀ mass, which can be compared with the results of the PM_{2.5} monitoring.
 - *Meteorological Monitoring Station* – Each station is equipped with a meteorological monitoring station, which measures wind speed, wind direction, and temperature. The meteorological data is used to analyze the air quality monitoring data and to define periods of onshore and offshore winds. The Wilmington station also measures additional meteorological parameters that should be representative of the broader Port region (barometric pressure, solar radiation, and relative humidity).
 - *Continuous PM_{2.5} Monitoring* – Each station is equipped with a DustTrak continuous PM_{2.5} monitor. The data collected by this instrument are used to supplement the integrated data collected by the sequential samplers. These data are useful in evaluating short-term variations in PM_{2.5} levels and in evaluating source/receptor relationships.
 - *Continuous Monitoring of PM* – In addition to the detailed 24-hr PM sampling described above, each of the Port's monitoring stations are equipped to monitor PM₁₀ and PM_{2.5} on a continuous and real-time hourly basis using Met One Instruments Beta Attenuation Monitors (BAM).

Additional Instrumentation at One Station

In addition to the instrumentation discussed above, the Wilmington Community station has two Federal Reference Method (FRM) samplers that have EPA design and operation certification to measure PM₁₀ and PM_{2.5} 24-hour average concentrations for compliance with the NAAQS and CAAQS.

3.3 STARTUP OF THE MONITORING PROGRAM

The monitoring program began with the collection of PM data at three stations (Wilmington and San Pedro Community Stations and Coastal Boundary Station) on February 9, 2005. The fourth station at TITP was added on April 28, 2005.

The expanded monitoring program with the real-time instrumentation was rolled out at the sites over a period of time:

- Coastal Boundary and TITP stations – December 1, 2007
- Wilmington Community station – April 1, 2008

- San Pedro Community station – May 1, 2008

This report focuses on the data collected during the 5th year of monitoring (May 2009 - April 2010) and includes data from the initial and expanded monitoring programs. The results presented here will also be compared with data from the first four monitoring periods: (1) May 2005 - April 2006; (2) May 2006 - April 2007; (3) May 2007 - April 2008; and (4) May 2008 - April 2009.

4.0 Data Analysis

Air quality can be characterized as the concentration of various pollutants within the ambient atmosphere. Comparison of these pollutants with the federal and state ambient air quality standards is often made to evaluate air quality conditions in an area. The USEPA has established the NAAQS, and maximum pollutant limits shall not be exceeded more than once per year (other than ozone, PM, and those based on annual averages). Annual pollutant averages are never to exceed the annual NAAQS. The CARB has established a set of state standards (CAAQS) that are often more stringent than the NAAQS. Table 1 presents the California and national ambient air quality standards.

Table 1. California and National Ambient Air Quality Standards

Pollutant	Averaging Times	California Standards	National Standards	
			Primary	Secondary
Ozone (O ₃)	8-hour	0.07 ppm	0.075	Same as Primary
	1-hour	0.09 ppm	---	
Carbon Monoxide (CO)	8-hour	9.0 ppm	9 ppm	---
	1-hour	20 ppm	35 ppm	---
Nitrogen Dioxide (NO ₂)	Annual	0.03 ppm	0.053 ppm	Same as primary
	1-hour	0.18 ppm	0.100 ppm*	
Sulfur Dioxide (SO ₂)	24-hour	0.04 ppm	---	---
	3-hour	---	---	0.5 ppm
	1-hour	0.25 ppm	0.075 ppm**	---
Lead	30-day	1.5 µg/m ³		
	Calendar Quarter	---	1.5 µg/m ³	Same as primary
	Rolling 3-Month	---	0.15 µg/m ³	
Respirable Particulate Matter (PM ₁₀)	Annual	20 µg/m ³	---	Same as primary
	24-hour	50 µg/m ³	150 µg/m ³	
Fine Particulate Matter (PM _{2.5})	Annual	12 µg/m ³	15 µg/m ³	Same as primary
	24-hour	---	35 µg/m ³	

Notes:

National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

*This standard was promulgated on January 22, 2010.

** The new one-hour SO₂ standard was promulgated on June 3, 2010.

The following analytical summaries of the data collected during May 2009 – April 2010 draw comparisons to the NAAQS and CAAQS. These summaries include the following parameters: [1] PM₁₀, and [2] PM_{2.5} [3] elemental carbon, [4] CO, [5] NO₂, [6] SO₂, and O₃. The wind speed and direction measurements collected during this period are also summarized. In addition to these written summaries, the data are presented in several ways:

1. Presentation of the air quality data in graphs (Figures A-1 to A-15 in Appendix A⁵). The graphs typically use monthly averages of the measured air quality data. Although there are no air quality standards that are based on a monthly average, that time period was used to average the data because it provides a good illustration of the annual trends in a data set.
2. Presentation of wind roses, which visually depict the distribution of winds at each site showing their speed, direction and frequency (Figures A-16 to A-19 in Appendix A).
3. Presentation of the air quality data in tables (Tables A-1 to A-3 in Appendix A).

This data summary is a compilation and presentation of data collected during the fifth year of sampling. Much of these data are also available on the Port's website (filter-based data) at <http://www.portoflosangeles.org>, and the Clean Air Action Plan (CAAP) website (real-time data) at http://www.cleanairaction_plan.org. The data summary includes the following presentations.

4.1 AIR QUALITY DATA – MAY 2005 THROUGH APRIL 2010

PM_{2.5} Data: Filter-Based Monitors

Table 2 shows the annual average PM_{2.5} concentrations measured by the filter-based SFS monitors at the four POLA network stations for the entire period of record over the last five years. The data are also shown in Appendix A (Figure A-1) as a bar graph.

The summary of the PM_{2.5} data in Table 2 and Figure A-1 show a number of features:

- Over the five-year period of record, the annual PM_{2.5} averages for all stations are well below the annual PM_{2.5} NAAQS of 15 µg/m³.
- During the last two years, all four stations were below the annual PM_{2.5} CAAQS. During the first years of the monitoring program, annual PM_{2.5} averages were above the PM_{2.5} CAAQS of 12 µg/m³ for two stations (the Wilmington Community and TITP Stations), and below the standard for the other two stations (Berth 47 and San Pedro Community Stations).
- In the four years since the peak concentrations were measured at the Port (May 2006 – April 2007), there has been a decrease of 25 to 36 percent in the annual average PM_{2.5} concentrations at the four stations. Figure A-1 shows this trend quite clearly.

⁵ The tabular and graphic data presentations are quite extensive, so that most figures and tables have been included in Appendix A, attached to the end of this document..

Table 2. Annual Average PM_{2.5} Concentrations in POLA Air Monitoring Network over the Period of Record

Averaging Period	Port of Los Angeles Monitoring Network			
	Wilmington Community Station	Coastal Boundary Station	San Pedro Community Station	Terminal Island Treatment Station
	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)
May 2005 – April 2006	12.6	10.2	10.6	13.7
May 2006 – April 2007	12.9	10.3	11.4	13.8
May 2007 – April 2008	12.7	10.1	10.6	11.6
May 2008 – April 2009	9.3	8.9	11.4	11.4
May 2009 – April 2010	8.3	7.3	8.6	9.3

- Not all NAAQS are based on the highest measured value of a pollutant. For PM_{2.5}, EPA has designated that the 24-hour standard of 35 µg/m³ is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard of 35 µg/m³. For the 2009-2010 reporting year, the 98th percentile concentration at each station was below the 35 µg/m³ standard, as shown below:

 - Wilmington Community Station, 15.4 µg/m³
 - Coastal Boundary Station, 17.5 µg/m³
 - San Pedro Community Station, 21.0 µg/m³
 - Terminal island Treatment Plant, 21.1 µg/m³
- Figures A-2 and A-3 show the monthly average PM_{2.5} concentrations during the current 2009-2010 reporting year and for the entire period of record, respectively. There were relatively small changes in PM_{2.5} concentrations during 2009-2010, with a slight increase in the November – January timeframe. This tendency for higher PM_{2.5} concentrations during the winter is also evident over the period of record, as shown in Figure A-3.

PM_{2.5} Data: BAM Real-time Monitors

- Figure A-4 provides a graph of the monthly average PM_{2.5} concentrations measured by the BAMs at the four POLA air monitoring stations during the 2009-2010 reporting year. The BAM measurements collected at the SCAQMD’s North Long Beach station are also included on the graph to provide a regional comparison. The BAM data from the four Port monitoring stations compare well with the data collected at the North Long Beach station, and exhibit similar patterns as shown by the Port’s filter-based monitors.

- Figures A-2 and A-4 show that the BAM data from the Port monitoring stations are consistently higher than filter-based data. Other studies have confirmed that continuous monitoring instruments such as the BAM exhibit a positive measurement bias when compared to FRM data.⁶

PM₁₀ Data: Filter-Based Monitors

Table 3 shows the PM₁₀ concentrations measured by the filter-based SFS monitors at the SPPS station during the most recent three years. The data are also shown in Figure A-5 as a bar graph.

Table 3. Annual Average PM₁₀ Concentrations in POLA Air Monitoring Network over the Period of Record

Averaging Period	Port of Los Angeles Monitoring Network	
	Wilmington Community Station	Coastal Boundary Station
	Conc. (µg/m ³)	Conc. (µg/m ³)
May 2005 – April 2006	28.7	--
May 2006 – April 2007	28.6	--
May 2007 – April 2008	28.5	--
May 2008 – April 2009	25.9	21.7
May 2009 – April 2010	23.5	24.0

Note: The annual PM₁₀ average at Coastal Boundary Site for the 2008/2009 period is based on 9 months of data.

The summary of the PM₁₀ data in Table 3 and Figure A-5 show a number of features:

- Over the five-year period of record, the annual average PM₁₀ concentration for the Wilmington Community Station has been above the annual PM₁₀ CAAQS of 20 µg/m³.
- Annual average PM₁₀ levels at the station during the first years of monitoring were very consistent, with PM₁₀ concentrations of 28.7, 28.6, 28.5 µg/m³ measured during the first three years of monitoring. However, during the last two years the annual average PM₁₀ concentration at the Wilmington Community station has been decreasing steadily, and is approximately 18 percent below the relatively constant annual averages measured during the earlier period.
- The 24-hour NAAQS for PM₁₀ is met when the expected number of days per calendar year with an average concentration above 150 µg/m³ is equal to or less

⁶ Wierman, S. and P. Doraiswamy, *Current Issues in Air Quality Monitoring*, A&WMA EM Magazine, 2009.

than one. There were no exceedances of the 150 $\mu\text{g}/\text{m}^3$ 24-hour NAAQS during the current reporting year.

- The 24-hour CAAQS for PM_{10} is met when the standard of 50 $\mu\text{g}/\text{m}^3$ is not exceeded. There were two exceedances of that CAAQS during the current reporting year at the Wilmington Community Station, and two exceedances at the Coastal Boundary Station. The highest PM_{10} measurement was 71.0 $\mu\text{g}/\text{m}^3$ on May 16, 2009 during the annual weekend “festival” held on the grounds of the Sts. Peter & Paul School, where the Wilmington Community station is located. The high PM_{10} measurements at the Coastal Boundary Station were attributed to major construction activities in the nearby vicinity.
- Figures A-6 and A-7 show the monthly average PM_{10} concentrations during the current 2009-2010 reporting year and for the entire period of record, respectively.
- The monthly average PM_{10} concentrations for the 2009-2010 year are shown in Figure A-6. They illustrate the relatively constant PM_{10} levels throughout the year, in comparison to trends in the $\text{PM}_{2.5}$ concentrations. There is a slight increasing trend in PM_{10} levels evident from the summer into the early winter, followed by a drop at the start of the rainy season in the January-February time period.
- Figure A-6 shows a graph of the monthly average PM_{10} concentrations over the five-year period of record. There are several features of the data evident in this figure:
 - PM_{10} concentrations tend to vary less over the period of record than the $\text{PM}_{2.5}$ concentrations (Figure A-3).
 - The maximum concentrations of PM_{10} were measured during fall of 2007, which reflects the influence of the wildfires.
 - Filter-based sampling of PM_{10} measurements commenced at the Coastal Boundary station in August 2008, and the monthly-averaged data at this station correlates very well with data from the Wilmington Community site.

PM_{10} Data: BAM Real-time Monitors

- Figure A-8 provides a graph of the monthly average PM_{10} concentrations measured by the BAMs at the four POLA air monitoring stations during the 2009-2010 reporting year. The BAM data from the four Port monitoring stations exhibit the same patterns shown by the Port’s filter-based monitors, with less variability than shown by the $\text{PM}_{2.5}$ data and somewhat higher concentrations in the fall.
- Figures A-6 and A-8 show that the BAM data from the Port monitoring stations are consistently somewhat higher than the filter-based data. As noted above, studies have confirmed that continuous monitoring instruments such as the BAM exhibit a positive measurement bias when compared to FRM data.

EC Data

Table 4 shows the EC concentrations measured by the filter-based SFS monitors at the four POLA network stations during the most recent four years. The data are also shown in Figure A-9 as a bar graph.

Table 4. Annual Average EC Concentrations in POLA Air Monitoring Network over the Period of Record

Averaging Period	Port of Los Angeles Monitoring Network			
	Wilmington Community Station	Coastal Boundary Station	San Pedro Community Station	Terminal Island Treatment Station
	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)
May 2005 – April 2006	1.5	1.1	1.5	2.5
May 2006 – April 2007	1.7	1.2	1.6	2.6
May 2007 – April 2008	1.4	1.1	1.4	2.0
May 2008 – April 2009	0.9	0.8	1.2	1.7
May 2009 – April 2010	0.8	0.6	1.0	1.2

The following conclusions have been drawn from the EC data:

- There are no federal or state standards for EC, but there is interest in the data because it has been used as a surrogate for diesel PM in the South Coast Air Quality Management District’s (SCAQMD) MATES-II and MATES-III studies.
- Table 4 shows that the annual average EC concentrations over the period of record peaked in the 2006-2007 year, and have consistently decreased at all four network stations since that year. From the peak concentrations measured in the 2006-2007 year, annual average EC concentrations in the 2009-2010 year have decreased by:
 - Wilmington Community station: -53%;
 - Coastal Boundary station: -50%;
 - San Pedro Community station: -38%;
 - Terminal Island Treatment Plant station: -54%.
- The consistent decrease in the annual average EC concentrations since 2006-2007 is clearly evident in Figure A-9, which presents the annual average EC concentration in a bar graph format.
- Figures A-10 and A-11 show the average monthly EC concentrations within the Port network for the 2009-2010 year and the period of record, respectively. The figures show several interesting features:
 - During the 2009-2010 year (Figure A-10), EC concentrations were low during the late spring/summer time period. In the November – January period, EC concentrations increased significantly, followed by a drop-off during the onset of the short rainy season.
 - Figure A-11 presents the average monthly EC concentrations for the entire period of record within the Port network (February 2005 - April 2010). The figure shows more clearly the annual peak in EC concentrations, which occurs during the November to January period at all stations and for all years.

- One interesting aspect of Figure A-11 is the year-to-year decrease in peak fall EC levels since the 2006-2007, which is also reflected in the annual average EC concentrations, as shown in Table 4. The figure shows that in addition to the decrease in peak monthly EC concentrations, over this time period there is a decrease in the minimum monthly EC concentrations.
- The highest measured EC concentrations are consistently measured at the “source-dominated” TITP station, and the lowest EC concentrations at the Coastal Boundary Station. However, the differential in peak EC concentrations between the source-dominated and coastal boundary stations has decreased over the period of record.

Gaseous Criteria Pollutants

Beginning in late November 2007, the capability of each air monitoring station was expanded by adding instruments that can monitor on a real-time basis for four gaseous criteria pollutants (CO, SO₂, NO₂, and O₃), particulates (PM_{2.5} and PM₁₀), ultrafine particle counts, and PAHs. Due to the logistics involved in this large expansion, the stations began operation on a phased schedule:

- Coastal Boundary and TITP stations on December 1, 2007;
- Wilmington Community station on April 1, 2008;
- San Pedro Community station on May 1, 2008.

The preliminary results are discussed below.

CO Data Summary

Compliance with the CO standards within the Port’s air monitoring network was determined by comparison with two standards:

- The maximum 1-hour average CO NAAQS of 35 ppm is not to be exceeded more than once per year, while the 1-hour average CO NAAQS of 20 ppm is not to be exceeded.
- The maximum 8-hour average CO NAAQS and CAAQS of 9 ppm is not to be exceeded more than once per year in the case of the NAAQS, and is not to be exceeded in the case of the CAAQS.

Table 5 presents the maximum 1-hour and 8-hour average CO concentrations measured during the 2009-2010 reporting period.

Table 5. Carbon Monoxide Concentrations in the POLA Air Monitoring Network over the Period May 2009 – April 2010

Averaging Period	Port of Los Angeles Monitoring Network			
	Wilmington Community Station	Coastal Boundary Station	San Pedro Community Station	Terminal Island Treatment Station
	Conc. (ppm)	Conc. (ppm)	Conc. (ppm)	Conc. (ppm)
Maximum 1-hr CO Concentration	4.5	2.2	2.7	4.9
Maximum 8-hr CO Concentration	2.8	2.1	1.4	1.6

As shown in the Table 5, the Port’s monitoring stations were in compliance with the CAAQS and NAAQS for CO during the reporting period.

Figure A-12 shows the average monthly concentration of CO over the period of record (the graphs of average monthly pollutant concentrations have been selected as a convenient scale for illustration of the main features in the data set, rather than as a direct comparison against the NAAQS and CAAQS regulatory standards). The highlights of this graph are:

- Average CO concentrations are low for this pollutant throughout the period.
- The increase in CO concentrations during the winter months is likely due to the light wind conditions and surface-based temperature inversions commonly present during this time of year, which tend to trap pollutants in the lower atmosphere.

NO₂ Data Summary

Compliance with the NO₂ standards within the Port’s air monitoring network was determined by comparison with two standards:

- USEPA established a new 1-hour NAAQS for NO₂ concentrations on January 22, 2010. This standard is met when the 3-year average of the 98th percentile of the daily maximum 1-hour NO₂ concentrations does not exceed 0.100 ppm. The 1-hour CAAQS for NO₂ is 0.18 ppm is not to be exceeded.
- The annual average NO₂ NAAQS is 0.050 ppm, while the annual average NO₂ CAAQS is 0.030 ppm.

Table 6 presents the 98th percentile of the daily maximum 1-hour NO₂ concentrations and the annual average NO₂ concentrations during the 2009-2010 reporting period.

Table 6. Nitrogen Dioxide Concentrations in the POLA Air Monitoring Network over the Period May 2009 – April 2010

Averaging Period	Port of Los Angeles Monitoring Network			
	Wilmington Community Station	Coastal Boundary Station	San Pedro Community Station	Terminal Island Treatment Station
	Conc. (ppm)	Conc. (ppm)	Conc. (ppm)	Conc. (ppm)
98 th percentile of the daily maximum 1-hr NO ₂ concentrations	0.071	0.066	0.082	0.087
Annual Average NO ₂ concentration	0.020	0.011	0.020	0.022

- As shown in Table 6, the Port’s monitoring stations were below the annual average and 1-hr CAAQS and NAAQS for NO₂ during the 2009-2010 reporting period. The 98th percentile of the daily maximum 1-hr NO₂ concentrations at the nearest SCAQMD station in North Long Beach was 0.070 ppm, which compares well with measurements from the Port’s air monitoring network.

Figure A-13 shows the average monthly concentration of NO₂ during over the period of record. The highlights of this graph are:

- The NO₂ concentrations follow an annual cyclical pattern during the reporting period. As shown in Figure A-4, average monthly NO₂ concentrations fell to a minimum during the summer months and gradually increased into the winter. There are two possible explanations for this pattern:
 - The surface-based temperature inversions commonly present during the winter months may trap the NO₂ closer to the ground, thereby increasing the ground level concentration of this pollutant.
 - The lower concentrations in the summer may be due to the complex series of atmospheric chemical reactions that exist between NO₂ and ground-level O₃.

O₃ Data Summary

Compliance with the O₃ standards within the Port's air monitoring network was determined by comparison with two standards:

- The maximum 1-hour average O₃ CAAQS of 0.09 ppm is not to be exceeded.
- The 8-hour NAAQS for O₃ of 0.075 ppm is met when the 4th highest 8-hour average concentration measured in a year, averaged over three years, is equal to or less than the standard. The 8-hour CAAQS for O₃ of 0.70 ppm is not to be exceeded.

Table 7 presents the maximum 1-hour O₃ concentrations and the 4th highest 8-hr average O₃ concentrations measured during the 2009-2010 reporting period.

Table 7. Ozone Concentrations in the POLA Air Monitoring Network over the Period May 2009 – April 2010

Averaging Period	Port of Los Angeles Monitoring Network			
	Wilmington Community Station	Coastal Boundary Station	San Pedro Community Station	Terminal Island Treatment Station
	Conc. (ppm)	Conc. (ppm)	Conc. (ppm)	Conc. (ppm)
Maximum 1-hr O ₃ Concentration	0.085	0.097	0.081	0.101
4 th highest 8-hr average O ₃ concentration	0.058	0.067	0.061	0.058

- As shown in Table 7, the Port's monitoring stations were below the 8-hour CAAQS and NAAQS for O₃ during the 2009-2010 reporting period, but the 1-hour CAAQS was exceeded at the Coastal Boundary and Terminal Island Treatment stations. For comparison, the 4th highest 8-hour average O₃ concentration at the nearest SCAQMD station in North Long Beach was 0.055 ppm.

Figure A-14 presents the annual average monthly concentrations of O₃. The graph shows that O₃ concentrations peak during the summer months at each station, likely because O₃ is a secondary pollutant formed from VOCs and NO_x in the presence of sunlight, and the photochemical reactions required to produce O₃ are stronger during the summer.

SO₂ Data Summary

Compliance with the SO₂ standards within the Port's air monitoring network was determined by comparison with three standards:

- EPA established a new 1-hour NAAQS for SO₂ concentrations on June 2, 2010. This standard is met when the 3-year average of the 99th percentile of the daily maximum 1-hour SO₂ concentrations at each does not exceed 0.075 ppm.
- The maximum 24-hour average SO₂ NAAQS and CAAQS are 0.14 and 0.04 ppm, respectively. EPA's June 2, 2010 rule-making revoked the 24-hour SO₂ NAAQS, but this standard is included here because EPA's action occurred after the end of the current 2009-2010 reporting period.
- The annual average SO₂ NAAQS is 0.030 ppm. EPA's June 2, 2010 rule-making also revoked the annual SO₂ NAAQS, but this standard is included here because EPA's action occurred after the end of the current 2009-2010 reporting period.

Table 8 presents the 99th percentile of the daily maximum 1-hour SO₂ concentrations and the annual average SO₂ concentrations during the 2009-2010 reporting period.

Table 8. Sulfur Dioxide Concentrations in the POLA Air Monitoring Network over the Period May 2009 – April 2010

Averaging Period	Port of Los Angeles Monitoring Network			
	Wilmington Community Station	Coastal Boundary Station	San Pedro Community Station	Terminal Island Treatment Station
	Conc. (ppm)	Conc.(ppm)	Conc. (ppm)	Conc. (ppm)
99 th percentile of the daily maximum 1-hr SO ₂ concentrations	0.022	0.023	0.030	0.059
24-hr Average SO ₂ concentration	0.007	0.015	0.010	0.025
Annual Average SO ₂ concentration	0.0025	0.0009	0.0022	0.0065

- As shown in Table 8, the Port's monitoring stations were in compliance with the CAAQS and NAAQS for SO₂ during the 2009-2010 reporting period.

Figure A-15 shows that the average monthly SO₂ concentration within the network remained relatively constant and at very low levels.

4.2 METEOROLOGICAL DATA

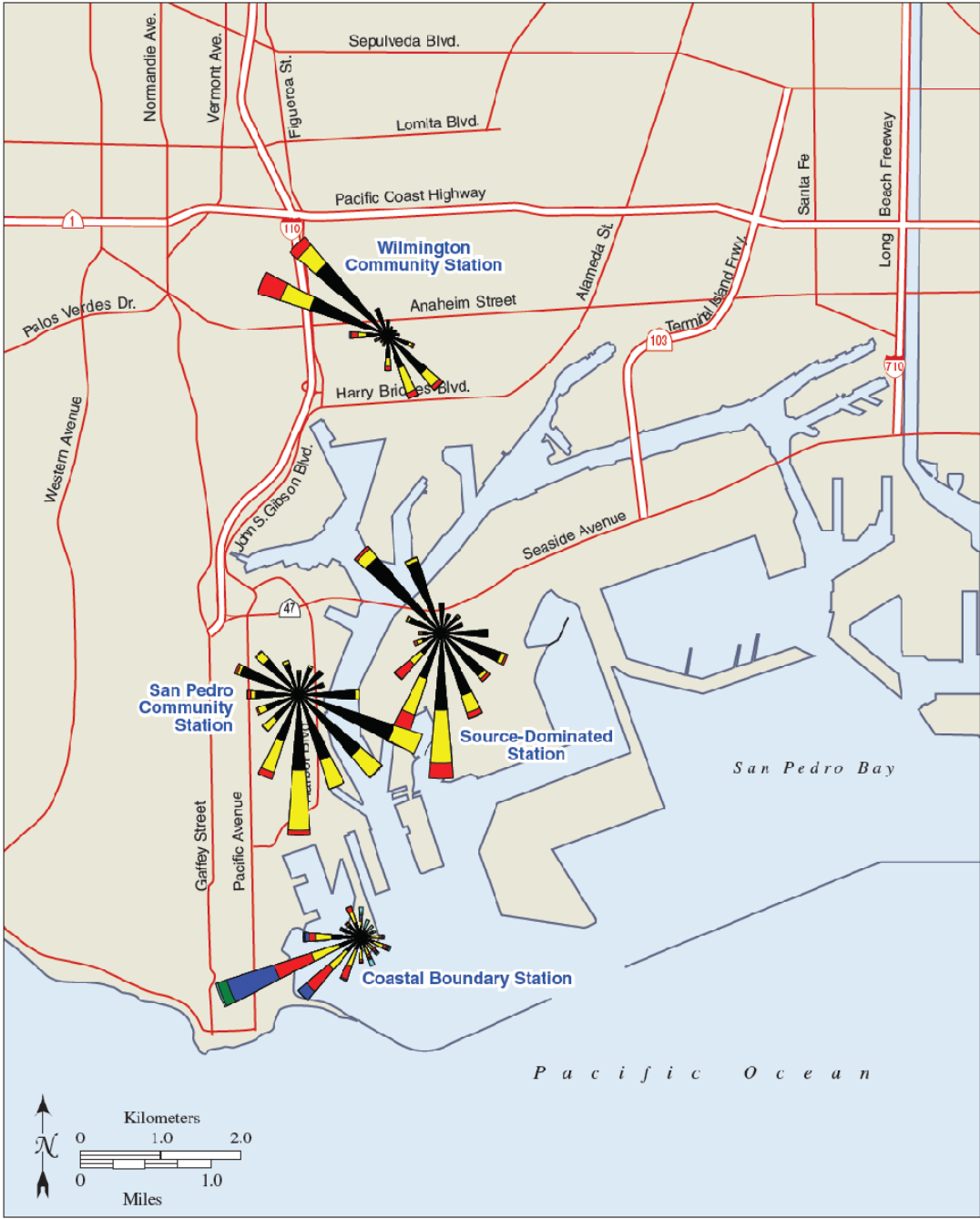
The meteorological data collected at each of the four stations are useful in interpreting the PM data collected at the site. In addition, the meteorological data sets can be used in air dispersion modeling and other data analyses.

Wind roses, which graphically show the frequency of occurrence of wind speed and direction at a site, have been constructed using from the data collected by this program. The historical data was used to develop the wind roses that are shown projected on the Port base map in Figure 2⁷. Wind roses were also created using the 5th year of meteorological data collected at each station and are shown in the Appendix, as Figures A-16 through A-19. The wind roses look very similar to previous annual wind roses

⁷ The wind speed scale typically included with a wind rose is not shown on Figure 2 for the sake of clarity. The full wind roses, with wind speed scales included, are provided in Figures A-16 through A-19 of the Appendix.

produced from previous years. Wind roses are useful in air quality analyses, because they readily indicate the directions in which emissions are most frequently transported. By convention, winds are shown in the direction from which they came; for example, a west wind blows from the west.

Figure 2. Wind Roses for the Port Air Monitoring Network Stations For the Period May 2009-April 2010



These figures indicate that the general air flow patterns during the current 2009-2010 period are very similar to the historical air flow patterns observed in the air monitoring network. The predominant wind patterns at each station are considerably different, indicating that the Port area experiences complex air flow patterns.

4.3 DATA QUALITY ASSURANCE

Several quality assurance measures have been incorporated into this program. These measures include:

1. Collocated monitors at the Wilmington Community Station. The Desert Research Institute (DRI) Sequential Filter Samplers (SFS) used at each site for speciation sample collection are not FRM monitors. $PM_{2.5}$ and PM_{10} FRM monitors are collocated with the SFS at the Wilmington Community Station to validate the operation of the SFS monitors in the Port monitoring network.
2. Field blanks were periodically taken at each station to ensure that there was no systematic contamination of the filters.
3. Monitoring checklists were routinely completed by the field technicians during every station visit, conducted on a third-day schedule.
4. Semi-annual external audits of the system were performed by an independent contractor.

Appendix A
FIGURES AND TABLES

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FIGURE A-1

Annual Average Filter-Based PM_{2.5} Concentrations at the Port of Los Angeles

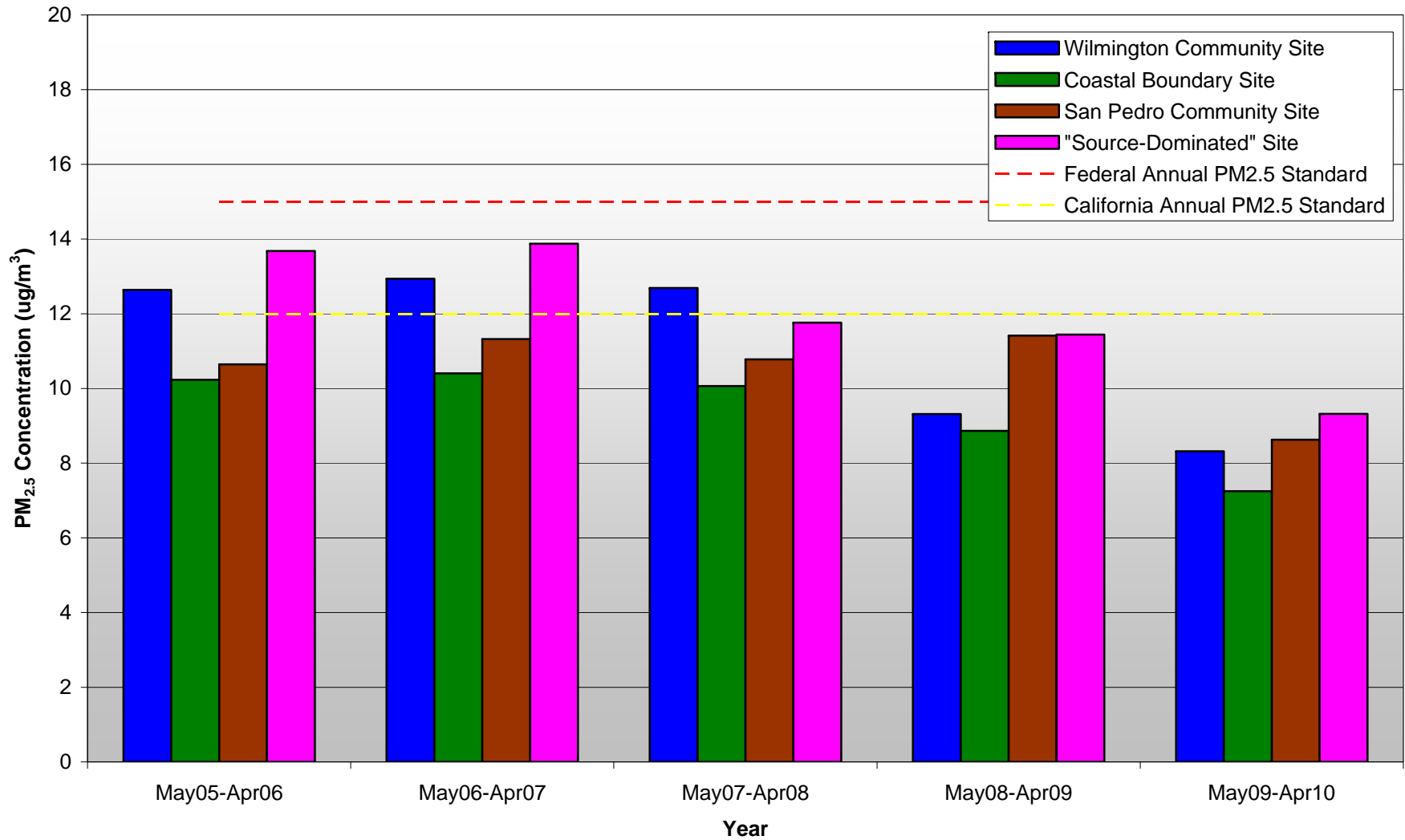


FIGURE A-2

Monthly Average Filter-Based PM_{2.5} Concentrations at the Port of Los Angeles
May 2009 - April 2010

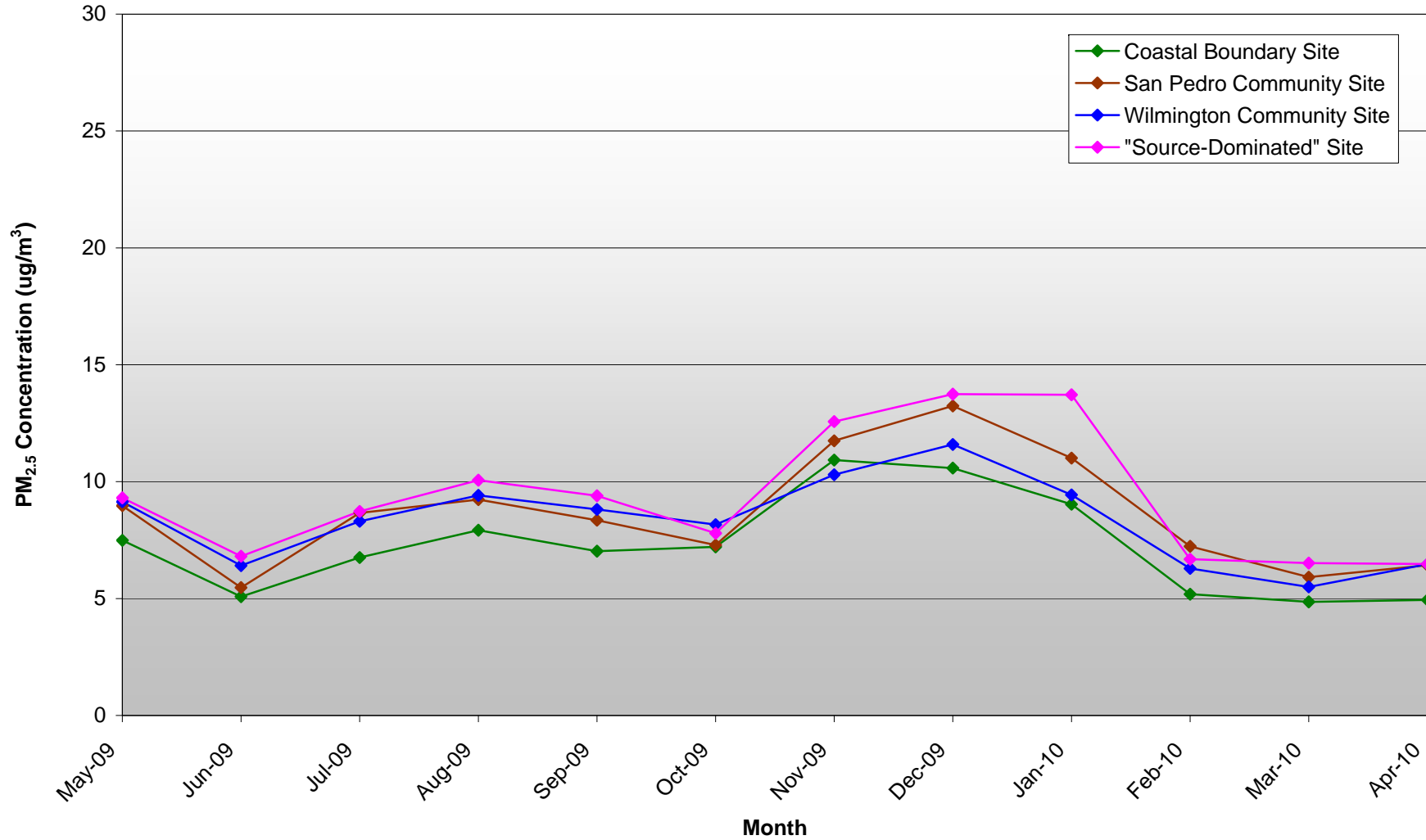


FIGURE A-3

Monthly Average Filter-Based PM_{2.5} Concentrations at the Port of Los Angeles
February 2005 - April 2010

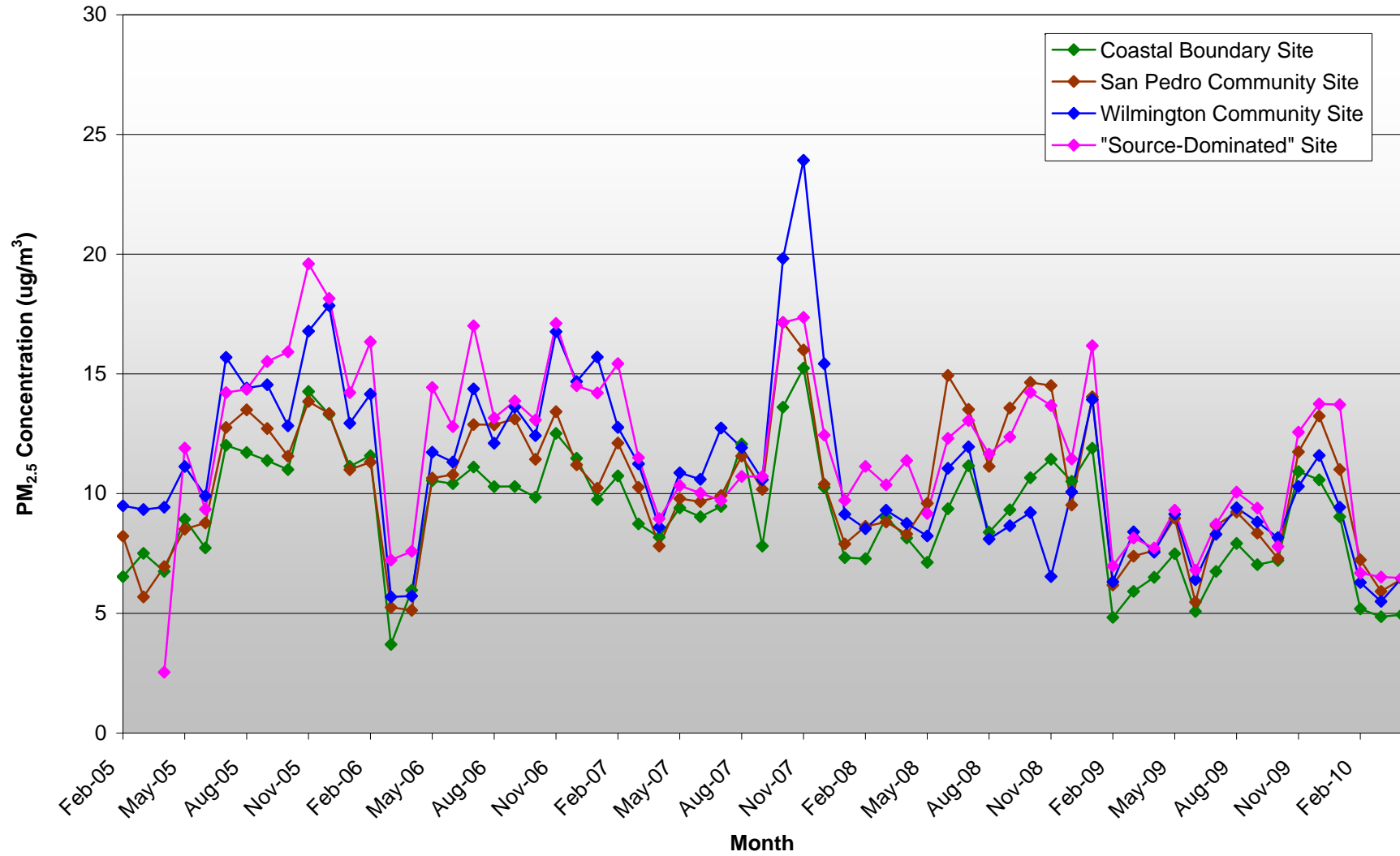


FIGURE A-4

Monthly Average BAM PM_{2.5} Concentrations at the Port of Los Angeles
May 2009 - April 2010

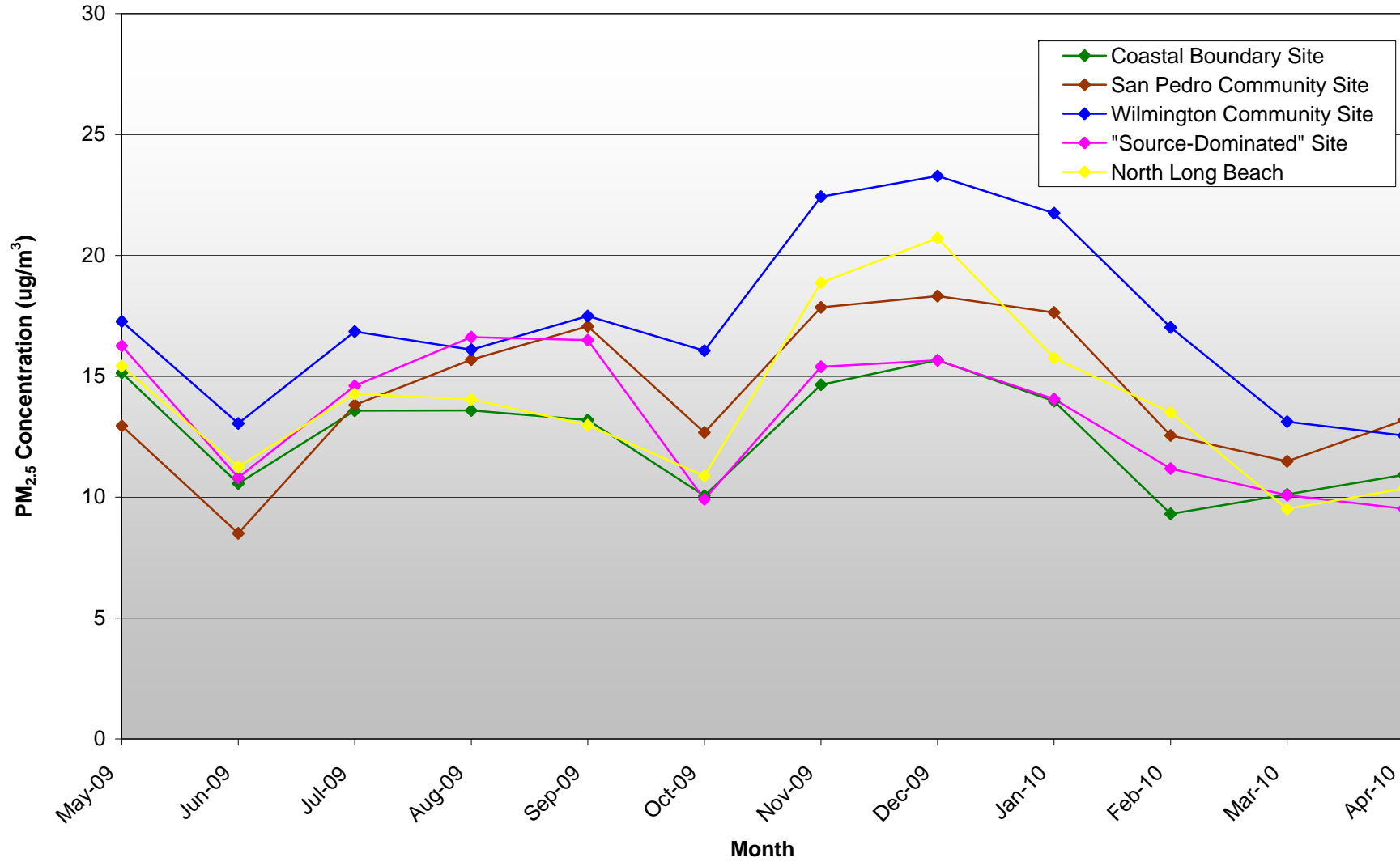


FIGURE A-5

Annual Average PM₁₀ Concentrations at the Port of Los Angeles

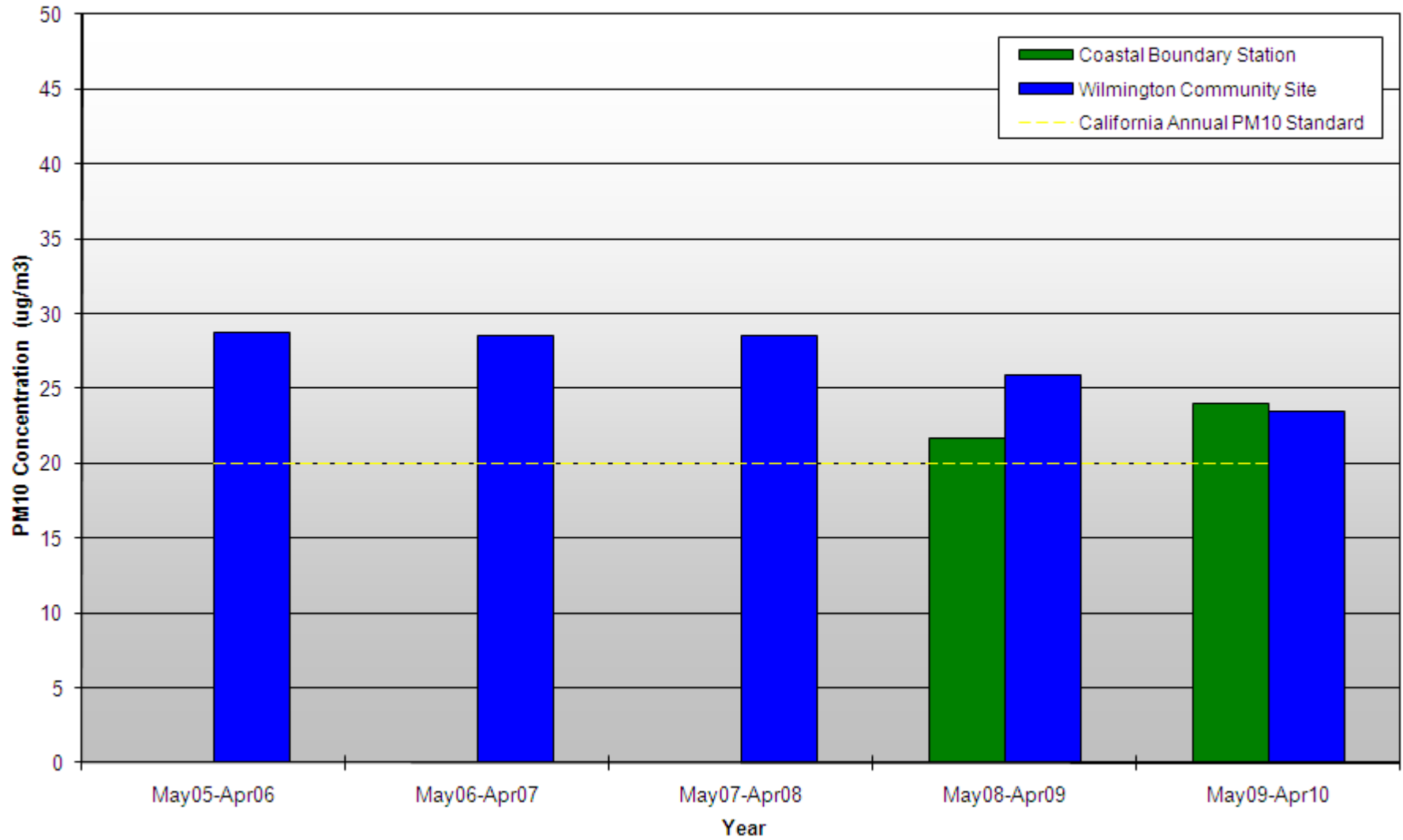


FIGURE A-6

Monthly Average Filter-Based PM₁₀ Concentrations at the Port of Los Angeles
May 2009 - April 2010

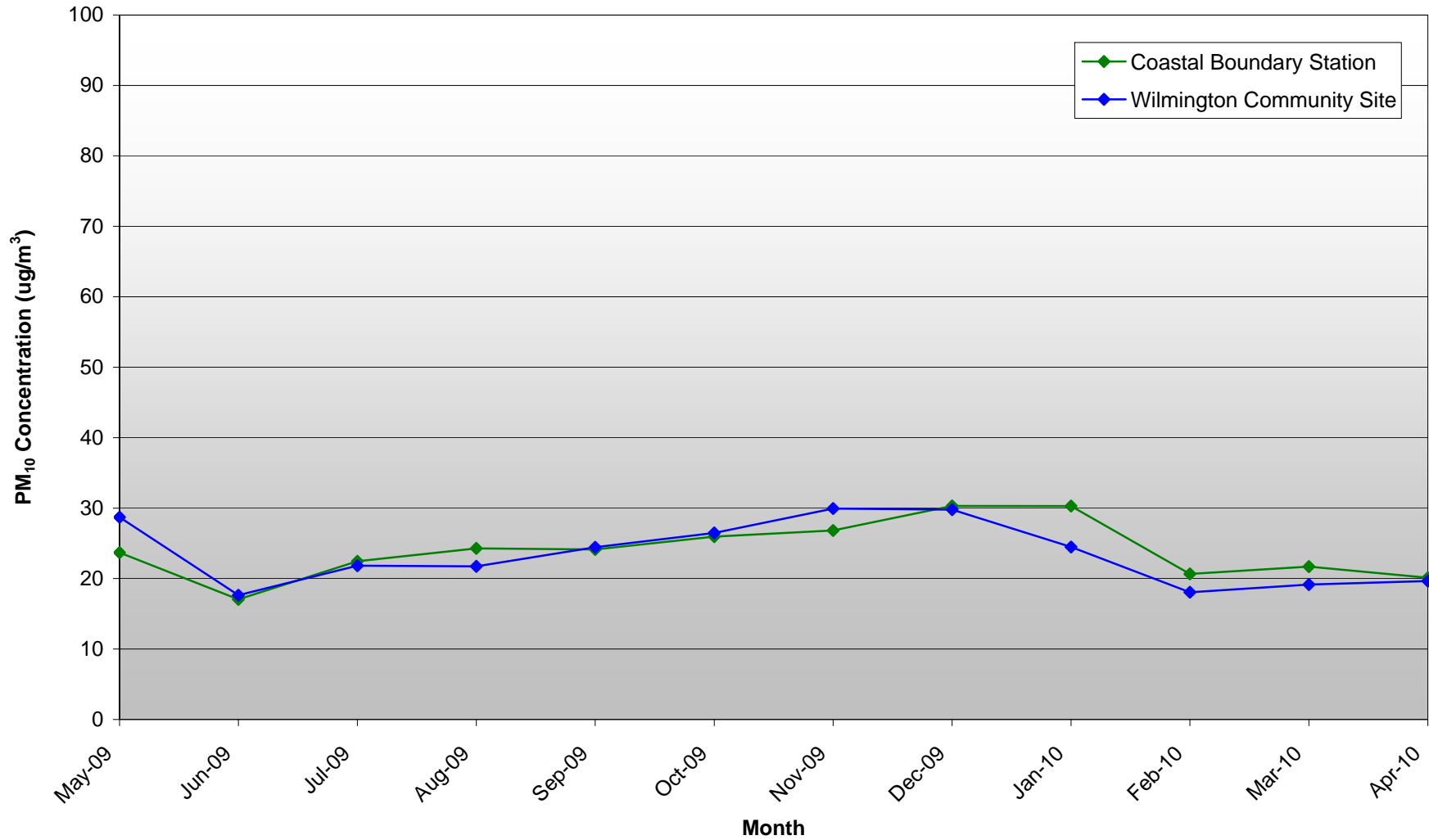


FIGURE A-7

Monthly Average Filter-Based PM₁₀ Concentrations at the Port of Los Angeles
February 2005 - April 2010

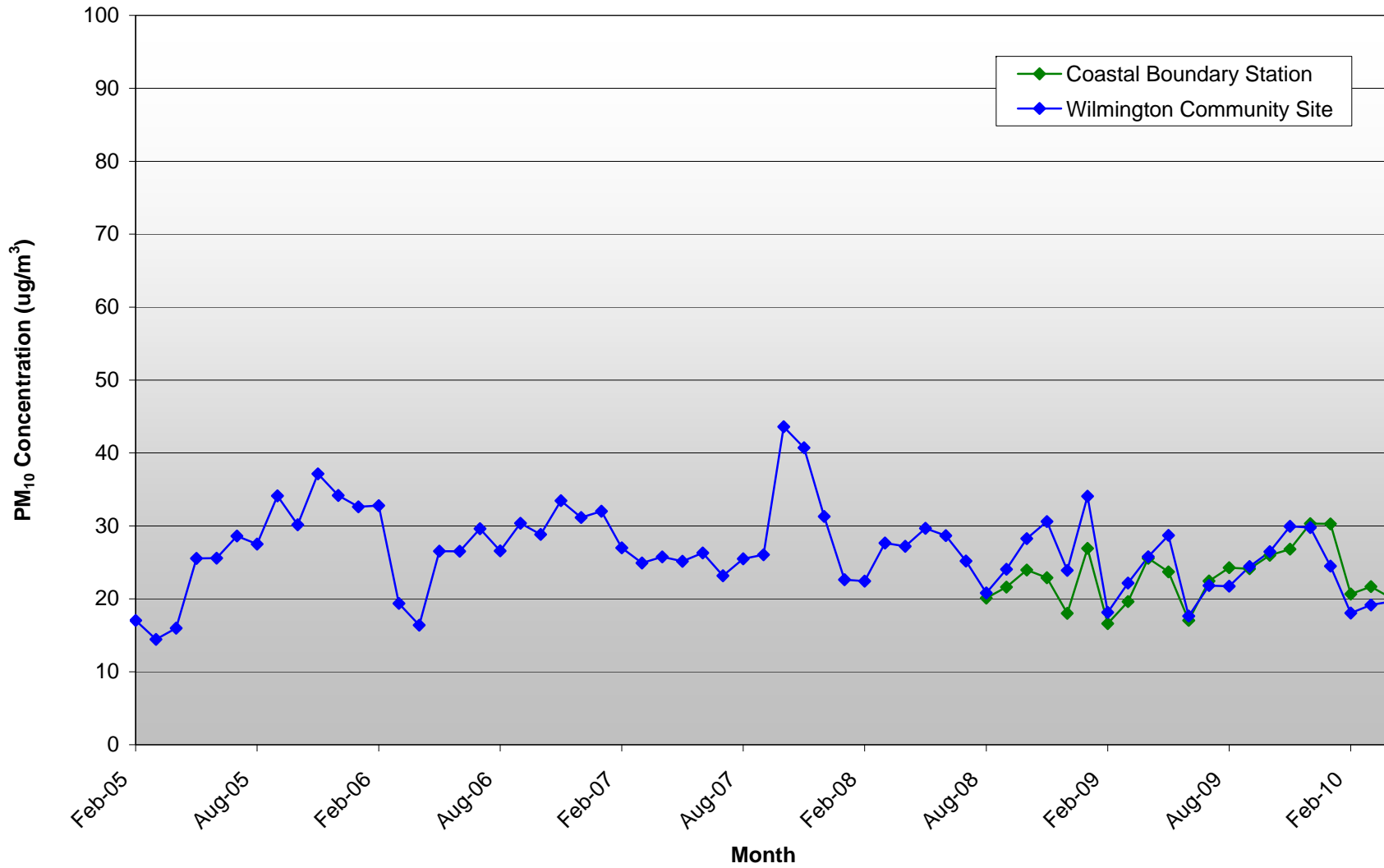


FIGURE A-8

Monthly Average BAM PM₁₀ Concentrations at the Port of Los Angeles
May 2009 to April 2010

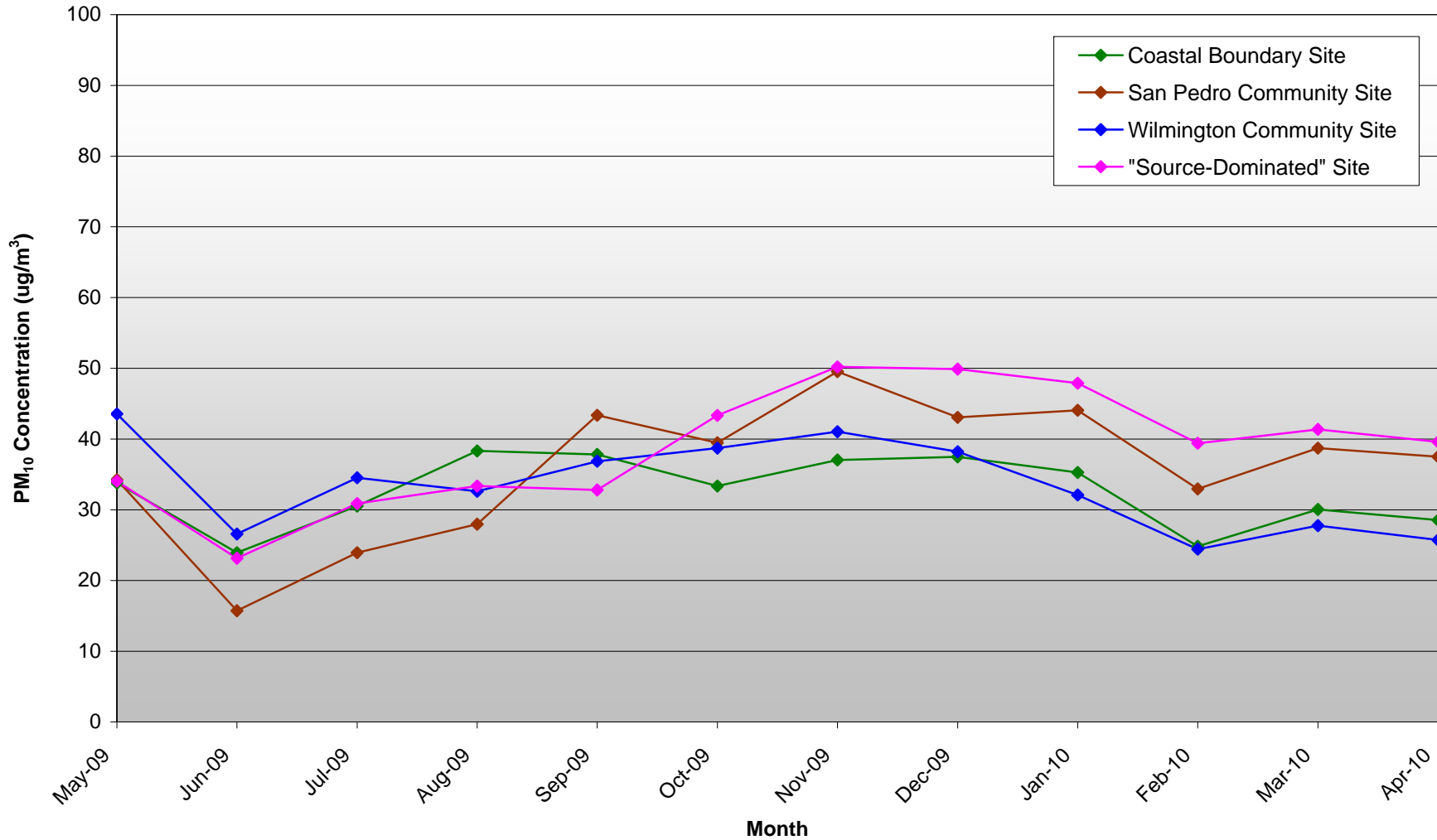


FIGURE A-9

Annual Average Elemental Carbon Concentrations at the Port of Los Angeles

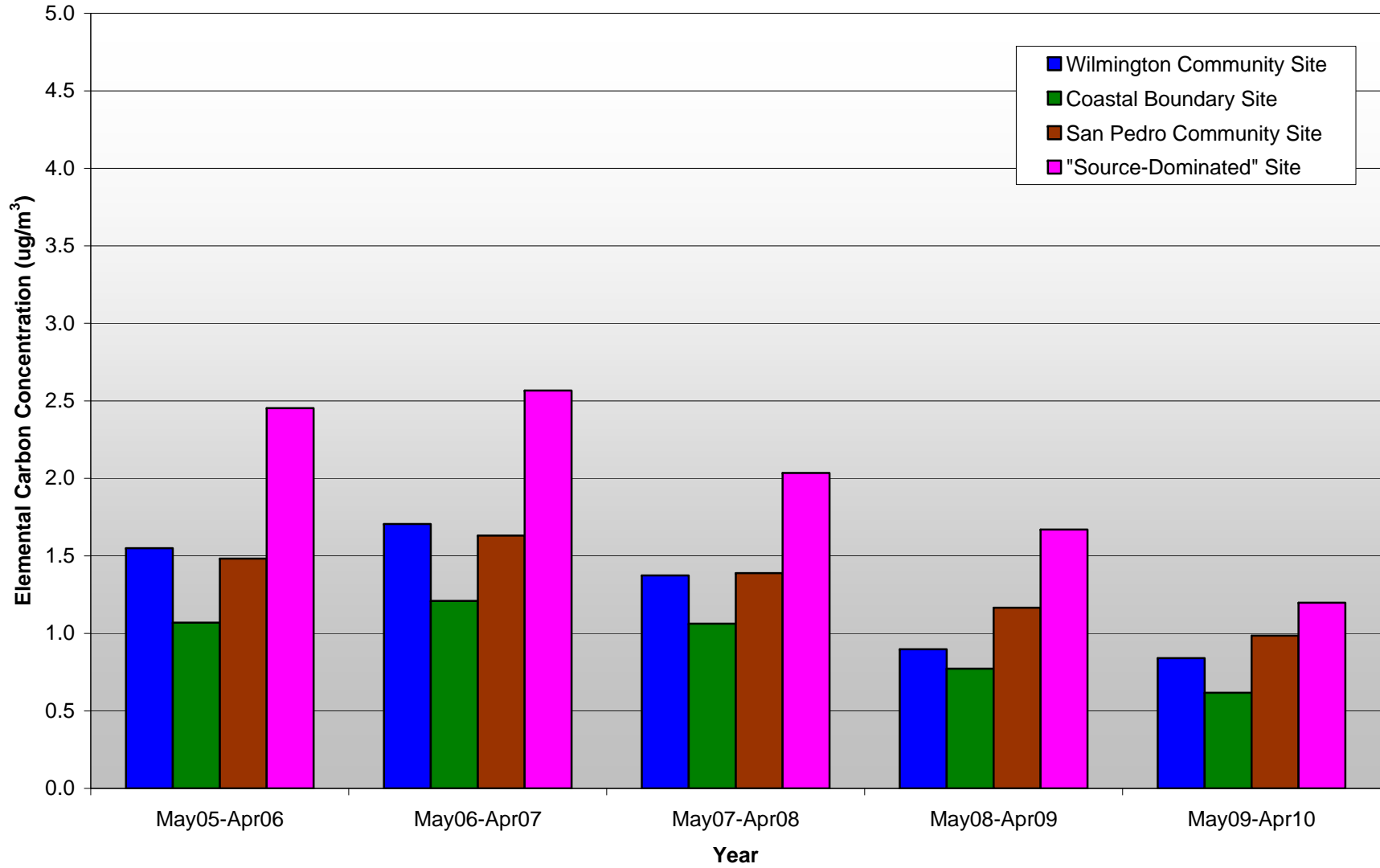


FIGURE A-10

Monthly Average Elemental Carbon Concentrations at the Port of Los Angeles
May 2009 - April 2010

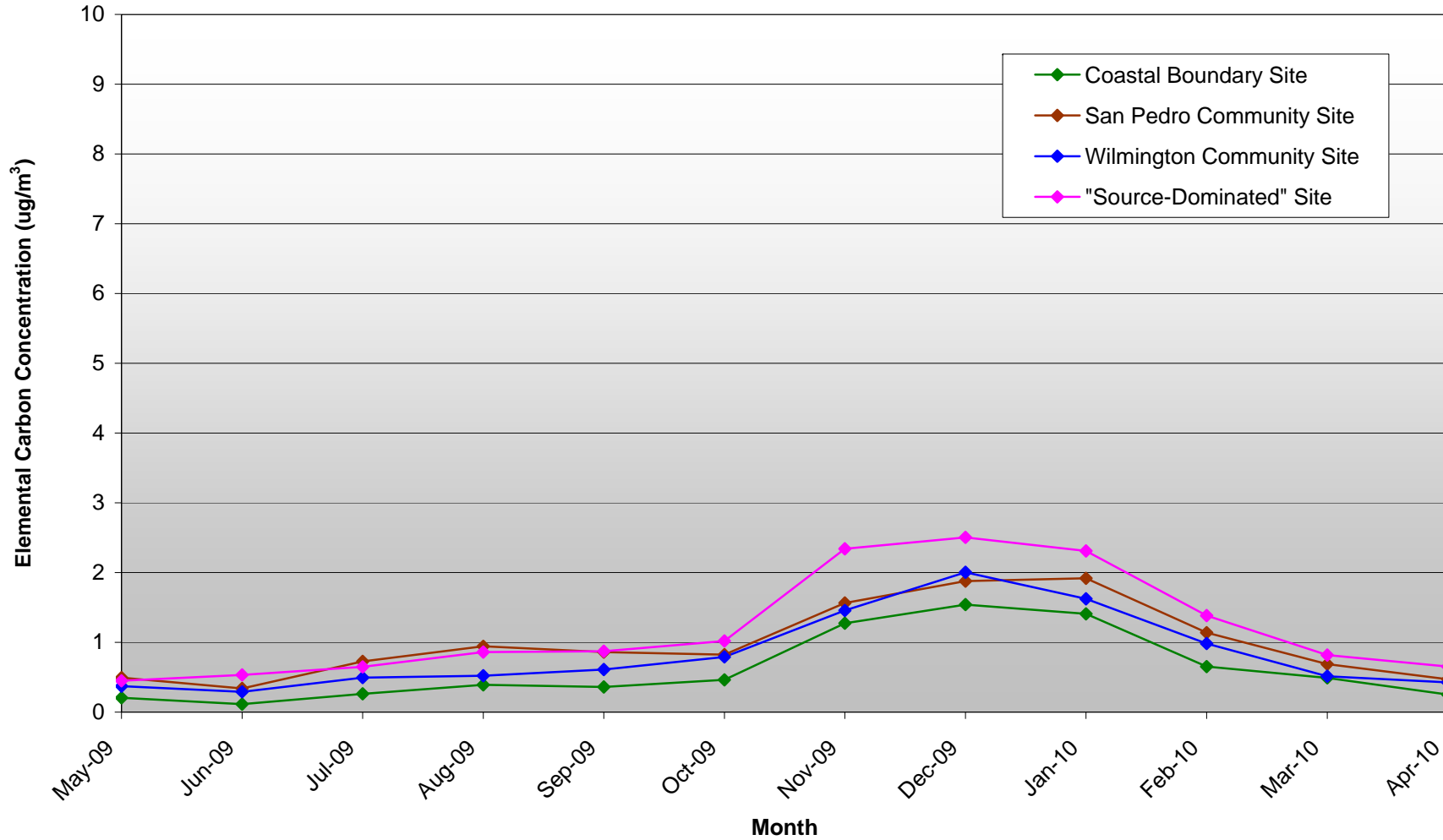


FIGURE A-11

Monthly Average Elemental Carbon Concentrations at the Port of Los Angeles
February 2005 - April 2010

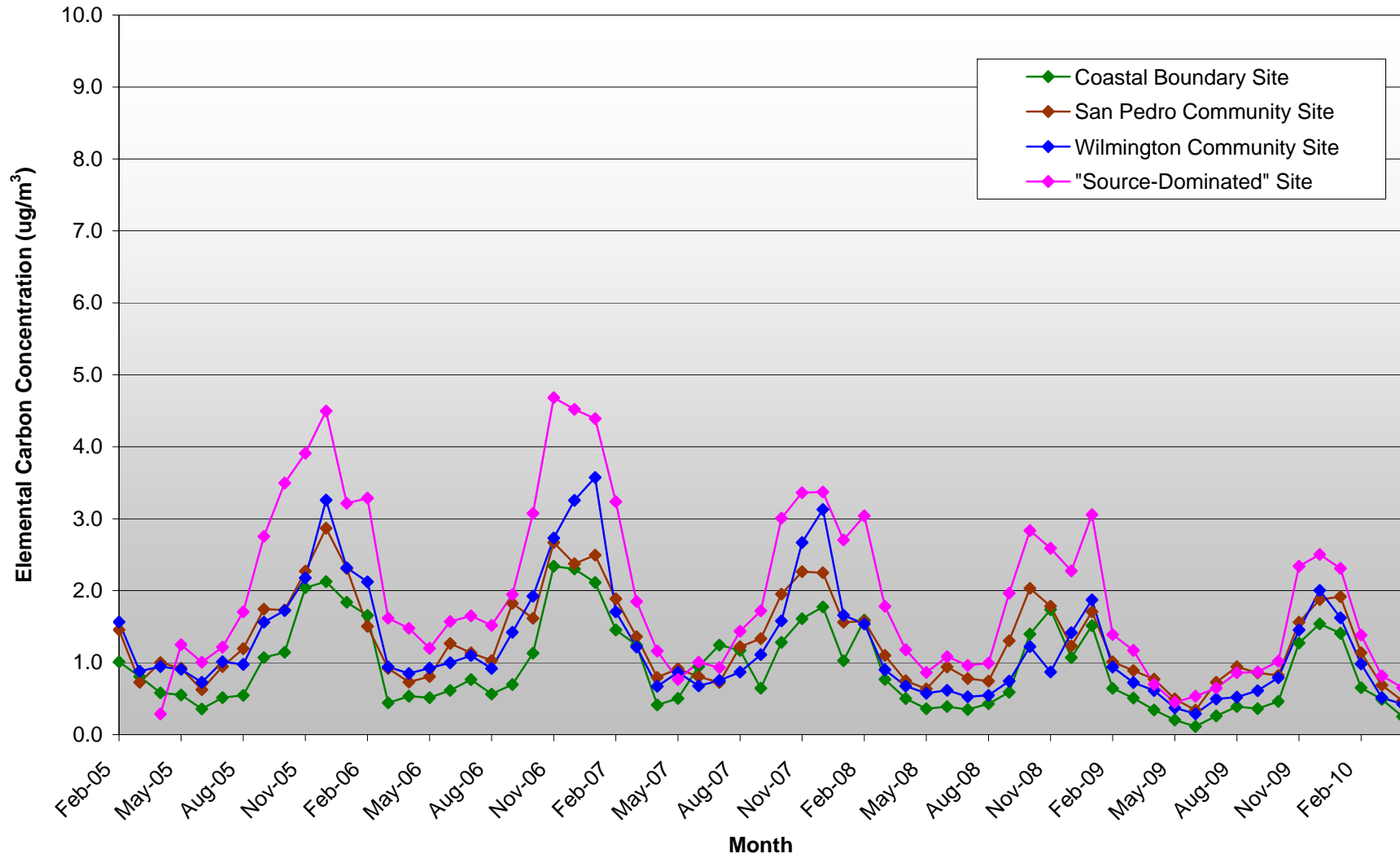


FIGURE A-12

Average Monthly CO Concentrations at the Port of Los Angeles May 2009 - April 2010

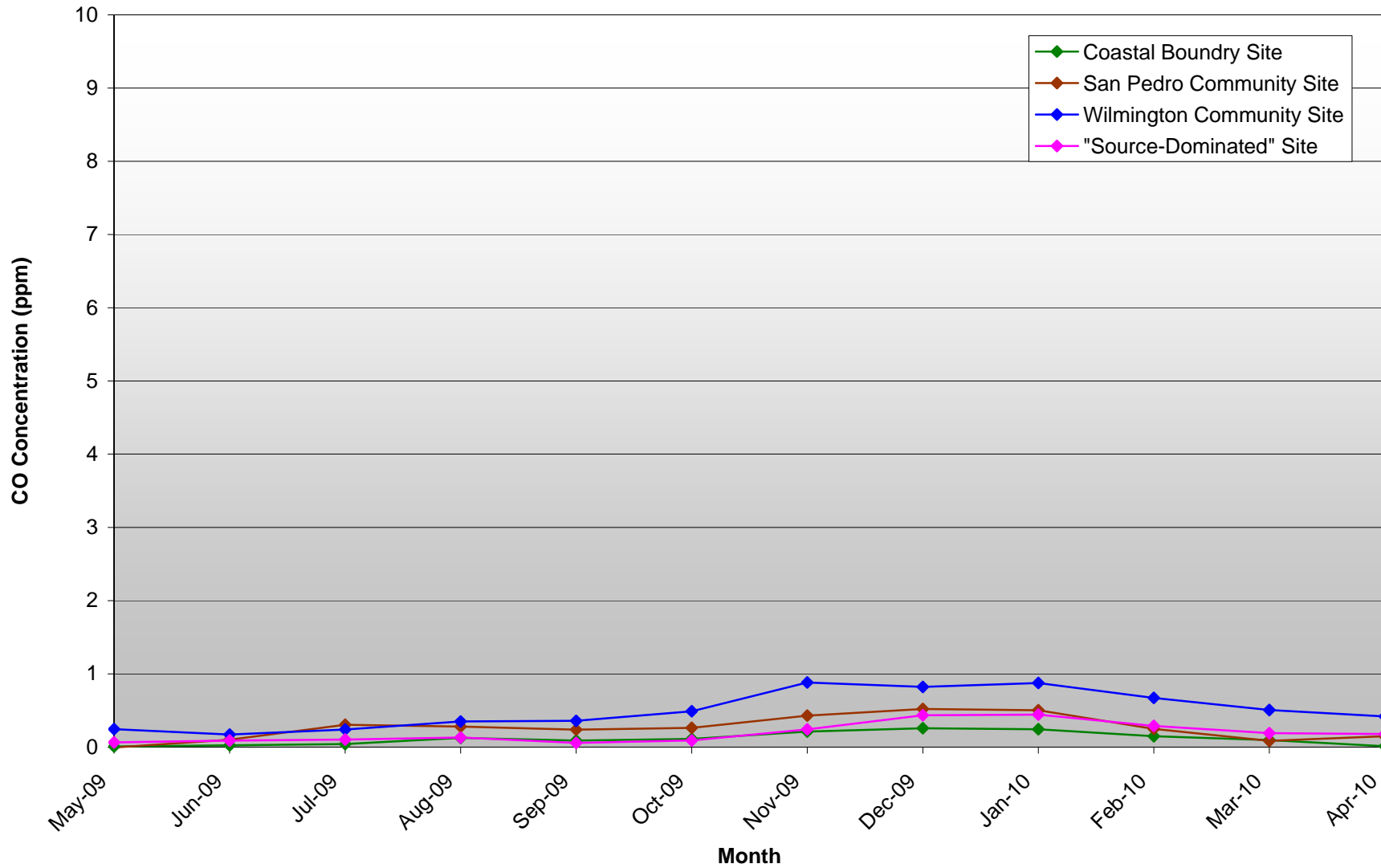


FIGURE A-13

Average Monthly NO₂ Concentrations at the Port of Los Angeles
May 2009 - April 2010

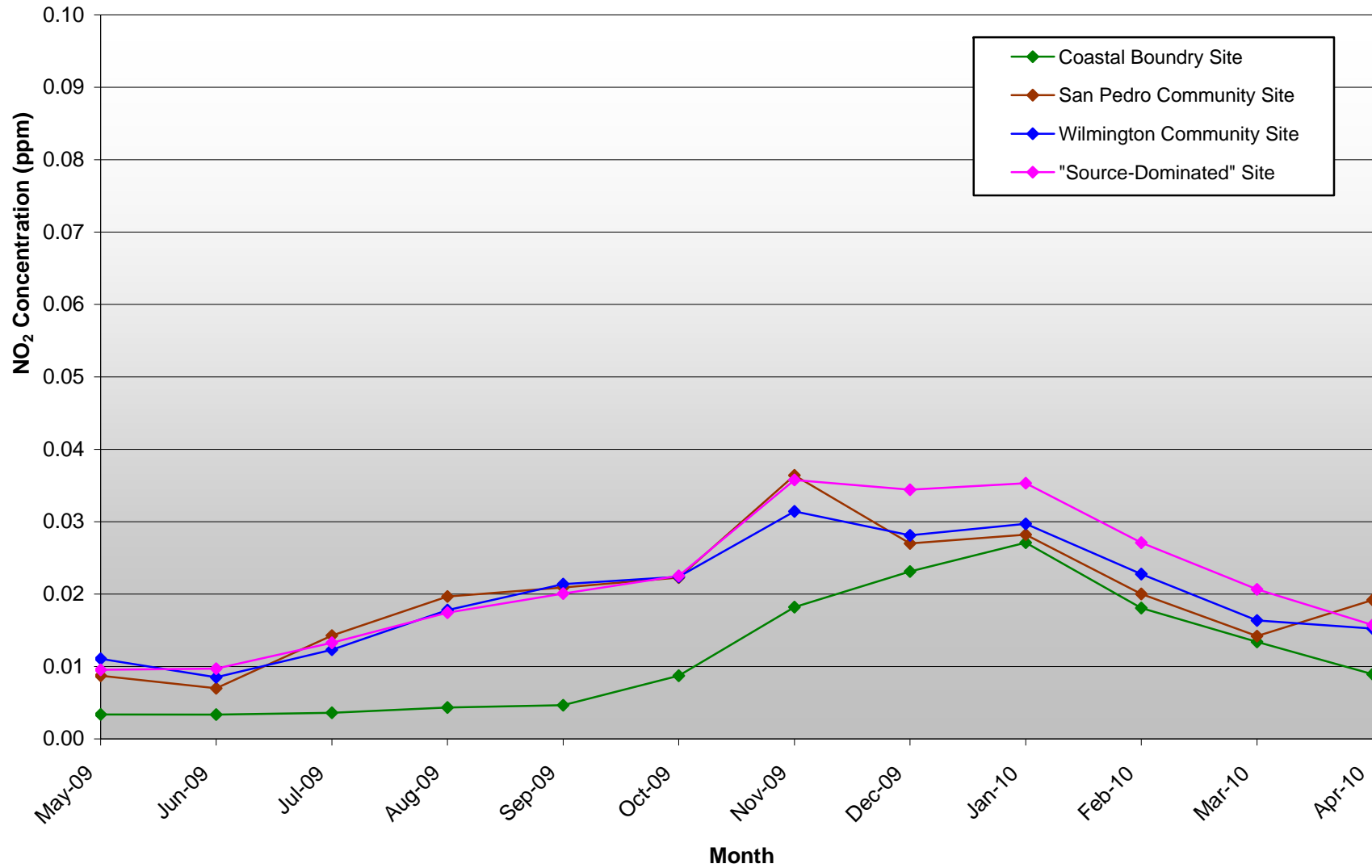


FIGURE A-14

Average Monthly O₃ Concentrations at the Port of Los Angeles
May 2009 - April 2010

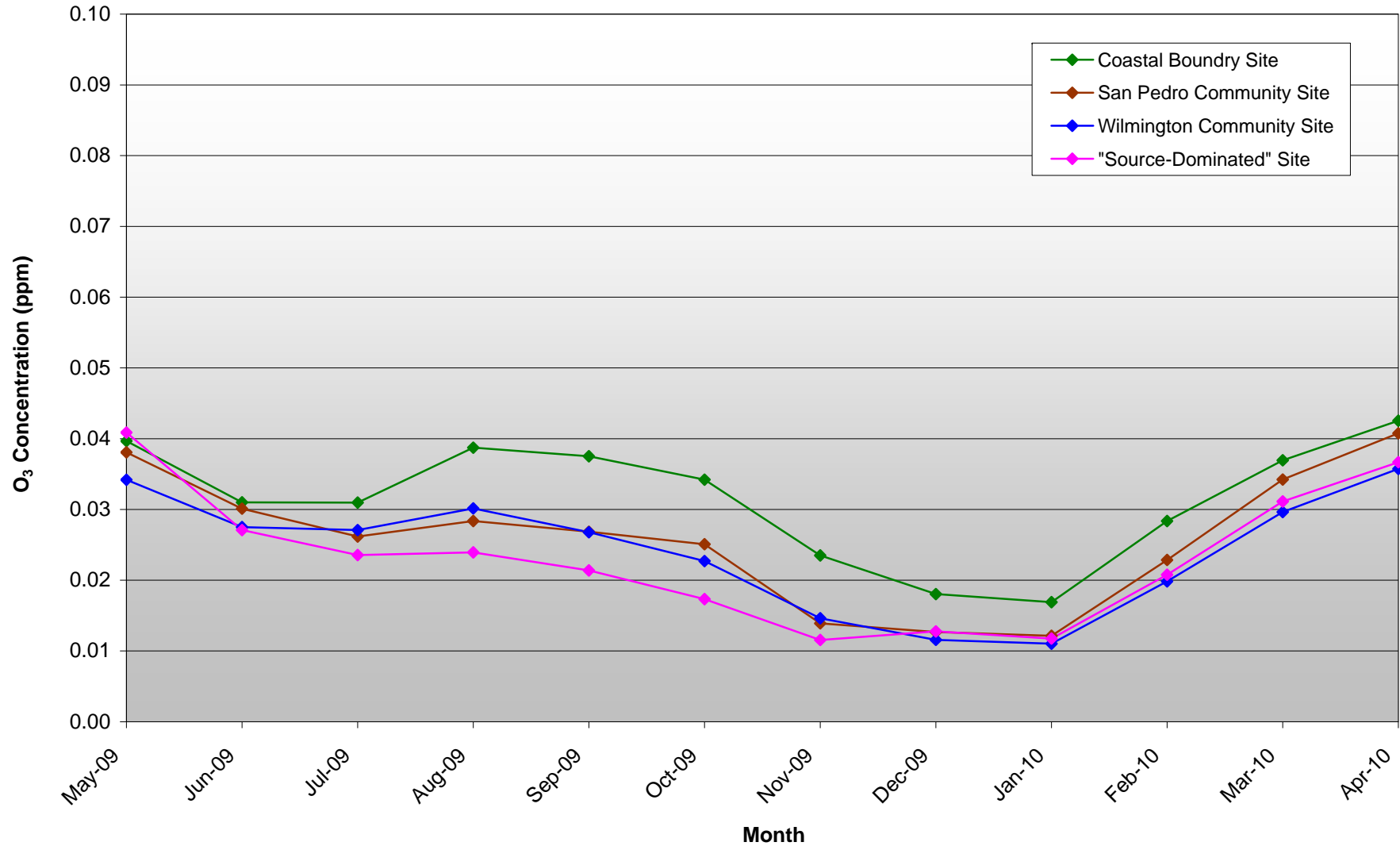


FIGURE A-15

Average Monthly SO₂ Concentrations at the Port of Los Angeles
May 2009 - April 2010

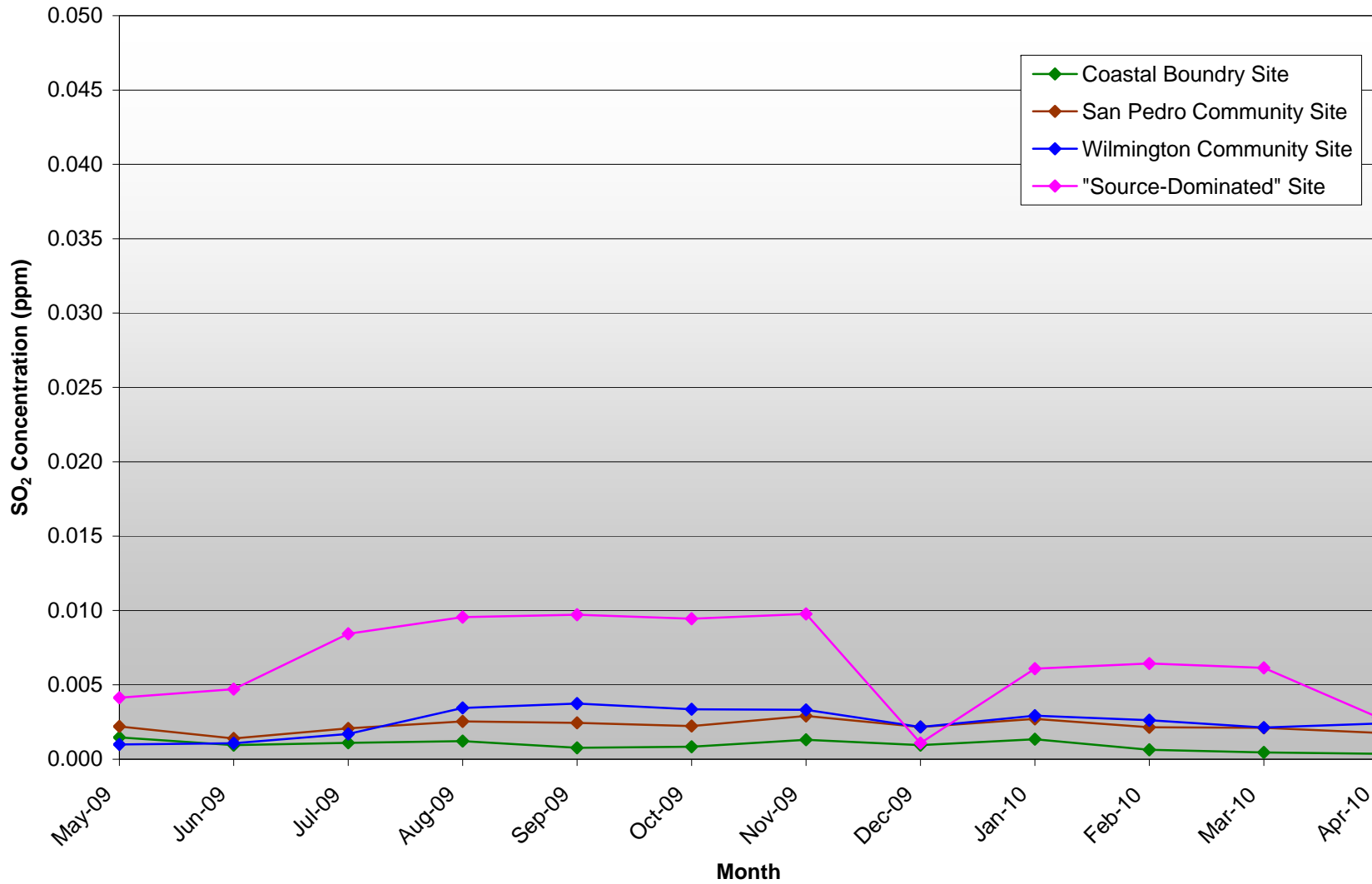


FIGURE A-16

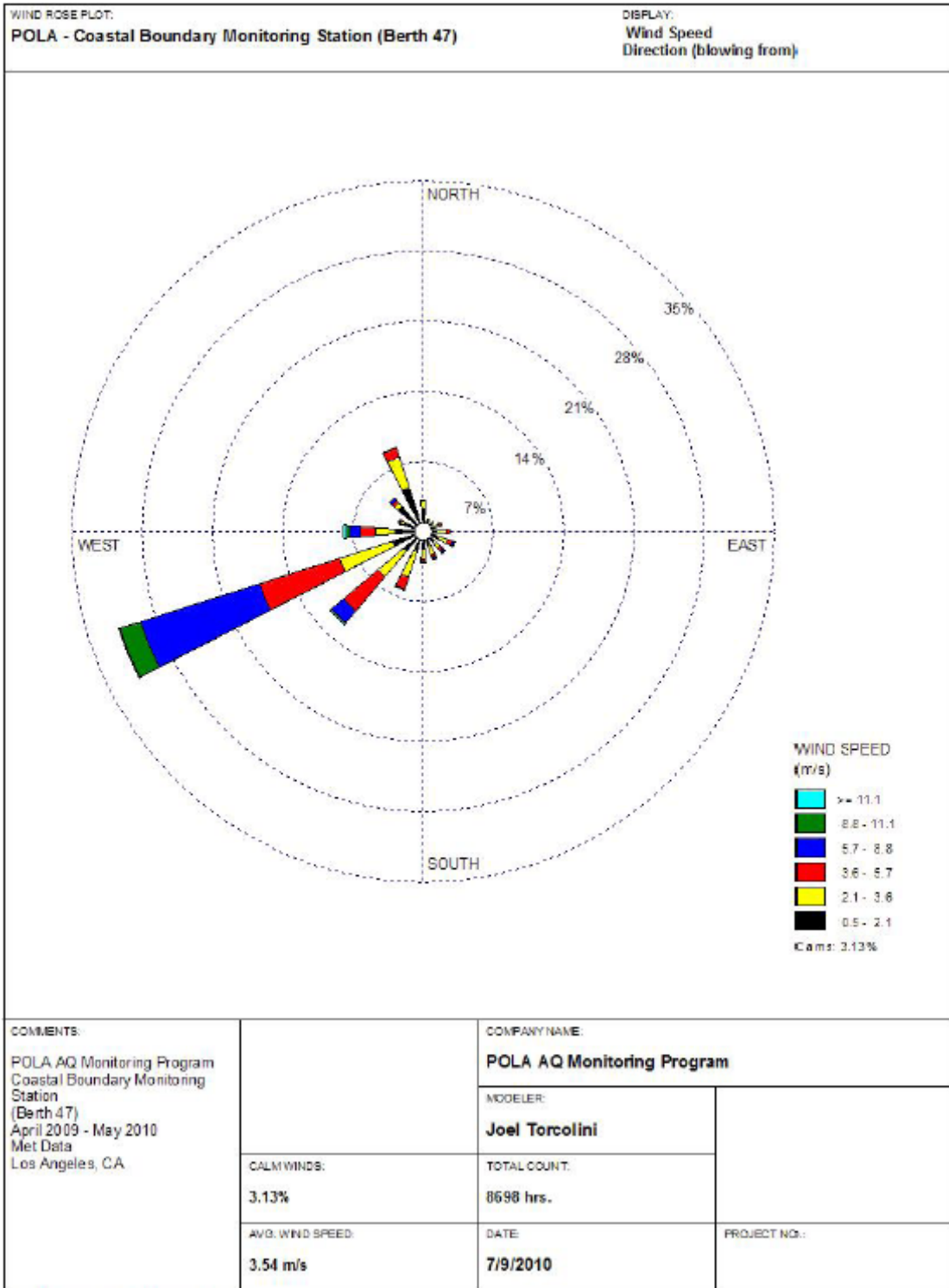
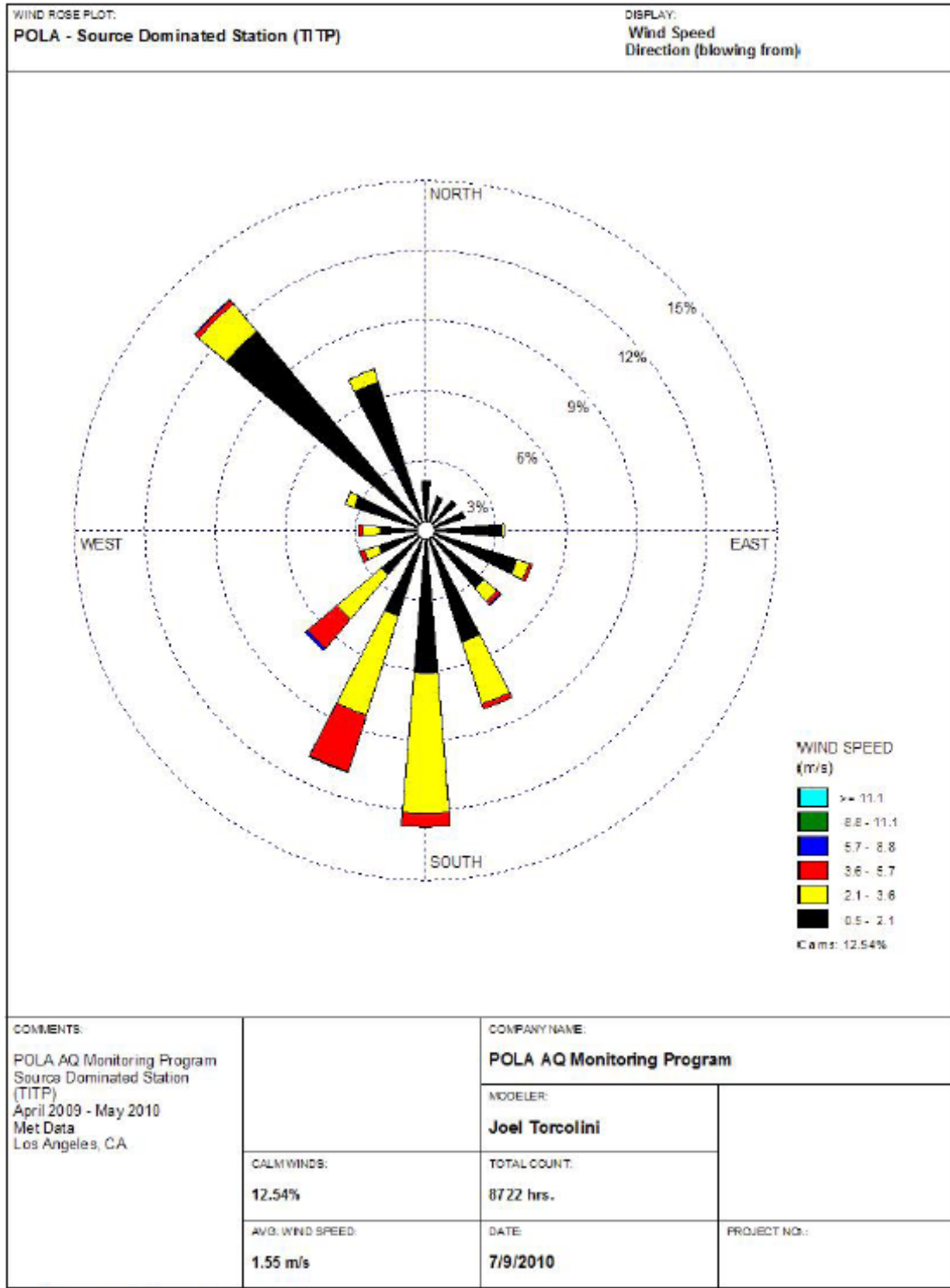
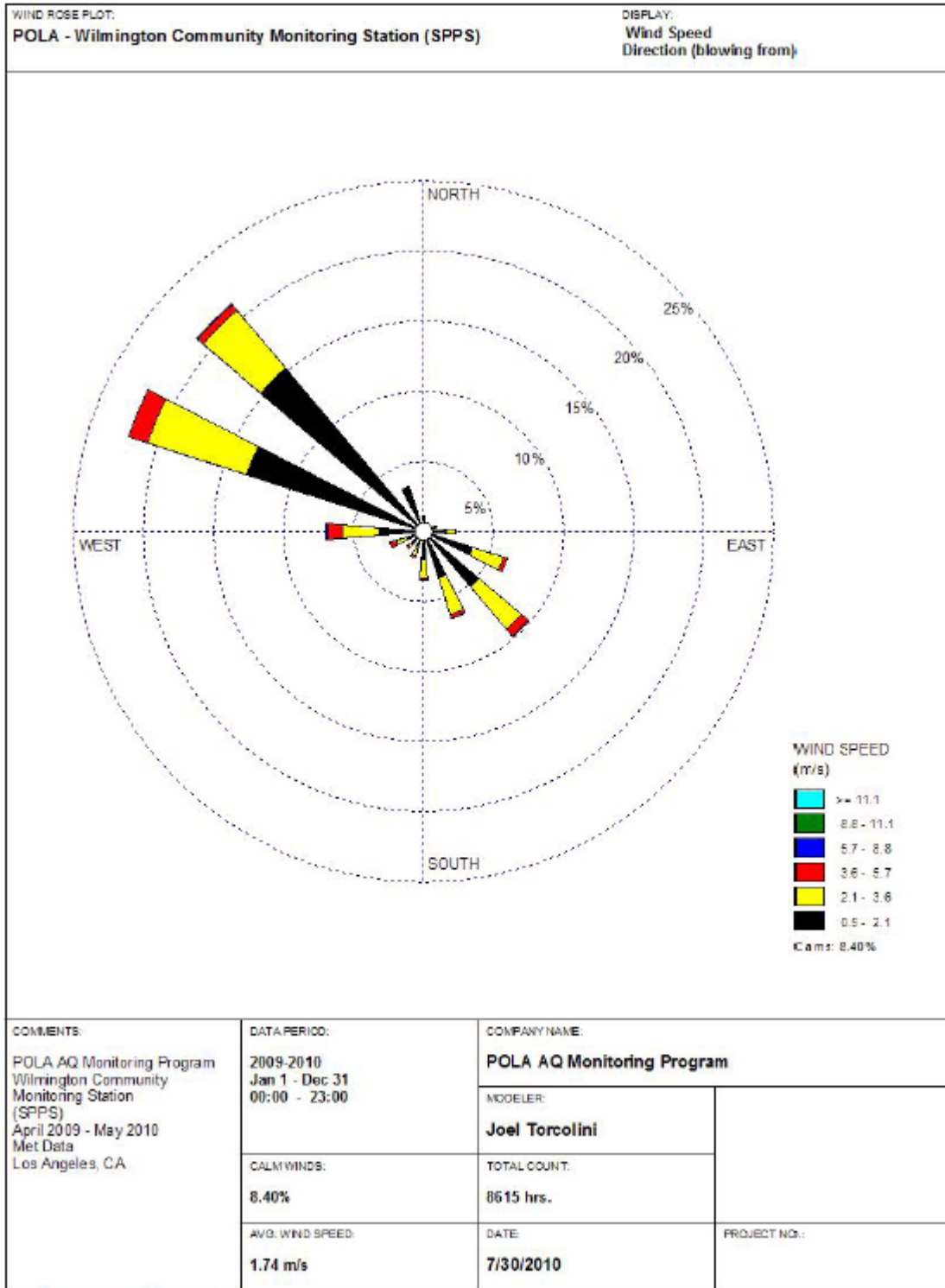


FIGURE A-17



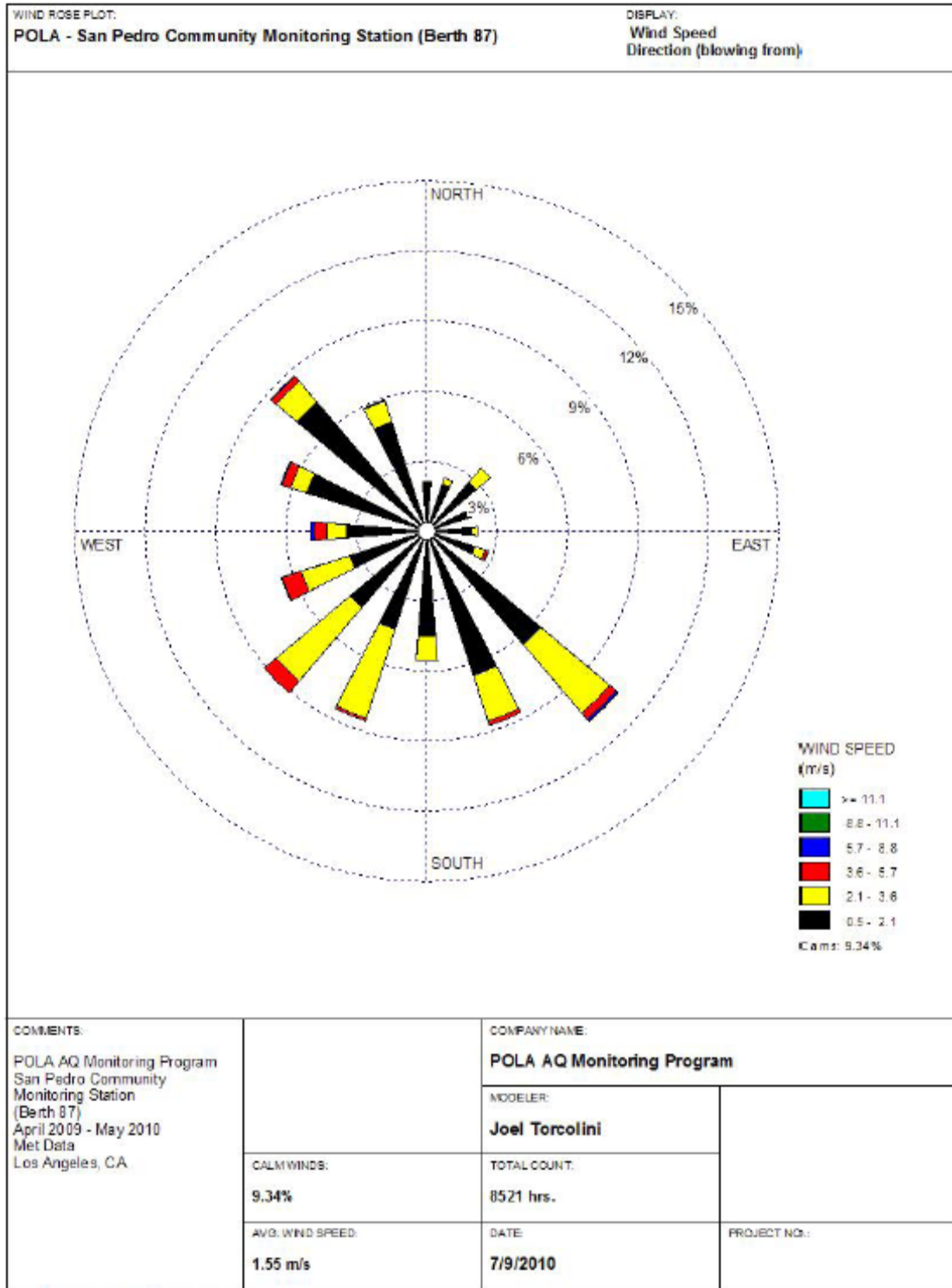
WRPLOT View - Lakes Environmental Software

FIGURE A-18



WRPLOT View - Lakes Environmental Software

FIGURE A-19



WRPLOT View - Lakes Environmental Software

**Table A-1
24-Hour Average PM_{2.5} Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)
	1-May-09	7.6	9.8	
4-May-09	3.9	4.7	5.1	5.0
7-May-09	6.8	9.5	8.7	10.0
10-May-09	9.4	10.7		11.7
13-May-09	7.7	10.2	10.9	10.6
16-May-09	10.3	11.7	15.4	11.1
19-May-09	7.4	9.2	8.6	9.5
22-May-09	7.2	8.1	9.7	9.3
25-May-09	6.7	7.8	7.1	7.7
28-May-09	10.8	12.0	11.6	12.8
31-May-09	4.6	5.1	5.2	5.4
3-Jun-09	4.2	6.6	7.6	7.0
6-Jun-09	1.8	1.8	2.0	2.8
9-Jun-09	5.3	6.6	5.7	6.8
12-Jun-09	4.2	4.7	5.6	4.4
15-Jun-09	2.2	3.1	3.1	3.0
18-Jun-09	6.2	8.1	9.1	8.7
21-Jun-09	5.4	6.3	6.3	6.2
24-Jun-09	6.1	6.5	7.4	7.2
27-Jun-09	7.8		8.9	11.1
30-Jun-09	7.5		8.4	10.9
3-Jul-09	6.4	10.1	8.8	8.6
6-Jul-09	5.8	8.7	7.6	8.1
9-Jul-09	7.0	8.3	7.5	8.9
12-Jul-09	6.7	8.3	8.2	8.4
15-Jul-09	8.2	11.0	10.5	11.2
18-Jul-09	5.9	8.5	7.2	9.0
21-Jul-09	7.6	9.5	10.3	9.6
24-Jul-09	7.0	7.9	8.4	8.1
27-Jul-09	7.6	8.6	9.1	8.8
30-Jul-09	5.3	6.4	5.7	6.5
2-Aug-09	5.0	6.1	6.6	6.8
5-Aug-09	3.5	5.1	5.4	6.2
8-Aug-09	7.4	8.2	8.2	6.9
11-Aug-09	6.2	7.9	8.4	8.0
14-Aug-09	8.6	8.8	8.9	9.3
17-Aug-09	14.2	12.0	15.4	17.0
20-Aug-09	7.7	10.1	11.3	10.6
23-Aug-09	8.3	8.0	7.9	8.5
26-Aug-09	8.9	14.3	11.6	15.6

**Table A-1
24-Hour Average PM_{2.5} Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)
	29-Aug-09	9.4	11.8	10.4
1-Sep-09	5.4	7.1	7.4	7.8
4-Sep-09	6.9	7.3	8.3	7.9
7-Sep-09	6.0	6.6	11.4	6.8
10-Sep-09	6.0	8.5	8.1	9.2
13-Sep-09	5.1	6.3	5.3	5.5
16-Sep-09	4.6	6.3	6.1	6.4
19-Sep-09	6.9	9.3	8.6	9.5
22-Sep-09	7.0	10.0	7.8	10.6
25-Sep-09	10.2	13.7	12.2	14.4
28-Sep-09	12.4		12.9	13.8
1-Oct-09	10.2	6.6	13.4	10.2
4-Oct-09	3.9		5.4	4.3
7-Oct-09	6.2	5.2	5.5	6.2
10-Oct-09	6.0	7.6	7.6	7.9
13-Oct-09	1.5	2.5	2.4	2.9
16-Oct-09	8.9	11.2	9.9	12.8
19-Oct-09	3.8	4.4	5.4	5.0
22-Oct-09	5.5	7.7	12.6	7.3
25-Oct-09	11.1	12.9	10.8	11.7
28-Oct-09	7.9	7.9	7.2	9.9
31-Oct-09	8.0	10.6	9.7	10.2
3-Nov-09	7.3	12.4	14.5	12.8
6-Nov-09	4.5	7.1	5.8	6.7
9-Nov-09	34.1	21.0	12.4	20.7
12-Nov-09	7.4	8.7	8.4	8.8
15-Nov-09	10.7	11.2	10.7	11.9
18-Nov-09	9.2	11.2	8.9	12.4
21-Nov-09	6.5	11.0	9.0	9.0
24-Nov-09	13.1	16.7	14.3	21.1
27-Nov-09	8.1	8.5	10.7	8.7
30-Nov-09	8.3	9.8	8.3	13.4
3-Dec-09	11.8	17.1	12.8	16.1
6-Dec-09	3.7	4.9	4.6	4.6
9-Dec-09	8.6	11.6	9.1	10.8
12-Dec-09	2.6	4.7	3.3	3.6
15-Dec-09	8.7	9.9	8.7	11.8
18-Dec-09	15.5	14.4	13.7	17.2
21-Dec-09	14.4	16.8	13.6	18.4
24-Dec-09	12.3	18.2	21.7	15.4
27-Dec-09	20.4	22.4	18.9	28.0

**Table A-1
24-Hour Average PM_{2.5} Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)	Conc. (µg/m ³)
	30-Dec-09	7.9	12.4	9.6
2-Jan-10	6.8	7.7	9.3	19.0
5-Jan-10	6.6	9.5	9.1	10.8
8-Jan-10	17.5	21.6	14.1	22.1
11-Jan-10	11.1	14.1	10.7	17.7
14-Jan-10	6.5	7.9	7.8	7.5
17-Jan-10	6.2	9.0	6.0	7.5
20-Jan-10	4.4	5.9	4.1	3.2
23-Jan-10	7.5	10.4	8.7	8.7
26-Jan-10	8.9	12.1	10.6	12.1
29-Jan-10	9.2	12.1	8.6	
01-Feb-10	7.7	14.1	9.6	
04-Feb-10	4.0	6.4	5.2	6.2
07-Feb-10	2.8	3.9	3.7	3.4
10-Feb-10	4.5	7.1	6.7	8.1
13-Feb-10	9.4	9.6	10.0	10.8
16-Feb-10	10.4	12.2	9.8	13.4
19-Feb-10	3.4	5.2	4.4	4.6
22-Feb-10	2.1	2.8	5.7	3.4
25-Feb-10	2.8	4.7	3.2	4.5
28-Feb-10	4.8	6.4	4.6	5.7
03-Mar-10	1.9	2.0	1.9	2.8
06-Mar-10	1.5	2.9	3.2	2.8
09-Mar-10	2.5	2.6	2.6	3.6
12-Mar-10	5.4	6.3	3.0	6.4
15-Mar-10	7.0	7.0	6.5	9.0
18-Mar-10	6.3	8.0	11.4	7.8
21-Mar-10	7.4	10.9	8.3	12.5
24-Mar-10	6.9	8.3	7.4	8.3
27-Mar-10	7.2	8.1	7.3	8.7
30-Mar-10	2.5	2.9	3.4	3.4
02-Apr-10	3.4	4.7	4.1	4.3
05-Apr-10	2.7	2.2	7.2	2.6
08-Apr-10		6.9	7.6	8.0
11-Apr-10	6.9	8.2	7.8	8.1
14-Apr-10	3.5	6.2	5.3	6.1
17-Apr-10	4.9	7.3	6.9	7.3
20-Apr-10	2.4	3.2	3.0	3.3
23-Apr-10	5.2	6.0	5.7	5.4
26-Apr-10	12.6	16.2	13.6	16.3
29-Apr-10	2.9	3.3	3.5	3.3

Table A-1 24-Hour Average PM_{2.5} Concentrations in the Vicinity of the Port of Los Angeles				
Sample Date	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. (µg/m³)	Conc. (µg/m³)	Conc. (µg/m³)	Conc. (µg/m³)
12-Month Averages				
May 05 - Apr 06	12.6	10.2	10.6	13.7
May 06 - Apr 07	12.9	10.4	11.3	13.9
May 07 - Apr 08	12.7	10.1	10.8	11.8
May 08 - Apr 09	9.3	8.9	11.4	11.4
May 09 - Apr 10	8.3	7.3	8.6	9.3
<ul style="list-style-type: none"> • Annual PM_{2.5} National Ambient Air Quality Standard is 15 µg/m³ • Annual PM_{2.5} California Ambient Air Quality Standard is 12 µg/m³ • 24-hour PM_{2.5} National Ambient Air Quality Standard is 35 µg/m³ 				

**Table A-2
24-Hour Average PM₁₀ Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Port of Los Angeles Monitoring Site	
	Wilmington Community Site	Coastal Boundary Site
	Conc. (µg/m ³)	Conc. (µg/m ³)
1-May-09	30.6	28.1
4-May-09	15.8	18.6
7-May-09	33.7	36.8
10-May-09	26.8	26.1
13-May-09	30.7	28.0
16-May-09	71.0	30.5
19-May-09	22.0	17.7
22-May-09	26.9	23.3
25-May-09	21.1	20.4
28-May-09	25.2	21.2
31-May-09	12.0	10.0
3-Jun-09	14.5	10.3
6-Jun-09	6.1	6.3
9-Jun-09		15.4
12-Jun-09	13.7	13.6
15-Jun-09	8.3	8.8
18-Jun-09	21.7	19.6
21-Jun-09	21.4	26.2
24-Jun-09	22.9	21.0
27-Jun-09	26.1	25.2
30-Jun-09	24.1	24.2
3-Jul-09	24.4	23.2
6-Jul-09	20.9	20.3
9-Jul-09	22.9	21.0
12-Jul-09	21.9	30.2
15-Jul-09	30.0	28.8
18-Jul-09	18.7	22.0
21-Jul-09	23.8	20.2
24-Jul-09	22.2	
27-Jul-09	19.6	22.7
30-Jul-09	14.9	14.1
2-Aug-09	14.1	14.9
5-Aug-09	20.3	21.9
8-Aug-09	22.5	24.0
11-Aug-09	17.2	15.4
14-Aug-09	18.5	18.2
17-Aug-09	32.3	28.4
20-Aug-09	18.6	16.7
23-Aug-09	17.8	20.5
26-Aug-09	26.7	35.6
29-Aug-09	29.4	47.4

**Table A-2
24-Hour Average PM₁₀ Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Port of Los Angeles Monitoring Site	
	Wilmington Community Site	Coastal Boundary Site
	Conc. (µg/m ³)	Conc. (µg/m ³)
1-Sep-09	23.2	23.0
4-Sep-09	27.8	28.7
7-Sep-09	23.1	25.2
10-Sep-09	28.0	26.8
13-Sep-09	13.8	15.1
16-Sep-09	21.0	23.7
19-Sep-09	20.7	20.5
22-Sep-09	26.8	23.5
25-Sep-09	27.3	30.1
28-Sep-09	32.5	24.6
1-Oct-09	40.0	50.0
4-Oct-09	29.3	27.1
7-Oct-09	24.9	26.5
10-Oct-09	20.8	16.8
13-Oct-09	9.7	10.4
16-Oct-09	29.1	32.3
19-Oct-09	11.6	10.7
22-Oct-09	28.5	20.3
25-Oct-09	24.6	25.8
28-Oct-09	44.2	42.9
31-Oct-09	28.3	23.0
3-Nov-09	22.2	14.9
6-Nov-09	18.9	14.7
9-Nov-09	44.0	
12-Nov-09	26.3	22.5
15-Nov-09	27.3	26.7
18-Nov-09	30.4	29.5
21-Nov-09	24.3	19.4
24-Nov-09	48.9	51.4
27-Nov-09	30.9	26.2
30-Nov-09	26.1	36.0
3-Dec-09	36.7	34.0
6-Dec-09	18.9	18.7
9-Dec-09	25.3	23.2
12-Dec-09	9.8	11.3
15-Dec-09	22.9	26.5
18-Dec-09	32.2	50.9
21-Dec-09	37.0	43.8
24-Dec-09	50.6	35.3
27-Dec-09	40.0	39.7
30-Dec-09	24.4	19.7
2-Jan-10	20.6	30.2

Table A-2 24-Hour Average PM₁₀ Concentrations in the Vicinity of the Port of Los Angeles		
Sample Date	Port of Los Angeles Monitoring Site	
	Wilmington Community Site	Coastal Boundary Site
	Conc. (µg/m³)	Conc. (µg/m³)
5-Jan-10	25.8	25.0
8-Jan-10	34.5	53.6
11-Jan-10	31.7	45.0
14-Jan-10	22.4	33.8
17-Jan-10	19.9	19.9
20-Jan-10	18.0	25.2
23-Jan-10	20.1	20.5
26-Jan-10	26.0	25.7
29-Jan-10	25.7	24.1
1-Feb-10	30.8	29.0
4-Feb-10	18.0	15.8
7-Feb-10	13.6	13.8
10-Feb-10	17.7	12.1
13-Feb-10	27.5	32.4
16-Feb-10	28.8	46.2
19-Feb-10	10.2	11.1
22-Feb-10	11.8	15.4
25-Feb-10	11.0	13.8
28-Feb-10	11.3	17.0
3-Mar-10	8.3	12.6
6-Mar-10	9.8	9.0
9-Mar-10	12.8	13.2
12-Mar-10	17.4	20.5
15-Mar-10	20.1	28.1
18-Mar-10	28.3	28.7
21-Mar-10	23.4	25.7
24-Mar-10	26.5	25.7
27-Mar-10	29.4	35.9
30-Mar-10	15.6	17.4
2-Apr-10	17.9	17.4
5-Apr-10	12.9	17.1
8-Apr-10	21.8	27.7
11-Apr-10	25.8	26.9
14-Apr-10	19.3	19.4
17-Apr-10	22.2	20.1
20-Apr-10	11.5	12.2
23-Apr-10	19.0	21.7
26-Apr-10	27.7	
29-Apr-10	18.4	18.6
12-Month Averages		
May 05 - Apr 06	28.7	---
May 06 - Apr 07	28.6	---

Table A-2 24-Hour Average PM₁₀ Concentrations in the Vicinity of the Port of Los Angeles		
Sample Date	Port of Los Angeles Monitoring Site	
	Wilmington Community Site	Coastal Boundary Site
	Conc. (µg/m³)	Conc. (µg/m³)
May 07 - Apr 08	28.5	- - -
May 08 - Apr 09	25.9	21.7
May 09 - Apr 10	23.5	24.0
<ul style="list-style-type: none"> • Annual PM10 average at Coastal Boundary Site for the 2008/2009 period is based on 9 months of data. • California Annual Ambient Air Quality Standard for PM₁₀ is 20 µg/m³ • There is currently no National Annual Ambient Air Quality Standard for PM₁₀ 		

**Table A-3
24-Hour Average Elemental Carbon Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Port of Los Angeles Monitoring Sites			
	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)
1-May-09	0.7	1.1		0.9
4-May-09	0.1	0.3	0.3	0.2
7-May-09	0.4	0.9	0.6	1.0
10-May-09	0.1	0.5	0.6	0.2
13-May-09	0.2	0.7	0.3	0.3
16-May-09	0.1	0.5	0.9	0.4
19-May-09	0.1	0.4	0.4	0.7
22-May-09	0.1	0.2	0.1	0.2
25-May-09	0.1	0.3	0.1	0.4
28-May-09	0.2	0.4	0.4	0.4
31-May-09	0.2	0.1	0.1	0.2
3-Jun-09	0.1	0.5	0.4	0.6
6-Jun-09	0.0	0.1	0.1	0.5
9-Jun-09	0.2	0.6	0.2	0.7
12-Jun-09	0.1	0.4	0.3	0.3
15-Jun-09	0.2	0.3	0.2	0.3
18-Jun-09	0.1	0.4	0.5	0.5
21-Jun-09	0.1	0.2	0.2	0.4
24-Jun-09	0.1	0.2	0.4	0.6
27-Jun-09	0.1		0.3	0.6
30-Jun-09	0.1		0.3	0.9
3-Jul-09	0.0	0.5	0.4	0.5
6-Jul-09	0.3	0.6	0.5	0.6
9-Jul-09	0.2	0.6	0.5	0.7
12-Jul-09	0.4	1.1	0.5	0.6
15-Jul-09	0.2	0.7	0.6	0.8
18-Jul-09	0.2	0.8	0.4	1.1
21-Jul-09	0.5	1.2	0.8	0.9
24-Jul-09	0.3	0.6	0.4	0.2
27-Jul-09	0.3	0.8	0.6	0.9
30-Jul-09	0.2	0.3	0.3	0.2
2-Aug-09	0.3	0.8	0.7	0.4
5-Aug-09	0.2	0.8	0.6	1.0
8-Aug-09	0.4	0.6	0.2	0.4
11-Aug-09	0.2	0.6	0.4	0.6
14-Aug-09	0.4	0.7	0.7	0.7
17-Aug-09	0.5	0.9	0.4	0.7
20-Aug-09	0.4	0.5	0.4	0.7
23-Aug-09	0.0	0.4	0.2	0.5
26-Aug-09	0.9	2.6	0.9	2.2

**Table A-3
24-Hour Average Elemental Carbon Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Port of Los Angeles Monitoring Sites			
	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)
29-Aug-09	0.7	1.3	0.7	1.6
1-Sep-09	0.4	0.8	0.8	1.0
4-Sep-09	0.4	0.7	0.9	0.7
7-Sep-09	0.2	0.5	0.2	0.2
10-Sep-09	0.3	0.8	0.7	1.0
13-Sep-09	0.1	0.2	0.2	0.2
16-Sep-09	0.3	0.8	0.5	0.9
19-Sep-09	0.3	0.5	0.3	0.5
22-Sep-09	0.4	1.4	0.7	1.4
25-Sep-09	0.8	2.1	1.2	2.1
28-Sep-09	0.5		0.5	0.7
29-Sep-09				0.8
1-Oct-09	0.9	1.2	1.4	1.4
4-Oct-09	0.0	0.1	0.0	0.0
7-Oct-09	0.3	0.3	0.3	0.8
10-Oct-09	0.3	0.6	0.2	0.6
13-Oct-09	0.1	0.5	0.3	0.8
16-Oct-09	1.1	1.7	1.8	2.1
19-Oct-09	0.0	0.2	0.4	0.5
22-Oct-09	0.6	1.0	1.6	1.3
25-Oct-09	0.6	1.0	1.0	0.8
28-Oct-09	0.1	0.4	0.1	0.5
31-Oct-09	1.0	2.1	1.6	2.3
3-Nov-09	0.8	2.0	1.8	2.9
6-Nov-09	0.7	0.8	0.8	1.0
9-Nov-09		2.0	1.1	2.7
12-Nov-09	0.7	0.9	1.4	1.3
15-Nov-09	1.3	1.3	1.2	1.8
18-Nov-09	1.5	1.7	1.6	2.2
21-Nov-09	1.0	1.4	1.3	2.2
24-Nov-09	2.6	2.6	2.4	4.8
27-Nov-09	1.3	1.2	1.8	1.5
30-Nov-09	1.8	1.8	1.1	2.6
3-Dec-09	1.2	1.6	1.5	2.2
6-Dec-09	0.0	0.2	0.2	0.3
9-Dec-09	1.4	1.9	1.6	2.6
12-Dec-09	0.3	0.5	0.4	0.6
15-Dec-09	1.2	1.8	1.5	3.2
18-Dec-09	3.5	2.6	3.3	4.2
21-Dec-09	2.3	3.1	2.8	3.8
24-Dec-09	2.3	3.3	4.4	2.8

**Table A-3
24-Hour Average Elemental Carbon Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Port of Los Angeles Monitoring Sites			
	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)
27-Dec-09	2.0	1.7	2.5	3.1
30-Dec-09	1.2	2.0	1.8	2.3
2-Jan-10	1.3	1.2	1.6	2.1
5-Jan-10	1.2	2.0	2.3	2.8
8-Jan-10	2.4	2.9	2.1	3.4
11-Jan-10	1.6	3.4	2.2	3.6
14-Jan-10	0.9	1.9	1.4	1.7
17-Jan-10	0.7	1.4	0.9	1.2
20-Jan-10	0.8	0.6	0.6	0.9
23-Jan-10	1.8	1.8	1.9	2.5
26-Jan-10	1.7	1.9	1.6	2.4
29-Jan-10	1.6	2.0	1.7	2.5
01-Feb-10	1.2	1.7	1.6	2.0
04-Feb-10	0.2	1.0	0.7	0.9
07-Feb-10	0.2	0.2	0.4	0.7
10-Feb-10	0.8	1.5	1.7	2.1
13-Feb-10	1.4	2.2	1.8	2.6
16-Feb-10	1.6	2.2	1.7	2.9
19-Feb-10	0.0	0.3	0.1	0.2
22-Feb-10	0.0	0.4	0.4	0.3
25-Feb-10	0.4	0.9	0.6	1.1
28-Feb-10	0.7	1.0	0.9	1.0
03-Mar-10	0.3	0.4	0.3	0.5
06-Mar-10	0.0	0.4	0.4	0.4
09-Mar-10	0.1	0.1	0.2	0.2
12-Mar-10	0.7	1.0	0.1	1.1
15-Mar-10	1.3	1.0	1.0	1.8
18-Mar-10	0.4	1.0	0.8	0.9
21-Mar-10	0.5	1.3	0.9	1.2
24-Mar-10	0.6	0.7	0.6	0.6
27-Mar-10	0.9	0.8	0.6	1.2
30-Mar-10	0.1	0.0	0.1	0.2
2-Apr-10	0.3	0.7	0.4	0.8
5-Apr-10	0.1	0.0	0.0	0.1
8-Apr-10		1.0	1.1	1.3
11-Apr-10	0.1	0.3	0.2	0.1
14-Apr-10	0.4	0.7	0.8	1.0
17-Apr-10	0.3	0.8	0.6	0.8
20-Apr-10	0.0	0.0	0.1	0.5
23-Apr-10	0.6	0.6	0.6	1.0
26-Apr-10	0.4	0.5	0.5	0.7

**Table A-3
24-Hour Average Elemental Carbon Concentrations in the
Vicinity of the Port of Los Angeles**

Sample Date	Port of Los Angeles Monitoring Sites			
	Wilmington Community Site	Coastal Boundary Site	San Pedro Community Site	Source- Dominated Site
	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)	Conc. ($\mu\text{g}/\text{m}^3$)
29-Apr-10	0.1	0.0	0.1	0.2
12-Month Averages				
May 05 – Apr 06	1.5	1.1	1.5	2.5
May 06 – Apr 07	1.7	1.2	1.6	2.6
May 07 – Apr 08	1.1	1.1	1.4	2.0
May 08 – Apr 09	0.9	0.8	1.2	1.7
May 09 - Apr 10	0.8	0.6	1.0	1.2