# PORT OF LONG BEACH
# AIR QUALITY MONITORING PROGRAM:
# ANNUAL SUMMARY REPORT
# CALENDAR YEAR 2010

***Prepared For:***

Port of LONG BEACH
The Green Port

***Prepared By:***

SAIC
From Science to Solutions

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## Table of Contents

# List of Acronyms

| | |
|---|---|
| **AQ** | Air Quality |
| **BAM** | Beta Attenuation Monitor |
| **CAAP** | Clean Air Action Program |
| **CAAQS** | California Ambient Air Quality Standard |
| **CARB** | California Air Resources Board |
| **CFR** | Code of Federal Regulations |
| **CO** | Carbon Monoxide |
| **DPM** | Diesel Particulate Matter |
| **DRI** | Desert Research Institute |
| **EC** | Elemental Carbon |
| **FEM** | Federal Equivalent Method |
| **FRM** | Federal Reference Method |
| **GP** | Gull Park |
| **NAAQS** | National Ambient Air Quality Standard |
| **NLB** | North Long Beach |
| **$NO_2$** | Nitrogen Dioxide |
| **$O_3$** | Ozone |
| **OC** | Organic Carbon |
| **PCH** | Pacific Coast Highway |
| **PM** | Particulate Matter |
| **$PM_{2.5}$** | Particulate Matter Less than 2.5 microns in aerodynamic diameter |
| **$PM_{10}$** | Particulate Matter Less than 10 microns in aerodynamic diameter |
| **POLA** | Port of Los Angeles |
| **POLB** | Port of Long Beach |
| **Port** | Port of Long Beach |
| **PPM** | Parts per million |
| **PAH** | Polycyclic Aromatic Hydrocarbon |
| **QA** | Quality Assurance |
| **ROI** | Region of Influence |
| **SB** | Superblock |
| **SC** | Suspected Carcinogen |
| **SoCAB** | South Coast Air Basin |
| **SCAQMD** | South Coast Air Quality Management District |
| **SFS** | Sequential Filter Samplers |
| **$SO_2$** | Sulfur Dioxide |
| **USEPA** | United States Environmental Protection Agency |

# Air Quality Monitoring Program at the Port of Long Beach 2010 Summary Report

## 1 Introduction

This report for the air quality monitoring program at the Port of Long Beach (Port or POLB) summarizes the data collected during calendar year 2010 (CY2010). In addition, the report will review the preliminary trends shown in the air quality data during the first four-year period of record (2007-2010). There are four gaseous criteria air pollutants measured on a real-time basis under this program: carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), and ozone ($O_3$). In addition, particulate matter is measured at the 10 micron and 2.5 microns size thresholds ($PM_{10}$ and $PM_{2.5}$, respectively) using two methods: (a) traditional filter-based samplers which are the Federal Reference Method (FRM); and (b) on a continuous basis using beta attenuation monitors (BAM) which are designated a Federal Equivalent Method (FEM). In addition, meteorological parameters are continuously measured. Data from the program are available for public review at the San Pedro Bay Ports Clean Air Action Plan website: http://www.cleanairactionplan.org.

The data collected at the Port's monitoring stations during CY2010 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.

### *1.1 Factors Affecting the Monitoring Data*

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 (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 sulfur dioxide ($SO_2$), are more localized in nature.

Emissions from port-related goods movement are an important contributor to air pollution levels in the SoCAB region. Figures 1 and 2 compare the Port's contribution to the regional emissions for nitrogen oxides ($NO_X$) and diesel particulate emissions (DPM) in the SoCAB in CY2009; the most recent year for which data are available. DPM emissions, an important air toxic, are also an important contributor to $PM_{2.5}$ concentrations. As shown below, port-related mobile source emissions are estimated to contribute about 3% of regional $NO_X$ emissions and 5% of regional DPM emissions (based on CY2009 data).

**Figure 1. 2009 $NO_X$ Emissions in the SoCAB (mass percent)[1]**

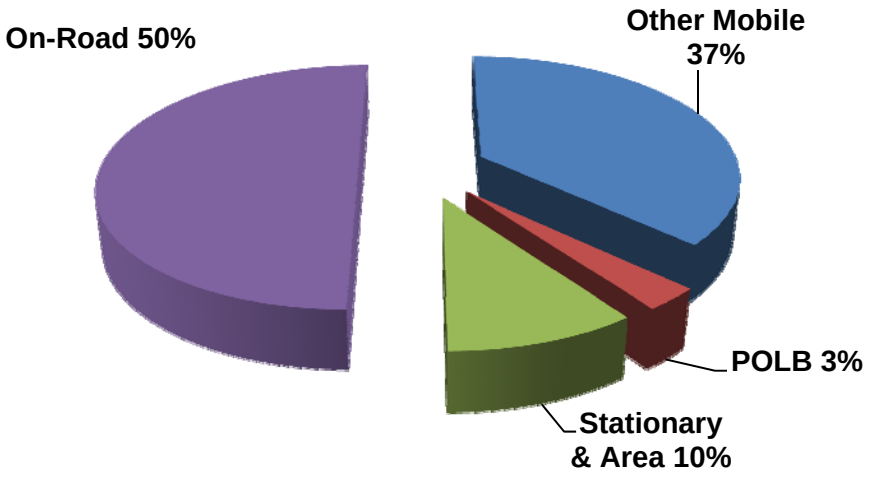
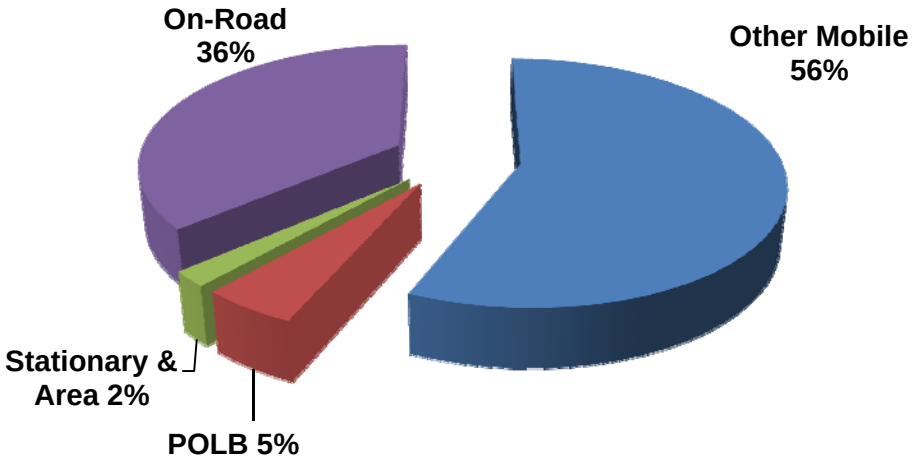



**Figure 2. 2009 DPM Emissions in the SoCAB (mass percent)**

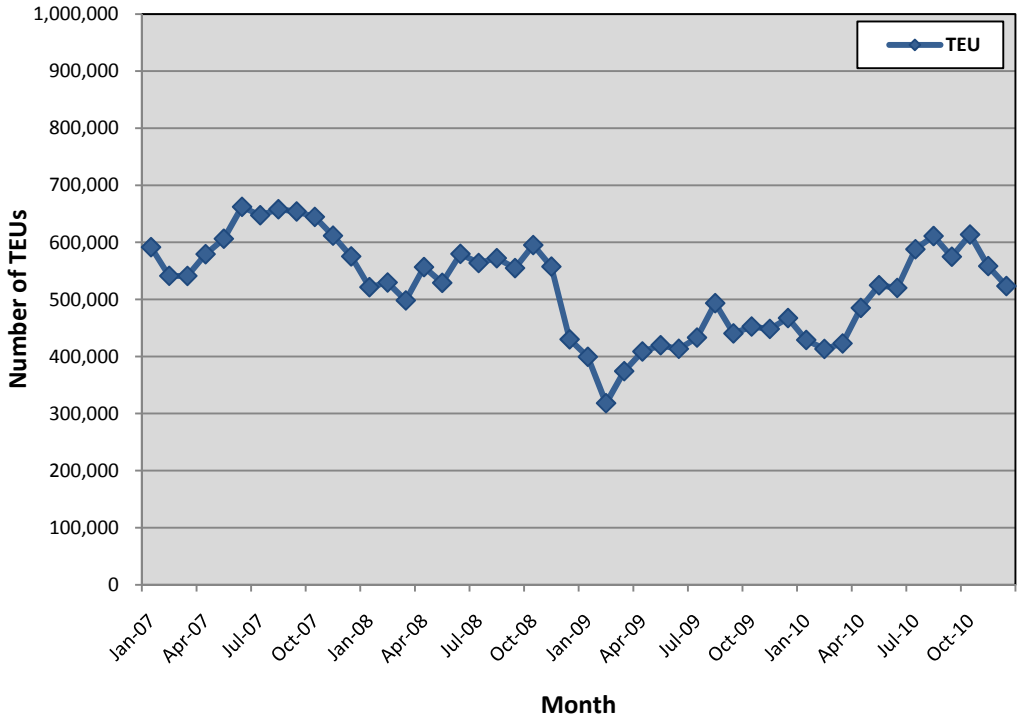



[1] Port of Long Beach Air Emissions Inventory – 2009. Starcrest Consulting Group LLC. (http://www.polb.com). June, 2010.

As shown in the Port's Annual Air Emissions Inventories, port-related air pollutant emissions have been declining in recent years (Port of Long Beach, 2009). 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 port-related goods movement sources such as heavy duty trucks, ocean going vessels, and cargo handling equipment. Between 2005, the CAAP baseline year, and 2009, emissions associated with Port of Long Beach operations showed a 52% reduction in DPM, a 46% reduction in sulfur oxides ($SO_x$) and a 35% reduction in $NO_x$.

In 2008 through 2009, the decrease in port-related emissions was also affected in part by a 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 30% lower in CY2009 as compared to CY2007. In CY2010 container throughput rebounded by about 20% compared to 2009, but it was still about 14% below cargo volumes seen in 2007. Monthly POLB container throughput (TEU) data for CY2007-2010 are shown in Figure 3.

**Figure 3. POLB Container Throughput (TEU), 2007-2010[2]**




Lastly, 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, it is not presently known how much of any decrease (or increase) in ambient air pollutant concentrations measured at the Port's air monitoring stations can be attributed to goods movement-focused measures under the CAAP.

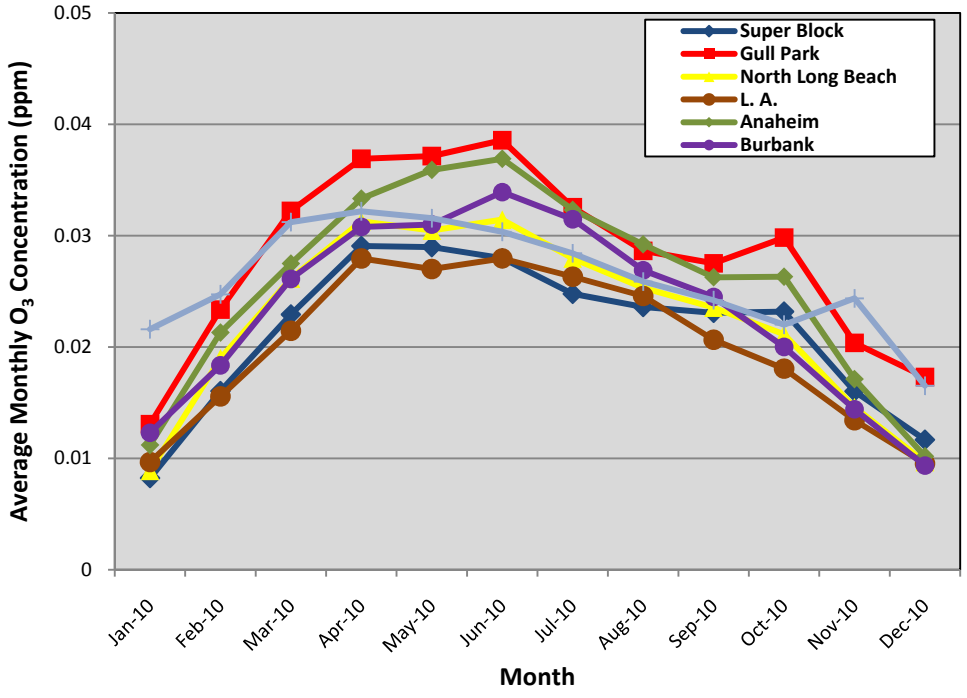
[2] Port of Long Beach container throughput at: http://www.polb.com/economics/stats/teus_archive.asp

For the gaseous air pollutants (i.e., $O_3$, CO, $NO_2$, and $SO_2$), ambient air concentrations measured at the Port's stations were below NAAQS or CAAQS levels during CY2010, with the exception of the 1-hour $O_3$ CAAQS at the Gull Park station and the new 1-hour $NO_2$ NAAQS at the Superblock station. The 1-hour $O_3$ CAAQS was exceeded once at the Gull Park station, and the latest 3-year average (2008-2010) of the 98$^{th}$ percentile 1-hour average $NO_2$ concentration at the Superblock station slightly exceeded (by 2 percent) the new 1-hour $NO_2$ NAAQS (see Section 3.1.2 for details).

$PM_{2.5}$ measurements at the Port were below the annual average and 24-hour NAAQS, and below the annual average CAAQS standards during the reporting period (there is no separate $PM_{2.5}$ 24-hour CAAQS). $PM_{10}$ measurements at the Port's stations were below the NAAQS levels during the reporting period, but exceeded the more restrictive annual average and 24-hour average CAAQS standards. The annual average $PM_{10}$ CAAQS was exceeded at both stations. The 24-hour $PM_{10}$ CAAQS was exceeded one time by the Gull Park station and fifteen times at the Superblock station.

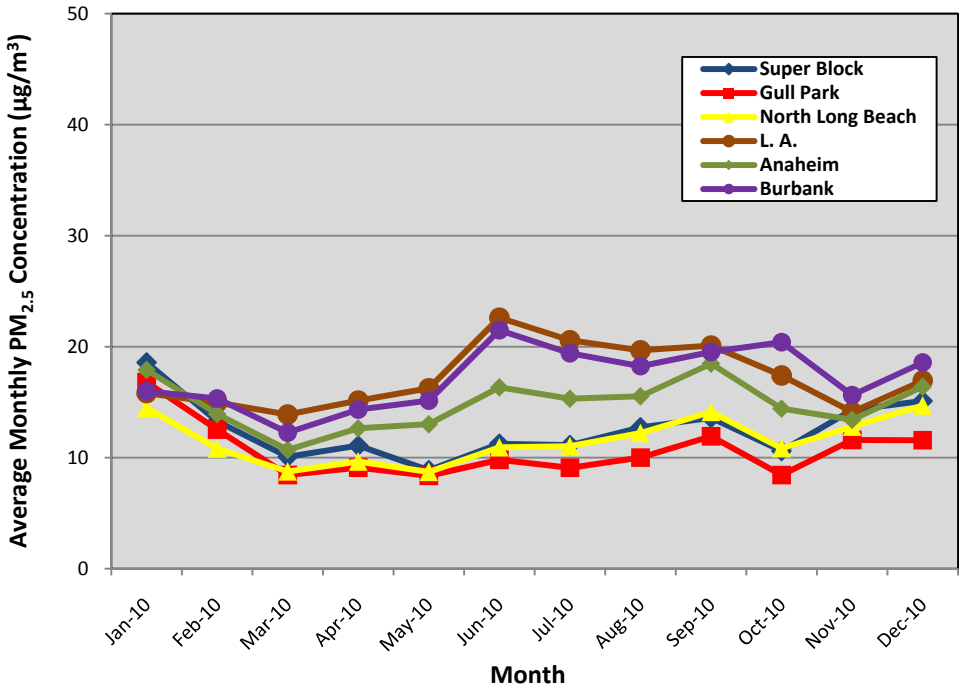
Data collected at the Port's stations were similar to data collected by the SCAQMD's stations located throughout the SoCAB region. Figure 4 compares the ozone concentrations measured at the Port's stations to selected SCAQMD stations during 2010, while Figure 5 compares the $PM_{2.5}$ measurements (BAM) for the same period.

**Figure 4. Average Monthly Ozone Concentrations (ppm) at the Port Stations and Selected SCAQMD Stations, CY2010[3]**




[3] Data from SCAQMD stations available at: http://www.arb.ca.gov/aqmis2/aqdselect.php

**Figure 5. Average Monthly $PM_{2.5}$ Concentrations ($\mu g/m^3$) at the Port Stations and Selected SCAQMD Stations, CY2010**




As shown in figures 4 and 5, the ozone and $PM_{2.5}$ levels in the Port were within the range observed at other monitoring stations in the South Coast Air Basin.

# 2 Monitoring Program Background

## *2.1 Objectives of the Study*

The Port of Long Beach developed a plan for an air monitoring program in 2005 to collect representative ambient air quality and meteorological data within the area of the Port's Harbor District. Start-up of the monitoring program was achieved in late 2006. The Port's network consists of two monitoring stations, located in the Inner Harbor and the Outer Harbor areas. Data on the following parameters are being collected:

- Real-time measurement of ambient air quality concentrations for nitrogen dioxide ($NO_2$), ozone ($O_3$), carbon monoxide (CO), sulfur dioxide ($SO_2$), particulate matter (PM) less than 10 microns in aerodynamic diameter ($PM_{10}$), and particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$).

- Integrated 24-hour ambient measurement of $PM_{10}$ and $PM_{2.5}$ concentrations, using traditional filter-based samplers.

- Real-time measurement of meteorological parameters, including wind direction, wind speed, ambient temperature, humidity, barometric pressure, precipitation, and solar radiation.

This annual report documents the findings of this program for January through December 2010. The goals of this program are to determine compliance of the area surrounding the Port with the National and State of California ambient air quality standards, and to communicate that information to the communities surrounding the Port.

This monitoring program is an integral part of the Port's commitment to improve the air quality through the CAAP. The environmental information collected by this program is used to provide a better understanding of the air quality and meteorological conditions in the Port area and to provide feedback on the Port's air quality improvement efforts.

## *2.2 Study Planning*

After establishing the overall goal of the program, the Port held extensive discussions with their technical consultants to finalize the details of the monitoring program and to generate a preliminary work plan. This preliminary work plan also received input from both SCAQMD and the California Air Resources Board (CARB). The preliminary work plan was revised to reflect the comments of these two agencies and a final copy of the work plan was then generated (Port 2008b).

As outlined in the work plan, a siting analysis was conducted and the Port identified a number of sites that could potentially be used for the air quality monitoring program. These sites were reviewed for site availability, physical infrastructure, security, proximity to the Port's emission sources and local environment, as well as regulations set forth in Title 40, Code of Federal Regulation (CFR), Part 58 and the United States Environmental Protection Agency (USEPA) Quality Assurance Handbook for Air Pollution Measurement Systems. The results of the siting analysis identified two monitoring station sites, one in the Inner Harbor area, and one in the Outer Harbor area, that were considered to best fit the criteria established for the monitoring program. These candidate sites were reviewed by SCAQMD, who concurred with the proposed locations. Additionally, both sites have been used to further expand on the other regional air quality monitoring efforts within the area, including programs operated by the Port of Los Angeles (POLA), SCAQMD, and CARB.

### 2.2.1 Location of the Monitoring Stations

The locations of the two monitoring stations are shown in Figure 6 and a description of each is given below.

> **Superblock" Inner Harbor Station (33$^{o}$ 46' 54.07" N, 118$^{o}$ 12' 48.93" W)** – This site is located near the intersection of Canal Avenue and 12$^{th}$ Street, is owned by the Port and is known as "Superblock." Superblock is a large paved area used as cargo storage (e.g. shipping containers and cars) and staging site and is heavily populated with mobile sources of air pollution (i.e. on-road diesel trucks); in addition the surrounding area is being used for commercial/industrial operations. There are several smaller container distribution sites and smaller stationary sources present near the Superblock as well. The major roadways in the area are not directly adjacent to the site, minimizing near-field sampling bias from mobile sources on these roadways. The Superblock location is situated downwind of the Port during onshore air flow patterns, and is


**Figure 6: Locations of Air Quality Monitoring Stations at the Port of Long Beach**

representative of the heavily industrialized setting that is the Inner Harbor area. Based on information gathered from the Port and from maps, photographs, and operations over the last four years, the site has adequate security and site access and no adverse geographical conditions.

**Navy Mole/Gull Park Outer Harbor Station (33 $^{o}$ 44' 40.26" N, 118 $^{o}$ 13' 05.14" W)** – The Gull Park site is located at the eastern end of the "Navy Mole" (i.e. eastern end of Nimitz Road), which is a peninsula that terminates at the Long Beach Channel. Unlike the Superblock site, there are no nearby stationary emission sources at the Gull Park site. However, sources that may impact the monitoring site at times include ocean-going vessels transiting the Long Beach Channel, as well as vessel and shore-side operations at the adjacent Sea Launch facility and other nearby Port terminals. The Gull Park site should have less impacts from Port related sources much of the time, and any impacts should be due primarily from ships and terminal operations, rather than on road trucks as is the case at the Superblock station. Based on information gathered from the Port and from maps, photographs and operations over the last four years, the site has adequate security and site access and no adverse geographical conditions.

## *2.3 Implementation of the Monitoring Program*

As part of the final work plan, the Port developed an Air Quality Monitoring Plan that outlines the design of the ambient air quality and meteorological monitoring stations including the specifications for all of the monitoring equipment, calibration systems, and flow recorders (Port 2010). The monitoring plan also specifies the locations for probes and samplers in a manner consistent with 40 CFR, Part 58 and the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems.

The Port's monitoring program also included the development of a Quality Assurance (QA) Plan that details all of the necessary quality assurance/control procedures for calibration and operation of the monitoring stations (Port 2010a). All QA methods are consistent with the USEPA requirements specified in Title 40 CFR, Part 58 and the USEPA Quality Assurance Handbook for Air Pollution Measurements Systems and the CARB Air Monitoring Quality Assurance Manual. Review and feedback on the draft monitoring and quality assurance plans were provided by the SCAQMD.

### 2.3.1 The Monitoring Network

As previously mentioned, the Port's monitoring program collects three different types of data: (1) air pollutant concentrations measured by real-time analyzers, (2) particulate matter (PM) concentrations measured by filter-based samplers and (3) meteorological data from real-time measurements. Each of the monitoring stations has the following four components:

#### 2.3.1.1 Integrated 24-hour PM Monitoring

$PM_{10}$ and $PM_{2.5}$ concentrations on a 24-hour integrated basis are measured using Federal Reference Method (FRM) monitors. FRM units operate on methods of sampling and analyzing ambient air that have been designated as a reference method in

accordance with 40 CFR Part 53. These monitors have an operational certification to measure 24-hr average concentrations for compliance with the NAAQS and CAAQS. The Superblock site contains FRM $PM_{10}$ and FRM $PM_{2.5}$ monitors, and the Gull Park site contains an FRM $PM_{10}$ monitor.

In order to further identify the particles that make up $PM_{2.5}$, samples can be collected on different filter media (Teflon and quartz) using a Sequential Filter Sampler (SFS) fabricated by the Desert Research Institute (DRI). Samples collected on these SFS units permits a detailed $PM_{2.5}$ speciation analysis which includes the concentration determination of elemental carbon (EC)/organic carbon (OC), various metals, ions and polycyclic aromatic hydrocarbons (PAH). Detailed $PM_{2.5}$ speciation was performed at both air monitoring stations during the 2007 and 2008 sampling period, but was not conducted in 2009 or in the current 2010 reporting period.

#### 2.3.1.2 Continuous Gaseous Pollutant Monitoring

Each station is equipped with analyzers to determine real-time air pollutant concentrations for the gaseous pollutants (i.e. NO-$NO_2$-$NO_x$, $O_3$, CO, and $SO_2$). These analyzers are FRM- or Federal Equivalent Method (FEM)-designated monitors and include the following:

- Pulsed Fluorescence $SO_2$ Analyzer
- Chemiluminescent NO-$NO_2$-$NO_x$ Analyzer
- Gas Filter Correlation CO Analyzer
- U.V. Photometric Ozone ($O_3$) Analyzer

In contrast to FRMs, FEMs are methods of sampling and analyzing ambient air that have been designated as an equivalent method in accordance with 40 CFR Part 53.

#### 2.3.1.3 Continuous Monitoring of PM

In addition to the Integrated 24-hr PM monitoring described above, both of the Port's monitoring stations are equipped to monitor $PM_{10}$ and $PM_{2.5}$ on a continuous and real-time basis. These data are collected with Beta Attenuation Monitors (BAMs) that measure $PM_{10}$ and $PM_{2.5}$ concentration at hourly intervals. The data collected by these instruments are used to supplement the filter-based data produced by the FRM units.

#### 2.3.1.4 Continuous Monitoring of Meteorological Parameters

Because meteorology greatly influences the transport and dispersion of pollutants in the atmosphere, each station is equipped with the necessary instrumentation to monitor various meteorological parameters such as ambient temperature, humidity, wind direction and speed, and barometric pressure. The Superblock station also has the necessary instrumentation to measure precipitation and solar radiation. These data are recorded in real-time and are then transmitted to a data logger which averages and stores the data.

### 2.3.2 Program Start Dates

The monitoring program officially began with the continuous monitoring of PM, gaseous criteria pollutants, and meteorological parameters at both the Superblock and Gull Park sites on October 1, 2006. The collection of filter-based (or gravimetric) samples from both of these sites started shortly thereafter, on November 22, 2006.

## *2.4 Development of Real-Time Data Presentation*

As part of the Port's air quality monitoring program, the Port has also developed a public web site to allow the public to see the data collected as part of this program. The web site (http://www.cleanairactionplan.org), allows the public to review the local air quality on a real-time basis and to see the effects of unusual environmental conditions (e.g. the southern California wildfires, Santa Ana conditions, etc.). The data on the program's web site is automatically uploaded on an hourly basis directly from the station data logger. Consequently, it is important to note as stated on the web site that the data on the web site should be considered as preliminary and has not been through a quality assurance review.

# 3 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, which are maximum pollutant limits that 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).

**Table 1. California and National Ambient Air Quality Standards**

| Pollutant | Averaging Times | California Standards | National Standards | |
|---|---|---|---|---|
| | | | Primary Standards | Secondary Standards |
| 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 Average | --- | 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 at the Port's air monitoring stations during January through December, 2010, draw comparisons to the NAAQS and CAAQS. These summaries include the following parameters: [1] CO, [2] $NO_2$, [3] $SO_2$, [4] $O_3$, [5] $PM_{10}$, and [6] $PM_{2.5}$. The wind speed and direction measurements collected during 2010 are also summarized. In addition to these written summaries, the data are presented in several ways:

1. Presentation of wind roses, which visually depict the distribution of winds at a site showing speed, direction and frequency (Figures A-1 to A-2).
2. Presentation of the air quality data in graphs (Figures A-3 to A-10).
3. Presentation of the air quality data in tables (Tables A-1 to A-28).

Since the tabular and graphic data presentations are quite extensive, most of the figures and many of the graphs are included in Appendix A. The figures and tables that have been included as part of Appendix A are denoted by the letter "A" in front of the number designation; for example, Figure A-1 and Table A-1 can be found in Appendix A.

## *3.1 Data Summary Calendar Year 2010*

### 3.1.1 CO Data Summary

Figure A-3 shows the average monthly concentrations 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. The highlights of this graph are:

- Average CO concentrations are low for this pollutant throughout the period.
- There is a slight increase in CO concentrations during the winter months, presumably 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.

CO averages are provided for the Superblock and Gull Park sites in Tables A-1 through A-3.

***NAAQS Compliance***

The NAAQS for CO are 9.0 ppm during an 8-hour period and 35 ppm during a 1-hour period, and are not to be exceeded more than once per year. During the 12-month reporting period, no exceedances of the NAAQS for CO were recorded at the Port's monitoring stations.

- Maximum 1-hour average CO concentrations were 4.4 and 2.7 ppm for the Superblock and Gull Park stations, respectively, and 4.0 ppm at the North Long Beach station as shown in Table 2. These are well below the 1-hour NAAQS of 35 ppm.

- Maximum 8-hour average CO concentrations were 2.6 and 2.1 ppm for the Superblock and Gull Park stations, respectively, and 2.1 ppm at the North Long Beach station as shown in Table 2. Thus, there were no exceedances of the 8-hour NAAQS of 9.0 ppm.

**TABLE 2. NAAQS Compliance - CO Concentrations Measured at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | CO Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | NAAQS |
| 1-hour | 2010 | 4.4 | 2.7 | 4.0 | 35 |
| 8-hour | 2010 | 2.6 | 2.1 | 2.1 | 9 |

***CAAQS Compliance***

The CAAQS for CO are 9.0 ppm during an 8-hour period and 20 ppm over a 1-hour period, and are not to be exceeded. During the 12-month reporting period, no exceedances of the CAAQS for CO were recorded at the Port's monitoring stations.

- Maximum 1-hour average CO concentrations were 4.4 and 2.7 ppm for the Superblock and Gull Park stations, respectively, and 4.0 ppm at the North Long Beach station as shown in Table 3. These are well below the 1-hour CAAQS of 20 ppm.

- Maximum 8-hour average CO concentrations were 2.6 and 2.1 ppm for the Superblock and Gull Park stations, respectively, and 2.1 ppm at the North Long Beach station. Thus there were no exceedances of the 8-hour CAAQS of 9.0 ppm.

**TABLE 3. CAAQS Compliance - CO Concentrations Measured at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | CO Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | CAAQS |
| 1-hour | 2010 | 4.4 | 2.7 | 4.0 | 20 |
| 8-hour | 2010 | 2.6 | 2.1 | 2.1 | 9 |

## 3.1.2 $NO_2$ Data Summary

Figure A-4 shows the average monthly concentrations of $NO_2$ over the period of record. The highlights of this graph are:

- Concentrations at the Superblock location are slightly higher than at the Gull Park location, potentially due to increased industrial activity near the Superblock site and its location downwind of sources in the port complex.

- The $NO_2$ concentrations follow an annual cyclical pattern during the reporting period. Average monthly $NO_2$ concentrations fall to a minimum level during the summer months and gradually increase into the winter. There are two possible explanations for this pattern:

    - The lower concentrations in the summer may be due to the complex series of atmospheric chemical reactions that exist between $NO_2$ and ground-level $O_3$.

    - The surface-based temperature inversions commonly present during the winter months may trap the $NO_2$ closer to the ground, thereby increasing the ground level concentration of this pollutant.

$NO_2$ averages are provided for the Superblock and Gull Park sites in Tables A-5 through A-7.

## ***NAAQS Compliance***

The NAAQS for $NO_2$ is an annual arithmetic mean of 0.053 ppm. In addition, effective January 22, 2010, EPA established a new 1-hour NAAQS for $NO_2$ which is attained when the 3-year average of the 98$^{th}$ percentile of the daily maximum 1-hour average does not exceed 0.100 ppm.

During the 12-month reporting period, the new 1-hour $NO_2$ NAAQS was exceeded at the Superblock station. The $NO_2$ annual average NAAQS was not exceeded.

- The latest 3-year (2008-2010) average of the 98$^{th}$ percentile $NO_2$ value was 0.103 ppm and 0.087 ppm at the Superblock and Gull Park stations, respectively, and 0.076 ppm at the North Long Beach station as shown in Table 4. Thus, the most recent data show that the 3-year average of the $NO_2$ value at the Superblock station exceeded the new 1-hour NAAQS for $NO_2$ (by 3 percent).

- The annual average $NO_2$ concentrations in 2010 were 0.025 and 0.018 ppm at the Superblock and Gull Park stations, respectively. These concentrations are well below the $NO_2$ annual average NAAQS of 0.053 ppm.

**TABLE 4. NAAQS Compliance - $NO_2$ Concentrations Measured at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $NO_2$ Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | NAAQS |
| 1-hour | 3-year Average (2008-2010) | 0.103 | 0.087 | 0.076 | 0.100 |
| Annual (Arithmetic Mean) | Annual Average (2010) | 0.025 | 0.018 | - | 0.053 |

***CAAQS Compliance***

The CAAQS for $NO_2$ is an annual arithmetic mean of 0.030 ppm. The 1-hour CAAQS is attained when the daily maximum 1-hour average does not exceed 0.18 ppm. Both are not to be exceeded. During the 12-month reporting period, there were no exceedances of the CAAQS for either the annual mean or 1-hour period.

- In 2010, the 98$^{th}$ percentile of the maximum 1-hour $NO_2$ concentrations were 0.101 ppm and 0.082 ppm at the Superblock and Gull Park stations, respectively, and 0.070 ppm for nearest SCAQMD station in North Long Beach, as shown in Table 5. (Comparison of the $NO_2$ data with data from additional SCAQMD stations is provided in Table A-5.) These concentrations were below the $NO_2$ 1-hour CAAQS of 0.18 ppm.

- The annual average $NO_2$ concentrations in 2010 were 0.025 and 0.018 ppm at the Superblock and Gull Park stations, respectively. These concentrations are well below the $NO_2$ annual average CAAQS of 0.030 ppm.

**TABLE 5. CAAQS Compliance - $NO_2$ Concentrations Measured at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $NO_2$ Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | CAAQS |
| 1-hour | 2010 | 0.101 | 0.082 | 0.070 | 0.18 |
| Annual (Arithmetic Mean) | Annual Average (2010) | 0.025 | 0.018 | - | 0.030 |

## 3.1.3 $O_3$ Data Summary

Figure A-4 shows the average monthly concentration of $O_3$ over the period of record. Additionally, figure 4 (shown in section 1.1) presents the average monthly concentrations of $O_3$ during 2010 for the Port stations and several SCAQMD stations operated in the SoCAB.

- The graph shows that $O_3$ concentrations peak during the summer months at each station, because the photochemical reactions required to produce $O_3$ are stronger during the summer ($O_3$ is a secondary pollutant formed from VOCs and $NO_x$ in the presence of sunlight).

- The graph also illustrates that the average monthly $O_3$ concentrations at the two Port stations are in the range of those found at the SoCAB stations.

    - The monthly average $O_3$ concentrations measured at the Gull Park station are generally higher than other nearby stations, including the Superblock station. Despite the fact that the Superblock station is in a more industrial location with localized emission sources, such as heavy duty trucks. Both

stations are exposed to similar regional levels of $O_3$, but it is likely that the NO emissions from the trucks around the Superblock station deplete the local ozone levels around that location through atmospheric chemical reactions.

$O_3$ data are presented for the Superblock and Gull Park sites in Tables A-9 through A-12.

## *NAAQS Compliance*

The 8-hour average $O_3$ NAAQS is met when the fourth-highest 8-hour concentration in a year, averaged over three years, is equal to or less than 0.075 ppm. During the reporting period there were no exceedances for the $O_3$ NAAQS. The following maximum $O_3$ concentrations were observed:

- For compliance with the NAAQS during latest 3-year period (2008-2010), the average fourth-highest 8-hour $O_3$ concentrations were 0.056 ppm and 0.059 ppm at the Superblock and Gull Park stations, respectively, and 0.062 ppm at the North Long Beach station, as shown in Table 6. These concentrations are below the 8-hour NAAQS.

**TABLE 6. NAAQS Compliance - Fourth-highest 8-hour Average $O_3$ concentrations at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $O_3$ Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | NAAQS |
| 8-hour | 3-year Average (2008-2010) | 0.056 | 0.059 | 0.062 | 0.075 |

## *CAAQS Compliance*

The CAAQS for $O_3$ are 0.070 ppm during an 8-hour period and 0.09 ppm over a 1-hour period, and are not to be exceeded. During the reporting period, the Gull Park station recorded exceedances of both the maximum 1-hour average CAAQS and maximum 8-hour CAAQS for $O_3$. The following maximum $O_3$ concentrations were observed:

- Maximum 1-hour average $O_3$ concentrations were 0.089 and 0.094 ppm for the Superblock and Gull Park stations, respectively. The Gull Park station observed one exceedance of the 1-hour $O_3$ CAAQS of 0.09 ppm. For comparison, the maximum 1-hour average $O_3$ concentrations during 2010 were 0.101 and 0.120 ppm at the North Long Beach and downtown Los Angeles SCAQMD monitoring stations, respectively, which also exceeded 1-hour $O_3$ CAAQS.

- In 2010, the maximum 8-hour average $O_3$ values were 0.070 ppm and 0.073 ppm at the Superblock and Gull Park stations, respectively, and 0.084 ppm for the nearest SCAQMD station in North Long Beach. (Comparison of $O_3$ data with data from additional SCAQMD stations is provided in Table A-9.) The concentrations at the Gull Park and North Long Beach stations both exceeded the $O_3$ 8-hour CAAQS of 0.070 ppm. The Gull Park station observed one exceedance of the 8-hour CAAQS.

**TABLE 7. CAAQS Compliance - Fourth-highest 8-hour Average $O_3$ Concentrations at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $O_3$ Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | CAAQS |
| 1-hour | 2010 | 0.089 | 0.094 | 0.101 | 0.09 |
| 8-hour | 2010 | 0.070 | 0.073 | 0.084 | 0.070 |

## 3.1.4 $SO_2$ Data Summary

Figure A-6 shows the average monthly concentration of $SO_2$ over the period of record (monthly averages are used in the figure for clarity in showing long-term trends in the data, not because it is related to a standard). Figure A-6 shows that $SO_2$ concentrations remained relatively constant over the period of record.

$SO_2$ averages are provided for the Superblock and Gull Park sites in Tables A-14 through A-17.

***NAAQS Compliance***

Effective August 23, 2010, EPA established a new 1-hour NAAQS for $SO_2$ which is attained when the 3-year average of the 99$^{th}$ percentile of the daily maximum 1-hour average does not exceed 0.075 ppm. The secondary NAAQS for $SO_2$ is a 3-hour average is attained if the second highest daily 3-hour maximum does not exceed 0.5 ppm. (Primary standards are designed to protect public health, while secondary standards are designed to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation and buildings). During the reporting period, no exceedances of the NAAQS for $SO_2$ were recorded at the Port's monitoring stations.

- The latest 3-year (2008-2010) average of the 99$^{th}$ percentile $SO_2$ concentration was 0.062 ppm and 0.047 ppm at the Superblock and Gull Park stations, respectively, and 0.028 ppm at the North Long Beach station, as shown in Table 8. These are below the new 1-hour NAAQS for $SO_2$ of 0.075 ppm.

- The second highest 3-hour average $SO_2$ concentrations in 2010 were 0.031 ppm and 0.021 ppm at the Superblock and Gull Park stations, respectively, and 0.077 ppm at North Long Beach. These concentrations are below the 3-hour average $SO_2$ NAAQS.

**TABLE 8. NAAQS Compliance – Three Year Average of the 99th Percentile 8-hour Average and Second Highest 3-hour Average $SO_2$ Concentrations at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $SO_2$ Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | NAAQS |
| 1-hour daily max | 3-year Average (2008-2010) | 0.062 | 0.047 | 0.028 | 0.075 |
| 3-hour | 2010 | 0.031 | 0.021 | 0.077 | 0.5 |

EPA revoked the previous 24-hour and annual average $SO_2$ NAAQS effective August 23, 2010.

***CAAQS Compliance***

The CAAQS for $SO_2$ are 0.25 ppm over a 1-hour period and 0.04 ppm over a 24-hour period, and are not to be exceeded.

- In 2010, the maximum 1-hour $SO_2$ concentrations were 0.089 ppm and 0.175 ppm at the Superblock and Gull Park stations, respectively, and 0.086 ppm for the nearest SCAQMD station in North Long Beach. These concentrations were below the $SO_2$ 1-hour CAAQS of 0.25 ppm.

- The maximum 24-hour average $SO_2$ concentrations were 0.009 ppm and 0.012 ppm at the Superblock and Gull Park stations, respectively, and 0.007 at North Long Beach. These concentrations are below the $SO_2$ maximum 24-hour average CAAQS of 0.04 ppm.

**TABLE 9. CAAQS Compliance – Highest 24-hour Average and Highest 1-hour Average $SO_2$ Concentrations at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $SO_2$ Concentration (ppm) | | | |
|---|---|---|---|---|---|
| | | Superblock | Gull Park | North Long Beach | CAAQS |
| 1-hour | 2010 | 0.089 | 0.175 | 0.086 | 0.25 |
| 24-hour | 2010 | 0.009 | 0.012 | 0.007 | 0.04 |

## 3.1.5 $PM_{10}$ Data Summary

$PM_{10}$ concentrations are measured by two monitoring techniques; traditional filter-based integrated monitors (FRMs, designed according to EPA specifications to determine compliance with standards) which collect samples over a 24-hour period, and real-time particulate monitors (beta attenuation monitors [BAMs]), which provide 1-hour averages to monitor shorter temporal variations. Figure A-8 presents a graph of the BAM $PM_{10}$ concentrations, measured over the entire period of record, and averaged to a monthly basis for smoothing.

Figure A-7 presents a graph of monthly average $PM_{10}$ concentrations from the FRM monitors over the entire period of record.

- The most evident feature of the graph is that spikes in $PM_{10}$ concentrations occasionally occur at the end or beginning of the year (October – January).

    - This is the period when wildfires are most likely and also the driest time of the year, when more dust is entrained in the atmosphere, before the short rainy season typically begins in southern California (i.e., January – March).

- Both graphs show that the $PM_{10}$ concentrations at the Superblock station are higher than at the Gull Park station. This is primarily a reflection of the surrounding conditions at the two sites:

    - The Superblock station is in a highly industrialized location, and there is an adjacent large container storage area and several smaller container distribution sites, all of which have considerable heavy diesel truck traffic throughout the day.

    - The Gull Park station has no nearby emission sources, although there may be some impact from Port terminals that are located within a few hundred yards, and at times ocean-going vessels transiting the Long Beach Channel pass fairly close to the station.

$PM_{10}$ averages are provided for the Superblock and Gull Park sites in Tables A-19 through A-22.

## ***NAAQS Compliance***

The 24-hour $PM_{10}$ NAAQS is attained when the number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. The annual average NAAQS for $PM_{10}$ was revoked in 2006.

- The 24-hour maximum $PM_{10}$ concentrations are shown in Table 10. There were no exceedances during 2010 of the federal 24-hour $PM_{10}$ NAAQS measured with the FRMs at either of the Port stations.

**TABLE 10. NAAQS Compliance – Highest 24-hour Average $PM_{10}$ Concentrations at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $PM_{10}$ Concentration ($\mu g/m^3$) | | |
|---|---|---|---|---|
| | | Superblock FRM | Gull Park FRM | NAAQS |
| 24-hour | 2010 | 90.1 | 55.5 | 150.0 |

***CAAQS Compliance***

The 24-hour CAAQS for $PM_{10}$ is 50 μg/m$^3$ and the annual average CAAQS is 20 μg/m$^3$, which are not to be exceeded.

- Table 11 shows that the annual average $PM_{10}$ concentrations measured with the FRM monitors in 2010 were above the annual CAAQS of 20 μg/m$^3$ at both monitoring sites. This is consistent with data collected throughout the South Coast Air Basin, which is designated as nonattainment for both $PM_{10}$ and $PM_{2.5}$. Exceedances of the 24-hour $PM_{10}$ CAAQS of 50 μg/m$^3$ were measured at both stations in 2010, with one exceedance at the Gull Park station and fifteen exceedances at the Superblock stations (Table A-19).

**TABLE 11. CAAQS Compliance – Highest 24-hour and Annual Average $PM_{10}$ Concentrations at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $PM_{10}$ Concentration (μg/m$^3$) | | |
|---|---|---|---|---|
| | | Superblock FRM | Gull Park FRM | CAAQS |
| 24-hour | 2010 | 90.1 | 55.5 | 50.0 |
| annual | 2010 | 40.6 | 23.6 | 20.0 |

## 3.1.6 $PM_{2.5}$ Data Summary

$PM_{2.5}$ concentrations are measured by two monitoring techniques, traditional filter-based integrated monitors (FRM monitors), and real-time particulate monitors (BAMs). Figure A-9 presents a graph of monthly average $PM_{2.5}$ concentrations from the filter-based data collected by the Superblock FRM monitor over the entire period of record. Data from the particulate monitor at the SCAQMD's North Long Beach site is included for comparison. At both stations, there is a general tendency evident in the $PM_{2.5}$ data for higher concentrations in the winter seasons. Figure A-10 presents a graph of the real-time BAM $PM_{2.5}$ concentrations, measured during the period of record, averaged on a monthly basis to show the overall trend and to remove the day-to-day variations in the data.

Figure 5 (shown in section 1.1) presents the average monthly concentrations of $PM_{2.5}$ during 2010 for the Port stations and several SCAQMD stations operated in the SoCAB. The graph shows that monthly average $PM_{2.5}$ concentrations at the stations nearest the coast (Gull Park, Superblock and the SCAQMD station at North Long Beach) are typically lower than the SCAQMD inland stations (downtown Los Angeles, Anaheim, and Burbank). The three coastal stations tend to have lower concentrations during the summer months and somewhat higher concentrations at the beginning and end of the year, which may be due to better dispersion of the emissions during the summer.

- The real-time data show the same pattern as the filter-based data, with generally higher concentrations in winter months of the year.

- Both graphs show the high correlation between the $PM_{2.5}$ concentrations at the two monitoring sites, indicating that regional influences affected the data at both sites. Both graphs illustrate that $PM_{2.5}$ concentrations at the Superblock station are higher than at the Gull Park station.

    - This is primarily a reflection of the greater industrial activity around the Superblock station, as discussed above for the $PM_{10}$ results.

$PM_{2.5}$ averages are provided for the Superblock and Gull Park sites in Tables A-23 through A-28.

***NAAQS Compliance***

The NAAQS for $PM_{2.5}$ is an annual arithmetic mean of 15 $\mu g/m^3$. The 24-hour $PM_{2.5}$ NAAQS is met when the 98$^{th}$ percentile of the daily average $PM_{2.5}$ concentrations, averaged over three years, are equal to or less than 35 $\mu g/m^3$.

- At Superblock, the annual average $PM_{2.5}$ concentration measured by the FRM monitor was 9.4 $\mu g/m^3$ (Table 12). Thus in 2010, the annual average $PM_{2.5}$ concentration was below the annual average NAAQS (15 $\mu g/m^3$).

- For comparison to the NAAQS, the three-year average (2008-2010) of the 98$^{th}$ percentile for the 24-hour average $PM_{2.5}$ concentrations at Superblock is 31.5 $\mu g/m^3$. Thus, data from the FRM monitor at Superblock shows that the station is currently meeting the 24-hour average $PM_{2.5}$ NAAQS.

**TABLE 12. NAAQS Compliance – Highest 24-hour and Annual Average $PM_{2.5}$ Concentrations at the Port Stations and the Nearest SCAQMD station.**

| Averaging Time | Period | $PM_{2.5}$ Concentration ($\mu g/m^3$) | | |
|---|---|---|---|---|
| | | Superblock FRM | Gull Park FRM | NAAQS |
| 24-hour | 2010 | 31.5 | -- | 35 |
| Annual | 2010 | 9.4 | -- | 15.0 |

[1] *The Gull Park station does not have a filter-based FRM $PM_{2.5}$ monitor.*

***CAAQS Compliance***

The Annual $PM_{2.5}$ CAAQS is met when the annual average $PM_{2.5}$ concentration are equal to or less than 12.0 $\mu g/m^3$.

- At Superblock, the annual average $PM_{2.5}$ concentration measured by the FRM monitor was 9.4 $\mu g/m^3$ (Table 13). Thus in 2010, the annual average $PM_{2.5}$ concentration was below the annual average CAAQS (12 $\mu g/m^3$).

**TABLE 13. CAAQS Compliance – Highest Annual Average $PM_{2.5}$ Concentrations at the Port Stations**

| Averaging Time | Period | $PM_{2.5}$ Concentration ($\mu g/m^3$) | | |
|---|---|---|---|---|
| | | Superblock FRM | Gull Park FRM | CAAQS |
| Annual | 2010 | 9.4 | -- | 12.0 |

[1] *The Gull Park station does not have a filter-based FRM $PM_{2.5}$ monitor.*

## *3.2 Meteorological Data*

The meteorological data collected at both monitoring stations are useful in interpreting the air quality data measured at each of the sites. Additionally, these data sets can be used in air dispersion modeling and other data analyses.

Wind roses were created from meteorological data collected at each station for calendar year 2010 and are shown in Figures A-1 to A-2. Wind roses graphically show the distribution of winds at a site, including speed, direction and frequency. By convention, winds are shown in the direction from which they came; for example, a west wind blows from the west. The wind rose at the Gull Park station shows that the predominant winds are from the south through southwest directions, occurring approximately 40 percent of the time. In contrast, winds at the Superblock station are more varied; they come from the south-southeast through south-southwest directions approximately 31 percent of the time, and from the west through northwest directions 26 percent of the time. Average wind speeds at the Gull Park and Superblock stations are 3.0 m/sec (6.7 mph) and 2.2 m/sec (4.9 mph), respectively.

The wind roses for each monitoring station were also projected onto the Port base map in Figure 7. These 2010 wind roses are similar to the historical record of wind roses at each of the two stations, although the predominant wind pattern at each station is different, implying that the Port area experiences complex air flow patterns.

## *3.3 PM Measurements during Unusual Events*

The concentration of PM at the Port's monitoring sites can be influenced by sources near the Port as well as by regional air quality. For example, $PM_{10}$ measurements can be strongly affected by regional events such as wildfires and Santa Ana conditions. No unusual events occurred during 2010 that affected the air quality data.

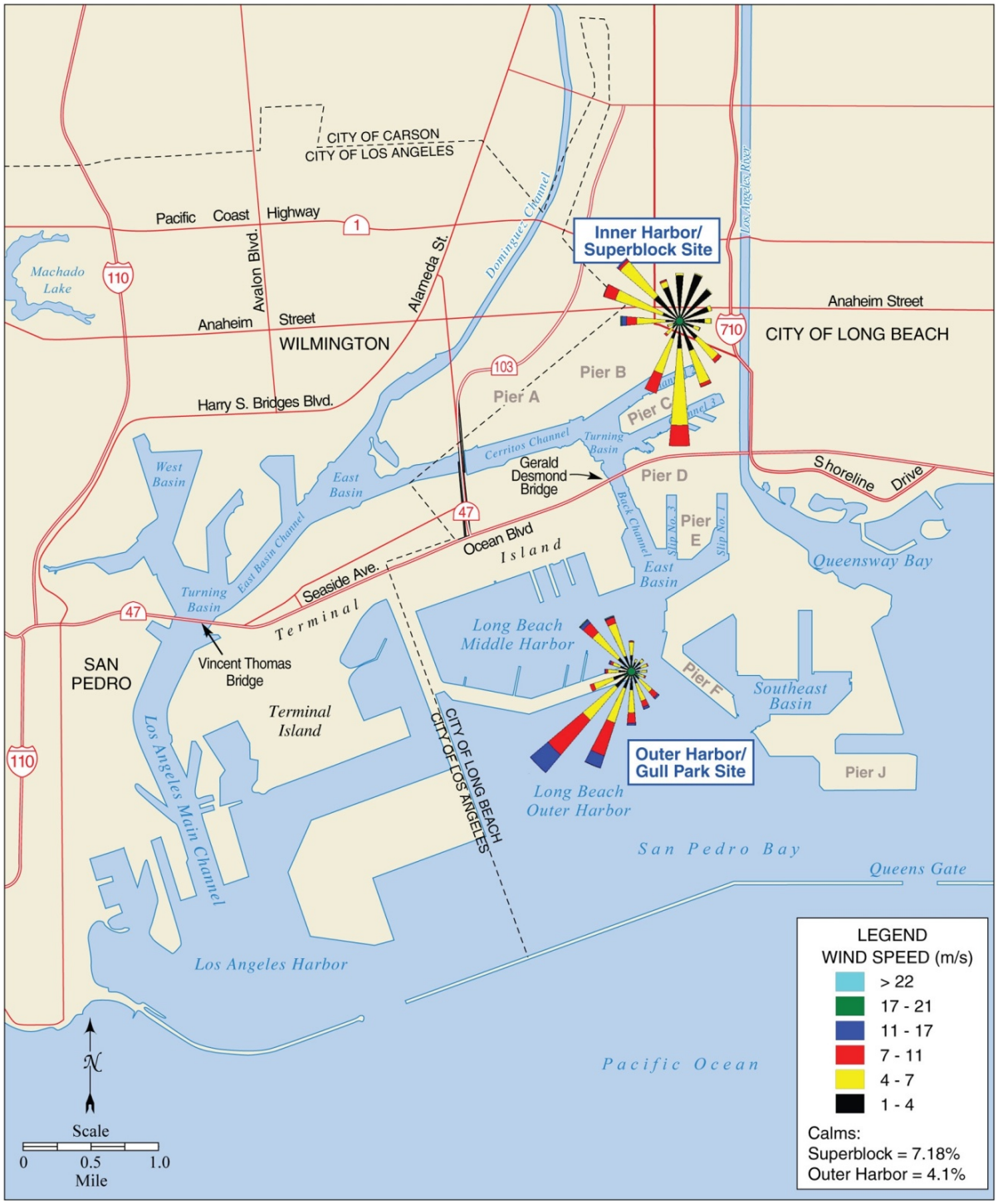



**Figure 7. Wind Roses for the Port of Long Beach Air Quality Monitoring Program, CY 2010**

## *3.4 Quality Assurance Procedures*

Several quality assurance measures have been built into the monitoring program in order to ensure the integrity of the data. These QA measures include the following:

- All of the data are reviewed through a comprehensive quality assurance process by the Port's technical consultants, to check for periods when the data are not valid (e.g., during instrument calibrations or when an instrument is out of service), to check for conditional flags put on the data by the data logging system, and to determine if the values being recorded are reasonable compared to other local monitoring programs (i.e., POLA, and SCAQMD North Long Beach). Data that has been determined to be invalid is removed from the data set.
- All continuous pollutant analyzers are calibrated daily to ensure the instrument is taking accurate measurements.
- To further ensure the validation of the collected results within the program, all of the analyzers are subjected to a biannual performance audit performed by an independent contractor.
- Field blanks on all of the gravimetric samplers are periodically taken at each station to eliminate the systematic contamination of sampling filters.
- Monitoring checklists are routinely completed by field technicians during every station visit.

## *3.5 Data Recovery*

Data recovery for all instruments, air quality and meteorological, was greater than 95 percent, as shown in the tables presented in the Appendix.

# 4 Trends Analysis

With four years of records, a preliminary analysis of the trends in the data was conducted. This analysis uses annual averages to assess the general long-term trends in the data, even if there are no annual standards for that pollutant.

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 (in whole or 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. Others pollutants, like $SO_2$, are more localized and directly influenced by nearby emissions sources.

As discussed in the Introduction, Port-related air pollutant emissions have declined in recent years.[4] 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

[4] Port of Long Beach Air Emissions Inventory for 2009. Starcrest Consulting Group LLC. (http://www.polb.com). June, 2010.

equipment. Between 2005, the CAAP baseline year, and 2009, emissions associated with Port of Long Beach operations showed a 52% reduction in DPM, a 46% reduction in sulfur oxides (SOx) and a 35% reduction in NOx. Additionally, the decrease in Port-related emissions was affected by a decline in goods movement activity at the San Pedro Bay ports in late-2008 through 2009. Meteorology can also have a significant influence on regional air pollution levels from one year to the next. So while CAAP measures have improved air emission levels, it is not presently known how much of any decrease (or increase) in ambient air pollutant concentrations measured at the Port air monitoring stations can be directly attributed to the Port's goods movement-focused measures under the CAAP.

## *4.1 Trends in Gaseous Criteria Pollutants*

### 4.1.1 CO Concentrations

Table 14 presents the annual average CO concentrations at the two stations in the Port's air monitoring network, over the four-year period of record.

**TABLE 14. Annual Average CO Concentrations Measured at the Port Stations**

| Year | Annual Average CO Concentrations (ppm) | |
|---|---|---|
| | Superblock | Gull Park |
| 2007 | 0.6 | 0.4 |
| 2008 | 0.6 | 0.5 |
| 2009 | 0.6 | 0.4 |
| 2010 | 0.6 | 0.6 |
| Change from 2007 -2010 | 0% | 50% |

The table shows that the annual average CO concentrations at both stations were in the range of 0.4 to 0.6 ppm throughout the period of record, which is very low compared to the 1-hour average NAAQS of 35 ppm and the 8-hour NAAQS of 9 ppm. Although the Gull Park station showed a 50 percent increase over the period of record, these values are near the detection limits of the CO instrument. Because these values are near the method's precision limits, the differences in these year-to-year values are not considered meaningful. Figure A-3 shows the average monthly concentration of CO over the three-year period of record.

## 4.1.2 $NO_2$ Concentrations

Table 15 presents the annual average $NO_2$ concentrations at the two stations in the Port's air monitoring network, over the four-year period of record.

**TABLE 15. Annual Average $NO_2$ Concentrations Measured at the Port Stations**

| Year | Annual Average $NO_2$ Concentrations* (ppm) | |
|---|---|---|
| | Superblock | Gull Park |
| 2007 | 0.030 | 0.020 |
| 2008 | 0.029 | 0.018 |
| 2009 | 0.025 | 0.020 |
| 2010 | 0.025 | 0.018 |
| Change from 2007 -2010 | -17% | -10% |

* Annual Average NAAQS for $NO_2$ is 0.053 ppm; Annual Average CAAQS for $NO_2$ is 0.030 ppm.

The table shows that average annual $NO_2$ concentrations at both stations were low during the period of record, relative to the NAAQS and CAAQS. There was a decrease over the period of record of 17 and 10 percent in the annual average concentrations at the Superblock and Gull Park stations, respectively. There is more industrial activity around the Superblock station, which may affect the $NO_2$ concentrations at that site. It is interesting to note that the $NO_2$ concentrations have decreased by a larger amount (17 vs. 10 percent) at the Superblock station located in the more industrial area. Figure A-4 shows the average monthly concentration of $NO_2$ over the four-year period of record.

Figure A-4 shows that the Superblock and Gull Park stations follow a similar trend as the nearest SCAQMD monitoring station at North Long Beach. Each of these stations shows a relatively high concentration at the beginning of the year, which falls to a minimum during the summer months. The $NO_2$ concentration then gradually increases and generally peaks in the November – January time frame.

## 4.1.3 $O_3$ Concentrations

Table 16 presents the annual average $O_3$ concentrations at the two stations in the Port's air monitoring network, over the four-year period of record.

There was a moderate increase (15 percent) observed in the long-term annual average $O_3$ concentrations. Because $O_3$ is a secondary pollutant that takes several hours to form from volatile organic compounds and nitrogen oxides in the presence of sunlight, ozone concentrations are more reflective of regional air quality pollutant levels in the SoCAB rather than localized pollutant levels. Figure A-5 shows the average monthly concentration of $O_3$ over the three-year period of record.

The Superblock and Gull Park stations follow the same trends as the SCAQMD monitoring sites in downtown Los Angeles, Anaheim, Burbank, and North Long Beach,

as shown earlier in Figure 4. All of the monitoring stations report lower $O_3$ concentrations at the beginning of the year. Concentrations then increase and peak in the April-June timeframe, followed by a gradual decrease towards the end of the year. The reason $O_3$ concentrations peak during the summer months at each station is because the photochemical reactions required to produce $O_3$ are stronger during the summer months, when ultraviolet light is more intense.

**TABLE 16. Annual Average $O_3$ Concentrations Measured at the Port Stations**

| Year | Annual Average $O_3$ Concentrations (ppm) | |
|---|---|---|
| | Superblock | Gull Park |
| 2007 | 0.018 | 0.024 |
| 2008 | 0.019 | 0.022 |
| 2009 | 0.018 | 0.027 |
| 2010 | 0.021 | 0.028 |
| Change from 2007 -2010 | 15% | 15% |

## 4.1.4 $SO_2$ Concentrations

Table 17 presents the annual average $SO_2$ concentrations at the two stations in the Port's air monitoring network over the four-year period of record.

The table shows that the annual average $SO_2$ concentrations at both stations were near the detection limits for the measurement method. At both stations, there was a small decrease in the absolute value of the annual average $SO_2$ concentration (shown as a large percentage decrease, because of the very low numbers), but these values are near the precision limits of the instruments and therefore are not considered meaningful. Figure A-6 shows the average monthly concentration of $SO_2$ over the three-year period of record.

**TABLE 17. Annual Average $SO_2$ Concentrations Measured at the Port Stations**

| Year | Annual Average $SO_2$ Concentrations* (ppm) | |
|---|---|---|
| | Superblock | Gull Park |
| 2007 | 0.005 | 0.004 |
| 2008 | 0.005 | 0.004 |
| 2009 | 0.003 | 0.003 |
| 2010 | 0.002 | 0.002 |
| Change from 2007 -2010 | -60% | -50% |

* Annual Average NAAQS for $SO_2$ is 0.03 ppm.

## *4.2 Trends in $PM_{10}$ and $PM_{2.5}$ Data*

Four years of $PM_{10}$ and $PM_{2.5}$ data are now available from the monitoring stations, which provide an initial analysis of trends in the PM data within the network. Table 13 presents the annual average $PM_{10}$ and $PM_{2.5}$ data collected by the FRM monitors at the two stations in the Port's air monitoring network over the four-year period of record.

### *Trends in $PM_{10}$ Concentrations*

Table 18 shows that annual $PM_{10}$ concentrations at the Superblock station had a moderate decrease of 17.3 percent based on the FRM monitors from 2007 to 2010. A larger decrease of 33.7 percent was recorded during this time period at the Gull Park station by the FRM monitor. $PM_{10}$ concentrations are primarily affected by fugitive emissions from construction and wind erosion, or resuspension of road dust by traffic. $PM_{10}$ concentrations at the Gull Park station are generally lower because the station is located at the end of the Navy Mole, a narrow peninsula of land surrounded by water. Therefore, its exposure to fugitive emissions from localized wind erosion or resuspension effects should be minimal, such that lower $PM_{10}$ concentrations and larger decreases from 2007 levels could occur.

**TABLE 18. Annual Average $PM_{10}$ Concentrations Measured at the Port Stations by the FRM Monitors.**

| Year | Annual Average $PM_{10}$ Concentrations* ($\mu g/m^3$) | |
|---|---|---|
| | $PM_{10}$ at Superblock | $PM_{10}$ at Gull Park |
| 2007 | 49.1 | 35.6 |
| 2008 | 44.1 | 29.7 |
| 2009 | 44.7 | 29.8 |
| 2010 | 40.6 | 23.6 |
| Change from 2007 -2010 | -17.3% | -33.7% |

** Annual Average CAAQS for $PM_{10}$ is 20 $\mu g/m^3$*

Table 19 shows that maximum 24-hour $PM_{10}$ concentrations at the Superblock station had a decrease of 32.3 percent based on the FRM monitors from 2007 to 2010. A smaller decrease of 16.4 percent was recorded during this same time period at the Gull Park station.

**TABLE 19. Maximum 24-hour Average $PM_{10}$ Concentrations measured at the Port Stations by the FRM Monitors.**

| Year | Maximum 24-hour Average $PM_{10}$ Concentrations* ($\mu g/m^3$) | |
|---|---|---|
| | $PM_{10}$ at Superblock | $PM_{10}$ at Gull Park |
| 2007 | 147.3 | 76.7 |
| 2008 | 104.0 | 66.5 |
| 2009 | 129.1 | 69.1 |
| 2010 | 99.8 | 64.1 |
| Change from 2007 -2010 | -32.3% | -16.4% |

** Maximum 24-hour Average CAAQS for $PM_{10}$ is 50 $\mu g/m^3$*
** Maximum 24-hour Average NAAQS for $PM_{10}$ is 150 $\mu g/m^3$*

## ***Trends in $PM_{2.5}$ Concentrations***

Table 20 shows that the annual average $PM_{2.5}$ concentrations over the 2007-2010 period at the Superblock station had a large decrease of 35.2 percent, based on data from the FRM monitor (there is no filter-based $PM_{2.5}$ monitor at Gull Park). During the last two years, the annual average $PM_{2.5}$ concentration has been below the CAAQS (12 $\mu g/m^3$).

**TABLE 20. Annual Average $PM_{2.5}$ Concentrations measured at the Superblock Station by the FRM Monitor.**

| Year | Annual Average $PM_{2.5}$ Concentrations[1] ($\mu g/m^3$) At Superblock Station |
|---|---|
| 2007 | 14.5 |
| 2008 | 13.8 |
| 2009 | 11.7 |
| 2010 | 9.4 |
| Change from 2007 -2010 | -35.2% |

**Notes:**
*[1] Annual Average NAAQS and CAAQS for $PM_{2.5}$ are 15 $\mu g/m^3$ and 12 $\mu g/m^3$, respectively.*
*[2]There is no filter-based $PM_{2.5}$ monitor at the Gull Park station.*
*[3] 2007 $PM_{2.5}$ data was collected by a Sequential Filter Sampler filter-based monitor, which is similar to an FRM monitor; all other data sets were collected by FRM filter-based monitors.*

Annual average $PM_{2.5}$ concentrations at the more industrial site (Superblock) have decreased more rapidly than $PM_{10}$ concentrations (35.2 percent vs. 17.3 percent) over the last four years, as shown in Table 19.

Table 21 shows that the 98$^{th}$ percentile of the 24-hour average $PM_{2.5}$ concentration over the 2007-2010 period at the Superblock station had a large decrease of 38.7 percent,

based on data from the FRM monitor (there is no filter-based $PM_{2.5}$ monitor at Gull Park). The 98$^{th}$ percentile values are presented to be consistent with the form of the NAAQS standard. The decrease in 24-hour average $PM_{2.5}$ values was very similar to the decrease in annual average $PM_{2.5}$ values (38.7 vs. 35.2 percent). Because both of these measures showed similar decreases, this indicates that $PM_{2.5}$ concentrations throughout the entire data set have been reduced.

**TABLE 21. 98$^{th}$ Percentile of the 24-hour Average $PM_{2.5}$ Concentrations Measured at the Superblock Station by the FRM Monitor.**

| Year | 98$^{th}$ Percentile 24-hour $PM_{2.5}$ Concentrations[1] (µg/m$^3$) |
|---|---|
| 2007 | 38.5 |
| 2008 | 33.8 |
| 2009 | 37.0 |
| 2010 | 23.6 |
| Change from 2007 -2010 | -38.7% |

** 24-hour Average NAAQS for $PM_{2.5}$ is 35 µg/m$^3$*

Figure 5, presented in Section 1.1, showed that monthly average $PM_{2.5}$ concentrations in 2010 at Superblock and Gull Park stations follow the same trends as the SCAQMD monitoring sites in downtown Los Angeles, Anaheim, Burbank, and North Long Beach. The monitoring stations closest to the Port (Superblock, Gull Park, and North Long Beach) track very closely and generally have lower $PM_{2.5}$ concentrations than stations further from the coast (e.g., Los Angeles, Anaheim, and Burbank). The three stations closest to the Port also show a moderate tendency for reduced concentrations at the beginning of the year, followed by increased concentrations toward the end of the year.

Figures A-7 through A-10 show the average monthly concentration of $PM_{10}$ and $PM_{2.5}$ over the four-year period of record. The Superblock and Gull Park monitoring stations follow a similar trend in $PM_{2.5}$ concentrations throughout the year. There are generally lower $PM_{2.5}$ concentrations throughout the first half of the year, with concentrations beginning to increase in September and peaking in the late fall/early winter period.

# 5 Conclusions

This report presents a summary of the data collected during 12 months of the Port's air quality monitoring program from January to December 2010. During this reporting period there were several exceedances of NAAQS or CAAQS recorded by the monitoring program:

- The (new) 1-hour average $NO_2$ NAAQS was exceeded by 2 percent at the Superblock station in 2010.

- The 1-hour average $O_3$ CAAQS was exceeded once at the Gull Park station.

- The annual and 24-hour $PM_{10}$ CAAQS were exceeded by the filter-based monitors at both Port stations, once at Gull Park and 15 times at Superblock.

These results were consistent with concentrations measured at other ambient monitoring stations in the SoCAB.

The trend analysis for the period of 2007 to 2010 showed that the most significant change were decreases of approximately 35-38 percent in the two measures of $PM_{2.5}$ concentrations (24-hour and annual average) at the more highly industrialized Superblock station.

Data recovery for the program was high during the reporting period. Those data are available for review at the Clean Air Action Plan website: http://www.cleanairactionplan.org.

# 6 References

Port of Long Beach Air Emissions Inventory for 2009. Starcrest Consulting Group LLC. (http://www.polb.com). June, 2010

Port of Long Beach. 2010. *Port of Long Beach Air Quality Monitoring Plan. April 2010 Update.*

_____. 2010a. *Port of Long Beach Quality Assurance Plan for the Air Quality Monitoring Program. April 2010 Update*

_____. 2008b. *Port of Long Beach Air Quality Monitoring Program Work Plan.*

U.S. Environmental Protection Agency, 2004. Air Quality Criteria for Particulate Matter, Volume I. EPA/600/P-99/002aF, Office of Research and Development, Research Triangle Park, NC.

# APPENDIX A

# POLB Air Quality Monitoring Program
# Annual Report for 2010
# Figures and Tables

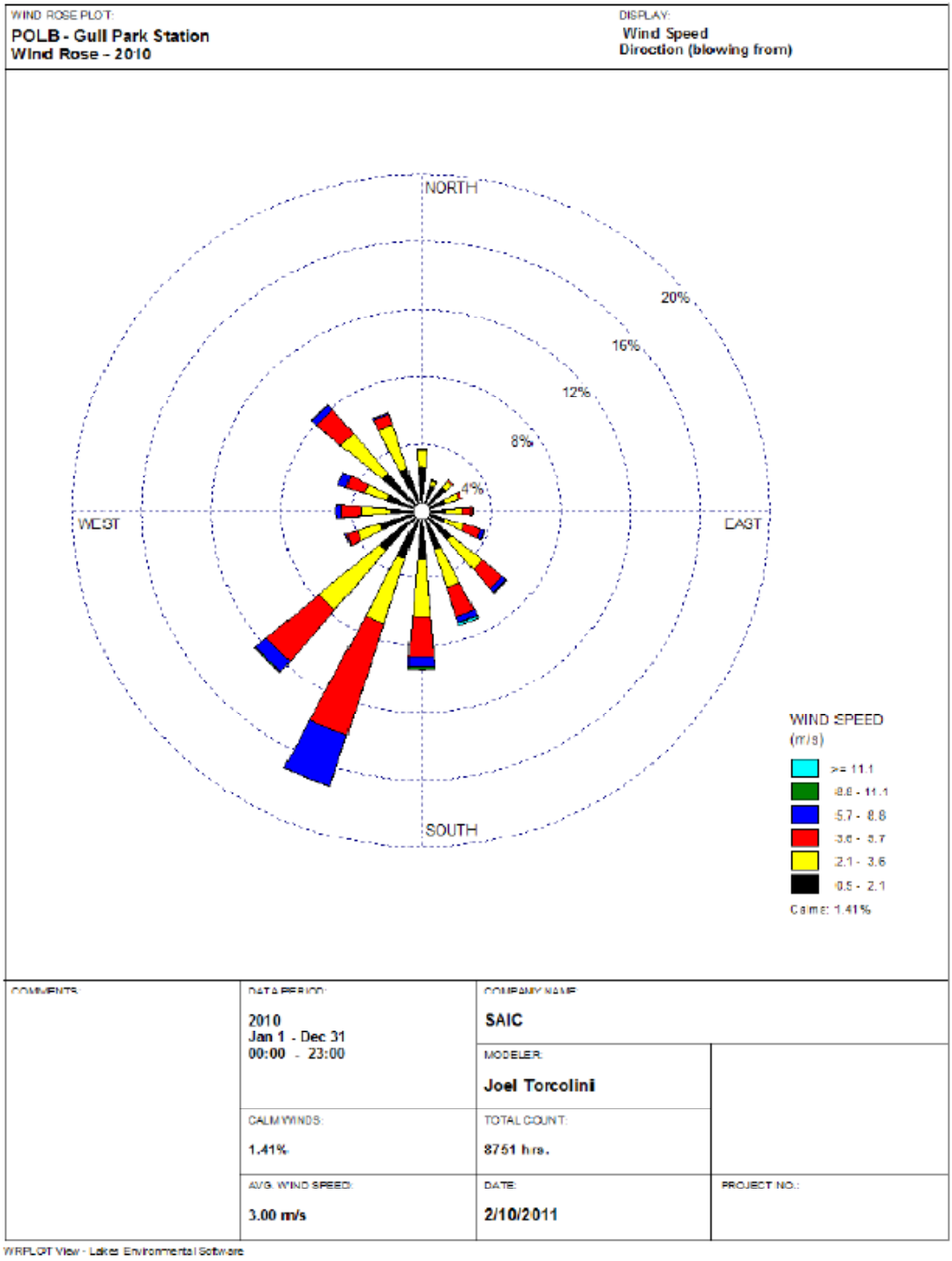



**Figure A-1: Gull Park Wind Rose for the Port of Long Beach Air Quality Monitoring Program (2010)**

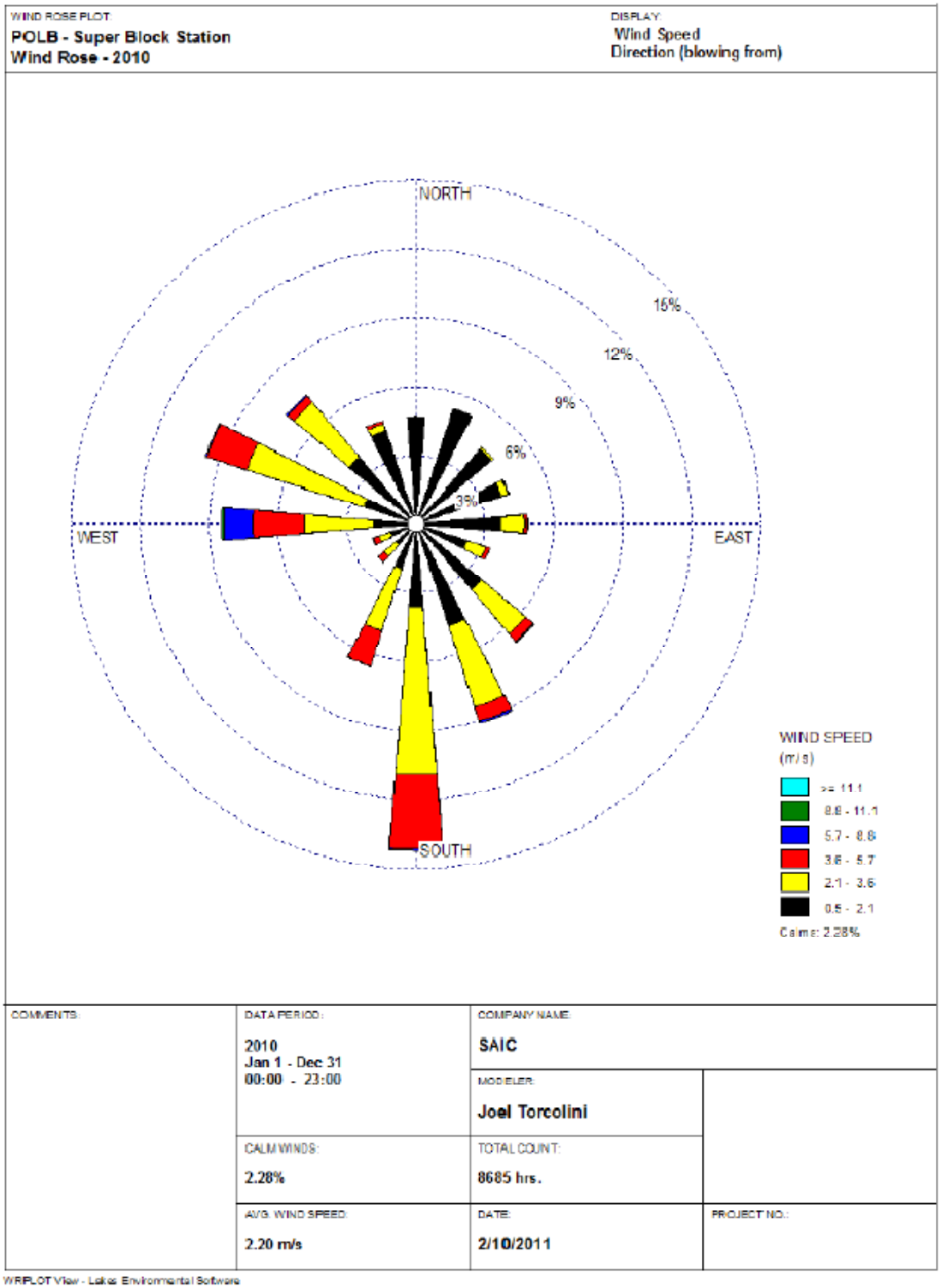



**Figure A-2: Superblock Wind Rose for the Port of Long Beach Air Quality Monitoring Program (2010)**

**Figure A-3: Average Monthly CO Concentrations at the Port of Long Beach**
**January 2007 - December 2010**

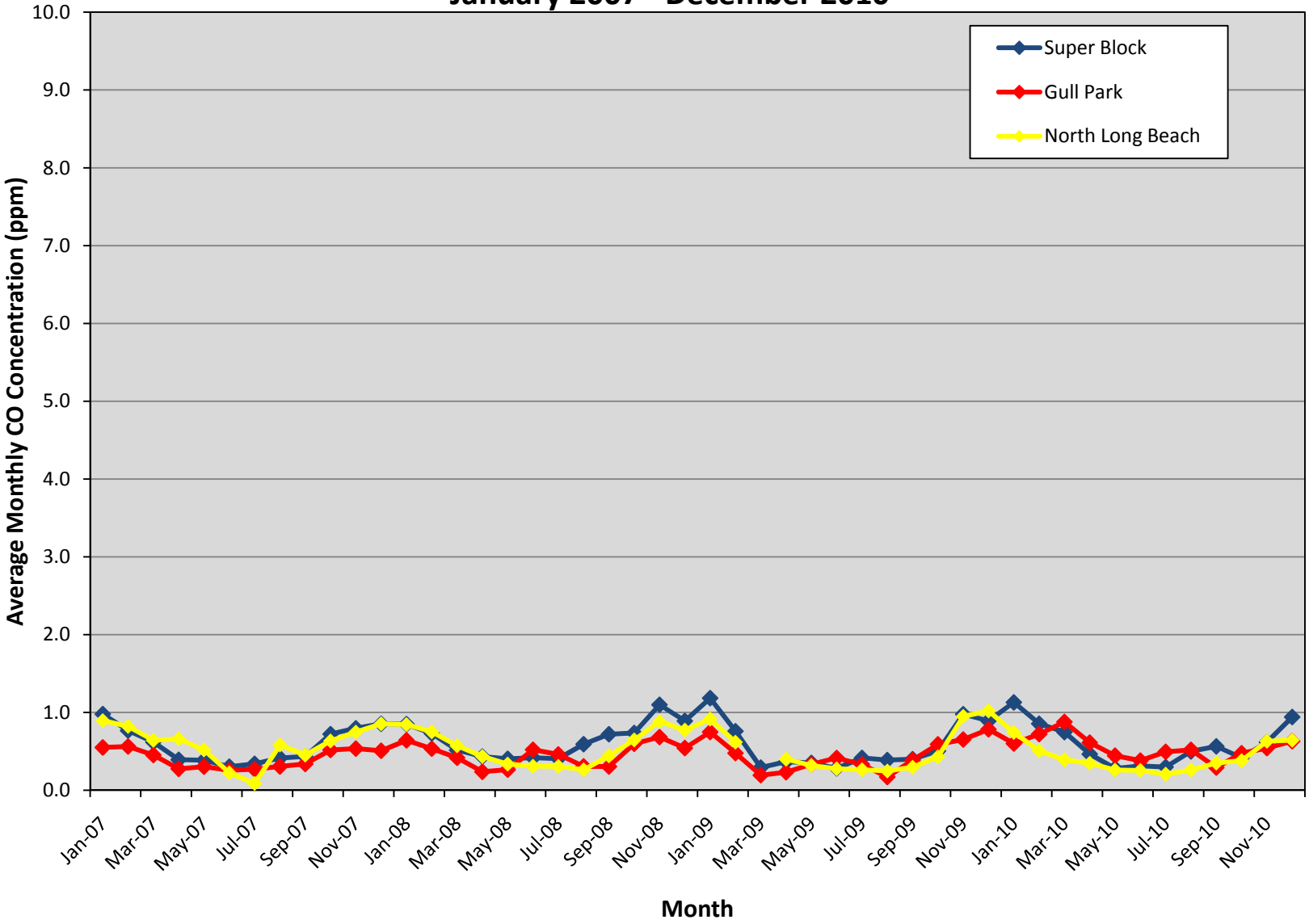


**Figure A-4: Average Monthly $NO_2$ Concentrations at the Port of Long Beach January 2007 - December 2010**

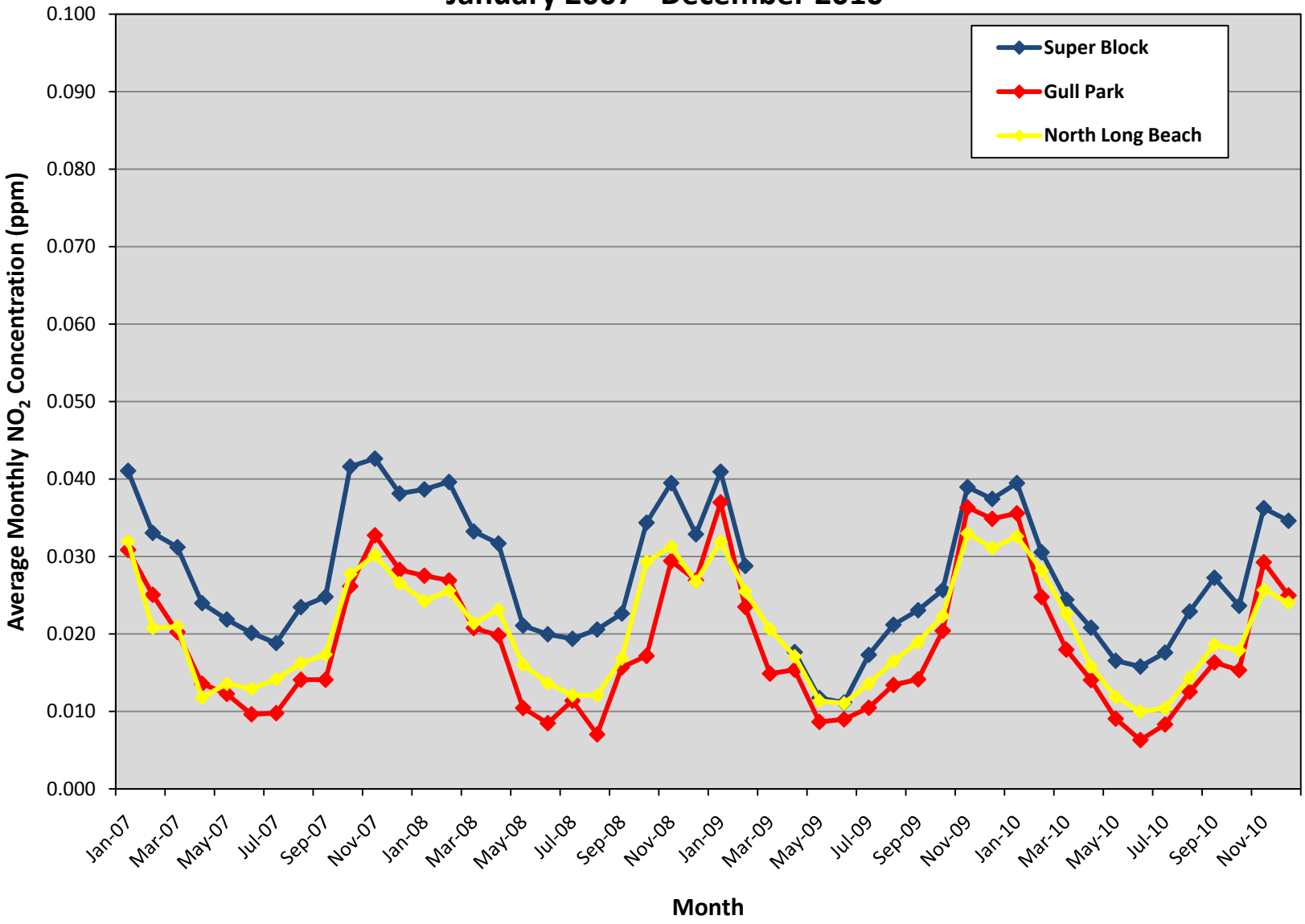
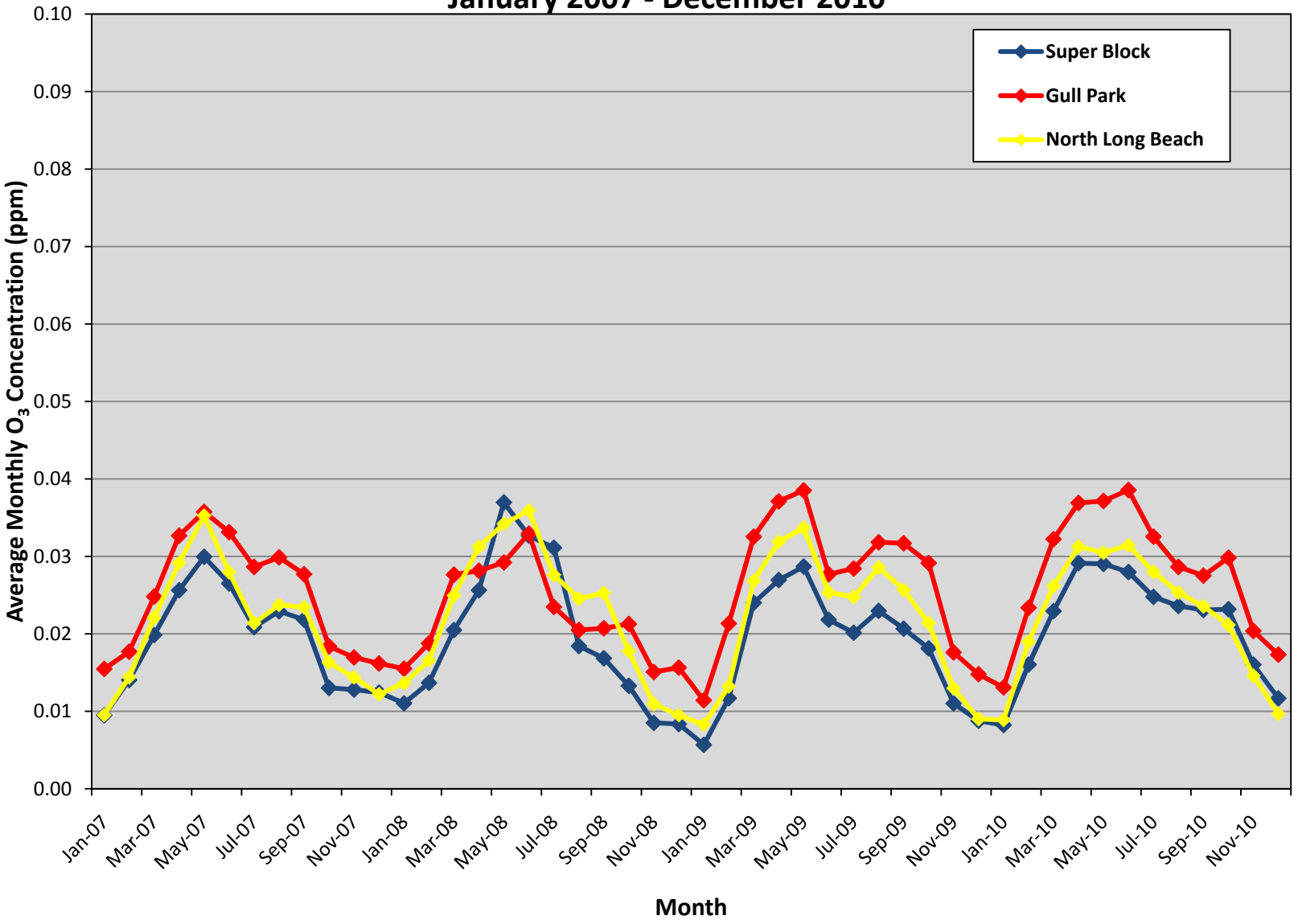


**Figure A-5: Average Monthly $O_3$ Concentrations at the Port of Long Beach January 2007 - December 2010**



## Figure A-6: Average Monthly $SO_2$ Concentrations at the Port of Long Beach January 2007 - December 2010

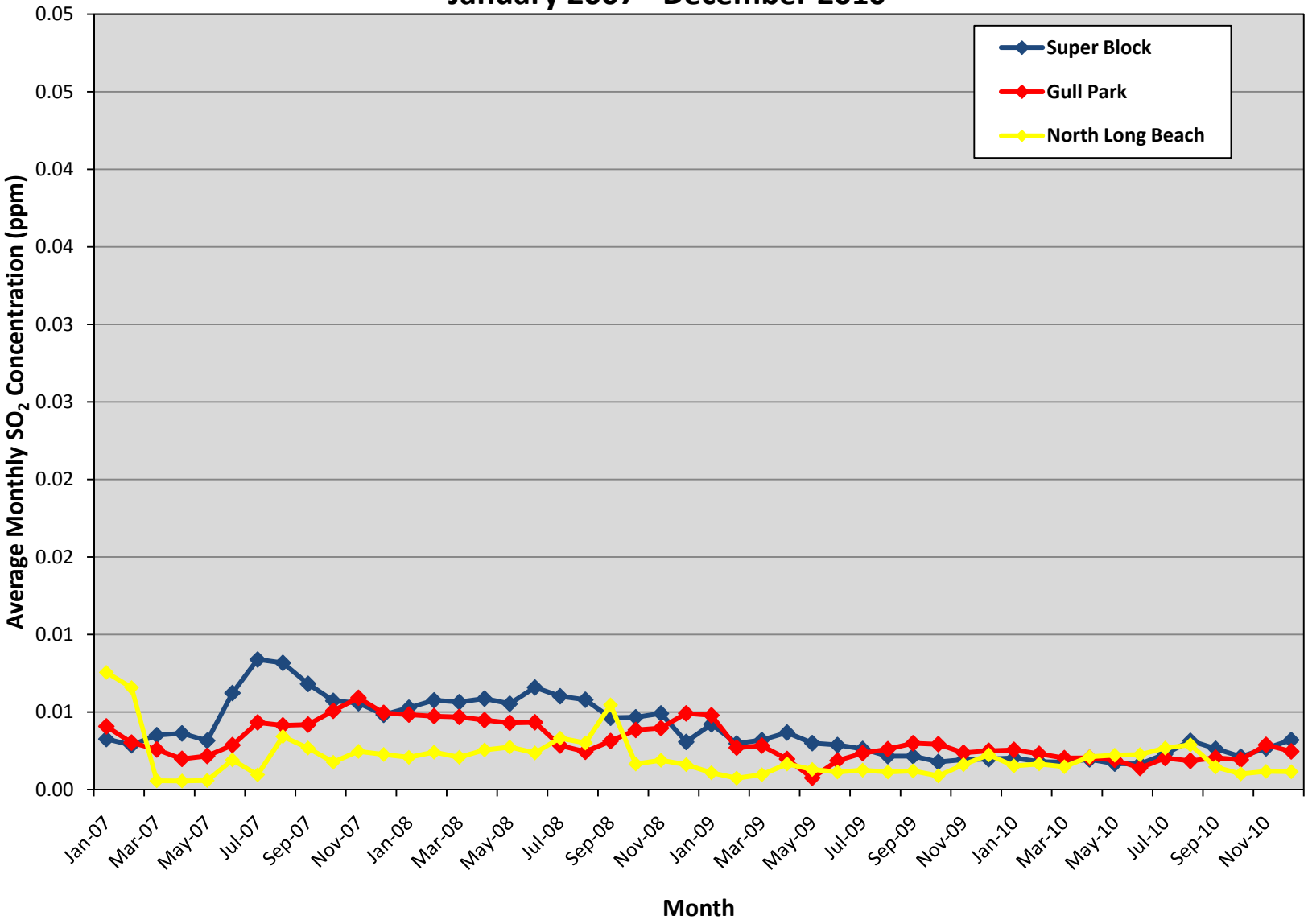


**Figure A-7: Average Monthly $PM_{10}$ Concentrations at the Port of Long Beach January 2007 - December 2010**

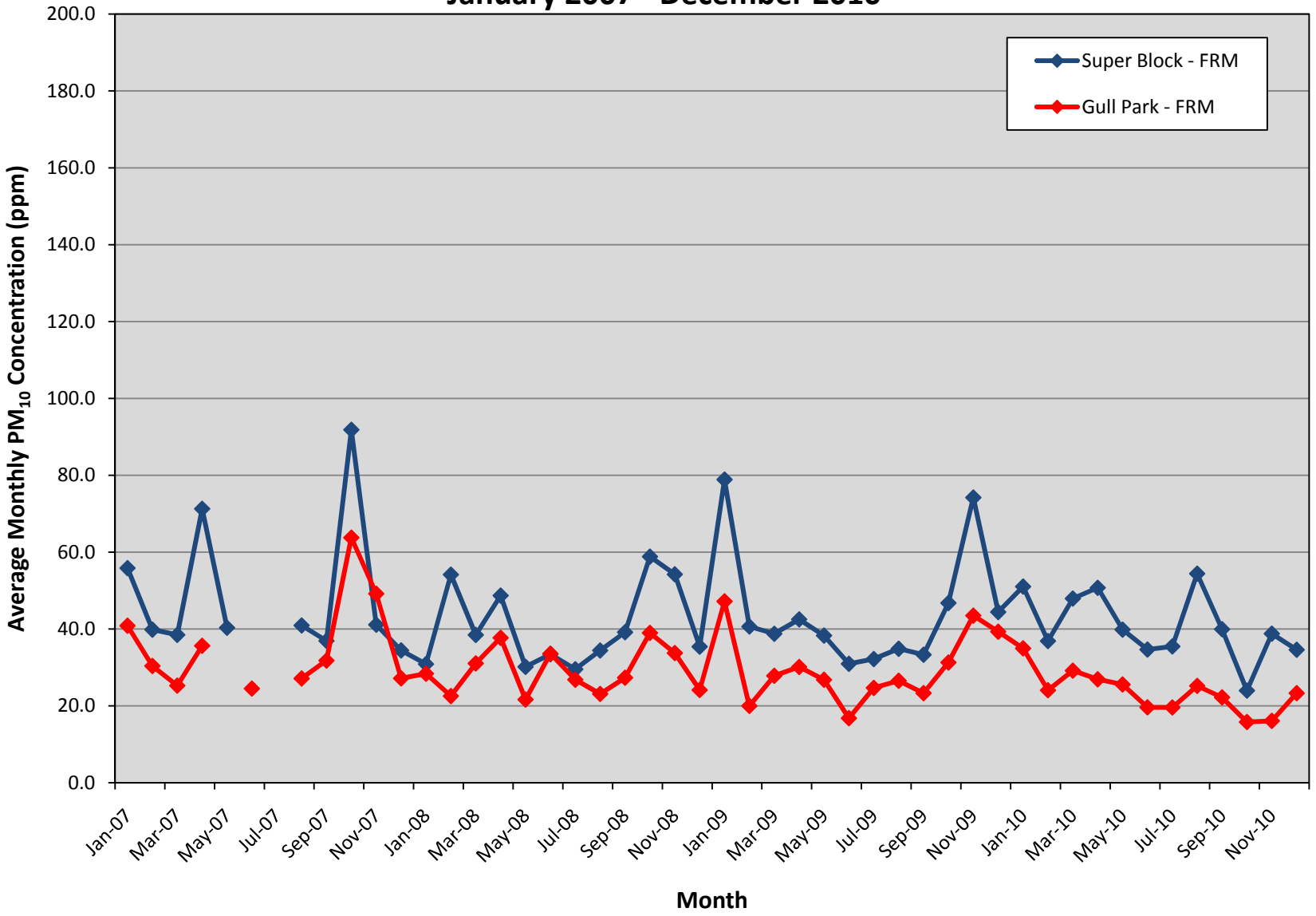


**Figure A-8: Average Monthly $PM_{10}$ Concentrations at the Port of Long Beach January 2007 - December 2010**

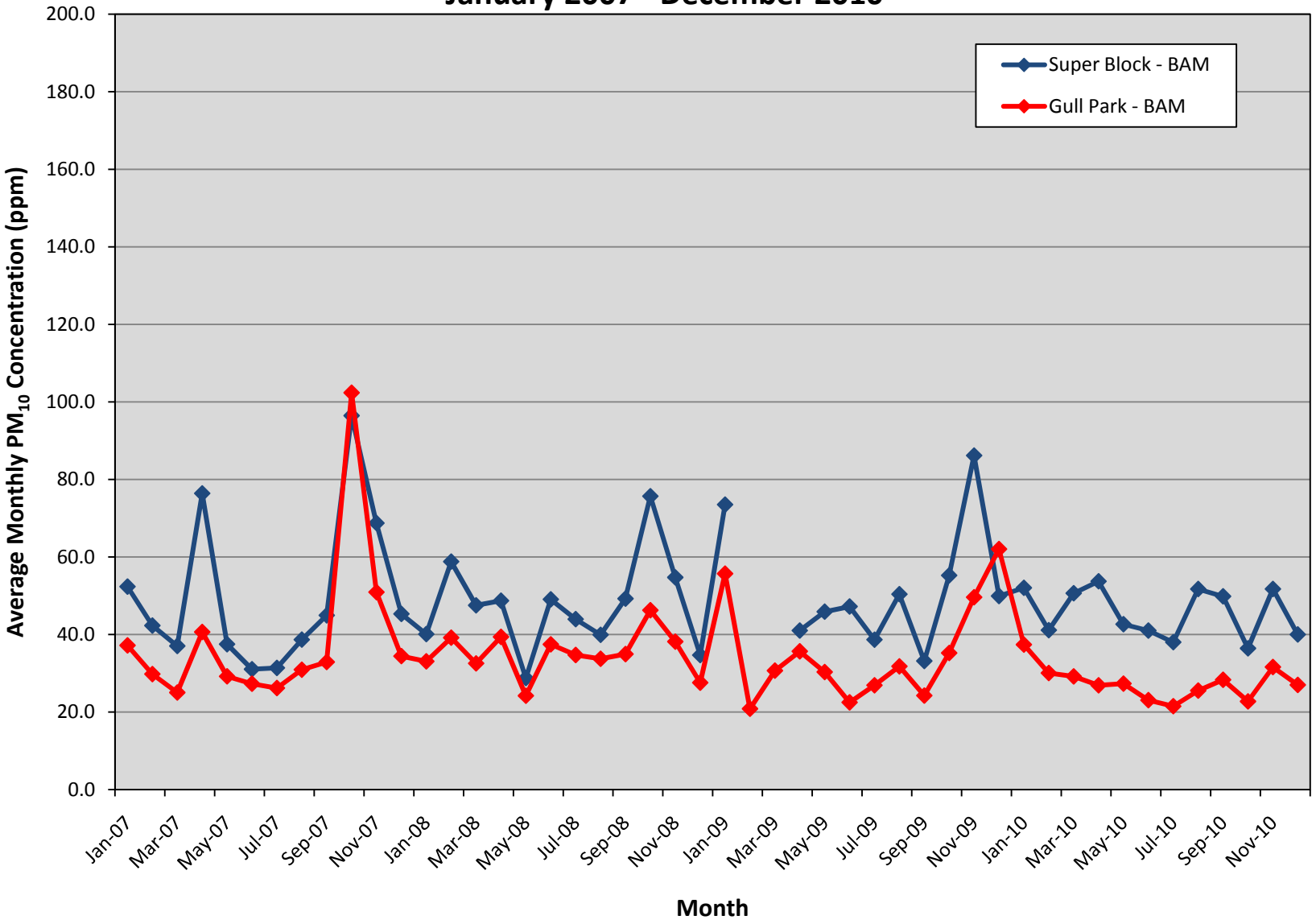


**Figure A-9: Average Monthly $PM_{2.5}$ Concentrations at the Port of Long Beach**
**January 2007 - December 2010**

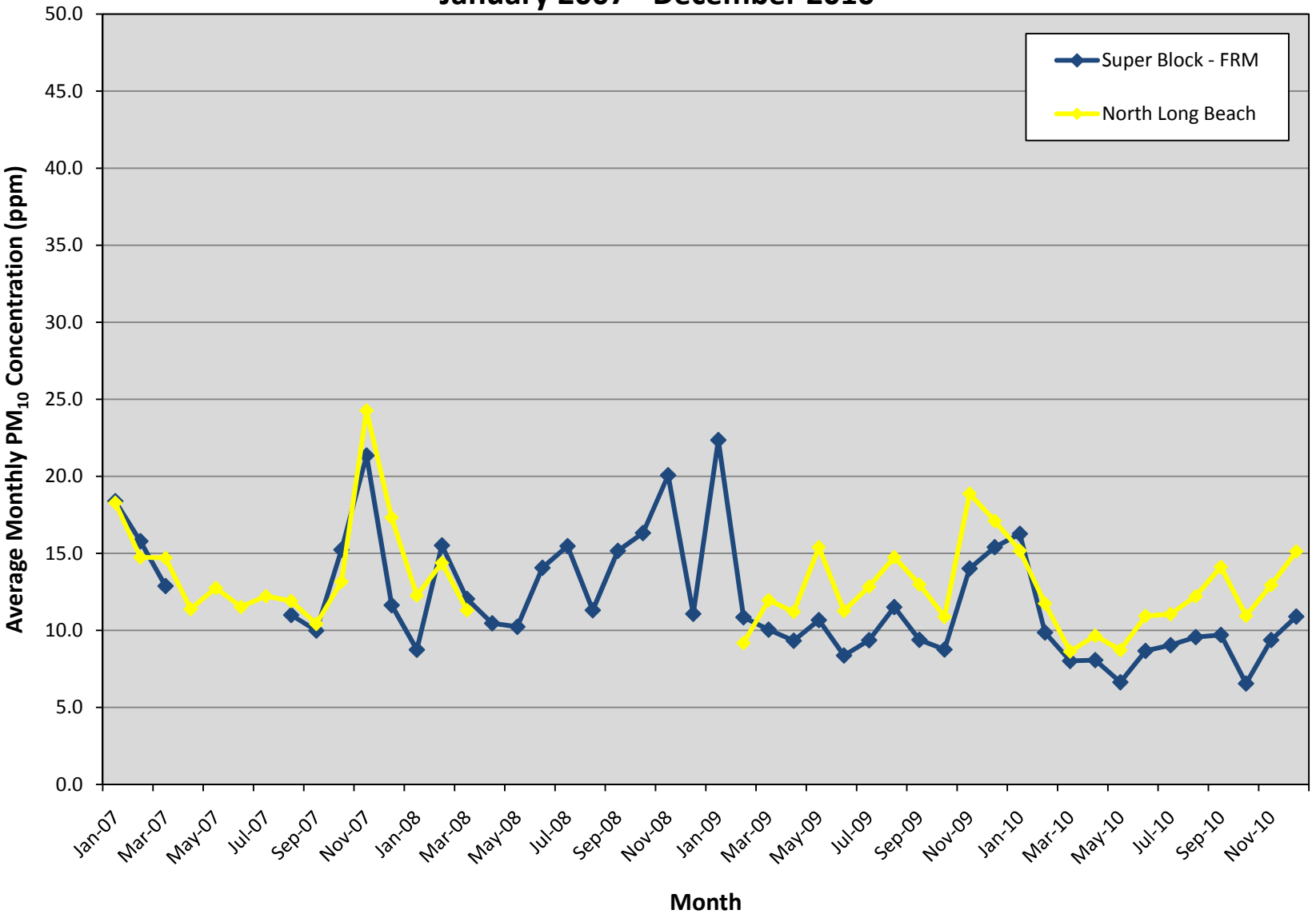


**Figure A-10: Average Monthly $PM_{2.5}$ Concentrations at the Port of Long Beach January 2007 - December 2010**

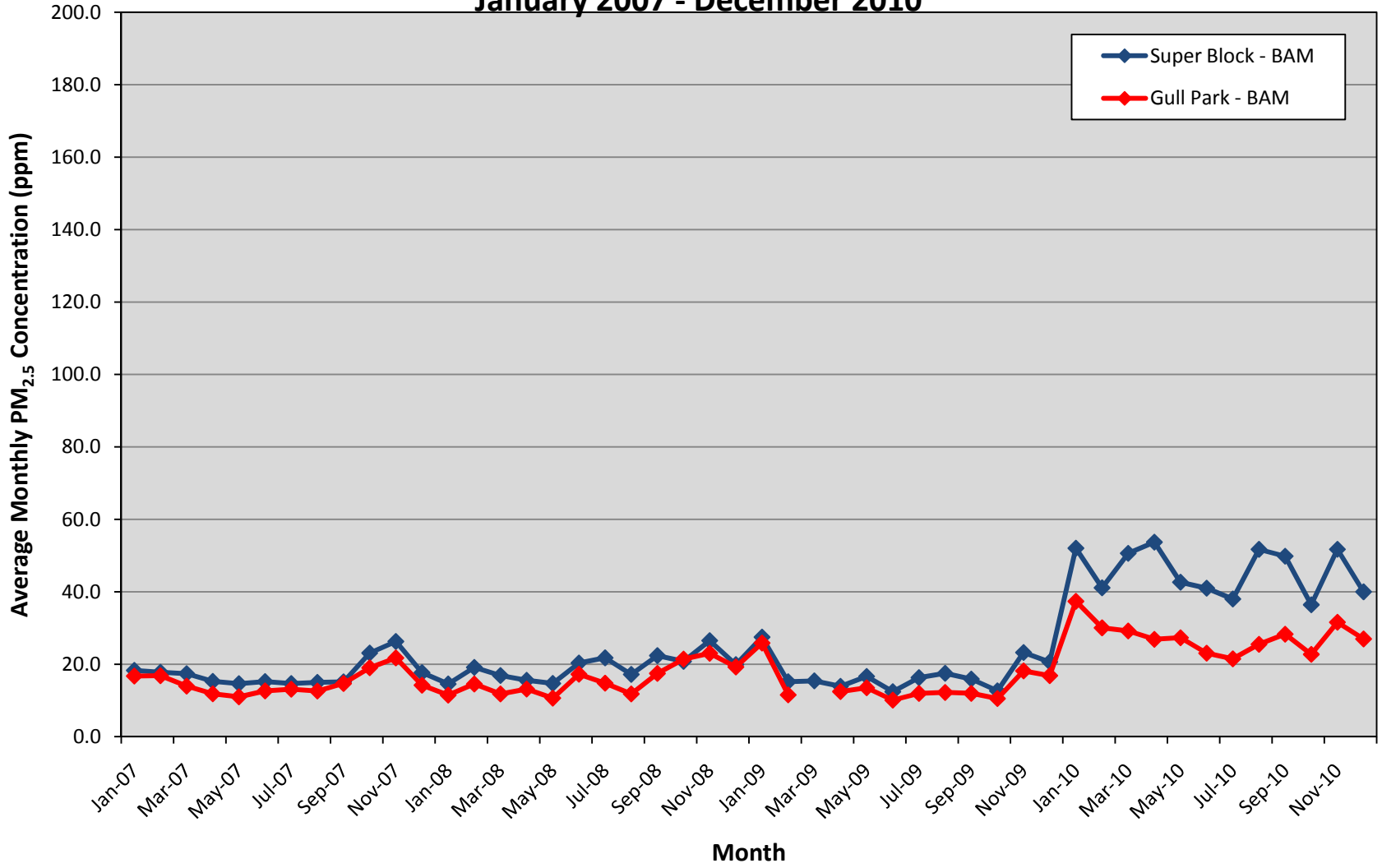


**Table A-1. Maximum 1-Hr CO Concentrations (ppm)**

| Year | CO Concentrations (ppm) | | | |
|---|---|---|---|---|
| | Superblock | Gull Park | North Long Beach | 1-hour NAAQS |
| **2007** | 4.7 | 2.8 | 3.3 | 35 |
| **2008** | 4.4 | 7.6 | 19.3 | 35 |
| **2009** | 4.7 | 3.3 | 3.1 | 35 |
| **2010** | 4.4 | 2.7 | 4.0 | 35 |

**Table A-2. Maximum 8-Hr CO Concentrations (ppm)**

| Year | CO Concentrations (ppm) | | | |
|---|---|---|---|---|
| | Superblock | Gull Park | North Long Beach | 8-hour NAAQS |
| **2007** | 3.4 | 2.3 | 3.3 | 9 |
| **2008** | 3.4 | 2.4 | 5.8 | 9 |
| **2009** | 3.3 | 2.4 | 2.2 | 9 |
| **2010** | 2.6 | 2.1 | 2.1 | 9 |

**Table A-3. Annual Average CO Concentrations (ppm)**

| Year | CO Concentrations (ppm) | | |
|---|---|---|---|
| | Superblock | Gull Park | North Long Beach |
| **2007** | 0.6 | 0.4 | 0.6 |
| **2008** | 0.6 | 0.5 | 0.5 |
| **2009** | 0.6 | 0.4 | 0.5 |
| **2010** | 0.6 | 0.6 | 0.4 |

**Table A-4. CO Data Recovery (1-Hr Data Points)**

| | Superblock | Gull Park | North Long Beach |
|---|---|---|---|
| **Total Data Points** [1] | 8,291 | 8,126 | 8,132 |
| **Potential 1-Hr Points** [2] | 8,395 | 8,395 | 8,760 |
| **% Data Recovery** | **98.8%** | **96.8%** | **92.8%** |

(1) Total data points represent the total number of valid 1-hour values during 2010 for each site.

(2) Potential 1-hour points represent the number of hours in a year minus the hours used for calibration of the monitor.

**Table A-5. Daily Maximum 1-Hr Average $NO_2$ Concentrations (ppm) During 2010**

| Superblock | | Gull Park | | North Long Beach | | LA - North Main | | Anaheim | | Burbank | | Azusa | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. |
| 9/27 | 0.136 | 11/2 | 0.091 | 9/27 | 0.09 | 8/24 | 0.089 | 9/27 | 0.069 | 1/7 | 0.082 | 12/10 | 0.077 |
| 11/2 | 0.11 | 1/5 | 0.09 | 2/1 | 0.077 | 9/24 | 0.078 | 1/8 | 0.066 | 1/6 | 0.069 | 11/17 | 0.068 |
| 11/3 | 0.108 | 11/4 | 0.088 | 9/24 | 0.074 | 9/25 | 0.073 | 2/16 | 0.064 | 8/26 | 0.069 | 12/9 | 0.068 |
| 12/7 | 0.105 | 11/3 | 0.087 | 11/2 | 0.071 | 9/26 | 0.073 | 9/26 | 0.063 | 9/24 | 0.069 | 8/24 | 0.067 |
| 12/3 | 0.104 | 1/6 | 0.086 | 3/21 | 0.07 | 9/27 | 0.073 | 2/15 | 0.062 | 8/23 | 0.068 | 1/12 | 0.061 |
| 1/5 | 0.101 | 1/8 | 0.086 | 9/25 | 0.07 | 12/9 | 0.073 | 9/24 | 0.061 | 2/17 | 0.067 | 12/8 | 0.061 |
| **11/4(1)** | **0.101** | 3/15(1) | 0.082 | 11/4(1) | 0.07 | 1/12(1) | 0.072 | 11/18(1) | 0.059 | 9/26(1) | 0.064 | 8/25(1) | 0.06 |
| 12/2 | 0.101 | 12/2 | 0.081 | 1/8 | 0.069 | 12/10 | 0.071 | 1/11 | 0.058 | 8/17 | 0.063 | 9/3 | 0.06 |
| 1/8 | 0.096 | 1/4 | 0.078 | 3/15 | 0.067 | 1/7 | 0.07 | 3/17 | 0.057 | 9/3 | 0.063 | 1/7 | 0.059 |
| 2/17 | 0.094 | 2/16 | 0.078 | 3/17 | 0.067 | 8/17 | 0.069 | 3/15 | 0.056 | 9/25 | 0.063 | 2/1 | 0.059 |
| 1/11 | 0.093 | 1/29 | 0.076 | 8/18 | 0.064 | 9/4 | 0.069 | 10/9 | 0.056 | 9/28 | 0.063 | 9/26 | 0.059 |
| 10/28 | 0.093 | 2/17 | 0.076 | 3/16 | 0.062 | 9/28 | 0.068 | 9/28 | 0.055 | 1/12 | 0.062 | 8/26 | 0.058 |
| 10/29 | 0.091 | 3/16 | 0.076 | 1/7 | 0.061 | 2/17 | 0.067 | 12/11 | 0.055 | 9/27 | 0.062 | 9/24 | 0.058 |
| 11/11 | 0.091 | 10/29 | 0.075 | 1/12 | 0.061 | 8/18 | 0.067 | 12/3 | 0.054 | 9/30 | 0.062 | 9/28 | 0.057 |
| 1/6 | 0.09 | 12/3 | 0.074 | 1/2 | 0.06 | 12/3 | 0.067 | 1/4 | 0.053 | 10/9 | 0.062 | 12/3 | 0.057 |
| 2/16 | 0.086 | 12/7 | 0.074 | 1/11 | 0.06 | 12/2 | 0.065 | 1/5 | 0.053 | 8/25 | 0.061 | 3/18 | 0.056 |
| 8/24 | 0.086 | 12/27 | 0.073 | 2/17 | 0.059 | 3/20 | 0.064 | 12/12 | 0.053 | 12/3 | 0.061 | 12/13 | 0.056 |
| 11/5 | 0.084 | 3/17 | 0.072 | 3/29 | 0.059 | 2/16 | 0.063 | 1/15 | 0.052 | 1/8 | 0.06 | 9/25 | 0.055 |

(1) This daily maximum 1-hour value represents the 98th percentile for 2010. This value will is used to calculate the 3-year average to determine attainment with the 1-hour $NO_2$ standard (0.100 ppm).

**Table A-6. 98th Percentile of the Daily Maximum 1-Hr Average $NO_2$ Concentrations (ppm)**

| Year | Superblock | Gull Park | North Long Beach | 3-year NAAQS |
|---|---|---|---|---|
| **2008** | 0.114 | 0.082 | 0.089 | N/A |
| **2009** | 0.095 | 0.097 | 0.070 | N/A |
| **2010** | 0.101 | 0.082 | 0.070 | N/A |
| **Average (1)** | **0.103** | **0.087** | **0.076** | **0.100** |

(1) This is the 3-year average of the 98th percentile of the daily maximum 1-hour NO2 concentration to determine attainment with the 1-hour $NO_2$ standard.

**Table A-7. Annual Average $NO_2$ Concentrations (ppm)**

| Year | Superblock | Gull Park | North Long Beach | Annual NAAQS |
|---|---|---|---|---|
| **2007** | 0.03 | 0.02 | 0.02 | 0.053 |
| **2008** | 0.03 | 0.02 | 0.02 | 0.053 |
| **2009** | 0.02 | 0.02 | 0.02 | 0.053 |
| **2010** | 0.03 | 0.02 | 0.02 | 0.053 |
| **% Change (1)** | **-15.2%** | **-10.8%** | **-4.2%** | **N/A** |

(1) Percent change is over the 4-year period of record.

**Table A-8. $NO_2$ Data Recovery (1-Hr Data Points)**

| | Superblock | Gull Park | North Long Beach |
|---|---|---|---|
| **Total Data Points (1)** | 7,994 | 8,361 | 7,920 |
| **Potential 1-Hr Points (2)** | 8,395 | 8,395 | 8,760 |
| **% Data Recovery** | **95.2%** | **99.6%** | **90.4%** |

(1) Total data points represent the total number of valid 1-hour values during 2010 for each site.

(2) Potential 1-hour points represent the number of hours in a year minus the hours used for calibration of the monitor.

**Table A-9. Daily Maximum 8-Hr Average $O_3$ Concentrations (ppm) During 2010**

| Superblock | | Gull Park | | North Long Beach | | LA - North Main | | Anaheim | | Burbank | | Azusa | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. | Date | Conc. |
| 9/26 | 0.0701 | 9/26 | 0.0731 | 9/26 | 0.0844 | 9/26 | 0.0810 | 9/26 | 0.0888 | 6/5 | 0.0846 | 9/4 | 0.0825 |
| 9/25 | 0.0555 | 9/25 | 0.0653 | 9/25 | 0.0634 | 9/25 | 0.0664 | 10/10 | 0.0665 | 9/26 | 0.0801 | 6/5 | 0.0791 |
| 4/25 | 0.0550 | 4/27 | 0.0641 | 10/10 | 0.0615 | 6/5 | 0.0656 | 5/8 | 0.0648 | 9/4 | 0.0795 | 9/26 | 0.0768 |
| 10/9[(1)] | 0.0516 | 4/25 | 0.0614 | 5/7 | 0.0585 | 8/23 | 0.0648 | 5/7 | 0.0644 | 9/25 | 0.0774 | 6/6 | 0.0763 |
| 10/10 | 0.0513 | 9/27 | 0.0606 | 9/27 | 0.0583 | 7/16 | 0.0638 | 9/4 | 0.0631 | 5/30 | 0.0763 | 9/25 | 0.0744 |
| 9/24 | 0.0498 | 9/24 | 0.0603 | 4/25 | 0.0563 | 5/30 | 0.0636 | 9/25 | 0.0613 | 7/10 | 0.0756 | 5/30 | 0.0733 |
| 5/7 | 0.0495 | 10/10 | 0.0595 | 3/28 | 0.0553 | 9/4 | 0.0596 | 4/25 | 0.0608 | 4/18 | 0.0739 | 7/16 | 0.0733 |
| 4/17 | 0.0494 | 4/10 | 0.0576 | 4/26 | 0.0544 | 10/10 | 0.0585 | 7/1 | 0.0593 | 8/17 | 0.0724 | 7/17 | 0.0715 |
| 4/27 | 0.0487 | 4/26 | 0.0573 | 3/27 | 0.0540 | 8/17 | 0.0583 | 6/24 | 0.0592 | 10/10 | 0.0718 | 4/18 | 0.0708 |
| 4/10 | 0.0485 | 5/7 | 0.0565 | 5/8 | 0.0523 | 5/16 | 0.0578 | 5/30 | 0.0590 | 7/16 | 0.0714 | 9/5 | 0.0708 |
| 5/16 | 0.0480 | 5/15 | 0.0559 | 5/29 | 0.0521 | 5/7 | 0.0575 | 4/26 | 0.0584 | 5/16 | 0.0706 | 8/1 | 0.0704 |
| 4/11 | 0.0469 | 3/21 | 0.0555 | 3/16 | 0.0515 | 4/18 | 0.0575 | 4/18 | 0.0579 | 6/6 | 0.0699 | 7/15 | 0.0703 |
| 3/28 | 0.0465 | 6/1 | 0.0554 | 4/7 | 0.0510 | 3/28 | 0.0558 | 6/14 | 0.0576 | 4/25 | 0.0696 | 4/25 | 0.0690 |
| 9/4 | 0.0459 | 5/16 | 0.0554 | 4/17 | 0.0508 | 8/18 | 0.0548 | 9/12 | 0.0576 | 7/11 | 0.0694 | 5/8 | 0.0680 |
| 8/22 | 0.0459 | 4/11 | 0.0551 | 9/24 | 0.0500 | 7/10 | 0.0547 | 4/27 | 0.0575 | 7/18 | 0.0694 | 7/24 | 0.0666 |
| 4/26 | 0.0458 | 3/28 | 0.0543 | 4/27 | 0.0499 | 4/25 | 0.0546 | 9/27 | 0.0571 | 7/15 | 0.0685 | 7/1 | 0.0665 |
| 5/15 | 0.0454 | 4/24 | 0.0538 | 10/9 | 0.0495 | 5/8 | 0.0545 | 5/29 | 0.0571 | 5/7 | 0.0678 | 6/20 | 0.0663 |
| 5/29 | 0.0454 | 5/8 | 0.0534 | 3/14 | 0.0489 | 9/24 | 0.0545 | 5/6 | 0.0570 | 9/5 | 0.0675 | 10/10 | 0.0661 |

(1) This daily max value represents the 99th percentile daily maximum 8-hr average during 2010. This value will is used to calculate the 3-year average to determine attainment with the 8-hour O3 standard (0.075 ppm).

**Table A-10. Fourth Highest 8-Hr $O_3$ Concentrations (ppm)**

| | Superblock | | Gull Park | | North Long Beach | |
|---|---|---|---|---|---|---|
| **Year** | **Date** | **Conc.** | **Date** | **Conc.** | **Date** | **Conc.** |
| **2008** | 5/17 | 0.068 | 11/22 | 0.054 | 5/17 | 0.065 |
| **2009** | 10/18 | 0.050 | 8/17 | 0.063 | 4/21 | 0.064 |
| **2010** | 10/9 | 0.052 | 4/25 | 0.061 | 5/7 | 0.059 |
| **Average [(1)]** | **N/A** | **0.056** | **N/A** | **0.059** | **N/A** | **0.062** |

(1) This is the 3-year average of the 99th percentile daily maximum 8-hour $O_3$ concentration to determine attainment with the 8-hour $O_3$ standard.

**Table A-11. Maximum 1-Hr $O_3$ Concentrations (ppm)**

| Year | Superblock | Gull Park | North Long Beach | 1-Hr NAAQS |
|---|---|---|---|---|
| **2007** | 0.093 | 0.100 | 0.099 | 0.12 |
| **2008** | 0.091 | 0.091 | 0.093 | 0.12 |
| **2009** | 0.069 | 0.072 | 0.089 | 0.12 |
| **2010** | 0.089 | 0.094 | 0.101 | 0.12 |

**Table A-12. Annual Average $O_3$ Concentrations (ppm)**

| Year | Superblock | Gull Park | North Long Beach |
|---|---|---|---|
| **2007** | 0.018 | 0.024 | 0.021 |
| **2008** | 0.019 | 0.022 | 0.023 |
| **2009** | 0.018 | 0.027 | 0.022 |
| **2010** | 0.021 | 0.028 | 0.019 |

**Table A-13. $O_3$ Data Recovery (1-Hr Data Points)**

| | Superblock | Gull Park | North Long Beach |
|---|---|---|---|
| **Valid Hourly Averages** [(1)] | 8,291 | 8,264 | 8,136 |
| **Total Available Hours** [(2)] | 8,395 | 8,395 | 8,395 |
| **% Data Recovery** | **98.8%** | **98.4%** | **96.9%** |

(1) Valid hourly averages are the total number of valid data points collected during 2010 at each station.
(2) Total available hours are the number of hr/yr minus the hours used for instrument calibration.

**Table A-14. Highest Daily Maximums 1-Hr $SO_2$ Concentrations (ppm) During 2010**

| Superblock | | Gull Park | | North Long Beach | |
|---|---|---|---|---|---|
| Date | Conc. | Date | Conc. | Date | Conc. |
| 10/19 | 0.089 | 7/19 | 0.175 | 8/17 | 0.086 |
| 7/13 | 0.049 | 4/9 | 0.05 | 8/12 | 0.077 |
| 12/27 | 0.038 | 12/23 | 0.03 | 5/14 | 0.069 |
| 11/12(1) | 0.031 | 11/12(1) | 0.028 | 4/26(1) | 0.043 |
| 5/4 | 0.026 | 12/22 | 0.024 | 2/1 | 0.04 |
| 2/1 | 0.025 | 12/30 | 0.024 | 6/1 | 0.033 |
| 8/15 | 0.025 | 2/18 | 0.023 | 6/21 | 0.033 |
| 8/18 | 0.024 | 1/2 | 0.022 | 6/23 | 0.032 |
| 8/19 | 0.02 | 4/7 | 0.021 | 7/14 | 0.032 |
| 8/20 | 0.02 | 5/13 | 0.021 | 8/8 | 0.032 |
| 9/26 | 0.02 | 12/11 | 0.019 | 11/12 | 0.032 |
| 4/7 | 0.019 | 3/14 | 0.018 | 6/24 | 0.031 |
| 9/24 | 0.019 | 7/9 | 0.018 | 6/25 | 0.031 |
| 12/1 | 0.018 | 11/13 | 0.018 | 8/13 | 0.031 |
| 12/20 | 0.018 | 9/4 | 0.017 | 9/25 | 0.031 |
| 11/1 | 0.017 | 8/13 | 0.015 | 9/27 | 0.031 |
| 11/13 | 0.016 | 8/26 | 0.015 | 4/22 | 0.03 |
| 12/8 | 0.016 | 12/27 | 0.015 | 4/23 | 0.03 |

(1) This daily max value represents the 99th percentile for daily maximum 1-hr SO2 concentrations in 2010. A three-year average of this value can be compared with the 1-hour SO2 NAAQS (0.075 ppm) to determine compliance.

**Table A-15. Maximum 24-Hr $SO_2$ Concentrations (ppm)**

| | $SO_2$ Concentrations (ppm) | | | |
|---|---|---|---|---|
| **Year** | **Superblock** | **Gull Park** | **North Long Beach** | **24-hour NAAQS** |
| **2007** | 0.022 | 0.012 | 0.009 | 0.140 |
| **2008** | 0.021 | 0.019 | 0.010 | 0.140 |
| **2009** | 0.013 | 0.012 | 0.004 | 0.140 |
| **2010** | 0.009 | 0.012 | 0.007 | 0.140 |

**Table A-16. Annual Average $SO_2$ Concentrations (ppm)**

| Year | Superblock | Gull Park | North Long Beach | Annual NAAQS |
|---|---|---|---|---|
| **2007** | 0.005 | 0.004 | 0.003 | 0.030 |
| **2008** | 0.005 | 0.004 | 0.003 | 0.030 |
| **2009** | 0.003 | 0.003 | 0.001 | 0.030 |
| **2010** | 0.002 | 0.002 | 0.002 | 0.030 |
| **% Change (1)** | **-56.9%** | **-44.2%** | **-33.3%** | **N/A** |

(1) Percent change is over the 4-year period of record.

**Table A-17. Maximum 3-Hr Average $SO_2$ concentrations (ppm)**

| Superblock | | Gull Park | | North Long Beach | |
|---|---|---|---|---|---|
| Date | Conc. | Date | Conc. | Date | Conc. |
| 7/13 | 0.039 | 7/19 | 0.087 | 8/17 | 0.086 |
| 10/19(1) | 0.031 | 11/12(1) | 0.021 | 8/12(1) | 0.077 |
| 2/1 | 0.019 | 12/23 | 0.021 | 2/1 | 0.028 |
| 12/27 | 0.019 | 4/7 | 0.018 | 5/14 | 0.024 |
| 8/18 | 0.018 | 4/9 | 0.017 | 7/23 | 0.017 |

(1) This daily max value represents the 2nd highest 3-hour daily SO2 concentration in 2010. This value can be compared with the 3-hr secondary SO2 NAAQS (0.5 ppm) to determine compliance.

**Table A-18. $SO_2$ Data Recovery (1-Hr Data Points)**

| | Superblock | Gull Park | North Long Beach |
|---|---|---|---|
| **Total Data Points (1)** | 8,294 | 8,363 | 8,135 |
| **Potential 1-Hr Points (2)** | 8,395 | 8,395 | 8,395 |
| **% Data Recovery** | **98.8%** | **99.6%** | **96.9%** |

(1) Total data points represent the total number of valid 1-Hr values during 2010 for each site.

(2) Potential 1-Hr points represent the number of hours in a year minus the hours used for calibration of the monitor.

**Table A-19. Filter-Based $PM_{10}$ Concentrations (µg/m3)**

| Sampling Date | Superblock - FRM | Gull Park - FRM |
|---|---|---|
| **1/5/2010** | 79.8 | 43.5 |
| **1/11/2010** | 82.0 | 49.8 |
| **1/17/2010** | 21.9 | 23.3 |
| **1/23/2010** | 27.3 | 23.6 |
| **1/29/2010** | 44.3 | 34.6 |
| **2/4/2010** | 28.3 | 19.3 |
| **2/10/2010** | 28.0 | 20.9 |
| **2/16/2010** | 77.0 | 55.5 |
| **2/19/2010** | 22.4 | 10.4 |
| **2/25/2010** | 28.6 | 14.3 |
| **3/3/2010** | 21.3 | 11.9 |
| **3/9/2010** | 41.0 | 15.7 |
| **3/15/2010** | 52.0 | 41.8 |
| **3/21/2010** | 38.2 | 32.7 |
| **3/27/2010** | 87.1 | 43.8 |
| **4/2/2010** | 28.3 | 19.4 |
| **4/8/2010** | 65.3 | 33.5 |
| **4/14/2010** | 54.5 | 26.6 |
| **4/20/2010** | 25.5 | 14.8 |
| **4/26/2010** | 79.9 | 40.4 |
| **5/2/2010** | 26.2 | 27.0 |
| **5/8/2010** | 43.4 | 35.4 |
| **5/14/2010** | 42.7 | 26.6 |
| **5/20/2010** | 38.2 | 26.9 |
| **5/26/2010** | 48.7 | 11.9 |
| **6/1/2010** | 35.1 | 21.5 |
| **6/7/2010** | 28.8 | 11.4 |
| **6/13/2010** | 35.3 | 19.4 |
| **6/19/2010** | 39.7 | 27.8 |
| **6/25/2010** | 34.3 | 18.0 |
| **6/28/2010** | | |
| **7/1/2010** | 42.3 | 24.3 |
| **7/7/2010** | 44.7 | 17.5 |
| **7/13/2010** | 60.2 | 24.7 |
| **7/19/2010** | 27.0 | 16.8 |
| **7/25/2010** | 20.0 | 17.9 |
| **7/31/2010** | 18.7 | 16.2 |
| **8/6/2010** | 34.5 | 17.0 |
| **8/12/2010** | 45.8 | 15.2 |
| **8/18/2010** | 56.7 | 26.0 |
| **8/24/2010** | 90.1 | 42.7 |
| **8/30/2010** | 45.0 | 25.2 |
| **9/5/2010** | 25.8 | 23.8 |

**Table A-19. Filter-Based $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - FRM | Gull Park - FRM |
|---|---|---|
| **9/11/2010** | 32.2 | 18.5 |
| **9/17/2010** | 36.2 | 17.2 |
| **9/23/2010** | 55.6 | 27.1 |
| **9/29/2010** | 49.9 | 24.4 |
| **10/5/2010** | 21.6 | 15.1 |
| **10/11/2010** | 26.0 | 19.0 |
| **10/17/2010** | 9.0 | 6.4 |
| **10/23/2010** | 8.5 | 7.3 |
| **10/29/2010** | 54.9 | 31.2 |
| **11/4/2010** | 76.0 | |
| **11/10/2010** | 44.5 | 22.4 |
| **11/16/2010** | 28.8 | 12.6 |
| **11/22/2010** | 32.1 | 18.4 |
| **11/28/2010** | 12.5 | 11.0 |
| **12/4/2010** | 72.4 | 40.5 |
| **12/10/2010** | 29.1 | 14.1 |
| **12/16/2010** | 29.8 | 19.1 |
| **12/22/2010** | 11.4 | 14.5 |
| **12/28/2010** | 30.3 | 28.3 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **01/01/2010** | 37.9 | 32.2 |
| **01/02/2010** | 48.9 | 39.0 |
| **01/03/2010** | 38.9 | 31.6 |
| **01/04/2010** | 73.1 | 39.4 |
| **01/05/2010** | 94.2 | 43.5 |
| **01/06/2010** | 79.0 | 50.0 |
| **01/07/2010** | 82.3 | 53.7 |
| **01/08/2010** | 100.8 | 66.2 |
| **01/09/2010** | 62.0 | 41.2 |
| **01/10/2010** | 47.4 | 38.8 |
| **01/11/2010** | 92.0 | 54.6 |
| **01/12/2010** | 82.9 | 33.7 |
| **01/13/2010** | 45.3 | 25.7 |
| **01/14/2010** | 64.5 | 36.6 |
| **01/15/2010** | 68.0 | 47.0 |
| **01/16/2010** | 52.9 | 39.7 |
| **01/17/2010** | 27.7 | 26.8 |
| **01/18/2010** | 25.4 | 25.0 |
| **01/19/2010** | 30.6 | 35.1 |
| **01/20/2010** | 24.6 | 35.2 |
| **01/21/2010** | 15.3 | 20.6 |
| **01/22/2010** | 11.0 | 13.0 |
| **01/23/2010** | 28.6 | 25.0 |
| **01/24/2010** | 39.1 | 41.7 |
| **01/25/2010** | 61.9 | 50.0 |
| **01/26/2010** | 50.1 | 36.7 |
| **01/27/2010** | 37.2 | 23.4 |
| **01/28/2010** | 53.4 | 40.7 |
| **01/29/2010** | 50.3 | 38.7 |
| **01/30/2010** | 46.8 | 35.7 |
| **01/31/2010** | 40.9 | 38.3 |
| **02/01/2010** | 62.8 | 43.6 |
| **02/02/2010** | 73.5 | 39.6 |
| **02/03/2010** | 64.0 | 44.1 |
| **02/04/2010** | 33.7 | 22.8 |
| **02/05/2010** | 16.4 | 19.1 |
| **02/06/2010** | 10.0 | 12.8 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **02/07/2010** | 17.0 | 19.0 |
| **02/08/2010** | 32.2 | 25.6 |
| **02/09/2010** | 29.1 | 18.2 |
| **02/10/2010** | 31.2 | 23.1 |
| **02/11/2010** | 32.6 | 31.2 |
| **02/12/2010** | 55.5 | 35.3 |
| **02/13/2010** | 52.4 | 55.0 |
| **02/14/2010** | 42.0 | 43.1 |
| **02/15/2010** | 61.0 | 52.2 |
| **02/16/2010** | 88.3 | 64.1 |
| **02/17/2010** | 84.1 | 58.1 |
| **02/18/2010** | 53.7 | 27.6 |
| **02/19/2010** | 26.2 | 13.9 |
| **02/20/2010** | 13.2 | 13.3 |
| **02/21/2010** | 14.4 | 15.2 |
| **02/22/2010** | 32.4 | 17.2 |
| **02/23/2010** | 71.8 | 31.3 |
| **02/24/2010** | 33.2 | 22.5 |
| **02/25/2010** | 37.9 | 20.4 |
| **02/26/2010** | 49.3 | 36.6 |
| **02/27/2010** | 14.4 | 14.5 |
| **02/28/2010** | 19.0 | 22.0 |
| **03/01/2010** | 38.6 | 33.9 |
| **03/02/2010** | 36.8 | 16.8 |
| **03/03/2010** | 29.4 | 14.9 |
| **03/04/2010** | 28.5 | 12.7 |
| **03/05/2010** | 34.3 | 25.4 |
| **03/06/2010** | 15.4 | 15.1 |
| **03/07/2010** | 17.3 | 16.3 |
| **03/08/2010** | 41.2 | 32.9 |
| **03/09/2010** | 53.7 | 15.6 |
| **03/10/2010** | 62.6 | 17.9 |
| **03/11/2010** | 54.9 | 36.0 |
| **03/12/2010** | 48.8 | 27.8 |
| **03/13/2010** | 25.5 | 17.7 |
| **03/14/2010** | 34.3 | 31.0 |
| **03/15/2010** | 71.3 | 47.6 |
| **03/16/2010** | 78.2 | 35.7 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **03/17/2010** | 90.2 | 44.1 |
| **03/18/2010** | 54.7 | 37.1 |
| **03/19/2010** | 69.6 | 38.5 |
| **03/20/2010** | 38.6 | 28.1 |
| **03/21/2010** | 49.4 | 40.4 |
| **03/22/2010** | 49.1 | 32.1 |
| **03/23/2010** | 79.7 | 40.4 |
| **03/24/2010** | 71.1 | 34.9 |
| **03/25/2010** | 51.8 | 26.5 |
| **03/26/2010** | 59.7 | 28.4 |
| **03/27/2010** | 81.0 | 52.8 |
| **03/28/2010** | 24.1 | 22.4 |
| **03/29/2010** | 91.7 | 41.6 |
| **03/30/2010** | 40.3 | 16.5 |
| **03/31/2010** | 48.3 | 23.8 |
| **04/01/2010** | 26.8 | 9.5 |
| **04/02/2010** | 32.7 | 21.6 |
| **04/03/2010** | 47.6 | 26.5 |
| **04/04/2010** | 25.9 | 21.5 |
| **04/05/2010** | 29.6 | 18.1 |
| **04/06/2010** | 70.8 | 29.1 |
| **04/07/2010** | 107.1 | 42.7 |
| **04/08/2010** | 71.5 | 37.0 |
| **04/09/2010** | 60.8 | 37.6 |
| **04/10/2010** | 42.1 | 33.7 |
| **04/11/2010** | 34.7 | 34.0 |
| **04/12/2010** | 25.0 | 19.2 |
| **04/13/2010** | 44.5 | 25.4 |
| **04/14/2010** | 52.6 | 26.7 |
| **04/15/2010** | 90.2 | 34.9 |
| **04/16/2010** | 69.4 | 24.5 |
| **04/17/2010** | 50.4 | 30.5 |
| **04/18/2010** | 44.0 | 30.9 |
| **04/19/2010** | 74.2 | 27.4 |
| **04/20/2010** | 33.7 | 13.3 |
| **04/21/2010** | 77.4 | 20.0 |
| **04/22/2010** | 25.7 | 13.0 |
| **04/23/2010** | 52.4 | 22.6 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **04/24/2010** | 44.6 | 34.8 |
| **04/25/2010** | 41.5 | 36.8 |
| **04/26/2010** | 99.8 | 47.7 |
| **04/27/2010** | 45.4 | 25.9 |
| **04/28/2010** | 33.9 | 13.9 |
| **04/29/2010** | 95.8 | 23.8 |
| **04/30/2010** | 61.4 | 24.0 |
| **05/01/2010** | 37.6 | 33.4 |
| **05/02/2010** | 25.7 | 29.1 |
| **05/03/2010** | 66.4 | 37.6 |
| **05/04/2010** | 53.2 | 23.4 |
| **05/05/2010** | 48.9 | 35.6 |
| **05/06/2010** | 66.8 | 44.9 |
| **05/07/2010** | 65.0 | 47.6 |
| **05/08/2010** | 47.7 | 38.9 |
| **05/09/2010** | 33.4 | 24.0 |
| **05/10/2010** | 35.1 | 21.5 |
| **05/11/2010** | 49.0 | 20.7 |
| **05/12/2010** | 46.9 | 28.3 |
| **05/13/2010** | 53.0 | 34.1 |
| **05/14/2010** | 53.8 | 29.6 |
| **05/15/2010** | 41.3 | 30.1 |
| **05/16/2010** | 15.0 | 16.1 |
| **05/17/2010** | 23.9 | 13.6 |
| **05/18/2010** | 22.4 | 8.1 |
| **05/19/2010** | 32.1 | 13.0 |
| **05/20/2010** | 39.9 | 28.1 |
| **05/21/2010** | 43.8 | 36.8 |
| **05/22/2010** | 46.2 | 33.3 |
| **05/23/2010** | 47.4 | 28.6 |
| **05/24/2010** | 38.3 | 29.4 |
| **05/25/2010** | | 24.5 |
| **05/26/2010** | | 11.2 |
| **05/27/2010** | 55.2 | 11.0 |
| **05/28/2010** | 48.8 | |
| **05/29/2010** | 47.5 | |
| **05/30/2010** | 30.8 | |
| **05/31/2010** | 26.5 | 30.8 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **06/01/2010** | 27.7 | 24.4 |
| **06/02/2010** | 86.3 | 21.3 |
| **06/03/2010** | 42.0 | 21.0 |
| **06/04/2010** | 31.3 | 18.4 |
| **06/05/2010** | 22.6 | 16.0 |
| **06/06/2010** | 13.4 | 9.6 |
| **06/07/2010** | 28.0 | 11.0 |
| **06/08/2010** | 20.1 | 6.3 |
| **06/09/2010** | 24.1 | 14.6 |
| **06/10/2010** | 27.7 | 19.2 |
| **06/11/2010** | 36.3 | 31.9 |
| **06/12/2010** | 32.4 | 29.9 |
| **06/13/2010** | 39.2 | 32.9 |
| **06/14/2010** | 69.9 | 37.5 |
| **06/15/2010** | 61.3 | 36.4 |
| **06/16/2010** | 49.9 | 32.7 |
| **06/17/2010** | 88.8 | 35.6 |
| **06/18/2010** | 65.6 | 35.6 |
| **06/19/2010** | 46.3 | 29.3 |
| **06/20/2010** | 33.0 | 29.5 |
| **06/21/2010** | 40.8 | 27.8 |
| **06/22/2010** | 71.9 | 31.3 |
| **06/23/2010** | 93.3 | 24.4 |
| **06/24/2010** | 63.5 | 23.8 |
| **06/25/2010** | 41.2 | 19.9 |
| **06/26/2010** | 21.8 | 16.8 |
| **06/27/2010** | 24.8 | 15.7 |
| **06/28/2010** | 24.2 | 11.0 |
| **06/29/2010** | 19.5 | 9.0 |
| **06/30/2010** | 61.7 | 18.7 |
| **07/01/2010** | 41.3 | 25.6 |
| **07/02/2010** | 44.6 | 29.9 |
| **07/03/2010** | 29.9 | 25.1 |
| **07/04/2010** | 21.7 | 20.6 |
| **07/05/2010** | 20.9 | 19.0 |
| **07/06/2010** | 32.2 | 11.8 |
| **07/07/2010** | 56.1 | 22.6 |
| **07/08/2010** | 37.4 | 18.4 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **07/09/2010** | 41.2 | 22.6 |
| **07/10/2010** | 27.4 | 22.0 |
| **07/11/2010** | 16.5 | 19.5 |
| **07/12/2010** | 42.1 | 20.9 |
| **07/13/2010** | 72.9 | 25.2 |
| **07/14/2010** | 62.5 | 30.7 |
| **07/15/2010** | 46.3 | 29.6 |
| **07/16/2010** | 60.8 | 36.3 |
| **07/17/2010** | 52.4 | 32.3 |
| **07/18/2010** | 26.8 | 25.8 |
| **07/19/2010** | 25.4 | 19.6 |
| **07/20/2010** | 30.7 | 14.6 |
| **07/21/2010** | 16.8 | 6.0 |
| **07/22/2010** | 21.1 | 8.9 |
| **07/23/2010** | 45.1 | 22.5 |
| **07/24/2010** | 30.9 | 21.3 |
| **07/25/2010** | 23.5 | 19.6 |
| **07/26/2010** | 24.7 | 19.6 |
| **07/27/2010** | 36.6 | 17.5 |
| **07/28/2010** | 56.7 | 17.4 |
| **07/29/2010** | 46.7 | 21.4 |
| **07/30/2010** | 48.9 | 21.2 |
| **07/31/2010** | 19.4 | 18.8 |
| **08/01/2010** | 22.2 | 19.5 |
| **08/02/2010** | 60.3 | 28.4 |
| **08/03/2010** | 71.2 | 21.2 |
| **08/04/2010** | 74.6 | 21.4 |
| **08/05/2010** | 42.6 | 18.1 |
| **08/06/2010** | 36.7 | 19.4 |
| **08/07/2010** | 30.5 | 19.9 |
| **08/08/2010** | 16.2 | 10.9 |
| **08/09/2010** | 46.1 | 17.5 |
| **08/10/2010** | 58.2 | 19.5 |
| **08/11/2010** | 50.7 | 18.3 |
| **08/12/2010** | 50.8 | 21.1 |
| **08/13/2010** | 54.9 | 18.6 |
| **08/14/2010** | 29.6 | 19.7 |
| **08/15/2010** | 26.6 | 21.0 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **08/16/2010** | 39.5 | 23.9 |
| **08/17/2010** | 56.3 | 25.9 |
| **08/18/2010** | 72.0 | 31.2 |
| **08/19/2010** | 68.1 | 31.5 |
| **08/20/2010** | 56.5 | 31.5 |
| **08/21/2010** | 41.5 | 26.4 |
| **08/22/2010** | 34.7 | 36.4 |
| **08/23/2010** | 54.3 | 28.7 |
| **08/24/2010** | 97.7 | 46.6 |
| **08/25/2010** | 92.6 | 42.4 |
| **08/26/2010** | 95.7 | 29.8 |
| **08/27/2010** | 58.9 | 26.1 |
| **08/28/2010** | 29.9 | 25.4 |
| **08/29/2010** | 30.5 | 28.4 |
| **08/30/2010** | 44.8 | 30.0 |
| **08/31/2010** | 57.5 | 31.7 |
| **09/01/2010** | 62.4 | 29.9 |
| **09/02/2010** | 92.7 | 35.3 |
| **09/03/2010** | 70.6 | 30.6 |
| **09/04/2010** | 34.8 | 21.1 |
| **09/05/2010** | 33.2 | 28.5 |
| **09/06/2010** | 31.2 | 30.3 |
| **09/07/2010** | 40.4 | 28.2 |
| **09/08/2010** | 37.6 | 20.6 |
| **09/09/2010** | 46.3 | 12.8 |
| **09/10/2010** | 56.3 | 26.3 |
| **09/11/2010** | 39.3 | 24.6 |
| **09/12/2010** | 32.2 | 31.3 |
| **09/13/2010** | 32.7 | 30.7 |
| **09/14/2010** | | 33.2 |
| **09/15/2010** | 47.7 | 29.6 |
| **09/16/2010** | 64.9 | 25.6 |
| **09/17/2010** | 44.4 | 22.1 |
| **09/18/2010** | 43.5 | 28.2 |
| **09/19/2010** | 30.1 | 22.0 |
| **09/20/2010** | 28.8 | 18.1 |
| **09/21/2010** | 35.2 | 16.5 |
| **09/22/2010** | 43.1 | 24.6 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **09/23/2010** | 59.5 | 35.0 |
| **09/24/2010** | 77.3 | 39.7 |
| **09/25/2010** | 60.8 | 42.0 |
| **09/26/2010** | 46.4 | 38.9 |
| **09/27/2010** | 78.7 | 40.9 |
| **09/28/2010** | 51.0 | 30.2 |
| **09/29/2010** | 51.3 | 25.6 |
| **09/30/2010** | 56.6 | 27.0 |
| **10/01/2010** | 37.7 | 17.5 |
| **10/02/2010** | 34.3 | 19.1 |
| **10/03/2010** | 30.1 | 23.9 |
| **10/04/2010** | 30.7 | 14.4 |
| **10/05/2010** | 25.9 | 19.4 |
| **10/06/2010** | 21.0 | 20.1 |
| **10/07/2010** | 43.7 | 28.6 |
| **10/08/2010** | 62.0 | 37.5 |
| **10/09/2010** | 56.4 | 42.1 |
| **10/10/2010** | 40.8 | 28.3 |
| **10/11/2010** | 31.7 | 22.5 |
| **10/12/2010** | 43.2 | 24.6 |
| **10/13/2010** | 71.6 | 36.0 |
| **10/14/2010** | 40.9 | 20.9 |
| **10/15/2010** | 27.7 | 11.8 |
| **10/16/2010** | 18.9 | 13.1 |
| **10/17/2010** | 11.8 | 10.3 |
| **10/18/2010** | 24.4 | 12.7 |
| **10/19/2010** | 23.7 | 19.8 |
| **10/20/2010** | 12.9 | 10.5 |
| **10/21/2010** | 32.7 | 17.4 |
| **10/22/2010** | 28.7 | 12.1 |
| **10/23/2010** | 12.6 | 9.6 |
| **10/24/2010** | 19.0 | 14.6 |
| **10/25/2010** | 34.9 | 18.8 |
| **10/26/2010** | 55.0 | 38.4 |
| **10/27/2010** | 68.7 | 48.8 |
| **10/28/2010** | 83.2 | 41.2 |
| **10/29/2010** | 69.3 | 39.8 |
| **10/30/2010** | 13.8 | 11.1 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **10/31/2010** | 21.4 | 19.5 |
| **11/01/2010** | 69.5 | 39.4 |
| **11/02/2010** | 107.7 | 49.1 |
| **11/03/2010** | 111.1 | 62.9 |
| **11/04/2010** | 99.6 | 58.5 |
| **11/05/2010** | 80.4 | 41.0 |
| **11/06/2010** | 42.2 | 25.1 |
| **11/07/2010** | 22.6 | 16.5 |
| **11/08/2010** | 47.3 | 12.5 |
| **11/09/2010** | 49.7 | 26.0 |
| **11/10/2010** | 56.7 | 28.9 |
| **11/11/2010** | 79.5 | 34.8 |
| **11/12/2010** | 74.8 | 41.3 |
| **11/13/2010** | 56.8 | 42.9 |
| **11/14/2010** | 35.3 | 38.3 |
| **11/15/2010** | 44.9 | 30.6 |
| **11/16/2010** | 34.0 | 16.5 |
| **11/17/2010** | 75.3 | 40.5 |
| **11/18/2010** | 78.5 | 54.9 |
| **11/19/2010** | 41.7 | 18.7 |
| **11/20/2010** | 10.0 | 9.3 |
| **11/21/2010** | 14.1 | 14.7 |
| **11/22/2010** | 33.8 | 22.6 |
| **11/23/2010** | 32.9 | 22.9 |
| **11/24/2010** | 32.3 | 24.0 |
| **11/25/2010** | 36.3 | 35.1 |
| **11/26/2010** | 34.5 | 27.7 |
| **11/27/2010** | 37.0 | 32.2 |
| **11/28/2010** | 16.5 | 15.1 |
| **11/29/2010** | 36.7 | 24.3 |
| **11/30/2010** | 59.9 | 39.3 |
| **12/01/2010** | 91.7 | 39.2 |
| **12/02/2010** | 78.2 | 55.8 |
| **12/03/2010** | 76.9 | 43.5 |
| **12/04/2010** | 57.2 | 47.2 |
| **12/05/2010** | 60.0 | 65.5 |
| **12/06/2010** | 34.8 | 27.8 |
| **12/07/2010** | 62.9 | 41.2 |

**Table A-20. Continuous $PM_{10}$ Concentrations (µg/m3) (cont.)**

| Sampling Date | Superblock - BAM | Gull Park - BAM |
|---|---|---|
| **12/08/2010** | 97.6 | 38.7 |
| **12/09/2010** | 63.6 | 33.4 |
| **12/10/2010** | 34.1 | 19.3 |
| **12/11/2010** | 41.6 | 19.8 |
| **12/12/2010** | 27.3 | 24.6 |
| **12/13/2010** | 56.4 | 35.5 |
| **12/14/2010** | 36.1 | 19.0 |
| **12/15/2010** | 29.9 | 21.0 |
| **12/16/2010** | 30.4 | 20.7 |
| **12/17/2010** | 14.3 | 17.7 |
| **12/18/2010** | 8.0 | 7.3 |
| **12/19/2010** | 4.3 | 7.5 |
| **12/20/2010** | 8.6 | 9.1 |
| **12/21/2010** | 8.9 | 10.2 |
| **12/22/2010** | 12.9 | 14.4 |
| **12/23/2010** | 24.6 | 20.6 |
| **12/24/2010** | 39.4 | 35.0 |
| **12/25/2010** | 26.4 | 23.7 |
| **12/26/2010** | 12.1 | 12.8 |
| **12/27/2010** | 52.4 | 37.9 |
| **12/28/2010** | 52.5 | 37.9 |
| **12/29/2010** | 26.0 | 19.7 |
| **12/30/2010** | 37.5 | 11.5 |
| **12/31/2010** | 31.7 | 19.0 |

**Table A-21. Maximum 24-Hr $PM_{10}$ Concentrations ($\mu g/m^3$)**

| Month | $PM_{10}$ Concentrations ($\mu g/m^3$)[1] | | | | |
|---|---|---|---|---|---|
| | Superblock - FRM | Gull Park - FRM | Superblock - BAM | Gull Park - BAM | 24-Hr NAAQS |
| **2010** | 90.1 | 55.5 | 111.1 | 66.2 | 150 |

(1) The maximum $PM_{10}$ concentration is the highest 24-hour average during 2010 as specified by the NAAQS.

**Table A-22. Annual Average $PM_{10}$ Concentrations ($\mu g/m^3$)**

| Year | $PM_{10}$ Concentrations ($\mu g/m^3$)[1] | | | | |
|---|---|---|---|---|---|
| | Superblock - FRM | Gull Park - FRM | Superblock - BAM | Gull Park - BAM | Annual CAAQS |
| **2007** | 49.1 | 35.6 | 50.2 | 38.9 | 20.0 |
| **2008** | 44.1 | 29.7 | 47.6 | 35.1 | 20.0 |
| **2009** | 44.7 | 29.8 | 52.1 | 35.4 | 20.0 |
| **2010** | 40.6 | 23.6 | 45.8 | 27.5 | 20.0 |
| **% Change [1]** | **-17.3%** | **-33.7%** | **-8.8%** | **-29.2%** | **N/A** |

(1) Percent change is over the 4-year period of record.

**Table A-23. Filter-Based $PM_{2.5}$ Concentrations ($\mu g/m^3$)**

| Sampling Date | Superblock - FRM |
|---|---|
| **1/2/2010** | 15.7 |
| **1/5/2010** | 15.8 |
| **1/8/2010** | 35.0 |
| **1/11/2010** | 22.5 |
| **1/14/2010** | 11.9 |
| **1/17/2010** | 9.4 |
| **1/20/2010** | 6.3 |
| **1/23/2010** | 12.8 |
| **1/26/2010** | 18.4 |
| **1/29/2010** | 15.0 |
| **2/1/2010** | 21.4 |
| **2/4/2010** | 6.8 |
| **2/7/2010** | 4.5 |
| **2/10/2010** | 10.2 |
| **2/13/2010** | 15.9 |
| **2/16/2010** | 17.2 |
| **2/19/2010** | 6.0 |
| **2/22/2010** | 4.7 |
| **2/25/2010** | 6.0 |
| **2/28/2010** | 6.0 |
| **3/3/2010** | 3.6 |
| **3/6/2010** | 3.6 |
| **3/9/2010** | 4.8 |
| **3/12/2010** | 8.2 |
| **3/15/2010** | 10.8 |
| **3/18/2010** | 8.9 |
| **3/21/2010** | 15.1 |
| **3/24/2010** | 10.9 |
| **3/27/2010** | 9.5 |
| **3/30/2010** | 4.7 |
| **4/2/2010** | 4.7 |
| **4/5/2010** | 4.2 |
| **4/8/2010** | 11.5 |
| **4/11/2010** | 8.0 |
| **4/14/2010** | 7.3 |
| **4/17/2010** | 8.9 |
| **4/20/2010** | 3.9 |
| **4/23/2010** | 6.3 |
| **4/26/2010** | 20.2 |
| **4/29/2010** | 5.7 |
| **5/2/2010** | 5.2 |
| **5/5/2010** | 7.9 |
| **5/8/2010** | 7.3 |

**Table A-23. Filter-Based $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Superblock - FRM |
|---|---|
| **5/11/2010** | 4.8 |
| **5/14/2010** | 10.1 |
| **5/17/2010** | 6.6 |
| **5/20/2010** | 6.9 |
| **5/23/2010** | 4.8 |
| **5/26/2010** | 6.3 |
| **5/29/2010** | 6.5 |
| **6/1/2010** | 8.5 |
| **6/4/2010** | 11.4 |
| **6/7/2010** | |
| **6/10/2010** | 5.8 |
| **6/13/2010** | 9.6 |
| **6/16/2010** | 9.6 |
| **6/19/2010** | 6.9 |
| **6/22/2010** | 10.0 |
| **6/25/2010** | 8.7 |
| **6/28/2010** | 7.6 |
| **7/1/2010** | 12.0 |
| **7/4/2010** | 8.4 |
| **7/7/2010** | 7.6 |
| **7/10/2010** | 11.5 |
| **7/13/2010** | 10.9 |
| **7/16/2010** | 12.8 |
| **7/19/2010** | 9.2 |
| **7/22/2010** | 5.7 |
| **7/25/2010** | 7.1 |
| **7/28/2010** | 6.9 |
| **7/31/2010** | 7.3 |
| **8/3/2010** | 10.5 |
| **8/6/2010** | 11.0 |
| **8/9/2010** | 9.4 |
| **8/12/2010** | 7.7 |
| **8/15/2010** | 6.0 |
| **8/18/2010** | 11.4 |
| **8/21/2010** | 7.9 |
| **8/24/2010** | 14.2 |
| **8/27/2010** | 11.0 |
| **8/30/2010** | 6.6 |
| **9/2/2010** | 14.2 |
| **9/5/2010** | 9.1 |
| **9/8/2010** | 6.7 |
| **9/11/2010** | 8.5 |
| **9/14/2010** | |
| **9/17/2010** | 9.2 |

**Table A-23. Filter-Based $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Superblock - FRM |
|---|---|
| **9/20/2010** | 7.0 |
| **9/23/2010** | 9.3 |
| **9/26/2010** | 12.8 |
| **9/29/2010** | 10.5 |
| **10/2/2010** | 8.0 |
| **10/5/2010** | 3.6 |
| **10/8/2010** | 10.6 |
| **10/11/2010** | 8.2 |
| **10/14/2010** | 9.4 |
| **10/17/2010** | 3.0 |
| **10/20/2010** | 2.5 |
| **10/23/2010** | 2.1 |
| **10/26/2010** | 6.7 |
| **10/29/2010** | 11.5 |
| **11/1/2010** | 12.8 |
| **11/4/2010** | 15.6 |
| **11/7/2010** | 3.8 |
| **11/10/2010** | 8.2 |
| **11/13/2010** | 13.7 |
| **11/16/2010** | 7.5 |
| **11/19/2010** | 8.4 |
| **11/22/2010** | 6.3 |
| **11/25/2010** | 15.1 |
| **11/28/2010** | 2.4 |
| **12/1/2010** | 11.1 |
| **12/4/2010** | 23.6 |
| **12/7/2010** | 15.1 |
| **12/10/2010** | 9.5 |
| **12/13/2010** | 12.5 |
| **12/16/2010** | 4.0 |
| **12/19/2010** | 1.1 |
| **12/22/2010** | 3.5 |
| **12/25/2010** | 12.5 |
| **12/28/2010** | 13.8 |
| **12/31/2010** | 13.3 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **1/1/2010** | 22.7 | 20.2 |
| **1/2/2010** | 19.4 | 16.1 |
| **1/3/2010** | 14.9 | 11.4 |
| **1/4/2010** | 13.7 | 10.5 |
| **1/5/2010** | 20.3 | 12.4 |
| **1/6/2010** | 27.3 | 22.9 |
| **1/7/2010** | 35.3 | 30.4 |
| **1/8/2010** | 40.4 | 39.9 |
| **1/9/2010** | 14.4 | 12.1 |
| **1/10/2010** | 17.6 | 16.5 |
| **1/11/2010** | 28.5 | 25.7 |
| **1/12/2010** | 30.3 | 19.9 |
| **1/13/2010** | 19.7 | 16.7 |
| **1/14/2010** | 14.1 | 12.7 |
| **1/15/2010** | 16.6 | 14.6 |
| **1/16/2010** | 18.7 | 16.1 |
| **1/17/2010** | 12.6 | 12.2 |
| **1/18/2010** | 7.4 | 7.3 |
| **1/19/2010** | 6.6 | 9.3 |
| **1/20/2010** | 6.2 | 9.0 |
| **1/21/2010** | 4.7 | 6.2 |
| **1/22/2010** | 5.2 | 6.4 |
| **1/23/2010** | 16.2 | 16.2 |
| **1/24/2010** | 21.6 | 19.3 |
| **1/25/2010** | 25.9 | 25.5 |
| **1/26/2010** | 21.4 | 18.6 |
| **1/27/2010** | 14.6 | 11.8 |
| **1/28/2010** | 17.7 | 19.2 |
| **1/29/2010** | 19.5 | 19.8 |
| **1/30/2010** | 20.5 | 20.4 |
| **1/31/2010** | 22.0 | 21.4 |
| **2/1/2010** | 28.6 | 23.7 |
| **2/2/2010** | 29.6 | 25.0 |
| **2/3/2010** | 23.6 | 24.7 |
| **2/4/2010** | 9.7 | 10.7 |
| **2/5/2010** | 6.2 | 6.3 |
| **2/6/2010** | 0.0 | 3.7 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **2/7/2010** | 4.5 | 6.9 |
| **2/8/2010** | 6.5 | 7.3 |
| **2/9/2010** | 7.3 | 6.2 |
| **2/10/2010** | 14.5 | 12.8 |
| **2/11/2010** | 10.7 | 11.9 |
| **2/12/2010** | 19.0 | 14.0 |
| **2/13/2010** | 24.1 | 24.2 |
| **2/14/2010** | 19.4 | 18.5 |
| **2/15/2010** | 19.4 | 19.7 |
| **2/16/2010** | 21.9 | 24.2 |
| **2/17/2010** | 27.2 | 23.0 |
| **2/18/2010** | 23.3 | 16.4 |
| **2/19/2010** | 7.1 | 5.9 |
| **2/20/2010** | 4.4 | 4.7 |
| **2/21/2010** | 2.2 | 3.8 |
| **2/22/2010** | 3.7 | 3.7 |
| **2/23/2010** | 10.8 | 8.5 |
| **2/24/2010** | 9.8 | 7.1 |
| **2/25/2010** | 12.9 | 9.2 |
| **2/26/2010** | 16.5 | 15.4 |
| **2/27/2010** | 2.2 | 3.0 |
| **2/28/2010** | 6.8 | 10.4 |
| **3/1/2010** | 12.0 | 9.0 |
| **3/2/2010** | 5.0 | 4.5 |
| **3/3/2010** | 3.4 | 3.1 |
| **3/4/2010** | 1.9 | 1.9 |
| **3/5/2010** | 8.1 | 6.8 |
| **3/6/2010** | 1.8 | 3.7 |
| **3/7/2010** | 3.7 | 6.4 |
| **3/8/2010** | 7.9 | 8.6 |
| **3/9/2010** | 2.8 | 2.3 |
| **3/10/2010** | 5.0 | 3.5 |
| **3/11/2010** | 11.4 | 9.0 |
| **3/12/2010** | 10.6 | 9.0 |
| **3/13/2010** | 4.5 | 4.5 |
| **3/14/2010** | 8.0 | 5.5 |
| **3/15/2010** | 11.6 | 10.2 |
| **3/16/2010** | 12.6 | 7.1 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **3/17/2010** | 13.7 | 12.7 |
| **3/18/2010** | 14.4 | 12.8 |
| **3/19/2010** | 13.1 | 14.0 |
| **3/20/2010** | 15.0 | 13.8 |
| **3/21/2010** | 28.2 | 23.0 |
| **3/22/2010** | 15.0 | 10.5 |
| **3/23/2010** | 14.0 | 13.4 |
| **3/24/2010** | 16.4 | 13.2 |
| **3/25/2010** | 14.5 | 10.6 |
| **3/26/2010** | 8.7 | 7.5 |
| **3/27/2010** | 13.6 | 9.8 |
| **3/28/2010** | 4.9 | 3.8 |
| **3/29/2010** | 15.4 | 10.8 |
| **3/30/2010** | 6.0 | 5.0 |
| **3/31/2010** | 9.4 | 5.7 |
| **4/1/2010** | 1.7 | 2.9 |
| **4/2/2010** | 6.3 | 6.2 |
| **4/3/2010** | 7.7 | 8.8 |
| **4/4/2010** | 7.2 | 7.3 |
| **4/5/2010** | 5.5 | 4.0 |
| **4/6/2010** | 10.6 | 10.2 |
| **4/7/2010** | 15.9 | 10.9 |
| **4/8/2010** | 14.1 | 13.2 |
| **4/9/2010** | 16.6 | 13.1 |
| **4/10/2010** | 13.6 | 12.6 |
| **4/11/2010** | 11.7 | 11.2 |
| **4/12/2010** | 5.0 | 5.0 |
| **4/13/2010** | 9.6 | 8.4 |
| **4/14/2010** | 9.6 | 7.4 |
| **4/15/2010** | 14.7 | 11.3 |
| **4/16/2010** | 13.2 | 6.5 |
| **4/17/2010** | 13.3 | 9.4 |
| **4/18/2010** | 18.3 | 15.8 |
| **4/19/2010** | 13.4 | 11.3 |
| **4/20/2010** | 5.3 | 3.1 |
| **4/21/2010** | 4.8 | 2.7 |
| **4/22/2010** | 3.3 | 2.9 |
| **4/23/2010** | 9.2 | 8.1 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **4/24/2010** | 15.0 | 12.0 |
| **4/25/2010** | 20.7 | 17.2 |
| **4/26/2010** | 37.7 | 30.6 |
| **4/27/2010** | 14.5 | 12.5 |
| **4/28/2010** | 4.3 | 3.2 |
| **4/29/2010** | 5.0 | 2.7 |
| **4/30/2010** | 5.1 | 2.9 |
| **5/1/2010** | 7.5 | 8.6 |
| **5/2/2010** | 6.1 | 8.7 |
| **5/3/2010** | 16.7 | 12.8 |
| **5/4/2010** | 14.1 | 9.2 |
| **5/5/2010** | 12.0 | 12.4 |
| **5/6/2010** | 14.4 | 12.5 |
| **5/7/2010** | 17.1 | 14.7 |
| **5/8/2010** | 11.0 | 9.8 |
| **5/9/2010** | 3.9 | 6.4 |
| **5/10/2010** | 5.0 | 4.3 |
| **5/11/2010** | 3.2 | 3.7 |
| **5/12/2010** | 7.5 | 8.4 |
| **5/13/2010** | 12.3 | 12.1 |
| **5/14/2010** | 13.6 | 12.0 |
| **5/15/2010** | 13.4 | 13.4 |
| **5/16/2010** | 7.3 | 6.9 |
| **5/17/2010** | 7.5 | 5.8 |
| **5/18/2010** | 2.2 | 2.4 |
| **5/19/2010** | 9.8 | 6.4 |
| **5/20/2010** | 10.5 | 8.7 |
| **5/21/2010** | 12.0 | 12.5 |
| **5/22/2010** | 7.2 | 6.0 |
| **5/23/2010** | 2.7 | 5.8 |
| **5/24/2010** | 8.4 | 5.2 |
| **5/25/2010** | | 4.4 |
| **5/26/2010** | | 4.7 |
| **5/27/2010** | 1.4 | 5.7 |
| **5/28/2010** | 5.8 | |
| **5/29/2010** | 7.9 | |
| **5/30/2010** | 7.5 | |
| **5/31/2010** | 7.4 | 11.3 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **6/1/2010** | 10.4 | 11.2 |
| **6/2/2010** | 12.1 | 8.9 |
| **6/3/2010** | 12.4 | 10.7 |
| **6/4/2010** | 12.4 | 11.6 |
| **6/5/2010** | 11.7 | 11.2 |
| **6/6/2010** | 8.2 | 6.0 |
| **6/7/2010** | 9.5 | 7.8 |
| **6/8/2010** | 5.5 | 1.9 |
| **6/9/2010** | 6.3 | 6.0 |
| **6/10/2010** | 7.1 | 5.6 |
| **6/11/2010** | 9.0 | 10.0 |
| **6/12/2010** | 8.4 | 10.9 |
| **6/13/2010** | 14.8 | 13.2 |
| **6/14/2010** | 22.1 | 18.3 |
| **6/15/2010** | 16.0 | 14.8 |
| **6/16/2010** | 13.5 | 11.8 |
| **6/17/2010** | 16.1 | 12.0 |
| **6/18/2010** | 16.9 | 13.4 |
| **6/19/2010** | 8.9 | 8.6 |
| **6/20/2010** | 10.1 | 8.4 |
| **6/21/2010** | 9.1 | 9.9 |
| **6/22/2010** | 15.1 | 12.2 |
| **6/23/2010** | 13.2 | 9.8 |
| **6/24/2010** | 15.4 | 12.6 |
| **6/25/2010** | 11.7 | 10.6 |
| **6/26/2010** | 4.8 | 5.8 |
| **6/27/2010** | 7.3 | 7.5 |
| **6/28/2010** | 9.3 | 7.3 |
| **6/29/2010** | 4.7 | 5.0 |
| **6/30/2010** | 15.7 | 11.6 |
| **7/1/2010** | 16.7 | 13.2 |
| **7/2/2010** | 11.8 | 11.9 |
| **7/3/2010** | 10.1 | 8.7 |
| **7/4/2010** | 8.4 | 10.4 |
| **7/5/2010** | 11.6 | 10.8 |
| **7/6/2010** | 7.8 | 5.4 |
| **7/7/2010** | 11.7 | 7.3 |
| **7/8/2010** | 9.8 | 9.1 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **7/9/2010** | 15.3 | 12.4 |
| **7/10/2010** | 14.7 | 13.2 |
| **7/11/2010** | 9.3 | 9.4 |
| **7/12/2010** | 9.5 | 8.3 |
| **7/13/2010** | 12.9 | 6.8 |
| **7/14/2010** | 11.4 | 8.3 |
| **7/15/2010** | 12.7 | 11.2 |
| **7/16/2010** | 17.4 | 15.4 |
| **7/17/2010** | 16.1 | 11.0 |
| **7/18/2010** | 12.8 | 11.2 |
| **7/19/2010** | 11.7 | 9.7 |
| **7/20/2010** | 10.6 | 6.7 |
| **7/21/2010** | 4.6 | 3.6 |
| **7/22/2010** | 6.4 | 4.5 |
| **7/23/2010** | 15.5 | 11.9 |
| **7/24/2010** | 10.2 | 9.5 |
| **7/25/2010** | 8.6 | 9.1 |
| **7/26/2010** | 9.7 | 8.9 |
| **7/27/2010** | 9.0 | 7.9 |
| **7/28/2010** | 9.2 | 5.0 |
| **7/29/2010** | 9.2 | 5.5 |
| **7/30/2010** | 12.0 | 8.2 |
| **7/31/2010** | 8.3 | 7.4 |
| **8/1/2010** | 10.6 | 8.5 |
| **8/2/2010** | 22.9 | 15.1 |
| **8/3/2010** | 15.6 | 9.8 |
| **8/4/2010** | 16.9 | 10.4 |
| **8/5/2010** | 12.9 | 12.9 |
| **8/6/2010** | 12.9 | 8.9 |
| **8/7/2010** | 11.2 | 11.4 |
| **8/8/2010** | 6.0 | 4.5 |
| **8/9/2010** | 11.2 | 9.9 |
| **8/10/2010** | 14.9 | 11.3 |
| **8/11/2010** | 12.7 | 8.9 |
| **8/12/2010** | 11.0 | 9.3 |
| **8/13/2010** | 8.9 | 5.5 |
| **8/14/2010** | 6.7 | 8.2 |
| **8/15/2010** | 7.8 | 8.3 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **8/16/2010** | 10.3 | 8.9 |
| **8/17/2010** | 14.7 | 10.5 |
| **8/18/2010** | 14.7 | 11.4 |
| **8/19/2010** | 15.2 | 10.7 |
| **8/20/2010** | 13.7 | 10.0 |
| **8/21/2010** | 11.2 | 8.4 |
| **8/22/2010** | 11.5 | 9.8 |
| **8/23/2010** | 15.6 | 10.7 |
| **8/24/2010** | 20.7 | 16.1 |
| **8/25/2010** | 16.1 | 13.6 |
| **8/26/2010** | 16.2 | 9.9 |
| **8/27/2010** | 17.1 | 12.6 |
| **8/28/2010** | 8.8 | 9.3 |
| **8/29/2010** | 8.0 | 8.8 |
| **8/30/2010** | 6.5 | 8.2 |
| **8/31/2010** | 12.9 | 9.0 |
| **9/1/2010** | 16.5 | 12.5 |
| **9/2/2010** | 25.1 | 20.9 |
| **9/3/2010** | 20.6 | 15.8 |
| **9/4/2010** | 12.4 | 8.3 |
| **9/5/2010** | 14.6 | 14.4 |
| **9/6/2010** | 10.0 | 11.5 |
| **9/7/2010** | 10.1 | 10.5 |
| **9/8/2010** | 7.4 | 8.0 |
| **9/9/2010** | 6.5 | 4.3 |
| **9/10/2010** | 10.3 | 8.5 |
| **9/11/2010** | 12.0 | 11.0 |
| **9/12/2010** | 12.0 | 16.2 |
| **9/13/2010** | 9.6 | 11.0 |
| **9/14/2010** | | 10.4 |
| **9/15/2010** | 10.2 | 10.8 |
| **9/16/2010** | 14.3 | 8.7 |
| **9/17/2010** | 14.6 | 12.0 |
| **9/18/2010** | 22.1 | 15.8 |
| **9/19/2010** | 11.2 | 11.4 |
| **9/20/2010** | 8.5 | 7.5 |
| **9/21/2010** | 9.3 | 8.7 |
| **9/22/2010** | 9.5 | 8.5 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **9/23/2010** | 12.8 | 11.5 |
| **9/24/2010** | 19.3 | 14.9 |
| **9/25/2010** | 15.2 | 14.9 |
| **9/26/2010** | 16.7 | 15.8 |
| **9/27/2010** | 18.4 | 15.0 |
| **9/28/2010** | 14.5 | 14.5 |
| **9/29/2010** | 13.2 | 13.8 |
| **9/30/2010** | 12.4 | 11.0 |
| **10/1/2010** | 11.4 | 8.8 |
| **10/2/2010** | 12.7 | 11.0 |
| **10/3/2010** | 17.6 | 14.5 |
| **10/4/2010** | 6.7 | 5.7 |
| **10/5/2010** | 4.1 | 6.3 |
| **10/6/2010** | 3.5 | 4.9 |
| **10/7/2010** | 9.6 | 9.0 |
| **10/8/2010** | 17.3 | 13.8 |
| **10/9/2010** | 18.1 | 16.8 |
| **10/10/2010** | 17.8 | 13.5 |
| **10/11/2010** | 12.2 | 11.6 |
| **10/12/2010** | 13.7 | 10.2 |
| **10/13/2010** | 23.7 | 18.2 |
| **10/14/2010** | 17.6 | 12.0 |
| **10/15/2010** | 10.4 | 4.8 |
| **10/16/2010** | 7.7 | 3.9 |
| **10/17/2010** | 5.4 | 3.6 |
| **10/18/2010** | 7.6 | 4.1 |
| **10/19/2010** | 10.7 | 6.3 |
| **10/20/2010** | 3.4 | 2.9 |
| **10/21/2010** | 10.6 | 7.0 |
| **10/22/2010** | 10.1 | 5.8 |
| **10/23/2010** | 4.6 | 4.1 |
| **10/24/2010** | 6.8 | 5.4 |
| **10/25/2010** | 5.8 | 3.9 |
| **10/26/2010** | 9.8 | 9.5 |
| **10/27/2010** | 11.3 | 9.8 |
| **10/28/2010** | 11.0 | 9.0 |
| **10/29/2010** | 15.5 | 13.6 |
| **10/30/2010** | 5.5 | 4.1 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **10/31/2010** | 6.8 | 8.0 |
| **11/1/2010** | 20.8 | 16.4 |
| **11/2/2010** | 24.1 | 14.7 |
| **11/3/2010** | 23.6 | 17.2 |
| **11/4/2010** | 22.8 | 16.4 |
| **11/5/2010** | 19.0 | 14.3 |
| **11/6/2010** | 9.3 | 8.7 |
| **11/7/2010** | 7.6 | 7.4 |
| **11/8/2010** | 5.6 | 2.3 |
| **11/9/2010** | 9.3 | 7.3 |
| **11/10/2010** | 9.6 | 9.3 |
| **11/11/2010** | 16.2 | 10.6 |
| **11/12/2010** | 17.7 | 12.8 |
| **11/13/2010** | 18.1 | 16.2 |
| **11/14/2010** | 15.5 | 16.0 |
| **11/15/2010** | 13.9 | 10.9 |
| **11/16/2010** | 15.2 | 11.9 |
| **11/17/2010** | 27.2 | 23.1 |
| **11/18/2010** | 36.1 | 33.9 |
| **11/19/2010** | 12.9 | 9.4 |
| **11/20/2010** | 1.2 | 1.6 |
| **11/21/2010** | 2.8 | 2.8 |
| **11/22/2010** | 5.9 | 6.7 |
| **11/23/2010** | 7.9 | 6.7 |
| **11/24/2010** | 7.0 | 5.0 |
| **11/25/2010** | 20.1 | 16.4 |
| **11/26/2010** | 14.7 | 11.0 |
| **11/27/2010** | 18.4 | 17.2 |
| **11/28/2010** | 0.4 | 2.9 |
| **11/29/2010** | 8.4 | 6.1 |
| **11/30/2010** | 17.7 | 11.6 |
| **12/1/2010** | 14.8 | 9.2 |
| **12/2/2010** | 22.3 | 21.5 |
| **12/3/2010** | 36.2 | 22.9 |
| **12/4/2010** | 36.5 | 30.8 |
| **12/5/2010** | 40.8 | 40.5 |
| **12/6/2010** | 13.3 | 9.8 |
| **12/7/2010** | 22.3 | 18.3 |

**Table A-24. Continuous $PM_{2.5}$ Concentrations ($\mu g/m^3$) (cont.)**

| Sampling Date | Super Block – BAM | Gull Park - BAM |
|---|---|---|
| **12/8/2010** | 25.9 | 16.3 |
| **12/9/2010** | 24.6 | 15.2 |
| **12/10/2010** | 16.7 | 7.7 |
| **12/11/2010** | 18.9 | 8.8 |
| **12/12/2010** | 11.5 | 8.6 |
| **12/13/2010** | 17.5 | 12.4 |
| **12/14/2010** | 16.8 | 11.5 |
| **12/15/2010** | 11.1 | 8.5 |
| **12/16/2010** | 6.0 | 4.1 |
| **12/17/2010** | 5.7 | 3.7 |
| **12/18/2010** | 1.3 | 0.7 |
| **12/19/2010** | 0.1 | -0.3 |
| **12/20/2010** | 1.4 | 0.4 |
| **12/21/2010** | 4.2 | 5.6 |
| **12/22/2010** | 2.8 | 1.4 |
| **12/23/2010** | 13.7 | 10.6 |
| **12/24/2010** | 20.9 | 19.9 |
| **12/25/2010** | 18.6 | 15.9 |
| **12/26/2010** | 3.7 | 3.9 |
| **12/27/2010** | 22.0 | 18.7 |
| **12/28/2010** | 19.3 | 16.5 |
| **12/29/2010** | 7.0 | 6.4 |
| **12/30/2010** | 0.7 | 0.9 |
| **12/31/2010** | 11.8 | 8.5 |

**Table A-25. Maximum 24-Hr $PM_{2.5}$ Concentrations ($\mu g/m^3$)**

| Year | $PM_{2.5}$ Concentrations ($\mu g/m^3$) | | | | |
|---|---|---|---|---|---|
| | Superblock - FRM | Superblock - BAM | Gull Park - BAM | North Long Beach | Annual NAAQS |
| **2010** | 35.0 | 40.8 | 40.5 | 40.0 | 35 |

(1) The maximum $PM_{2.5}$ concentration is the fourth highest annual value as specified by the NAAQS.

**Table A-26. Annual Average $PM_{2.5}$ Concentrations ($\mu g/m^3$)**

| Year | Superblock - FRM | Superblock - BAM | Gull Park - BAM | North Long Beach | Annual NAAQS |
|---|---|---|---|---|---|
| **2007** | 14.5 | 17.5 | 14.9 | 14.4 | 15.0 |
| **2008** | 13.8 | 19.1 | 15.6 | N/A | 15.0 |
| **2009** | 11.7 | 17.3 | 14.1 | 13.3 | 15.0 |
| **2010** | 9.4 | 12.6 | 10.7 | 11.8 | 15.0 |
| **% Change (1)** | **-35.2%** | **-28.1%** | **-28.5%** | **-17.7%** | **N/A** |

(1) Percent change is over the 4-years period of record.

**Table A-27. Highest 24-Hr $PM_{2.5}$ Average Concentrations ($\mu g/m^3$)**

| Superblock BAM(1) | | Gull Park BAM(1) | | Superblock FRM(2) | |
|---|---|---|---|---|---|
| Date | Conc. | Date | Conc. | Date | Conc. |
| 12/5 | 40.77 | 12/5 | 40.54 | 1/8 | 34.96 |
| 1/8 | 40.44 | 1/8 | 39.91 | **12/4(2)** | **23.58** |
| 4/26 | 37.72 | 11/18 | 33.87 | 1/11 | 22.46 |
| 12/4 | 36.52 | 12/4 | 30.76 | 2/1 | 21.38 |
| 12/3 | 36.23 | 4/26 | 30.63 | 4/26 | 20.17 |
| 11/18 | 36.05 | 1/7 | 30.35 | 1/26 | 18.42 |
| **1/7(1)** | **35.30** | **1/11(1)** | **25.73** | 2/16 | 17.17 |
| 1/12 | 30.34 | 1/25 | 25.52 | 2/13 | 15.88 |
| 2/2 | 29.60 | 2/2 | 25.03 | 1/5 | 15.79 |
| 2/1 | 28.59 | 2/3 | 24.65 | 1/2 | 15.71 |
| 1/11 | 28.53 | 2/13 | 24.23 | 11/4 | 15.58 |
| 3/21 | 28.17 | 2/16 | 24.18 | 3/21 | 15.13 |
| 1/6 | 27.31 | 2/1 | 23.73 | 11/25 | 15.08 |
| 11/17 | 27.22 | 11/17 | 23.10 | 12/7 | 15.08 |
| 2/17 | 27.21 | 2/17 | 23.04 | 1/29 | 15.00 |
| 1/25 | 25.94 | 3/21 | 22.99 | 8/24 | 14.24 |
| 12/8 | 25.90 | 12/3 | 22.90 | 9/2 | 14.24 |
| 9/2 | 25.10 | 1/6 | 22.90 | 12/28 | 13.79 |

(1) This is the 98th percentile of the 24-hour average $PM_{2.5}$ concentrations measured by the BAMs during 2010.

(2) This is the 98th percentile of the 24-hour average $PM_{2.5}$ concentrations measured by the filter-based monitor during 2010.

**Table A-28. 98th Percentile of the 24-Hr $PM_{2.5}$ Average Concentrations ($\mu g/m^3$)**

| | Superblock BAM | | Gull Park BAM | | Superblock FRM | |
|---|---|---|---|---|---|---|
| **Year** | **Date** | **Conc.** | **Date** | **Conc.** | **Date** | **Conc.** |
| **2008** | 11/22 | 43.52 | 12/31 | 40.77 | 2/12 | 33.79 |
| **2009** | 1/8 | 40.00 | 12/25 | 34.65 | 1/7 | 37.04 |
| **2010** | 1/7 | 35.30 | 1/11 | 25.73 | 12/4 | 23.58 |
| **Average (1)** | **N/A** | **39.61** | **N/A** | **33.72** | **N/A** | **31.47** |

(1) This is the 3-year average of the 98th percentile of the 24-hour $PM_{2.5}$ concentration during 2008-2010