# South Coast Air Quality Management District
# Monitoring and Analysis

Rule 1158 Follow-Up Study #11

Sampling Conducted
October 2004 – December 2004

Program Monitoring Conducted By
RES Environmental, Inc.
865 Via Lata, Colton, CA, 92324

Sample Analysis By
Steven Barbosa, Principal Air Quality Chemist
Sandra Hom, Senior Air Quality Chemist
Roger Bond, Air Quality Chemist
Jorge Diez, Laboratory Technician

Report Prepared By
Jeremy C. O'Kelly, Air Quality Chemist
October 2005

Reviewed By
Henry Hogo
Assistant DEO, Science and Technology Advancement

Report # MA 2005-15

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## EXECUTIVE SUMMARY

Purpose

In June 1999, Rule 1158 affecting storage, handling and shipment of petroleum coke, coal, and sulfur was amended to further reduce particulate emissions from these sources. The mandated date for full compliance with the Rule was June 2004. This study is one of an ongoing series examining elemental carbon (EC) contained in the inhalable particulate fraction ($PM_{10}$) in the greater Long Beach/Wilmington area. This series of studies consists of $PM_{10}$ sampling in the spring/summer and fall/winter, observing trends in ambient $PM_{10}$ concentration and the EC content of collected samples.

Sampling

Sampling was conducted between October 30, 2004 and December 5, 2004, coincident with the AQMD $PM_{10}$ monitoring network one-in-six day schedule. Sampling locations were identical to those utilized for the previous Rule 1158 follow-up studies. It is intended that these sites be used throughout the entire series of studies. Field operations were conducted by RES Environmental, Inc., while all laboratory operations and data analysis were performed by AQMD staff. Twenty samples were collected over seven non-consecutive sampling days.

Key Findings

1. Measured average ambient $PM_{10}$ and elemental carbon concentrations at the Hudson and Edison School sites are higher than the AQMD Long Beach and Central Los Angeles network stations for the duration of the study. The average $PM_{10}$ measured at Hudson School and Edison School were 48 $\mu g/m^3$ and 42 $\mu g/m^3$ respectively, during the study, while all other sites examined had averages ranging from 27-35 $\mu g/m^3$.

2. While averages are used to analyze $PM_{10}$ trends over the course of the nine Rule 1158 follow-up studies, individual sites often experienced days where $PM_{10}$ exceeded the State 24-hour $PM_{10}$ standard of 50 $\mu g/m^3$. In 1998, approximately 70% of all measurements exceeded this standard. The incidence of 24-hour exceedences has since steadily declined and constituted 20% of the $PM_{10}$ measurements in the current study.

3. The current and previous monitoring studies indicate that higher $PM_{10}$ and EC concentrations are measured at the Hudson School site than any other study sites, and measurements are often higher compared to most of the AQMD network sites for $PM_{10}$. During this study the average EC at Hudson School (7.0 $\mu g/m^3$) was 59% higher than any other study site. The two closest AQMD network sites that have measurements of EC, Central Los Angeles and Long Beach, reported concentrations of 2.7 $\mu g/m^3$ and 3.6 $\mu g/m^3$, respectively.

4. Monitoring at Long Beach shows a significant decline in ambient elemental carbon since Rule 1158 was amended in July 1999. In 1998, prior to Rule amendment, EC at the study sites averaged 7.8 $\mu g/m^3$ and steadily declined to an average of 4.5 $\mu g/m^3$ by fall 2000. More recent studies have shown average EC concentration to fluctuate within a narrow range between 5.0-5.5 $\mu g/m^3$. This increase from the lowest observation ( 4.5 $\mu g/m^3$ in 2000) may be attributed to increased commercial and private vehicular traffic in the area, and year to year variations in meteorology.

5. Monitoring during the spring/summer period shows lower and more consistent $PM_{10}$ levels, whereas fall/winter measurements (which are historically higher throughout the Basin than springtime measurements) have been illustrative of trends in the area. Examination of all of the monitoring data for spring and fall suggests that measurable benefits of Rule 1158 have been observed, and increasing emissions from other sources of $PM_{10}$ and EC in the area may be greater contributors to $PM_{10}$, compared to $PM_{10}$ from the coke/coal sources.

## 1.0 INTRODUCTION

Over the course of several years prior to 1997, the AQMD had received complaints of black, oily airborne dust from residents of Long Beach and Wilmington area neighborhoods. Surveys of the area noted that there were numerous coal and petroleum coke production, storage, and shipment facilities. These included open stockpiles of green coke, enclosed "coke barns", refinery kilns producing petroleum coke, and a variety coke and coal carrying trains and trucks. Other industrial processes including sulfur distribution facilities, heavy traffic patterns, and general construction activities were also noted in the area.

In August 1996, AQMD staff attended a public meeting in San Pedro that focused on public concern over the levels of particulate matter in the region. Subsequently, the AQMD staff coordinated with various public action groups to select several sites for particulate monitoring, including sites located at specific areas of community concern.

Two studies were conducted at these sites, one in May 1997[1] and one in fall/winter 1998[2]. These studies were designed to characterize local micrometeorological parameters, and to microscopically and chemically characterize airborne particulate collected in the area. The most pronounced findings of these studies were the elevated levels of elemental carbon and inhalable particulate matter at some study sites, including a monitoring site adjacent to Elizabeth Hudson Elementary School in Long Beach.

In June 1999 the AQMD amended Rule 1158 affecting storage, handling and shipment practices for petroleum coke, coal, and sulfur. Subsequent California State legislation HSC 40459 (AB 1775 – Lowenthal) requires that the AQMD, in conjunction with the California Air Resources Board (CARB), prepare an annual study for the California State Legislature examining the frequency and severity of violations related to AQMD Rule 1158. To monitor the efficacy of the Rule and provide supporting data for the Legislative Report, the AQMD initiated a series of *Rule 1158 Follow-up Studies.* These studies are conducted twice annually on an ongoing basis; once each spring/summer and fall/winter.

Removal and enclosure of open coke storage piles, and modification to equipment and work practices to comply with Rule 1158 requirements is ongoing. The Rule 1158 compliance schedule mandates implementation of the majority of control measures by August 1999, with full implementation of all measures by June 2004. AQMD Compliance staff have documented a high rate of compliance with the initial rule implementation requirements, including covered transport, truck washing, prompt roadway/spill clean-up and the removal of several large open coke piles that has resulted in the reduction of fugitive coke emissions from storage, handling, and shipping

[1] South Coast Air Quality Management District. (September 1997) *Micrometeorological and Ambient Air Quality Monitoring Conducted Simultaneously in the Vicinity of the Los Angeles and Long Beach Harbors.* Diamond Bar, CA.
[2] South Coast Air Quality Management District. (March 1999) *Micrometeorological and Ambient Air Quality Monitoring Conducted Simultaneously in the Vicinity of the Los Angeles and Long Beach Harbors.* Diamond Bar, CA.

operations. Implementation of Rule 1158 has contributed to a decrease in ambient $PM_{10}$ concentrations in the local area.

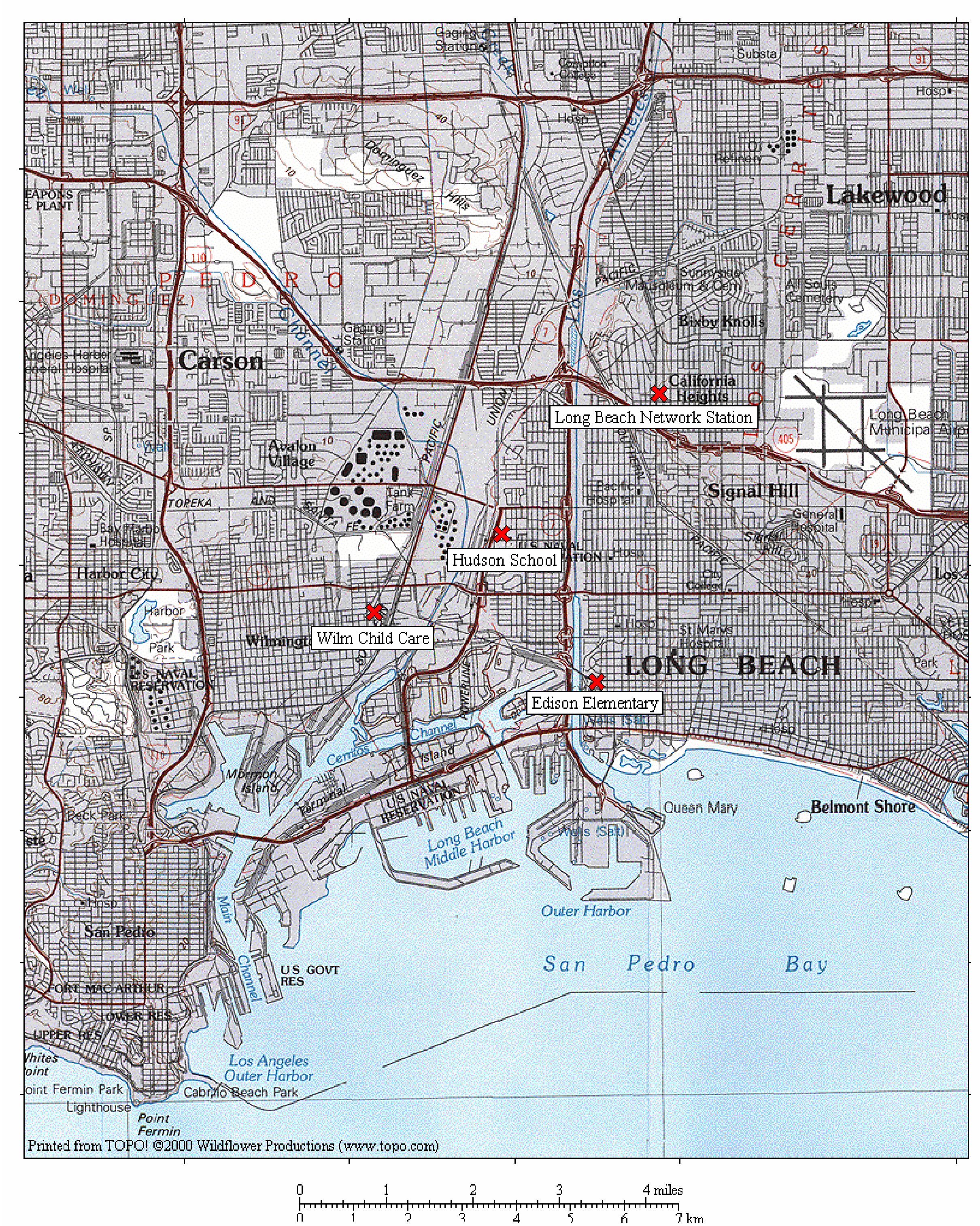


Figure 1 – Study Sampling Sites

## 2.0 PROJECT DISCUSSION

From October 30 to December 5, 2004, $PM_{10}$ monitoring was conducted at three locations in the cities of Long Beach (two sites) and Wilmington (one site). This study constituted the eleventh in a series of follow-up studies evaluating improvements in local air quality precipitated through implementation of Rule 1158, as amended on June 11, 1999.

This study builds on a base of knowledge established by several previous studies: two prior to Rule amendment and ten follow-up studies. Together they constitute a set of seven spring/summer studies[3,4] and six fall/winter[5,6]. The primary objectives of the current study are to collect data suitable for the evaluation of:

- Current inhalable particulate ($PM_{10}$) ambient concentration trends for the study area.

- Speciation of the carbonaceous component of the collected particulate samples for elemental and organic carbon content.

- Comparison of 2004 $PM_{10}$ mass and carbon data with that obtained during the earlier Rule 1158 studies.

The prevailing winds in the study area place portions of the community downwind of coal and coke production and/or storage facilities, and fugitive dust from these activities has been a longstanding community concern. This fugitive dust contributes to increases in the $PM_{10}$ particulate concentration. Mobile sources such as diesel trucks, trains and ships in the area also contribute to the overall ambient particulate matter concentrations.

Site selection and the sampling calendar were influenced by several factors. Sampling dates were scheduled to repeat as closely as possible the sampling dates of the previous studies, while coinciding with the U.S. EPA one-in-six monitoring schedule utilized by the AQMD in its $PM_{10}$ monitoring network. Samples were scheduled for collection on October 30, 2004, November 5, 11, 17, 23, and 29, 2004, and December 5, 2004, producing a data set consisting of 21 samples. One sample was invalid due to a power failure at Edison School on December 5th.

The three current monitoring sites were chosen from seven sites used in the fall/winter 1998 study, *Micrometeorological and Ambient Air Quality Monitoring Conducted Simultaneously in the Vicinity of the Los Angeles and Long Beach Harbors* (March 1999); the sites have remained constant during the course of the *Rule 1158 Follow-Up* series of studies (Figure 1.) Site selection criteria included site locations relative to coal

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[3] South Coast Air Quality Management District. (September 1997)
[4] South Coast Air Quality Management District. *Rule 1158 Follow-Up Study #2, #4, #6. #8 and #10,* Diamond Bar, CA.
[5] South Coast Air Quality Management District. (March 1999)
[6] South Coast Air Quality Management District. *Rule 1158 Follow-Up Study #1, #3, #5, #7 and #9.* Diamond Bar, CA.

and coke facilities with respect to the local prevailing wind patterns, and their importance as locations at or near student populations (the sites include two schools and a child care center. Of the seven sites included in the 1998 study, the two school sites exhibited the highest levels of ambient $PM_{10}$ and elemental carbon. Detailed site maps can be found in Appendix A-2.

## 2.1 SITE DESCRIPTIONS

RES Environmental, Inc. (RES), was contracted by the AQMD to perform field operations for the current study at three sampling locations:

**Site 1:** School Building Services Facilities/Hudson School (HUD)
2401 Webster Avenue
Long Beach, California

The monitoring site is located at the Long Beach School Building Services facility (maintenance yard), adjacent to the Hudson Middle School. The $PM_{10}$ sampler was installed on top of two adjoining steel containers. Potential exposures consist of Henry Ford Freeway, which runs parallel to the monitoring site to the west; and the maintenance yard to the north, east and south of the monitoring site. The maintenance yard consists of repairs and fabrication of materials, including welding. Meteorological monitoring equipment was included at this site.

**Site 2:** Edison Elementary School (EDI)
625 Maine Avenue
Long Beach, California

This site was located at the Edison Elementary School in Long Beach. The $PM_{10}$ sampler was located on a steel container at the western side of the school and playground. The sampler was also installed on a five-foot platform to clear the school building to the east. Potential exposures consist of a main street artery (16$^{th}$ Street) located to the north, which carries heavy vehicle traffic; and a small bus terminal to the west of the monitoring site.

**Site 3:** Wilmington Childcare Center (WIL)
1419 Young Street
Wilmington, California

The monitoring equipment was installed on the roof of the Childcare Center. Potential exposures consist of a commercial/industrial development to the east; and a parking area to the west of the monitoring site.

## 2.2 SAMPLING AND ANALYSIS METHODOLOGY

The AQMD maintains a $PM_{10}$ monitoring network throughout the South Coast Air Basin (Basin). The Federal Reference Method (FRM) selective size inlet (SSI) $PM_{10}$ samplers utilized in the $PM_{10}$ network and analytical procedures are summarized here.

The SSI sampler used in this study is the U.S. EPA's FRM sampler found in the Code of Federal Regulations (40CFR50 Appendix J). It is used to monitor particulate matter 10 microns in diameter and less ($PM_{10}$). For the purposes of this study, the SSI samplers are used to collect $PM_{10}$ samples, which were also used for the determination of organic carbon (OC), elemental carbon (EC), and total carbon.

The SSI sampler contains a pump controlled by a programmable timer. An elapsed time accumulator, linked in parallel with the pump, records total pump operation time in hours. During operation, a known quantity of air is drawn through a particle size separator, which achieves particle separation, by impaction. The correct flow rate through the inlet is critical to collection of the correct particle size so that after impaction, only particles with a diameter of 10 microns or less remain suspended in the airstream. The flow of air then passes through a quartz filter medium, upon which the particles are collected. A programmable timer automatically turns the pump off at the end of the 24-hour sampling period.

Once a sample has been collected it is returned to the laboratory, following chain-of-custody protocols, where both $PM_{10}$ mass and carbon content are determined. Ambient $PM_{10}$ mass is determined by subtracting the weight of the clean unsampled filter (measured in the laboratory prior to sampling) from the weight of the sampled filter containing the collected $PM_{10}$, to yield the mass of the $PM_{10}$ collected on the filter. This mass is then divided by the amount of air drawn through the filter to give the ambient concentration, expressed as mass per cubic meter ($\mu g/m^3$).

Ambient carbon levels are determined by taking a small portion of the $PM_{10}$ filter and putting it into a carbon analyzer. The analyzer consists of a computer-controlled programmable oven, computer controlled gas flows, a laser, and a flame ionization detector (FID). The sample is first heated in the oven in increasing amounts of oxygen. As the temperature rises, organic carbon followed by elemental carbon are evolved from the filter. The laser beam passes through the filter, and the transmitted intensity increases at the detector as the light-absorbing carbon leaves the filter, causing the filter to become less black. The evolved carbon is swept from the oven by gas flow, and is transported to the FID where it is detected (in the form of methane) throughout the heating process. The computer that controls these processes collects data on the oven temperature profile, laser light absorption, and FID response to determine the OC and EC content of the filter. This information, combined with the volume of air sampled, provides the OC and EC concentration in the ambient air.

## 3.0 DATA ANALYSIS

Data collected from the current study are compared with data collected from the previous Long Beach/Wilmington area studies. The following sections discuss the results of the analysis.

## 3.1 $PM_{10}$ AMBIENT CONCENTRATION ANALYSIS

$PM_{10}$ ambient concentrations observed during the study are shown in Table 1. Complete data tabulations can be found in Appendix A-1. Long Beach values are provided for comparison. The Central Los Angeles data reflect conditions within the urban core, where particulate levels are typically higher in carbonaceous compounds, as a result of a higher contribution from vehicle emissions.

Table 1: Fall/Winter 2004 $PM_{10}$ Concentrations ($\mu g/m^3$) at Sampling Sites

| | Date | | | | | | |
|---|---|---|---|---|---|---|---|
| **Location** | **10/30/04** | **11/5/04** | **11/11/04** | **11/17/04** | **11/23/04** | **11/29/04** | **12/5/04** |
| HUD | 40 | 43 | 45 | 77 | 36 | 72 | 21 |
| EDI | 36 | 39 | 35 | 66 | 30 | 45 | * |
| WIL | 31 | 39 | 25 | 64 | 32 | 40 | 13 |
| Los Angeles | 23 | 31 | 26 | 41 | 24 | 28 | 18 |
| Long Beach | 47 | 32 | 28 | 53 | 30 | 32 | 18 |

Twenty-four hour ambient $PM_{10}$ concentrations during the study period ranged from a maximum of 77 $\mu g/m^3$ at HUD on November 17th, to a minimum of 13 $\mu g/m^3$ obtained at the WIL site on December 5th. The average $PM_{10}$ concentration for the three study sites was 41 $\mu g/m^3$.

Four of the 20 (20%) samples collected during the course of the study exceeded the State 24 hour $PM_{10}$ standard of 50 $\mu g/m^3$. The Federal $PM_{10}$ 24-hour standard of 150 $\mu g/m^3$ was not exceeded in the current study. The highest site average value of 48 $\mu g/m^3$ over the course of the study occurred at the Hudson School site. As observed in previous studies, the Hudson School site ranked highest for $PM_{10}$.

On every sampling day other than October 30th, one or more study samples exceeded both the nearby Long Beach and Central Los Angeles network stations.

For all studies except the fall/winter 2000 study, the HUD site exhibited the highest $PM_{10}$ average. It should also be noted that on several occasions in the previous studies the HUD site $PM_{10}$ concentrations are significantly higher than those observed at EDI and WIL. Taken together, these trends suggest that HUD consistently experiences higher $PM_{10}$ concentrations than elsewhere in the study area. Such elevated samples may be the result of local sources or meteorological conditions influencing the immediate area adjacent to the sampler, and underscore the complexity and variety of particulate sources that contribute to ambient $PM_{10}$.

## 3.2 $PM_{10}$ TREND ANALYSIS

Figure 2 summarizes the ambient $PM_{10}$ concentrations observed over the course of the seven fall/winter studies. The black line represents the three-site study average for each study. The data show a varying three-site seasonal $PM_{10}$ decline from a 2000 average 64.5 $\mu g/m^3$, to a 2003 average 42.3 $\mu g/m^3$ – an average decline of 7 $\mu g/m^3$ per year. The 2004 average of 41.5 $\mu g/m^3$ is statistically unchanged from the prior study.

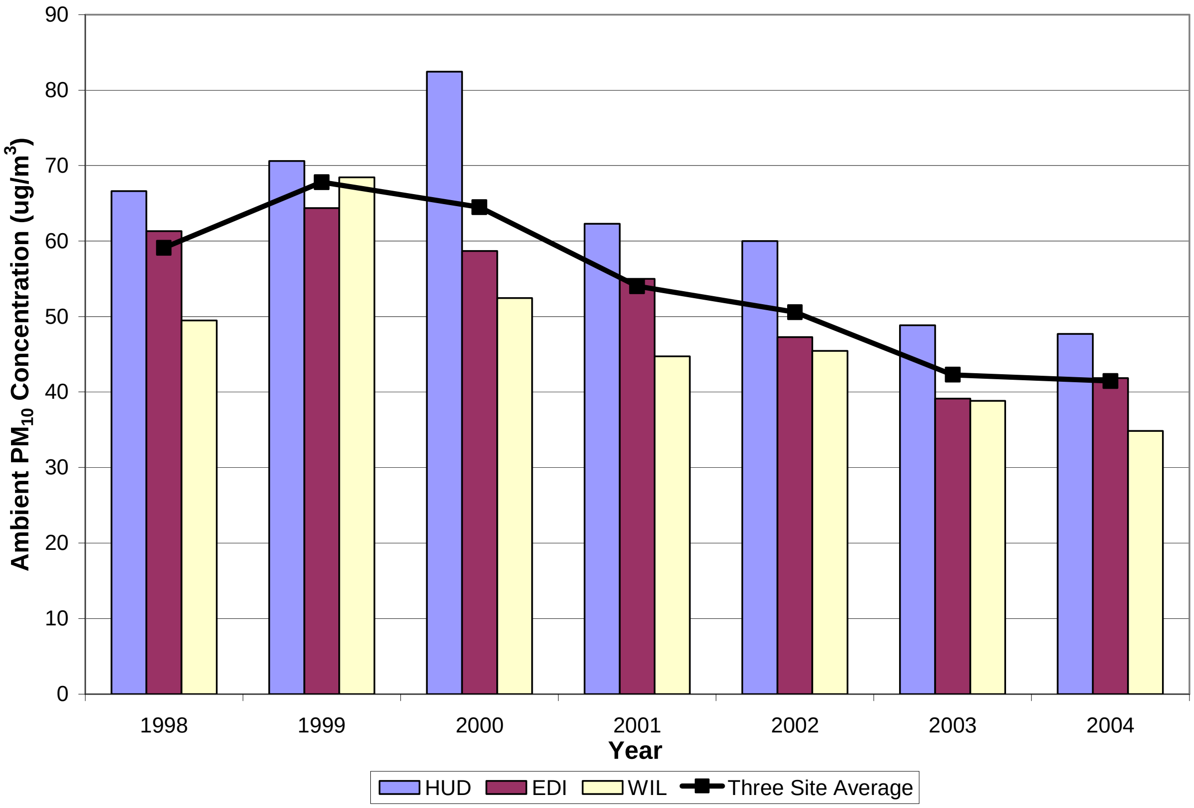



**Figure 2: Fall/Winter Ambient $PM_{10}$ Concentrations by Site and Year**

Exceedences of the state 24-hour $PM_{10}$ standard of 50$\mu g/m^3$ are shown in Figure 3. During the course of the fall/winter study sampling, yearly exceedences of the state $PM_{10}$ standard have declined from approximately 70% of the samples taken in 1998 to 20% of the samples in 2004.

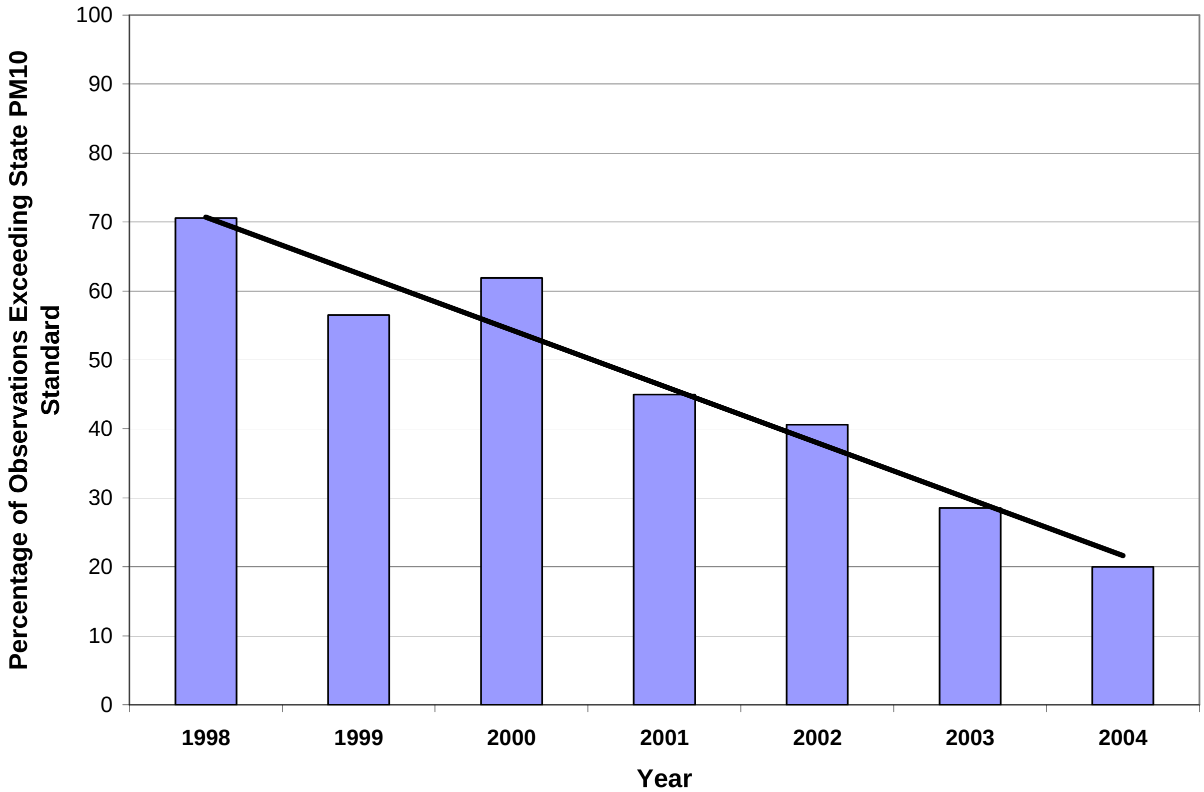



**Figure 3: Percent of Study Observations Exceeding State PM10 Standard**

### 3.3 ELEMENTAL CARBON ANALYSIS

Elemental carbon (EC) is of particular interest in this study, as it arises in part from coke and coal storage as well as from transportation including diesel emissions from trucks, trains and ships. During the 2004 study, EC analysis was performed on samples collected at the Long Beach and Central Los Angeles network stations in addition to the samples collected at the study sites. The highest average ambient EC concentration of 7.0 $\mu g/m^3$ was measured at the Hudson School site (HUD). A summary of the EC data is provided in Table 2.

Table 2: Fall/Winter 2004 EC Concentrations ($\mu g/m^3$) at Sampling Sites

| | Date | | | | | | |
|---|---|---|---|---|---|---|---|
| **Location** | **10/30/04** | **11/5/04** | **11/11/04** | **11/17/04** | **11/23/04** | **11/29/04** | **12/5/04** |
| HUD | 3.4 | 0.9 | 0.4 | 17.6 | 7.5 | 14.1 | 5.1 |
| EDI | 3.4 | 2.6 | 1.7 | 6.1 | 5.7 | 7.0 | * |
| WIL | 0.4 | 1.1 | 2.3 | 9.3 | 6.1 | 5.6 | 3.5 |
| Los Angeles | 2.5 | 2.8 | 2.4 | 3.7 | 2.5 | 3.5 | 1.7 |
| Long Beach | 4.1 | 3.8 | 3.2 | 5.0 | 3.9 | 3.2 | 2.0 |

* No Sample

Elemental carbon concentrations were averaged over the duration of each study, and the results are presented in Figure 4. Complete data tabulations can be found in Appendix A-1. The compiled fall/winter data in Figure 4 shows the ambient EC downward trend from 1998 through implementation of Rule 1158 revisions in 2000. Subsequently, average EC has remained between 5.0 $\mu g/m^3$ and 5.5 $\mu g/m^3$ during the past four years.

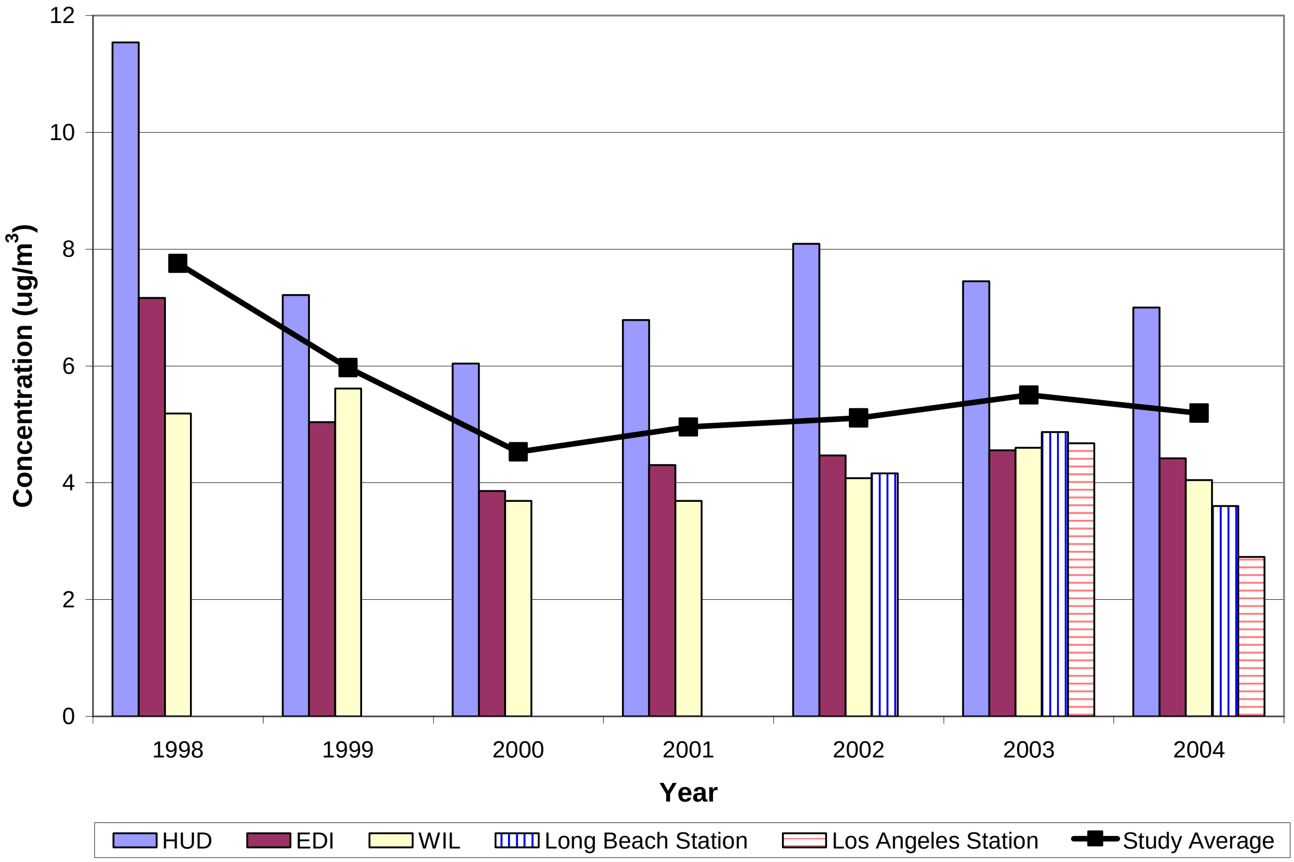



**Figure 4: Fall/Winter Average EC by Site and Year**

The marked EC reduction from 1998 thru 2000 can be attributed to implementation of the amended Rule 1158. After the major benefits of the Rule were realized, EC concentrations increased slowly over the following years as contributions from heavier commercial and private vehicular traffic increased. However, ambient EC concentrations have not returned to pre-rule amendment levels.

After an initial decline in EC concentration between 1997 and 2000, the spring/summer studies do not show any consistent trend (see Figure 5). However, these studies do reinforce the observation that HUD is characteristically higher for EC than other sites examined.

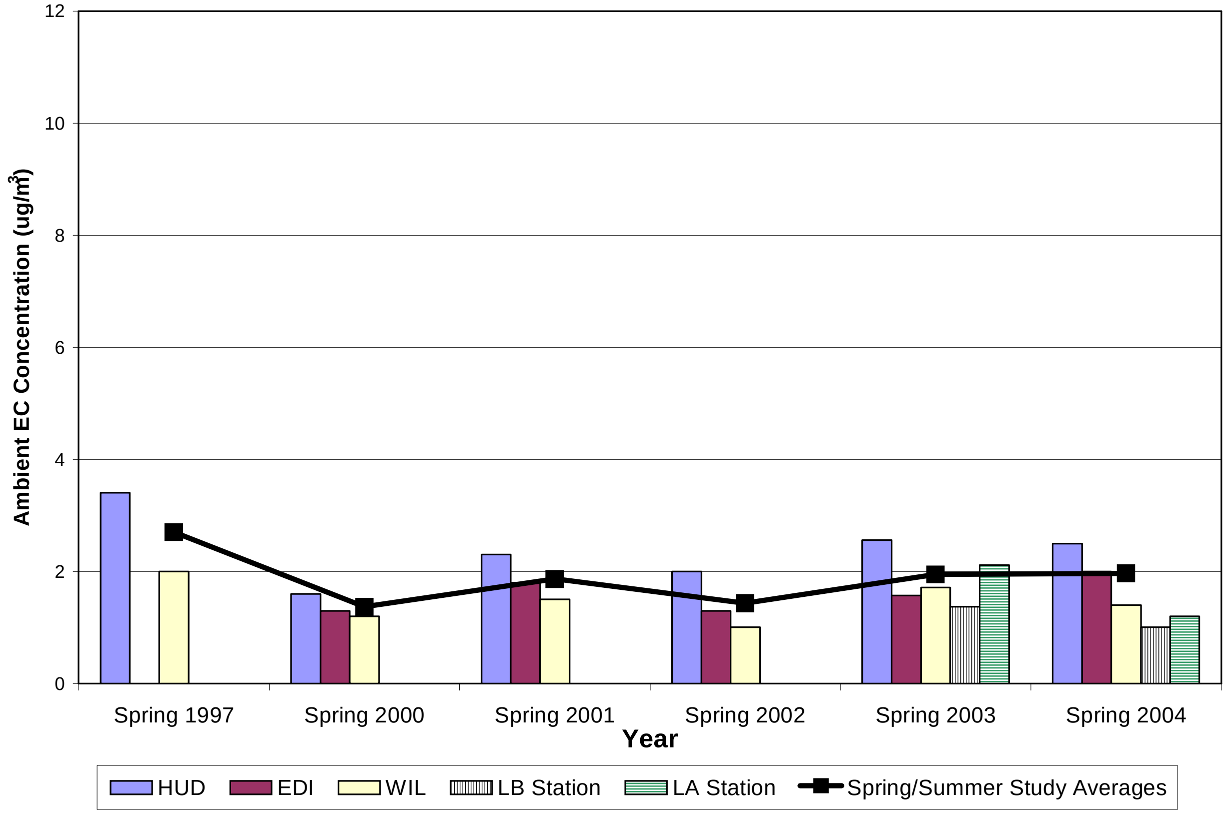



**Figure 5: Spring/Summer Average EC by Site and Year**

## 4.0 CONCLUSIONS

Other than the Hudson School site, measured average ambient $PM_{10}$ and elemental carbon were comparable to the AQMD Long Beach and Central Los Angeles network stations for the duration of the study. This suggests that pollution contributions from coal/coke operations has been reduced, and that the majority of existing ambient $PM_{10}$ in the greater Long Beach/Wilmington area arises from sources similar to those in Central Los Angeles.

During the course of fall/winter study sampling, yearly exceedences of the state $PM_{10}$ standard have declined from approximately 70% of samples taken in 1998 to 20% of samples in 2004. This suggests a decreased incidence of acute exposures to $PM_{10}$ in the area.

The current and previous monitoring studies indicate that $PM_{10}$ and EC concentrations measured at the Hudson School site are often higher than the other study sites, and higher than many AQMD network sites for $PM_{10}$. This indicates that localized sources or meteorological conditions may disproportionately impact the Hudson site. Hudson School is located in close proximity to BP-Arco, a large oil refining facility, which is located to the northwest, and is adjacent to the Terminal Island Freeway and a significant rail spur (see map, Appendix A-3).

Ambient EC remains well below concentrations observed in studies prior to Rule 1158 amendment (June 1999). The compiled fall/winter data in Figure 4 clearly shows the ambient EC downward trend from 1998 through implementation of Rule 1158 revisions in 2000. The marked EC reduction from 1998 thru 2000 can be attributed to implementation of the Amended Rule 1158.

Subsequently, EC has fluctuated in a narrow range over the past four years. After the major benefits of coke/coal abatement were realized, EC concentrations have increased slowly, as contributions from heavier commercial and private vehicular traffic increased. However, ambient EC concentrations have not returned to pre-rule amendment levels.

In summary, the spring/summer series of studies is yielding increasingly less information on the impact of Rule 1158. However, the fall/winter measurements have been more illustrative of trends in the area. The longer trend shown in the data for the spring and fall studies suggests that the measurable benefits of Rule 1158 revision have been observed, and other sources of $PM_{10}$ and EC in the area are now more dominant than the coke/coal contribution.

The studies indicate higher $PM_{10}$ and EC concentrations at the Hudson School site than at the other study sites, and that monitoring at Hudson School often show higher measured levels than many of the AQMD $PM_{10}$ network sites. This suggests greater influence of the ambient air quality at the Hudson School site by nearby $PM_{10}$ and EC sources, among them BP Arco and local commercial and private vehicular traffic, than by Port coke/coal operations.

# APPENDIX A-1 RULE 1158 LONG BEACH $PM_{10}$ MONITORING DATA

**2004 Fall/Winter $PM_{10}$ Ambient Concentration Results**

| Location | 10/30/04 | 11/5/04 | 11/11/04 | 11/17/04 | 11/23/04 | 11/29/04 | 12/5/04 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 40 | 43 | 45 | 77 | 36 | 72 | 21 | 48 |
| EDI | 36 | 39 | 35 | 66 | 30 | 45 | * | 42 |
| WIL | 31 | 39 | 25 | 64 | 32 | 40 | 13 | 35 |
| Los Angeles | 23 | 31 | 26 | 41 | 24 | 28 | 18 | 27 |
| Long Beach | 47 | 32 | 28 | 53 | 30 | 32 | 18 | 34 |
| * No Sample | | | | | | | | 41.5 |

**2004 Fall/Winter Organic Carbon Ambient Concentration Results**

| Location | 10/30/04 | 11/5/04 | 11/11/04 | 11/17/04 | 11/23/04 | 11/29/04 | 12/5/04 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 13.4 | 13.9 | 14.8 | 13.9 | 6.9 | 12.7 | 4.8 | 11.5 |
| EDI | 8.9 | 9.6 | 9.0 | 17.1 | 6.3 | 8.6 | * | 9.9 |
| WIL | 11.8 | 10.9 | 5.2 | 9.9 | 6.5 | 7.6 | 4.4 | 8.0 |
| Los Angeles | 7.1 | 6.2 | 5.9 | 7.9 | 5.0 | 7.6 | 5.1 | 6.4 |
| Long Beach | 10.5 | 7.4 | 5.6 | 10.2 | 8.4 | 7.5 | 5.3 | 7.8 |
| | | | | | | | | 9.8 |

**2004 Fall/Winter Elemental Carbon Ambient Concentration Results**

| Location | 10/30/04 | 11/5/04 | 11/11/04 | 11/17/04 | 11/23/04 | 11/29/04 | 12/5/04 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 3.4 | 0.9 | 0.4 | 17.6 | 7.5 | 14.1 | 5.1 | 7.0 |
| EDI | 3.4 | 2.6 | 1.7 | 6.1 | 5.7 | 7.0 | * | 4.4 |
| WIL | 0.4 | 1.1 | 2.3 | 9.3 | 6.1 | 5.6 | 3.5 | 4.0 |
| Los Angeles | 2.5 | 2.8 | 2.4 | 3.7 | 2.5 | 3.5 | 1.7 | 2.7 |
| Long Beach | 4.1 | 3.8 | 3.2 | 5.0 | 3.9 | 3.2 | 2.0 | 3.6 |

**2004 Fall/Winter Total Carbon Ambient Concentration Results**

| Location | 10/30/04 | 11/5/04 | 11/11/04 | 11/17/04 | 11/23/04 | 11/29/04 | 12/5/04 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 16.8 | 14.9 | 15.2 | 31.5 | 14.4 | 26.8 | 9.9 | 18.5 |
| EDI | 12.3 | 12.2 | 10.7 | 23.2 | 12.0 | 15.6 | * | 14.3 |
| WIL | 12.2 | 12.0 | 7.5 | 19.2 | 12.6 | 13.2 | 7.9 | 12.1 |
| Los Angeles | 9.6 | 9.0 | 8.3 | 11.6 | 7.5 | 11.1 | 6.8 | 9.1 |
| Long Beach | 14.6 | 11.2 | 8.8 | 15.2 | 12.3 | 10.7 | 7.3 | 11.4 |

**2003 Fall/Winter $PM_{10}$ Ambient Concentration Results**

| Location | 10/24/03 | 10/30/03 | 11/5/03 | 11/11/03 | 11/17/03 | 11/23/03 | 11/29/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 54 | 40 | 52 | 39 | 35 | 71 | 51 | 49 |
| EDI | 45 | 27 | 44 | 29 | 31 | 55 | 43 | 39 |
| WIL | 45 | 22 | 42 | 33 | 34 | 55 | 41 | 39 |
| Los Angeles | 81 | 27 | 32 | 25 | 24 | 31 | 24 | 35 |
| Long Beach | 48 | 24 | 44 | 26 | 28 | 50 | 29 | 36 |
| * No Sample | | | | | | | | 42.3 |

**2003 Fall/Winter Organic Carbon Ambient Concentration Results**

| Location | 10/24/03 | 10/30/03 | 11/5/03 | 11/11/03 | 11/17/03 | 11/23/03 | 11/29/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 5.0 | 4.6 | 7.5 | 6.2 | 6.8 | 11.3 | 6.8 | 6.9 |
| EDI | 4.3 | 3.2 | 6.6 | 4.6 | 5.4 | 8.7 | 6.8 | 5.7 |
| WIL | 3.9 | 2.9 | 5.9 | 4.3 | 6.1 | 9.1 | 7.1 | 5.6 |
| Los Angeles | 9.2 | 3.4 | 4.2 | 4.3 | 5.0 | 2.9 | 3.7 | 4.7 |
| Long Beach | 3.5 | 2.6 | 5.2 | 3.9 | 4.9 | 5.3 | 4.3 | 4.2 |
| | | | | | | | | 6.1 |

**2003 Fall/Winter Elemental Carbon Ambient Concentration Results**

| Location | 10/24/03 | 10/30/03 | 11/5/03 | 11/11/03 | 11/17/03 | 11/23/03 | 11/29/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 4.3 | 3.9 | 9.9 | 7.7 | 8.3 | 10.2 | 7.9 | 7.5 |
| EDI | 2.6 | 1.7 | 6.3 | 4.3 | 5.1 | 6.2 | 5.7 | 4.6 |
| WIL | 4.0 | 1.0 | 5.2 | 3.8 | 6.3 | 6.1 | 5.8 | 4.6 |
| Los Angeles | 7.2 | 2.2 | 4.3 | 4.0 | 4.3 | 6.0 | 4.7 | 4.7 |
| Long Beach | 3.6 | 1.6 | 6.6 | 4.5 | 6.9 | 6.7 | 4.3 | 4.9 |

**2003 Fall/Winter Total Carbon Ambient Concentration Results**

| Location | 10/24/03 | 10/30/03 | 11/5/03 | 11/11/03 | 11/17/03 | 11/23/03 | 11/29/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 9.3 | 8.5 | 17.4 | 13.9 | 15.1 | 21.5 | 14.7 | 14.3 |
| EDI | 6.9 | 4.9 | 12.9 | 8.9 | 10.5 | 14.9 | 12.5 | 10.2 |
| WIL | 7.9 | 3.9 | 11.1 | 8.1 | 12.4 | 15.2 | 12.9 | 10.2 |
| Los Angeles | 16.4 | 5.6 | 8.5 | 8.3 | 9.3 | 8.9 | 8.4 | 9.4 |
| Long Beach | 7.1 | 4.2 | 11.8 | 8.4 | 11.8 | 12.0 | 8.6 | 9.1 |

**2002 Fall/Winter $PM_{10}$ Ambient Concentration Results**

| Location | 10/5/02 | 10/17/02 | 10/23/02 | 10/29/02 | 11/4/02 | 11/10/02 | 11/16/02 | 11/22/02 | 11/28/02 | 12/4/02 | 12/10/02 | 12/16/02 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HUD | 46 | 43 | 52 | 37 | 58 | * | 87 | 88 | * | 98 | 63 | 28 | 60 |
| EDI | 46 | 40 | 45 | 48 | 48 | 25 | * | 55 | 62 | 78 | 47 | 26 | 47 |
| WIL | * | 39 | 32 | 38 | 55 | 20 | 34 | 75 | 66 | 78 | 38 | 25 | 45 |
| LB Station | 45 | 35 | 43 | 32 | 50 | 23 | 28 | 51 | 51 | 75 | 44 | 24 | 42 |

* No Sample

**2002 Fall/Winter Organic Carbon Ambient Concentration Results**

| Location | 10/5/02 | 10/17/02 | 10/23/02 | 10/29/02 | 11/4/02 | 11/10/02 | 11/16/02 | 11/22/02 | 11/28/02 | 12/4/02 | 12/10/02 | 12/16/02 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HUD | 6.6 | 5.1 | 5.3 | 3.6 | 4.7 | * | 10.5 | 10.7 | * | 9.8 | 9.8 | 3.0 | 6.9 |
| EDI | 6.9 | 4.4 | 4.4 | 3.9 | 5.0 | 3.8 | * | 7.4 | 8.7 | 7.4 | 8.4 | 2.5 | 5.7 |
| WIL | * | 4.8 | 3.3 | 3.8 | 7.5 | 3.0 | 5.3 | 8.6 | 9.9 | 7.3 | 7.8 | 2.2 | 5.8 |
| LB Station | 7.2 | 4.0 | 3.4 | 3.9 | 3.7 | 2.8 | 4.0 | 6.7 | 6.6 | 10.2 | 6.7 | 3.4 | 5.2 |

**2002 Fall/Winter Elemental Carbon Ambient Concentration Results**

| Location | 10/5/02 | 10/17/02 | 10/23/02 | 10/29/02 | 11/4/02 | 11/10/02 | 11/16/02 | 11/22/02 | 11/28/02 | 12/4/02 | 12/10/02 | 12/16/02 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HUD | 2.8 | 3.1 | 5.5 | 3.1 | 3.7 | * | 11.0 | 17.0 | * | 17.1 | 12.7 | 4.8 | 8.1 |
| EDI | 2.7 | 2.0 | 2.8 | 1.5 | 1.6 | 2.8 | * | 8.5 | 6.5 | 11.0 | 6.0 | 3.5 | 4.5 |
| WIL | * | 2.1 | 1.3 | 2.2 | 0.3 | 1.6 | 4.6 | 10.0 | 5.3 | 10.6 | 3.5 | 3.3 | 4.1 |
| LB Station | 2.5 | 1.7 | 3.0 | 1.8 | 3.1 | 2.8 | 4.4 | 7.3 | 7.0 | 5.9 | 7.6 | 2.7 | 4.2 |

**2002 Fall/Winter Total Carbon Ambient Concentration Results**

| Location | 10/5/02 | 10/17/02 | 10/23/02 | 10/29/02 | 11/4/02 | 11/10/02 | 11/16/02 | 11/22/02 | 11/28/02 | 12/4/02 | 12/10/02 | 12/16/02 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HUD | 9.5 | 8.2 | 10.8 | 6.7 | 8.4 | * | 21.6 | 27.8 | * | 26.9 | 22.4 | 7.7 | 15.0 |
| EDI | 9.6 | 6.4 | 7.2 | 5.4 | 6.6 | 6.6 | * | 15.9 | 15.2 | 18.5 | 14.4 | 6.0 | 10.2 |
| WIL | * | 7.0 | 4.6 | 6.0 | 7.8 | 4.7 | 9.9 | 18.7 | 15.2 | 17.9 | 11.3 | 5.5 | 9.9 |
| LB Station | | 5.7 | 6.4 | 5.7 | 6.8 | 5.7 | 8.4 | 13.9 | 13.6 | 16.2 | 14.3 | 6.1 | 9.3 |

**2002 Fall/Winter Elemental Carbon as a Percentage of Total $PM_{10}$**

| Location | 10/5/02 | 10/17/02 | 10/23/02 | 10/29/02 | 11/4/02 | 11/10/02 | 11/16/02 | 11/22/02 | 11/28/02 | 12/4/02 | 12/10/02 | 12/16/02 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HUD | 6.2% | 7.2% | 10.6% | 8.4% | 6.4% | * | 12.7% | 19.4% | * | 17.5% | 20.1% | 17.1% | 12.6 |
| EDI | 5.9% | 5.1% | 6.3% | 3.2% | 3.3% | 11.2% | * | 15.5% | 10.6% | 14.1% | 12.8% | 13.3% | 9.2 |
| WIL | * | 5.4% | 4.1% | 5.7% | 0.5% | 8.1% | 13.5% | 13.4% | 8.0% | 13.6% | 9.3% | 13.2% | 8.6 |
| LB Station | * | 4.8% | 7.1% | 5.7% | 6.3% | 12.3% | 15.9% | 14.3% | 13.8% | 7.9% | 17.2% | 11.1% | 10.6 |

# APPENDIX A-1 RULE 1158 LONG BEACH $PM_{10}$ MONITORING DATA (CONTINUED)

**2001 Fall/Winter $PM_{10}$ Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 40 | 62 | 97 | 39 | 36 | 76 | 86 | 62 |
| EDI | 24 | * | 105 | 33 | 33 | 63 | 72 | 55 |
| WIL | 16 | 43 | 47 | 37 | 25 | 75 | 70 | 45 |
| LB Station | 25 | 14 | 24 | 30 | 24 | 56 | * | 29 |

* No Sample

**2001 Fall/Winter Organic Carbon Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 5.6 | 12.9 | 10.9 | 9.7 | 6.9 | 16 | 17.2 | 11.3 |
| EDI | 3.3 | * | 8.8 | 8.7 | 7 | 13.9 | 15.9 | 9.6 |
| WIL | 2.9 | 9.2 | 6.9 | 9.4 | 4.7 | 15.5 | 13.5 | 8.9 |

**2001 Fall/Winter Elemental Carbon Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 5.2 | 7.8 | 7.1 | 4.7 | 4.6 | 8.4 | 9.7 | 6.8 |
| EDI | 2.3 | * | 4.3 | 3.8 | 3.3 | 5.5 | 6.6 | 4.3 |
| WIL | 1.4 | 4.2 | 2.7 | 4.1 | 1.8 | 6.2 | 5.4 | 3.7 |

**2001 Fall/Winter Total Carbon Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 10.8 | 20.7 | 18 | 14.4 | 11.5 | 24.4 | 26.9 | 18.1 |
| EDI | 5.6 | * | 13.1 | 12.5 | 10.3 | 19.4 | 22.5 | 13.9 |
| WIL | 4.3 | 13.4 | 9.6 | 13.5 | 6.5 | 21.7 | 18.9 | 12.6 |

**2000 Fall/Winter $PM_{10}$ Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 134 | 56 | 143 | 73 | 100 | 28 | 43 | 82 |
| EDI | 52 | 48 | 78 | 73 | 105 | 18 | 37 | 59 |
| WIL | 56 | 45 | 55 | 65 | 93 | 16 | 37 | 52 |
| LB Station | 44 | 49 | 92 | * | 105 | 20 | 35 | 58 |

* No Sample

**2000 Fall/Winter Organic Carbon Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 17.1 | 10.6 | 22.6 | 9 | 9.2 | 4.6 | 8.7 | 11.7 |
| EDI | 8.9 | 9.7 | 15.4 | 7.6 | 10.2 | 2.8 | 7.8 | 8.9 |
| WIL | 10.5 | 9.7 | 10.9 | 7 | 8.1 | 2.9 | 7.2 | 8.0 |

**2000 Fall/Winter Elemental Carbon Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 7.6 | 6.4 | 11.6 | 4.8 | 4.6 | 3.7 | 3.6 | 6.0 |
| EDI | 3.8 | 4.1 | 7.4 | 4.3 | 3.3 | 2 | 2.1 | 3.9 |
| WIL | 4.6 | 4.1 | 5.1 | 3.8 | 3.6 | 1.7 | 2.9 | 3.7 |

**2000 Fall/Winter Total Carbon Ambient Concentration Results**

| Location | 11/8/00 | 11/14/00 | 11/20/00 | 11/26/00 | 12/2/00 | 12/8/00 | 12/14/00 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 24.7 | 17 | 34.2 | 13.8 | 13.8 | 8.3 | 12.3 | 17.7 |
| EDI | 12.7 | 13.8 | 22.8 | 11.9 | 13.5 | 4.8 | 9.9 | 12.8 |
| WIL | 15.1 | 13.8 | 16 | 10.8 | 11.7 | 4.6 | 10.1 | 11.7 |

**1999 Fall/Winter $PM_{10}$ Ambient Concentration Results**

| Location | 11/2/99 | 11/8/99 | 11/14/99 | 11/20/99 | 11/26/99 | 12/2/99 | 12/8/99 | 12/14/99 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 92 | 38 | 50 | 30 | 47 | 69 | 68 | 171 | 71 |
| EDI | 85 | 33 | 47 | 37 | 49 | 74 | 93 | 97 | 64 |
| WIL | 92 | 89 | 46 | 30 | 65 | 70 | * | 87 | 68 |
| LB Station | 77 | 22 | 38 | 27 | 38 | 50 | 55 | 59 | 46 |

* No Sample

**1999 Fall/Winter Organic Carbon Ambient Concentration Results**

| Location | 11/2/99 | 11/8/99 | 11/14/99 | 11/20/99 | 11/26/99 | 12/2/99 | 12/8/99 | 12/14/99 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 9.9 | 6 | 6 | 4.5 | 11 | 13.3 | 10.4 | 22.2 | 10.4 |
| EDI | 8.3 | 4.8 | 5.8 | 4.9 | 10.5 | 14.1 | 13.4 | 14.2 | 9.5 |
| WIL | 8.1 | 14.1 | 6.4 | 4.4 | 12.6 | 13.5 | * | 12.2 | 10.2 |

**1999 Fall/Winter Elemental Carbon Ambient Concentration Results**

| Location | 11/2/99 | 11/8/99 | 11/14/99 | 11/20/99 | 11/26/99 | 12/2/99 | 12/8/99 | 12/14/99 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 7.9 | 4.1 | 4.8 | 2.7 | 5.9 | 7.9 | 6.6 | 17.8 | 7.2 |
| EDI | 5.7 | 2.6 | 4 | 2.7 | 4.6 | 6.1 | 6.1 | 8.5 | 5.0 |
| WIL | 6 | 6.7 | 4.1 | 2.4 | 7.4 | 5.5 | * | 7.2 | 5.6 |

**1999 Fall/Winter Total Carbon Ambient Concentration Results**

| Location | 11/2/99 | 11/8/99 | 11/14/99 | 11/20/99 | 11/26/99 | 12/2/99 | 12/8/99 | 12/14/99 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 17.8 | 10.1 | 10.8 | 7.2 | 16.9 | 21.2 | 17 | 40 | 17.6 |
| EDI | 14 | 7.4 | 9.8 | 7.6 | 15.1 | 20.2 | 19.5 | 22.6 | 14.5 |
| WIL | 14.1 | 20.8 | 10.5 | 6.8 | 20 | 19 | * | 19.4 | 15.8 |

**1998 Fall/Winter $PM_{10}$ Ambient Concentration Results**

| Location | 11/1/98 | 11/7/98 | 11/13/98 | 11/19/98 | 11/25/98 | 12/13/98 | Average |
|---|---|---|---|---|---|---|---|
| HUD | 61 | 56 | 72 | 89 | * | 55 | 67 |
| EDI | 50 | 49 | 67 | 73 | 74 | 55 | 61 |
| WIL | 54 | 43 | 45 | 52 | 70 | 33 | 50 |
| LB Station | 43 | 31 | 39 | 54 | * | 27 | 39 |

* No Sample

**1998 Fall/Winter Organic Carbon Ambient Concentration Results**

| Location | 11/1/98 | 11/7/98 | 11/13/98 | 11/19/98 | 11/25/98 | 12/13/98 | Average |
|---|---|---|---|---|---|---|---|
| HUD | 7.5 | 6.4 | 11.2 | 14.2 | * | 8.6 | 9.6 |
| EDI | 7 | 5.5 | 11.3 | 10.4 | 9.3 | 10.1 | 8.9 |
| WIL | 6.9 | 5.7 | 8.4 | 8.3 | 9.9 | 5.8 | 7.5 |

**1998 Fall/Winter Elemental Carbon Ambient Concentration Results**

| Location | 11/1/98 | 11/7/98 | 11/13/98 | 11/19/98 | 11/25/98 | 12/13/98 | Average |
|---|---|---|---|---|---|---|---|
| HUD | 6.2 | 6.2 | 16.6 | 19.8 | * | 8.9 | 11.5 |
| EDI | 4.3 | 3.3 | 9.2 | 12.5 | 7.9 | 5.8 | 7.2 |
| WIL | 4.1 | 3.8 | 5.9 | 7.3 | 6.6 | 3.4 | 5.2 |

**1998 Fall/Winter Total Carbon Ambient Concentration Results**

| Location | 11/1/98 | 11/7/98 | 11/13/98 | 11/19/98 | 11/25/98 | 12/13/98 | Average |
|---|---|---|---|---|---|---|---|
| HUD | 13.7 | 12.6 | 27.9 | 34 | * | 17.5 | 21.1 |
| EDI | 11.3 | 8.8 | 20.5 | 22.9 | 17.2 | 15.9 | 16.1 |
| WIL | 11 | 9.4 | 14.4 | 15.6 | 16.5 | 9.2 | 12.7 |

# APPENDIX A-1 RULE 1158 LONG BEACH $PM_{10}$ MONITORING DATA (CONTINUED)

**2004 Spring/Summer $PM_{10}$ Ambient Concentration Results**

| Location | 5/15/04 | 5/21/04 | 5/27/04 | 6/2/04 | 6/8/04 | 6/14/04 | 6/20/04 | 7/2/04 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 37 | 28 | 32 | 36 | 38 | 32 | 37 | 32 | 34 |
| EDI | 37 | 20 | 33 | 31 | 34 | 21 | 39 | 23 | 30 |
| WIL | 34 | 23 | 25 | 33 | 31 | 29 | 30 | 23 | 27 |
| LB Station | 34 | 20 | 31 | 33 | 30 | 30 | 34 | 24 | 30 |
| LA Station | 37 | 20 | 31 | 44 | 29 | 41 | 35 | 25 | 33 |

**2004 Spring/Summer Organic Carbon Ambient Concentration Results**

| Location | 5/15/04 | 5/21/04 | 5/27/04 | 6/2/04 | 6/8/04 | 6/14/04 | 6/20/04 | 7/2/04 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 3.6 | 3.4 | 3.7 | 3.3 | 4.3 | 3.1 | 4.0 | 6.8 | 4.0 |
| EDI | 3.9 | 2.8 | 5.0 | 3.3 | 4.0 | 2.9 | 3.6 | 4.0 | 3.7 |
| WIL | 3.7 | 2.4 | 3.1 | 3.9 | 3.3 | 2.4 | 3.1 | 3.9 | 3.2 |
| LB Station | 3.5 | 3.2 | 3.6 | 3.8 | 3.8 | 2.6 | 3.7 | 3.5 | 3.5 |
| LA Station | 4.5 | 3.0 | 3.6 | 4.5 | 4.3 | 4.1 | 3.5 | 3.6 | 3.9 |

**2004 Spring/Summer Elemental Carbon Ambient Concentration Results**

| Location | 5/15/04 | 5/21/04 | 5/27/04 | 6/2/04 | 6/8/04 | 6/14/04 | 6/20/04 | 7/2/04 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 2.1 | 2.5 | 2.2 | 2.1 | 2.8 | 2.3 | 2.2 | 3.5 | 2.5 |
| EDI | 2.0 | 1.4 | 2.4 | 1.9 | 2.1 | 1.4 | 2.6 | 2.3 | 2.0 |
| WIL | 1.7 | 1.0 | 1.4 | 1.7 | 1.2 | 1.5 | 0.7 | 2.0 | 1.4 |
| LB Station | 0.8 | 1.0 | 1.2 | 0.8 | 0.9 | 0.9 | 1.0 | 1.2 | 1.0 |
| LA Station | 2.1 | 0.7 | 1.3 | 1.5 | 1.1 | 1.2 | 0.8 | 0.9 | 1.2 |

**2004 Spring/Summer Total Carbon Ambient Concentration Results**

| Location | 5/15/04 | 5/21/04 | 5/27/04 | 6/2/04 | 6/8/04 | 6/14/04 | 6/20/04 | 7/2/04 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 5.7 | 5.9 | 5.9 | 5.4 | 7.1 | 5.4 | 6.2 | 10.3 | 6.5 |
| EDI | 5.9 | 4.2 | 7.4 | 5.2 | 6.1 | 4.3 | 5.2 | 6.3 | 5.6 |
| WIL | 5.4 | 3.4 | 4.5 | 5.6 | 4.5 | 3.9 | 3.8 | 5.9 | 4.6 |
| LB Station | 4.3 | 4.2 | 4.8 | 4.6 | 4.7 | 3.5 | 4.7 | 4.7 | 4.4 |
| LA Station | 6.6 | 3.7 | 4.9 | 6.0 | 5.4 | 5.3 | 4.3 | 4.5 | 5.1 |

**2003 Spring/Summer $PM_{10}$ Ambient Concentration Results**

| Location | 5/15/03 | 5/21/03 | 5/27/03 | 6/2/03 | 6/8/03 | 6/14/03 | 6/20/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 29 | 53 | 44 | 31 | 20 | 41 | 37 | 36 |
| EDI | 28 | 50 | 48 | 26 | 9 | 48 | 31 | 34 |
| WIL | 29 | 48 | 38 | 32 | 19 | 33 | 27 | 32 |
| LB Station | 26 | 38 | 49 | 22 | 18 | 31 | 24 | 30 |
| LA Station | 35 | 46 | 53 | 58 | 35 | 41 | 28 | 42 |

**2003 Spring/Summer Organic Carbon Ambient Concentration Results**

| Location | 5/15/03 | 5/21/03 | 5/27/03 | 6/2/03 | 6/8/03 | 6/14/03 | 6/20/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 4.0 | 8.7 | 5.5 | 2.9 | 2.9 | 5.3 | 3.2 | 4.6 |
| EDI | 3.2 | 6.9 | 6.0 | 2.7 | 2.8 | 5.0 | 2.8 | 4.2 |
| WIL | 3.4 | 6.6 | 4.2 | 2.9 | 2.7 | 4.2 | 2.6 | 3.8 |
| LB Station | 3.2 | 4.7 | 3.7 | 2.9 | 2.8 | 4.1 | 3.0 | 3.5 |
| LA Station | 4.7 | 7.6 | 6.9 | 6.1 | 4.1 | 3.4 | 3.0 | 5.1 |

**2003 Spring/Summer Elemental Carbon Ambient Concentration Results**

| Location | 5/15/03 | 5/21/03 | 5/27/03 | 6/2/03 | 6/8/03 | 6/14/03 | 6/20/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 1.5 | 3.9 | 1.7 | 1.4 | 1.6 | 3.3 | 4.5 | 2.6 |
| EDI | 1.1 | 3.4 | 0.9 | 0.9 | 0.6 | 2.4 | 1.7 | 1.6 |
| WIL | 1.1 | 4.7 | 1.4 | 1.0 | 1.0 | 1.7 | 1.1 | 1.7 |
| LB Station | 1.1 | 2.3 | 2.4 | 0.5 | 0.9 | 1.1 | 1.3 | 1.4 |
| LA Station | 2.1 | 3.7 | 3.4 | 0.9 | 0.4 | 3.2 | 1.1 | 2.1 |

**2003 Spring/Summer Total Carbon Ambient Concentration Results**

| Location | 5/15/03 | 5/21/03 | 5/27/03 | 6/2/03 | 6/8/03 | 6/14/03 | 6/20/03 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 5.5 | 12.6 | 7.2 | 4.3 | 4.5 | 8.6 | 7.7 | 7.2 |
| EDI | 4.3 | 10.3 | 6.9 | 3.6 | 3.4 | 7.4 | 4.5 | 5.8 |
| WIL | 4.5 | 11.3 | 5.6 | 3.9 | 3.7 | 5.9 | 3.7 | 5.5 |
| LB Station | 4.3 | 7.0 | 6.1 | 3.4 | 3.7 | 5.2 | 4.3 | 4.9 |
| LA Station | 6.8 | 11.3 | 10.3 | 7.0 | 4.5 | 6.6 | 4.1 | 7.2 |

**2002 Spring/Summer $PM_{10}$ Ambient Concentration Results**

| Location | 5/8/02 | 5/14/02 | 5/20/02 | 5/26/02 | 6/1/02 | 6/7/02 | 6/13/02 | 6/19/02 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 50 | 58 | 22 | 22 | 28 | 20 | 55 | 32 | 36 |
| EDI | 40 | 56 | 18 | 21 | 31 | 18 | 50 | 32 | 33 |
| WIL | 37 | 54 | 47 | 19 | 21 | 17 | 41 | 31 | 33 |
| LB Station | NS | NS | 16 | 27 | 24 | 21 | 34 | 30 | 25 |

**2001 Spring/Summer Organic Carbon Ambient Concentration Results**

| Location | 5/8/02 | 5/14/02 | 5/20/02 | 5/26/02 | 6/1/02 | 6/7/02 | 6/13/02 | 6/19/02 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 5.4 | 4.8 | 3.3 | 2.1 | 1.8 | 2.4 | 5.0 | 2.4 | 3.4 |
| EDI | 3.4 | 4.5 | 3.1 | 2.3 | 2.6 | 2.0 | 3.5 | 2.8 | 3.0 |
| WIL | 2.8 | 4.5 | 2.2 | 1.9 | 2.0 | 2.4 | 3.2 | 2.6 | 2.7 |

**2001 Spring/Summer Elemental Carbon Ambient Concentration Results**

| Location | 5/8/02 | 5/14/02 | 5/20/02 | 5/26/02 | 6/1/02 | 6/7/02 | 6/13/02 | 6/19/02 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 3.5 | 2.2 | 2.6 | 0.9 | 1.0 | 1.2 | 3.5 | 1.0 | 2.0 |
| EDI | 1.5 | 2.0 | 1.7 | 1.1 | 0.8 | 0.9 | 1.7 | 0.9 | 1.3 |
| WIL | 1.1 | 1.8 | 0.7 | 0.8 | 0.5 | 1.1 | 1.3 | 1.1 | 1.0 |

**2001 Spring/Summer Total Carbon Ambient Concentration Results**

| Location | 5/8/02 | 5/14/02 | 5/20/02 | 5/26/02 | 6/1/02 | 6/7/02 | 6/13/02 | 6/19/02 | Average |
|---|---|---|---|---|---|---|---|---|---|
| HUD | 8.9 | 7.1 | 5.9 | 3.1 | 2.8 | 3.6 | 8.5 | 3.4 | 5.4 |
| EDI | 4.9 | 6.5 | 4.9 | 3.4 | 3.4 | 3.0 | 5.2 | 3.7 | 4.4 |
| WIL | 3.8 | 6.3 | 2.9 | 2.7 | 2.5 | 3.5 | 4.5 | 3.7 | 3.7 |

**2001 Spring/Summer $PM_{10}$ Ambient Concentration Results**

| Location | 5/25/01 | 5/31/01 | 6/6/01 | 6/12/01 | 6/18/01 | 6/24/01 | 6/30/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 39 | 70 | 47 | 34 | 63 | 36 | 38 | 47 |
| EDI | 31 | 67 | 41 | 32 | 49 | 36 | 33 | 41 |
| WIL | 39 | 56 | 43 | 36 | 47 | 35 | 35 | 42 |
| LB Station | 30 | 48 | 45 | 29 | 43 | 32 | 37 | 38 |

**2001 Spring/Summer Organic Carbon Ambient Concentration Results**

| Location | 5/25/01 | 5/31/01 | 6/6/01 | 6/12/01 | 6/18/01 | 6/24/01 | 6/30/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 3.6 | 6.6 | 4.6 | 3.1 | 6.1 | 3.2 | 3.4 | 4.4 |
| EDI | 3.4 | 5.1 | 4.9 | 2.5 | 4.9 | 3.4 | 3.3 | 3.9 |
| WIL | 4.1 | 3.7 | 4.0 | 3.2 | 4.8 | 3.1 | 3.1 | 3.7 |

**2001 Spring/Summer Elemental Carbon Ambient Concentration Results**

| Location | 5/25/01 | 5/31/01 | 6/6/01 | 6/12/01 | 6/18/01 | 6/24/01 | 6/30/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 1.7 | 3.9 | 2.0 | 1.1 | 3.5 | 1.3 | 2.2 | 2.3 |
| EDI | 1.0 | 2.9 | 1.6 | 1.1 | 3.0 | 1.2 | 1.5 | 1.8 |
| WIL | 2.3 | 1.2 | 1.8 | 1.1 | 2.1 | 1.1 | 0.9 | 1.5 |

**2001 Spring/Summer Total Carbon Ambient Concentration Results**

| Location | 5/25/01 | 5/31/01 | 6/6/01 | 6/12/01 | 6/18/01 | 6/24/01 | 6/30/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 5.3 | 10.5 | 6.6 | 4.2 | 9.6 | 4.6 | 5.6 | 6.6 |
| EDI | 4.4 | 8.0 | 6.5 | 3.6 | 7.9 | 4.7 | 4.8 | 5.7 |
| WIL | 6.4 | 4.9 | 5.8 | 4.3 | 6.9 | 4.2 | 4.0 | 5.2 |

# APPENDIX A-1 RULE 1158 LONG BEACH $PM_{10}$ MONITORING DATA (CONTINUED)

**2000 Spring/Summer $PM_{10}$ Ambient Concentration Results**

| Location | 5/24/00 | 5/30/00 | 6/5/00 | 6/11/00 | 6/17/00 | 6/23/00 | 6/29/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 27 | 31 | 40 | 32 | 18 | 19 | 42 | 30 |
| EDI | 20 | 28 | 37 | 31 | 25 | 17 | 35 | 28 |
| WIL | 22 | 38 | 41 | 33 | 19 | 24 | 37 | 31 |
| LB Station | * | * | 32 | 30 | 17 | 19 | 34 | 26 |

* No Sample

**2000 Spring/Summer Organic Carbon Ambient Concentration Results**

| Location | 5/24/00 | 5/30/00 | 6/5/00 | 6/11/00 | 6/17/00 | 6/23/00 | 6/29/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 2.9 | 2.6 | 3.8 | 3.0 | 2.3 | 2.0 | 3.7 | 2.9 |
| EDI | 2.5 | 2.6 | 3.6 | 2.8 | 2.6 | 2.1 | 3.1 | 2.8 |
| WIL | 2.5 | 2.9 | 3.7 | 3.0 | 2.4 | 2.9 | 3.3 | 3.0 |

**2000 Spring/Summer Elemental Carbon Ambient Concentration Results**

| Location | 5/24/00 | 5/30/00 | 6/5/00 | 6/11/00 | 6/17/00 | 6/23/00 | 6/29/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 1.7 | 1.2 | 2.6 | 1.4 | 0.7 | 0.8 | 2.5 | 1.6 |
| EDI | 1.2 | 1.2 | 1.7 | 1.4 | 0.8 | 0.6 | 1.3 | 1.3 |
| WIL | 1.3 | 1.2 | 1.8 | 1.1 | 0.9 | 1.0 | 1.6 | 1.2 |

**2000 Spring/Summer Total Carbon Ambient Concentration Results**

| Location | 5/24/00 | 5/30/00 | 6/5/00 | 6/11/00 | 6/17/00 | 6/23/00 | 6/29/01 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 4.6 | 3.7 | 6.4 | 4.4 | 3 | 2.8 | 6.2 | 4.4 |
| EDI | 3.7 | 3.8 | 5.3 | 4.2 | 3.4 | 2.7 | 4.4 | 3.9 |
| WIL | 3.8 | 4.1 | 5.5 | 4.1 | 3.3 | 3.9 | 4.9 | 4.2 |

**1997 Spring/Summer $PM_{10}$ Ambient Concentration Results**

| Location | 5/4/97 | 5/8/97 | 5/12/97 | 5/14/97 | 5/20/97 | 5/22/97 | 5/27/97 | Average |
|---|---|---|---|---|---|---|---|---|
| HUD | 48 | 50 | 36 | * | 32 | 39 | 58 | 44 |
| EDI | * | * | * | * | * | * | * | * |
| WIL | 43 | 50 | 35 | 42 | 30 | 36 | 48 | 41 |
| LB Station | | | | | | | | |

* No Sample

**1997 Spring/Summer Organic Carbon Ambient Concentration Results**

| Location | 5/20/97 | 5/22/97 | 5/27/97 | Average |
|---|---|---|---|---|
| HUD | 3.6 | 4.3 | 6.9 | 4.9 |
| EDI | * | * | * | * |
| WIL | 4.1 | 4.2 | 5.8 | 4.7 |

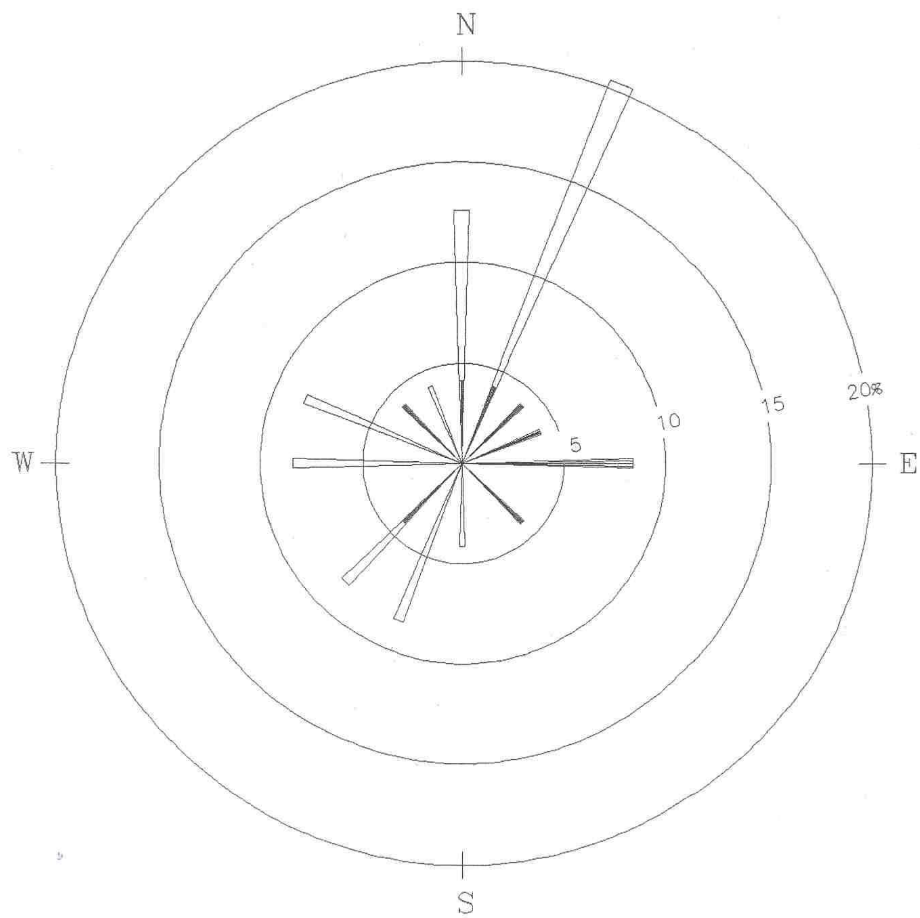
**1997 Spring/Summer Elemental Carbon Ambient Concentration Results**

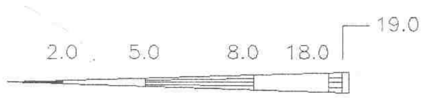
| Location | 5/20/97 | 5/22/97 | 5/27/97 | Average |
|---|---|---|---|---|
| HUD | 2.3 | 2.4 | 5.4 | 3.4 |
| EDI | * | * | * | |
| WIL | 1.2 | 1.6 | 3.3 | 2.0 |

**1997 Spring/Summer Total Carbon Ambient Concentration Results**

| Location | 5/20/97 | 5/22/97 | 5/27/97 | Average |
|---|---|---|---|---|
| HUD | 5.9 | 6.7 | 12.3 | 8.3 |
| EDI | * | * | * | |
| WIL | 5.3 | 5.8 | 9.1 | 6.7 |

**APPENDIX A-2 STUDY WIND DATA**



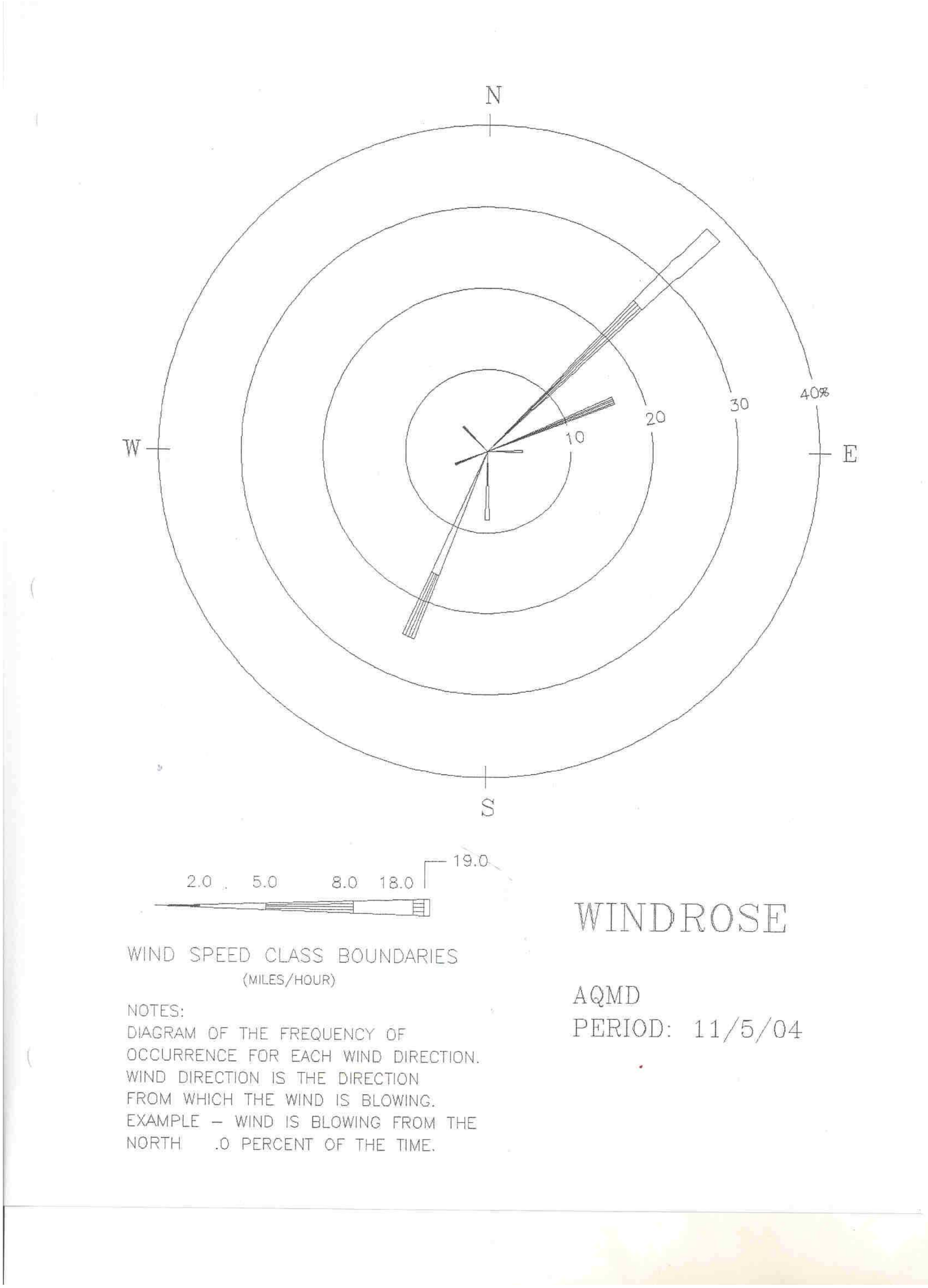

WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 12.6 PERCENT OF THE TIME.

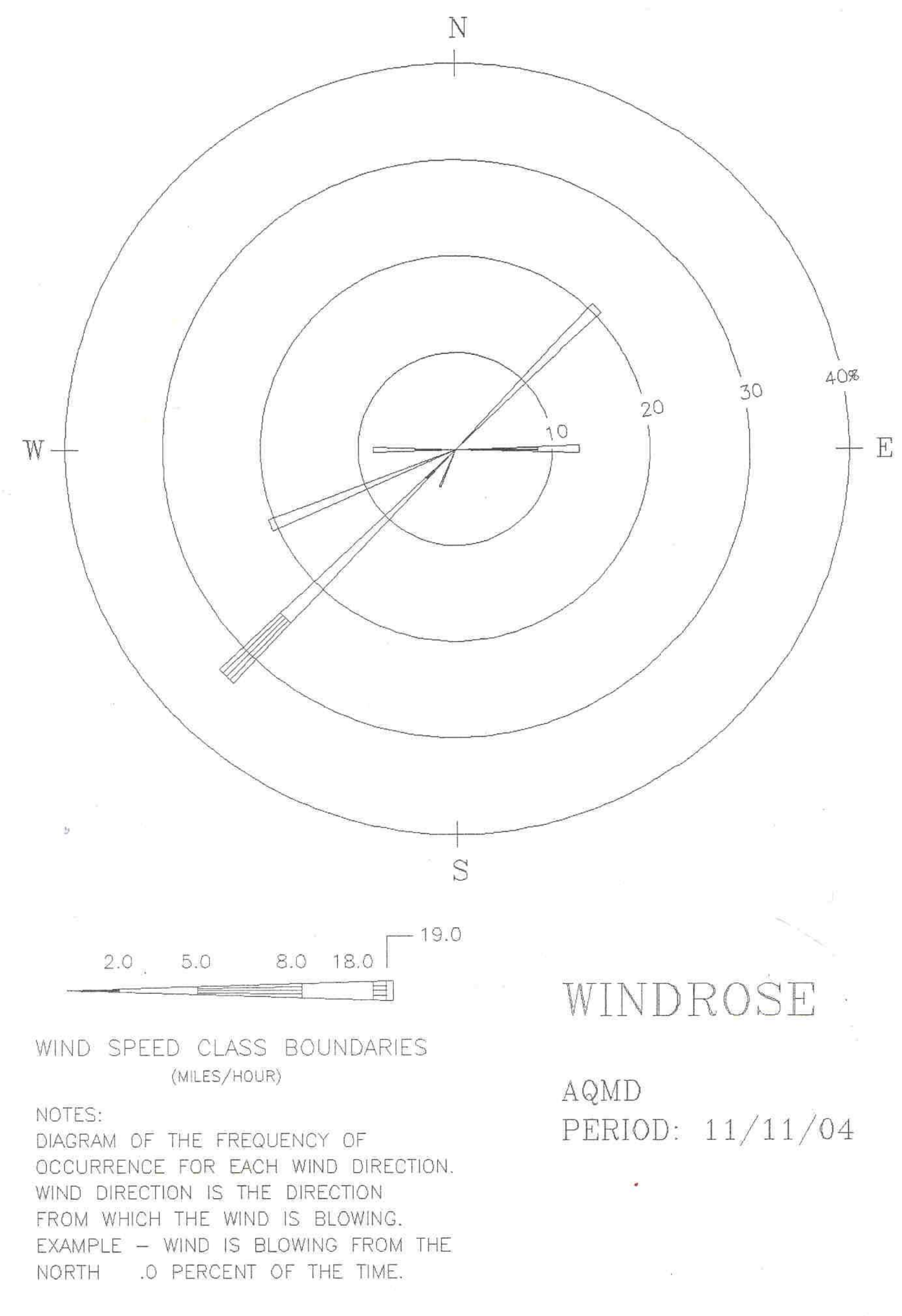
WINDROSE

AQMD
PERIOD: 10/30/04

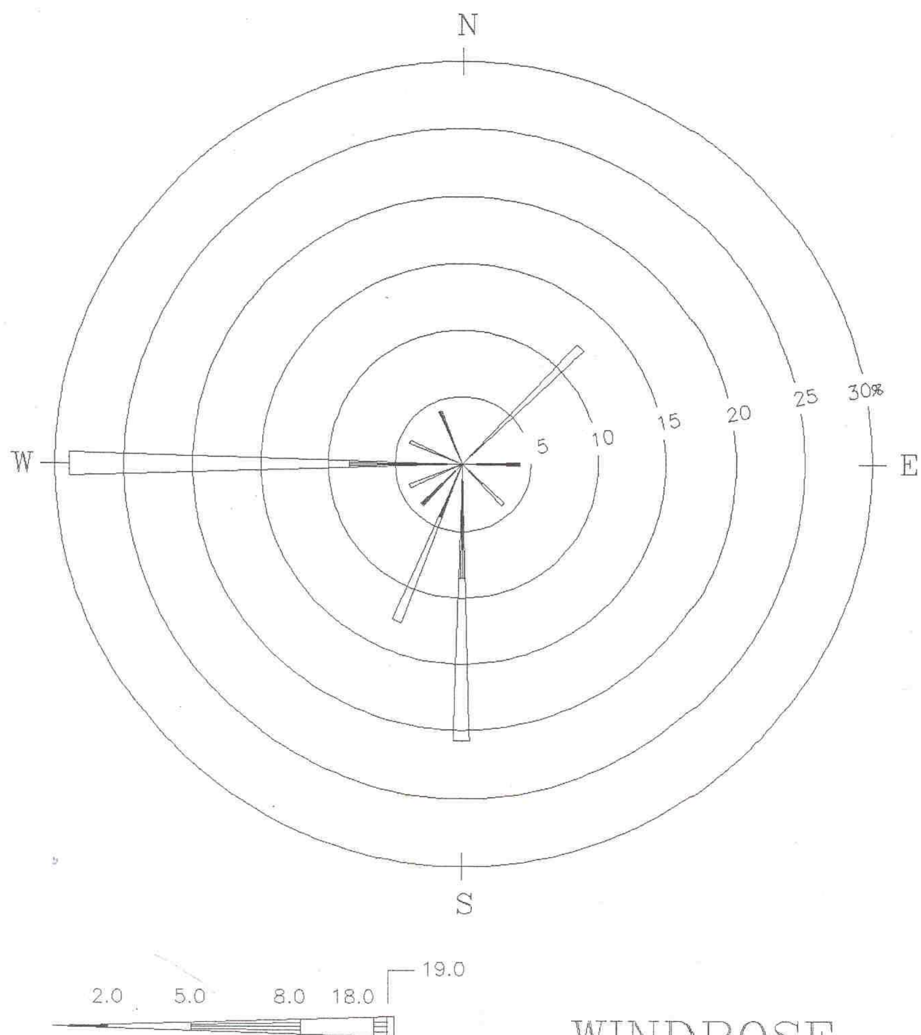
**APPENDIX A-2 STUDY WIND DATA**



**APPENDIX A-2 STUDY WIND DATA**



## APPENDIX A-2 STUDY WIND DATA



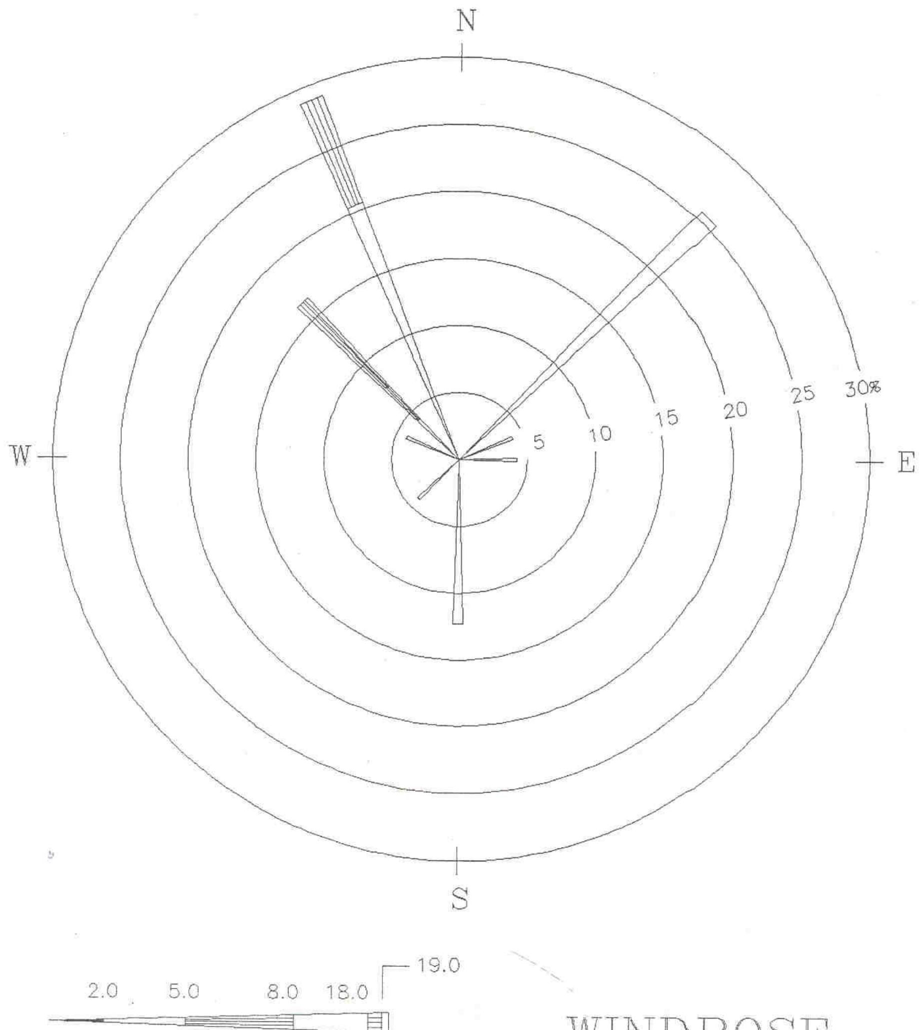

WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH .0 PERCENT OF THE TIME.

WINDROSE

AQMD
PERIOD: 11/17/04

**APPENDIX A-2 STUDY WIND DATA**



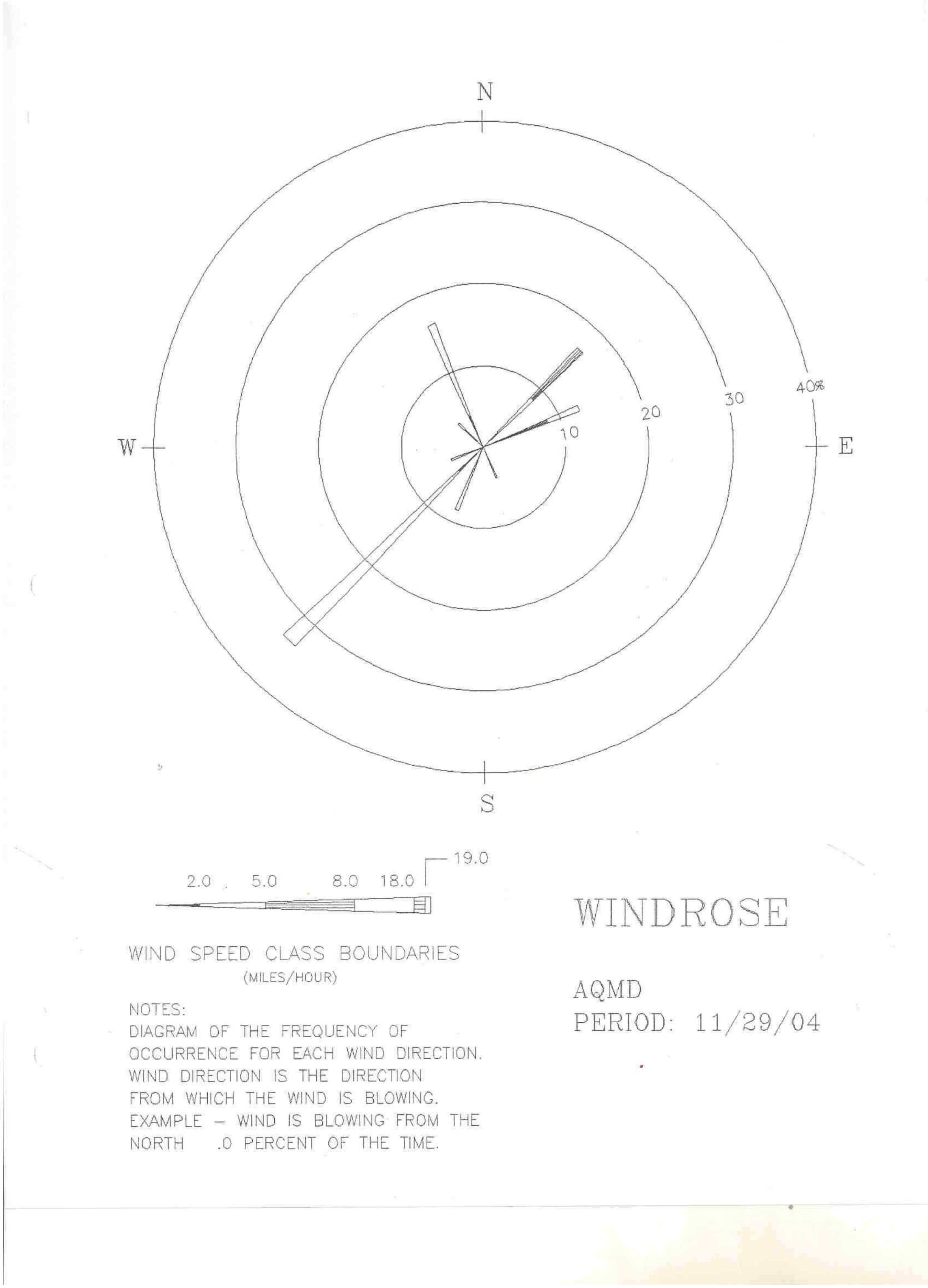

WIND SPEED CLASS BOUNDARIES
(MILES/HOUR)

NOTES:
DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION.
WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING.
EXAMPLE – WIND IS BLOWING FROM THE NORTH .0 PERCENT OF THE TIME.

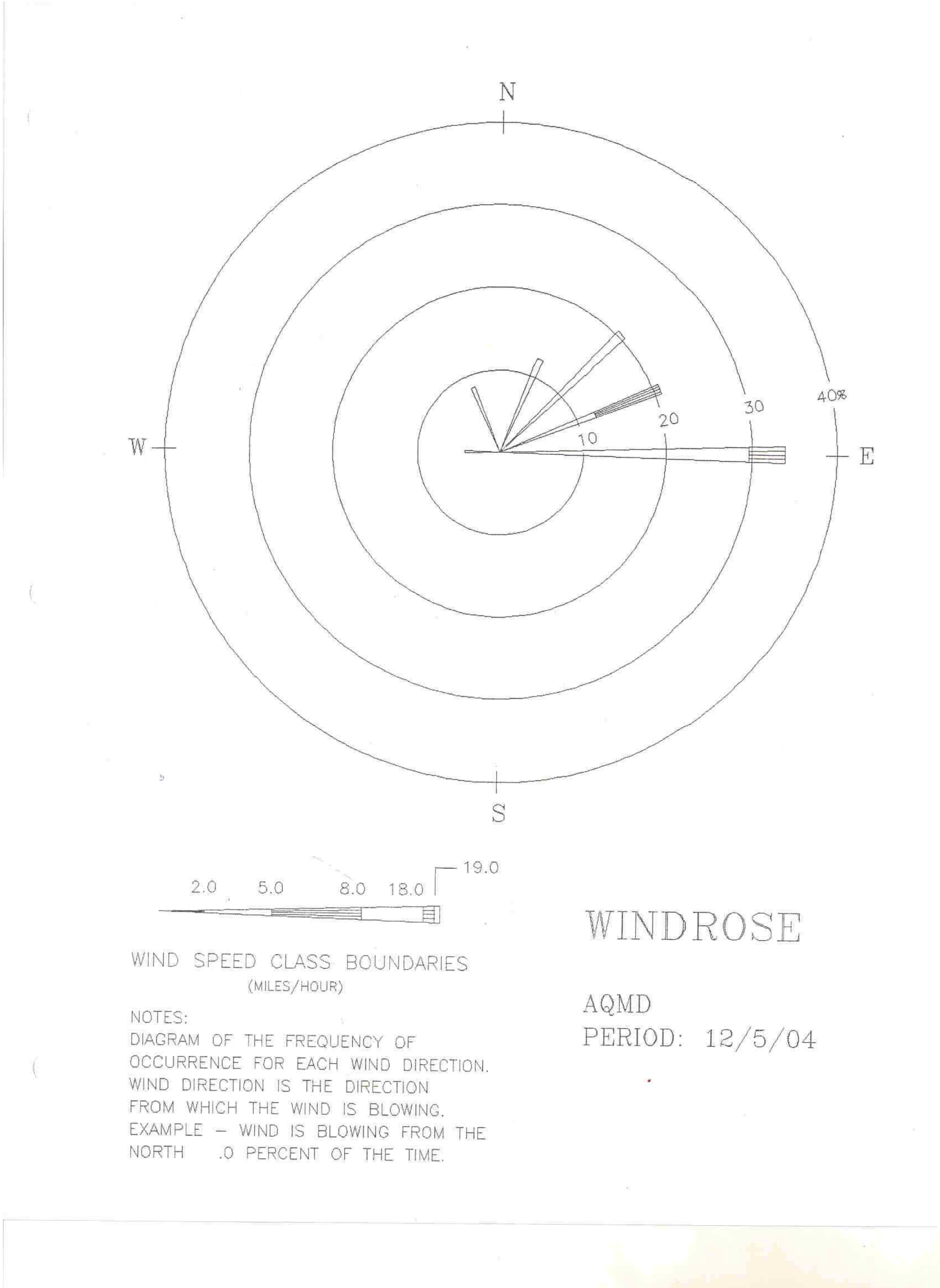
WINDROSE

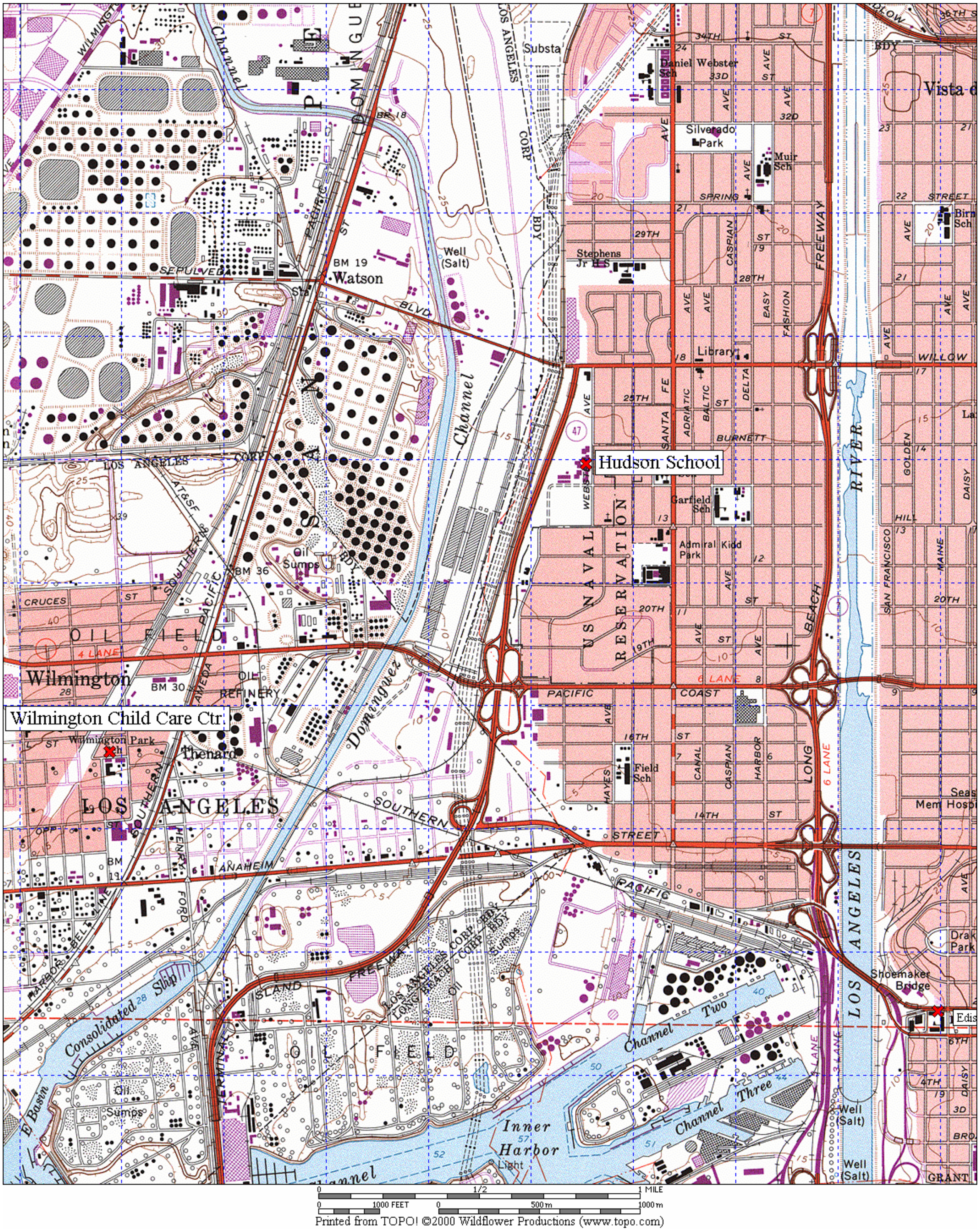
AQMD
PERIOD: 11/23/04

**APPENDIX A-2 STUDY WIND DATA**

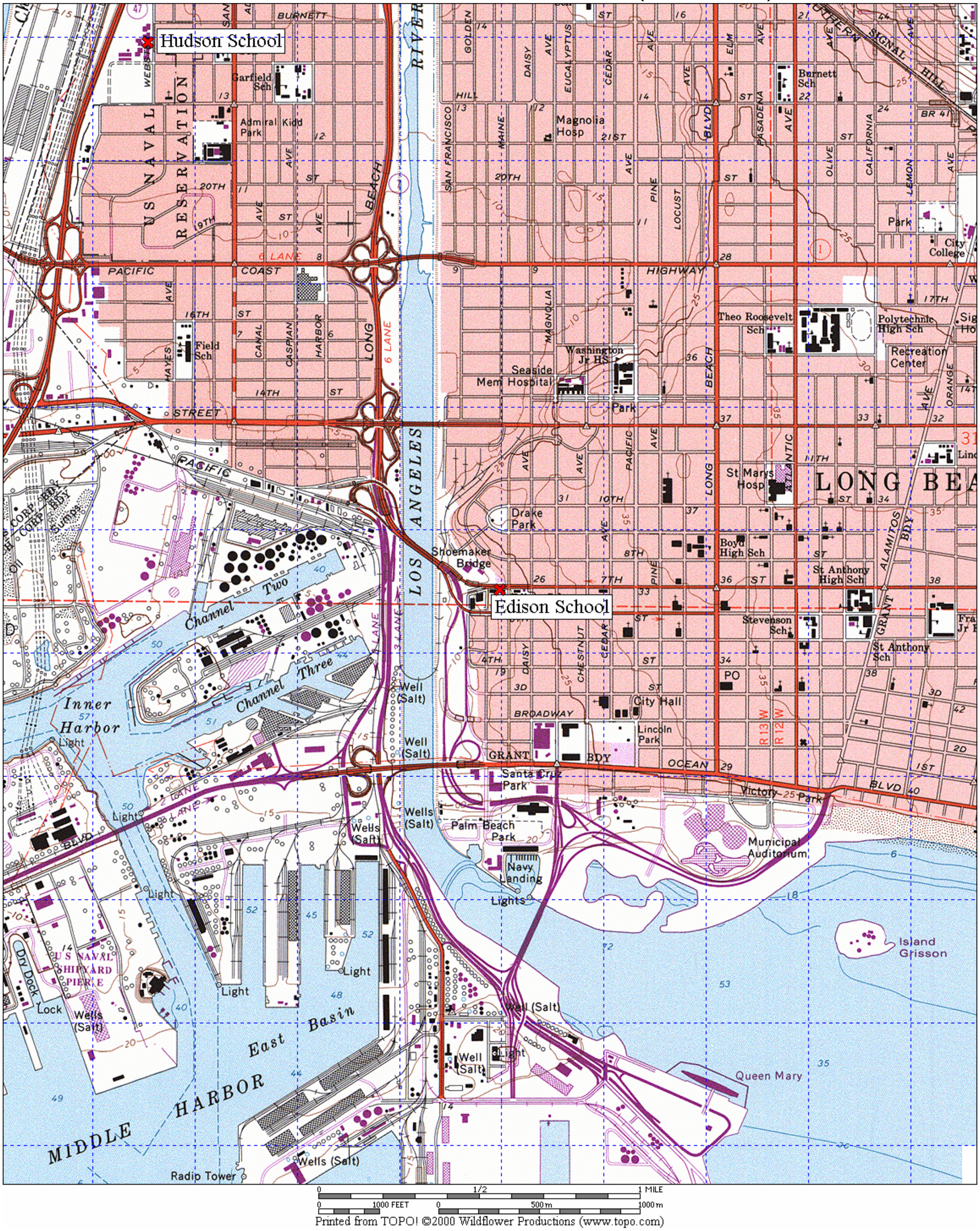


**APPENDIX A-2 STUDY WIND DATA**

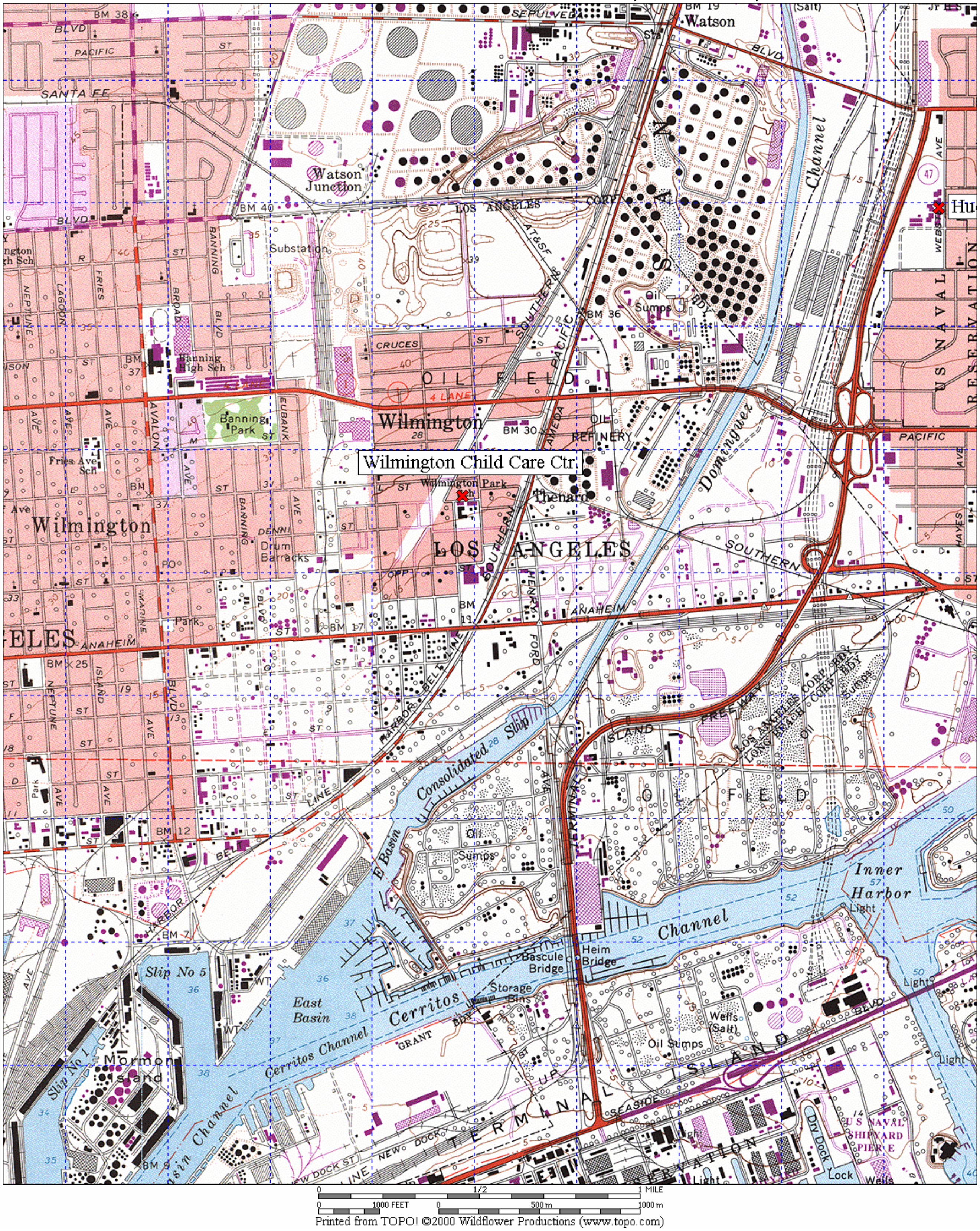




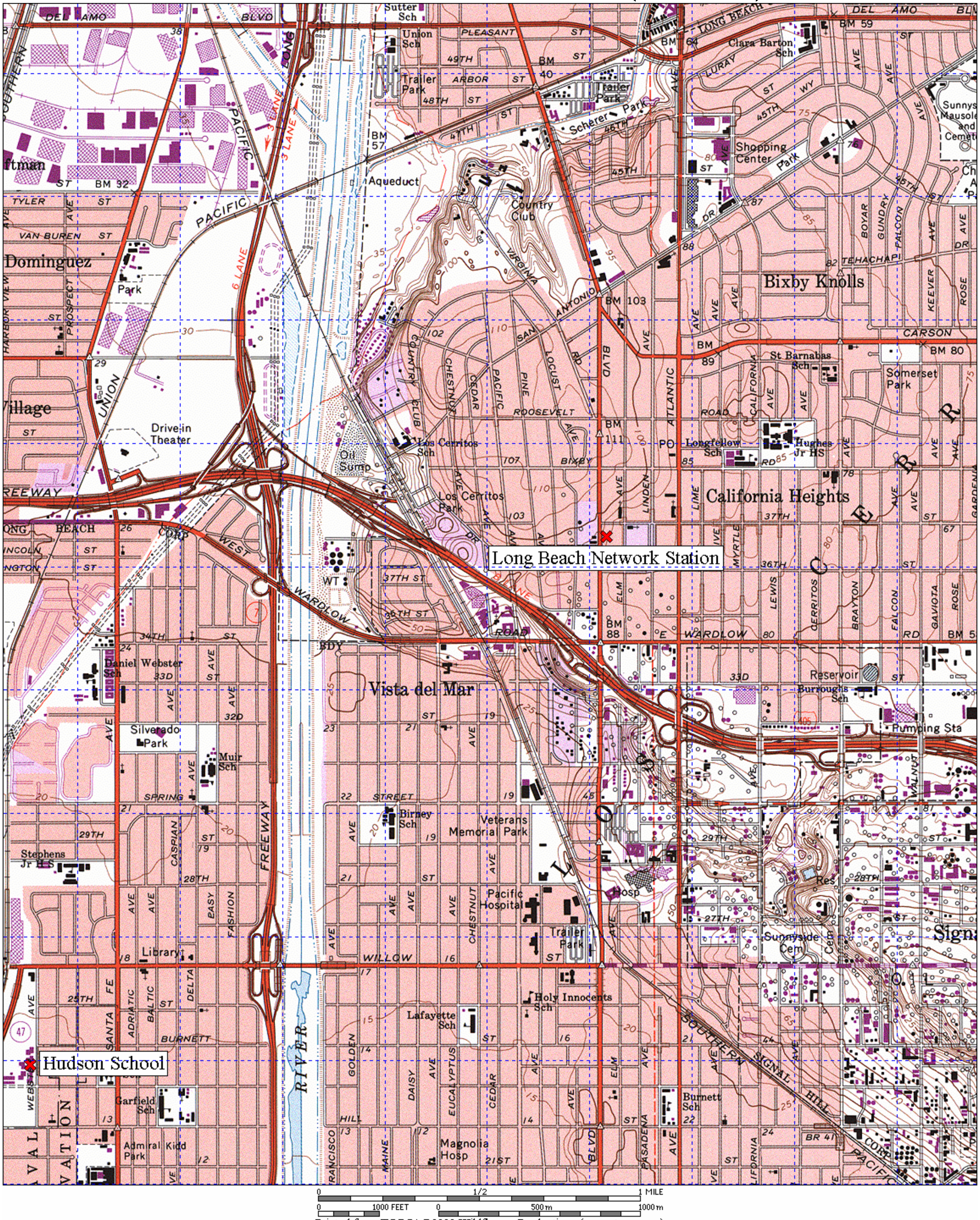

**Hudson School and Surrounding Area**




**Edison School and Surrounding Area**




**Wilmington Childcare Center and Surrounding Area**

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**Long Beach Station and Surrounding Area**