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Los Angeles Catalyst Study

Annual Report

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LOS ANGELES CATALYST STUDY

ANNUAL REPORT

by

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FOREWORD

Measurement and monitoring research efforts are designed to anticipate potential environmental problems, to support regulatory actions by developing an in-depth understanding of the nature and processes that impact health and the ecology, to provide innovative means of monitoring compliance with regulations and to evaluate the effectiveness of health and environmental protection efforts through the monitoring of long-term trends. The Environmental Monitoring and Support Laboratory, Research Triangle Park, North Carolina, is responsible for development of: environmental monitoring technology and systems; agency-wide quality assurance programs for air pollution measurement systems; and technical support to the Agency's operating functions including the Office of Air, Noise and Radiation, the Office of Toxic Substances and the Office of Enforcement.

The Environmental Monitoring and Support Laboratory, Research Triangle Park, North Carolina, has conducted the Los Angeles Catalyst Study since June 1974, before the introduction of the 1975 model year catalyst equipped automobiles. Through a combination of careful site selection and study design, best-technology sampling equipment, experienced personnel, and a carefully created quality assurance program, an extensive and reliable data base has been generated for a multitude of ambient pollutants relating to automotive emissions. The Los Angeles Catalyst Study site has also proved to be an excellent location for evaluating the performance parameters of the newer methods applied to the measurement of catalyst emission products.

Thomas R. Hauser
Director
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ABSTRACT

This report is a summary of the data collected at the Los Angeles Catalyst Study (LACS) from June 1974 through December 1977. Previous reports of the LACS data were presented at the symposium held in April 1977, covering the data through 1976. The current report follows the same data presentation format, showing 6-month average trends of the summer seasons (April through September) beginning in 1974. Additional graphs are included in this report giving more detailed comparisons of freeway pollutant contributions with traffic parameters. Also included are method comparisons of high volume and membrane samplers for total mass, $SO_4^=$, Pb, and ratios of S/SO_4 and Pb/Br.

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SECTION 1

INTRODUCTION

The Los Angeles Catalyst Study (LACS) was established in the summer of 1974 to assess the impact of catalytic converters on air quality. Several previous LACS reports were presented at a symposium in April 1977 and compiled in an EPA technical document, The Los Angeles Catalyst Study Symposium.[1] That report details the rationale behind the site selection, pollutant and measurement technique selection, and data presentation format. The current report highlights the sampling philosophy and updates the data through December 1977. Trends are described and selected methods compared.

The location of the monitoring sites on the San Diego Freeway in Los Angeles is shown in Figure 1. At this location the freeway is 6.5 kilometers from the Pacific Ocean and approximately parallel to the coast line. The terrain near the freeway is relatively flat as can be seen in the photograph in Figure 2, which identifies monitoring Sites A, B, C, and D. The freeway is approximately 2 meters above grade as shown in the elevation diagram in Figure 3, and all sampling inlets are raised to 1 meter above the freeway grade.

The sampling equipment currently operated at the LACS sites is also indicated in Figure 3. Sites A and C are fully instrumented with aerosol and gas samplers. Sites B and D contain only aerosol samplers. Using extended sampling lines, the carbon monoxide (CO) at Site B is monitored from Site A, and the CO in the center of the freeway is monitored at Site C. All meteorological data are collected at 10 meters elevation at Site A, while all traffic speed and count data from the freeway are monitored by a computer controlled data system at Site C. Additional monitors generate hourly averages for NO, NO_2 and O_3 concentrations. Total sulfur monitoring was discontinued in the fall of 1977 because the extremely low sulfur levels (typically $<20 \mu g/m^3$) were near the operating threshold for the instruments. Integrating samplers include standard high volume (hi-vol) samplers operated at 1.4 m^3/min. with glass fiber filters, low volume membrane samplers (0.14 m^3/min.) using cellulose ester filters and dichotomous samplers (0.14 m^3/min). Two types of aerosol size fractionating samplers have been operated at the LACS. The Anderson 5-stage cascade was operated until the fall of 1977. The 3-stage massive volume impactor developed by Battelle is operated to collect large (>1 gram) aerosol samples for health screening studies.

Integrating samplers are operated on both a midnight-to-midnight and 3 to 7 p.m. basis. The latter 4-hour time period coincides with peak traffic volume and meteorological conditions favorable to the detection of the freeway contribution of air pollutants. Since differences between upwind and downwind

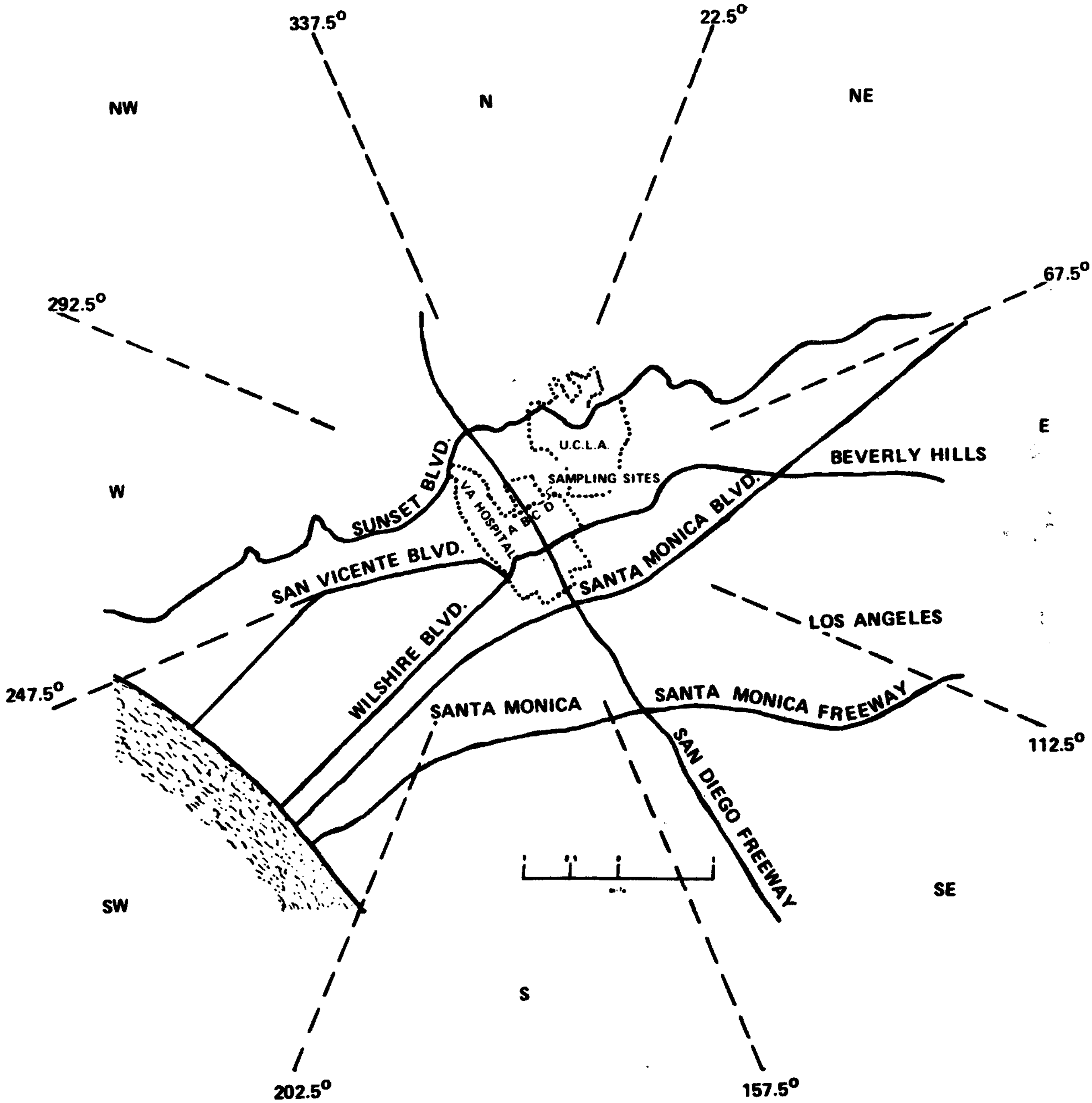


Figure 1. Site location in Los Angeles.

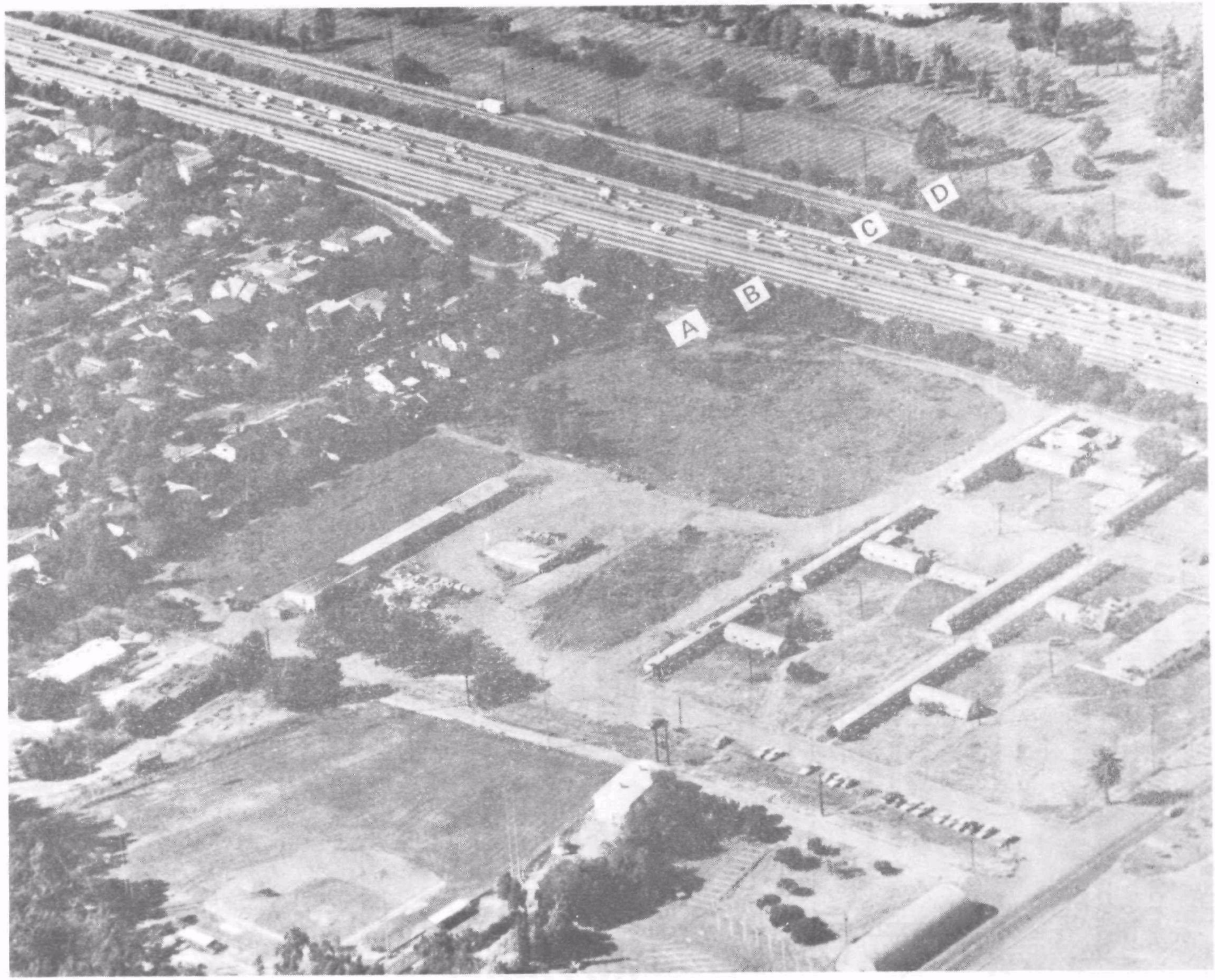
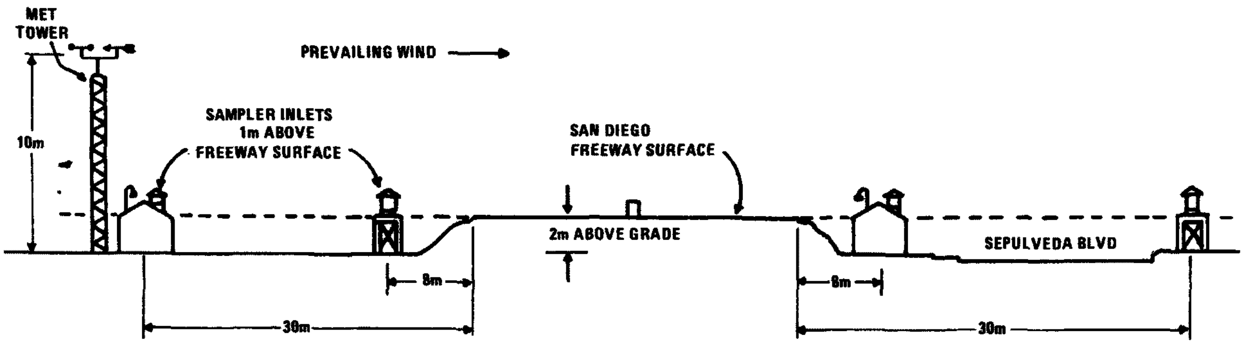


Figure 2. Aerial view of sampling sites.



SITE A

CO ANALYZER
TOTAL SULFUR (SO_2) ANALYZER
NO/NO_2 ANALYZER
O_3 ANALYZER

24-HR SO_2 BUBBLER

24-HR HI-VOL
4-HR HI-VOL (3-7 PM)
4-HR MEMBRANE (3-7 PM)
24-HR CASCADE
MASSIVE VOLUME AIROSOL SAMPLER
24-HR DICHOTOMOUS SAMPLER

AMBIENT TEMP. AND DEWPOINT
WIND SPEED
WIND DIRECTION

SITE B

24-HR HI-VOL
4-HR HI-VOL (3-7 PM)
24-HR MEMBRANE

SITE C

CO ANALYZER
TOTAL SULFUR (SO_2) ANALYZER
NO/NO_2 ANALYZER
O_3 ANALYZER

24-HR SO_2 BUBBLER

24-HR HI-VOL
4-HR HI-VOL (3-7 PM)
4-HR MEMBRANE (3-7 PM)
24-HR CASCADE
MASSIVE VOLUME AEROSOL SAMPLER
24-HR DICHOTOMOUS SAMPLER

TRAFFIC SPEED AND COUNT SYSTEM

SITE D

24-HR HI-VOL
4-HR HI-VOL (3-7 PM
24-HR MEMBRANE

Figure 3. LACS study site composition and elevation.

measurements are the basis for determining the freeway contribution, the windspeed and direction are very important ancillary measurements.

Data from the continuous samplers are collected on strip charts which are subsequently electronically digitized to obtain hourly averages. The integrated samples collected on-site are sent to the contractor's (Rockwell Air Monitoring Center) laboratory for subsequent analyses. Membrane samples are also sent to Lawrence Berkeley Laboratory (LBL) for X-Ray Fluorescence (XRF) elemental analyses. The data are transmitted to EPA/RTP on magnetic tape in SAROAD[2] format for processing and interpretation.

In order to maintain data quality, a comprehensive Quality Assurance Program is maintained during the sampling and analysis following the guidelines in the EPA Quality Assurance Handbook.[3] The sampling QA program includes checks and calibrations of flowrates and pollutant measurements. The laboratory QA program includes routine unknown (spiked) samples sent to the contractor's laboratory as well as samples split with the EPA reference laboratory at RTP to verify comparability.

The current validated data set contains approximately 500,000 continuous monitor hourly averages and 180,000 analysis values on integrated aerosol samples. The data are examined by EPA for long term trends, effects of parameters such as meteorology and traffic flow on pollutant data, and intercomparison of methods. Because the data base is large and varied a contract was awarded to the University of Wisconsin's Department of Statistics (68-02-2261) to examine the LACS data and, through various techniques such as time series modeling, quantify the trend results and explore perturbations in the data. Some of the key results from this contract are also presented in this report.

SECTION 2

CONCLUSIONS

- The LACS site continues to provide favorable meteorological and traffic conditions for the determination of the freeway contribution to ambient concentrations of air pollutants. This is especially so during summer months and between the hours of 3-7 p.m.

- There has been virtually no change in the distribution of wind directions since the beginning of the study. Average summer wind speed, however, has decreased ten percent since 1975 and the resulting decrease in dilution air may have contributed to a slight inflation in apparent freeway contribution to air pollutant concentrations.

- The opening of a fifth northbound lane in February 1977 resulted in a ten percent increase in weekday northbound traffic volume and, perhaps more significantly, an increase in 3-7 p.m. average weekday northbound speed from 25 to 45 mph. This change produced a dramatic impact on 3-7 p.m. concentrations of pollutants, especially Pb. Southbound and weekend traffic patterns exhibited very little change.

- The proportion of vehicle miles driven on the San Diego Freeway by catalyst-equipped vehicles reached an estimated 43 percent in December 1977.

- Carbon monoxide measurements made in the center of the freeway average twice the corresponding concentration observed at the near downwind location (Site C).

- The background concentrations of CO, NO, NO_2, O_3, TSP (except 4-hour membrane measurements) and Pb have remained essentially constant since monitoring commenced.

- Background levels of SO_4 decreased sharply in 1976 followed by a slight increase in 1977 while the background level of SO_2 exhibited a marked increase in 1977.

- The freeway contribution of CO, TSP and Pb has <u>not</u> decreased to the extent expected since the introduction of the catalyst with the 1975 model vehicles. Rapid decrease in catalyst efficiency with accumulated mileage, reported increases in the improper usage of leaded gasoline in catalyst automobiles and changes in the traffic flow patterns at the LACS may all have contributed to this observation.

- The freeway contribution of NO and NO_2 has increased significantly through the study period.

- The freeway contribution of SO_4 (4-hour membrane measurements, only) appears to have increased slightly, but still represents only a minor increment ($\sim 1 \mu g/m^3$) above background levels. The freeway contribution of SO_2, meanwhile, has not decreased significantly.

- Linear comparisons between collocated high volume and membrane samplers reveal that while the overall TSP agreement is unsatisfactory, there is very good agreement for 4-hour and 24-hour Pb measurements.

- Four-hour SO_4 measurements from high volume samplers, thought to be inflated by artifact formation, do not compare well with simultaneous membrane measurements. Twenty-four-hour SO_4 measurements, however, exhibit very strong correlation and excellent agreement between the two sampling methods.

- Comparison of membrane S and SO_4 results suggest that virtually all of the aerosol S observed at the LACS sites exists in the SO_4 form.

- Comparison of membrane Pb and Br results suggest that almost all of the Pb observed at the LACS sites is automobile-generated.

- A method to normalize contribution measurements based upon meteorology and traffic effects needs to be developed in order to improve the analysis of trends in the LACS data base.

SECTION 3

RESULTS AND DISCUSSION

METEOROLOGICAL CONDITIONS, EFFECTS AND TRENDS

The configuration of the sampling sites for the Los Angeles Catalyst Study (LACS) is shown in Figure 1. The four primary sites are situated along a line perpendicular to the San Diego Freeway with two sites on either side. Through this part of the Los Angeles basin, the freeway runs roughly parallel to the Pacific Ocean (i.e., southeast to northwest) at a distance of approximately 6.5 kilometers inland. The freeway perpendicular, serving as the site line, occurs at 235° (i.e., in the southwest octant).

Figure 2 is an aerial view of the Veterans Administration Hospital and cemetery property on which the LACS sites are located. The figure indicates the positions of Sites A and B on the ocean (or "upwind") side of the freeway and C and D on the opposite (or "downwind") side. As shown in Figure 3, all of the continuous monitoring equipment is located at Site A (30 meters upwind of the freeway) and/or Site C (8 meters downwind). In addition, some carbon monoxide measurements have been made at the freeway median and at a remote site located 230 meters from the freeway on the upwind side.

Wind direction and speed have been continuously monitored since the beginning of the LACS (June 1974) by means of a anemometer located at Site A at an elevation of 10 meters. Figure 4 depicts the distribution of occurrences and the associated average windspeed as a function of wind direction. Wind direction strip charts are reduced to hourly averages and reported to the nearest ten degrees. Thus, there are 36 possible values for wind direction plus the classification 'calm' (denoted by zero) which is used for any hour for which the accompanying windspeed is less than one mile per hour. The lower curve in Figure 4 is a frequency distribution of all the wind direction data collected at Site A since the beginning of the study. It was plotted by tabulating the number of hours of occurrence for each possible wind direction, dividing by the total number of hours for which valid wind direction data are available and expressing the quotients as percentages. The upper curve is the average windspeed over all hours for which the winds were from the indicated direction.

Prevailing wind direction was one of the prime considerations involved in the selection of a suitable site for the LACS. Areas of the Los Angeles basin which are close to the ocean are characterized by an alternating pattern of onshore (or "sea breeze") winds during the daylight hours and offshore (or "land breeze") winds during the dark hours. Thus, it was felt that a major freeway running parallel and near to the ocean would provide

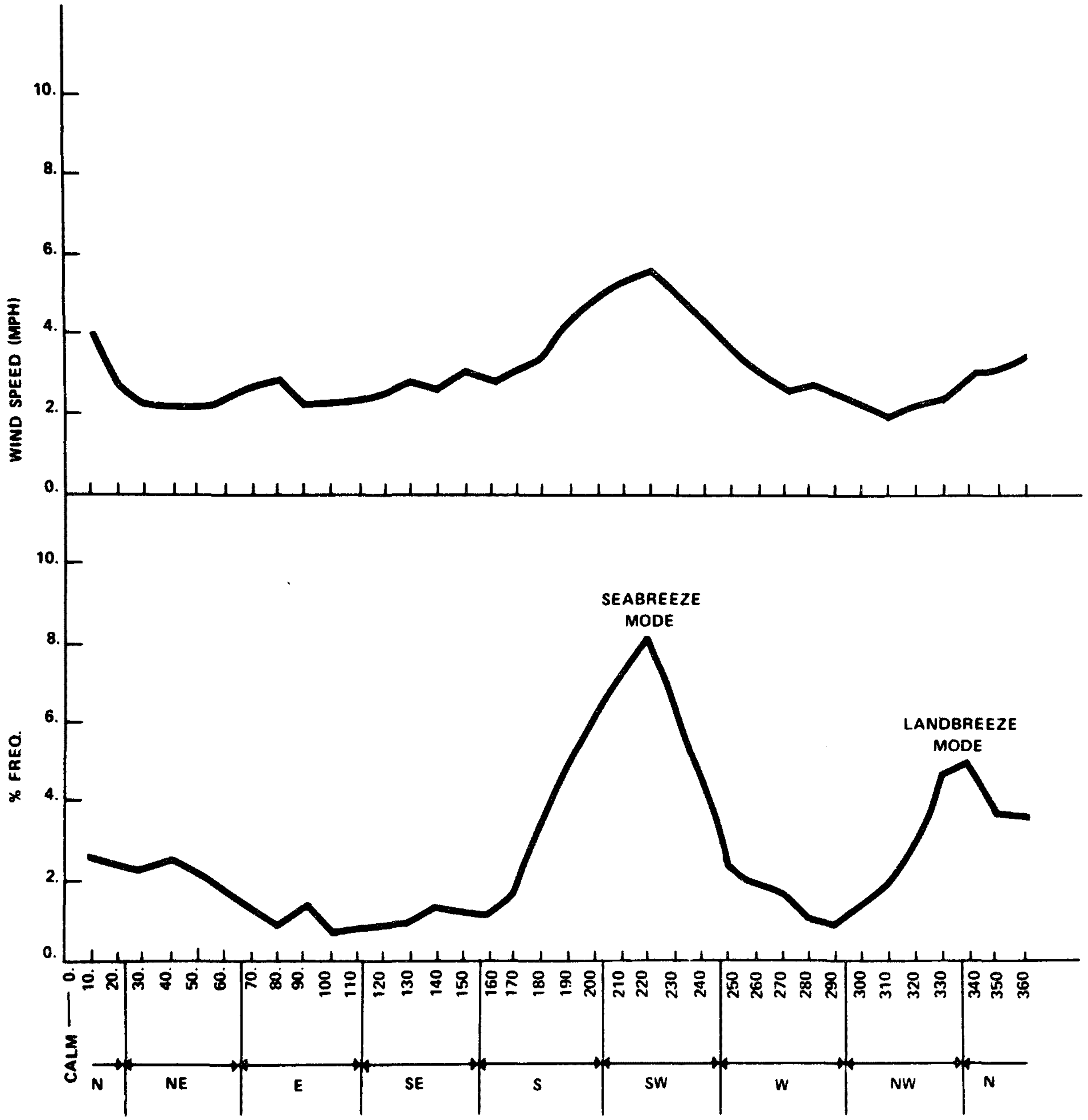


Figure 4. Percent frequency and speed by wind direction (all data).

the desirable property of prevailing winds which were perpendicular to the freeway for a large portion of almost every day. Such a wind pattern would enable the detection of the freeway contribution to ambient levels of air pollutants by differencing simultaneous measurements taken upwind and downwind of the freeway.

As shown in the lower curve in Figure 4, wind direction at the LACS site follows a bimodal distribution with two distinct patterns: a sea breeze pattern centered in the southwest octant with tails in the south and west and a somewhat more diffuse land breeze pattern centered in the north with tails in the northwest and northeast. The upper curve in Figure 4 shows that the sea breeze mode (wind directions from the south, southwest and west) is accompanied by the highest average windspeeds.

Since the sea breeze mode provides the most favorable conditions for the detection of pollutant sources on the freeway, it is useful to look at the diurnal and seasonal patterns in the occurrence of winds from this sector. Figure 5 shows the percentage occurrence of sea breeze by hour-of-day for all summer months (defined as April through September, inclusive). In the early morning hours, winds are typically light and variable and are out of the sea breeze sector (S+SW+W) for only about 20% of all summer days. Following sunrise (about 7 a.m.) the wind pattern begins to shift into the sea breeze mode and from noon until 7 p.m. winds are nearly always from this sector.

Since the LACS integrated samplers are operated on either a 24-hour basis (midnight to midnight) or a 4-hour basis (3-7 p.m.), the overall percentage occurrence of sea breeze for each of these intervals is shown in the figure (61% and 97%, respectively). This suggests that while the 4-hour afternoon sampling interval should provide a good measure of the freeway contribution to pollutant concentrations, the 24-hour interval will likely be an underestimate since the diurnal wind pattern is such that all sites will be impacted by the freeway during some portion of the day.

Figure 6 shows the diurnal pattern of sea breeze for winter months (October through March). While similar to the summer pattern, the figure shows that the period of favorable meteorology is of much shorter duration because there are fewer hours of sunlight. Overall, the sea breeze accounts for only 35% of winter hours and from 3-7 p.m. the percentage sea breeze is about 65%. Thus, cross-freeway differences obtained from integrated samplers would be expected to be notably different between summer and winter seasons.

The diurnal pattern for temperature is shown in Figure 7 with separate curves for the summer and winter seasons. Temperature follows a symmetrical pattern reaching its peak in the early afternoon. The seasonal difference in temperature is not large (5°F overall average). Figure 8 provides the same information for percent relative humidity. Humidity reaches a minimum in the early afternoon and averages 5% higher in the summer season.

To evaluate the impact of meteorology on observed pollutant concentrations, the carbon monoxide data collected at the LACS sites will be examined in some detail. Carbon monoxide is particularly useful as a "tracer" of

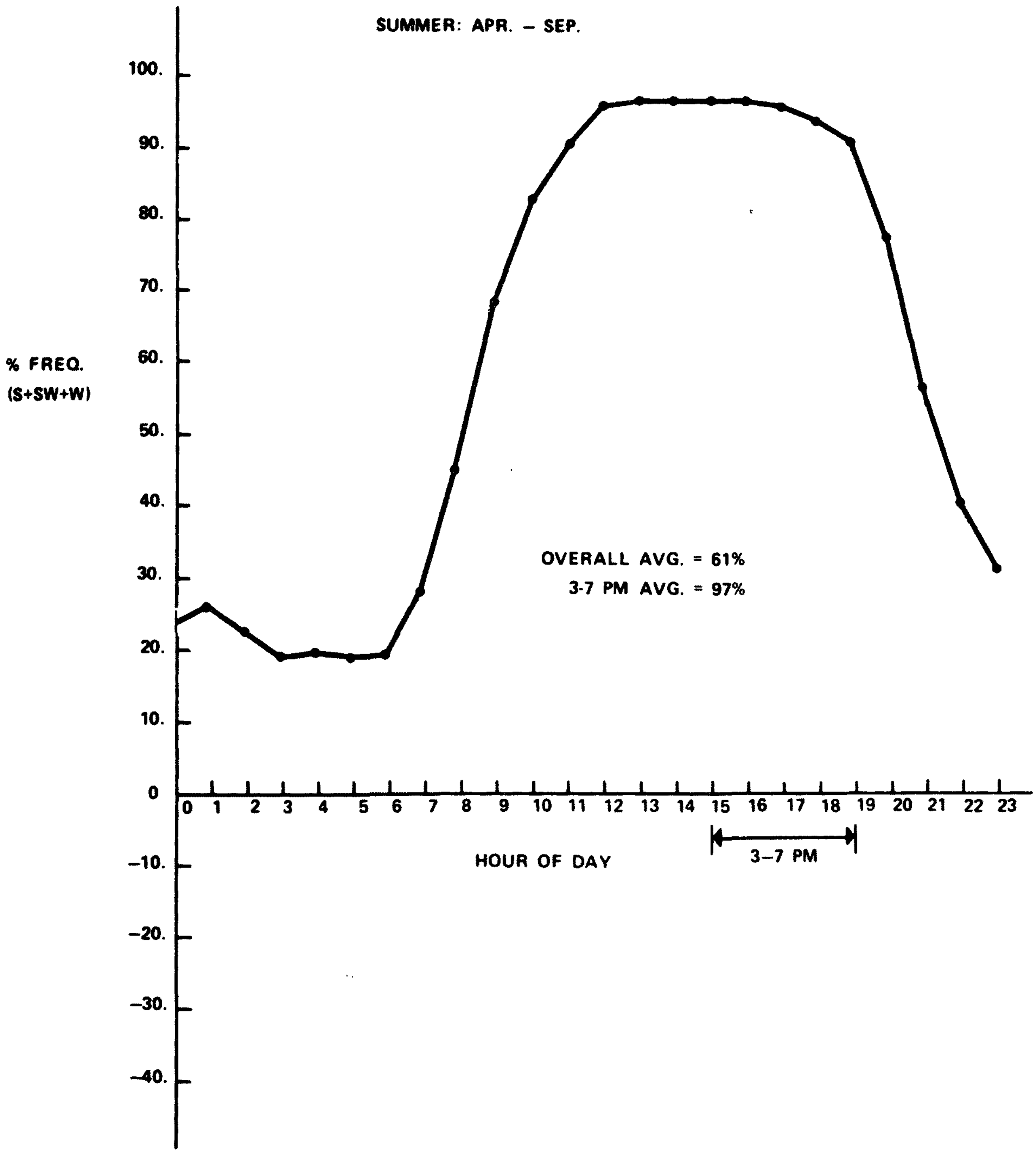


Figure 5. Frequency of seabreeze diurnal pattern.

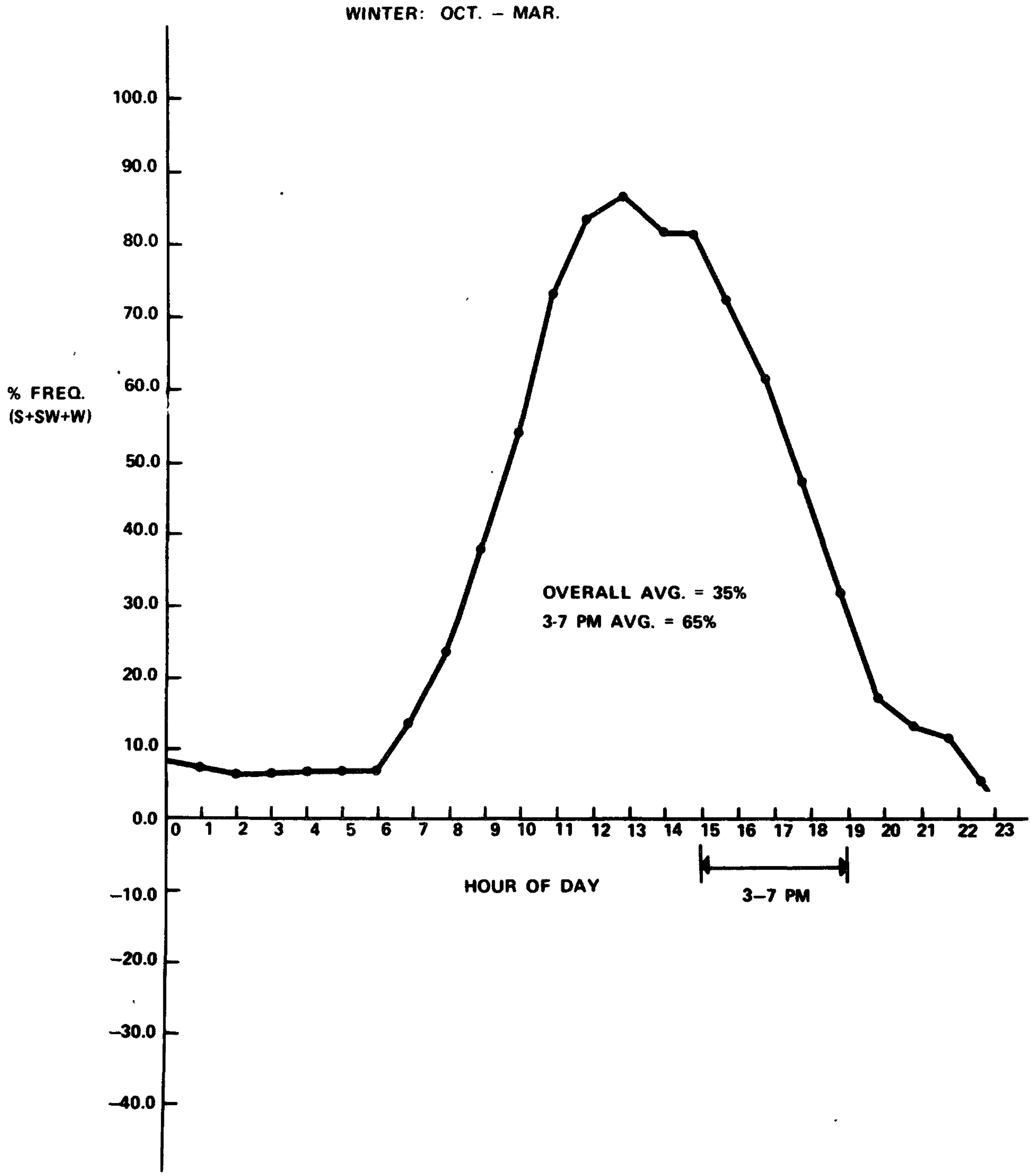


Figure 6. Frequency of seabreeze diurnal pattern.

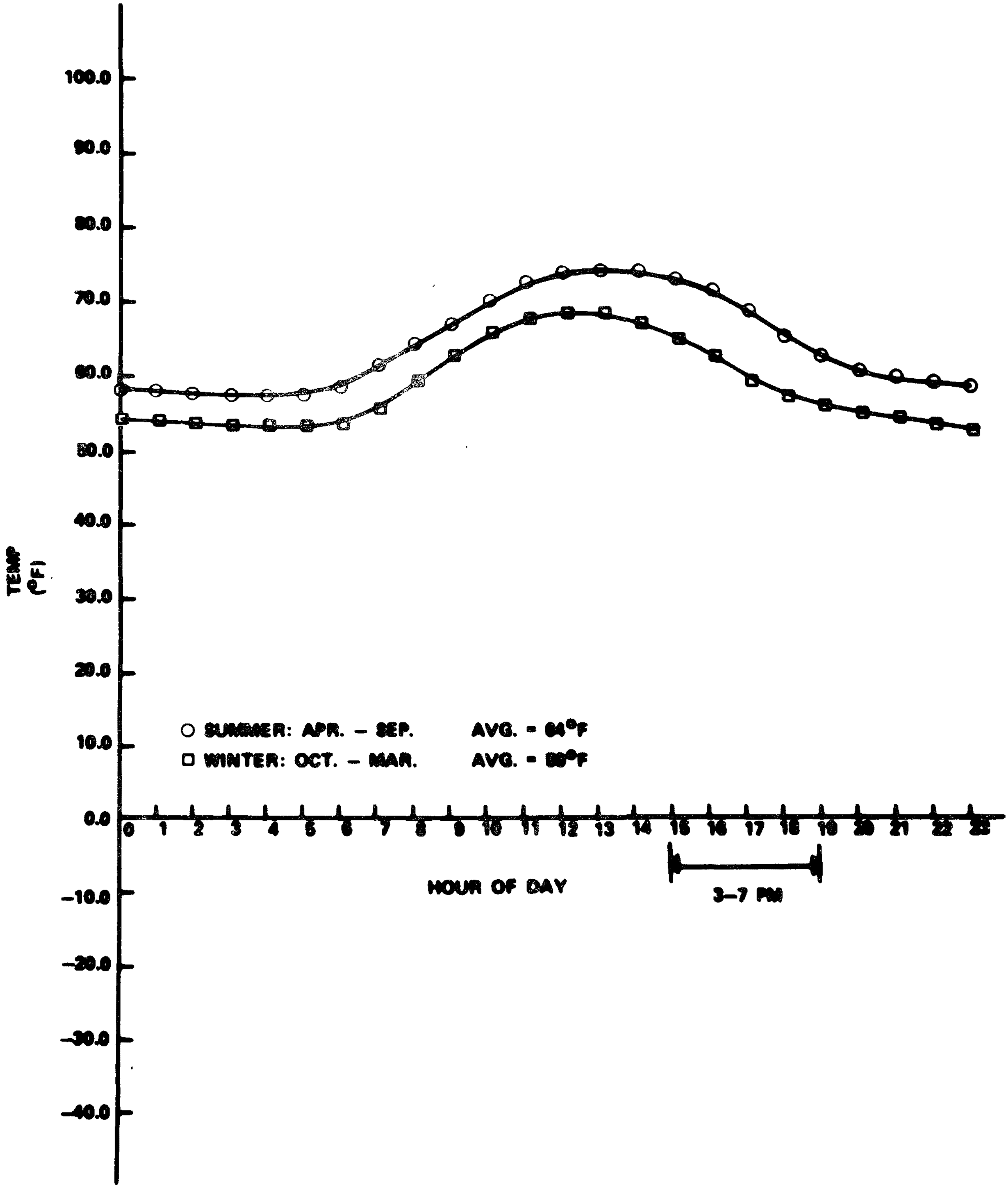


Figure 7. Temperature by hour.

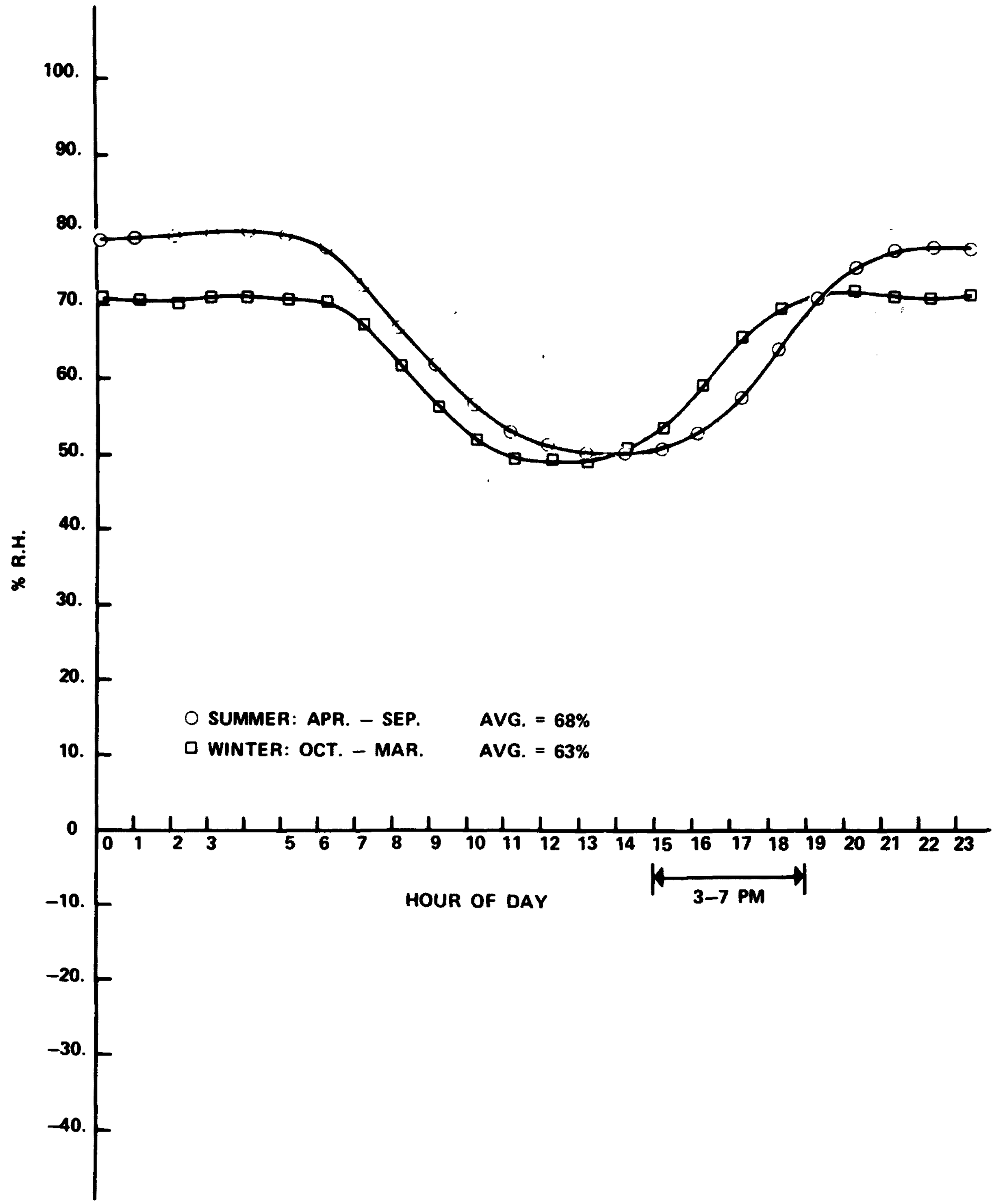


Figure 8. Relative humidity by hour.

pollutant behavior because it is an inert, automobile-generated pollutant and has been continuously monitored since June 1974 at both Sites A and C. Inlet probes are at an elevation of about one meter above freeway grade (i.e., approximately at commuter elevation).

Figure 9 shows CO concentrations at Site A (Symbol "A"), Site C (Symbol "C"), and the cross-freeway (C-A) difference (Symbol "Δ") as a function of wind direction. The plots were constructed using all valid CO data since the beginning of the study, stratifying by wind direction and computing average concentrations by site and the average concentration difference (C-A) for each wind direction. It is interesting to note that when winds are calm (wind direction = 0), Site C exceeds Site A by about one part per million (1 ppm) due to a proximity effect (Site C is 8 meters from the freeway while Site A is 30 meters from the freeway). The cross-freeway difference (C-A) curve is slightly (<1 ppm) negative (A exceeding C) when winds are from the north, northeast or east. It crosses the zero line when winds are along the freeway parallels (southeast or northwest) and is distinctly positive when winds are from the sea breeze mode (south, southwest or west), reaching a maximum of about 5 ppm when winds are from the southwest (i.e., directly perpendicular to the freeway). This pattern confirms the utility of the study design in making use of the naturally occurring sea-breeze to separate emission products from background levels of automobile-generated pollutants.

In an attempt to investigate the effect of windspeed on pollutant concentrations, the CO data base was first sorted for all hours when the prevailing wind direction was from the southwest (since these essentially perpendicular winds give rise to the largest cross-freeway differences). The restricted data base was then further stratified on the basis of windspeed intervals, and the average CO concentrations at Site A, Site C and the freeway difference (C-A) were computed for each interval. The results are plotted in Figure 10. Again, it is observed that the concentration at Site C substantially exceeds that at Site A even at very light windspeeds due to the proximity effect. As windspeed increases, the average CO concentration decreases at Site A and increases at Site C until windspeed reaches about 4.5 mph. Above this speed, the average CO concentration at both sites and the cross-freeway difference decrease due to the effect of increased dilution.

Figure 11 shows the diurnal pattern in CO concentration for each site and the cross-freeway difference as a composite of all summer months. The cross-freeway difference is very small during early morning hours but begins to build at about 7 a.m. as the sea breeze mode begins to predominate and the morning traffic rush hour period begins. It levels off at about noon when the sea breeze mode is well established and the morning rush hour period subsides. Then at about 3 p.m. the cross-freeway difference increases again in response to the afternoon rush hour period, reaching a diurnal maximum of about 6 ppm at 5 p.m. It is worth pointing out that the 3-7 p.m. sampling interval for integrated samplers appears to cover the optimum period for the detection of emission sources on the freeway.

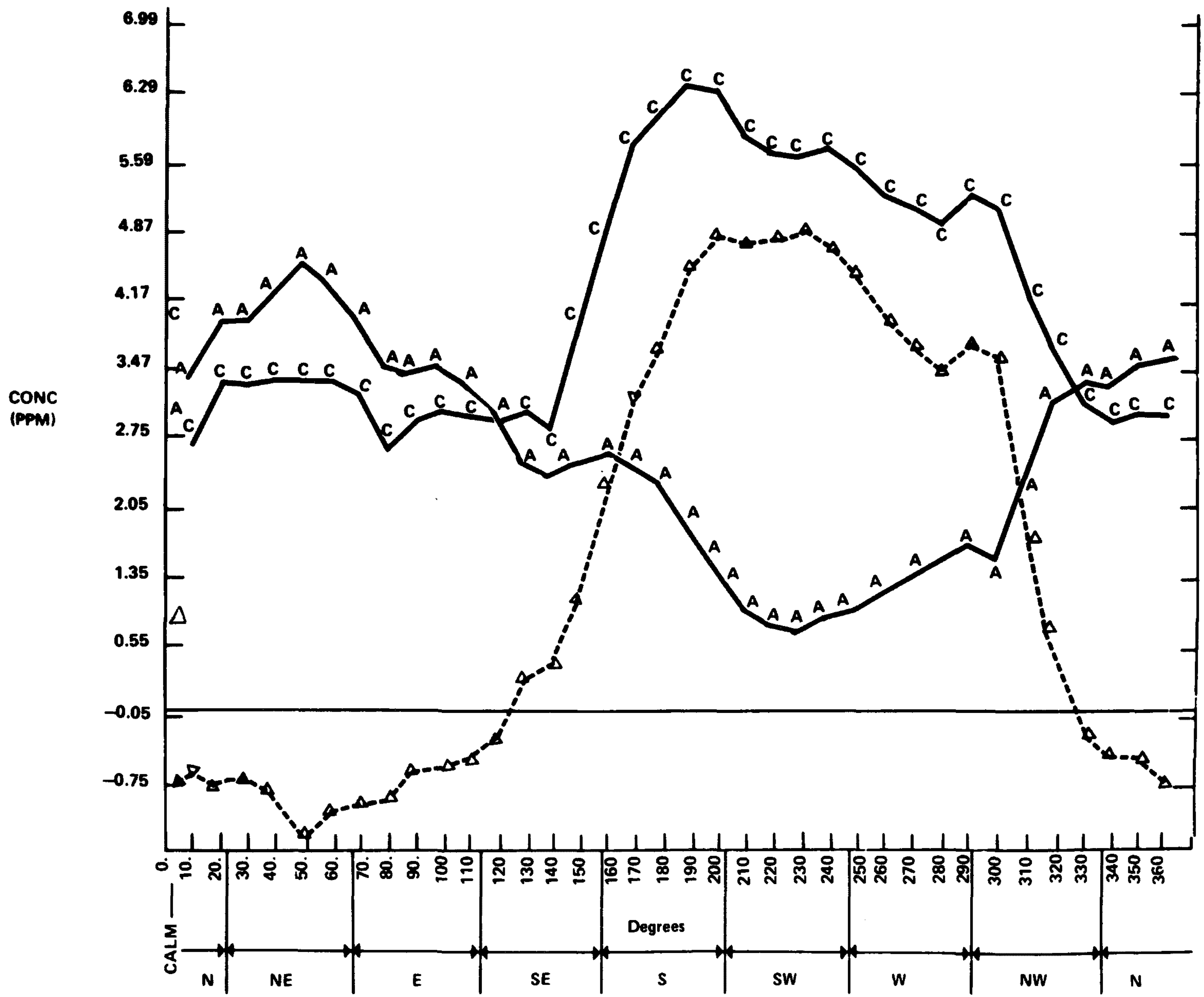
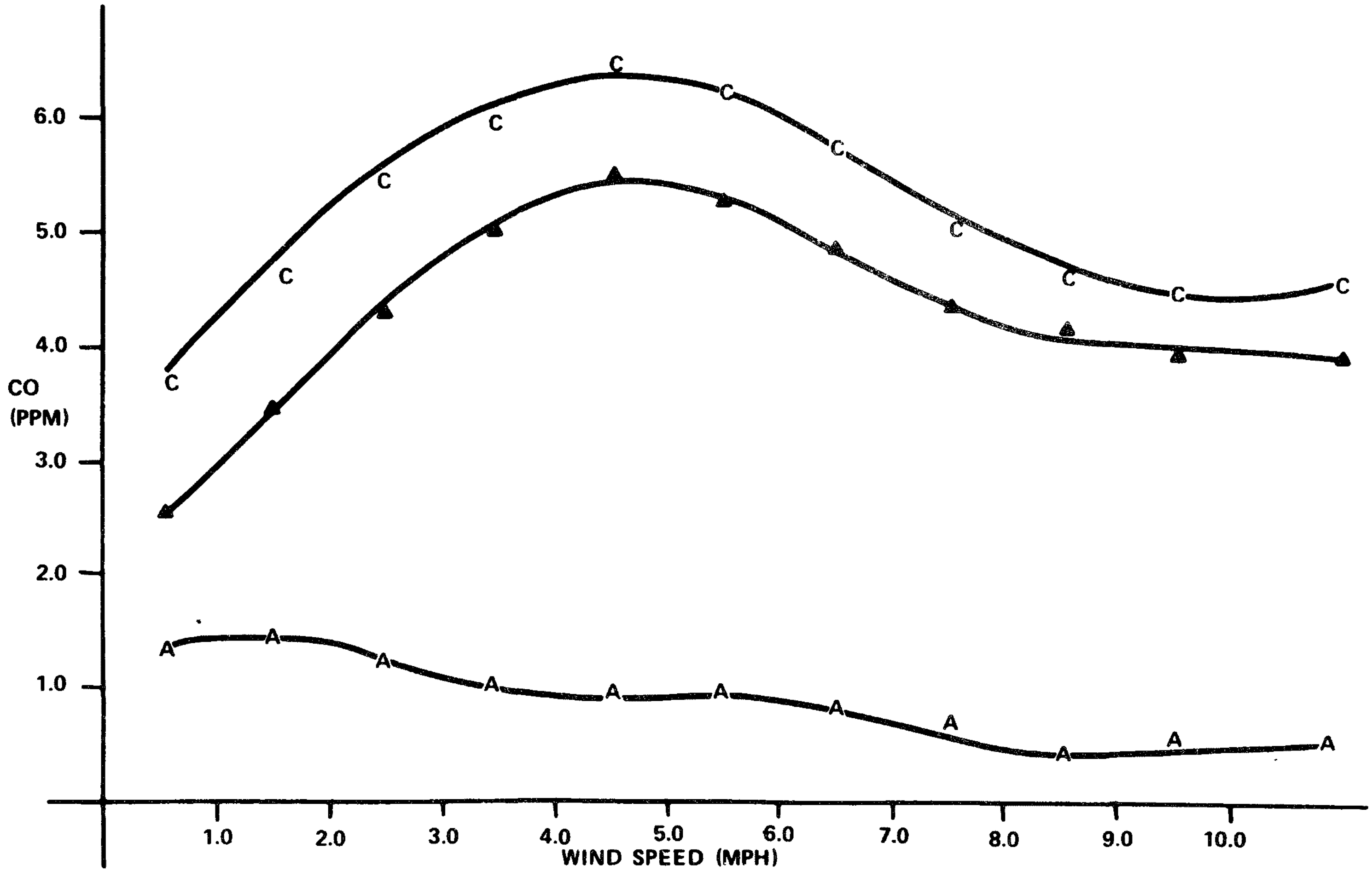


Figure 9. CO by wind direction (all data).



A – AVG. CO CONCENTRATION AT SITE A

C – AVG. CO CONCENTRATION AT SITE C

▲ – AVG. CO CONCENTRATION DIFFERENCE (C-A)

Figure 10. CO by wind speed for WD=SW.

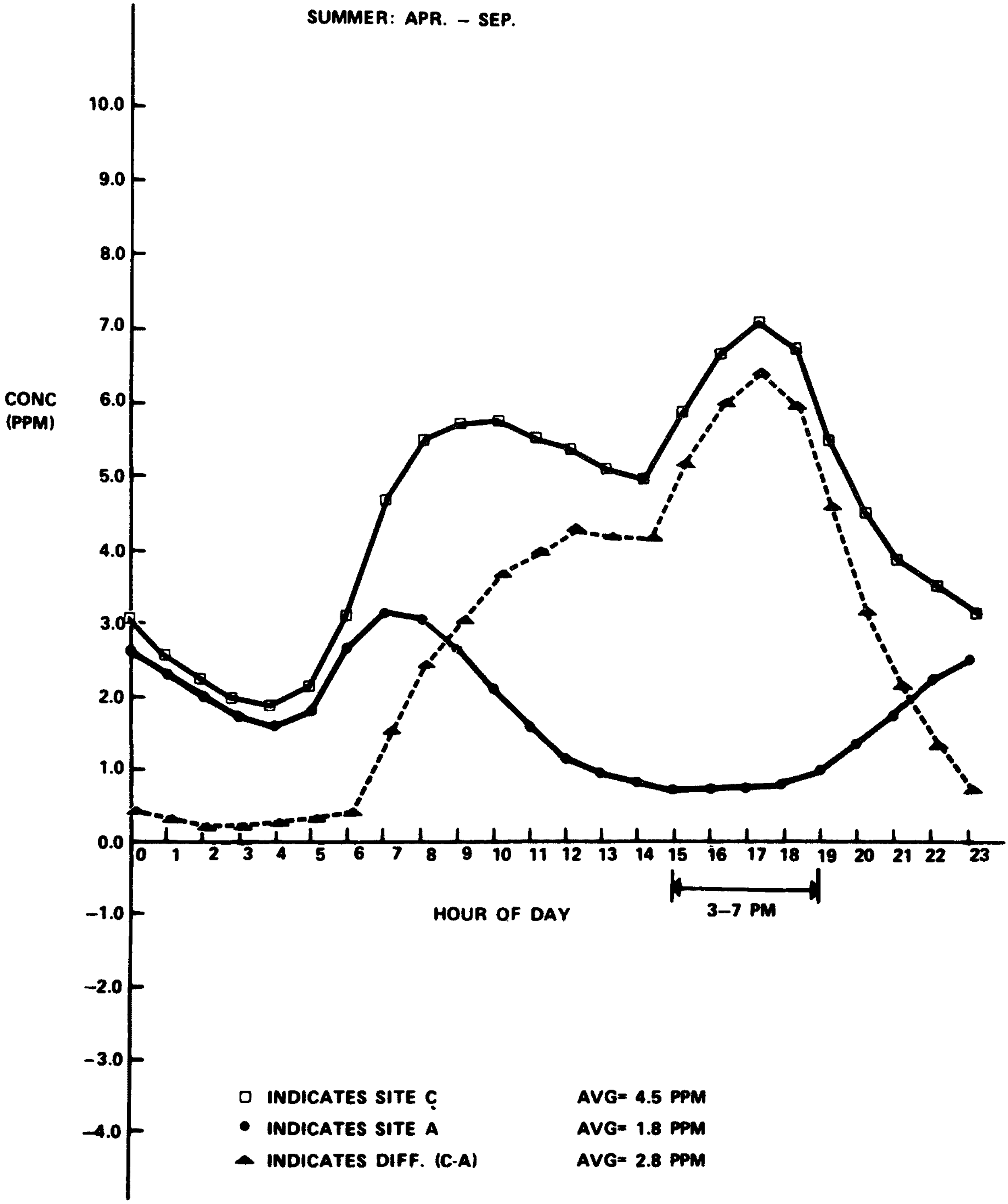


Figure 11. Carbon monoxide by hour.

Figure 12 shows the CO diurnal pattern as a composite of all winter months (October through March). Though similar in pattern to the summer months, the winter pattern is strongly affected by the shorter duration of the sea breeze mode. By 7 p.m. the cross-freeway difference in CO concentration has practically disappeared for the average winter day.

Figure 13 depicts the average percentage sea breeze occurring during each of the four summer seasons since the beginning of the study. The averages are computed on both a 24-hour and a 4-hour (1500-1800 hours) basis to conform to the intervals of operation of integrated samplers. As the figure shows, sea breeze accounts for virtually all summer hours during the 4-hour afternoon sampling period and for about two-thirds of all summer hours on a 24-hour basis. There has been no apparent trend in the occurrence of sea breeze over the four years of the study.

Figure 14 is a similar plot for summer windspeed data. In addition to the seasonal average, the 95th percentile value is included in the 24-hour plots to give some indication of the upper tail of the distribution. As previously noted, afternoon (sea breeze) winds tend to be stronger than the average for the entire day. In addition, average windspeed increased slightly in 1975 and has subsequently decreased to the 1974 average level. Since decreased windspeed provides less dilution air, this trend may have the effect of slightly increasing the apparent freeway contribution of air pollutants (see Figure 10).

Ambient temperature and percent relative humidity have been collected continuously at LACS Site A since October 1974. Summer season temperature and humidity data are shown in Figures 15 and 16, respectively. The high relative humidity in the summer of 1977 should be noted.

TRAFFIC CONDITIONS, EFFECTS AND TRENDS

The LACS traffic count and speed system became operational in September 1976. The system consists of inductive loops embedded in each of the ten lanes of the San Diego Freeway, an interface system to convert electric impulses from the loops to digital counts and a minicomputer located in the shelter at Site C to store traffic count data on magnetic tape. Operating on a ten-minute cycle, the system provides a total vehicle count for each lane and within each of six speed categories: 0-25, 25-35, 35-45, 45-55, 55-65 and greater than 65 miles per hour (mph). Every two weeks, the magnetic tape from the on-site computer is forwarded to Research Triangle Park, North Carolina (RTP) where the data are reduced to hourly traffic volume and estimated average speed northbound and southbound.

Initially, only eight freeway lanes were open to traffic (four lanes northbound and four lanes southbound). In February 1977, a fifth northbound lane was opened and the marked consequences of that change will be discussed later in this section.

Since no statistically significant day-of-week differences appear for the composited Monday through Thursday data, these days may be pooled into

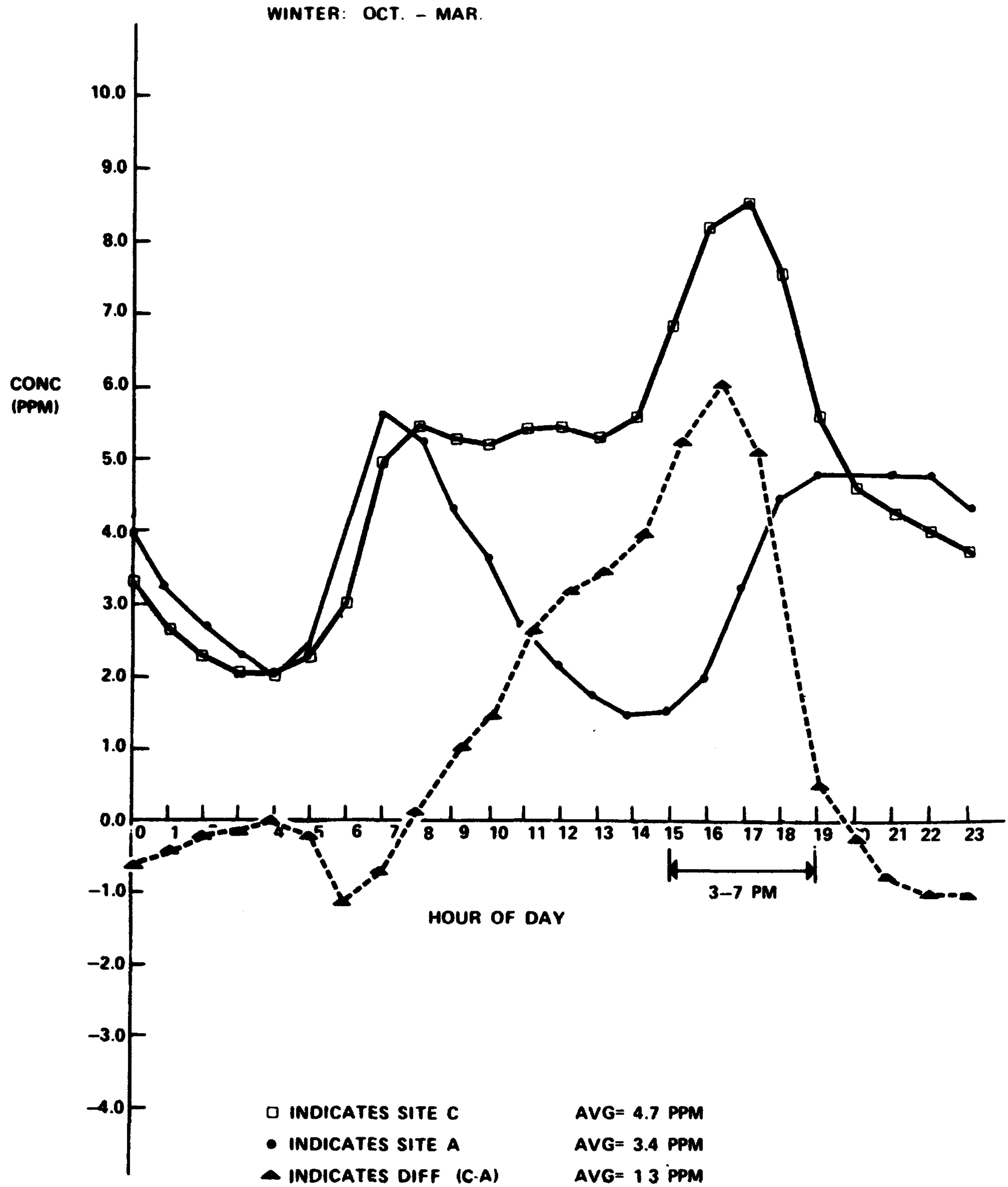


Figure 12. Carbon monoxide by hour.

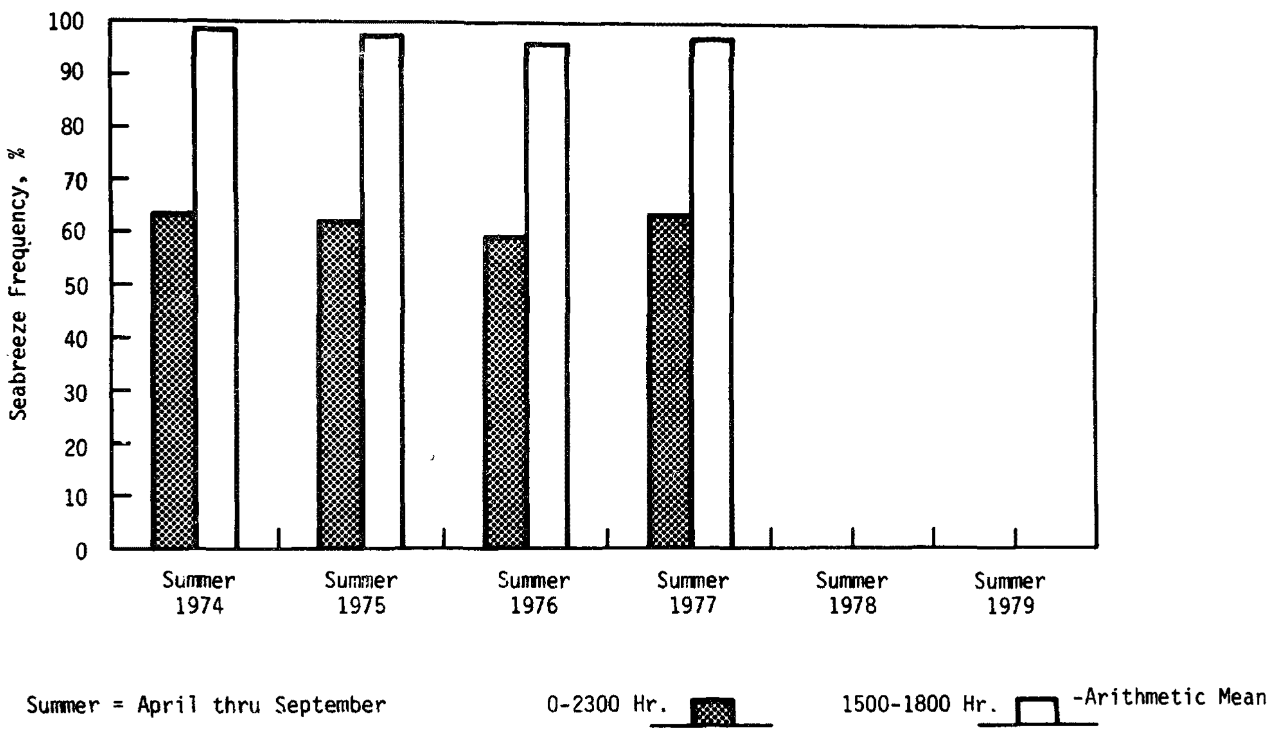


Figure 13. LACS trend data. Seabreeze frequency (interval comparison).

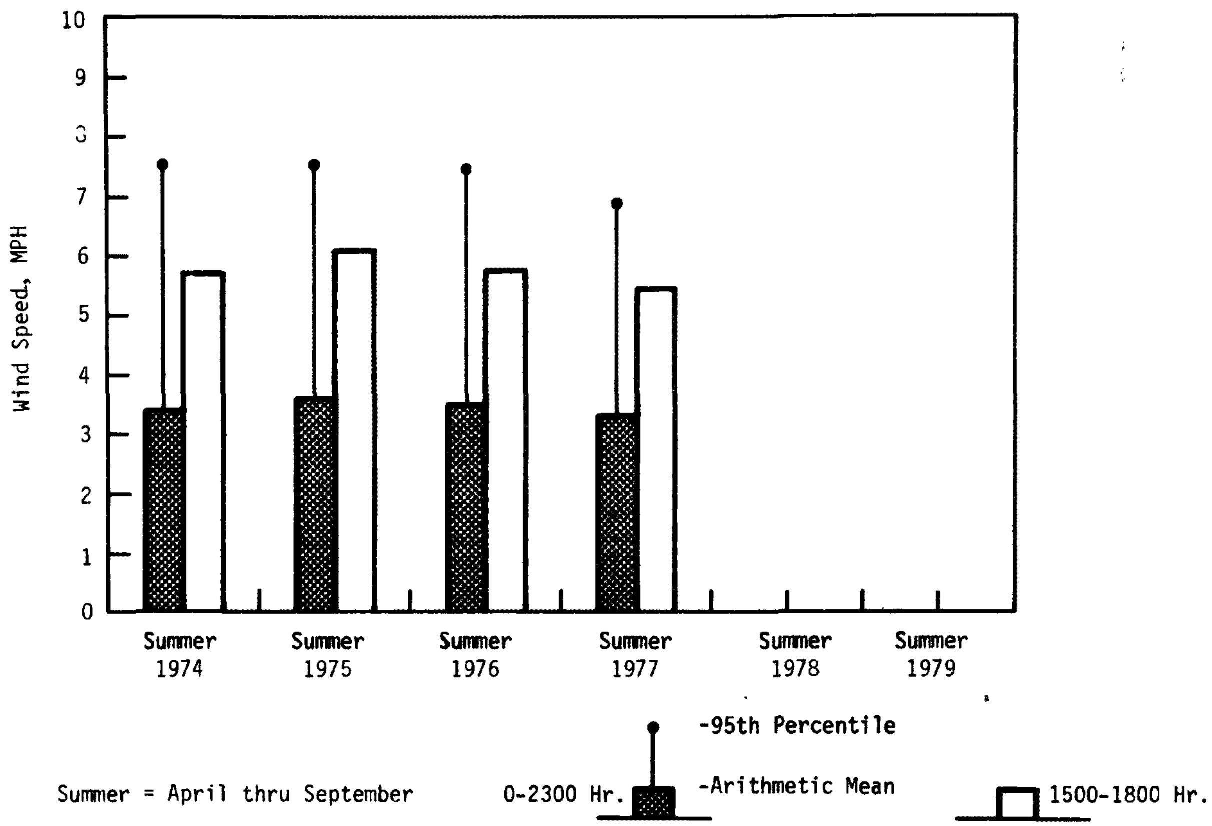


Figure 14. LACS trend data. Wind speed (interval comparison).

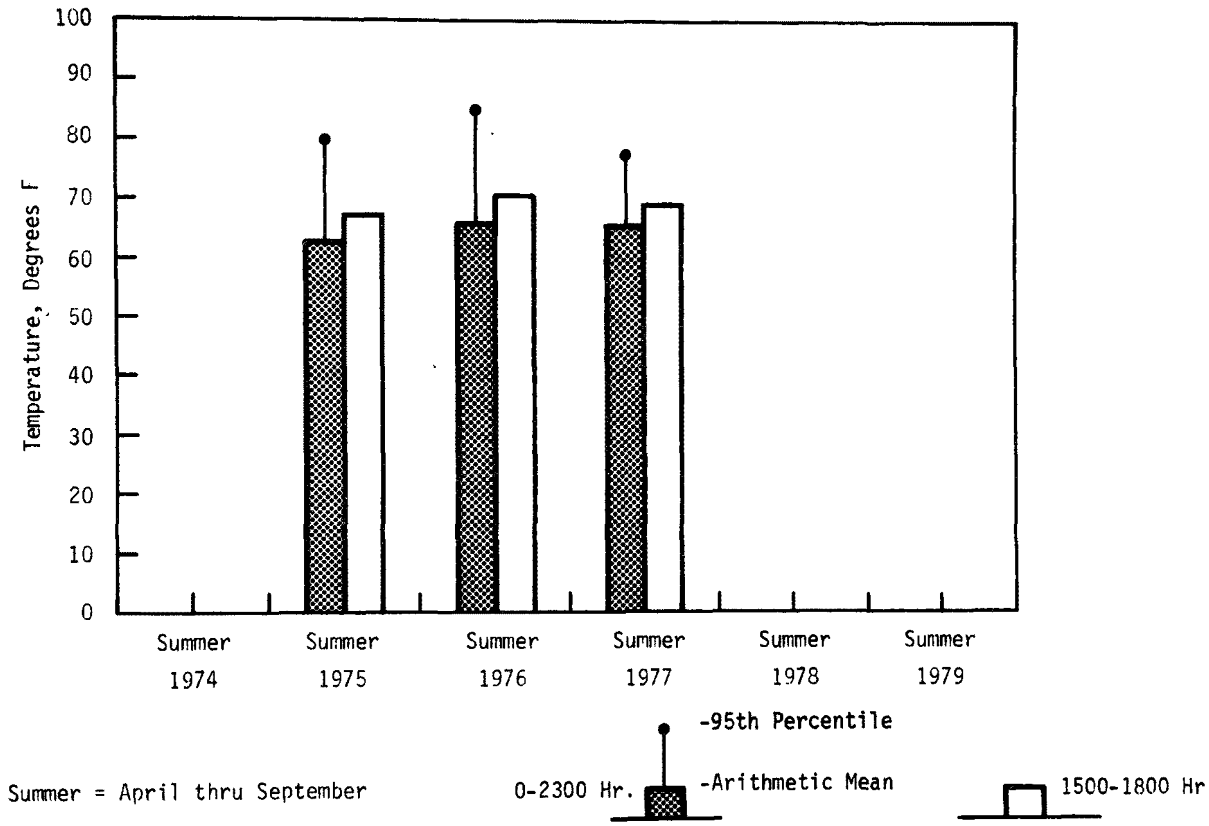


Figure 15. LACS trend data. Ambient temperature (interval comparison).

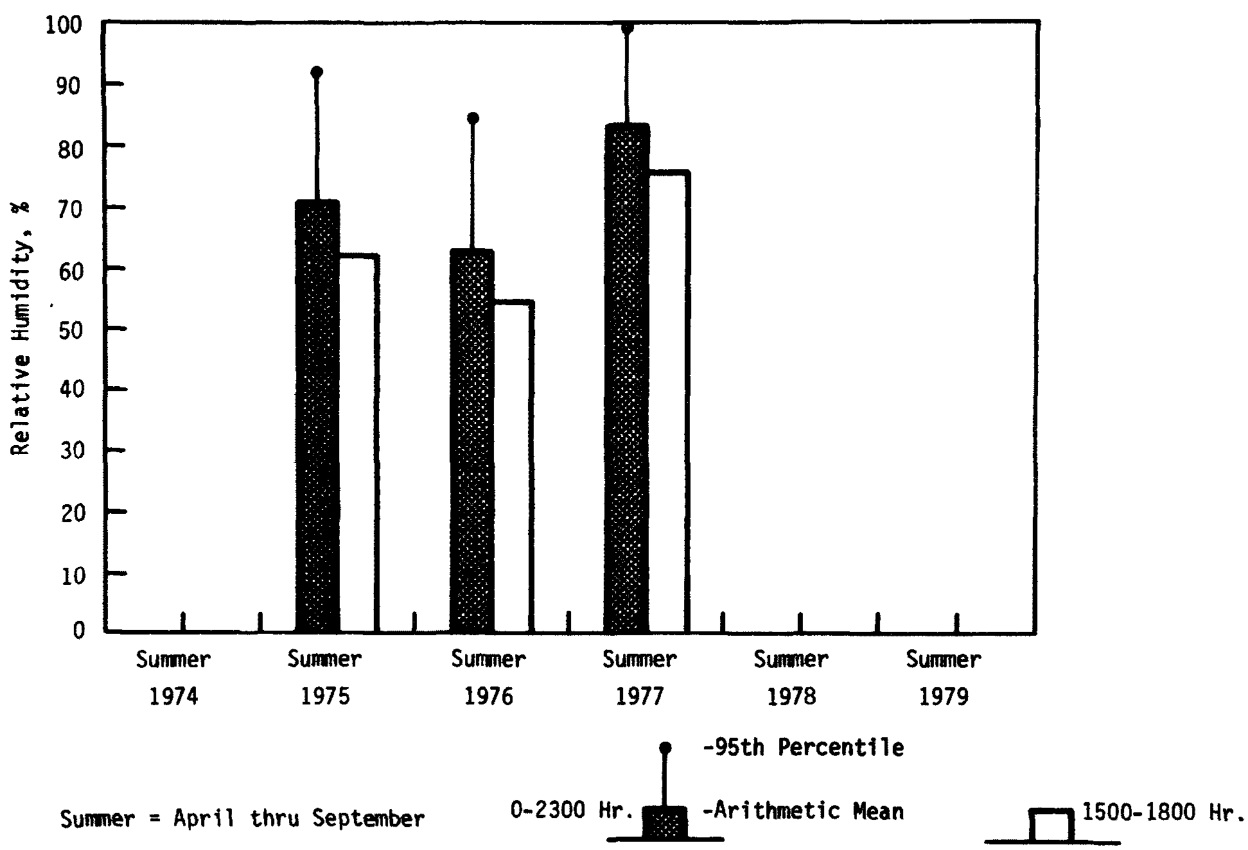


Figure 16. LACS trend data. Ambient relative humidity (interval comparison).

an overall "weekday" traffic pattern. Friday, Saturday and Sunday traffic patterns are treated individually.

Figures 17 and 18 depict the weekday diurnal traffic patterns for September through December 1976 and for the same period in 1977. Traffic volume follows a bimodal pattern reaching peaks at about 7 a.m. (morning rush period) and again at about 4 p.m. (afternoon rush period). The southbound lanes exhibit the larger peak during the morning rush period while northbound lanes exhibit the larger peak during the afternoon rush period. This observation is consistent with the fact that the LACS location is northwest of downtown Los Angeles and, thus, the weekday traffic burden shifts from southbound in the morning to northbound in the afternoon. Traffic speed averages about 55 mph but congestion causes it to dip somewhat during the morning and afternoon rush periods.

A comparison of Figure 17 with Figure 18 reveals that while southbound traffic was virtually unchanged from 1976 to 1977, the northbound patterns changed significantly in response to the opening of the fifth lane. Northbound traffic count increased approximately 10% with most of the increase taking place during the two rush periods. In addition, the minimum average hourly traffic speed (i.e., the afternoon rush hour speed) exhibited an increase from 18 mph in 1976 to 43 mph in 1977. Apparently traffic volume northbound on the freeway in the afternoon had been approaching capacity and the opening of the fifth lane has reduced congestion to a considerable extent enabling an increase in traffic volume and average speed.

Friday consistently carries the heaviest traffic volume of the week on the San Diego Freeway at the LACS. The diurnal traffic patterns for Friday in the fall of 1976 and 1977 are shown in Figures 19 and 20, respectively. The year-to-year changes are similar to those discussed for the weekday traffic patterns.

Figures 21 through 24 display the diurnal traffic patterns by year for Saturdays and Sundays. As expected, the patterns for weekend do not show the characteristic morning and afternoon rush period effects, average speed remains fairly constant throughout the course of the day and overall traffic volume is considerably less than that for weekdays. Except for an overall increase of about 5% in northbound traffic, there was little change between the two years in weekend traffic patterns.

In Figure 25, the percentage of vehicle miles driven by catalyst equipped cars in Los Angeles County is presented as a function of time. The curve was generated by Rockwell Air Monitoring Center from county sales registration data adjusted to reflect actual vehicle miles driven as a function of model year. This curve indicates that catalyst equipped vehicles accounted for approximately 43% of vehicle miles traveled as of December 1977.

To illustrate the impact of changing traffic conditions upon pollutant concentrations, it is useful to return to the example of carbon monoxide. In Figure 26, the cross-freeway difference (C-A) in CO concentration is plotted to contrast the difference in the diurnal pattern between weekdays (Monday through Friday) and weekends (Saturday and Sunday). The impact of

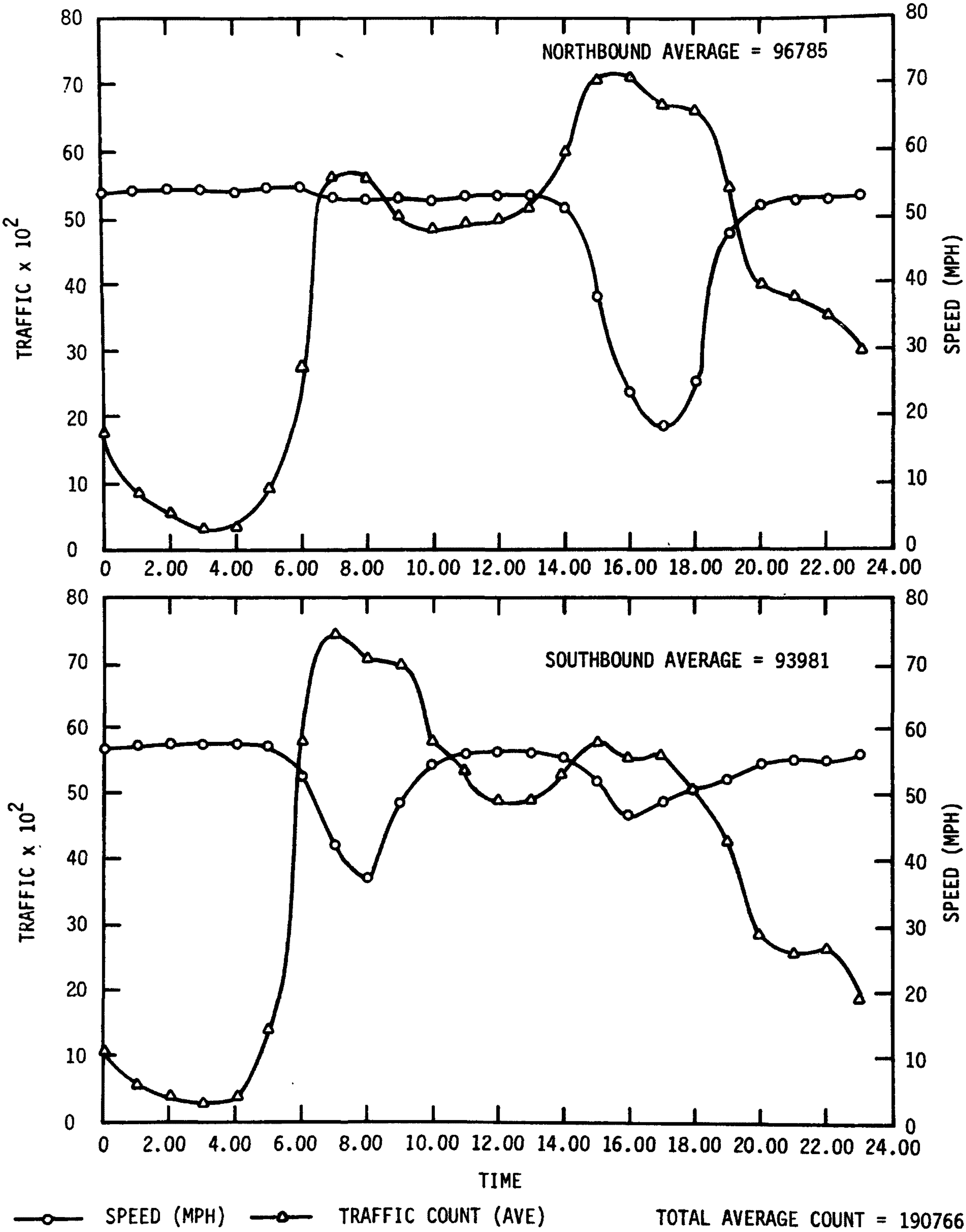


Figure 17. LACS traffic data. 1976 Weekday composite. Monday- Thursday (42 days).

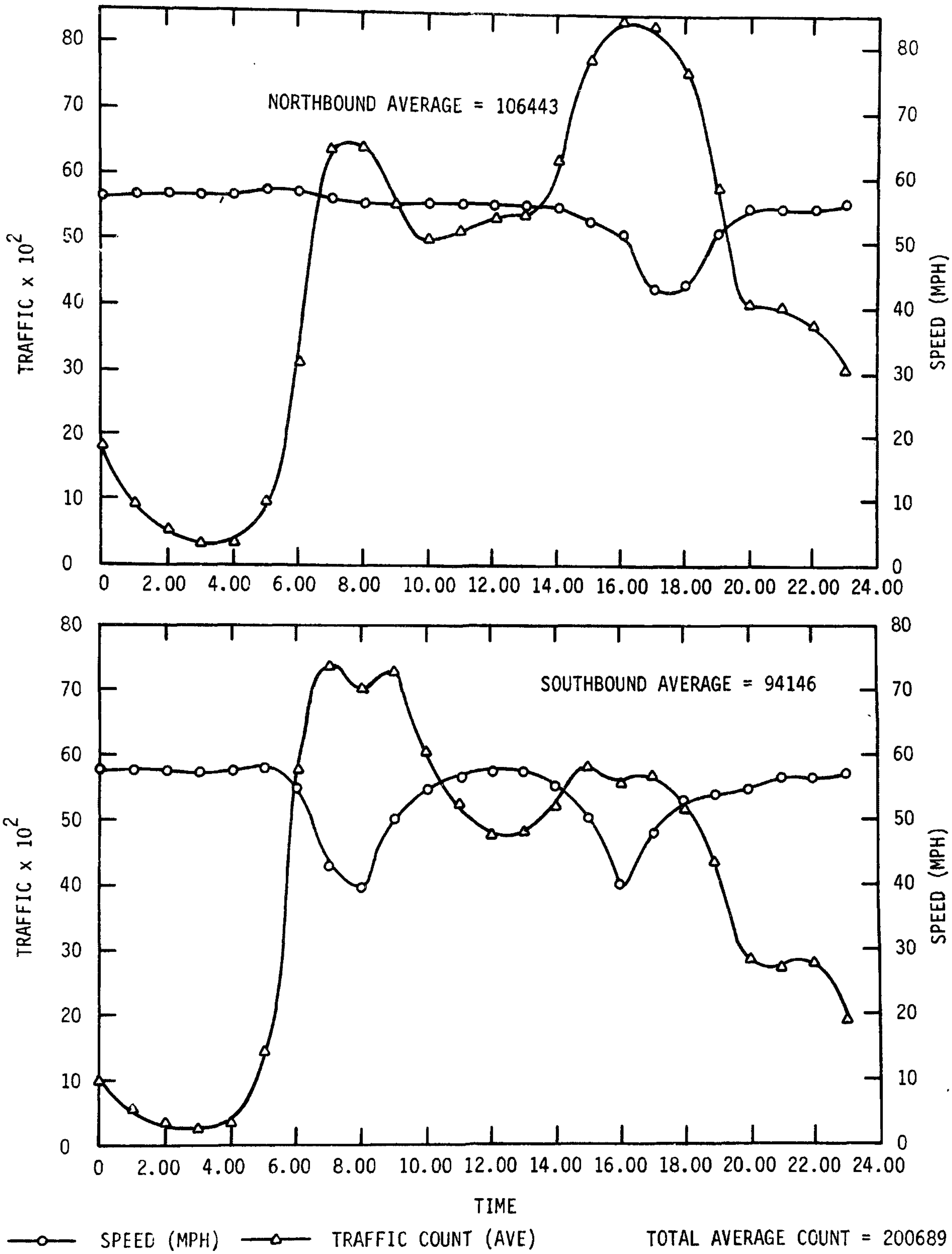


Figure 18. LACS traffic data. 1977 Weekday composite. Monday- Thursday (29 days).

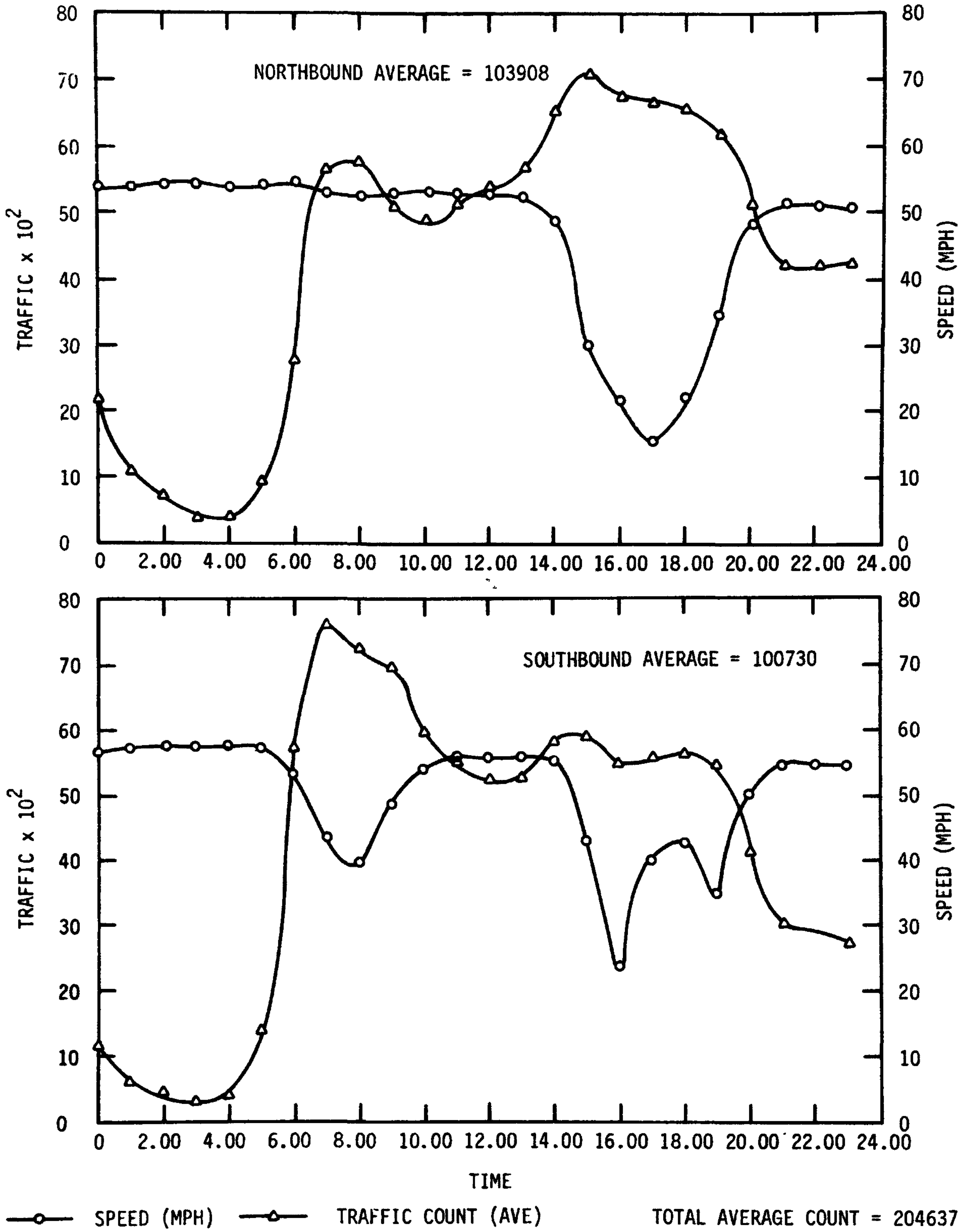


Figure 19. LACS traffic data. 1976 Friday composite (9 days).

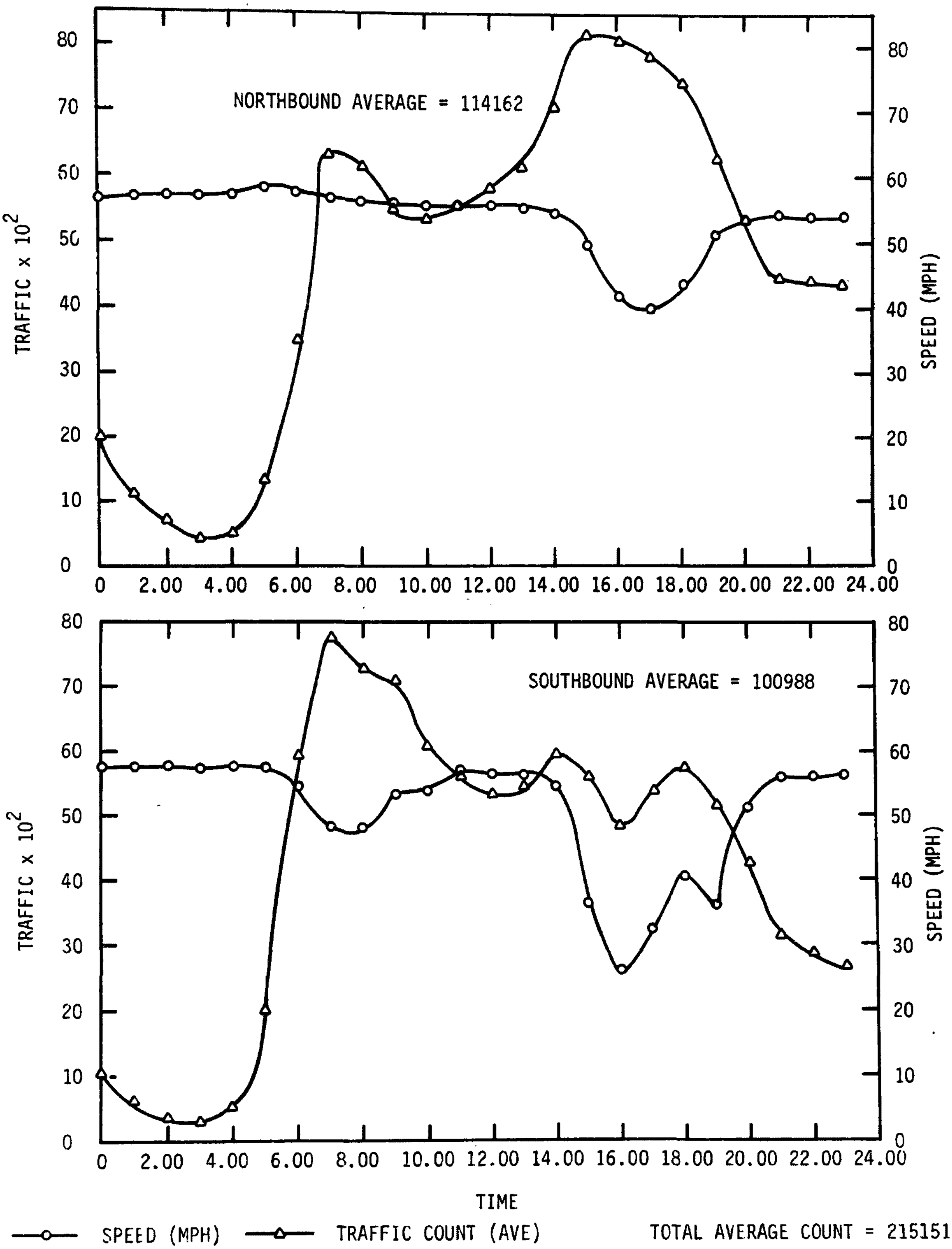


Figure 20. LACS traffic data. 1977 Friday composite (9 days).

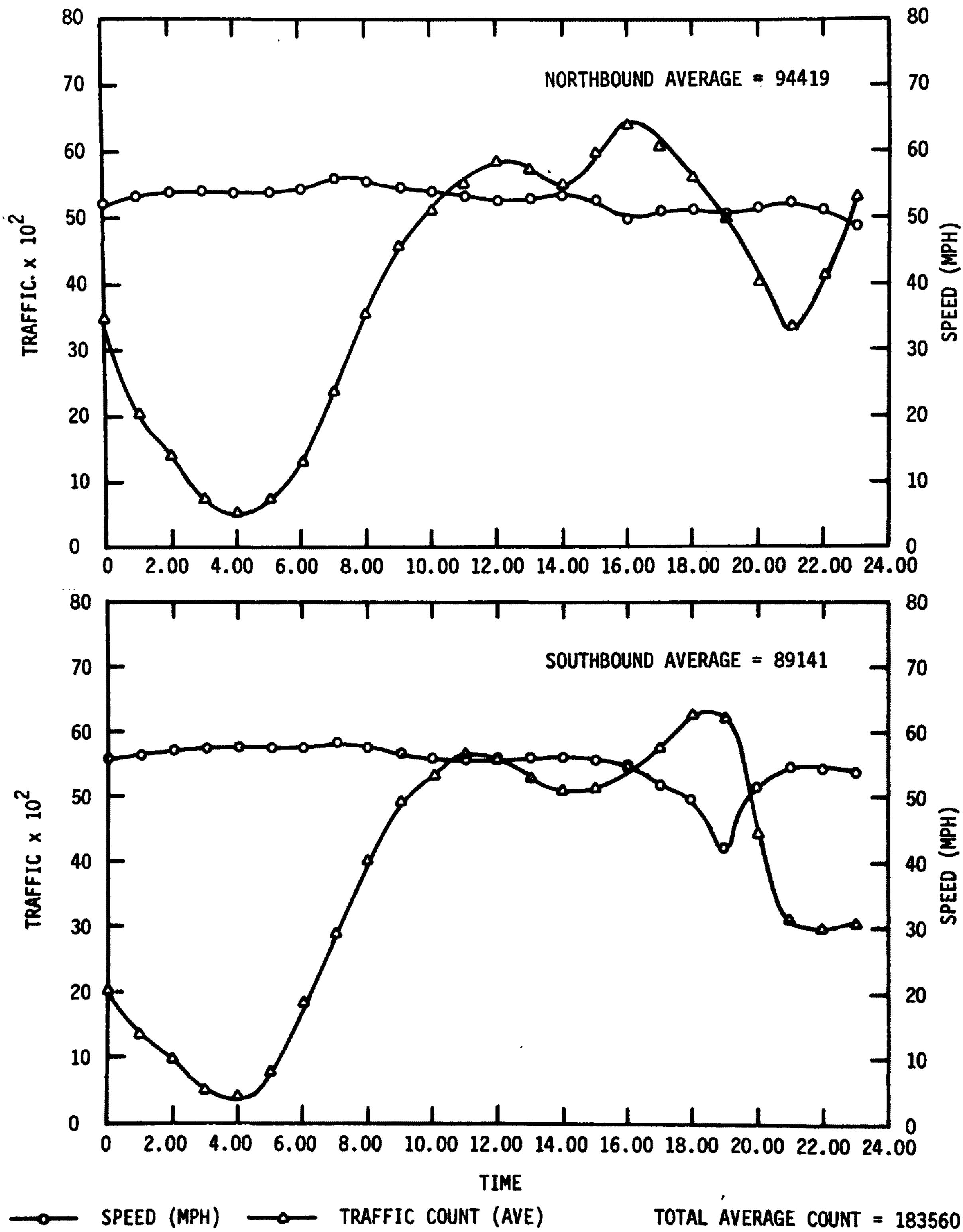


Figure 21. LACS traffic data. 1976 Saturday composite (10 days).

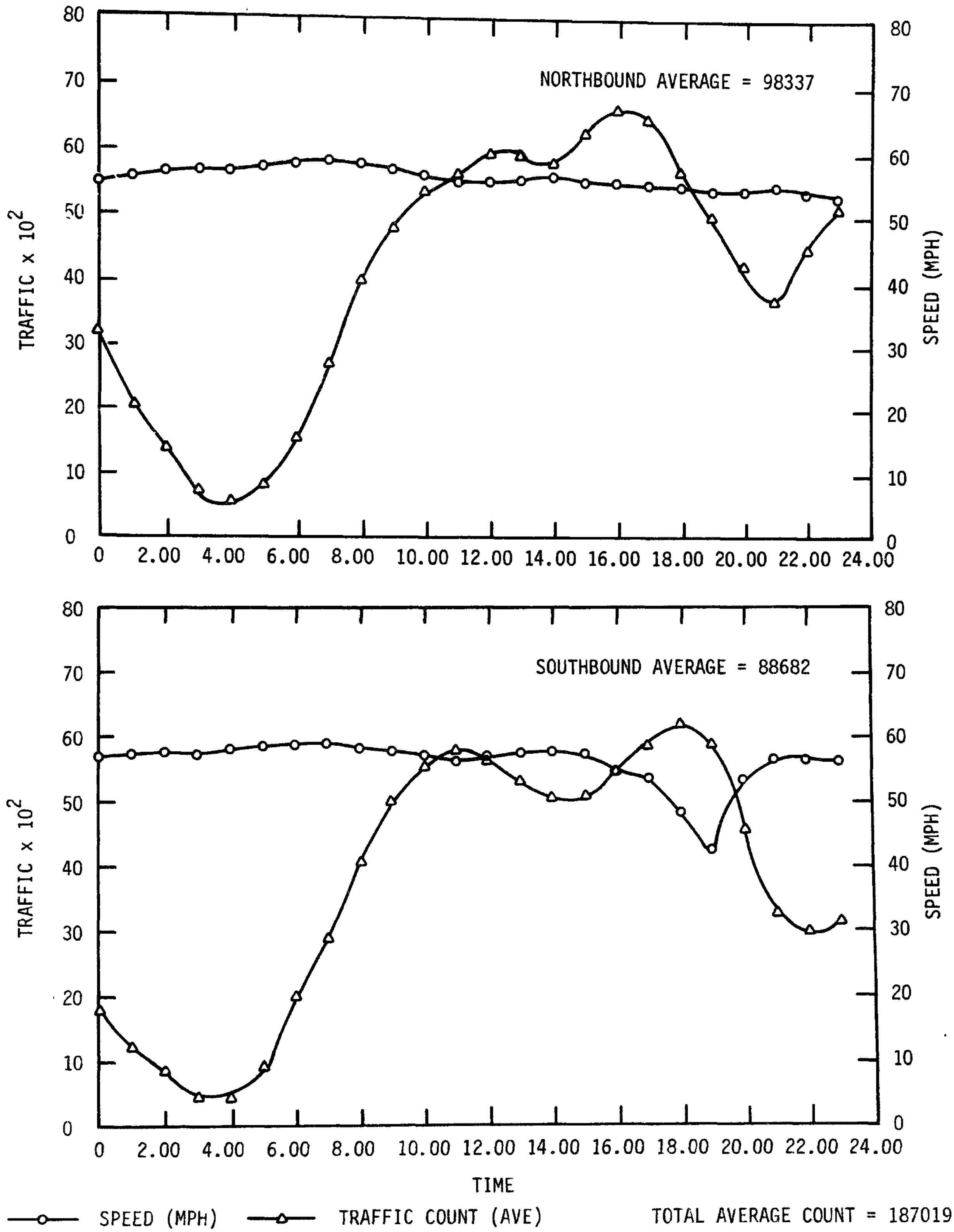


Figure 22. LACS traffic data. 1977 Saturday composite (11 days).

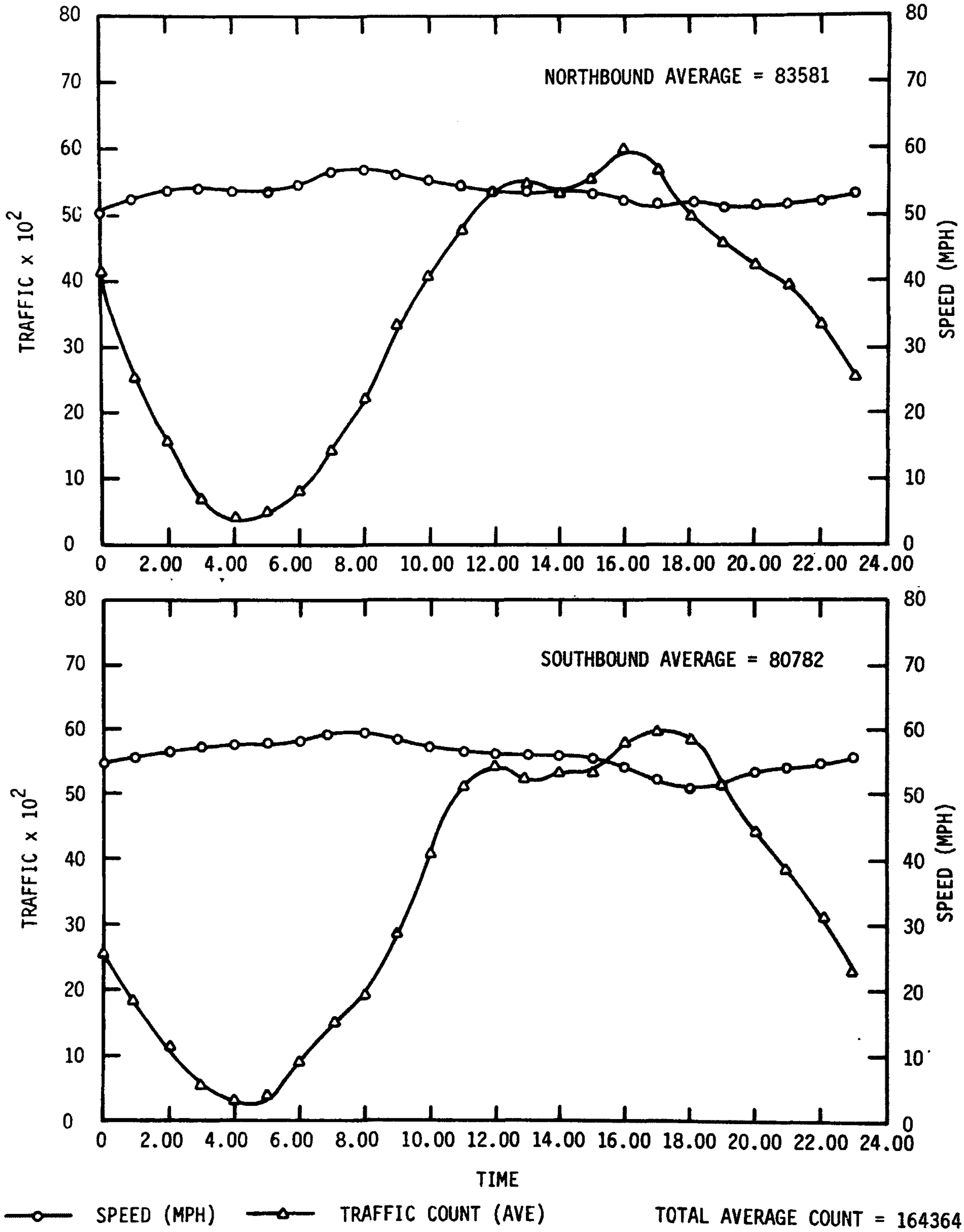


Figure 23. LACS traffic data. 1976 Sunday composite (11 days).

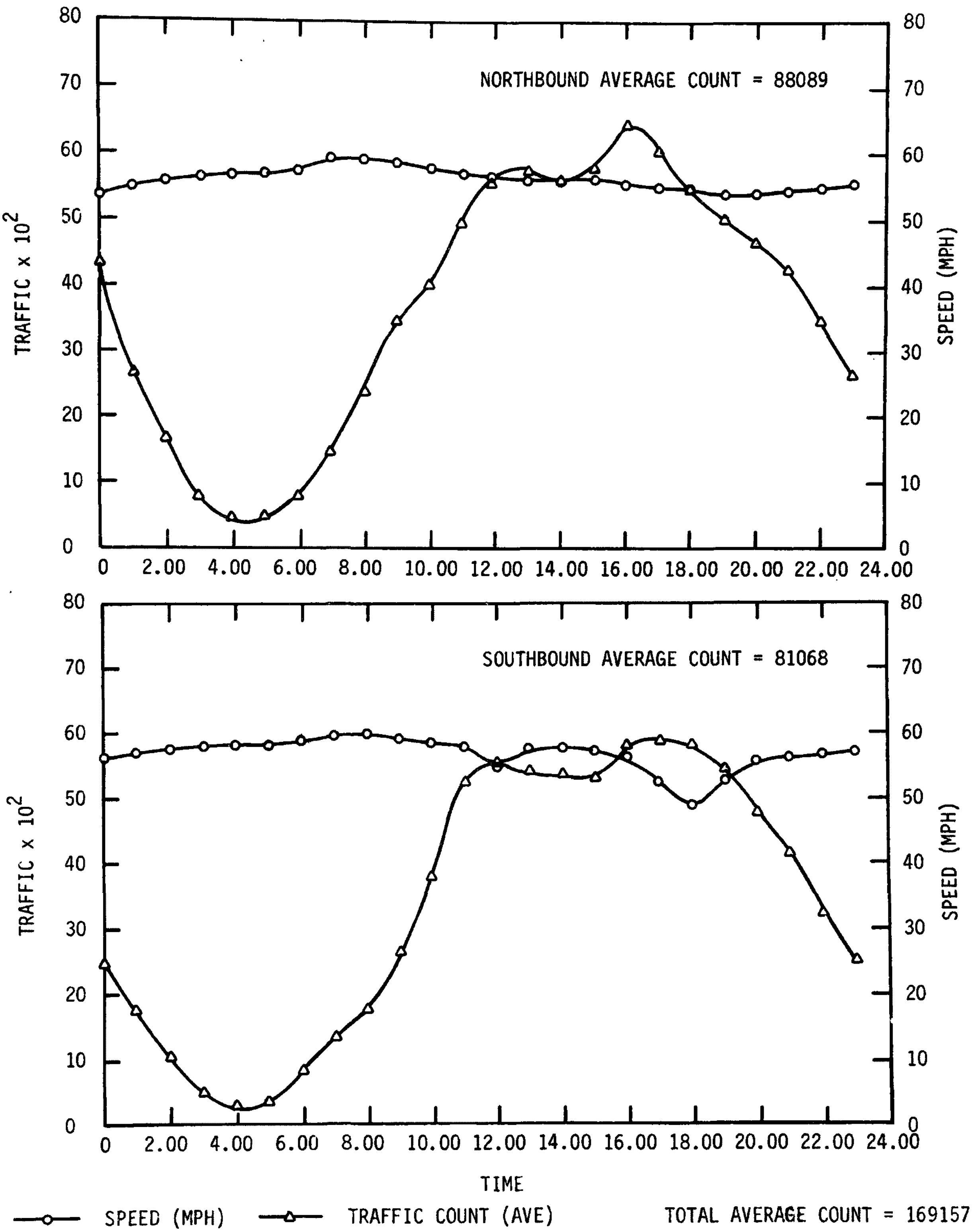


Figure 24. LACS traffic data. 1977 Sunday composite (10 days).

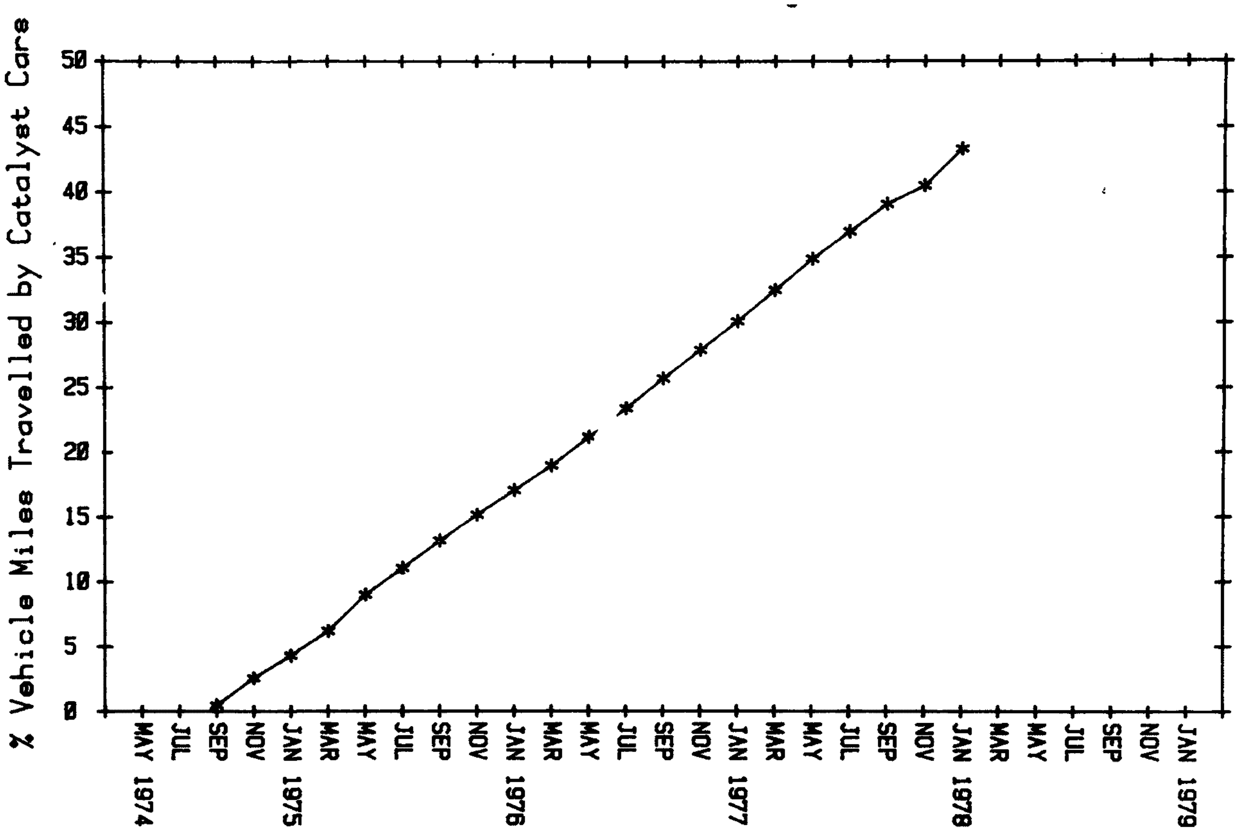


Figure 25. LACS data. Catalyst miles travelled on San Diego Freeway based on Los Angeles County registration data.

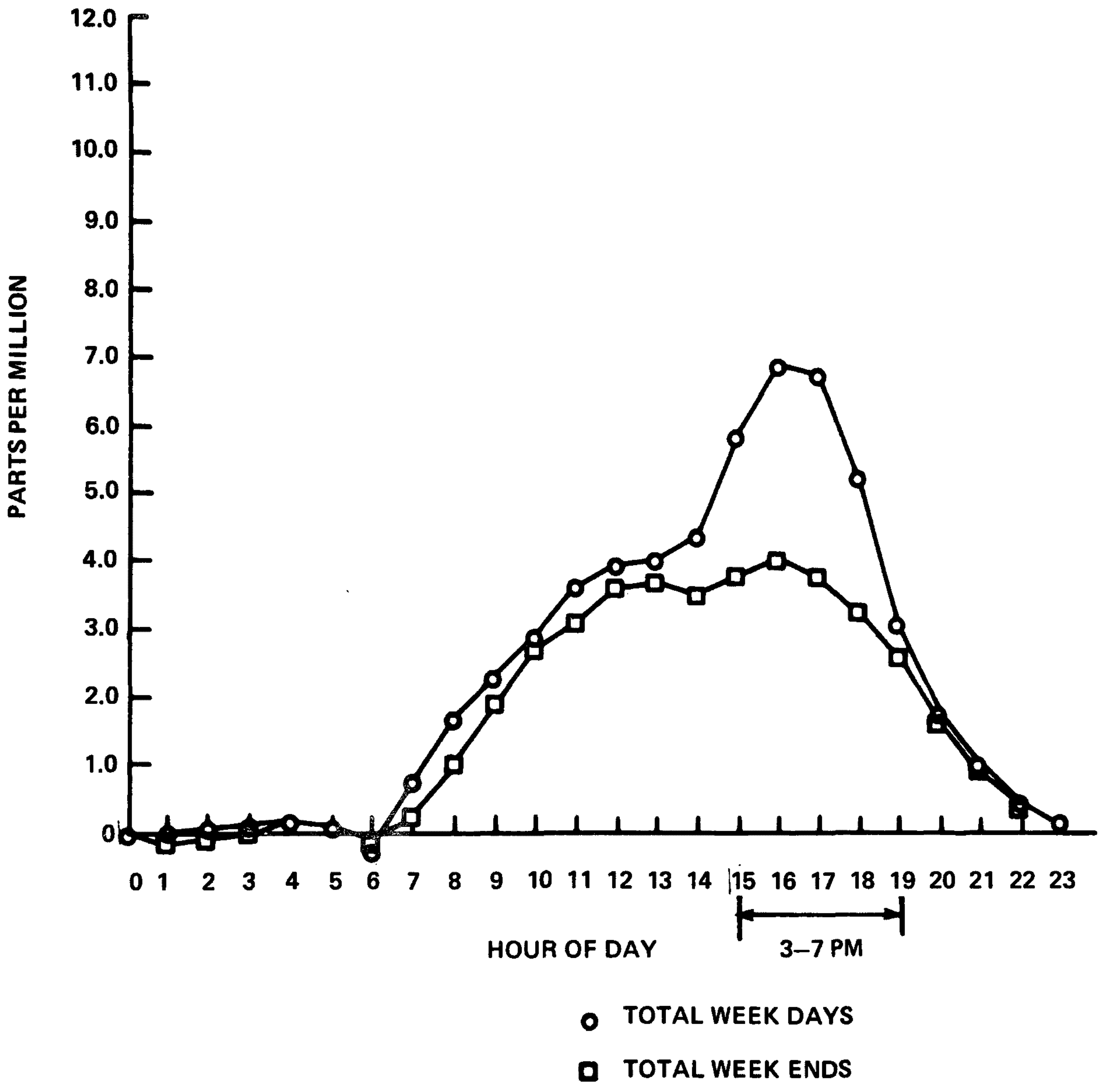


Figure 26. CO difference (C-A) weekdays vs. weekends.

the afternoon rush period is obvious in the plot comparison.

In February 1977, a probe was placed in the freeway median for the purpose of obtaining on-freeway measurements of CO concentrations. The diurnal pattern in CO concentrations in the freeway median is shown in Figure 27 for the summer of 1977. Unlike the patterns observed at Sites A and C, CO concentrations in the freeway median follow the traffic pattern quite closely and do not appear to be substantially affected by changes in wind direction and speed. In addition, the median concentrations significantly exceed the corresponding concentrations observed at the off-freeway locations (Sites A and C).

Afternoon (1500-1800 hours) traffic and pollutant data for September 1976 were examined in some detail in an effort to determine the impact of the change in traffic volume and speed that occurred with the opening of the fifth northbound lane in February 1977. The data used in this analysis appear in Table A-1 of the appendix. The data were initially screened to insure homogeneous meteorological conditions. A matrix of cross-correlation coefficients of the variables involved appears in Table A-2. The strongest correlation in evidence is between average traffic speed and Δ(C-A) Pb concentrations ($r=0.98$).

Several literature articles have discussed the relationship between average vehicle speed and the Pb emission rate.[4,5,6] Essentially, the rate of Pb emission has been shown to be a linear function of the average vehicular speed. A plot of this relationship for the LACS data is shown in Figure 28. This relationship, coupled with the increase in average weekday afternoon traffic speed noted in 1977, accounts for the rather dramatic increase exhibited by the 4-hour (1500-1800 hours) cross-freeway difference (C-A) in Pb concentrations for 1977 (see next section).

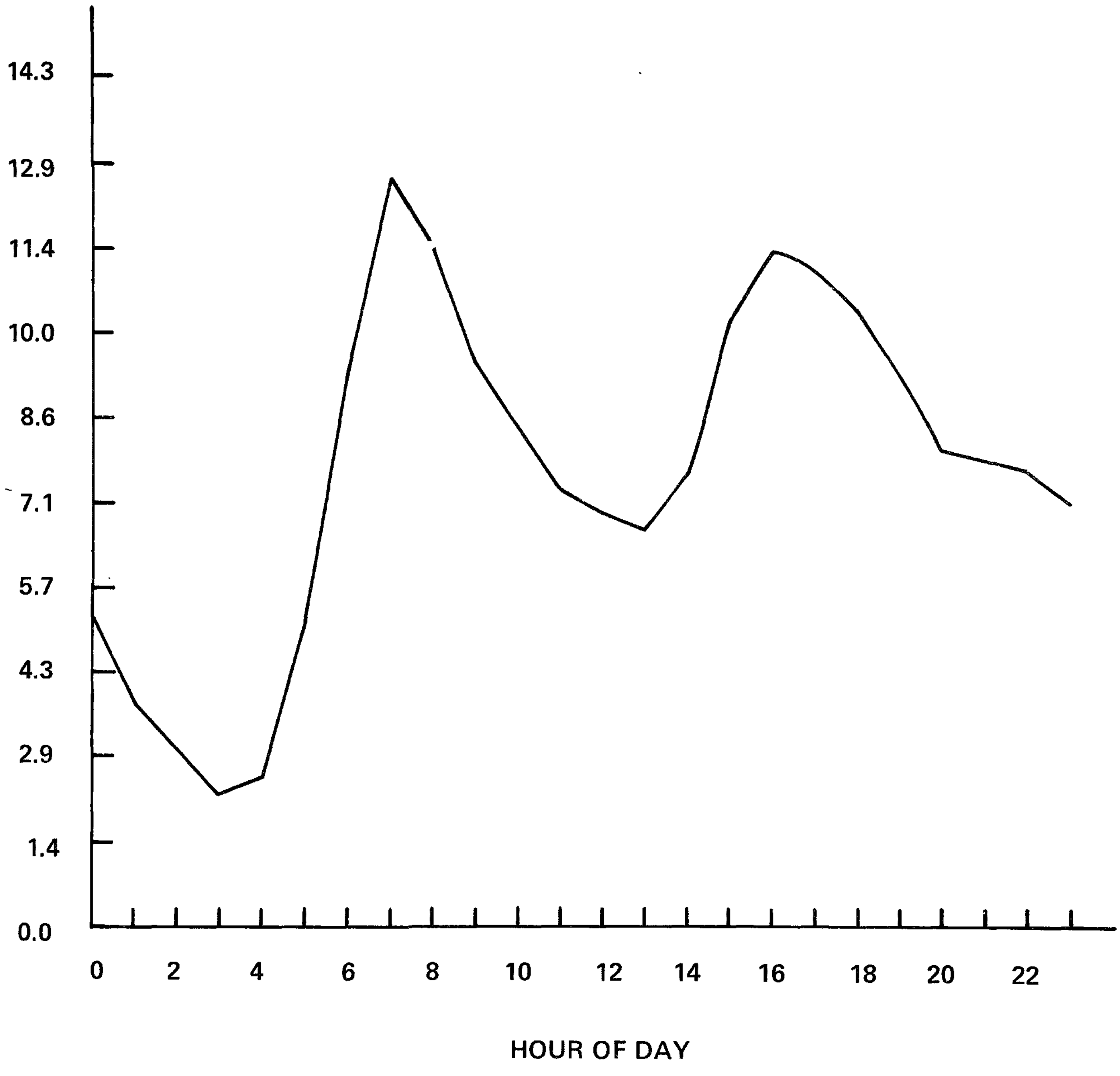


Figure 27. Carbon monoxide by hour (freeway median).

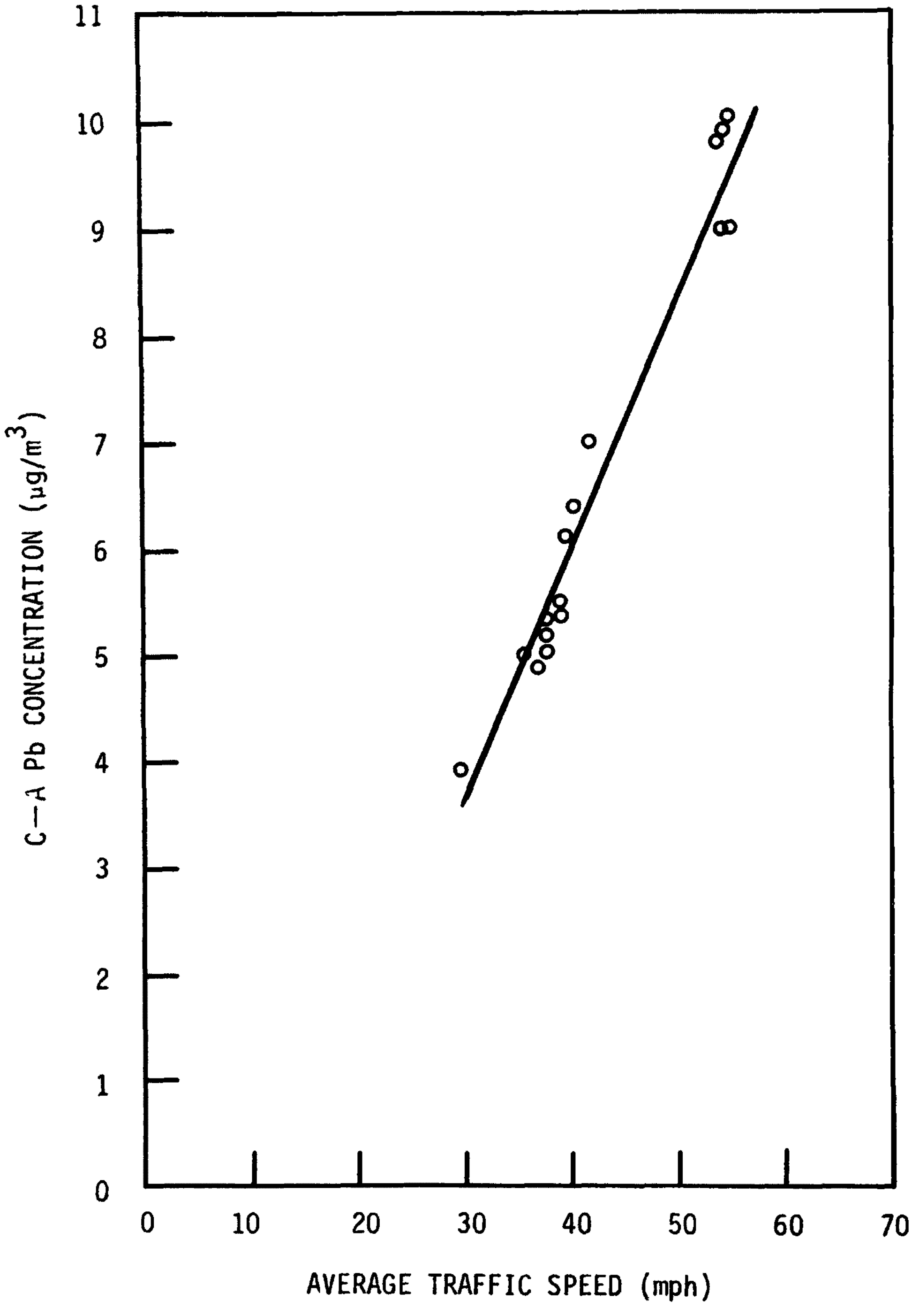


Figure 28. Δ(C-A) Pb concentrations vs. average traffic speed. 1500-1800 hours, September 1976.

POLLUTANT TRENDS (BACKGROUND AND FREEWAY CONTRIBUTIONS)

The primary objective of the LACS is to observe the long term trends in ambient air pollutant concentrations attributable to automobiles in order to determine the impact of the catalytic converter. As was discussed earlier, estimations of trends are more accurate when meteorology can be eliminated as a variable. This is possible during the summer 1500-1800 hour intervals because of the near perpendicular winds that exist almost 100% of the time. Examination of summer 24-hour averages and data collected during the winter are much less meaningful because of the substantial increase in frequency of non-perpendicular winds. The trend data in this section are presented in a bar-graph format with a dotted trend line to visually compare years. Because there is often great variability from month-to-month, however, a paired t-test based on monthly means was utilized to determine whether each year-to-year change was statistically significant. The changes that are significant at the 95% confidence level are designated with an "S" adjacent to the appropriate dotted line segment. Those not marked are differences which may have been due to chance. It should be noted that this t-test considers only the six summer season monthly average data pairs, and hence is a very conservative test.

The primary pollutant emission levels designed to be reduced by the catalyst are those of carbon monoxide (CO) and total hydrocarbons. Because of the simplicity of monitoring CO in the field as compared to hydrocarbons, only CO is monitored as a direct measure of catalyst performance.

Figures 29 and 30 show the CO background and freeway contribution (Site C-Site A) on both 24-hour and 4-hour average bases. Both graphs show little change in the background CO concentration, although because of its consistency during the 1500-1800 hour interval the slight increase from 1974 to 1975 was significant. In the previous LACS summary report describing the trends through 1976, the decrease in CO contribution in both the 24 and 4-hour averages was attributed to substantial increased usage of catalyst vehicles. The apparent increase in the 1977 summer season CO contribution does not test as statistically significant. This perturbation could be a result of the 10% increase in northbound traffic volume from 1976 to 1977. The increase in CO contribution was also noted by Ledolter, et al,[7] (University of Wisconsin) in applying predictive models to the LACS data. Current efforts examining the extended performance of the catalyst[8] are indicating a rapid decrease in catalyst efficiency in the first 20,000 miles. This coupled with reports of increased improper usage of leaded gasoline in catalyst automobiles suggest that the CO ambient levels will probably not decrease as rapidly as would be expected from the increased use of the catalyst.

The oxidation catalyst (the type installed since 1974) was not designed to control the oxides of nitrogen, although the newer 3-way catalysts being added to the 1979 and later model year vehicles should reduce NO_x emissions. The freeway contribution trends in NO levels as shown in Figures 31 and 32 have shown apparent dramatic increases since NO monitoring began in 1975. These increases are much greater than the increases noted in traffic volume and except for the 1500-1800 hour 1976 to 1977 period do not test as

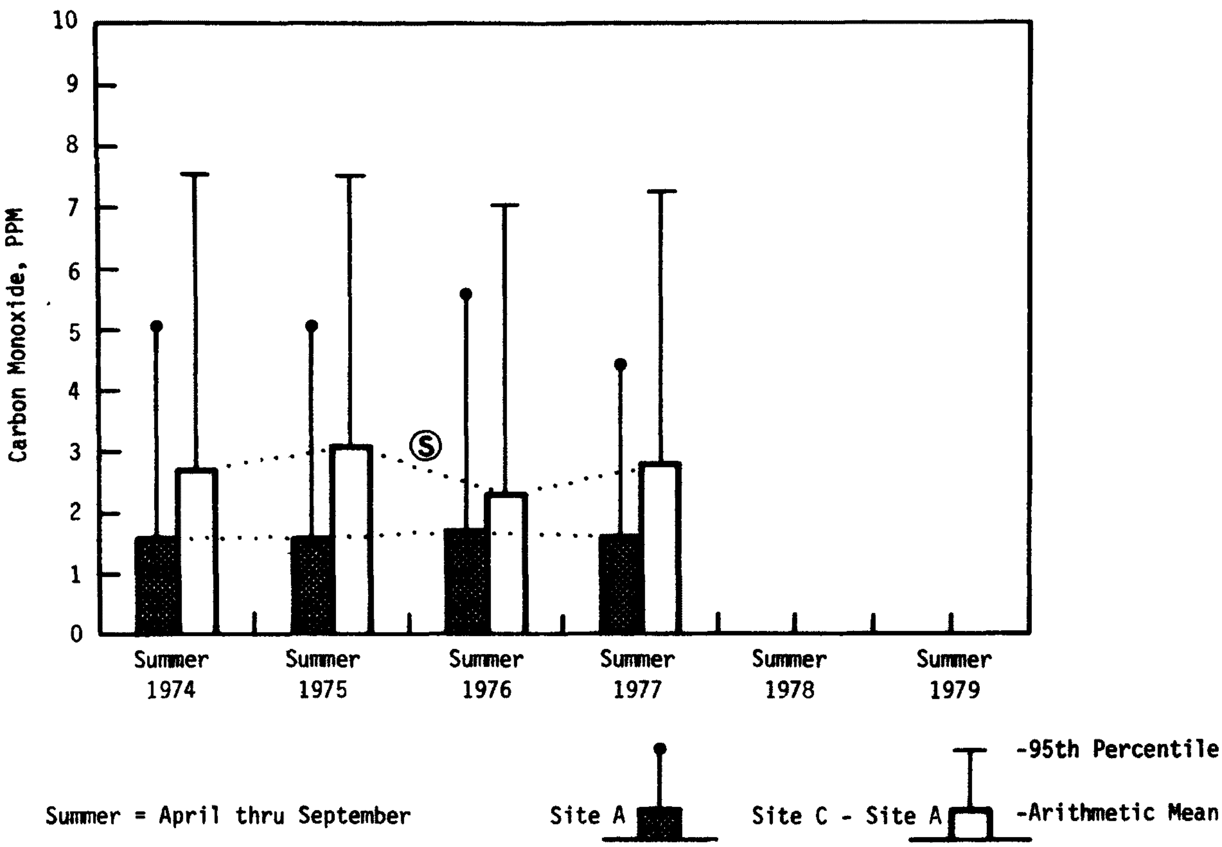


Figure 29. LACS trend data. Carbon monoxide (CO) - all hours.

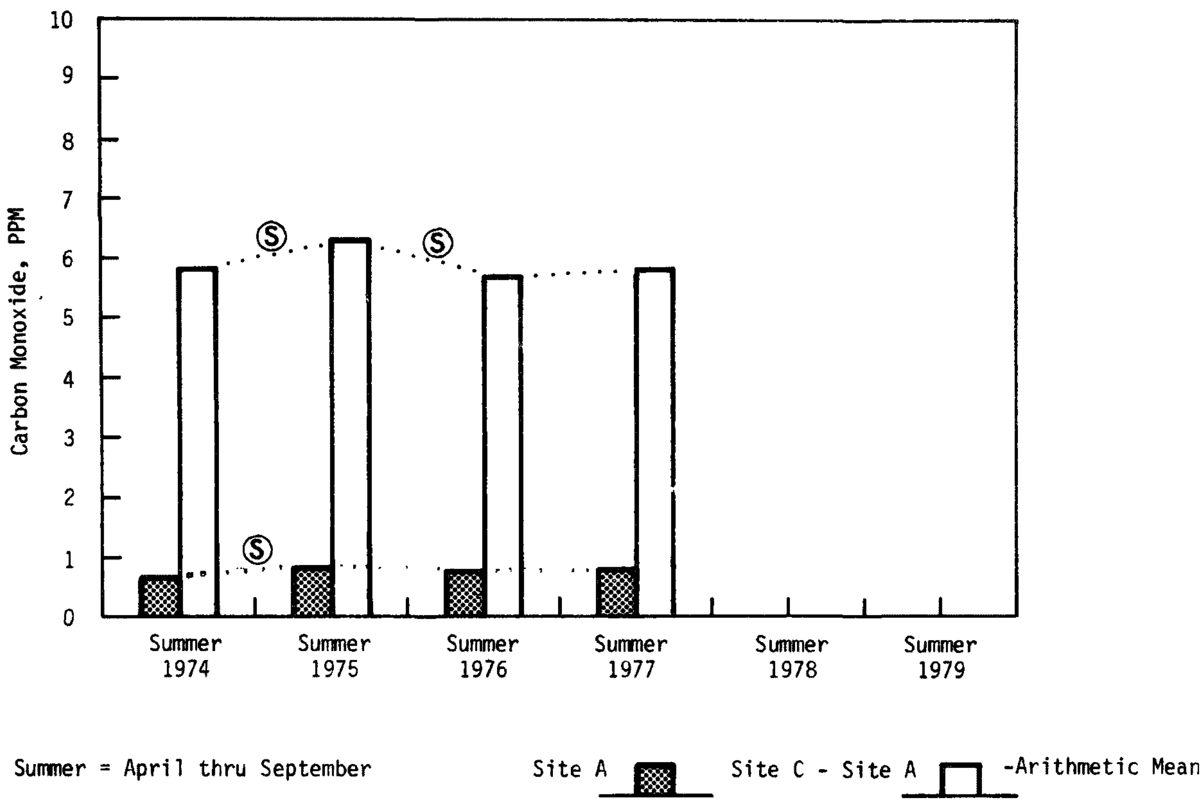


Figure 30. LACS trend data. Carbon monoxide (CO) 1500-1800 hours.

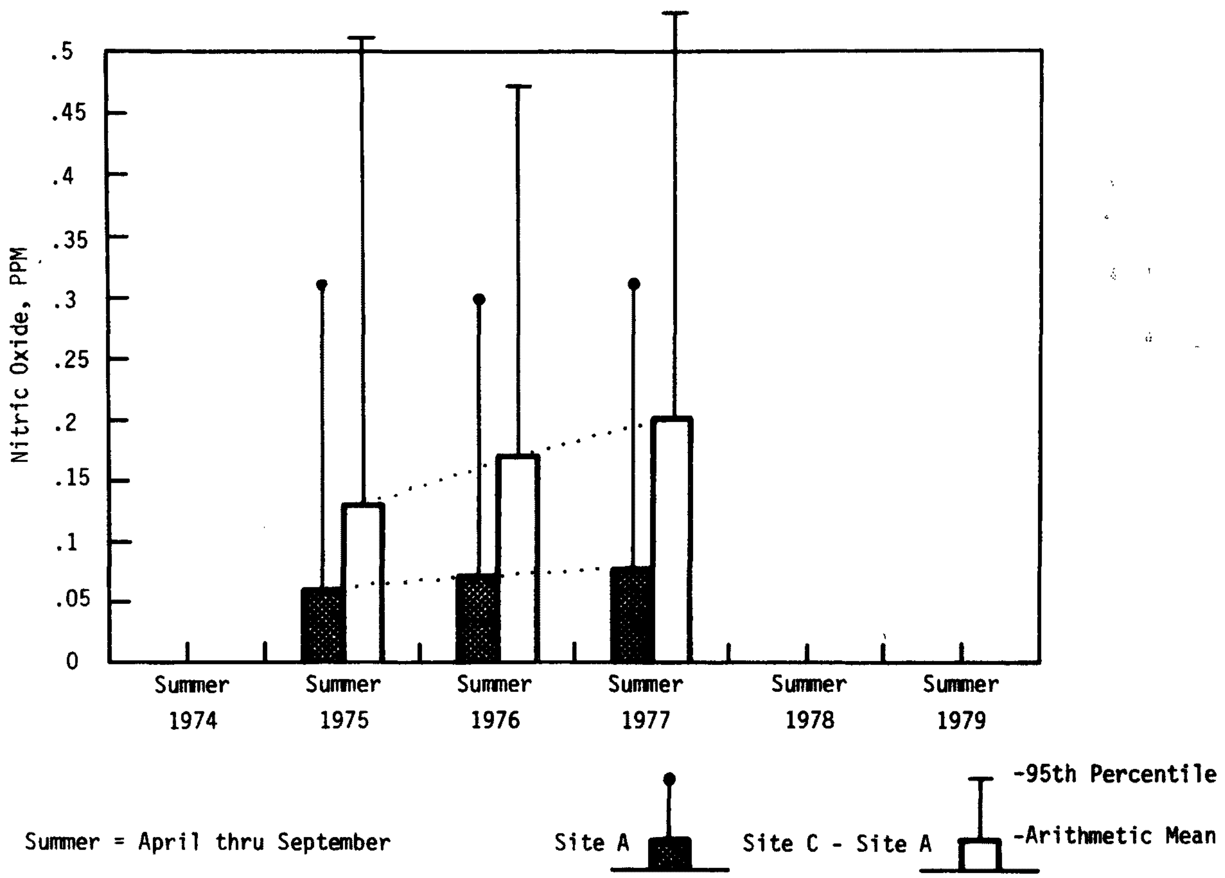


Figure 31. LACS trend data. Nitric oxide (NO) - all hours.

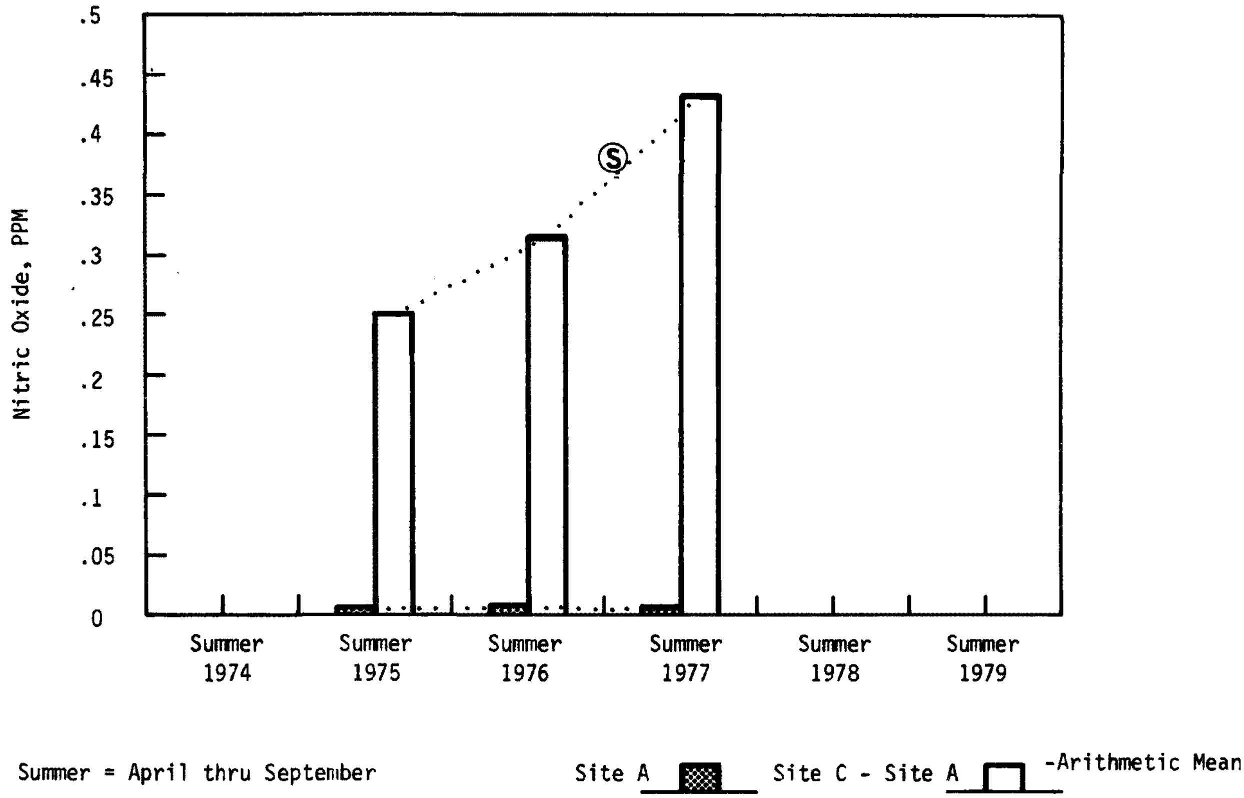


Figure 32. LACS trend data. Nitric oxide (NO) - 1500-1800 hours.

statistically significant. These trends are probably real but, because of the variability in the NO data (note the 95th percentile bars), are not noted as such by the conservative t-test. The background levels of NO appear to show a slight increase on a 24-hour basis but none of the interval changes are statistically significant.

The nitrogen dioxide (NO_2) background trends in Figures 33 and 34 show no significant changes from 1974 through 1977. The freeway contribution, however, indicates the same increase pattern as NO and shows statistical significance in 3 of the 4 yearly intervals. Since the background ozone levels (Figures 35 and 36) have remained relatively constant, the rate of conversion of NO to NO_2 should show corresponding increases.

Catalyst equipped vehicles have lower emission rates of aerosols than those without catalysts because of particle decomposition at the elevated temperatures and because of the exclusion of Pb from the fuel. Therefore the total suspended particulate (TSP) trend levels should also be indicative of catalyst performance. The background levels of TSP in Figures 37 and 38 show no significant changes. The freeway contributions, however, showed significant decreases from 1975 to 1976 (probably due to the catalyst), but from 1500-1800 hours showed a significant increase from 1976 to 1977. The 4-hour membrane data (Figure 39) show the same trend. This increase is partially due to the increased traffic speed resulting in a larger portion of resuspended particles. The decline of the 24-hour trend for the same period did not test as significant because of a high degree of month-to-month variability during the summer of 1977.

The rise in usage of unleaded fuel in catalyst vehicles was expected to result in lower ambient Pb as catalyst usage increased. As was pointed out earlier, however, contrary to CO, Pb emissions apparently increase rapidly with increased average speed. Adding the 5th lane northbound to the freeway changed the driving patterns substantially, resulting in the increases noted in Figures 40, 41, and 42. It is reasonable to conclude that the decrease from 1975 to 1976 is a direct result of unleaded fuel usage, since traffic and meteorological parameters were not significantly different during those years. The increase in average speed from 1976 to 1977 resulted in trend levels that must be corrected for traffic flow effects before comparison. As was indicated in Figure 28, Pb contribution from the freeway is strongly speed dependent. The average weekday speed northbound in the 1500-1800 hour period increased from 25 to 45 mph. This would result in an increase of freeway Pb contribution of 4 $\mu g/m^3$. In addition, the increased speed probably causes a significant increase in turbulence intensity, resulting in a larger concentration of reintrained large particle Pb. The contribution of these larger particles, however, is nearly impossible to quantify. A more definitive procedure for normalizing freeway contributions with both meteorology and traffic flow is currently being studied.

The pollutant of primary interest early in the study was sulfuric acid aerosol emitted from catalysts as a result of sulfur oxidation. This aerosol, it has been determined,[10] is quickly neutralized by ambient ammonia (NH_3) to form ammonium sulfate. Monitoring of the total sulfate ($SO_4^=$) freeway contribution has shown only small freeway contributions as shown in Figures 43, 44,

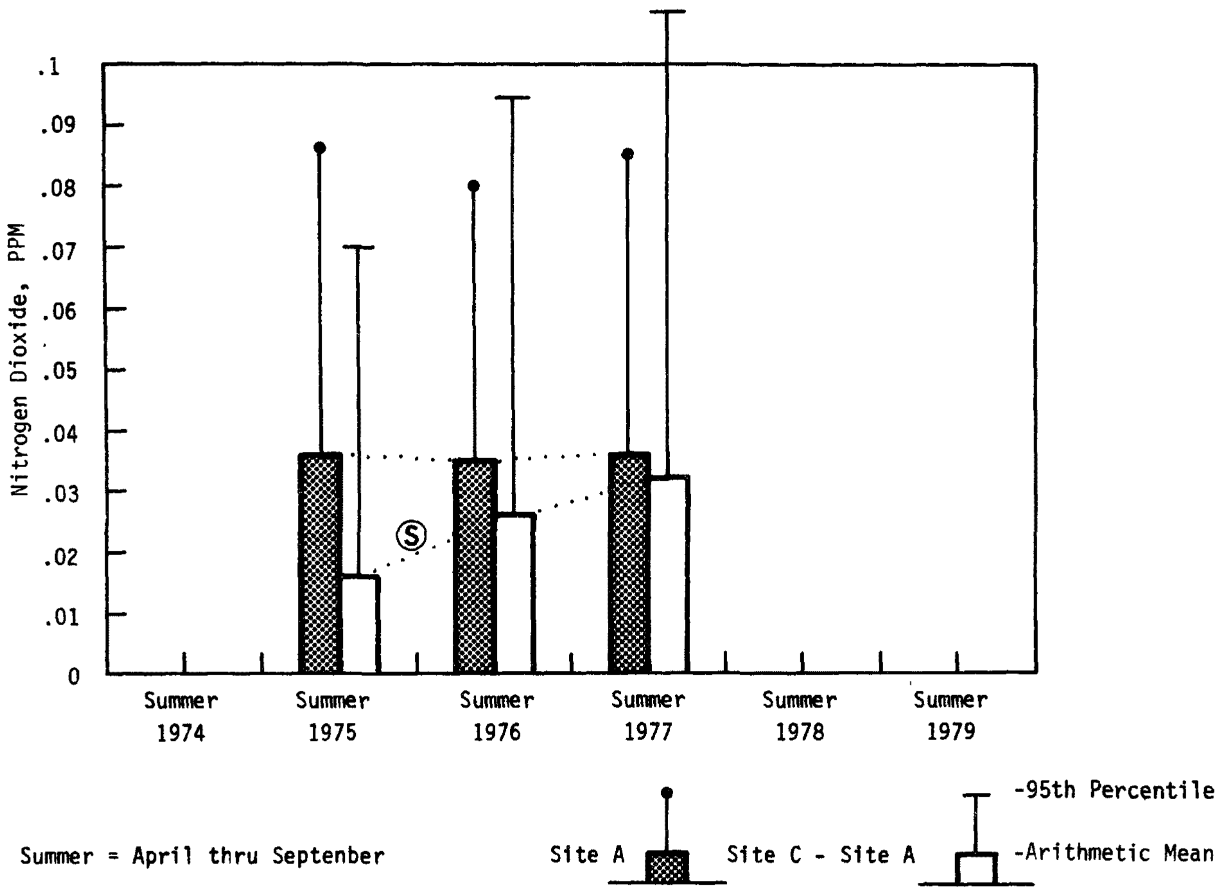


Figure 33. LACS trend data. Nitrogen dioxide (NO_2) all hours.

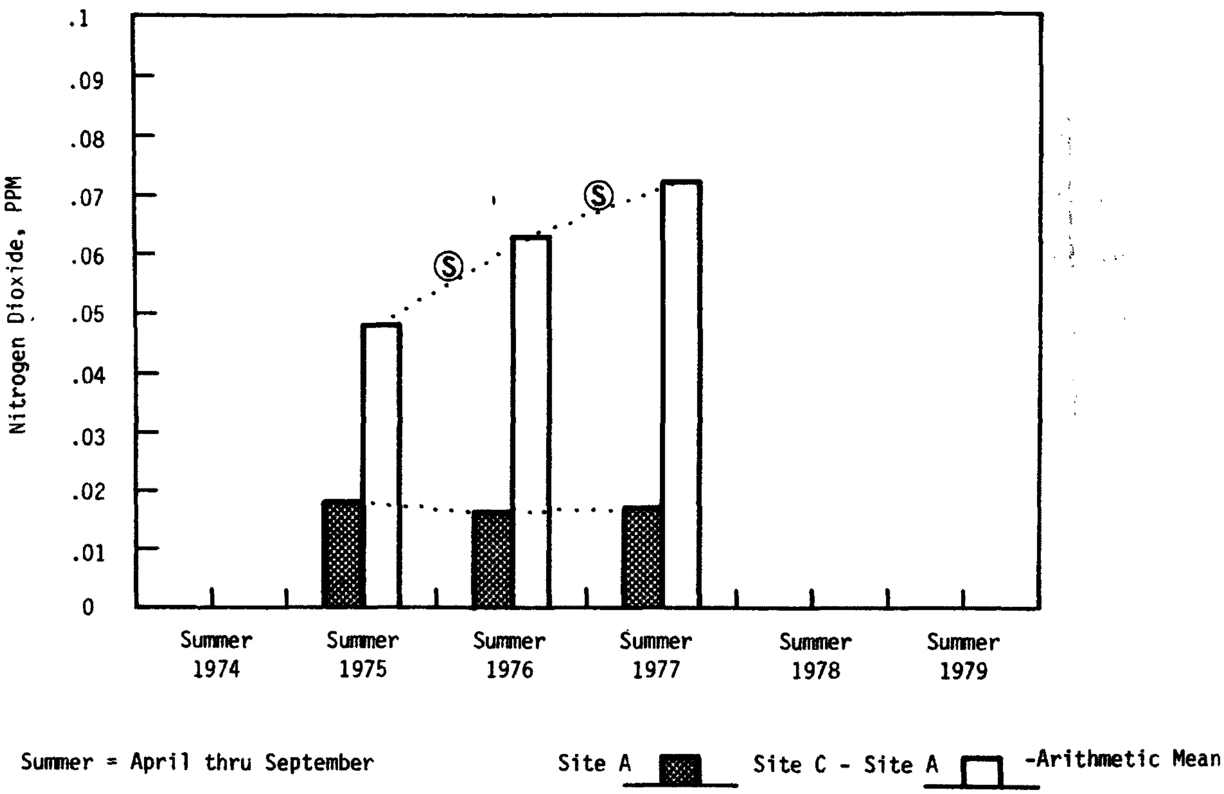


Figure 34. LACS trend data. Nitrogen dioxide (NO_2) - 1500-1800 hours.

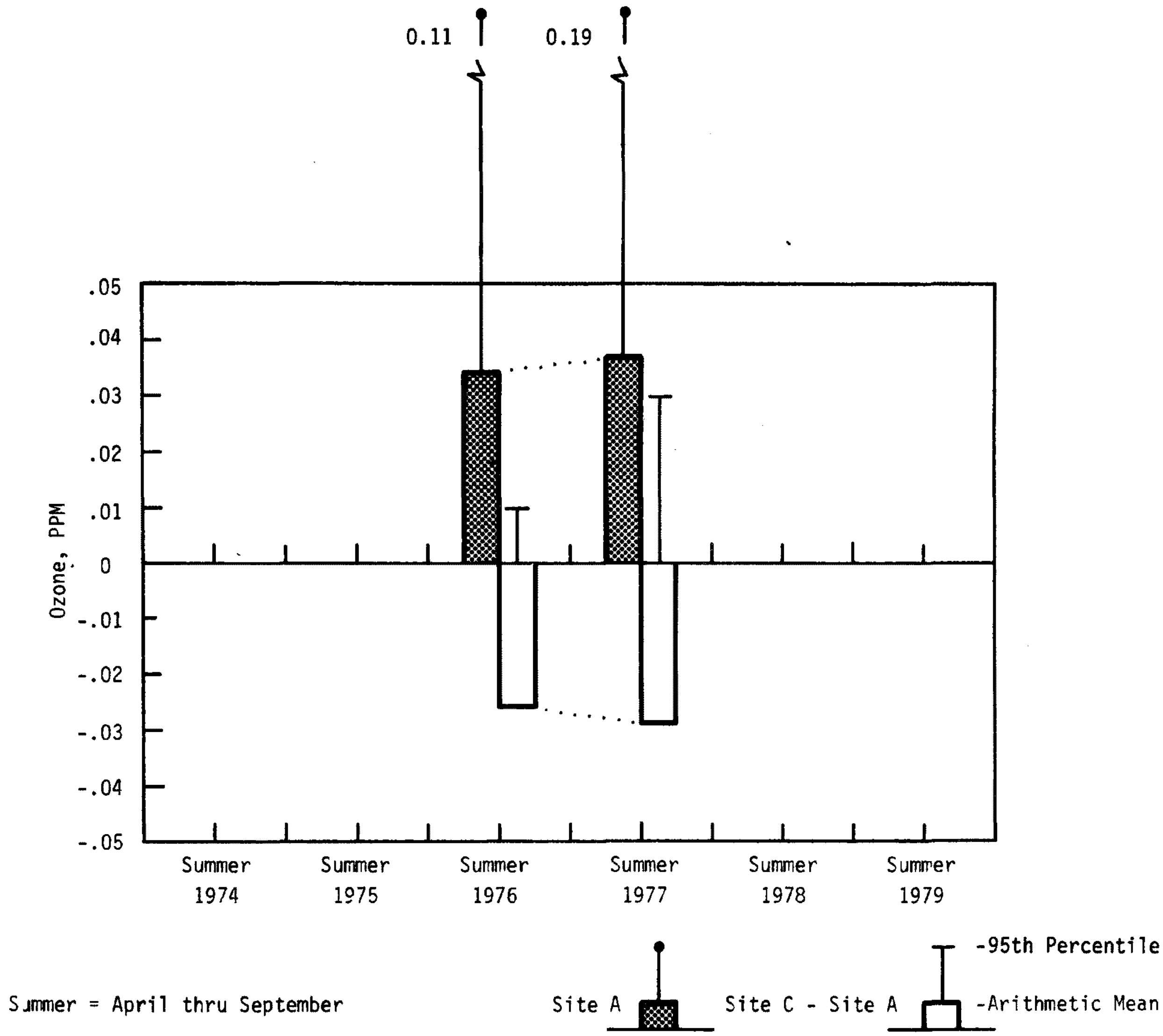


Figure 35. LACS trend data. Ozone (O_3) - all hours.

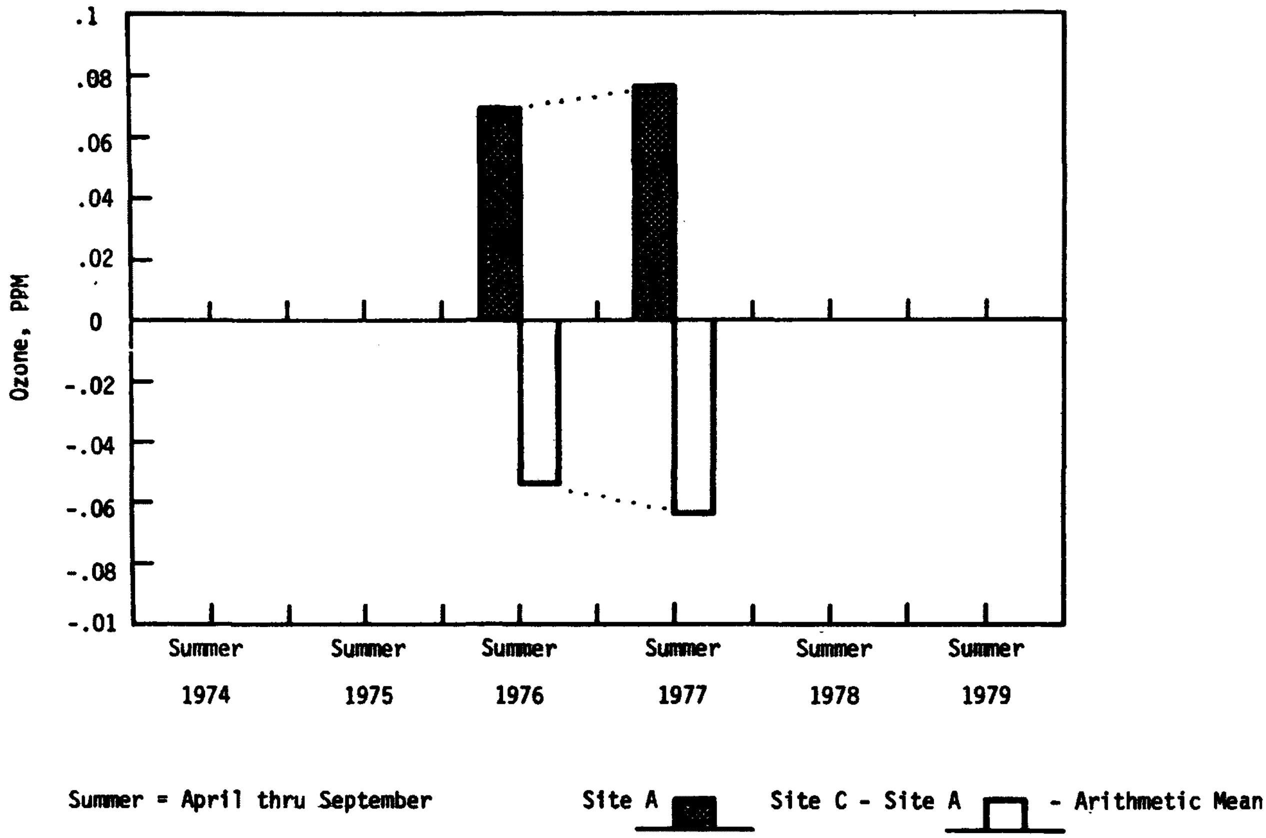


Figure 36. LACS trend data. Ozone (O_3)-- 1500-1800 hours.

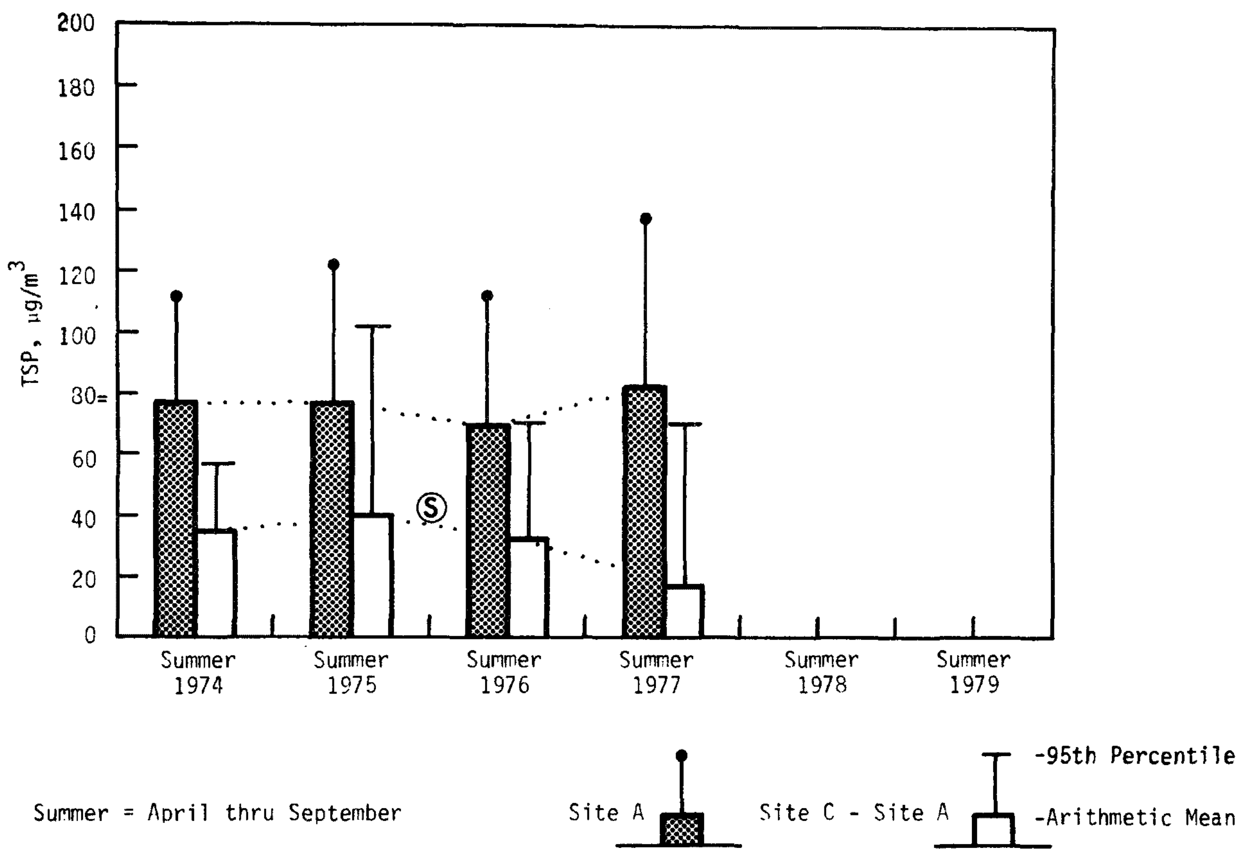


Figure 37. LACS trend data. TSP (Hi-Vol) 0-23 hr. average.

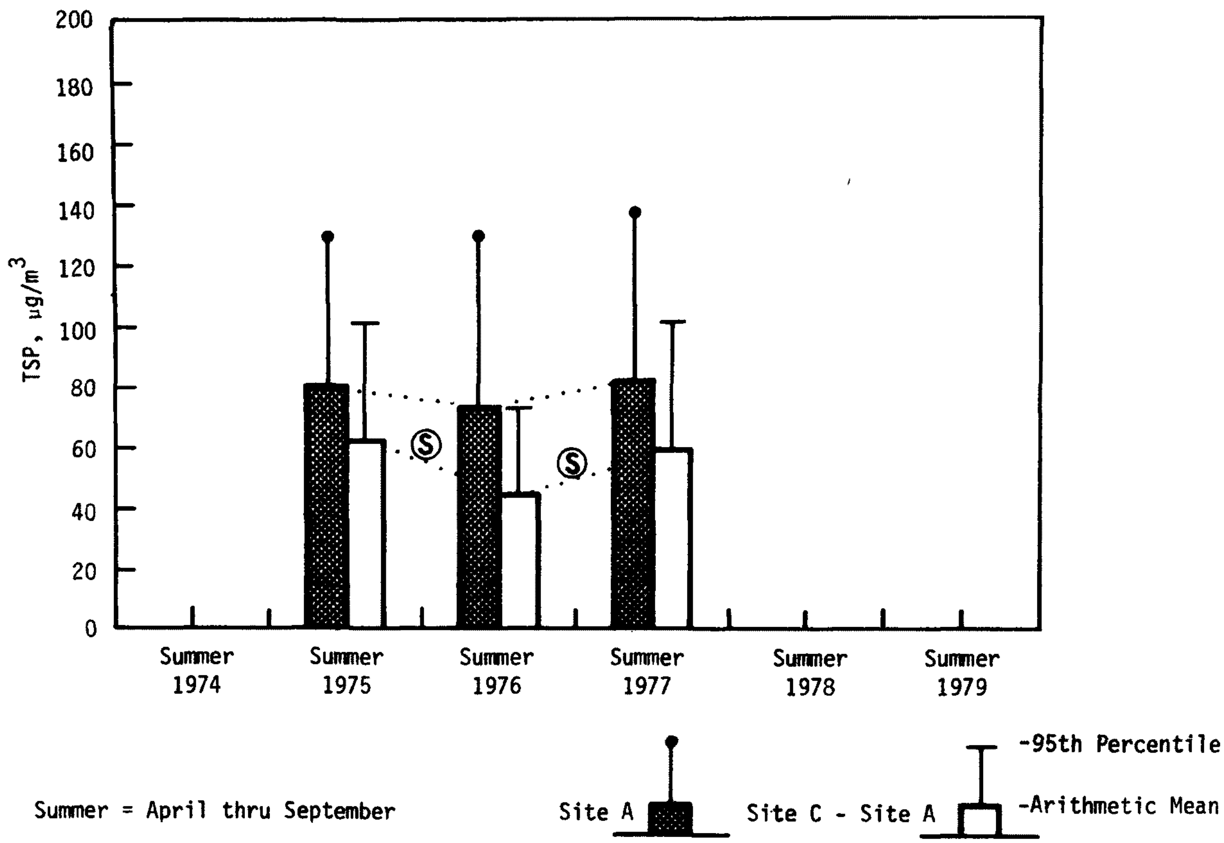


Figure 38. LACS trend data. TSP (Hi-Vol) - 1500-1800 hours.

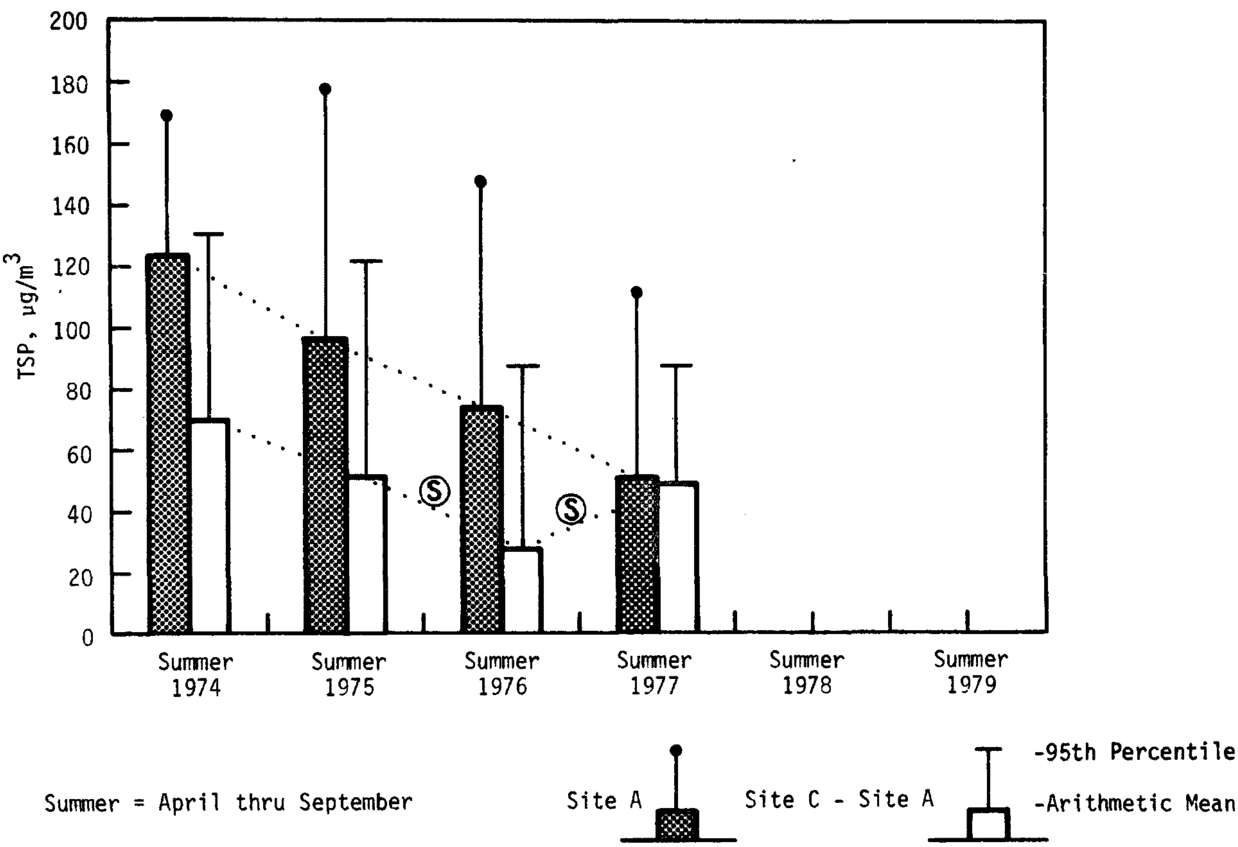


Figure 39. LACS trend data. TSP (Membrane) - 1500-1800 hours.

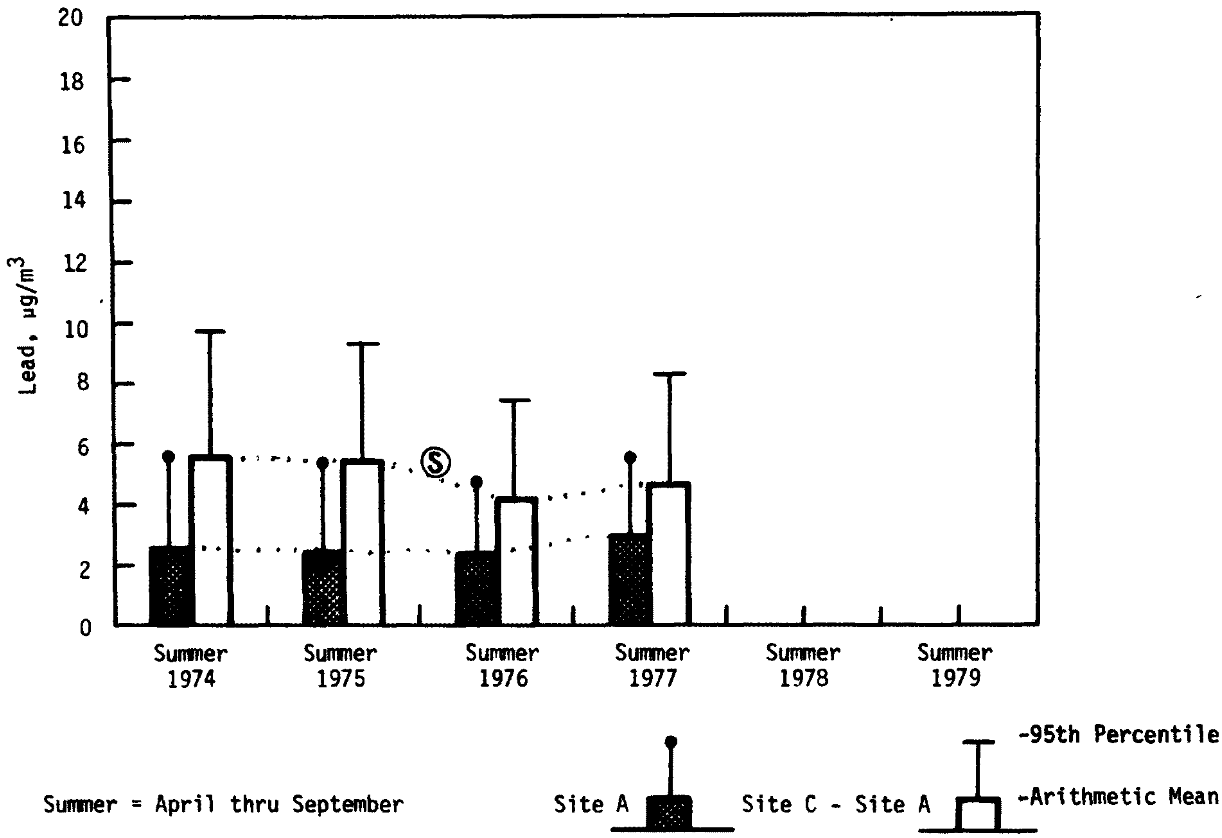


Figure 40. LACS trend data. Lead (Hi-Vol) - 0-23 hr. average.

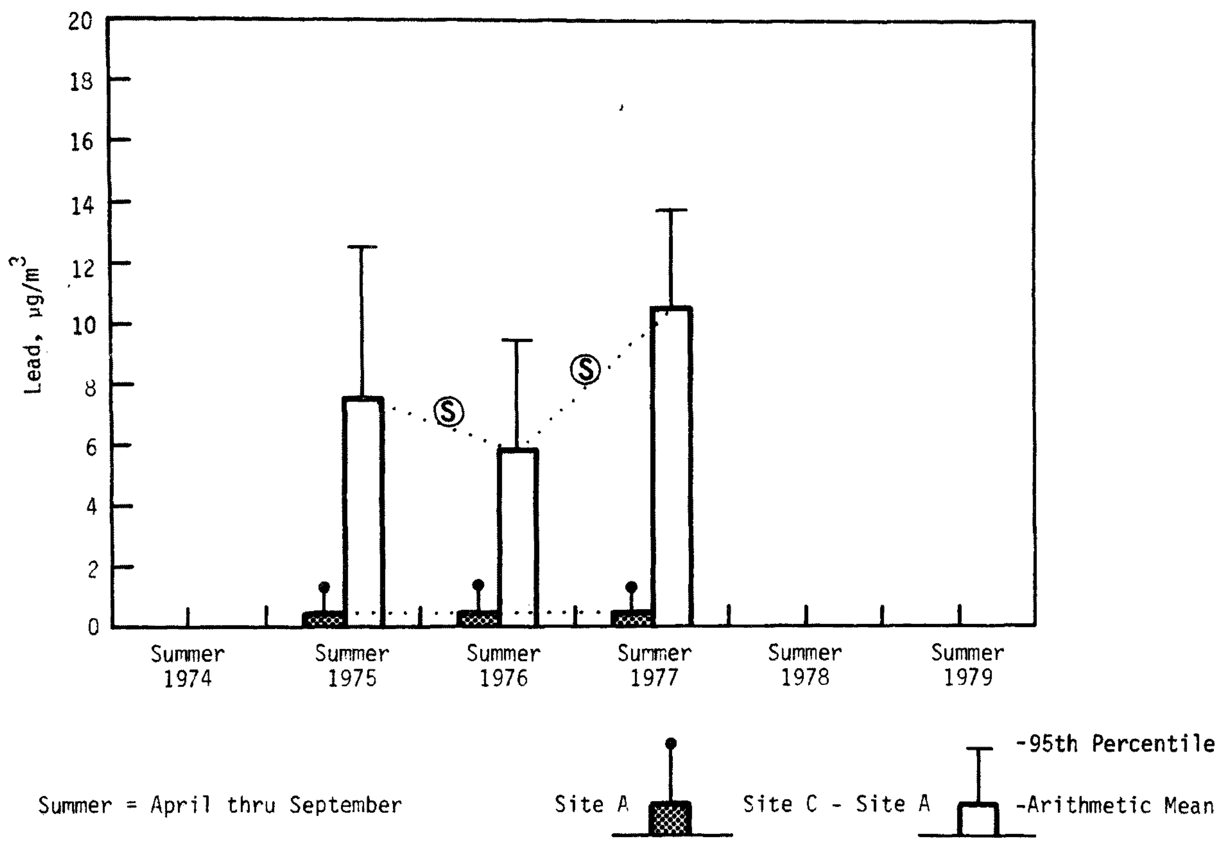


Figure 41. LACS trend data. Lead (Hi-Vol) 1500-1800 hours.

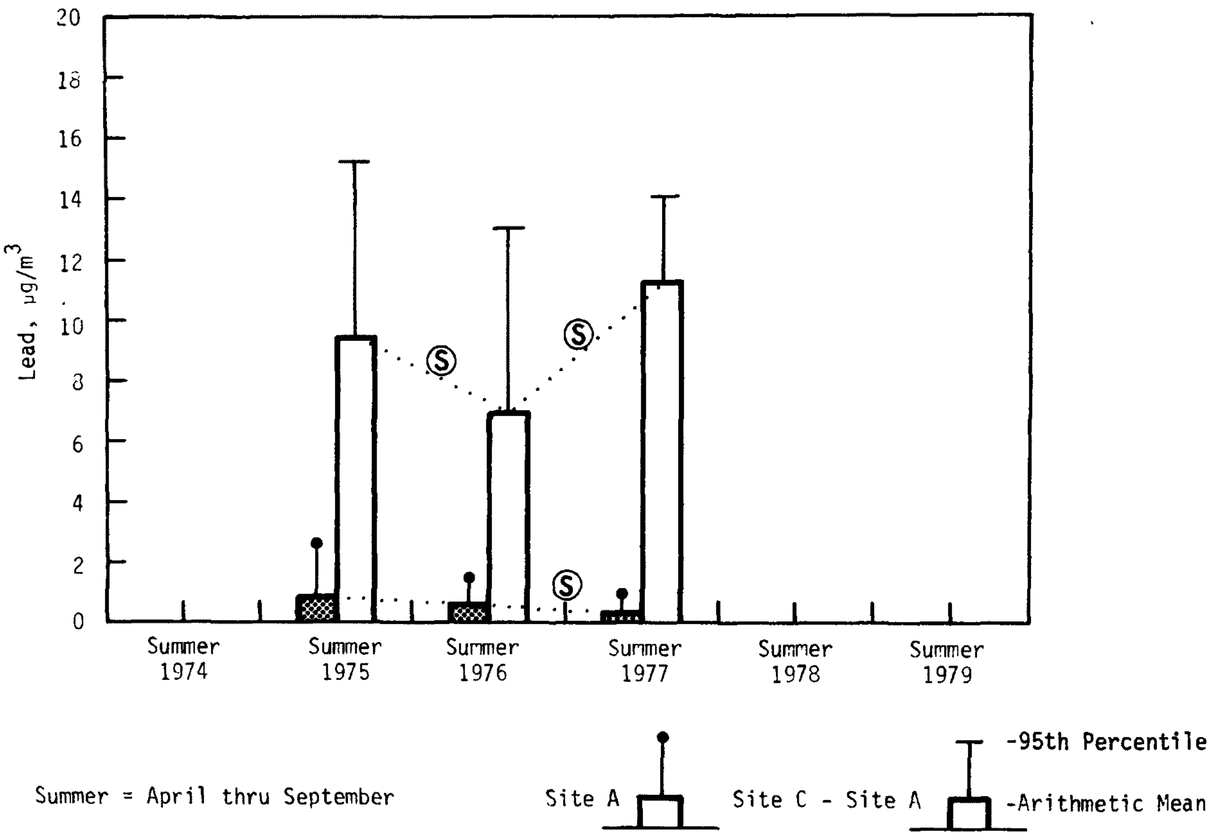


Figure 42. LACS trend data. Lead (Membrane) 1500-1800 hours.

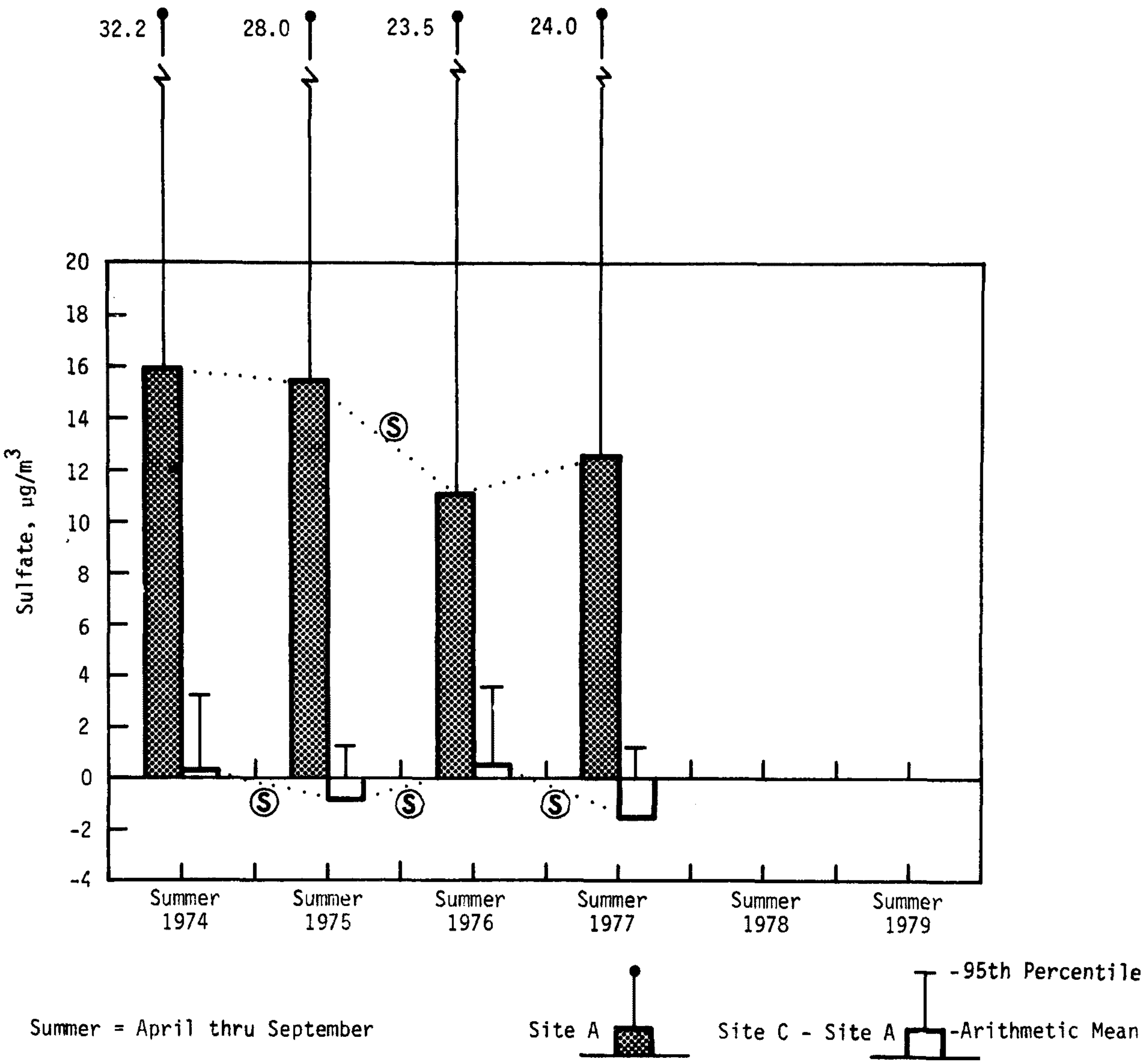


Figure 43. LACS trend data. Sulfate (Hi-Vol) - 0-23 hr. average.

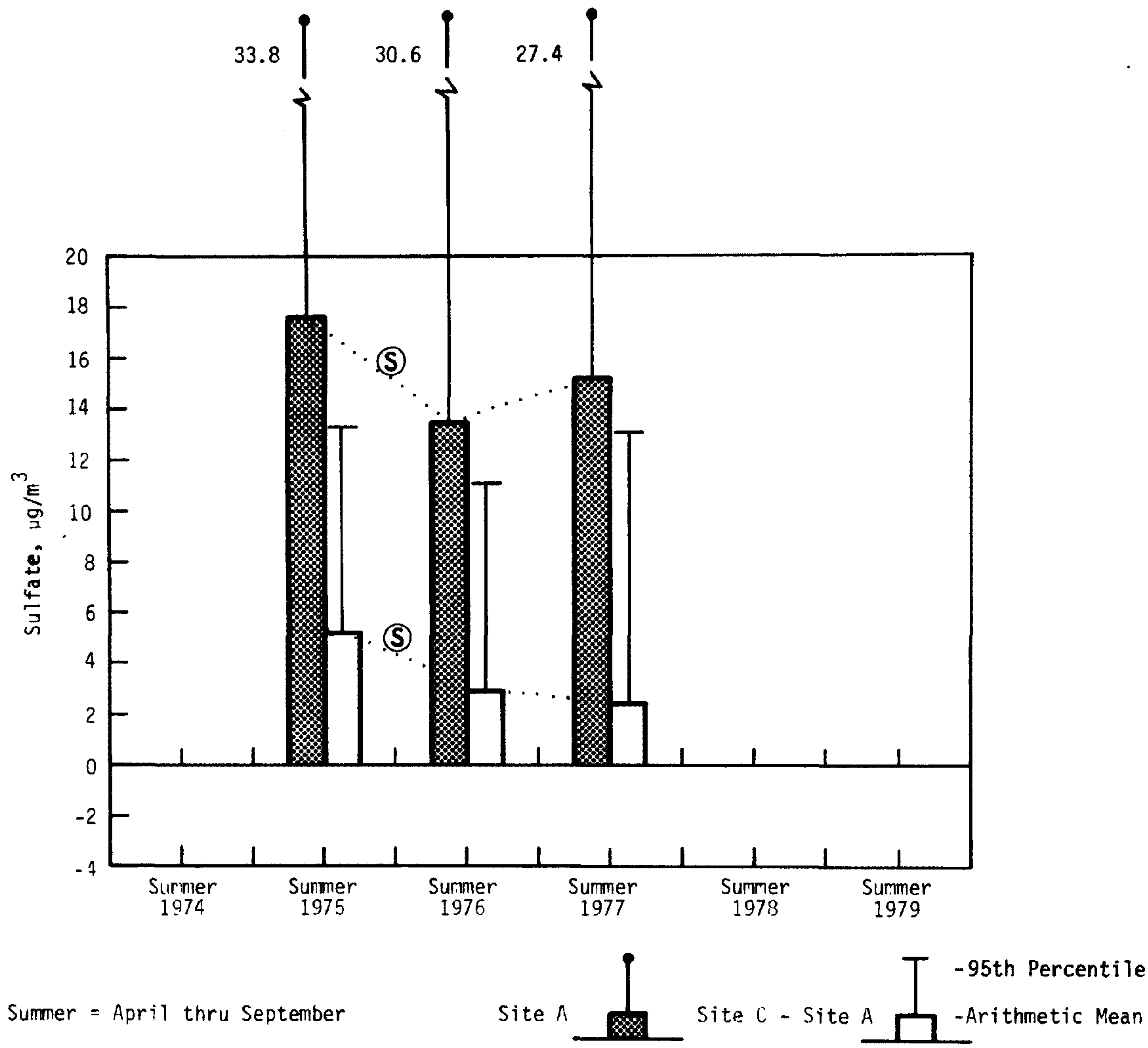


Figure 44. LACS trend data. Sulfate (Hi-Vol)-1500-1800 hours.

and 45. The 4-hour hi-vol data is considered suspect because of artifact sulfate formation. The 1500-1800 hour membrane contribution in the summer of 1977 was only 1.2 $\mu g/m^3$, compared to a background of 11.1 $\mu g/m^3$. The slight increases in freeway sulfate contribution though not significant may be related to the increased average speed and total traffic volumes. Ammonium and nitrate ions have been monitored at the LACS (Figures 46 and 47) but cross-freeway differences do not appear to be significant.

The background and freeway contribution of SO_2 on a 24-hour basis shown in Figure 48 showed significant increases from 1976 to 1977. The absolute magnitudes of these values are very small, both being less than 0.01 ppm.

A summary of the pollutant trend significance tests appears in Table 1 (on page 85). The overall conclusions obtained from the LACS trend data to date suggest that while the previous reports used the pollutant data to discern trends without making corrections for meteorology or traffic parameters, this simplistic approach isn't sufficient to compare data sets before and after the significant changes in traffic flow caused by the addition of the lane northbound in early 1977. It also is probable that downwind Site C is much more strongly influenced by the nearer northbound lanes than the southbound lanes. A concerted effort to apply normalizing factors (such as the vector components used by the University of Wisconsin)[7] will be made in future reports in order to more accurately analyze data trends. These normalized data should then be related to actual on-roadway exposure by developing in-roadway/roadside concentration relationships based on the CO monitoring at Site F (center of the freeway). If possible this exposure effort should also examine an aerosol constituent such as Pb to determine if the higher in-roadway levels of gases are indicative of higher aerosol levels.

LINEAR COMPARISONS

Selected aerosol measurements at the LACS are made by more than one method to provide confirmatory and method comparison information. These simultaneous measurements allow methods to be compared under near-background conditions (Sites A and B) and at sites strongly influenced by the freeway (Sites C and D). Because of the very large data base coupled with the extensive quality control measures, meaningful correlations can be made that demonstrate long term field performance.

The high volume (hi-vol) sampler has been the primary aerosol measurement method used at the LACS. But because of the reactive nature of the glass fiber filter, the sulfate values were determined to be partly artifact. The low volume membrane sampler, 0.14 m^3/min. compared to 1.4 m^3/min. for the hi-vol sampler, has been operated utilizing relatively inert cellulose filters. In the previous LACS report[1] the hi-vol sampler was shown to be more repeatable for mass than the membrane sampler for 4-hour samples in side-by-side comparison testing (coefficient of variation of 5% compared to 15%). The results of nearly 500 data pairs comparing 4-hour hi-vol and membrane samples at Sites A and C are shown in Figures 49 and 50. Each data point indicates a single pair of values. A number instead of a data point indicates multiple points of the same value. It is apparent that there is

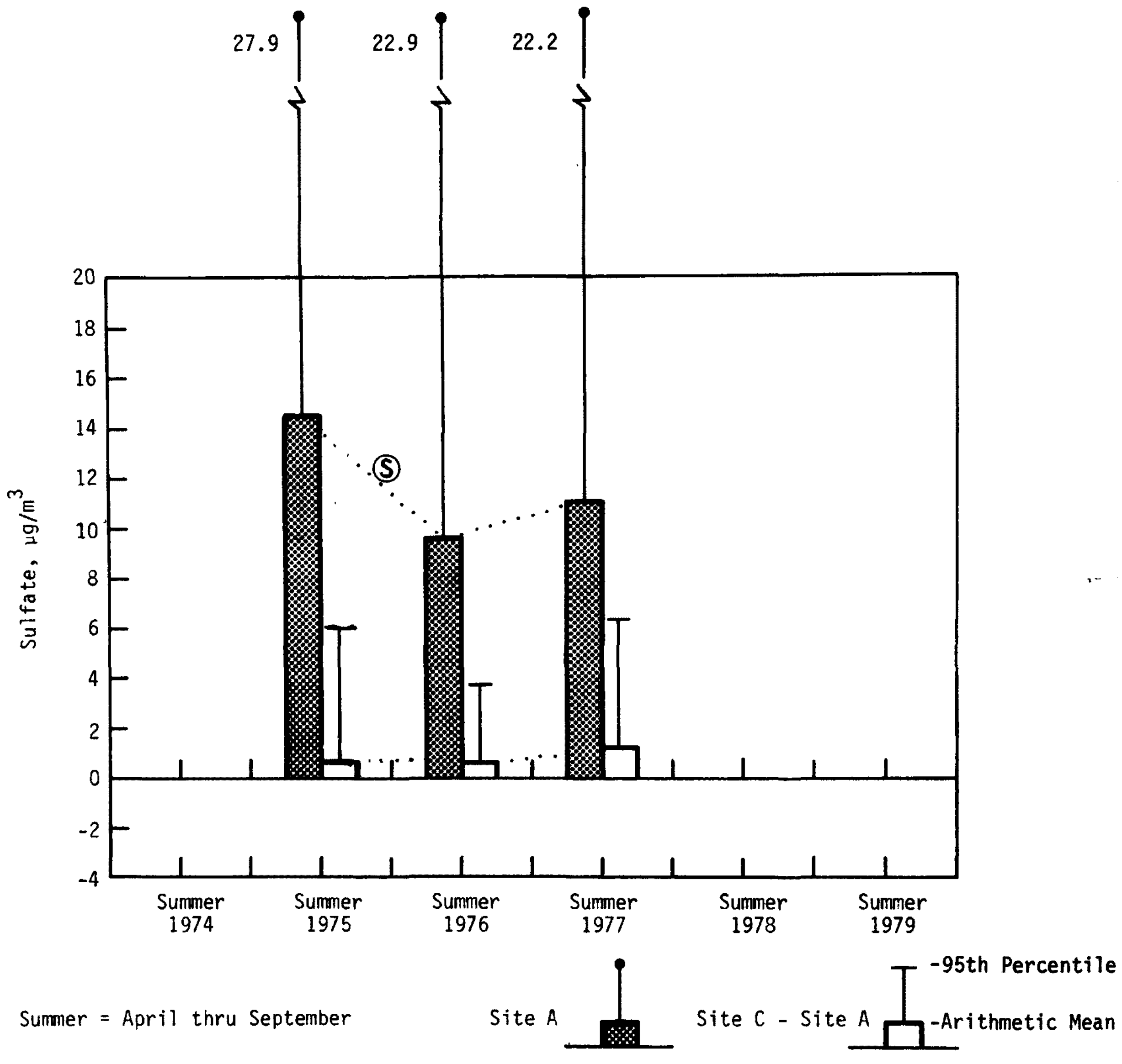


Figure 45. LACS trend data. Sulfate (Membrane) - 1500-1800 hours.

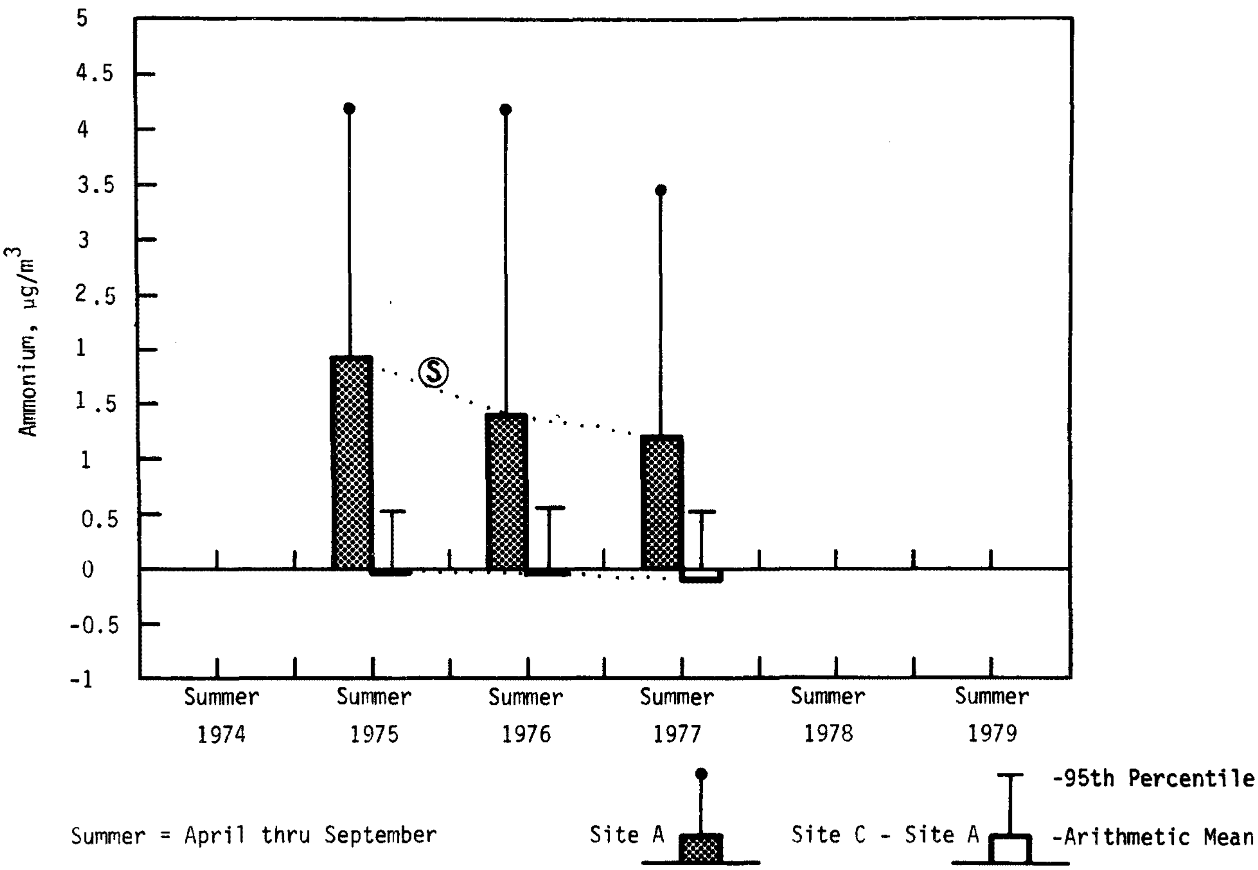


Figure 46. LACS trend data. Ammonium (Hi-Vol) - 0-23 hr. average.

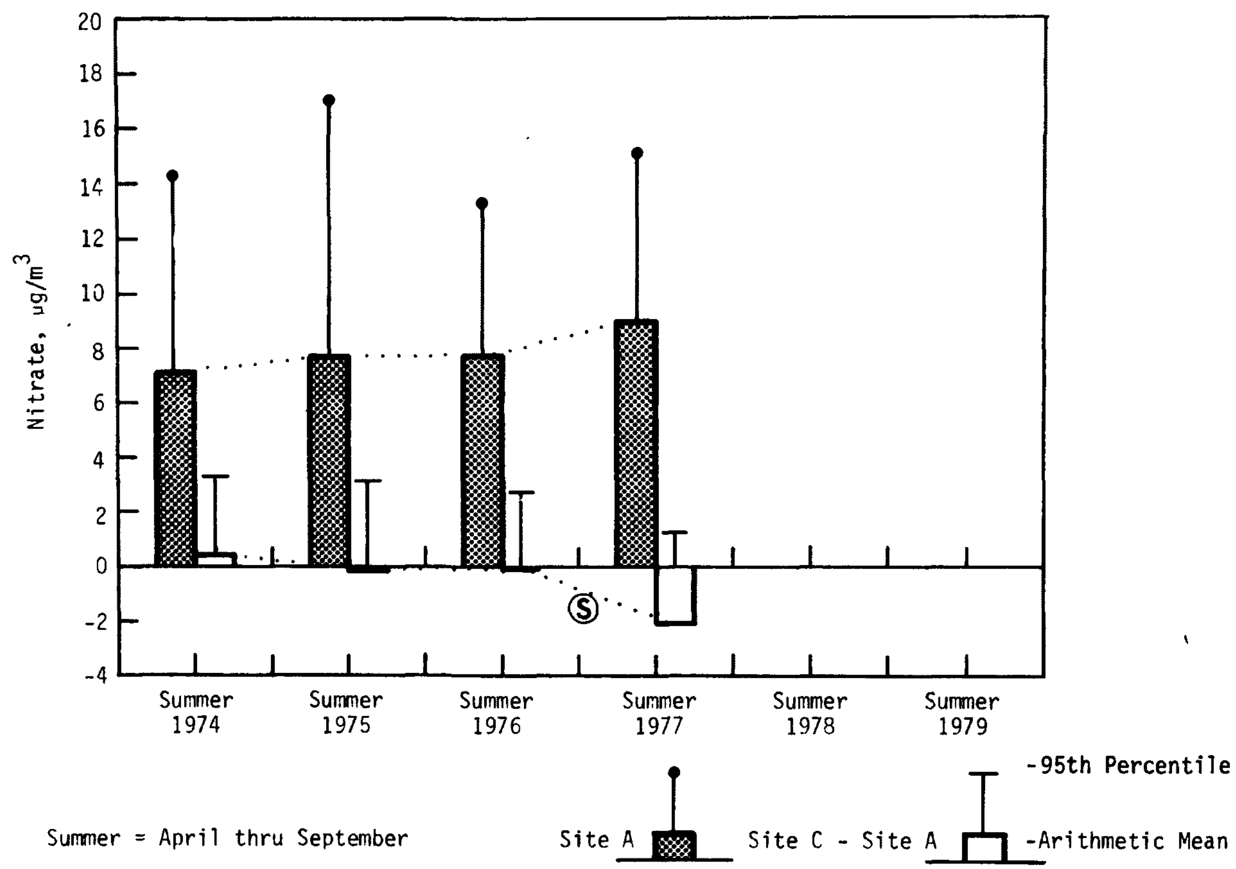


Figure 47. LACS trend data. Nitrate (Hi-Vol) - 0-23 hr. average.

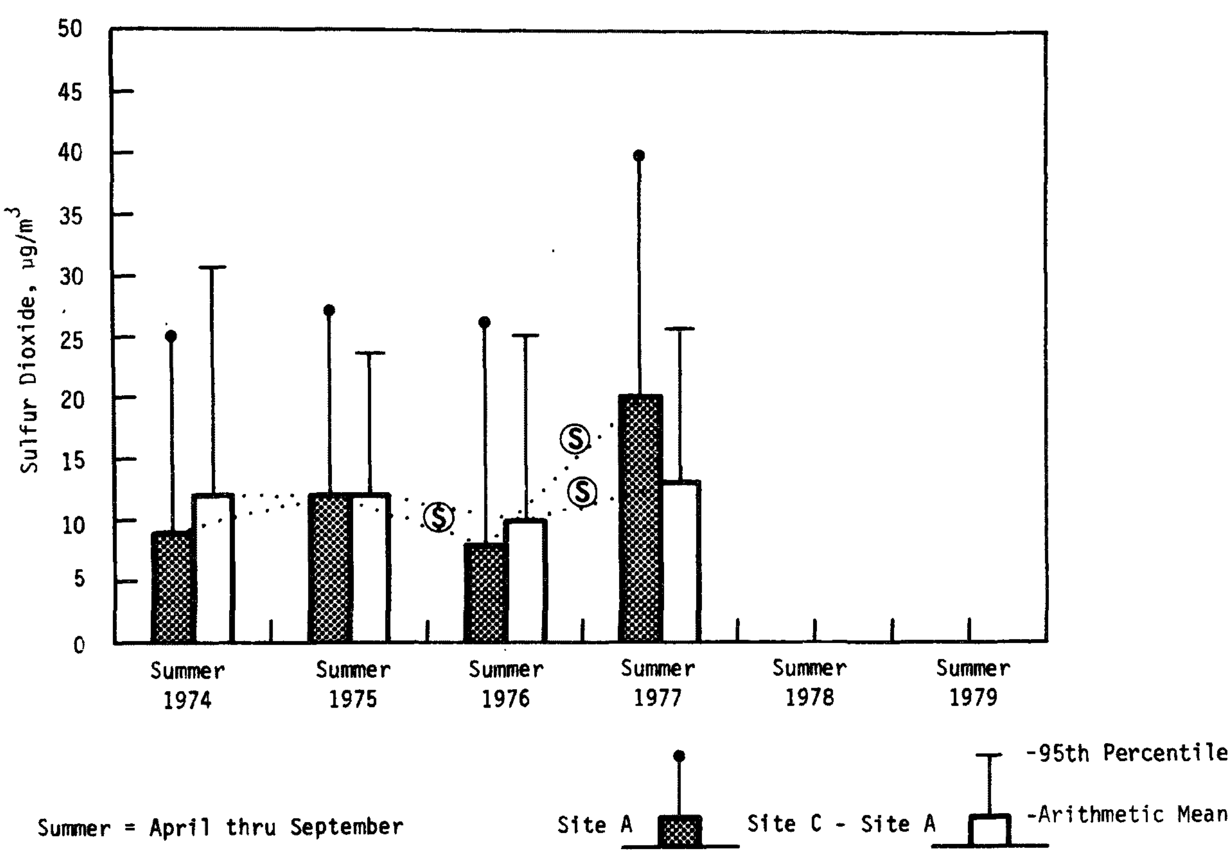


Figure 48. LACS trend data. Sulfur dioxide (SO_2) - 0-23 hr. average.

TABLE I

Summary of Pollutant Trend Significance Tests

0: No Significan Change
+: Significant Increase
-: Significant Decrease

Pollutant	Data Base		Trend/Period 74-75	75-76	76-77	Overall*
CO	All Hours	A	0	0	0	0
		C-A	0	-	0	0
	1500-1800 Hrs	A	+	0	0	0
		C-A	+	-	0	0
NO	All Hours	A		0	0	+
		C-A		0	0	0
	1500-1800 Hrs	A		0	0	0
		C-A		0	+	+
NO_2	All Hours	A		0	0	0
		C-A		+	0	+
	1500-1800 Hrs	A		0	0	0
		C-A		+	+	+
O_3	All Hours	A			0	
		C-A			0	
	1500-1800 Hrs	A			0	
		C-A			0	
TSP	0-23 Hi Vol	A	0	0	0	0
		C-A	0	-	0	-
	15-18 Hi Vol	A		0	0	0
		C-A		-	+	0
	15-18 Membrane	A	0	0	0	-
		C-A	0	-	+	0
Pb	0-23 Hi Vol	A	0	0	0	0
		C-A	0	-	0	0
	15-18 Hi Vol	A		0	0	0
		C-A		-	+	+
	15-18 Membrane	A		0	-	-
		C-A		0	+	+
SO_4	0-23 Hi Vol	A	0	-	0	0
		C-A	-	+	-	-
	15-18 Hi Vol	A		-	0	0
		C-A		-	0	-
	15-18 Membrane	A		-	0	0
		C-A		0	0	0
NH_4	0-23 Hi Vol	A		-	0	0
		C-A		0	0	0
NO_3	0-23 Hi Vol	A	0	0	0	+
		C-A	0	0	-	-
SO_2	0-23 Bubbler	A	0	-	+	0
		C-A	0	0	+	0

*Overall: 74-77 or 75-77

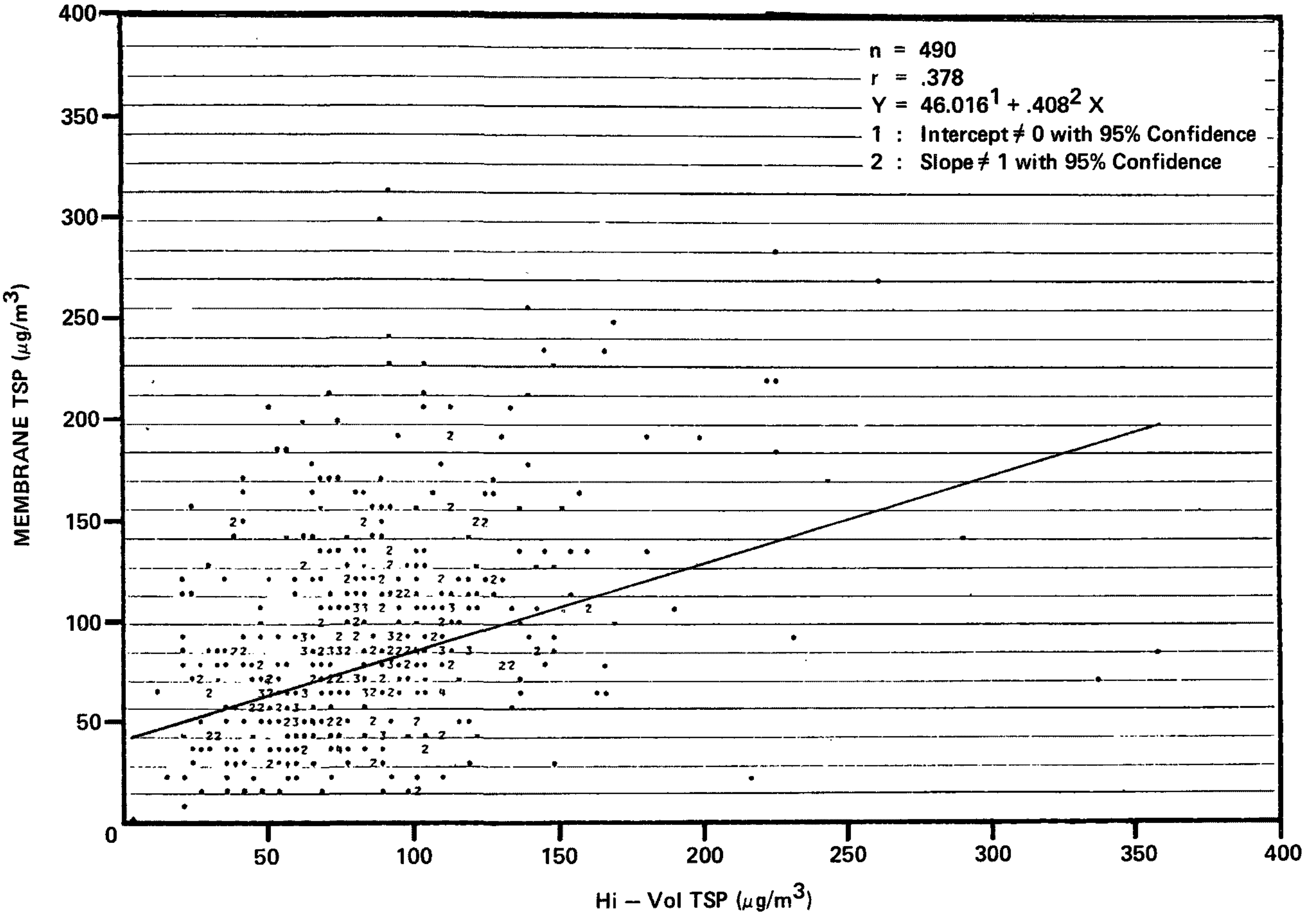


Figure 49. Membrane TSP vs. Hi-Vol TSP. Site A: 1500-1800 hours.

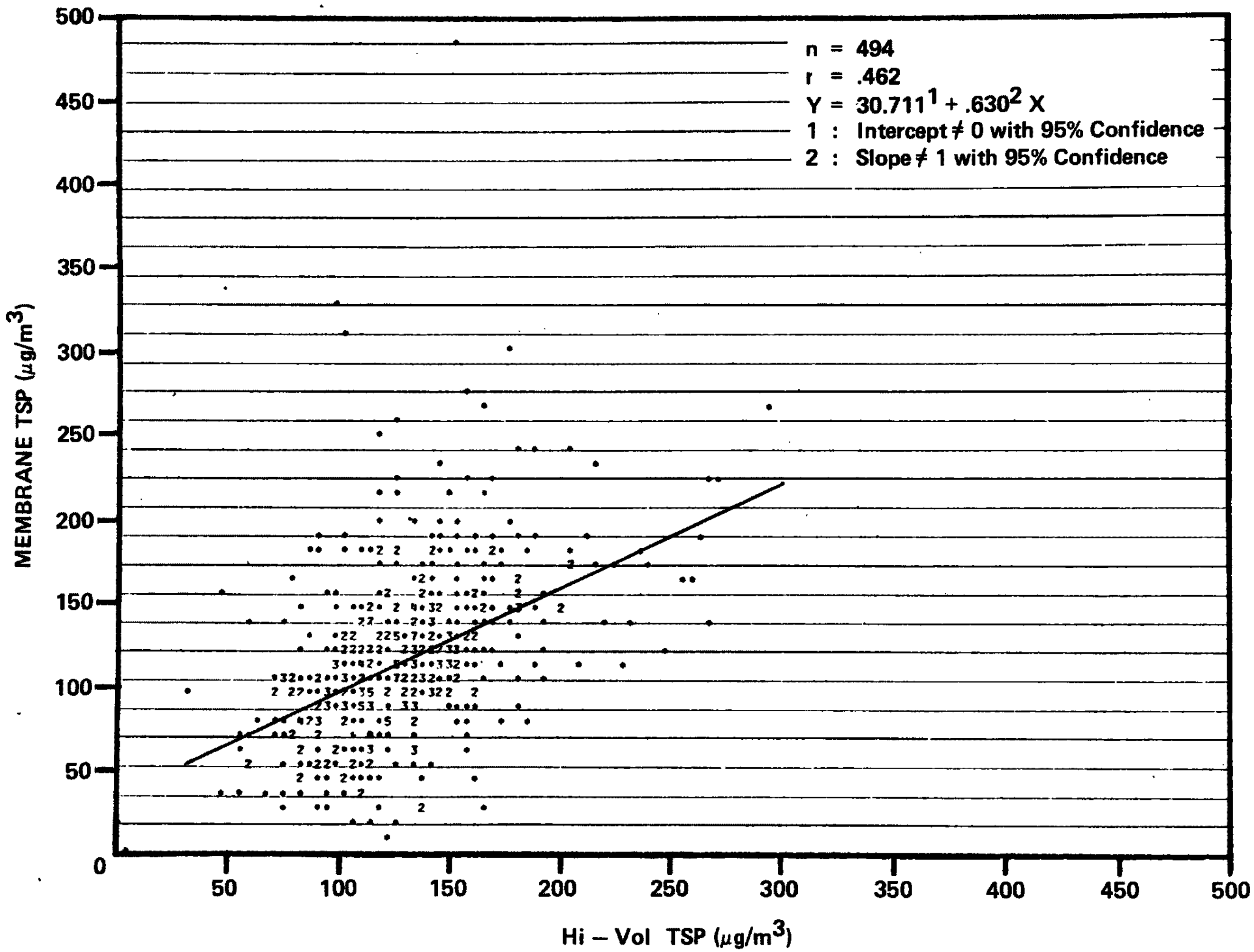


Figure 50. Membrane TSP vs. Hi-Vol TSP. Site C: 1500-1800 hours.

very poor correlation between these samplers when used on a 4-hour basis. The slopes and intercepts suggest that at very low levels ($<75 \mu g/m^3$) the membrane sampler produces higher values than the hi-vol, and the converse at higher levels. The reason for the poor correlation between these two samplers is apparently related to the small size of collected sample, since the correlation improves significantly in the 24-hour measurements shown in Figures 51 and 52. These two plots show much stronger correlations and far less scatter. Lee, et al[11] in a similar comparison study in England generated a regression equation of y=18.134+0.772X, which compares very well with the data from Site B. The correlation coefficient obtained by Lee of 0.922 (666 data pairs) for 24-hour sampling, however, indicates better agreement than that shown by the LACS data. Recent aerosol collection efficiency testing of the LACS hi-vol sampler and membrane samplers has shown that the hi-vol sampler has the greater efficiency for particles greater than 20μm.[12] Apparently there is a significant concentration of large particles (especially at Site C) which are more efficiently collected by the hi-vol sampler.

The comparison of the Pb analyses for the same samplers are shown in Figures 53, 54, 55 and 56. Again there is a better correlation between the samplers for measurements made over 24 hours (Sites B and D), but the scatter about the regression lines is substantially less than that observed for TSP. This would indicate that the poor agreement in the mass measurements is due primarily to factors related to analysis and sample handling. Note that the hi-vol Pb is determined by Atomic Absorption (AA) by Rockwell, whereas the membrane Pb is measured by X-Ray Fluorescence (XRF) at Lawrence Berkeley Laboratory (LBL). Therefore, these methods comparisons are composites of sampling and analysis variables. Overall the comparison between these methods is very good, especially on a 24-hour basis. It appears that membrane sampling with XRF analyses would be a viable candidate as an equivalent method to the proposed hi-vol Pb method.

The membrane sampler was added at the beginning of the study to confirm (on a different sampling substrate) the freeway contribution of sulfates. It has been shown that there is only a small freeway contribution of sulfate and that, especially on a short term 4-hour basis, there is a significant artifact formation of $SO_4^=$. As can be seen from comparing Figures 57 and 58, which were samples averaged over 4 hours, with Figures 59 and 60 (24-hours), the length of collection time has a great influence over correlation, bias, and data scatter. The 24-hour plots indicate that a hi-vol operated for this time interval has no more than 1 $\mu g/m^3$ additional $SO_4^=$ than a membrane sampler using a cellulose ester filter.

The comparisons of $SO_4^=$ measurements just described involved the same analysis technique (methylthymol blue) but different samplers. The membrane filters are also analyzed by XRF for total elemental sulfur. If these latter measurements are plotted against one another for the same sample, a determination can be made of the fraction of the total aerosol sulfur associated with water soluble sulfates. As can be seen from Figures 61, 62, 63, and 64, there is little difference in the degree of scatter or strength of correlation between the 4-hour and the 24-hour measurements. This would suggest that the analytical methods are adequately sensitive for the amount of material collected in either time interval. The stoichiometric ratio of

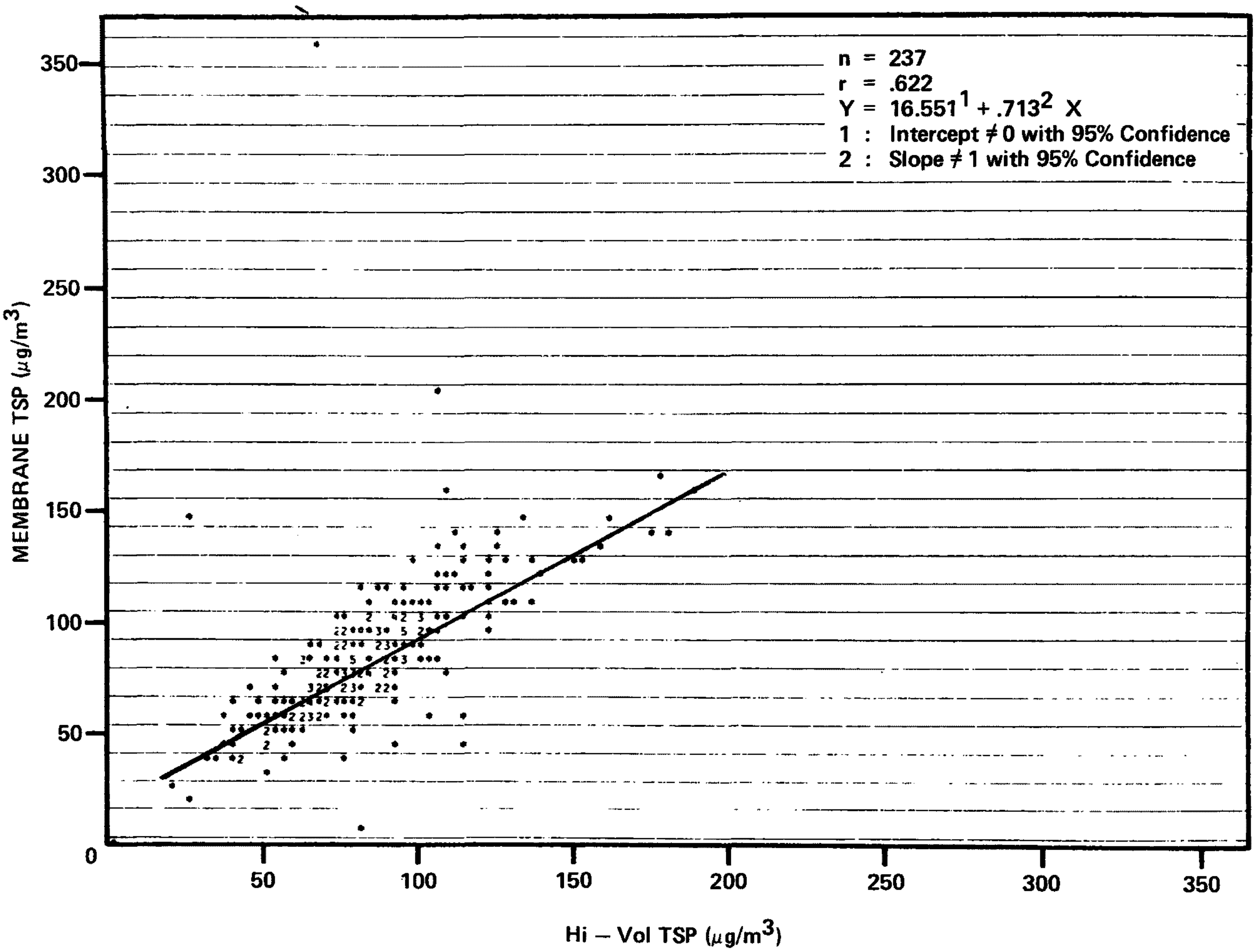


Figure 51. Membrane TSP vs. Hi-Vol TSP. Site B: 0-2300 hours.

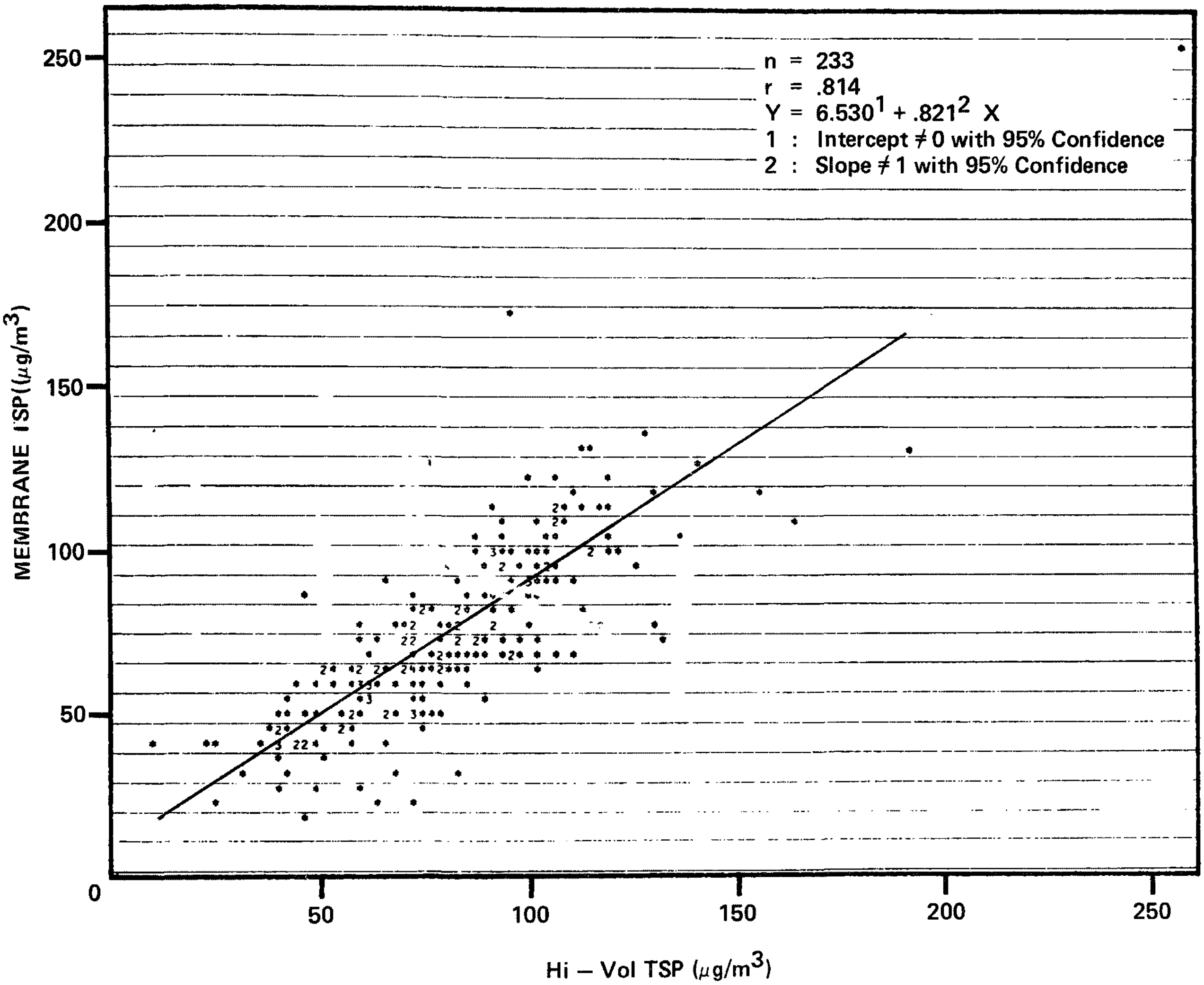


Figure 52. Membrane TSP vs. Hi-Vol TSP. Site D: 0-2300 hours.

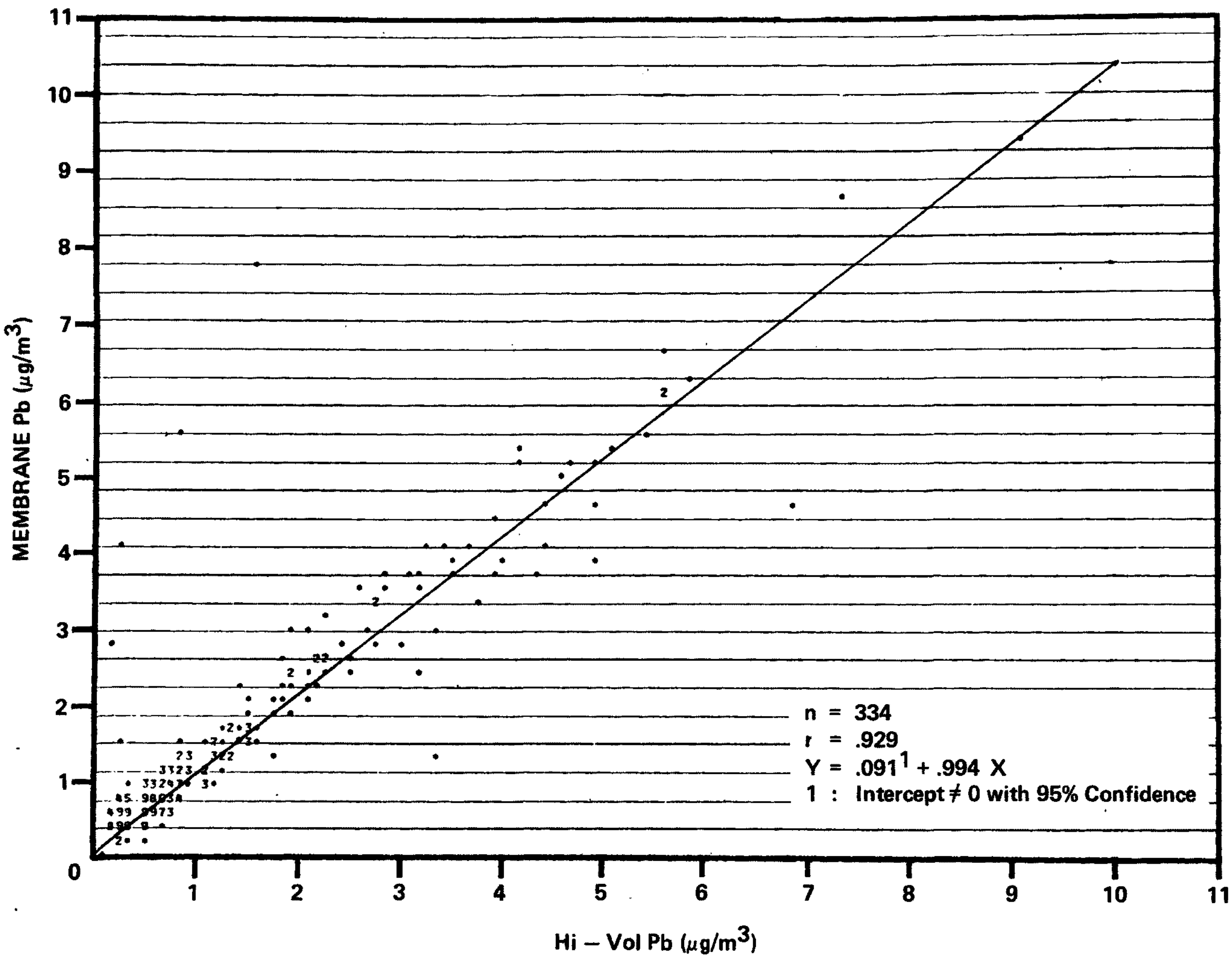


Figure 53. Membrane Pb vs. Hi-Vol Pb. Site A: 1500-1800 hours.

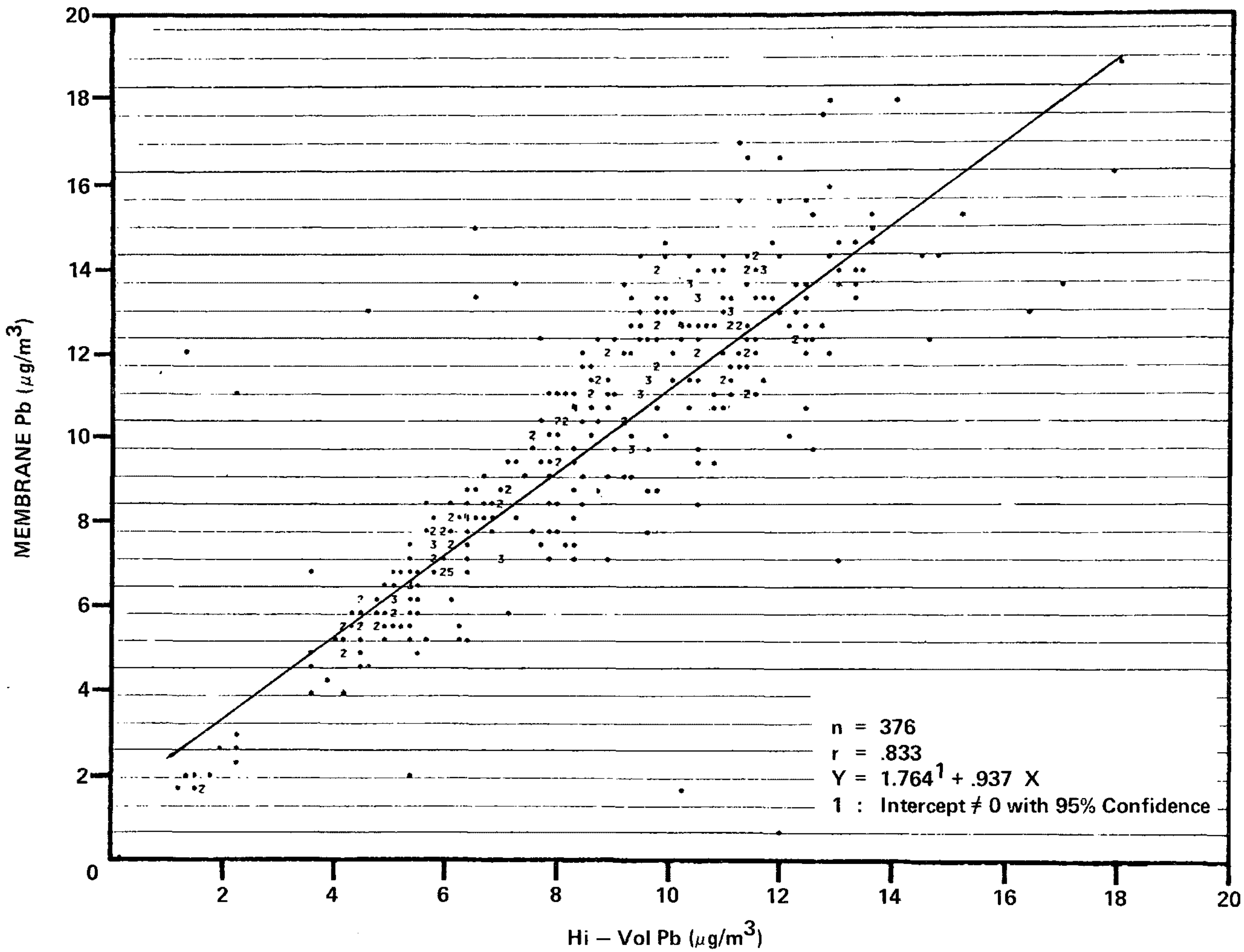


Figure 54. Membrane Pb vs. Hi-Vol Pb. Site C: 1500-1800 hours.

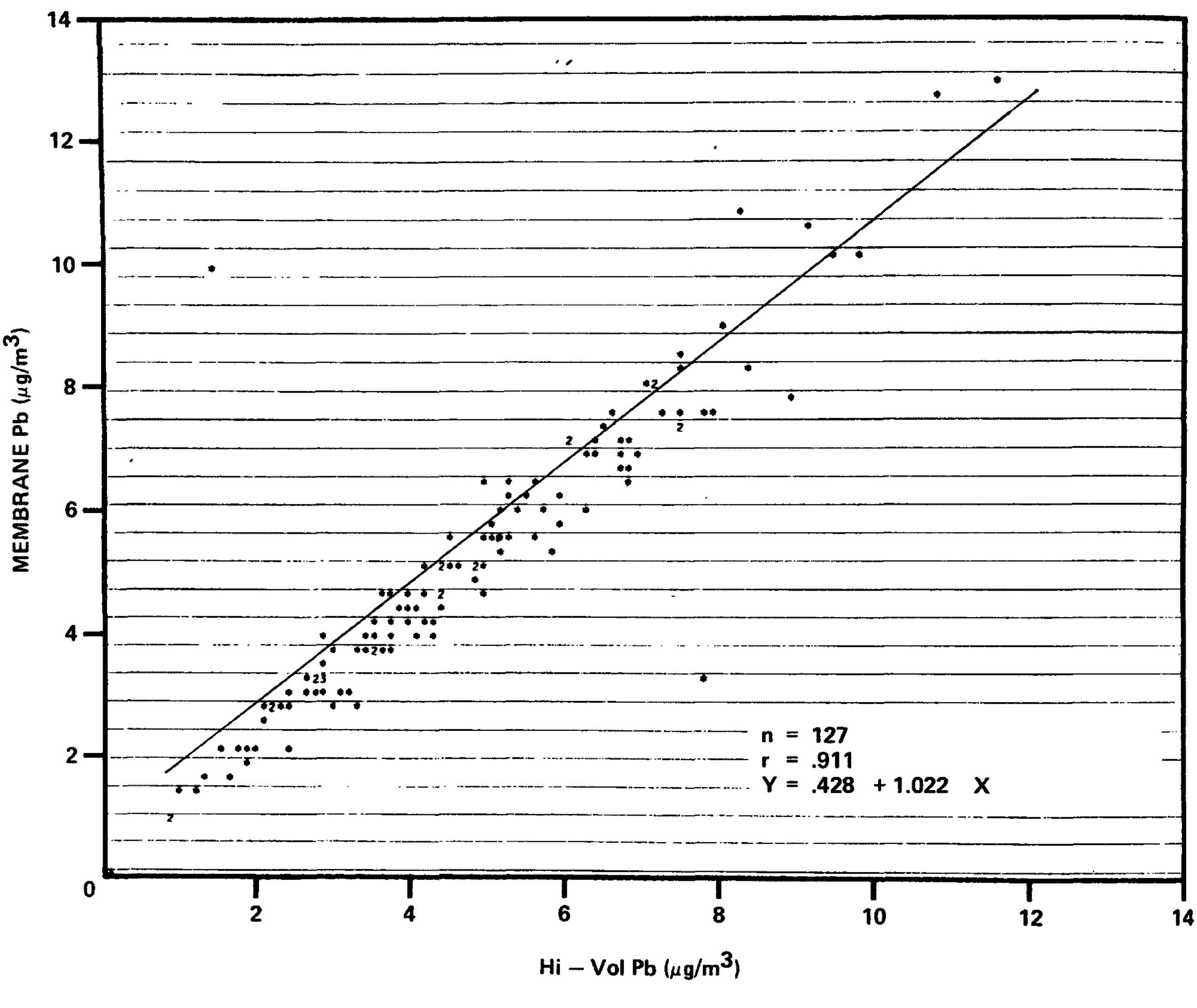


Figure 55. Membrane Pb vs. Hi-Vol Pb. Site B: 0-2300 hours.

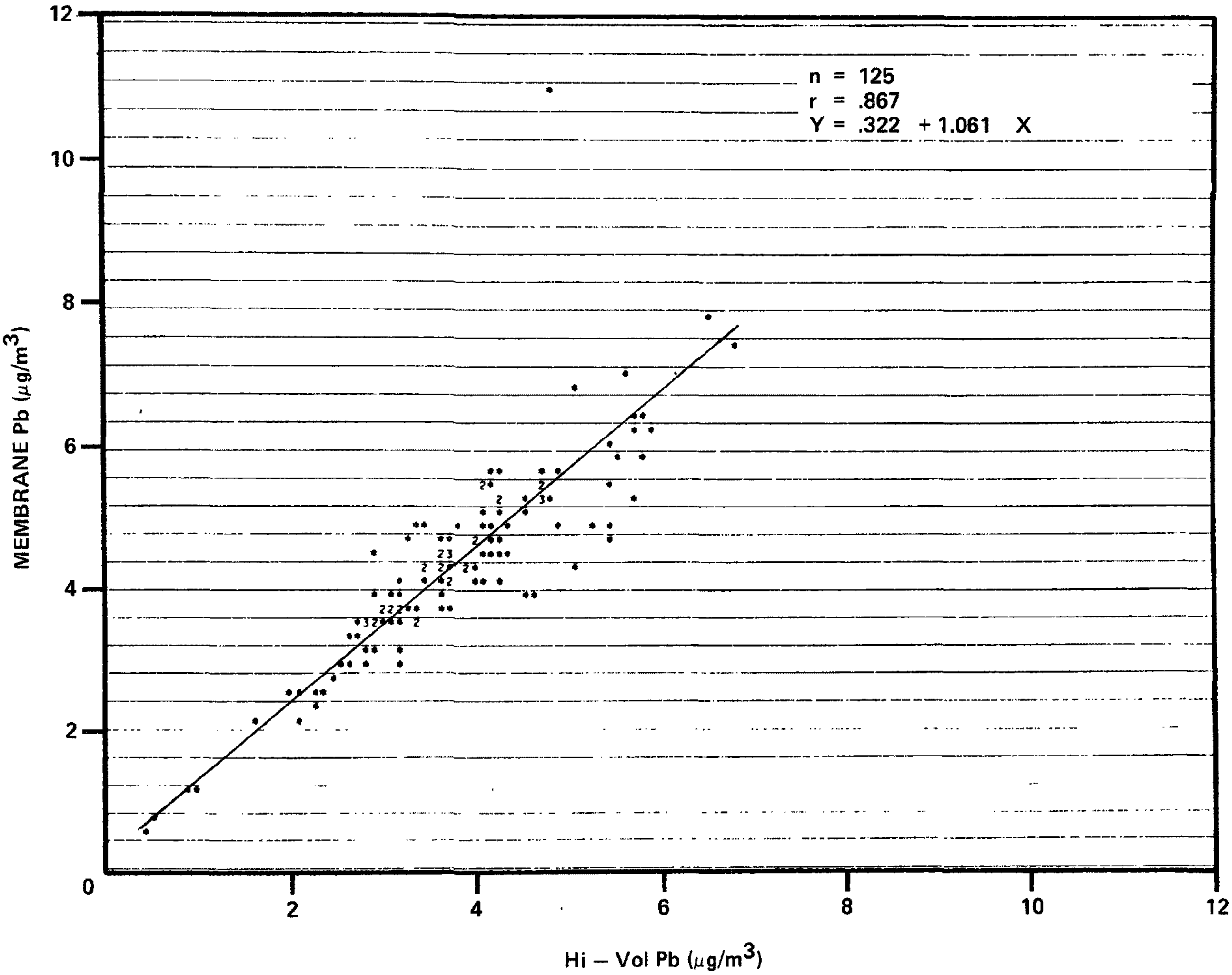


Figure 56. Membrane Pb vs. Hi-Vol Pb. Site D: 0-2300 hours.

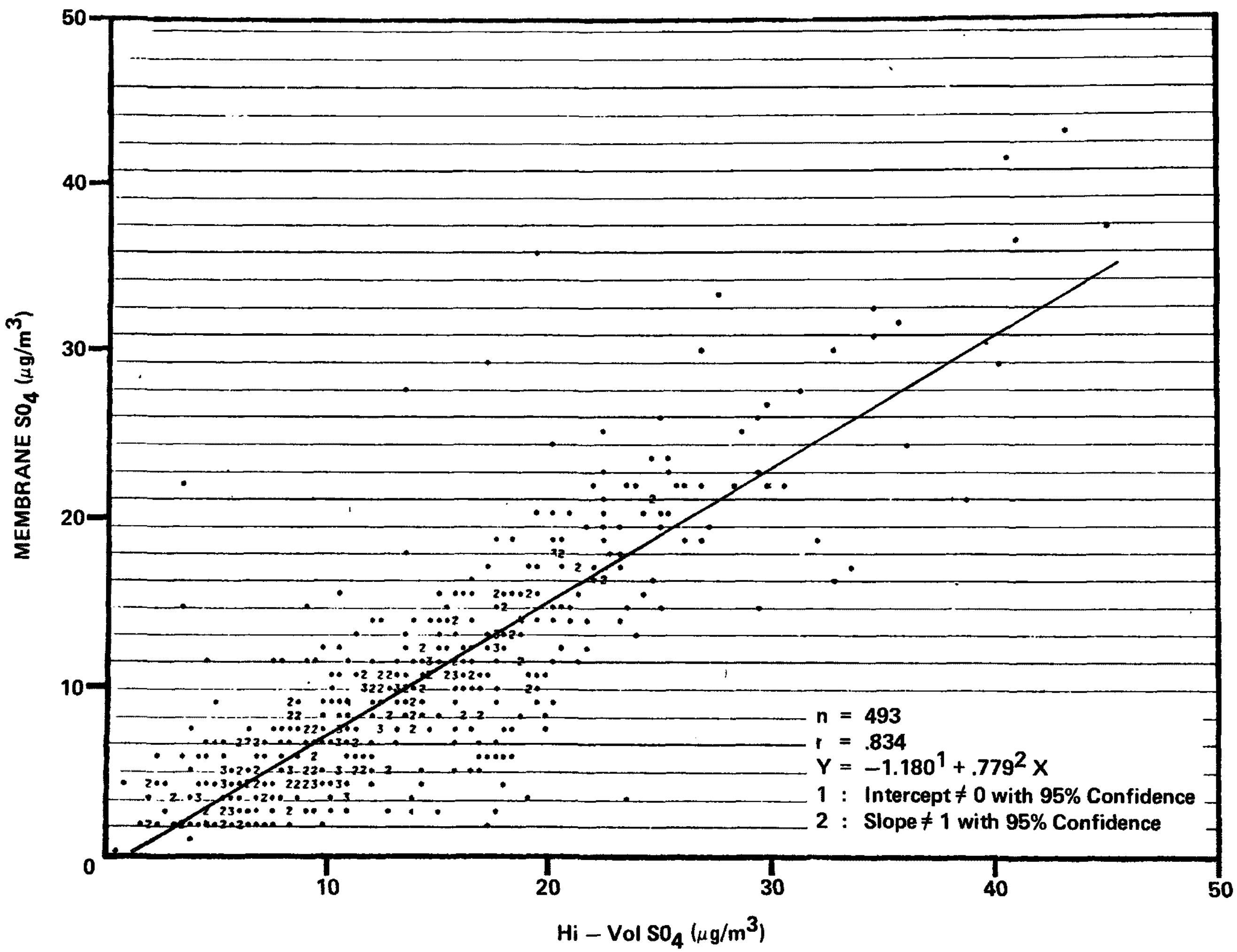


Figure 57. Membrane SO_4 vs. Hi-Vol SO_4. Site A: 1500-1800 hours.

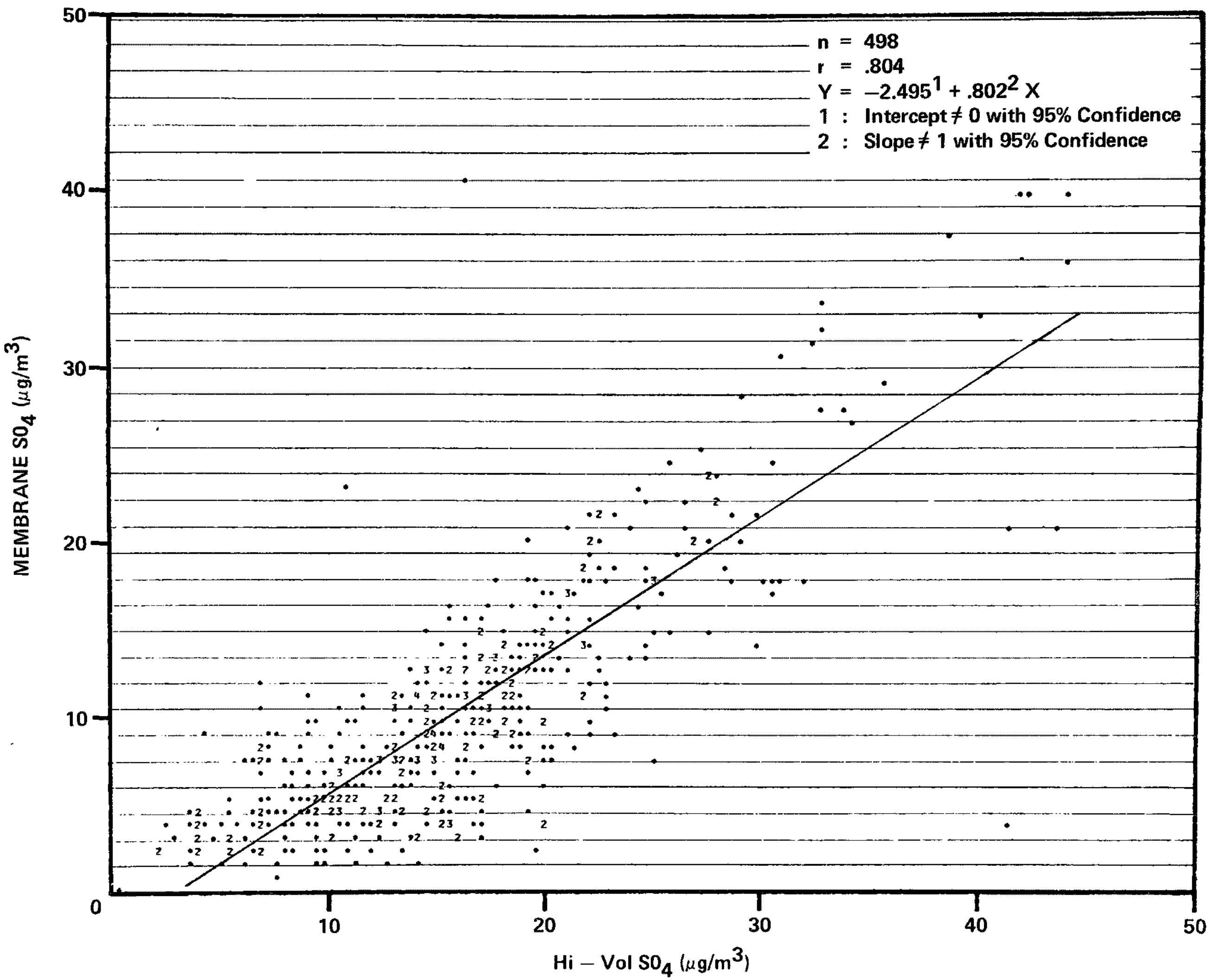


Figure 58. Membrane SO_4 vs. Hi-Vol SO_4. Site C: 1500-1800 hours.

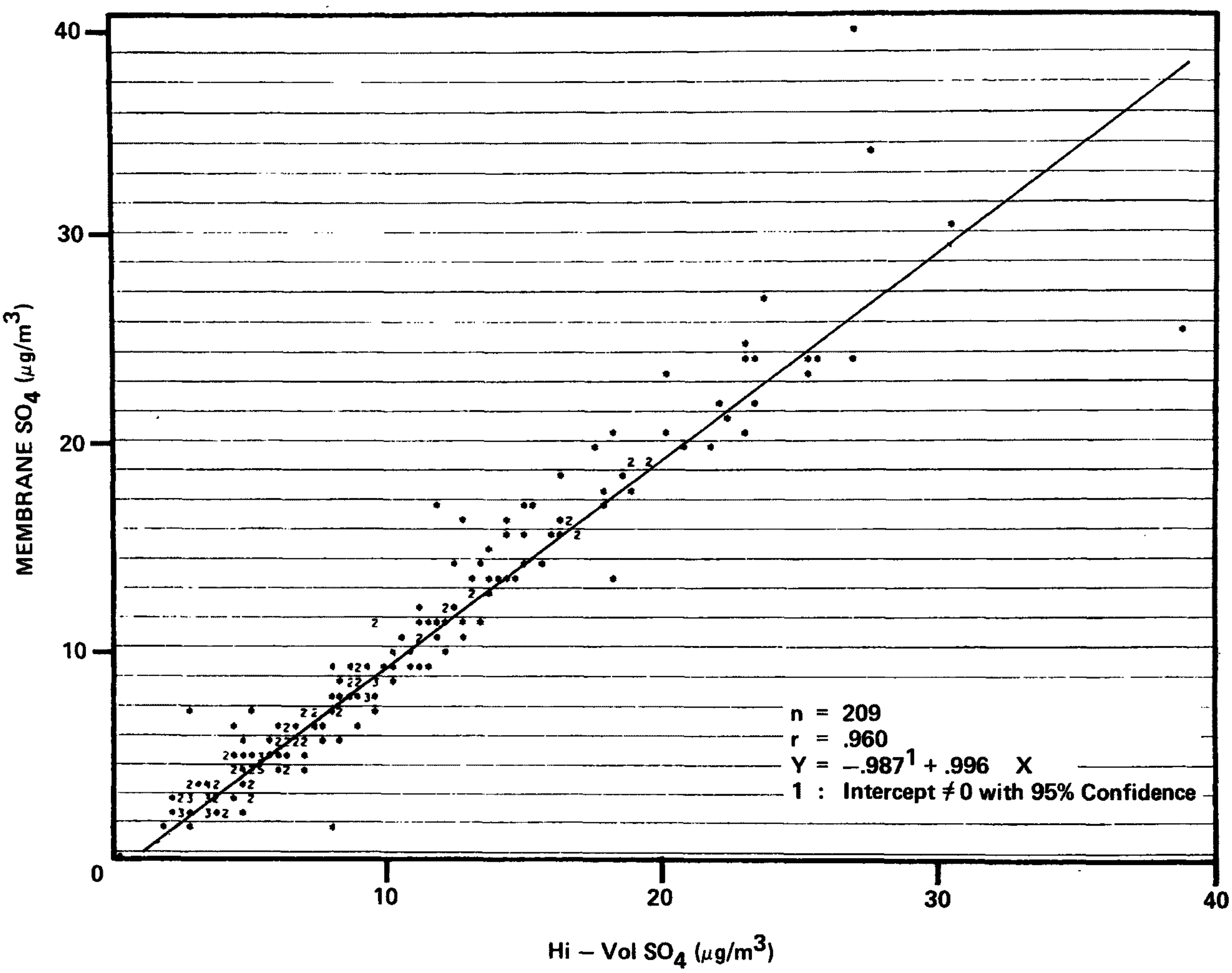


Figure 59. Membrane SO_4 vs. Hi-V0l SO_4. Site B: 0-2300 hours.

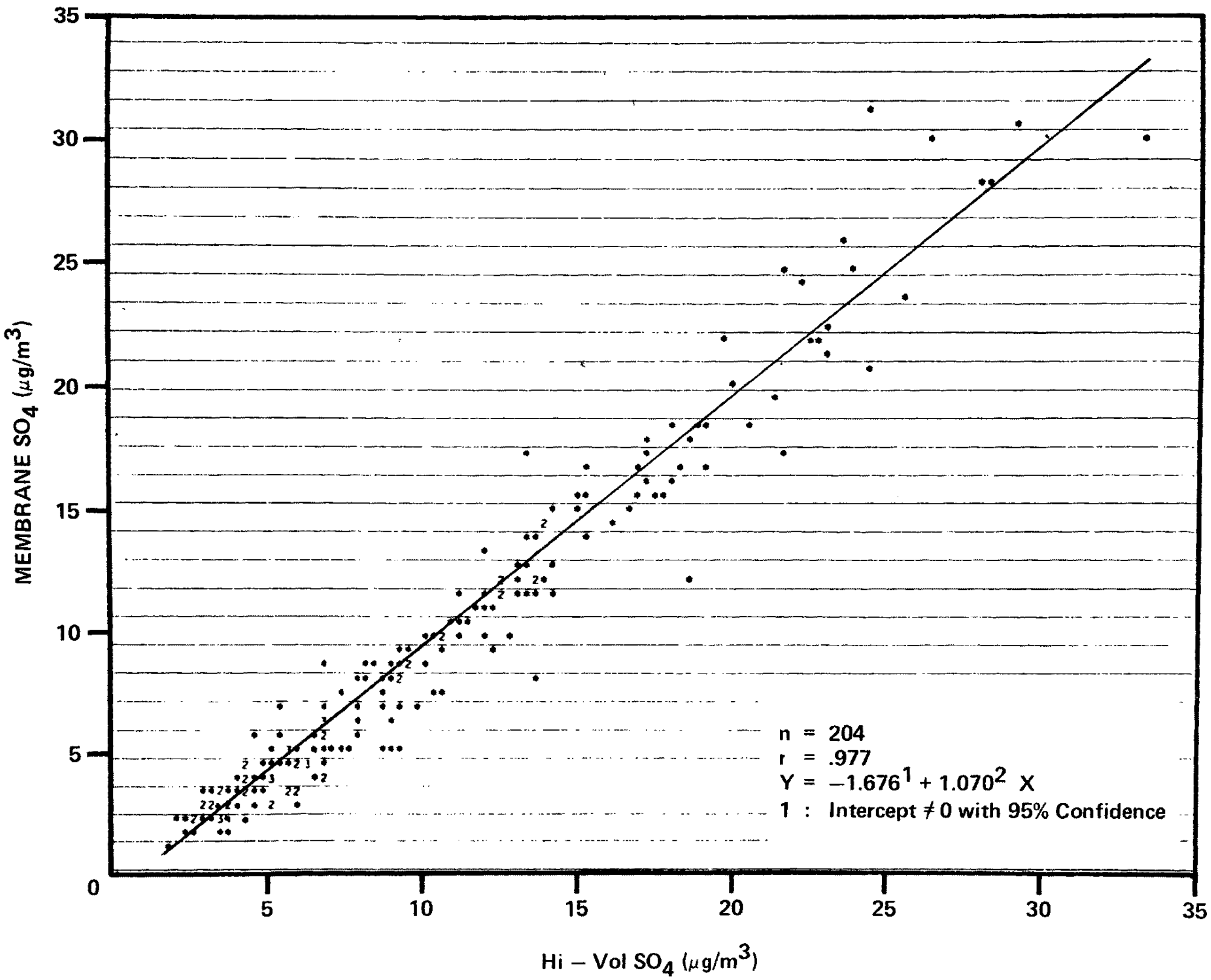


Figure 60. Membrane SO_4 vs. Hi-Vol SO_4. Site D: 0-2300 hours.

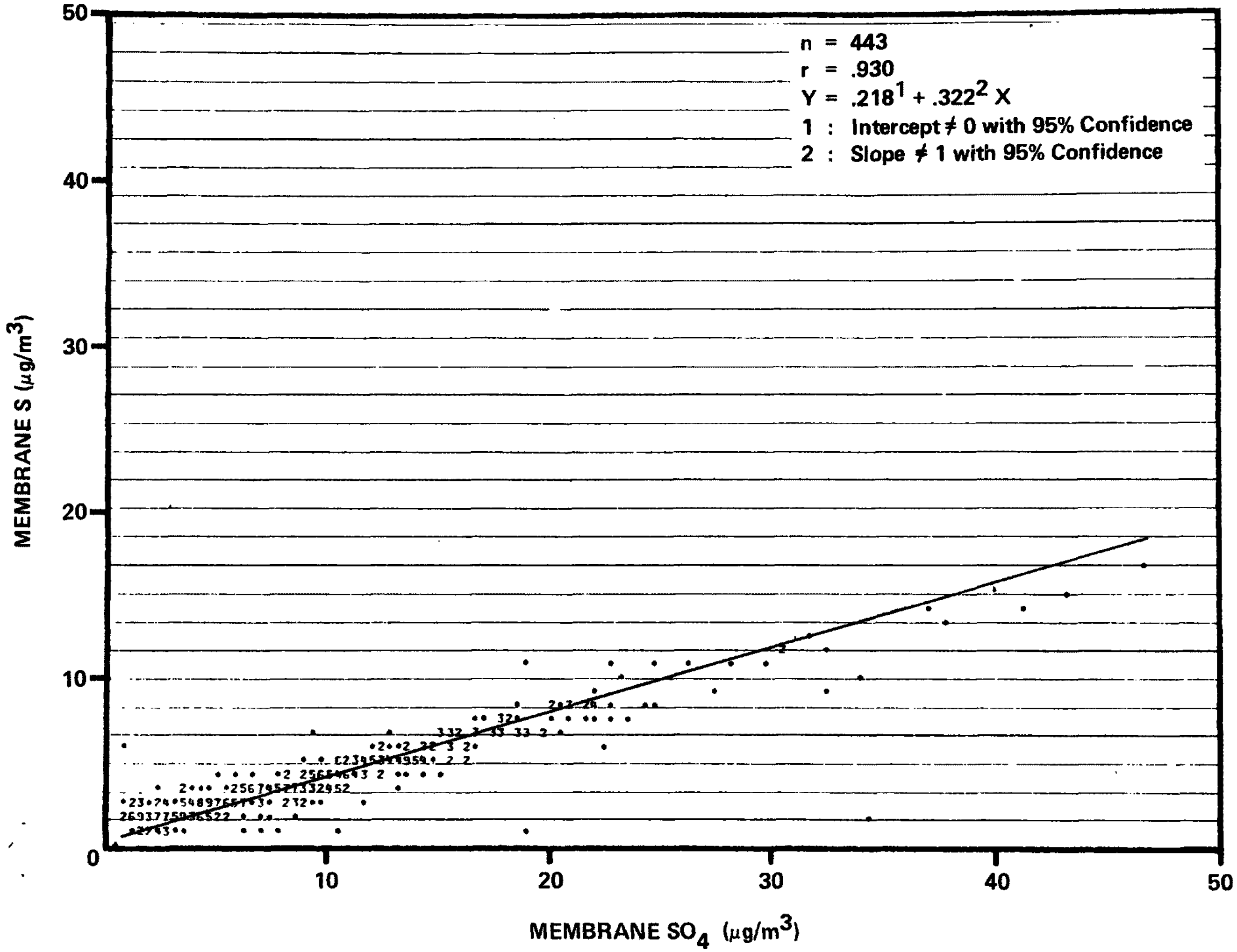


Figure 61. Membrane S vs. Membrane SO_4. Site A: 1500-1800 hours.

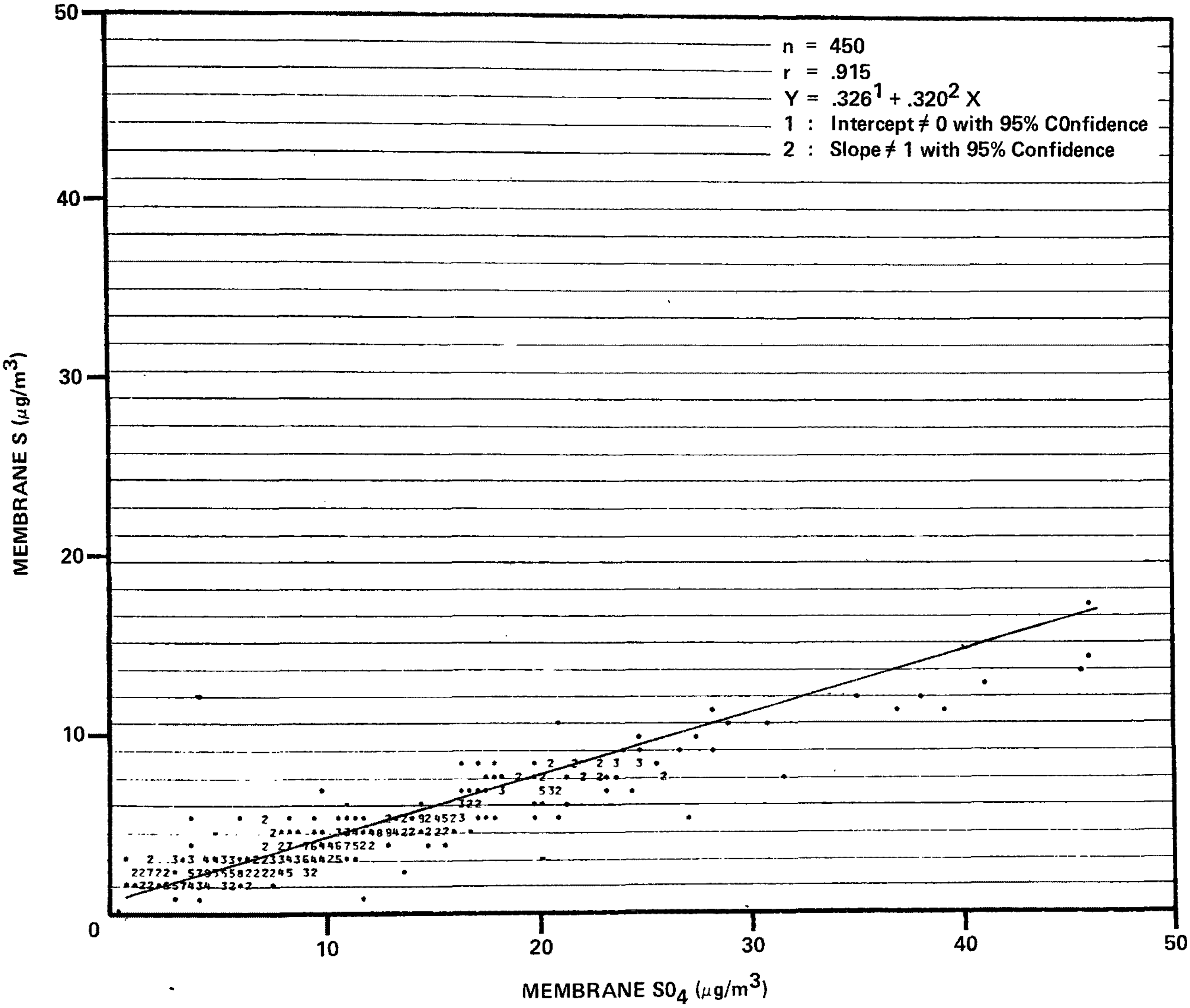


Figure 62. Membrane S vs. Membrane SO_4. Site C: 1500-1800 hours.

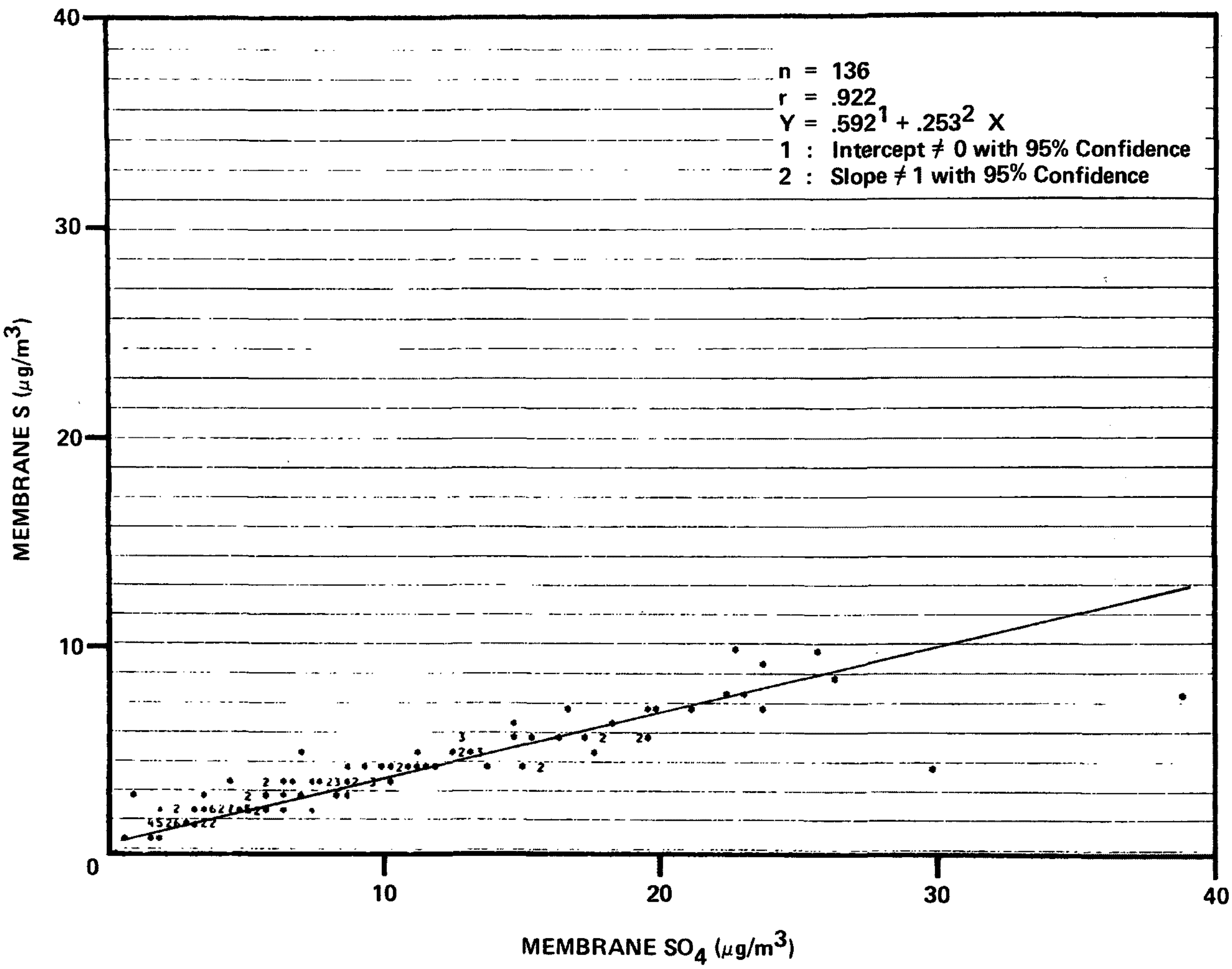


Figure 63. Membrane S vs. Membrane SO_4. Site B: 0-2300 hours.

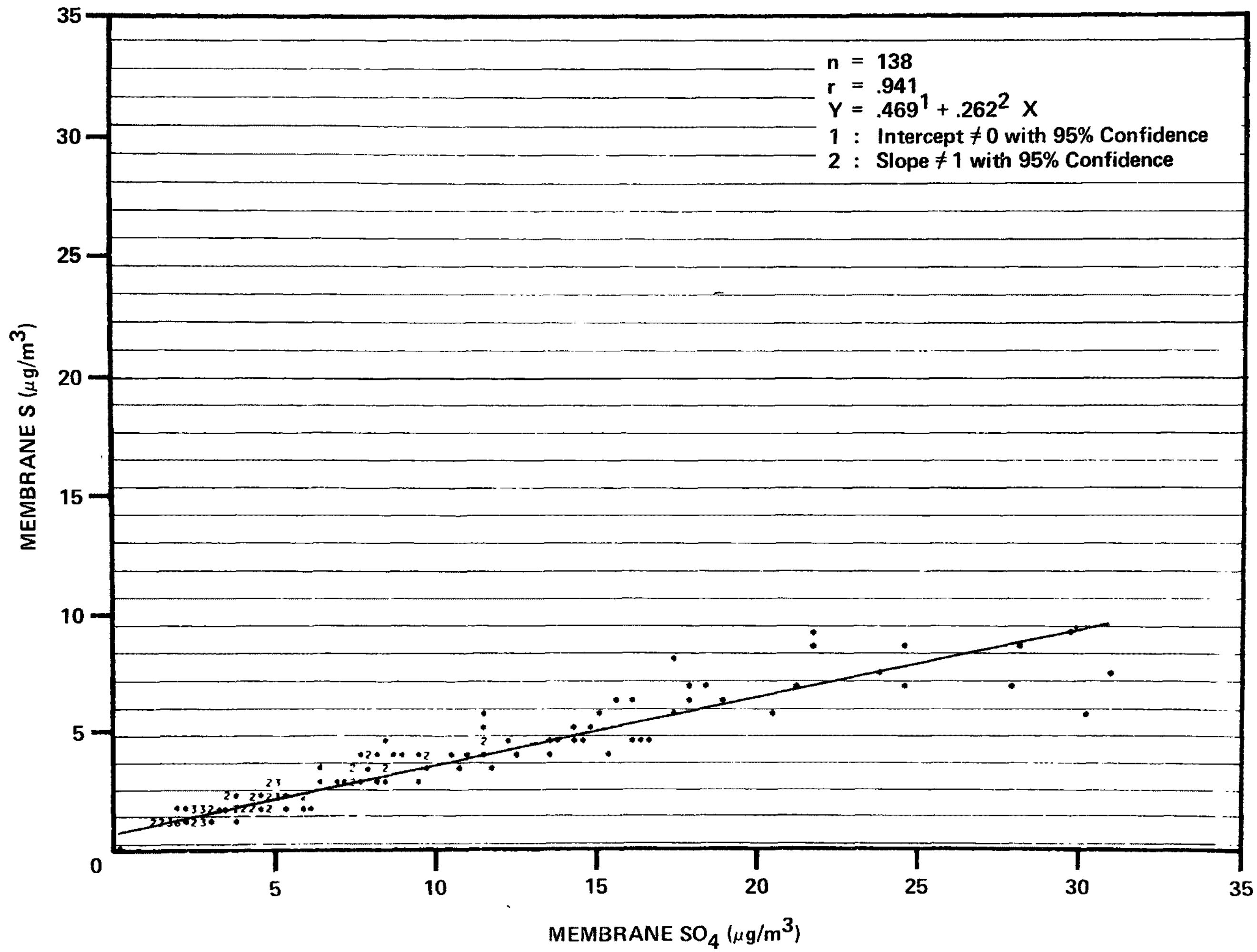


Figure 64. Membrane S vs. Membrane SO_4. Site D: 0-2300 hours.

sulfur to sulfate on a mass basis should be 1/3 (0.333) if all of the sulfur were in the form of sulfate. The slopes of the Sites A and C data (1500-1800 hours) are almost exactly this, whereas the results for 24-hour data at the other sites is significantly less than 0.333. The analyst at LBL, Mr. Robert Giaugue, noted that the difference between the data sets was not caused primarily by sulfur in a form other than sulfate, but a sampling problem that primarily affects XRF measurements. Apparently the 24-hour samples during the high humidity early morning hours cause moisture to appear on the filters which dissolves some of the $SO_4^=$ and soaks it into the filter.[9] Since XRF is a surface measurement technique, this portion of the sulfur is not measured. If penetration into the filter is prevented, the XRF sulfur values give an extremely good estimation of the total sulfate present.

The final set of plots in Figures 65, 66, 67 and 68 show the comparison of lead (Pb) with bromine(Br) at the four LACS sites. Lead in gasoline is primarily present in the form of PbBrCl, such that freshly generated auto exhaust should contain a stoichiometric ratio of Pb/Br of 2.59. It has been shown[10] that bromine is lost rapidly from the aerosol as it ages. Therefore the ratio of Pb/Br increases as the particles are transported from the source. The background measurements at Site A are not affected by the freeway emissions during the 1500-1800 hour interval. Therefore these Pb/Br ratios should be higher than those at Site C. Examination of the slopes at Sites A, B, C and D indicate the freeway influence and the effect of diluting the fresh aerosols with the background aged aerosols. The very high correlation coefficients are evidence that almost all of the Pb observed at the LACS sites are probably automobile generated.

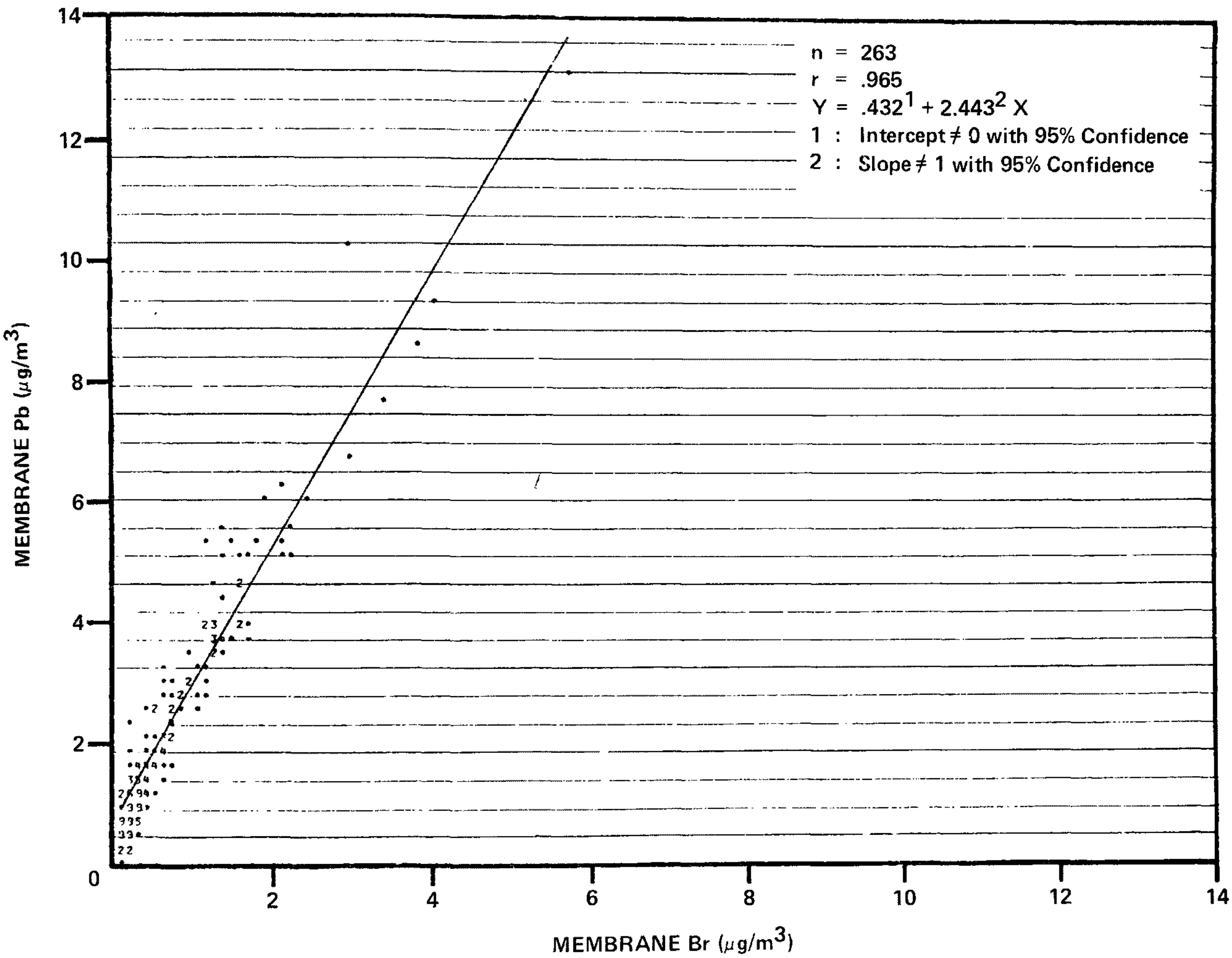


Figure 65. Membrane Pb vs. Membrane Br. Site A: 1500-1800 hours.

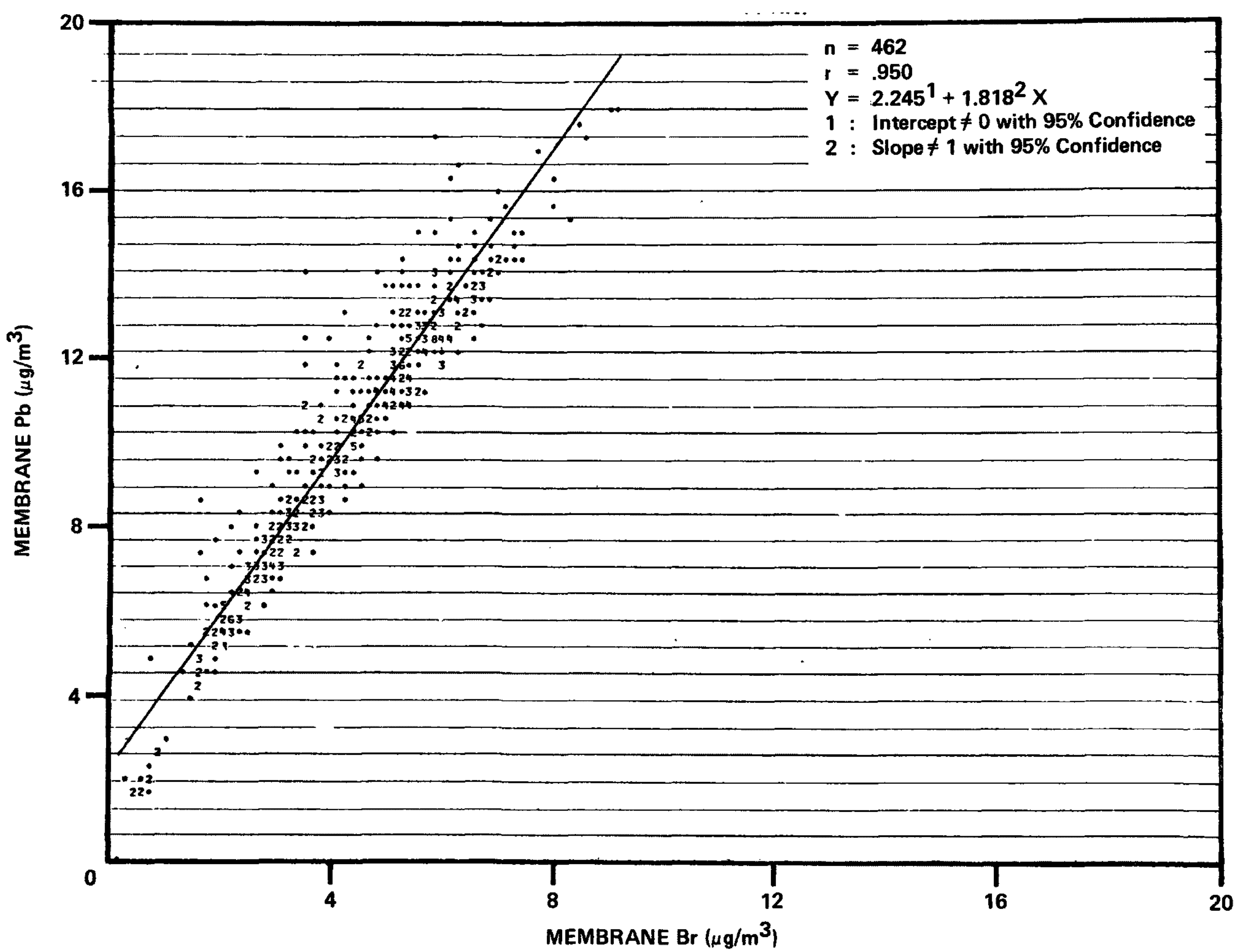


Figure 66. Membrane Pb vs. Membrane Br. Site C: 1500-1800 hours.

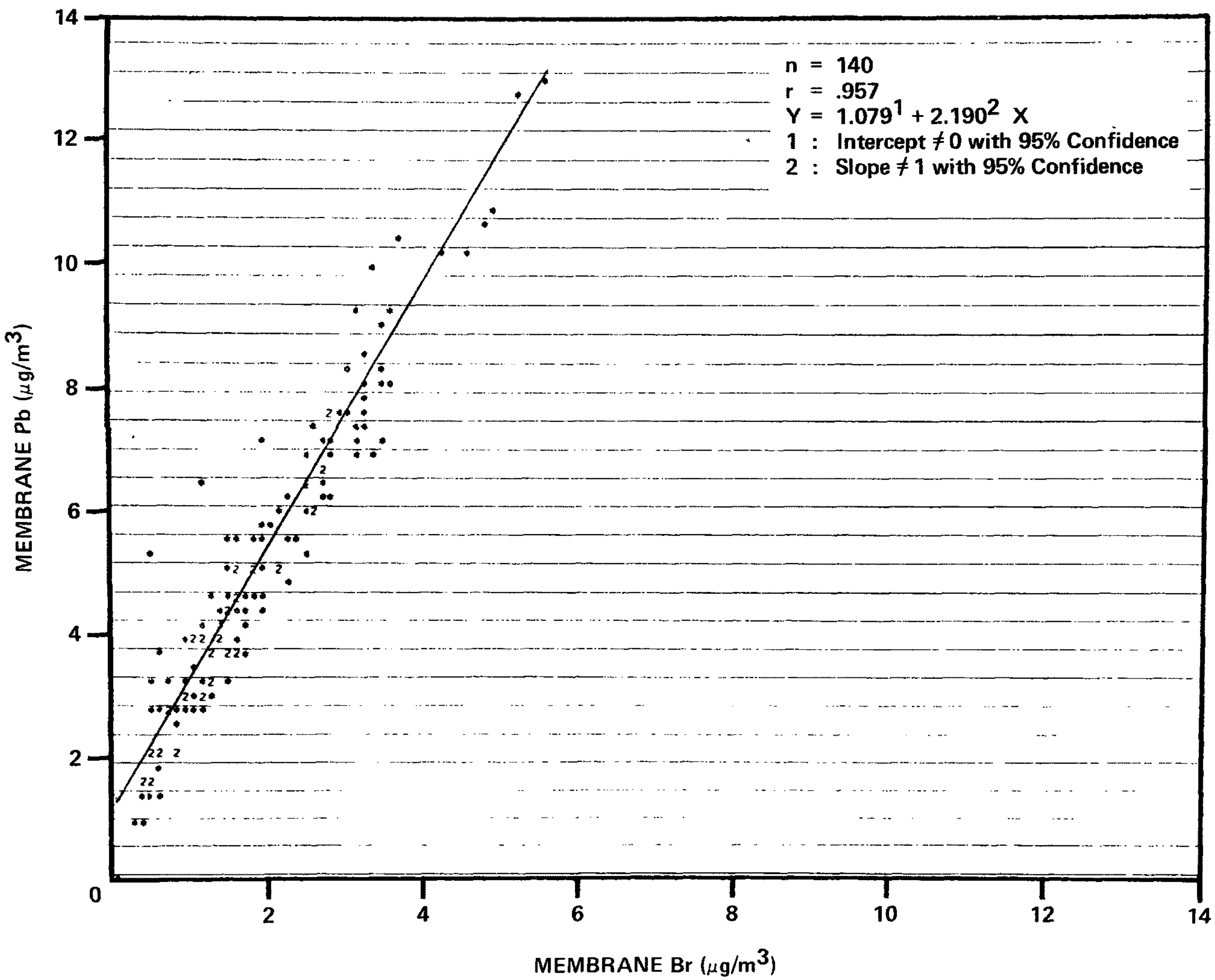


Figure 67. Membrane Pb vs. Membrane Br. Site B: 0-2300 hours.

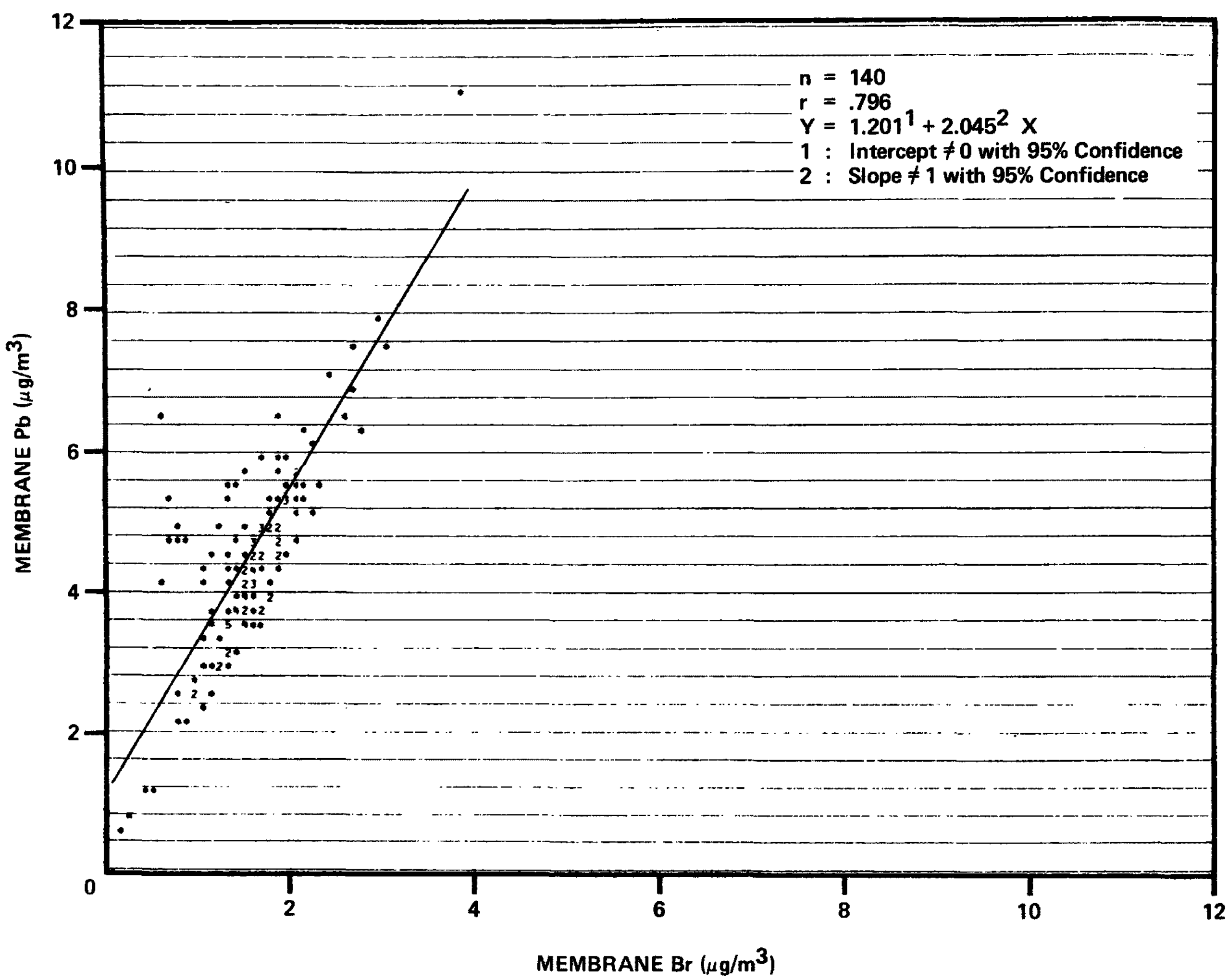


Figure 68. Membrane Pb vs. Membrane Br. Site D: 0-2300 hours.

Table 1: SUMMARY OF POLLUTANT TREND SIGNIFICANCE TESTS

0: NO SIGNIFICANT CHANGE
+: SIGNIFICANT INCREASE
–: SIGNIFICANT DECREASE

			TREND/PERIOD			
POLLUTANT	DATA BASE		74-75	75-76	76-77	OVERALL*
CO	ALL HOURS	A	0	0	0	0
		C-A	0	–	0	0
	1500-1800 Hrs	A	+	0	0	0
		C-A	+	–	0	0
NO	ALL HOURS	A		0	0	+
		C-A		0	0	0
	1500-1800 Hrs	A		0	0	0
		C-A		0	+	+
NO_2	ALL HOURS	A		0	0	0
		C-A		+	0	+
	1500-1800 Hrs	A		0	0	0
		C-A		+	+	+
O_3	ALL HOURS	A			0	
		C-A			0	0
	1500-1800 Hrs	A			0	
		C-A			0	
TSP	0 -23 HI VOL	A	0	0	0	0
		C-A	0	–	0	–
	15-18 HI VOL	A		0	0	0
		C-A		–	+	0
	15-18 MEMBRANE	A	0	0	0	–
		C-A	0	–	+	0
Pb	0 -23 HI VOL	A	0	0	0	0
		C-A	0	–	0	0
	15-18 HI VOL	A		0	0	0
		C-A		–	+	+
	15-18 MEMBRANE	A		0	–	–
		C-A		0	+	+
SO_4	0 -23 HI VOL	A	0	–	0	0
		C-A	–	+	–	–
	15-18 HI VOL	A		–	0	0
		C-A		–	0	–
	15-18 MEMBRANE	A		–	0	0
		C-A		0	0	0
NH_4	0 -23 HI VOL	A		–	0	0
		C-A		0	0	0
NO_3	0 -23 HI VOL	A	0	0	0	+
		C-A	0	0	–	–
SO_2	0 -23 BUBBLER	A	0	–	+	0
		C-A	0	0	+	0

*OVERALL: 74-77 OR 75-77

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4. "Particulate Lead Components in Automobile Exhaust Gas," D.A. Hirschler et. al., Industrial and Engineering Chemistry July 1957.
5. "Atmospheric Lead: Its Relationship to Traffic Volume and Proximity to Highways," R.N. Daines et. al, Environmental Science and Technology, April 1970.
6. "Measurements of Particulate Lead on the M4 Motorway at Horlington," M.G. Bevan et. al, Great Britain Department of the Environment, 1974.
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8. Characterization of Sulfate and Gaseous Emissions from California Consumer-Owned Catalyst Equipped Vehicles. R.J. Herling, R.D. Gafford, R.R. Carlson and A. Lyles, Olson Laboratories, final report on EPA contract 68-02-2232, 1977.
9. Private communication. Robert D. Giaugue, Lawrence Berkeley Laboratory, July 26, 1978, to Charles E. Rodes, EPA/EMSL/RTP.
10. "Bromine Loss from Automotive Particulate Associated at California Sites." R.A. Eldred, T.A. Cahill and R.G. Flocchini, University of California at Davis, presented at the 71st APCA meeting, June 25, 1978, Houston, Texas.
11. "The Evaluation of Methods for Measuring Suspended Particulates in Air," R.E. Lee, Jr., J.S. Caldwell and G.B. Morgan, Atmospheric Environment, Volume 6, pages 593-622, 1972.
12. "Aerosol Characterization of Ambient Particulate Samplers Used in Environmental Monitoring Studies"

APPENDIX

OBS	COUNT	SPEED	DENSITY	TSP	PB	CO	NO
1	50817	37.7	337	20	5.2	7.9	.282
2	51008	29.9	427	43	3.9	7.2	.309
3	44674	54.4	205	47	9.9	3.6	.401
4	49953	40.1	311	57	6.5	6.4	.310
5	51107	39.4	324	58	5.5	5.4	.356
6	51878	39.5	328	87	6.1	3.8	.439
7	44352	53.9	206	71	9.8	4.4	.501
8	49488	37.1	333	49	4.9	6.0	.330
9	49675	41.7	298	58	7.0	7.9	.444
10	49823	35.1	355	31	5.0	8.7	.219
11	43086	54.1	199	58	9.0	2.9	.370
12	39080	54.9	178	47	9.0	3.5	.324
13	50094	39.1	320	50	5.4	6.6	.295
14	50070	37.6	333	49	5.3	7.9	.144
15	42629	54.5	214	55	10.0	4.0	.492
16	49143	37.8	325	42	5.0	6.1	.340

N = 16 CORRELATION COEFFICIENTS / PROB > |R| UNDER HO: RHO=0

	COUNT	SPEED	DENSITY	TSP	PB	CO	NO
COUNT	1.000000	-.905279	.903974	-.071147	-.856827	.692257	-.375777
	.0000	.0001	.0001	.7889	.0001	.0032	.1486
SPEED	-.905279	1.000000	-.989224	.300883	.979983	-.792629	.577731
	.0001	.0000	.0001	.2566	.0001	.0004	.0182
DENSITY	.903974	-.989224	1.000000	-.276413	-.952609	.764371	-.519818
	.0001	.0001	.0000	.3005	.0001	.0008	.0372
TSP	-.071147	.300883	-.276413	1.000000	.348358	-.555248	.602959
	.7889	.2566	.3005	.0000	.1836	.0243	.0129
PB	-.856827	.979983	-.952609	.348358	1.000000	-.745468	.643074
	.0001	.0001	.0001	.1836	.0000	.0012	.0072
CO	.692257	-.792629	.764371	-.555248	-.745468	1.000000	-.620425
	.0032	.0004	.0008	.0243	.0012	.0000	.0101
NO.	-.375777	.577731	-.519818	.602959	.643074	-.620425	1.000000
	.1486	.0182	.0372	.0129	.0072	.0101	.0000

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	2571	LD	1.0	1.5	2.0	2.0	3.0	4.0	5.0	6.0	7.0	7.5	9.0	11.0	3.6	2.25	3.01	1.79
	OCT4-MAR5	3520	LD	1.5	1.5	2.0	2.5	3.0	3.5	4.5	5.5	7.0	9.0	12.5	19.0	3.7	2.55	3.06	1.86
	APR5-SEP5	4221	LD	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0	7.5	9.5	13.5	3.6	2.30	3.03	1.79
	OCT5-MAR6	2122	LD	1.5	2.0	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.5	11.0	14.5	3.8	2.35	3.26	1.76
	APR6-SEP6	4076	LD	1.5	1.5	2.0	2.0	2.6	3.5	5.0	6.0	7.0	7.5	9.0	13.0	3.5	2.20	3.01	1.77
	OCT6-MAR7	3075	LD	1.8	2.2	2.4	2.8	3.1	3.5	4.2	5.0	6.4	7.7	10.4	12.4	3.7	2.00	3.21	1.67
	APR7-SEP7	4356	.1	1.1	1.4	1.7	2.1	2.5	3.3	4.5	5.6	6.5	7.1	8.2	11.5	3.3	2.12	2.78	1.80
	OCT7-MAR8	3496	LD	1.1	1.5	1.8	2.2	2.7	3.2	3.9	4.8	6.3	7.8	10.8	14.3	3.3	2.28	2.69	1.88
	NOTINRNGE	743	.4	1.2	1.5	1.8	2.2	2.8	3.5	4.8	6.0	7.2	8.3	10.8	12.2	3.6	2.46	3.02	1.85
C - A	NOTINRNGE	0	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	743.0	743.0	743.0	.0	.00	.00	1.00

A-3 POLLUTANT-61101 Wind Speed
METHOD-11 Instrumental Spot Reading
UNITS-12 Miles/Hour
SAMPLING INTERVAL-1-01 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	OCT4-MAR5	2866	36.0	45.0	48.0	50.0	52.0	54.0	57.0	59.0	61.0	67.0	70.0	82.0	97.0	55.2	8.68	54.53	1.17
	APR5-SEP5	3638	36.0	52.0	56.0	58.0	60.0	61.0	63.0	66.0	70.0	75.0	79.0	88.0	105.0	62.6	9.31	61.94	1.16
	OCT5-MAR6	1451	40.0	50.0	53.0	55.0	57.0	59.0	62.0	65.0	69.0	74.0	77.0	87.0	93.0	60.8	9.27	60.09	1.16
	APR6-SEP6	4184	.0	55.0	59.0	61.0	63.0	65.0	67.0	70.0	74.0	79.0	83.0	92.0	106.0	65.9	10.47	65.12	1.17
	OCT6-MAR7	2480	.0	50.0	53.0	56.0	58.0	61.0	63.0	66.0	69.0	75.0	80.0	91.0	98.0	61.4	10.49	60.52	1.18
	APR7-SEP7	2245	51.0	58.0	60.0	61.0	63.0	65.0	67.0	69.0	71.0	74.0	77.0	82.0	86.0	65.5	6.48	65.20	1.10
	OCT7-MAR8	3462	45.0	54.0	56.0	58.0	60.0	61.0	63.0	66.0	69.0	74.0	79.0	86.0	91.0	62.9	7.89	62.42	1.13
	NOTINRNGE	741	46.0	52.0	55.0	56.0	58.0	59.0	62.0	64.0	67.0	70.0	72.0	76.0	79.0	60.5	6.85	60.12	1.12
LOS ANGELES																			
054180005A05	OCT6-MAR7	942	39.0	44.0	47.0	50.0	52.0	54.0	56.0	59.0	62.0	67.0	69.0	76.0	82.0	54.7	8.40	54.07	1.16
	APR7-SEP7	4273	41.0	52.0	55.0	58.0	60.0	63.0	65.0	69.0	73.0	78.0	80.0	88.0	95.0	63.9	9.60	63.24	1.16
	OCT7-MAR8	3528	40.0	50.0	52.0	55.0	57.0	58.0	60.0	62.0	66.0	72.0	76.0	83.0	90.0	59.5	8.52	58.93	1.15
	NOTINRNGE	711	39.0	47.0	50.0	52.0	54.0	56.0	58.0	61.0	63.0	67.0	68.0	72.0	75.0	56.6	7.27	56.11	1.14
C - A	OCT6-MAR7	775	15.0-	9.0-	7.0-	5.0-	2.0-	.0	1.0	2.0	2.0	4.0	5.0	6.0	9.0	1.7-	4.82	.55-	4.44
C - A	APR7-SEP7	2170	10.0-	2.0-	1.0-	.0	1.0	2.0	4.0	5.0	6.0	8.0	9.0	11.0	18.0	2.6	3.72	1.51	2.86
C - A	OCT7-MAR8	3413	17.0-	6.0-	5.0-	5.0-	4.0-	3.0-	3.0-	2.0-	1.0-	.0	1.0	4.0	14.0	3.3-	2.53	2.60-	1.98
C - A	NOTINRNGE	708	15.0-	8.0-	7.0-	5.0-	5.0-	4.0-	3.0-	2.0-	1.0-	.0	1.0	2.0	3.0	4.0-	3.07	3.15-	1.98

A-4 POLLUTANT-62101 Temperature
METHOD-11 Instrumental Spot Reading
UNITS-15 Degrees, Fahrenheit
SAMPLING INTERVAL-1-01 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	OCT4-MAR5	2692	11	32	42	52	60	67	74	79	83	87	90	94	101	63	20.7	60.35	1.37
	APR5-SEP5	3465	12	51	57	62	69	76	80	84	87	89	91	95	101	72	16.3	69.87	1.25
	OCT5-MAR6	1451	13	29	46	56	65	73	77	81	86	92	95	99	102	66	22.4	62.72	1.39
	APR6-SEP6	4141	15	44	49	54	61	66	71	74	78	81	84	88	96	64	14.7	62.05	1.26
	OCT6-MAR7	2384	11	23	31	40	50	57	65	73	79	85	89	97	1038	58	42.7	46.41	1.94
	APR7-SEP7	2244	37	64	70	76	82	87	90	93	95	98	101	104	109	83	14.0	82.01	1.18
	OCT7-MAR8	3459	12	37	49	60	68	76	83	88	92	95	98	102	113	71	22.1	67.71	1.36
	NOTINRNGE	740	35	50	55	60	68	76	80	84	86	90	92	96	99	72	15.6	70.14	1.24
LOS ANGELES																			
054180005A05	OCT6-MAR7	942	17	30	38	45	52	60	67	78	85	89	92	98	110	60	22.3	56.65	1.43
	APR7-SEP7	4267	18	51	57	62	71	79	84	88	91	95	98	104	125	75	17.9	72.82	1.27
	OCT7-MAR8	3523	12	34	48	59	67	76	85	91	94	97	99	103	109	71	23.8	67.74	1.38
	NOTINRNGE	709	31	50	58	65	74	82	89	92	95	97	99	101	107	77	18.3	75.15	1.26
C - A	OCT6-MAR7	771	949-	7-	3-	1-	1	2	3	5	7	11	13	22	45	4-	61.4	.27-	10.30
C - A	APR7-SEP7	2167	39-	17-	14-	12-	10-	8-	6-	4-	1-	4	7	14	33	7-	8.4	4.97-	2.47
C - A	OCT7-MAR8	3407	26-	8-	5-	3-	2-	0	2	4	6	10	13	17	30	0	7.0	.03	10.42
C - A	NOTINRNGE	706	9-	3-	0	2	4	5	7	8	10	13	16	21	26	5	6.1	3.54	2.48

A-5 POLLUTANT-62201 Relative Humidity
METHOD-11 Instrumental Computed (indirect)
UNITS-19 Per Cent Relative Humidity
SAMPLING INTERVAL-1-01 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	2626	LD	LD	.5	.5	1.0	1.0	1.5	2.0	3.0	4.0	5.0	6.5	10.0	1.7	1.56	1.22	2.21
	OCT4-MAR5	3426	LD	.5	1.0	1.0	1.5	2.0	3.0	3.5	5.0	6.5	8.5	12.6	20.0	3.0	2.00	2.24	2.19
	APR5-SEP5	4132	LD	.4	.5	.5	1.0	1.0	1.5	2.0	2.9	4.0	5.0	7.0	13.5	1.7	1.61	1.21	2.24
	OCT5-MAR6	2721	LD	.5	1.0	1.5	2.0	2.5	3.5	4.0	5.5	7.5	9.0	13.0	21.0	3.4	2.85	2.60	2.08
	APR6-SEP6	3419	LD	LD	.5	.5	1.0	1.0	1.5	2.3	3.0	4.5	5.5	7.7	10.1	1.8	1.73	1.32	2.23
	OCT6-MAR7	3357	LD	.7	1.2	1.6	2.1	2.7	3.5	4.4	5.6	7.4	9.1	12.7	23.4	3.5	2.82	2.74	2.03
	APR7-SEP7	4180	LD	LD	.5	.7	.9	1.2	1.5	2.0	2.7	3.6	4.4	6.5	12.7	1.6	1.44	1.24	2.13
	OCT7-MAR8	3062	LD	LD	LD	LD	LD	.4	.9	1.6	2.6	4.4	6.4	10.6	17.4	1.6	2.31	.88	2.93
	NOTINRNGE	428	LD	LD	LD	LD	LD	.7	1.1	1.6	2.2	3.0	4.2	5.6	6.2	1.2	1.34	.82	2.43
LOS ANGELES																			
054180005A05	APR4-SEP4	2773	LD	1.5	2.0	3.0	3.5	4.0	5.0	5.5	6.5	7.5	8.5	10.0	15.0	4.4	2.39	3.83	1.67
	OCT4-MAR5	2515	LD	.5	1.2	2.0	3.0	4.0	4.5	5.5	7.0	9.0	11.0	15.0	23.0	4.4	3.40	3.46	1.99
	APR5-SEP5	4208	LD	1.6	2.5	3.2	4.0	4.5	5.0	6.0	7.0	8.0	9.0	11.5	18.0	4.8	2.45	4.25	1.62
	OCT5-MAR6	2650	LD	1.0	2.0	3.0	3.5	4.5	5.0	6.0	7.0	9.0	10.5	14.0	24.0	4.8	3.11	4.04	1.81
	APR6-SEP6	3199	LD	1.4	2.0	2.6	3.5	4.0	4.5	5.0	6.0	7.4	8.5	10.4	16.4	4.2	2.33	3.62	1.69
	OCT6-MAR7	3198	LD	1.0	1.7	2.6	3.4	4.1	4.9	5.7	6.8	8.7	10.6	14.5	27.4	4.6	3.18	3.76	1.87
	APR7-SEP7	3912	LD	1.4	2.1	2.8	3.7	4.4	5.1	5.7	6.4	7.5	8.6	10.6	18.2	4.4	2.40	3.91	1.66
	OCT7-MAR8	2982	LD	.7	1.5	2.2	3.0	3.9	4.7	5.7	6.9	8.7	10.4	14.0	33.8	4.4	3.31	3.52	1.95
	NOTINRNGE	305	LD	.4	1.1	1.6	2.3	2.9	3.6	4.2	5.0	6.0	7.1	10.9	12.9	3.2	2.37	2.57	1.92
C - A	APR4-SEP4	2358	9.0-	1.0-	.0	.5	1.5	3.0	4.0	4.5	5.0	6.5	7.5	9.0	11.0	2.7	2.98	1.79	2.46
C - A	OCT4-MAR5	2312	15.0-	2.0-	1.5-	1.0-	.5-	.0	1.0	3.0	4.5	6.0	8.0	10.5	17.8	1.2	3.55	.39	4.51
C - A	APR5-SEP5	3966	7.0-	.5-	.2	1.0	2.0	3.5	4.0	4.5	5.5	6.9	7.5	9.5	12.0	3.0	2.87	2.21	2.72
C - A	OCT5-MAR6	2282	15.0-	2.0-	1.5-	.5-	.0	.5	1.5	3.5	4.5	6.0	7.5	10.5	17.5	1.4	3.47	.55	3.99
C - A	APR6-SEP6	2918	7.8-	1.4-	.5-	.0	1.0	2.5	3.5	4.0	4.9	6.0	7.0	8.8	12.3	2.3	2.94	1.41	2.68
C - A	OCT6-MAR7	3054	9.9-	2.5-	1.5-	1.0-	.5-	.0	.8	3.1	4.3	5.7	7.5	11.3	15.7	1.1	3.53	.32	4.77
C - A	APR7-SEP7	3724	6.8-	.8-	.2-	.4	1.6	3.4	4.2	4.8	5.4	6.3	7.2	9.3	14.8	2.8	2.92	1.98	2.34
C - A	OCT7-MAR8	2620	10.4-	1.6-	.2-	.9	1.8	2.6	3.7	4.6	5.8	7.5	9.0	12.4	24.1	2.9	3.61	1.80	2.64
C - A	NOTINRNGE	267	3.6-	1.6-	1.0-	.5-	.1	1.3	2.5	3.5	4.3	5.7	7.1	8.8	12.6	1.7	2.97	.88	3.21

A-6 POLLUTANT-42101 Carbon Monoxide
METHOD-11 Instrumental Nondespersive Infra-red
UNITS-07 Parts Per Million
SAMPLING INTERVAL-1-01 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA LOS ANGELES																			
054180003A05	OCT4-MAR5	921	LD	LD	LD	LD	.040	.090	.140	.180	.250	.370	.460	.700	.930	.140	.1616	.09	2.51
	APR5-SEP5	3548	LD	LD	LD	LD	LD	LD	LD	.039	.110	.225	.310	.460	.760	.062	.1071	.03	3.25
	OCT5-MAR6	2873	LD	LD	LD	.010	.050	.100	.170	.220	.310	.430	.520	.740	3.300	.165	.1907	.11	2.52
	APR6-SEP6	3550	LD	LD	LD	LD	LD	.010	.040	.100	.160	.230	.290	.400	.550	.076	.1025	.04	2.79
	OCT6-MAR7	3366	LD	LD	LD	.011	.071	.134	.190	.259	.345	.474	.588	.770	1.041	.186	.1974	.13	2.38
	APR7-SEP7	4122	LD	LD	LD	LD	LD	LD	.038	.099	.163	.251	.311	.430	.789	.078	.1096	.05	2.84
	OCT7-MAR8	3379	LD	LD	LD	.020	.066	.114	.164	.222	.287	.399	.496	.688	.968	.160	.1678	.11	2.37
	NOTINRNGE	724	LD	LD	LD	LD	LD	.031	.079	.133	.189	.264	.349	.458	.579	.094	.1176	.06	2.64
LOS ANGELES																			
054180005A05	OCT4-MAR5	1200	LD	.040	.090	.120	.170	.225	.300	.390	.475	.550	.590	.690	.850	.269	.1912	.22	1.90
	APR5-SEP5	3890	LD	.015	.030	.042	.060	.120	.205	.310	.390	.460	.515	.590	.720	.192	.1795	.14	2.21
	OCT5-MAR6	2736	LD	.030	.070	.110	.160	.220	.300	.360	.430	.505	.570	.700	7.350	.253	.2287	.19	2.16
	APR6-SEP6	3539	LD	.040	.071	.110	.170	.230	.280	.330	.380	.432	.470	.580	5.349	.245	.2696	.16	2.44
	OCT6-MAR7	3410	LD	.028	.073	.115	.160	.216	.281	.354	.430	.508	.575	.686	.835	.249	.1817	.20	1.92
	APR7-SEP7	4227	LD	.058	.096	.135	.209	.298	.367	.401	.444	.495	.542	.625	.756	.280	.1706	.24	1.75
	OCT7-MAR8	3316	LD	.030	.068	.109	.151	.204	.275	.366	.447	.531	.595	.728	1.006	.252	.1929	.20	1.97
	NOTINRNGE	684	LD	.042	.084	.123	.167	.251	.335	.407	.468	.522	.575	.633	.746	.273	.1865	.23	1.86
C - A	OCT4-MAR5	881	.540-	.190-	.120-	.070-	.030-	.020	.150	.335	.450	.510	.560	.650	.760	.117	.2776	.05	3.95
C - A	APR5-SEP5	3308	.740-	.147-	.035-	.009	.035	.050	.150	.290	.380	.460	.510	.590	.720	.131	.2321	.06	3.30
C - A	OCT5-MAR6	2596	2.810-	.230-	.145-	.085-	.040-	.020	.130	.290	.390	.480	.550	.665	7.310	.094	.3158	.03	4.87
C - A	APR6-SEP6	3384	.420-	.140-	.077-	.010-	.075	.191	.249	.320	.370	.430	.470	.560	5.349	.166	.2922	.08	3.29
C - A	OCT6-MAR7	3272	.641-	.256-	.178-	.120-	.069-	.016-	.066	.251	.380	.477	.540	.640	.799	.062	.2856	.01	5.83
C - A	APR7-SEP7	3993	.514-	.138-	.074-	.003	.106	.257	.341	.391	.438	.490	.533	.616	.740	.198	.2482	.12	2.64
C - A	OCT7-MAR8	3189	.598-	.206-	.141-	.094-	.049-	.002-	.085	.282	.414	.512	.578	.696	.821	.095	.2816	.03	4.53
C - A	NOTINRNGE	664	.346-	.155-	.098-	.050-	.000	.125	.306	.397	.460	.517	.570	.628	.714	.171	.2706	.09	3.07

A-7 POLLUTANT-42601 Nitric Oxide
METHOD-14 Instrumental Chemiluminescence
UNITS-07 Parts Per Million
SAMPLING INTERVAL-1-01 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA LOS ANGELES																			
054180003A05	OCT4-MAR5	1673	LD	.015	.025	.035	.040	.045	.050	.060	.075	.095	.125	.210	.355	.054	.0410	.04	1.97
	APR5-SEP5	3801	LD	.010	.015	.020	.025	.035	.040	.045	.055	.065	.085	.125	.275	.037	.0266	.03	1.91
	OCT5-MAR6	2859	LD	.020	.030	.040	.045	.050	.055	.065	.080	.095	.120	.185	.280	.056	.0347	.05	1.77
	APR6-SEP6	3546	LD	.010	.010	.015	.023	.030	.038	.045	.053	.065	.080	.130	.240	.035	.0270	.03	1.98
	OCT6-MAR7	3424	LD	.019	.032	.040	.045	.051	.059	.069	.082	.101	.122	.187	.335	.058	.0358	.05	1.77
	APR7-SEP7	4184	LD	.010	.013	.019	.025	.033	.040	.047	.055	.069	.083	.136	.248	.037	.0274	.03	1.94
	OCT7-MAR8	3223	LD	.020	.031	.037	.043	.049	.056	.067	.083	.106	.133	.200	.354	.059	.0383	.05	1.82
	NOTINRNGE	725	LD	LD	.014	.021	.031	.038	.043	.050	.058	.069	.079	.101	.143	.038	.0240	.03	1.78
LOS ANGELES																			
054180005A05	OCT4-MAR5	1568	LD	.020	.025	.030	.035	.040	.050	.055	.075	.105	.140	.210	.270	.053	.0405	.04	1.98
	APR5-SEP5	4098	LD	.030	.035	.035	.040	.045	.050	.060	.070	.090	.100	.140	.240	.053	.0260	.05	1.59
	OCT5-MAR6	2794	LD	.025	.030	.035	.045	.050	.060	.070	.090	.115	.145	.210	.340	.063	.0422	.05	1.85
	APR6-SEP6	3499	LD	.033	.040	.045	.049	.054	.060	.065	.080	.100	.125	.198	.280	.061	.0326	.05	1.65
	OCT6-MAR7	3465	LD	.031	.038	.045	.052	.059	.067	.079	.097	.128	.157	.213	.324	.070	.0422	.06	1.75
	APR7-SEP7	4275	.016	.035	.042	.047	.053	.059	.066	.076	.091	.116	.140	.206	.405	.069	.0373	.06	1.66
	OCT7-MAR8	3398	LD	.025	.031	.035	.041	.049	.058	.069	.087	.122	.156	.228	.338	.063	.0448	.05	1.90
	NOTINRNGE	729	.014	.028	.034	.038	.042	.046	.050	.055	.065	.088	.108	.141	.167	.052	.0250	.05	1.57
C - A	OCT4-MAR5	1407	.140-	.025-	.020-	.015-	.010-	.005-	.000	.010	.020	.035	.050	.095	.124	.001-	.0284	.00	14.79
C - A	APR5-SEP5	3533	.165-	.020-	.015-	.010-	.000	.015	.025	.035	.045	.060	.070	.095	.130	.016	.0339	.01	3.71
C - A	OCT5-MAR6	2568	.225-	.025-	.020-	.015-	.010-	.005-	.000	.013	.030	.055	.075	.125	.205	.005	.0373	.00	7.85
C - A	APR6-SEP6	3342	.118-	.015-	.006-	.000	.005	.020	.035	.045	.055	.075	.094	.149	.213	.025	.0393	.01	3.03
C - A	OCT6-MAR7	3383	.244-	.021-	.014-	.010-	.006-	.002-	.004	.016	.042	.068	.097	.149	.223	.012	.0419	.00	5.05
C - A	APR7-SEP7	4111	.099-	.010-	.004-	.001	.009	.025	.040	.051	.066	.088	.107	.149	.339	.032	.0422	.02	2.73
C - A	OCT7-MAR8	3092	.102-	.032-	.021-	.015-	.011-	.007-	.002-	.009	.031	.062	.091	.143	.196	.005	.0411	.00	8.14
C - A	NOTINRNGE	710	.046-	.021-	.017-	.012-	.006-	.002	.017	.032	.043	.058	.079	.115	.143	.013	.0341	.00	4.18

A-8 POLLUTANT-42602 Nitrogen Dioxide
METHOD -14 Instrumental Chemiluminescence
UNITS-07 Parts Per Million
SAMPLING INTERVAL -1-01 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	OCT5-MAR6	1726	LD	LD	LD	LD	LD	LD	.010	.020	.035	.060	.090	.130	.255	.022	.0298	.01	2.81
	APR6-SEP6	3112	LD	LD	LD	LD	.010	.021	.035	.045	.060	.090	.110	.178	.305	.036	.0395	.02	2.45
	OCT6-MAR7	3464	LD	LD	LD	LD	LD	LD	LD	.020	.044	.075	.115	.238	.616	.027	.0513	.01	3.41
	APR7-SEP7	4206	LD	LD	LD	LD	LD	.023	.039	.054	.069	.094	.119	.180	.487	.039	.0428	.03	2.45
	OCT7-MAR8	3308	LD	LD	LD	LD	LD	LD	LD	.014	.034	.064	.092	.148	.214	.021	.0315	.01	2.97
	NOTINRNGE	723	LD	LD	LD	LD	LD	.011	.025	.038	.046	.066	.084	.129	.150	.026	.0286	.02	2.43
LOS ANGELES																			
054180005A05	OCT5-MAR6	1650	LD	LD	LD	LD	LD	LD	LD	.010	.015	.025	.035	.045	.055	.010	.0098	.01	2.22
	APR6-SEP6	3309	LD	LD	LD	LD	LD	LD	LD	.010	.015	.020	.030	.048	.141	.010	.0098	.01	2.27
	OCT6-MAR7	3394	LD	LD	LD	LD	LD	LD	LD	LD	.011	.020	.028	.042	.072	.009	.0085	.01	2.26
	APR7-SEP7	4317	LD	LD	LD	LD	LD	LD	LD	LD	.013	.019	.026	.045	.170	.009	.0093	.01	2.32
	OCT7-MAR8	3300	LD	LD	LD	LD	LD	LD	LD	LD	.012	.019	.025	.040	.157	.009	.0079	.01	2.20
	NOTINRNGE	585	LD	LD	LD	LD	LD	LD	LD	.010	.014	.019	.023	.034	.040	.009	.0070	.01	2.00
C - A	OCT5-MAR6	1532	.205-	.050-	.030-	.015-	.000	.000	.000	.000	.005	.015	.025	.035	.045	.011-	.0285	.00	4.22
C - A	APR6-SEP6	2928	.265-	.072-	.050-	.039-	.030-	.015-	.002-	.000	.000	.005	.010	.025	.040	.026-	.0356	.02-	2.79
C - A	OCT6-MAR7	3359	.588-	.066-	.037-	.010-	.001-	.000	.000	.001	.003	.010	.017	.028	.058	.018-	.0499	.01-	4.33
C - A	APR7-SEP7	4170	.317-	.079-	.058-	.045-	.033-	.017-	.004-	.000	.000	.001	.003	.013	.057	.030-	.0375	.02-	2.66
C - A	OCT7-MAR8	3099	.185-	.055-	.029-	.007-	.001-	.000	.000	.001	.002	.009	.015	.023	.040	.013-	.0304	.00	3.99
C - A	NOTINRNGE	564	.123-	.048-	.037-	.029-	.018-	.004-	.001-	.000	.002	.005	.013	.022	.031	.016-	.0251	.01-	3.04

A-9 POLLUTANT-44201 Ozone
METHOD-11 Instrumental Chemiluminescence
UNITS-07 Parts Per Million
SAMPLING INTERVAL-1-01 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	115	37	51	57	63	68	74	77	85	94	108	116	151	164	77	23.8	73.91	1.35
	OCT4-MAR5	139	28	46	57	63	68	72	80	97	108	128	154	228	280	84	39.9	76.31	1.57
	APR5-SEP5	161	LD	47	60	65	69	78	81	88	94	109	121	144	203	77	27.2	73.12	1.41
	OCT5-MAR6	112	20	34	60	69	77	90	96	100	114	126	138	192	206	87	34.7	80.48	1.47
	APR6-SEP6	173	18	35	45	55	62	70	75	83	91	100	111	120	147	69	24.8	65.12	1.42
	OCT6-MAR7	136	LD	47	60	70	82	86	91	97	110	123	127	143	155	85	28.9	80.45	1.39
	APR7-SEP7	104	23	52	58	67	75	81	85	92	100	118	137	144	159	82	26.3	78.21	1.37
	NOTINRNGE	2	29	29	29	29	29	29	29	29	39	39	39	39	39	34	7.1	33.29	1.23
LOS ANGELES																			
054180005A05	APR4-SEP4	113	71	82	89	97	106	111	116	122	132	147	161	180	191	113	26.0	10.15	1.25
	OCT4-MAR5	143	30	58	71	77	84	94	104	119	134	158	176	227	232	102	40.1	95.46	1.46
	APR5-SEP5	175	36	81	92	102	108	114	123	132	137	156	168	198	223	117	31.3	13.10	1.30
	OCT5-MAR6	118	20	54	62	77	92	102	112	125	132	143	162	234	239	102	39.7	95.52	1.45
	APR6-SEP6	171	18	62	79	88	92	100	107	117	125	141	150	166	189	102	29.8	97.43	1.33
	OCT6-MAR7	139	23	68	78	84	93	103	108	121	131	148	158	191	202	105	31.5	.38	1.34
	APR7-SEP7	103	50	69	80	83	87	94	99	106	113	132	146	166	193	98	26.0	94.79	1.30
	NOTINRNGE	5	49	49	49	58	58	62	62	70	70	105	105	105	105	69	21.6	65.64	1.36
C - A	APR4-SEP4	82	19-	18	25	27	31	35	38	41	47	54	57	59	63	35	14.6	31.89	1.50
C - A	OCT4-MAR5	127	121-	4-	7	10	13	15	19	23	28	35	45	88	118	16	23.7	8.89	2.95
C - A	APR5-SEP5	143	69-	12	21	25	29	36	43	47	59	72	101	150	183	40	31.6	31.60	2.00
C - A	OCT5-MAR6	100	30-	5-	0	6	9	12	16	20	26	33	50	99	139	16	22.9	9.09	2.88
C - A	APR6-SEP6	162	45-	8	14	21	25	30	33	39	48	57	68	80	100	32	21.0	26.29	1.83
C - A	OCT6-MAR7	133	47-	6-	0	4	10	15	20	27	37	51	61	107	150	20	26.3	11.69	2.76
C - A	APR7-SEP7	94	41-	11-	1-	5	11	17	21	27	35	43	52	62	89	17	21.8	10.41	2.68
C - A	NOTINRNGE	2	20	20	20	20	20	20	20	20	23	23	23	23	23	22	2.1	21.40	1.10

A-10 POLLUTANT-11101 Suspended Part.
METHOD-91 Hi-Vol Gravimetric
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL-7-24 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	3	74	74	74	74	74	39	39	39	39	95	95	95	95	69	28.3	64.20	1.48
	OCT4-MAR5	102	LD	34	50	62	70	77	89	107	126	164	196	220	266	90	50.4	78.75	1.68
	APR5-SEP5	173	8	42	55	63	69	77	85	93	10H	113	127	180	298	80	36.0	73.10	1.53
	OCT5-MAR6	122	16	35	46	64	77	86	94	105	120	166	231	268	347	95	58.3	81.45	1.76
	APR6-SEP6	173	10	26	42	54	66	72	80	87	100	117	126	162	196	73	34.3	66.27	1.56
	OCT6-MAR7	138	19	39	53	65	77	91	99	113	129	145	157	183	185	91	40.4	83.45	1.53
	APR7-SEP7	109	15	38	50	61	70	78	87	94	105	123	135	240	369	83	44.0	73.22	1.65
	OCT7-MAR8	66	11	23	31	43	51	66	84	93	104	123	204	232	248	77	53.9	62.90	1.88
	NOTINRNGE	4	17	17	17	17	17	17	17	33	33	38	38	38	38	26	10.9	24.25	1.49
LOS ANGELES																			
054180005A05	APR4-SEP4	3	106	106	106	106	106	120	120	120	120	126	126	126	126	117	10.3	16.89	1.09
	OCT4-MAR5	48	LD	75	93	105	116	128	134	170	191	222	253	279	279	141	60.4	29.19	1.51
	APR5-SEP5	172	58	100	116	125	132	137	146	156	168	188	201	236	255	142	35.1	37.72	1.28
	OCT5-MAR6	119	32	82	95	109	119	129	140	152	168	197	235	268	278	136	47.7	28.50	1.41
	APR6-SEP6	172	29	80	93	102	112	116	121	132	142	160	169	217	227	119	31.9	14.57	1.30
	OCT6-MAR7	147	43	77	91	102	111	124	131	143	155	173	187	217	221	124	37.2	19.25	1.34
	APR7-SEP7	108	LD	94	109	117	129	135	142	151	159	184	211	296	623	142	61.2	30.46	1.51
	OCT7-MAR8	62	LD	60	88	103	115	130	139	151	167	196	236	274	303	132	58.4	21.11	1.52
	NOTINRNGE	5	72	72	72	91	91	109	109	109	109	150	150	150	150	106	28.9	2.48	1.31
C - A	APR4-SEP4	3	32	32	32	32	32	81	81	81	81	31	31	31	31	48	28.6	41.24	1.73
C - A	OCT4-MAR5	47	101-	7	32	33	43	52	55	57	63	74	109	133	133	47	36.9	36.54	2.01
C - A	APR5-SEP5	164	189-	40	50	56	60	62	67	74	80	91	102	114	140	62	35.6	53.42	1.71
C - A	OCT5-MAR6	118	220-	4	32	37	44	48	54	59	68	78	87	97	122	43	43.1	29.93	2.32
C - A	APR6-SEP6	165	25-	28	34	37	40	44	47	51	57	64	73	88	123	44	19.7	40.39	1.53
C - A	OCT6-MAR7	137	90-	3-	16	22	34	39	42	48	53	63	70	107	163	34	30.8	24.96	2.18
C - A	APR7-SEP7	102	211-	30	37	47	53	57	60	65	71	83	102	171	498	59	58.4	41.95	2.29
C - A	OCT7-MAR8	58	58-	4-	34	45	50	60	64	68	71	89	99	143	221	54	42.2	42.11	2.00
C - A	NOTINRNGE	4	53	53	53	53	55	55	55	76	76	92	92	92	92	69	18.5	66.64	1.30

A-11 POLLUTANT-11101 Suspended Part.
METHOD-91 Hi-Vol Gravimetric
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL-3-04 Hour Data

																ARITHMETIC		GEOMETRIC	
	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	MEAN	STD	MEAN	STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	12	29	29	64	95	99	116	119	143	168	166	166	286	286	125	65.2	10.46	1.64
	OCT4-MAR5	34	LD	LD	LD	36	78	87	101	120	125	170	197	291	291	89	72.4	69.54	2.03
	APR5-SEP5	60	LD	21	57	73	83	98	107	125	139	150	178	191	193	96	47.8	86.37	1.60
	OCT5-MAR6	39	8	35	54	58	64	78	82	93	122	143	199	334	334	91	62.7	75.06	1.86
	APR6-SEP6	152	3	23	36	51	60	72	81	93	107	126	144	190	212	75	41.1	65.38	1.67
	OCT6-MAR7	120	LD	28	45	58	64	71	82	102	124	173	207	233	276	88	55.0	74.32	1.78
	APR7-SEP7	165	LD	6	21	30	39	52	59	69	81	97	109	120	138	52	33.2	43.43	1.80
	OCT7-MAR8	65	LD	12	19	32	44	57	68	75	92	121	169	174	203	62	45.7	49.80	1.93
	NOTINRNGE	8	LD	LD	LD	LD	LD	6	7	84	84	91	93	93	93	35	44.9	21.84	2.67
LOS ANGELES																			
054180005A05	APR4-SEP4	12	24	24	138	180	180	192	218	219	224	228	228	294	294	189	66.3	78.52	1.41
	OCT4-MAR5	42	LD	LD	LD	39	100	119	137	162	180	227	264	552	552	125	111.8	92.97	2.15
	APR5-SEP5	61	LD	75	101	120	130	142	152	164	178	187	218	304	601	147	80.2	28.72	1.67
	OCT5-MAR6	41	LD	51	79	90	102	110	119	130	155	181	225	279	279	118	54.2	7.28	1.55
	APR6-SEP6	156	3	42	59	69	88	95	105	118	128	151	181	227	326	98	48.9	87.89	1.60
	OCT6-MAR7	125	11	49	74	86	99	108	131	146	169	189	234	262	315	119	58.1	6.64	1.59
	APR7-SEP7	167	4	51	71	79	89	95	103	113	124	139	150	168	294	97	36.6	90.90	1.44
	OCT7-MAR8	62	LD	39	55	75	85	102	115	125	144	181	191	271	493	109	72.9	90.71	1.84
	NOTINRNGE	8	36	36	40	40	50	61	123	150	150	157	169	169	169	98	57.0	84.99	1.71
C - A	APR4-SEP4	11	95-	95-	14	22	67	75	93	116	120	129	129	150	150	70	69.1	49.43	2.29
C - A	OCT4-MAR5	33	291-	78-	0	0	12	29	33	44	76	173	180	456	456	44	125.0	14.86	4.39
C - A	APR5-SEP5	60	140-	3	22	33	39	45	51	57	63	87	121	229	423	51	69.2	29.85	2.79
C - A	OCT5-MAR6	38	84-	16-	14	19	25	29	37	43	45	59	82	120	120	29	36.6	17.62	2.68
C - A	APR6-SEP6	144	156-	20-	6	12	22	27	32	39	53	69	85	123	212	28	39.0	16.21	2.83
C - A	OCT6-MAR7	115	218-	42-	6-	16	29	39	46	58	70	102	114	189	257	33	63.5	15.07	3.48
C - A	APR7-SEP7	154	60-	27	32	38	44	48	53	58	63	76	84	92	201	49	25.0	43.41	1.62
C - A	OCT7-MAR8	58	26-	0	21	29	40	43	51	57	64	83	119	146	392	50	56.0	33.53	2.46
C - A	NOTINRNGE	7	36	36	36	39	40	44	44	54	59	59	64	64	64	48	10.9	46.80	1.25

A-12 POLLUTANT-11101 Suspended Part.
METHOD-92 Membrane Sampler Gravimetric
UNITS-01 UG/CU Meter (25C)
SAMPLING INTERVAL-3-04 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	115	.20	.70	1.00	1.50	2.00	2.30	2.70	3.30	3.70	4.60	5.60	7.50	9.20	2.55	1.639	2.15	1.80
	OCT4-MAR5	139	LD	2.00	2.80	3.30	4.10	4.60	5.00	5.50	6.10	7.10	7.80	9.60	13.90	4.59	2.069	4.18	1.54
	APR5-SEP5	160	LD	.60	.90	1.30	1.70	2.10	2.50	3.20	3.80	4.90	5.40	6.10	7.20	2.42	1.680	2.02	1.82
	OCT5-MAR6	112	.60	1.80	2.60	3.10	3.40	3.80	4.30	5.00	5.70	6.60	7.10	8.30	8.30	4.12	1.737	3.80	1.50
	APR6-SEP6	168	.20	.70	1.10	1.60	1.90	2.30	2.60	3.00	3.50	4.00	4.50	5.40	7.20	2.37	1.282	2.09	1.66
	OCT6-MAR7	136	LD	2.80	3.60	4.30	4.80	5.30	5.80	6.70	7.50	8.20	8.90	9.80	11.20	5.45	2.200	5.05	1.47
	APR7-SEP7	104	.30	1.00	1.90	2.10	2.60	2.80	3.10	3.80	4.20	4.60	5.30	5.70	6.40	2.95	1.354	2.69	1.65
	NOTINRNGE	2	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	3.50	3.50	3.50	3.50	3.50	2.65	1.202	2.41	1.64
LOS ANGELES																			
054180005A05	APR4-SEP4	113	3.00	5.80	6.50	7.20	7.90	8.40	8.90	9.20	9.90	10.70	11.20	12.00	12.20	8.24	1.893	8.03	1.25
	OCT4-MAR5	142	.40	3.20	4.70	5.20	5.70	6.40	7.00	7.40	8.20	9.20	10.00	12.60	14.70	6.34	2.399	5.93	1.44
	APR5-SEP5	175	2.00	5.80	6.40	6.90	7.40	7.70	8.10	8.50	9.10	9.80	10.30	11.00	11.50	7.74	1.639	7.57	1.23
	OCT5-MAR6	118	1.10	3.20	4.10	4.70	5.20	5.60	6.30	6.90	7.40	8.40	8.90	10.30	11.50	5.77	2.024	5.45	1.41
	APR6-SEP6	164	1.50	4.70	5.30	5.60	6.00	6.30	6.70	7.20	7.70	8.20	8.80	9.90	22.50	6.52	1.919	6.26	1.33
	OCT6-MAR7	139	1.30	4.80	5.80	6.60	7.10	7.70	8.00	8.60	9.10	9.60	10.20	11.60	11.60	7.42	2.026	7.16	1.31
	APR7-SEP7	103	LD	6.00	6.50	7.00	7.30	7.60	7.90	8.30	8.70	9.20	9.80	10.60	12.10	7.54	1.643	7.37	1.24
	NOTINRNGE	5	5.50	5.50	5.50	5.60	5.60	6.30	6.30	6.50	6.50	7.10	7.10	7.10	7.10	6.20	.663	6.16	1.11
C - A	APR4-SEP4	82	.70-	2.50	3.60	4.40	5.10	5.90	6.80	7.30	8.10	8.70	9.70	10.70	11.10	5.86	2.453	5.41	1.49
C - A	OCT4-MAR5	127	5.50-	.80-	.10-	.40	1.00	1.50	1.90	2.50	3.50	4.90	5.80	8.10	8.70	1.65	2.361	.94	2.87
C - A	APR5-SEP5	129	3.00-	2.10	3.20	4.20	4.80	5.40	5.80	6.50	7.20	8.30	9.10	10.10	10.20	5.26	2.446	4.77	1.56
C - A	OCT5-MAR6	100	2.40-	.80-	.10	.50	1.00	1.60	2.30	2.70	3.30	4.10	5.40	6.40	6.40	1.71	1.972	1.12	2.51
C - A	APR6-SEP6	157	2.00-	1.50	2.20	2.90	3.40	3.90	4.40	5.20	6.10	7.10	7.40	9.10	17.60	4.16	2.421	3.59	1.72
C - A	OCT6-MAR7	133	3.00-	1.40-	.20-	.80	1.30	1.70	2.30	3.00	3.80	5.30	6.70	8.80	9.40	1.98	2.483	1.24	2.64
C - A	APR7-SEP7	94	5.70-	2.10	3.40	3.70	3.90	4.30	5.20	5.60	6.40	7.10	8.10	9.70	11.80	4.64	2.398	4.13	1.63
C - A	NOTINRNGE	2	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.60	3.60	3.60	3.60	3.60	3.70	.141	3.70	1.04

A-13 POLLUTANT-12128 Lead
METHOD-92 Hi-Vol Atomic Absorption
UNITS-01 UG/CU Meter (25C)
SAMPLING INTERVAL-7-24 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	OCT4-MAR5	101	LD	.10	.40	.50	1.00	1.70	2.30	2.80	3.80	5.20	6.30	7.60	9.30	2.20	2.059	1.61	2.21
	APR5-SEP5	173	LD	.10	.20	.20	.30	.30	.40	.50	.60	.80	1.10	3.20	5.20	.47	.618	.28	2.73
	OCT5-MAR6	122	LD	.30	.40	.70	1.00	1.20	1.70	2.10	2.80	3.70	4.50	5.70	6.40	1.70	1.438	1.30	2.08
	APR6-SEP6	168	LD	.10	.20	.20	.30	.30	.40	.50	.60	.80	1.20	2.90	7.60	.48	.687	.27	2.88
	OCT6-MAR7	138	.10	.40	.60	.90	1.40	1.90	2.40	3.10	3.70	4.90	5.70	7.00	7.00	2.26	1.727	1.79	1.97
	APR7-SEP7	109	LD	.20	.20	.20	.30	.30	.40	.40	.60	.80	1.20	2.50	7.90	.50	.808	.27	3.09
	OCT7-MAR8	66	.10	.30	.50	.60	.80	1.00	1.30	2.00	3.00	4.20	5.00	9.40	10.30	1.80	1.995	1.20	2.45
	NOTINRNGE	4	.10	.10	.10	.10	.20	.20	.20	.20	.20	1.40	1.40	1.40	1.40	.47	.618	.29	2.71

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
LOS ANGELES																			
054180005A05	OCT4-MAR5	49	LD	2.00	4.50	5.80	6.90	7.50	8.30	8.70	9.30	9.80	11.20	15.10	15.10	7.06	3.129	6.46	1.53
	APR5-SEP5	173	.50	5.40	5.80	6.20	6.60	7.10	7.60	8.90	10.60	11.90	13.00	15.20	16.30	7.98	2.693	7.56	1.39
	OCT5-MAR6	120	.20	3.60	5.20	5.90	6.20	6.50	7.40	7.80	8.50	9.70	11.20	13.50	15.20	6.84	2.509	6.42	1.43
	APR6-SEP6	165	1.20	4.20	4.60	4.90	5.30	5.80	6.20	7.30	8.60	9.40	9.90	10.10	12.50	6.31	2.050	6.00	1.37
	OCT6-MAR7	147	1.00	4.80	6.20	6.80	7.80	8.50	9.10	9.90	10.50	11.30	12.40	18.40	29.10	8.33	3.339	7.74	1.47
	APR7-SEP7	108	LD	8.40	9.50	10.30	10.90	11.30	11.60	11.90	12.60	13.60	14.70	16.80	17.50	11.09	2.298	10.86	1.23
	OCT7-MAR8	62	1.40	3.80	5.30	7.10	8.30	9.10	9.60	10.60	11.50	12.20	13.30	13.70	13.90	8.58	3.182	8.04	1.43
	NOTINRNGE	5	9.10	9.10	9.10	9.20	9.20	9.70	9.70	9.90	9.90	10.10	10.10	10.10	10.10	9.60	.436	9.59	1.05

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
C - A	OCT4-MAR5	47	6.80-	1.60-	1.10	3.60	4.50	5.20	6.10	6.50	7.20	8.10	9.20	10.50	10.50	4.47	3.666	3.46	2.05
C - A	APR5-SEP5	165	2.20-	5.00	5.50	5.90	6.30	6.80	7.50	8.40	10.00	11.80	12.50	14.30	16.20	7.56	2.853	7.07	1.44
C - A	OCT5-MAR6	119	3.90-	1.10	3.60	4.40	4.90	5.30	5.70	6.10	7.20	8.70	10.20	13.20	14.10	5.22	3.050	4.50	1.72
C - A	APR6-SEP6	159	4.90-	3.90	4.10	4.40	4.90	5.30	5.80	6.80	8.10	9.00	9.50	10.00	12.50	5.83	2.295	5.43	1.46
C - A	OCT6-MAR7	137	4.00-	1.70	3.40	4.50	5.30	6.10	7.40	8.60	9.30	10.40	11.00	16.50	25.10	6.22	3.966	5.25	1.79
C - A	APR7-SEP7	102	2.50-	7.50	9.00	9.80	10.50	10.80	11.00	11.40	12.20	13.20	13.90	15.30	16.80	10.53	2.482	10.24	1.26
C - A	OCT7-MAR8	58	2.90-	1.30	3.70	5.50	6.50	7.10	8.00	9.30	10.20	11.50	12.50	13.10	13.50	6.87	3.870	5.98	1.69
C - A	NOTINRNGE	4	7.70	7.70	7.70	7.70	9.10	9.10	9.10	9.50	9.50	9.70	9.70	9.70	9.70	9.00	.902	8.96	1.11

A-14 POLLUTANT-12128 Lead
METHOD-01 Hi-Vol Atomic Absorption
UNITS-01 UG/CU Meter (25C)
SAMPLING INTERVAL-3-04 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR5-SEP5	23	.00	.21	.38	.41	.59	.68	.81	.83	.88	1.34	2.33	3.99	3.99	.86	.833	.62	2.25
	OCT5-MAR6	39	.00	.30	.57	.69	.97	1.30	1.48	2.49	2.97	5.02	5.33	5.45	5.45	1.91	1.660	1.44	2.12
	APR6-SEP6	107	.00	.00	.17	.23	.29	.33	.44	.51	.59	.90	1.44	7.76	8.81	.61	1.186	.28	3.49
	OCT6-MAR7	95	.00	.19	.46	.88	1.10	1.40	1.81	2.56	3.48	4.49	5.28	6.20	6.67	1.97	1.693	1.49	2.10
	APR7-SEP7	165	.00	.09	.15	.21	.25	.28	.34	.39	.45	.64	.77	1.48	2.22	.34	.301	.26	2.13
	OCT7-MAR8	64	.00	.17	.45	.59	.82	1.07	1.22	2.03	3.13	4.26	5.52	10.43	13.33	1.97	2.475	1.23	2.64
	NOTINRNGE	2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.000	.00	1.00
LOS ANGELES																			
054180005A05	APR5-SEP5	25	4.99	5.60	6.80	7.60	7.86	8.73	9.85	13.16	13.82	15.76	18.21	18.23	18.23	10.41	4.075	9.69	1.46
	OCT5-MAR6	41	1.74	4.74	5.69	6.47	6.84	8.07	9.22	10.06	10.83	12.00	12.90	14.52	14.52	8.27	2.973	7.78	1.42
	APR6-SEP6	103	1.52	4.59	5.24	5.76	6.18	6.90	7.66	8.32	9.44	11.38	13.04	14.63	16.61	7.48	2.740	7.02	1.43
	OCT6-MAR7	103	1.20	5.35	7.93	8.97	10.43	11.36	12.11	12.72	13.85	14.49	16.01	17.12	17.60	10.66	3.828	10.04	1.42
	APR7-SEP7	166	5.12	8.37	10.05	10.94	11.33	11.86	12.43	12.75	13.24	14.09	14.76	15.38	18.00	11.64	2.162	11.45	1.20
	OCT7-MAR8	61	.00	2.94	5.57	6.87	8.28	9.35	10.25	10.70	11.61	12.62	13.60	14.66	15.22	8.74	3.604	8.08	1.49
	NOTINRNGE	1	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	.000	10.13	1.00
C - A	APR5-SEP5	23	4.61	4.75	6.27	6.38	6.90	7.73	8.54	12.39	12.94	14.28	15.26	17.40	17.40	9.44	3.871	8.73	1.48
C - A	OCT5-MAR6	37	.58	3.45	4.03	5.49	5.70	6.17	6.94	7.39	8.44	10.67	11.07	13.12	13.12	6.65	2.794	6.14	1.50
C - A	APR6-SEP6	100	5.52-	4.12	4.76	5.25	5.87	6.50	6.97	7.88	9.13	11.18	13.04	14.21	16.41	6.95	3.118	6.34	1.53
C - A	OCT6-MAR7	93	4.98-	1.60	5.83	7.17	7.99	9.69	10.63	11.57	12.51	13.78	14.23	14.73	15.26	8.70	4.629	7.68	1.65
C - A	APR7-SEP7	153	4.83	8.23	9.45	10.49	11.03	11.46	11.99	12.43	12.75	13.78	14.10	15.13	17.90	11.28	2.188	11.07	1.21
C - A	OCT7-MAR8	57	12.97-	.56-	3.14	4.93	6.98	7.46	8.55	9.38	10.27	11.51	13.36	13.58	14.63	6.72	4.854	5.45	1.91
C - A	NOTINRNGE	1	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	.000	10.13	1.00

A-15 POLLUTANT-12128 Lead
METHOD -98 Membrane X-Ray Fluorescence
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL - 3-04 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	115	2.6	7.2	9.1	10.9	12.0	13.5	15.1	18.4	22.1	26.2	32.2	47.2	50.0	15.9	8.97	13.86	1.69
	OCT4-MAR5	139	LD	3.1	3.9	4.6	5.8	6.5	7.8	10.2	13.0	23.6	29.0	43.0	47.9	10.0	8.84	7.44	2.19
	APR5-SEP5	160	2.6	6.0	8.1	9.7	13.1	14.8	16.5	19.2	22.1	25.9	28.0	36.8	44.4	15.5	7.82	13.80	1.61
	OCT5-MAR6	112	1.7	2.4	3.1	4.1	5.1	5.9	6.5	8.8	14.1	17.3	19.0	23.2	26.5	8.0	5.76	6.48	1.91
	APR6-SEP6	173	2.6	4.7	5.9	6.9	8.2	9.7	11.1	12.9	14.9	19.1	23.5	30.4	34.4	11.1	6.44	9.61	1.71
	OCT6-MAR7	136	LD	2.1	3.0	3.6	3.9	4.6	6.1	8.0	10.5	16.9	19.7	26.3	29.2	7.1	5.94	5.48	2.07
	APR7-SEP7	104	4.3	5.6	7.6	8.9	9.9	11.2	12.0	14.8	17.5	20.8	24.0	29.3	29.6	12.5	5.85	11.38	1.56
	NOTINRNGE	2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.6	3.6	3.6	3.6	3.3	.35	3.33	1.11
LOS ANGELES																			
054180005A05	APR4-SEP4	113	1.1	7.2	8.8	10.8	12.1	14.5	16.8	19.3	21.7	29.2	36.2	44.6	47.2	16.5	9.20	14.36	1.68
	OCT4-MAR5	143	2.0	3.4	4.0	4.9	5.9	7.1	8.6	10.8	12.9	21.2	28.6	42.9	51.3	10.2	8.83	7.71	2.11
	APR5-SEP5	175	3.1	6.5	8.0	10.2	11.7	14.0	15.3	17.8	20.2	24.7	25.7	31.0	31.5	14.5	6.72	13.18	1.55
	OCT5-MAR6	118	1.5	2.9	3.6	4.2	5.0	5.7	6.6	8.8	11.9	14.9	19.6	23.3	31.3	7.7	5.54	6.28	1.90
	APR6-SEP6	171	3.1	4.8	6.0	7.2	8.3	10.2	11.2	13.1	16.9	21.6	24.4	30.0	36.6	11.5	6.61	9.97	1.71
	OCT6-MAR7	139	1.3	2.7	3.3	3.9	4.2	4.8	6.3	8.0	9.7	16.2	21.1	31.7	33.0	7.4	6.13	5.74	2.05
	APR7-SEP7	103	LD	5.1	6.7	7.7	8.4	9.5	10.5	11.8	14.6	18.0	21.0	28.3	31.2	10.8	5.51	9.60	1.62
	NOTINRNGE	5	3.5	3.5	3.5	3.8	3.8	4.0	4.0	4.2	4.2	11.9	11.9	11.9	11.9	5.5	3.60	4.58	1.82
C - A	APR4-SEP4	82	8.3-	1.6-	.8-	.6-	.0	.5	.8	1.0	1.9	2.6	3.1	7.0	8.7	.4	2.28	.08	6.22
C - A	OCT4-MAR5	127	13.8-	1.6-	.9-	.4-	.1-	.1	.3	.4	.6	1.1	1.9	5.6	6.0	.2-	2.22	.01-	9.37
C - A	APR5-SEP5	142	7.4-	3.1-	2.4-	1.9-	1.4-	1.0-	.6-	.3-	.1	.5	1.1	2.5	20.7	1.0-	2.34	.39-	3.95
C - A	OCT5-MAR6	100	3.8-	1.2-	.4-	.2-	.0	.2	.3	.5	.6	.8	.9	6.5	15.6	.2	1.92	.02	8.47
C - A	APR6-SEP6	162	5.2-	1.6-	.8-	.3-	.0	.2	.5	1.1	1.9	2.8	3.5	4.4	5.0	.5	1.74	.12	5.16
C - A	OCT6-MAR7	133	6.9-	1.7-	.8-	.5-	.1-	.1	.5	.8	1.0	1.7	3.6	5.4	28.8	.3	3.07	.04	8.22
C - A	APR7-SEP7	94	12.0-	5.2-	3.4-	2.8-	2.1-	1.6-	1.2-	.5-	.1	.9	1.3	4.4	4.7	1.7-	2.47	.99-	2.87
C - A	NOTINRNGE	2	.7	.7	.7	.7	.7	.7	.7	.7	.1-	.1-	.1-	.1-	.1-	.3	.57	.14	3.43

A-16 POLLUTANT-12403 Sulfate
METHOD-91 Hi-Vol Colorimetric
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL-7-24 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA LOS ANGELES 054180003A05	OCT4-MAR5	102	LD	7.1	8.0	9.6	11.0	13.2	15.4	17.0	20.4	24.9	30.1	68.4	70.5	15.5	10.62	12.74	1.86
	APR5-SEP5	172	3.3	8.1	10.4	13.3	14.6	16.6	18.1	20.5	23.6	28.4	33.8	42.3	46.4	17.7	8.40	15.95	1.57
	OCT5-MAR6	122	LD	5.9	7.5	9.2	10.7	12.1	13.8	15.7	19.8	22.9	26.2	31.1	46.4	13.6	7.20	12.07	1.64
	APR6-SEP6	174	LD	5.0	6.6	9.5	10.9	12.4	14.0	15.4	16.7	22.7	30.6	41.9	46.5	13.6	8.28	11.58	1.76
	OCT6-MAR7	138	1.2	4.1	5.3	6.9	8.4	9.6	11.5	13.9	17.8	20.7	23.5	36.8	37.2	11.6	7.24	9.89	1.77
	APR7-SEP7	109	.6	4.1	7.0	9.5	13.1	17.1	18.5	19.6	21.1	24.7	27.4	32.9	35.6	15.2	7.98	13.46	1.64
	OCT7-MAR8	66	1.0	4.9	6.1	7.0	8.4	9.2	13.6	17.2	18.3	20.8	24.1	30.2	40.1	12.2	7.47	10.45	1.76
	NOTINRNGE	4	1.1	1.1	1.1	1.1	1.4	1.4	1.4	1.6	1.6	8.3	8.3	8.3	8.3	3.1	3.47	2.06	2.46
LOS ANGELES 054180005A05	OCT4-MAR5	49	LD	7.3	9.2	10.3	11.9	13.6	15.4	17.9	20.8	23.6	26.8	38.1	38.1	15.1	7.19	13.69	1.57
	APR5-SEP5	173	6.4	14.0	16.4	18.0	19.2	21.2	22.4	24.5	28.2	34.6	39.7	47.9	59.6	22.8	8.59	21.30	1.44
	OCT5-MAR6	120	5.0	9.2	11.0	12.5	13.9	16.0	18.5	22.4	25.4	29.3	31.3	35.8	56.4	18.2	8.42	16.48	1.55
	APR6-SEP6	172	4.8	11.0	12.4	13.7	14.6	15.2	16.1	17.7	19.4	22.6	27.5	42.5	43.2	16.6	6.04	15.65	1.42
	OCT6-MAR7	147	1.7	3.9	5.7	7.2	9.5	10.8	12.6	15.6	16.8	19.5	27.8	35.1	45.1	12.1	7.45	10.35	1.76
	APR7-SEP7	108	LD	7.6	9.9	14.9	16.6	18.5	19.9	20.9	22.7	25.8	29.5	42.5	44.7	17.9	7.43	16.53	1.49
	OCT7-MAR8	62	5.4	7.0	9.1	13.1	15.6	17.1	18.1	20.0	21.0	22.7	23.0	24.6	31.6	16.1	5.86	15.14	1.42
	NOTINRNGE	5	13.7	13.7	13.7	13.8	13.8	14.2	14.2	19.5	19.5	24.3	24.3	24.3	24.3	17.1	4.70	16.49	1.31
C - A	OCT4-MAR5	48	8.3-	2.4-	1.0-	.2-	.8	1.5	2.5	3.8	6.0	10.4	11.2	15.6	15.6	2.5	5.18	1.12	3.60
C - A	APR5-SEP5	164	5.6-	1.0	2.0	2.9	3.4	4.2	5.3	6.6	7.9	10.4	13.3	20.1	20.9	5.2	4.23	4.04	2.04
C - A	OCT5-MAR6	119	3.4-	1.1-	.2	1.5	2.6	3.6	4.8	6.3	8.1	10.7	12.7	17.7	18.4	4.5	4.71	3.08	2.37
C - A	APR6-SEP6	165	13.3-	1.6-	.1-	.9	1.5	2.2	3.2	4.8	6.4	8.5	11.0	14.1	17.1	2.9	4.53	1.59	3.02
C - A	OCT6-MAR7	137	14.1-	4.4-	2.7-	2.0-	1.1-	.1-	.4	1.6	3.3	5.3	7.0	13.0	14.0	.2	4.20	.01	12.02
C - A	APR7-SEP7	102	22.2-	4.4-	2.0-	.6-	1.0	2.4	3.2	4.6	6.1	10.8	13.0	18.9	19.1	2.4	6.18	.85	4.18
C - A	OCT7-MAR8	58	17.2-	1.2-	.3	1.4	2.1	2.5	4.0	6.7	8.9	12.1	14.9	16.8	19.0	4.0	6.48	2.14	3.09
C - A	NOTINRNGE	4	5.4	5.4	5.4	5.4	12.4	12.4	12.4	12.6	12.6	18.4	18.4	18.4	18.4	12.2	5.32	11.18	1.52

A-17 POLLUTANT-12403 Sulfate
METHOD-91 Hi-Vol Colorimetric
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL-3-04 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	OCT4-MAR5	13	7.0	7.0	7.8	7.9	8.1	10.6	13.0	13.3	14.4	22.3	22.3	29.6	29.6	12.8	6.77	11.33	1.64
	APR5-SEP5	49	LD	6.6	9.6	10.4	11.2	13.1	13.6	17.2	19.3	25.1	27.9	37.5	37.5	14.6	7.13	13.11	1.59
	OCT5-MAR6	39	.6	3.0	3.8	4.1	5.4	7.0	8.1	9.9	12.1	18.4	21.1	22.9	22.9	8.6	5.90	7.05	1.87
	APR6-SEP6	161	1.1	2.7	3.6	4.7	6.7	7.9	9.6	11.5	13.6	18.1	22.9	38.3	43.7	9.6	7.32	7.64	1.97
	OCT6-MAR7	123	LD	.6	1.2	2.2	3.2	4.3	5.7	8.9	12.2	18.6	24.7	36.4	47.4	7.7	8.84	5.06	2.50
	APR7-SEP7	165	LD	3.3	6.2	7.8	8.8	10.4	11.3	13.4	15.3	19.0	22.2	32.1	34.7	11.1	6.45	9.61	1.71
	OCT7-MAR8	65	1.2	1.7	2.0	2.4	3.3	3.9	4.5	6.5	9.9	17.0	18.0	22.0	26.3	6.3	5.89	4.64	2.20
	NOTINRNGE	68	1.1	2.1	3.0	3.5	4.1	5.1	7.2	8.6	11.1	19.8	26.4	38.0	41.8	8.6	8.70	6.04	2.32
LOS ANGELES																			
054180005A05	OCT4-MAR5	15	4.2	7.6	7.7	7.9	8.2	8.7	9.3	15.8	19.0	24.2	24.2	74.3	74.3	15.6	17.28	10.49	2.44
	APR5-SEP5	57	5.1	8.6	9.5	11.3	12.3	13.4	15.0	18.3	21.0	28.6	33.8	38.4	40.9	16.2	8.20	14.51	1.61
	OCT5-MAR6	41	.6	3.5	4.0	4.9	5.3	7.0	8.4	9.8	13.3	14.7	18.7	21.4	21.4	8.3	5.05	7.13	1.75
	APR6-SEP6	158	LD	3.4	4.4	5.9	7.4	9.0	10.9	12.5	14.2	17.8	22.7	34.4	43.0	10.3	7.04	8.49	1.86
	OCT6-MAR7	128	LD	1.4	2.3	3.3	4.1	5.0	7.1	9.6	11.8	18.6	24.1	36.4	43.0	8.1	7.75	5.84	2.24
	APR7-SEP7	167	LD	4.0	7.2	8.3	9.3	10.4	11.7	13.5	15.9	19.8	22.0	26.1	37.2	11.5	6.15	10.13	1.65
	OCT7-MAR8	62	.7	2.1	2.8	3.5	4.2	4.8	5.6	6.8	10.8	15.2	19.2	21.0	22.4	6.9	5.32	5.46	1.98
	NOTINRNGE	67	1.6	2.7	3.7	4.6	5.2	6.1	7.5	10.8	12.6	16.3	25.8	37.9	43.1	9.3	8.43	6.90	2.17
C - A	OCT4-MAR5	10	2.9-	2.9-	.6-	.4-	.2-	.3	.5	.9	2.8	4.6	17.2	17.2	17.2	2.2	5.63	.81	4.12
C - A	APR5-SEP5	45	13.9-	2.2-	1.5-	1.0-	.8-	.1	.3	.9	1.5	3.6	5.9	18.3	18.3	.5	4.54	.05	8.41
C - A	OCT5-MAR6	38	3.9-	3.3-	1.0-	.6-	.2-	.3	.5	.9	1.2	1.9	2.2	5.6	5.6	.0	1.93	.00	17.11
C - A	APR6-SEP6	154	34.8-	1.2-	.1-	.2	.5	.7	1.0	1.5	2.3	3.2	3.8	4.5	5.6	.6	3.41	.12	6.31
C - A	OCT6-MAR7	119	17.9-	2.9-	.5-	.2	.6	1.0	1.3	1.7	2.3	3.5	4.6	11.5	16.2	.8	3.55	.19	5.55
C - A	APR7-SEP7	154	27.5-	1.4-	.6-	.0	.4	1.0	1.6	2.2	2.9	4.5	6.2	8.4	12.5	1.2	3.44	.37	4.54
C - A	OCT7-MAR8	58	7.1-	1.3-	.0	.1	.3	.6	1.1	1.2	1.5	2.4	2.5	3.5	5.1	.6	1.75	.18	4.59
C - A	NOTINRNGE	63	12.7-	.7-	.1-	.4	.8	1.2	1.4	1.8	2.0	2.5	3.4	3.6	4.2	.6	2.88	.11	6.09

A-18 POLLUTANT-12403 Sulfate
METHOD-83 Membrane Methylthymol Blue
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL-3-04 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	8n	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	OCT4-MAR5	81	LD	.09	.15	.28	.42	.61	.97	1.74	3.39	4.70	5.62	9.50	12.12	1.67	2.258	1.00	2.77
	APR5-SEP5	161	LD	.19	.61	1.07	1.36	1.82	2.14	2.46	2.90	3.57	4.14	5.07	10.13	1.92	1.436	1.54	1.95
	OCT5-MAR6	112	.10	.20	.33	.47	.68	1.00	2.12	3.21	3.72	4.71	5.28	6.88	6.95	2.00	1.864	1.46	2.21
	APR6-SEP6	173	LD	.17	.31	.48	.61	.87	1.25	1.72	2.26	3.27	4.18	5.65	8.60	1.41	1.423	.99	2.31
	OCT6-MAR7	136	LD	LD	.26	.44	.61	.85	1.31	2.08	3.14	4.49	5.51	7.09	7.48	1.69	1.827	1.14	2.41
	APR7-SEP7	104	LD	.09	.25	.38	.53	.84	1.23	1.59	2.23	2.94	3.42	3.87	3.92	1.21	1.085	.90	2.16
	NOTINRNGE	2	.17	.17	.17	.17	.17	.17	.17	.17	.60	.60	.60	.60	.60	.38	.304	.30	2.01
LOS ANGELES																			
054180005A05	OCT4-MAR5	84	.06	.18	.27	.38	.43	.58	.79	1.68	2.74	5.06	6.01	10.67	13.84	1.74	2.465	1.00	2.86
	APR5-SEP5	175	LD	.34	.69	1.04	1.46	1.79	2.11	2.47	3.00	3.50	3.85	4.59	5.33	1.89	1.206	1.60	1.79
	OCT5-MAR6	118	.12	.26	.33	.42	.58	.85	1.67	2.65	3.32	4.41	5.29	6.44	6.90	1.82	1.778	1.30	2.27
	APR6-SEP6	171	.06	.26	.35	.47	.63	.87	1.18	1.60	2.14	3.01	4.56	5.44	6.60	1.37	1.316	.99	2.24
	OCT6-MAR7	139	LD	.17	.30	.46	.59	.89	1.12	1.80	3.20	4.52	5.97	7.78	10.33	1.72	1.986	1.13	2.51
	APR7-SEP7	103	LD	.22	.32	.45	.57	.72	.98	1.36	1.68	2.45	3.10	3.56	3.71	1.07	.906	.81	2.09
	NOTINRNGE	5	.22	.22	.22	.32	.32	.71	.71	.75	.75	2.71	2.71	2.71	2.71	.94	1.015	.64	2.41
C - A	OCT4-MAR5	75	3.56-	.58-	.26-	.10-	.04-	.00	.03	.06	.13	.26	.35	2.01	2.70	.11-	.794	.01-	7.39
C - A	APR5-SEP5	142	1.20-	.51-	.31-	.19-	.11-	.00	.07	.14	.22	.31	.51	1.55	3.66	.02-	.481	.00	12.22
C - A	OCT5-MAR6	100	1.07-	.66-	.39-	.17-	.12-	.08-	.03-	.02	.08	.11	.22	.74	3.39	.11-	.473	.03-	5.48
C - A	APR6-SEP6	162	2.72-	.58-	.26-	.10-	.04-	.04	.08	.14	.23	.44	.55	.65	.86	.05-	.483	.00	8.70
C - A	OCT6-MAR7	133	2.34-	.74-	.28-	.16-	.08-	.00	.05	.14	.20	.52	1.34	2.85	4.22	.05	.801	.00	10.46
C - A	APR7-SEP7	94	3.22-	.92-	.46-	.19-	.11-	.04-	.04	.13	.26	.41	.50	.92	1.20	.12-	.580	.02-	5.93
C - A	NOTINRNGE	2	.05	.05	.05	.05	.05	.05	.05	.05	.15	.15	.15	.15	.15	.10	.071	.08	1.89

A-19 POLLUTANT-12301 Ammonium
METHOD-92 Hi-Vol Sodium Phenolate
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL - 7-24 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	115	LD	1.40	2.28	4.35	6.10	7.30	8.26	9.70	11.00	12.30	14.03	16.25	19.20	7.10	4.341	6.06	1.76
	OCT4-MAR5	139	1.10	2.43	3.37	5.52	6.32	7.73	9.02	10.40	12.14	17.16	22.59	30.39	32.12	8.97	6.335	7.33	1.89
	APR5-SEP5	160	.05	1.53	2.65	4.14	5.85	7.06	9.11	10.62	12.43	14.65	16.68	18.62	18.99	7.78	4.964	6.56	1.79
	OCT5-MAR6	112	.80	2.11	3.65	5.00	6.43	8.35	10.29	11.77	14.56	17.39	18.65	21.84	22.30	9.11	5.436	7.82	1.74
	APR6-SEP6	173	.86	3.04	4.50	5.64	6.91	7.93	8.55	9.44	10.33	12.11	13.02	17.95	20.75	7.73	3.565	7.02	1.55
	OCT6-MAR7	136	LD	2.69	3.43	4.65	5.87	7.56	9.45	10.95	13.32	16.32	18.52	23.15	28.78	8.67	5.515	7.32	1.79
	APR7-SEP7	104	1.39	4.00	5.85	7.12	7.74	8.19	9.91	11.13	12.34	13.97	15.38	18.51	20.96	9.06	3.868	8.33	1.51
	NOTINRNGE	2	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	5.02	5.02	5.02	5.02	5.02	4.21	1.138	4.07	1.30
LOS ANGELES																			
054180005A05	APR4-SEP4	113	LD	1.80	3.56	5.16	6.93	7.71	8.63	9.74	10.90	12.44	13.26	16.74	17.10	7.46	3.952	6.60	1.64
	OCT4-MAR5	143	1.00	1.92	3.57	5.28	6.26	8.13	9.25	10.70	13.35	17.49	20.93	33.10	40.82	9.20	6.671	7.45	1.92
	APR5-SEP5	175	.82	2.67	4.11	5.59	6.52	7.70	8.68	9.80	10.68	12.25	13.91	16.28	18.01	7.69	3.705	6.93	1.58
	OCT5-MAR6	118	.77	2.09	3.36	4.45	5.81	8.32	10.19	11.37	13.85	16.38	17.55	20.16	21.07	8.65	5.358	7.36	1.77
	APR6-SEP6	171	.80	2.86	4.47	5.63	6.91	8.02	8.83	9.44	10.40	11.12	12.35	16.15	17.41	7.61	3.293	6.98	1.51
	OCT6-MAR7	139	1.29	2.77	3.38	4.65	6.42	7.65	9.08	10.95	13.74	17.13	19.40	24.67	32.47	8.83	5.713	7.42	1.81
	APR7-SEP7	103	LD	3.04	4.07	5.21	5.96	6.55	7.28	7.72	8.59	9.98	13.56	15.21	16.65	6.72	3.156	6.08	1.56
	NOTINRNGE	5	1.70	1.70	1.70	2.27	2.27	4.24	4.24	4.64	4.64	10.29	10.29	10.29	10.29	4.63	3.404	3.73	1.93
C - A	APR4-SEP4	82	5.48-	1.37-	.77-	.20-	.15	.67	1.02	1.42	2.11	2.97	3.19	3.60	4.18	.63	1.697	.22	4.26
C - A	OCT4-MAR5	127	16.54-	1.99-	1.02-	.67-	.48-	.29-	.14-	.10	.55	1.23	4.41	8.46	17.99	.04-	2.863	.00	19.14
C - A	APR5-SEP5	142	6.10-	2.81-	1.73-	.90-	.38-	.08-	.27	.78	1.47	2.39	3.01	4.92	8.40	.06-	2.057	.00	14.63
C - A	OCT5-MAR6	100	3.66-	2.17-	1.36-	.91-	.70-	.40-	.26-	.12-	.08	.63	1.25	3.65	6.22	.50-	1.344	.17-	4.28
C - A	APR6-SEP6	162	10.28-	1.48-	.99-	.64-	.30-	.15-	.06	.49	1.05	2.16	2.56	3.20	4.86	.02-	1.784	.00	20.19
C - A	OCT6-MAR7	133	4.22-	2.24-	1.69-	1.14-	.52-	.26-	.07-	.49	1.03	2.77	3.73	14.11	17.32	.10	2.718	.00	13.11
C - A	APR7-SEP7	94	18.51-	4.96-	3.47-	2.86-	2.43-	1.80-	1.26-	.81-	.50-	.36	1.28	2.94	3.55	2.12-	2.813	1.28-	2.74
C - A	NOTINRNGE	2	1.14-	1.14-	1.14-	1.14-	1.14-	1.14-	1.14-	1.14-	.78-	.78-	.78-	.78-	.78-	.96-	.255	.93-	1.30

A-20 POLLUTANT-12306 Nitrate
METHOD-92 Hi-Vol Reduction-Diazo Coupling
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL - 7-24 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR4-SEP4	98	LD	LD	LD	LD	5	8	11	15	18	22	25	36	38	10	8.6	8.03	2.06
	OCT4-MAR5	141	LD	LD	6	8	10	13	17	22	28	37	46	69	72	17	14.6	13.38	2.07
	APR5-SEP5	173	LD	LD	LD	6	9	10	13	16	20	24	27	35	41	12	8.5	9.99	1.88
	OCT5-MAR6	115	LD	LD	6	8	11	13	15	19	24	32	35	45	45	16	10.9	12.73	1.88
	APR6-SEP6	173	LD	LD	LD	LD	LD	6	9	11	15	21	26	37	63	9	9.0	6.58	2.27
	OCT6-MAR7	115	LD	LD	7	12	15	16	20	23	28	35	39	58	117	19	15.1	15.13	2.00
	APR7-SEP7	114	LD	7	9	12	16	20	24	27	29	36	39	46	47	21	11.3	18.06	1.67
	OCT7-MAR8	66	LD	LD	9	16	18	18	19	20	24	28	44	45	47	18	10.5	15.96	1.70
	NOTINRNGE	9	14	14	15	15	15	17	17	18	20	23	43	43	43	20	9.0	18.08	1.54
LOS ANGELES																			
054180005A05	APR4-SEP4	109	LD	7	12	15	18	20	23	27	31	36	44	53	54	22	11.9	19.24	1.66
	OCT4-MAR5	145	LD	6	12	16	18	22	27	32	37	46	53	77	79	25	15.8	20.92	1.79
	APR5-SEP5	173	LD	8	16	19	22	25	28	31	34	38	41	53	58	25	11.2	22.46	1.54
	OCT5-MAR6	118	LD	LD	LD	10	13	18	22	28	34	40	48	57	70	21	15.5	16.56	1.95
	APR6-SEP6	176	LD	LD	LD	12	15	19	23	26	29	34	40	52	54	19	12.6	15.96	1.82
	OCT6-MAR7	119	LD	11	16	20	22	26	28	30	37	46	55	70	74	27	14.3	24.16	1.64
	APR7-SEP7	114	LD	12	18	24	29	34	39	43	47	53	58	71	73	34	16.2	30.32	1.58
	OCT7-MAR8	62	5	7	14	21	24	28	32	37	44	48	55	59	67	29	14.9	26.29	1.61
	NOTINRNGE	9	15	15	22	24	25	26	26	28	35	39	42	42	42	28	8.5	27.24	1.34
C - A	APR4-SEP4	87	25-	0	5	10	12	14	15	17	21	27	31	33	47	13	11.4	9.86	2.12
C - A	OCT4-MAR5	126	18-	1-	0	4	6	7	9	10	13	15	19	29	31	7	7.6	4.96	2.37
C - A	APR5-SEP5	160	19-	3	6	9	11	13	14	16	19	21	23	31	51	12	8.7	10.19	1.88
C - A	OCT5-MAR6	111	25-	10-	5-	2-	2	6	9	11	14	19	24	35	51	5	12.2	1.99	3.96
C - A	APR6-SEP6	167	35-	3-	0	6	9	12	14	16	18	22	25	29	43	10	10.9	6.69	2.44
C - A	OCT6-MAR7	106	32-	2-	2	4	7	8	10	13	16	22	32	46	53	10	12.0	5.94	2.65
C - A	APR7-SEP7	110	24-	0	6	8	11	14	16	18	20	24	26	42	48	13	9.7	10.67	1.93
C - A	OCT7-MAR8	59	7-	1	2	4	5	9	12	15	19	22	25	29	31	10	8.8	7.98	2.08
C - A	NOTINRNGE	9	18-	18-	0	5	10	11	11	13	16	17	22	22	22	9	11.8	5.05	2.80

A-21 POLLUTANT-42401 Sulfur Dioxide
METHOD-91 Gas Bubbler Pararosaniline
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL - 7-24 Hour Data

	YEAR	NUM	MIN	10	20	30	40	50	60	70	80	90	95	99	MAX	ARITHMETIC MEAN	ARITHMETIC STD	GEOMETRIC MEAN	GEOMETRIC STD
CALIFORNIA																			
LOS ANGELES																			
054180003A05	APR7-SEP7	102	LD	LD	10	11	13	18	19	21	26	33	36	54	77	18	12.1	15.38	1.82
	OCT7-MAR8	102	LD	LD	8	13	15	18	19	20	23	36	43	74	75	19	13.8	14.88	1.94
	NOTINRNGE	9	13	13	13	13	13	13	13	14	14	14	15	15	15	14	.7	13.58	1.06
LOS ANGELES																			
054180005A05	APR7-SEP7	107	LD	15	22	28	35	40	42	45	50	58	62	74	95	38	16.8	34.81	1.50
	OCT7-MAR8	100	LD	14	23	27	32	37	43	46	50	58	71	106	113	39	19.3	34.46	1.61
	NOTINRNGE	9	18	18	20	22	32	32	32	33	34	37	38	38	38	30	7.4	28.73	1.28
C - A	APR7-SEP7	96	39-	4	7	12	17	19	23	25	28	33	37	48	60	19	13.3	15.22	1.90
C - A	OCT7-MAR8	96	18-	1	8	14	19	22	26	28	31	33	35	38	44	20	12.8	16.46	1.81
C - A	NOTINRNGE	9	5	5	6	10	18	19	19	20	21	22	24	24	24	16	7.2	14.61	1.53

A-22 POLLUTANT-42401 Sulfur Dioxide
METHOD-91 Gas Bubbler Pararosaniline
UNITS-01 UG/CU Meter (25 C)
SAMPLING INTERVAL-3-04 Hour Data

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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4. TITLE AND SUBTITLE Los Angeles Catalyst Study Annual Report		5. REPORT DATE May 1979 6. PERFORMING ORGANIZATION CODE
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15. SUPPLEMENTARY NOTES		

16. ABSTRACT

This report is a summary of the data collected at the Los Angeles Catalyst Study (LACS) from June 1974 through December 1977. Previous reports of the LACS data were presented at the symposium held in April 1977, covering the data through 1976. The current report follows the same data presentation format, showing 6-month average trends of the summer seasons (April through September) beginning in 1974. Additional graphs are included in this report giving more detailed comparisons of freeway pollutant contributions with traffic parameters. Also included are method comparisons of high volume and membrane samplers for total mass, $SO_4^=$, Pb, and ratios of S/SO_4 and Pb/Br.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Ambient Air Monitoring Air Pollution Aerosols Traffic Meteorology Sulfates, Lead, Carbon Monoxide	Los Angeles San Diego Freeway Catalytic Convertor	68 A 43 F

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