KNECHTEL

AIR QUALITY DATA SUMMARY

for counties of

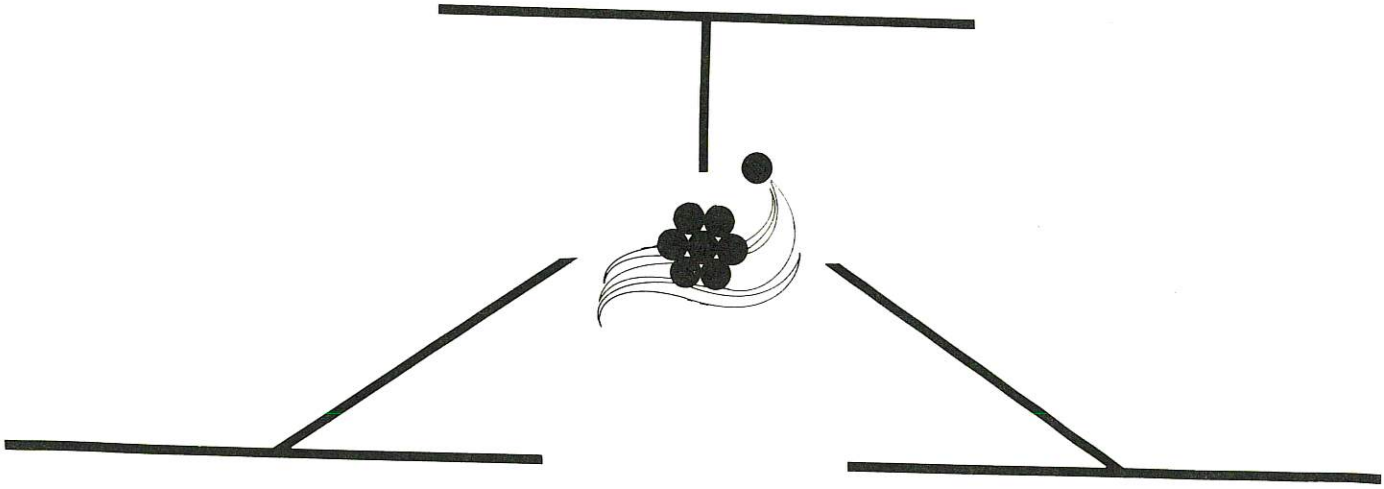
King

Kitsap

Pierce

Snohomish

1978



measured and compiled by

Technical Services Division

Puget Sound

Air Pollution

Control Agency

REFERENCE COPIES OF THIS SUMMARY HAVE BEEN PLACED IN PUBLIC AND COLLEGE LIBRARIES WITHIN THE PUGET SOUND REGION. INDIVIDUAL COPIES ARE FOR SALE AT THE PUGET SOUND AIR POLLUTION CONTROL AGENCY SEATTLE HEADQUARTERS OFFICE. PRICE: $4.00

PUBLISHED OCTOBER, 1979

TECHNICAL SERVICES DIVISION

(206) 344-7325

1978
AIR QUALITY
DATA SUMMARY

measured and compiled by the
Technical Services Division

PUGET SOUND
AIR POLLUTION CONTROL AGENCY
410 West Harrison Street
P.O. Box 9863
Seattle, Washington 98109

Puget Sound Air Pollution Control Agency

410 West Harrison Street, P.O. Box 9863 (206) 344-7330
Seattle, Washington 98109

Serving King, Kitsap, Pierce and Snohomish Counties

1978 AIR QUALITY DATA SUMMARY

CONTENTS

AIR QUALITY UNITS CONVERSION TABLE

Air quality standards for gases are defined in terms of micrograms (μg) or milligrams (mg) per cubic meter as well as in parts per million (ppm). As this data summary expresses measurements for gaseous pollutants in terms of ppm, the following conversion table is for the convenience of those of our readers who wish to interpret our results in terms of $\mu g/m^3$ or mg/m^3. Conversion factors, extracted from the Federal Register, assume a pressure of 760 mm Hg and a temperature of 25^oC.

Pollutant	Multiply PPM by	To Obtain
CO	1.145	mg/m^3
NO_2	1880	$\mu g/m^3$
O_3	1961	$\mu g/m^3$
SO_2	2619	$\mu g/m^3$

INTRODUCTION

Air Quality and meteorological data collected in the Central Puget Sound Region during 1978 are presented in this seventh annual Data Summary. The format is approximately the same as that of past annual summaries but much of the content has been expanded upon or is new. For example, there is a more complete presentation of suspended particulate data. Carbon monoxide and ozone are more fully discussed. Data on the incidence of lead in the ambient air are presented here for the first time together with a discussion.

The summary begins with a list of the Agency's air sampling sites. The related locator map makes clear that air monitoring is concentrated in or near industrial/urban centers. The body of the report contains summaries of pollutant measurements for 1978 together with interpretive comments. The report ends with meteorological data collected in the region. For the first time, a set of stability wind roses has been included. These are pictorial presentations of exact distributions of meteorological data used in modeling.

All data collected are reported quarterly to the State Department of Ecology; some of it is forwarded from there to the National Aerometric Data Bank maintained by the U. S. Environmental Protection Agency. The State Department of Ecology conducts some air monitoring within the region in addition to that done by the Agency. The Department of Ecology publishes its own annual summary which contains data for the state as a whole. Requests for specific information on carbon monoxide, ozone and oxides of nitrogen should be directed to the Washington State Department of Ecology, Olympia, Washington 98504 (206) 753-2843.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Atmospheric Sampling Network

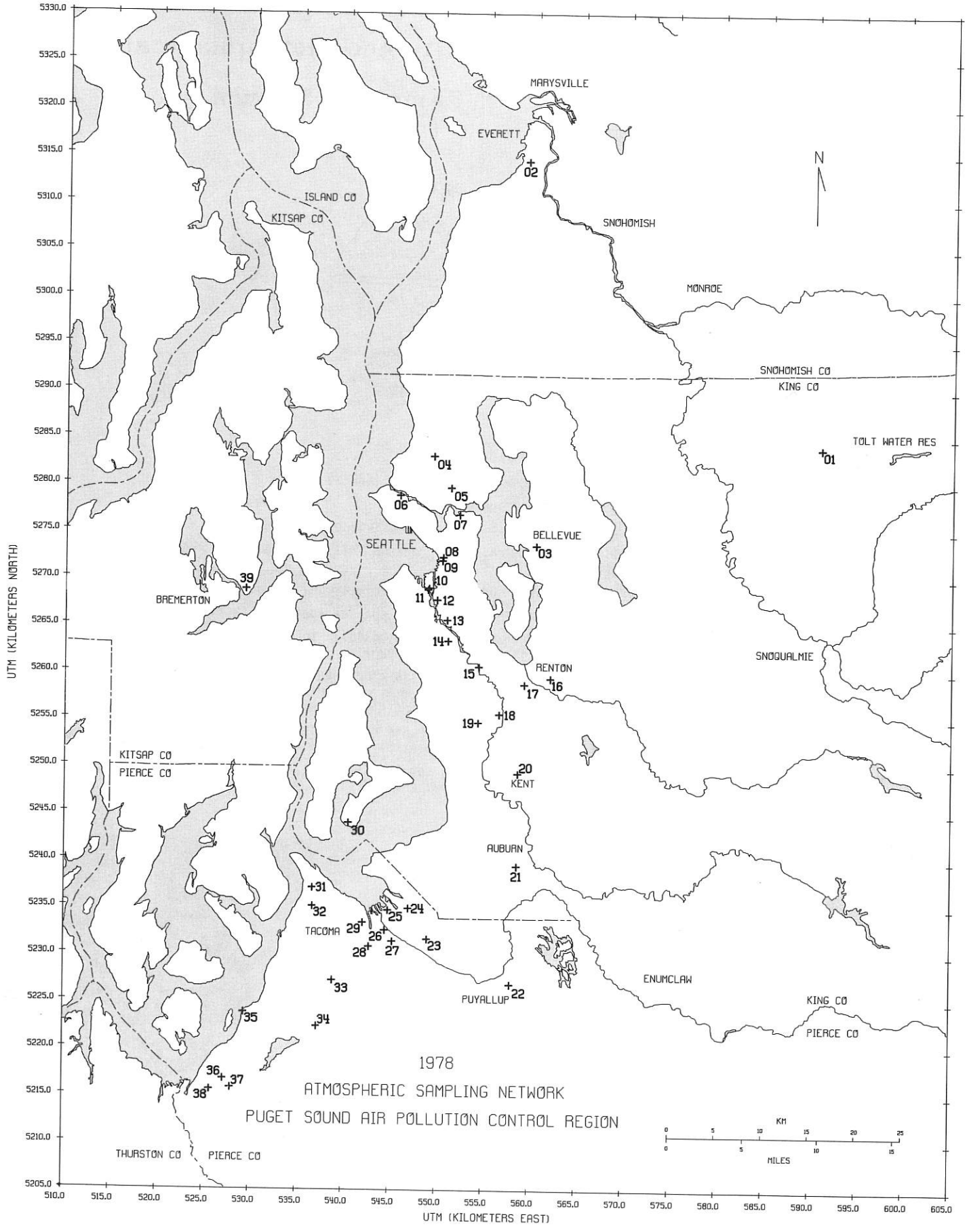
1978

Sta. Code	Location	[a] Type of Sampling A	B	C	D	E	F	G	H	I	J	K
01	TOLT RIVER WATERSHED, KING CO, WA	A										
02	MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	A	B	C	D							
03	PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA	A										
04	NORTH 98TH ST & STONE AVE N, SEATTLE, WA	A	B	C	D							
05	5701 - 8TH AVE NE, SEATTLE, WA *	A										
06	2700 W COMMODORE WAY, SEATTLE, WA	A										
07	PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA *	A			D							
08	PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	A										
09	FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA *	A										
10	HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	A										
11	HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA		B		D							
12	DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	A	B	C	D							
13	SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA *	A										
14	SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	A										
15	DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	A										
16	SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	A										
17	SOUTH 2ND ST & LAKE AVE S, RENTON, WA	A										
18	SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	A	B	C	D							
19	MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA	A	B	C	D			G				
20	22916 86TH AVE S, KENT, WA	A	B	C	D			G				K
21	115 E MAIN ST, AUBURN, WA	A										
22	SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	A	B	C	D			G				
23	FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	A										
24	2340 TAYLOR WAY, TACOMA, WA	A										
25	FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	A		C	D							
26	TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	A										
27	CASCADIA, 2002 E 28TH ST, TACOMA, WA	A										
28	WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	A		C	D							
29	HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	A										
30	SW 283RD & 101ST AVE SW, MAURY ISLAND, WA		B		D							
31	NORTH 43RD & VISSCHER STS, TACOMA, WA	A	B	C	D							
32	NORTH 26TH & PEARL STS, TACOMA, WA	A	B	C	D							
33	MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA *	A										
34	5502 - 112TH ST SW, LAKEWOOD, WA *	A										
35	STEILACOOM MARINA (GORDON PT), STEILACOOM, WA	A										
36	SECOND OLD FORT NISQUALLY, DUPONT, WA	A	B	C	D	E	F		H	I	J	
37	CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA	A										
38	YEHLE'S RESIDENCE, DUPONT AVE, DUPONT, WA	A										
39	EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	A										

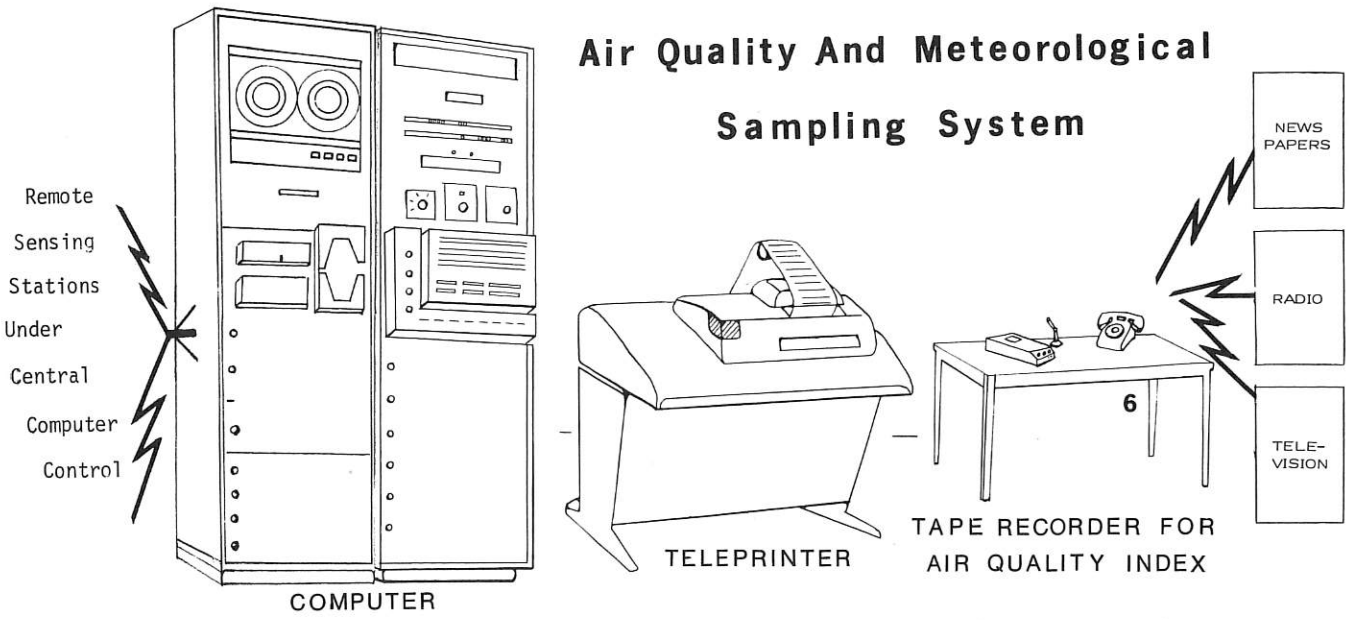
* Station operated by Washington State Department of Ecology

[a] Type of Sampling

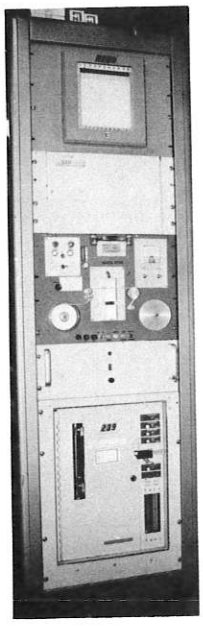
A Suspended Particulates-HiVol
B Sulfur Dioxide (SO2)
C Suspended Particulates-COH'S
D Wind Speed & Direction
E Nitrogen Dioxide (NO2)
F Nitrogen Oxides (NOx)
G Ozone (O3)
H Hydrocarbons (Nonmethane)
I Carbon Monoxide (CO)
J Delta Temperature
K Atmospheric Particles (b - Scattering)


MARYSVILLE
EVERETT
ISLAND CO
KITSAP CO
SNOHOMISH
MONROE
SNOHOMISH CO
KING CO
TOLT WATER RES
SEATTLE
BELLEVUE
BREMERTON
RENTON
SNOQUALMIE
KITSAP CO
PIERCE CO
KENT
AUBURN
TACOMA
PUYALLUP
ENUMCLAW
KING CO
PIERCE CO
THURSTON CO
PIERCE CO
N
1978
ATMOSPHERIC SAMPLING NETWORK
PUGET SOUND AIR POLLUTION CONTROL REGION
KM
MILES
UTM (KILOMETERS NORTH)
UTM (KILOMETERS EAST)

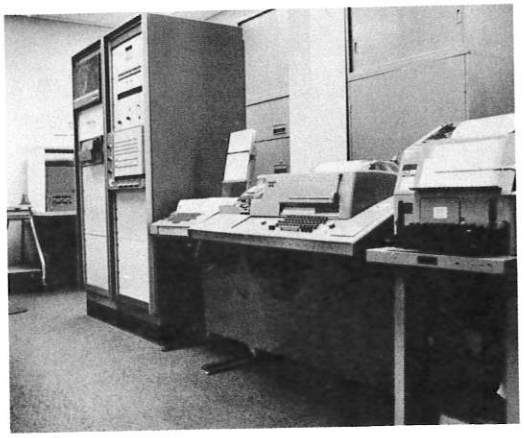
Air Quality And Meteorological Sampling System



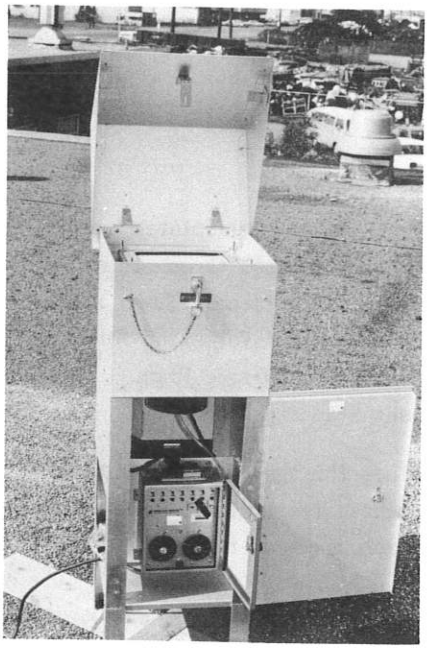
- Remote stations in the Puget Sound Region continuously monitor.....
  WIND DIRECTION WIND SPEED SULFUR DIOXIDE SUSPENDED PARTICULATES (COH's)
  (A few stations have additional sensors for monitoring OZONE)
- Raw data is immediately telemetered to the central station computer via phone lines.
- Central station computer controls the entire network. It processes all raw data, and computes 15-minute, 1-hour, and 24-hour averages for immediate printout.
- Processed averages are printed by teleprinter on a continuous schedule around the clock each day of the year.
- All data is checked for validity or instrument malfunction by air quality specialists prior to use.
- Data is used to evaluate the attainment of ambient air quality standards; to maintain real-time surveillance for episode avoidance; and to report an air quality index to the public.
- After validation and deletion of any erroneous data, the data is processed by off-line computer to provide a monthly summary containing the specific hourly averages, daily maximum, minimum, and mean, monthly arithmetic and geometric means, selected moving averages and pertinent identifying information.
- Permanent data files stored on magnetic tape or disk allow rapid retrieval for correlation with other data, trend analyses, atmospheric modeling, land use planning, control strategy evaluation and special studies.
- Nontelemetered data from the high volume samplers measuring total suspended particulates is manually reduced, punched on cards, processed, printed, and stored in permanent computer files for rapid retrieval.



On the left is one of the fifteen remote station equipment cabinets housing the sulfur dioxide monitor, the wind speed and direction signal conditioner and translator, the tape sampler for suspended particulates measured as COH (soiling index) and the telemetry electronics. The anemometer, wind direction sensor, and probes for SO_2 and COH are installed to obtain representative samples in the ambient air. Each station has a capability of fourteen separate sensors.



On the right is the central station computer whose functions are described above. One equipment rack contains the magnetic tape recorder and high speed paper tape reader; the 32K byte computer and telemetry interface electronics are in the other equipment rack. Next to it is a console printer which also serves as a standby system printer. The large teletype console prints the processed data. At the extreme right is a weather teletype.



Above is a high volume air sampler used for measuring suspended particulates. This instrument, open for illustrative purposes, contains a special filter in the top portion of the protective cabinet and an electric timer at the base. This instrument is normally operated for a 24-hour period every sixth day and will collect particulates as small as 0.3 micron with 99.7% efficiency. A micron is 0.001 millimeters or 0.000039 inches.

Most of the Agency equipment is located in schools, fire stations, municipal and commercial buildings. In some areas, buildings do not exist or do not meet the siting criteria. In these areas, trailers or portable buildings must be used as shelters for sampling equipment. At the top center is a semiportable building used at the McMicken Heights Reservoir, east of SEA-TAC Airport. Visible on the roof are the high volume sampler, the wind sensing equipment, and the probes for SO_2, COH (tape sampler) and ozone. The analyzers and the telemetry electronics are located inside the building.

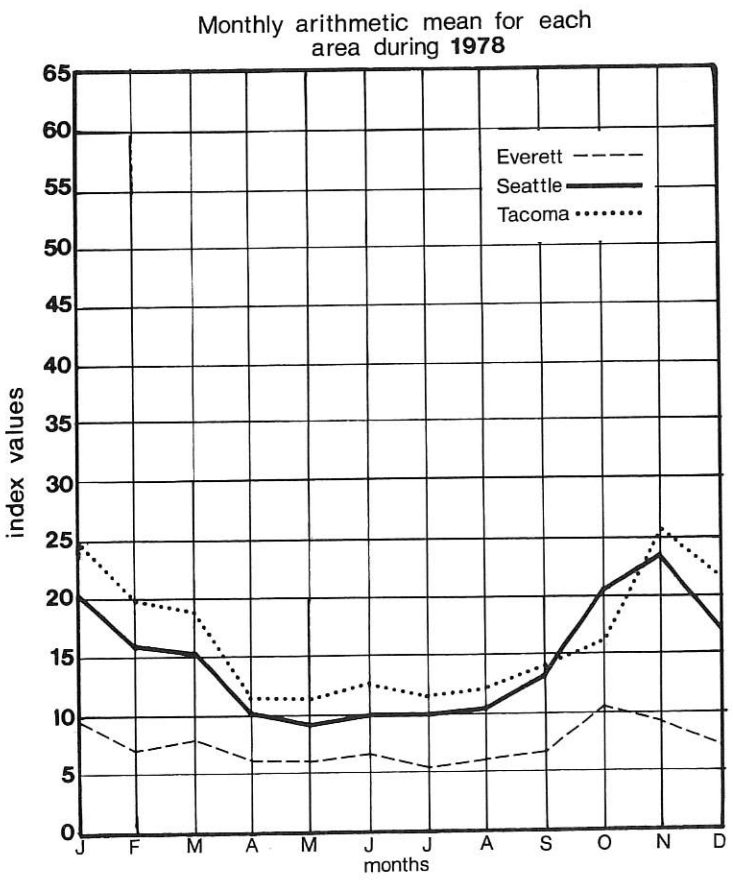
On the top right is a trailer used at Kent. On the roof are the high volume sampler, the wind sensing equipment and probes for bringing air to the analyzers. This station measures SO_2, Ozone, COH, b_{scat} (a measure of light scatter by aerosols), wind speed, direction and suspended particulates by high volume sampler. All the data except suspended particulates measured by the high volume sampler are telemetered.

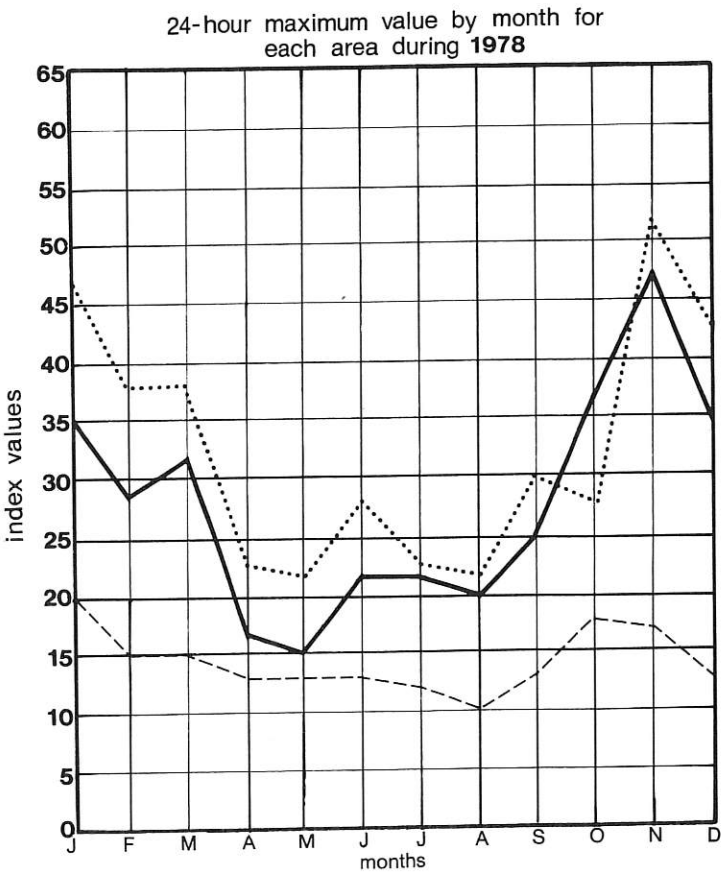
Below is a municipal building being utilized as a sampling site. Visible from ground level is the wind sensing equipment and probe system. Not visible is the high volume sampler located on the roof near the wind equipment mast. This site is located in the Duwamish Basin Industrial Area.

AIR QUALITY INDEX

The air quality index is a scalar value representing the average concentration of suspended particulates and/or sulfur dioxide at a particular location for the most recent 24 hours. An index is calculated three times a day at 8 AM, 12 noon, and 4 PM, for each of the three geographic areas-Everett, Seattle and Tacoma. These index values are immediately tape-recorded Monday through Friday to provide continuous up-to-date information for the news media. An index of 50 is approximately equal to the alert stage of the Washington Episode Plan. This index, in use locally since October, 1971, is compatible with the national Pollutant Standards Index.

The charts below depict variations from month to month in air quality index values for the Everett, Seattle, and Tacoma areas during 1978. The chart at the left displays monthly arithmetic means of calculated daily index values while the chart at the right presents maximum index values reached during each month of the year.





An "AIR STAGNATION ADVISORY" is issued by the National Weather Service when poor atmospheric dispersion conditions exist and these conditions are forecast to persist for 24 hours or more. An Air stagnation advisory was in effect in the Puget Sound region for the following period during 1978:

Valid From:	To:
10 AM, Wednesday, November 1	12 Noon, Thursday, November 2

SUSPENDED PARTICULATES

Acquisition of Data

The Agency operates a network of high volume samplers which monitors suspended particulates at various locations within King, Kitsap, Pierce and Snohomish Counties. High volume sampling is the federal reference method for measuring total suspended particulates. These samplers operate on an intermittent schedule sampling continuously for 24 hours every sixth day.

The Annual Standard

In April, 1971, the U.S. Environmental Protection Agency established national primary and secondary ambient air quality standards. Later in that year, the Agency's existing standard for suspended particulates was amended so that it was identical to the national secondary standard. This sets a value of 60 micrograms per cubic meter, annual geometric mean, which shall not be exceeded. The standard is written in terms of a geometric mean rather than an arithmetic mean because the distribution of air quality data is better described by the geometric statistic.

As a result of the averaging period indicated by the standard, a minimum of one year of sampling is required at any location to assess the suspended particulate concentrations with respect to the annual standard. Additional years of data document more more completely the concentrations at that location.

Factors Influencing Concentrations

The ambient suspended particulate concentrations are a complex function of the amount emitted from many sources, meteorological transport, diffusion and dispersion of these emissions, and the local topographic features. For example, valleys are topographic features that limit and modify surface air motion, thus contributing to the trapping of suspended particulates emitted from sources in the valley. Meteorological patterns follow average seasonal and annual cycles; however, each year varies somewhat from average conditions. Source emissions also change from day to day and from year to year.

Action to Reduce Concentrations

In urban areas where suspended particulate levels exceed the standards, the Clean Air Act and the 1977 Amendments require a plan to meet the standards. The Agency has adopted emission standards, enforced these standards, encouraged paving of roads and parking lots, reduced open burning, and taken many other individual actions designed to reduce the amount of particulates which escape to the ambient air.

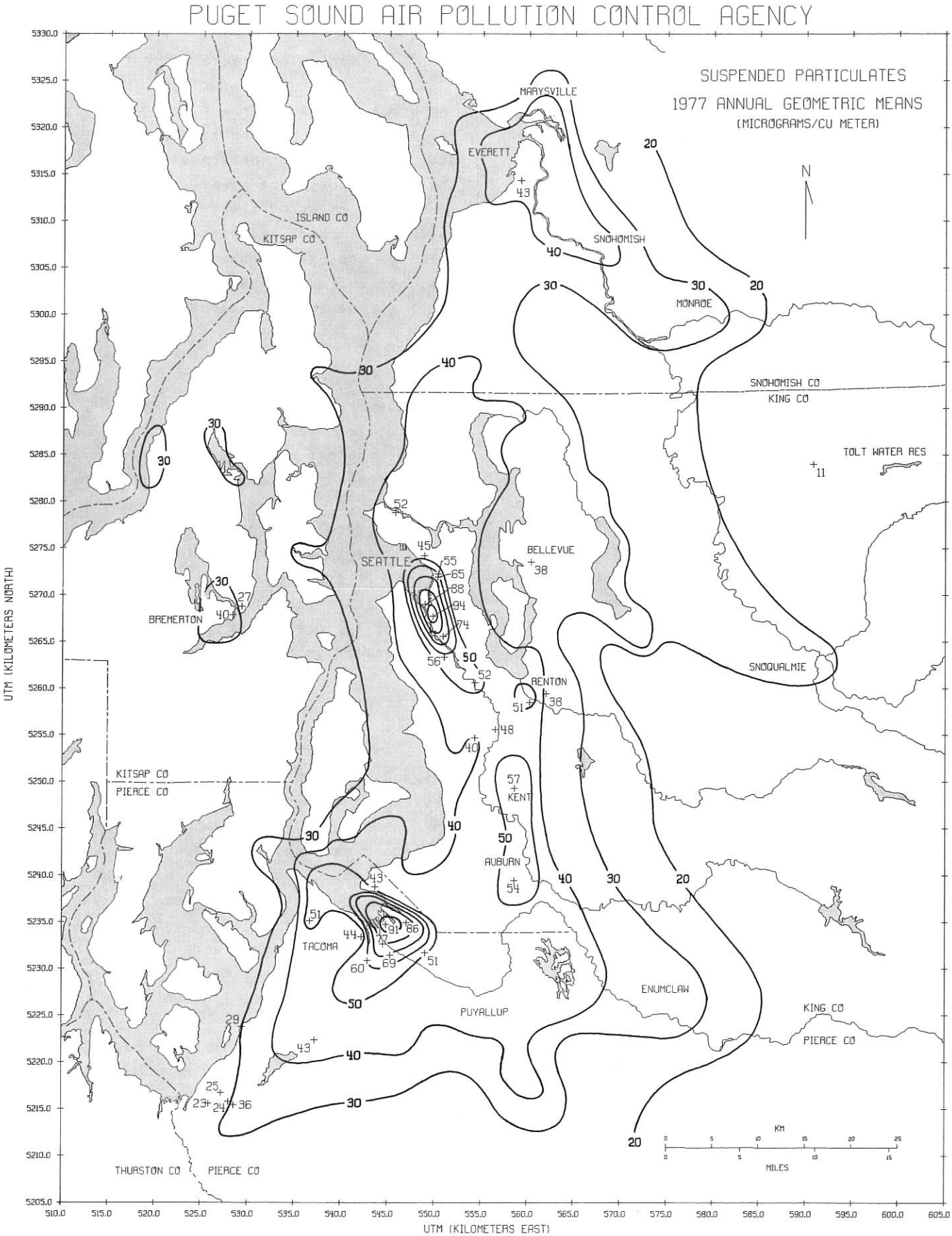
Assessing The Results

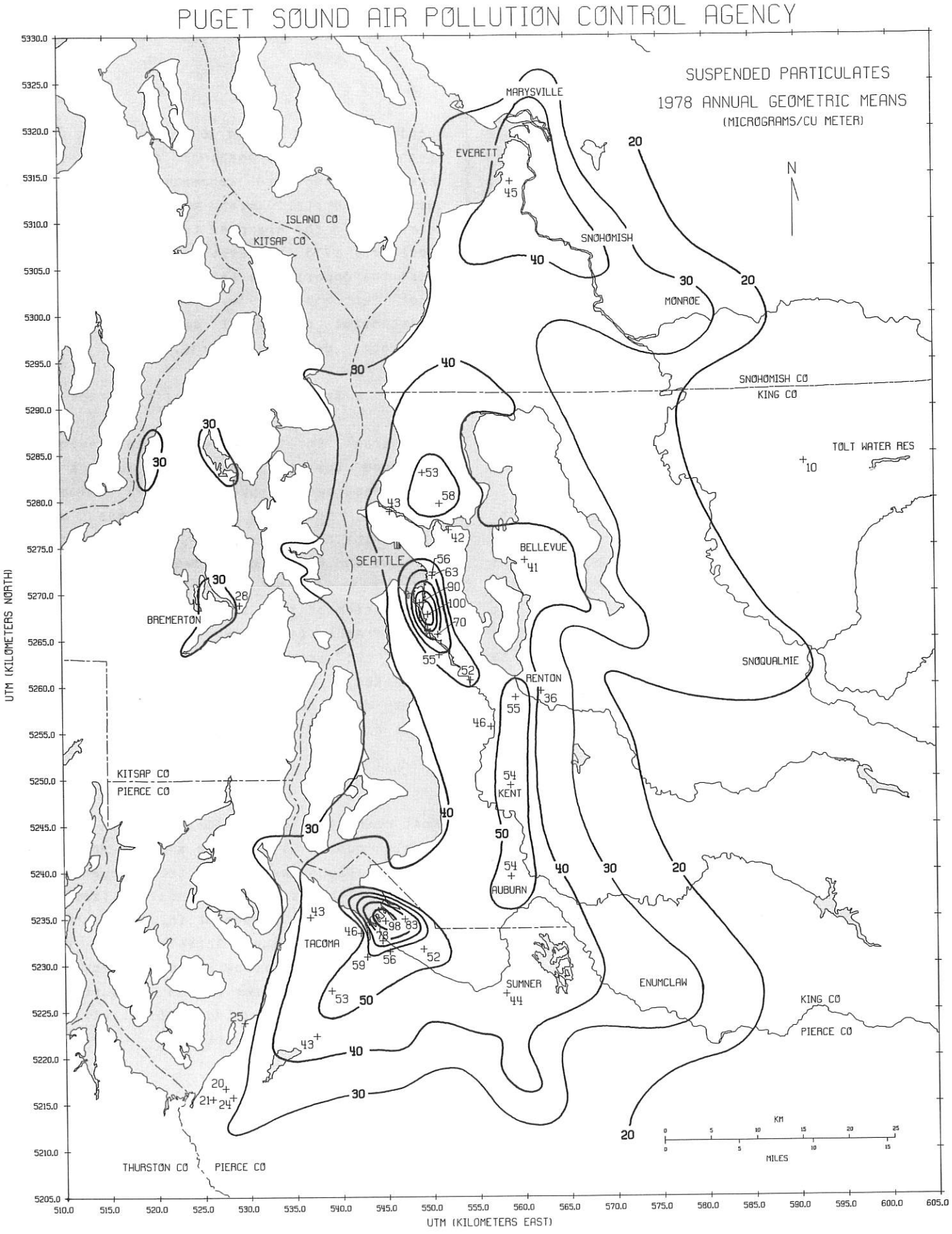
Since several factors influence the suspended particulate values, it is never absolutely evident whether an increase or decrease measured at a station results directly from corresponding changes in source emmissions. Stagnant meteorological conditions on a sampling day may contribute to a higher measured reading, but the reverse is also true. Therefore, analysis of trends in air quality must recognize all relevant factors. Assessment of a long-term trend should be based on several years of data.

Suspended Particulate Maps - 1977 & 1978

The maps which follow this page summarize suspended particulate values throughout the region for each of calendar years 1977 and 1978. Each map presents annual geometric mean suspended particulate concentrations and depicts the horizontal distribution of this pollutant. The observed concentrations at each sampling station, together with a detailed particulate emission inventory and information about meteorological conditions, topography, and demography, were used in developing each map.

The concentration of suspended particulates at a location may be determined by interpolating between adjacent isopleths (lines connecting points of equal concentration). Areas which exceed the annual standard of 60 micrograms per cubic meter are clearly delineated. The Tideflats-Puyallup Valley area of Tacoma, and the Harbor Island-Duwamish Valley area of Seattle exceeded this standard in 1977 and 1978.


PUGET SOUND AIR POLLUTION CONTROL AGENCY
SUSPENDED PARTICULATES
1977 ANNUAL GEOMETRIC MEANS
(MICROGRAMS/CU METER)
N
MARYSVILLE
EVERETT
ISLAND CO
KITSAP CO
SNOHOMISH
MONROE
SNOHOMISH CO
KING CO
TOLT WATER RES
SEATTLE
BELLEVUE
BREMERTON
RENTON
SNOQUALMIE
KITSAP CO
PIERCE CO
KENT
AUBURN
TACOMA
PUYALLUP
ENUMCLAW
KING CO
PIERCE CO
THURSTON CO
PIERCE CO
KM
MILES
UTM (KILOMETERS NORTH)
UTM (KILOMETERS EAST)


PUGET SOUND AIR POLLUTION CONTROL AGENCY
SUSPENDED PARTICULATES
1978 ANNUAL GEOMETRIC MEANS
(MICROGRAMS/CU METER)
N
MARYSVILLE
EVERETT
45
ISLAND CO
KITSAP CO
SNOHOMISH
MONROE
SNOHOMISH CO
KING CO
TOLT WATER RES
10
SEATTLE
BELLEVUE
41
BREMERTON
28
RENTON
36
SNOQUALMIE
KENT
AUBURN
TACOMA
SUMNER
44
ENUMCLAW
KING CO
PIERCE CO
KITSAP CO
PIERCE CO
THURSTON CO
PIERCE CO
KM
MILES
UTM (KILOMETERS NORTH)
UTM (KILOMETERS EAST)

SUSPENDED PARTICULATE TRENDS

A Technique to Examine Trends

An analysis technique which allows a reasonable determination of trends is the moving mean or average. As applied to suspended particulates, a 12 month moving geometric mean relates directly to the annual standard. This moving mean is calculated simply by computing the 12 month geometric mean for consecutive 12 month periods moving along in one month steps. The moving mean is displayed by plotting each calculated value against the ending month of each period. These moving mean suspended particulate values may be compared directly to the annual standard. As more and more years of data are acquired at a sampling station, the power of the technique to display a trend is enhanced.

A variation of this technique which does even a better job of displaying a trend, but requires more years of data, is calculation of the moving geometric mean in multiples of 12 months. For example, 24 and 36 month moving geometric means smooth out some of the year to year variations in meteorology and short-term changes in source emissions to more clearly depict the trend.

Trends - Background Areas

The Agency has operated a single station near the Tolt Water Reservoir in the foothills of the Cascade Mountains since November, 1966. The 12, 24, and 36 month moving geometric mean graphs all depict a rather low and steady value ranging between 10 and 14 micrograms per cubic meter. This station exhibits a level trend and appears unaffected by the urbanized areas in the Puget Sound. The value documented at Tolt represents an estimate of the background value for the air of the Puget Sound region.

Trends - Displayed by Long-Term Sampling

Data has been acquired at the Public Safety Building in Seattle since February, 1965. The long-term trend decreases gradually, then appears to become level or slightly increase during 1976 through 1978. This is most clearly depicted by the 24 and 36 month moving geometric mean graphs. Assessment of a long-term trend based on isolated segments of the 12 month moving geometric mean plot could easily be erroneous; for example, the period from July to December, 1975 indicates a moderate decrease and just the opposite is indicated during the period from September, 1976, to August, 1977. A substantial period of sampling is needed to accurately depict the trend.

Trends - Industrialized Areas

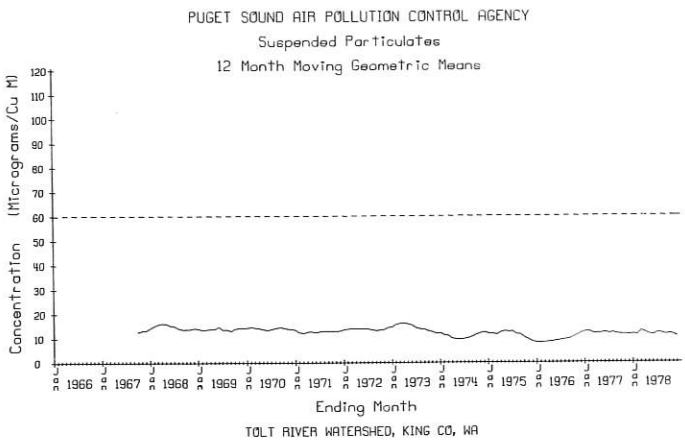
Two areas in the Puget Sound region have exceeded the annual standard most of the time that measurements have been made. As delineated by the preceding maps, these are the industrialized Duwamish Valley in south Seattle and the industrialized Tideflats area in Tacoma.

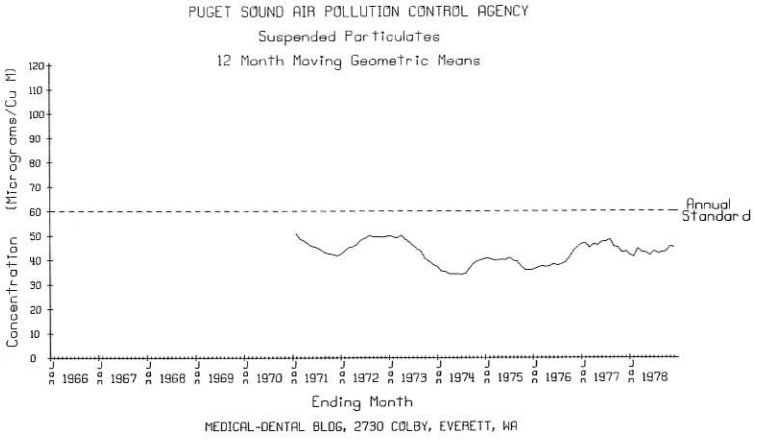
Examination of the 12 month moving geometric mean graphs for several stations in each of these two areas reveals some substantial increases over the last three years. Twenty-four and 36 month moving geometric mean plots also depict the upward trend.

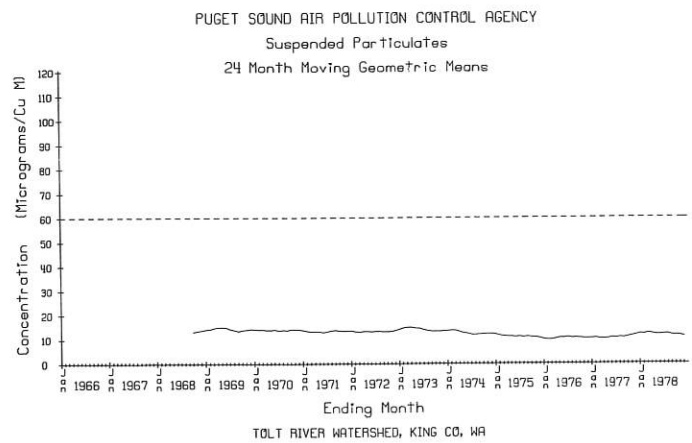
Summary

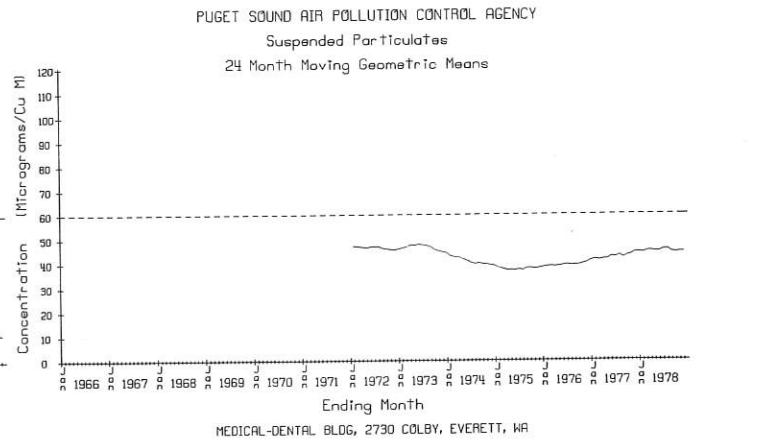
Most changes in the total suspended particulate levels during 1978 were small compared to the concentrations measured in the preceding year. Of 10 stations in the industrialized valleys, five recorded no change or insignificant changes in annual mean values, three recorded decreases (3, 4, and 13 micrograms per cubic meter) and two recorded increases (6 and 7 micrograms per cubic meter). The two stations with observed increases were the stations measuring the highest concentrations.

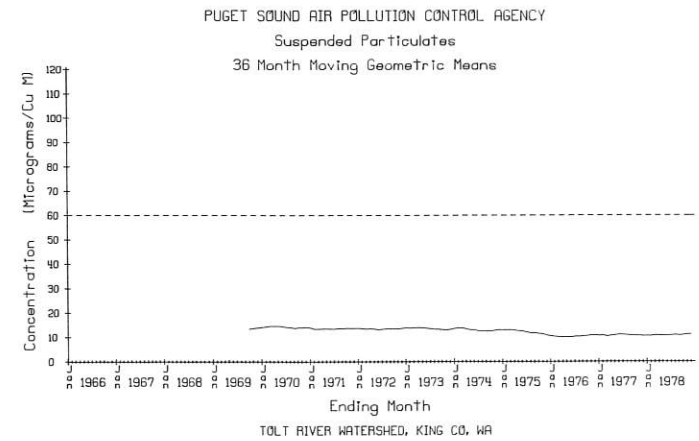
Outside the two industrialized areas, all other locations recorded no change or just small increases or decreases in annual mean values except for two stations which showed decreases of 8 and 9 micrograms per cubic meter.

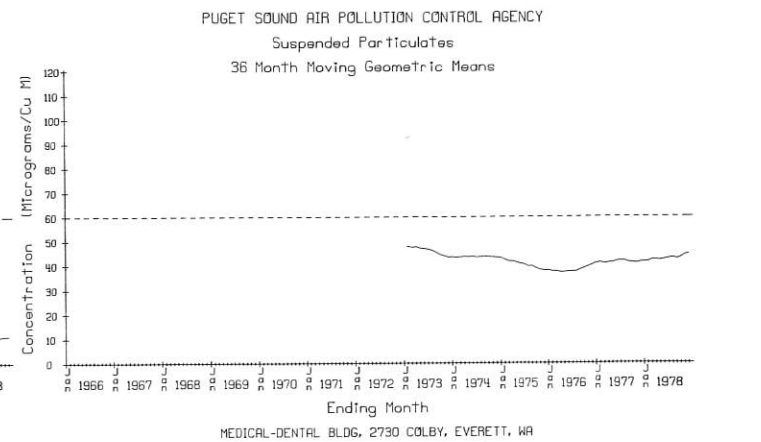

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED, KING CO, WA

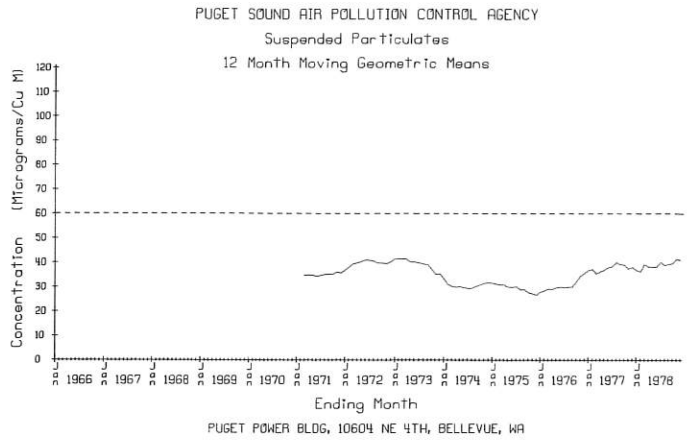

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA

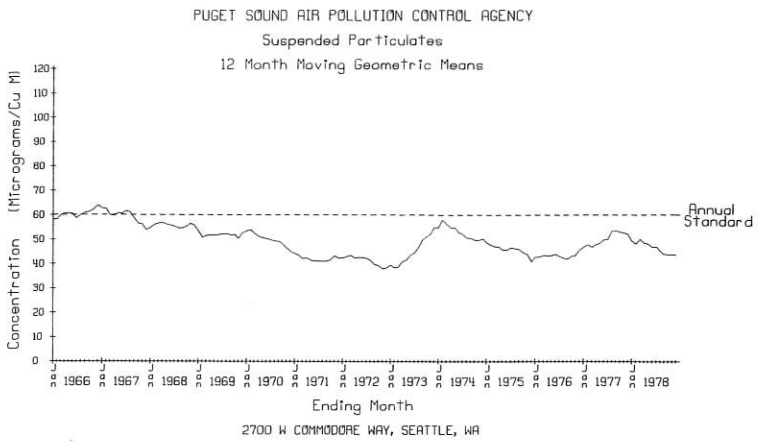

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED, KING CO, WA

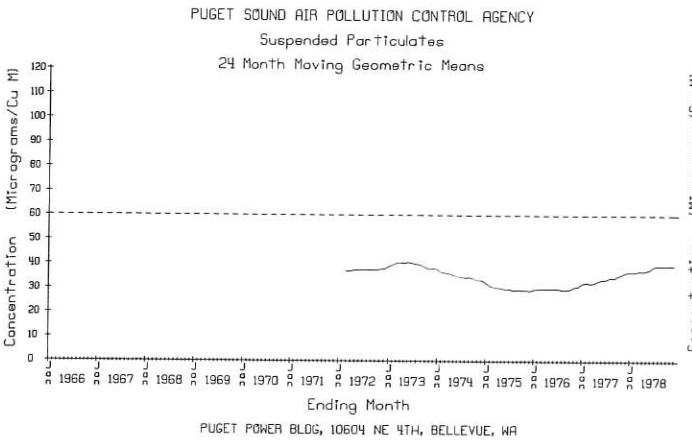

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA

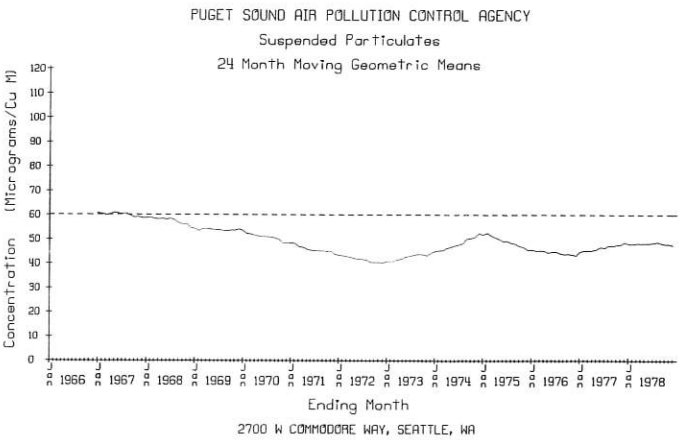

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED, KING CO, WA

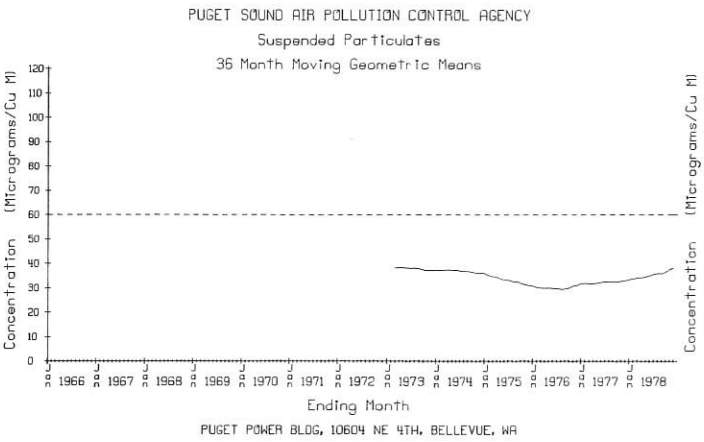

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA

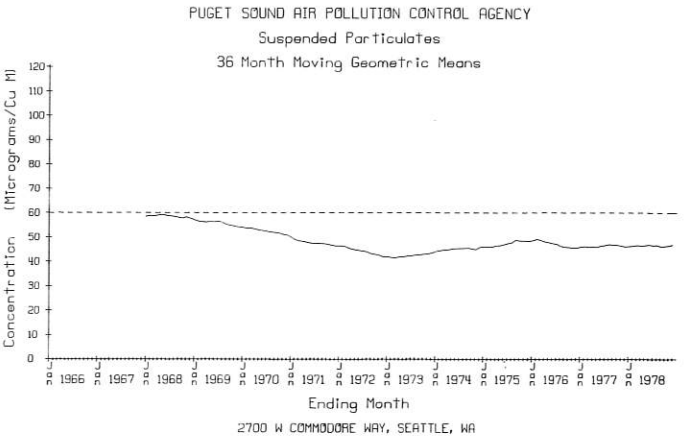

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA

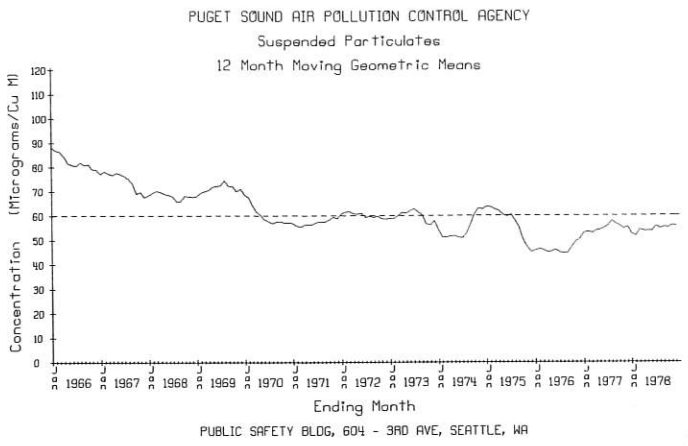

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
2700 W COMMODORE WAY, SEATTLE, WA

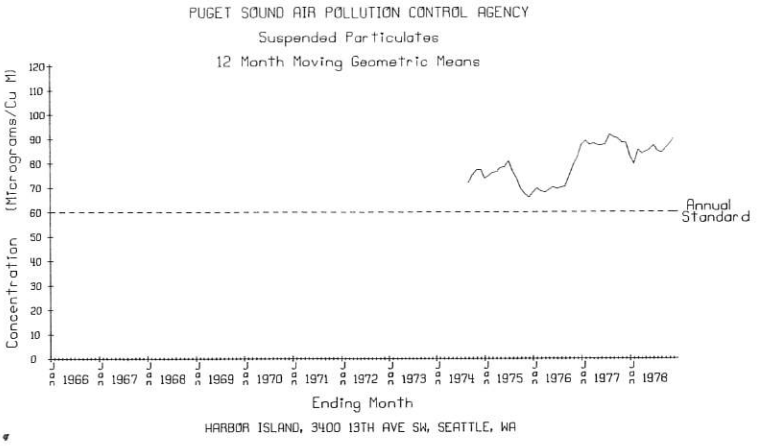

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA

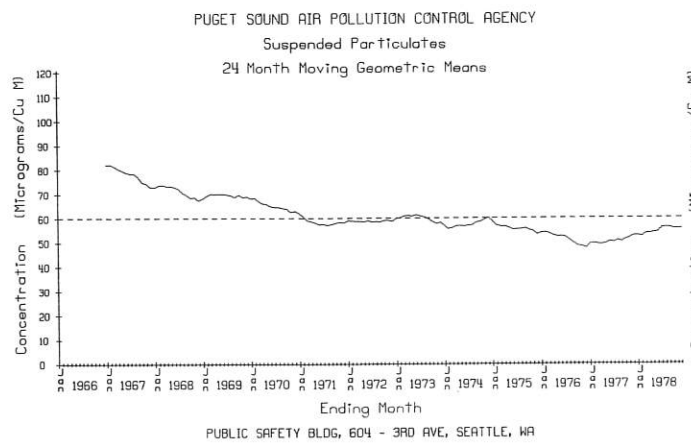

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
2700 W COMMODORE WAY, SEATTLE, WA

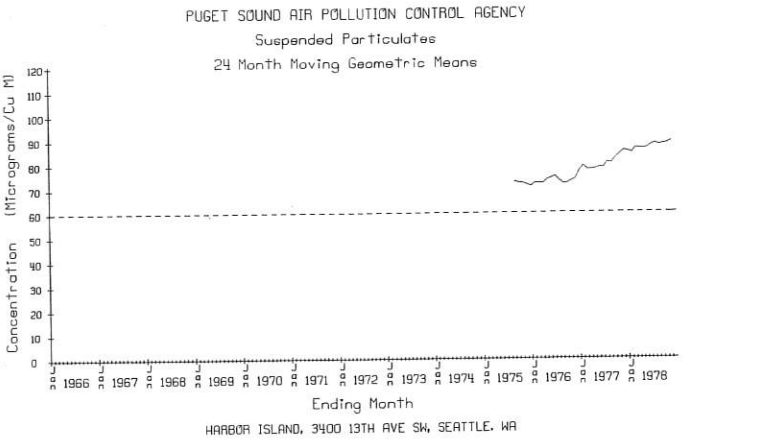

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA

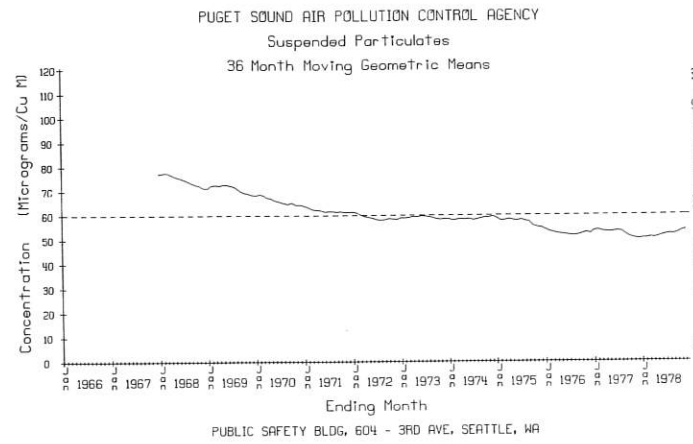

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
2700 W COMMODORE WAY, SEATTLE, WA

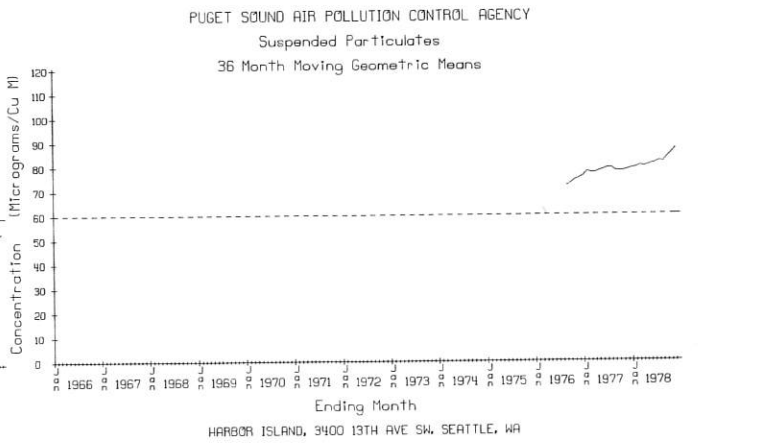

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA

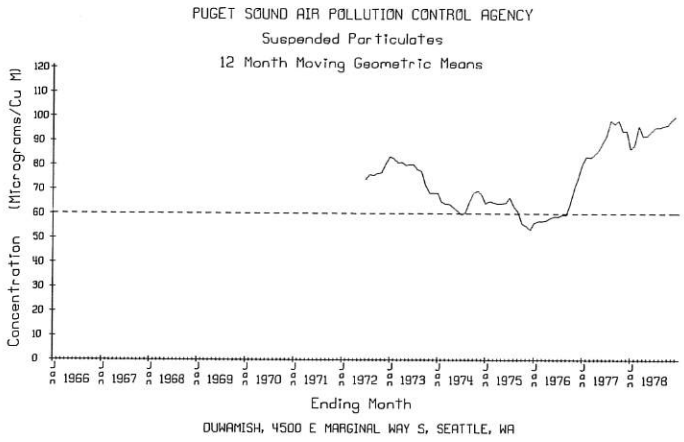

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA

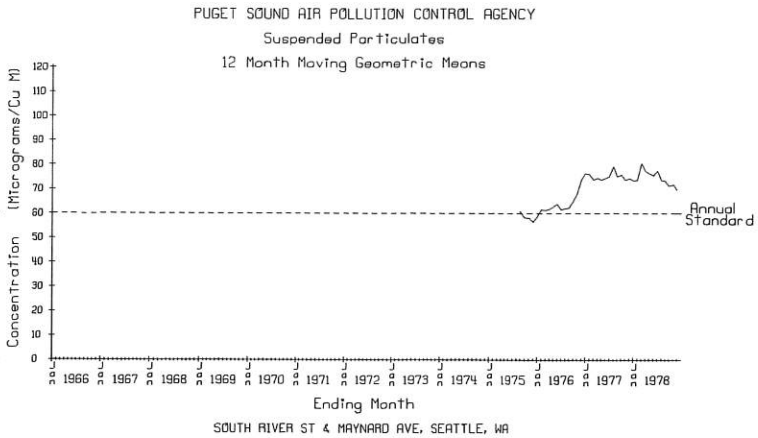

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA

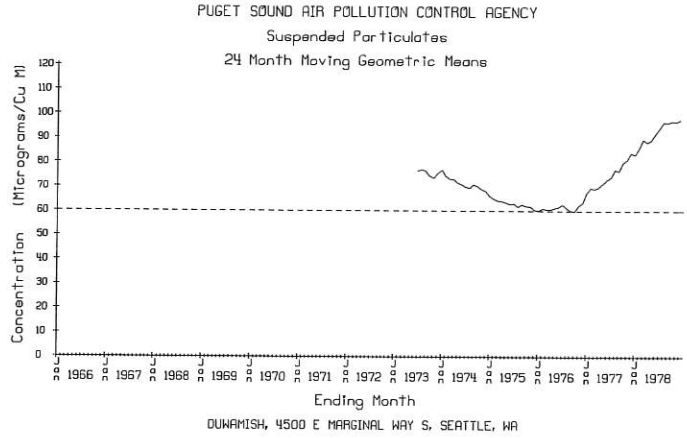

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA

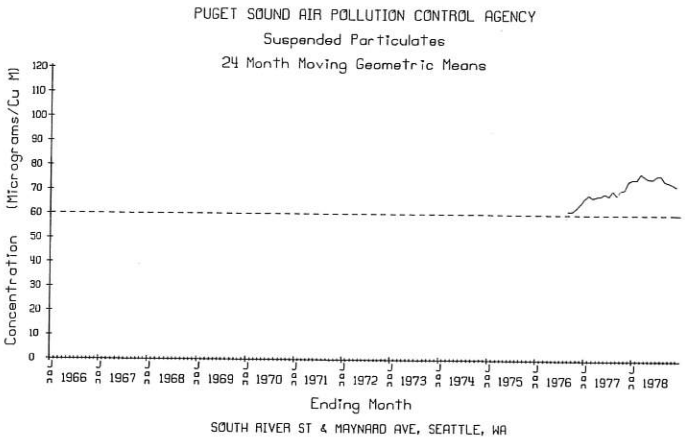

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA

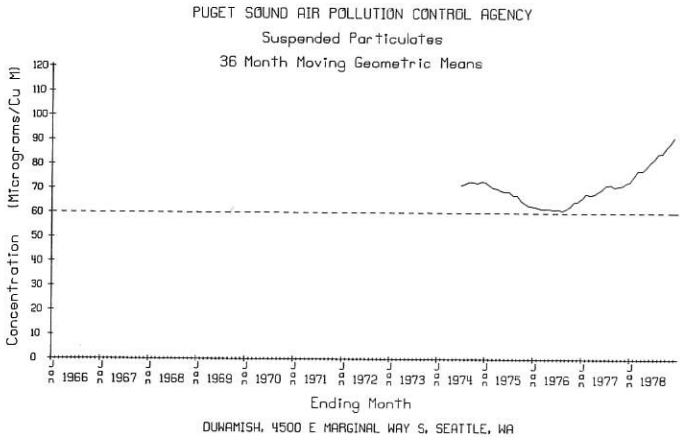

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA

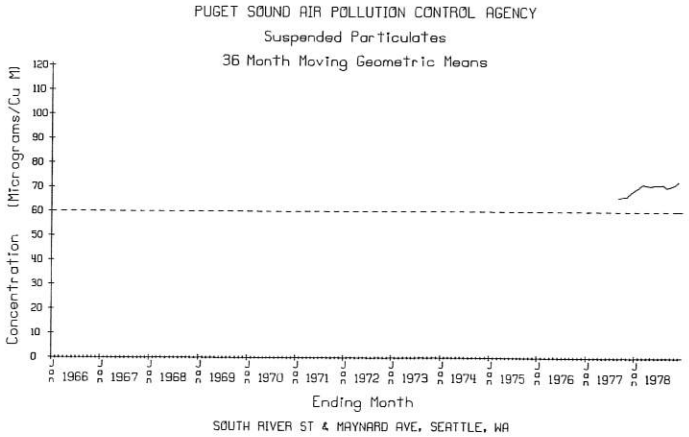

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA

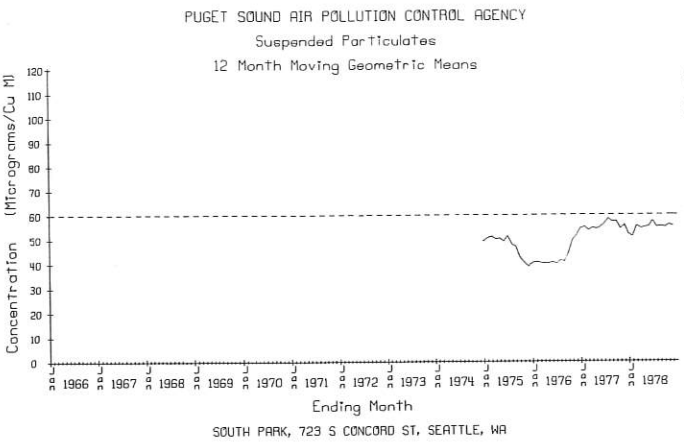

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Annual Standard
Ending Month
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA

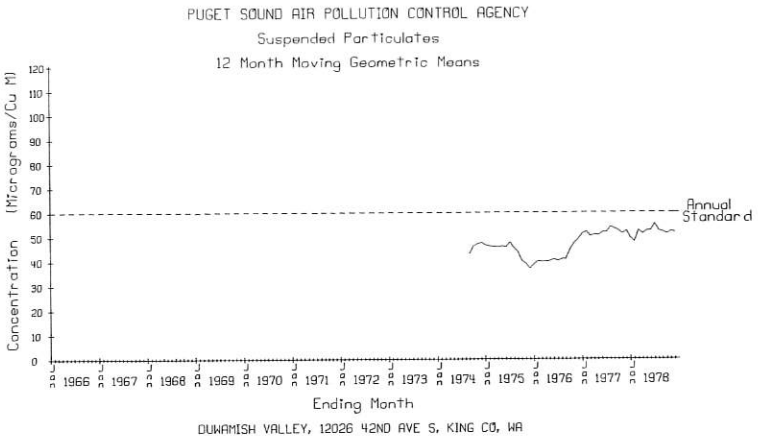

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA

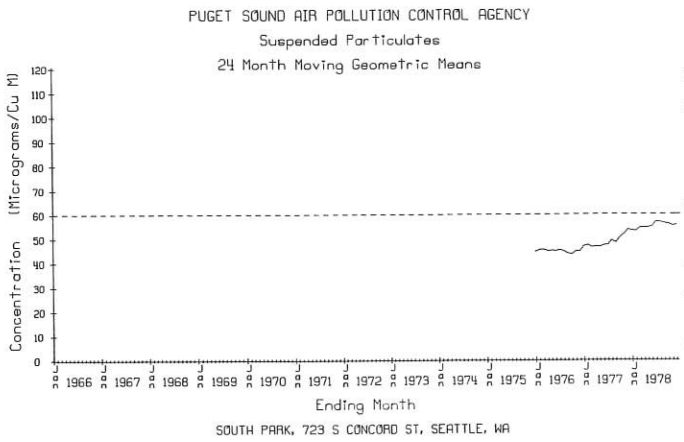

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA

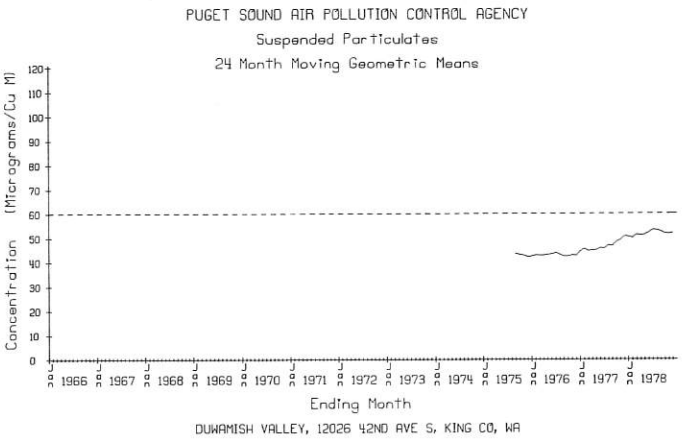

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA

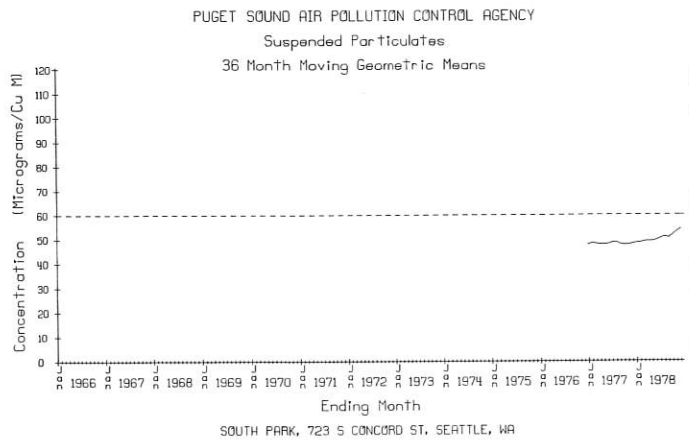

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA

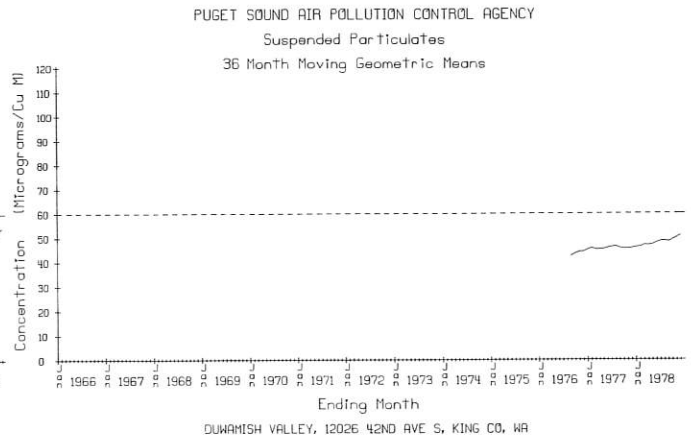

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA

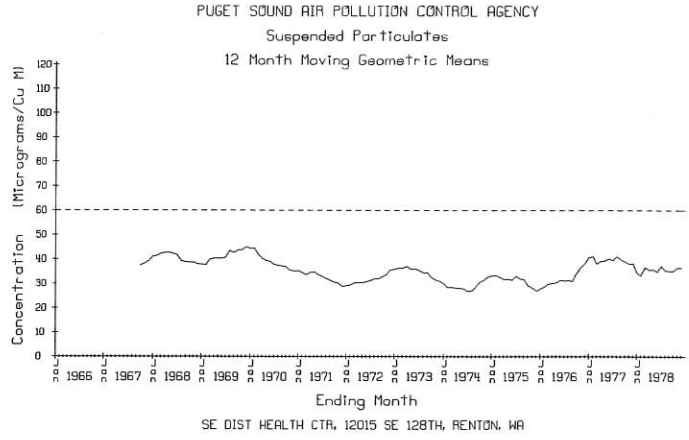

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA

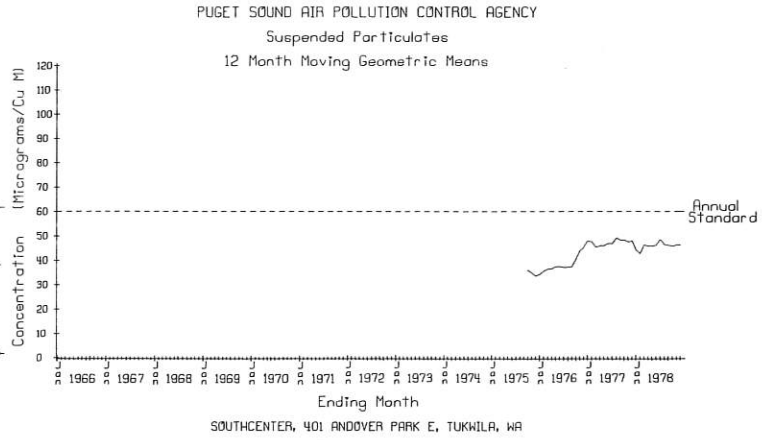

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA

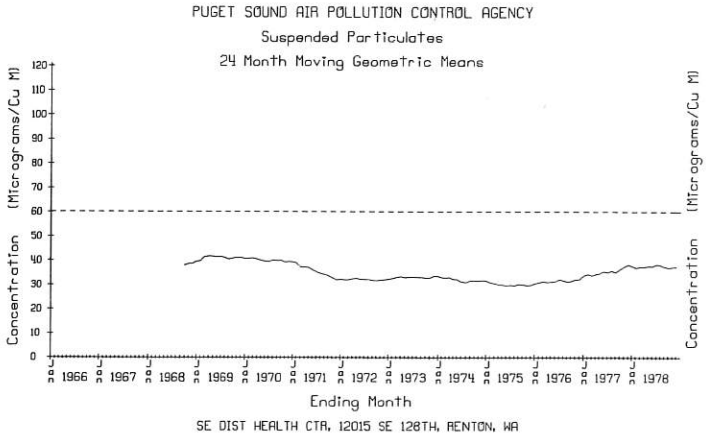

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA

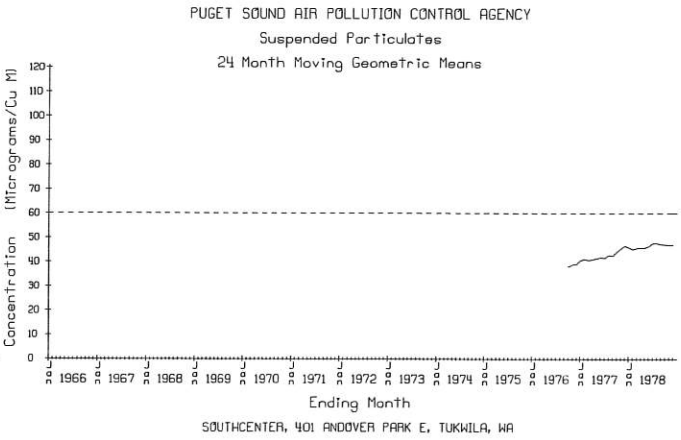

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA

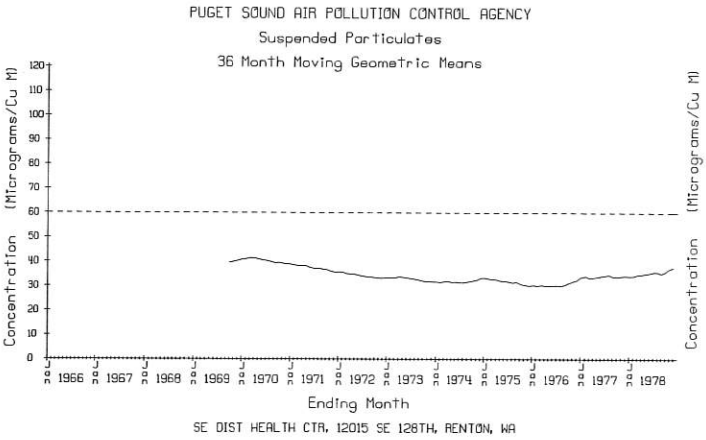

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA

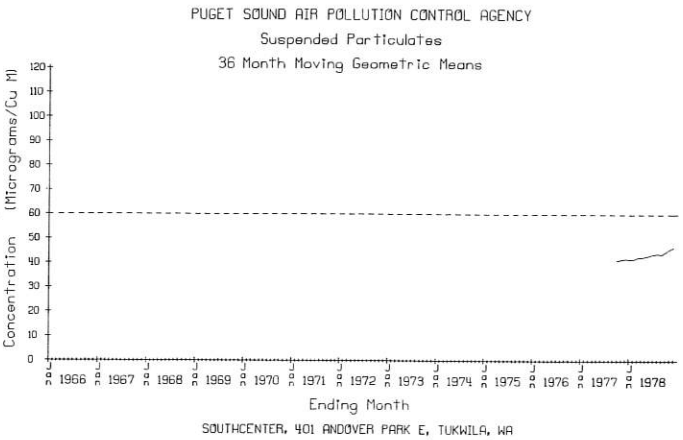

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

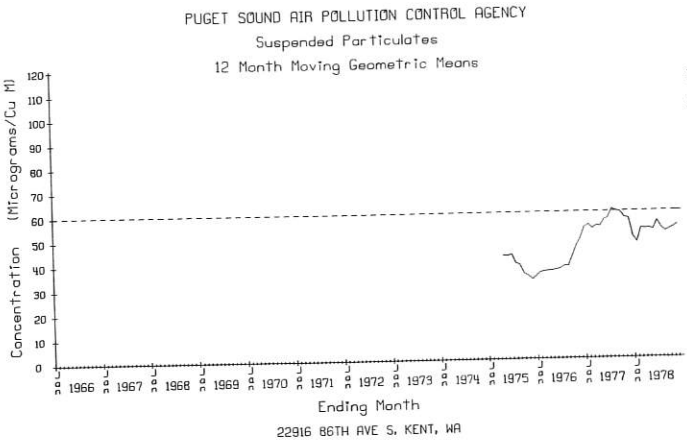

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA

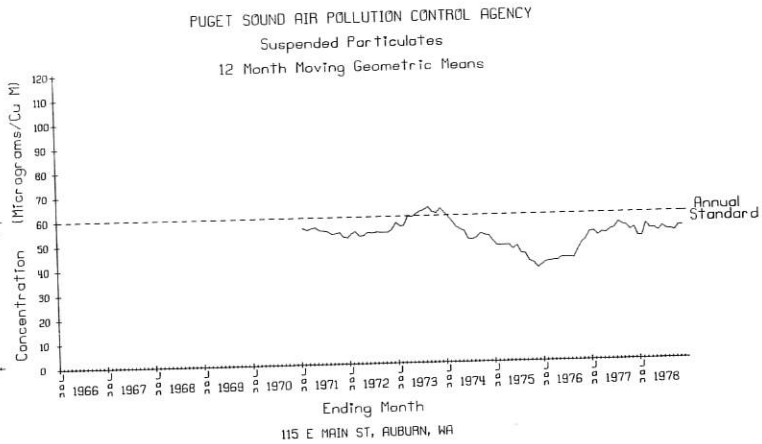

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

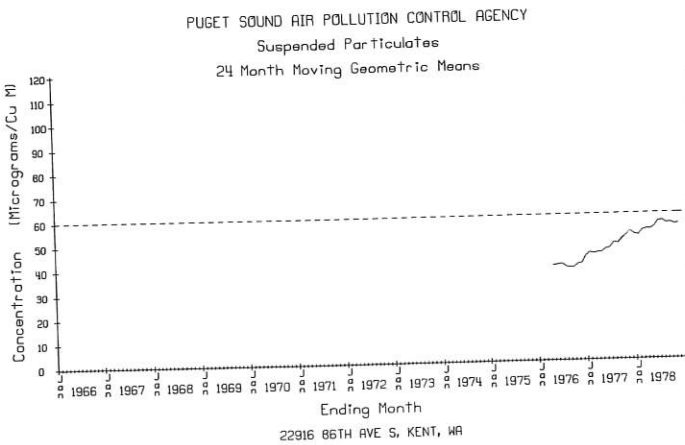

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA

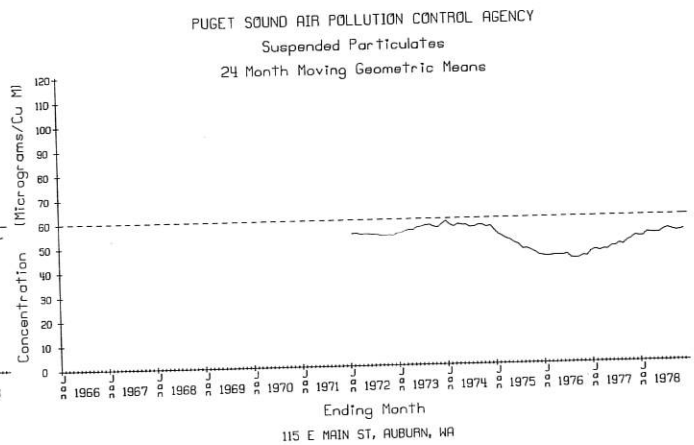

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

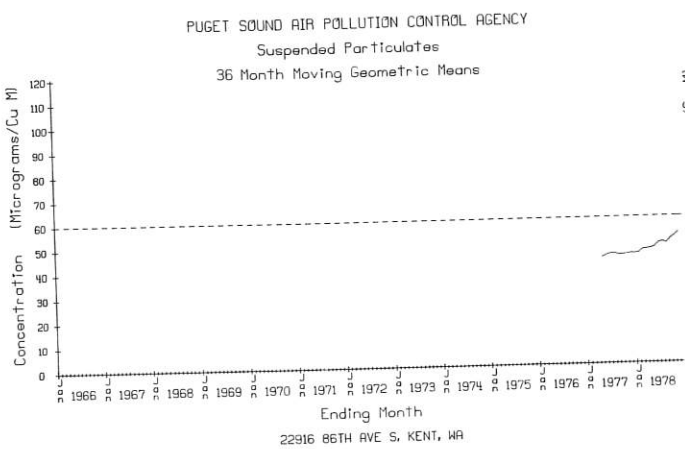

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA

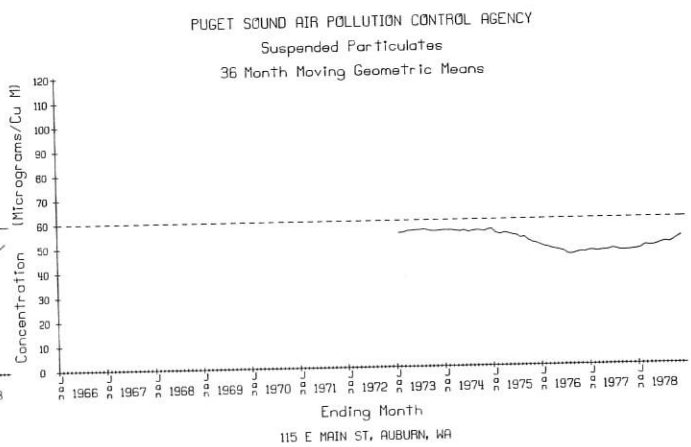

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
22916 86TH AVE S, KENT, WA

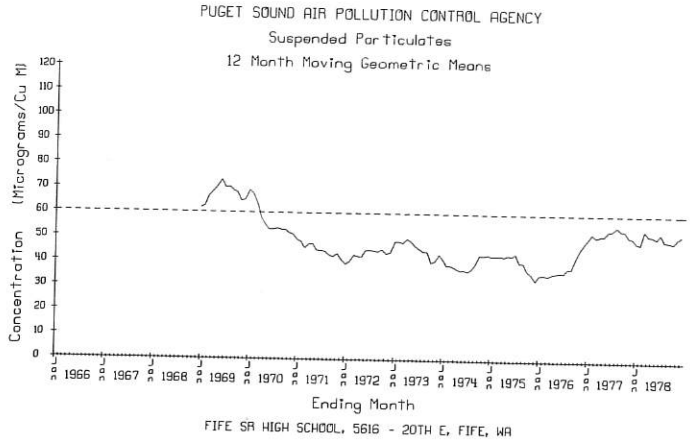

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
115 E MAIN ST, AUBURN, WA

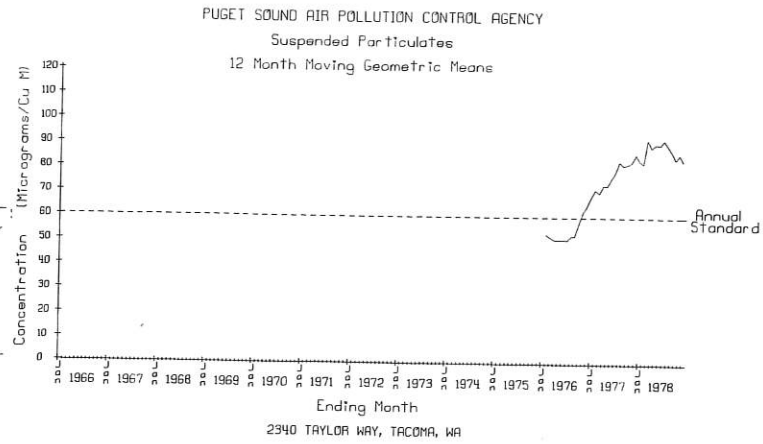

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
22916 86TH AVE S, KENT, WA

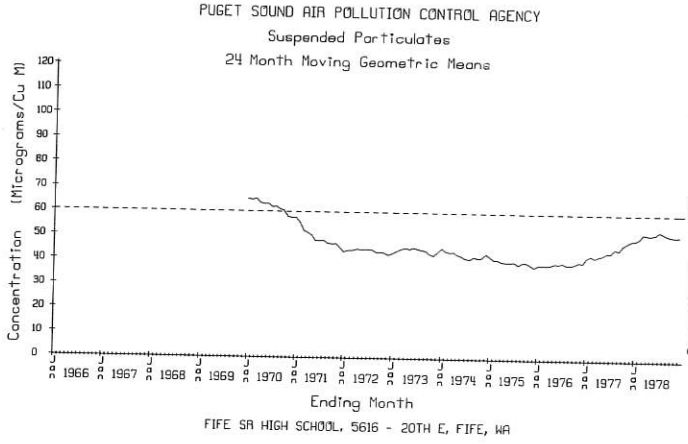

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
115 E MAIN ST, AUBURN, WA

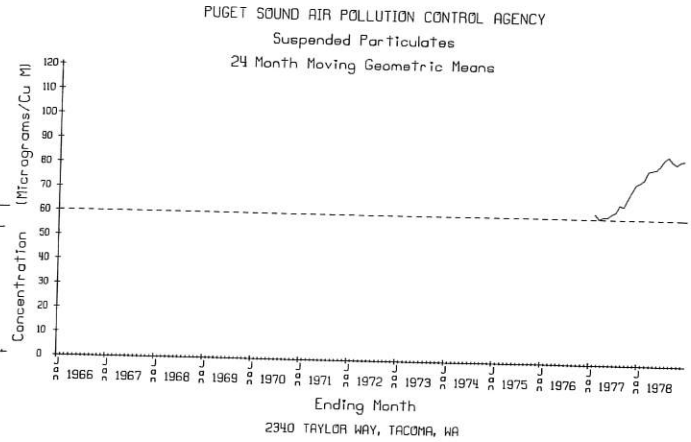

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
22916 86TH AVE S, KENT, WA

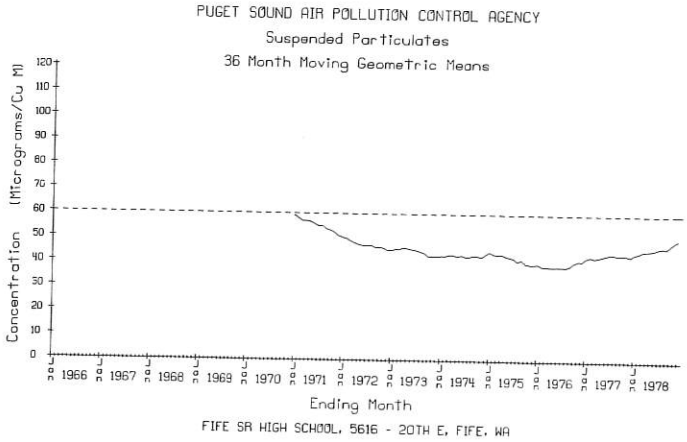

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
115 E MAIN ST, AUBURN, WA

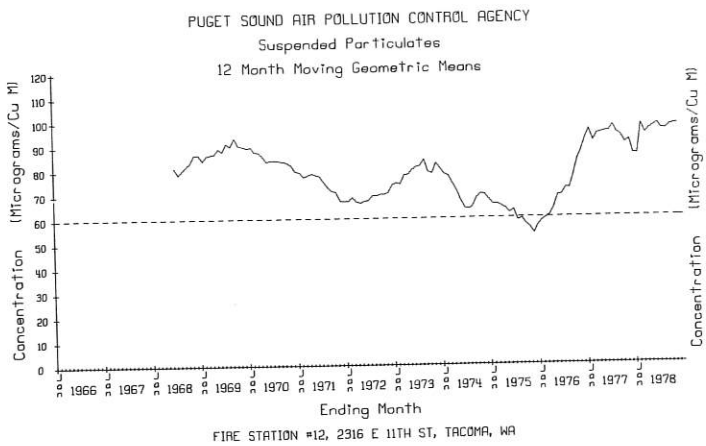

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA

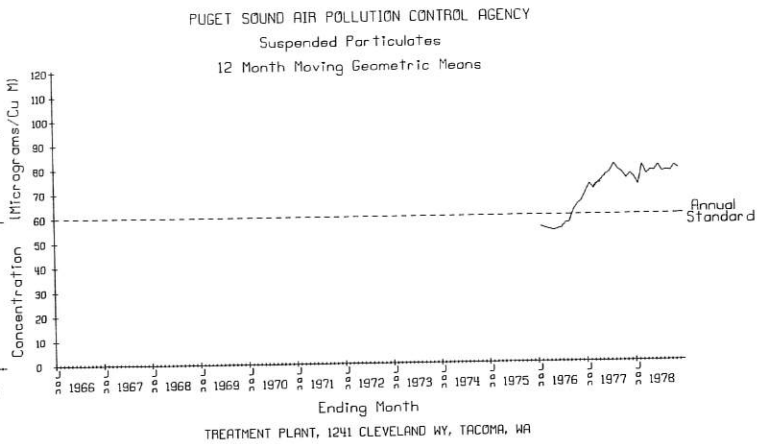

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Annual Standard
Ending Month
2340 TAYLOR WAY, TACOMA, WA

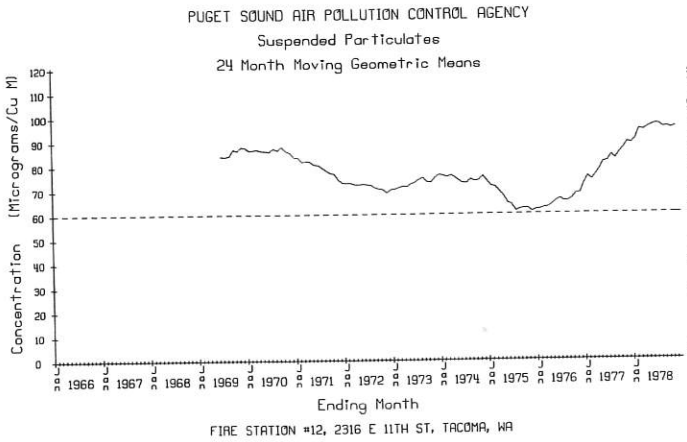

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA

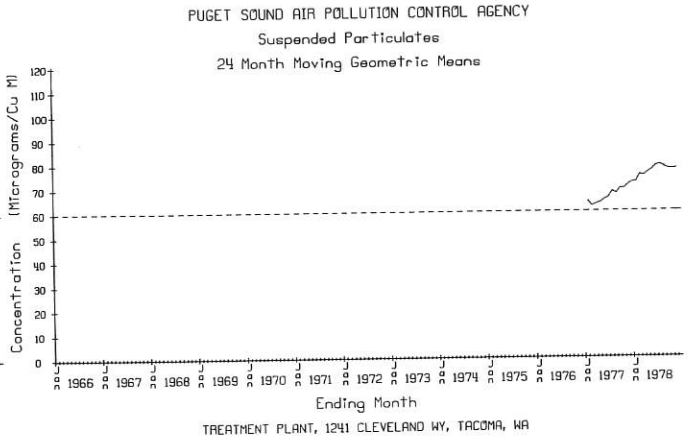

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
2340 TAYLOR WAY, TACOMA, WA

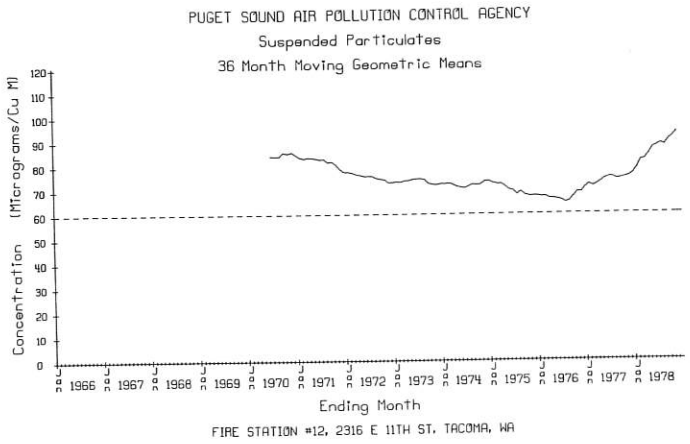

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA

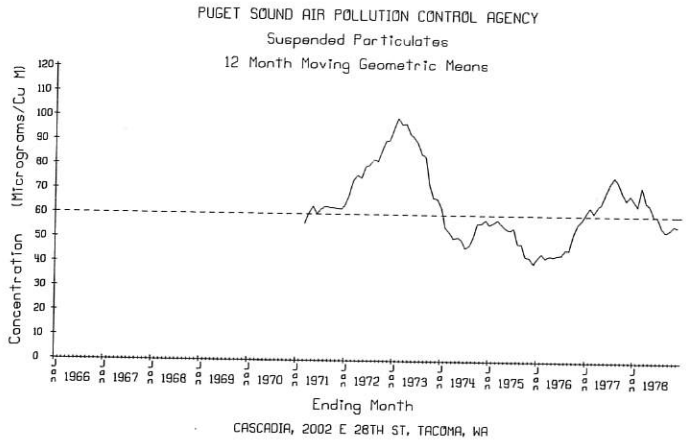

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

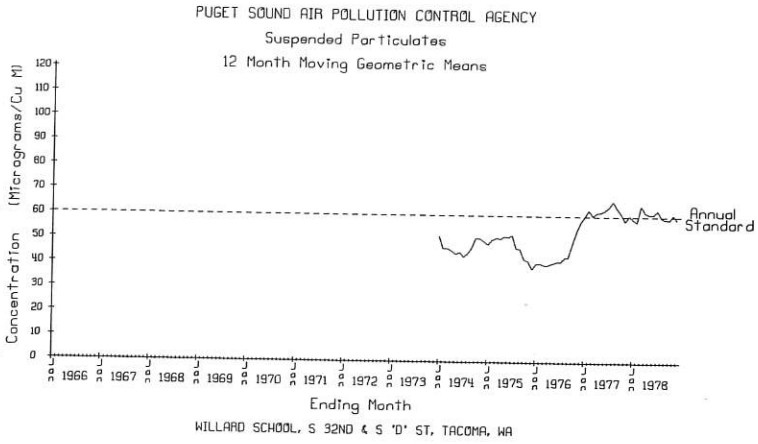

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Annual Standard
Ending Month
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

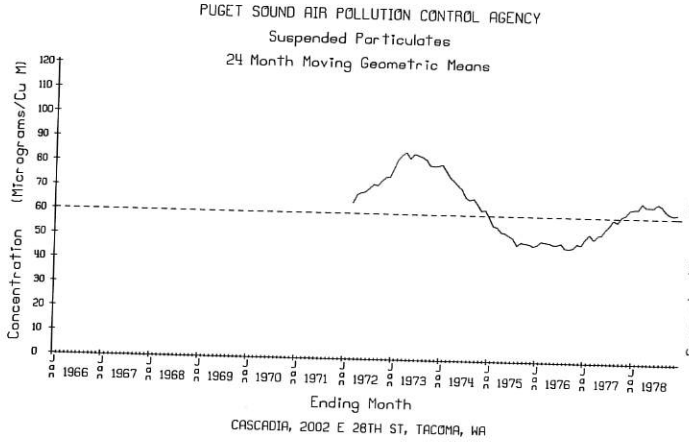

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

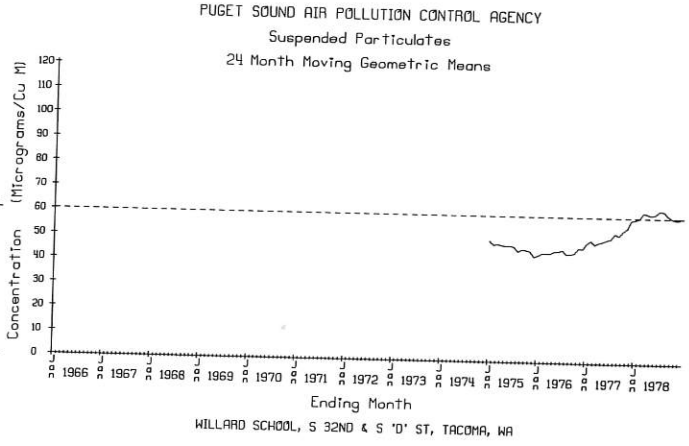

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

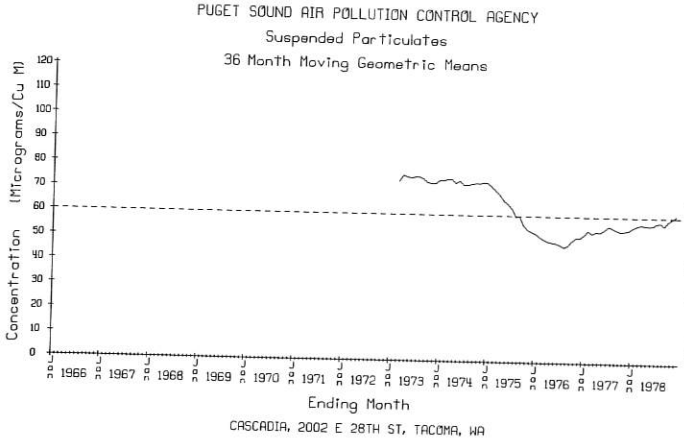

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

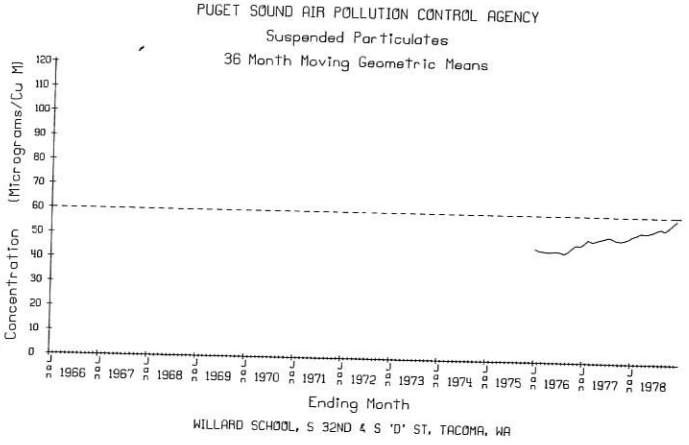

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
CASCADIA, 2002 E 28TH ST, TACOMA, WA

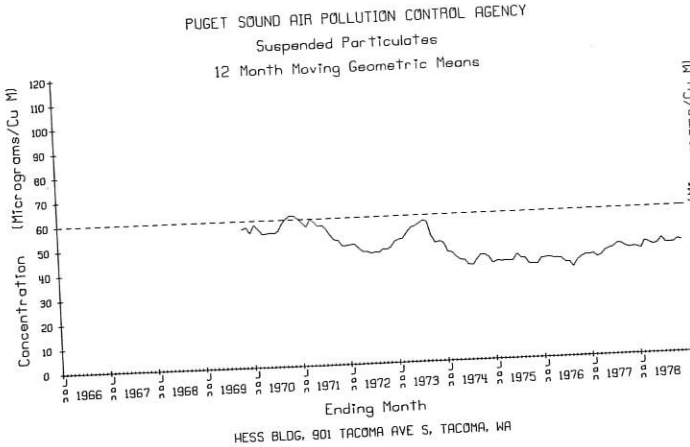

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Annual Standard
Ending Month
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA

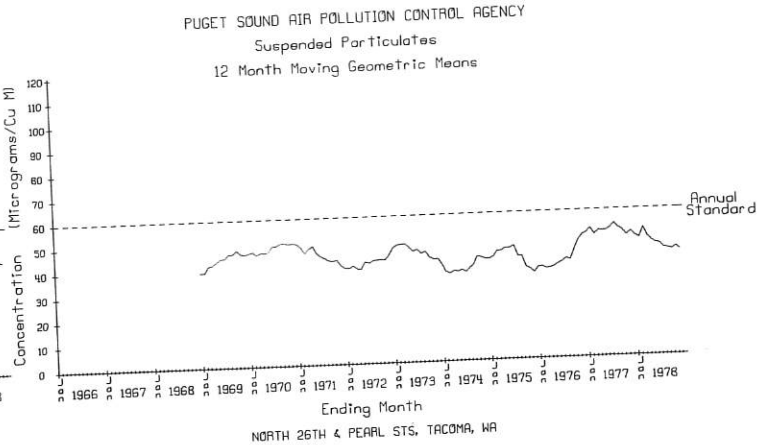

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
CASCADIA, 2002 E 28TH ST, TACOMA, WA

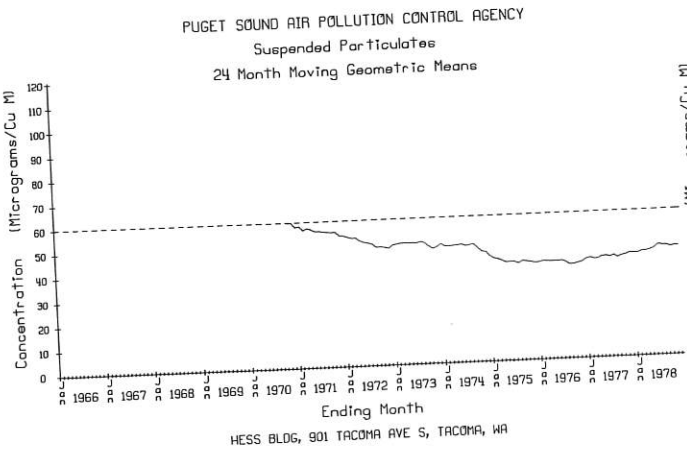

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA

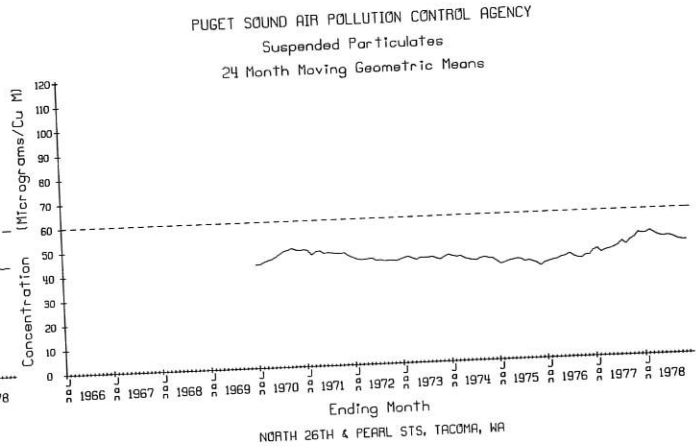

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
CASCADIA, 2002 E 28TH ST, TACOMA, WA

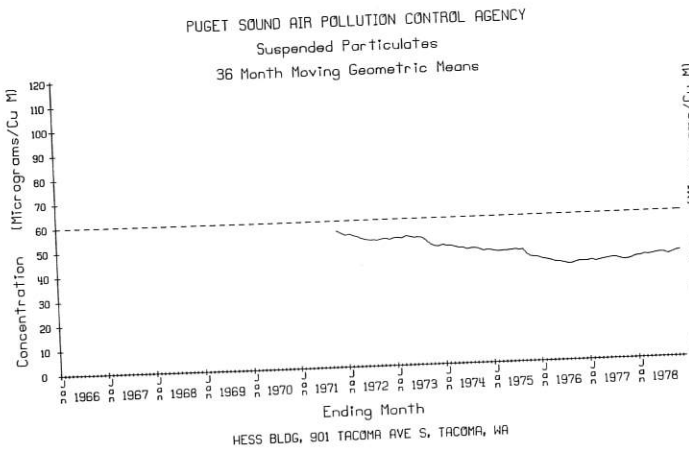

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA

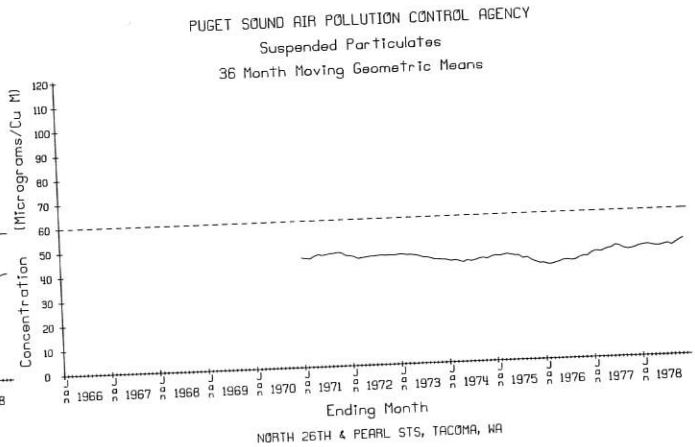

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
NORTH 26TH & PEARL STS, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
NORTH 26TH & PEARL STS, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
NORTH 26TH & PEARL STS, TACOMA, WA

SUSPENDED PARTICULATE (Micrograms per Cubic Meter)
1978 Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages												No. Of Obs.	Year Arith Mean	Year Geom Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
TOLT RIVER WATERSHED, KING CO, WA	5	8	25	8	15	26	34	20	13	20	7	4	60	15	10
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	39	38	70	40	46	53	66	44	41	60	55	41	60	50	45
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA	51	37	57	31	36	45	58	33	39	53	53	45	60	45	41
NORTH 98TH ST & STONE AVE N, SEATTLE, WA [a]					48	66	65	50	44	67	63	51	41	57	53
5701 - 8TH AVE NE, SEATTLE, WA [b]									45	54	75	72	21	62	58
2700 W COMMODORE WAY, SEATTLE, WA	55	63	60	38	41	44	41	37	35	55	42	53	60	47	43
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA [c]							51	32	34	46	55	50	29	45	42
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	57	53	78	48	54	56	68	52	55	61	68	55	61	59	56
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	82	55	89	62	69	71	71	57	48	59	81	60	61	67	63
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	80	90	132	65	85	102	96	84	73	143	116	115	60	99	90
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	74	139	128	66	107	118	123	127	95	122	110	120	112	112	100
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA	84	93	138	50	63	76	88	60	57	70	80	62	60	78	70
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	51	54	81	40	51	72	83	46	55	74	79	62	59	63	55
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	52	47	84	36	54	64	82	41	47	53	65	59	58	58	52
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	23	27	54	31	43	44	67	35	36	49	57	36	60	42	36
SOUTH 2ND ST & LAKE AVE S, RENTON, WA [d]		43	73	39	59	61	82	43	49	60	84	69	52	61	55
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	35	34	63	40	47	59	71	42	45	61	67	49	60	51	46
22916 86TH AVE S, KENT, WA	27	34	99	54	54	93	123	52	47	101	63	64	57	70	54
115 E MAIN ST, AUBURN, WA	45	65	95	41	49	54	78	56	47	60	70	64	60	60	54
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA [e]						52	70	36	38	58	48	39	35	49	44
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	87	64	82	38	51	59	87	40	51	64	61	48	58	60	52
2340 TAYLOR WAY, TACOMA, WA	84	71	119	61	97	96	121	87	65	91	140	72	57	94	83
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	74	128	160	84	122	120	107	88	95	128	102	103	108	111	98
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	97	82	117	51	101	98	109	65	76	89	82	69	57	87	78
CASCADIA, 2002 E 28TH ST, TACOMA, WA	62	69	105	41	57	68	96	46	55	96	61	53	60	68	56
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	82	78	100	39	57	69	84	41	54	76	74	54	61	68	59
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	53	47	59	32	45	51	58	35	41	59	64	48	60	50	46
NORTH 26TH & PEARL STS, TACOMA, WA	47	49	55	27	48	59	67	37	38	50	51	36	58	48	43
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	75	70	94	50	48	64	74	40	38	109	68	37	61	64	53
5502 - 112TH ST SW, LAKEWOOD, WA	63	52	71	40	46	47	54	28	32	52	55	43	61	49	43
STEILACOOM MARINA (GORDON PT), STEILACOOM, WA [f]	32	30	41	21	20	27							27	28	25
SECOND OLD FORT NISQUALLY, DUPONT, WA [f]	25	19	32	14	18	29							28	23	20
CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA	29	24	38	18	21	32	45	26	20	37	24	15	56	28	24
YEHLE'S RESIDENCE, DUPONT AVE, DUPONT, WA [f]	23	19	26	17	21	24							28	22	21
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	35	26	32	22	27	33	34	21	26	34	34	27	60	29	28

[a] Sampling Started 5/ 2/78
[b] Sampling Started 9/ 5/78
[c] Sampling Started 7/13/78
[d] Sampling Started 2/19/78
[e] Sampling Started 6/ 1/78
[f] Sampling Ended 6/19/78

SUSPENDED PARTICULATE (Micrograms per Cubic Meter)
1978 Statistical Summary

Location	No. Of Obs.	Frequency Distribution - Percent										Arith Mean	Geom Mean	Geom Std Dev	Arith Std Dev
		10	20	30	40	50	60	70	80	90	95				
TOLT RIVER WATERSHED, KING CO, WA	60	3	5	6	8	11	13	17	28	35	38	15	10	2.60	12.86
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	60	23	31	33	39	44	52	61	65	83	89	50	45	1.57	22.24
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA	60	22	27	31	37	40	46	51	61	73	76	45	41	1.52	19.28
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	41	31	40	41	46	55	60	65	73	79	87	57	53	1.43	21.84
5701 - 8TH AVE NE, SEATTLE, WA	21	39	41	43	45	53	55	65	75	98	105	62	58	1.45	27.18
2700 W COMMODORE WAY, SEATTLE, WA	60	26	29	36	39	43	46	51	59	73	78	47	43	1.46	19.29
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	29	26	29	35	40	42	45	45	51	67	71	45	42	1.42	16.95
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	61	34	41	46	49	57	63	69	77	83	86	59	56	1.40	20.82
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	61	40	46	52	58	66	70	74	84	94	111	67	63	1.42	25.16
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	60	52	58	69	82	87	97	107	124	163	169	99	90	1.53	45.40
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	112	56	61	75	86	98	110	135	157	182	210	112	100	1.62	55.96
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA	60	39	45	51	59	69	77	86	96	134	163	78	70	1.60	37.99
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	59	30	34	38	47	50	58	69	86	114	127	63	55	1.65	36.38
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	58	30	34	37	40	49	60	64	75	96	114	58	52	1.59	28.71
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	60	17	21	26	30	37	42	53	62	69	79	42	36	1.75	23.35
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	52	31	34	41	45	58	65	71	76	97	103	61	55	1.56	30.67
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	60	23	32	35	43	47	54	59	66	77	94	51	46	1.58	23.81
22916 86TH AVE S, KENT, WA	57	20	30	33	41	50	62	89	105	150	169	70	54	2.09	50.25
115 E MAIN ST, AUBURN, WA	60	26	32	42	47	55	63	72	84	102	117	60	54	1.63	28.84
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	35	20	24	33	37	52	55	67	67	76	81	49	44	1.66	22.66
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	58	23	30	38	44	56	63	77	84	95	119	60	52	1.74	32.30
2340 TAYLOR WAY, TACOMA, WA	57	44	53	60	72	88	98	109	128	133	179	94	83	1.62	48.53
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	108	49	58	67	83	103	122	136	151	186	200	111	98	1.67	54.67
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	57	41	49	59	70	78	91	110	118	141	153	87	78	1.57	38.66
CASCADIA, 2002 E 28TH ST, TACOMA, WA	60	23	29	39	46	55	67	88	101	122	138	68	56	1.90	42.97
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	61	25	36	46	52	58	68	82	101	114	131	68	59	1.72	35.35
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	60	28	32	35	40	43	50	59	67	75	91	50	46	1.51	22.28
NORTH 26TH & PEARL STS, TACOMA, WA	58	21	25	31	38	43	48	57	65	79	93	48	43	1.63	23.72
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	61	21	27	36	45	55	62	75	105	118	125	64	53	1.90	39.96
5502 - 112TH ST SW, LAKEWOOD, WA	61	19	25	34	37	45	51	60	70	85	95	49	43	1.70	24.23
STEILACOOM MARINA (GORDON PT), STEILACOOM, WA	27	12	13	18	21	25	27	37	43	48	50	28	25	1.71	13.88
SECOND OLD FORT NISQUALLY, DUPONT, WA	28	8	13	15	16	20	25	31	35	36	40	23	20	1.72	10.82
CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA	56	11	12	16	21	24	33	36	40	46	49	28	24	1.82	14.76
YEHLE'S RESIDENCE, DUPONT AVE, DUPONT, WA	28	13	16	17	18	20	23	26	28	30	33	22	21	1.35	6.45
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	60	17	20	23	24	29	32	34	37	42	47	29	28	1.44	10.79

SUSPENDED PARTICULATE (Micrograms per Cubic Meter)

1978 Summary of Observations Greater Than 150 ug/m**3

Location	Jan 24 Tue	Feb 4 Sat	Feb 10 Fri	Feb 13 Mon	Feb 16 Thu	Feb 19 Sun	Feb 22 Wed	Mar 3 Fri	Mar 9 Thu	Mar 15 Wed	Mar 18 Sat	Mar 21 Tue	Apr 11 Tue	May 2 Tue	May 5 Fri	May 8 Mon	May 20 Sat
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--	--	--		--		--				--		--		--		
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	--	--	--	152	--		--	153		168	--	151	--		--		
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	--	240	166	169		182	228	153		205		157			198	160	164
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA	--	--	--	163	--		--	188		173	--	165	--		--		
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	--	--	--		--		--				--		--		--		
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	--	--	--		--		--				--		--		--		
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	--	--	--	--	--		--				--		--		--		
22916 86TH AVE S, KENT, WA	--	--	--		--		--				--		--		--		
2340 TAYLOR WAY, TACOMA, WA	--	--	--	--	--		--				--	215	--			--	
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	--			225	187		272	151	225	154 310	-- 210	186	-- 151	168	--	179	
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	156	--	--	177	--		--			173	--		--		169 --		151
CASCADIA, 2002 E 28TH ST, TACOMA, WA	--	--	--	176	--	--	166			207	--		--		--	153	
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--	--	--	166	--		--				--		--		--		
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--	--	--		--		--				--		--		--		

Location	May 23 Tue	Jun 1 Thu	Jun 3 Sat	Jun 7 Wed	Jun 28 Wed	Jul 13 Thu	Jul 19 Wed	Jul 21 Fri	Jul 22 Sat	Jul 25 Tue	Jul 28 Fri	Aug 3 Thu	Aug 6 Sun	Aug 8 Tue	Aug 30 Wed	Sep 29 Fri	Oct 2 Mon
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--		--		--			--	--		--	--		--			--
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	--	163	--		--			--	--		--	--		--			--
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA		153	177	191	155		179	210	267			337	157	169	176	210	162
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA	--		--		--			--	--		--	--		--			--
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	--	160	--		--			--	--		--	--		--			--
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	--		--		--			--	--		--	--		--			--
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	--		--		--			--	--		--	--		--			--
22916 86TH AVE S, KENT, WA	--	176	--		--	160		--	--	171	--	--		--			--
2340 TAYLOR WAY, TACOMA, WA	--		--		--			--	--	202	--	--		--			--
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	169		153		180					--	188			157		171	
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	--		--		--			--	--		--	--		--	--		--
CASCADIA, 2002 E 28TH ST, TACOMA, WA	--		--		--			--	--		--	--		--			--
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--		--		--			--	--		--	--		--			--
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--		--		--			--	--		--	--		--			--

Location	Oct 3 Tue	Oct 5 Thu	Oct 6 Fri	Oct 14 Sat	Oct 17 Tue	Oct 23 Mon	Oct 31 Tue	Nov 1 Wed	Nov 10 Fri	Nov 13 Mon	Nov 14 Tue	Nov 22 Wed	Dec 7 Thu	Dec 10 Sun	Dec 13 Wed	Dec 28 Thu
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--		--	--			--			--	--	170	--		--	
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	--	169	--	--	169	212	--	--		--	--	279	--	184	--	
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	--	177					--	176		--	256	236	236		200	
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA	--		--	--			--			--	--	152	--		--	--
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	--		--	--			--	--		--	--	204	--	--	--	
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	--	--	--	--			--	--		--	--	151	--	--	--	
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	--		--	--			--	--		--	--	208	--		--	
22916 86TH AVE S, KENT, WA	--	169	--	--			--	--		--	--	169	--		--	
2340 TAYLOR WAY, TACOMA, WA	--		--	--	--		--	--	289	--	--	214	--		--	
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	152		166	199		151	--	--		184	218	200	187		192	164
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	--		--	--			--	--		--	--	176	--		--	
CASCADIA, 2002 E 28TH ST, TACOMA, WA	--		--	--	166		--	--		--	--		--		--	
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--		--	--			--	--		--	--	157	--		--	
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--		--	--			--	--		--	--		--		--	
						208										

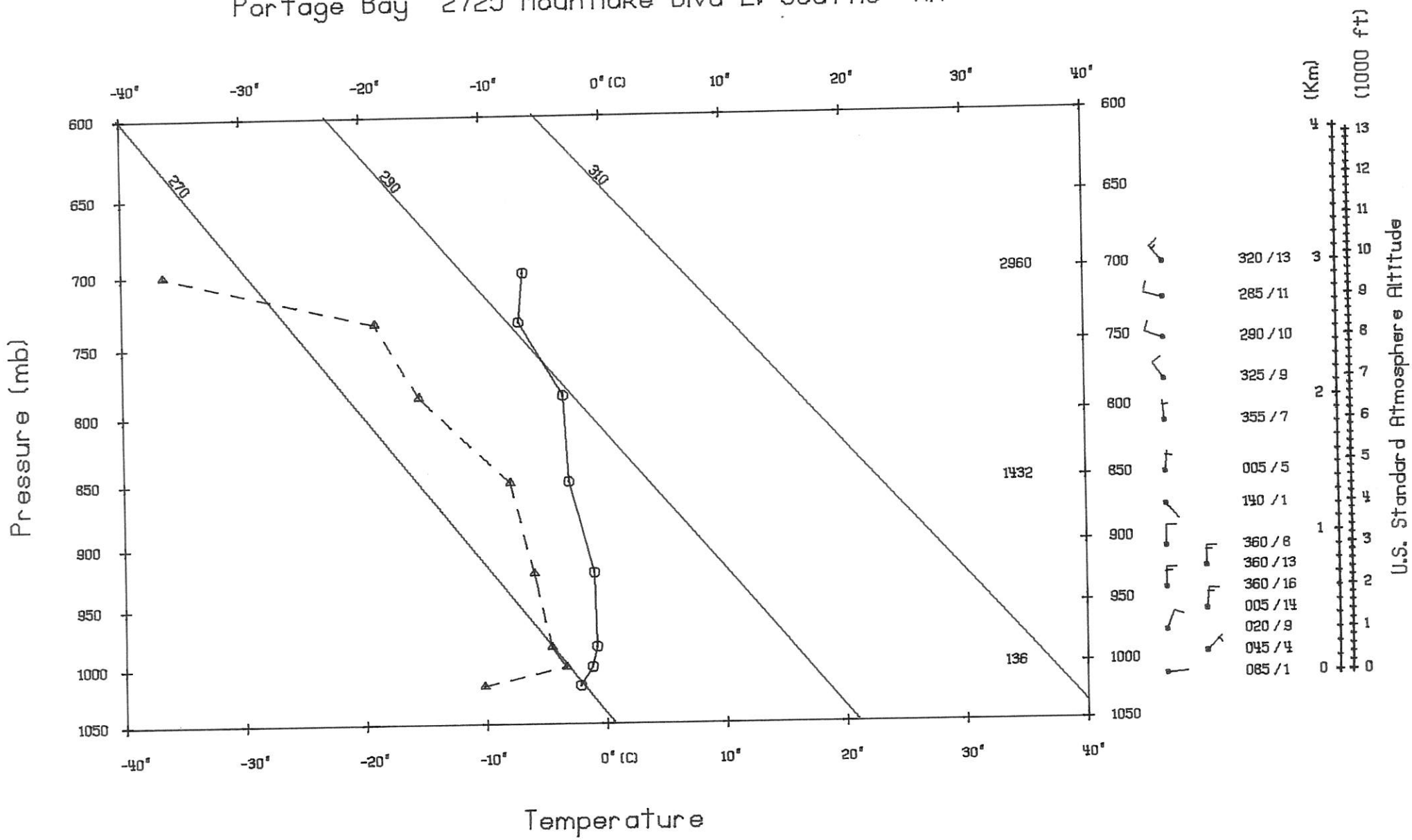
-- Indicates no sample on specified day

PUGET SOUND AIR POLLUTION CONTROL AGENCY

PSEUDO-ADIABATIC CHART

0700 PST 22 Nov 1978

Portage Bay 2725 Mountlake Blvd E. Seattle WA



SUSPENDED PARTICULATE (Micrograms per Cubic Meter)

1978 Summary of Maximum and 2nd High Observed Concentrations ug/m**3

Location	Jan 2 Mon	Jan 24 Tue	Jan 25 Wed	Feb 13 Mon	Feb 19 Sun	Feb 22 Wed	Mar 3 Fri	Mar 15 Wed	Mar 21 Tue	May 20 Sat	Jun 1 Thu	Jun 7 Wed	Jul 13 Thu	Jul 22 Sat	Jul 25 Tue	Aug 3 Thu	Oct 23 Mon	Oct 31 Tue	Nov 1 Wed	Nov 10 Fri	Nov 22 Wed	Dec 12 Tue	Dec 16 Sat
TOLT RIVER WATERSHED, KING CO, WA		--	--			--	--		51					--	43	--		--	--			--	
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA		--	--			--		95						--		--		--	--		118	--	
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA		100	--			--						91		--		--		--	--		113	--	
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	--	--	--	--	--	--	--	--	--			--	--	--	--	--		--	--		143	--	
5701 - 8TH AVE NE, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	105		143	--	
2700 W COMMODORE WAY, SEATTLE, WA		--	--		132	--								--		--		--	--			117	
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--		--		--		--	--		101	--	71
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA		--	--	99		--								--		--		--	--		147	--	
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA		--	134			--								--		--		--			170	--	
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA		--	--			--								--		--	212	--	--		279	--	
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA		--	--											267		337		--				--	
SOUTH RIVER ST & MAYNARD AVE, SEATTLE, WA		--	--			--	188	173						--		--		--				--	
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA		--	--			--					160			--		--		--	--		204		
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA		--	--			--		130						--	87	--		--	--		151		
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA		--	--			--								--		--		--	--		136	--	
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	--	--	--	--		--		106						--	108	--		--	--		208	--	
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA		--	--			--			--					--		--		--	--		147	--	
22916 86TH AVE S, KENT, WA		--	--			--			215		176			--		--		--	--			--	
115 E MAIN ST, AUBURN, WA		--	--	122		--								--		--		--	--		137	--	
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	--	--	--	--	--	--	--	--	--	--				--	101	--		--	--		92	--	
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA			--	146		--			--					--	143	--		--	--			--	
2340 TAYLOR WAY, TACOMA, WA		--	--	--		--								--		--		--	--	289	214	--	
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA		--	--			272		310							--			--	--			--	
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA			--	177		--								--		--		--	--		176	--	
CASCADIA, 2002 E 28TH ST, TACOMA, WA		--	--	176	--			207						--		--		--	--			--	
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA		--	--	166		--								--		--		--	--		157	--	
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA		--	--	94		--								--		--		--	--		143	--	
NORTH 26TH & PEARL STS, TACOMA, WA		--	--			--							105	--		--		--	--		118	--	
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA		--	--			--		146						--		--		208				--	
5502 - 112TH ST SW, LAKEWOOD, WA	102	--	--			--			102					--		--		--			113	--	
STEILACOOM MARINA (GORDON PT), STEILACOOM, WA	52	--	--	--		--			50				--	--	--	--	--	--	--	--	--	--	--
SECOND OLD FORT NISQUALLY, DUPONT, WA	41	--	--			--			40				--	--	--	--	--	--	--	--	--	--	--
CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA		--	--			--			53					--	71	--		--	--			--	
YEHLE'S RESIDENCE, DUPONT AVE, DUPONT, WA		--	--			--			33	35			--	--	--	--	--	--	--	--	--	--	--
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	64	--	--			--								--		--		--	--		62	--	

-- Indicates no sample on specified day

SUSPENDED PARTICULATES (COH'S/1000 LIN FT)
1978 Statistical Summary

Location	No. of 1 Hour Samples	Frequency Distribution - Percent												Arith Mean	Geom Mean	Geom Std Dev	Arith Std Dev
		5	10	20	30	40	50	60	70	80	90	95	99				
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	8468	.1	.2	.2	.3	.3	.4	.4	.5	.6	.8	.9	1.3	.44	.37	1.80	.26
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	5425	.2	.2	.3	.3	.4	.4	.5	.6	.8	1.2	1.8	2.8	.61	.46	2.02	.53
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	8475	.2	.2	.3	.4	.5	.7	.8	1.0	1.2	1.6	2.0	2.7	.82	.63	2.10	.58
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	8301	.1	.1	.2	.3	.4	.5	.6	.7	.9	1.3	1.5	2.1	.60	.45	2.25	.47
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA	4877	.1	.1	.2	.2	.2	.3	.3	.4	.5	.7	.9	1.2	.36	.29	2.00	.26
22916 86TH AVE S, KENT, WA	8396	.1	.2	.2	.3	.4	.5	.6	.8	1.0	1.3	1.6	2.1	.62	.46	2.25	.47
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	4757	.1	.1	.1	.2	.3	.4	.5	.6	.7	1.0	1.2	1.6	.46	.32	2.53	.36
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	8269	.2	.3	.4	.6	.7	.9	1.0	1.3	1.6	2.0	2.4	3.3	1.04	.81	2.10	.72
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	8617	.1	.1	.2	.2	.3	.4	.5	.6	.8	1.1	1.4	2.2	.52	.38	2.24	.45
NORTH 43RD & VISSCHER STS, TACOMA, WA	4721	.1	.1	.2	.3	.4	.4	.5	.7	.9	1.2	1.5	2.1	.57	.41	2.32	.47
NORTH 26TH & PEARL STS, TACOMA, WA	7067	.1	.1	.2	.2	.3	.4	.4	.6	.7	1.0	1.4	2.5	.50	.36	2.24	.48
SECOND OLD FORT NISQUALLY, DUPONT, WA	3735	.0	.1	.1	.1	.2	.2	.3	.5	.7	1.0	1.2	1.7	.39	.24	2.88	.40

1978 Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	.59	.43	.47	.36	.34	.37	.34	.34	.40	.65	.55	.43
NORTH 98TH ST & STONE AVE N, SEATTLE, WA					.36	.35	.37	.38	.58	.80	1.15	.78
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	1.18	.93	.87	.61	.53	.60	.56	.62	.78	.85	1.33	.97
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	.70	.57	.55	.36	.32	.35	.45	.45	.60	.85	1.06	.88
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA	.48	.41	.40	.30	.25	.21			.45			
22916 86TH AVE S, KENT, WA	.78	.70	.70	.47	.41	.47	.52	.48	.58	.72	.91	.68
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA						.19	.36	.30	.39	.59	.66	.63
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	1.46	1.20	1.08	.72	.72	.77	.69	.73	.87	1.26	1.51	1.37
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	.98	.61	.53	.34	.30	.31	.31	.28	.37	.72	.85	.62
NORTH 43RD & VISSCHER STS, TACOMA, WA	.64	.64						.25	.41	.65	.81	.60
NORTH 26TH & PEARL STS, TACOMA, WA	.43		.55	.39	.29	.28	.32	.30	.45	.74	1.03	.73
SECOND OLD FORT NISQUALLY, DUPONT, WA	.71	.45	.40	.24	.22	.26						

ATMOSPHERIC PARTICLES (B-SP (X 10000/M))
1978 Statistical Summary

Location	No. of 1 Hour Samples	Frequency Distribution - Percent												Arith Mean	Geom Mean	Geom Std Dev	Arith Std Dev
		5	10	20	30	40	50	60	70	80	90	95	99				
22916 86TH AVE S, KENT, WA	7469	.1	.2	.2	.3	.4	.5	.7	.9	1.2	1.6	2.1	3.5	.76	.51	2.58	.72

1978 Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
22916 86TH AVE S, KENT, WA		.96	.74	.40	.35	.54	.72	.51	.65	1.28	1.40	.78

SUSPENDED PARTICULATES
Comparison of Methods

COH: SUSPENDED PARTICULATES (COH/1000 LIN FT)
B-SP: ATMOSPHERIC PARTICLES (B-SP (X 10000/M))
TSP: SUSPENDED PARTICULATES (MICROGRAMS PER CUBIC METER)

1978 Correlation Coefficients

Location: 22916 86TH AVE S, KENT, WA

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALL AVAILABLE SAMPLES													
1 HR COH VS 1 HR B-SP Sample Correlation Coefficient	.83		.84	.85	.78	.74	.76	.75	.80	.81	.76	.89	.89
Number of 1 Hour Samples	7281	0	436	717	683	628	611	632	725	713	703	713	720
24 HR COH VS 24 HR B-SP Sample Correlation Coefficient	.87		.84	.90	.72	.84	.84	.82	.90	.89	.78	.93	.91
Number of 24 Hour Samples	290	0	18	29	26	23	22	24	30	30	28	30	30
TSP SAMPLING DAYS ONLY													
24 HR COH VS 24 HR B-SP Sample Correlation Coefficient	.86												
24 HR COH VS 24 HR TSP Sample Correlation Coefficient	.65												
24 HR B-SP VS 24 HR TSP Sample Correlation Coefficient	.65												
Number of 24 Hr Samples Common to all Three Parameters	49												

Note: 24 Hour Averages Taken From Midnight to Midnight

Coefficient of Haze (COH) represents a measure of suspended particulates derived from the decrease in light transmission through a filter tape as particulates accumulate on the tape. Ambient air is drawn through the filter tape continuously for 28 minutes; the final reading is taken; the tape then advances to a new position and the cycle repeats again and again to provide continous sampling. The calculated concentrations measured by this method are reported in COH - units per thousand linear feet of sampled air.

The light scattering extinction coefficient (B-SP) represents a measure of atmospheric particles. The light scattering extinction coefficient is inversely related to visibility and has been shown highly correlated to fine particle mass concentration. B-SP values summarized here were continuously measured using a model 1561 integrating nephelometer. The sample air stream was heated 5 to 15 degrees C above ambient air to dry the particles.

Total suspended particulates (TSP) are measured by the federal reference method of high volume sampling.

SULFUR DIOXIDE (PARTS PER MILLION)
1978 Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages												No. of 1 Hour Samples	Year Arith Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	.012	.011	.013	.010	.017	.017	.010	.012	.003	.002	.008	.001	7957	.010
NORTH 98TH ST & STONE AVE N, SEATTLE, WA					.003	.003	.004	.004	.005	.004	.009	.013	5230	.006
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA	.003	.009	.008	.007	.005	.005	.005	.004	.011	.008	.002		8536	.006
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	.012	.012	.013	.009	.008	.014	.009	.010	.008	.006	.012	.011	8215	.010
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	.010	.008	.011		.006	.008	.008	.007	.006	.008		.001	6563	.007
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA	.003	.004	.006	.003	.004	.007	.007	.003	.003	.003	.002	.004	8003	.004
22916 86TH AVE S, KENT, WA				.003	.007	.005	.009	.006	.003	.003	.002	.000	5576	.004
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA	.004	.005	.003	.013	.007	.005	.003	.005	.005	.006	.010	.008	7587	.006
NORTH 43RD & VISSCHER STS, TACOMA, WA	.013	.011	.010	.009	.009	.006	.009	.006	.006	.011	.007	.007	8252	.009
NORTH 26TH & PEARL STS, TACOMA, WA	.005	.014	.010	.010	.008	.006	.011	.008	.004	.011	.010	.008	8154	.009
SECOND OLD FORT NISQUALLY, DUPONT, WA	.001	.001	.001	.001	.001	.001							3853	.001

Number of Concentrations Exceeding Selected Values for Various Averaging Periods

1978

Location	5 Minute Average	1 Hour Average		3 Hour Average	24 Hour Average	
	1.00 ppm	0.40 ppm	0.25 ppm	0.50 ppm	0.10 ppm	0.14 ppm
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	4	2	16	0	0	0
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	0	0	0	0	0	0
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA	15	7	25	0	0	0
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	0	0	3	0	0	0
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	0	0	4	0	0	0
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA	0	0	2	0	0	0
22916 86TH AVE S, KENT, WA	0	0	2	0	0	0
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA	0	0	4	0	0	0
NORTH 43RD & VISSCHER STS, TACOMA, WA	12	4	5	0	0	0
NORTH 26TH & PEARL STS, TACOMA, WA	3	0	10	0	0	0
SECOND OLD FORT NISQUALLY, DUPONT, WA	0	0	0	0	0	0

Sulfur Dioxide is continuously measured using one of the following three methods: ultraviolet fluorescence, flame photometric detection, or conductimetry.

SULFUR DIOXIDE
(Parts per Million)
1978

Summary of Maximum and Second Highest Concentrations
for Various Averaging Periods

Location	5 Minute Average			1 Hour Average			3 Hour Average			24 Hour Average		
	Value	Date	End Time	Value	Date	End Time	Value	Date	End Time	Value	End Date	End Time
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	1.46	7 Aug	1356	.52	7 Aug	1430	.30	23 May	1900	.08	18 Jun	1300
	1.28	7 Aug	1401	.42	23 May	1800	.27	19 Jun	1900	.06	6 Apr	1900
NORTH 98TH ST & STONE AVE N, SEATTLE, WA				.16	19 Dec	2000	.11	19 Dec	2200	.05	20 Dec	0600
				.13	7 Dec	1600	.08	7 Dec	1700	.03	14 Nov	0500
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA	1.59	16 Mar	1205	.56	16 Mar	1242	.28	16 Mar	1400	.10	13 Oct	2300
	1.56	16 Mar	1200	.49	12 Apr	2051	.24	13 Oct	0400	.08	24 Feb	1200
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA				.33	22 Jul	0448	.18	16 Mar	1400	.06	20 Dec	0100
				.31	17 Jun	2015	.18	17 Jun	2200	.05	17 Mar	1100
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA				.38	7 Oct	1208	.19	27 Mar	1500	.04	4 Feb	0100
				.36	24 Jul	0030	.19	24 Jul	0100	.04	28 Mar	0800
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA				.38	7 Oct	1154	.16	27 Mar	1400	.04	3 Jul	2100
				.34	27 Mar	1228	.15	7 Oct	1300	.04	19 Dec	1500
22916 86TH AVE S, KENT, WA				.40	6 Jun	1806	.21	6 Jun	2000	.04	6 Jun	1300
				.17	27 May	1800	.09	27 May	1900	.02	27 May	1900
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA				.33	3 Feb	0111	.16	8 Apr	1200	.05	8 Apr	1200
				.32	8 Apr	1146	.16	22 Dec	0800	.05	29 Oct	1100
NORTH 43RD & VISSCHER STS, TACOMA, WA	1.83	18 Jan	0908	.92	29 Jul	2204	.50	18 Jan	1129	.08	18 Jan	1200
	1.80	18 Jan	0903	.89	18 Jan	0929	.44	29 Jul	2300	.08	29 Jul	2400
NORTH 26TH & PEARL STS, TACOMA, WA	1.75	19 Jul	0115	.34	19 Feb	1327	.17	25 Apr	1400	.05	25 Apr	1600
	1.28	31 Oct	0600	.34	12 Apr	1109	.16	19 Feb	1400	.04	19 Feb	1900
SECOND OLD FORT NISQUALLY, DUPONT, WA				.10	25 Feb	1900	.05	25 Feb	2100	.02	26 Feb	1500
				.09	24 Apr	1400	.05	24 Apr	1500	.01	2 Jan	1500

5 Minute Average Recorded Only for Concentrations Exceeding 1.00 ppm
Ending Times are Reported in Pacific Standard Time

Photochemical Oxidants

The oxidant found in largest amounts in photochemical smog is ozone, a very reactive form of oxygen. Most oxidants are not emitted directly into the atmosphere but instead result from a series of chemical reactions between nitrogen oxides and reactive hydrocarbons in the presence of sunlight. This series of "photochemical" reactions proceeds for several hours generally producing maximum ozone levels between noon and early evening.

In the Puget Sound region the highest ozone concentrations occur during summer months when there are more hours of sunlight and the sun reaches higher elevation angles. Light northerly winds frequently accompany these warm, dry days. As a result, the highest ozone concentrations normally occur 5 to 15 miles south to southeast of the major urban centers.

The Photochemical Oxidant/Ozone Standards

In April, 1971, the U.S. Environmental Protection Agency established national ambient air quality standards. The photochemical oxidant standard was set at a 1 hour average of 0.08 parts per million (ppm) not to be exceeded more than once per year. Later in 1971 the Agency adopted an identical local standard.

New national standards for ozone were established in February, 1979. The level of the primary and secondary standards is 0.12 ppm. The standard is attained "when the expected number of days per calender year with maximum hourly average concentrations above 0.12 ppm is equal to or less than one".

If an "exceedence" is defined to be a day with the maximum 1 hour average greater than 0.12 ppm, the standard is attained when the expected number of exceedences is equal to or less than one. In the case of a complete data set, the expected number of exceedences is simply the average number of observed exceedences during the most recent 3 years.

An incomplete data set for a given year requires an estimate of the number of exceedences in that year. This estimate is based upon the observed number of exceedences, the number of required monitoring days, the number of days upon which a valid maximum was recorded, and the number of days assumed to be less than the standard level.

The estimated number of exceedences is always greater than or equal to the observed number of exceedences, and, in cases where no exceedences are observed, the estimate is always zero.

The expected number of exceedences is then calculated as the three year average of the estimated number of exceedences. A shorter sampling period may shorten the averaging period to a minimum of one year.

Using the Ozone Table to Assess Attainment

The 1978 ozone table shows whether national and local standards were attained in 1978. In some instances, the table allows projection of nonattainment of the national standard into the following 1 or 2 years.

Examination of the column entitled "No. of Days 1 Hour Average Exceeded .08 ppm" shows that 7 of 10 stations had at least two 1 hour averages in excess of .08 ppm, and thus exceeded the local standard in 1978.

The column at the extreme right of the table shows that 4 of 10 stations had expected number of exceedences greater than 1.0, and thus exceeded the national standard in 1978.

The estimated number of exceedences shown for 1977 and 1978 may be used to project nonattainment of the national standard for three stations; Lake Sammamish, Kent, and Sumner, at least through 1979.

OZONE
(Parts per Million)
1978

Location / Period of Sampling	Four Highest Daily Maximum 1 Hour Averages			No. of Days 1 Hour Average	Estimated No. of Days Daily Maximum 1 Hour Average Exceeded .12 ppm			No. of Days Daily Maximum 1 Hour Average Expected To Exceed .12 ppm
	Value	Date	End Time	Exceeded .08 ppm	1976	1977	1978	
SNOHOMISH CO, FIRE DISTRICT #22, ARLINGTON, WA* 13 Apr - 31 Oct	.12 .09 .08 .08	23 Jul 22 Jul 2 Jun 3 Jun	1500 1500 1500 1500	2	-	-	0.0	0.0
3108 180TH ST SE, BOTHELL, WA* 11 Apr - 31 Oct	.07 .07 .07 .07	20 May 24 May 2 Jun 5 Jun	1500 1900 1900 1300	0	-	0.0	0.0	0.0
LAKE SAMMAMISH STATE PARK, KING CO, WA* 1 Jan - 31 Dec	.16 .13 .13 .13	3 Jun 21 Jul 25 Jul 8 Aug	1400 1500 1600 1500	11	0.0	5.5	4.1	3.2
KING CO, FIRE DISTRICT #27, FALL CITY, WA* 4 May - 31 Oct	.11 .11 .10 .10	5 Jun 8 Aug 13 Jul 23 Jul	1400 1500 1500 1600	9	-	-	0.0	0.0
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA 1 Jan - 31 Dec	.12 .12 .12 .11	3 Jun 22 Jul 25 Jul 5 Jun	1200 1600 1800 1400	7	0.0	0.0	0.0	0.0
22916 86TH AVE S, KENT, WA 1 Jan - 31 Dec	.14 .14 .13 .12	3 Jun 22 Jul 5 Jul 8 Aug	1300 1600 1400 1400	8	0.0	1.1	3.1	1.4
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA 1 Jan - 31 Dec	.15 .14 .14 .12	3 Jun 21 Jul 22 Jul 2 Jun	1400 1400 1500 1400	15	-	3.2	3.1	3.2
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA* 1 Jan - 12 Apr	.05 .04 .03 .03	9 Apr 21 Mar 12 Jan 2 Mar	1500 1400 1400 1400	0	-	0.0	0.0	0.0
PIERCE CO, FIRE DISTRICT #21, GRAHAM, WA* 6 Jun - 24 Oct	.13 .12 .12 .12	25 Jul 14 Jul 22 Jul 8 Aug	1600 1700 1400 1400	10	-	-	1.5	1.5
KING CO, FIRE DISTRICT #28, ENUMCLAW, WA* 8 Sep - 24 Oct	.05 .05 .05 .05	10 Sep 1 Oct 3 Oct 6 Oct	1200 1100 1300 1400	0	-	-	0.0	0.0

* Washington State Department of Ecology Station
\- Indicates no Ozone Sampling for Given Year
Ending Times are Reported in Pacific Standard Time
Ozone is continuously measured using gas phase chemiluminescence or ultraviolet photometric detection.

CARBON MONOXIDE

Data Acquisition

The Washington State Department of Ecology has statewide jurisdiction over motor vehicular sources of pollution. During 1978, carbon monoxide analyzers were operated at 12 locations in the Puget Sound region.

Factors Influencing Concentrations

In general, high ambient levels of carbon monoxide occur near congested, slow-moving motor vehicle traffic when low level winds are light and stable meteorological conditions exist. Peak concentrations normally coincide with the weekday morning and evening traffic peaks. Minimum values generally occur late at night and on some weekends.

Episode Levels

Episode criteria are specified in the Washington State Emergency Episode Plan (Washington Administrative Code (WAC) 173-435). The Alert stage is to be declared when the ambient carbon monoxide concentration reaches 15 parts per million (ppm) for an 8 hour average, and meteorological conditions are such that the carbon monoxide concentration can be expected to remain at that level for 12 or more hours or increase unless control actions are taken.

Correspondingly, the carbon monoxide concentration for the Warning stage is 30 ppm for an 8 hour average, and for the Emergency stage is 40 ppm for an 8 hour average. A similar statement on the forecast of meteorological conditions and persistence of the carbon monoxide concentration is also part of the declaration of each of these stages.

Data Summary

The carbon monoxide data presented on the following page were obtained from the Department of Ecology monthly data summaries and from the Department publication, "Washington State Air Monitoring Data for 1978". All stations operated throughout 1978, except the Bellevue station which began operating in September.

A review of the data shows that 10 of the 12 stations exceeded an 8 hour average of 9 ppm at least twice. Therefore all of these 10 stations exceeded the 8 hour average standard. None of the 12 stations measured 1 hour average concentrations exceeding the 35 ppm standard. Detailed information regarding site locations; hourly, daily and seasonal averages; and trends may be obtained by contacting the Department of Ecology.

CARBON MONOXIDE
(Parts Per Million)
1978

Location	Maximum and Second Highest Concentrations						Number of 8 Hour Averages Exceeding 9 ppm	Number of Days 8 Hour Average Exceeded 9 ppm
	1 Hour Average			8 Hour Average				
	Value	Date	End Time	Value	Date	End Time		
622 BELLEVUE WAY NE, BELLEVUE, WA	19	1 Nov	1800	11	1 Nov	2200	3	3
	18	31 Oct	1800	10	18 Oct	2400		
4511 UNIVERSITY WAY NE, SEATTLE, WA	24	1 Nov	1900	15	4 Feb	2300	30	30
	22	14 Nov	2100	14	14 Nov	2200		
3921 LINDEN AVE N, SEATTLE, WA	12	9 Jan	900	9	4 Feb	2400	0	0
	12	15 Nov	2100	7	9 Jan	1400		
1300 MADISON ST, SEATTLE, WA	17	6 Oct	900	11	6 Oct	1400	2	2
	14	6 Oct	1000	10	31 Oct	2300		
417 PIKE ST, SEATTLE, WA	23	3 Feb	2000	19	4 Feb	2400	44	40
	23	4 Feb	2000	14	3 Jan	1800		
1424 - 4TH AVE, SEATTLE, WA	32	31 Oct	1100	18	13 Jan	1700	88	76
	23	13 Jan	1500	16	9 Jan	1800		
2ND AVE & UNIVERSITY ST, SEATTLE, WA	22	14 Feb	1800	12	13 Jan	1900	7	7
	21	5 Apr	1800	12	4 Feb	2400		
5TH AVE & JAMES ST, SEATTLE, WA	24	14 Nov	1800	17	9 Jan	1700	47	39
	21	6 Apr	1000	15	13 Jan	1600		
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	19	14 Nov	2000	12	14 Nov	2300	4	4
	18	22 Nov	2000	11	13 Jan	1800		
1000 4TH AVE S, SEATTLE, WA	19	14 Nov	2000	13	14 Nov	2400	2	2
	17	22 Nov	900	12	22 Nov	2400		
2809 26TH AVE S, SEATTLE, WA	18	9 Jan	900	13	4 Feb	2300	8	8
	18	4 Feb	2000	13	14 Nov	2400		
715 S 11TH ST, TACOMA, WA	21	14 Nov	2200	15	14 Nov	2400	1	1
	17	14 Nov	2300	9	3 Jan	1500		

Ending Times are Reported in Pacific Standard Time
Carbon Monoxide is Measured on a Continuous Basis Using the Nondispersive Infrared Method

LEAD

In October, 1978, the U.S. Environmental Protection Agency (EPA) established a national ambient air quality standard for lead. The new standard is a primary (health related) standard and is set at 1.5 micrograms per cubic meter averaged over one calendar quarter. EPA based the new standard on preventing exposure of children, ages one to five, to ambient air lead which might cause their blood lead level to exceed 30 micrograms of lead per deciliter of blood.

According to EPA, about 90 percent of the lead emitted into the nation's air comes from automobile exhaust. The remainder comes from stationary sources such as primary and secondary nonferrous smelters.

In 1978, the State Department of Ecology, together with the Agency, established a network for monitoring lead in the ambient air. The first data indicate that ambient air lead is in excess of the new national standard at three stations in the Puget Sound region.

LEAD
(Micrograms per cubic meter)
1978 Quarterly Arithmetic Averages

Location	1st	2nd	3rd	4th
North 98th St & Stone Ave N, Seattle, Wa		0.49[a]	0.64	1.07
5701 - 8th Ave NE, Seattle, Wa				1.69
Portage Bay,2725 Montlake Blvd E, Seattle, Wa			0.82	1.15
Fire Station #10, 301 2nd Ave S, Seattle, Wa	1.28	0.66[b]	0.73	1.16
Harbor Island, 3400 13th Ave SW, Seattle, Wa	2.13	1.61	1.51	2.33
Duwamish, 4500 E Marginal Way S, Seattle, Wa				1.54
South River St & Maynard Ave, Seattle, Wa	1.26	0.36[b]	0.80	1.17
Fire Station #12, 2316 E 11th St, Tacoma, Wa	1.21	1.23	1.09	1.04
North 43rd & Visscher Sts, Tacoma, Wa				0.80[d]
North 26th & Pearl Sts, Tacoma, Wa	1.12	0.49	0.63	0.86
5502 - 112th St SW, Lakewood, Wa	1.11	0.28[b]	0.40[c]	1.02

a May and June only
b May only
c July only
d November and December only

LOWER ATMOSPHERE TEMPERATURE SOUNDINGS

A lower atmosphere sounding unit began operating at 2725 Montlake Boulevard East (east shore of Portage Bay) in Seattle during 1971. The normal operation provides one slow ascent sounding to 700 millibars about 0700 local time each Monday through Friday except on holidays. Since the sounding provides the only lower atmosphere data in the Puget Sound Basin, the information is an essential basis for many different types of forecasts including air stagnation forecasts.

The Agency makes regular use of the daily sounding in evaluating and interpreting air quality data and also encodes and stores the sounding data in a computerized data base. The Agency has developed a lower atmosphere climatology from this data base.

Each individual temperature sounding is analyzed to determine the vertical lapse rate of temperature, (-DT/DZ), between significant levels. These "significant level" layers are then grouped into sounding layers by the following four stability categories:

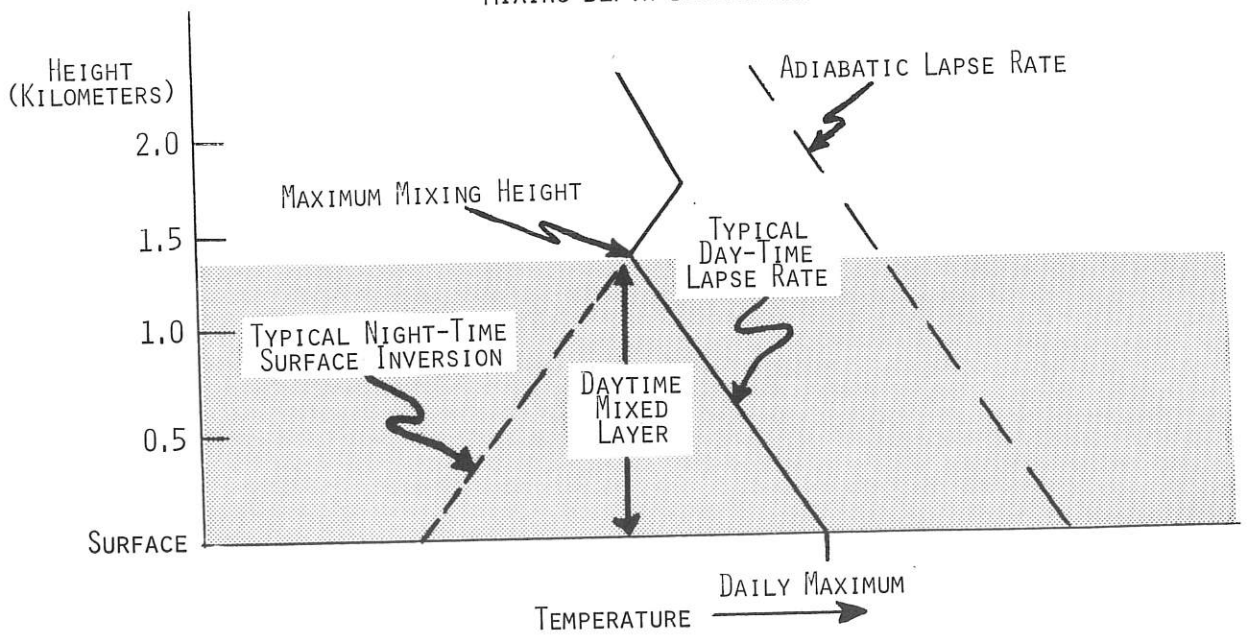
1) Temperature inversion (a stable condition)
2) Stable (no inversion)
3) Conditionally stable
4) Unstable

Two types of summary tables of these sounding layers are presented on the following page. One table presents a frequency distribution of TEMPERATURE INVERSION LAYERS showing the height of the inversion base together with the thickness or depth of the inversion layer. A temperature inversion near the surface that is thick enough so that the daytime MIXING DEPTH will not exceed the depth of the inversion layer is a significant restriction to vertical dispersion. This stable condition is associated with higher concentrations of air pollutants.

The other type of summary table shows the distribution of the four mutually exclusive SOUNDING LAYERS by height of the base of each layer.

The tables summarize seven years of data (1972 through 1978). There are separate tables for all seven years combined and for calendar year 1978 alone. Seasonal variations may be developed from monthly tables presented in a previous Air Quality Data Summary.

MIXING DEPTH DETERMINATION



PUGET SOUND AIR POLLUTION CONTROL AGENCY

FREQUENCY DISTRIBUTION OF SOUNDING LAYERS
(Within Given Lapse Rate Interval Based At or Below Given Height)

PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA (Elevation 8 M Above MSL)

ALL MONTHS 1978
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	LAPSE RATE CATEGORIES (DEGREES C/KM) Stable < 0.0	Stable 0.0 to 5.0	Cond Stable 5.1 to 10.0	Unstable > 10.0	Total No. Sounding Layers
SFC	29	31	96	93	249
150	67	48	138	94	347
300	99	76	189	100	464
500	126	113	225	100	564
1000	153	209	302	103	767
1500	184	273	387	110	954
2000	228	343	460	114	1145
2500	255	410	529	120	1314
3000	284	445	578	125	1432
700 MB	287	445	578	125	1435

Number of Soundings: 249

ALL MONTHS 1972-78
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	LAPSE RATE CATEGORIES (DEGREES C/KM) Stable < 0.0	Stable 0.0 to 5.0	Cond Stable 5.1 to 10.0	Unstable > 10.0	Total No. Sounding Layers
SFC	251	277	529	689	1746
150	422	440	929	720	2511
300	642	599	1226	754	3221
500	831	852	1465	766	3914
1000	1099	1414	2040	808	5361
1500	1405	1992	2633	883	6913
2000	1724	2472	3183	939	8318
2500	2028	2926	3688	999	9641
3000	2240	3269	4035	1046	10590
700 MB	2248	3271	4037	1048	10604

Number of Soundings: 1746

PUGET SOUND AIR POLLUTION CONTROL AGENCY

FREQUENCY DISTRIBUTION OF TEMPERATURE INVERSION LAYERS
(Within Given Thickness Interval Based At or Below Given Height)

PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA (Elevation 8 M Above MSL)

ALL MONTHS 1978
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	Thickness (GPM) 0 to 150	151 to 300	301 to 450	451 to 600	601 to 750	751 to 900	> 900	Total No. Temperature Inversions	Total No. Sounding Layers
SFC	7	12	7	3				29	249
150	15	22	10	10	5	3	2	67	347
300	25	30	14	15	5	6	4	99	464
500	31	38	19	17	6	9	6	126	564
1000	44	45	22	20	7	9	6	153	767
1500	57	57	25	21	7	10	7	184	954
2000	77	68	33	23	10	10	7	228	1145
2500	86	80	36	26	10	10	7	255	1314
3000	97	90	43	27	10	10	7	284	1432
700 MB	100	90	43	27	10	10	7	287	1435

Number of Soundings: 249

ALL MONTHS 1972-78
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	Thickness (GPM) 0 to 150	151 to 300	301 to 450	451 to 600	601 to 750	751 to 900	> 900	Total No. Temperature Inversions	Total No. Sounding Layers
SFC	65	68	46	28	15	13	16	251	1746
150	94	107	74	63	32	21	31	422	2511
300	159	159	107	87	44	37	49	642	3221
500	225	213	130	106	54	45	58	831	3914
1000	346	290	160	128	63	47	65	1099	5361
1500	490	388	188	150	69	50	70	1405	6913
2000	635	487	241	163	77	50	71	1724	8318
2500	771	589	282	179	84	51	72	2028	9641
3000	876	660	313	184	84	51	72	2240	10590
700 MB	884	660	313	184	84	51	72	2248	10604

Number of Soundings: 1746

NOTES:

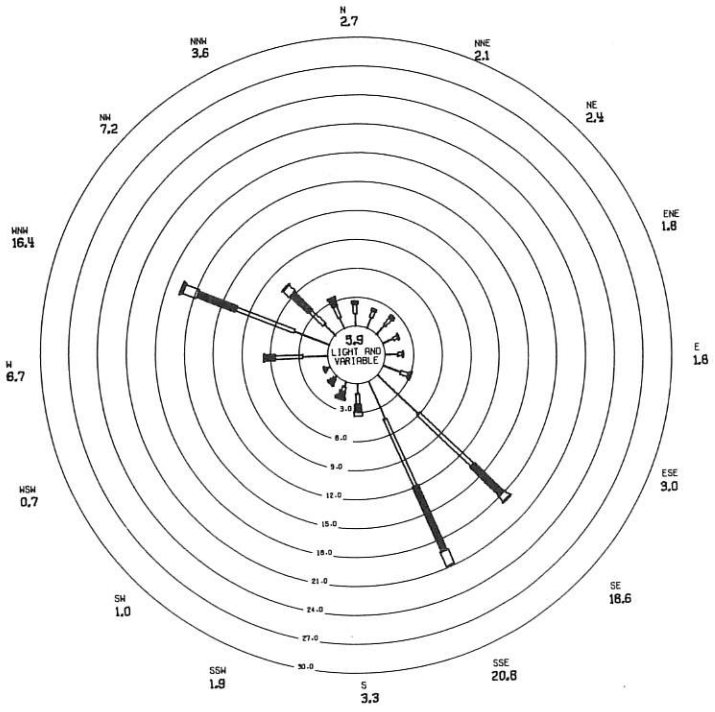
(1) All Heights are measured in Geopotential Meters above Mean Sea Level.
(2) Sounding terminates at 700 MB (3010 GPM - U.S. Standard Atmosphere).
(3) Because the Numbers in each Column are cumulative, Totals may be read Directly from the last Row (Height of Base At or Below 700 MB).
(4) The Lapse Rate is defined as -DT/DZ where DT is Temperature Difference and DZ is Height Difference (or Thickness) between consecutive Sounding Layers. Thus an Inversion is defined by a negative Lapse Rate.

The measurement of local area wind speed and direction is essential to the evaluation and control of air pollution. Low wind speeds contribute to higher air pollutant concentrations, particularly near major urban or industrialized areas. Wind direction data aids in determining which sources or source areas affect a specific location.

A wind rose is a graphical means of summarizing the winds for a given time period. It is essentially a count, expressed in these graphs as a percentage frequency, of the number of observations or hours which had a particular direction and speed during the summary period.

The wind rose spokes or arms represent 16 points of the compass, each pointing towards a wind direction compass point. The percentage frequency of winds from a given direction (without regard to speed) is expressed numerically beneath that direction on the perimeter of each rose.

The length of each segment of a spoke indicates the relative frequency of winds within the different speed categories. Using the percent scale located to the lower right of each rose, these lengths may be converted to number of observations or hours during which each speed category occurred. The percentage frequency of light and variable winds (winds less than 1.5 knots) is shown in the center of the rose.



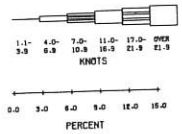
HOUR AVERAGE SURFACE WINDS

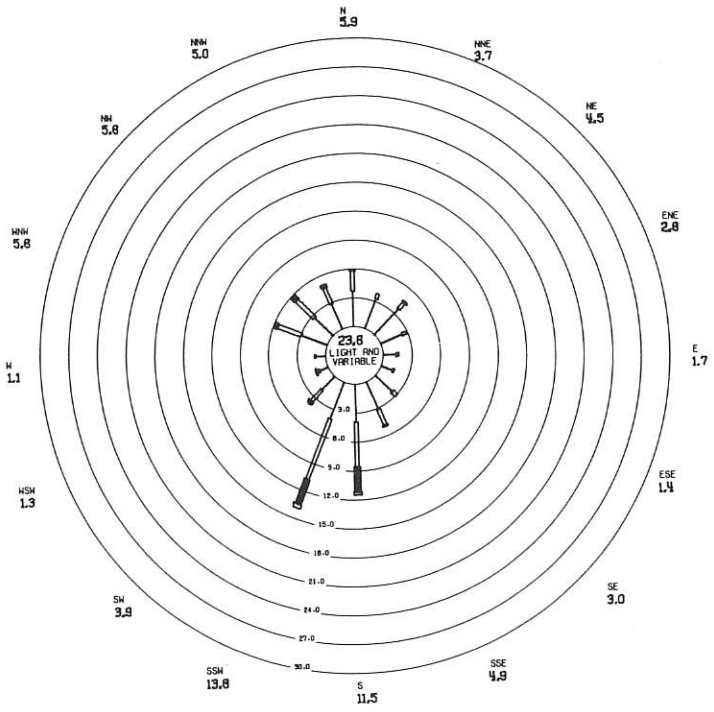
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY MEDICAL-DENTAL BLDG. 2730 COLBY. EVERETT. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,617





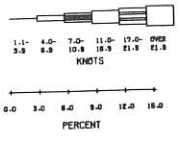
HOUR AVERAGE SURFACE WINDS

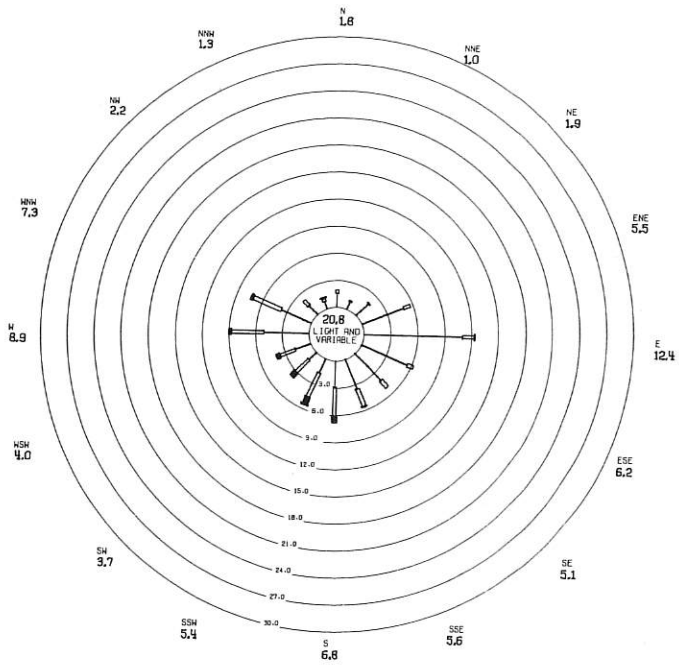
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY NORTH 98TH ST & STONE AVE N. SEATTLE. WA

INCLUSIVE DATES- MAY. JUN. JUL. AUG. SEP. OCT. NOV. DEC. 1978

TOTAL OBSERVATIONS- 5,448





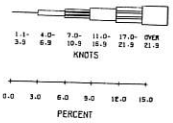
HOUR AVERAGE SURFACE WINDS

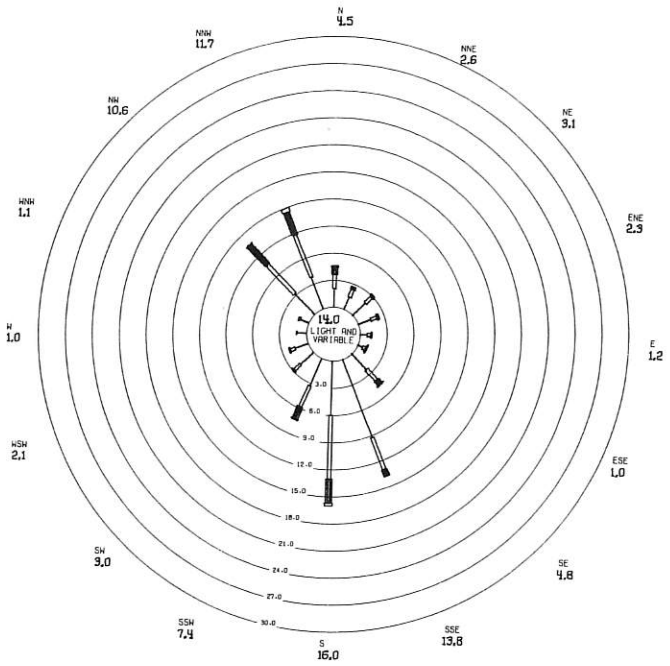
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
PORTAGE BAY. 2725 MONTLAKE BLVD E. SEATTLE. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,383





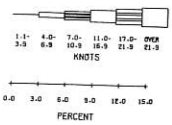
HOUR AVERAGE SURFACE WINDS

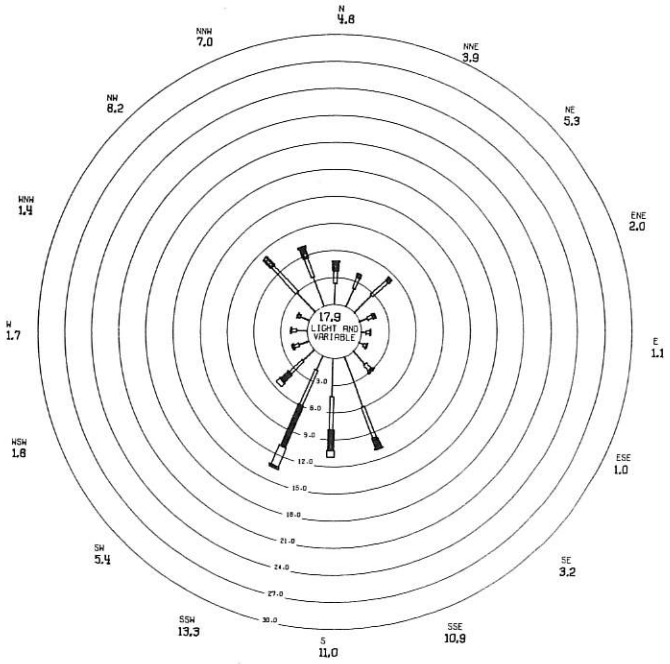
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
HARBOR ISLAND. 3419 13TH AVE SW. SEATTLE. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,614





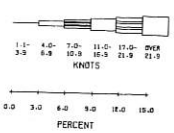
HOUR AVERAGE SURFACE WINDS

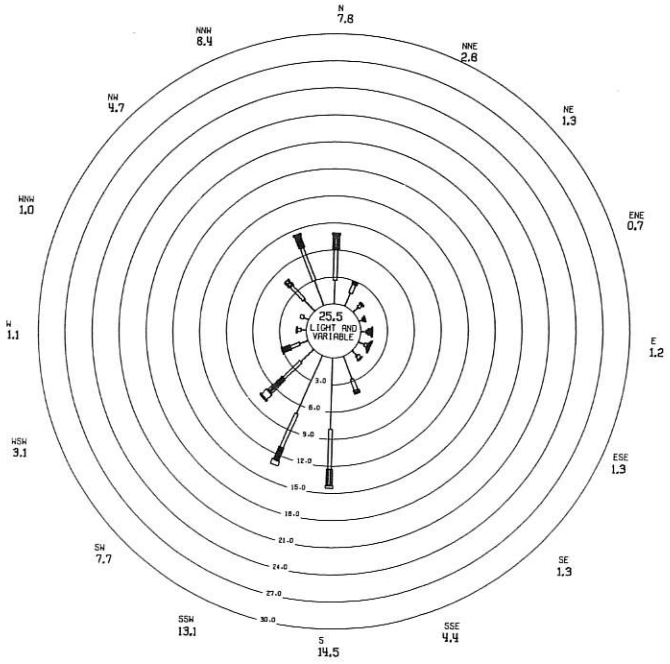
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
DUWAMISH. 4500 E MARGINAL WAY S. SEATTLE. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,548





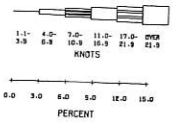
HOUR AVERAGE SURFACE WINDS

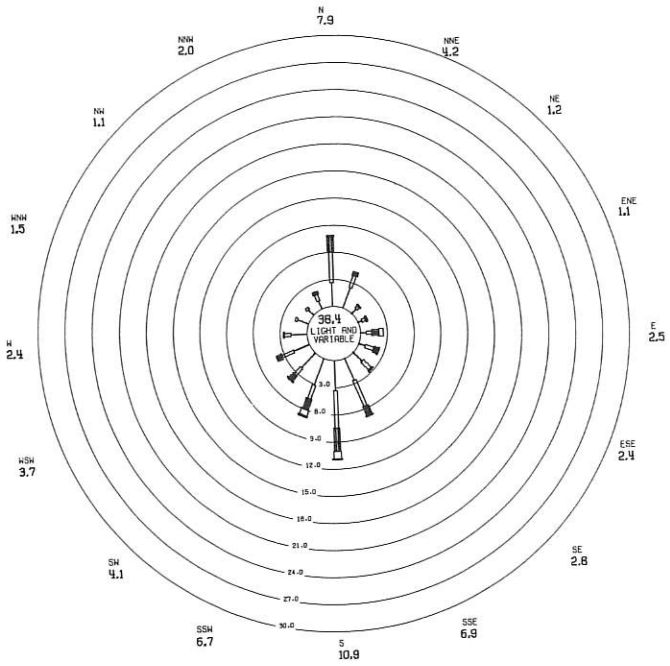
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SOUTHCENTER. 401 ANDOVER PARK E. TUKWILA. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,607





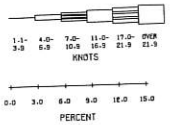
HOUR AVERAGE SURFACE WINDS

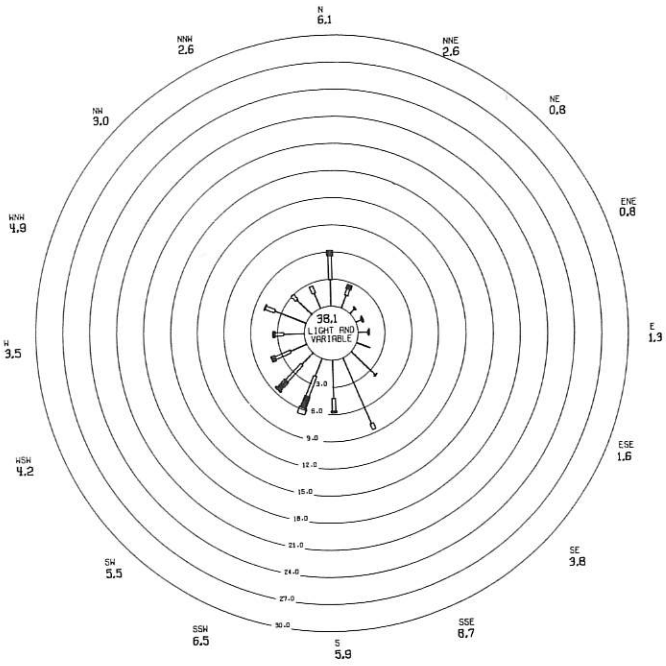
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
22916 86TH AVE S. KENT. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,467





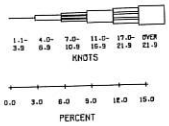
HOUR AVERAGE SURFACE WINDS

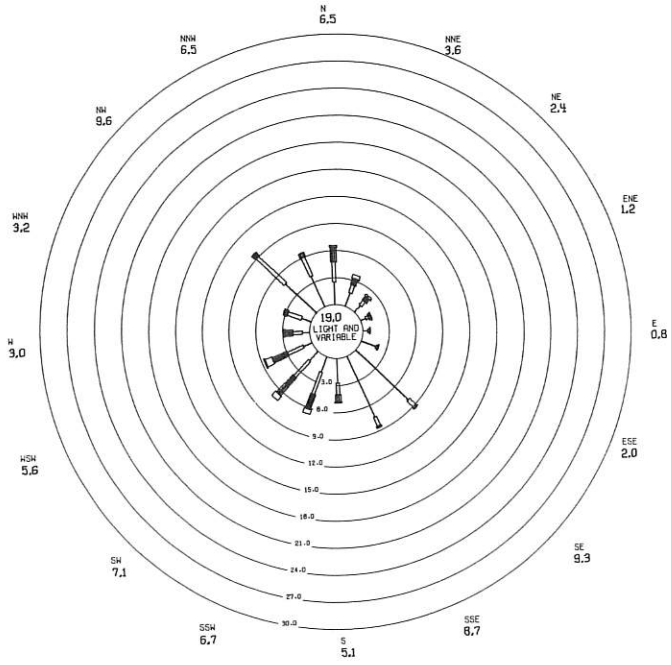
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SUMNER JR HS. 1508 WILLOW ST. SUMNER. WA

INCLUSIVE DATES- JUN. JUL. AUG. SEP. OCT. NOV. DEC. 1978

TOTAL OBSERVATIONS- 4,968





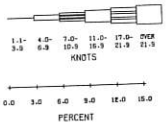
HOUR AVERAGE SURFACE WINDS

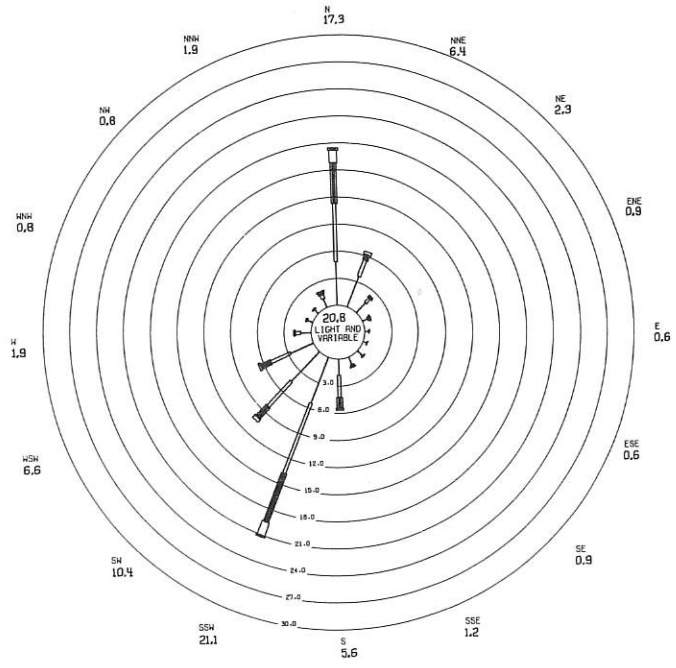
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
FIRE STATION #12. 2316 E 11TH ST. TACOMA. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,485





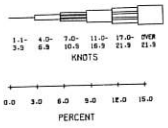
HOUR AVERAGE SURFACE WINDS

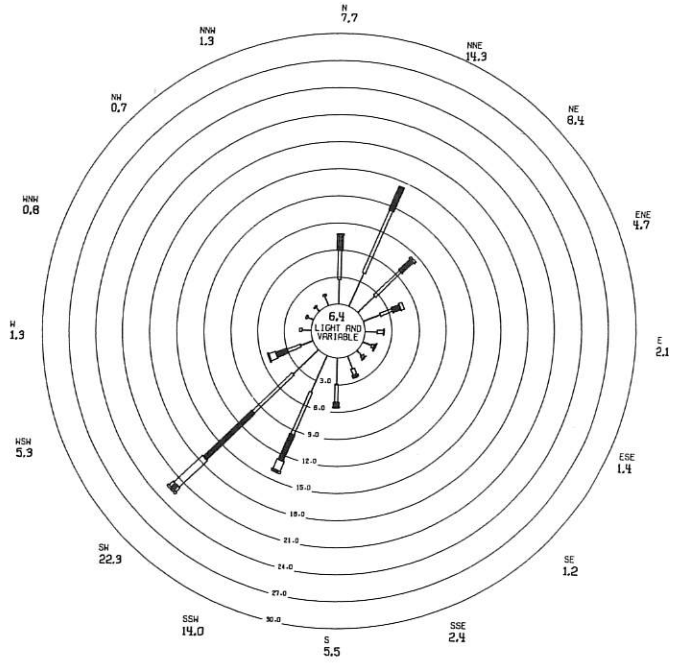
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
WILLARD SCHOOL. S 32ND & S 'D' ST. TACOMA. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,620





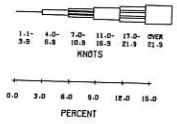
HOUR AVERAGE SURFACE WINDS

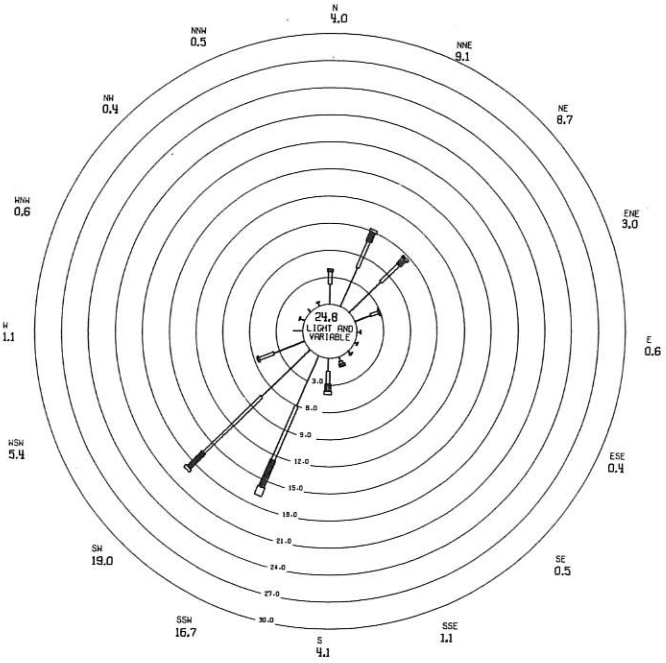
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SW 288RD & 101ST AVE SW. MAURY ISLAND. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,277





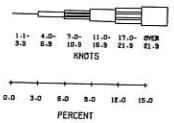
HOUR AVERAGE SURFACE WINDS

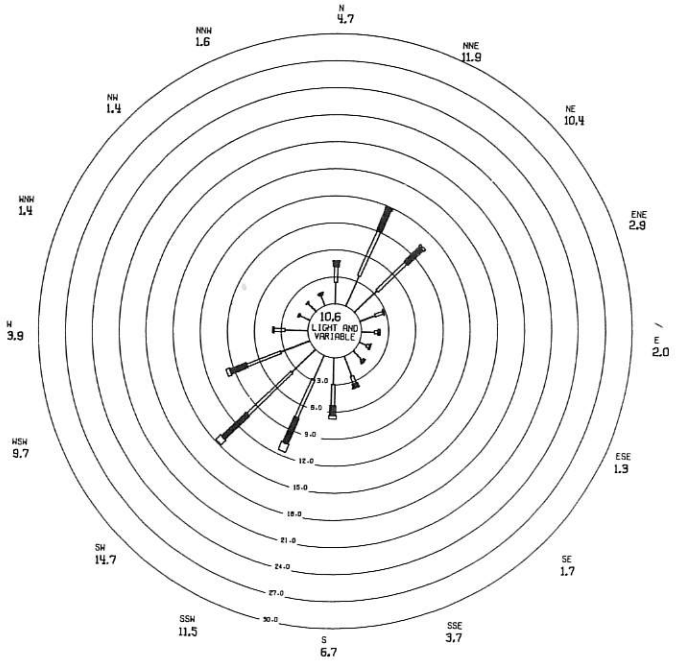
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
NORTH 43RD & VISSCHER STS. TACOMA. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,567





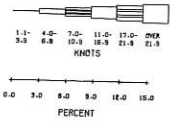
HOUR AVERAGE SURFACE WINDS

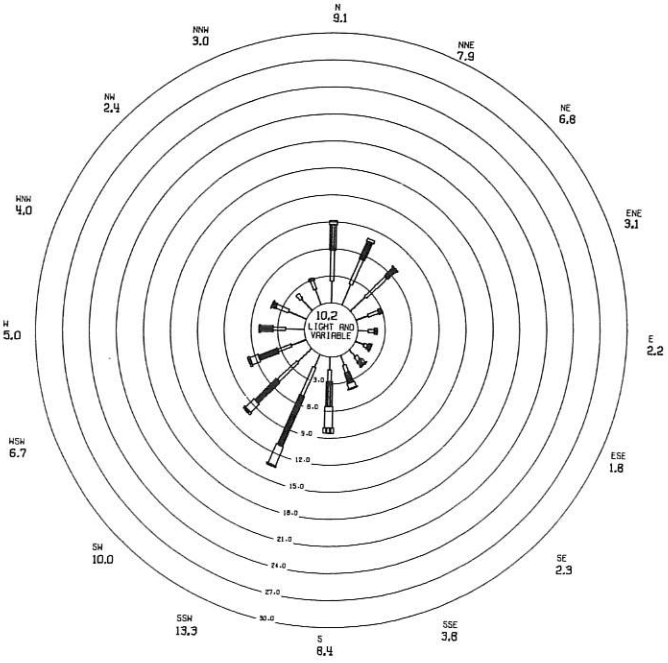
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
NORTH 26TH & PEARL STS. TACOMA. WA

INCLUSIVE DATES- ALL MONTHS 1978

TOTAL OBSERVATIONS- 8,555





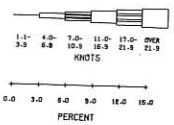
HOUR AVERAGE SURFACE WINDS
(60 METERS ABOVE GROUND LEVEL)

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SECOND OLD FORT NISQUALLY. DUPONT. WA

INCLUSIVE DATES- JAN. FEB. MAR. APR. MAY. JUN. 1978

TOTAL OBSERVATIONS- 3,806



STABILITY WIND ROSES

Introduction

The stability wind rose summarizes individual observations of wind direction and wind speed plus an objective calculation of low level stability existing at the same time. Each hourly observation is added to a three dimensional table at the position indicated by the wind direction assigned to the nearest of 16 compass points, by the wind speed assigned to one of 6 separate intervals, and by the low level stability category. The graphical presentation is similar to the wind rose except that separate wind roses are constructed for each stability category.

Determination of Stability

The low level stability is calculated following an objective procedure documented by D. Bruce Turner in the "Journal of Applied Meteorology", February, 1964. Low level stability depends primarily upon net radiation and wind speed. In this technique the estimate of daytime incoming radiation is developed from solar altitude for time of day and time of year at the particular location. Incoming radiation is then decreased for increased cloud cover and lower cloud ceiling height. The estimate of nighttime outgoing radiation is also decreased for increased total cloud cover.

Stability Classes

A. EXTREMELY UNSTABLE. Daytime occurrence with high positive net radiation and wind speed 5 knots or less.

B. UNSTABLE. Daytime occurrence with wind speed less than 10 knots.

C. SLIGHTLY UNSTABLE. Daytime occurrence.

D. NEUTRAL. Characterized by low or zero net radiation. Separated into daytime or nighttime occurrence by local daily sunrise and sunset times.

E. STABLE. Nighttime occurrence in conjunction with lighter wind speeds. All stable conditions are combined within this class since urban areas do not become as stable in the lower layers as rural areas.

Discussion of Local Stability Wind Roses

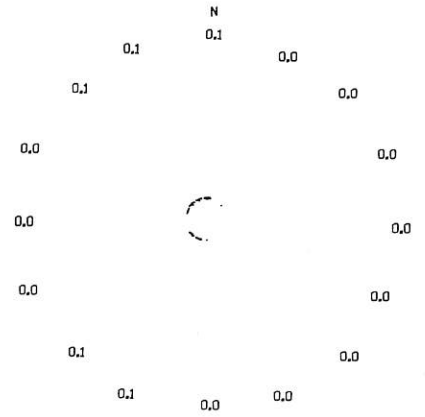
The local area stability wind roses are developed using 3 hour interval cloud data recorded for Seattle Tacoma International Airport. Persistence in cloud data is assumed for the hour preceding and the hour following the observation. This cloud data is then interfaced with the 1 hour average wind data observed at the location for which the stability wind rose is constructed.

Stability wind roses for three locations in the Puget Sound region follow this discussion. The wind rose for each stability class may be interpreted by reviewing the discussion in the preceding section on wind roses. There are two main differences. First, percent frequencies refer to the total of all observations. Thus the sum of the frequency of winds from 16 compass points displayed around each wind rose equals the frequency of occurrence for that stability class. Second, light and variable wind cases are distributed within the lowest wind speed class based upon actual occurrences in the lowest two wind speed classes.

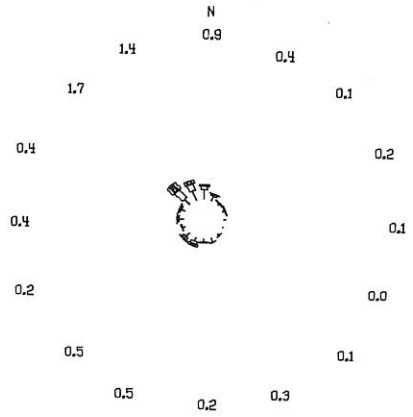
The stability wind rose summaries are required for air quality modeling. The Climatological Dispersion Model uses tabular summaries from which the accompanying stability wind roses were plotted.

Clearly the most significant difference between locations exists in the wind distribution. The frequency of occurrence of each stability class is about the same at each location. Neutral stability exists about one-half of the time. Stable nighttime conditions occur about 29 percent of the time. The wind rose associated with these stable conditions is probably the most important in describing poor pollutant dispersion and is generally different than that occuring during any other stability class.

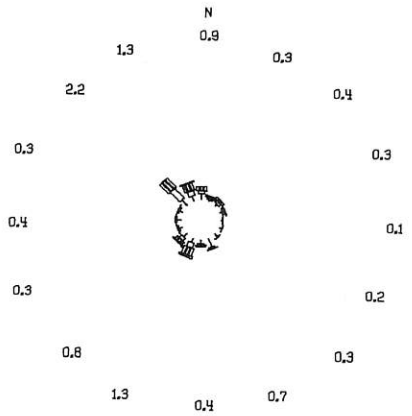
PUGET SOUND AIR POLLUTION CONTROL AGENCY



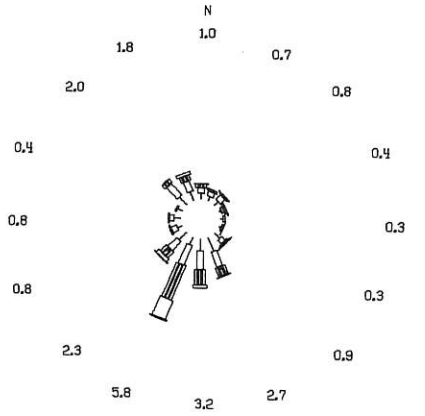
Extremely Unstable
0.5 %



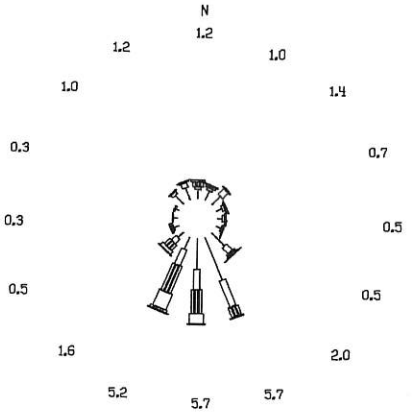
Unstable
7.6 %



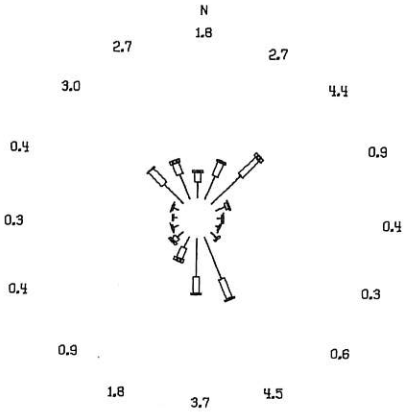
Slightly Unstable
10.1 %



Neutral Daytime
24.2%



Neutral Nighttime
28.8%



Stable
28.8%

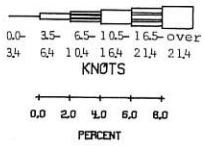
STABILITY WIND ROSES

Percentage Frequency of Occurrence

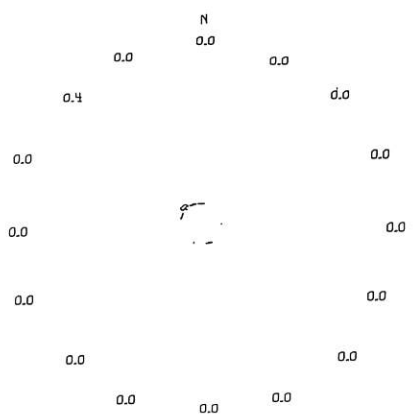
Period of Record: JAN 1978 to DEC 1978

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

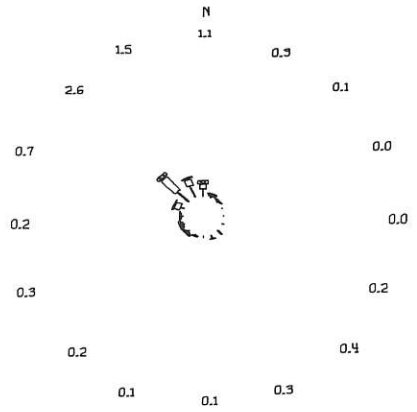
1 Hr Wind Location: DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA



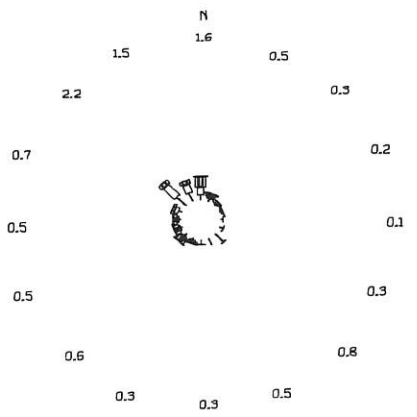
PUGET SOUND AIR POLLUTION CONTROL AGENCY



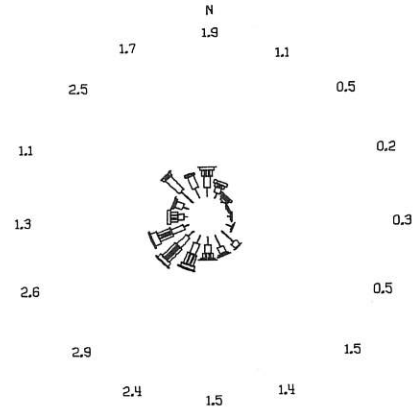
Extremely Unstable
0.5 %



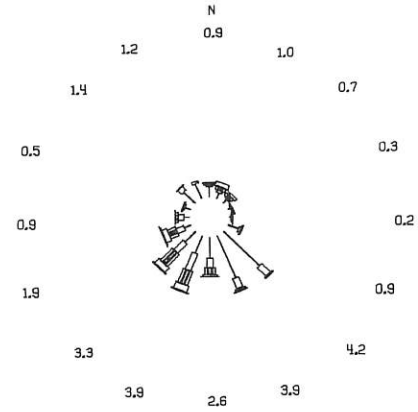
Unstable
8.0 %



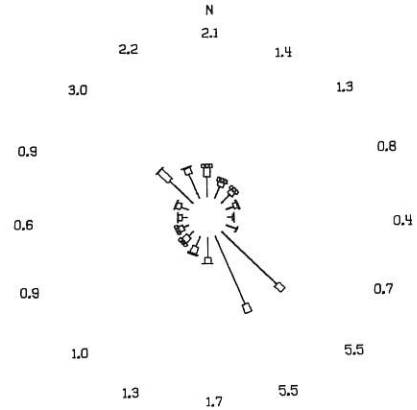
Slightly Unstable
10.8 %



Neutral Daytime
23.4%



Neutral Nighttime
27.9%



Stable
29.3%

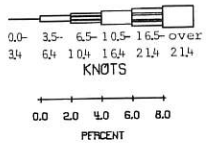
STABILITY WIND ROSES

Percentage Frequency of Occurrence

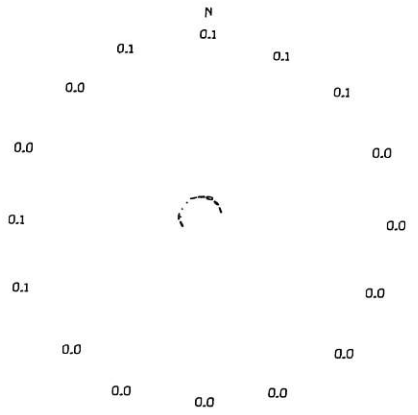
Period of Record: JAN 1978 to DEC 1978

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

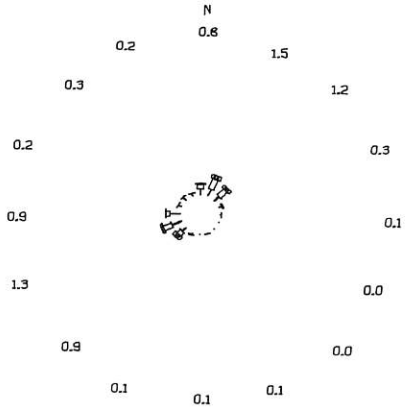
1 Hr Wind Location: FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA



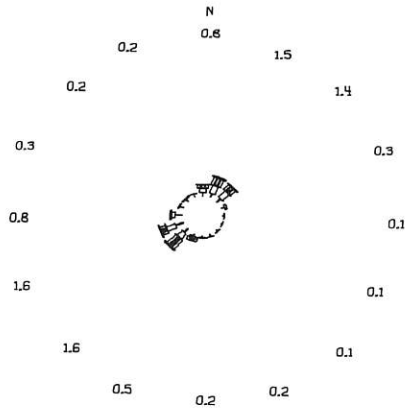
PUGET SOUND AIR POLLUTION CONTROL AGENCY



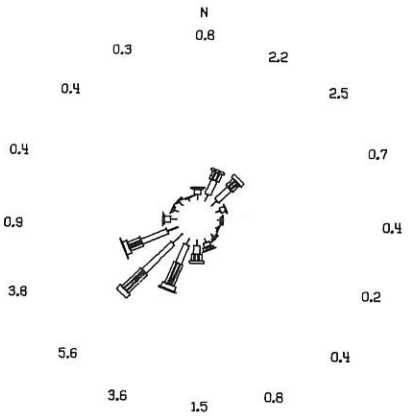
Extremely Unstable
0.6 %



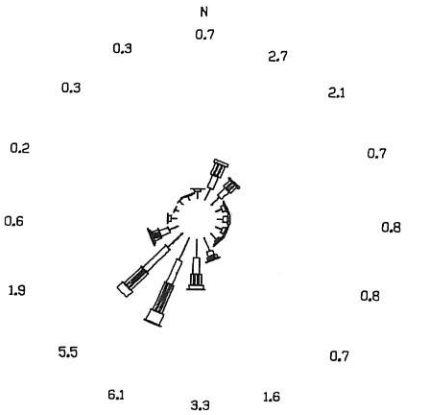
Unstable
7.9 %



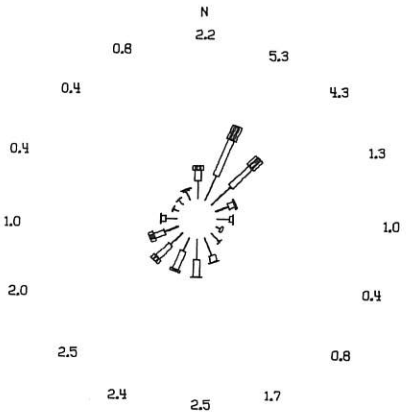
Slightly Unstable
9.7 %



Neutral Daytime
24.4%



Neutral Nighttime
28.5%



Stable
28.9%

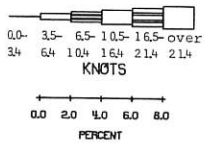
STABILITY WIND ROSES

Percentage Frequency of Occurrence

Period of Record: JAN 1978 to DEC 1978

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

1 Hr Wind Location: NORTH 26TH & PEARL STS, TACOMA, WA



AMBIENT AIR QUALITY STANDARDS

SULFUR OXIDES

The presence of sulfur oxides in the ambient air has been associated with a variety of respiratory diseases and increased mortality rates. They represent a significant economic burden and have a nuisance impact. When sulfur oxides are inhaled with small particles, the effect on health is increased. Inhalation of sulfur dioxide can cause increased airway resistance by constricting lung passages.

PARTICULATES

Small discrete masses of solid or liquid matter dispersed in the atmosphere, especially those of one micron or less in diameter, are associated with a variety of adverse effects on public health and welfare. Particulate matter in the respiratory tract may produce injury by itself, or it may act in conjunction with gases to increase the effect on the body. Small particles suspended in the air are chiefly responsible for reduced visibility in the Puget Sound area. Soiling of buildings and other property is a common effect of high particulate levels.

CARBON MONOXIDE

Carbon monoxide reacts with the hemoglobin in red blood cells to decrease the oxygen-carrying capacity of the blood. The national primary standard for carbon monoxide was based on evidence that levels of carboxyhemoglobin in human blood as low as 2.5% may be associated with impairment of ability to discriminate time intervals. The national ambient air quality standards for carbon monoxide are intended to protect against the occurrence of carboxyhemoglobin levels above 2%. Note: Smoking up to 2 packs of cigarettes a day raises carboxyhemoglobin levels to about 5%. This is equivalent to exposure for 8 or more hours to 30 ppm of carbon monoxide.

	NATIONAL			WASHINGTON STATE		PUGET SOUND REGION	
	PRIMARY	SECONDARY	Notes		Notes		Notes
SULFUR OXIDES	ppm	ppm		ppm		ppm	
Annual Average	0.03		a	0.02	a	0.02	a
30 day Average						0.04	a
24-hour Average	0.14		b	0.10	b	0.10	a
3-hour Average		0.50	b				
1-hour Average				0.25	c	0.25	c
1-hour Average				0.40	b	0.40	a
5 min. Average						1.00	d
SUSPENDED PARTICULATES	µg/m³	µg/m³		µg/m³		µg/m³	
Annual Geo. Mean	75	60	a	60	a	60	a
24-hour Average	260	150	b	150	b	150	b
CARBON MONOXIDE	ppm						
8-hour Average	9	same	b	same		same	
1-hour Average	35		b				
OZONE	ppm					ppm	
1-hour Average	0.12	same	e	same		0.08	b
NITROGEN DIOXIDE	ppm						
Annual Average	0.05	same	a	same		same	
HYDROCARBONS (Less Methane)	ppm						
3-hour Average	0.24	same	b f	same but applies only 4/1 thru 10/31		same as National	
LEAD	µg/m³						
Calendar Quarter Average	1.5	same	a				

ppm = parts per million

µg/m³ = micrograms per cubic meter

a Never to be exceeded
b Not to be exceeded more than once per year
c Not to be exceeded more than twice in seven days
d Not to be exceeded more than once in eight hours
e Standard attained when expected number of days per year with maximum hourly average above 0.12 ppm is equal to or less than one
f Applies 6 a.m. to 9 a.m. daily

PSAPCA 6/79

OZONE

Oxidants are produced in the atmosphere when nitrogen oxides and some hydrocarbons are exposed to sunlight. Ozone is the oxidant found in largest amounts. It is a pulmonary irritant that affects lung tissues and respiratory functions. Ozone impairs the normal function of lung and, at concentrations between 0.15 and 0.25 ppm, causes lung tightness, coughing, and wheezing. Other oxidants, produced in smaller amounts than ozone, cause eye irritation. Persons with chronic respiratory problems such as asthma seem most sensitive to changes in ozone concentration.

NITROGEN DIOXIDE

Nitric oxide results from the fixation of nitrogen and oxygen at high temperatures as in fuel combustion. There are several atmospheric reactions which lead to the oxidation of nitric oxide to nitrogen dioxide, and the presence of nitrogen dioxide in ambient air is essential to the production of photochemical oxidants. The presence of nitrogen dioxide in ambient air has been associated with a variety of respiratory diseases.

HYDROCARBONS

Defined as organic compounds composed exclusively of carbon and hydrogen, hydrocarbons are primarily associated with the use of petroleum products. They are the main components of photochemical smog. Hydrocarbons alone have no known effect on human health; therefore the sole purpose of prescribing a hydrocarbon standard is to control photochemical oxidants.

LEAD

Lead affects humans in numerous ways, but the greatest effects appear to be on the blood-forming system, the nervous system, and the kidneys. It affects some persons more than others. Young children (ages 1-5) are particularly sensitive to lead exposure. The standard for lead in air is intended to prevent most children from exceeding blood lead levels of 30 micrograms per deciliter of blood.