KNECHTEL

PUGET SOUND
AIR POLLUTION CONTROL AGENCY

1980 AIR QUALITY DATA SUMMARY

Counties Of

King
Kitsap
Pierce
Snohomish

Puget Sound Air Pollution Control Agency

P.O. Box 9863 (206) 344-7330
Seattle, Washington 98109

Serving King, Kitsap, Pierce and Snohomish Counties

1980
AIR QUALITY
DATA SUMMARY

measured and compiled by the
Technical Services Division

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

1980 AIR QUALITY DATA SUMMARY

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PUBLISHED NOVEMBER, 1981
TECHNICAL SERVICES DIVISION
(206) 344-7326

INTRODUCTION

This ninth annual data summary presents air quality and meteorological data measured in the Puget Sound Region during 1980. The format is similar to that of past annual summaries. The report begins with a table outlining the sampling network (with addresses) and a map of the network. Within the report are summaries of pollutant measurements together with interpretive comments. The last sections present meteorological data consisting of temperature soundings, wind roses, and stability wind roses.

An entirely new feature is the section which presents the nationally uniform Pollutant Standards Index (PSI) beginning on page 6. The PSI is presented for each of the Everett, Seattle and Tacoma areas. Along with a brief description, there are plots of daily PSI values and a table listing, by month, the number of values in each PSI category and the maximum PSI. Each weekday the Agency reports the current PSI to the news media and the public. Interested citizens may also obtain the current PSI from the Washington Lung Association in Seattle by dialing 322-7110 or by dialing 1-800-732-9339 toll-free from outside Seattle.

During 1980, a major volcanic eruption of Mt. St. Helens first occurred on the morning of May 18. Other major eruptions, all less significant than the first eruption, took place on May 25, June 12, July 22, August 7, and October 16-18. Though a significant amount of volcanic ash fell in some areas of Washington, the Puget Sound Region received very little ash fallout. Other than some very light dustings of ash, the most significant volcanic ash fallout in the Puget Sound area occurred in eastern King and Pierce Counties following the August 7 eruption. About one-half of the suspended particulates measured at the Cedar River Masonry Dam on August 7 and 8 appeared to be volcanic ash (see data on page 25).

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 air monitoring within the region in addition to that done by the Agency. The Department publishes an annual summary of data for the entire state. Inquiries concerning the statewide data should be directed to the Washington State Department of Ecology-PV11, Office of Air Programs, Data Control Section, Olympia, Washington 98504.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Atmospheric Sampling Network

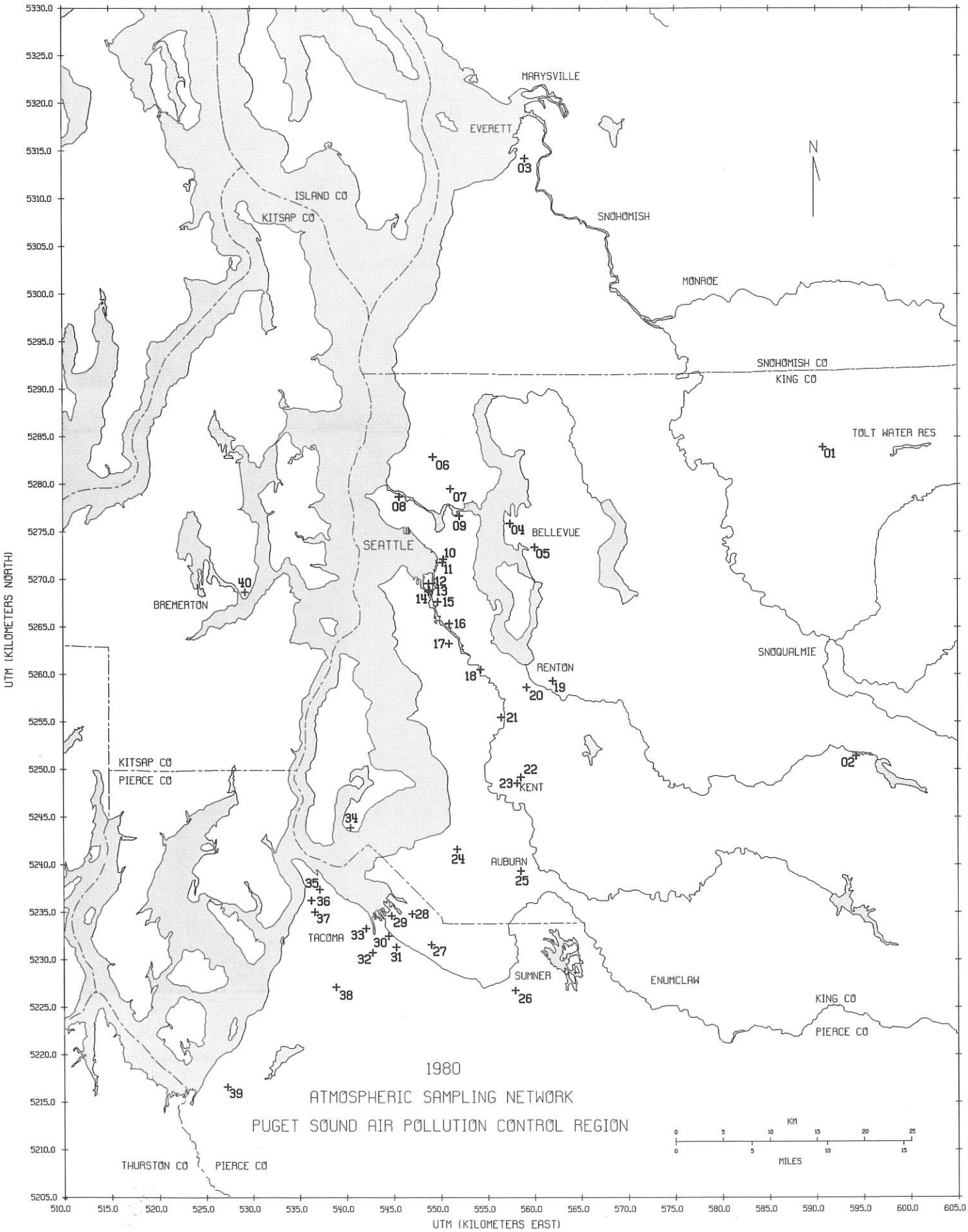
1980

Sta. Code	Location	Type of Sampling[a] A	B	C	D	E	F	G	H	I	J
01	TOLT RIVER WATERSHED, KING CO, WA	A									
02	CEDAR RIVER MASONRY DAM, KING COUNTY, WA	A									
03	MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	A	B	C	D						
*04	EVERGREEN POINT BRIDGE TOLL PLAZA, MEDINA, WA									I	
*05	504 BELLEVUE WAY NE, BELLEVUE, WA	A								I	
06	NORTH 98TH ST & STONE AVE N, SEATTLE, WA	A	B	C	D				H	I	J
*07	5701 - 8TH AVE NE, SEATTLE, WA	A								I	
08	2700 W COMMODORE WAY, SEATTLE, WA	A									
*09	PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	A			D					I	
10	PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	A									
*11	FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	A									
12	HARBOR ISLAND, 2555 13TH AVE SW, SEATTLE, WA	A								I	
13	HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	A								I	
14	HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA		B		D						
15	DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	A	B	C	D						J
*16	GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	A									J
17	SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	A									
18	DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	A									
19	SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	A									
20	SOUTH 2ND ST & LAKE AVE S, RENTON, WA	A									
21	SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	A		C	D						
22	22916 86TH AVE S, KENT, WA	A		C	D	E	F	G	H		
23	MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	A									
24	FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	A	B	C	D						
25	115 E MAIN ST, AUBURN, WA	A									
26	SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	A		C	D			G			
27	FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	A									
28	2340 TAYLOR WAY, TACOMA, WA	A									
29	FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	A		C	D				H		J
30	TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	A									
31	CASCADIA, 2002 E 28TH ST, TACOMA, WA	A									
32	WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	A		C	D						
33	HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	A									
34	SW 283RD & 101ST AVE SW, MAURY ISLAND, WA		B		D						
35	4716 NORTH BALTIMORE, TACOMA, WA	A								I	
36	NORTH 37TH & VASSAULT STS, TACOMA, WA		B		D						
37	NORTH 26TH & PEARL STS, TACOMA, WA	A	B		D					I	
*38	MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	A									
*39	CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA	A									
40	EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	A									

* Station operated by Washington State Department of Ecology (Additional Ozone sampling and all Carbon Monoxide sampling is performed by the Department of Ecology. Summaries of these data are included in this publication).

[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 Nitric Oxide (NO)
G Ozone (O3)
H Atmospheric Particles (b - Scattering)
I Lead
J Suspended Particulates (dichotomous sampling)


MARYSVILLE
EVERETT
ISLAND CO
KITSAP CO
SNOHOMISH
MONROE
SNOHOMISH CO
KING CO
TOLT WATER RES
BELLEVUE
SEATTLE
BREMERTON
SNOQUALMIE
RENTON
KITSAP CO
PIERCE CO
KENT
AUBURN
TACOMA
SUMNER
ENUMCLAW
KING CO
PIERCE CO
THURSTON CO
PIERCE CO
1980
ATMOSPHERIC SAMPLING NETWORK
PUGET SOUND AIR POLLUTION CONTROL REGION
KM
MILES
UTM (KILOMETERS NORTH)
UTM (KILOMETERS EAST)

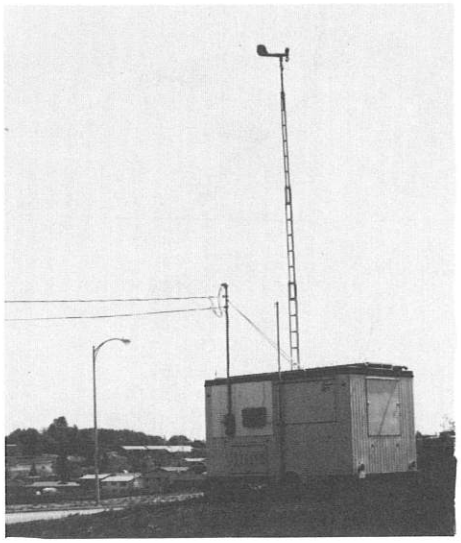
AIR QUALITY AND METEOROLOGICAL SAMPLING SYSTEM

- All remote telemetry stations continuously monitor:
  WIND DIRECTION and WIND SPEED

- Each Station continuously measures one or more of these pollutants:
  SUSPENDED PARTICULATES (COH's)
  ATMOSPHERIC PARTICLES (b scattering)
  SULFUR DIOXIDE
  NITROGEN DIOXIDE
  NITRIC OXIDE
  OZONE

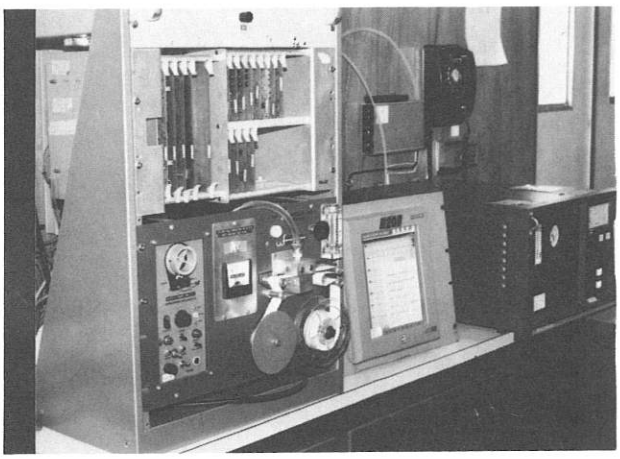
N. 98th St. and Stone Ave. North, Seattle

The WIND DIRECTION and SPEED sensor is mounted on a 10 meter tower. A sampling probe immediately left of the tower obtains an ambient air sample for analysis by instruments inside the station. Self-contained high volume samplers and a dichotomous sampler are located on the roof.

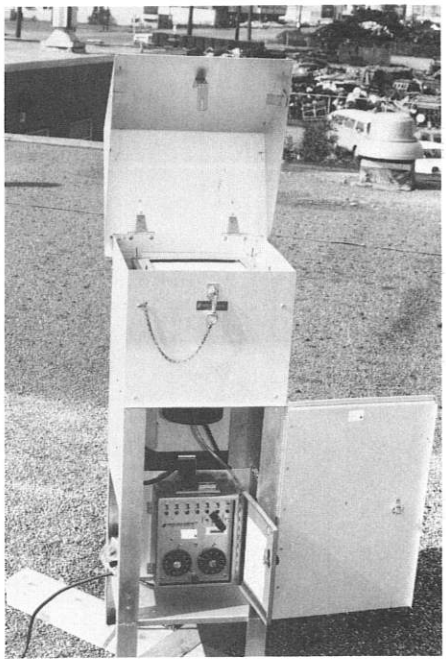


North 37th and Vassault Sts., Tacoma

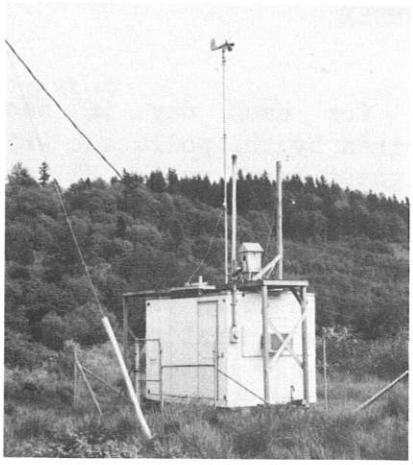
Pictures on this page and one on the following page show sites where sampling is conducted. The monitoring objective and therefore the parameters actually sampled are often different. Actual sampling at each station is documented in the table on page 2.



Inside a station are the telemetry electronics which translate all the instrument signals for transmission over phone lines at the command of the central control station computer. A tape sampler analyzes SUSPENDED PARTICULATES measured as COHs. An analyzer operating on the principle of ultraviolet fluorescence measures SULFUR DIOXIDE. This measurement is also recorded at the site on a strip chart recorder.

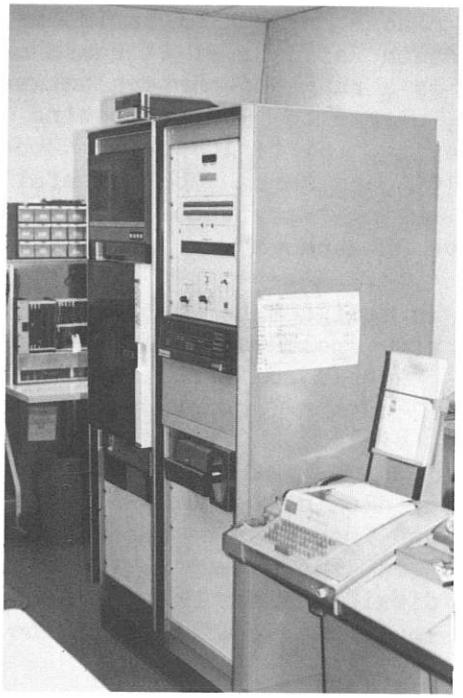


A high volume sampler is the federal reference method for measuring TOTAL SUSPENDED PARTICULATES. The instrument in the picture above is open to show the filter (in frame beneath hinged sampler cover) on which the sample is collected. An electric high flow rate blower pulls air through the filter at about 50 cubic feet per minute. Particulates with diameters from about 0.1 micrometer to 100 micrometers are collected on the filter. The sampler is normally operated continuously for 24 hours every sixth day.



station at 22916 86th Ave. S., Kent

Data from all remote stations is immediately telemetered to the central station computer via phone lines.



Central station computer controls the entire network. It processes all incoming 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 by air quality specialists prior to use.
- After validation, the data is processed by off-line computer to provide a monthly summary for each station and parameter containing hour averages, daily maximum and mean, monthly means and selected moving averages.
- Permanent data files stored on magnetic tape and disk allow rapid retrieval for correlation with other data, for trend analyses, for atmospheric modeling, for land use planning, for control strategy evaluation and for special studies.
- Nontelemetered data from the high volume samplers measuring total suspended particulates is manually processed, summarized and stored in permanent computer files for rapid retrieval.
- All these data are used to evaluate the attainment of ambient air quality standards; to maintain real-time surveillance for episode avoidance; and to report the Pollutant Standards Index to the public.

POLLUTANT STANDARDS INDEX

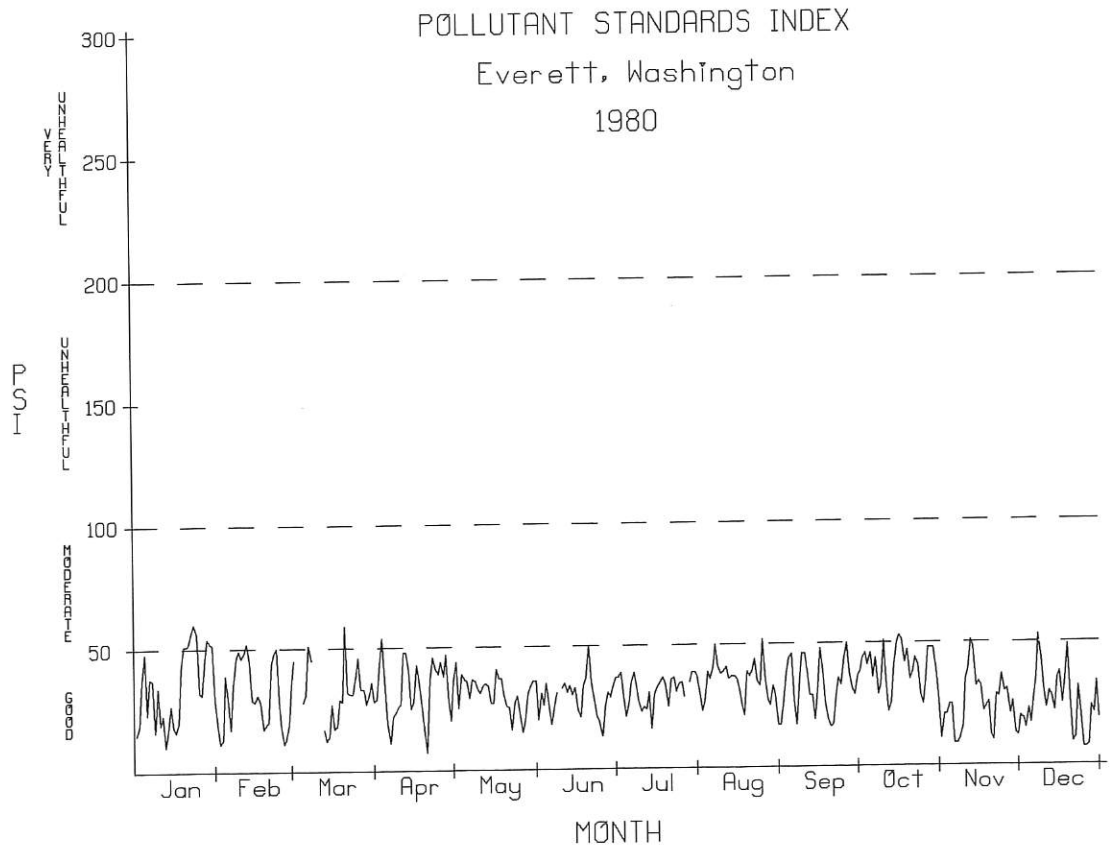
The Pollutant Standards Index (PSI) is a nationally uniform index for daily reporting of air quality. In cooperation with the State Department of Ecology, the Agency began reporting the PSI in 1980 for the Everett, Seattle, and Tacoma areas.

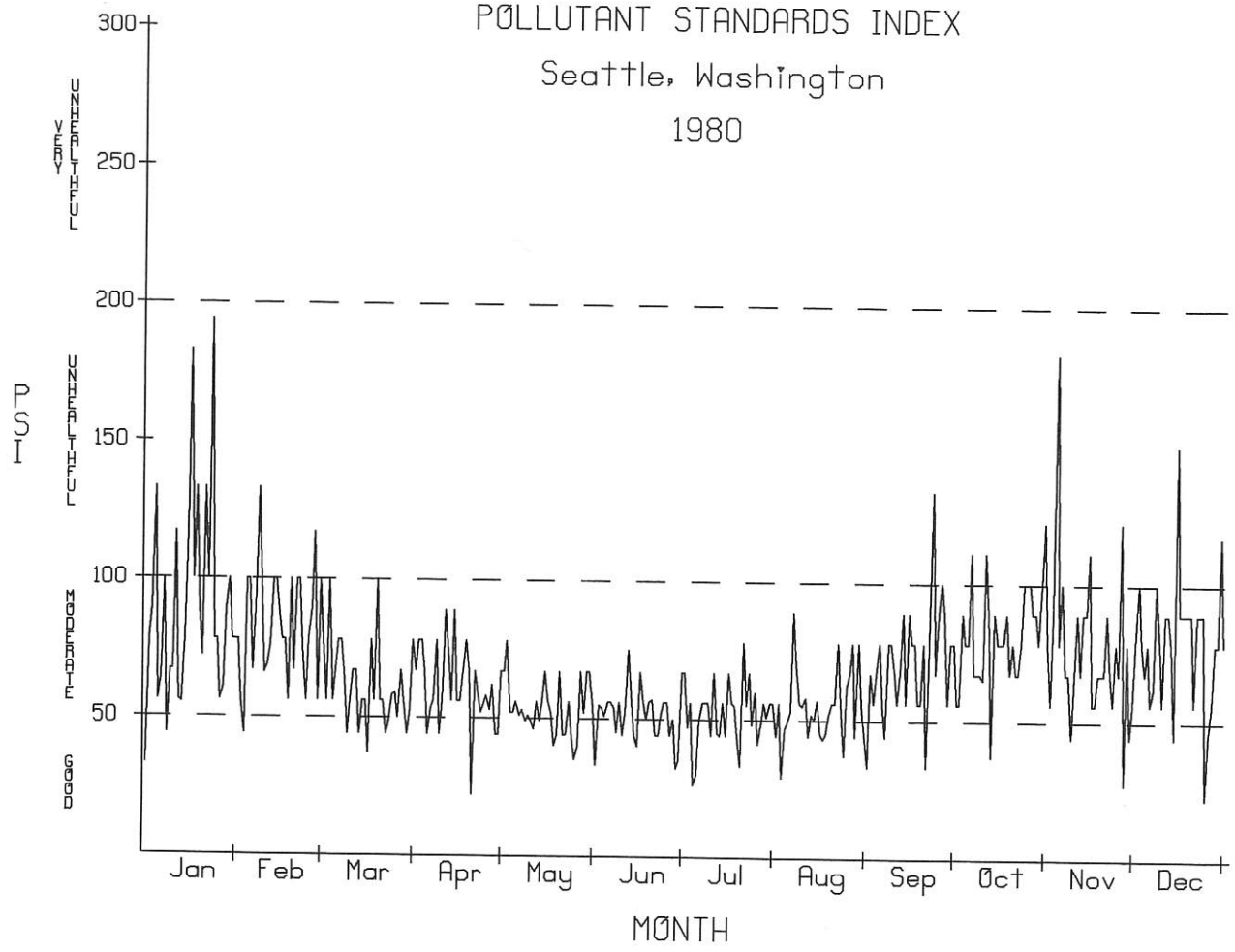
The PSI places maximum emphasis on short term health effects of 24 hours or less. The PSI is a range of numbers between zero and 500, with 0 to 50 indicating "Good" air quality, 51 to 100 being "Moderate", 101 to 199 considered "Unhealthful", 200 to 299 being "Very Unhealthful", and 300 and above "Hazardous".

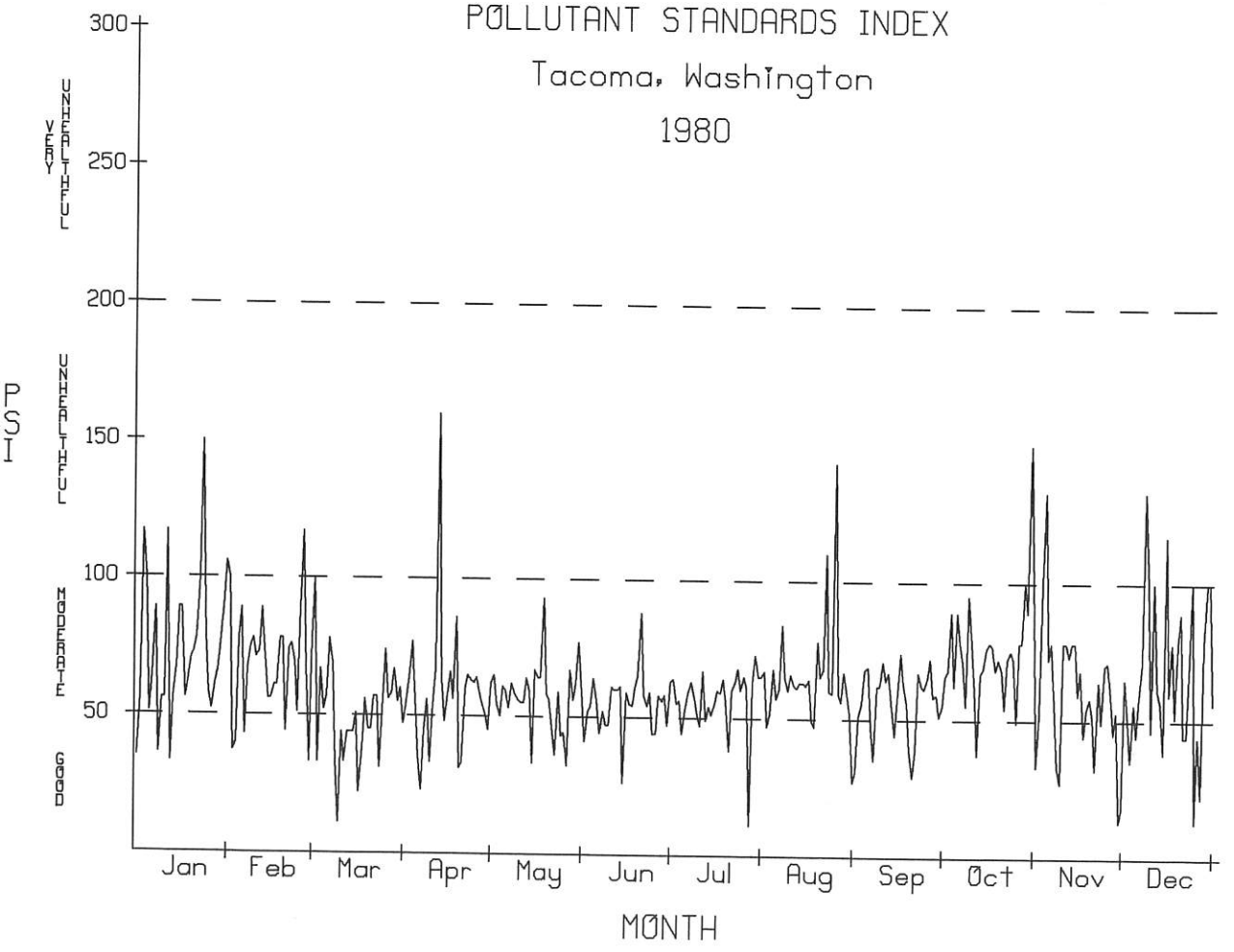
The PSI is designed to report upon five major air pollutants of concern for health: suspended particulates, sulfur dioxide, carbon monoxide, ozone, and nitrogen dioxide. The Agency reviews carbon monoxide, suspended particulates, and sulfur dioxide to report the index for Seattle and Tacoma. The index for Everett is based on suspended particulates and sulfur dioxide since carbon monoxide is not presently measured there. The index value for each day in each area is determined by the pollutant which reaches the highest level on the PSI scale.

Whenever the PSI is higher than 100, a primary air quality standard has been exceeded. An index value of 200 means the pollutant concentration has reached the "Alert" level listed in the Washington Episode Plan.

The graphs below and on the following page present plots of the daily PSI for Everett, Seattle, and Tacoma during 1980. A summary table lists the number of PSI values in each air quality category by month and also lists the maximum index for each month, the date of occurrence, and the pollutant causing that index value. The PSI values are observably lower during the spring and summer compared to fall and winter. Highest index values of 194 and 60 were reported for Seattle and Everett respectively on January 23. The highest value in Tacoma was 160 on April 12; the second high Tacoma index of 150 occurred on both January 23 and October 30.




POLLUTANT STANDARDS INDEX
Seattle, Washington
1980
PSI
300
250
200
150
100
50
VERY UNHEALTHFUL
UNHEALTHFUL
MODERATE
GOOD
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
MONTH


POLLUTANT STANDARDS INDEX
Tacoma, Washington
1980
PSI
300
250
200
150
100
50
VERY UNHEALTHFUL
UNHEALTHFUL
MODERATE
GOOD
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
MONTH

POLLUTANT STANDARDS INDEX

1980

EVERETT

Number of PSI Values in Each Category during Each Month

AIR QUALITY	(PSI Interval)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GOOD	(0 to 50)	22	28	24	29	31	29	30	30	30	28	29	30	340
MODERATE	(51 to 100)	9	1	2	1	0	0	0	1	0	3	1	1	19
UNHEALTHFUL	(101 to 199)	0	0	0	0	0	0	0	0	0	0	0	0	0
VERY UNHEALTHFUL	(200 to 299)	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum PSI each month		60	52	59	54	44	50	39	52	50	53	51	53	60
Date		23rd	12th	20th	3rd	1st	20th	7th	25th	26th	16th	12th	8th	Jan 23
Pollutant		TSP	TSP	SO2	TSP	TSP	TSP	TSP	TSP	TSP	TSP	TSP	TSP	TSP

SEATTLE

Number of PSI Values in Each Category during Each Month

AIR QUALITY	(PSI Interval)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GOOD	(0 to 50)	2	1	7	5	11	12	13	12	3	1	3	3	73
MODERATE	(51 to 100)	22	26	24	25	20	18	18	19	26	27	24	26	275
UNHEALTHFUL	(101 to 199)	7	2	0	0	0	0	0	0	1	3	3	2	18
VERY UNHEALTHFUL	(200 to 299)	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum PSI each month		194	133	100	89	78	75	78	89	133	122	183	150	194
Date		23rd	8th	3rd	14th	2nd	12th	21st	7th	23rd	31st	4th	15th	Jan 23
Pollutant		TSP	CO	CO	CO	CO	TSP	CO	CO	CO	CO	CO	CO	TSP

TACOMA

Number of PSI Values in Each Category during Each Month

AIR QUALITY	(PSI Interval)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GOOD	(0 to 50)	3	5	14	9	7	8	5	4	7	2	9	10	83
MODERATE	(51 to 100)	24	23	17	20	24	22	26	25	23	28	20	19	271
UNHEALTHFUL	(101 to 199)	4	1	0	1	0	0	0	2	0	1	1	2	12
VERY UNHEALTHFUL	(200 to 299)	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum PSI each month		150	117	100	160	93	88	73	143	74	150	133	133	160
Date		23rd	26th	1st	12th	18th	20th	29th	25th	16th	30th	4th	8th	Apr 12
Pollutant		CO	CO	TSP	TSP	TSP	TSP	TSP	TSP	TSP	CO	CO	CO	TSP

(TSP = Total Suspended Particulates; CO = Carbon Monoxide; SO2 = Sulfur Dioxide)

SUSPENDED PARTICULATES

Introduction

Total Suspended Particulates (TSP) is a general term for particles composed of dust, soot, organic matter, and compounds containing sulfur, nitrogen, and metals. These particulates, when sampled by the present high volume federal reference method, range in diameter from 0.1 micrometer to 100 micrometers (the upper diameter range is not very specific; it is often as small as 25 to 30 micrometers). Some newer instruments specifically collect particulates less than 15 micrometers diameter (sometimes called inhalable particulates) or particulates less than 2.5 micrometers diameter (often termed fine particulates). A standard for a specific size fraction is under discussion, but none has yet been established.

Particulate Sources and Measured Levels

Particulates are released from industrial operations, from auto and truck traffic, and from other sources. These emissions change from day to day due to intermittent industrial operations, equipment breakdown and traffic variations. Once into the air, particulates are dispersed and transported by the wind. Valleys, hills, and large bodies of water affect the local direction and speed of the wind. Lower atmosphere stability influences how quickly particulates are dispersed. Measured 24 hour TSP levels may vary significantly from day to day responding to how much enters the air and how quickly meteorological processes disperse the particulates. Tables in this section summarize 24 hour measurements and document that highest levels are often recorded at many stations on the same day.

Annual Average Suspended Particulate Maps

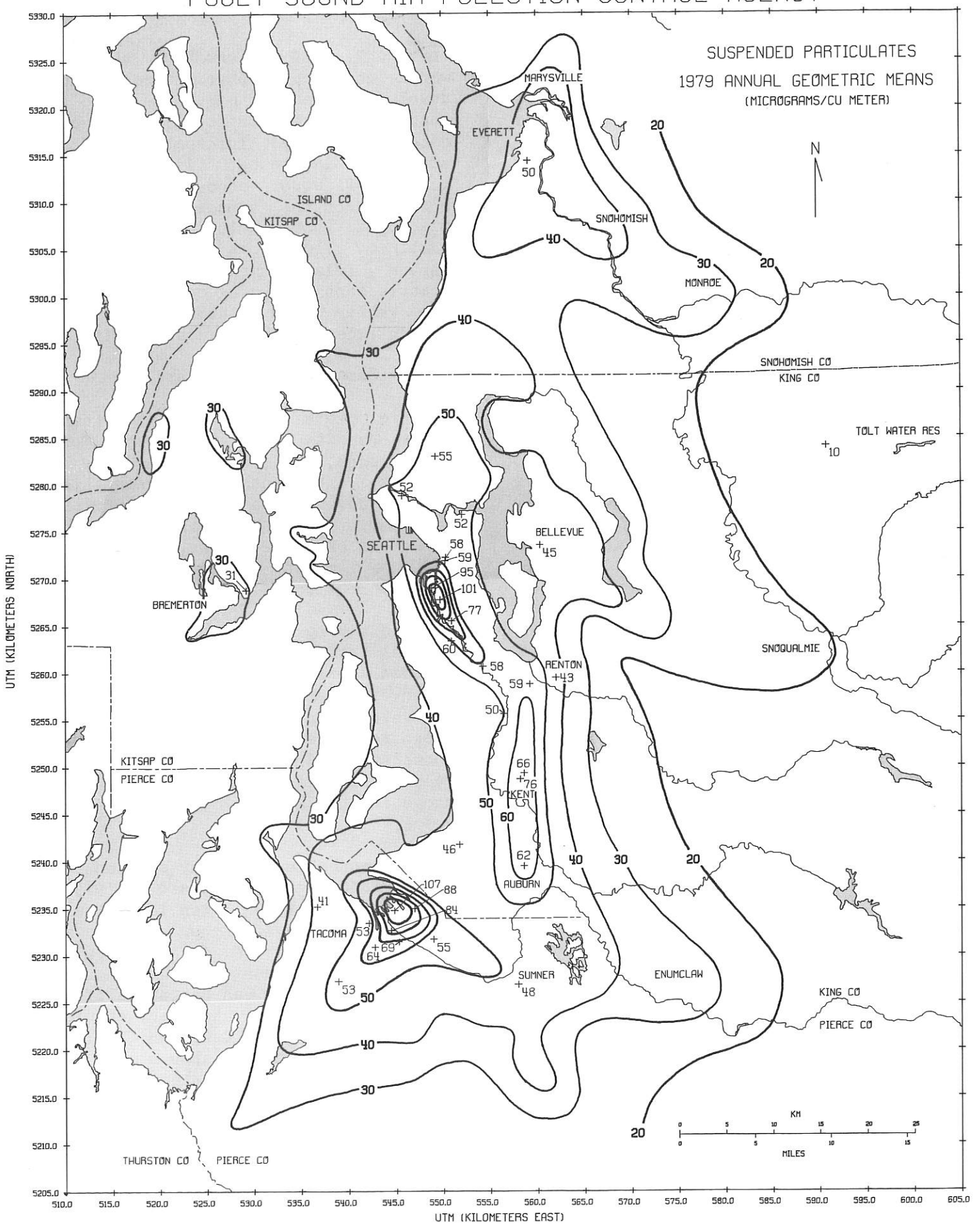
The maps which follow this page present annual geometric mean TSP values throughout the region for each of calendar years 1979 and 1980. Measured concentrations at each sampling station, together with a particulate emission inventory and information about local winds and topography, were used in developing each map. The annual concentration of TSP 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 outlined. The Tacoma Port area and the Harbor Island-Duwamish Valley area of Seattle continue to exceed this standard. The valley from Renton through Kent to Auburn exceeded the standard in 1979.

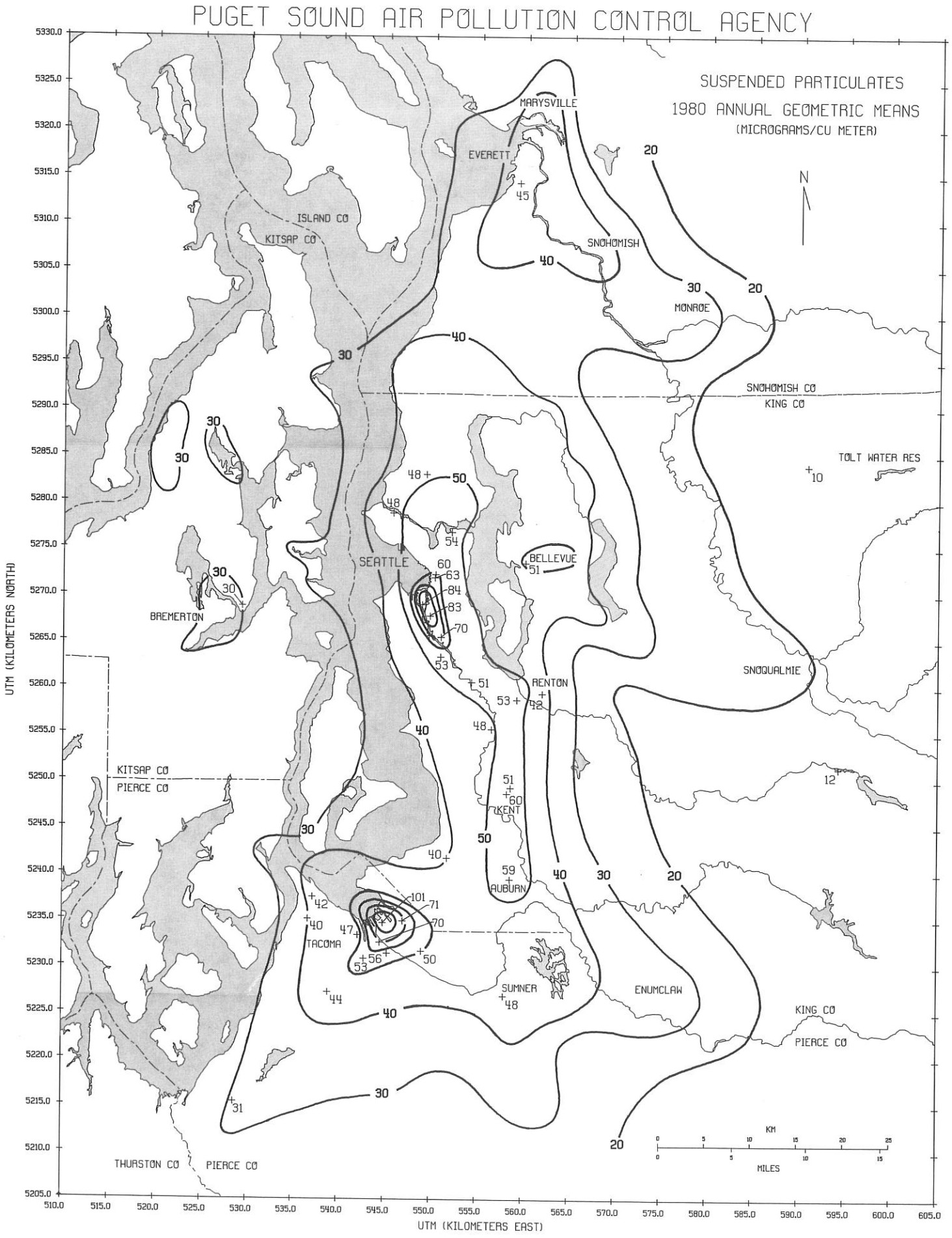
Suspended Particulate Trends

Graphic plots of moving TSP geometric means permit quick visual review of long term trends, but they require many years of data. A 12 month moving geometric mean relates directly to the annual standard. Calculation of the moving geometric mean in multiples of 12 months, for example 24 and 36 month moving means, enhances display of a trend.

Plotted moving geometric mean charts for several stations are presented in this section. One station near the Tolt Water Reservoir presents a steady unchanging low TSP value apparently unaffected by the urbanized areas. Other stations in the industrialized Seattle Duwamish Valley and Tacoma Port area clearly show values exceeding the annual TSP standard for many years.

TSP concentrations at many stations in the Puget Sound region increased in 1979 then decreased in 1980. When TSP values rise one year at a group of stations representing a wide area, and fall as a group in the year which immediately follows, the cause can be partially due to weather differences. However, stations in Kent, in the Seattle Duwamish Valley and the Tacoma Port area show a much greater change than can be accounted for entirely by weather factors. The changes at these stations were probably directly influenced by emission changes within a radius of about three miles.


PUGET SOUND AIR POLLUTION CONTROL AGENCY
SUSPENDED PARTICULATES
1979 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
SNOQUALMIE
RENTON
KITSAP CO
PIERCE CO
KENT
AUBURN
TACOMA
SUMNER
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
1980 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
51
BREMERTON
SNOQUALMIE
RENTON
KITSAP CO
PIERCE CO
KENT
AUBURN
TACOMA
SUMNER
ENUMCLAW
KING CO
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KM
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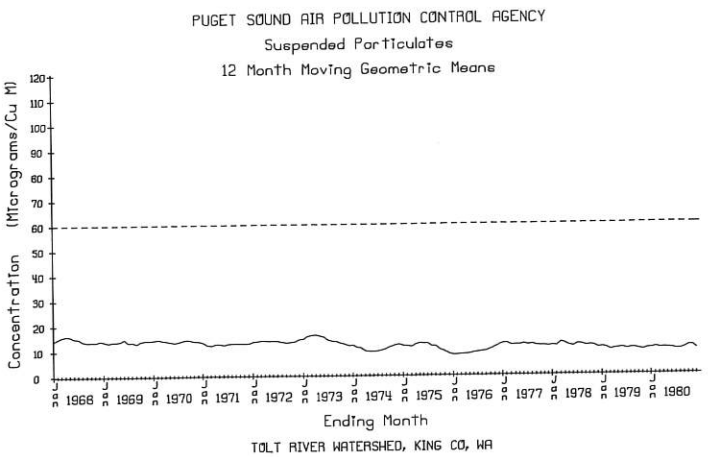
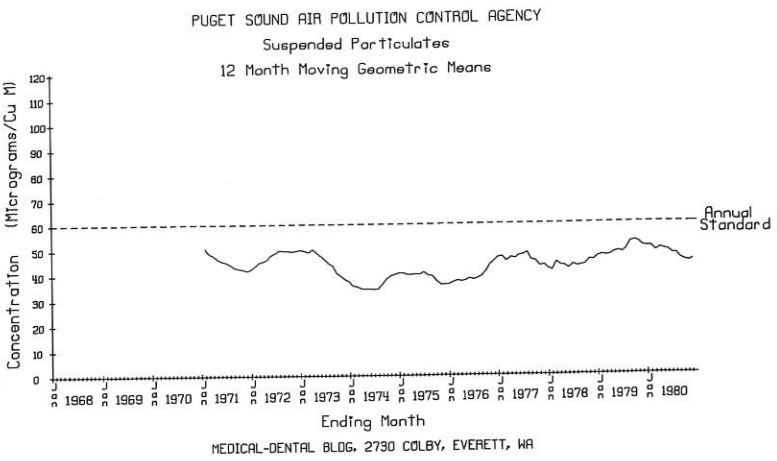
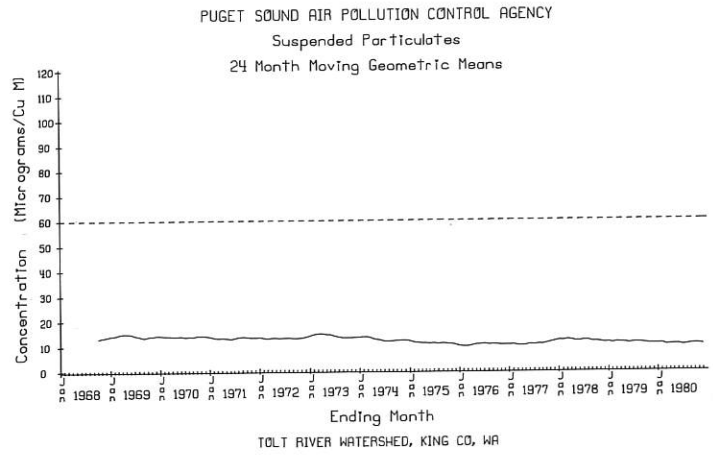
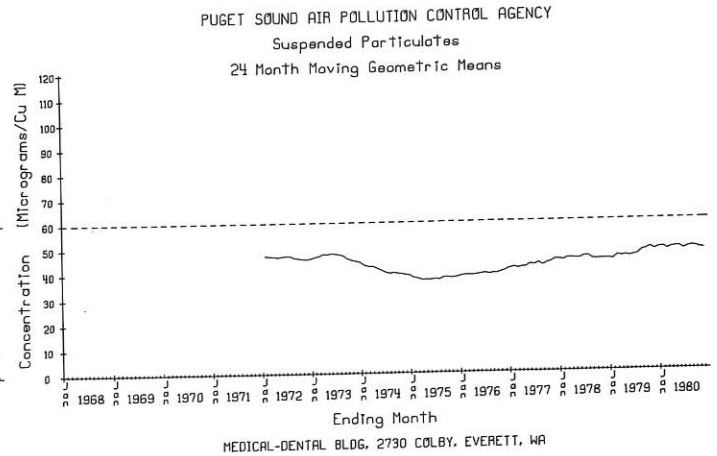
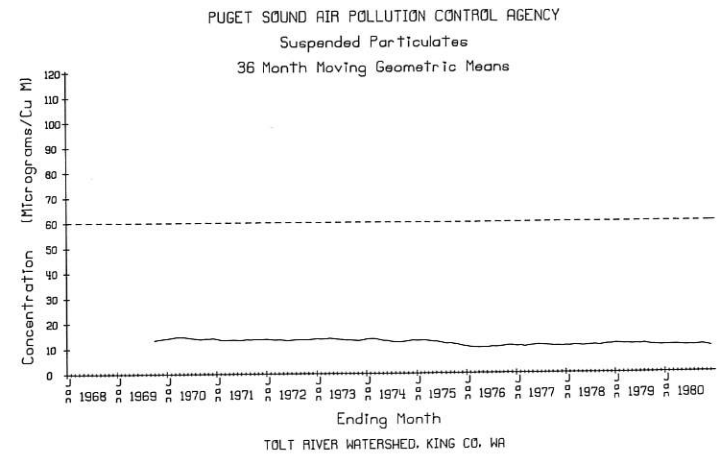
UTM (KILOMETERS NORTH)
UTM (KILOMETERS EAST)

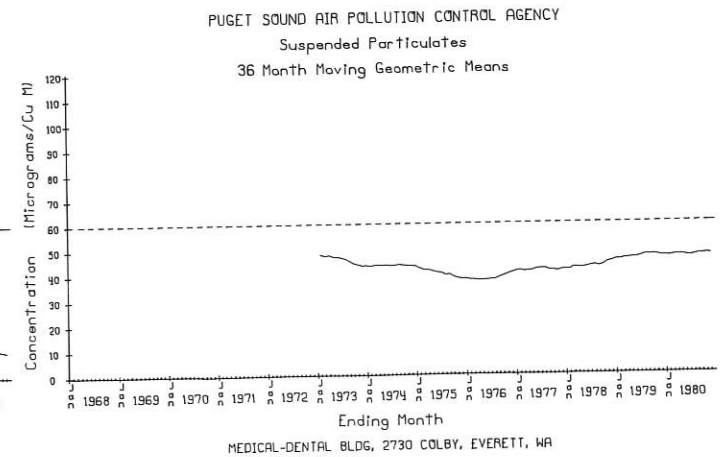

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED, KING CO, WA

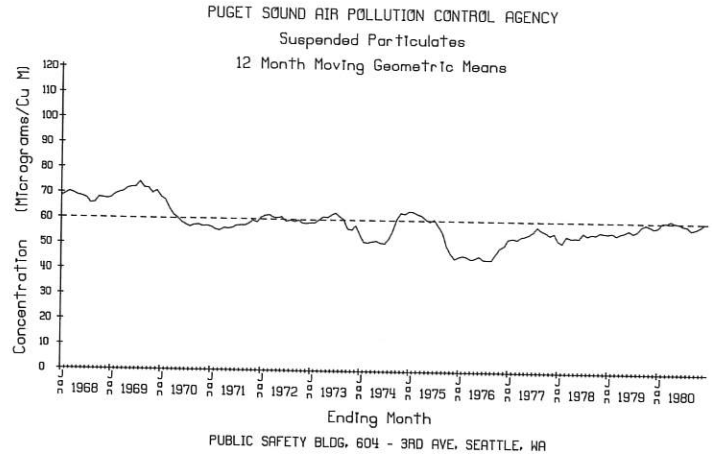

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA

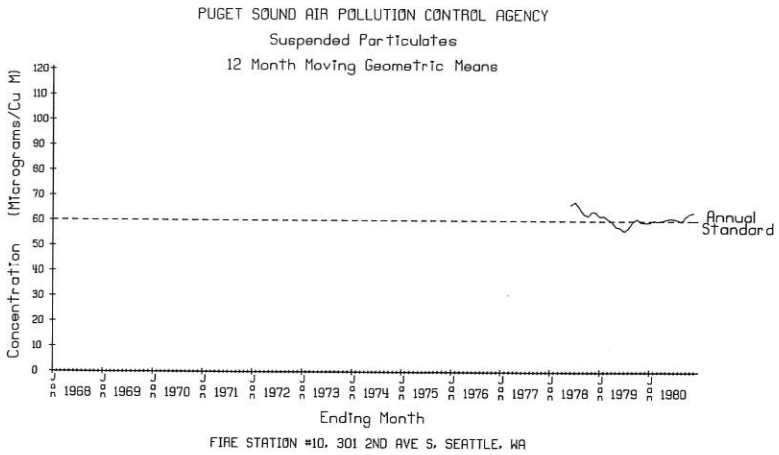

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED, KING CO, WA

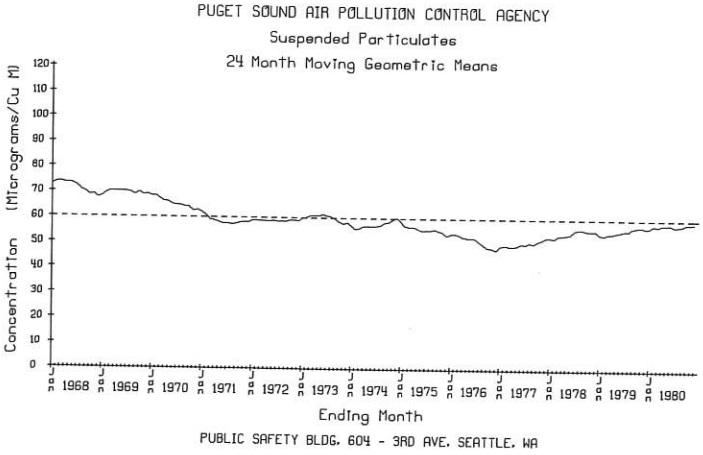

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA

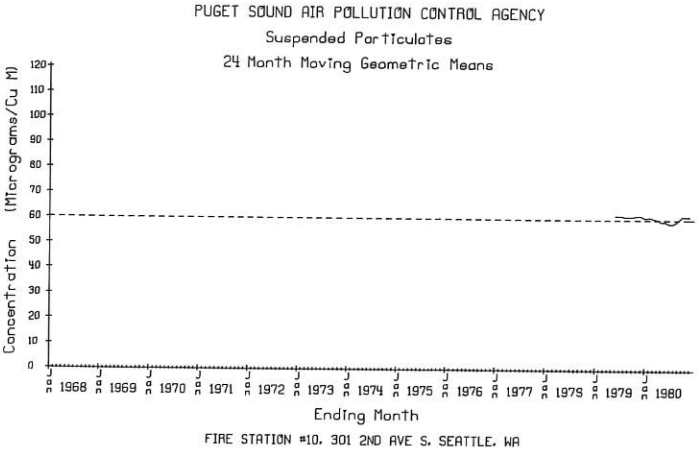

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED, KING CO, WA

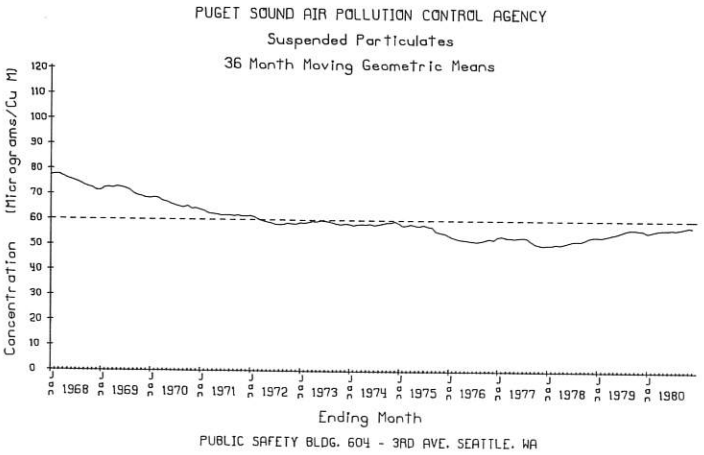

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA

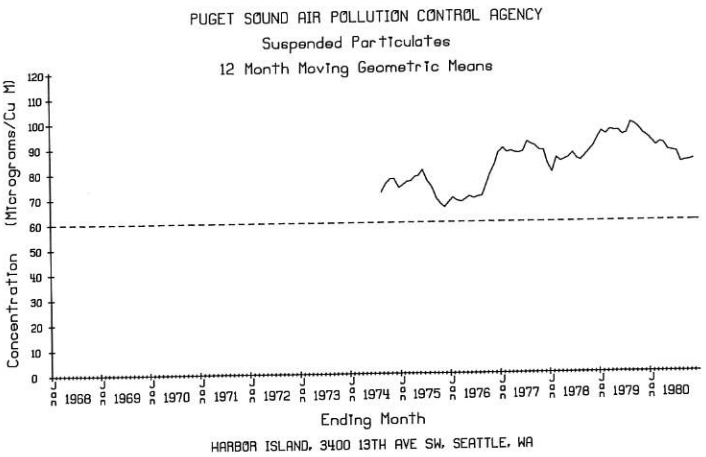

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUBLIC SAFETY BLDG. 604 - 3RD AVE. SEATTLE. WA

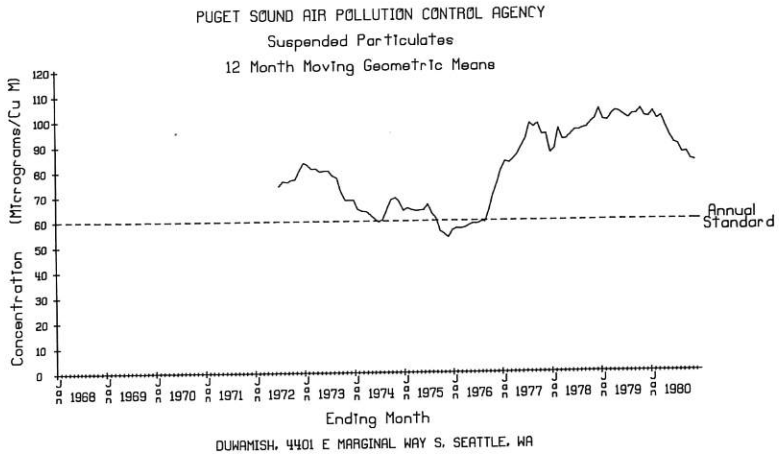

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #10. 301 2ND AVE S. SEATTLE. WA

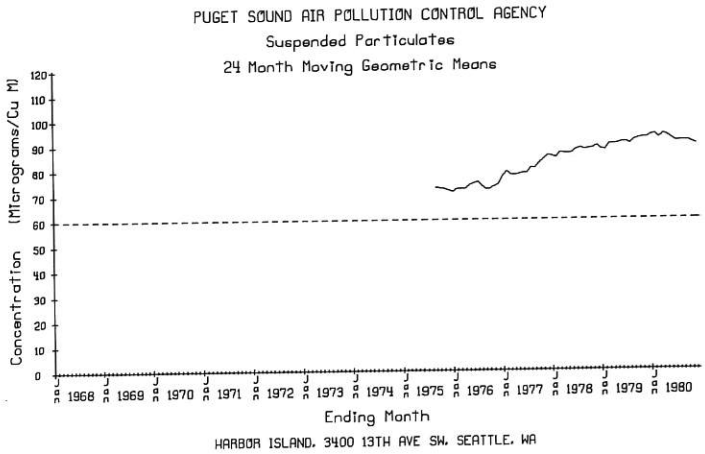

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUBLIC SAFETY BLDG. 604 - 3RD AVE. SEATTLE. WA

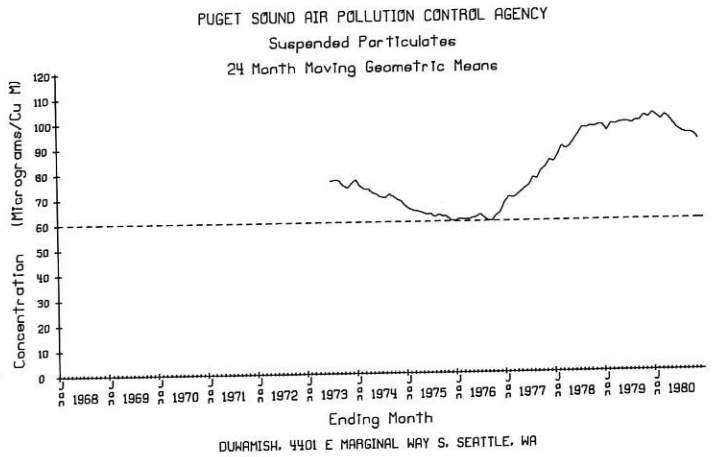

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #10. 301 2ND AVE S. SEATTLE. WA

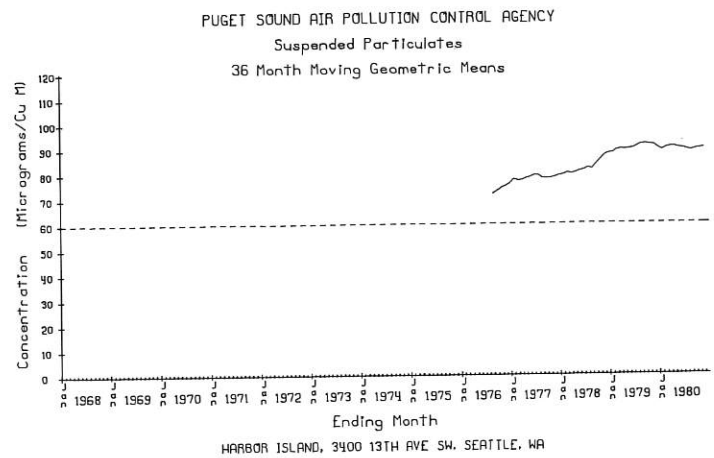

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUBLIC SAFETY BLDG. 604 - 3RD AVE. SEATTLE. WA

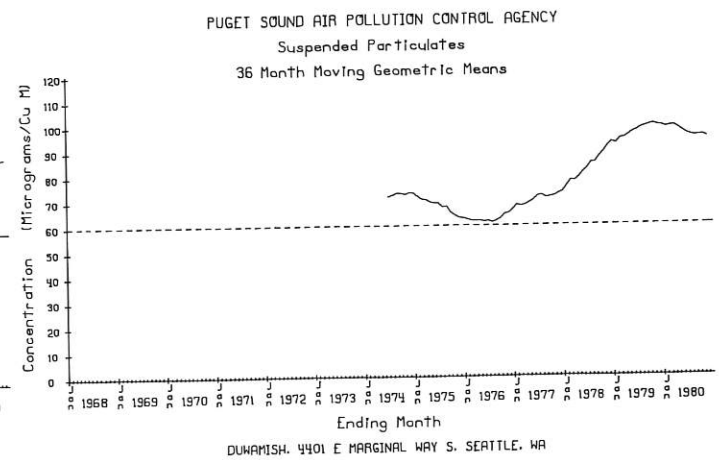

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA

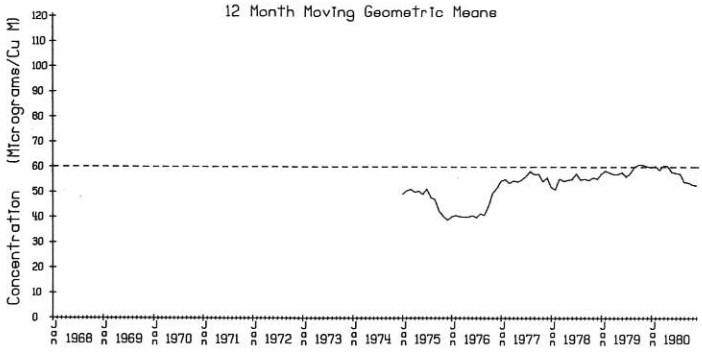

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH, 4401 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
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA

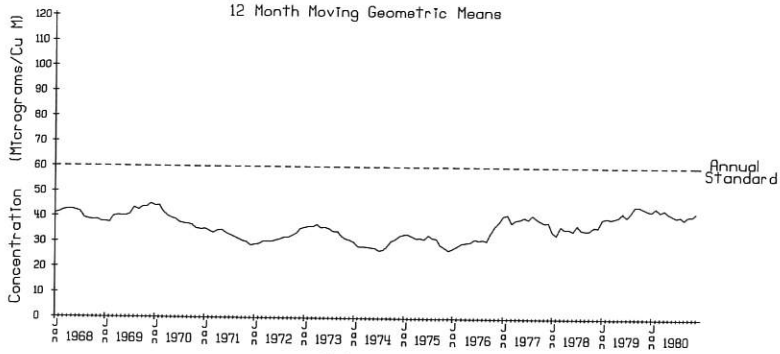

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



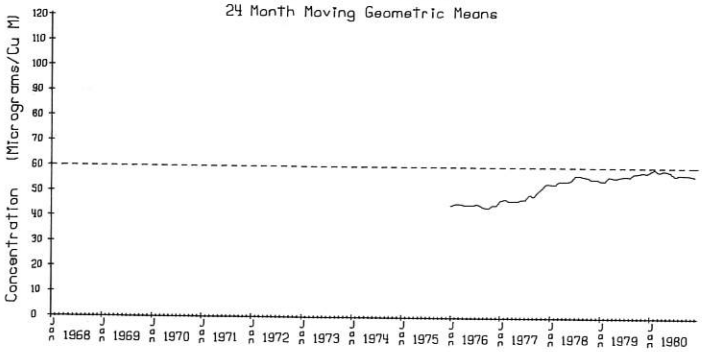
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



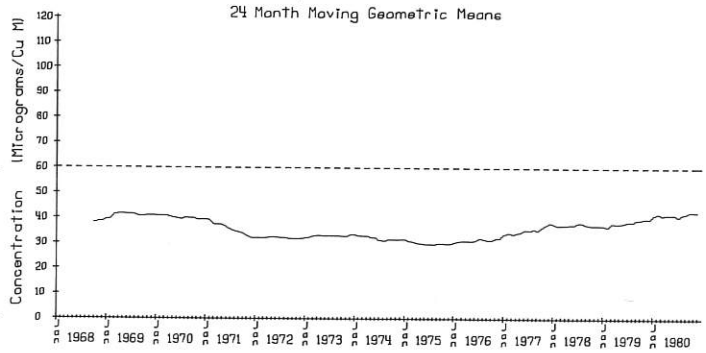
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



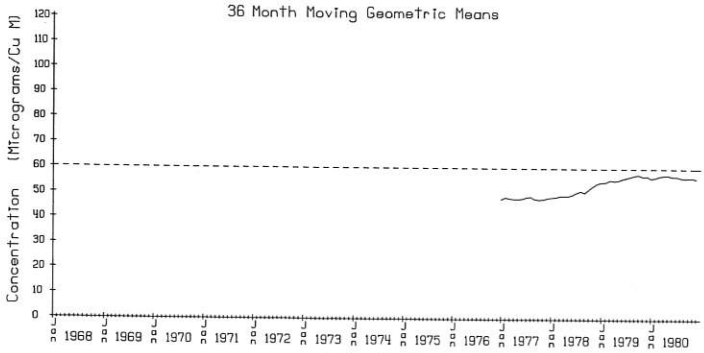
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



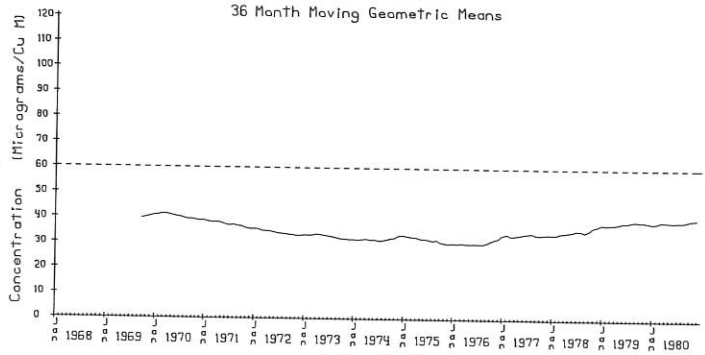
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



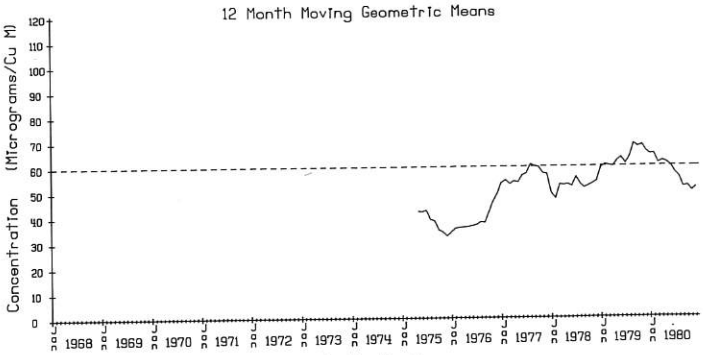
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



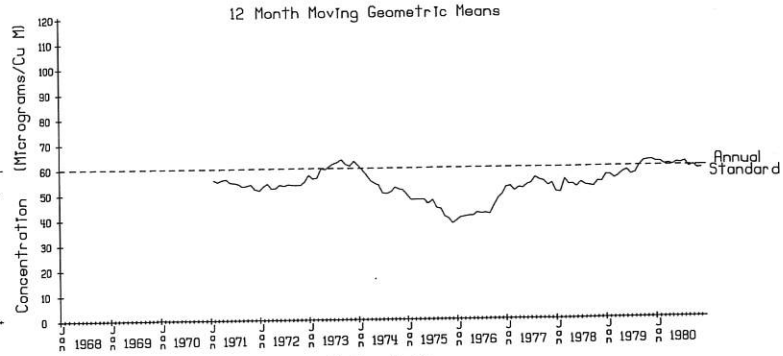
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



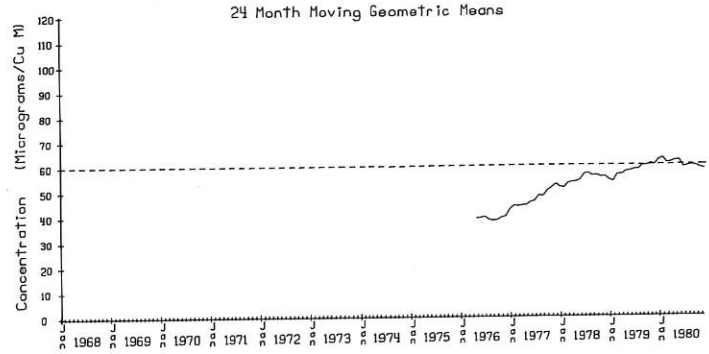
22916 86TH AVE S. KENT, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



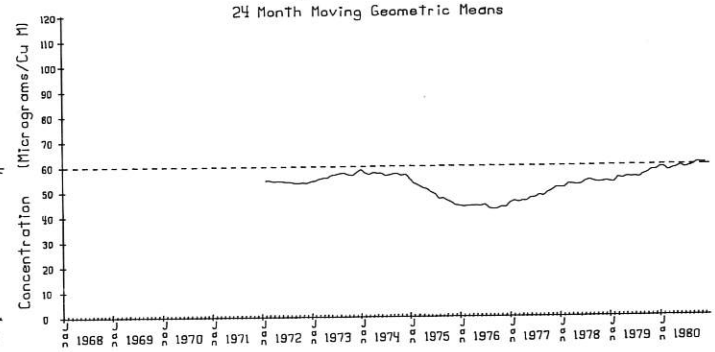
115 E MAIN ST, AUBURN, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



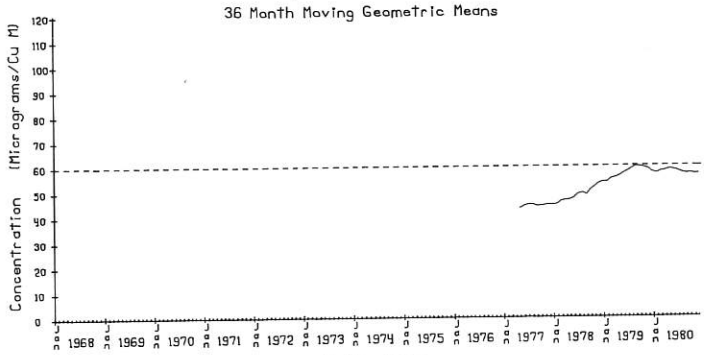
22916 86TH AVE S. KENT, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



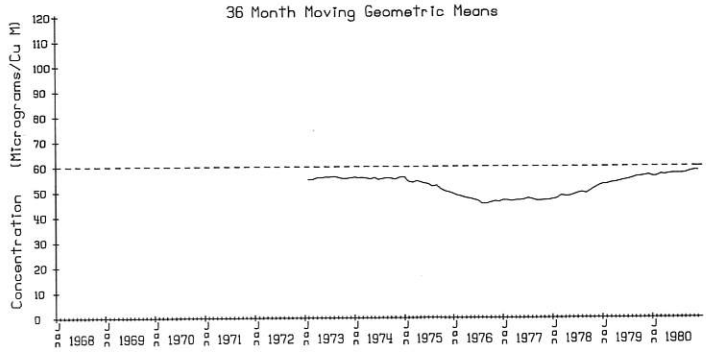
115 E MAIN ST, AUBURN, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

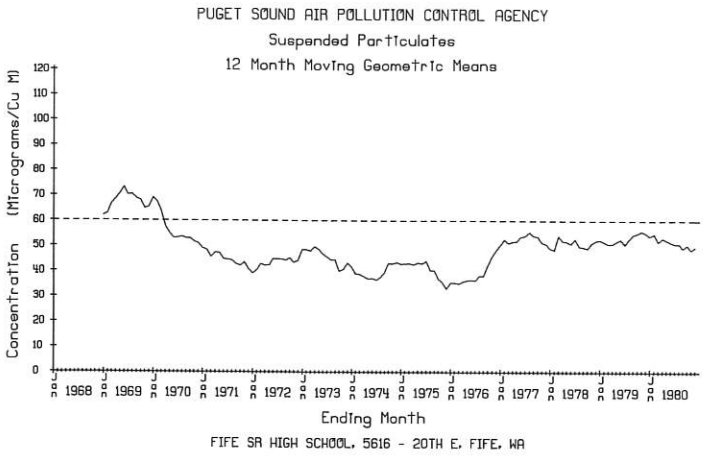


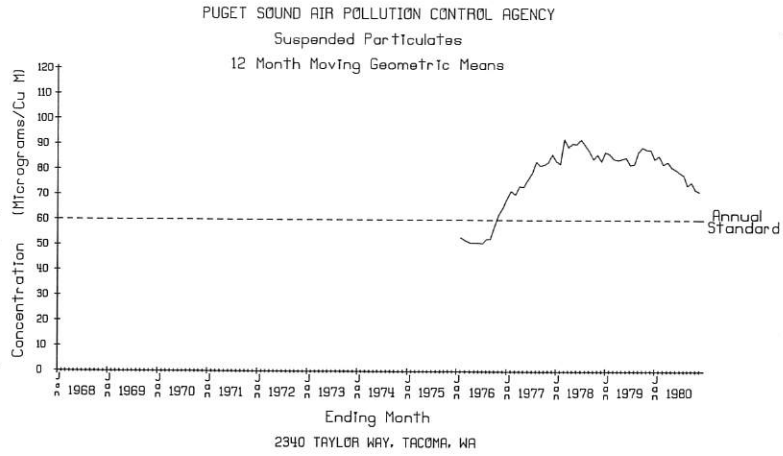
22916 86TH AVE S. KENT, WA

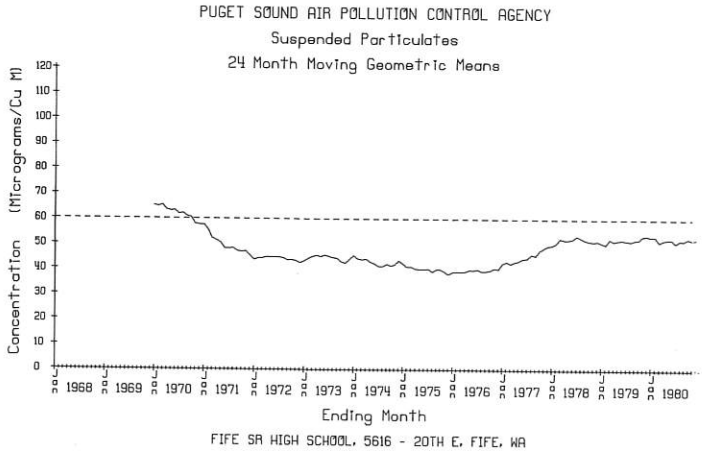
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

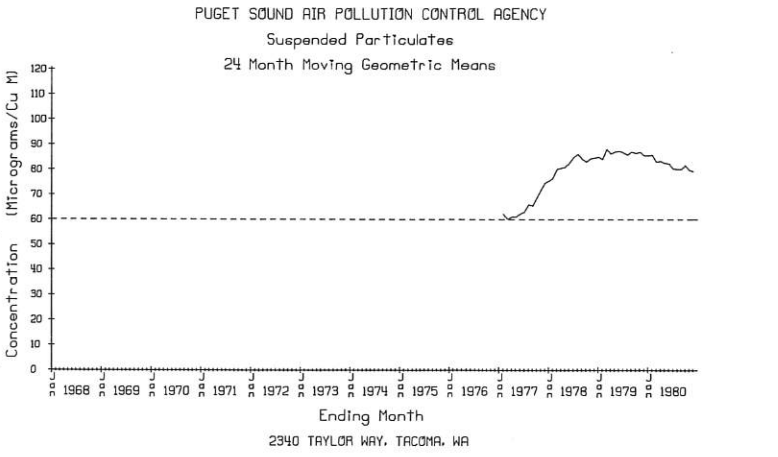


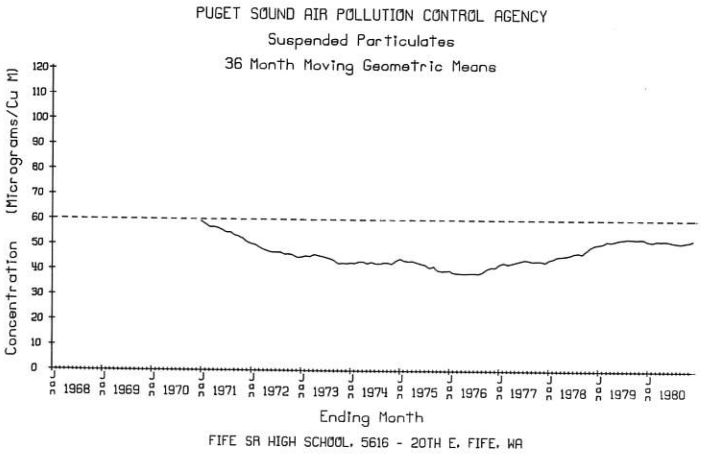
115 E MAIN ST, AUBURN, WA

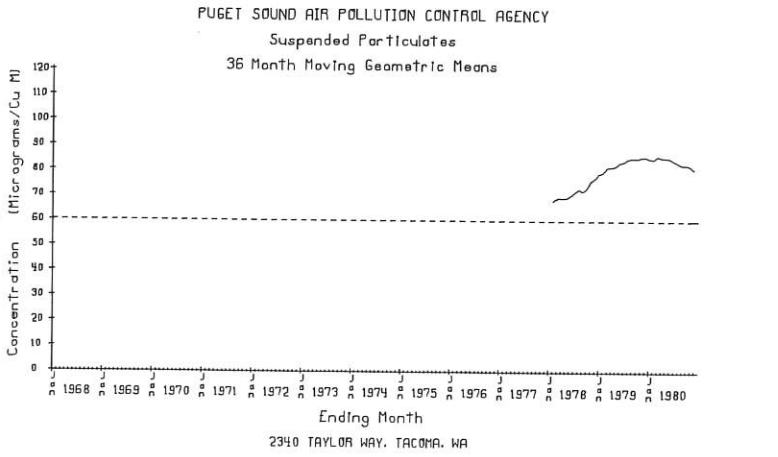

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
120
110
100
90
80
70
60
50
40
30
20
10
0
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
Ending Month
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Annual Standard
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
Ending Month
2340 TAYLOR WAY, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
120
110
100
90
80
70
60
50
40
30
20
10
0
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
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)
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
Ending Month
2340 TAYLOR WAY, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
120
110
100
90
80
70
60
50
40
30
20
10
0
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
Ending Month
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
1968
1969
1970
1971
1972
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1974
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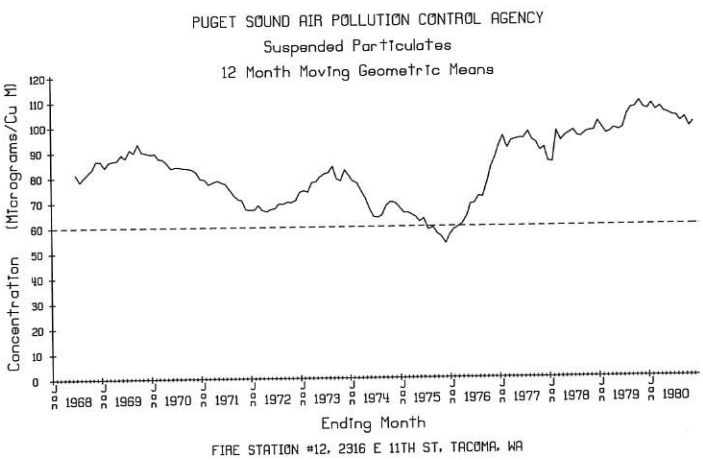
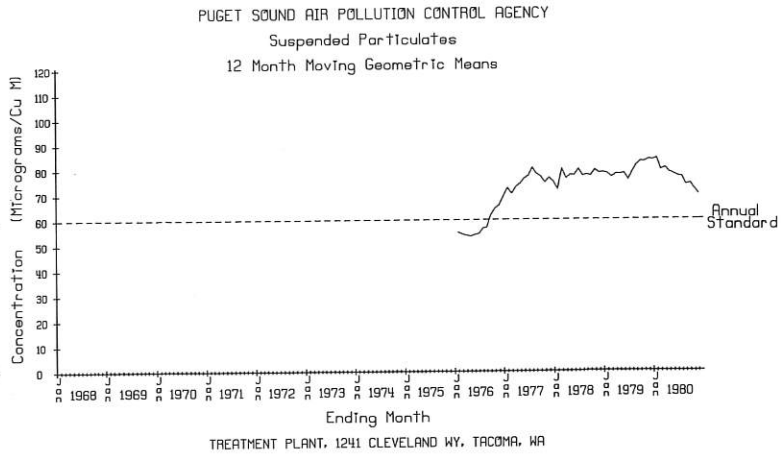
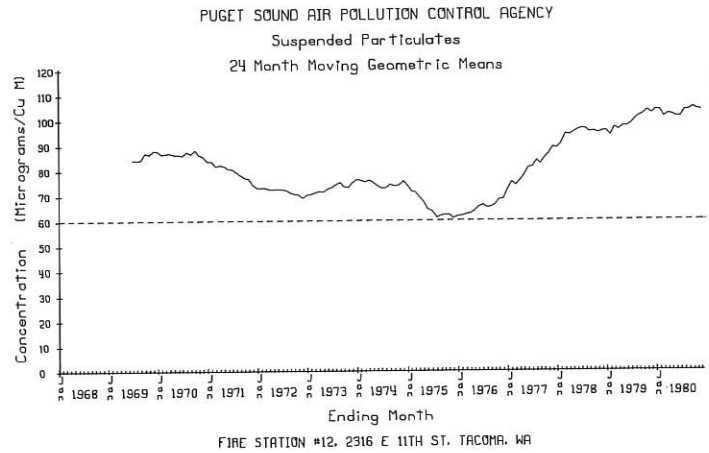
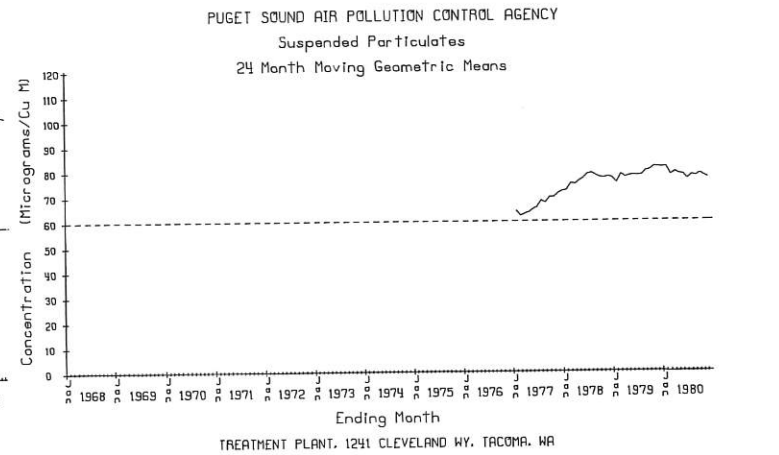
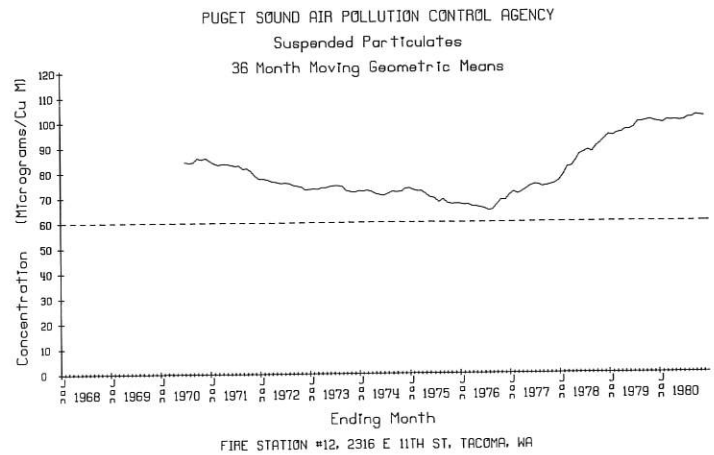
1976
1977
1978
1979
1980
Ending Month
2340 TAYLOR WAY, TACOMA, WA

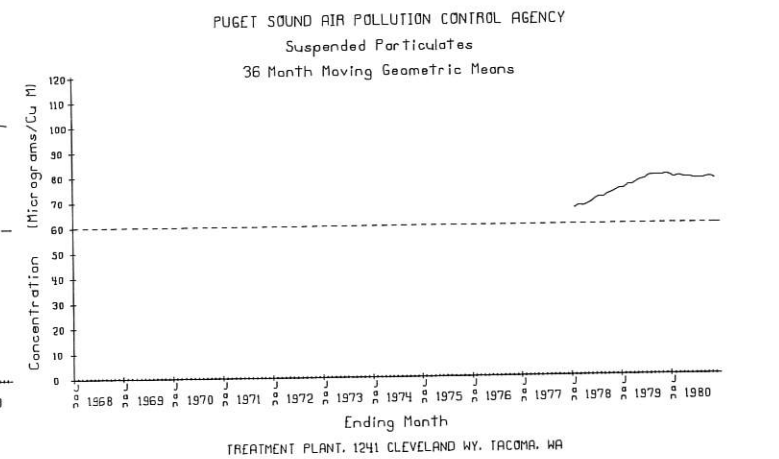

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

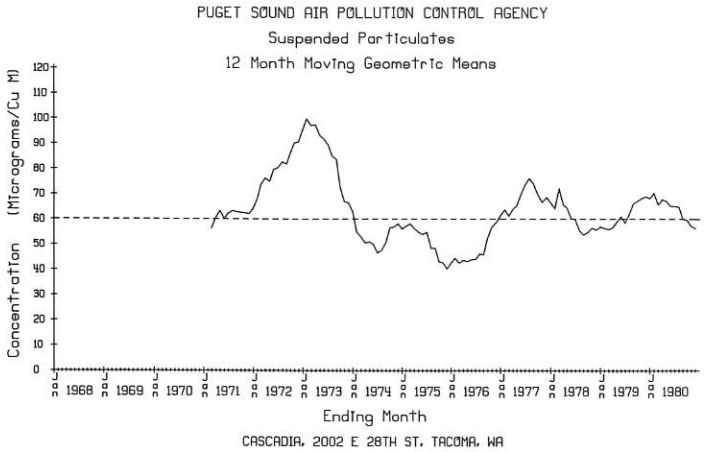

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Annual Standard
Ending Month
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

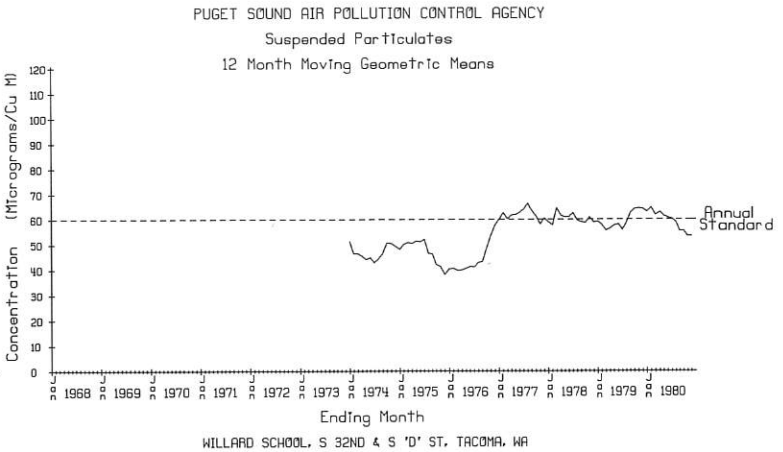

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

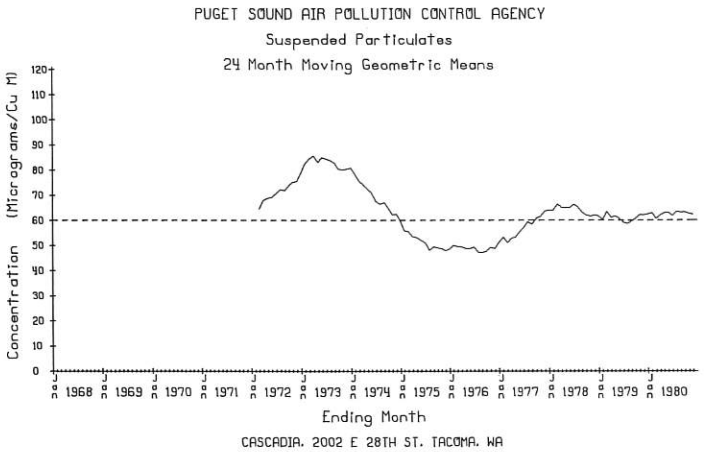

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

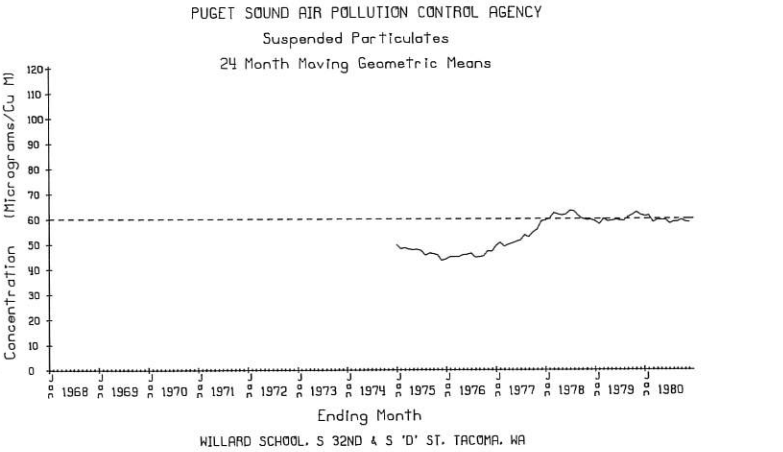

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

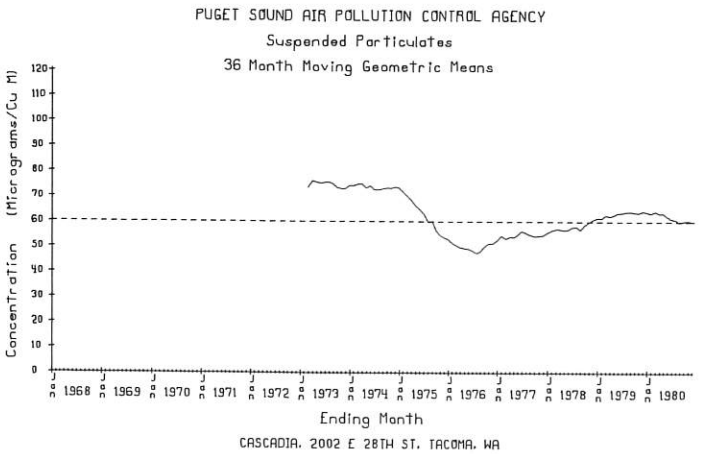

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

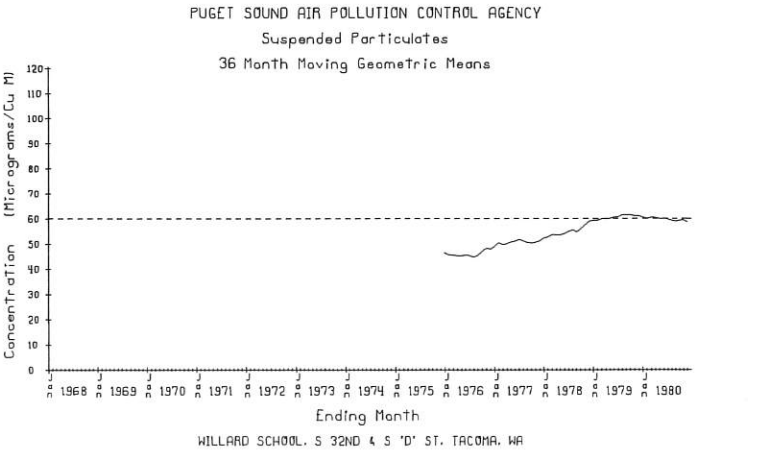

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
CASCADIA, 2002 E 28TH ST, TACOMA, WA


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

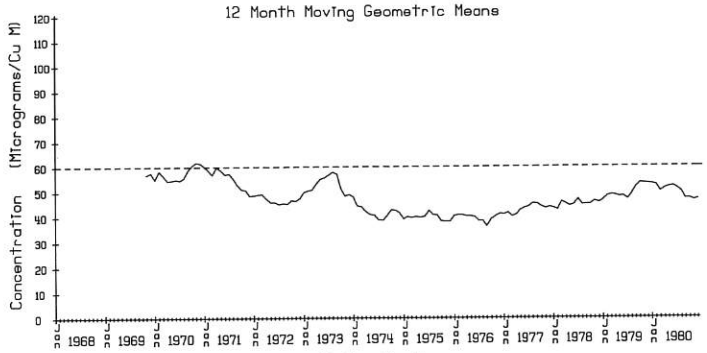

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
CASCADIA, 2002 E 28TH ST, TACOMA, WA


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

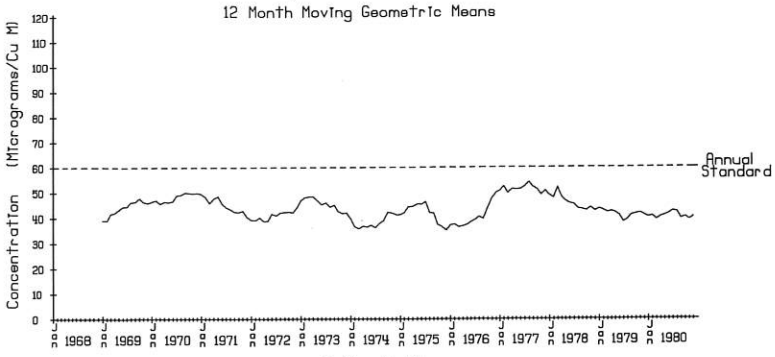

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



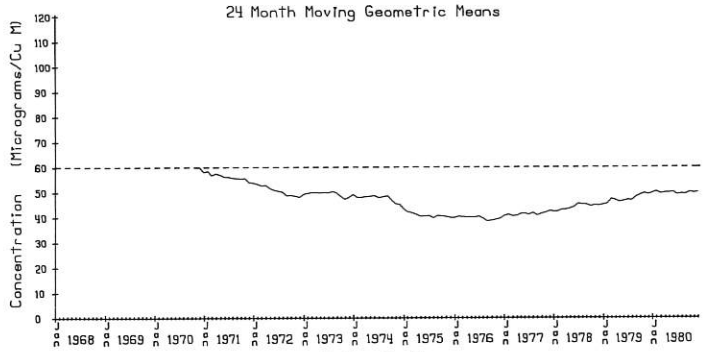
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



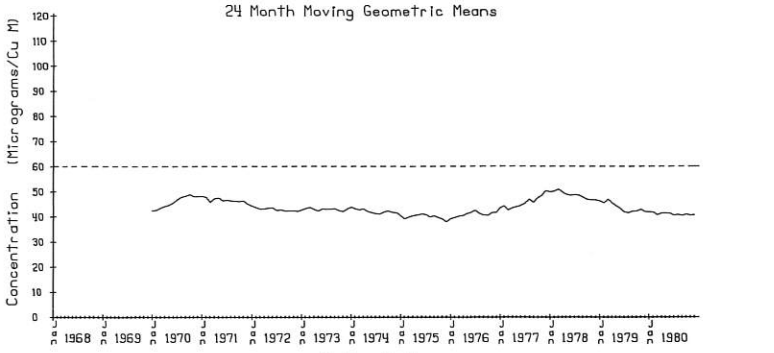
NORTH 26TH & PEARL STS, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



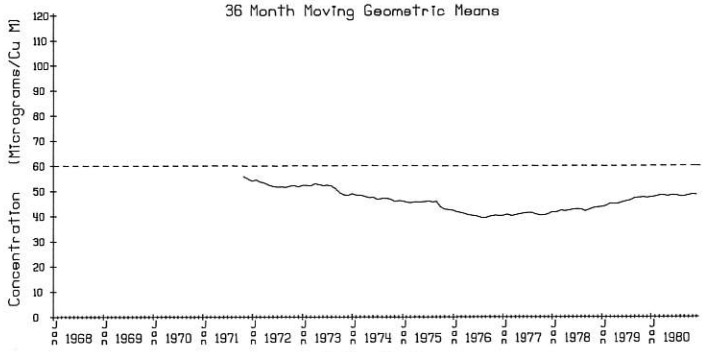
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



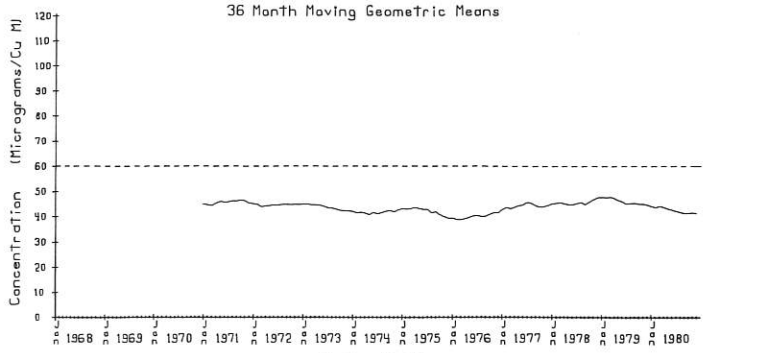
NORTH 26TH & PEARL STS, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

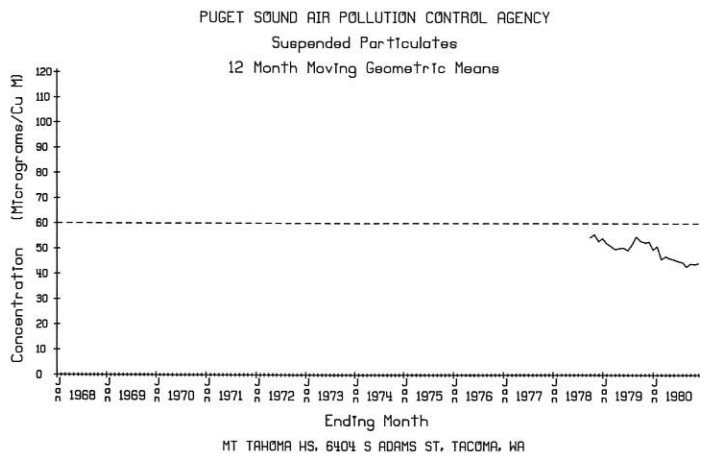


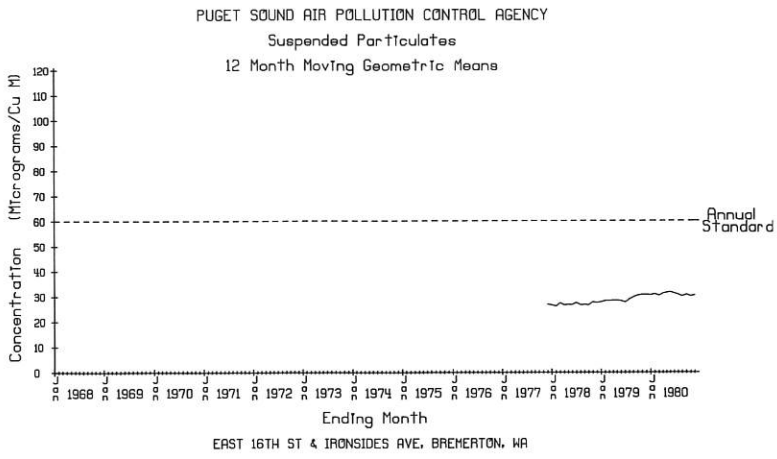
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA

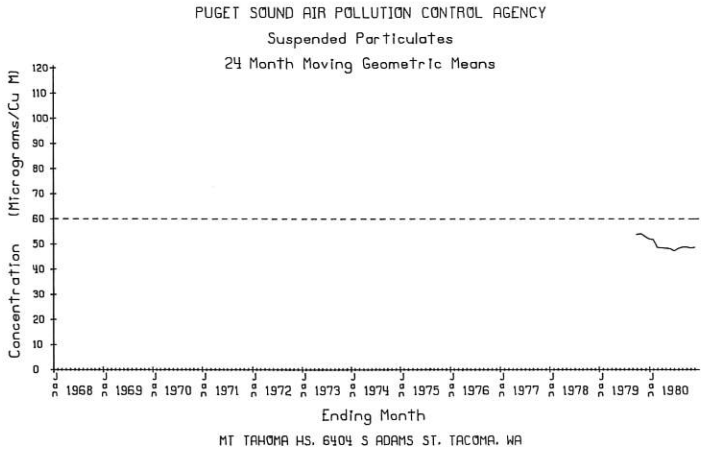
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

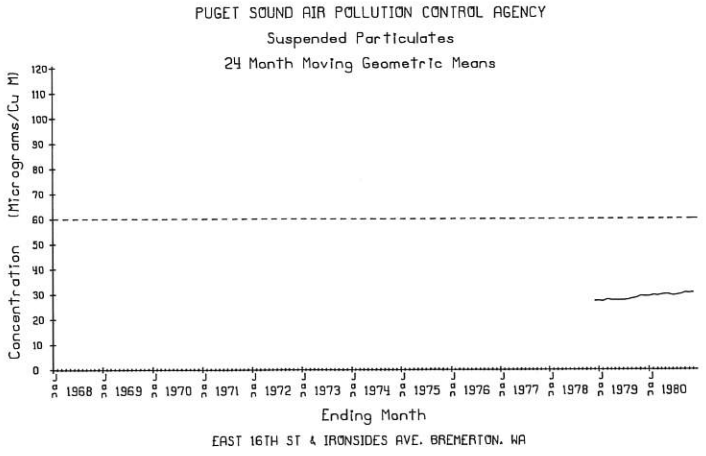


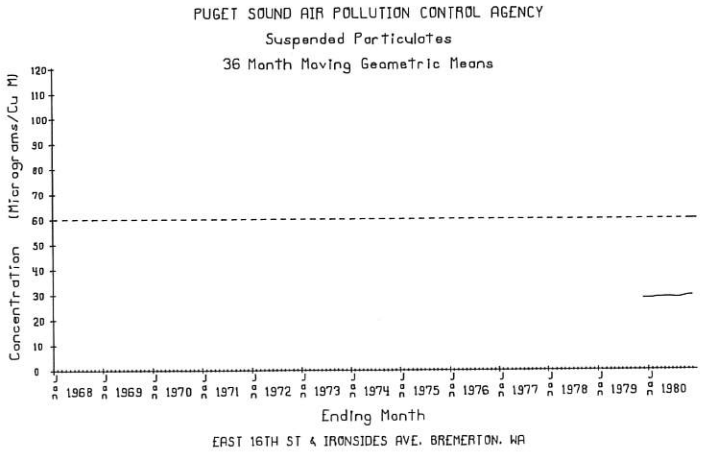
NORTH 26TH & PEARL STS, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA

SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)
1980

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	11	7	6	15	12	24	21	31	24	26	6	2	60	15	10
CEDAR RIVER MASONRY DAM, KING COUNTY, WA [a]						38	32	70	19	21	5	2	33	27	12
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	63	46	39	64	43	50	43	64	47	50	38	36	57	48	45
504 BELLEVUE WAY NE, BELLEVUE, WA	77	64	40	49	42	64	57	74	45	70	54	49	54	57	51
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	59	62	49	50	47	50	45	57	49	77	40	37	61	52	48
5701 - 8TH AVE NE, SEATTLE, WA	72	89	60	63	44	60	41	63	51	86	61	71	48	64	59
2700 W COMMODORE WAY, SEATTLE, WA	58	71	59	52	37	51	35	46	41	83	48	44	60	52	48
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	95	63	51	33	41	54	41	52	54	93	68	63	54	60	54
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	71	91	63	69	51	62	48	57	55	89	62	57	56	64	60
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	67	75	65	57	48	67	55	71	69	112	72	62	55	69	63
HARBOR ISLAND, 2555 13TH AVE SW, SEATTLE, WA [b]											78	116	8		
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	111	100	87	105	74	73	68	91	74	133	94	91	60	92	84
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	139	102	80	105	71	68	68	87	74	122	84	72	115	90	83
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	101	86	70	77	60	63	70	92	63	114	73	78	58	79	70
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	83	72	44	61	44	48	47	61	45	85	53	52	60	58	53
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	80	78	44	63	41	47	42	56	44	73	52	59	59	56	51
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	59	50	31	44	31	51	41	61	41	76	44	40	60	48	42
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	75	69	49	52	45	62	46	62	44	84	55	55	61	58	53
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	71	66	45	57	43	52	43	52	42	73	45	48	60	53	48
22916 86TH AVE S, KENT, WA	76	54	37	70	66	82	48	63	44	78	41	48	60	59	51
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	104	71	61	72	50	78	58	72	51	89	52	64	60	68	60
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	44	42	31	42	39	54	39	46	36	66	42	40	60	44	40
115 E MAIN ST, AUBURN, WA	78	64	53	63	49	85	54	69	50	97	56	62	59	65	59
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	69	53	30	50	47	58	55	79	45	73	38	48	57	54	48
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	71	64	30	62	48	59	49	65	45	99	48	50	60	58	50
2340 TAYLOR WAY, TACOMA, WA	91	84	55	83	68	88	73	85	62	147	69	60	60	80	71
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	131	114	97	129	111	99	103	163	90	160	87	91	117	115	101
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	105	79	48	85	67	90	64	114	65	123	57	56	56	80	70
CASCADIA, 2002 E 28TH ST, TACOMA, WA	88	72	36	86	69	67	66	83	47	98	48	44	61	67	56
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	86	81	34	66	46	69	49	61	50	107	52	49	61	62	53
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	83	70	35	51	42	60	37	47	37	93	56	53	60	55	47
4716 NORTH BALTIMORE, TACOMA, WA [c]					35	53	41	53	29	84	50	39	37	49	42
NORTH 26TH & PEARL STS, TACOMA, WA	53	49	27	49	44	55	51	51	29	73	41	41	61	47	40
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	56	63	22	52	42	68	46	63	40	162	46	40	48	55	44
CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA [d]			32	30	35	59	34	51	21	54	26	23	41	36	31
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	38	38	24	34	28	36	24	27	30	60	31	33	56	34	30

a Sampling Started 6/01/80
b Sampling Started 11/17/80
c Sampling Started 5/21/80
d Sampling Started 3/04/80

SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)
1980

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	2	3	6	9	12	15	17	28	31	43	15	10	2.93	13.17
CEDAR RIVER MASONRY DAM, KING COUNTY, WA	33	1	3	8	9	16	19	22	28	74	81	27	12	3.83	40.48
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	57	25	33	37	42	45	48	55	59	74	84	48	45	1.47	18.48
504 BELLEVUE WAY NE, BELLEVUE, WA	54	28	38	40	46	51	55	67	73	96	101	57	51	1.57	24.90
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	61	27	32	36	43	50	53	59	68	80	91	52	48	1.50	21.45
5701 - 8TH AVE NE, SEATTLE, WA	48	36	43	47	51	55	62	76	83	100	111	64	59	1.51	28.10
2700 W COMMODORE WAY, SEATTLE, WA	60	30	33	38	41	46	48	54	65	87	102	52	48	1.51	24.18
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	54	33	38	42	49	50	55	62	73	88	129	60	54	1.52	30.95
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	56	41	47	51	54	56	58	64	69	92	123	64	60	1.40	24.95
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	55	38	42	51	56	63	68	75	80	110	121	69	63	1.48	29.51
HARBOR ISLAND, 2555 13TH AVE SW, SEATTLE, WA	8	37	65	65	80	88	108	109	109	134	191				
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	60	46	60	72	77	81	90	97	115	143	185	92	84	1.52	40.31
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	115	54	60	68	71	80	85	97	124	152	164	90	83	1.48	36.84
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	58	36	46	57	63	68	75	91	103	133	164	79	70	1.62	39.41
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	60	32	37	39	44	48	54	64	81	99	103	58	53	1.54	27.36
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	59	31	36	41	45	47	50	55	72	89	118	56	51	1.53	28.24
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	60	21	28	31	37	42	49	54	62	86	94	48	42	1.66	24.61
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	61	33	37	41	46	51	57	65	73	92	113	58	53	1.53	27.41
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	60	28	35	40	44	46	49	53	69	78	103	53	48	1.54	25.21
22916 86TH AVE S, KENT, WA	60	25	29	39	43	51	61	68	82	96	119	59	51	1.72	33.51
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	60	31	40	45	51	58	66	79	87	106	132	68	60	1.63	41.07
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	60	23	27	33	37	41	45	48	56	69	75	44	40	1.51	18.03
115 E MAIN ST, AUBURN, WA	59	35	43	47	50	56	62	74	82	106	112	65	59	1.55	29.95
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	57	29	34	38	44	49	53	60	70	80	95	54	48	1.62	28.16
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	60	21	31	38	43	56	59	67	76	100	112	58	50	1.79	31.05
2340 TAYLOR WAY, TACOMA, WA	60	41	47	54	64	66	74	91	109	143	155	80	71	1.65	41.20
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	117	51	64	76	88	103	115	131	159	208	236	115	101	1.71	61.80
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	56	36	45	52	61	69	75	81	126	144	162	80	70	1.70	42.26
CASCADIA, 2002 E 28TH ST, TACOMA, WA	61	26	33	39	50	55	74	84	97	119	139	67	56	1.86	39.63
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	61	25	33	38	45	52	62	71	90	106	131	62	53	1.77	36.51
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	60	25	28	37	39	44	48	60	76	100	118	55	47	1.73	33.14
4716 NORTH BALTIMORE, TACOMA, WA	37	21	25	34	36	39	44	54	63	87	89	49	42	1.74	31.31
NORTH 26TH & PEARL STS, TACOMA, WA	61	20	25	27	31	39	50	60	70	79	94	47	40	1.77	26.38
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	48	18	24	31	35	47	55	59	63	95	123	55	44	1.91	40.99
CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA	41	16	18	22	26	29	36	43	54	57	73	36	31	1.71	19.17
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	56	18	20	24	26	28	32	35	45	58	62	34	30	1.54	16.05

SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)

1980

Summary of Observations Greater Than 150

Location	Jan 19 Sat	Jan 22 Tue	Jan 23 Wed	Jan 24 Thu	Jan 25 Fri	Jan 28 Mon	Jan 31 Thu	Feb 9 Sat	Feb 12 Tue	Feb 21 Thu	Mar 1 Sat	Mar 25 Tue	Apr 3 Thu	Apr 12 Sat
CEDAR RIVER MASONRY DAM, KING COUNTY, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5701 - 8TH AVE NE, SEATTLE, WA	--		--	--	--		--	156	--	--	--	--		--
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	--	189	--	--	--		--		--	--	--	--	--	
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--		--	--	--		--		--		--	--		--
HARBOR ISLAND, 2555 13TH AVE SW, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	--	203	--	--	--		--	159	--	161	--	--	203	--
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	163	189	368		177	191	161	152	173	153		--	164	165
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	--	199	--	--	--		--	--	--	178	--	--		--
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	--	166	--	--	--		--		--		--	--		--
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	--	167	--	--	--		--		--		--	--		--
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	--	165	--	--	--		--		--		--	--		--
22916 86TH AVE S, KENT, WA	--	204	--	--	--		--		--		--	--		--
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	--	296	--	--	--		--		--		--	--		--
115 E MAIN ST, AUBURN, WA	--	176	--	--	--		--		--		--	--		--
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	--		--	--	--		--		--		--	--		--
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	--	160	--	--	--		--		--		--	--		--
2340 TAYLOR WAY, TACOMA, WA	--	181	--	--	--		--		--		--	--	161	--
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	153	236	258	165			267	173	211	164	260	164	174	329
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	--	189	--	--	--		--		--	--	--	--	173	--
CASCADIA, 2002 E 28TH ST, TACOMA, WA	--	182	--	--	--		--		--		--	--	189	--
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--	176	--	--	--		--		--		--	--		--
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	--	153	--	--	--	--	--		--		--	--		--
4716 NORTH BALTIMORE, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--	--	--	--	--		--	--	--		--	--		--

Location	Apr 18 Fri	May 18 Sun	May 30 Fri	Jun 12 Thu	Jun 20 Fri	Jul 29 Tue	Aug 7 Thu	Aug 8 Fri	Aug 19 Tue	Aug 22 Fri	Aug 25 Mon	Sep 26 Fri	Oct 3 Fri	Oct 5 Sun
CEDAR RIVER MASONRY DAM, KING COUNTY, WA	--	--	--	--			213	153						
5701 - 8TH AVE NE, SEATTLE, WA	--	--	--	--		--		--		--	--	--	--	--
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	--	--	--	--		--		--		--		--	--	--
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--	--	--	--		--		--		--	--	--	--	--
HARBOR ISLAND, 2555 13TH AVE SW, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	--	--	--	--		--		--		--		--	--	--
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA				169								161	163	167
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	--	--	--	--		--	168	--		--		--	--	--
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	--	--	--	--		--		--		--		--	--	--
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	--	--	--	--		--		--		--		--	--	--
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	--	--	--	--		--		--		--		--	--	--
22916 86TH AVE S, KENT, WA	--	--	--	--		--		--		--		--	--	--
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	--	--	--	--		--		--		--		--	--	--
115 E MAIN ST, AUBURN, WA	--	--	--	--		--		--		--		--	--	--
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	--	--	--	--		--	186	--		--		--	--	--
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	--	--	--	--		--		--		--		--	--	--
2340 TAYLOR WAY, TACOMA, WA	--	--	--	--		--	--	--		--		--	--	--
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	208	235	176	--	216	159	200	--	180	271	310	--	208	--
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	--	--	--	--		--	162	--		--		--	--	--
CASCADIA, 2002 E 28TH ST, TACOMA, WA	--	--	--	--		--		--		--		--	--	--
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--	--	--	--		--		--		--		--	--	--
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	--	--	--	--		--		--		--		--	--	--
4716 NORTH BALTIMORE, TACOMA, WA	--	--	--	--		--		--		--		--	--	--
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--	--	--	--		--		--		--		--	--	--

Location	Oct 6 Mon	Oct 9 Thu	Oct 10 Fri	Oct 15 Wed	Oct 18 Sat	Oct 24 Fri	Oct 30 Thu	Nov 5 Wed	Nov 11 Tue	Nov 13 Thu	Dec 8 Mon	Dec 9 Tue	Dec 29 Mon
CEDAR RIVER MASONRY DAM, KING COUNTY, WA											--		
5701 - 8TH AVE NE, SEATTLE, WA		--	--	--			--	--		--	--	--	
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA		--	--	--						--	--	--	
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA		--	--	--			172			--	--		--
HARBOR ISLAND, 2555 13TH AVE SW, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	191
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA		--	--	--			200		185	--	--	--	
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA			165				167			158	--	179	
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA		--	--	--			164			--	--	--	
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA		--	--	--		--	--			--	--	--	
SOUTH 2ND ST & LAKE AVE S, RENTON, WA		--	--	--						--	--	--	
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA		--	--	--						--	--	--	
22916 86TH AVE S, KENT, WA		--	--	--						--	--	--	
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA		--	--	--						--	--	--	
115 E MAIN ST, AUBURN, WA		--	--	--						--	--	--	
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA		--	--	--						--	--	--	
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA		--	--	--						--	--	--	--
2340 TAYLOR WAY, TACOMA, WA		--	--	--		155	227			--	--	--	
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	180	242	--	170		155	222	156		--	191	--	
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	153	--	--	--			165			--	--	--	
CASCADIA, 2002 E 28TH ST, TACOMA, WA		--	--	--						--	--	--	
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA		--	--	--			185			--	--	--	
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA		--	--	--			178			--	--	--	
4716 NORTH BALTIMORE, TACOMA, WA		--	--	--			178			--	--	--	
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--	--	--	--	175		228		--	--	--		

-- Indicates no sample on specified day

SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)
1980

Summary of Maximum and 2nd High Observed Concentrations

Location	Jan 22 Tue	Jan 23 Wed	Jan 28 Mon	Jan 30 Wed	Feb 9 Sat	Feb 21 Thu	Apr 3 Thu	Apr 12 Sat	May 31 Sat	Jun 20 Fri	Aug 7 Thu	Aug 8 Fri	Aug 11 Mon	Aug 25 Mon	Oct 18 Sat	Oct 30 Thu	Nov 11 Tue	Dec 11 Thu	Dec 29 Mon
TOLT RIVER WATERSHED, KING CO, WA		--		--				--	61			--	68						
CEDAR RIVER MASONRY DAM, KING COUNTY, WA	--	--	--	--	--	--	--	--	--		213	153							
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	102	--	89	--			89	--	--			--	--						
504 BELLEVUE WAY NE, BELLEVUE, WA	126	--		125				--	--			--	--	--					--
NORTH 98TH ST & STONE AVE N, SEATTLE, WA		--		--	106			--	--			--	--			118			
5701 - 8TH AVE NE, SEATTLE, WA	142	--		--	156	--		--	--			--	--	--		--			
2700 W COMMODORE WAY, SEATTLE, WA		--		--	129			--	--			--	--			129			
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	189	--		--		--	--		--			--	--			149			
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	139	--	--	--	137			--	--			--	--						
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA		--		--	147			--	--			--	--	--		172			--
HARBOR ISLAND, 2555 13TH AVE SW, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	134	191
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	203	--		--			203	--	--			--	--						
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA		368	191	--															
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	199	--		--	--	178		--	--			--	--						
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	149	--		--				--	--			--	--			130			
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	166	--		--		137		--	--			--	--			--			
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	132	--		--				--	--			--	--			109			
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	167	--		--				--	--			--	--			135			
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	165	--		--		115		--	--			--	--						
22916 86TH AVE S, KENT, WA	204	--		--			121	--	--			--	--						
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	296	--		--		148		--	--			--	--						
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	79	--		--				--	--			--	--			106			
115 E MAIN ST, AUBURN, WA	176	--		--				--	--			--	--			137			
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	127	--		--				--	--		186	--	--						
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	160	--		--				--	--			--	--			140			--
2340 TAYLOR WAY, TACOMA, WA	181	--		--				--	--		--	--	--			227			
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA				--				329	--			--	--	310					
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	189	--		--		--	173	--	--			--	--						
CASCADIA, 2002 E 28TH ST, TACOMA, WA	182	--		--			189	--	--			--	--						
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	176	--		--				--	--			--	--			185			
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	153	--	--	--				--	--			--	--			178			
4716 NORTH BALTIMORE, TACOMA, WA	--	--	--	--	--	--	--	--	--			--	--			178	104		
NORTH 26TH & PEARL STS, TACOMA, WA		--		--				--	--		106	--	--			136			
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--	--		--	--			--	--			--	--		175	228	--		
CITY WATER SUPPLY PUMP HOUSE, DUPONT, WA	--	--	--	--	--	--		--	--	90		--	--			84		--	
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA		--		--	--			--	--			--	--	--	82	76			

-- Indicates no sample on specified day

SUSPENDED PARTICULATES
(COH's/1000 Lin Ft)
1980

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	8369	.1	.1	.2	.3	.3	.4	.4	.5	.7	.9	1.2	1.8	.47	.36	2.10	.35
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	8431	.1	.2	.2	.3	.4	.4	.5	.7	1.0	1.4	1.8	2.6	.63	.44	2.35	.55
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	8359	.1	.2	.3	.3	.4	.6	.7	.9	1.2	1.6	1.9	2.6	.74	.53	2.40	.59
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	6670	.1	.1	.2	.2	.3	.3	.4	.6	.8	1.1	1.4	1.9	.48	.33	2.51	.41
22916 86TH AVE S, KENT, WA	8402	.1	.1	.2	.3	.3	.4	.5	.6	.9	1.3	1.6	2.4	.57	.40	2.39	.51
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	8319	.1	.1	.2	.2	.3	.3	.4	.5	.7	1.0	1.3	1.8	.47	.35	2.13	.38
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	7760	.1	.1	.2	.2	.3	.4	.5	.6	.8	1.0	1.3	1.8	.48	.34	2.47	.40
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	8310	.2	.2	.4	.5	.7	.9	1.0	1.3	1.7	2.5	3.0	3.9	1.11	.80	2.39	.89
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	8343	.2	.2	.3	.4	.4	.5	.7	.9	1.1	1.6	2.0	3.0	.75	.55	2.20	.62

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	.80	.63	.45	.46	.30	.26	.27	.37	.48	.63	.47	.47	8369	.47
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	1.09	.93	.59	.47	.33	.29	.25	.35	.47	1.04	.85	.84	8431	.63
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	1.21	1.17	.65	.59	.41	.39	.37	.45	.63	1.10	.88	1.00	8359	.74
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	.84	.81	.42	.40	.31	.26	.29	.33	.50			.66	6670	.48
22916 86TH AVE S, KENT, WA	1.13	.90	.48	.48	.38	.29	.31	.32	.42	.84	.62	.66	8402	.57
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	.74	.69	.42	.35	.29	.23	.22	.28	.36	.72	.61	.62	8319	.47
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	.81	.65	.31	.35	.30	.24	.26	.28	.40	.73	.65	.76	7760	.48
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	1.71	1.65	.94	.71	.64	.64	.60	.72	.95	1.73	1.45	1.59	8310	1.11
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	.96	.72	.49	.45	.32	.45	.54	.52	.71	1.38	1.07	1.22	8343	.75

ATMOSPHERIC PARTICLES
(bsp (X 10 Exp-4)/M)
1980 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				
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	1026	.1	.2	.2	.4	.4	.6	.7	.9	1.3	2.0	2.7	4.0	.86	.57	2.54	.86
22916 86TH AVE S, KENT, WA	8216	.1	.2	.2	.3	.4	.5	.6	.8	1.1	1.7	2.4	3.9	.76	.51	2.48	.79
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	1353	.2	.3	.6	.8	1.0	1.4	1.7	2.1	2.7	3.7	4.4	6.4	1.73	1.19	2.62	1.41

Location	Monthly Arithmetic Averages												No. of 1 Hour Samples	Year Arith Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
NORTH 98TH ST & STONE AVE N, SEATTLE, WA											.85	.86	1026	.86
22916 86TH AVE S, KENT, WA	1.26	.98	.51	.50	.47	.34	.39	.57	.73	1.37	.98	1.03	8216	.76
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA										1.88	1.89	1.43	1353	1.73

SUSPENDED PARTICULATES
Comparison of Methods

COH: SUSPENDED PARTICULATES (COH/1000 LIN FT)
bsp: ATMOSPHERIC PARTICLES (bsp (X 10 Exp-4)/M)
TSP: SUSPENDED PARTICULATES (MICROGRAMS PER CUBIC METER)

1980 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 bsp Sample Correlation Coefficient	.87	.93	.85	.91	.85	.72	.66	.61	.70	.67	.83	.91	.88
Number of 1 Hour Samples	8154	613	660	566	694	731	703	656	726	678	735	658	734
24 HR COH VS 24 HR bsp Sample Correlation Coefficient	.90	.96	.85	.95	.88	.69	.58	.71	.76	.76	.88	.95	.92
Number of 24 Hour Samples	325	22	26	20	28	30	29	24	30	27	31	27	31

TSP SAMPLING DAYS ONLY	
24 HR COH VS 24 HR bsp Sample Correlation Coefficient	.89
24 HR COH VS 24 HR TSP Sample Correlation Coefficient	.60
24 HR bsp VS 24 HR TSP Sample Correlation Coefficient	.51
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 and referenced to the reading for the clean filter tape at the beginning of the cycle; 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 (bsp) 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. Values of bsp summarized here were continuously measured using an integrating nephelometer. The sample air stream was heated 6 to 12 degrees C above ambient air temperature to dry the particles.

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

SULFUR DIOXIDE
(Parts per Million)
1980

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	.005	.005	.007	.007	.007	.008	.009	.005	.004	.007	.004	.006	8239	.006
NORTH 98TH ST & STONE AVE N, SEATTLE, WA										.006	.005	.010	1804	.008
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA	.008	.011	.010	.008	.005	.006							4009	.008
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	.008	.010	.010	.010	.009	.011	.009	.009	.006	.010	.006	.016	7792	.009
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	.005	.006	.006	.006	.009	.010	.004	.004	.004	.005			6454	.006
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA	.008	.008	.012	.010	.007	.007	.003	.004	.004	.007	.010	.012	8361	.008
NORTH 37TH & VASSAULT STS, TACOMA, WA	.009	.009	.006	.012	.009	.006	.003	.003	.003	.004	.004	.009	8350	.007
NORTH 26TH & PEARL STS, TACOMA, WA	.008	.012	.007	.009	.009	.007	.003	.003	.004	.004	.005	.009	8368	.007

Number of Concentrations Exceeding Selected Values
for Various Averaging Periods

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	4	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	0	0	1	0	0	0
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA	0	0	0	0	0	0
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	0	0	4	0	0	0
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA	4	1	4	0	0	0
NORTH 37TH & VASSAULT STS, TACOMA, WA	1	0	5	0	0	0
NORTH 26TH & PEARL STS, TACOMA, WA	3	2	7	0	0	0

At all stations except Harbor Island, Sulfur Dioxide was continuously measured using the method of ultraviolet fluorescence. At the Harbor Island station the method of measurement was flame photometric detection.

SULFUR DIOXIDE
(Parts per Million)
1980

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	1.86	13 Jul	2015	.58	20 Mar	2147	.36	20 Mar	2300	.05	21 Mar	0600
	1.17	23 Oct	0606	.28	30 Apr	1721	.11	30 Apr	1900	.03	23 Oct	0800
NORTH 98TH ST & STONE AVE N, SEATTLE, WA				.10	9 Dec	2300	.06	13 Dec	1900	.03	10 Dec	0800
				.07	13 Dec	1900	.06	14 Dec	0500	.03	14 Dec	0500
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA				.35	16 Jun	1046	.19	16 Jun	1100	.05	5 Mar	2300
				.17	22 Apr	1000	.11	5 Mar	0500	.03	16 Jun	2400
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA				.15	24 Aug	2200	.09	13 Jun	1000	.05	16 Dec	1600
				.13	11 Oct	1200	.08	10 Oct	1200	.04	10 Oct	1300
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA				.29	11 Jun	1218	.20	11 Jun	1300	.05	11 Jun	1400
				.28	22 Jun	1713	.16	8 Jun	2100	.04	5 May	2300
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA	1.61	4 Apr	1019	.77	4 Apr	1045	.32	4 Apr	1200	.05	13 Mar	1800
	1.36	4 Apr	1024	.30	13 Mar	1200	.16	30 Nov	1200	.05	4 Apr	1500
NORTH 37TH & VASSAULT STS, TACOMA, WA	1.11	4 Apr	1255	.40	4 Apr	1255	.23	12 Feb	0400	.07	12 Feb	2300
				.36	12 Feb	0348	.21	4 Apr	1400	.05	17 May	1400
NORTH 26TH & PEARL STS, TACOMA, WA	1.55	21 Feb	0535	.46	7 May	1128	.19	7 May	1300	.06	12 Feb	2000
	1.16	17 Jun	1432	.44	17 Jun	1455	.18	12 Feb	0400	.05	6 Dec	2200

(1) 5 minute average reported only for concentrations exceeding 1.00 ppm.
(2) Ending times are reported in Pacific Standard Time.
(3) For equal, high concentration values, the reported date and time refer to the earliest occurrences during the year.

OZONE

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 urban area emissions are trapped beneath a temperature inversion during nighttime and morning hours followed by hot afternoon temperatures. Light northerly winds often develop on these hot days. As a result, the highest ozone concentrations normally occur 5 to 15 miles south to southeast of the major urban centers.

Ozone Standard

The level of the ozone standard 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 avera number of observed exceedences during t most recent 3 years.

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

The estimated number of exceedences i always equal to or greater than the observed number of exceedences. However, for stations where no exceedences are observed, the estimate is 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 1980 ozone table summarizes the four highest daily maximum 1 hour ozone averages and shows whether the standard was attained in 1980. The rightmost column documents that 2 of 7 stations had a value for expected number of exceedences greater than 1.0, and thus exceeded the ozone standard for the three year period ending in 1980. However, there were no ozone values exceeding the level of the standard during 1980. Thus, attainment of the standard could be achieved by the end of 1981 unless more than one exceedance is recorded during 1981.

NITROGEN OXIDES

Nitric oxide (NO) and nitrogen dioxide (NO_2) are released to the atmosphere as the result of high temperature fuel combustion. Motor vehicles and power plants are the most common fuel combustion sources emitting oxides of nitrogen.

Nitric oxide oxidizes rather quickly to nitrogen dioxide. Nitrogen dioxide plays an important role in the photochemical reactions which produce ozone. The nitrogen dioxide standard is an annual arithmetic average of 0.05 ppm.

OZONE
(Parts per Million)
1980

Location / Period of Sampling	Four Highest Daily Maximum 1 Hour Averages			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	1978	1979	1980	
SNOHOMISH CO, FIRE DISTRICT #22, ARLINGTON, WA*	.07	10 Aug	1500	0.0	0.0	0.0	0.0
7 May - 14 Oct	.06	7 Jul	1700				
	.06	21 Jul	1500				
	.06	9 Aug	1400				
LAKE SAMMAMISH STATE PARK, KING CO, WA*	.10	10 Aug	1500	4.1	2.1	0.0	2.1
1 Jan - 15 Oct	.09	9 Aug	1500				
	.08	29 Jul	1700				
	.08	30 Jul	1400				
22916 86TH AVE S, KENT, WA	.08	9 Aug	1500	3.1	0.0	0.0	1.0
1 Jan - 31 Dec	.08	10 Aug	1300				
	.07	27 Apr	1400				
	.07	4 May	1400				
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	.10	5 Oct	1400	3.1	1.1	0.0	1.4
1 Jan - 31 Dec	.09	9 Aug	1600				
	.09	10 Aug	1600				
	.09	10 Sep	1600				
PIERCE CO, FIRWOOD FIRE STATION, FIFE, WA*	.08	9 Aug	1500	-	-	0.0	0.0
19 Apr - 30 Sep	.07	8 Aug	1700				
	.07	10 Aug	1400				
	.06	27 Apr	1200				
GIG HARBOR HS, GIG HARBOR, WA*	.06	10 May	1500	-	0.0	0.0	0.0
9 May - 8 Oct	.06	4 Sep	1400				
	.06	15 Sep	1500				
	.06	16 Sep	1500				
PIERCE CO, FIRE DISTRICT #21, GRAHAM, WA*	.12	9 Aug	1800	1.5	1.6	0.0	1.0
9 May - 8 Oct	.11	21 Jul	1600				
	.11	10 Aug	1400				
	.10	8 Jul	1500				

(1) * Station operated by Washington State Department of Ecology.
(2) - Indicates no Ozone sampling for given year.
(3) Ending times are reported in Pacific Standard Time.
(4) For equal, high concentration values, the reported date and time refer to the earliest occurrences during the year.
(5) At all stations except Graham, Ozone was continuously measured using ultraviolet photometric detection. At Graham the method of measurement was gas phase chemiluminescence.

NITRIC OXIDE (NO)
(Parts per Million)
1980

Location	Monthly Arithmetic Averages												No. of 1 Hour Samples	Year Arith Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
22916 86TH AVE S, KENT, WA										.059	.047	.058	2348	.053

NITROGEN DIOXIDE
(Parts per Million)
1980

Location	Monthly Arithmetic Averages												No. of 1 Hour Samples	Year Arith Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
22916 86TH AVE S, KENT, WA										.012	.011	.011	2330	.012

CARBON MONOXIDE

Introduction

The Washington State Department of Ecology has statewide jurisdiction over motor vehicle emissions. Motor vehicles are the largest source of carbon monoxide and are the principal contributor to the carbon monoxide levels which exceed standards in the cities of the Puget Sound area.

During 1980, the Department operated carbon monoxide analyzers at 10 locations in the Puget Sound region. All ten of these stations were also in operation during 1979. Sampling was discontinued at one of these stations at the end of November, 1980.

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. The Alert stage is reached 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 expectation on the forecast of meteorological conditions and persistence of the carbon monoxide level 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 1980". Detailed information regarding site locations; hourly and 8 hour averages; and trends may be obtained by contacting the Department of Ecology.

A review of the table of data shows that 8 of the 10 stations exceeded an 8 hour average of 9 ppm at least twice. Therefore all of these 8 stations violated the 8 hour average standard. The maximum 1 hour average recorded at any of the stations was 23 ppm. Therefore none of the monitoring sites exceeded the 1 hour standard of 35 ppm.

CARBON MONOXIDE
(Parts Per Million)
1980

Location / Period of Sampling	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 1 Jan - 31 Dec	16	4 Nov	1800	12	15 Dec	2200	3	3
	16	15 Dec	1800	11	4 Nov	2200		
4511 UNIVERSITY WAY NE, SEATTLE, WA 1 Jan - 20 Apr; 20 Aug - 31 Dec	23	4 Nov	1900	14	4 Nov	2200	9	9
	17	4 Nov	1800	12	23 Jan	2300		
3921 LINDEN AVE N, SEATTLE, WA 1 Jan - 30 Jun; 9 Oct - 31 Dec	9	9 Feb	2100	7	10 Feb	100	0	0
	9	21 Feb	900	6	8 Dec	2400		
417 PIKE ST, SEATTLE, WA 1 Jan - 30 Nov	20	1 Feb	1800	10	7 Jan	1800	5	5
	17	7 Jan	1800	10	1 Feb	2200		
1424 4TH AVE, SEATTLE, WA 1 Jan - 31 Dec	21	16 Jan	1100	14	16 Jan	1800	11	11
	20	4 Jan	1800	11	4 Jan	1900		
2ND AVE & UNIVERSITY ST, SEATTLE, WA 1 Jan - 31 Dec	20	7 Jan	1700	10	7 Jan	1900	2	2
	15	7 Jan	1800	10	29 Feb	2300		
5TH AVE & JAMES ST, SEATTLE, WA 1 Jan - 31 Dec	18	4 Nov	1800	12	4 Nov	1900	5	5
	18	15 Dec	1700	12	15 Dec	2200		
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA 1 Jan - 31 Dec	23	9 Feb	2400	11	10 Feb	100	1	1
	16	9 Feb	2300	8	23 Jan	2300		
2809 26TH AVE S, SEATTLE, WA 1 Jan - 31 Dec	23	10 Oct	800	11	15 Dec	2300	2	2
	16	28 Jan	900	10	10 Oct	1200		
942 PACIFIC AVE, TACOMA, WA 1 Jan - 31 Dec	20	30 Oct	1800	12	23 Jan	2200	9	8
	20	8 Dec	1800	12	30 Oct	2200		

(1) Ending times are reported in Pacific Standard Time.
(2) For equal, high concentration values, the reported date and time refer to the earliest occurrences during the year.
(3) At all stations, Carbon monoxide was continuously measured using the nondispersive infrared method.

LEAD

The ambient air quality standard for lead is set at 1.5 micrograms per cubic meter averaged over one calendar quarter. About 90 percent of the lead emitted into the air comes from automobile exhaust. The remainder comes from stationary sources such as primary and secondary nonferrous smelters.

Data from a coordinated network operated by the Department of Ecology and the Agency has previously identified two areas in the Puget Sound region which exceed the lead standard. These are both in Seattle. One area is a strip bordering Interstate 5 from Spokane Street to Northgate. The other area is the Harbor Island industrial region. The table below presents the results of sampling during 1980. Two stations, one in each of these areas, show lead concentrations in excess of the standard.

LEAD
(Micrograms per cubic meter)
1980 Quarterly Arithmetic Averages

Location	1st	2nd	3rd	4th
Evergreen Point Bridge Toll Plaza, Medina, Wa	1.13	0.61	0.63	0.78
504 Bellevue Way NE, Bellevue, Wa	0.68	0.35	0.50	0.57
North 98th St & Stone Ave N, Seattle, Wa	0.60	0.26	0.31	0.50
5701 - 8th Ave NE, Seattle, Wa	1.25	0.91	1.59	1.20
Portage Bay,2725 Montlake Blvd E, Seattle, Wa	0.88	0.42	0.53	0.94
Harbor Island, 2555 13th Ave SW, Seattle, Wa				13.2 [a]
Harbor Island, 3400 13th Ave SW, Seattle, Wa	1.27	1.00 [b]	1.27	1.03
4716 North Baltimore, Tacoma, Wa		0.13	0.18	0.37
North 26th & Pearl Sts, Tacoma, Wa	0.52	0.33	0.23	0.48

a Mid November through end of December
b Mid May through end of June

AIR STAGNATION ADVISORIES

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 periods during 1980:

Valid From:	To:
10 AM, Tuesday, December 9	7 AM, Wednesday, December 10
10 AM, Tuesday, December 16	10 AM, Thursday, December 18

LOWER ATMOSPHERE TEMPERATURE SOUNDINGS

A lower atmosphere sounding unit began operating on the east shore of Portage Bay in Seattle during 1971. The Department of Ecology operates the station. Normal operation provides one slow ascent sounding to 700 millibars about 0700 local time each Monday through Friday except on holidays. This sounding is the primary source of lower atmosphere data in the Puget Sound Basin and is an essential basis for many forecasts including air stagnation forecasts. Each sounding is reasonably representative of the lower atmosphere in the entire Puget Sound area. The Agency makes regular use of the sounding in evaluating and interpreting air quality data and also enters the sounding in a computerized data base.

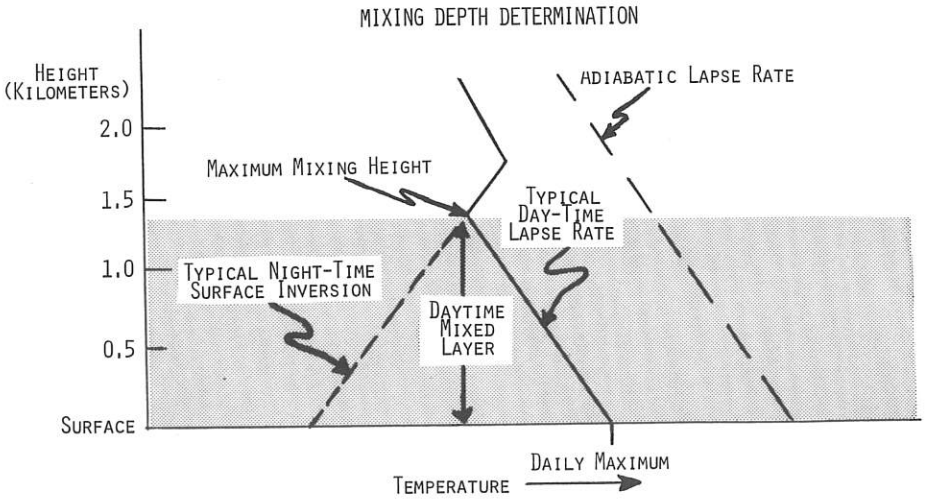
The figure below illustrates some key concepts. Temperature increasing with height is termed a TEMPERATURE INVERSION. A temperature inversion limits the height to which pollutants are mixed or dispersed vertically. The MIXING DEPTH is simply the height from the surface to the temperature inversion base. The mixing depth continuously changes in response to diurnal surface temperature changes and to other processes.

On days with no temperature inversion, the mixing depth is unlimited and this contributes to rapid pollutant dispersion and good air quality. In contrast, a temperature inversion near the surface thick enough so that the daytime mixing depth will not exceed the depth of the inversion significantly restricts vertical dispersion. This stable condition is associated with higher pollutant levels.

The plots of four soundings during 1980 are presented on the following pages. Temperature is represented by a solid line connecting actual data values enclosed by circles. The dewpoint temperature is represented by a dashed line connecting actual data values enclosed by triangles. Measured winds at several heights are plotted to the right of the sounding and also reported as numerical values in degrees/knots.

These soundings provide a meteorological picture of four days when TSP and Carbon Monoxide levels reached highest or 2nd highest values of the year at several stations. Many stations measured values exceeding standards. The TSP and Carbon Monoxide summaries document the significant cases. These are better understood when reviewed with the soundings on the dates indicated.

JAN 22 & 23: two day stagnant period
TSP, Carbon Monoxide
OCT 30: TSP, Carbon Monoxide
DEC 16: Air Stagnation Advisory
Carbon Monoxide

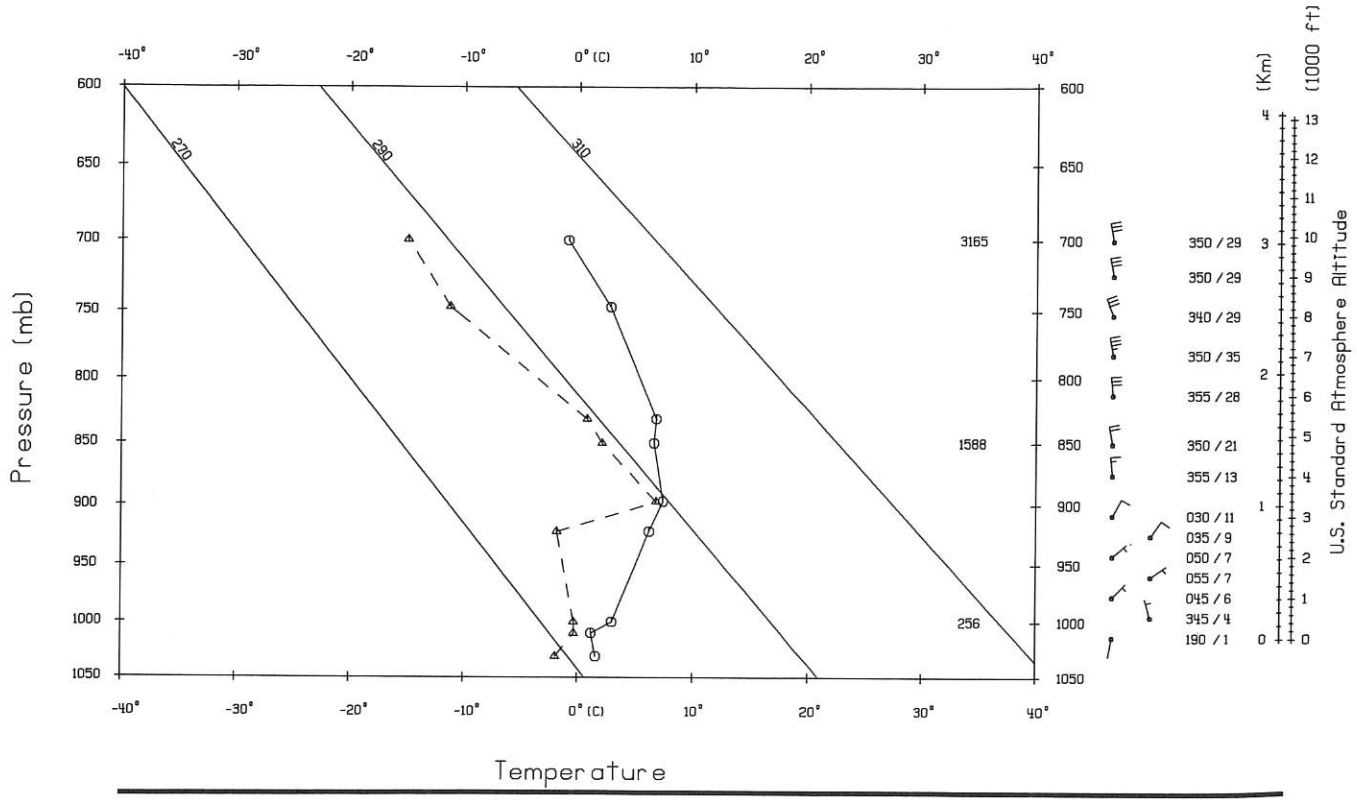


PUGET SOUND AIR POLLUTION CONTROL AGENCY

PSEUDO-ADIABATIC CHART

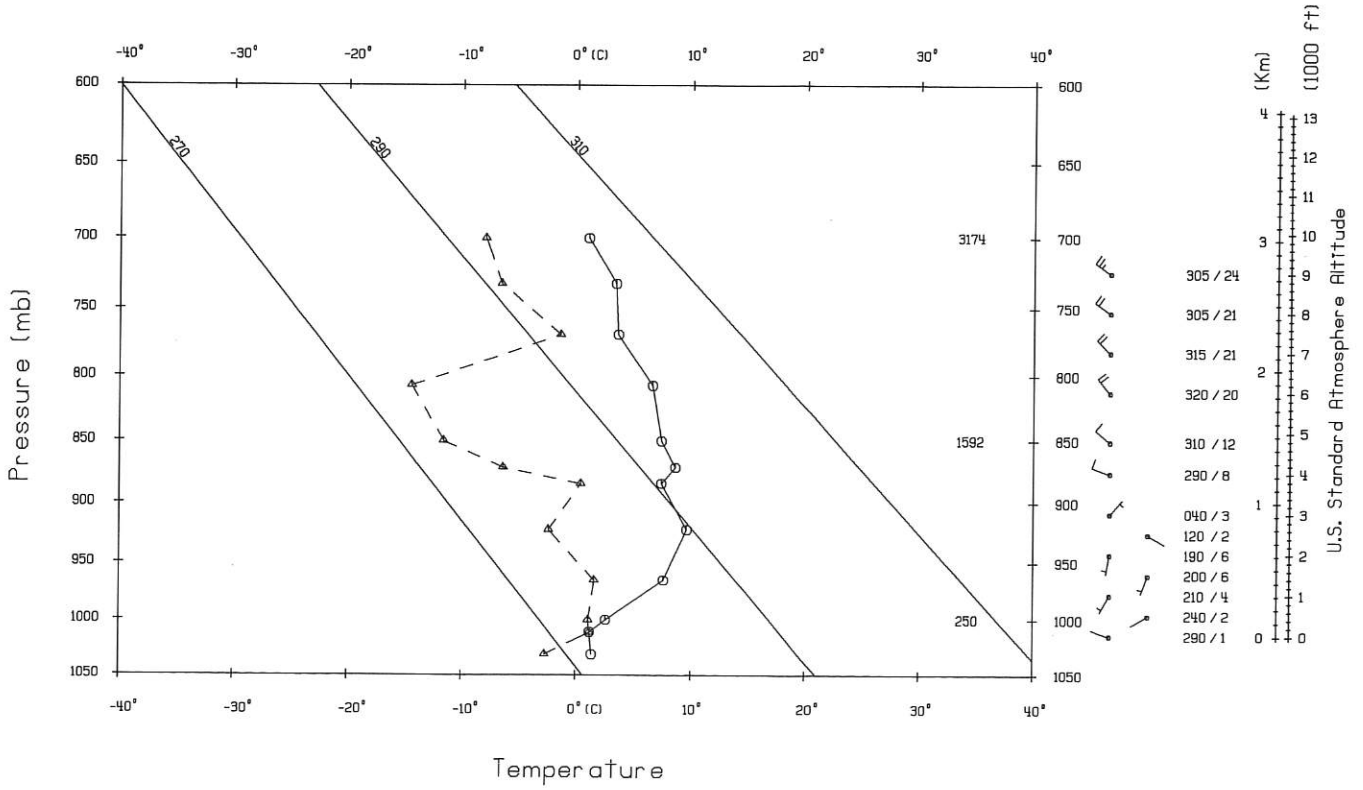
0700 PST 22 Jan 1980

Portage Bay, 2725 Montlake Blvd E, Seattle, WA



0700 PST 23 Jan 1980

Portage Bay, 2725 Montlake Blvd E, Seattle, WA



PUGET SOUND AIR POLLUTION CONTROL AGENCY

PSEUDO-ADIABATIC CHART

0700 PST 30 Oct 1980

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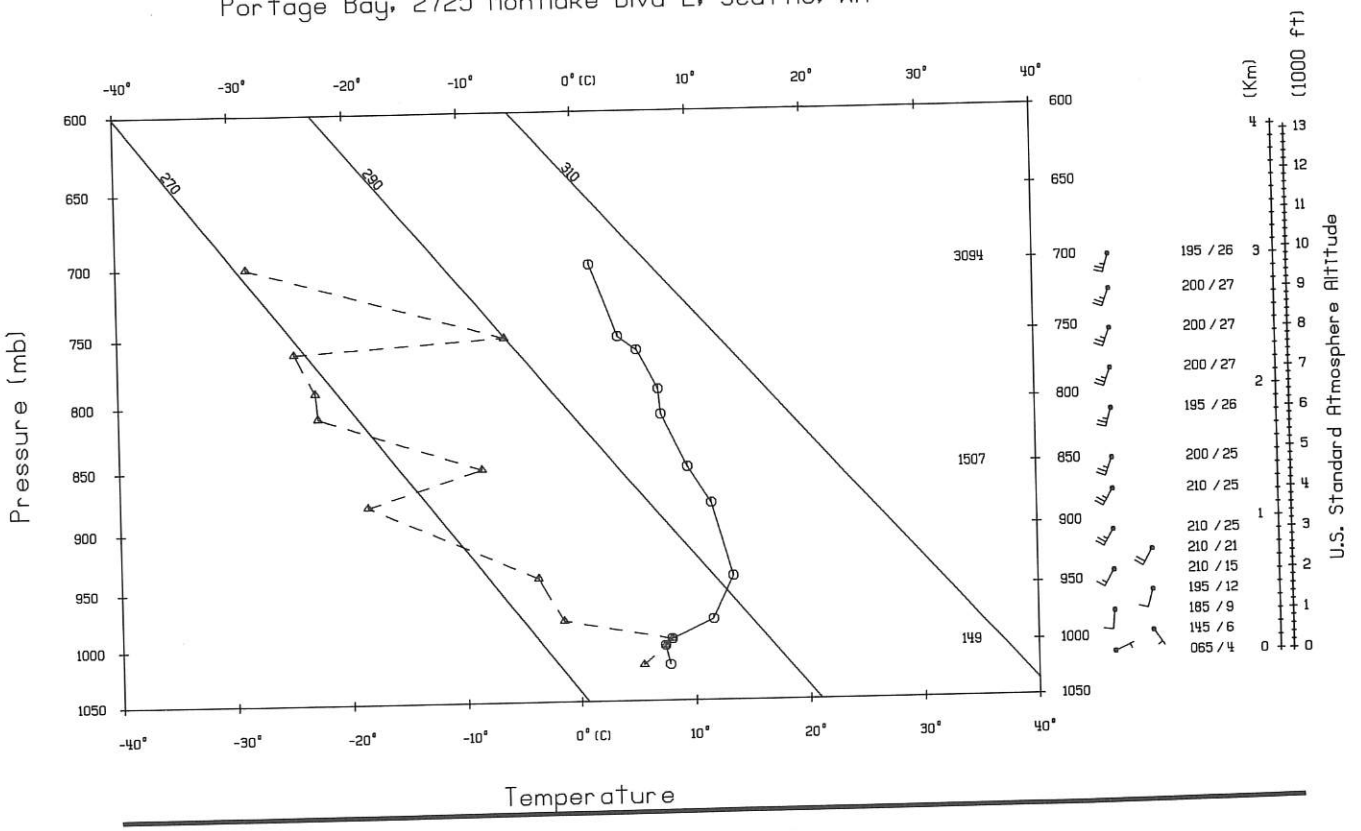
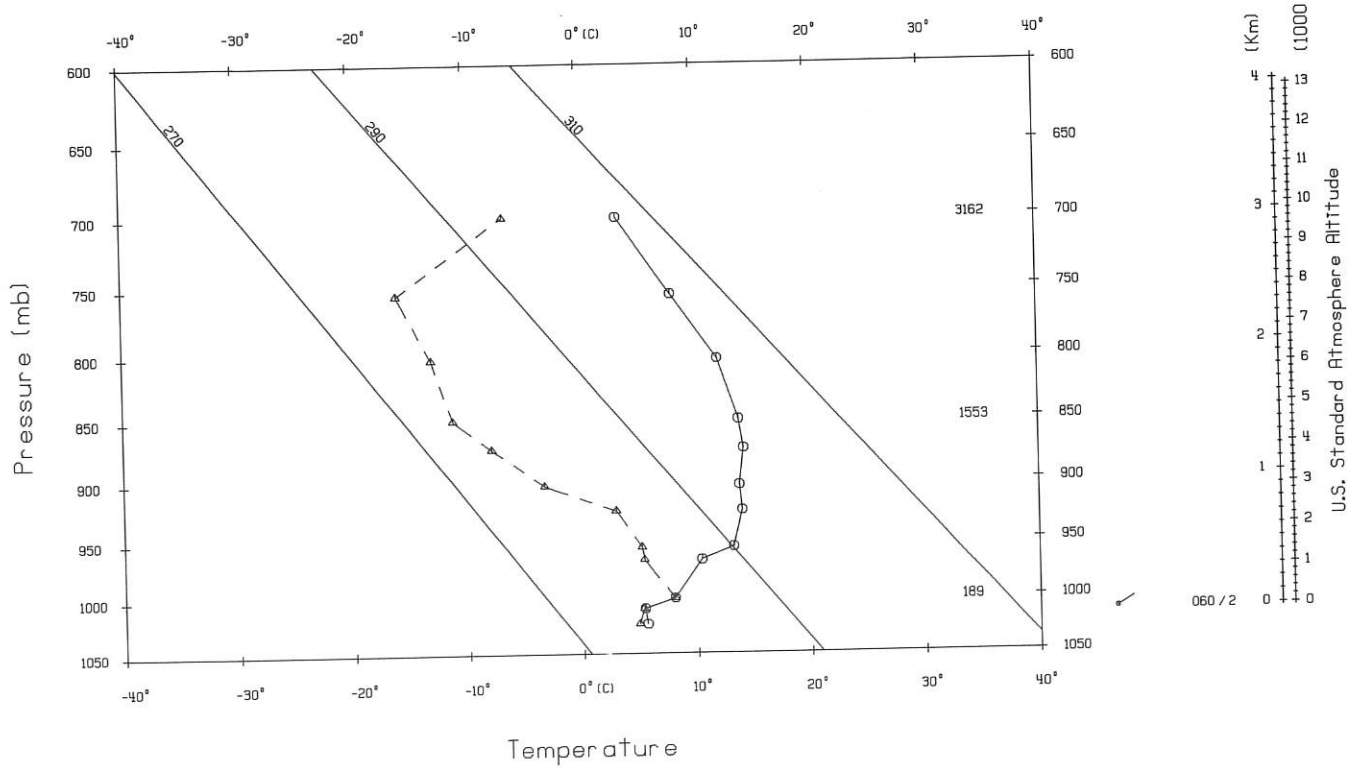


0700 PST 16 Dec 1980

Portage Bay, 2725 Montlake Blvd E, Seattle, WA



LOWER ATMOSPHERE TEMPERATURE SOUNDING CLIMATOLOGY

The Agency has developed a lower atmosphere climatology from the sounding 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 below. On the right the tables present a distribution of TEMPERATURE INVERSION LAYERS showing the number of inversions of a given thickness (or depth) by height of the inversion base. Tables on the left present the distribution of the four mutually exclusive SOUNDING LAYERS by height of the base of each layer.

This analysis includes tables summarizing nine years of data (1972 through 1980) as well as tables for calendar year 1980 alone. Seasonal variations are shown by monthly tables presented in the Air Quality Data Summary for 1977.

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

PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA

ALL MONTHS 1980
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	32	33	48	138	251
150	59	49	120	142	370
300	86	85	172	142	485
500	120	131	199	142	592
1000	169	205	289	145	808
1500	209	289	378	148	1024
2000	252	367	464	155	1238
2500	290	439	536	165	1430
3000	313	483	607	168	1571
700 MB	313	483	609	168	1573

Number of Soundings: 251

ALL MONTHS 1972-80
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	313	356	641	937	2247
150	533	558	1166	974	3231
300	825	772	1564	1011	4172
500	1081	1116	1857	1023	5077
1000	1435	1841	2605	1073	6954
1500	1824	2575	3374	1156	8929
2000	2220	3199	4093	1229	10741
2500	2593	3788	4750	1305	12436
3000	2864	4224	5228	1361	13677
700 MB	2873	4227	5232	1363	13695

Number of Soundings: 2247

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 1980
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	8	9	7	1	4	1	2	32	251
150	14	17	16	3	4	1	4	59	370
300	20	22	20	7	7	2	8	86	485
500	32	35	24	9	8	2	10	120	592
1000	47	51	31	15	8	3	14	169	808
1500	60	70	35	17	8	5	14	209	1024
2000	71	91	40	21	10	5	14	252	1238
2500	86	99	50	22	13	6	14	290	1430
3000	93	112	53	22	13	6	14	313	1571
700 MB	93	112	53	22	13	6	14	313	1573

Number of Soundings: 251

ALL MONTHS 1972-80
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	77	82	59	32	24	17	22	313	2247
150	115	137	96	71	44	29	41	533	3231
300	199	201	144	101	65	48	67	825	4172
500	289	278	176	125	77	57	79	1081	5077
1000	436	385	218	154	88	61	93	1435	6954
1500	612	519	255	179	94	67	98	1824	8929
2000	773	660	317	197	107	67	99	2220	10741
2500	934	780	375	217	118	69	100	2593	12436
3000	1062	882	411	222	118	69	100	2864	13677
700 MB	1071	882	411	222	118	69	100	2873	13695

Number of Soundings: 2247

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.

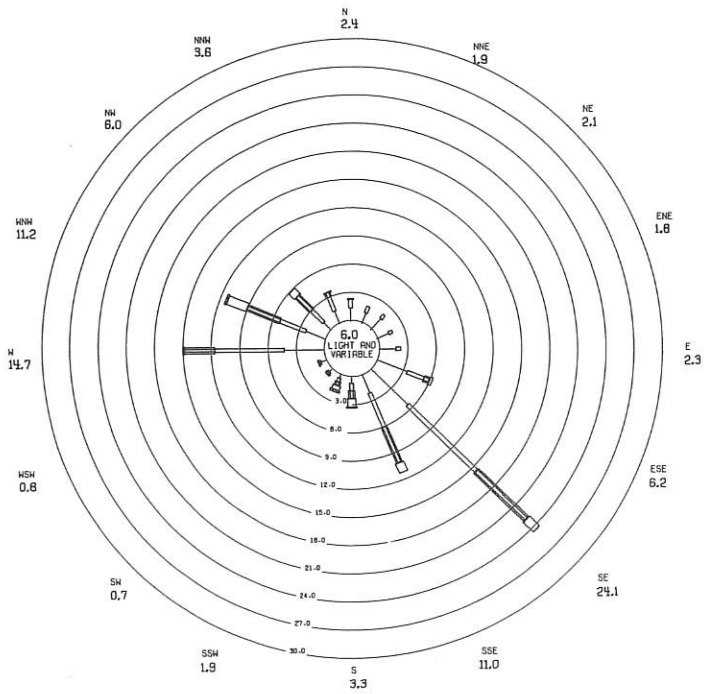
WIND ROSES

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 to 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.



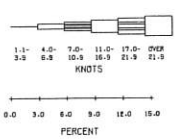
HOUR AVERAGE SURFACE WINDS

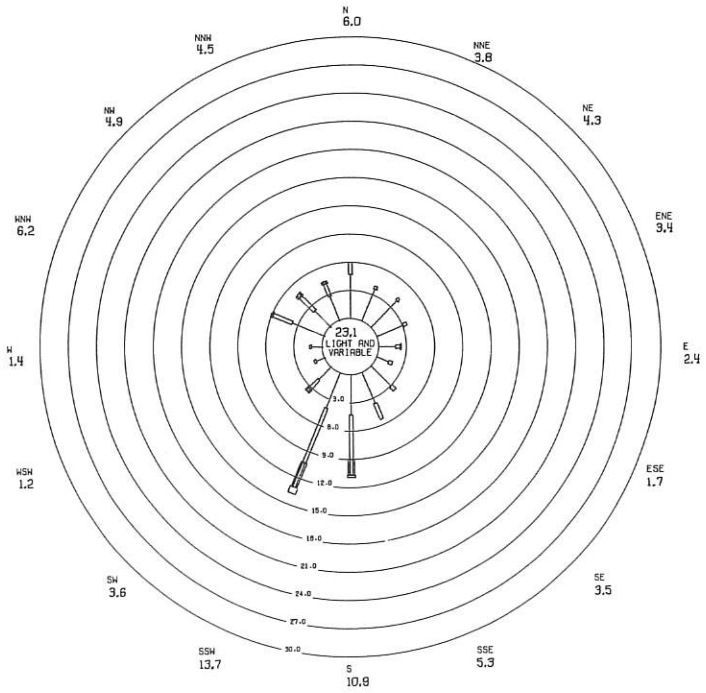
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,441





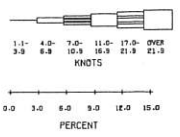
HOUR AVERAGE SURFACE WINDS

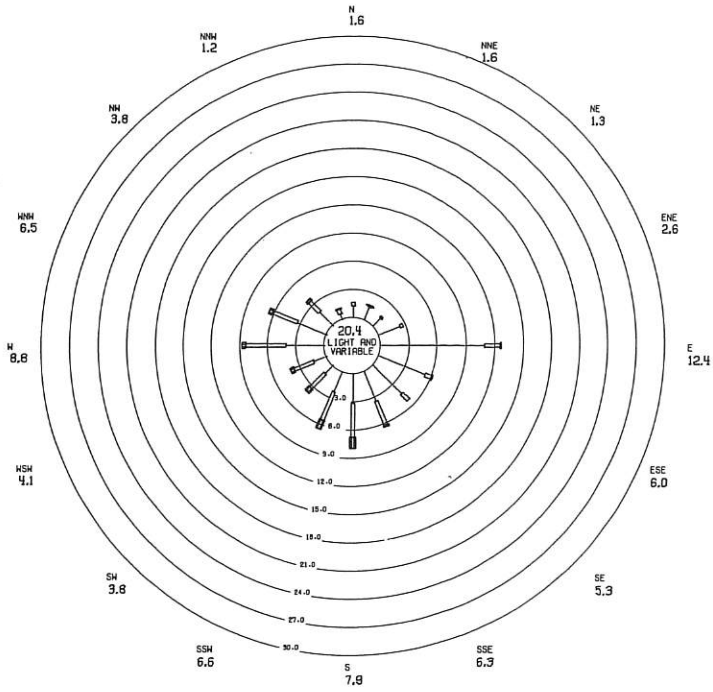
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,039





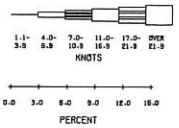
HOUR AVERAGE SURFACE WINDS

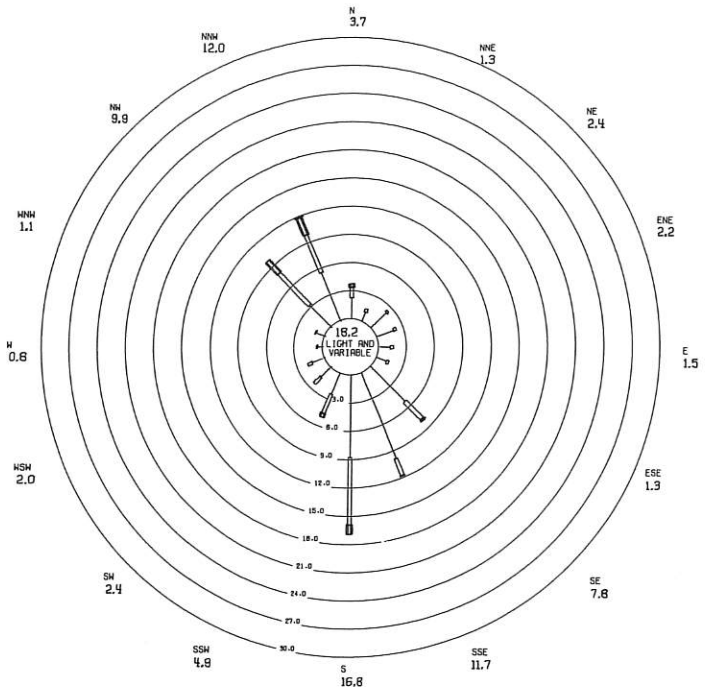
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 6,522





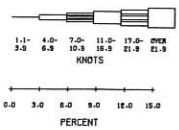
HOUR AVERAGE SURFACE WINDS

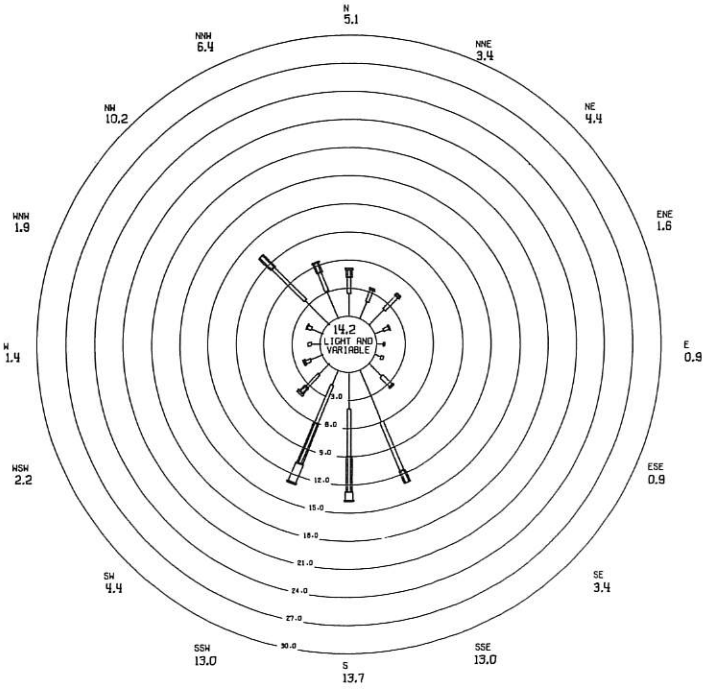
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- JAN, FEB, MAR, APR, MAY, JUN, 1980

TOTAL OBSERVATIONS- 4,116





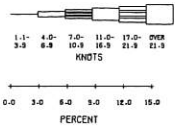
HOUR AVERAGE SURFACE WINDS

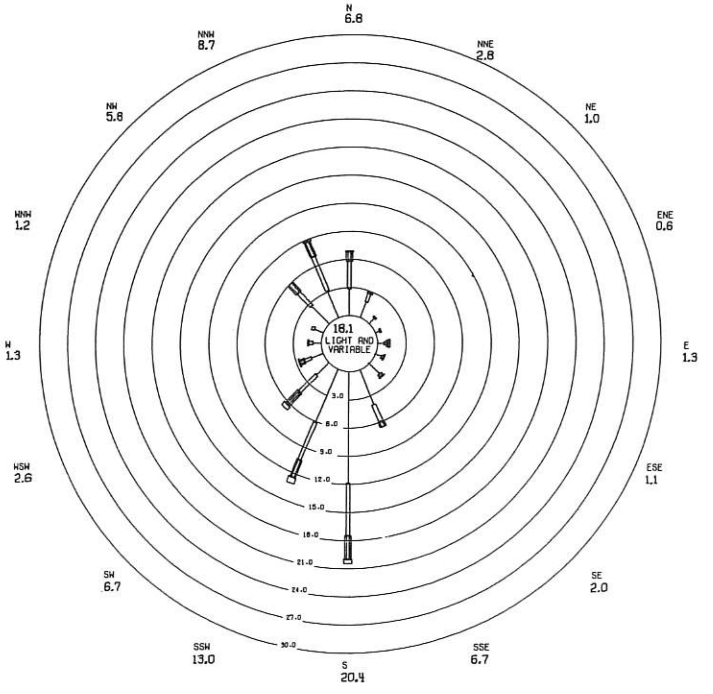
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,314





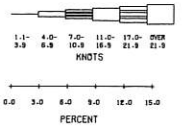
HOUR AVERAGE SURFACE WINDS

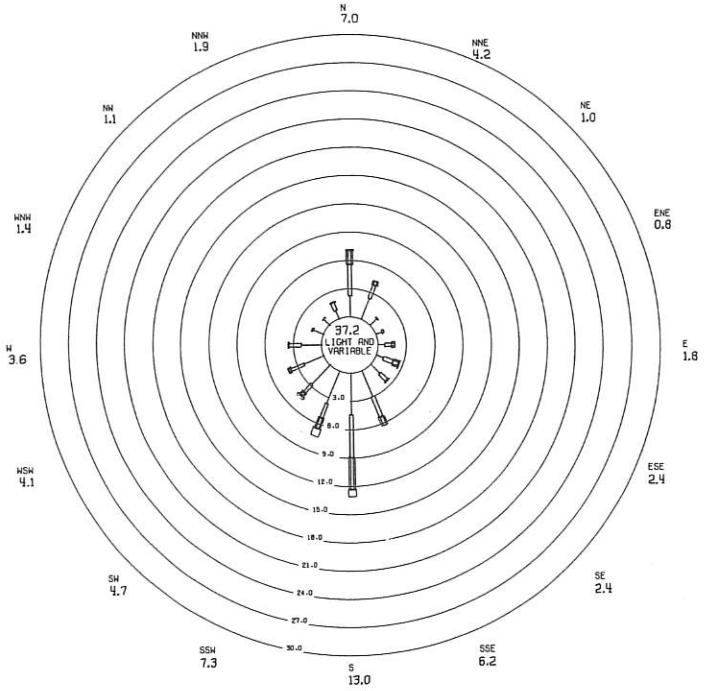
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,373





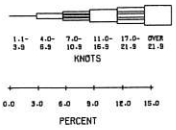
HOUR AVERAGE SURFACE WINDS

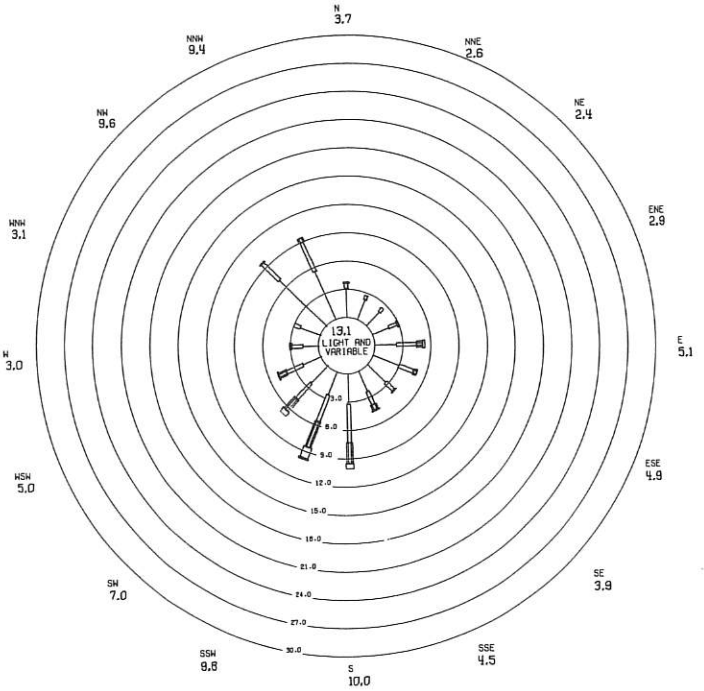
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,442





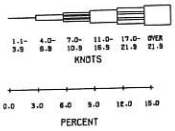
HOUR AVERAGE SURFACE WINDS

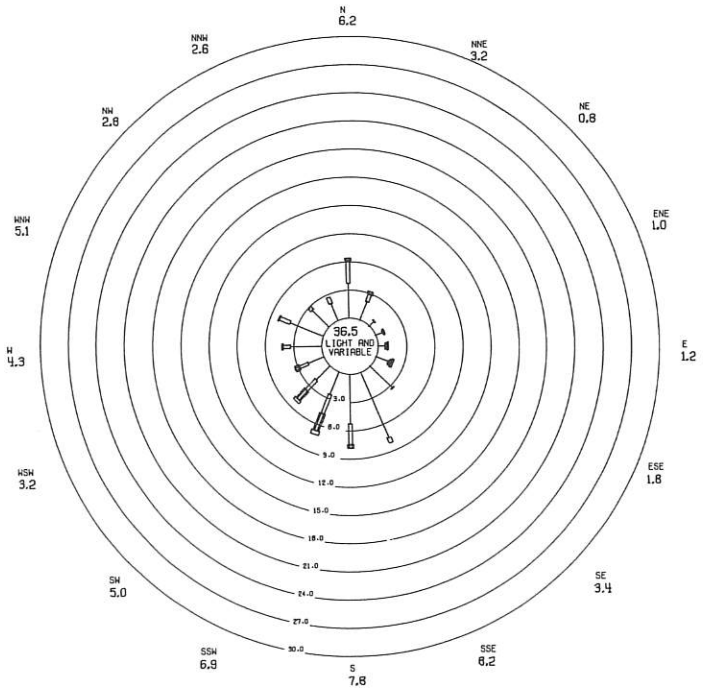
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,429





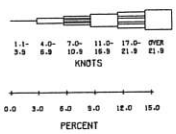
HOUR AVERAGE SURFACE WINDS

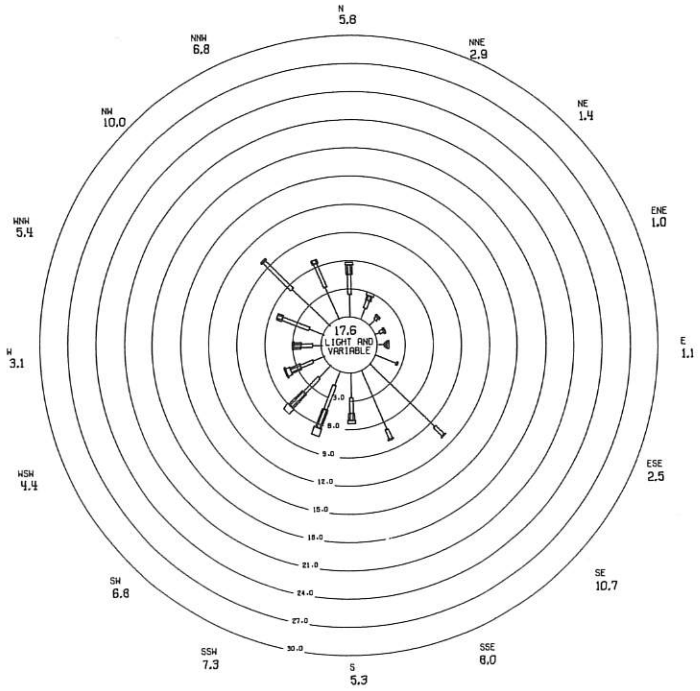
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,258





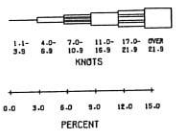
HOUR AVERAGE SURFACE WINDS

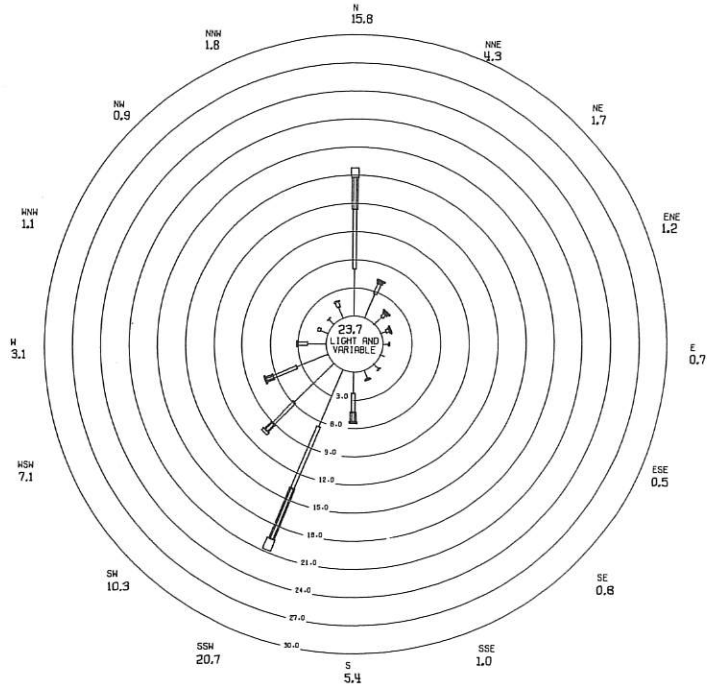
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,369





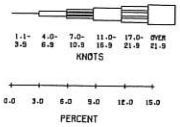
HOUR AVERAGE SURFACE WINDS

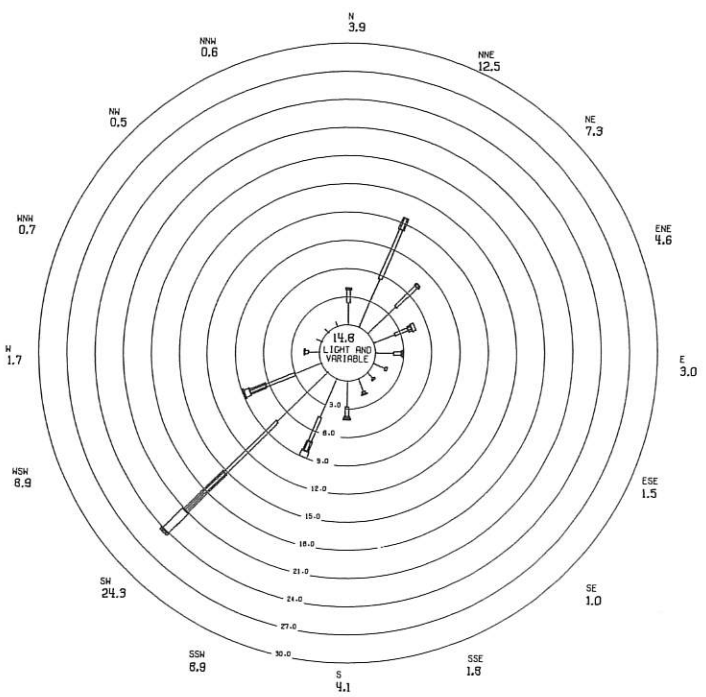
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,321





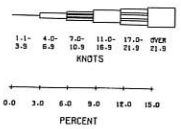
HOUR AVERAGE SURFACE WINDS

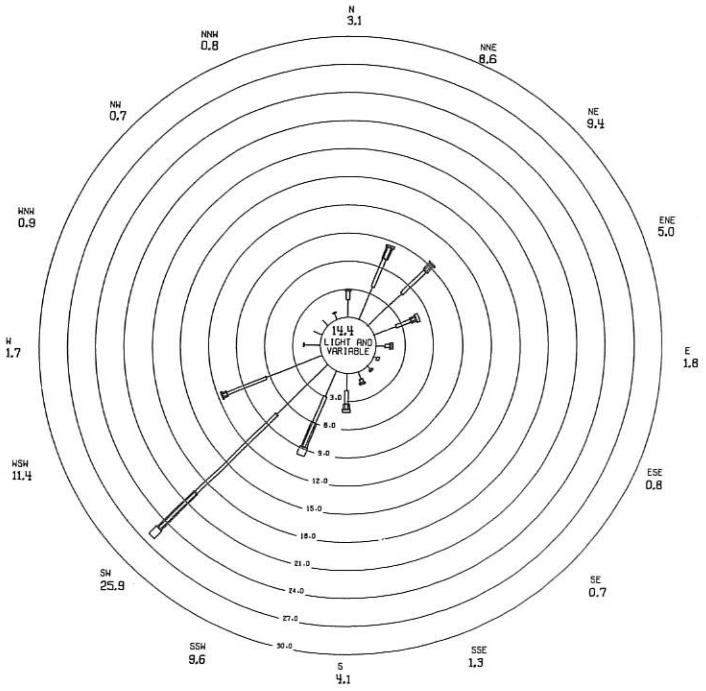
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,401





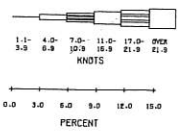
HOUR AVERAGE SURFACE WINDS

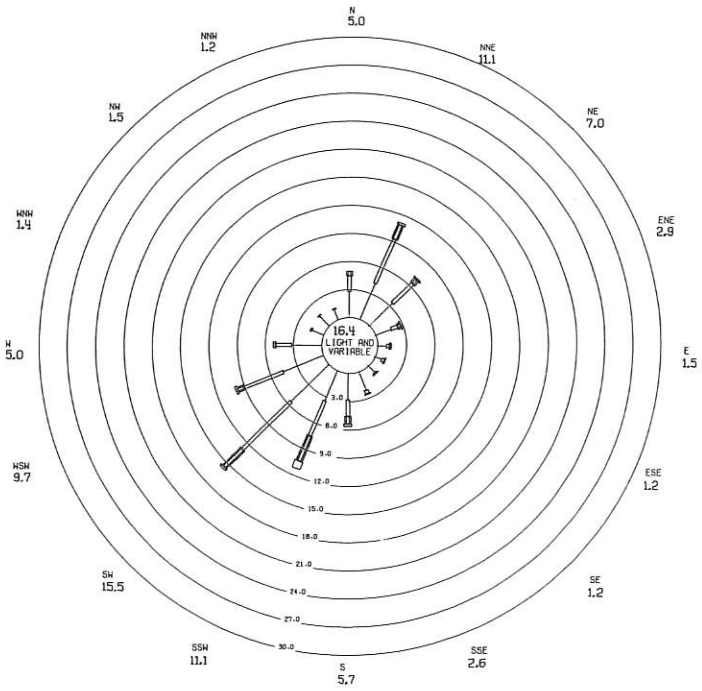
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
NORTH 37TH & VASSAULT STS. TACOMA, WA

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,442





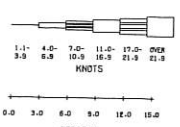
HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1980

TOTAL OBSERVATIONS- 8,436



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

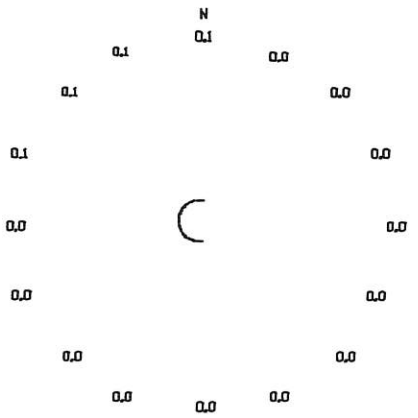
The local area stability wind roses are developed using 3 hour interval cloud data recorded for Seattle Tacoma International Airport. Persistence in cloud data is assumed for the hour preceding and the hour following the observation. This cloud data is then interfaced with the 1 hour average wind data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

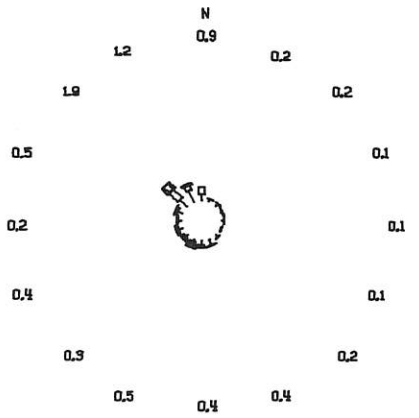
The stability wind rose summaries are required for air quality modeling. The Climatological Dispersion Model uses tabular summaries from which the accompanying stability wind roses were plotted.

Clearly the most significant difference between locations is in the wind fields. The frequency of occurrence of each stability class is about the same at each location. Neutral stability exists about 49 percent of the time. Stable nighttime conditions occur about 31 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 occurring during any other stability class.

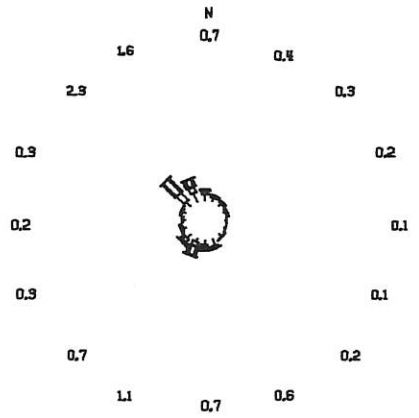
PUGET SOUND AIR POLLUTION CONTROL AGENCY



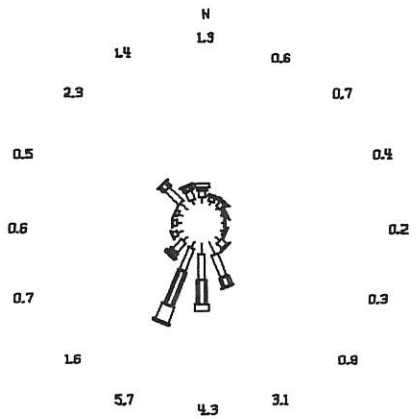
Extremely Unstable
0.4 %



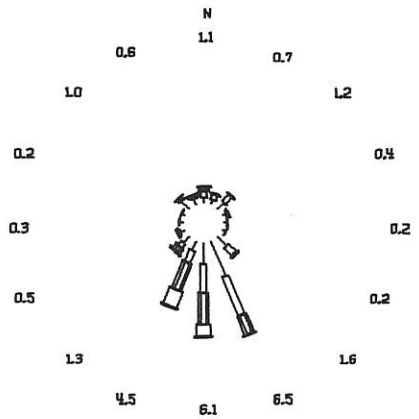
Unstable
7.8 %



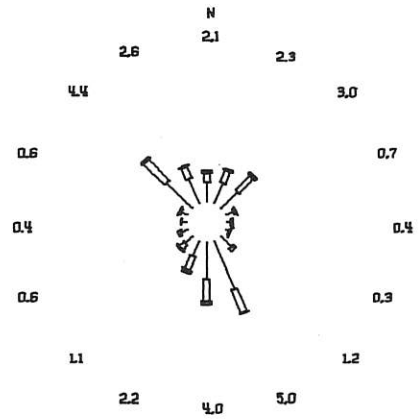
Slightly Unstable
10.0 %



Neutral Daytime
24.6%



Neutral Nighttime
26.4%

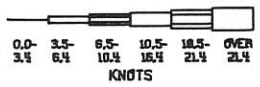


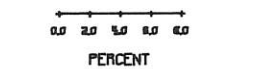
Stable
30.8%

STABILITY WIND ROSES

DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA

Percentage Frequency of Occurrence



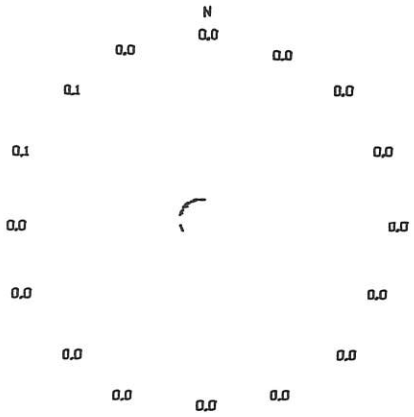


Period of Record: JAN 1980 to DEC 1980

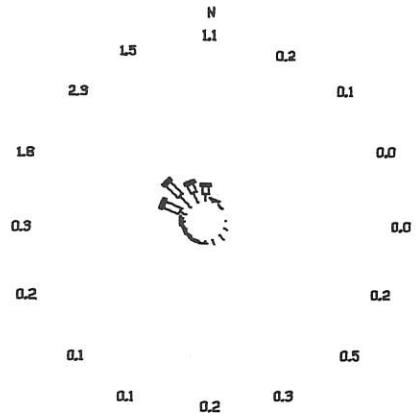
1 Hr Wind Location: DUWAMISH, 4401 E MARGINAL WAY S, SEATTLE, WA

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

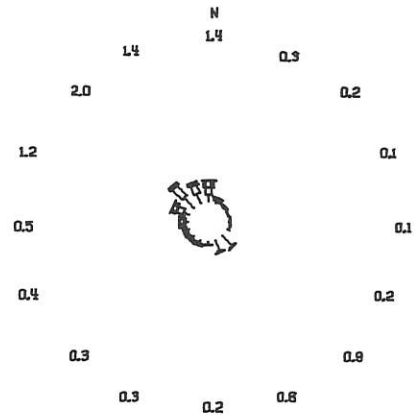
PUGET SOUND AIR POLLUTION CONTROL AGENCY



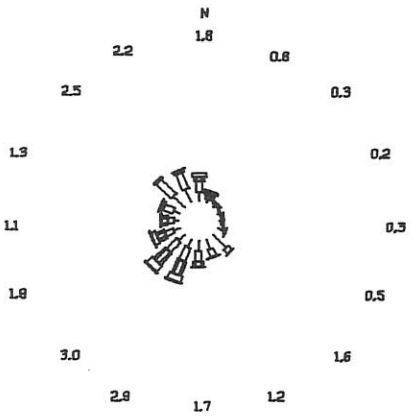
Extremely Unstable
0.3 %



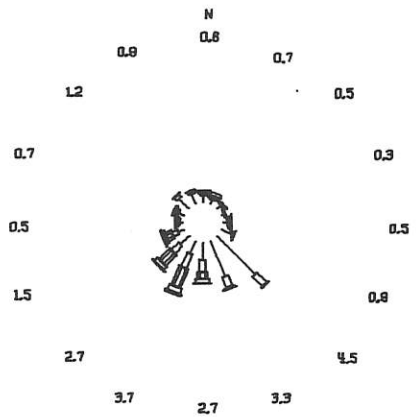
Unstable
8.9 %



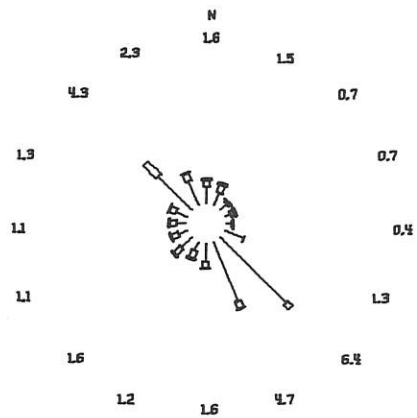
Slightly Unstable
10.2 %



Neutral Daytime
23.4%



Neutral Nighttime
25.4%



Stable
31.8 %

STABILITY WIND ROSES

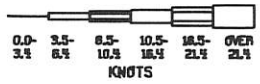
FIRE STATION #12, 2316 E 11TH ST. TACOMA, WA

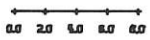
Period of Record: JAN 1980 to DEC 1980

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

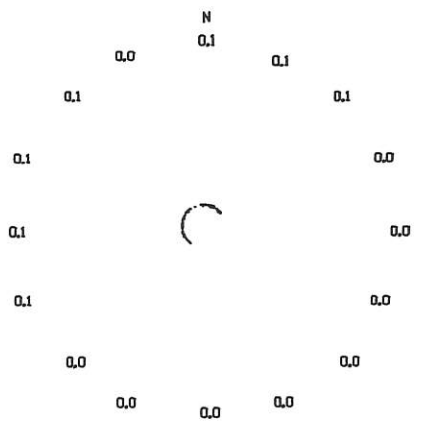
3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

Percentage Frequency of Occurrence

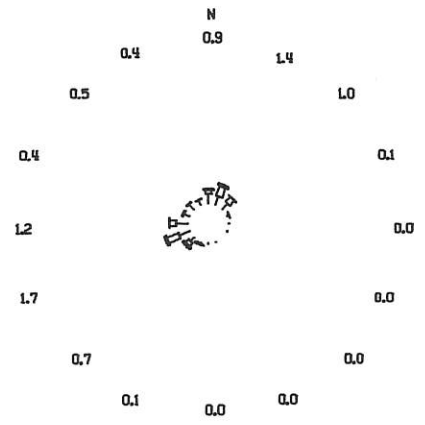




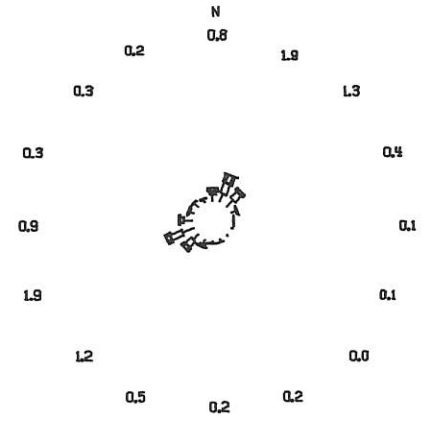
PUGET SOUND AIR POLLUTION CONTROL AGENCY



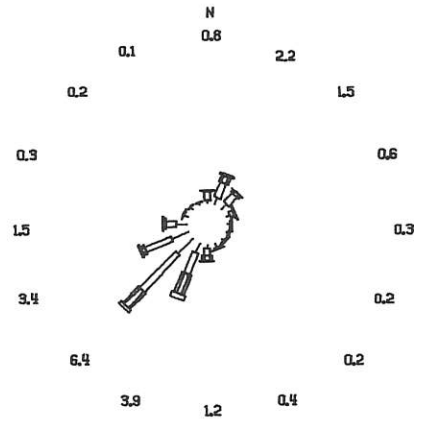
Extremely Unstable
0.6 %



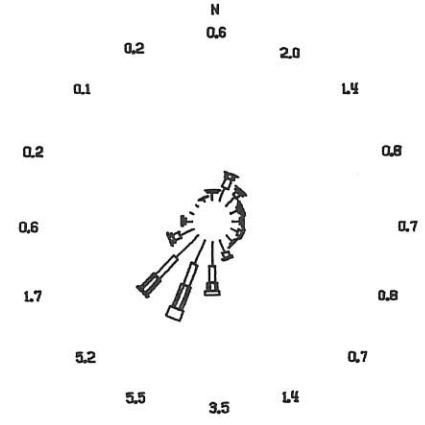
Unstable
8.5 %



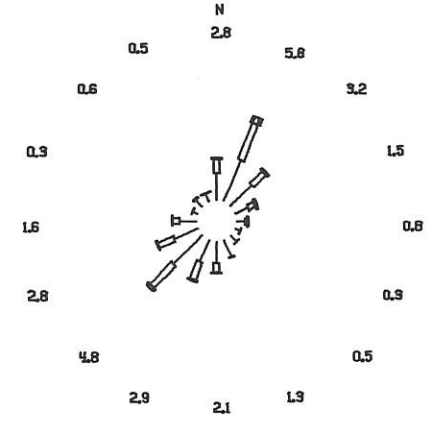
Slightly Unstable
10.3 %



Neutral Daytime
23.2%



Neutral Nighttime
25.5%



Stable
31.9 %

STABILITY WIND ROSES

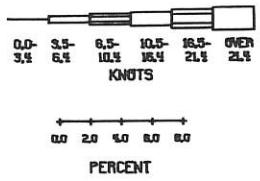
NORTH 26TH & PEARL STS, TACOMA, WA

Period of Record: JAN 1980 to DEC 1980

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

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

Percentage Frequency of Occurrence



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 $25^{o}C$.

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	$\mu g/m^3$

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	$\mu g/m^3$	$\mu g/m^3$		$\mu g/m^3$		$\mu g/m^3$	
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						
1-hour Average	0.12	same	e	same		same	
NITROGEN DIOXIDE	ppm						
Annual Average	0.05	same	a	same		same	
HYDROCARBONS (Less Methane)	ppm		b				
3-hour Average	0.24	same	f				
LEAD	$\mu g/m^3$					same as National	
Calendar Quarter Average	1.5	same	a				

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

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

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.

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