KNECHTEL

AIR QUALITY DATA SUMMARY

for counties of

King

Kitsap

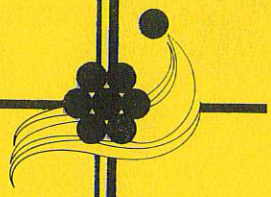
Pierce

Snohomish

1977

measured and compiled by

Technical Services Division



Puget Sound

Air Pollution Control Agency

1977
AIR QUALITY
DATA SUMMARY

measured and compiled by the
Technical Services Division

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

Puget Sound Air Pollution Control Agency

410 West Harrison Street, P.O. Box 9863 (206) 344-7330
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Serving King, Kitsap, Pierce and Snohomish Counties
410 W. Harrison St., P.O. Box 9863, Seattle, WA 98109

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PUBLISHED SEPTEMBER 15, 1978
TECHNICAL SERVICES DIVISION
(206) 344-7326

1977 AIR QUALITY DATA SUMMARY

CONTENTS

INTRODUCTION

Air Quality and Meteorological data collected in the Central Puget Sound Region during 1977 are presented in this Sixth Annual Data Summary. The format is similar to that in past annual summaries with a few pages of data that has not been previously reported. A short discussion about local areas where ambient air quality standards have yet to be met is presented on Page 7. Lower atmosphere temperature sounding data for the region are presented here for the first time together with a discussion of their significance.

The summary begins with a table showing addresses of the Agency's air sampling sites. The related locator map makes clear that monitoring is concentrated in or near industrial/urban centers. A detailed description of the data collection system follows the locator map. The body of the report contains summaries of pollutant measurements for 1977 and several interpretive analyses and comments on the data. The report ends with meteorological data summarized in a series of wind roses.

The Agency collects air quality and meteorological data by means of telemetry. In addition, a network of high volume air samplers obtains suspended particulate measurements in accordance with the federal reference method. All data collected are reported quarterly to the State Department of Ecology; some of it is forwarded from there to the National Aerometric Data Bank maintained by the U. S. Environmental Protection Agency. The State Department of Ecology conducts some air monitoring within the region in addition to that done by the Agency. The Department of Ecology publishes its own annual summary which contains data for the state as a whole. Requests for specific information on such air pollutants as carbon monoxide, ozone, and oxides of nitrogen should be directed to the Washington State Department of Ecology, Olympia, Washington, 98504, (206) 753-2843).

Those who require information for decision making or scientific purposes need the detail that is presented in these annual data summaries. Persons who only have a general interest or who are not familiar with air quality or meteorological data may call the Agency's Technical Services Division for help in interpreting the data.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

ATMOSPHERIC SAMPLING NETWORK

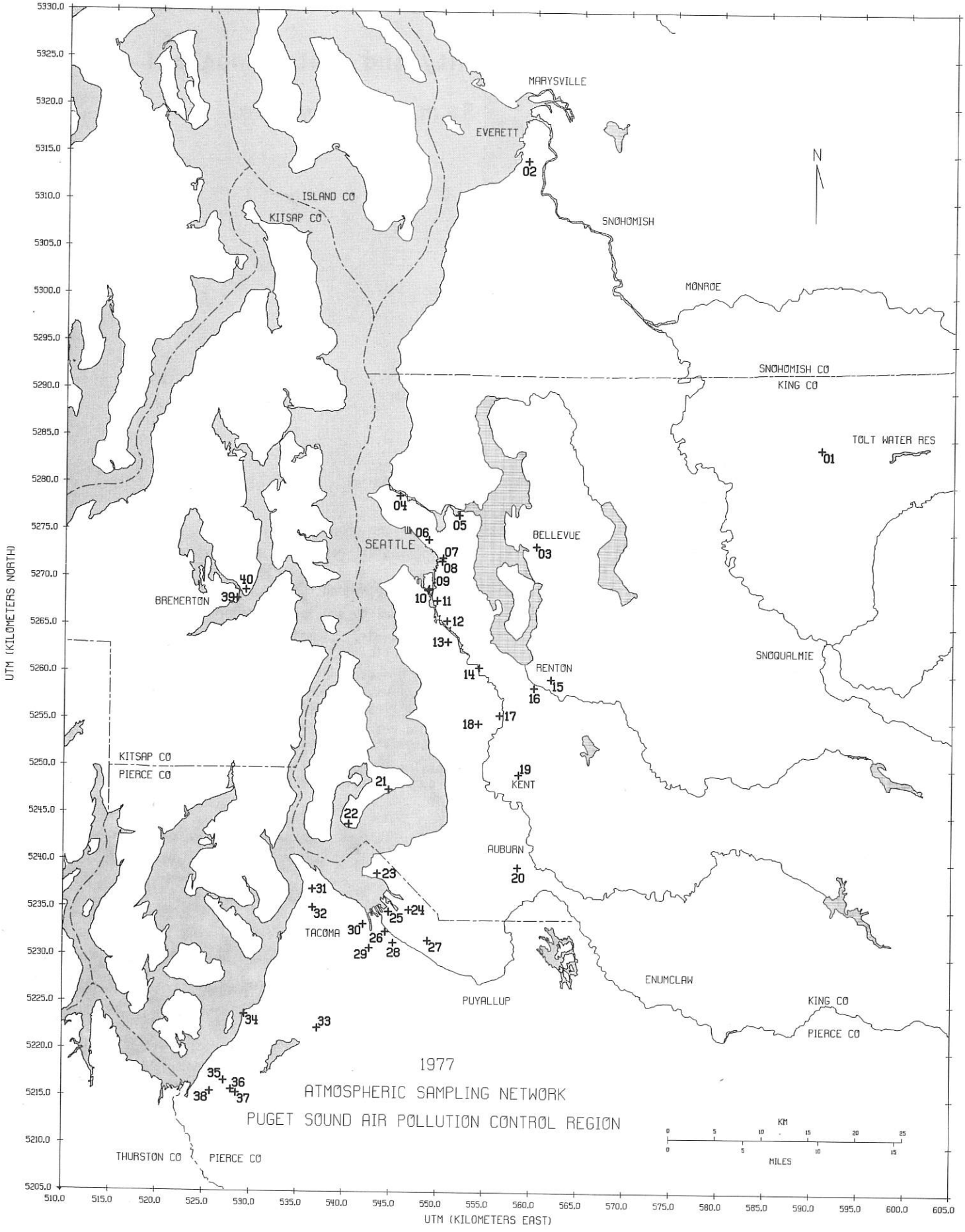
1977

Sta. Code	Location	Type of Sampling** A	B	C	D	E	F	G	H	I	J	K
01	Tolt River Watershed (East of Lake Joy)	A										
02	Medical Dental Bldg., 2730 Colby Ave., Everett	A	B	C	D							
03	Puget Power Bldg., 10604 N.E. 4th, Bellevue	A										
04	USCG Station, 2700 W. Commodore Way, Seattle	A										
05	NWS Urban Site, 2725 Montlake Blvd. E., Seattle*				D							
06	Food Circus Building, Seattle Center	A	B	C	D							
07	Public Safety Bldg., 604 3rd Ave., Seattle	A										
08	Fire Station #10, 301 2nd Ave. S., Seattle*	A										
09	Harbor Island, 3400 13th Ave. S.W., Seattle	A										
10	Harbor Island, 3419 13th Ave. S.W., Seattle		B		D							
11	Duwamish, 4500 E. Marginal Way S., Seattle	A	B	C	D							
12	S. River St. & Maynard Ave., Seattle*	A										
13	South Park, 723 S. Concord St., Seattle	A										
14	Duwamish Valley, 12026 42nd Ave. S., King County	A										
15	S.E. Dist. Health Center, 12015 S.E. 128th St., Renton	A										
16	Municipal Bldg., 200 Mill Ave. S., Renton	A										
17	Southcenter, 401 Andover Park E., Tukwila	A	B	C	D							
18	McMicken Hts., S. 176th & 42nd Ave. S., King County	A	B	C	D			G				
19	22916 86th Ave. S., Kent	A	B	C	D			G				K
20	115 E. Main St., Auburn	A										
21	S.W. 248th & 59th Ave. S.W., Maury Island		B		D							
22	S.W. 283rd & 101st Ave. S.W., Maury Island		B		D							
23	Meeker Jr. H.S., 1526 51st St. N.E., Tacoma	A	B	C	D							
24	2340 Taylor Way, Tacoma	A										
25	Fire Station #12, 2316 E. 11th St., Tacoma	A		C	D							
26	Treatment Plant, 1241 Cleveland Way, Tacoma	A										
27	Fife Sr. H.S., 5616 20th E., Fife	A										
28	Cascadia, 2002 E. 28th St., Tacoma	A										
29	Willard Elem. School, S. 32nd & S. "D" St., Tacoma	A		C	D							
30	Hess Bldg., 901 Tacoma Ave. S., Tacoma	A										
31	N. 43rd and Visscher Streets, Tacoma		B	C	D							
32	N. 26th and Pearl Streets, Tacoma	A	B	C	D							
33	5502 - 112th St. S.W., Lakewood*	A										
34	Steilacoom Marina (Gordon Pt.), Steilacoom	A										
35	Second Old Fort Nisqually, Du Pont	A	B	C	D	E	F		H	I	J	
36	City Water Supply Pump House, Du Pont	A										
37	PNW-Bell Repeater Bldg., Du Pont (Near I5)	A	B	C	D	E	F		H	I		
38	Yehle's Residence, Du Pont Ave., Du Pont	A										
39	City Hall, 239 4th St., Bremerton*	A										
40	E. 16th St. & Ironsides Ave., Bremerton	A										

*Station operated by Washington State Department of Ecology

**Type of Sampling

A Suspended Particulates (High-Volume)
B Sulfur Dioxide (SO_2)
C Suspended Particulates (COH's)
D Wind Speed & Direction
E Nitrogen Dioxide (NO_2)
F Nitrogen Oxides (NO_x)
G Ozone (O_3)
H Hydrocarbons (Nonmethane)
I Carbon Monoxide (CO)
J Delta Temperature
K Atmospheric Particles (B - Scattering)


1977
ATMOSPHERIC SAMPLING NETWORK
PUGET SOUND AIR POLLUTION CONTROL REGION
MARYSVILLE
EVERETT
ISLAND CO
KITSAP CO
SNOHOMISH
MONROE
SNOHOMISH CO
KING CO
TOLT WATER RES
SEATTLE
BELLEVUE
BREMERTON
RENTON
SNOQUALMIE
KENT
AUBURN
TACOMA
PUYALLUP
ENUMCLAW
KITSAP CO
PIERCE CO
KING CO
PIERCE CO
THURSTON CO
PIERCE CO
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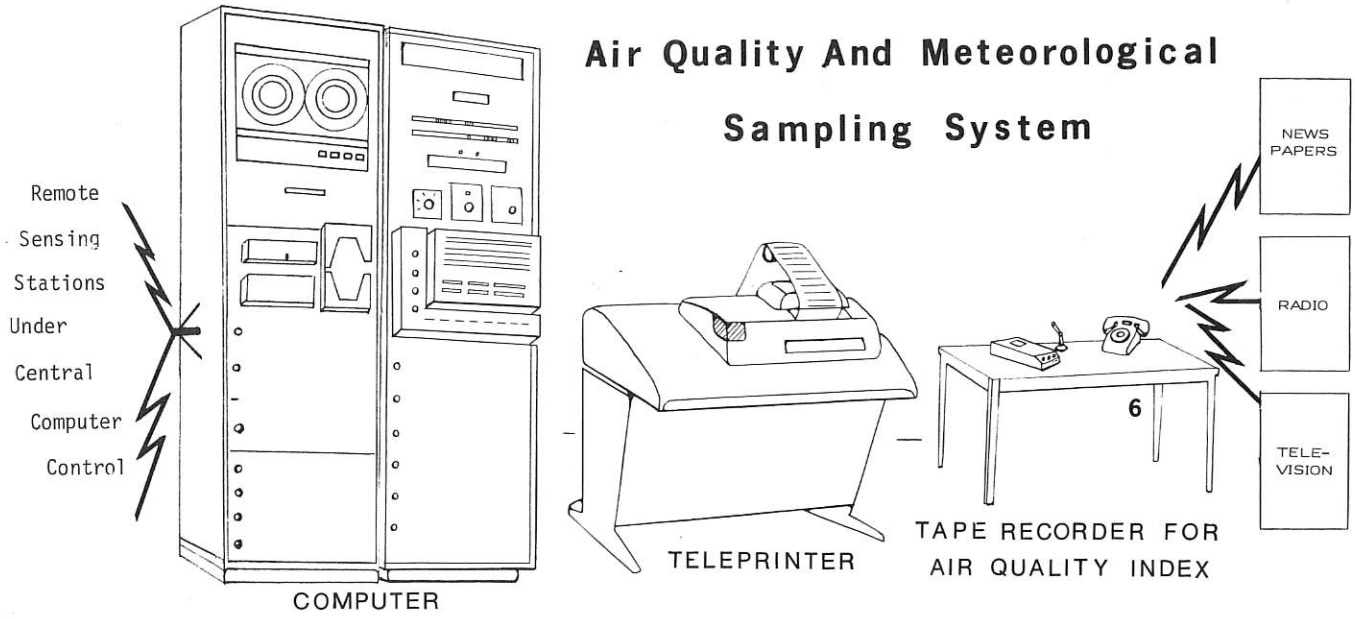
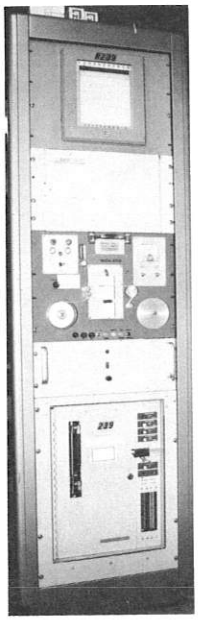
KM
MILES
UTM (KILOMETERS NORTH)
UTM (KILOMETERS EAST)

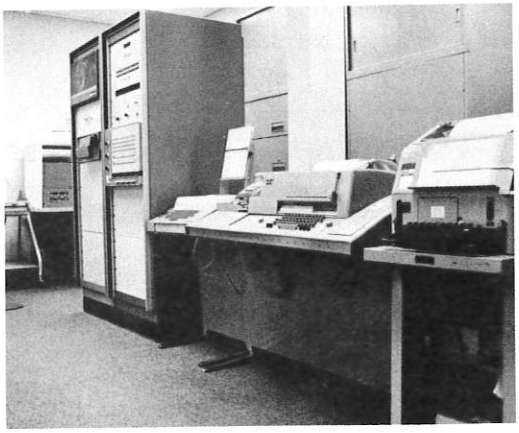
Air Quality And Meteorological Sampling System



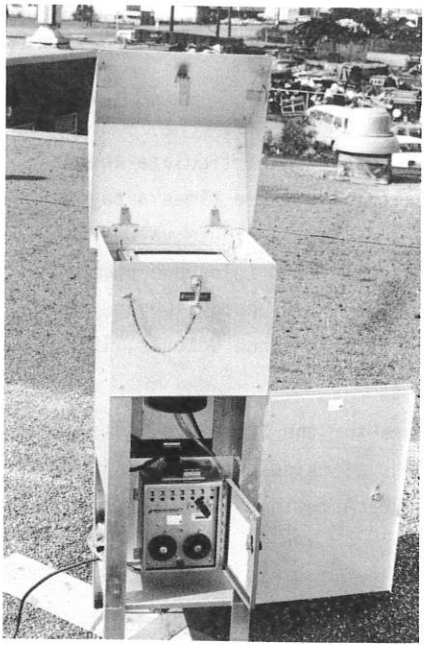
- Remote stations in the Puget Sound Region continuously monitor.....
  WIND DIRECTION WIND SPEED SULFUR DIOXIDE SUSPENDED PARTICULATES (COH's)
  (A few stations have additional sensors for monitoring OZONE)
- Raw data is immediately telemetered to the central station computer via phone lines.
- Central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



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



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



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

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

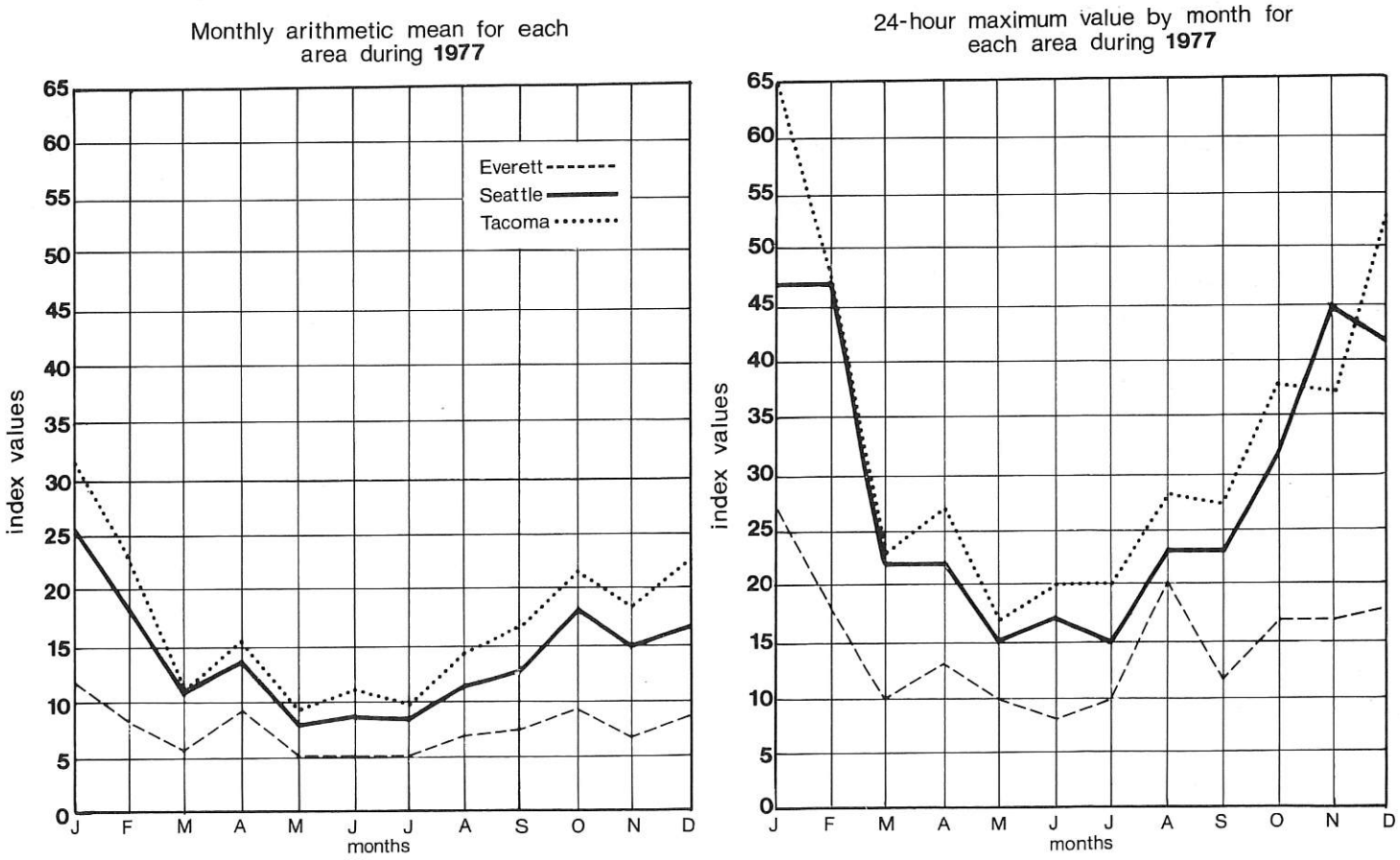
On the top right is a trailer used at Kent. On the roof are the high volume sampler, the wind sensing equipment and probes for bringing air to the analyzers. This station measures SO_2, Ozone, COH, b_{scat} (a measure of light scatter by aerosols), wind speed, direction and suspended particulates by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

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

AIR QUALITY INDEX

The air quality index is a scalar value representing the average concentration of suspended particulate and/or sulfur dioxide at a particular location over a 24-hour period. An index is calculated three times a day at 8 AM, 12 noon, and 4 PM, for each of the three geographic areas - Everett, Seattle and Tacoma These values are tape-recorded Monday through Friday and are available to the news media through an unlisted telephone number. An index of 50 corresponds to the alert stage of the Washington Episode Avoidance Plan. Values of 100 and 150 correspond to the warning and emergency stages, respectively. This index, in use locally since October, 1971, is compatible with the national Pollutant Standards Index.

The charts below depict variations from month to month in air quality index values for the Everett, Seattle, and Tacoma areas during 1977. The chart at the left gives monthly arithmetic means of calculated daily index values while the chart at the right indicates maximum index values reached during each month of the year.



"AIR STAGNATION ADVISORIES" are issued by the National Weather Service when poor atmospheric dispersion conditions exist and these conditions are forecast to persist for 24 hours or more. Air stagnation advisories were in effect during 1977 for the following periods:

Valid From:	To:
10 AM, Monday, January 24	12 Noon, Tuesday, January 25
10 AM, Wednesday, January 26	12 Noon, Sunday, January 30
10 AM, Thursday, February 3	9 AM, Friday, February 4

NON-ATTAINMENT OF AMBIENT AIR QUALITY STANDARDS

In 1970 the U. S. Congress established deadline dates for meeting National Ambient Air Quality Standards (NAAQS). The deadlines have long passed. The U.S. Environmental Protection Agency (EPA) has documented general progress toward meeting the standards, but there are yet many places which haven't attained them. The 1977 federal Clean Air Act Amendments now require that all NAAQS be met as "expeditiously as practicable",but in the case of primary (health related) NAAQS, the new deadline is December 31, 1982. With respect to carbon monoxide and photochemical oxidant, if states show that the standards cannot be met by the end of 1982, the final deadline is December 31, 1987.

Since 1972, all states have carried on air pollution control work under state plans reviewed and approved in whole or in part by EPA. The 1977 Amendments require revisions of these plans by January 1, 1979, to show the control strategies that will assure attainment of NAAQS by the deadline dates. For planning purposes, each state was required to submit to EPA by December 6, 1977, a list identifying areas which did not meet the NAAQS for each pollutant. In Washington, this duty fell upon the State Department of Ecology. After review and some revisions, EPA published the designations of non-attainment areas for all states in the Federal Register for March 3, 1978. These designations are under review, and EPA expects to publish any revisions in summer, 1978.

The description of Puget Sound non-attainment areas shown on page 8 are extracts from the Federal Register. Precise boundaries for non-attainment areas are difficult to determine because the Monitoring Network cannot be dense enough to define the exact boundary nor is air pollution simply contained within such a physical boundary. It is especially difficult in the case of carbon monoxide because the most significant source, the motor vehicle, is mobile. The State Department of Ecology has, however, identified seven "hot spots" where ambient carbon monoxide standards are being exceeded. If more monitoring data becomes available , future "hot spots" may be identified. The Northgate area , Seattle's University District, the Central Business Districts of Seattle, Bellevue, and Tacoma, and a strip along Aurora Avenue and along Rainier Avenue South in Seattle are currently identified "hot spots".

DESIGNATION OF AREAS WITHIN CENTRAL PUGET SOUND REGION

THAT HAVE NOT ATTAINED NATIONAL AMBIENT AIR QUALITY STANDARDS

(Extracted from Federal Register for March 3, 1978)

	Primary Standard Exceeded	Secondary Standard Exceeded
TOTAL SUSPENDED PARTICULATE (TSP)		
Seattle - That area including the north portion of the Duwamish industrial area, and extending to the southern boundary of the Central Business District (CBD).	X	
Seattle - An area of the Duwamish Valley extending approximately 2½ miles further south than the above area.		X
Renton		X
Kent		X
Tacoma - That area including the Tideflats industrial area, east end of the CBD, and the north end of South Tacoma Way Corridor.	X	
SULFUR DIOXIDE (SO_2)		
Tacoma - A parabolic shaped area extending about 3½ miles SSW from the ASARCO copper smelter.	X	
CARBON MONOXIDE (CO)		
Greater Seattle-Tacoma Area - Boundaries to be determined.	X	
OXIDANT Ox		
Greater Seattle-Tacoma Area - in general, from Puget Sound at the west to North Bend at the east, from Puyallup at the south to Edmonds at the north.	X	

Acquisition of Data

The Agency operates a network of high volume samplers which monitors suspended particulate at various locations within King, Kitsap, Pierce and Snohomish Counties. High volume sampling is the federal reference method for measuring total suspended particulates. These samplers operate on an intermittent schedule sampling continuously for 24 hours every sixth day. A total of 20 stations have acquired at least four years of data through the end of 1977; two Seattle area stations have been in operation since 1965, thus accumulating thirteen years of data.

The Annual Standard

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

As a result of the averaging period indicated by the standard, a minimum of one year of sampling is required at any location to assess the suspended particulate concentrations with respect to the annual standard. As additional years of data are acquired, the suspended particulate concentrations become better documented at that location.

Factors Influencing Concentrations

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

Action to Reduce Concentrations

In urban areas where suspended particulate levels exceed the standards, action is required by the Clean Air Act and the 1977 Amendments to reduce concentrations of suspended particulate to meet the standards. The Agency has implemented emission standards and required sources to comply with these standards, encouraged paving of roads and parking lots, reduced open burning, and taken many other individual actions designed to reduce the amount of particulates which escape to the ambient air.

Assessing The Results

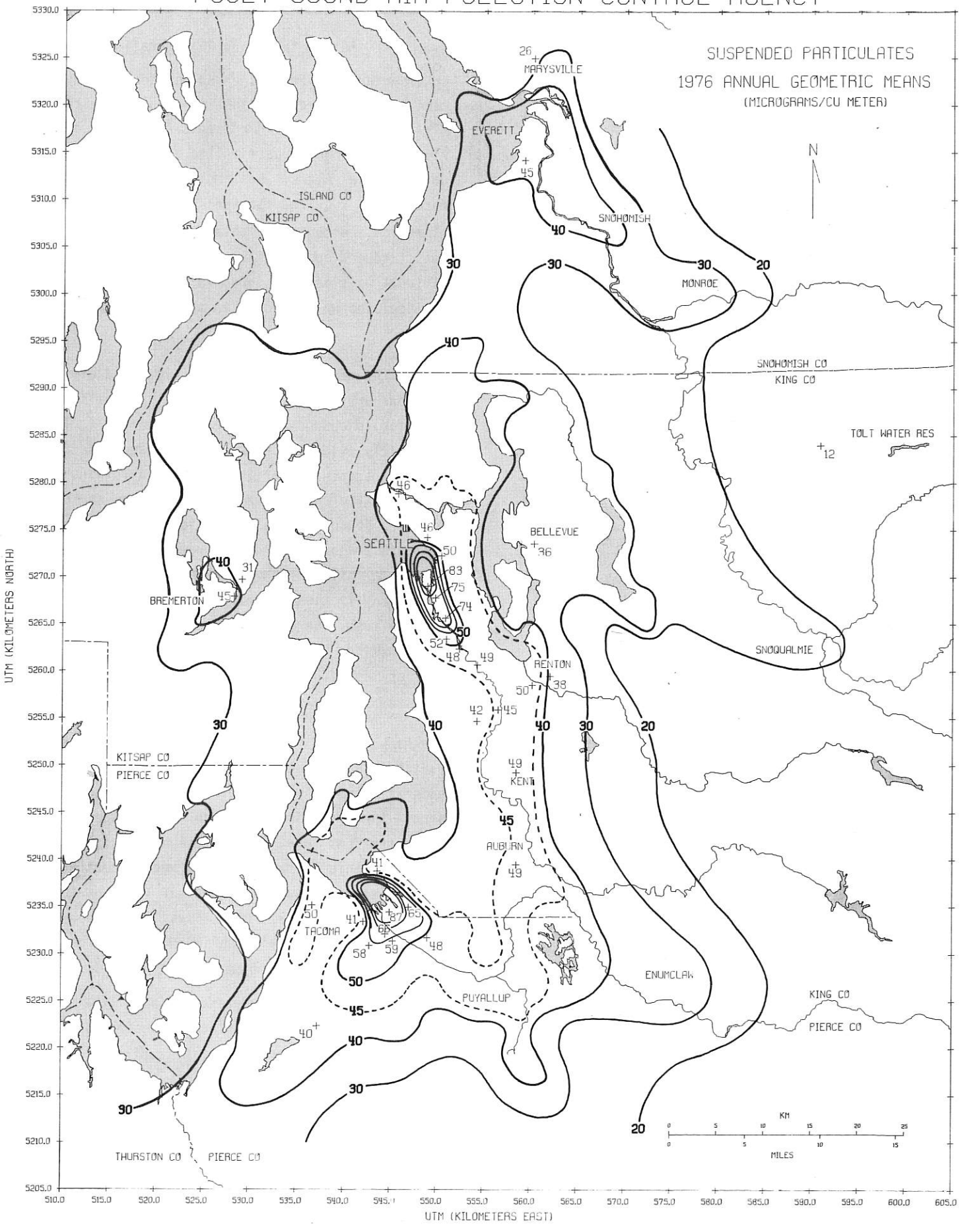
Since the air quality levels measured at sampling stations are a complex function of other factors in addition to changes in source emissions, it is never absolutely evident whether an increase or decrease in measured suspended particulate concentrations is a direct result of corresponding changes in source emissions. Meteorological conditions on sampling days that are slightly different from normal can have considerable influence on the concentrations measured at a sampling station. Analysis of trends in the air quality must, therefore, be considered with all factors in mind. Assessment of a trend based on only a year or two of data may be quite erroneous.

Suspended Particulate Maps - 1976 & 1977

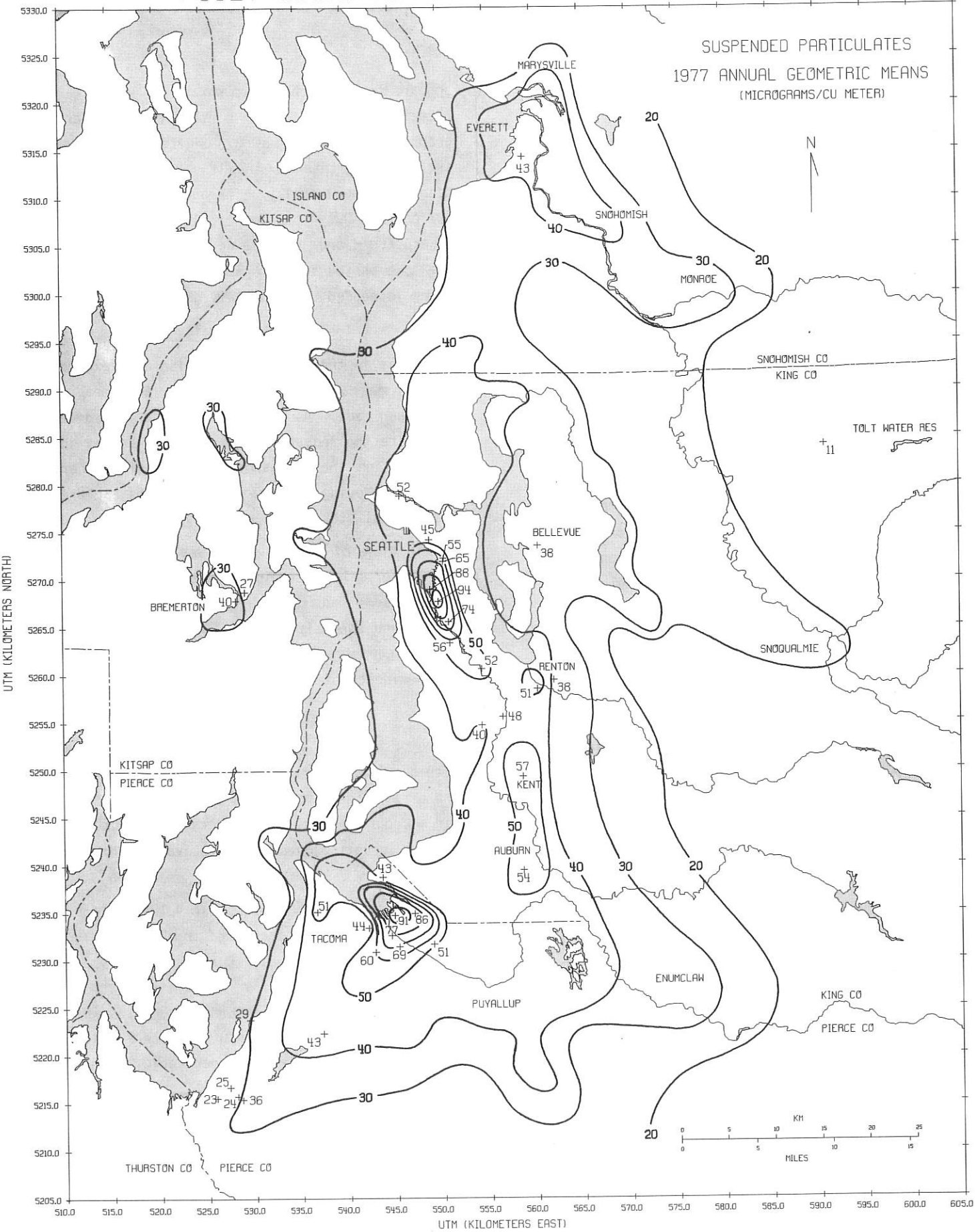
The maps which follow this page summarize suspended particulate concentrations throughout the region for each of calendar years 1976 and 1977. Each map presents annual geometric mean suspended particulate concentrations and depicts the horizontal distribution of this pollutant. Observed concentrations at each sampling station, together with information about meteorological conditions, topography, a detailed particulate emission inventory, and demography, were used in developing each map.

These maps enable the determination of the suspended particulate concentration at any desired location by interpolating between adjacent isopleths (lines connecting points of equal concentration). Areas which exceed the annual standard of 60 micrograms per cubic meter are clearly delineated. Areas exceeding this standard in 1976 and 1977 are the Tideflats-Puyallup Valley area of Tacoma, and the Harbor Island-Duwamish Valley area of Seattle.

PUGET SOUND AIR POLLUTION CONTROL AGENCY



PUGET SOUND AIR POLLUTION CONTROL AGENCY



A Technique to Examine Trends

An analysis technique which allows a reasonable determination of trends is the moving mean or average. As applied to suspended particulates, a 12 month moving geometric mean relates directly to the annual standard. This moving mean is calculated simply by computing the 12 month geometric mean for consecutive 12 month intervals and identifying each resultant value with the ending month for the particular 12 month interval. These values may be easily plotted on a graph and related directly to the annual standard. As more and more years of data are acquired at a sampling station, the power of the technique to portray a trend is enhanced.

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

These analysis techniques were applied to suspended particulate monitoring stations in the Puget Sound region which had acquired at least two years of data through the end of 1977. The longer moving geometric means were applied as the period of sampling at each station permitted.

Trends - Background Areas

The Agency has operated a single station near the Tolt Water Reservoir in the foothills of the Cascade Mountains since November, 1966. The 12, 24, and 36 month moving geometric mean graphs all depict a rather low and steady value ranging between 10 and 14 micrograms per cubic meter. This station exhibits no change in trend and appears unaffected by the urbanized areas in the Puget Sound. The value documented at Tolt is considered to be an average background value for the air of the Puget Sound region.

Trends - Portrayed by Long-Term Sampling

Data has been acquired at the Public Safety Building in Seattle since February, 1965. The long-term trend appears to be gradually downward as most clearly depicted by the 24 and 36 month moving geometric mean graphs. Assessment of a long-term trend based on isolated segments of the 12 month moving geometric mean plot could easily be erroneous; for example, the period from July to December, 1974, indicates a sharp upward trend and just the opposite is indicated during the same period in 1975. A substantial period of sampling is needed to accurately depict the trend.

Trends - Industrialized Areas

Two areas in the Puget Sound region have exceeded the annual standard most of the time that measurements have been made. As delineated by the preceding maps, these are the industrialized Duwamish Valley in South Seattle and the industrialized Tideflats area in Tacoma. Moving geometric mean graphs are presented for several stations in each of these areas.

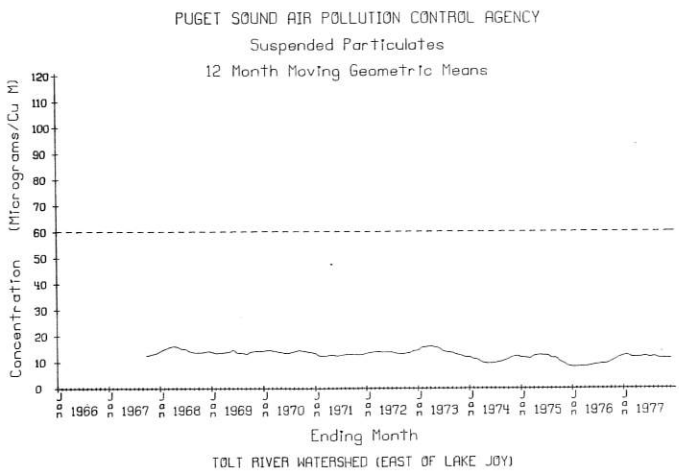
Examination of the 12-month moving geometric mean graphs for several stations in each of these two areas reveals some substantial increases over the last one to one and one-half years. Twenty-four and 36-month moving geometric mean plots, where available, also show evidence of an upward trend.

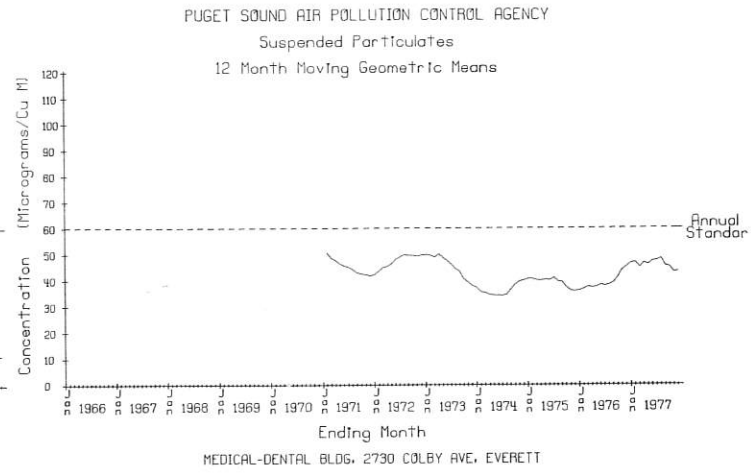
Summary - 1975 through 1977

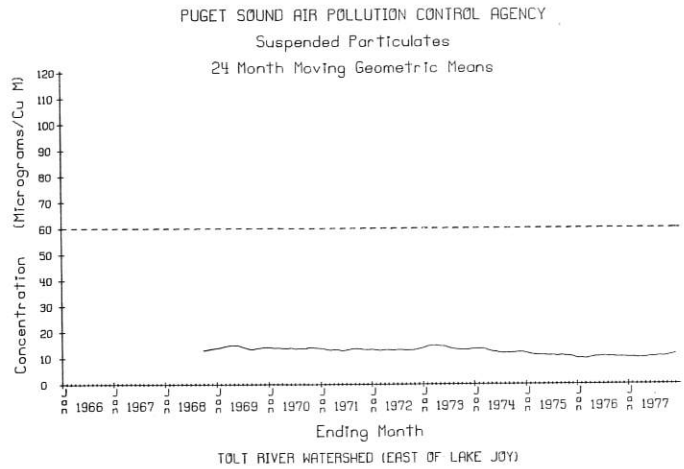
As reported last year, results of suspended particulate sampling showed higher annual mean values at the end of 1976 than at the end of 1975. These increases (in micrograms per cubic meter) ranged from about 20 in the industrialized areas to around 5 in the rural areas.

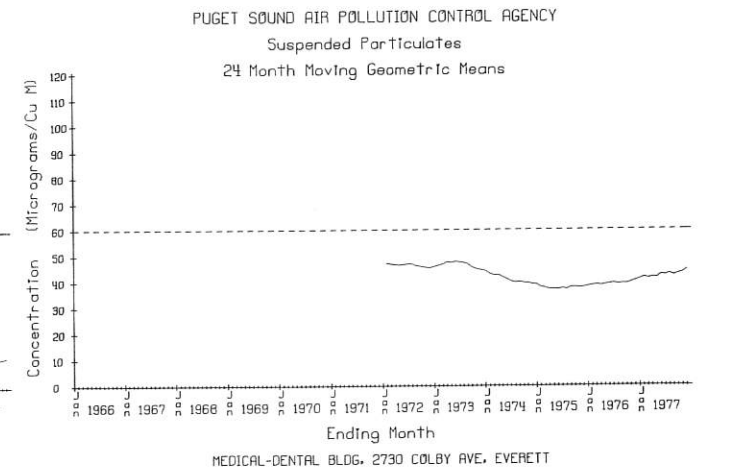
By the end of 1977, annual mean values in the industrialized areas had increased again, with increases varying between 3 and 21. During the two-year period terminating with 1977, four of 11 stations in the industrialized valleys experienced increases in the annual geometric mean of over 30, while 7 stations had increases over 20 micrograms per cubic meter.

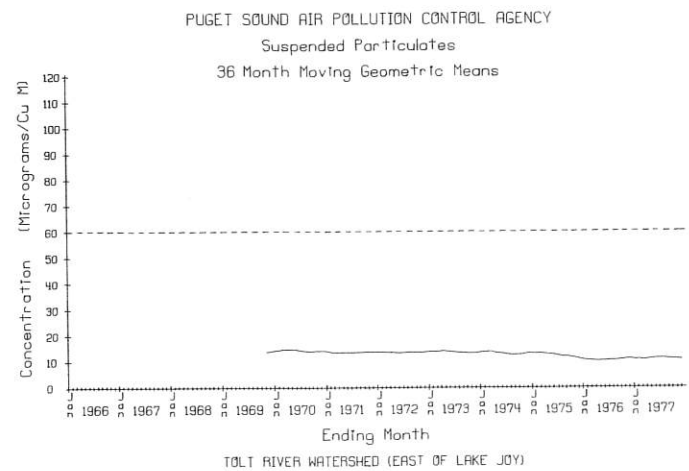
Outside the two industrialized areas, the Kent-Auburn areas recorded an increase of 5 to 8 at the end of 1977 as compared to 1976. The remainder of the Puget Sound Region recorded no change or just small increases or decreases in annual mean values.

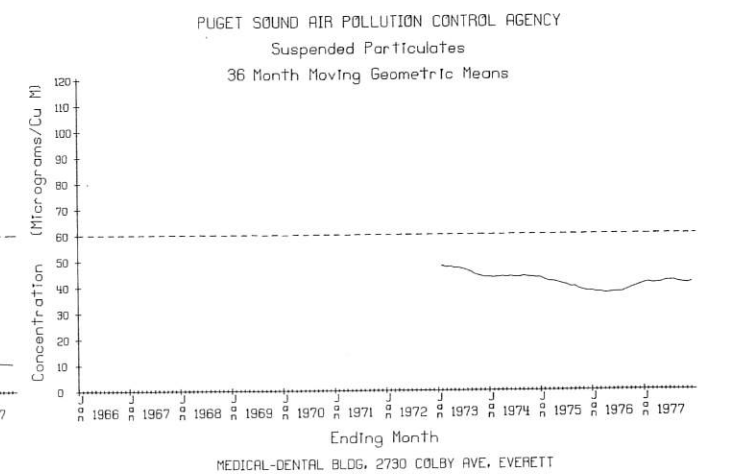

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED (EAST OF LAKE JOY)

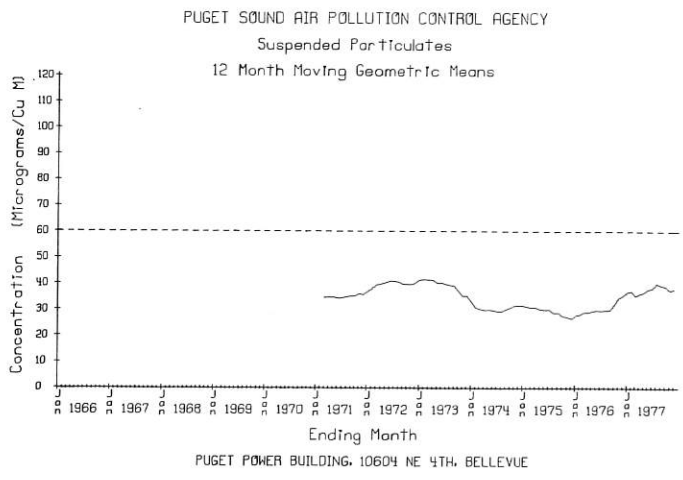

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG. 2730 COLBY AVE. EVERETT

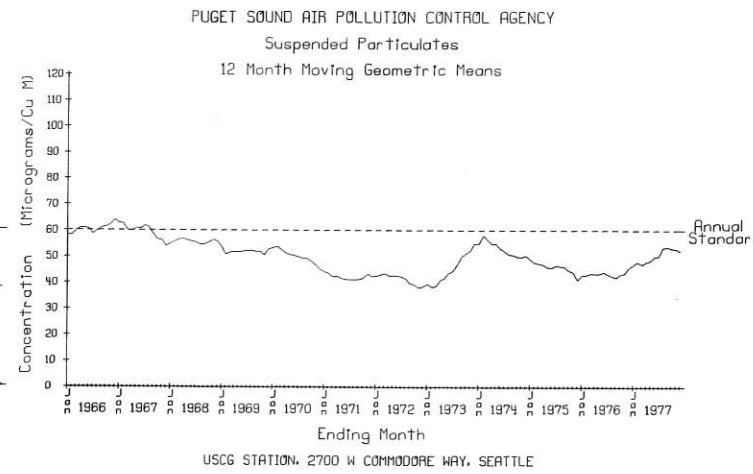

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED (EAST OF LAKE JOY)

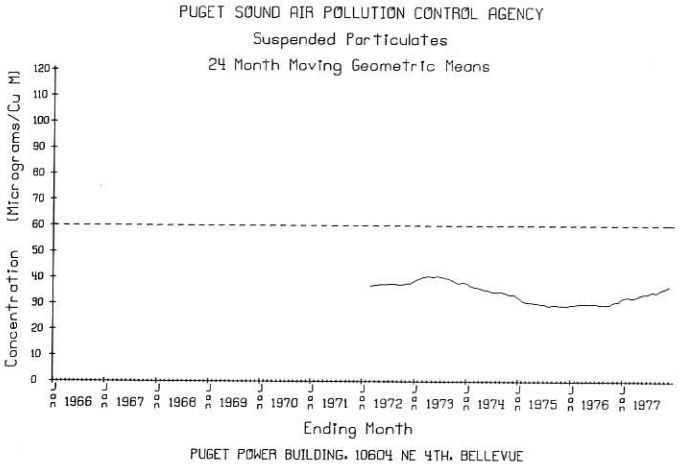

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG. 2730 COLBY AVE. EVERETT

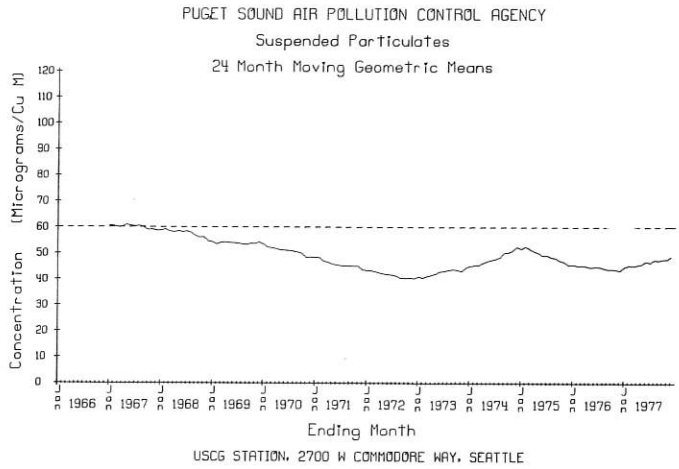

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TOLT RIVER WATERSHED (EAST OF LAKE JOY)

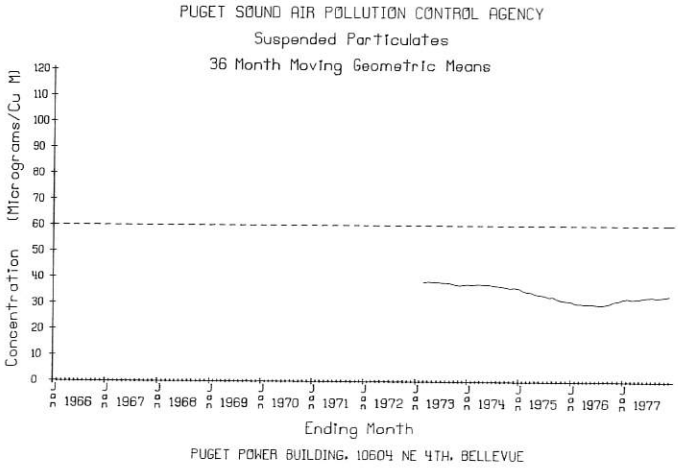

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
MEDICAL-DENTAL BLDG. 2730 COLBY AVE. EVERETT

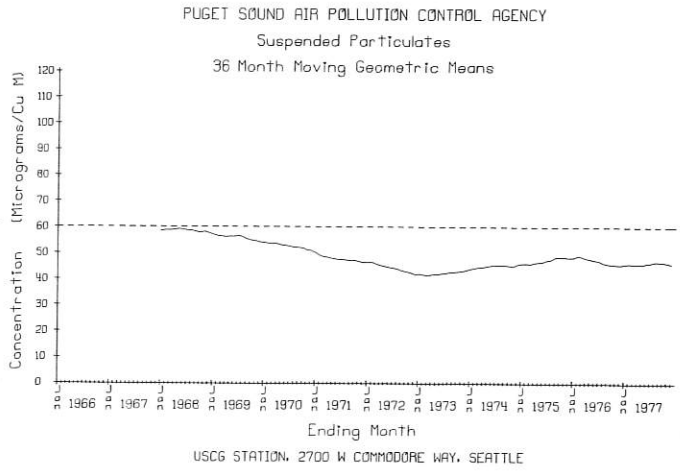

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUGET POWER BUILDING, 10604 NE 4TH, BELLEVUE


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

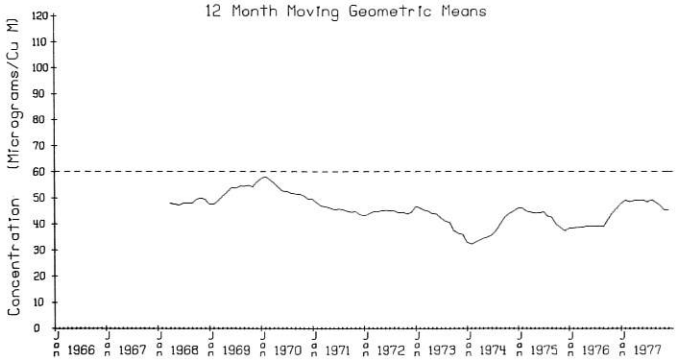

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
PUGET POWER BUILDING, 10604 NE 4TH, BELLEVUE


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


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

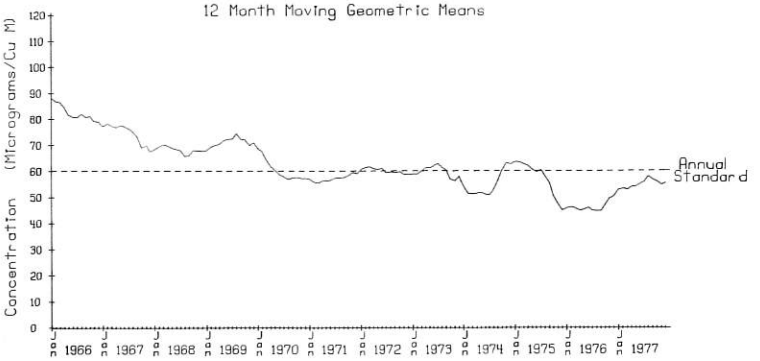

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
USCG STATION, 2700 W COMMODORE WAY, SEATTLE

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



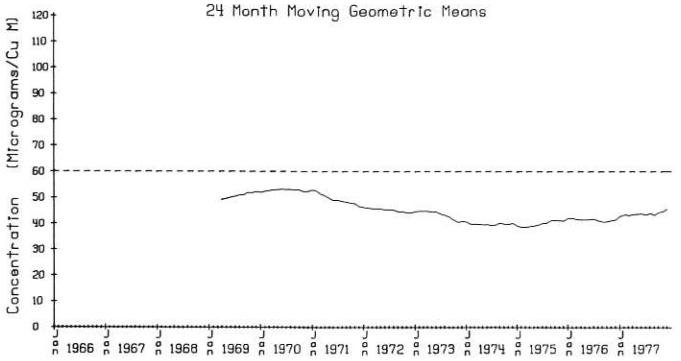
FOOD CIRCUS BUILDING, SEATTLE CENTER

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



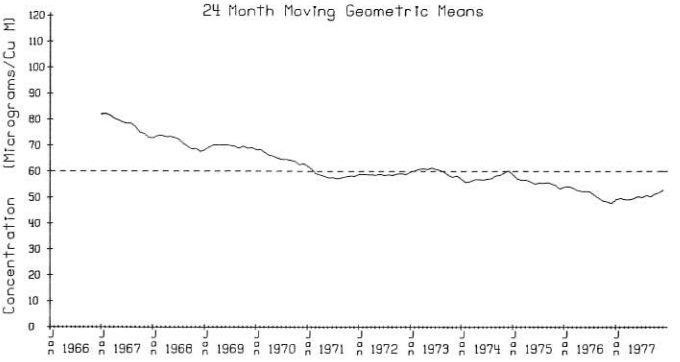
PUBLIC SAFETY BUILDING, 604 - 3RD AVE, SEATTLE

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



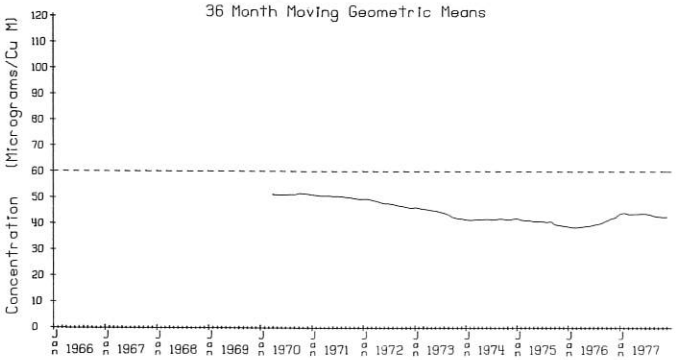
FOOD CIRCUS BUILDING, SEATTLE CENTER

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



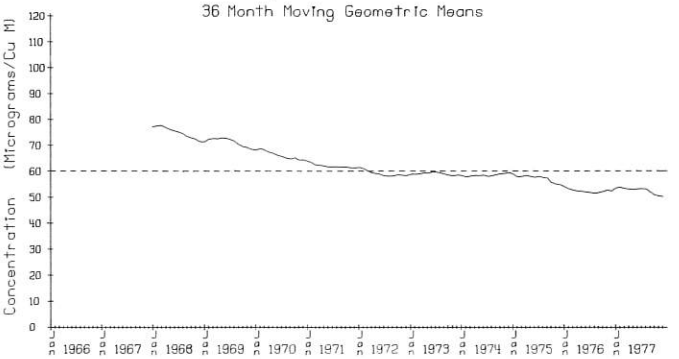
PUBLIC SAFETY BUILDING, 604 - 3RD AVE, SEATTLE

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

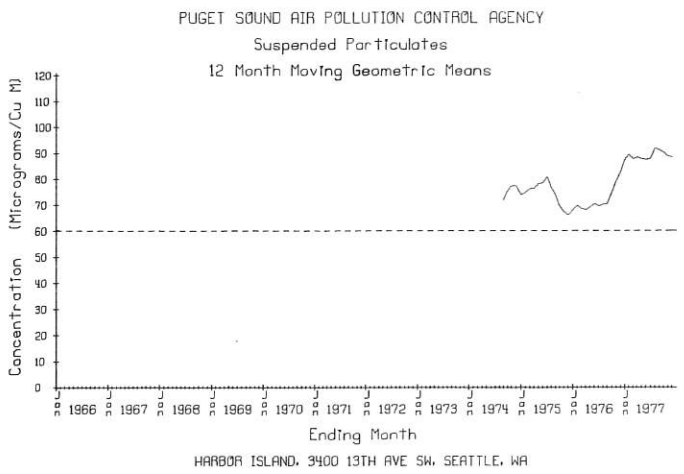


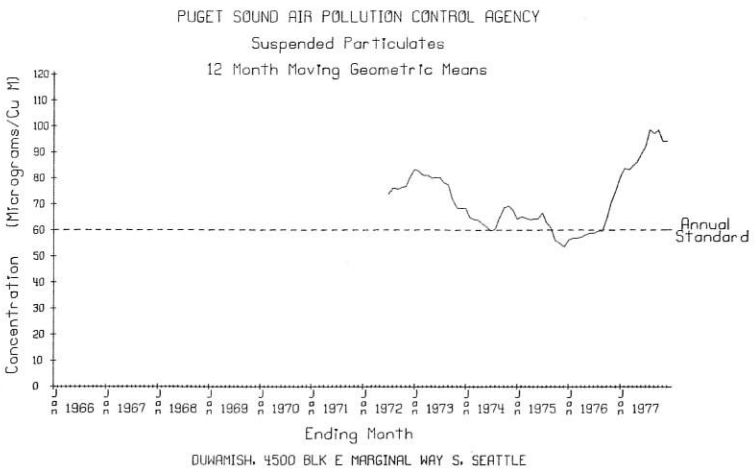
FOOD CIRCUS BUILDING, SEATTLE CENTER

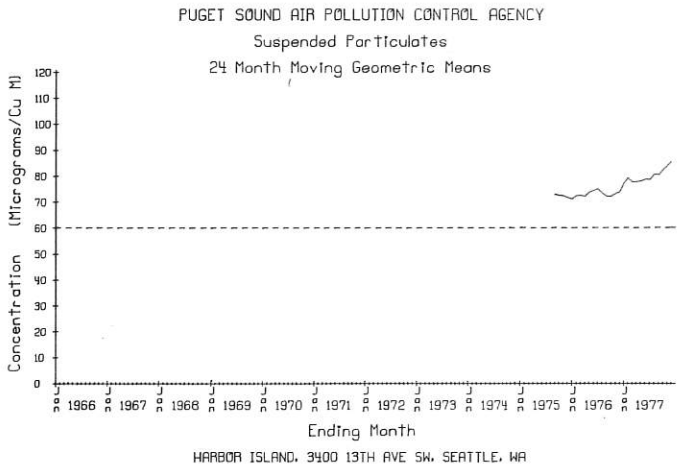
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

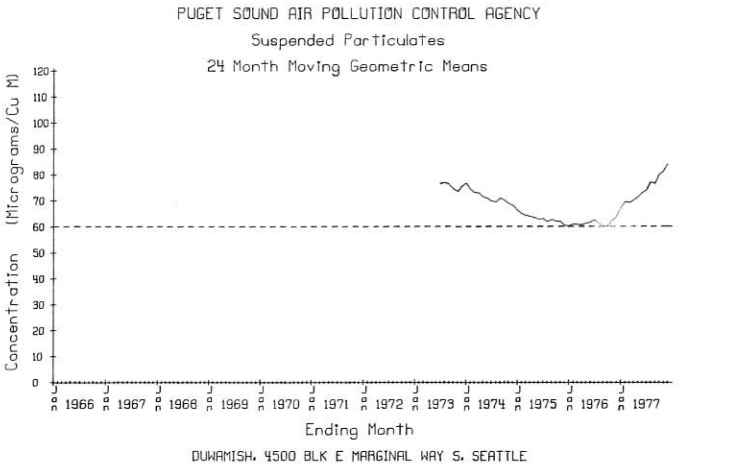


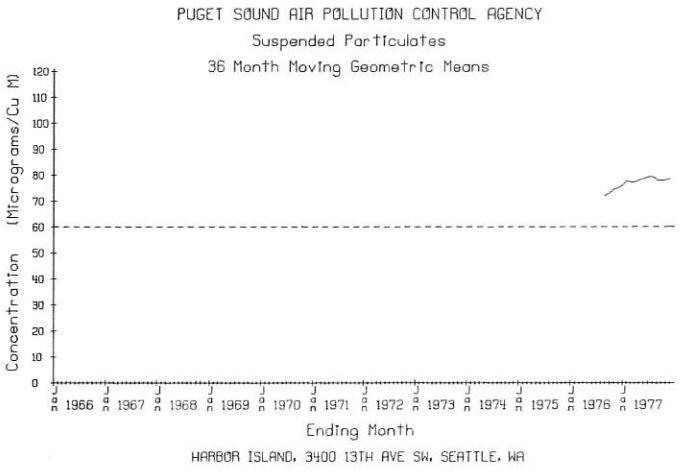
PUBLIC SAFETY BUILDING, 604 - 3RD AVE, SEATTLE

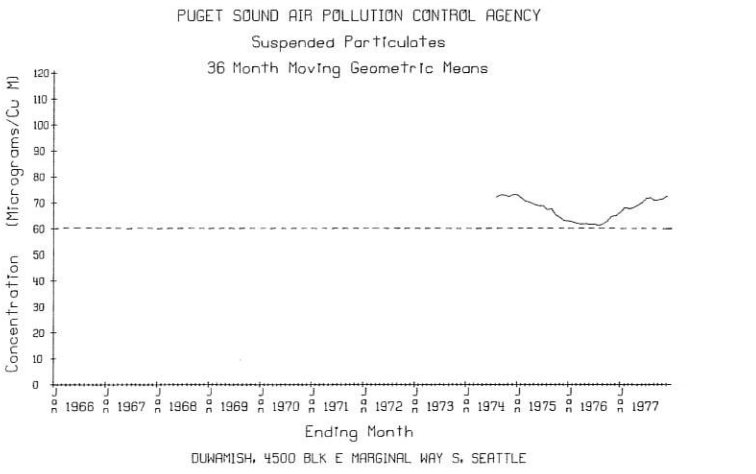

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA


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


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, 4500 BLK E MARGINAL WAY S, SEATTLE

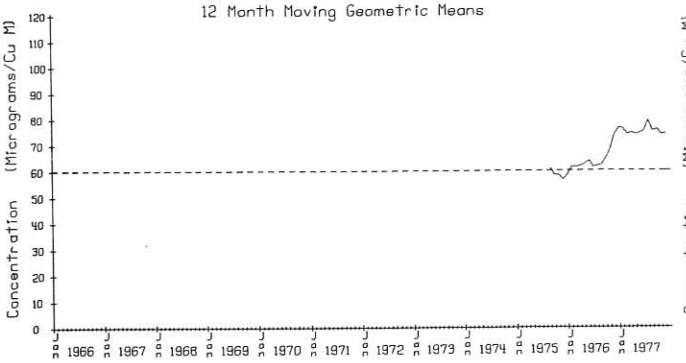

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA


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

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

12 Month Moving Geometric Means

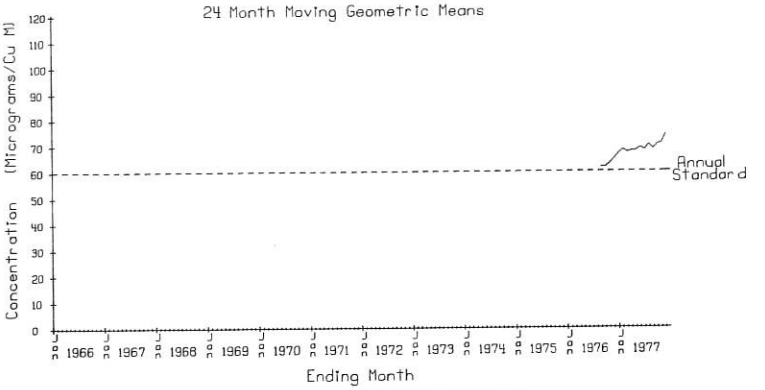


S RIVER ST AND MAYNARD AVE. SEATTLE. WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

24 Month Moving Geometric Means

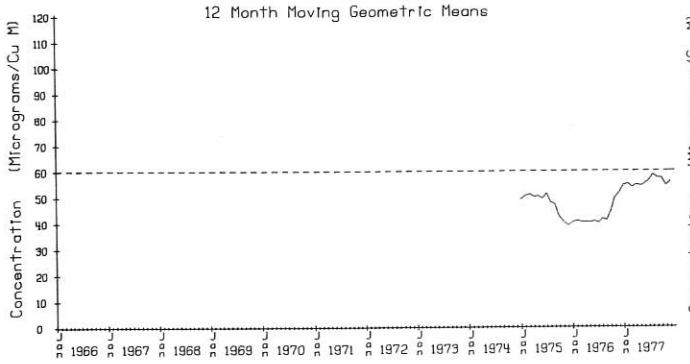


S RIVER ST AND MAYNARD AVE. SEATTLE. WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

12 Month Moving Geometric Means

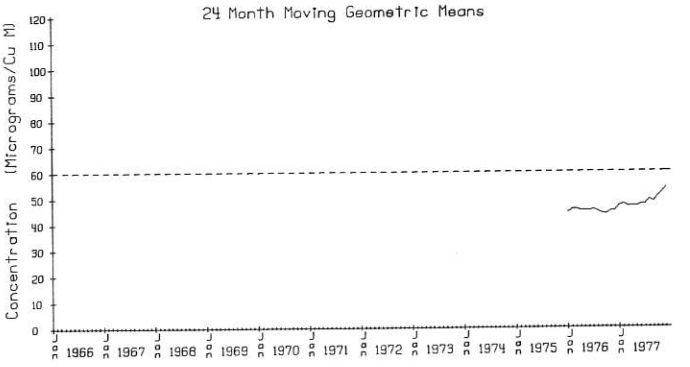


SOUTH PARK. 723 S CONCORD STREET. SEATTLE. WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

24 Month Moving Geometric Means

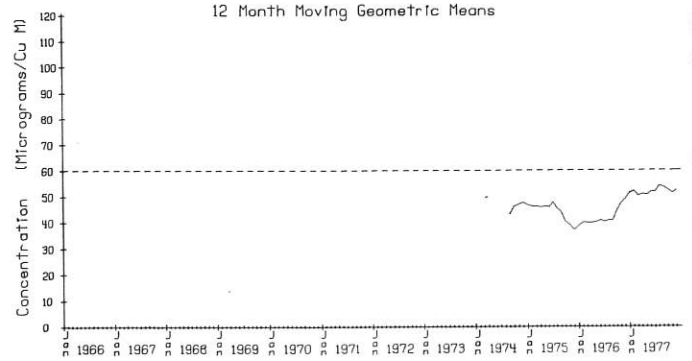


SOUTH PARK. 723 S CONCORD STREET. SEATTLE. WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

12 Month Moving Geometric Means

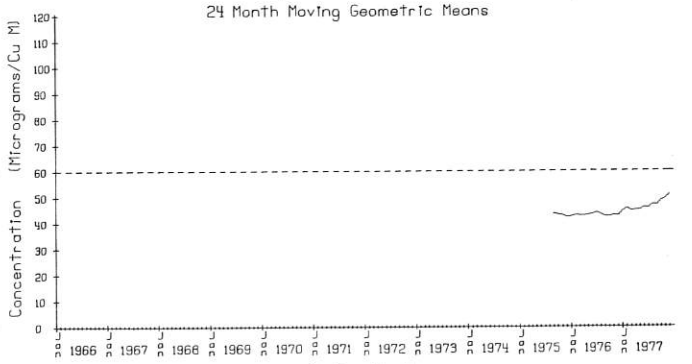


DUWAMISH VALLEY. 12026 42ND AVE S. KING CO. WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

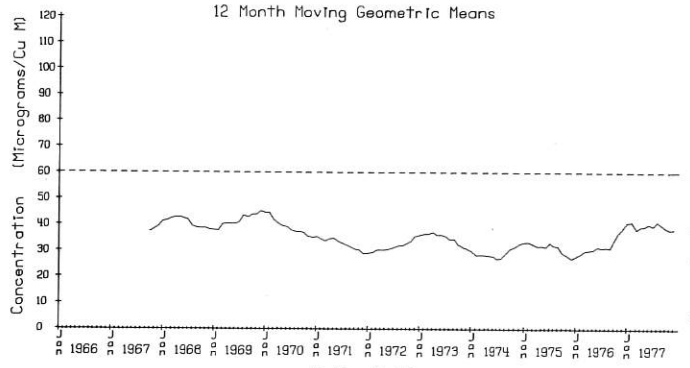
Suspended Particulates

24 Month Moving Geometric Means



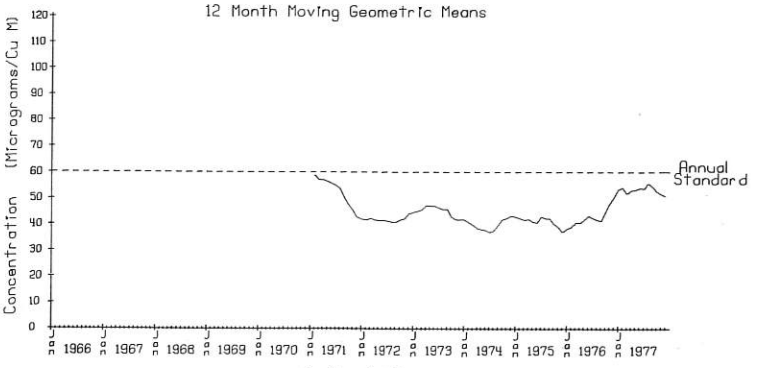
DUWAMISH VALLEY. 12026 42ND AVE S. KING CO. WA

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



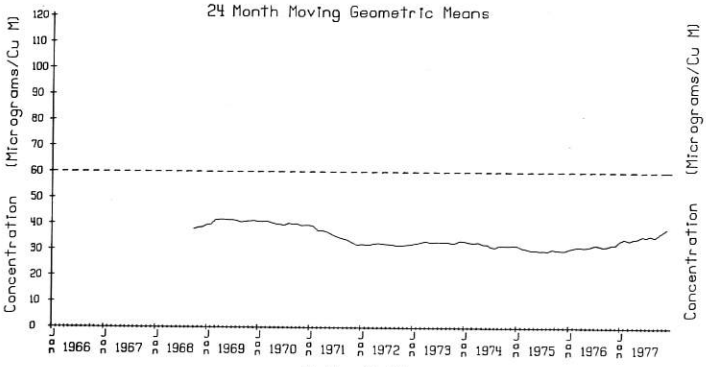
SE DIST HEALTH CENTER, 12015 SE 128TH, RENTON

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



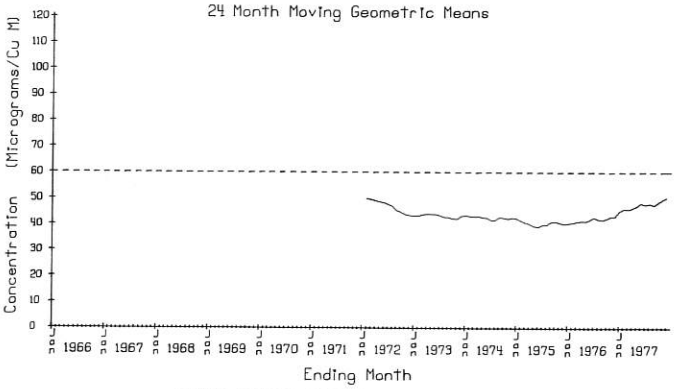
RENTON MUNICIPAL BLDG, 200 MILL AVE S, RENTON

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



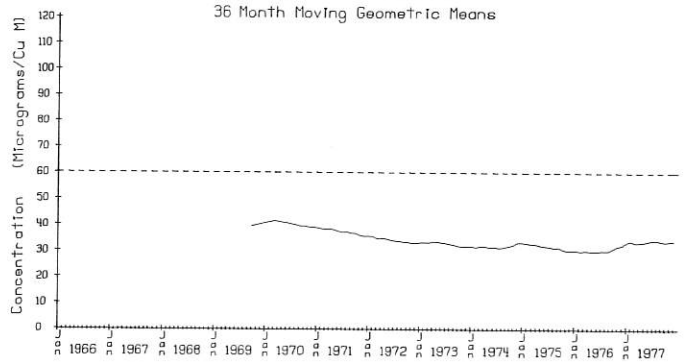
SE DIST HEALTH CENTER, 12015 SE 128TH, RENTON

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



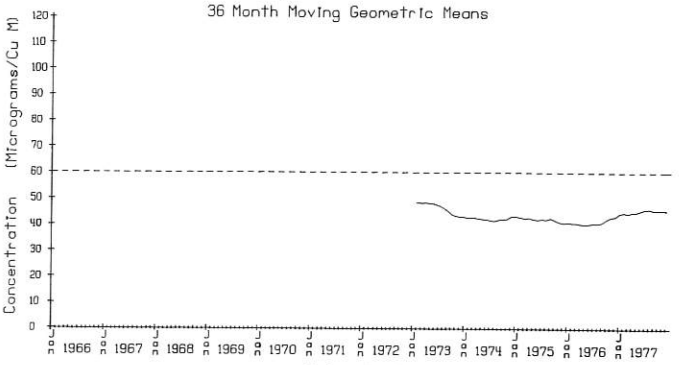
RENTON MUNICIPAL BLDG, 200 MILL AVE S, RENTON

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

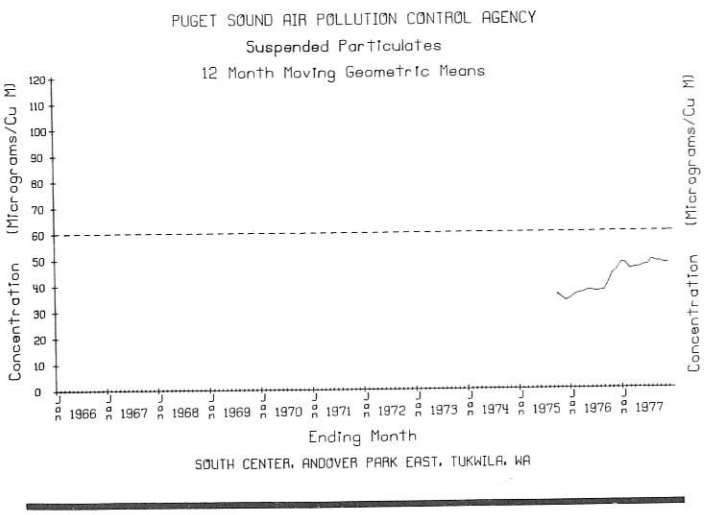


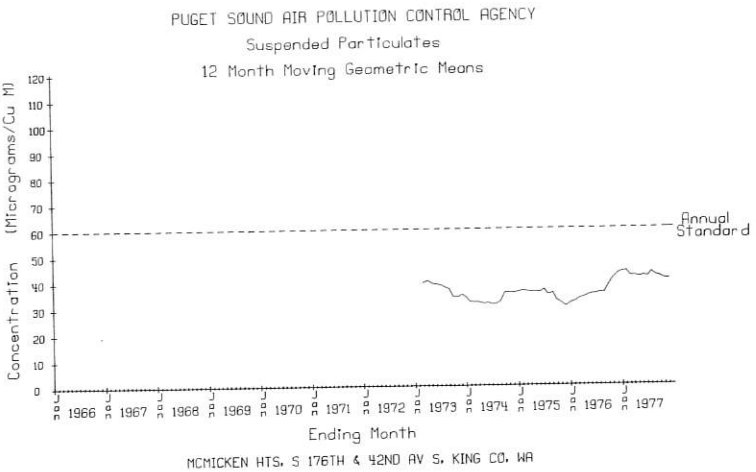
SE DIST HEALTH CENTER, 12015 SE 128TH, RENTON

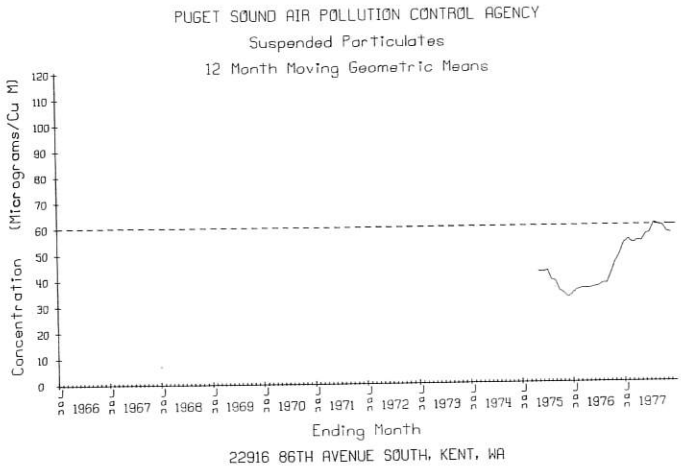
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

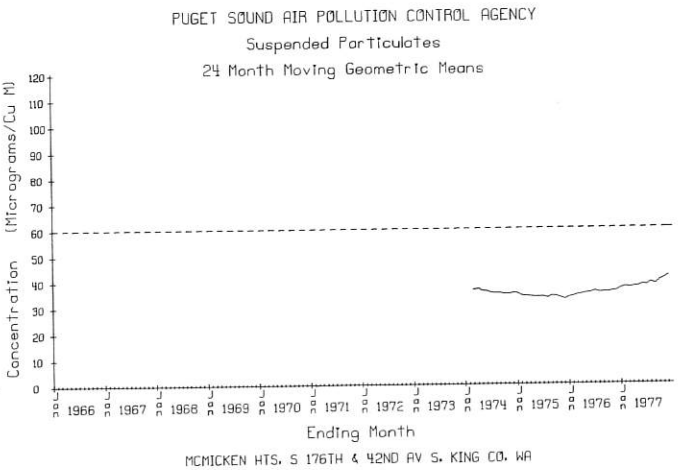


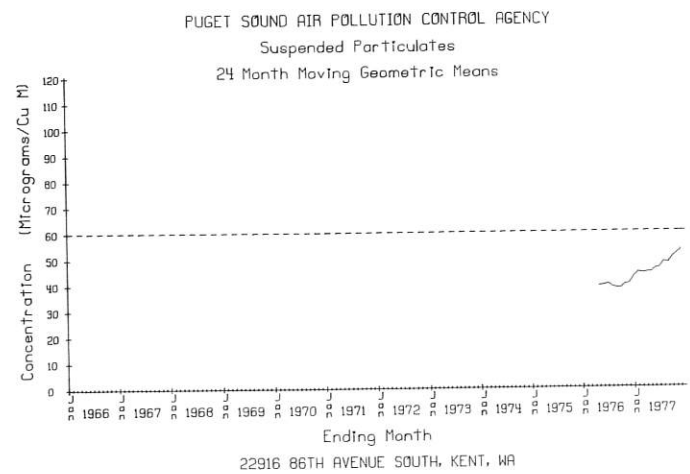
RENTON MUNICIPAL BLDG, 200 MILL AVE S, RENTON


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
1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977
Ending Month
SOUTH CENTER, ANDOVER PARK EAST, TUKWILA, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Annual Standard
120
110
100
90
80
70
60
50
40
30
20
10
0
1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977
Ending Month
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, 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
1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977
Ending Month
22916 86TH AVENUE SOUTH, KENT, 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
1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977
Ending Month
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
120
110
100
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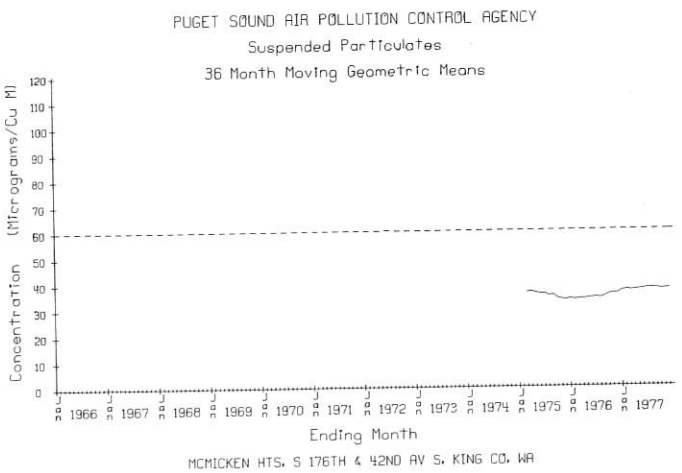
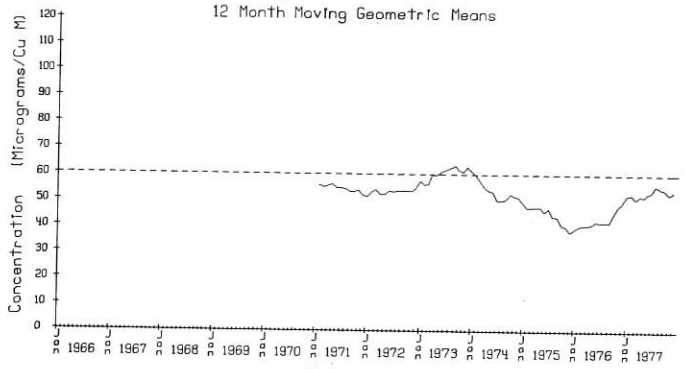
70
60
50
40
30
20
10
0
1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977
Ending Month
22916 86TH AVENUE SOUTH, KENT, WA

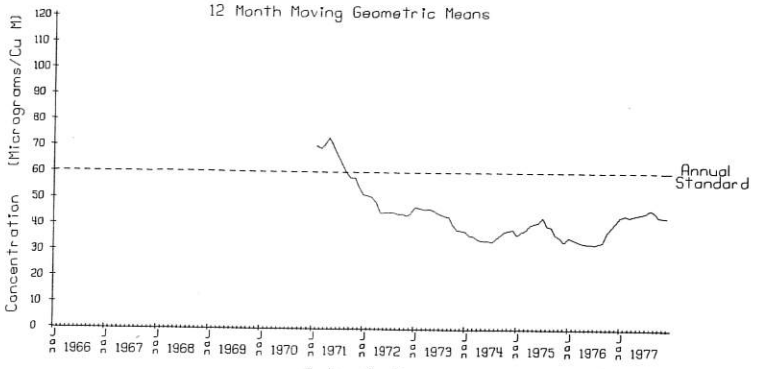

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
120
110
100
90
80
70
60
50
40
30
20
10
0
1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977
Ending Month
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA

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



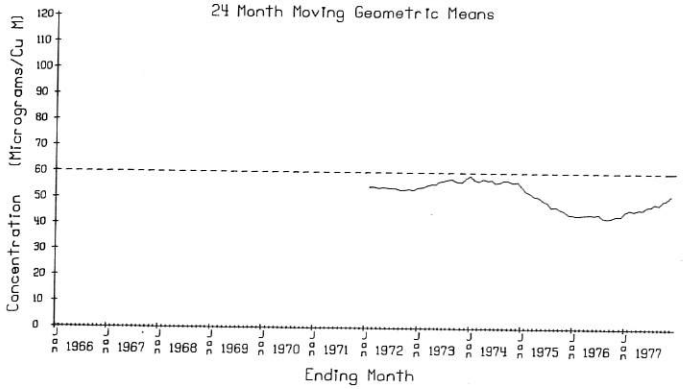
115 EAST MAIN STREET & AUBURN AVE. AUBURN, WA

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



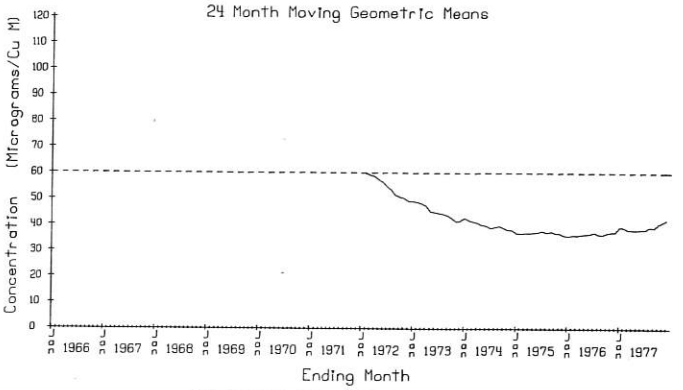
MEEKER JR HS. 1526 - 51ST STREET NE. TACOMA

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



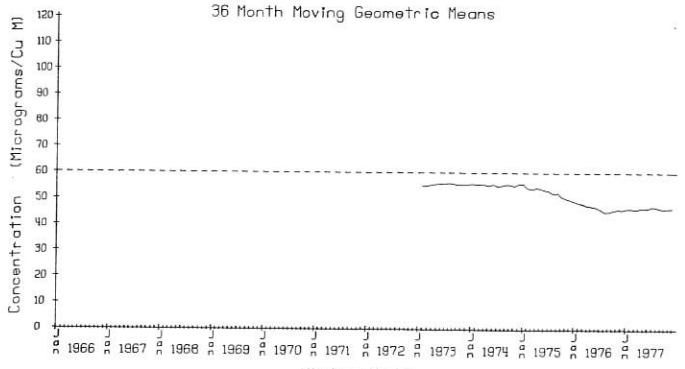
115 EAST MAIN STREET & AUBURN AVE. AUBURN, WA

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



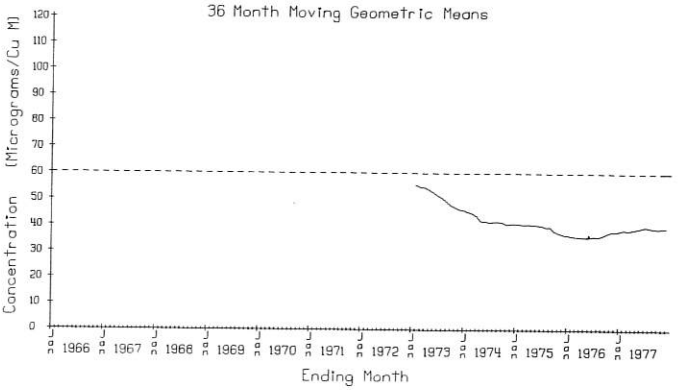
MEEKER JR HS. 1526 - 51ST STREET NE. TACOMA

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

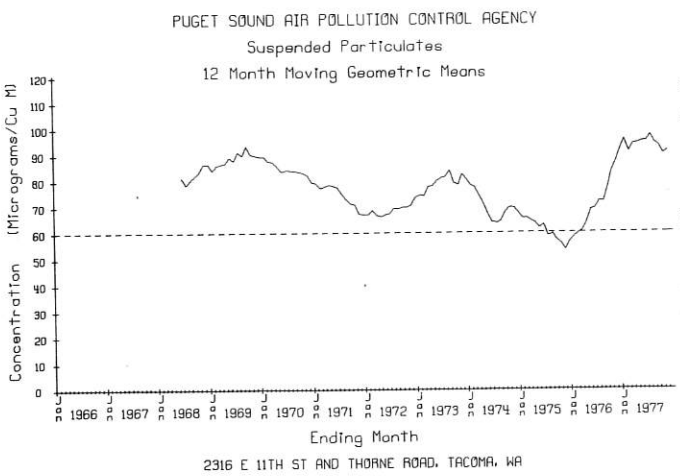


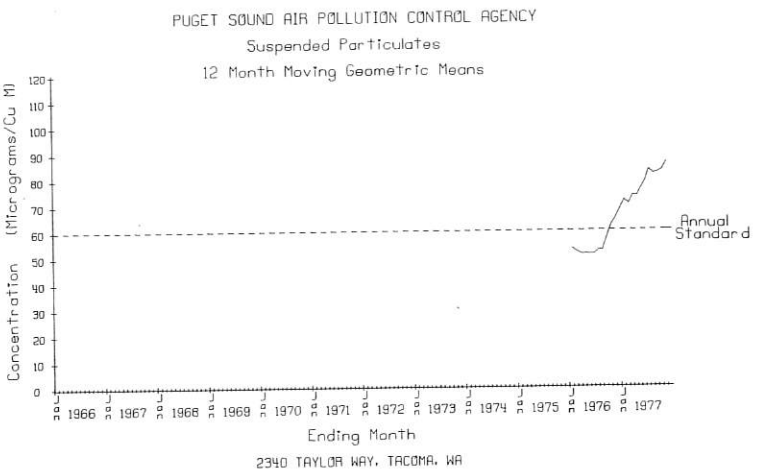
115 EAST MAIN STREET & AUBURN AVE. AUBURN, WA

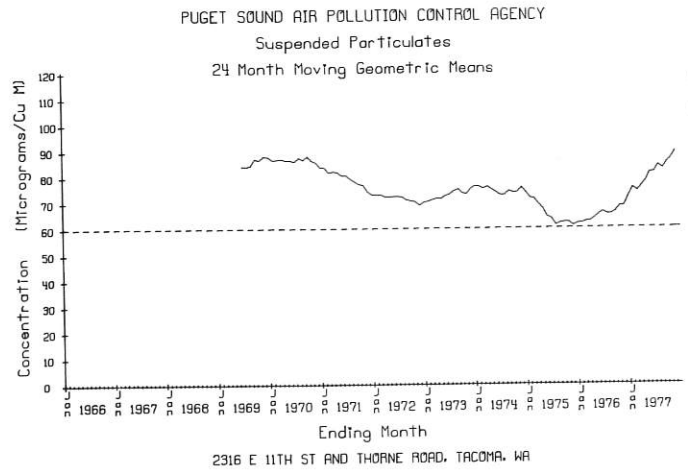
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

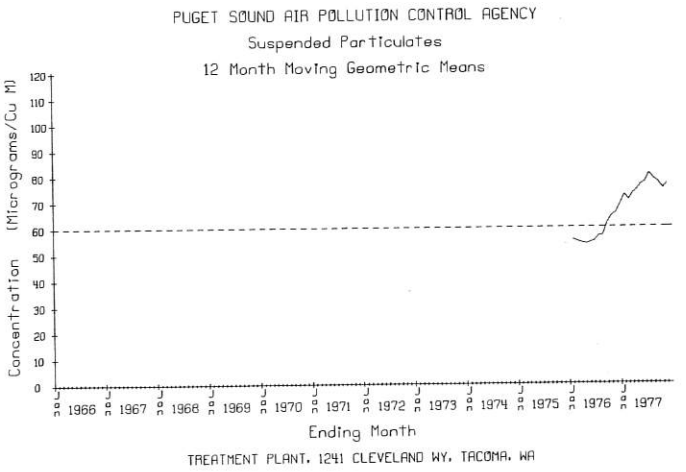


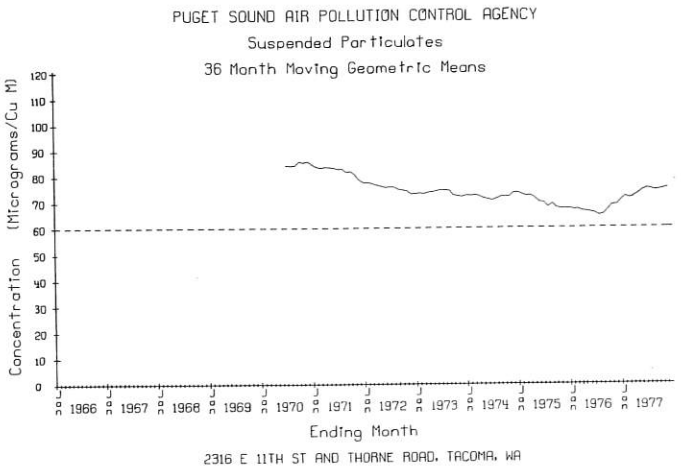
MEEKER JR HS. 1526 - 51ST STREET NE. TACOMA

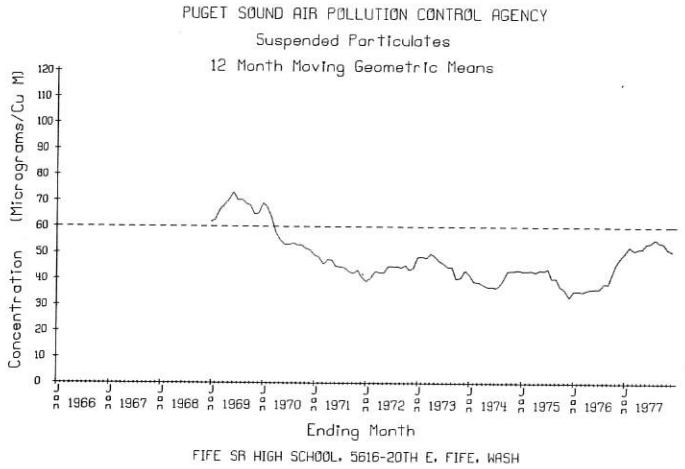

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
2316 E 11TH ST AND THORNE ROAD, TACOMA, WA

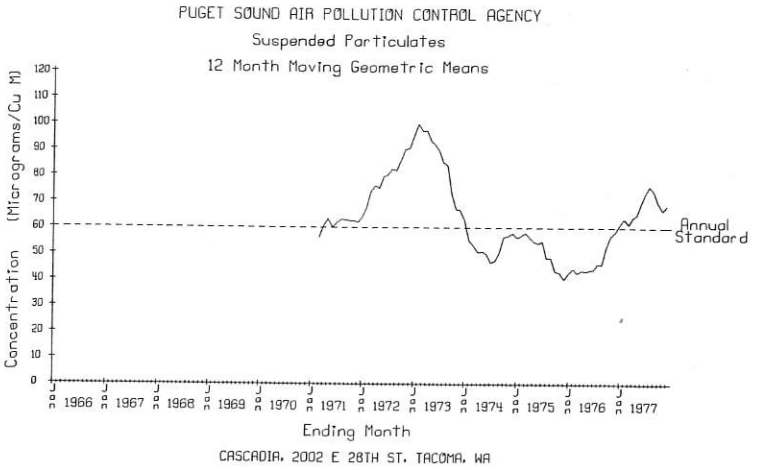

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Annual Standard
Concentration (Micrograms/Cu M)
Ending Month
2340 TAYLOR WAY, TACOMA, WA

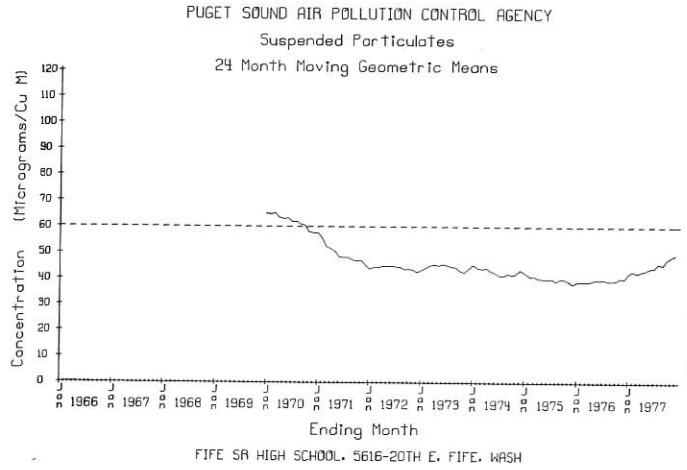

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
2316 E 11TH ST AND THORNE ROAD, TACOMA, WA

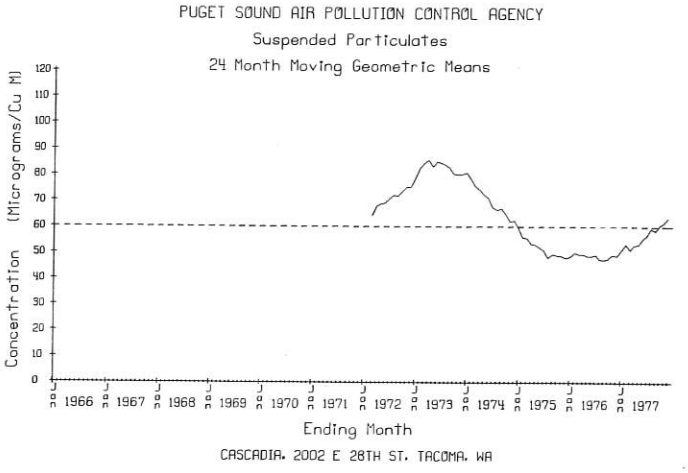

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

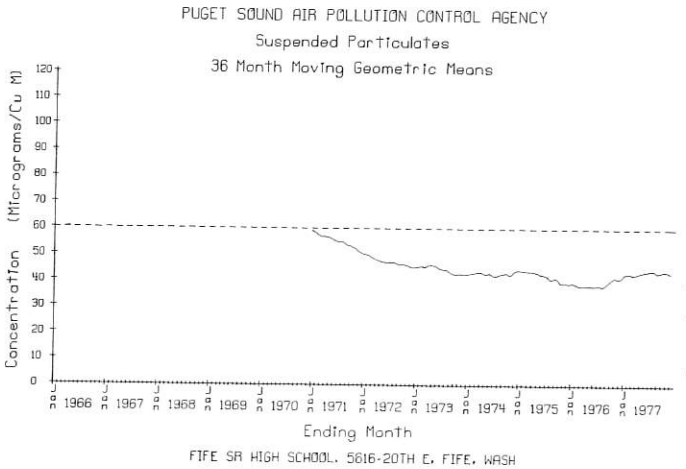

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
2316 E 11TH ST AND THORNE ROAD, TACOMA, WA

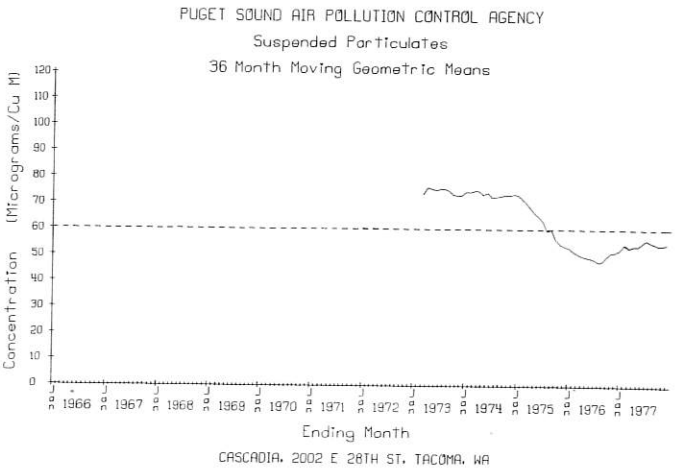

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIFE SR HIGH SCHOOL. 5616-20TH E. FIFE. WASH


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


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

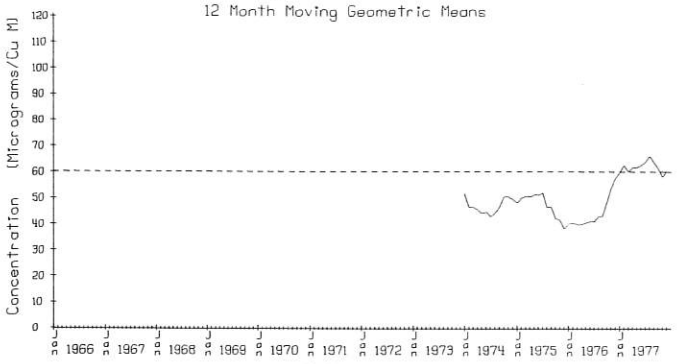

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means
Concentration (Micrograms/Cu M)
Ending Month
FIFE SR HIGH SCHOOL. 5616-20TH E. FIFE. WASH


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

12 Month Moving Geometric Means

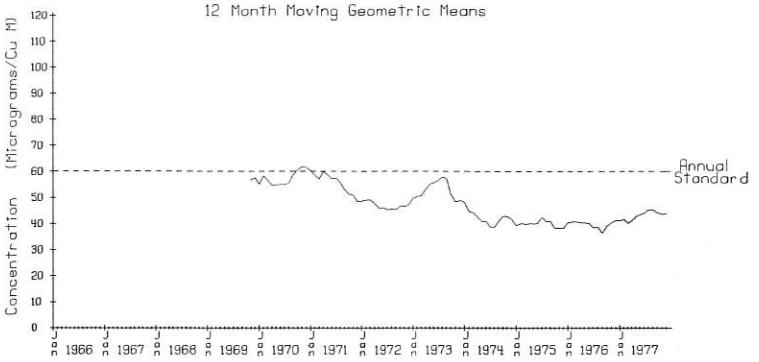


WILLARD ELEM SCHOOL, S 32ND & S 'D' ST, TACOMA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

12 Month Moving Geometric Means

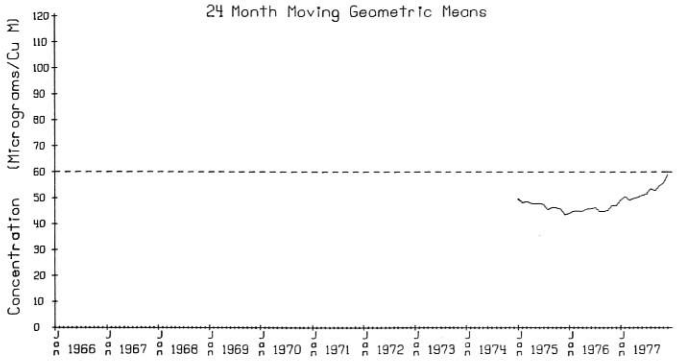


HESS BUILDING, 901 TACOMA AVE S, TACOMA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

24 Month Moving Geometric Means

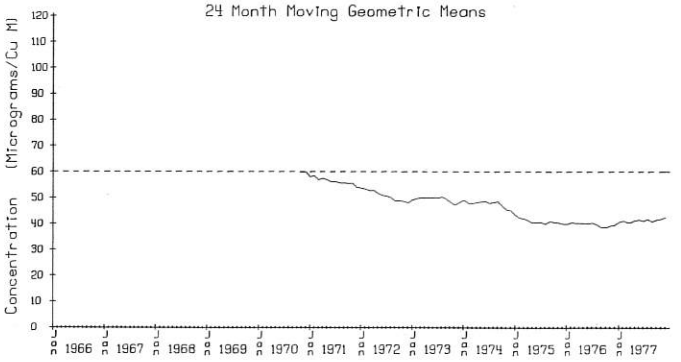


WILLARD ELEM SCHOOL, S 32ND & S 'D' ST, TACOMA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

24 Month Moving Geometric Means

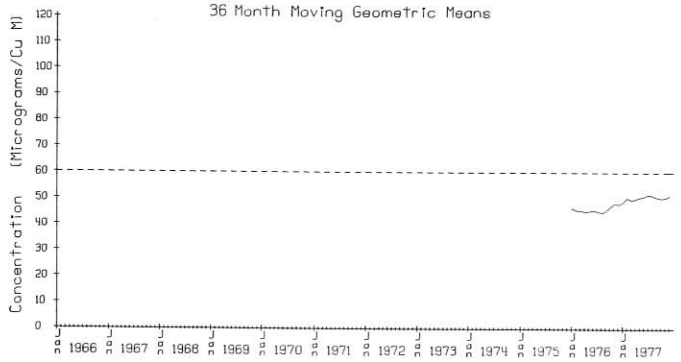


HESS BUILDING, 901 TACOMA AVE S, TACOMA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

36 Month Moving Geometric Means

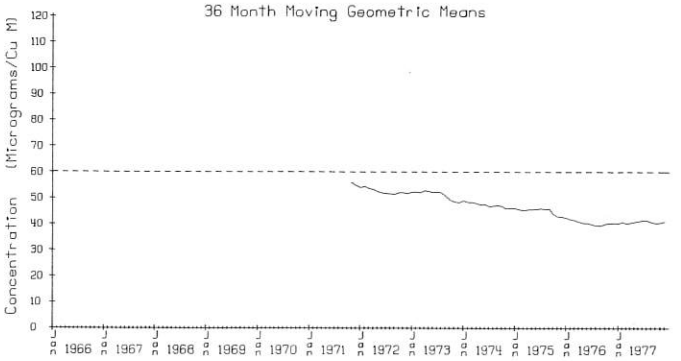


WILLARD ELEM SCHOOL, S 32ND & S 'D' ST, TACOMA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

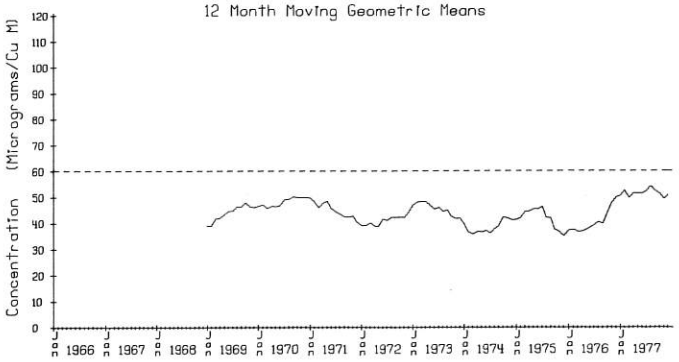
Suspended Particulates

36 Month Moving Geometric Means



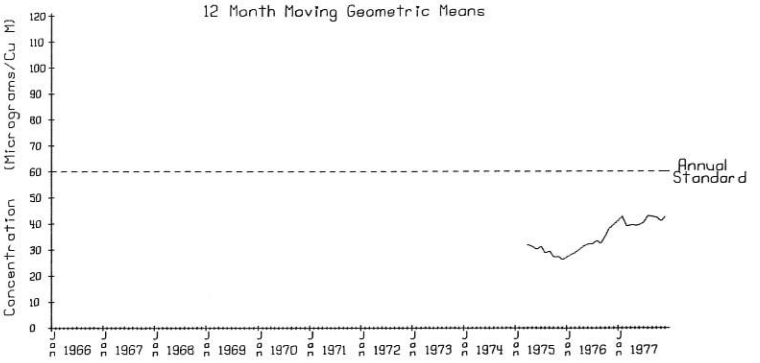
HESS BUILDING, 901 TACOMA AVE S, TACOMA

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



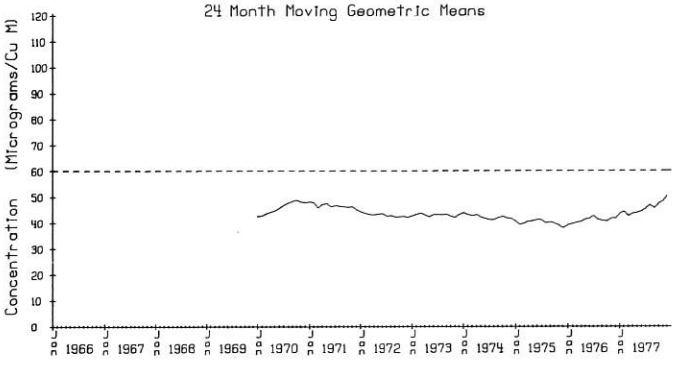
N 26TH AND PEARL STREET, TACOMA

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



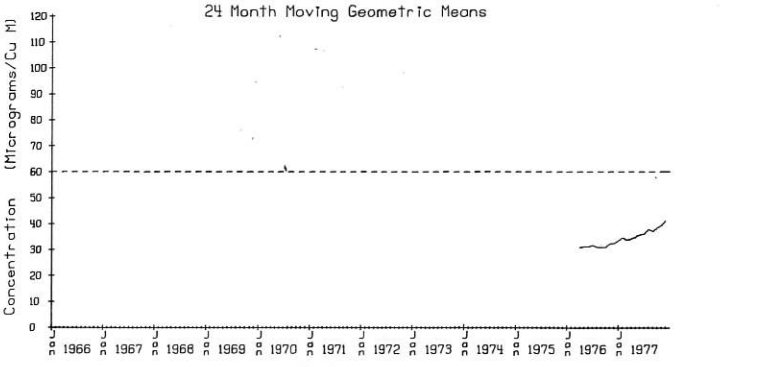
5502 - 112TH STREET SW, LAKEWOOD, WASH.

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



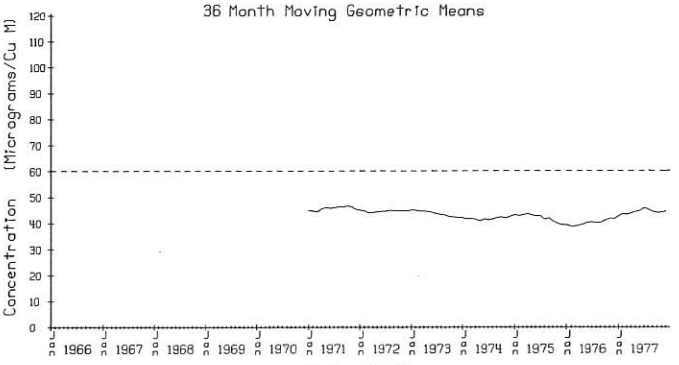
N 26TH AND PEARL STREET, TACOMA

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



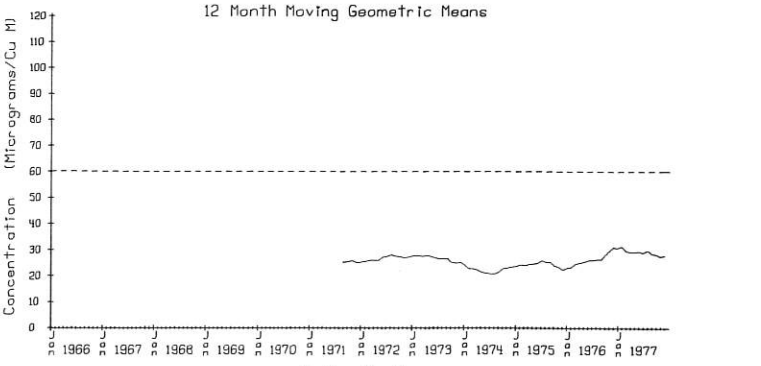
5502 - 112TH STREET SW, LAKEWOOD, WASH.

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



N 26TH AND PEARL STREET, TACOMA

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



EAST 16TH ST & IRONSIDES AVE, BREMERTON

SUSPENDED PARTICULATE (Micrograms per cubic meter)
1977 Statistical Summary

Location	No. of Obs.	Min.	Date	Frequency Distribution-Percent 10	20	30	40	50	60	70	80	90	95	Max.	Date	Arith. Mean	Geo. Mean	Std. Geo. Dev.	Std. Arith. Dev.
Tolt River Watershed	59	1	Jan 31	4	5	7	9	13	15	17	28	34	38	66	Aug 17	16	11	2.54	13.09
Medical Dental Bldg., Everett	59	17	Sep 4	20	29	34	38	42	52	57	65	80	86	125	Aug 17	48	43	1.61	22.59
Puget Power Bldg., Bellevue	61	13	Sep 4	18	22	31	34	40	43	50	57	74	77	140	Dec 21	43	38	1.66	22.32
2700 W. Commodore Way, Seattle	58	23	Mar 8	28	33	41	46	50	54	63	76	95	111	140	Jun 18	57	52	1.55	26.79
Food Circus Bldg., Seattle Center	60	20	Sep 4	27	31	36	39	44	49	57	67	74	89	97	Jan 1	49	45	1.50	19.83
Public Safety Bldg., Seattle	61	22	Sep 4	36	40	44	47	53	61	66	75	87	99	118	Dec 21	59	55	1.44	21.99
301 2nd Ave. S., Seattle*[a]	28	33	Nov 27	38	43	51	56	64	72	83	84	104	137	163	Sep 16	71	65	1.50	30.81
3400 - 13th Ave. S.W., Seattle	64	33	Sep 4	41	58	71	81	90	102	107	122	177	198	216	Feb 3	98	88	1.60	45.67
4500 E. Marginal Way S., Seattle	63	30	Nov 27	41	52	71	83	93	113	121	163	198	221	319	Aug 11	110	94	1.78	62.41
S. River St. & Maynard Ave., Seattle*	61	29	Apr 13	34	46	53	61	75	82	97	104	165	182	250	Dec 27	87	74	1.73	52.05
South Park, Seattle	60	19	Mar 8	24	30	38	50	59	67	76	90	117	145	184	Aug 17	66	56	1.80	38.50
Duwamish Valley, King County	61	18	Mar 8	24	28	39	45	56	62	70	84	113	127	152	Dec 27	61	52	1.74	33.82
S. E. District Health Center, Renton	59	11	Mar 8	16	21	31	38	43	48	53	63	72	81	92	Aug 17	44	38	1.75	21.22
Municipal Bldg., Renton	60	17	Mar 8	24	32	40	50	55	59	66	71	82	110	146	Aug 17	57	51	1.64	27.04
Southcenter, Tukwila	60	17	Mar 8	21	27	36	44	50	58	64	75	99	104	118	Aug 17	55	48	1.70	27.34
McMicken Hts., King County	60	17	Sep 4	22	24	28	39	42	44	52	59	68	77	108	Aug 17	45	40	1.56	19.75
22916 - 86th Ave. S., Kent	60	12	Mar 8	22	26	38	57	67	74	82	94	117	154	187	Jan 7	69	57	1.93	41.25
115 E. Main St., Auburn	60	19	Nov 27	24	34	39	48	58	64	69	78	109	131	160	Dec 21	61	54	1.66	31.31
Meeker Jr. H.S., Tacoma	61	16	Mar 26	24	30	34	41	45	49	53	59	72	79	90	Aug 17	46	43	1.49	17.60
2340 Taylor Way, Tacoma	61	18	Mar 26	33	50	65	79	92	103	128	138	166	220	393	Nov 21	103	86	1.85	64.58
2316 E. 11th St., Tacoma	62	25	Nov 27	38	52	73	89	97	109	120	144	181	204	223	Dec 27	104	91	1.72	51.29
1241 Cleveland Way, Tacoma	63	25	Dec 3	30	45	60	70	83	88	106	113	149	165	244	Dec 21	88	77	1.74	46.23
Fife Sr. H.S., Fife	59	13	Mar 14	19	27	43	49	57	60	67	80	101	121	143	Aug 17	59	51	1.82	31.11
Cascadia, 2002 E. 28th St., Tacoma	62	13	Mar 8	20	28	53	59	75	90	109	148	177	213	266	Aug 11	90	69	2.19	61.77
Willard Elementary School, Tacoma	63	18	Mar 8	24	35	44	54	68	77	84	93	137	158	204	Dec 28	72	60	1.83	41.95
Hess Bldg., Tacoma	60	14	Jan 15	21	30	32	38	44	48	57	70	76	97	118	Jan 25	49	44	1.63	23.98
N. 26th & Pearl Sts., Tacoma	60	14	Mar 8	18	24	38	53	61	68	73	83	97	113	138	Jan 7	60	51	1.85	30.34
5502 - 112th St. S.W., Lakewood*	61	4	Mar 8	17	26	32	40	46	56	64	74	85	114	119	Aug 17	51	43	1.96	28.03
Steilacoom Marina, Steilacoom[b]	30	9	Nov 9	10	15	23	28	33	37	43	46	51	57	64	Dec 21	33	29	1.78	15.36
Second Old Fort Nisqually, Du Pont[c]	33	5	Nov 27	8	20	22	24	29	32	34	37	46	47	51	Aug 17	28	25	1.80	12.74
Water Supply Pump House, Du Pont[c]	32	6	Nov 9	6	12	22	26	27	30	33	40	44	52	64	Aug 11	28	24	1.93	14.90
PNW-Bell Repeater Bldg., Du Pont[c]	32	13	Jul 12	14	17	29	33	39	45	50	56	76	78	105	Dec 27	42	36	1.79	22.90
Yehle's Residence, Du Pont[b]	31	11	Nov 27	12	15	18	21	24	24	26	30	34	41	64	Aug 17	25	23	1.50	10.86
City Hall, 239 - 4th St., Bremerton*[d]	32	21	Mar 26	23	27	36	38	42	44	48	50	58	59	76	Jan 25	42	40	1.38	12.92
E. 16th & Ironsides Ave., Bremerton	61	11	Nov 9	14	18	20	25	28	30	36	40	43	53	69	Dec 21	29	27	1.54	12.58

* Washington State Department of Ecology Station

a Sampling started July 18, 1977
b Sampling started June 30, 1977
c Sampling started June 18, 1977
d Sampling ended June 30, 1977

SUSPENDED PARTICULATE (Micrograms per cubic meter)

1977 Summary of Observations Greater Than 150 µg/m³

Location	JAN 7 Fri	JAN 13 Thu	JAN 19 Wed	JAN 25 Tue	JAN 27 Thu	FEB 3 Thu	FEB 16 Wed	FEB 18 Fri	APR 7 Thu	APR 19 Tue	APR 25 Mon	JUN 6 Mon	JUN 12 Sun	JUN 30 Thu
301 2nd Ave S, Seattle*[a]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3400 13th Ave SW, Seattle	200			177	198	216	162							
4500 E Marginal Way S, Seattle	259		198	210	221	201	174	168				179		--
S River St & Maynard Ave, Seattle*	245			165	--	--	--		165		162			
South Park, Seattle	153					--	--	--						
Duwamish Valley, King County					--	--	--							
22916 86th Ave S, Kent	187					--	--							154
115 E Main St, Auburn					--	--	--							
2340 Taylor Way, Tacoma	169			157	--	--	--							
2316 E 11th St, Tacoma	197	173		208	--	211	200	152	160					
1241 Cleveland Way, Tacoma				158	--	165	167							
Cascadia, 2002 E 28th St, Tacoma					--		--		164	211			156	213
Willard Elem School, Tacoma	175			151	--	--	158							

Location	JUL 24 Sun	JUL 30 Sat	AUG 5 Fri	AUG 11 Thu	AUG 17 Wed	SEP 10 Sat	SEP 16 Fri	OCT 4 Tue	OCT 10 Mon	OCT 22 Sat	NOV 21 Mon	DEC 21 Wed	DEC 27 Tue	DEC 28 Wed
301 2nd Ave S, Seattle*[a]							163							
3400 13th Ave SW, Seattle				177	199							192	172	--
4500 E Marginal Way S, Seattle	154		152	319	184			163	189			228	188	--
S River St & Maynard Ave, Seattle*				182	169							224	250	--
South Park, Seattle					184							169		--
Duwamish Valley, King County													152	--
22916 86th Ave S. Kent				163	173									--
115 E Main St. Auburn												160		--
2340 Taylor Way, Tacoma				179	220			166		152	393	254	254	--
2316 E 11th St, Tacoma			204	181	169		--					--	223	--
1241 Cleveland Way, Tacoma					207							244	164	--
Cascadia, 2002 E 28th St, Tacoma	169	177	182	266	222	222			--					--
Willard Elem School, Tacoma												175	--	204

--No sample on indicated date
* Washington State Department of Ecology Station
a Sampling started 7/18/77

SUSPENDED PARTICULATE (Micrograms per cubic meter)

1977 Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages												No. Of Obs.	Arith. Mean	Geo. Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
Tolt River Watershed	5.9	6.8	4.5	18.8	21.0	30.7	18.3	33.1	19.5	15.7	10.7	7.8	59	16	11
Medical Dental Bldg., Everett	57.5	45.6	26.2	60.1	42.0	66.7	45.1	62.2	41.0	51.4	29.5	51.0	59	48	43
Puget Power Bldg., Bellevue	64.2	43.5	20.5	47.2	36.6	43.8	35.3	51.3	35.2	46.8	29.6	58.5	61	43	38
2700 W. Commodore Way, Seattle	91.0	82.9	38.1	56.5	46.3	70.1	38.6	63.0	49.6	57.4	38.3	57.2	58	57	52
Food Circus Bldg., Seattle Center	79.9	66.6	33.7	50.6	42.7	42.4	33.3	49.9	41.0	52.0	33.8	59.9	60	49	45
Public Safety Bldg., Seattle	89.0	63.4	42.5	61.0	50.5	56.9	41.6	68.2	47.9	63.5	46.1	65.8	61	59	55
301 2nd Ave. S., Seattle* [a]							54.3	89.2	79.6	72.2	50.2	71.6	28	71	65
3400 13th Ave. S.W., Seattle	145.0	128.0	54.1	88.1	78.1	88.4	73.1	123.4	91.1	104.6	77.1	105.7	64	98	88
4500 E. Marginal Way S., Seattle	170.1	136.0	47.6	90.6	97.7	103.4	99.8	151.4	75.1	130.8	74.8	112.3	63	110	94
S. River St. & Maynard Ave., Seattle*	110.5	91.2	45.0	97.8	73.2	82.2	63.0	118.6	65.6	97.2	66.0	127.6	61	87	74
South Park, Seattle	98.3	63.0	27.7	58.6	44.5	61.4	51.6	95.5	52.2	78.9	57.7	86.1	60	66	56
Duwamish Valley, King County	93.6	71.4	25.1	55.3	42.5	60.5	49.4	87.6	54.0	62.4	45.6	80.8	61	61	52
S.E. District Health Center, Renton	62.9	42.1	15.9	47.5	38.6	55.4	35.7	84.8	37.1	45.1	34.0	41.0	59	44	38
Municipal Bldg., Renton	90.2	57.6	31.2	55.8	44.9	60.2	48.2	83.7	54.3	59.2	36.5	50.7	60	57	51
Southcenter, Tukwila	80.2	51.6	21.8	48.1	42.9	50.4	44.3	78.6	51.9	67.8	58.4	55.1	60	55	48
McMicken Hts., King County	58.1	42.8	24.5	45.2	35.0	48.5	38.7	65.9	38.1	53.2	38.2	42.3	60	45	40
22916 86th Ave. S., Kent	105.6	63.6	21.6	59.2	42.2	95.5	73.1	107.4	64.9	72.5	49.0	52.2	60	69	57
115 E. Main St., Auburn	93.3	62.6	29.1	66.1	45.6	68.1	54.3	74.5	49.5	62.1	39.5	78.1	60	61	54
Meeker Jr. H.S., Tacoma	64.4	47.4	26.3	44.3	44.4	45.2	42.9	60.2	43.1	54.4	35.9	43.3	61	46	43
2340 Taylor Way, Tacoma	115.1	91.9	30.0	103.2	73.3	99.8	100.5	131.5	90.7	131.9	129.7	135.0	61	103	86
2316 E. 11th St., Tacoma	147.6	141.8	37.2	118.3	92.2	105.7	85.8	130.9	83.3	110.1	80.9	97.4	62	104	91
1241 Cleveland Way, Tacoma	111.4	118.0	32.1	94.4	70.4	95.3	80.5	118.3	70.8	94.9	55.6	108.3	63	88	77
Fife Sr. H.S., Fife	93.4	69.4	22.5	56.6	45.6	66.7	62.2	90.2	53.7	70.9	36.1	29.5	59	59	51
Cascadia, 2002 E. 28th St., Tacoma	93.7	89.4	24.6	121.4	60.4	136.2	124.0	145.2	95.7	69.6	43.9	77.4	62	90	69
Willard Elem. School, Tacoma	109.9	98.0	25.2	67.3	55.4	63.3	60.9	85.9	59.8	74.8	50.4	98.3	63	72	60
Hess Bldg., Tacoma	70.5	55.6	23.6	46.5	49.1	42.5	36.3	61.6	40.1	60.7	41.5	64.2	60	49	44
N 26th and Pearl Sts., Tacoma	75.9	66.1	18.3	68.7	64.1	72.5	76.3	70.2	45.4	55.9	34.9	65.1	60	60	51
5502 112th St. S.W., Lakewood*	62.0	49.0	14.0	50.2	36.5	51.8	46.2	75.6	48.2	70.2	45.4	64.4	61	51	43
Steilacoom Marina, Steilacoom [b]						30.3	24.4	39.3	31.0	44.1	24.5	35.1	30	33	29
Second Old Fort Nisqually, Du Pont [c]						26.0	34.8	33.8	21.7	33.5	18.3	28.7	33	28	25
Water Supply Pump House, Du Pont [c]						29.0	26.0	33.2	26.9	33.1	18.3	32.5	32	28	24
PNW-Bell Repeater Bldg., Du Pont [c]						52.8	33.9	50.4	29.1	51.4	32.0	53.0	32	42	36
Yehle's Residence, Du Pont [b]						24.3	24.3	36.5	21.3	26.8	16.8	23.1	31	25	23
City Hall, 239 - 4th St., Bremerton* [d]	47.3	43.6	28.0	46.2	39.8	44.0							32	42	40
E. 16th & Ironsides Ave., Bremerton	36.2	31.0	16.4	32.7	25.6	32.3	26.5	36.9	24.2	36.8	19.4	36.0	61	29	27

* Washington State Department of Ecology Station

[a] Sampling Started 7/18/77 [b] Sampling Started 6/30/77 [c] Sampling Started 6/18/77 [d] Sampling Ended 6/30/77

SUSPENDED PARTICULATE

(COH's/1000 Linear Feet)

1977

Location	Monthly Arithmetic Averages												Arith.[a] Mean	Geo.[a] Mean
	J	F	M	A	M	J	J	A	S	O	N	D		
Medical Dental Bldg, Everett	0.74	0.51	0.35	0.43	0.32	0.30	0.31	0.40	0.44	0.56	0.41	0.50	0.44	0.37
Food Circus Bldg, Seattle Center	1.05	0.71	0.46	0.48	0.35	0.31	0.30	0.45	0.57	0.77	0.62	0.74	0.57	0.45
4500 E Marginal Way S, Seattle	1.55	1.08	0.65	0.62	0.46	0.49	0.48	0.67	0.71	1.04	0.93	0.98	0.80	0.59
Southcenter, Tukwila	1.13		0.43	0.55	0.35	0.38	0.32	0.52	0.67	0.79	0.52	0.60	0.58	0.43
McMicken Hts, King County	1.19	0.71	0.51	0.53	0.40	0.37	0.29	0.46	0.60	0.70	0.40	0.44	0.56	0.43
22916 86th Ave S, Kent	1.17	0.70	0.36	0.49	0.32	0.31	0.28	0.43	0.48	0.58	0.61	0.72	0.55	0.40
Meeker Jr HS, Tacoma	0.95	0.63	0.36	0.40	0.29	0.26	0.23	0.31	0.43	0.58	0.46	0.52	0.45	0.35
2316 E 11th St, Tacoma	1.90	1.39	0.72	0.75	0.58	0.70	0.61	0.87	0.94	1.28	1.10	1.32	1.03	0.79
Willard Elem School, Tacoma	1.40	0.97	0.44	0.49	0.42	0.43	0.38	0.58	0.85	1.04	0.88	1.04	0.74	0.54
N 43rd and Visscher Sts, Tacoma[b]							0.21	0.25	0.48	0.62	0.47	0.57	0.46	0.31
N 26th and Pearl Sts, Tacoma	1.17	0.69	0.33	0.39	0.27	0.22	0.20	0.27	0.43	0.56	0.38	0.41	0.44	0.30
Second Old Fort Nisqually, Du Pont[c]							0.18	0.28	0.39	0.58	0.42	0.61	0.41	0.23
PNW-Bell Repeater Bldg, Du Pont[d]							0.36	0.47	0.65	0.88	0.66	0.92	0.66	0.45

a Developed from all available hourly values

b Sampling started 7/20/77

c Sampling started 7/1/77

d Sampling started 7/1/77

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 30 minutes; the final reading is taken; the tape then quickly advances to a new position and the cycle repeats again and again to provide continuous sampling.

SULFUR DIOXIDE POLLUTION ROSE FREQUENCY DISTRIBUTION

During 1977, sulfur dioxide and wind were measured continuously on a simultaneous basis at a number of monitoring stations. Hour average readings for each parameter were stored in historical data files for further summary and analysis. The Sulfur Dioxide Pollution Rose is an analysis depicting the wind direction associated with various sulfur dioxide concentrations for each simultaneous hour of observation.

The sulfur dioxide pollution roses on the pages which follow are tabular arrays with sulfur dioxide summarized in columns and wind direction summarized in rows. Data is presented for only those stations that have measured a significant number of violations of the ambient air quality standard over the past five years. Each table value is the total number of hours for which the indicated sulfur dioxide concentration was observed at a given wind direction. Occurrences of sulfur dioxide with very light winds at the station appear in the next to the last row of the table.

This analysis allows an assessment of the location of source(s) having the most prominent effect on sulfur dioxide air quality at the station. When the period of sampling is substantial enough (a full year or more of data) this analysis technique becomes a reliable method to document source relationships. Caution must be exercised in the interpretation of these relaships since the wind direction at the receptor may not completely represent the transport wind between a source and the receptor.

This analysis also provides a frequency distribution of all the hour average sulfur dioxide concentrations at the station. The distribution is presented in the row of column totals. The first column (0.00 to 0.00) presents specifically the occurrence of 0.00 hour average sulfur dioxide readings.

Finally, the column of row totals provides a frequency distribution of hourly wind direction (to 16 points of the compass) or simply a wind rose without respect to speed.

PUGET SOUND AIR POLLUTION CONTROL AGENCY - FREQUENCY DISTRIBUTION OF HOURLY AVERAGES

MEDICAL-DENTAL BLDG, 2730 COLBY AVE, EVERETT
ALL MONTHS 1977

SULFUR DIOXIDE (PPM)

WIND DIRECTION (DEGREES)	.00 TO .00	.01 TO .02	.03 TO .04	.05 TO .06	.07 TO .08	.09 TO .10	.11 TO .15	.16 TO .20	.21 TO .25	.26 TO .30	.31 TO .35	.36 TO .40	.41 TO .50	.51 TO .60	.61 TO .70	OVER .70	TOTALS
N (349 - 011)	137	33															170
NNE (012 - 033)	143	20	2														165
NE (034 - 056)	124	34	2														160
ENE (057 - 078)	94	38	2														134
E (079 - 101)	119	50	1														170
ESE (102 - 123)	340	115	6														461
SE (124 - 146)	1468	384	10														1862
SSE (147 - 168)	900	314	7														1221
S (169 - 191)	246	65	2														313
SSW (192 - 213)	174	37	1														212
SW (214 - 236)	95	15	1														111
WSW (237 - 258)	61	15	3														79
W (259 - 281)	792	320	37	10	5	5	3	2		2				1			1177
WNW (282 - 303)	238	329	105	61	28	12	8	3	2		3		3	1	1	1	795
NW (304 - 326)	188	209	79	22	12	5	4	1	1								521
NNW (327 - 348)	227	78	5														310
CALM AND LIGHT/VARIABLE	208	136	19	3		1											367
TOTALS	5554	2192	282	96	45	23	15	6	3	2	3		3	2	1	1	8228

MEDICAL-DENTAL BLDG, 2730 COLBY AVE, EVERETT
ALL MONTHS 1973
ALL MONTHS 1974
ALL MONTHS 1975
ALL MONTHS 1976
ALL MONTHS 1977

SULFUR DIOXIDE (PPM)

WIND DIRECTION (DEGREES)	.00 TO .00	.01 TO .02	.03 TO .04	.05 TO .06	.07 TO .08	.09 TO .10	.11 TO .15	.16 TO .20	.21 TO .25	.26 TO .30	.31 TO .35	.36 TO .40	.41 TO .50	.51 TO .60	.61 TO .70	OVER .70	TOTALS
N (349 - 011)	826	118	9				1										954
NNE (012 - 033)	715	98	19	5		1		1									839
NE (034 - 056)	703	142	6			1											852
ENE (057 - 078)	574	130	3														707
E (079 - 101)	682	179	6	1													868
ESE (102 - 123)	2120	525	30	3													2678
SE (124 - 146)	8305	1642	52	1													10000
SSE (147 - 168)	4109	1056	34	2	1												5202
S (169 - 191)	1315	312	7	1													1635
SSW (192 - 213)	751	152	9	3	1												916
SW (214 - 236)	331	86	4	4				1									426
WSW (237 - 258)	341	150	18		1	1		1									512
W (259 - 281)	3975	2164	306	68	24	12	14	8	1	3				1			6576
WNW (282 - 303)	1454	1550	528	265	141	86	90	29	13	8	13	4	7	2	1	1	4192
NW (304 - 326)	1298	875	279	95	37	18	15	4	5		2	1	3			1	2633
NNW (327 - 348)	1193	232	19	2	1		1										1448
CALM AND LIGHT/VARIABLE	816	438	53	8	1	1	5										1322
TOTALS	29508	9849	1382	458	207	120	126	44	19	11	15	5	10	3	1	2	41760

PUGET SOUND AIR POLLUTION CONTROL AGENCY - FREQUENCY DISTRIBUTION OF HOURLY AVERAGES

HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA
ALL MONTHS 1977

SULFUR DIOXIDE (PPM)

WIND DIRECTION (DEGREES)	.00 TO .00	.01 TO .02	.03 TO .04	.05 TO .06	.07 TO .08	.09 TO .10	.11 TO .15	.16 TO .20	.21 TO .25	.26 TO .30	.31 TO .35	.36 TO .40	.41 TO .50	.51 TO .60	.61 TO .70	OVER .70	TOTALS
N (349 - 011)	49	79	44	18	14	15	21	5	1	1	1						248
NNE (012 - 033)	81	59	9	9	4	5				1							168
NE (034 - 056)	210	79	4	1													294
ENE (057 - 078)	100	56	6														162
E (079 - 101)	72	15															87
ESE (102 - 123)	34	5	2	1													42
SE (124 - 146)	319	70	11	2	1												403
SSE (147 - 168)	951	264	30	4													1249
S (169 - 191)	985	187	43	8	4	1	1										1229
SSW (192 - 213)	408	53	6	1													468
SW (214 - 236)	217	30	4	1	2		1										255
WSW (237 - 258)	141	18	1	3													163
W (259 - 281)	74	7	1				2										84
WNW (282 - 303)	69	16	4	2	2	1	1										95
NW (304 - 326)	860	98	11	4	4		2		1								980
NNW (327 - 348)	379	146	28	21	12	9	9	5	1	1	1	1					613
CALM AND LIGHT/VARIABLE	403	171	40	12	2	4	1										633
TOTALS	5352	1353	244	87	45	35	38	10	3	3	2	1					7173

HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA
APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC, 1975
ALL MONTHS 1976
ALL MONTHS 1977

SULFUR DIOXIDE (PPM)

WIND DIRECTION (DEGREES)	.00 TO .00	.01 TO .02	.03 TO .04	.05 TO .06	.07 TO .08	.09 TO .10	.11 TO .15	.16 TO .20	.21 TO .25	.26 TO .30	.31 TO .35	.36 TO .40	.41 TO .50	.51 TO .60	.61 TO .70	OVER .70	TOTALS
N (349 - 011)	199	260	108	65	40	37	52	19	5	6	3	3	2		1		800
NNE (012 - 033)	174	159	34	21	14	12	3	2	1	2			1				423
NE (034 - 056)	496	213	11	3	1												724
ENE (057 - 078)	283	167	13	1													464
E (079 - 101)	150	62	5														217
ESE (102 - 123)	86	47	4	1													138
SE (124 - 146)	659	242	28	4	2	1	1										937
SSE (147 - 168)	2210	968	97	20	2		1	1									3299
S (169 - 191)	2434	1086	190	31	13	2	3										3759
SSW (192 - 213)	1050	272	21	3	2	1	2										1351
SW (214 - 236)	556	113	11	3	2		1										686
WSW (237 - 258)	345	89	3	5	1	1											444
W (259 - 281)	142	53	2				2										199
WNW (282 - 303)	171	67	15	4	2	2	1										262
NW (304 - 326)	2088	640	43	15	6	1	4	1	1								2799
NNW (327 - 348)	1250	644	94	60	37	23	25	16	8	3	1	1					2162
CALM AND LIGHT/VARIABLE	1178	706	90	27	8	8	1	1									2019
TOTALS	13471	5788	769	263	130	88	96	40	15	11	4	4	3		1		20683

PUGET SOUND AIR POLLUTION CONTROL AGENCY - FREQUENCY DISTRIBUTION OF HOURLY AVERAGES

N 26TH AND PEARL STREET, TACOMA, WA
ALL MONTHS 1977

SULFUR DIOXIDE (PPM)

WIND DIRECTION (DEGREES)	.00 TO .00	.01 TO .02	.03 TO .04	.05 TO .06	.07 TO .08	.09 TO .10	.11 TO .15	.16 TO .20	.21 TO .25	.26 TO .30	.31 TO .35	.36 TO .40	.41 TO .50	.51 TO .60	.61 TO .70	OVER .70	TOTALS
N (349 - 011)	136	144	33	10	12	5	6	5			1		1	1			354
NNE (012 - 033)	364	386	89	33	25	9	19	6	3	3	1	2	1				941
NE (034 - 056)	383	281	40	12	6	3	3	2	2	2							734
ENE (057 - 078)	93	77	20	2	2		1	1									196
E (079 - 101)	53	72	16	6													147
ESE (102 - 123)	64	52	10		1	1	1										129
SE (124 - 146)	48	47	16	3			1		1								116
SSE (147 - 168)	188	123	8		1		1										321
S (169 - 191)	402	183	2		1												588
SSW (192 - 213)	669	209	3	1													882
SW (214 - 236)	1106	231	6	2			1										1346
WSW (237 - 258)	835	124	2			1	2										964
W (259 - 281)	264	54	6			1											325
WNW (282 - 303)	80	36	8	1	1		1		1								128
NW (304 - 326)	76	32	10	3	1	1											123
NNW (327 - 348)	59	28	7	2		4	2					1					103
CALM AND LIGHT/VARIABLE	237	239	61	15	2	5	7	6		1		1			1		575
TOTALS	5057	2318	337	90	52	30	45	20	7	6	2	4	2	1	1		7972

N 26TH AND PEARL STREET, TACOMA, WA
ALL MONTHS 1973
ALL MONTHS 1974
ALL MONTHS 1975
ALL MONTHS 1976
ALL MONTHS 1977

SULFUR DIOXIDE (PPM)

WIND DIRECTION (DEGREES)	.00 TO .00	.01 TO .02	.03 TO .04	.05 TO .06	.07 TO .08	.09 TO .10	.11 TO .15	.16 TO .20	.21 TO .25	.26 TO .30	.31 TO .35	.36 TO .40	.41 TO .50	.51 TO .60	.61 TO .70	OVER .70	TOTALS
N (349 - 011)	740	486	140	65	46	28	29	22	6	3	7	2	3	1			1578
NNE (012 - 033)	1885	1449	405	184	127	76	108	48	25	22	8	3	3	1	3	1	4348
NE (034 - 056)	2534	1113	198	68	46	28	41	13	9	3	3	1		1		1	4059
ENE (057 - 078)	702	307	57	11	7	8	14	5	3	2	2		1				1119
E (079 - 101)	385	240	60	12	3		1	2	1								704
ESE (102 - 123)	286	152	26	1	4	2	3										474
SE (124 - 146)	323	142	28	5	2		1		1						1		503
SSE (147 - 168)	1050	284	23	1	1		4										1363
S (169 - 191)	2534	368	8		1		1										2912
SSW (192 - 213)	4385	430	7	1			1										4824
SW (214 - 236)	5836	556	15	3	1		1										6412
WSW (237 - 258)	4468	396	21	2		3	5	1									4896
W (259 - 281)	1892	227	26	10	2	1	1										2159
WNW (282 - 303)	561	109	31	7	4	1	3	1	1			1					719
NW (304 - 326)	368	124	34	12	12	3	5	7	1							1	567
NNW (327 - 348)	329	137	30	19	6	9	7	5	3		1	2					548
CALM AND LIGHT/VARIABLE	2637	1274	260	79	34	14	37	20	10	10	4	4	7	2	1	3	4396
TOTALS	30915	7794	1369	480	296	173	262	124	60	40	25	13	14	5	5	6	41581

SULFUR DIOXIDE
(Concentration in parts per million)
1977

Location	Maximum 24-Hour Average	Maximum 3-Hour Average	Maximum 1-Hour Average	Maximum 5-Min. Avg. Exceeding 1.00 ppm
Medical Dental Bldg, Everett	.12	.72	.95	1.54
Food Circus Bldg, Seattle Center	.05	.10	.13	
3419 13th Ave SW, Seattle	.04	.17	.44	1.39
4500 E Marginal Way S, Seattle	.06	.21	.39	
Southcenter, Tukwila[a]	.03	.06	.11	
McMicken Hts, King County	.03	.19	.36	
22916 86th Ave S, Kent	.02	.12	.20	
SW 248th & 59th Ave SW, Maury Is[a]	.05	.18	.33	
SW 283rd & 101st Ave SW, Maury Is[a]	.03	.12	.18	
Meeker Jr HS, Tacoma	.05	.20	.45	
N 43rd and Visscher Sts, Tacoma[a]	.08	.34	.91	1.52
N 26th and Pearl Sts, Tacoma	.11	.47	.65	1.46
Second Old Fort Nisqually, Du Pont[a]	.03	.14	.25	
PNW-Bell Repeater Bldg, Du Pont[a]	.00	.02	.03	

[a]More that 50% of possible data missing.

Sulfur dioxide is measured on a continuous basis using the conductometric method or the flame photometric method.

SULFUR DIOXIDE
Monthly and Annual Arithmetic Averages
(Concentrations in parts per million)
1977

Location	Monthly Arithmetic Averages												Annual Arith. Average
	J	F	M	A	M	J	J	A	S	O	N	D	
Medical-Dental Bldg, Everett	.005	.004	.003	.007	.004	.006	.009	.012	.009	.010	.007	.007	.007
Food Circus Bldg, Seattle Center	.020	.011	.012	.007	.008	.012	.001	.003	.003	.006			.008
3419 - 13th Ave SW, Seattle	.013	.011		.007	.005	.005	.005	.006	.003	.005	.006	.001	.006
4500 E Marginal Way S, Seattle	.021	.021	.010	.016	.008	.012	.014	.014	.011	.015	.014	.012	.014
Southcenter, Tukwila						.009	.003	.003	.005		.011		.006
McMicken Hts, King County	.010	.007	.005	.006	.005	.007	.001	.002		.010	.007	.007	.006
22916 - 86th Ave S, Kent				.006	.004	.006	.000	.000	.001	002	.001	.000	.002
SW 248th & 59th Ave SW, Maury Is[a]		.017		.012	.015	.020	.002						.013
SW 283rd & 101st Ave SW, Maury Is[b]									.004	.006	.005	.006	.005
Meeker Jr HS, Tacoma		.009	.009	.010	.005	.005	.000	.002	.005	.007	.001		.005
N 43rd & Visscher Sts, Tacoma[c]							.000		.003	.006	.005	.008	.004
N 26th & Pearl Sts, Tacoma	.023	.009	.006	.011	.005	.007	.000	.002	.010	.016	.003	.008	.008
Second Old Fort Nisqually, Du Pont[d]							.000	.000	.001	.003	.001	.001	.001
PNW-Bell Repeater Bldg, Du Pont[d]							.000	.000	.001	.000	.000		.000

[a] Sampling ended July 31, 1977
[b] Sampling started September 1, 1977
[c] Sampling started July 20, 1977
[d] Sampling started July 1, 1977

SULFUR DIOXIDE
Summary of Concentrations Exceeding Selected Values
(Concentrations in parts per million)
1977

A. Number of occurences > 1.00 ppm for 5 minutes
B. Number of occurences > 0.25 ppm for 1 hour
C. Number of occurences > 0.40 ppm for 1 hour

D. Number of occurences > 0.50 ppm for 3 hours
E. Number of occurences > 0.10 ppm for 24 hours

Location	Jan.			Feb.			Mar.			Apr.			May			June			July			Aug.			Sept.			Oct.			Nov.			Dec.			Annual		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Medical Dental Bldg, Everett										2						1			4	4	1	14	8	5				2	1							18	17	7
Food Circus Bldg, Seattle Center																																							
3419 - 13th Ave SW, Seattle				1						1	1					1				2	2		3												1	8	2
4500 E Marginal Way S, Seattle										1													1													2	
Southcenter, Tukwila																															1					3		
McMicken Hts, King County				1			1																															
22916 - 86th Ave S, Kent																																				3		
SW 248th & 59th Ave SW, Maury Is[a]										1			2																									
SW 283rd & 101st Ave SW, Maury Is[b]																																				4	2	
Meeker Jr HS, Tacoma										4	2																	1	1	4	2	2			4	3	3
N 43rd & Visscher Sts, Tacoma[c]																												2							4	23	6
N 26th & Pearl Sts, Tacoma	7	3		2	1		1			2	6	1				1	3								1	2	1											
Second Old Fort Nisqually, Du Pont[d]																																						
PNW-Bell Repeater Bldg, Du Pont[d]																																						
All Station Totals	7	3		4	1		2			3	15	3	2			1	5		4	6	3	14	12	5	1	2	1	5	2	4	3	2			27	63	20

Location	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.		Annual	
	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E
Medical Dental Bldg, Everett															1	1									1	1
N 26th & Pearl Sts, Tacoma	2																									2
All Station Totals	2														1	1									1	3

a Sampling Ended 7/31/77

b Sampling Started 9/1/77

c Sampling Started 7/20/77

d Sampling Started 7/1/77

OZONE

Photochemical reactivity may be defined as the tendency of an atmospheric system containing organic substances (such as reactive hydrocarbons) and nitrogen oxides to undergo, under the influence of ultraviolet radiation and appropriate meteorological conditions, a series of chemical reactions that result in the formation of ozone. This reaction requires some time (2 to 5 hours) to take place; therefore, the maximum concentrations of ozone normally occur from 5 to 15 miles downwind of the sources that emit reactive hydrocarbons and nitrogen oxides.

Since ultraviolet radiation is a necessary part of this reaction, the highest ozone concentrations occur during the summer months when there are more hours of sunlight with the sun at a higher elevation angle. Light northerly winds frequently accompany the sunny, clear days in the Puget Sound Region during the summer. As a result, the highest ozone concentrations are normally observed 5 to 15 miles south of the major urban centers. The maximum values generally occur between noon and sunset.

OZONE
(Concentrations in parts per million)
1977

Location	Period of Operation	Maximum 4-Hour Average	Maximum 1-Hour Average	No. 1-Hr. Avgs. Exceeding .08 ppm	No. Days 1-Hr. Avg. Exceeded .08 ppm
3108 -180th SE, Bothell*	Apr 5 - Oct 31	.09	.10	6	2
Lake Sammamish State Park*	Jan 1 - Dec 31	.16	.17	38	14
McMicken Hts, King County	Jan 1 - Dec 31	.10	.10	16	7
22916 - 86th Ave S, Kent	Jan 1 - Dec 31	.11	.13	29	11
Sumner Jr HS, Sumner*	Jun 20 - Dec 31	.13	.15	42	12
Mt Tahoma HS, Tacoma*	Nov 3 - Dec 31	.03	.03	0	0
5502 - 112th St SW, Lakewood*	Jan 1 - Oct 31	.09	.10	10	4

* Washington State Department of Ecology Station

Ozone is measured on a continuous basis using the gas phase chemiluminescence method, or the ultraviolet photometric detection method.

CARBON MONOXIDE

The Washington State Department of Ecology (DOE) has statewide jurisdiction over motor vehicular sources of pollution, The DOE operates equipment that measures motor vehicle related pollutants in certain areas of the State. During 1977, carbon monoxide analyzers were operated at 12 locations in the Puget Sound Air Quality Control Region for periods varying from several months to a full year. Some of these stations were in operation prior to 1977.

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 generally coincide with the weekday morning and evening traffic peaks. Minimum values generally occur during the night and on weekends.

Episode criteria are specified in the Washington State Emergency Episode Plan (Washington Administrative Code (WAC) 173-435). The Alert stage is to be declared when the ambient carbon monoxide concentration reaches 15 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 Warning stage is 30 ppm for an 8-hour average, and the Emergency stage is 40 ppm for an 8-hour average, each with a similar statement on the forecast of meteorological conditions.

The carbon monoxide data presented below were extracted from the Department of Ecology monthly data summary and from the DOE publication, "Washington State Air Monitoring Data for 1977." Detailed information regarding site locations; hourly, daily and seasonal averages; and trends may be obtained by contacting the Department of Ecology.

CARBON MONOXIDE
(Concentrations in parts per million)
1977

Location	Period of Record	Maximum 1-Hour Average	Maximum 8-Hour Average	No. 8-Hr. Avgs. Exceeding 9 ppm	No. Days 8-Hr. Avg. Exceeded 9 ppm
4511 University Way NE, Seattle	Aug 1 - Dec 31	23	20	22	19
3921 Linden Ave N, Seattle	Jan 1 - Dec 31	15	10	3	3
1300 Madison St, Seattle	Jan 1 - Dec 31	22	12	3	3
417 Pike St, Seattle	Feb 10 - Dec 31	24	15	34	28
1424 - 4th Ave, Seattle	Apr 1 - Dec 31	25	20	76	56
2nd & University Ave, Seattle	Jan 1 - Dec 31	21	14	25	23
5th & James St, Seattle	Jan 1 - Dec 31	25	19	66	57
301 - 2nd Ave S, Seattle	Jan 1 - Dec 31	22	17	7	6
1000 - 4th Ave S, Seattle	Jan 1 - Dec 31	17	9	0	0
2809 - 26th Ave S, Seattle	Jan 1 - Dec 31	19	15	10	10
901 Tacoma Ave S, Tacoma	Jan 1 - Jun 30	15	10	1	1
715 S 11th St, Tacoma	Oct 1 - Dec 31	14	9	0	0

Carbon Monoxide is measured on a continuous basis using the nondispersive infrared method.

LOWER ATMOSPHERE TEMPERATURE SOUNDINGS

A lower atmosphere sounding unit began operating at 2725 Montlake Boulevard East (east shore of Portage Bay) in Seattle during 1971. This radiosonde unit was originally operated by the National Weather Service, but after a couple years, the operation of the unit was assumed by the Department of Ecology with the National Weather Service providing equipment and equipment support.

Most of the data consists of one slow ascent sounding to 700 millibars daily, Monday through Friday except on holidays. The sounding is taken about 0700 local time and is transmitted to user's teletype circuits. Since the sounding provides the only lower atmosphere data in the Puget Sound Basin, the information is an essential basis for many different types of forecasts including air stagnation forecasts.

The Agency makes regular use of the daily sounding in evaluating and interpreting air quality data and also encodes and stores the sounding data in the computerized data base. This computer data base has made possible the development of a lower atmospheric climatology for the Puget Sound Region. The first results are presented in this document.

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

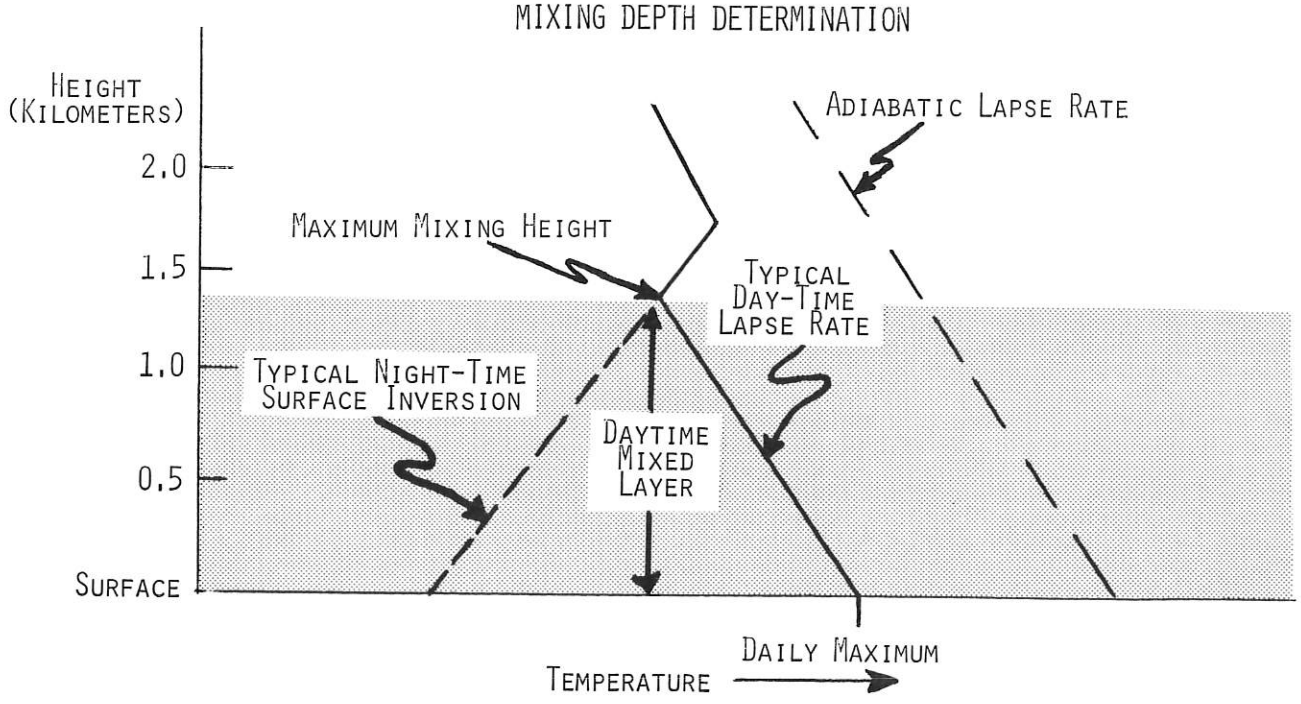
1) Temperature inversion (a stable condition)
2) Stable (no inversion)
3) Conditionally stable
4) Unstable.

Two types of summaries of these sounding layers are presented in the following pages. One summary presents a frequency distribution of temperature inversion layers showing the height of the inversion base together with the thickness of the inversion layer. From an air quality standpoint a temperature inversion near the surface that is thick enough so that daytime heating will not break through the inversion layer is a significant restriction to vertical dispersion. This stability condition is associated with higher concentrations of air pollutants.

The second type of summary shows the distribution of the four mutually exclusive sounding stability layers by height of the base of each layer.

Six years (1972 through 1977) of data are summarized and presented in the tables. There are separate tables for all six years combined and for calendar year 1977 alone. Monthly tables developed from six years of data for each month present the seasonal variations.

MIXING DEPTH DETERMINATION



PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

ALL MONTHS 1977
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	31	35	73	111	250
150	57	57	127	113	354
300	83	83	172	117	455
500	111	118	202	118	549
1000	144	195	273	120	732
1500	184	266	354	125	929
2000	222	325	441	127	1115
2500	257	380	506	135	1278
3000	279	431	550	141	1401
700 MB	280	431	550	141	1402

Number of Soundings: 250

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

ALL MONTHS 1977
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	2	12	2	6	3	3	3	31	250
150	6	18	4	13	4	4	8	57	354
300	11	27	11	15	6	5	8	83	455
500	15	38	13	18	9	7	11	111	549
1000	26	49	18	20	11	7	13	144	732
1500	42	64	23	23	12	7	13	184	929
2000	59	77	30	23	13	7	13	222	1115
2500	72	91	34	25	14	8	13	257	1278
3000	85	97	37	25	14	8	13	279	1401
700 MB	86	97	37	25	14	8	13	280	1402

Number of Soundings: 250

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

ALL MONTHS 1972-77
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	222	246	433	596	1497
150	355	392	791	626	2164
300	543	523	1037	654	2757
500	705	739	1240	666	3350
1000	946	1205	1738	705	4594
1500	1221	1719	2246	773	5959
2000	1496	2129	2723	825	7173
2500	1773	2516	3159	879	8327
3000	1956	2824	3457	921	9158
700 MB	1961	2826	3459	923	9169

Number of Soundings: 1497

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.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

ALL MONTHS 1972-77
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	58	56	39	25	15	13	16	222	1497
150	79	85	64	53	27	18	29	355	2164
300	134	129	93	72	39	31	45	543	2757
500	194	175	111	89	48	36	52	705	3350
1000	302	245	138	108	56	38	59	946	4594
1500	433	331	163	129	62	40	63	1221	5959
2000	558	419	208	140	67	40	64	1496	7173
2500	685	509	246	153	74	41	65	1773	8327
3000	779	570	270	157	74	41	65	1956	9158
700 MB	784	570	270	157	74	41	65	1961	9169

Number of Soundings: 1497

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).

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

JAN 1972-77
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	25	22	46	35	128
150	32	38	68	37	175
300	48	49	87	38	222
500	56	68	114	40	278
1000	82	105	154	43	384
1500	107	147	200	47	501
2000	130	182	236	51	599
2500	152	214	265	54	685
3000	159	232	287	60	738
700 MB	160	232	287	61	740

Number of Soundings: 128

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

JAN 1972-77
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	6	7		2	1	1	25	128
150	12	6	9		2	1	2	32	175
300	17	12	11		2	2	4	48	222
500	22	12	11	1	2	3	5	56	278
1000	41	15	12	3	2	3	6	82	384
1500	53	22	13	7	3	3	6	107	501
2000	65	29	16	7	4	3	6	130	599
2500	73	40	18	7	5	3	6	152	685
3000	77	42	19	7	5	3	6	159	738
700 MB	78	42	19	7	5	3	6	160	740

Number of Soundings: 128

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

FEB 1972-77
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	35	20	32	29	116
150	40	31	62	31	164
300	46	39	81	35	201
500	52	47	108	36	243
1000	66	79	130	36	311
1500	82	116	165	43	406
2000	97	143	204	47	491
2500	113	168	230	52	563
3000	124	189	242	58	613
700 MB	124	189	242	58	613

Number of Soundings: 116

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.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

FEB 1972-77
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	11	8	8	3	1	1	3	35	116
150	12	10	8	4	1	1	4	40	164
300	16	10	9	5	1	1	4	46	201
500	19	11	10	5	2	1	4	52	243
1000	24	16	12	6	3	1	4	66	311
1500	34	21	13	6	3	1	4	82	406
2000	40	25	17	6	4	1	4	97	491
2500	46	32	19	7	4	1	4	113	563
3000	52	34	21	8	4	1	4	124	613
700 MB	52	34	21	8	4	1	4	124	613

Number of Soundings: 116

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).

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

MAR 1972-77
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	22	31	41	39	133
150	38	42	73	42	195
300	46	61	98	44	249
500	54	77	123	47	301
1000	68	105	172	54	399
1500	89	147	217	58	511
2000	115	182	254	58	609
2500	136	211	285	63	695
3000	155	233	308	68	764
700 MB	155	233	308	68	764

Number of Soundings: 133

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

MAR 1972-77
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	Thickness (GPM) 0 to 150	151 to 300	301 to 450	451 to 600	601 to 750	751 to 900	> 900	Total No. Temperature Inversions	Total No. Sounding Layers
SFC	7	9	4	2				22	133
150	13	14	6	4	1			38	195
300	19	14	6	5	1	1		46	249
500	25	16	6	5	1	1		54	301
1000	31	23	7	5	1	1		68	399
1500	45	26	8	6	2	1	1	89	511
2000	54	37	10	8	4	1	1	115	609
2500	64	41	14	10	5	1	1	136	695
3000	73	50	15	10	5	1	1	155	764
700 MB	73	50	15	10	5	1	1	155	764

Number of Soundings: 133

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

APR 1972-77
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	9	18	45	56	128
150	32	27	78	60	197
300	37	38	99	61	235
500	51	49	113	61	274
1000	63	94	162	63	382
1500	80	135	203	70	488
2000	98	163	238	74	573
2500	121	191	274	79	665
3000	136	217	296	80	729
700 MB	136	217	296	80	729

Number of Soundings: 128

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.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

APR 1972-77
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	2	4	1	2				9	128
150	6	10	5	7	3		1	32	197
300	7	10	5	11	3		1	37	235
500	12	14	9	12	3		1	51	274
1000	20	18	9	12	3		1	63	382
1500	26	26	10	14	3		1	80	488
2000	36	33	11	14	3		1	98	573
2500	48	40	14	15	3		1	121	665
3000	55	45	16	16	3		1	136	729
700 MB	55	45	16	16	3		1	136	729

Number of Soundings: 128

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).

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

MAY 1972-77
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	6	12	30	78	126
150	13	25	74	83	195
300	29	34	104	86	253
500	47	51	119	86	303
1000	60	89	176	88	413
1500	85	151	216	91	543
2000	102	174	259	98	633
2500	132	210	296	101	739
3000	151	238	320	105	814
700 MB	152	238	320	105	815

Number of Soundings: 126

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

MAY 1972-77
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	3		1	2				6	126
150	4	1	4	4				13	195
300	8	4	8	5	2	1	1	29	253
500	13	14	9	6	3	1	1	47	303
1000	21	17	9	8	3	1	1	60	413
1500	36	26	10	8	3	1	1	85	543
2000	46	30	13	8	3	1	1	102	633
2500	58	40	19	10	3	1	1	132	739
3000	69	44	22	11	3	1	1	151	814
700 MB	70	44	22	11	3	1	1	152	815

Number of Soundings: 126

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

JUN 1972-77
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		8	24	96	128
150	8	19	73	98	198
300	28	33	94	99	254
500	50	63	109	100	322
1000	82	111	154	105	452
1500	108	155	207	107	577
2000	139	203	251	110	703
2500	169	239	298	115	821
3000	188	269	325	117	899
700 MB	189	270	325	117	901

Number of Soundings: 128

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

JUN 1972-77
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								0	128
150	1		2	2	1	1	1	8	198
300	5	8	5	3	2	3	2	28	254
500	10	18	8	6	2	3	3	50	322
1000	23	25	17	7	4	3	3	82	452
1500	34	36	18	9	5	3	3	108	577
2000	48	45	23	11	6	3	3	139	703
2500	61	54	29	12	6	4	3	169	821
3000	72	60	31	12	6	4	3	188	899
700 MB	73	60	31	12	6	4	3	189	901

Number of Soundings: 128

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.

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).

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

JUL 1972-77
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	1	10	28	88	127
150	13	21	60	90	184
300	42	35	88	93	258
500	68	64	95	95	322
1000	95	112	143	98	448
1500	126	152	183	103	564
2000	157	194	223	106	680
2500	189	235	260	110	794
3000	207	258	299	114	878
700 MB	207	258	299	114	878

Number of Soundings: 127

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

JUL 1972-77
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					1			1	127
150		1	4	5	2		1	13	184
300	6	8	7	9	5	2	5	42	258
500	14	12	11	14	5	3	9	68	322
1000	25	19	15	16	5	3	12	95	448
1500	40	28	19	17	7	3	12	126	564
2000	52	42	22	18	7	3	13	157	680
2500	67	54	24	21	7	3	13	189	794
3000	77	59	27	21	7	3	13	207	878
700 MB	77	59	27	21	7	3	13	207	878

Number of Soundings: 127

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

AUG 1972-77
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	9	19	37	62	127
150	26	32	65	65	188
300	46	36	84	68	234
500	65	61	91	69	286
1000	95	109	127	71	402
1500	117	152	172	82	523
2000	145	193	220	88	646
2500	159	228	266	89	742
3000	173	251	292	91	807
700 MB	173	251	292	91	807

Number of Soundings: 127

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.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

AUG 1972-77
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	2	1	2	1	1	1	1	9	127
150	3	3	6	6	2	2	4	26	188
300	5	8	11	9	4	3	6	46	234
500	11	14	12	11	7	4	6	65	286
1000	21	23	13	18	7	4	9	95	402
1500	30	31	16	20	7	4	9	117	523
2000	41	39	23	22	7	4	9	145	646
2500	49	43	23	24	7	4	9	159	742
3000	56	48	25	24	7	4	9	173	807
700 MB	56	48	25	24	7	4	9	173	807

Number of Soundings: 127

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).

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

SEP 1972-77
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	35	26	33	25	119
150	45	35	53	27	160
300	59	42	61	31	193
500	70	56	73	33	232
1000	88	91	109	37	325
1500	114	127	153	41	435
2000	140	157	194	49	540
2500	161	190	236	56	643
3000	178	227	268	59	732
700 MB	179	227	269	60	735

Number of Soundings: 119

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

SEP 1972-77
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	6	5	6	4	5	6	3	35	119
150	6	6	6	6	7	9	5	45	160
300	6	12	9	6	8	11	7	59	193
500	10	14	10	8	8	12	8	70	232
1000	15	19	14	9	10	13	8	88	325
1500	28	22	18	13	10	15	8	114	435
2000	36	32	25	14	10	15	8	140	540
2500	46	38	27	15	11	15	9	161	643
3000	55	43	30	15	11	15	9	178	732
700 MB	56	43	30	15	11	15	9	179	735

Number of Soundings: 119

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

OCT 1972-77
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	27	23	47	32	129
150	37	37	66	35	175
300	61	48	81	35	225
500	72	69	92	35	268
1000	91	111	134	39	375
1500	116	164	170	46	496
2000	134	198	213	51	596
2500	163	232	255	56	706
3000	179	266	277	60	782
700 MB	179	267	278	60	784

Number of Soundings: 129

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

OCT 1972-77
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	3	7	4	3	3	2	5	27	129
150	3	9	5	6	5	2	7	37	175
300	13	11	9	8	7	4	9	61	225
500	15	13	11	9	10	5	9	72	268
1000	21	20	14	10	11	6	9	91	375
1500	31	28	17	12	12	6	10	116	496
2000	43	31	19	13	12	6	10	134	596
2500	58	39	23	13	14	6	10	163	706
3000	63	48	24	14	14	6	10	179	782
700 MB	63	48	24	14	14	6	10	179	784

Number of Soundings: 129

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.

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).

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

NOV 1972-77
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	27	29	33	29	118
150	35	48	58	30	171
300	52	61	84	35	232
500	64	72	104	35	275
1000	82	107	146	38	373
1500	103	134	186	47	470
2000	125	172	220	50	567
2500	142	199	254	56	651
3000	156	224	277	58	715
700 MB	157	224	277	58	716

Number of Soundings: 118

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

NOV 1972-77
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	10	9	3	3		1	1	27	118
150	10	14	4	4		1	2	35	171
300	17	18	7	6		1	3	52	232
500	23	21	8	7	1	1	3	64	275
1000	33	26	9	9	1	1	3	82	373
1500	37	36	14	11	1	1	3	103	470
2000	45	43	20	12	1	1	3	125	567
2500	56	47	21	12	2	1	3	142	651
3000	64	50	24	12	2	1	3	156	715
700 MB	65	50	24	12	2	1	3	157	716

Number of Soundings: 118

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

DEC 1972-77
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	26	28	37	27	118
150	36	37	61	28	162
300	49	47	76	29	201
500	56	62	99	29	246
1000	74	92	131	33	330
1500	94	139	174	38	445
2000	114	168	211	43	536
2500	136	199	240	48	623
3000	150	220	266	51	687
700 MB	150	220	266	51	687

Number of Soundings: 118

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.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

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

NWS URBAN SITE, 2725 MONTLAKE BLVD E, SEATTLE (Elevation 8 M Above MSL)

DEC 1972-77
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	6	7	3	5	2	1	2	26	118
150	9	11	5	5	3	1	2	36	162
300	15	14	6	5	4	2	3	49	201
500	20	16	6	5	4	2	3	56	246
1000	27	24	7	5	6	2	3	74	330
1500	39	29	7	6	6	2	5	94	445
2000	52	33	9	7	6	2	5	114	536
2500	59	41	15	7	7	2	5	136	623
3000	66	47	16	7	7	2	5	150	687
700 MB	66	47	16	7	7	2	5	150	687

Number of Soundings: 118

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).

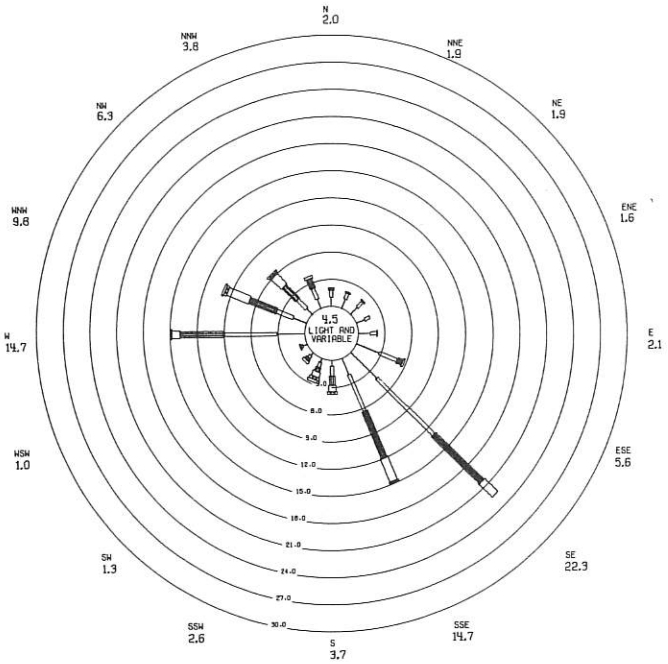
WIND ROSES

The measurement of local area wind speed and direction, concomitant with air quality, is essential to the evaluation and control of air pollution. Lower wind speeds usually result in higher air pollutant concentrations, particularly near major urban or industrialized areas. Wind direction information is essential for 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 as a percentage frequency, of the number of observations which had a particular direction and speed during that time period.

The spokes of these 1977 wind roses represent 16 points of the compass, each pointing towards the direction from which the wind blows. The length of each segment of a spoke indicates the relative frequency of winds of different speeds. Using the scale located to the lower right of each rose, these lengths may be converted to percentages of the total observations.

The percentage frequency of winds from any given direction (without regard to speed) is expressed numerically beneath that direction on the perimeter of the roses. The percentage frequency of light and variable winds (winds less than 1.5 knots) is shown in the center of the rose.



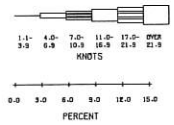
HOUR AVERAGE SURFACE WINDS

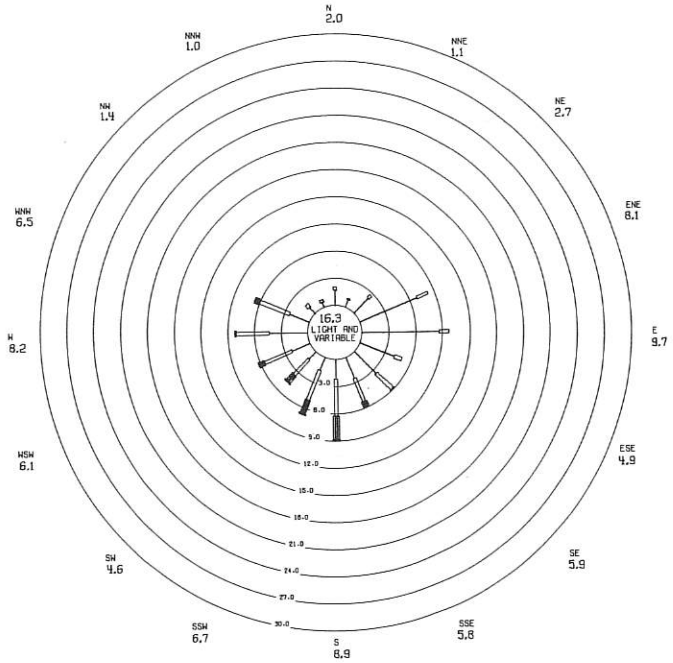
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,531





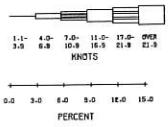
HOUR AVERAGE SURFACE WINDS

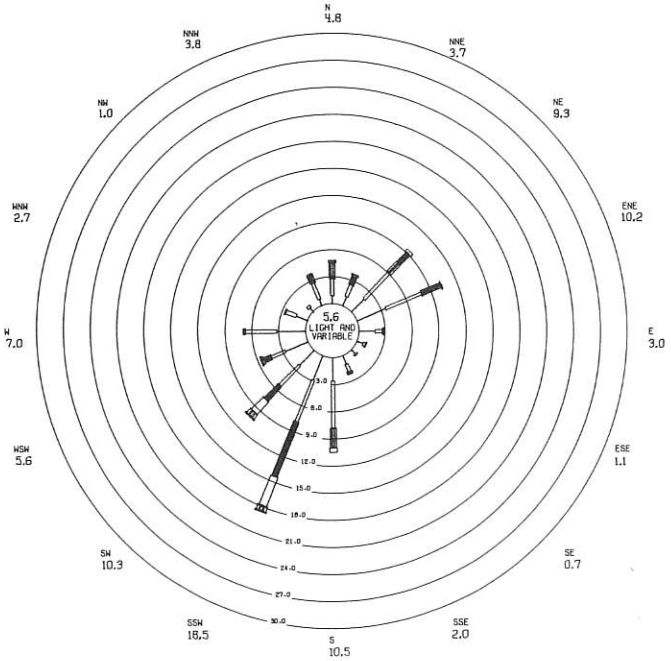
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
NWS URBAN SITE. 2725 MONTLAKE BLVD E. SEATTLE

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,200





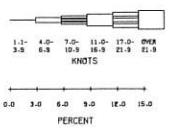
HOUR AVERAGE SURFACE WINDS

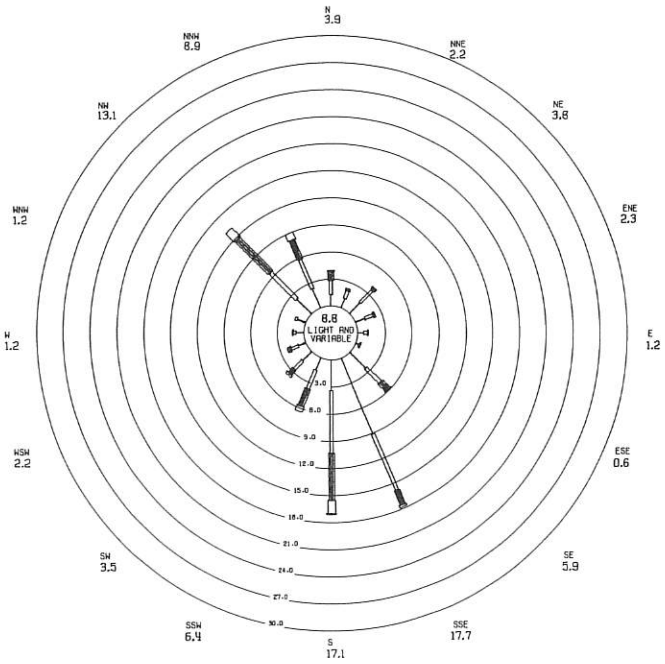
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
FOOD CIRCUS BUILDING. SEATTLE CENTER

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,400





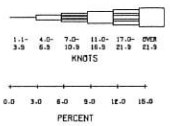
HOUR AVERAGE SURFACE WINDS

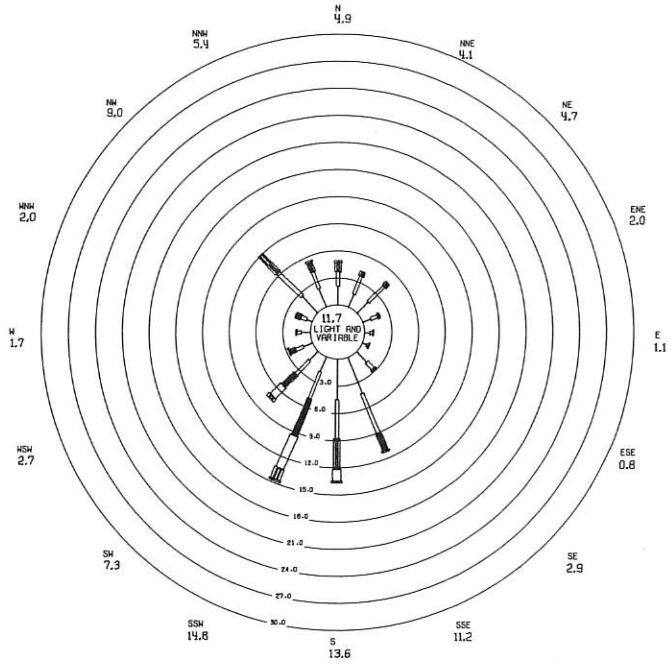
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,524





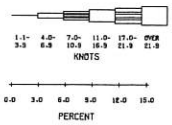
HOUR AVERAGE SURFACE WINDS

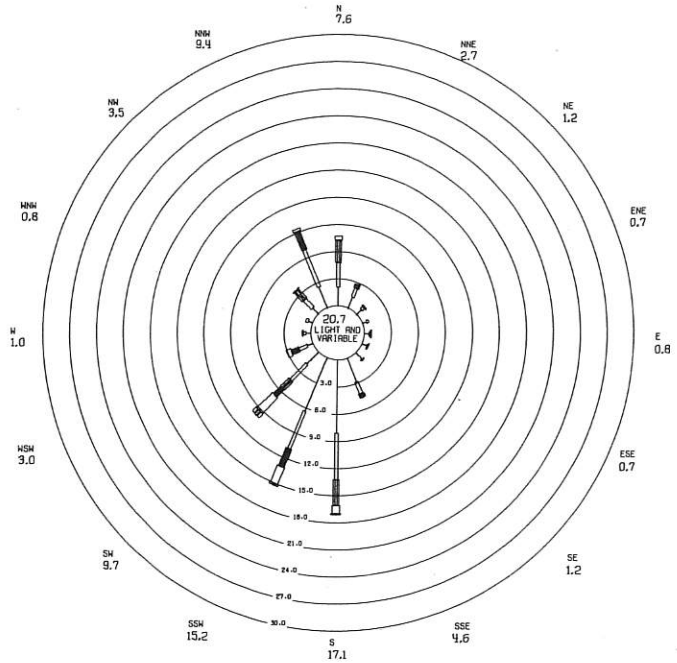
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,269





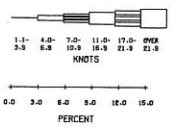
HOUR AVERAGE SURFACE WINDS

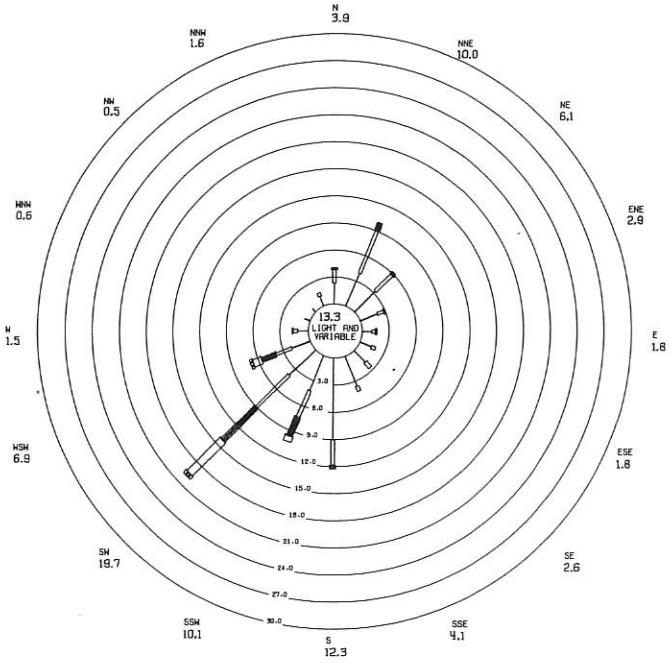
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SOUTH CENTER, ANDOVER PARK EAST, TUKWILA, WA

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,532





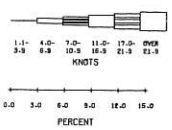
HOUR AVERAGE SURFACE WINDS

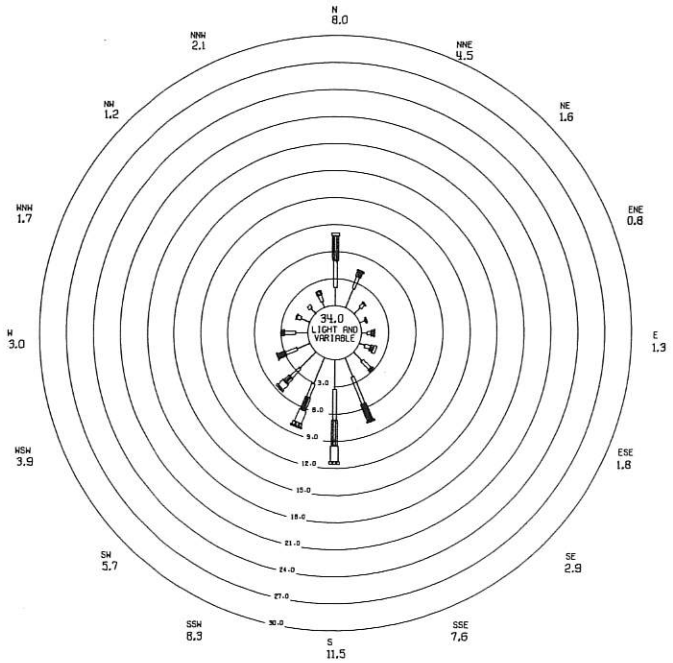
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
MCMICKEN HTS, S 176TH & 42ND AV S, KING CO, WA

INCLUSIVE DATES- JAN, FEB, MAR, APR, MAY, NOV, DEC, 1977

TOTAL OBSERVATIONS- 4,957





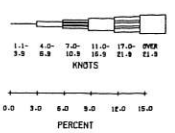
HOUR AVERAGE SURFACE WINDS

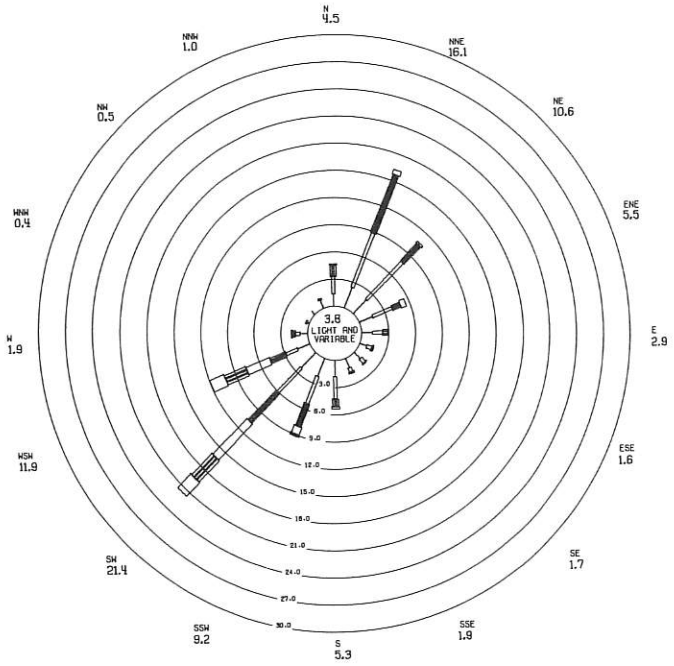
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
22916 86TH AVENUE SOUTH, KENT, WA

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 7,725





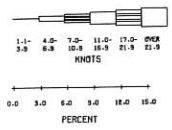
HOUR AVERAGE SURFACE WINDS

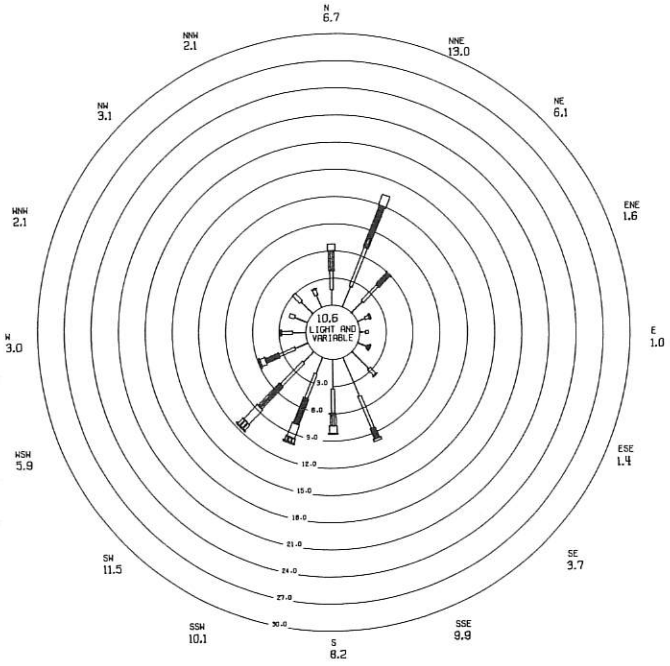
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- SEP, OCT, NOV, DEC, 1977

TOTAL OBSERVATIONS- 2,638





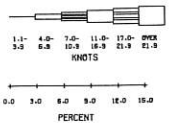
HOUR AVERAGE SURFACE WINDS

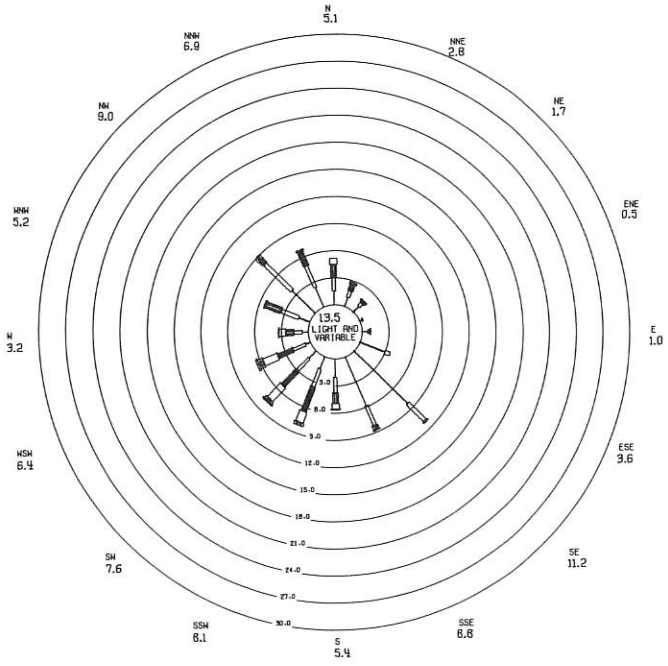
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
MEEKER JR HS. 1526 - 51ST STREET NE. TACOMA

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,346





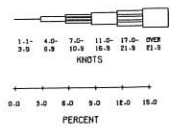
HOUR AVERAGE SURFACE WINDS

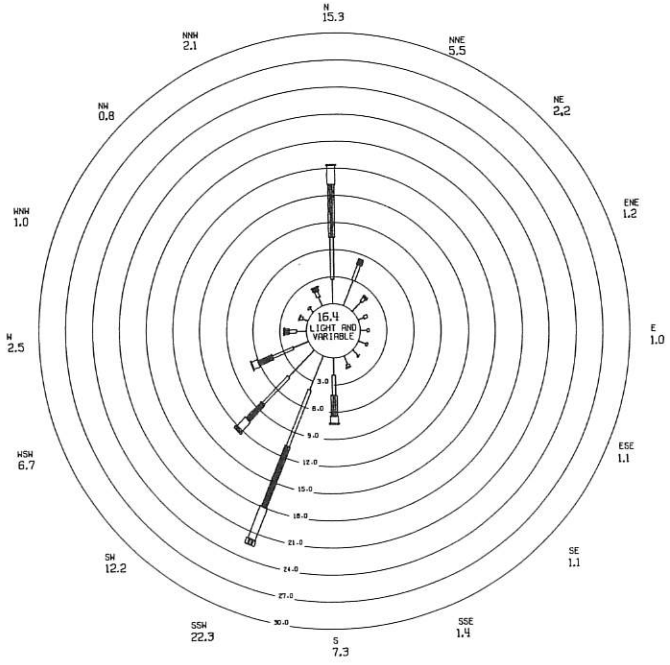
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
2316 E 11TH ST AND THORNE ROAD. TACOMA. WA

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,429





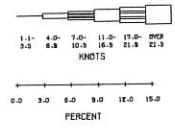
HOUR AVERAGE SURFACE WINDS

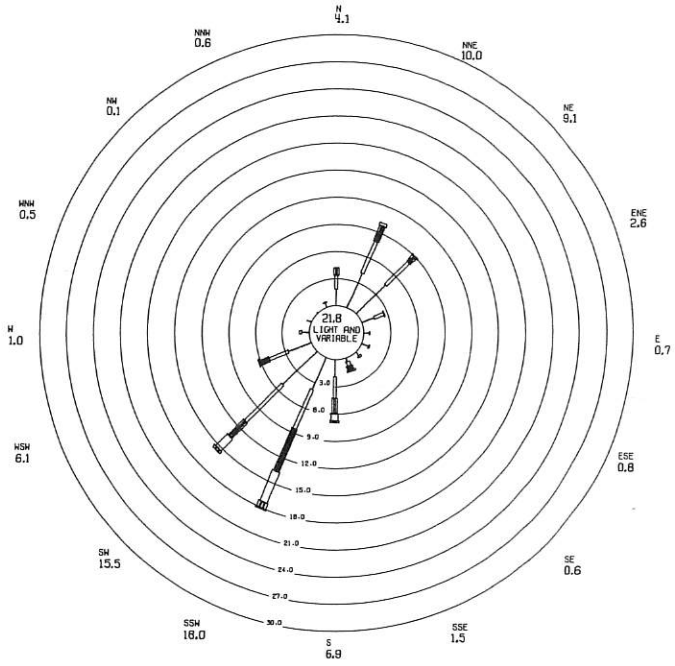
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,537





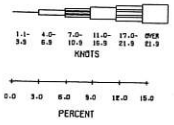
HOUR AVERAGE SURFACE WINDS

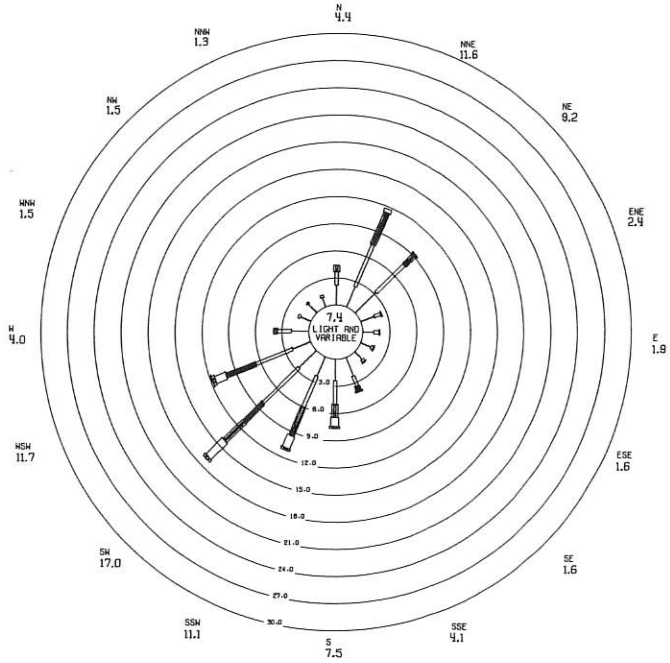
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
N 43RD AND VISSCHER STREETS. TACOMA. WA

INCLUSIVE DATES- JUL. AUG. SEP. OCT. NOV. DEC. 1977

TOTAL OBSERVATIONS- 3,718





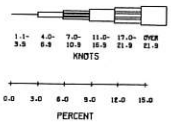
HOUR AVERAGE SURFACE WINDS

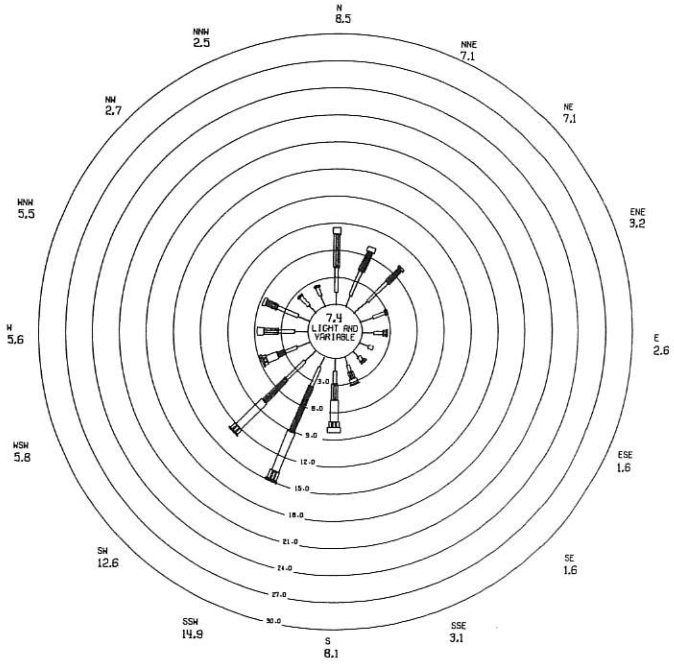
PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
N 26TH AND PEARL STREET. TACOMA

INCLUSIVE DATES- ALL MONTHS 1977

TOTAL OBSERVATIONS- 8,485



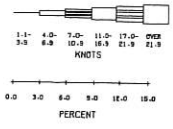


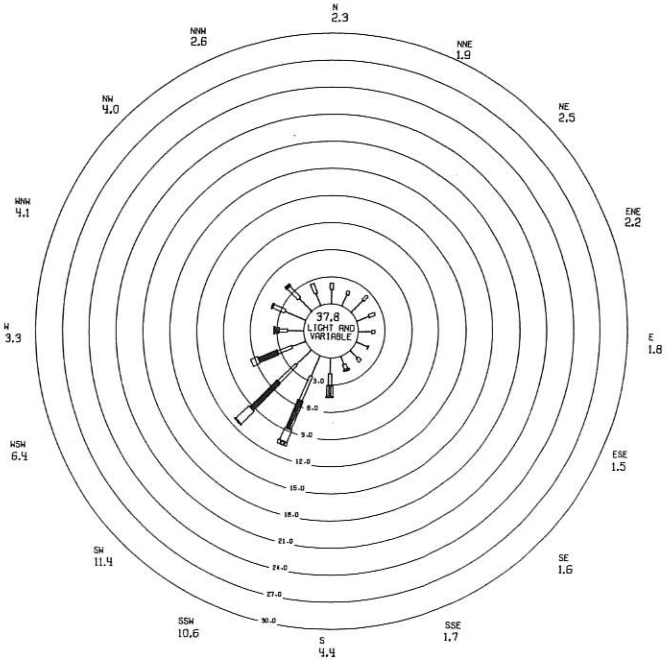
HOUR AVERAGE SURFACE WINDS
(60 METERS ABOVE GROUND LEVEL)
PERCENTAGE FREQUENCY OF OCCURRENCE

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

INCLUSIVE DATES- JUL. AUG. SEP. OCT. NOV. DEC. 1977

TOTAL OBSERVATIONS- 4,226





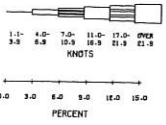
HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
PNW-BELL REPEATER BLDG. DUPONT. WA (NEAR I5)

INCLUSIVE DATES- JUL. AUG. SEP. OCT. NOV. DEC. 1977

TOTAL OBSERVATIONS- 4,262



AIR QUALITY UNITS CONVERSION TABLE

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

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

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	$\mu g/m^3$	ppm	$\mu g/m^3$	ppm		ppm		ppm	
Annual Average	80	.03			a	.02	a	.02	a
30-day Average								.04	a
24-hour Average	365	.14			b	.10	b	.10	a
3-hour Average			1300	.50	b				
1-hour Average						.25	c	.25	c
1-hour Average						.40	b	.40	a
5-min. Average								1.00	d
SUSPENDED PARTICULATES	$\mu g/m^3$	ppm	$\mu g/m^3$	ppm		$\mu g/m^3$		$\mu g/m^3$	
Annual Geom. Mean	75	---	60	---	a	60	a	60	a
24-hour Average	260	---	150	---	b	150	b	150	b
CARBON MONOXIDE	mg/m^3	ppm							
8-hour Average	10	9	same		b	same		same	
1-hour Average	40	35			b				
PHOTOCHEMICAL OXIDANTS	$\mu g/m^3$	ppm							
1-hour Average	160	.08	same		b	same but applies only 10 a.m.- 4 p.m. 4/1 thru 10/31		same as National	
NITROGEN DIOXIDE	$\mu g/m^3$	ppm							
Annual Average	100	.05	same		a	same		same	
HYDROCARBONS (Less Methane)	$\mu g/m^3$	ppm							
3-hour Average	160	.24	same		b e	same but applies only 4/1 thru 10/31		same as National	
PARTICLE FALLOUT						grams/m^2/mo.			
Industrial Areas						10			
Commercial-Residential Areas						5			

ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
mg/m^3 = milligrams per cubic meter

a Never to be exceeded
b Not to be exceeded more than once per year
c Not to be exceeded more than twice in seven days
d Not to be exceeded more than once in eight hours
e Applies to 3-hour period 6 to 9 a.m. daily

PHOTOCHEMICAL OXIDANTS

Photochemical oxidants are produced in the atmosphere when nitrogen oxides and some hydrocarbons are exposed to sunlight. Photochemical oxidants cause irritation to the mucous membranes, damage to vegetation and deterioration of materials. They affect the clearance mechanism of the lungs and alter resistance to respiratory bacterial infections. The national primary air quality standard for photochemical oxidants is based on evidence of increased frequency of asthma attacks for some people on days when hourly averages reach 0.1 ppm. Eye irritation is possible when atmospheric concentrations reach this level.

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.

PSAPCA 4/76