Southwest Clean Air Agency

Annual Report 1999

ON THE COVER

The front cover of this year's report shows three photographs of Mount Hood taken with the agency's visibility camera mounted atop Smith Tower in downtown Vancouver. The top photograph was taken on a clear day, the center photograph was taken on a day with moderate haze impairment, and the bottom photograph was taken on a day with significant haze impairment. It is interesting to note that the wide range of visibility impairment evidenced in these photographs can occur at ambient fine particle (PM_{10} and PM2.5) concentrations that are well below the health-based National Ambient Air Quality Standards (NAAQS) established by the Environmental Protection Agency. The PM_{10} and PM2.5 concentrations, as measured with the Vancouver compliance monitors operated by the Southwest Clean Air Agency, were both less than 20% of their respective NAAQS on all three of these days.

A more detailed discussion of the agency's visibility monitoring program, including a summary of monitoring results for calendar year 1999, is presented on page 54.

1999

Southwest Clean Air Agency
Vancouver, Washington

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The Southwest Clean Air Agency (SWCAA) board members represent each county and the major cities within the region. In addition, one member-at-large completes the eleven member board. The board is the policy making arm of the Agency and adopts Agency regulations.

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.... from the Executive Director

The mild temperatures during the summer of 1999 were key in making it a much better summer for ground level ozone air quality than our previous summer. There were no exceedances of the ozone air quality health standard, but we need to be cautious about our future ozone air quality for two reasons. First, there were 2 days of potential high ground level ozone air pollution that caused Clean Air Action Days to be implemented. Second, we experienced higher than expected ground level ozone levels when temperatures were only in the high 80 degree Fahrenheit range. Previously, high ozone levels have required outdoor temperatures to be in the mid 90 degrees Fahrenheit range to risk experiencing unhealthy air.

A major success milestone for SWCAA occurred with the signing of the contract on May 20, 1999 for the $225 million sulfur dioxide emission control equipment to be installed at the 1,340 megawatt coal-fired Centralia Power Plant. The Pollution Control Hearings Board (PCHB) unanimously upheld SWCAA's Reasonably Available Control Technology (RACT) Order in March 1999. Nevertheless, a Seattle resident appealed the PCHB decision to King County Superior Court. SWCAA then filed a counter motion for the Washington Court of Appeals to hear this matter to expedite the appeal process. SWCAA's motion was granted in August 1999. Construction of the sulfur dioxide scrubbers continues on schedule with a January 1, 2003 operational deadline.

Although public health is the primary mission of the agency, SWCAA began a new effort in 1999 to also measure and document the change of visibility (i.e., scenic panoramas) within the Vancouver/Portland area. A 35-millimeter camera was installed on top of the Smith Tower in downtown Vancouver. It is taking photographs of Mount Hood. These pictures give a qualitative measurement of visibility. Another part of this project involved installing a nephelometer on the roof of McLoughin Middle School to provide a quantitative measurement of any reduction in visibility looking towards Mount Hood. This instrument measures the amount of light scattering occurring in the atmosphere.

Regional haze is another visibility issue affecting all 50 states. In particular, the 10 western States have formed a regional planning body to develop a strategy to comply with the U.S. EPA's new Regional Haze rule. This federal rule has the objective of requiring all 50 states to return the visibility within national parks and wilderness areas to their original visibility conditions by 2064. SWCAA's Executive Director, Robert Elliott, has been appointed to the Public Advisory Board for this process which will provide public input and oversight on the plans developed by the 10 member states. This organization is called the Western Regional Air Partnership (WRAP).

In April 1999, SWCAA and other air quality agencies met with the Columbia River Gorge National Scenic Area Commission to discuss the intent of air quality language in their Management Plan. Their air quality policy language recommends performing studies to convert the area from a Class II designation to a Class I designation and to avoid having any significant degradation in visibility in the Scenic Area. The purpose of the meeting was to brief the Gorge Commission and community leaders about the technical aspects of their air quality language and seek from them a clarification on their intent when they incorporated this language into the Scenic Area Management Plan.

Robert D. Elliott

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Introductory Comments to the 1999 Southwest Clean Air Agency Annual Report

This report is compiled annually by the Southwest Clean Air Agency (SWCAA) staff. An attempt was made to present this data in a clear, concise manner and in a format that would serve an audience having wide and varying needs. We hope that we have succeeded in making it easy to read and understandable so that it can serve for both informational and educational purposes.

The reader will be able to compare the air quality in previous years to that measured in 1999 by reviewing the ambient sampling statistics. In areas where the air quality is good, SWCAA carries out many activities designed to preserve that status; and in areas where the standards have been exceeded SWCAA has established programs to insure attainment will be maintained. These activities include maintaining a permit and inspection program for industrial facilities, developing pollution control strategies, enforcement of the regulations and encouraging public involvement in the environmental policy process.

Our readers may notice that we have a new name. The change from *Southwest Air Pollution Control Authority* to *Southwest Clean Air Agency* was initiated by the Board of Directors. As explained by Jack Burkman, Chairman, "The Board of Directors adopted the new name because we believe the old name did not adequately convey our desire to emphasize education and voluntary efforts to maintain clean air in our communities."

We hope you find this report useful and informative. Please contact us if you have any questions or comments regarding this report or SWCAA activities in general.

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I. CLEAN AIR WASHINGTON ACT

A. WASHINGTON'S CLEAN AIR ACT OF 1991

The Clean Air Washington Act was signed into law in May 1991. This was the most important legislation in the history of clean air in Washington. The Act declares that air pollution is our most important environmental problem, and establishes two objectives: 1) to prevent the deterioration of air quality in areas that already have clean air, and 2) to return the air quality in other areas to levels that protect human health and the environment. The Act encompasses such issues as outdoor burning, wood stoves, motor vehicles, industrial pollution, global warming and ozone depletion.

B. OUTDOOR BURNING

Outdoor burning includes many kinds of fires, from leaf burning in a resident's backyard to burning of forest harvest slash. Outdoor fires account for more than ten percent of the state's air pollution. This includes a wide range of contaminants from carbon monoxide, volatile organic compounds (which lead to ozone pollution), particulate matter and toxic air pollutants.

Although fire is a quick and easy way to dispose of yard and land clearing debris, outdoor burning is also causing a growing health problem and is the number one cause of public nuisance complaints. Alternatives to burning are becoming more common. Clean Air Washington requires commercial and residential open burning to be phased out in urban growth areas over 5,000 population by no later than the year 2001, as composting and other alternatives become available. In areas that do not meet federal standards for carbon monoxide or particulate matter, outdoor burning is banned. In many areas of SWCAA the local fire protection districts have taken over the program of permit issuance and enforcement of the rules. Within the Clark County non-attainment (now maintenance) area all outdoor burning has been curtailed since 1994. State legislation has allowed qualified agricultural burning to continue in the non-attainment areas of Washington. Under the definition provided in the legislation, agricultural burning can take place if the land use can be determined to be commercial in nature. In this case the farmer must be able to produce a recently filed IRS Schedule F form indicating that the venture is a commercial operation. Qualified agricultural burning can only take place on those days having good dispersion of the air contaminants generated. No burning is allowed when an air stagnation advisory has been called by SWCAA. Major efforts have been devoted to defining "agricultural burning" on a statewide basis, as separate and distinct from "outdoor burning" or other types of burning. The scope of this definition is important, as it affects many members of the agricultural community and the citizenry as a whole.

C. WOOD STOVES AND FIREPLACES

There has been a rapid rise in ownership of wood stoves, pellet stoves, fireplace inserts and fireplaces. Wood burning devices are the most polluting means of home heating. This problem is magnified because they are used only about one half of the year - during the winter heating season, which is commonly a time of stagnant air and inversions. This atmospheric condition causes wood smoke to be trapped close to the ground where it is inhaled. In addition, burning often takes place in the neighborhoods we live in, where our children, and adults as well, spend two-thirds of their time. Clean Air Washington set tougher emission standards for new wood stoves and fireplaces. The Act also established an increase in fees assessed on new wood stove or fireplace inserts to $30. This revenue is used for wood stove education and enforcement programs. Installation of used, uncertified stoves is banned. New buildings in areas that exceed federal standards for particulate matter must have an adequate non-wood heat source.

D. MOTOR VEHICLES

Motor vehicles are southwest Washington's largest air pollution producer, and their use is steadily increasing. Motor vehicle use is growing significantly faster than our rate of population growth. Clean Air Washington is designed to reduce motor vehicle pollution and remove tens of thousands of vehicles from southwest Washington's roads during peak commute hours. This will not only improve air quality, but also reduce traffic congestion at the same time. To do this, Clean Air Washington concentrates on three separate motor vehicle issues: motor vehicle emission inspections, clean fuels and conformity. Transportation Demand Management, a companion effort, is authorized by separate legislation.

E. MOTOR VEHICLE EMISSION INSPECTION AND MAINTENANCE (I & M)

Vehicles registered in certain areas of the state must pass an inspection of their emission control systems - or be granted a waiver - in order to be re-registered. The inspection program identifies the worst polluting cars and trucks and requires vehicle owners to correct the problem. And, for the first time, Clean Air Washington adds diesel vehicles to the inspection program. Federal law expanded the vehicle testing and inspection program to include the greater Vancouver area in 1993. The first test station opened in June 1993 in the North Vancouver area, followed in May 1995 by a second location in the Cascade Park area of Vancouver. In 1996, the testing area was expanded to include the areas of Battle Ground, Brush Prairie, LaCenter and Ridgefield as part of the Agency's ozone maintenance strategy. Vehicles in this expanded area began testing in April of 1997.

F. CLEAN FUELS

Clean Air Washington requires the development of specifications for "clean fuels" - fuels that result in lower emissions of air pollutants than today's gasoline and diesel motor fuels. Some potential clean fuels include compressed natural gas and electricity. Thirty percent of new vehicles purchased by state government must be clean fuel vehicles. This requirement increases 5% every year. A matching grant program is established to promote local government clean fuel programs. Through federal regulations the lead content in gasoline steadily declined until December 31, 1995. Since this date it has been illegal to sell leaded gasoline for highway use throughout the U.S.

G. CONFORMITY

The objective of conformity is to ensure that transportation construction dollars are spent on projects in ways that improve - or at least, do not worsen - air quality. Clean Air Washington mirrors federal requirements for federally funded transportation plans and projects to conform to air quality improvement plans.

H. TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) or Commute Trip Reduction, although enacted under legislation separate from the Clean Air Washington Act, is closely related to the motor vehicle issues addressed by Clean Air Washington. TDM helps solve transportation-related air pollution, energy and congestion problems by promoting changes in driving behavior. TDM in Washington focuses on commute trip reduction efforts. It promotes alternatives to single occupant vehicles, such as transit, carpools and vanpools, cycling, walking and telecommuting. Clean Air Washington directs local governments in Clark County to adopt Commute Trip Reduction ordinances and plans. It also requires major public and private employers to adopt and implement Commute Trip Reduction programs after local jurisdictions have adopted their plans. To do this, companies and local governments can offer incentives such as parking incentives for

car-poolers and alternative work schedules. The Washington Department of Transportation has the main responsibility for implementing Commute Trip Reduction (CTR). Further details can be obtained by contacting C-TRAN at (360) 696-4494 for their progress with CTR.

I. INDUSTRIAL SOURCES

Clean Air Washington requires the largest industrial air pollution sources (major sources) in the state to have federally enforceable air operating permits (AOP). Prior to this requirement, Washington was one of the few states in the United States without renewable industrial permits. These new permits will be renewed every 5 years or less and in many cases will require additional monitoring and record keeping. Smaller sources that emit hazardous air pollutants (HAP) or operate in areas where air quality exceeds federal health-based standards may also require an AOP. Clean Air Washington authorizes SWCAA to request delegation of this air operating permit program from the U.S. EPA so that this issue can be handled at the local level. The Southwest Clean Air Agency received delegation of the AOP program in December 1994 and is swiftly moving toward meeting all the necessary commitments of the program.

J. GLOBAL WARMING AND OZONE DEPLETION

Chlorofluorocarbons (CFCs), carbon dioxide, methane, nitrous oxide and certain other gases are known as "greenhouse" gases. They trap energy from the sun in the lower atmosphere, contributing to a gradual warming of the earth's surface. CFCs also contribute to depletion of the layer of ozone in the upper atmosphere that filters harmful ultraviolet rays. Clean Air Washington requires people who repair, service or dispose of any motor vehicle air conditioning system, commercial or industrial air conditioning, heating or refrigeration system or consumer appliance that uses ozone depleting chemicals to recover and recycle them. It also bans the sale of nonessential products containing gases harmful to the ozone layer if substitutes for the products are readily available. Examples of these products include air horns, noisemakers, party streamers and certain cleaning sprays.

K. FUTURE PRIORITIES

SWCAA continually refines program priorities and the measurements that will be used to identify air quality improvements and success in achieving those priorities. SWCAA's future priorities include:

- Maintaining a "clean air" classification for the entire SWCAA region through sound management practices, public education, and contingency measures.

- Reducing motor vehicle exhaust emissions by supporting the Washington Department of Ecology's (WDOE) efforts in the inspection of all registered vehicles in emission inspection areas and ensuring they are properly tuned or repaired as needed.

- Continuing to support the Salvation Army, the Department of Ecology and the Clark County Department of Community Services with the Low Income Assistance Program to help low income families get their vehicles repaired if they fail the emissions test.

- Reducing vehicle miles traveled in the region through increased public awareness of motor vehicle pollution and resulting lifestyle changes, which are needed.

- Maintaining ambient monitoring capabilities for "real-time" measurements that provide for more timely burn ban alert calls and better protection of the public's health.

- Assisting WDOE with development of urban visibility standards, maintaining the recently established visibility monitoring program for the urban Vancouver area, and adding visibility recommendations to state implementation plans.

- Participating with the Washington Department of Ecology, the Oregon Department of Environmental Quality, U.S. Forest Service, the Columbia River Gorge Commission, and the public in the process of assessing and protecting the quality of visibility in the Columbia River Gorge National Scenic Area.

- Participating with member states and the public in the Western Regional Air Partnership to develop a strategy for complying with the U.S. EPA's new Regional Haze Rule. The rule requires restoration of original visibility conditions in national parks and wilderness areas by 2064.

- Reducing emissions of toxic air pollutants and criteria air pollutants from existing industrial facilities through the application of reasonably available control technology (RACT).

- Assisting the Waste Reduction, Recycling and Litter Control program in meeting its goal of reducing hazardous waste generation through encouragement of technologies that reduce hazardous air emissions.

- Supporting comprehensive strategies and curricula for air quality education in grades K through 12, including teacher workshops.

- Maintaining and improving upon a comprehensive inventory of air pollutant emissions in SWCAA's five county jurisdiction.

- Providing timely review of industrial and commercial applications for new construction permits.

- Supporting the development and long-range improvement of intra-county transportation.

- Supporting the goal of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and its successor act, the Transportation Equity Act for the 21st Century (TEA-21) of 1998, to more adequately integrate clean air planning and transportation planning.

- Developing rewards and incentives for citizens to switch to cleaner energy, transportation, and lifestyle options.

- Promoting bicycle lanes and the use of bicycles as a means of alternate transportation.

- Continuing public education and public information efforts to expand citizen awareness on air quality issues and the impact of individual activities on the air quality environment.

- Involving our citizens in the regulatory process.

- Promoting life style changes that contribute to improved air quality not only in Southwest Washington, but also throughout the state.

Many of the priorities listed above are readily achievable today.

L. SIGNIFICANT ACTIVITIES COMPLETED DURING 1999

- SWCAA, the Washington State Department of Ecology (DOE), and the Oregon State Department of Environmental Quality (DEQ) met with the Columbia River Gorge National Scenic Area Commission to discuss the intent of air quality language in their Management Plan.

- 10 western States formed a regional planning body to develop a strategy to comply with the U.S. EPA's new Regional Haze rule. SWCAA's Executive Director, Robert Elliott, has been appointed to the Public Advisory Board for this process which will provide public input and oversight on the plans developed by the 10 member states.

- SWCAA's Reasonably Available Control Technology (RACT) Order for the 1,340 megawatt Centralia Coal Fired Power Plant was unanimously upheld in its entirety by the Pollution Control Hearings Board in March 1999.

- The Centralia Coal Fired Power Plant signed a contract for construction of sulfur dioxide and nitrogen oxide emission control systems in May of 1999, and began physical construction in August of 1999.

- The voters in the State of Washington passed initiative 695 in November 1999 eliminating the Clean Air Excise Tax. This source of funding for clean air agencies provided $2.00 from each motor vehicle licensed in Washington.

- EPA proposed reinstatement of the old 1-hour national ambient air quality standard (NAAQS) of 0.12 ppm in December 1999. This action was taken because a court ruling struck down significant portions of the new 8-hour ozone standard of 0.08 ppm, following a challenge of that standard by special interests. The U.S. Supreme Court will review EPA's authority in this matter.

- The Department of Ecology (DOE) proposed regulations to revise the statewide outdoor burning rules. SWCAA requested changes in the "reasonable alternatives" portion of the rule, and the DOE incorporated them as requested.

- SWCAA received their biannual financial audit from the State Auditor in which they concluded: "Management has demonstrated a genuine concern for the safeguarding of public resources, which has resulted in an exemplary audit history."

- A 35-millimeter camera, installed on top of the Smith Tower in downtown Vancouver late in 1998, took three photographs of Mount Hood each day during 1999. These pictures mark the first full year of what is expected to be a long-term qualitative record of visibility in the Vancouver urban area.

- An integrating nephelometer was installed on the roof of Vancouver's McLoughlin Middle School in June of 1999. This instrument will compliment the photographic record with a quantitative measure of visibility reduction due to light scattering caused by dry particulate pollution suspended in the atmosphere.

- A $PM_{2.5}$ monitor was installed at Centralia College in December of 1999.

- The Moose Lodge TEOM was switched from monitoring PM-10 to monitoring PM-2.5 in December of 1999.

- The interactive video kiosks were deployed to numerous locations as public education tools throughout SWCAA's five county region.

- The agency's public education and outreach efforts included participation in the Clark County Fair, school functions, community and neighborhood environmental functions, and development of public education/outreach materials.

- Two-day Teacher Workshops were held in Clark County, training elementary school, middle school, and high school teachers to provide instruction about air pollution issues.

- Final Air Operating (Title V) Permits were issued to two companies in SWCAA's jurisdiction: Clark Public Utilities/River Road Generating Station, and PacifiCorp (now TransAlta)/Centralia Coal Fired Power Plant. Also, public comment was solicited on Draft Title V Permits for Clark Public Utilities/River Road Generating Station, BF Goodrich Kalama Chemical, Inc., and Northwest Pipeline Company/Chehalis.

- In cooperation with The Salvation Army, the Department of Ecology (DOE), and the Clark County Department of Community Services (DCS), funds awarded SWCAA through an Environmental Justice/Pollution Prevention grant from the EPA were used to assist qualifying low-income citizens with getting their vehicles repaired as necessary to pass the required I/M emissions testing. During 1999, 240 vehicles were repaired for low-income Clark County citizens in need.

- The Agency's General Regulations for Air Pollution Sources (SWAPCA 400) were revised in April of 1999.

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II. SWCAA OPERATIONS

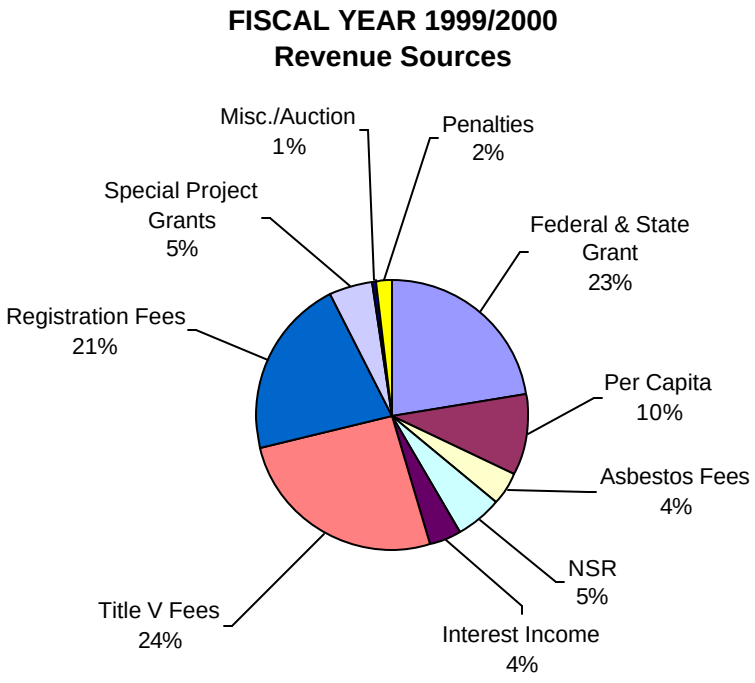
A. HISTORY

In October 1967 the Agency was formed as a single county jurisdiction serving Clark County. For a time the agency's work was accomplished by the Southwest Washington Health Department. In April 1968 a resolution was passed and recorded that expanded the agency's jurisdictional boundaries to 5 counties. Business rules were adopted in 1968 followed by the first regulation, known as "Regulation 1" on December 17, 1968. On October 28, 1969 "Regulation 2" was added. While Regulation 1 dealt primarily with general requirements, Regulation 2 expanded this regulatory base by addressing such things as permissible ambient concentrations, acceptable contaminant levels from industrial stacks and odor limits. These two regulations remained in effect until December 1979 at which time they were superseded in order to comply with federal and state laws and to include many of the provisions within the federal and state regulations. The Agency's General Regulations for Air Pollution Sources was then adopted. These regulations closely paralleled the Washington State Department of Ecology's General Regulations, yet included specific portions of the Agency's earlier versions. Over the years, SWCAA has attempted to maintain current regulations that include the most up to date standards as mandated by the federal and state statutes.

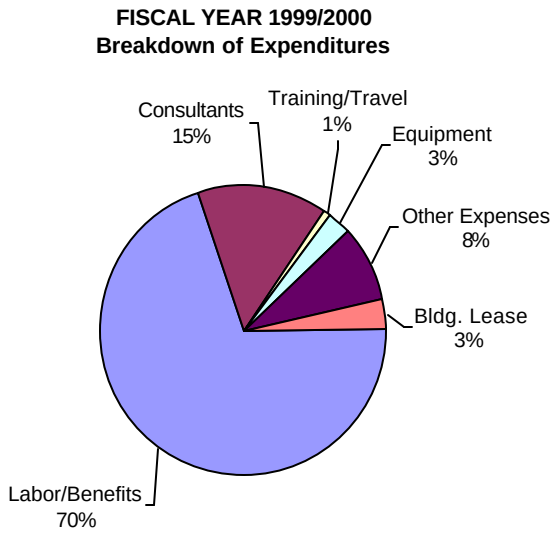
The Southwest Clean Air Agency (SWCAA) is a five county regional air pollution control agency responsible for the vast majority of air pollution control in that region. SWCAA's jurisdictional area consists of Clark, Cowlitz, Lewis, Skamania and Wahkiakum counties.

B. AGENCY FUNDING

The Southwest Clean Air Agency's (SWCAA) budget is based on a fiscal year concept beginning July 1 and ending June 30 of each year, as provided in RCW 70.94.092. Revenue to fund the programs administered by SWCAA comes from a wide range of sources. Grants are received from the State of Washington and the U.S. Environmental Protection Agency as core or supplemental funds. Core grants are relatively general in nature and can be used to cover the costs incurred by the Agency's basic core programs. Supplemental grants are sometimes provided to fund dedicated special tasks, such as establishing two new visibility monitoring sites in Vancouver. SWCAA currently has a per capita assessment in the amount of $0.30 per citizen, which is levied through the normal taxation process of the counties and cities.

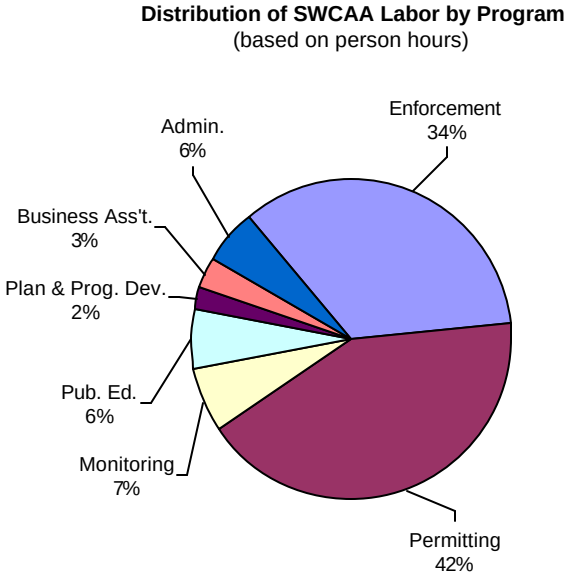


The Agency also receives revenue from registration fees, new source review fees and Title V permit fees. Penalties collected for violation of the rules and regulations of SWCAA are transferred into the fiscal year budget in the following year after collection. The above pie chart provides an overview of the relative contribution from each funding source to SWCAA's fiscal year 1999/2000 budget. The adjacent pie chart shows the relative distribution of expenditures for the same budget period. The pie chart below shows SWCAA staff labor distribution for fiscal year 1999/2000.

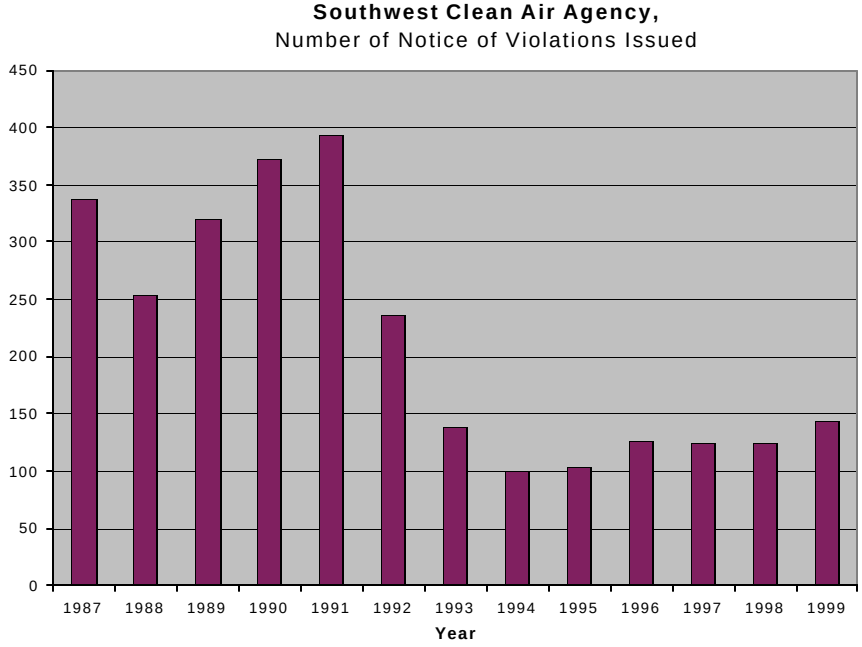


C. FIELD OPERATIONS

1. Introduction

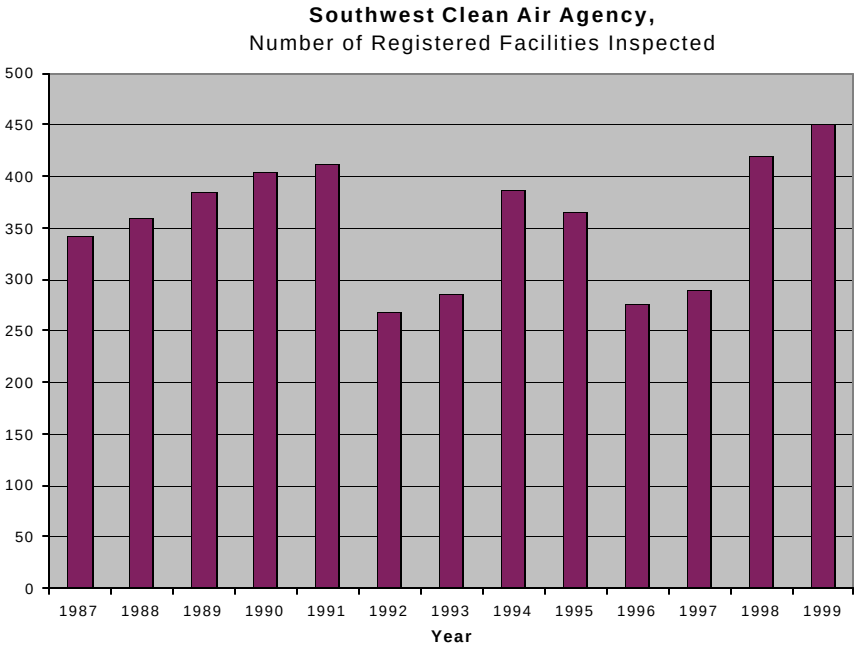


SWCAA's field operations consist of a diverse blend of inspections, complaint response, public education, ambient air monitoring, emissions inventory, and enforcement activities. Each employee is expected to be certified to record visual emissions. This is accomplished through a coordinated effort of certification through the Washington State Department of Ecology and Oregon Department of Environmental Quality. Once the employees have received their initial certification, utilizing the criteria of EPA Method 9, recertification is required every 6 months. This method enables the inspector to evaluate the degree of opaqueness of a plume and record this as a number from 0 to 100 percent opacity. The field staff is often called upon to issue Field Notices of Correction/Violation. These can be the result of a verified citizen complaint, excessive visual emission readings, illegal open burning, violation of the operating stipulations contained in a company's Order of Approval, odor violations or exceedance of emission limits in new source review approvals. After the Field Notice of Correction/Violation has been issued, a determination is made by management on appropriate follow-up actions. The Executive Director may take several courses of action as a result of these field notices. The Agency could issue a formal corrective notice outlining what action is required to regain compliance. This is sometimes done in first offense cases or when it is felt that the violating party was not aware of the regulatory requirements. A civil penalty assessment of up to $10,000 per violation, and/or an Order requiring corrective actions are other options. The agency also has the ability to proceed with criminal charges, or any combination of these actions. Since 1991 SWCAA has experienced a trend showing a reduction in Notices of Violations. This trend has leveled since 1995. This reduction was due to a number of factors. The banning of outdoor burning in the major population areas and good citizen compliance could be credited for some of this reduction. In addition, it is believed that the Agency's stepped-up public outreach program has also made a difference.



Any punitive decision involving a violation of the Agency's regulations can be appealed. Normally, these appeals are heard by the Washington State Pollution Control Hearings Board (PCHB). The purpose of the PCHB is to give all litigants a full and complete public hearing and provide a fair and impartial written decision based on the facts and the law. By establishing the PCHB to preside over environmental cases it speeds up the hearing process and reduces the caseload on the other court systems. To insure the Board's impartiality, the state Legislature created this independent, quasi-judicial state agency, entirely separate from any other state, regional or local unit of government. The Board consists of three full-time members, who are appointed by the Governor and confirmed by the State Senate for staggered six-year terms. One of the three must be an attorney. All are salaried employees of the State, who also serve on the Shorelines Hearings Board.

2. Registration of Sources



Each facility having a potential for emissions of 1 ton per year of all criteria pollutants, but less than 100 tons per year of each, is carried on a registration tracking system by the Agency. In order to offset the cost of site inspections to the taxpayer, SWCAA charges these sources annual fees of $75.00 per emission unit and $39.00 per ton of emissions. The exception is gasoline transport tankers, which are charged $50.00 per tanker unit. A facility may have only one emissions unit, or many, depending upon the type of operation. While these fees are not adequate to pay for the entire registration and inspection program, they do defray some of the cost. SWCAA registers numerous air contaminant-emitting facilities, commonly referred to as “sources”. This registration system is facilitated and maintained through a program of rotating compliance inspections and reporting. After a field inspection of a source has been completed, an inspection report is prepared on a standardized format. This report outlines all of the Orders of Approval (permits) issued to the source, the approved Emission Units and associated equipment, all of the emission limits, operating limits, monitoring/recordkeeping requirements, and reporting requirements, and the observed compliance status of each requirement. If a violation is found,

a Field Notice of Violation (FNOV) is issued, facilitating follow-up enforcement and/or corrective action. Inspections are repeated on an annual to five-year cycle, based on the size, emission impacts and the complexity of the sources.

3. Title V Operating Permit Program

Title V of the Federal Clean Air Act, and subsequently 40 CFR Part 70, requires permitting authorities to issue renewable Operating Permits to major sources of criteria and hazardous air pollutants for a fixed term of up to five years. These permits apply to sources greater than 100 tons of emissions per year and are to be uniform in nature and content throughout the United States. The purpose of the operating permit program is to compile all applicable requirements into one document. The goal is to improve source compliance. The permit issuance process begins with submittal of applications and certification statements by the owners or operators of sources and includes provisions for a public comment period, hearings if necessary, as well as review of draft permits by EPA and affected states.

EPA published a notice in the Federal Register on November 9, 1994 granting interim approval of SWCAA's Operating Permit Program. The Program became effective on December 9, 1994. Minor deficiencies prevented SWCAA and other Washington local air agencies from obtaining final approval of the program at that time. All corrective measures requiring action by Ecology and the Washington legislature have since been completed.

Through 1999, 15 complete Title V Air Operating Permit applications have been received from major sources in SWCAA's jurisdiction. SWCAA staff time continued to be expended in processing these applications during 1999. Upon receipt, staff evaluated each application for completeness, and additional information was requested as required. In addition to SWCAA reviewing their own permit applications, Oregon's permits were also reviewed under procedures established for "affected states review". SWCAA submitted early draft Title V permits to EPA that were used to develop an acceptable format, and existing Orders of Approval were modified in preparation for the Title V permitting process. One draft Title V permits and two final Title V permits were issued by SWCAA in 1999. Synthetic minors are facilities that voluntarily limit their operations to maintain emission levels below the threshold for Title V permitting. There were 27 synthetic minor sources in SWCAA's jurisdiction at the end of 1999.

4. Outdoor Burning

In late 1992, SWCAA adopted a program to permanently eliminate outdoor burning within the southern Clark County carbon monoxide non-attainment area by the end of 1994. Three phases of curtailment were established based on availability of alternate methods of disposal. The burning in the last phase came to a conclusion on November 6, 1994. In all other areas of SWCAA's jurisdiction citizens may burn, but they must obtain approval and can only burn natural vegetation.

Outdoor burning is the number one cause of public nuisance complaints received by the Agency. Virtually hundreds of complaints are received and investigated each year by the field staff as is shown in the graph on page 24. Of the 287 complaints received by SWCAA in calendar year 1999, 121 of these were the result of open burning activities. Most of these complaints fall into one of three categories: 1) smoke nuisance, 2) burning by sources that are not legally permitted to burn, or 3) the burning of prohibited materials. These complaints are investigated and if a violation is noted, a Field Notice of Correction/Violation is issued.

The way agricultural burning is managed has changed considerably in Washington State in recent years. This change is part of a comprehensive revision of the state's air pollution laws that affects not just agriculture, but many other commercial, industrial, residential and municipal activities. In December 1994, WAC 173-430 "Agricultural Burning" was adopted and became effective early in 1996. WAC 173-430 makes it possible for continued agricultural burning in some areas where all other forms of open burning are prohibited, for example in areas that are deemed to exceed the federal standards. Burning is only allowed by

individuals that can provide an Internal Revenue Service Schedule F form, indicating a commercial agricultural operation, and if no reasonable alternatives exist according to *Best Management Practices*. Thus qualified, the individual must apply for a permit, depending on the nature of the proposed burning.

5. Wood Stoves and Fireplaces

The smell of wood smoke evokes pleasant memories for many people, but for others it presents a health problem. Wood smoke, largely from wood stoves and fireplaces, has become a major part of the air pollution problem in the United States and particularly in the Northwest. Many residents are operating under the belief that burning wood will cut their heating bills. In actuality, this may not be the case when all of the costs of wood burning are considered. A growing body of evidence suggests that we cannot ignore the medical consequences of extensive exposure to wood smoke.

Smoke is composed of many small particles of carbon compounds from the burning of organic matter such as wood, coal or oil. This small particulate matter (particles less than 10 microns in diameter) is called PM_{10}. PM_{10} is regulated by the EPA and by SWCAA as one of the criteria air pollutants.

In SWCAA jurisdiction, wood stoves and fireplaces account for approximately 17 percent of the total PM_{10} air pollution, produced mostly during the winter months. This is also the time when stagnant air and temperature inversions are likely to occur. These conditions limit air movement, "trapping" the pollution close to the ground and keeping it within our breathing space. All new stoves sold in the state of Washington must be EPA certified stoves that are required to meet federal standards of emission control. In addition, there are visual emission standards that are enforced by SWCAA on all wood heating devices. Dry fuel and adequate amounts of combustion air for the fire are necessary to avoid exceeding these standards. A good fire produces no smoke with only heat waves visible at the outlet of the chimney.

SWCAA curtails fireplace and wood stove use when the ambient concentrations of either carbon monoxide or particulate matter approaches or threatens to exceed health standards. When this happens, the local newspapers, radio and television stations are notified. A Stage I alert prohibits the use of fireplaces and uncertified stoves. A Stage II alert is called as ambient levels of contamination reaches higher levels. When this happens the prohibition is extended to include certified wood stoves. Wood stoves that are the sole source of heat for the residence are not affected by these prohibitions. However, no wood stove is allowed to operate with visible smoke that exceeds 20 percent opacity. No curtailments were called in 1999.

SWCAA received 40 complaints related to wood stove and fireplace activities during 1999. These complaints were either followed-up in the field for compliance purposes or the party received a letter providing information on proper use of their wood burning devices and how to limit impact to the airshed and neighbors.

The Agency maintains a recorded message in order to disseminate burning information. The public can call either the normal business number of 574-3058 or the 24 hour burn information hot line of 574-0057.

6. Asbestos

Asbestos is a name given to a group of minerals found naturally in our environment. They are flexible in nature and serve as an excellent insulation for fire and heat resistance. Unfortunately, asbestos is also comprised of tiny respirable fibers that have been directly linked to serious health problems. These fibers can cause asbestosis, a scarring of the lungs, which can lead to breathing problems and heart failure. In addition, it can cause cancer of the lungs and mesothelioma, a rare cancer of the chest or abdominal lining. There is also evidence that links asbestos to cancer of the stomach, intestines and rectum.

Unlike many other air contaminants, asbestos has no known safe exposure level. It is believed that minute concentrations of asbestos fibers, either breathed in or swallowed, can cause cancer in humans.

For many years, asbestos was commonly used for insulation against heat damage and fire hazard. It was used for insulation around commercial and industrial boilers and their steam pipes, as well as in floor tile, glues, roofing, insulation around fireplaces and wood stoves, plaster, patching and spackling compounds, and in automotive brake linings. Although less common, many of these products remain in use today.

There is no question asbestos has distinct advantages for thermal insulation. Unfortunately, the related health effects far outweigh the beneficial properties it possesses. Also tragic is the fact it takes from fifteen to forty years for any sign of health problems to manifest themselves. This is why it was not until many years after the completion of World War II that the problem was recognized and corrective actions began. During the war years, shipyard workers were exposed to large quantities of asbestos in the ship building process.

In order for asbestos to become a health problem it must first be released into the air we breathe, or contaminate products we ingest. As long as the asbestos stays "encased" or intact and never gets to the air - there is little danger associated with it. Unfortunately, asbestos is not always closely contained. As insulation, fire proofing, roofing materials and other products are exposed to normal day-in and day-out traffic, the material begins to break down and the asbestos fibers begin to separate from their bonding agents. As a consequence, the fibrous compounds can eventually become airborne. Asbestos subject to airborne release by such mechanisms is termed “friable”.

During remodeling or demolition projects, glues and adhesives are often sawed and sanded. If those products contain friable asbestos, significant airborne contamination and an unhealthful atmosphere for the workers and residents can result. Even at dump sites, if not handled properly, friable asbestos can become airborne as a result of heavy earthmoving equipment and other vehicles driving over it. For this reason, special precautions must be implemented even during the ultimate disposal.

Prior to beginning any demolition work on structures within SWCAA's jurisdiction, an asbestos survey must be completed by an AHERA certified contractor. Before any friable asbestos can legally be removed, or encapsulated, the contractor must submit a request and obtain prior approval, called a "Notice of Intent to Remove or Encapsulate Asbestos". In order to process this request and insure that all responsible parties, including the Washington Department of Labor and Industries (L&I), are properly notified, the application must be received at least ten days prior to commencement of the job. Information required includes a site description, method of handling the waste, amount of material, specific type of asbestos, and final disposition of the material. For significant demolition projects, including the intentional burning of structures for firefighter training, a “Demolition Notification” must be submitted to SWCAA, even if no asbestos is found by the survey. This insures that only asbestos free structures are being demolished. Heavy emphasis has been placed on the removal and/or encapsulation of asbestos laden products throughout the nation in recent years. Working with L&I and the U.S. EPA, SWCAA tracks removal, encapsulation, and demolition projects and makes sure all jobs are conducted by licensed contractors, who are trained and certified in survey, removal, and disposal practices.

The asbestos is tracked to its ultimate disposal site in order to insure it is properly handled and disposed of. This material, because of the health risks associated with it, is not intermingled with the other refuse, but handled separately and covered daily.

During 1999 a total of 264 asbestos removal/encapsulation project applications were received and reviewed by SWCAA, 6 asbestos related complaints were received, and 14 asbestos removal and encapsulation projects were inspected. In order to offset the cost of administering this program, a fee is required on each notification. The fee amount varies depending upon the type and size of the project.

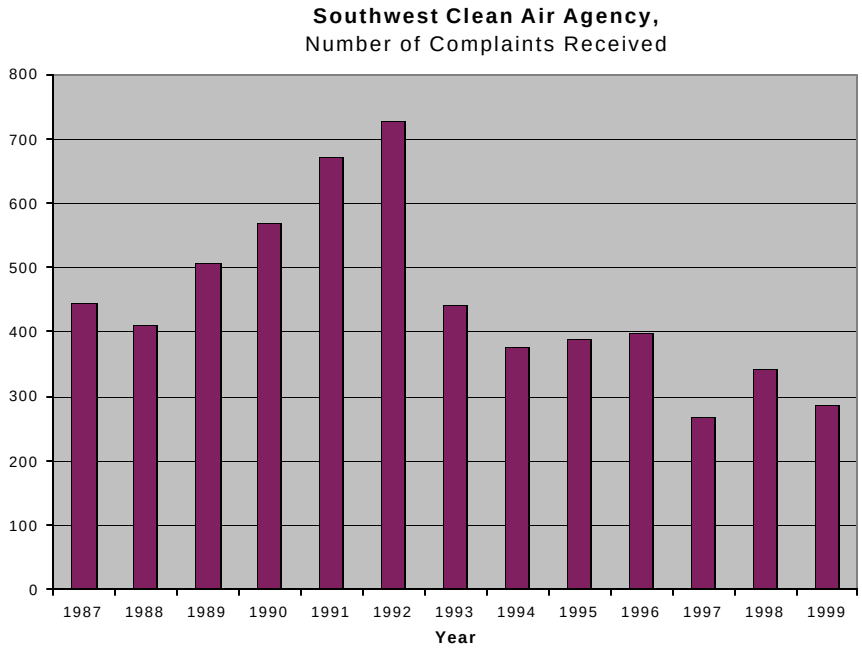
7. Gasoline Vapor Recovery

Gasoline dispensing facilities, bulk handling terminals and gasoline hauling tank trucks can release fumes into the ambient air. These vapors contribute to ozone smog and contain toxic and cancer causing compounds. Toluene, xylene and the state's second leading cancer causing air pollutant, benzene are contained in these emissions. As gasoline enters an enclosure, vapors are displaced. In the past these vapors were vented directly into the atmosphere, however new requirements prohibit many of these uncontrolled emissions sources. Many gasoline-dispensing facilities are now equipped with Stage II vapor recovery controls. These controls capture and recover the displaced vapors as the vehicle's gasoline tank is filled. All of the larger gasoline dispensing stations were required to install Stage II vapor recovery controls by May 1, 1994. In 1999, 21 gasoline stations applied for approval to install Stage II vapor recovery systems. That number consisted of 11 facilities located in Clark County, 2 in Cowlitz County, 5 in Lewis County, 2 in Skamania County, and 1 in Wahkiakum County.

Even more gasoline dispensing facilities are equipped with Stage I control, which captures and controls the fumes during tank truck delivery operations. Vapors can be lessened with Stage I control as a result of submerged fill tubes. By extending the fill tube in the bulk storage tanks below the surface of the gasoline, less vapor results. All new and upgraded tanks and all facilities with greater than 360,000 gallons per year throughput are equipped with this type of control.

8. Citizen Complaints

SWCAA tries to effectively cover the five county area of its jurisdiction as frequently as possible, but the Agency's field staff can not be everywhere all of the time. For this reason, citizen complaints are used to help locate problems and violations. The sharp reduction in complaints occurring in 1993-94 and sustained through 1999 appears to coincide with the curtailment of outdoor burning in southern Clark County. In 1999 the number of outdoor burning related complaints received by SWCAA was 121. This is nearly one half of all of the 287 complaints received by the agency in the year.



9. Public Outreach

While early efforts to control air pollution successfully focused exclusively on industrial and commercial sources, the burden of responsibility for polluted air has shifted in recent years to individual southwest Washington residents--people who drive single occupant vehicles, burn yard debris, or heat their homes with wood.

Beyond encouraging voluntary cooperation from citizens to minimize air pollution, SWCAA assists and/or operates several air quality control programs that focus on "people-caused" pollution. Probably the most

familiar of these programs is the mandatory motor vehicle emissions testing that was implemented in June of 1993. Other examples are the phase out of backyard burning in the Vancouver metropolitan area and the statewide wood stove certification program designed to reduce emissions.

A major public education program was initiated in 1994 by SWCAA. This included classroom training for teachers in air pollution issues. This training program was sustained through 1999 with two two-day workshops in Clark County, and the distribution of 40 Environmental Resource Guides (ERG) to teachers within our five-county jurisdiction. Also, an interactive video program, which explains a variety of air pollution subjects, was placed in 8 public and private facilities throughout SWCAA's jurisdiction. Schools, businesses and governmental facilities wanting to use this equipment should call SWCAA for information and scheduling. In an important continuing program, C-TRAN provided free bus rides on high ozone air pollution days that are called Clean Air Action Days. Two Clean Air Action Days were called in 1999, down from eight in 1998. Typically, a significant increase in C-TRAN ridership is realized on these days.

Residents of southwest Washington are encouraged to participate in air pollution control. No regulations affecting the area's air quality are adopted by the Agency's Board of Directors without a prior public hearing, and the participation of any interested person is welcome. Copies of proposed rules, or rule changes, are available well in advance of the hearings. We encourage the public to contact SWCAA for handouts and further information.

Successful government relies on the support of an informed public. This report, published every year, updates SWCAA's air quality activities, and summarizes air-monitoring data collected. SWCAA publishes other reports and pamphlets that are available to the public. Increasing emphasis will be placed by the Agency on this program in the future.

10. Business Assistance

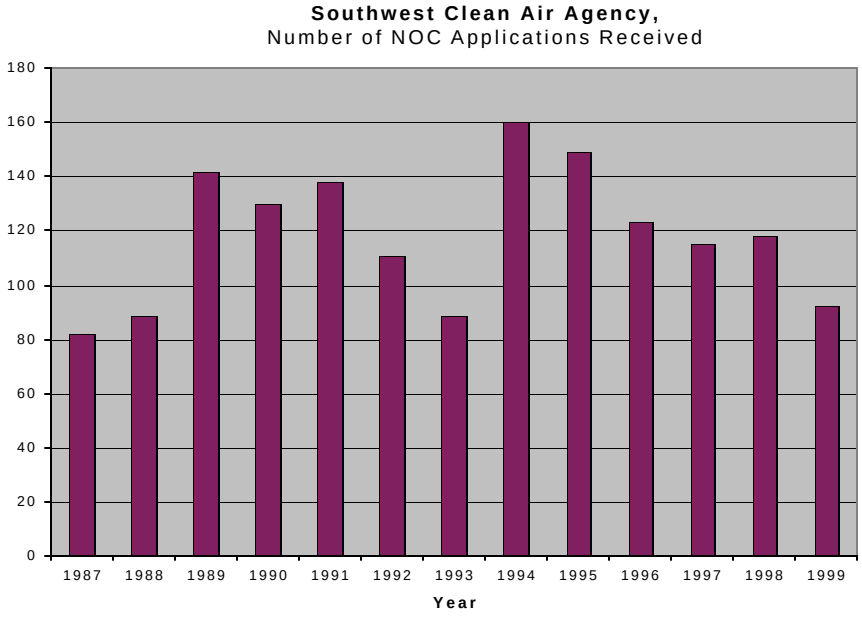
Clean Air Washington requires that SWCAA establish a business assistance program to help companies understand air quality regulations and to aid them in complying with the requirements of those regulations. Formerly provided through contract with the Columbia River Economic Development Council (CREDC), this service was assumed by SWCAA staff in July 1998. This approach was developed in order to keep the program entirely under the control of SWCAA and insure that all communication is direct with SWCAA engineers and specialists. The business assistance program is multifaceted and provides general, technical and developmental assistance to the business community. Public assistance is provided on all of the agency's processes including Notice of Construction (NOC) applications and approvals, Best Available Control Technology (BACT) analysis, emissions calculations, registration requirements, applicable rules and regulations, and compliance assurance.

D. ENGINEERING

1. New Source Review

Prior to the construction of any new source of air contaminants, or modification to existing sources, SWCAA must review the proposal in order to determine if the project will conform to the criteria generally associated with Best Available Control Technology (BACT). SWCAA's approval must be granted before any construction can legally take place. In order to help offset the cost of this review a $300.00 filing fee is required with each application plus an additional review fee. The additional amount is based upon the size and complexity of the source.

After the Agency's review has been completed and SWCAA is satisfied that the proposal can be built in a manner that will not violate any portion of the State or Federal laws pertaining to air pollution, an order called a "Preliminary Determination" is issued. This document is sent to the Applicant and EPA. A public notice for the project is published in the local newspaper where the construction is intended to take place, announcing their plans. The document and its recommendations remain open for public input and comment for thirty days. The engineering staff then reviews it once again, including any public comments that may have been received. The public's input is then used in order to make the final approval determination. If the comments do not outweigh the initial preliminary determination results, "final approval" is granted. A copy is mailed to the U.S. Environmental Protection Agency and the original is sent to the Applicant.



A total of 92 "Applications for Approval/Notices of Construction" were received during calendar year 1999. That number consisted of 50 Applications in Clark County, 18 in Cowlitz, 20 in Lewis, 3 in Skamania, and 1 in Wahkiakum County. Ninety-one Applications for Approval/Notices of Construction were given final approval in calendar year 1999.

Once built, the projects are inspected in order to determine: 1) whether the proposed equipment was actually installed as approved, and 2) whether the systems and equipment are capable of continued compliance with all applicable regulations in actual field application. Results are documented in an inspection report. If compliance issues are found, corrective and possibly enforcement actions are initiated accordingly.

2. Emission Reduction Credits

In the mid-to-late 1980's, the greater Vancouver area was in nonattainment status for CO and ozone. At that time, new or modified industrial sources with emissions greater than one ton/year in a nonattainment area needed to obtain emissions offsets at a ratio of 1.3 to 1.0 (i.e., a 100 ton source would have to get 130 tons of offsets). This requirement was pursuant to federal Clean Air Act requirements. The objectives of the offset policy were to promote more cost-effective pollution control through the use of market mechanisms and to allow for economic growth within areas in which the ambient air quality standards were being exceeded.

In order to provide an easily available growth mechanism for new or modified sources in the nonattainment areas of SWCAA jurisdiction, SWCAA adopted new general regulations in 1986 that included provisions for an emission credit bank and conditions for issuance of emission credits. Accordingly, VOC and PM credits were made available for sources that emitted greater than 1 ton/year of these pollutants. The beginning balance of the private and public VOC bank was established with emission credits from the December 1982 shutdown of Carborundum, a silicon carbide processing facility in Vancouver. The Port of Vancouver purchased the Carborundum property (in 1986), requested, and was granted 100 tons/year of PM and VOC emission credits to be able to attract new businesses to the Port. The remaining Carborundum credits were

assigned to SWCAA (400 tons per year PM and 140 tons per year VOC) for attracting new businesses or expanding existing businesses.

In addition to the Carborundum credits, the SWCAA Board of Directors adopted two resolutions that added emission credits to the bank. Resolution 1988-3 adopted on July 19, 1988 allocated 1,120 kg/day VOCs, 70% of VOC emissions determined to be excess in the State Implementation Plan at that time, to the bank. Amended Resolution 1989-3 adopted on January 24, 1989 amended emissions to the bank to 972 kg/day, 30% of VOC emissions determined to be excess in the State Implementation Plan at that time.

In September of 1993, the SWCAA General Regulations (SWAPCA 400) were revised to be consistent with federal and state of Oregon rules for nonattainment areas which only require an offset of 1.1 to 1.0 and only for new sources of 100 tons or greater or modified sources with an increase of 40 tons or greater instead of the previous 1.3 to 1.0 and 1 ton increase threshold. Most, if not all, public credit banking transactions performed by SWCAA prior to these regulation changes were for quantities less than 40 tons per year. Therefore, those sources that had requested and received emission credits prior to 1993 no longer are required to go through this process for quantities less than those described above.

Private CO and NOx credit banks have also been established with requests for credits from several industries due to shutdowns or modifications.

Neither the SWCAA credit bank or credit program has been approved by the US Environmental Protection Agency (EPA). Each year when the Washington Department of Ecology (WDOE) and SWCAA submitted the general regulations to the EPA for update as part of the Washington State Implementation Plan, EPA rejected the rules for the emission credit bank. This is because the WDOE and SWCAA rules for emission banking, as established in 1986, did not conform to EPA guidelines or current regulations. Therefore, the credits established under the bank were not federally recognized or approvable for large sources and could not be used for satisfying federal programs such as prevention of significant deterioration (PSD), offsets, or new source review.

The Vancouver Ozone Maintenance Plan/Redesignation Request (approved by EPA on April 30, 1997) for the Portland/Vancouver ozone nonattainment area did not account for credits in the SWCAA VOC bank in the emission inventory in the plan. However, there would have been an issue of federal enforceability and time periods to reconcile as part of proposing use of these credits. (The private NOx and CO ERCs were accounted for in the Ozone and CO Maintenance Plans due to the fact that 1992 actual emissions were used in the Maintenance Plans and all the current CO and NOx bank credits were accounted for in those emissions; i.e., the shutdowns occurred after 1992.) The proposed Ozone Maintenance Plan does include a growth margin for new or modified sources, however, this margin does not provide for use of any existing or future credits. Since the Ozone Maintenance Plan has this growth margin for industrial sources, emission reduction credits are not needed until the growth margin is used up and the rules require offsets once again. Since SWCAA rarely has new major sources, this may not occur until after the full 10 year Maintenance Plan time period. If a major source did need offsets, they currently would not be able to use the VOC credits in the existing banks since they are not federally enforceable. Also, even if EPA approves the SWCAA credit bank, there are only enough VOC credits in the public VOC bank for one new major source to use.

Due to the above problems with the bank, the following actions were proposed in 1998 to correct identified deficiencies in the existing emission credits banking program:

- Dissolve and close the public VOC and PM credit bank. SWCAA should reconcile the public VOC and PM credit bank in a manner that results in the least burden on sources and the Agency. SWCAA would propose that any source that has been assigned credits from either the SWCAA bank or the Port of Vancouver be allowed to retain those emission credits as part of their facility emission limit. No additional paperwork would be necessary on the part of the individual sources to ensure that the current emission limits include these previously issued credits. For those credits that are not assigned to industry by SWCAA or the Port of Vancouver prior to July 1996, they would be dissolved and the bank closed.

- Retain the private VOC, PM, CO and NOx bank and run according to SWCAA regulations; i.e., credits expire 5 years after issuance of order of expiration date in ERC Order.
- Revise the rules to be consistent with the federal rules and obtain EPA approval of the private credit bank program, so that if offsets become required again, the private credits can be used. Otherwise, there may not be a need for the banks if one could only use credits that had been approved in the SIP.
- Revise rules to allow the ability for future interstate emission trading. Other states and agencies will have to revise their own rules to accommodate interstate trading issues; other states and agencies have not shown great interest however. The Oregon Department of Environmental Quality has stated they could approve an interstate transfer on a case-by-case basis using a source-specific SIP revision.

The SWCAA Board of Directors approved board Resolution 1998-9 at the October 15, 1998 board meeting. The Resolution 1998-9, in conjunction with proposed changes (at that time) in SWCAA regulations 400-130, 400-131, and 400-136, dissolved the public portion of the ERC bank which contained credits from Resolution 1988-3 as superseded by Resolution 1989-3. These actual changes were not finalized until the total SWCAA 400 regulations were adopted by the Board of Directors in 1999.

As of December 31, 1999, the bank balances were as follows:

Public VOC bank	dissolved
Private VOC bank	24.2 tons/yr.
Public PM bank	dissolved
Private PM bank	0 tons/yr.
Public CO bank	dissolved
Private CO bank	22.9 tons/yr.
Public NOx bank	dissolved
Private NOx bank	213.2 tons/yr.

3. Emissions Inventory

The Federal Clean Air Act Amendments of 1990, passed by Congress, recognized that many areas across the United States were in violation of the National Ambient Air Quality Standards (NAAQS) for ozone and/or carbon monoxide (CO). To develop and implement an effective air quality control strategy, an air pollution control agency must compile information on the important sources of these pollutants. The role of the emission inventory is to identify the source types present in an area, the amounts of each pollutant emitted and the types of processes and control devices employed at each plant.

a. Emission Sources

Air pollutants are emitted from a wide variety of sources in southwest Washington. Sources are often lumped into three broad categories: point sources, area sources and mobile sources. Point sources are traditionally stationary facilities like factories. Mobile sources represent motor vehicles of all types. Area sources are widely dispersed and often non-regulated and non-controlled. Dry cleaning, painting operations, open burning, gasoline lawn mowers, and biogenic sources such as forest and brush fires are some examples.

Point sources emit relatively large volumes of pollutants from a single location. Examples include rock quarries, lumber mills, and other manufacturing plants and processes. Each source over 100 tons per year (major source) operates under a Title V Air Operating Permit. Each source less than 100 tons per year operates under one or more Orders of Approval issued by SWCAA or, if grandfathered, the source must comply with the General Regulations for Air Pollution Sources (SWCAA 400). Each source must demonstrate that it can operate with its emissions at or below the emission limits prescribed by SWCAA as stated in their Order(s) of Approval and/or SWCAA 400.

Area sources are classified as categories of relatively small individual sources of pollution, usually spread over a broad geographic area, that collectively contribute significant levels of emissions. Wood stoves, slash and field burns, forest fires, backyard burning, and dust emissions from roads are examples of area sources. Area sources usually do not operate under the emission permit system.

Mobile sources include cars, trucks, and other vehicles. There are both "on-road vehicle" and "off-road vehicle" components to this category. While each individual unit in the area or mobile source categories may emit only a small amount of pollution, taken as a whole their emissions are generally much larger than those from point sources in southwest Washington. In fact, transportation accounts for over 50% of all air pollution nationwide.

SWCAA maintains a detailed inventory of air pollution emissions in southwest Washington (See Appendix F). Our inventory is normally compiled and reported to EPA once per year.

b. Particulate Emissions

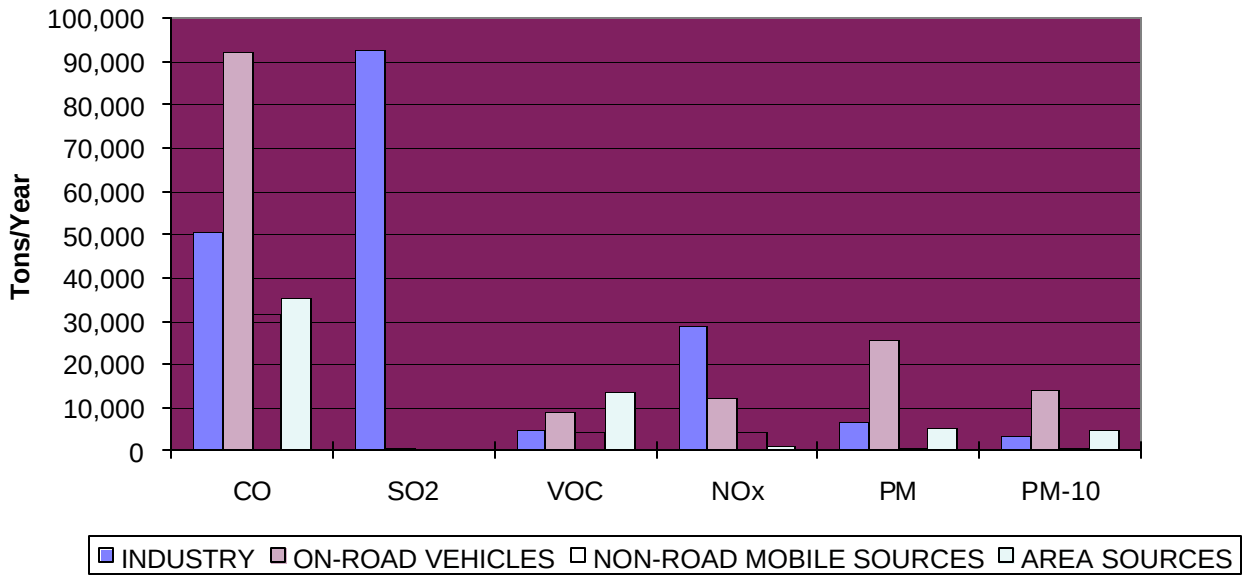
In recent years, the Portland/Vancouver Air Quality Maintenance Area (AQMA) has seen considerable variation in particulate emissions from industrial sources as a result of fluctuating production levels. The overall trend suggests that emissions from point sources are decreasing. This is probably a result of improved pollution control equipment. However, the benefits of these reductions appear to have been offset to a certain degree by increased emissions from area sources such as home heating with wood.

The EPA Wood Stove Testing and Certification Program is expected to continue reducing particulate emissions in the future by ensuring that both new and replacement wood stoves are of the cleaner burning variety.

It is in the interest of SWCAA and its citizens to be able to monitor the ambient air on a continuous basis and in a manner that provides for the generation of accurate and timely data. Until 1994, monitoring for particulate matter was only conducted with high volume PM_{10} samplers. While these units provide very accurate data, they do not provide it instantaneously. Currently the standards are based on a 24-hour average and annual rolling average data in micrograms per cubic meter. The high volume samplers provided this data in a manner that allowed SWCAA and other control agencies to monitor the quality of the air based on these standards. The drawback to this method is that there is often a several day lag period between when the sample is collected and when it can be processed, weighed and evaluated. In some cases by the time this analysis has been completed, the problem condition has either passed or worsened. For this reason, it became obvious that an alternate or supplemental method of monitoring was appropriate.

SWCAA placed into operation its first tapered element oscillating microbalance mass monitoring unit or "TEOM" in 1994. This equipment provides accurate real time measuring of the PM_{10} levels. When the sampler is linked with a computer and modem located in SWCAA's office, the staff is able to instantaneously monitor the ambient concentrations. By being able to monitor particulate matter in the air continuously and generate data in the form of 15 or 60-minute averages it provides SWCAA with the ability to take action before violations or health effects occur. Used in a program of wood stove and open burning curtailment alerts, the TEOM unit is a very useful tool in SWCAA's overall program of air pollution control.

The first TEOM was installed at the Moose Lodge in Vancouver. At the end of 1994 the unit was operating and collecting data, but it was not until mid 1995 that all the necessary phone lines, modifications and connections were complete. Since 1995, SWCAA has been able to telemeter the data to the agency's computers. This permitted the Agency to more closely monitor the changing situations. This is very helpful in providing data for curtailment calls in open burning and wood stove/fireplace use.



Another change occurred in 1997 with EPA's adoption of a new $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) on July 18, 1997. Because three full years of valid data are required before a compliance determination can be made with the new $PM_{2.5}$ standard, SWCAA installed a new $PM_{2.5}$ particulate monitor at the Moose Lodge monitoring site in November of 1998 to begin collecting data for eventual compliance determination. However, in May of 1999, the DC Circuit Court of Appeals remanded the new $PM_{2.5}$ standard (along with the new 8-hour ozone standard) in response to a special interest appeal challenging EPA's authority to implement the new standards. Following a failed petition to the Court of Appeals for rehearing, the EPA successfully petitioned the U.S. Supreme Court to review the underlying issues. This process is underway and a response is expected in the spring of 2001. SWCAA expects EPA to prevail in this matter and for a $PM_{2.5}$ standard of some form to be reinstated. Accordingly, the $PM_{2.5}$ particulate monitor at the Moose Lodge monitoring site has been and will continue to be operated without interruption. Also, in order to compliment this new monitoring program, the Moose Lodge TEOM was converted to measure $PM_{2.5}$ rather than PM_{10}, and a $PM_{2.5}$ particulate monitor was installed at a new monitoring site atop the Centralia Library. These complimentary changes were made in December of 1999.

Another impact of interest from fine particulate pollution in the atmosphere is visibility impairment caused by the light scattering effect of the fine particles. In June of 1999, an integrating nephelometer was installed on the roof of Vancouver's McLoughlin Middle School. This instrument will provide a quantitative measure of this light scattering effect, complimenting the photographic record from the camera atop Smith Tower in downtown Vancouver. The camera was installed in November of 1998 and is focused on Mount Hood. McLoughlin Middle School is in the Vancouver urban area, within the camera's view path.

c. Carbon Monoxide Emissions

Trends indicate a gradual reduction in ambient levels of carbon monoxide (CO) in the Vancouver area. Because CO accumulation is so dependant on weather conditions and patterns, trends of this nature should be viewed with cautious optimism. During 1987 the Vancouver sampling site experienced four exceedances of the 8 hour average standard of 9 parts per million. In 1992 and 1993, there were no exceedances recorded, but one exceedance was recorded in January 1994. None have been recorded since, until January 10, 1999 when an exceedance was recorded at the Atlas & Cox site in Vancouver. Because this was the only

exceedance in 1999 it did not result in a violation of the federal standard. The subsequent graphs (Section III) and table (Section IV) depict this trend in more detail.

The federal Clean Air Act Amendments of 1990 passed by Congress required that carbon monoxide attainment be reached by December 31, 1995 in order for southern Clark County to avoid sanctions from the U.S. Environmental Protection Agency. Southern Clark County had not violated the carbon monoxide health standards for three consecutive years and only exceeded the standards once in 1994, making it eligible to request redesignation. A technical advisory committee, made up of interested individuals from the community, was formed for this endeavor in early 1994 and worked throughout that year and 1995 on a 10-year Maintenance Plan for the region. The redesignation request provided for the removal of the oxygenated fuel program upon EPA approval of the plan. This was done because projections indicated that the carbon monoxide emission reductions from the vehicle fleet and maintenance programs would keep the area in attainment. This proposal was adopted by SWCAA's Board of Directors on December 19, 1995, and a state implementation plan (SIP) hearing was held on January 30, 1996. Redesignation was approved by the EPA in October of 1996 and the use of oxygenated fuel was discontinued in November of 1996. SWCAA continues to operate according to the terms of the Carbon Monoxide Maintenance Plan.

d. Ozone

The ozone trend in the Vancouver area had been fairly constant until the mid 1990s. Historically, exceedances had not been recorded on the Washington side of the Columbia River. Over the years, nearly all exceedances have occurred in the Portland, Oregon area of the non-attainment area. SWCAA, however, experienced its first exceedance since 1982 on July 20, 1994. Three exceedances were recorded in the Portland area during the 1998 ozone season and none in 1999. The federal Clean Air Act Amendments of 1990 passed by Congress require that ozone attainment be reached by December 31, 1993 in order for southern Clark County to avoid sanctions from the U.S. Environmental Protection Agency. The Portland/Vancouver area met that deadline and applied for redesignation to attainment status. SWCAA, in conjunction with the Oregon Department of Environmental Quality (ODEQ) requested redesignation to attainment status for ozone in midyear 1996. SWCAA's technical advisory committee developed a 10-year Ozone Maintenance Plan, simultaneously with the Carbon Monoxide Maintenance Plan. Additional control measures were implemented in Clark County so population growth would not cause a return to dirty air or non-attainment status. These measures, including an expanded vehicle inspection boundary and better vehicle emission test methods, were part of the redesignation request. Additional ambient sampling was also planned in the region for volatile organic compounds (VOC), ozone (O_3) and nitrogen oxides (NO_x). This expanded testing was begun in 1996 with the objective of gathering data needed to analyze the ozone formation process in southwest Washington and to determine the significance of any impacts caused in the metropolitan area by upwind sources. In addition, more meteorological monitoring sites were planned as well. A Vancouver site was established in 1996, additional sites to the north were established in 1997, and expanded testing continued through the ozone season of 1998. The Portland/Vancouver area was redesignated attainment by the EPA in April of 1997 and SWCAA continues to operate according to the terms of the Ozone Maintenance Plan.

e. Volatile Organic Compound Emissions

The relationship between volatile organic compound emissions and ambient ozone levels is not a simple one. This is largely because of the complex nature of ozone formation and its dependence on sunlight, temperature and atmospheric mixing. Generally the ozone-forming potential of an airshed increases with increasing VOC and NO_x emissions.

Emission inventories show steady and substantial decreases in VOC emissions within the Portland/Vancouver ozone non-attainment (now maintenance) area in recent years, but this trend is expected to reverse itself due to population growth. Major reductions in VOC emissions have been achieved through the federal new automobile program, and industrial emissions control. Future major reductions will come

from Vancouver's vehicle inspection and maintenance program and local transportation control strategies, even though traffic volumes continue to increase significantly. Industrial and commercial emissions from gasoline handling have also been substantially reduced by improved controls on gasoline storage, transportation, and delivery systems. Further reductions have been realized by additional controls and process changes in surface coating, degreasing technology, and other industrial processes.

Vapor recovery at gasoline stations is another method of significantly reducing VOC emissions. This technology captures vapors from gasoline dispensing equipment instead of releasing them into the air. Implementation of this program began in 1991 when all gasoline stations were required to install equipment to recover vapors when transferring gasoline to underground storage tanks (Stage I). The second stage of the program involves installing special nozzles and hoses so that vapors are captured and recovered when gasoline is dispensed into vehicles (Stage II). This equipment has the added advantage of reducing public and attendant exposure to the harmful volatile components in gasoline. When fully implemented, this program is expected to reduce total VOC in the Portland/Vancouver airshed by roughly 3000 tons per year. Continued traffic growth is expected to be the greatest challenge to maintaining compliance with the ozone standard in future years.

4. Carbon Monoxide and Ozone Maintenance Plans

By the end of April 1997 the Portland/Vancouver area was redesignated to "attainment" status for carbon monoxide and for ground level ozone. For the few years prior, the area had met the standards for these pollutants and was able to apply to the U.S. EPA for redesignation to "attainment" status. In order to do this, SWCAA was required to submit a 10-year Maintenance Plan for both pollutants. A committee of community representatives, including business owners and concerned citizens, was established to help guide the development of these plans. The first meeting of the Maintenance Plan Technical Advisory Committee (TAC) was in February of 1994. The TAC met monthly throughout a 1 1/2-year period to discuss and evaluate potential control measures. Each control strategy was evaluated for its cost effectiveness as well as its ability to insure no further violations of the National Ambient Air Quality Standards (NAAQS). These meetings concluded in the fall of 1995 after the development of the final recommendations. On December 19, 1995, the SWCAA Board of Directors adopted the carbon monoxide plan, which provided for the removal of the oxygenated fuels program on the EPA approval date. Redesignation to attainment status was then granted in October 1996. The plan also requires a carbon monoxide (CO) saturation study every four years in the Vancouver maintenance area to insure that the permanent monitors are appropriately located to record “worse case” CO concentrations for the area. The saturation study for the 1998/1999 winter was initiated in October 1998 and sampling was completed in February of 1999. Results of the study confirmed proper location of the Atlas & Cox and the Hazel Dell monitors.

The Ozone Maintenance Plan was adopted early in 1996. This plan called for expansion of the existing vehicle inspection and maintenance program and enhanced testing. The plan also required the TAC to review any exceedances that may occur over the term of the plan and report their recommendations, including any corrective measures. The TAC reconvened in December of 1996 to begin review of the exceedance of the ozone standard that occurred in Portland during the 1996 ozone season. Following the TAC review and recommendations, the redesignation to attainment status for ozone was granted in April of 1997. During the summer of 1998 there were four exceedances of the 1-hour standard in the Portland area, three of which were at one site. These exceedances, in combination with the 1996 exceedance would normally have constituted a violation of the 1-hour ozone standard and triggered the appropriate responses defined in the maintenance plan. But this did not occur because the 1-hour standard had just been replaced by the new 8-hour standard, which was not violated by these exceedances. However, in May of 1999, the DC Circuit Court of Appeals remanded the new 8-hour ozone standard (along with the new $PM_{2.5}$ standard) in response to a special interest appeal challenging EPA's authority to implement the new standards. Following a failed petition to the Court of Appeals for rehearing, the EPA successfully petitioned the U.S. Supreme Court to review the underlying issues. In the mean time, the EPA has moved to reinstate the old 1-hour standard, effective October 18, 2000. This will cause a violation for the three-year period from 1996 through

1998 based on the series of exceedances described above. SWCAA and the Oregon Department of Environmental Quality (DEQ) will then negotiate with EPA Region 10 to determine whether any contingency measures in the Ozone Maintenance Plan must be implemented as a result of this "retroactive" violation. There were no exceedances in Portland/Vancouver of the 1-hour or 8-hour ozone standard in 1999.

Southwest Clean Air Agency
Maintenance Area Map

III. AIR POLLUTANTS: HEALTH AND WELFARE EFFECTS

A. SUMMARY

National Ambient Air Quality Standards (NAAQS) were adopted in the early 1970s to protect the public health and welfare from the known adverse effects of air pollution. The U.S. EPA set primary standards that define levels of air quality that protect the public health. Secondary ambient air quality standards define levels judged to be necessary to protect the public welfare. Southwest Washington's control strategies have been directed to meet the more stringent primary air quality standards.

The results and conclusions of a very extensive study were recently released by Harvard School of Public Health. Researchers at Harvard were joined by Brigham Young University and the American Cancer Society. The study focused on the increased risk of death as a result of being exposed to smoke and soot in most American cities. It encompassed ten years, one half a million people and 151 American cities. The study concluded that people living in the most polluted areas had a 15% to 17% increased risk of death compared with people living in the least polluted areas. Douglas Dockery, Professor of Environmental Epidemiology at the Harvard School of Public Health and co-author of the study commented:

> "The danger is not just in Los Angeles or New York. We found unexpectedly large results, that is to say, modest air pollution exposures are shortening the lives of Americans by several years. The adverse health effects of air pollution are cumulative, placing stress on health, and therefore leading to our observation of increased deaths associated with pollution over a period of almost 10 years. Not only are levels of pollution in these cities below EPA standards, but the impact on life and health is more pervasive than previously thought. Smokers as well as nonsmokers are at increased risk of death from breathing the air of U.S. cities."

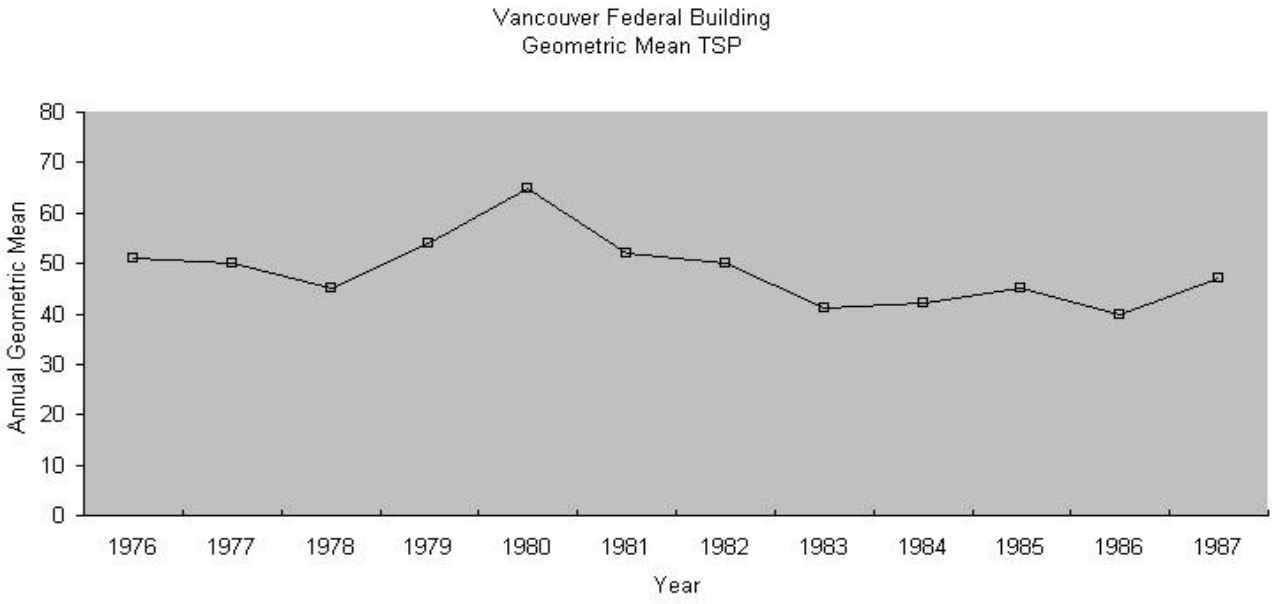
The pollutants for which standards have been established are common pollutants that have been shown to be harmful. These standards are shown in the table below and Appendix A.

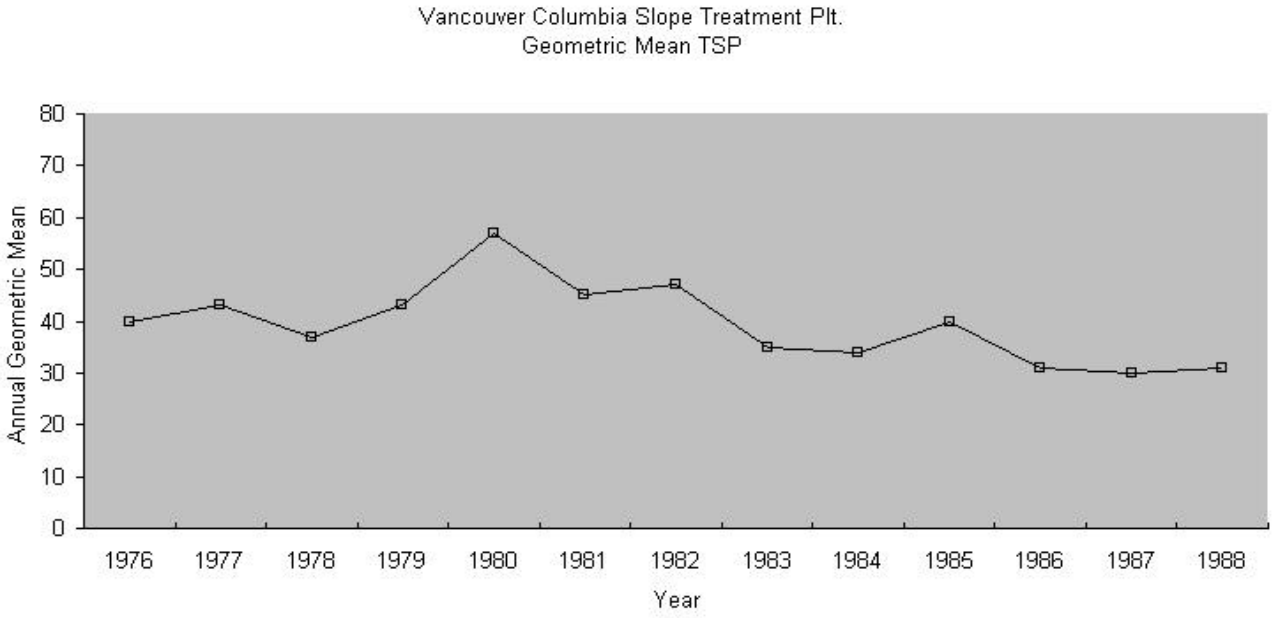
AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standard	State Standard
PM_{10}	Annual	50 ug/m^3	50 ug/m^3
	24 hours	150 ug/m^3	150 ug/m^3
$PM_{2.5}$ - (Remanded)	Annual	15 ug/m^3	----------
- (Remanded)	24 hours	65 ug/m^3	----------
Ozone - Old	1 hour	0.12 ppm	0.12 ppm
- (Remanded)	8 hour	0.08 ppm	----------
Carbon Monoxide	8 hours	9 ppm	9 ppm
	1 hour	35 ppm	35 ppm
Sulfur Dioxide	Annual	0.03 ppm	0.02 ppm
	24 hours	0.14 ppm	0.10 ppm
	3 hours	0.5 ppm	0.5 ppm
Nitrogen Dioxide	Annual	0.053 ppm	0.053 ppm
Lead	Calendar Quarter	1.5 ug/m^3	1.5 ug/m^3

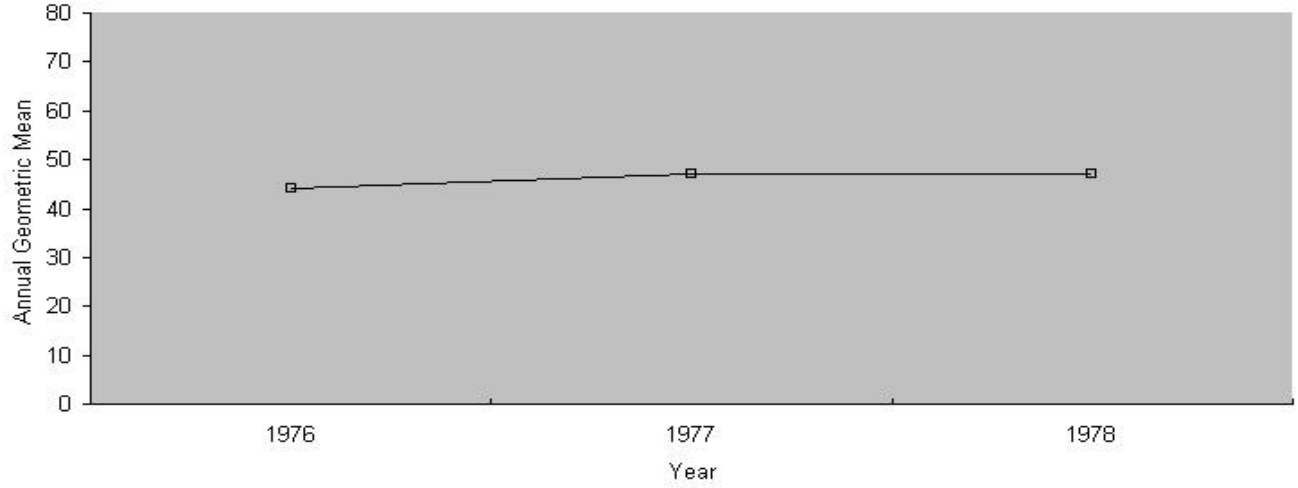
B. TOTAL SUSPENDED PARTICULATE MATTER (TSP)

Any matter that exists in a finely divided filterable form, whether liquid or solid, is defined as particulate matter when airborne. In years past, emphasis was placed on the total combined weight of all suspended particles with little consideration given to whether they were within the respiratory size or not. This philosophy was changed in 1987, and revised again in 1997 to base the U.S. EPA health standard on respirable sized particulate (i.e., $PM_{10,}$ $PM_{2.5}$). Therefore, SWCAA no longer samples for TSP. The following TSP sampling data is still useful however. This data can be used to show historical trends in the region.

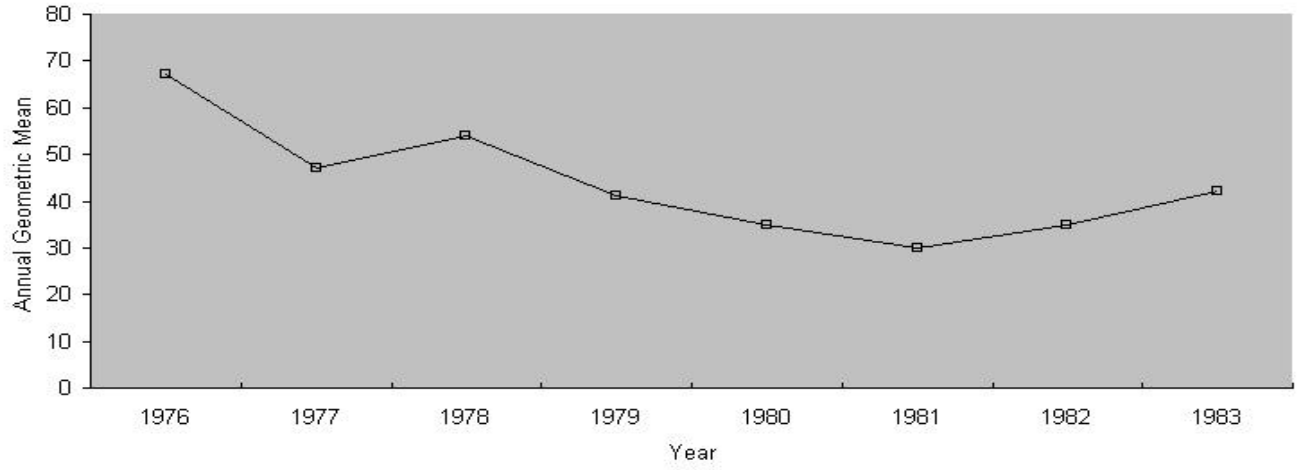




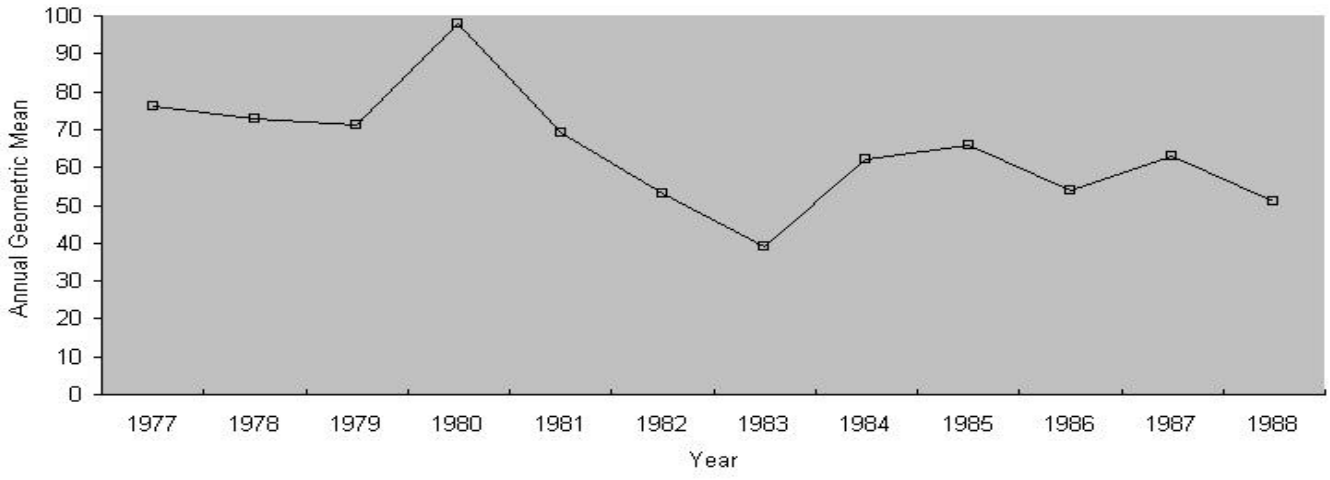
Port of Vancouver Terminal #2
Geometric Mean TSP

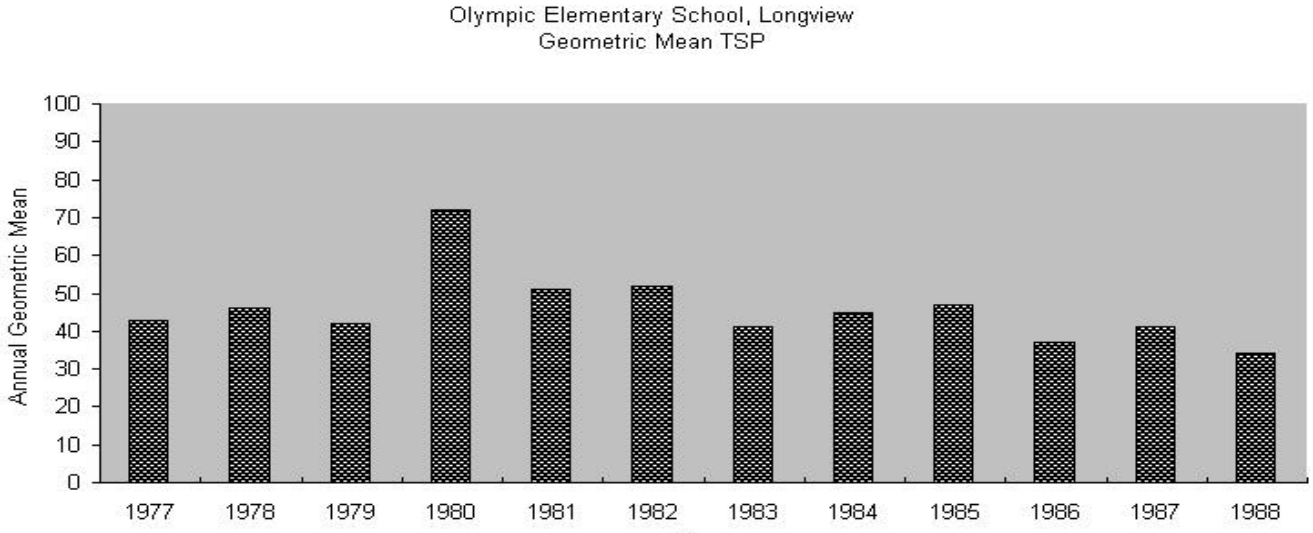


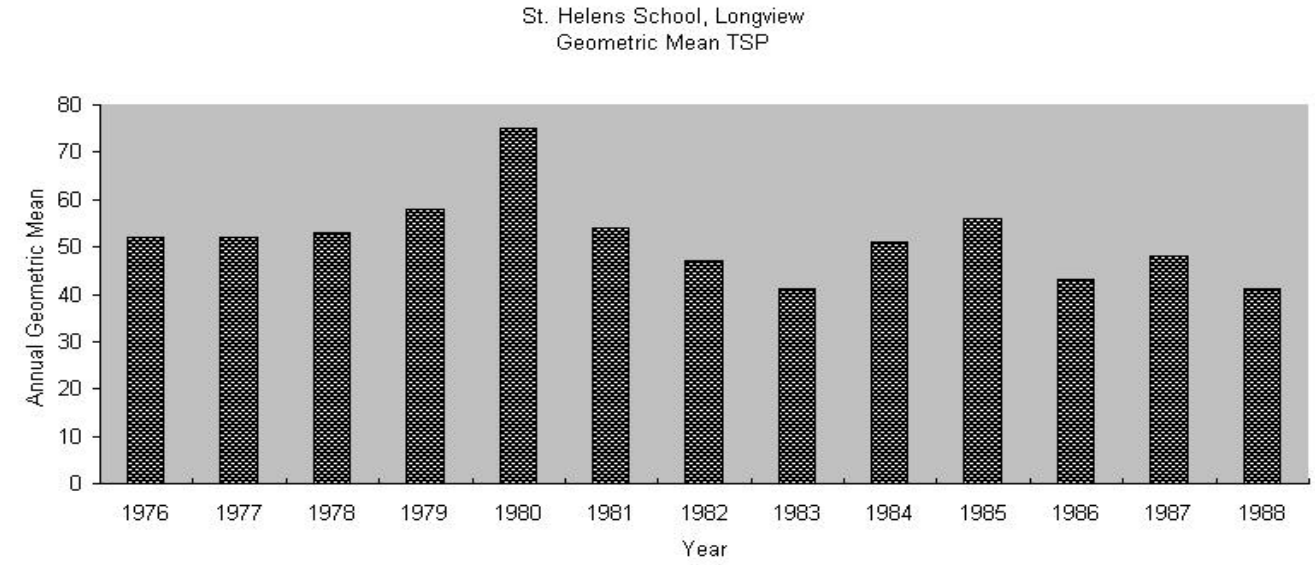
Columbia River High School
Geometric Mean TSP



Longview City Shop
Geometric Mean TSP







C. FINE PARTICULATE (PM_{10}, $PM_{2.5}$)

Particulate matter is emitted from both natural and anthropogenic sources. Nature provides particulate matter in a variety of forms such as spores, pollen, volcanic ash, salt, soil and meteoric dust. To this natural background, man adds fly ash, smoke, iron oxide, cement and countless other materials. Usually these pollutants are produced by a variety of sources such as traffic, industry, combustion and other man made activities.

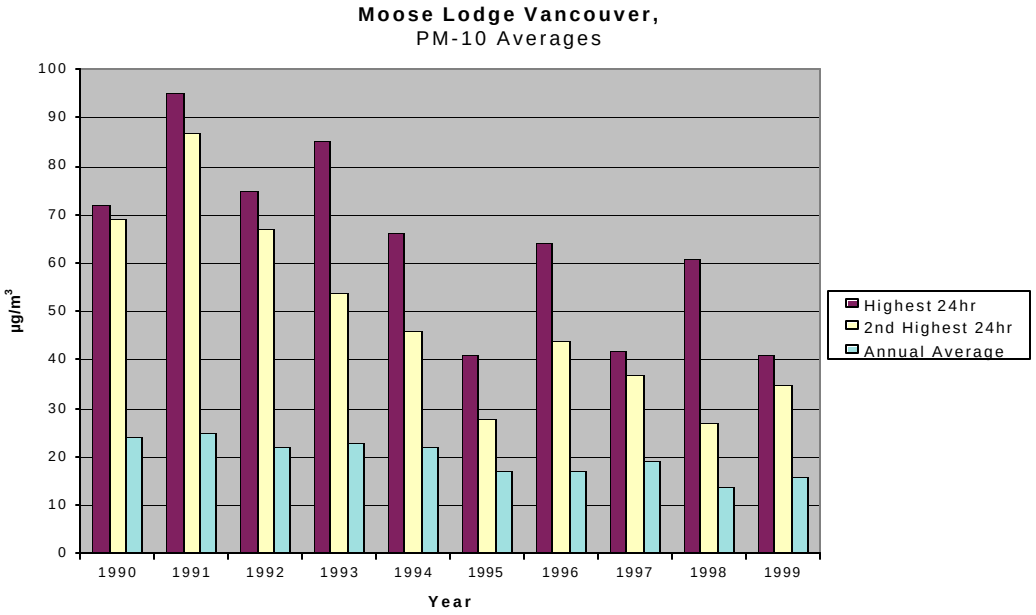
Airborne particulate generally ranges from .005 to 250 microns in diameter. Particles of this size range may remain in the air anywhere from a few seconds to several months. Gravitational settling comprises the main mechanism by which particles are removed from the air. Rain also removes particles from the air, but its effectiveness drops with particle size and is relatively ineffective on particles smaller than 2-3 microns.

Fine particulate air pollution consists of solid particles or liquid droplets that are 10 microns or less in diameter (PM_{10}). A subset of this population is particles of 2.5 microns or less in diameter ($PM_{2.5}$). Particles in this size range are of greatest concern because they can be inhaled past the nose and mouth and may penetrate deeply into the lungs where they can remain for years. The health effects of particulate matter vary with the size, concentration, and chemical composition of the particles. In general, particulate matter may

cause health problems in three ways:

1. The particles may be inherently toxic because of their chemistry.
2. The particles may mechanically damage the respiratory system.
3. The particles may be carriers for absorbed toxic substances.

Relationships have been shown between exposure to high concentrations of particulate matter and increased hospital admissions for respiratory infections, heart disease, bronchitis, asthma, emphysema, and similar diseases. In addition, there may be several potential carcinogens present in particulate matter. Of particular concern are the condensed organic compounds released from low temperature combustion processes (wood stoves, for example).

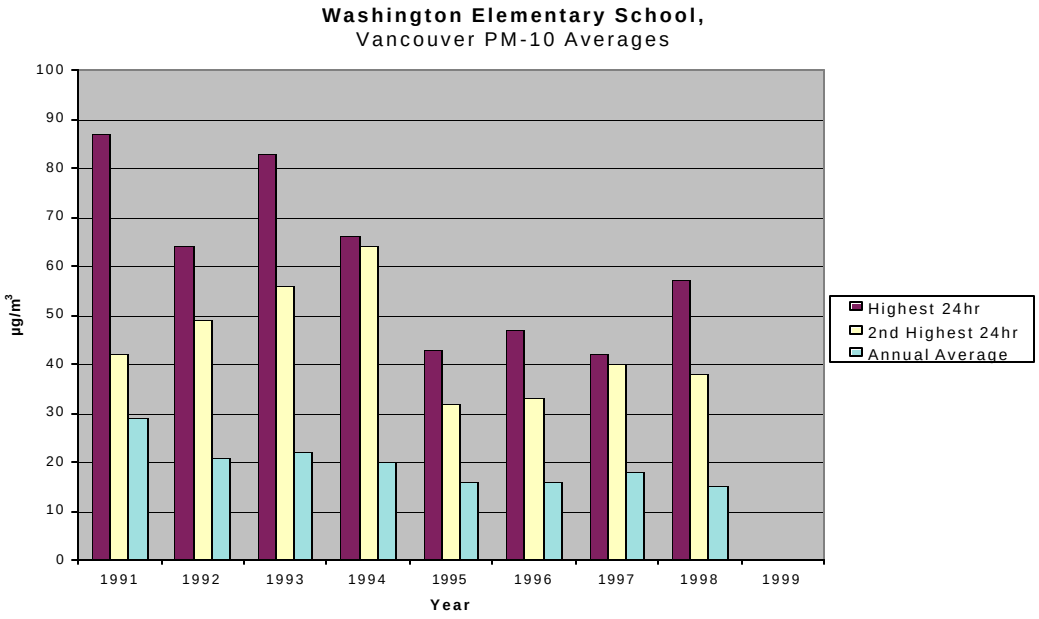


Among the most obvious effects of fine particles are reductions in insulation and visibility due to absorption and scattering of light by suspended particles. Virtually all smoke particles from residential wood stoves and fireplaces, industrial boilers, field burning, and other combustion processes can be characterized as PM_{10}, and the vast majority as $PM_{2.5}$.

Particulates constitute a large fraction of the pollutants in the air and often are the most hazardous to human health and welfare. Effects of total suspended particulates on animals, materials and vegetation are related to the chemical composition and physical state of the particulate. The effects on human health are primarily associated with injuries to the respiratory system. Particles less than 10 microns can easily reach the bronchial passage, while those with diameters less than 2.5 microns can reach the deepest portions of the lung. Fine particles are also associated with burning and irritated eyes, surface soiling, visibility degradation and degradation of materials. The trends in control of particulate matter include high efficiency filters, control of precursor gases that may form particles in the atmosphere, and cleaner fuels.

During 1999 PM_{10} was monitored at the Moose Lodge site in Vancouver and at the City Shops site in Longview. The Washington Elementary site was discontinued due to resource limitations and its relatively close proximity to the Moose Lodge site.

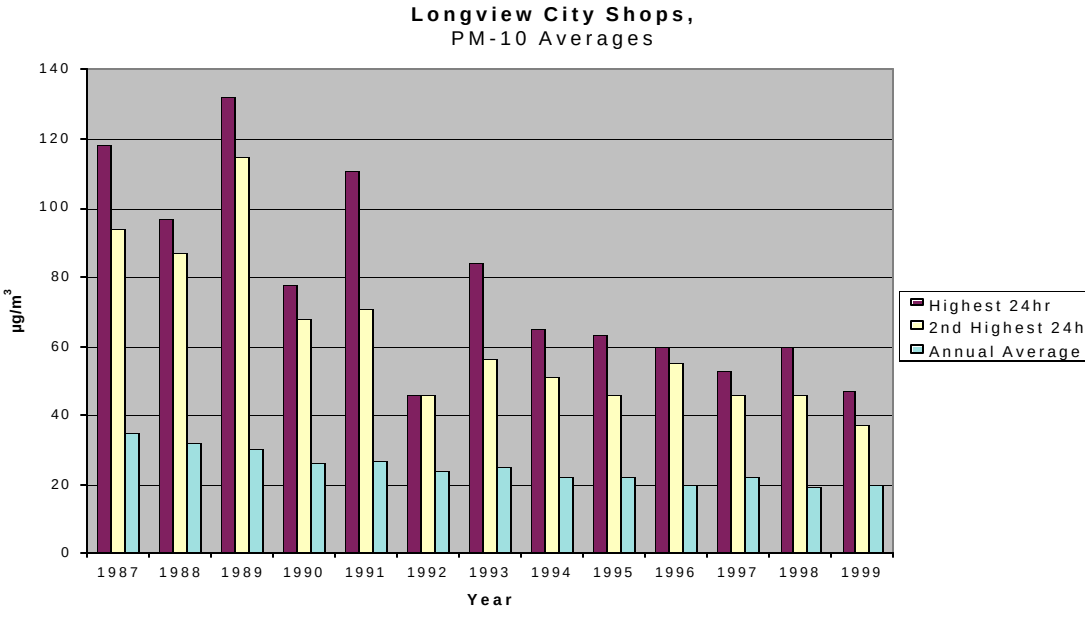
The U.S. EPA imposed a new fine particulate matter standard on July 17, 1997, setting limits on $PM_{2.5}$. As a result, SWCAA began monitoring $PM_{2.5}$ at the Moose Lodge site in Vancouver in November 1998. The Clean Air Act requires that EPA review and, as necessary, revise the air quality standards every five years to ensure that the public health is protected. Despite a comprehensive review of recent health studies, which led the EPA to conclude that the current PM_{10} standard is not sufficient to protect the public health, the DC Circuit Court of Appeals remanded the new PM2.5 standard in May of 1999 following appeal by special interests. The U.S. Supreme Court is reviewing this matter and a response is expected in the spring of 2001. SWCAA expects EPA to prevail and for a $PM_{2.5}$ standard of some form to be reinstated. Accordingly, the $PM_{2.5}$ particulate monitor at the Moose Lodge monitoring site has been and will continue to be operated without interruption. The results of this monitoring effort for 1999 are as follows:

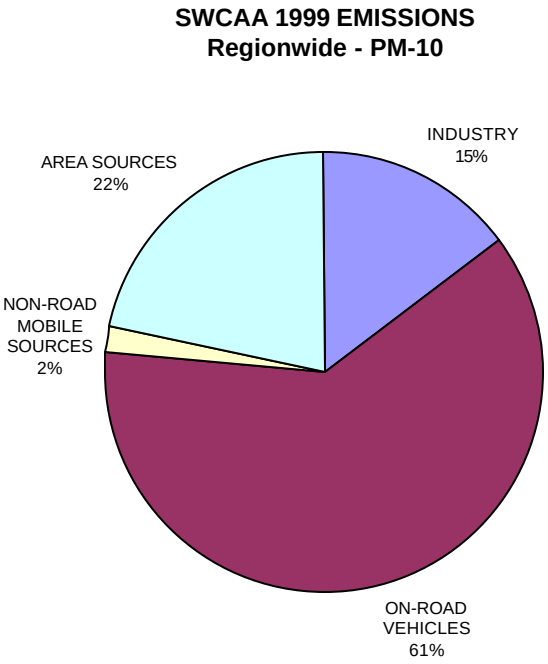


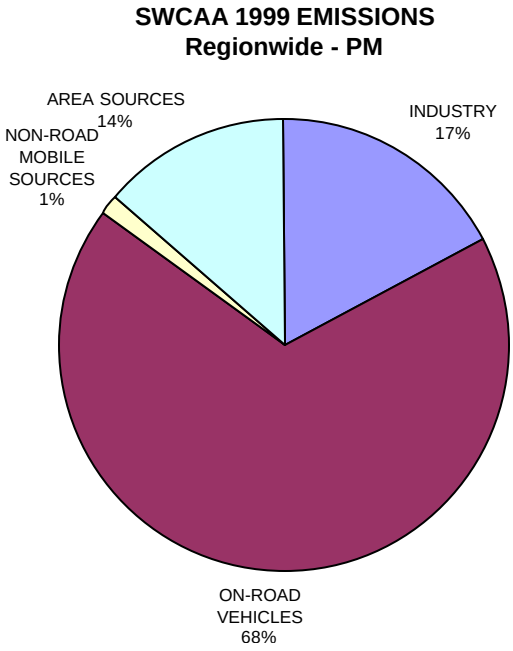
Moose Lodge $PM_{2.5}$ Averages

- Highest 24-hour concentration 37.7 µg/m^3
- 2nd Highest 24-hour concentration 33.8 µg/m^3
- Annual Average concentration 9.6 µg/m^3

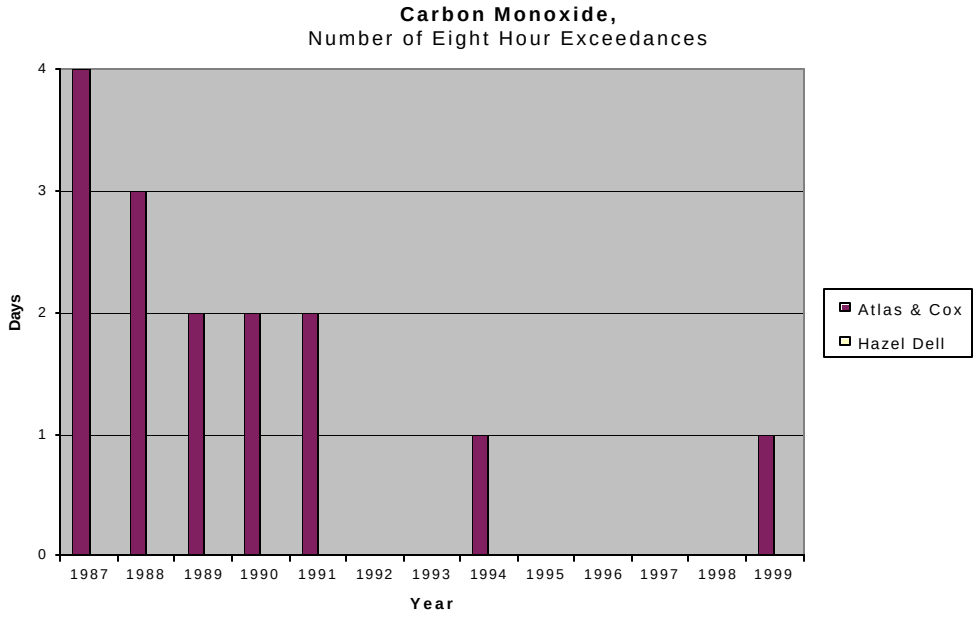
Also, in order to compliment this new monitoring program, the Moose Lodge TEOM was converted to measure $PM_{2.5}$ rather than PM_{10}, and a $PM_{2.5}$ particulate monitor was installed at a new monitoring site atop the Centralia Library. These complimentary changes were made in December of 1999. Data from these monitors will first be reported for calendar year 2000.







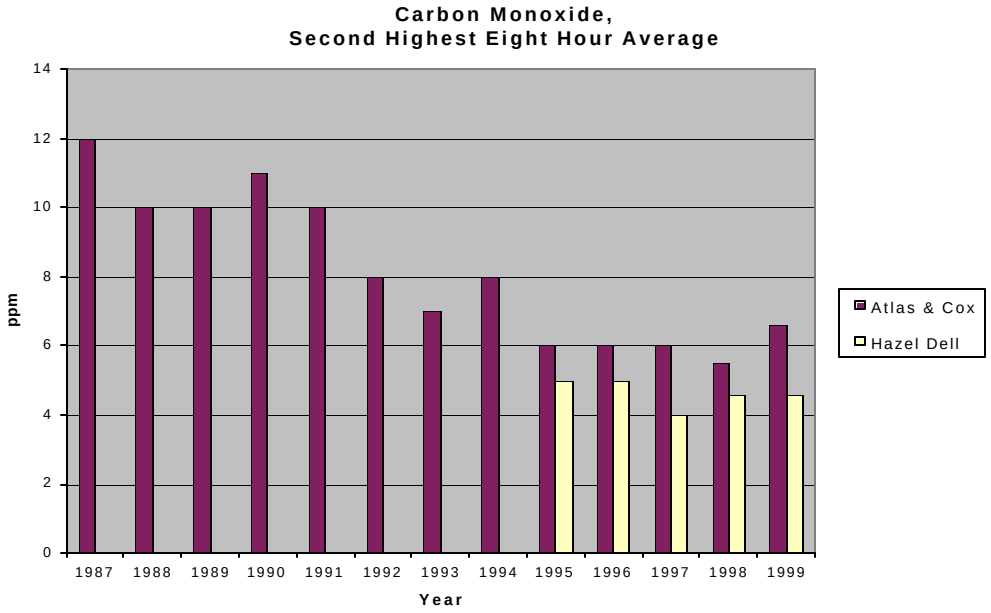
D. CARBON MONOXIDE (CO)



Carbon monoxide (CO) is a colorless, odorless, poisonous gas. In the body, CO binds tightly to hemoglobin (the red pigment in blood that moves oxygen from the lungs to the rest of the body). Once hemoglobin is bound to CO, it can no longer carry oxygen. In this way, CO reduces the oxygen-carrying capacity of the blood and can result in adverse health effects.

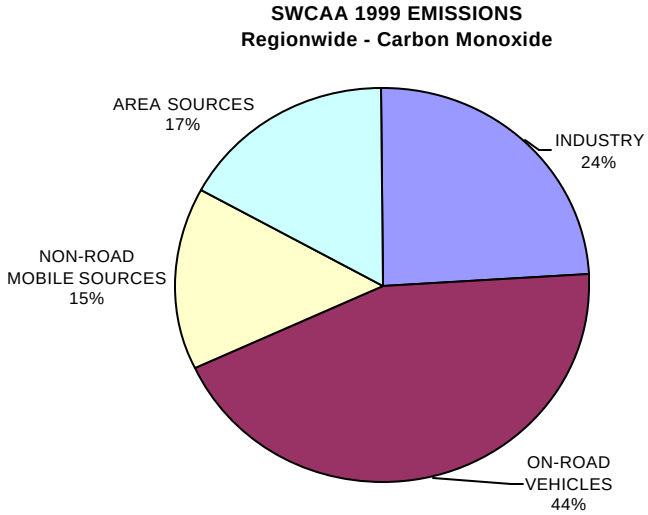
High concentrations of CO strongly impair the functions of oxygen-dependent tissues, including the brain, heart, and muscles. Prolonged exposure to low levels of CO aggravates existing conditions in people with heart disease or circulatory disorders. There is a correlation between CO exposure and increased hospitalization and death among such patients. Even in otherwise healthy adults, carbon monoxide has been linked to increased heart disease, decreased athletic performance, and diminished mental capacity.

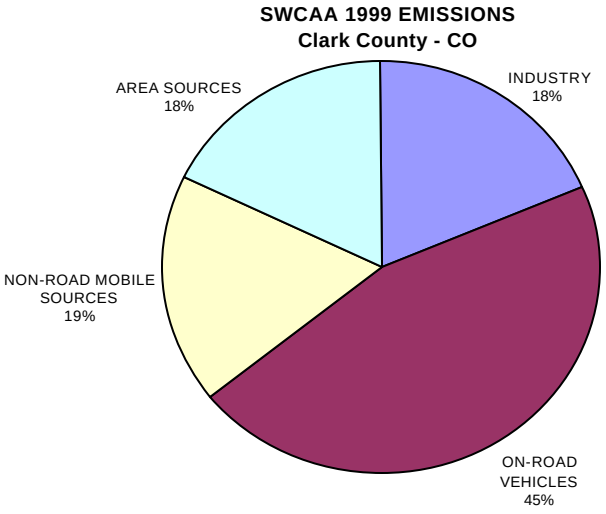
Carbon monoxide also affects newborn and unborn children. High CO levels have been associated with low birth weights and increased infant mortality. Even healthy individuals can be affected at relatively low carbon monoxide concentrations, temporarily resulting in impaired mental functions, visual acuity and alertness.



Another potential danger of carbon monoxide is its association with cigarette smoke. This habit can inactivate a smoker's hemoglobin even further, causing a greater exposure to carbon monoxide when combined with external air pollution. Because of its unique mode of action, carbon monoxide is not known to have adverse effects on vegetation, visibility or material objects.

A major natural source of CO is spontaneous oxidation of naturally occurring methane (swamp gas). The major human caused source is incomplete combustion of carbon-based fuels. This is primarily from gasoline-powered motor vehicles. Other important sources are wood stoves, open burning and fuel combustion in industrial and utility boilers.



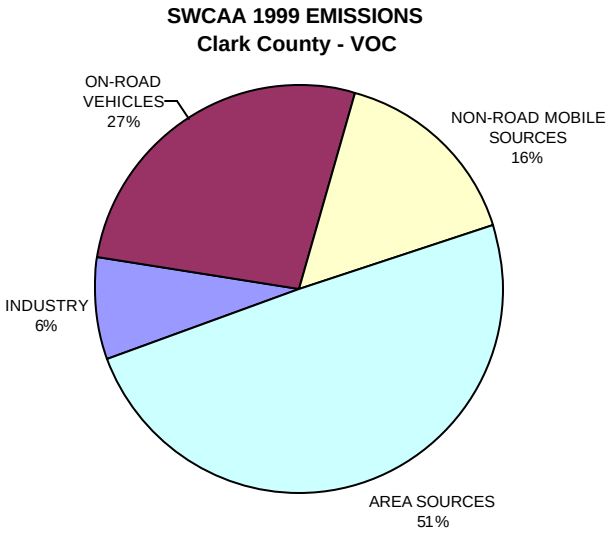


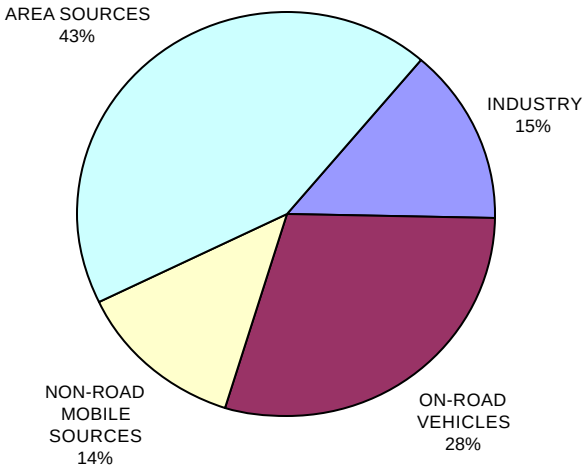
Carbon monoxide emissions from motor vehicles are highest during cold starts. This is one reason why it is best to have alternative transportation modes available that never requires that the vehicle be started in the first place. How a motor vehicle is operated also has an effect on the amount of CO emitted. In stop-and-go driving conditions, CO emissions are also increased when the outside temperature is low. Southwest Washington's most serious CO problems occur during the winter in urban areas, when CO emitted by slow-moving traffic is trapped near the ground.

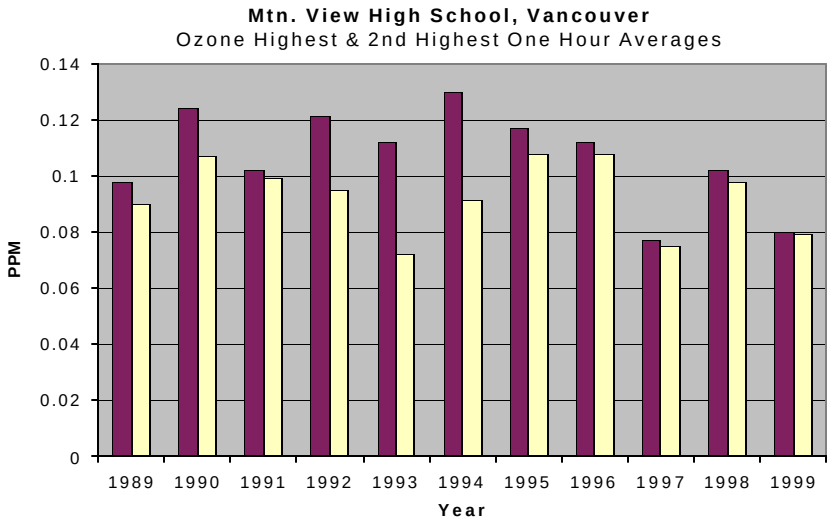
E. OZONE (O_3)

Ozone is a pungent, toxic, highly reactive form of oxygen. It causes irritation of the nose, throat, and lungs. Exposure to ozone can cause increased airway resistance and decreased efficiency of the respiratory system. In individuals involved in strenuous physical activity and in people with pre-existing respiratory disease, ozone can cause sore throat, chest pain, cough, and headaches. Plants can also be affected by exposure to high ozone levels, as evidenced by reductions in growth and crop yield. Ozone can affect a variety of materials, resulting in fading of paint and fiber, and accelerated aging and cracking of rubber and similar synthetic materials. It is also a major contributor to photochemical smog.

Ozone is not emitted directly into the air. It is formed through a series of photochemical (sunlight-requiring) reactions between other pollutants and oxygen (O_2). Most important of these are nitrogen oxides (NO_x) and volatile organic compounds (VOC). To control ozone pollution, it is most common to control both NO_x and VOC. Detailed monitoring and modeling studies are required to justify focusing on only one or the other of these two pollutants. Such a special study was initiated by SWCAA and the Washington State Department of Ecology (WDOE) in the spring of 1996.







The "ozone layer" in the stratosphere should not be confused with the ozone in the air we breathe. Stratospheric ozone is formed by the ionization of the upper levels of the atmosphere and provides protection from the sun's harmful ultraviolet radiation.

In humans, ozone acts as a mucous membrane irritant resulting in impaired respiratory functions. Symptoms may include sore

throat, chest pain, coughing and headaches. Particularly susceptible to the effects of ozone are young children, the elderly, persons with respiratory ailments and individuals who exercise vigorously.

Ozone reacts chemically with alphenic, amino and sulfhydryl groups to damage the mucosal lining of the respiratory tract. The mucosal lining, in secreting mucous, traps particulates and other foreign bodies which are then removed from the lungs by the flagellating action of cilia. Damage to the mucosal lining destroys the ability of the lungs to remove harmful particulates, and the accumulation of mucous and particulates impedes the absorption of oxygen in the lungs. With increased ozone exposure, the lungs become more susceptible to bacterial infection, tissue scarring and ultimately lung damage.

High concentrations of ozone also affect vegetation, resulting in leaf damage and/or reductions in crop growth and yield. Ozone also degrades rubber, textiles, paint, and many similar polymeric and natural materials.

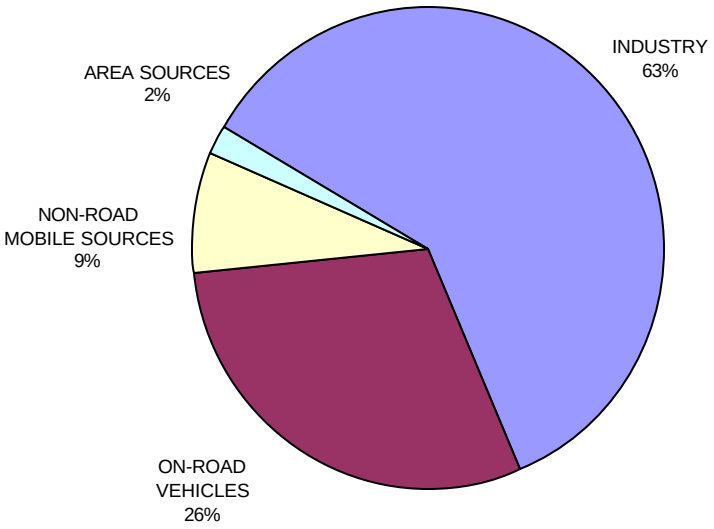
F. NITROGEN DIOXIDE (NO_2)

Nitrogen dioxide is a reddish-brown gas that is toxic in high concentrations. It is a lung irritant and may be related to chronic pulmonary fibrosis. It is also important in the photochemical reactions leading to the formation of ozone. It can cause indirect damage to materials when it combines with moisture in the air to form nitric acid. The nitric acid can then cause corrosion of metal surfaces and can also contribute to acid rain. In addition, NO_2 absorbs visible light and causes reduced visibility. It has also been linked to suppressed growth rates in some plants. Air is composed approximately of 78% nitrogen and 21% oxygen. Together, these predominant gases constitute up to 99% of our atmosphere by volume. When combustion occurs at high temperatures such as in automobile engines and in power plants, nitrogen may combine with oxygen to form several different gaseous compounds collectively known as oxides of nitrogen (NO_x). Of these, nitrogen dioxide (NO_2) and nitric oxide (NO) are the most important from an air pollution standpoint.

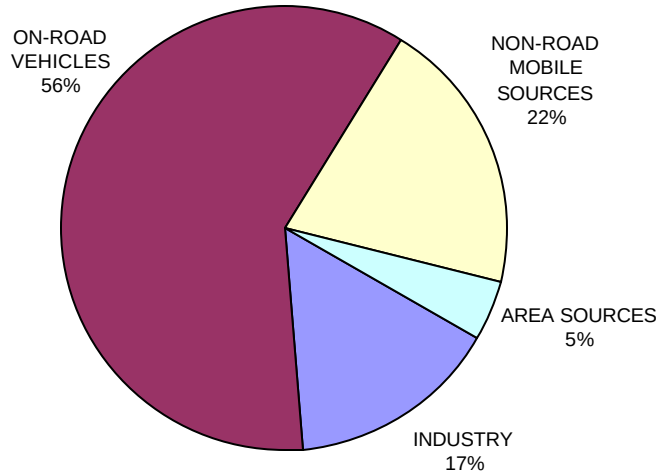
Both NO_2 and nitric oxide (NO) are potential health hazards. NO is not considered a direct health threat because of the low concentrations found in our atmosphere. The threat NO poses is its ability to react in the atmosphere to form the more toxic compound NO_2.

Nitrogen dioxide is a pulmonary irritant affecting primarily the upper respiratory

SWCAA 1999 EMISSIONS
Regionwide - Nitrogen Oxides



SWCAA 1999 EMISSIONS
Clark County - NOx



tract. Although four times more toxic than nitric oxide, NO_2 rarely produces even the mildest of effects. The principal harm most people experience is not from nitrogen oxides directly, but rather from a reaction NO_x has with hydrocarbons in sunlight to produce the photochemical oxidants, ozone and smog.

Nitrogen dioxide also reacts with moisture in the atmosphere to form nitric acid, a contributor to acid rain, which even in small concentrations can corrode metal surfaces. It has adverse effects on atmospheric visibility and vegetation, although these effects are more commonly found in the northeastern U.S. than in southwest Washington. In addition, nitrogen oxides and their reaction products have been linked to stress corrosion failures of nickel-brass alloys, and to the damaging of fabrics and dyes.

The major human-caused source of NO_2 is fuel combustion in motor vehicles, and utility and industrial boilers. Nitric oxide (NO) is the major nitrogen oxide produced during the combustion process, but once in the atmosphere, NO is rapidly oxidized to NO_2 in the presence of ozone.

G. VOLATILE ORGANIC COMPOUNDS (VOC)

VOC are a large family of compounds made up primarily of hydrogen and carbon. These compounds are instrumental in the complex series of reactions leading to the formation of ozone and photochemical smog.

These compounds come primarily from motor vehicles, fuel evaporation, industrial coatings and combustion processes. The U.S. Environmental Protection Agency has repealed its health based standard for VOC also termed non-methane hydrocarbons and SWCAA has taken similar action. However SWCAA does regulate VOC emissions through permit limits consistent with its own NSR/BACT process and federal NSPS and NESHAP rules.

H. LEAD (Pb)

Lead is a toxic heavy metal, abundant in the earth's crust. Airborne lead particles are small in size (less than 1 micron). For this reason, they can penetrate deep within the lungs and ultimately be absorbed into the human bloodstream.

High concentrations of lead in the blood can cause severe and permanent brain damage, especially in children. Lower levels have vague, non-specific symptoms, including headaches, malaise, stomach pain, irritability, and pallor. Damage can be caused to the heart, kidney, liver, and nerve and blood tissues.

Exposure to lead can occur through multiple pathways, including inhalation of air, ingestion of lead in food, water, soil or dust. Because airborne lead particles are small in size (generally less than 1 micron), a large amount may be inhaled and deposited in the lungs throughout a lifetime. Three systems in the body appear to be sensitive to lead interference; the blood forming system, the nervous system and the renal (kidneys) system. Excessive lead exposure can cause seizures, mental retardation and/or behavior disorders. Fetuses, infants and children are especially susceptible because adverse effects usually occur at lower lead levels than found in the average adult resulting in central nervous system damage. In addition, children are at a greater risk through everyday contact with dust and soil. Streets, playgrounds and the normal hand-to-mouth activities of a child can ultimately lead to high lead exposures. Recent studies have also shown that lead may be a factor in high blood pressure and subsequent heart disease in middle-aged white males.

The major source of lead in the air was the combustion of leaded gasoline in automobiles. This one source accounted for close to 90 percent of the total emissions in the U.S. annually. The U.S. ban on leaded gasoline, effective December 31, 1995, sharply reduced lead contamination in our airshed.

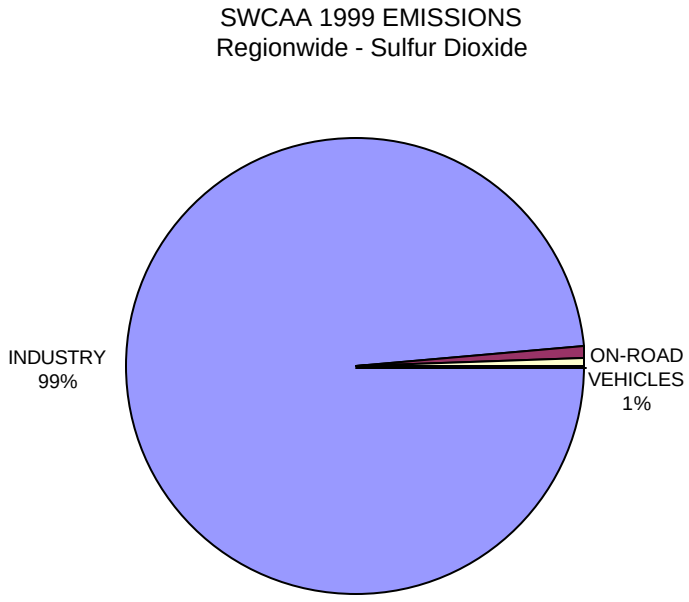
I. SULFUR DIOXIDE (SO_2)

Sulfur dioxide (SO_2) is a colorless, pungent, nonflammable gas. In the body it acts as a lung and eye irritant.

When SO_2 is inhaled it causes bronchial constriction, which results in breathing difficulty and an increase in pulse and respiratory rate. People with respiratory diseases like asthma, bronchitis, or emphysema are particularly susceptible to the effects of SO_2.

When conditions promoting oxidation of SO_2 to sulfuric acid are present, the irritant response of SO_2 increases in magnitude by a factor of two to three. When sulfuric acid is inhaled, mucous production increases. This reduces the respiratory system's ability to remove particulate matter, and can lead to more severe respiratory infections, such as pneumonia. Chronic exposure to SO_2 can lead to coughs, shortness of breath, fatigue, and bronchitis. Healthy individuals may experience abnormal breathing due to airway resistance. Studies indicate hourly SO_2 concentrations of 250 parts per billion (ppb) have been known to cause bronchial-constriction in asthmatics and sensitive individuals. Other cases show sulfuric acid formation in the lower respiratory tract as a direct result of SO_2 absorption onto inhalable particulate. SO_2 can also damage plants and building materials. The leaves of some vegetables (spinach and lettuce, for example) are damaged by exposure to high levels of SO_2. Sulfur oxides (SO_X) accelerate corrosion of metals and other building materials (e.g. limestone, marble, mortar) by forming sulfuric acid on the surface of the material, or in the atmosphere with subsequent deposition on the material. In addition, sulfuric acid and sulfate particles formed in the atmosphere from SO_2 can cause scattering of visible light, thus contributing to haze and visibility degradation. These same processes can contribute to acid rain and lead to acidification of lakes and soils.

SO_2 is emitted into the atmosphere through the combustion of sulfur-containing fossil fuels. At concentrations above 3 parts per million (ppm), it can be distinguished by its pungent and irritating odor. In the United States, more than half of the SO_2 pollution originates from power-generating plants. When SO_2 leaves a stack, it may oxidize in the plume to form sulfur trioxide, an exceedingly reactive colorless gas, which combines rapidly with water vapor to form sulfuric acid. This sulfuric acid may further react to form sulfates that, if carried by the wind, may fall miles from the source as acid rain.



Coal is the primary fuel of electricity producing power plants. Because coal contains 0.2% to 7.0% sulfur, its removal presents a serious air pollution need. Early removal of sulfur occurs from some fossil fuels, such as natural gas and petroleum, while still in a gaseous or liquid state. This technology is not easily transferred to sulfur-containing solids. The technology used by industry today involves "coal washing," a method by which the sulfur content in coal is partially reduced before combustion. In addition to this practice, SO_2 emissions can be controlled by other means. These include scrubbing of stack gases, flue gas desulfurization, and the burning of low sulfur coal and oil.

Nationally, coal combustion is the major source of SO_2 emissions. The only coal fired power plant in Washington is in SWCAA jurisdiction. SO_2 emissions from this source will be reduced by about 90% when scrubbers are installed (2002). Even with this reduction, this will be the dominant SO_2 source in SWCAA jurisdiction. Diesel fuel and heating oil are other sources of SO_2.

J. INDOOR AIR QUALITY

Indoors was traditionally thought to be a haven from air pollution. But more recently, indications are that air in the work place and home may be as polluted or worse than the outdoors. Why is this? There are three general reasons. In modern times, the use of synthetic building materials and fabrics has become commonplace. After World War II, traditional building materials such as wood were replaced with cheaper alternative materials that could be produced and processed on a large scale. New products such as plastics and pressed-wood products were introduced as materials for building construction and furnishings.

An explosion also occurred in the development of personal care products, pesticides, and household cleaners. Relatively simple and less toxic household cleaners such as baking soda, vinegar, soap, and lye solutions were replaced by more sophisticated chemical formulations. These consumer products were increasingly packaged in convenient aerosol cans, which released their contents directly into the indoor air.

During the energy crisis of 1974, our focus was on conserving energy in homes and other buildings. The desire to reduce heating and cooling costs led to changes in construction techniques in both residential and commercial buildings which reduced building ventilation rates. These changes included tighter building envelopes; inoperable windows; decreased use of operable windows in older construction; use of sealant foams and vapor barriers; reductions in the amount of outdoor air used for ventilation; improperly sized and designed heating, ventilating, and air conditioning (HVAC) systems; the renovation of existing buildings (without corresponding changes to the HVAC systems); and inadequate building maintenance. All of these developments have had two basic effects; an increase in the number and type of contaminants released into the indoor environment, and a decrease in the amount of fresh outdoor air that is introduced into structures to dilute contaminants and satisfy the health and comfort needs of occupants. Increased insulation in buildings and changes in acceptable operating temperatures increased energy efficiency, but also resulted in tight buildings which retained moisture and other contaminants and provided a more favorable environment for microbial growth.

Common indoor air pollutants include:

- Combustion products such as particulates (ash), CO and NO_2 from tobacco smoking and improper operation of gas appliances, fireplaces, wood stoves, and space heaters.

- Formaldehyde from new home materials like carpet, upholstery, and wood products.

- Vapors from paints, solvents, and aerosols.

- Pesticide and herbicide residues.

- Asbestos, found in older home products like ceiling tiles, flooring, dry wall and insulation.

- Biological contaminants like bacteria, mold, mildew, and pollen.

- Radon, a radioactive gas caused by the natural breakdown of uranium. Radon can be found in high concentration in soils and rocks containing uranium, granite, shale phosphates, and pitchblende.

- Particulates from humidifiers using tap water.

Currently, SWCAA's enforcement authority is limited to outdoor air pollution. However, since indoor air is a significant concern, SWCAA will provide indoor air guidance on request, as resources are available.

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IV. SOUTHWEST WASHINGTON'S AIR QUALITY IN 1999

A. SUMMARY

Air pollution trends over the early 1990s have, for the most part, shown gradual reduction, with some leveling since about 1994-95. In 1999, air pollution levels in southwest Washington were for the most part quite satisfactory, with virtually all monitored pollutants well below EPA standards. In 1994, for the first time, two readings over the ozone 1-hour standard were recorded in Vancouver. These two readings are considered to be only one exceedance of the National Ambient Air Quality Standard (NAAQS) because they occurred on the same day. One exceedance of the carbon monoxide standard also occurred in 1994. For the period of 1995 through 1998, there were no exceedances of any air quality standards recorded in SWCAA jurisdiction. However, in 1999 there was one carbon monoxide exceedance in Vancouver at the Atlas and Cox site on the fifth of January.

With the exception of the Atlas and Cox CO exceedance, all of SWCAA's air quality sampling sites operated in 1999 indicated that the short-term air pollution levels (24 hour, 8 hour, and 1 hour averages) are not significantly different from the recent previous years. Some are higher than l998 and some are lower, but all are within their respective standard limits and sustain the general leveling trend following reductions from the levels of the early nineties. The PM_{10} annual average concentrations for Vancouver are below the 1997 levels but above the record low set in 1998. The 1999 PM_{10} annual average for Longview sets an all-time record low for that site. All PM_{10} and $PM_{2.5}$ annual and 24-hour averages remain well below EPA standards. The maximum 1-hour ozone levels for 1999 are down from 1998 but slightly higher than 1997, the best season of record. The Co exceedance at the Atlas and Cox site was investigated and considered an isolated incident due largely to stagnant meteorological conditions. As such, no violation occurred. However, the CO exceedance and apparent PM and ozone leveling do underscore the agency's concern for the constant pressure imposed on the airshed by continued growth and the associated disproportionate increase in vehicular traffic. Some minor variation can always be expected and consequently, this trend of continuing attainment should be viewed with cautious optimism, particularly in light of the continuing high growth rate in the area. In many cases, minor variations from year to year in meteorological conditions can be responsible for fluctuations in air pollution levels. These up and down short-term trends can be misleading if not viewed in the proper prospective. In order to obtain a more meaningful picture of air quality trends a period of several years should be reviewed and analyzed. The reader will be able to do this by referring to the data contained on the graphs, tables and summaries within this report.

B. FACTORS AFFECTING AIR QUALITY

Air pollution levels vary from one part of southwest Washington to another, from day to day, and from year to year. Short-term changes are primarily related to variations in the weather and the amount of pollution emitted into the air, while long-term changes are normally associated with changes in population, pollution sources, trends and economics. Differences in geography and general meteorology from one area to another also have a significant impact on air quality.

Air pollution levels are reflective of seasonal patterns. Increased emissions from automobiles and wood stoves during colder weather, combined with stable air masses that prevent dilution, contribute to higher levels of carbon monoxide and particulate pollution in the winter. Elevated levels of ozone only occur during the summer because ozone formation is dependent upon photochemical reactions occurring at high temperatures and under sunlight. Particulate matter in SWCAA's region is generally higher during the winter months due to increases in space heating. In some other areas, like eastern Washington, the levels of PM_{10} concentration are higher in the summer and fall months. This is because of the effects of wind blown dust and large scale field burning.

It is always difficult to make generalizations about air quality trends over short time spans. In addition,

trends in air quality attributable to control strategies are equally difficult to estimate.

C. EXCEEDANCES OF STANDARDS

The following table indicates the number of days in each of the past twenty-one years that southwest Washington experienced pollution concentrations above the NAAQS levels. An exceedance day occurs if any monitoring site records one or more values above these standards during the midnight-to-midnight period. Instances of more or fewer exceedance days from one year to the next may be the result of more intensive monitoring efforts and do not necessarily indicate deteriorating or improving air quality.

NUMBER OF EXCEEDANCE DAYS

City	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Fine Particulate (PM_{10})											
Longview	na	na	na	na	na	na	na	na	0	0	0
Carbon Monoxide (CO)											
Vancouver	15	2	2	0	0	1	1	0	0	4	3
Ozone (O_3)											
Vancouver	na	na	na	0	1	0	0	0	0	0	0
Sulfur Dioxide (SO_2)											
Longview	na	na	na	0	0	0	0	0	0	na	na

City	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Fine Particulate (PM_{10})											
Vancouver	na	0	0	0	0	0	0	0	0	0	0
Longview	0	0	0	0	0	0	0	0	0	0	0
Carbon Monoxide (CO)											
Vancouver	2	2	2	0	0	1	0	0	0	0	1
Ozone (O_3)											
Vancouver	0	0	0	0	0	1	0	0	0	0	0
Sulfur Dioxide (SO_2)											
Camas	na	0	0	na	na	na	na	na	na	na	na
Longview	na	0	0	na	na	na	na	na	na	na	na

(na = data not available)

D. PM_{10}, $PM_{2.5}$

With the advent of the new PM_{10} particulate standards in 1987, monitoring efforts in southwest Washington shifted from measuring Total Suspended Particulate (TSP) to monitoring for inhalable particulate with a diameter of 10 microns or smaller (PM_{10}). Since much of the particulate collected as TSP is too large to be inhaled into the lungs (because of the natural capture mechanisms of the upper respiratory tract), it was recognized that PM_{10} was more appropriate in terms of protecting human health. Then, in response to a mandated review of the most recent scientific data on the health effects of particulate matter, the EPA imposed a new $PM_{2.5}$ standard effective July 18, 1997. SWCAA began monitoring $PM_{2.5}$ at the Moose Lodge site in Vancouver in November of 1998. SWCAA continues to monitor PM_{10} also, and will report both in future years.

Currently, none of the communities within SWCAA's jurisdiction are designated as being out of compliance with the PM_{10} standards. Because the standard allows for one exceedance per site per year, the second highest reading is the value used to evaluate compliance status. There has never been a PM_{10} exceedance in SWCAA jurisdiction. The $PM_{2.5}$ levels monitored by SWCAA since November of 1998 have been below the new standard. However, the EPA will make official $PM_{2.5}$ attainment designations based on no less than three years of validated monitoring data. This official designation was originally to have occurred in the year 2002. However, in May of 1999, the DC Circuit Court of Appeals remanded the new $PM_{2.5}$ standard (along with the new 8-hour ozone standard) in response to a special interest appeal challenging EPA's authority to implement the new standards. Following a failed petition to the Court of Appeals for rehearing, the EPA successfully petitioned the U.S. Supreme Court to review the underlying issues. This process is underway and a response is expected in the spring of 2001. SWCAA expects EPA to prevail in this matter and for a $PM_{2.5}$ standard of some form to be reinstated. Accordingly, the $PM_{2.5}$ particulate monitor at the Moose Lodge monitoring site has been and will continue to be operated without interruption. Also, in order to compliment this new monitoring program, the Moose Lodge TEOM was converted to measure $PM_{2.5}$ rather than PM_{10}, and a $PM_{2.5}$ particulate monitor was installed at a new monitoring site atop the Centralia Library. These complimentary changes were made in December of 1999.

Wood stoves and open burning are considered primary contributors to PM_{10} and $PM_{2.5}$ levels. Increasingly tighter restrictions on open burning, mandatory curtailments on open burning and the use of wood stoves/fireplaces during times of poor atmospheric ventilation, and an ongoing public education program will help to insure continued compliance with the ambient standards.

E. OZONE

In the presence of sunlight, ozone is formed near ground level by chemical reactions between organic compounds and nitrogen oxides. When enough volatile organic compounds (VOCs) and nitrogen oxides (NOx) are present and temperatures are above 95 degrees F, these reactions can produce considerable amounts of ozone. Normally, elevated ozone levels occur in Vancouver only during the months of June through August. In 1994 ozone levels rose above the 1-hour standard twice on one day in mid-July, but it is considered to be only one exceedance for determining compliance with the NAAQS. Since 1994, no ozone exceedances have been recorded in Vancouver. However, three in 1996 and four in 1998 were recorded in the greater Portland area. One of the exceedances in 1996 and three in 1998 occurred at the same monitoring site. The number of exceedances at a single site is the criteria utilized by the EPA for determining the air quality status of a community.

It is important to understand that the areas of Vancouver, Washington and Portland, Oregon share the same airshed. This area is commonly referred to as the "Portland-Vancouver Interstate Air Quality Maintenance Area" (AQMA). In this situation, the consequences of a violation of the federal ambient air quality standards in either state are shared equally by both. Because it takes several hours to produce peak levels of ozone

through the chemical reactions with VOCs, NO_x and sunlight, a recorded exceedance of ozone may be a significant distance from the sources that released the corresponding VOC and NO_x (precursor) emissions.

The pre-existing federal and state standards for ozone (1 hour, 0.12 ppm) allowed no more than 1 day per year at a given site to be above the standard when averaged over the most recent three years. With the exception of the one in 1994, Vancouver has had no ozone exceedances since 1989. Portland had no days above the standard (exceedance days) in 1989, four in 1990, one in 1991, one in 1992, none in 1993, 1994 or 1995, three in 1996, none in 1997, four in 1998, and none in 1999. Only one of the 1996 exceedances occurred at the same site so a violation was not experienced. However, these exceedances precipitated a review process by the Technical Advisory Committee (TAC), as required by the Ozone Maintenance Plan, which began in December of 1996. The TAC findings and recommendations were submitted to EPA and redesignation to attainment status was granted in April of 1997. On July 18, 1997 EPA announced a new National Ambient Air Quality Standard for ozone. The new standard set a lower level (0.08 ppm) with a longer averaging time (8 hours) and allowed 3 days per year at a given site to be above the standard when averaged over the most recent three years.

Because the Portland/Vancouver AQMA had recently shown attainment with the pre-existing 1-hour standard, it was revoked effective June 5, 1998 in favor of the new 8-hour standard. Based upon the ozone levels monitored to-date, the agency has shown attainment status with the new ozone standard. However, the special interest actions that recently caused the new $PM_{2.5}$ standard to be remanded had the same impact on the new ozone standard, effective May 14, 1999. In response, the EPA has moved to reinstate the old 1-hour standard, and this action will become final on October 18, 2000. This will cause a violation for the three-year period from 1996 through 1998 based on the series of exceedances described above. SWCAA and the Oregon Department of Environmental Quality (DEQ) will then negotiate with EPA Region 10 to determine whether any contingency measures in the Ozone Maintenance Plan must be implemented as a result of this "retroactive" violation. There were no exceedances in Portland/Vancouver of the 1-hour or 8-hour ozone standard in 1999.

In 1996 SWCAA received grants to install additional ozone monitors at sites north of the non-attainment area. In 1997 these sites were expanded to include other pollutants, such as NO_x, VOC and meteorological data. These special study sites were operated through the 1998 ozone season. Data from these and other sites established in cooperation with the Department of Ecology and the U.S. Forest Service are being used to study the ozone formation and transport mechanisms in southwest Washington. A better understanding of these mechanisms is necessary to design effective control strategies for continued compliance as the area grows.

F. CARBON MONOXIDE

Both the Portland and Vancouver areas recorded no exceedances of the carbon monoxide standard in 1997. The carbon monoxide standard is violated when more than one exceedance of the 9 ppm (parts per million) 8-hour average occurs in a calendar year. There is an hourly CO standard of 35 ppm, but it is extremely unlikely that Portland or Vancouver would ever approach this level.

Because carbon monoxide pollution is strongly influenced by motor vehicle emissions, control strategies have focused on the federal Motor-Vehicle Emission Control Program. Automobile manufacturers responded to this program by equipping most vehicles that were built after 1974 with catalytic converters and other emission control features. EPA began to tighten emission standards in 1981 on automobiles and with the adoption of the federal Clean Air Act of 1990 the acceptable emission levels were further reduced.

For carbon monoxide non-attainment areas, EPA has also developed a list of Reasonable Available Control Measures (RACM) that can be employed for transportation sources. These additional measures are weighted for cost-effectiveness and feasibility of implementation before they are recommended for a specific area. The measures include motor vehicle inspection and maintenance, public transportation improvements, park-

and-ride lots, parking management, and traffic flow improvements.

SWCAA conducted a carbon monoxide saturation study in the winter of 1993/94. This study was a crucial part of SWCAA's plan to request redesignation to attainment status from EPA. The objective of the study was to observe the spatial distribution of carbon monoxide throughout the Vancouver non-attainment area, and identify the appropriate location(s) for permanent monitor installation(s) to record "worse case" carbon monoxide concentrations. Based on traffic counts and an understanding of the local traffic congestion problems, ten different locations were selected for sampling. Generally, sampling was planned on a 1-3 days per week basis, with the flexibility to focus on days when meteorological conditions favored high carbon monoxide concentration. As a result of the 1993/94 carbon monoxide saturation study, a second carbon monoxide monitor was installed in the Hazel Dell area of Vancouver in mid 1995. That site is located at Highway 99 and 78th Street. In addition, the Washington Department of Ecology (WDOE) established a meteorological monitoring station in Vancouver during 1996. This meteorological station is providing valuable information for managing our airshed. This station will continue to provide data useful to both SWCAA and WDOE for planning and modeling purposes.

Vancouver's carbon monoxide control strategy includes an Inspection and Maintenance (I&M) Program operated under the auspices of the Washington Department of Ecology. This program began in June of 1993 and requires automobiles registered within the carbon monoxide non-attainment area to be inspected bi-annually prior to license renewal. A second emissions testing station opened in May of 1995 in the Cascade Park area of Vancouver. As provided by the Agency's Ozone Maintenance Plan the I&M testing has been expanded into the Ridgefield, Battle Ground, Brush Prairie and LaCenter areas. Also, the Carbon Monoxide Maintenance Plan prescribes another carbon monoxide saturation study for the winter of 1998/99. This second study was initiated in October 1998 and sampling was completed in February of 1999. Results of the study confirmed proper location of the Atlas & Cox and the Hazel Dell monitors.

In January 1999 a carbon monoxide exceedance occurred at the Atlas & Cox location. This exceedance was most likely due to an inversion layer caused by cold, stagnant air. The carabon monoxide emissions, primarily from vehicles and wood stoves, are trapped in this stagnant air and, as more carbon monoxide is produced, the concentration rises. The highest concentration of carbon monoxide on the day of the exceedance was 10.1 ppm, 1.1 ppm above the NAAQS standard.

G. LEAD

The last exceedance of the lead standard was reported in Portland during the second quarter of 1984 at a site near the Interstate 5 freeway and Going Street. Most recent monitoring data indicate levels at that site less than 10% of the standard. The dramatic decrease in ambient lead levels is due to phasing out lead in gasoline. Now that leaded gasoline can no longer be legally sold in the U.S. this should further reduce the lead levels in the atmosphere. Lead has not been monitored in Vancouver.

H. SULFUR DIOXIDE

No exceedances of the sulfur dioxide (SO_2) standard have been recorded in either Portland or southwest Washington since 1977. This is due primarily to the discontinuation of high sulfur-containing fuels in the state. Sulfur dioxide is currently monitored in Portland and, during a 1991 study, it was monitored by SWCAA in the Camas, Washington area. The Camas study revealed no exceedances of the standard. Prior to the 1991 Camas study, SO_2 was monitored in the Longview, Washington area, but also indicated no exceedances.

I. NITROGEN DIOXIDE

No exceedances of the nitrogen dioxide standard have ever been recorded in either Portland or southwest Washington. Nitrogen oxides (NO_X) were monitored temporarily in the Clark County area as a component

of the special ozone study discussed above. There is a single monitoring site for nitrogen dioxide in Oregon located generally downwind of downtown Portland. With the exception of the Mountain View site in Vancouver, data from these sites is only collected during the summer months (ozone season).

J. METEOROLOGY

Natural weather processes usually cleanse the air of most pollution. Pollutants normally disperse and are removed by chemical reactions, deposition, condensation, or the scrubbing action of rain.

SWCAA installed a meteorological station in the Vancouver area in 1996. Atmospheric stability is one of the more important aspects of the weather's effect on air quality. The stability of an air mass controls the amount of vertical mixing that can occur to disperse pollutants. If conditions are such that there is no mixing caused by winds and temperature changes, pollutants will remain trapped at ground level. Prolonged periods with little vertical mixing usually result in a condition commonly called "air stagnation" or "inversion" that may result in increased pollutant concentrations.

The National Weather Service issues an Air Stagnation Advisory (ASA) when stagnation persists over a large area for an extended period. When air pollution problems develop, SWCAA in coordination with the Washington Department of Ecology (WDOE) uses the ASA, along with weather forecasts and information on current air quality conditions, to determine what actions should be taken to protect public health.

The seasons also have an important impact on meteorology. Both weather and pollutant emissions vary with the time of year. These factors combine to cause seasonal patterns in air quality.

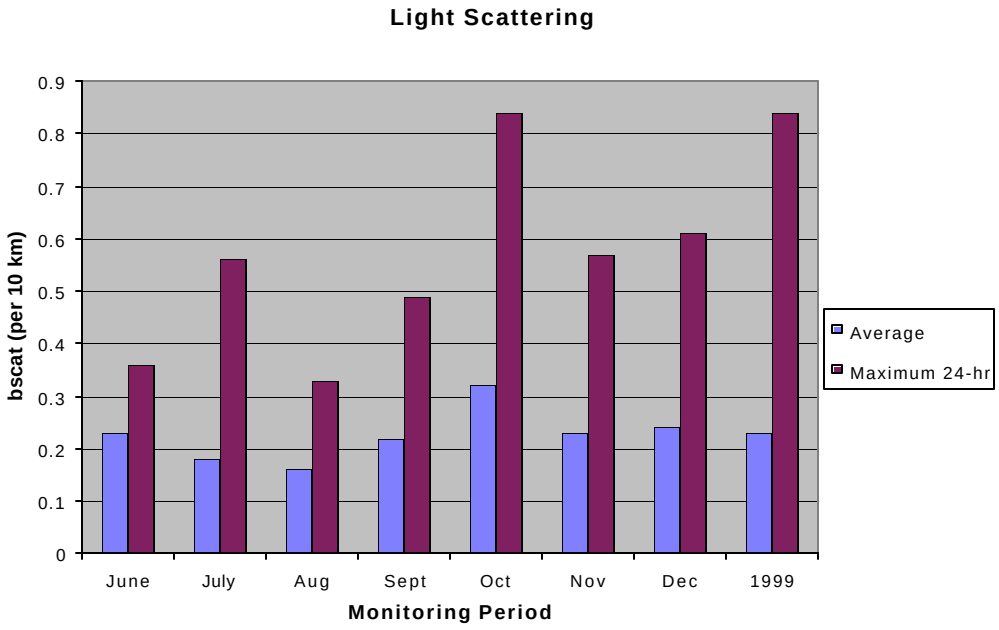
Between storms in late fall and winter, much of southwest Washington is often blanketed with a relatively stable air mass that inhibits the dispersion effects of atmospheric mixing. During the winter automobiles tend to produce more carbon monoxide and home heating produces both carbon monoxide and particulate, especially when wood is used as a fuel. These factors combine to produce the higher pollution levels for these pollutants during the winter. On the other hand, atmospheric ventilation is generally better during spring and summer, when less carbon monoxide and particulate are produced. Consequently, these pollutants are generally not a summertime problem in southwest Washington.

Periods of relatively poor ventilation do occur even in the summer, however. Ozone concentrations reach peak levels when sunshine and temperatures above 95 degrees Fahrenheit accompany periods of stagnation, and poor ventilation. Although ozone is not released directly into the atmosphere, it is produced during periods of sunlight and elevated temperatures by chemical reactions involving VOC and NO_x. The meteorological factors favorable to significant ozone formation occur only during the summer.

K. VISIBILITY

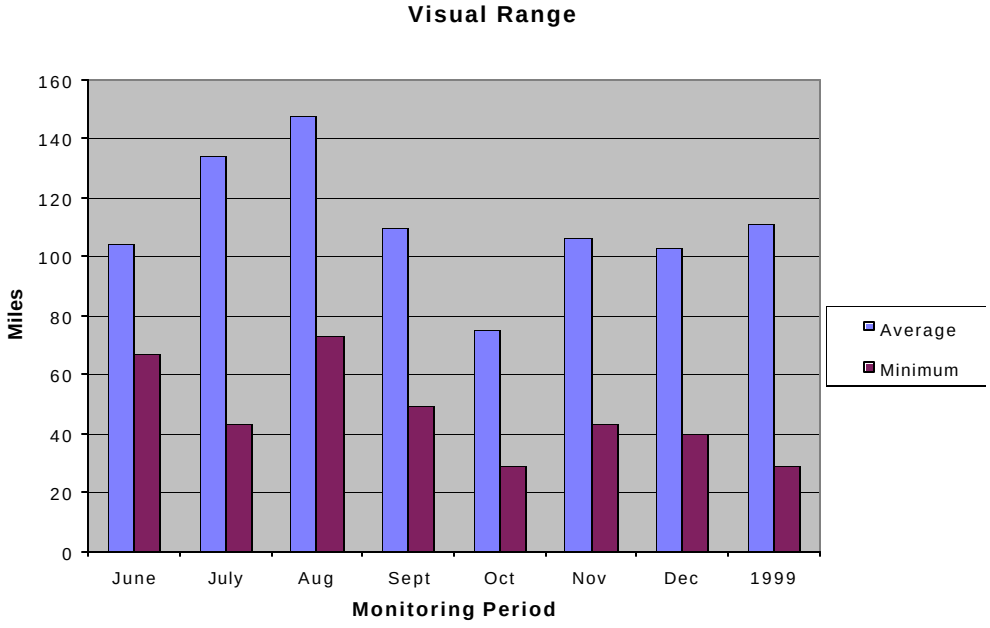
Although public health is the primary mission of the agency, the Cascade scenery and panoramic vistas are also considered as important elements of the high quality of life in the Northwest. Fine particulate air pollution, particularly $PM_{2.5,}$ at concentrations well below the health-based standards can cause visibility impairment by scattering visible light and reducing visual range. SWCAA began a new monitoring effort in late 1998 to also measure and document the change of visibility (i.e., scenic panoramas) from the Vancouver/Portland area. In November 1998 a 35-millimeter camera was installed on top of the Smith Tower in downtown Vancouver. It continues to take daily photographs of Mount Hood. These pictures allow for a qualitative assessment of visibility. The second phase of this project involved installing an integrating nephelometer on the roof of McLoughin Middle School in the camera's view path looking towards Mount Hood. This instrument provides a quantitative measure of light scattering caused by dry fine particulate pollution in the atmosphere. The nephelometer began operating in June of 1999 and, aside from maintenance and unscheduled downtime, operates continuously.

Visibility is often explained in terms of visual range and light extinction. Visual range is the maximum distance – usually miles or kilometers – that you can see a black object against the horizon. Light extinction is the sum of light scattering and light absorption by fine particles and gases in the atmosphere. The more light extinction you have, the shorter your visual range will be.



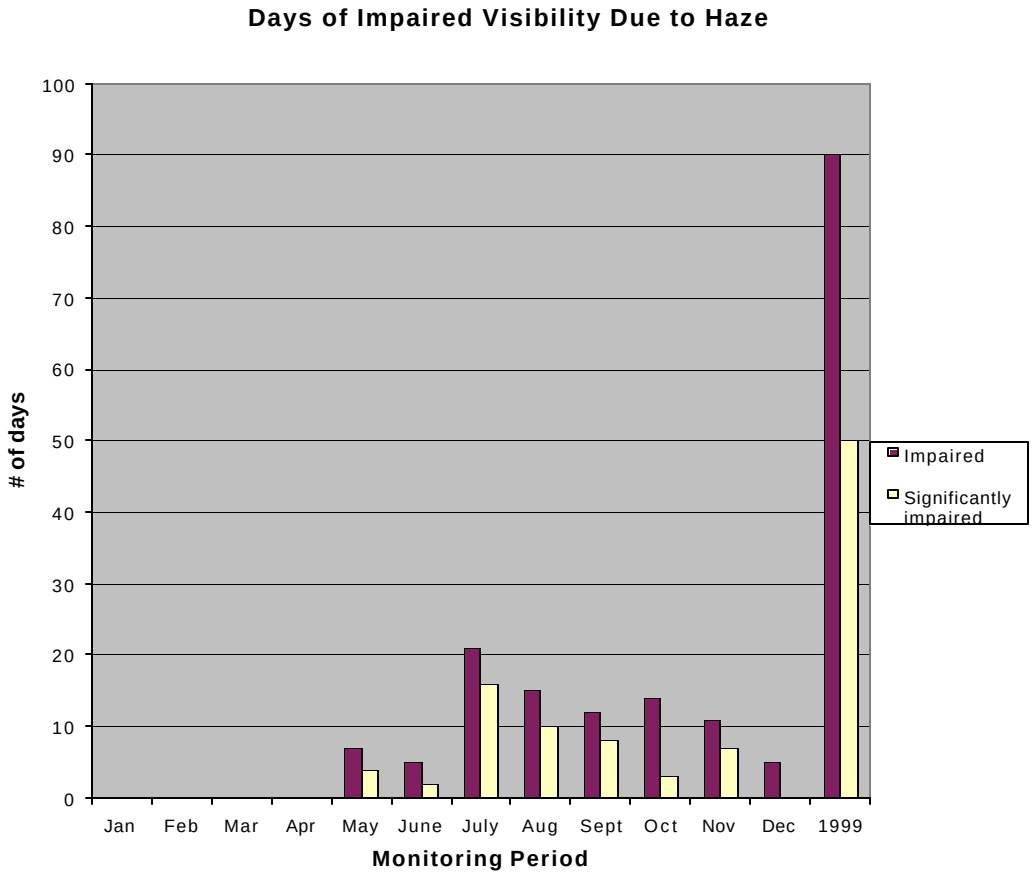
Reduced visibility (or visual range) is caused by weather (clouds, fog, and rain) and air pollution (fine particles and gases). The major pollution contributor is fine particulate matter (PM2.5) emissions, which are transported aloft and may remain suspended for a week or longer. Fine particles seem to have a greater impact than coarse particles at locations far from the emitting source(s) because they remain suspended in the atmosphere longer and travel farther.

Light extinction measurement is a scientific method of characterizing visibility. An instrument termed an integrating nephelometer is used to measure light extinction caused by particulate pollution. The nephelometer continuously measures light scattering, the main cause of light extinction. The instrument is calibrated to yield an output termed b_{scat} , expressed in units of scattering per 10 kilometers of sighting distance. The instrument has a heated sample inlet to eliminate water vapor, and measure only scattering due to dry particle pollution. By measuring light scattering this way, reproducible, real-time data is obtained that can be used for evaluating pollution control strategies and analyzing trends.



Nephelometers only measure light scattering at the locale of the monitoring site and may not accurately represent pollution and weather variations over the entire range to a distant viewpoint. However, we believe that the visual ranges derived from the McLoughin nephelometer are representative of visibility in the communities surrounding the monitoring site.

The accompanying graphs indicate light scattering, visual range, and haze impairment information for each month monitored and for the total period monitored in calendar year 1999. The light scattering and visual range was derived from the McLoughlin Middle School nephelometer data. As mentioned above, the nephelometer did not begin operating until June 1999. Since *light scattering* and *light extinction* are not familiar terms, some comparisons may be useful for relating the Vancouver results. According to visibility trends data developed by the National Park Service, the Great Basin, central Rocky Mountains, and nonurban areas in the Southwest exhibit the lowest light extinction levels, averaging 0.1 to 0.15 per 10 km (162 to 242 mi. visual range). The highest levels occur in the eastern United States, averaging as high as 1.2 to 1.3 per 10 km (18 to 20 mi. visual range) in some places. The number of days of visibility impairment due to haze was derived from review and codification of the photographs taken from the Smith Tower camera. If objects in the scene are obscured by haze, but some of the markers or their outlines can still be seen, the scene is codified as *impaired*. If objects in the scene are concealed by haze and outlines are difficult or impossible to determine, the scene is codified as *significantly impaired*. Although the camera was operated for the entire calendar year, zero days of haze impairment were recorded for the months of January through April. Haze obscuration was not clearly discernable in any of the photographs from this period because the scenes were either clear or dominated by northwest winter weather to the extent that recognition of any haze present was not possible.



APPENDIX A

AMBIENT AIR QUALITY STANDARDS

Pollutant	**Averaging Time**	**Federal Standard**	**State Standard**
Pollutant	Averaging Time	Federal Standard	State Standard
PM_{10}	Annual	50 ug/m^3	50 ug/m^3
	24 hours	150 ug/m^3	150 ug/m^3
$PM_{2.5}$ - Remanded	Annual	15 ug/m^3	----------
- Remanded	24 hours	65 ug/m^3	----------
Ozone - Old	1 hour	0.12 ppm	0.12 ppm
- Remanded	8 hour	0.08 ppm	
Carbon Monoxide	8 hours	9 ppm	9 ppm
	1 hour	35 ppm	35 ppm
Sulfur Dioxide	Annual	0.03 ppm	0.02 ppm
	24 hours	0.14 ppm	0.10 ppm
	3 hours	0.5 ppm	0.5 ppm
Nitrogen Dioxide	Annual	0.053 ppm	0.053 ppm
Lead	Calendar Quarter	1.5 ug/m^3	1.5 ug/m^3

Notes: The federal total suspended particulate standard (TSP) was dropped in 1987.
ug/m^3 = micrograms of pollutant per cubic meter of air.
ppm = parts per million.

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APPENDIX B

Criteria Pollutants			
Pollutants	**Description**	**Sources**	**Health Effects**
Particulate (PM_{10}) **Particulate (PM2.5)**	Particles of 10 microns or Less in diameter. Particles of 2.5 microns or Less in diameter	Wood stove, industry, dust construction, street sand application, open burning agricultural activities.	Aggravates ailments such as bronchitis and emphysema, especially bad for those with chronic heart and lung disease, as well as the very young and old and pregnant women.
Carbon Monoxide (CO)	An odorless, tasteless, colorless gas which is emitted primarily from any form of combustion	Mobile sources (autos, trucks, buses), wood stoves, open burning, industrial combustion sources.	Deprives the body of oxygen by reducing the blood'' capacity to carry oxygen: causes headaches, dizziness, nausea, and listlessness and in high doses may cause death.
Ozone (O_3)	Formed when nitrogen oxides and volatile organic compounds react with one another in the presence of sunlight and warm temperatures. A component of smog.	Mobile sources, industry, power plants, gasoline storage and transfer, paint, solvent usage.	Irritates eyes, nose, throat and respiratory system; especially bad for those with chronic heart and lung disease, as well as the very young and old, and pregnant women.
Nitrogen Dioxide (NO_2)	A poisonous gas produced when nitrogen oxide becomes a byproduct of sufficiently high-burning temperatures.	Fossil fuel power, mobile sources, industry, explosives manufacturing, fertilizer manufacturing.	Harmful to lungs, irritates bronchial and respiratory systems; increases symptoms in asthmatic patients.
Sulfur Dioxide (SO_2)	A gas or liquid resulting from the burning of sulfur-containing fuel.	Fossil fuel power plants, non-ferrous smelters, kraft pulp production.	Increases symptoms in asthmatic patients; irritates respiratory system.
Lead (Pb)	A widely used metal, which may accumulate in the body.	Leaded gasoline, smelting, battery manufacturing, and recycling.	Affects motor function and reflexes and learning; causes damage to the central nervous system, kidneys and brain. Children affected more than adults

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APPENDIX C

GLOSSARY

Air impairment: Unhealthy levels of air pollutants necessitating open burning bans. SWCAA may declare air impairments based on monitored levels of pollution and weather forecasts.

Ambient air: The surrounding air (excluding indoor air).

Area source: A pollution source not confined to one point, but spread out in a large geographical area. Area sources include automobiles, wood stoves, small businesses (i.e. dry cleaners), etc.

BACT: Best Available Control Technology, or the most effective way that is technically and economically feasible to limit the amount of air pollutants emitted.

Carbon monoxide (CO): A colorless, poisonous gas formed when carbon-containing fuel is not burned completely. Sources include vehicle emissions, industry and wood burning. Related to respiratory and heart diseases.

Class I area: All international parks, national wilderness areas and memorial parks which exceed 5,000 acres, and all national parks which exceed 6,000 acres in size.

Criteria pollutants: A category of pollutants identified by EPA for which standards for protecting human health have been set. Includes carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, particulate matter and lead.

Emission inventory: A data bank of air pollution statistics, identifying the type, size and location of various pollution sources. Categories include point sources and area sources.

Environment 2010: A strategic plan to identify and ultimately solve the environmental problems faced by Washington State both now and in the future.

EPA: Environmental Protection Agency, a federal agency responsible for environmental concerns.

Federal Clean Air Act: The first major legislation to target air pollution. First passed in 1963, with subsequent revisions in 1970, 1977, and 1990.

Lead (Pb): A heavy gray metal found in gasoline, paints, and plumbing. Exposure can adversely affect the nervous system.

National Ambient Air Quality Standards (NAAQS): Primary and secondary standards set at a national level for criteria pollutants. The purpose of these standards is to protect human health.

Nephelometer: A device that measures light scattering by fine particulate pollution in the air.

Nitrogen dioxide (NO_2): A brownish gas and strong oxidizing agent that is one of the major components of acid rain and smog.

Non-attainment area: An area designated by EPA in which National Ambient Air Quality Standards are exceeded.

Offset: A policy requiring reductions in emissions before a permit will be granted.

Ozone (O_3): A poisonous, bluish gas form of oxygen, which is the result of chemical reactions between volatile organic compounds and nitrogen oxides. Destroys crops and impairs breathing.

Particulate matter (PM_{10}, $PM_{2.5}$): Airborne particles resulting from wood stove burning, outdoor burning, road dust and industry, which can penetrate into the lungs and impair the respiratory system.

Point sources: Identifiable pollution sources such as large industries that emit significant levels of air pollutants in a particular geographic location.

PSD: Prevention of Significant Deterioration. A permit issued before construction can begin on new or expanded facilities that emit air pollutants. The purpose of the permit is to ensure that the air pollution in the area does not reach unhealthy levels in areas currently meeting federal standards, and that the facility is using BACT.

SPMS: Special Purpose Monitoring Site. Used by SWCAA mainly for short-term studies of air pollution or non-criteria pollutant monitoring.

SLAMS: State and Local Air Monitoring Site. Site for air monitoring and data collection.

SIP: State Implementation Plan. A plan the state adopts to ensure that state air quality objectives are met.

Sulfur dioxide (SO_2): A gas or liquid resulting from the burning of sulfur-containing fuel. May cause breathing problems.

Telemetry: A method of collecting data from monitoring sites. Data is electronically sent over telephone lines to a central computer at SWCAA.

Toxic air pollutants: Compounds that may cause cancer and/or other health problems at extremely low concentrations.

Volatile organic compounds (VOCs): Unstable carbon-based compounds that combine with nitrogen oxides, sunlight, and high ambient temperatures to will produce ozone.

APPENDIX D

FACTS YOU SHOULD KNOW

about

YOUR CLEAN AIR AGENCY

and

HOW YOU CAN HELP

SOUTHWEST CLEAN AIR AGENCY

Serving Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties

WHO IS SWCAA?

The Southwest Clean Air Agency (SWCAA) was formed after passage of the 1967 Clean Air Act of Washington (RCW 70.94). That Act required the more populated counties within the State of Washington to activate local air pollution control authorities. Altogether, there are seven such agencies within the State. Many people think that SWCAA is part of the City, County, State or Federal government, but in actuality, we are a separate government entity classified as a municipal corporation. Our jurisdiction includes the five counties of Clark, Cowlitz, Lewis, Skamania and Wahkiakum. It covers a total of 6,127 square miles and served an estimated population of 513,900 in 1999.

MISSION:

The mission of SWCAA is to preserve, and enhance air quality in southwest Washington.

PURPOSE:

SWCAA administers the laws and regulations regarding air pollution control. The basis for these laws and regulations can be either state, federal, our own air pollution control regulations, the State Environmental Policy Act, or State Implementation Plan requirements. There are also agreements with other governmental agencies, such as the State Department of Ecology and the State Department of Natural Resources regarding funding, program commitments, and open burning control.

HISTORY:

In December of 1968, the Agency's Board of Directors adopted Regulation 1, which together with the Washington Clean Air Act, became the primary air pollution control law for SWCAA. In October 1969, the Board of Directors adopted Regulation 2 to establish additional controls for industrial pollution sources. Regulation 1 and 2 have been amended numerous times to meet state and federal requirements and to establish programs necessary for control of air pollution.

RESPONSIBILITIES:

In achieving the purposes of the Clean Air Act, SWCAA is to hold hearings, control emissions of air contaminants through the adoption of regulations, review new sources, maintain proper records of operations, contract with individuals for studies and reports, and inspect and monitor air pollution sources and levels. SWCAA issues citations, initiates court suits, or uses other legal means to enforce the provisions of this regulation.

FUNDING:

The State Clean Air Act empowers local air pollution control boards to apply to the state and federal governments for grants-in-aid, to charge fees for certain services, and to assess cities and counties within SWCAA's boundaries for "supplemental income" in proportion to their population. SWCAA has financed its program through state and federal grants, permit fees from industry, assessments of cities and counties within its five county jurisdiction according to population, and through penalties collected for infractions.

BOARD OF DIRECTORS:

The governing Board of SWCAA consists of eleven members. This includes a County Commissioner from each of the five counties, one City Council representative from the largest city within each of the five counties, and one member-at-large.

The Board of Directors holds public meetings on the first Thursday of each month at 3:00 p.m. Most meetings are held at SWCAA's office, located at 1308 N.E. 134th Street, Vancouver, WA. However, an effort is made to meet about once per year in Cowlitz, Lewis, Wahkiakum, and Skamania Counties as well.

STAFF AND RESPONSIBILITIES:

SWCAA employs a professional staff to provide technical, engineering, enforcement, and administrative and clerical support.

The Executive Director is appointed by the Board of Directors to serve in a professional capacity as its technical advisor and administrative officer.

The engineering staff reviews new source applications, provides information on regulations to interested parties, maintains the emission inventory, assists in source testing activities, and gives technical assistance to inspectors. They review environmental impact statements, SEPA actions, coordinate with city and county departments, and assist in regulation review. They also assist in developing control plans to meet and maintain air quality standards and conduct or review special studies.

The operations staff conducts source inspections, responds to citizen complaints, does routine surveillance to maintain compliance of point sources and enforces air pollution regulations. They maintain the air-monitoring network and perform data analysis and quality assurance. They provide computer service assistance to other agency staff and assist in the planning and development of plans to meet and maintain air quality standards. All staff members participate in special projects, routine information requests, enforcement and public education programs.

The clerical staff provides a variety of specialized secretarial/clerical assistance, performs work in accounting, financial records, preparation of periodic reports, fiscal status reports, payroll, personnel records, library filing, and other assistance as needed by the Agency staff.

ADVISORY BOARD:

An Advisory Board advises the Executive Director and Board of Directors on air pollution matters. Two must represent industry and all should be skilled and experienced in the field of air pollution control. They are appointed by the Executive Director.

AIR SAMPLING:

An air pollution monitoring network is operated within SWCAA's jurisdiction. Pollutants sampled are small size particulate (PM_{10}, $PM_{2.5}$) carbon monoxide, and ozone. Meteorological parameters are also monitored, including temperature, wind speed, wind direction, visibility and related statistical indicators. Special studies also occur for monitoring other compounds as needed.

VIOLATIONS:

As a means of enforcing the regulations, SWCAA has the responsibility to issue civil penalties and initiate actions in court. Additional means of enforcement include injunctions, restraining orders, assurances of discontinuance, and other administrative means.

PUBLIC EDUCATION AND INFORMATION:

SWCAA maintains a library of information on environmental issues, which is open to the public for research purposes. Informational brochures, leaflets, and fact sheets are available upon request. Staff members are available for presentations to civic, educational and other interested groups. Telephone message lines provide information on air pollution levels and seasonal topics like woodstoves and open burning. Information on specific air pollution problems, current control requirements and general regulations is also available.

HOW CAN I GET MORE INFORMATION

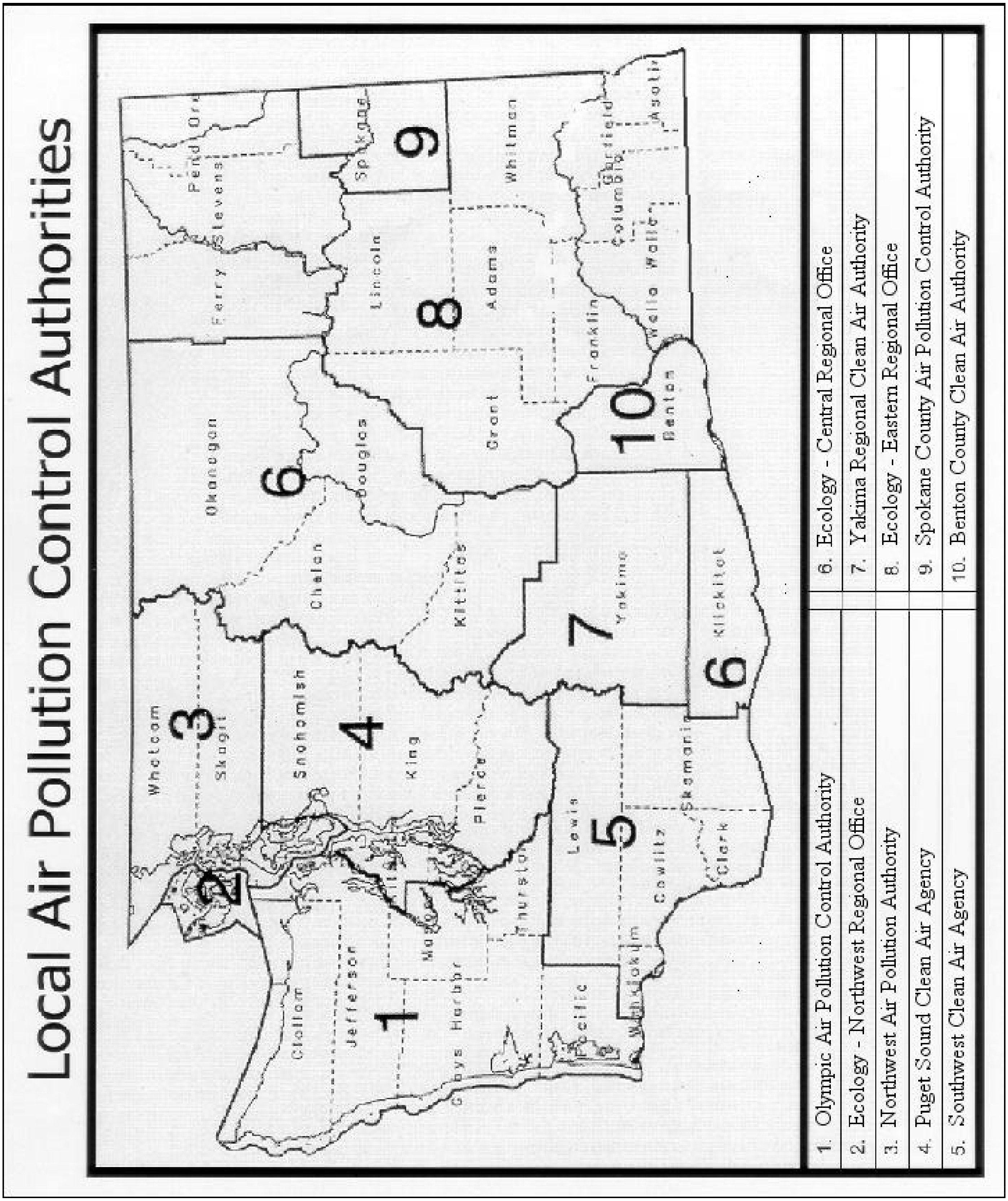
SWCAA Office: (360) 574-3058
Burning and Wood Stove Information: (360) 574-0057
Web Page: http://www.swcleanair.org
(e-mail addresses for all SWCAA staff can be found on the web page under *STAFF*)

IF EVERYONE DOES SOMETHING

WE CAN KEEP THE AIR CLEAR IN SOUTHWEST WASHINGTON!

1. Avoid using your wood stove or fireplace when air quality is poor.
2. Burn only dry, seasoned wood in your wood stove or fireplace.
3. Observe open burning restrictions and use alternative disposal means.
3. Keep your car tuned for fuel efficiency.
4. Combine your errands into just one trip.
5. Walk or ride your bike on short trips.
6. Take the bus or car pool at least one day a week.
7. Use the phone to cut down on “looking and travel” time.

APPENDIX E


Local Air Pollution Control Authorities
Whatcom
Skagit
Okanogan
Ferry
Stevens
Pend Oreille
Spokane
Lincoln
Whitman
Adams
Garfield
Columbia
Asotin
Walla Walla
Franklin
Benton
Grant
Douglas
Chelan
Kittitas
Yakima
Klickitat
Snohomish
King
Pierce
Lewis
Skamania
Cowlitz
Clark
Clallam
Jefferson
Grays Harbor
Pacific
Wahkiakum
Thurston
Mason
1
2
3
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1. Olympic Air Pollution Control Authority
2. Ecology - Northwest Regional Office
3. Northwest Air Pollution Authority
4. Puget Sound Clean Air Agency
5. Southwest Clean Air Agency
6. Ecology - Central Regional Office
7. Yakima Regional Clean Air Authority
8. Ecology - Eastern Regional Office
9. Spokane County Air Pollution Control Authority
10. Benton County Clean Air Authority

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APPENDIX F

TOTAL SWCAA REGIONAL EMISSIONS

1999 Annual Emission Inventory

	Tons per Year					
	CO	SO2	VOC	NOx	PM	PM-10
INDUSTRY	50,418	92,524	4,560	28,775	6,471	3,328
ON-ROAD VEHICLES	92,152	634	8,845	12,001	25,673	14,099
NON-ROAD MOBILE SOURCES	31,663	386	4,288	4,278	478	478
AREA SOURCES	35,419	70	13,505	902	5,178	4,915
TOTAL	209,652	93,615	31,198	45,955	37,802	22,820
INDUSTRY						
Large Industries	50,337	92,508	4,202	28,625	6,084	3,201
Small industries	81	16	358	150	388	127
sub-total	50,418	92,524	4,560	28,775	6,471	3,328
ON-ROAD VEHICLES						
Vehicles	92,152	634	8,845	12,001	1,057	1,057
Road Dust Paved	0	0	0	0	23,185	12,469
Road Dust Unpaved	0	0	0	0	1,432	573
sub-total	92,152	634	8,845	12,001	25,673	14,099
NON-ROAD MOBILE SOURCES						
Aircraft	1,084	1	35	6	0	0
Vessels/ships	135	37	72	427	14	14
Railroads	35	16	18	223	6	6
Lawn & Garden Equipment	14,801	9	1,660	34	31	31
Recreational Vehicles	748	0	249	2	3	3
Recreational Marine Vehicles	3,839	11	1,281	125	53	53
Light Commercial Equipment	5,308	6	265	49	7	7
Industrial Equipment	1,598	10	110	231	13	13
Construction Equipment	2,379	200	361	2,183	234	234
Agricultural Equipment	169	13	37	172	25	25
Logging Equipment	1,567	83	201	827	91	90
sub-total	31,663	386	4,288	4,278	478	478
AREA SOURCES						
Solvent Utilization	0	0	7,431	0	0	0
Gasoline Storage and Transport	0	0	705	0	0	0
Stationary Source Fuel Combustion	146	15	65	411	43	42
Woodstoves/Fireplaces	28,433	52	4,696	352	3,976	3,976
Residential Trash & Yard Burning	826	3	195	40	139	139
Slash Burning	5,800	0	380	93	956	693
Structure and Wildfires	215	0	34	5	64	64
sub-total	35,419	70	13,505	902	5,178	4,915

Clark County Emissions
1999 Annual Emission Inventory

Tons per Year

		CO	SO2	VOC	NOx	PM	PM-10
INDUSTRY		18,331	2,424	1,011	1,742	1,846	1,123
ON-ROAD VEHICLES		46,037	332	4,305	5,997	13,428	7,374
NON-ROAD MOBILE SOURCES		19,885	205	2,565	2,280	257	257
AREA SOURCES		18,576	44	8,089	519	2,684	2,655
	TOTAL	102,830	3,005	15,971	10,538	18,215	11,408
INDUSTRY							
Large Industries		18,291	2,416	851	1,655	1,665	1,086
Small industries		40	8	160	87	180	37
	sub-total	18,331	2,424	1,011	1,742	1,846	1,123
ON-ROAD VEHICLES							
Vehicles		46,037	332	4,305	5,997	553	553
Road Dust Paved						12,127	6,522
Road Dust Unpaved						749	299
	sub-total	46,037	332	4,305	5,997	13,428	7,374
NON-ROAD MOBILE SOURCES							
Aircraft		711	1	23	4	0	0
Vessels/ships		88	24	47	280	9	9
Railroads		23	11	12	146	4	4
Lawn & Garden Equipment		9,706	6	990	25	21	21
Recreational Vehicles		491	0	158	1	2	2
Recreational Marine Vehicles		2,517	7	840	82	35	35
Light Commercial Equipment		3,481	4	158	33	5	5
Industrial Equipment		1,048	7	72	149	9	9
Construction Equipment		1,642	138	246	1,469	162	162
Agricultural Equipment		5	0	1	5	1	1
Logging Equipment		173	8	20	85	10	10
	sub-total	19,885	205	2,565	2,280	257	257
AREA SOURCES							
Solvent Utilization		0	0	4,717	0	0	0
Gasoline Storage and Transport		0	0	298	0	0	0
Stationary Source Fuel Combustion		96	10	42	270	28	28
Woodstoves/Fireplaces		17,497	32	2,877	217	2,451	2,451
Residential Trash & Yard Burning		209	2	90	18	57	57
Slash Burning		639	0	44	10	107	78
Structure and Wildfires		136	0	21	3	41	41
	sub-total	18,576	44	8,089	519	2,684	2,655

Cowlitz County Emissions
1999 Annual Emission Inventory

		Tons per Year					
		CO	SO2	VOC	NOx	PM	PM-10
INDUSTRY		30,267	2,331	3,116	5,232	3,020	1,515
ON-ROAD VEHICLES		23,039	151	2,268	3,000	6,118	3,360
NON-ROAD MOBILE SOURCES		5,914	116	860	827	90	90
AREA SOURCES		8,133	14	2,805	189	1,173	1,093
	TOTAL	67,353	2,612	9,049	9,248	10,401	6,057
INDUSTRY							
Large Industries		30,252	2,328	3,039	5,202	2,875	1,437
Small industries		15	3	77	30	145	78
	sub-total	30,267	2,331	3,116	5,232	3,020	1,515
ON-ROAD VEHICLES							
Vehicles		23,039	151	2,268	3,000	252	252
Road Dust Paved		0	0	0	0	5,525	2,971
Road Dust Unpaved		0	0	0	0	341	136
	sub-total	23,039	151	2,268	3,000	6,118	3,360
NON-ROAD MOBILE SOURCES							
Aircraft		198	0	6	1	0	0
Vessels/ships		25	7	13	78	2	2
Railroads		6	3	3	41	1	1
Lawn & Garden Equipment		2,710	2	356	5	6	6
Recreational Vehicles		137	0	49	0	1	1
Recreational Marine Vehicles		703	2	235	23	10	10
Light Commercial Equipment		972	1	57	8	1	1
Industrial Equipment		293	2	21	44	2	2
Construction Equipment		328	28	51	317	32	32
Agricultural Equipment		45	4	10	46	7	7
Logging Equipment		497	68	59	265	28	27
	sub-total	5,914	116	860	827	90	90
AREA SOURCES							
Solvent Utilization		0	0	1,444	0	0	0
Gasoline Storage and Transport		0	0	186	0	0	0
Stationary Source Fuel Combustion		27	3	12	75	8	8
Woodstoves/Fireplaces		5,933	11	997	73	825	825
Residential Trash & Yard Burning		294	1	50	10	39	39
Slash Burning		1,840	0	110	29	290	210
Structure and Wildfires		40	0	6	1	12	12
	sub-total	8,133	14	2,805	189	1,173	1,093

Lewis County Emissions
1999 Annual Emission Inventory

Tons per Year

		CO	SO2	VOC	NOx	PM	PM-10
INDUSTRY		1,790	87,768	411	21,753	1,584	669
ON-ROAD VEHICLES		20,275	133	1,996	2,640	5,384	2,956
NON-ROAD MOBILE SOURCES		4,782	52	706	925	105	104
AREA SOURCES		6,748	10	2,157	154	1,017	909
	TOTAL	33,595	87,963	5,270	25,472	8,089	4,639
INDUSTRY							
Large Industries		1,777	87,763	309	21,725	1,524	658
Small industries		13	5	102	28	60	11
	sub-total	1,790	87,768	411	21,753	1,584	669
ON-ROAD VEHICLES							
Vehicles		20,275	133	1,996	2,640	222	222
Road Dust Paved		0	0	0	0	4,862	2,615
Road Dust Unpaved		0	0	0	0	300	120
	sub-total	20,275	133	1,996	2,640	5,384	2,956
NON-ROAD MOBILE SOURCES							
Aircraft		146	0	5	1	0	0
Vessels/ships		18	5	10	57	2	2
Railroads		5	2	2	30	1	1
Lawn & Garden Equipment		1,987	1	261	4	4	4
Recreational Vehicles		100	0	36	0	0	0
Recreational Marine Vehicles		515	1	172	17	7	7
Light Commercial Equipment		713	1	42	6	1	1
Industrial Equipment		215	1	15	32	2	2
Construction Equipment		342	29	54	331	34	34
Agricultural Equipment		110	9	24	112	16	16
Logging Equipment		632	3	86	336	37	37
	sub-total	4,782	52	706	925	105	104
AREA SOURCES							
Solvent Utilization		0	0	1,059	0	0	0
Gasoline Storage and Transport		0	0	206	0	0	0
Stationary Source Fuel Combustion		20	2	9	55	6	6
Woodstoves/Fireplaces		4,095	8	673	51	574	574
Residential Trash & Yard Burning		264	1	45	9	35	35
Slash Burning		2,337	0	160	37	393	285
Structure and Wildfires		32	0	5	1	10	10
	sub-total	6,748	10	2,157	154	1,017	909

Skamania County Emissions
1999 Annual Emission Inventory

Tons per Year

	CO	SO2	VOC	NOx	PM	PM-10
INDUSTRY	29	2	20	46	21	21
ON-ROAD VEHICLES	1,875	12	185	244	498	273
NON-ROAD MOBILE SOURCES	678	7	99	124	14	14
AREA SOURCES	1,062	2	301	23	160	144
TOTAL	3,645	22	604	437	692	451
INDUSTRY						
Large Industries	17	2	3	44	20	20
Small industries	12	0	16	2	1	1
sub-total	29	2	20	46	21	21
ON-ROAD VEHICLES						
Vehicles	1,875	12	185	244	20	20
Road Dust Paved	0	0	0	0	450	242
Road Dust Unpaved	0	0	0	0	28	11
sub-total	1,875	12	185	244	498	273
NON-ROAD MOBILE SOURCES						
Aircraft	21	0	1	0	0	0
Vessels/ships	3	1	1	8	0	0
Railroads	1	0	0	4	0	0
Lawn & Garden Equipment	285	0	38	1	1	1
Recreational Vehicles	14	0	5	0	0	0
Recreational Marine Vehicles	74	0	25	2	1	1
Light Commercial Equipment	102	0	6	1	0	0
Industrial Equipment	31	0	2	5	0	0
Construction Equipment	48	4	8	47	5	5
Agricultural Equipment	6	1	1	7	1	1
Logging Equipment	93	0	12	49	6	5
sub-total	678	7	99	124	14	14
AREA SOURCES						
Solvent Utilization	0	0	152	0	0	0
Gasoline Storage and Transport	0	0	7	0	0	0
Stationary Source Fuel Combustion	3	0	1	8	1	1
Woodstoves/Fireplaces	667	1	110	8	93	93
Residential Trash & Yard Burning	43	0	7	2	6	6
Slash Burning	344	0	23	6	58	42
Structure and Wildfires	5	0	1	0	2	2
sub-total	1,062	2	301	23	160	144

Wahkiakum County Emissions
1999 Annual Emission Inventory

Tons per Year

	CO	SO2	VOC	NOx	PM	PM-10
INDUSTRY	0	0	2	2	2	1
ON-ROAD VEHICLES	926	6	91	121	246	135
NON-ROAD MOBILE SOURCES	404	7	57	122	14	13
AREA SOURCES	899	1	154	17	145	115
TOTAL	2,229	13	304	261	406	264
INDUSTRY						
Large Industries	0	0	0	0	0	0
Small industries	0	0	2	2	2	1
sub-total	0	0	2	2	2	1
ON-ROAD VEHICLES						
Vehicles	926	6	91	121	10	10
Road Dust Paved	0	0	0	0	222	119
Road Dust Unpaved	0	0	0	0	14	5
sub-total	926	6	91	121	246	135
NON-ROAD MOBILE SOURCES						
Aircraft	8	0	0	0	0	0
Vessels/ships	1	0	1	3	0	0
Railroads	0	0	0	2	0	0
Lawn & Garden Equipment	112	0	15	0	0	0
Recreational Vehicles	6	0	2	0	0	0
Recreational Marine Vehicles	29	0	10	1	0	0
Light Commercial Equipment	40	0	2	0	0	0
Industrial Equipment	12	0	1	2	0	0
Construction Equipment	19	2	3	18	2	2
Agricultural Equipment	3	0	1	3	0	0
Logging Equipment	173	4	23	92	10	10
sub-total	404	7	57	122	14	13
AREA SOURCES						
Solvent Utilization	0	0	60	0	0	0
Gasoline Storage and Transport	0	0	8	0	0	0
Stationary Source Fuel Combustion	1	0	0	3	0	0
Woodstoves/Fireplaces	241	0	40	3	34	34
Residential Trash & Yard Burning	16	0	3	1	2	2
Slash Burning	640	0	43	10	108	78
Structure and Wildfires	2	0	0	0	1	1
sub-total	899	1	154	17	145	115