

Portland-Vancouver  
Air Quality Maintenance Area  
(Oregon Portion)  
and  
Salem-Keizer Area  
Ozone Maintenance Plan

Oregon Department of Environmental Quality  
811 SW Sixth Avenue  
Portland, OR 97204

Adopted by the Environmental Quality Commission  
February 22, 2007

**Oregon State Implementation Plan  
Section 4.50**

**Portland-Vancouver AQMA  
(Oregon portion)  
And  
Salem-Keizer Area  
8-hour Ozone Maintenance Plan**

**Table of Contents**

Section	Subsection	Section Heading	Page
		Executive Summary	5
4.50.1		Background	6
	4.50.1.1	• Portland-Vancouver AQMA (Oregon portion)	7
	4.50.1.2	• Salem SKATS	8
4.50.2		Ozone Trends and Compliance with Standards	10
4.50.3		Attainment Inventory (2002)	12
4.50.4		Control Strategies	14
	4.50.4.1	• Portland-Vancouver AQMA (Oregon portion)	14
	4.50.4.2	• Salem SKATS	19
4.50.5		Maintenance Demonstration	20
	4.50.5.1	• Ozone Modeling Study	20
	4.50.5.2	• Growth Projections	21
	4.50.5.3	• Forecast and Maintenance Inventory (2015)	22
	4.50.5.4	• Maintenance Demonstration (2015)	26
4.50.6		Air Quality Monitoring	27
4.50.7		Contingency Plan	28
	4.50.7.1	• Request to Remove 1-hour Contingency Plan	28
	4.50.7.2	• Portland-Vancouver AQMA	28
	4.50.7.3	• Salem SKATS	30
4.50.8		Verification of Continued Attainment	31

**For more information**

If you have questions or would like more information, including a copy of the proposed rule revisions or appendices, please contact David Collier at DEQ's Air Quality Division in Portland at (503) 229-5946, or [collier.david@deq.state.or.us](mailto:collier.david@deq.state.or.us).

### List of Tables

Table No.	Subject	Page
1	8-hour Ozone, Maximum Values (1998, 2003-2005)	11
2	8-hour Ozone, Fourth High Design Values (1998, 2003-2005)	12
3	Portland and Salem 2002 Annual Emissions (tons/year)	13
4	Portland Area 2002 Attainment Inventories (lb/day)	13
5	Salem Area 2002 Attainment Inventories (lb/day)	14
6	Portland and Salem Area Population Projections	21
7	Portland-Area 2015 Maintenance Demonstration (lb/day, tons/year)	24
8	Portland Area VOC and NO <sub>x</sub> Emissions (lb/day), % Change	24
9	Salem-Area 2015 Maintenance Demonstration (lb/day)	25
10	Salem Area VOC and NO <sub>x</sub> Emissions (lb/day), % Change	25
11	2015 Maintenance Demonstration (ozone values)	27
12	Portland Area VOC and NO <sub>x</sub> and CO Emissions (tons/year)	40
13	Salem Area VOC and NO <sub>x</sub> and CO Emissions (tons/year)	40
14	2002 Emissions Inventory Grouped by Source Category Codes	47
15	2015 Emissions Inventory Grouped by Source Category Codes	48

### List of Figures

Figure No.	Subject	Page
1	Portland-Vancouver AQMA (map)	8
2	Salem SKATS Air Quality Area (map)	9
3	Portland-Vancouver and Salem 8-Hour Ozone Values	11
4	Portland Area VOC and NO <sub>x</sub> Emissions (lb/day) and 2015 Maintenance Demonstration	23
5	Salem Area VOC and NO <sub>x</sub> Emissions (lb/day) and 2015 Maintenance Demonstration	23
6	Portland Vancouver and Salem Ozone Maintenance Demonstration	26
7	Top Ten Sources, Portland	41
8	Top Ten Sources, Salem	42

### Appendices

No.	Subject	Page
D10-1	Ozone Monitoring Network (Portland-Vancouver and Salem)	33
D10-2	1992 to 2005 Meteorological Factors Conducive to Ozone Formation in the Portland-Vancouver Area (ODEQ, April 2006)	37
D10-3	Emission Inventory <ul style="list-style-type: none"> <li>• Annual Emissions Inventory</li> <li>• Typical Summer Day Emission Inventory</li> <li>• Summary of Portland AQMA Emissions</li> <li>• Summary of Salem-Keizer Area Emissions</li> </ul>	38
D10-4	Historical and Future Ozone Simulations Using the MM5/SMOKE/CMAQ System in the Portland-Vancouver Area (WSU, December 31, 2005)	49
D10-5	Economic Report to the Metro Council, 2000-2030 Regional Forecast for the Portland-Vancouver Metropolitan Area (Metro's Data Resource Center, December 2002 final draft)	50
D10-6	Modeled Attainment Test	51

## 4.50.0 Acknowledgement and Summary

### 4.50.0.1 Acknowledgements

Without the efforts of numerous individuals in state and local governments who are dedicated to healthy air, this maintenance plan would not have been possible. Special appreciation goes to:

**Principal Authors:** Marianne Fitzgerald and David Collier, DEQ Air Quality Planning

#### **Principal Contributors:**

##### Oregon Department of Environmental Quality

Andy Ginsburg	Division Administrator, Air Quality
Dick Pedersen	Division Administrator, Northwest Region
David Collier	Manager, Air Quality Planning
Cory Ann Wind	Acting Manager, Northwest Region Air Quality
Cheryll Hutchens	Manager, Western Region Air Quality
Gerry Preston	Manager, Air Quality Technical Services
Jeffrey Stocum	Acting Manager, Air Quality Technical Services
Wes Risher	Air Quality Technical Services
Svetlana Lazarev	Air Quality Technical Services
Chris Swab	Air Quality Technical Services
Phil Allen	Air Quality Technical Services
Susan Drake	Northwest Region Air Quality
Karen White-Fallon	Western Region Air Quality

##### Southwest Clean Air Agency

Bob Elliott	Executive Director
Paul Mairose	Chief Engineer
Wade Strange	Air Quality Engineer (former)
Laurie Hulse-Moyer	Air Quality Scientist

##### Washington Department of Ecology

Doug Schneider	Air Quality Program, SIP Coordination
Clint Bowman	Air Quality Program, Meteorology
Sally Otterson	Air Quality Program, Emission Inventories
Cristiana Figueroa-Kaminsky	Air Quality Program (former)

##### Metro

Mark Turpel  
Pam Peck  
Andy Cotugno

##### Salem-Keizer Area Transportation Study

Mike Jaffe

#### 4.50.0.2 Executive Summary

The Portland area has violated federal clean air standards for ground level ozone (commonly known as smog) as recently as 1998. In 1996, the Oregon Department of Environmental Quality (DEQ) and the Southwest Clean Air Agency (SWCAA) developed Ozone Maintenance Plans for the Portland-Vancouver Air Quality Maintenance Area (AQMA) that included several strategies to reduce air pollutants and ensure compliance with the one-hour ozone standard. These strategies were successful in reducing smog forming emissions and no violations of the ozone standard have occurred in the Portland-Vancouver area since 1998.

In 1997, the U. S. Environmental Protection Agency (EPA) revised the national ambient air quality standard (NAAQS) for ozone from a one-hour average of 0.12 parts per million (ppm) to an 8-hour average of 0.08 ppm, and in 2005 EPA revoked the one-hour ozone standard. This 2006 ozone maintenance plan is a revision to the 1996 maintenance plan for the Portland-Vancouver area, and ensures continued compliance with the new 8-hour ozone standard through at least 2015. The plan also includes an ozone maintenance plan for the Salem-Keizer Area Transportation Study (SKATS) air quality area. Both the Portland-Vancouver and Salem areas are included in the ozone modeling and maintenance analysis. An ozone maintenance plan update for the Vancouver portion of the Portland-Vancouver AQMA is being prepared by the Southwest Clean Air Agency in Vancouver, Washington. These plans are required by the federal Clean Air Act, federal regulations and EPA guidance.

This 2006 maintenance plan continues the same strategies adopted for the Portland-Vancouver AQMA in 1996 to reduce and manage volatile organic compounds (VOC) and nitrogen oxide (NO<sub>x</sub>) emissions. Air quality data and projections show that ozone levels can still occasionally approach or exceed the 8-hour ozone standard in the Portland-Vancouver area, but that with the existing strategies in place, both the Portland and Salem areas will maintain compliance with the 8-hour ozone standard. The suite of strategies described below work together to protect air quality as growth and population pressures increase over the next ten years. Implementing this suite of strategies will also reduce emissions of air toxics and greenhouse gases that are important emerging issues of concern.

The following strategies will remain in the Portland-Vancouver Ozone Maintenance Plan as they currently apply to sources in the Portland area:

- Motor Vehicle Inspection Program;
- Emission Standards for Industrial Sources of VOC;
- New Source Review Program for new and expanding major industrial facilities;
- Voluntary Parking Ratio Rules;
- Barge Loading Rules that control VOCs from gasoline delivery operations;
- Aerosol Paint Rules that lower VOC content from spray paints sold in the Portland area;
- Motor Vehicle Refinishing Rules that require low-emitting painting methods at autobody repair shops; and
- Public education and outreach that encourages people to voluntarily reduce emissions, such as not mowing lawns and driving less on Clean Air Action Days (now called Air Pollution Advisories).

Strategies that have reduced VOC emissions in the Salem SKATS air quality area will also remain in place, including emission standards for existing industrial sources of VOC.

The 2006 maintenance plan includes updates to several programs:

- Revised rules for Employee Commute Options in the Portland Area to reduce administrative burdens while maintaining alternative commute programs at larger employers;
- Updated rules for Industrial Emission Management in the Portland area, to reestablish the growth allowance for new and expanding major industrial sources and ensure that the ozone standard will not be violated even under conservative industrial growth assumptions;
- Designated Salem/SKATS as an ozone maintenance area under state rules;
- Revised rules for new and expanding major industrial sources in the Salem area, to remove the most stringent industrial emission control equipment requirements for sources in nonattainment areas, known as Lowest Achievable Emission Rate, and replace them with emission control requirements known as Best Achievable Control Technology that are consistent with what is required in Portland and continue to provide a high level of emission control; and
- Amended DEQ rules to reflect the new federal ozone air quality standard, from the old one-hour standard (which EPA has revoked) to the current federal 8-hour standard of 0.08 ppm, three year rolling average.

DEQ is tracking legal issues which may result in a need to amend the maintenance plan in the future. This maintenance plan was prepared under the guidance of EPA's 2004 Final Rule to Implement the 8-Hour Ozone NAAQS-Phase 1 (69 FR 23951, 40 CFR 51.900). On December 22, 2006 the U.S. Court of Appeals released a decision to "vacate the 2004 rule and remand the matter to EPA" (*South Coast Air Quality Management District v. EPA*). In particular, the court ruled that certain requirements adopted for the 1-hour ozone standard, such as conformity and contingency plans, must be retained to prevent backsliding. Depending on how EPA interprets the court's decision in new guidance and rules, this maintenance plan may need to be amended. In the interim, the existing 1-hour ozone maintenance plan requirements will remain federally enforceable until EPA approves this 8-hour ozone maintenance plan.

#### **4.50.1 Background**

Ground level ozone, also known as smog, is an air pollutant formed in the atmosphere by a chemical reaction of volatile organic compounds (VOC) and oxides of nitrogen (NO<sub>x</sub>). This reaction is most intense on hot summer days with poor ventilation. Ozone is a strong respiratory system irritant that aggravates respiratory illnesses, impairs athletic performance, and can cause permanent respiratory system damage. Ozone can be especially harmful to older people and children, and can damage crops and other materials. In the past, motor vehicles and industrial operations have been the major sources of ozone precursors. Now, other sources such as household products, paints, construction equipment, watercraft and lawnmowers are major contributors to ozone formation.

Historically, the Portland-Vancouver and Salem-Keizer areas violated the national ambient air quality standard (NAAQS) for ground level ozone<sup>1</sup>. The Portland-Vancouver Air Quality Maintenance Area (AQMA) and the Salem-Keizer Area Transportation Study (SKATS) areas were designated nonattainment for ozone on March 3, 1978 under the 1977 Clean Air Act Amendments. Plans were subsequently developed to reduce ozone precursor emissions of VOC and NO<sub>x</sub>, and bring the areas into compliance (attainment) with standards. Under the 1990 Clean Air Act Amendments, the Portland-Vancouver AQMA was designated a "marginal"

---

<sup>1</sup> Ozone monitoring sites were established in Oregon beginning in the early 1970s (see Appendix D10-1).

ozone nonattainment area, and Salem-Keizer Transportation Area Study was designated “nonattainment/insufficient data”.

#### 4.50.1.1 Portland-Vancouver AQMA

Over several decades, efforts to reduce smog forming emissions in the Portland area have included a combination of federal, state, and local emission control strategies. The first State Implementation Plan was adopted in 1972; the first Portland-Vancouver AQMA Ozone Attainment Plan was adopted on July 16, 1982 and approved by EPA on October 7, 1982. Some of the control strategies in the 1982 ozone attainment plan included a vehicle inspection and maintenance program for Portland-area motor vehicles (1975), motor vehicle trip reduction and traffic flow improvements and measures; and industrial VOC controls (1978). Area source controls on gasoline station vapors were added in 1991. The original ozone maintenance plans for Portland-Vancouver were adopted by the Oregon Environmental Quality Commission (EQC) on July 12, 1996 and the Board of Directors of the Southwest Air Pollution Control Authority on March 19, 1996. The Portland and Vancouver Interstate AQMA Ozone Maintenance Plans were approved by EPA on May 19, 1997 (62 FR 27204).

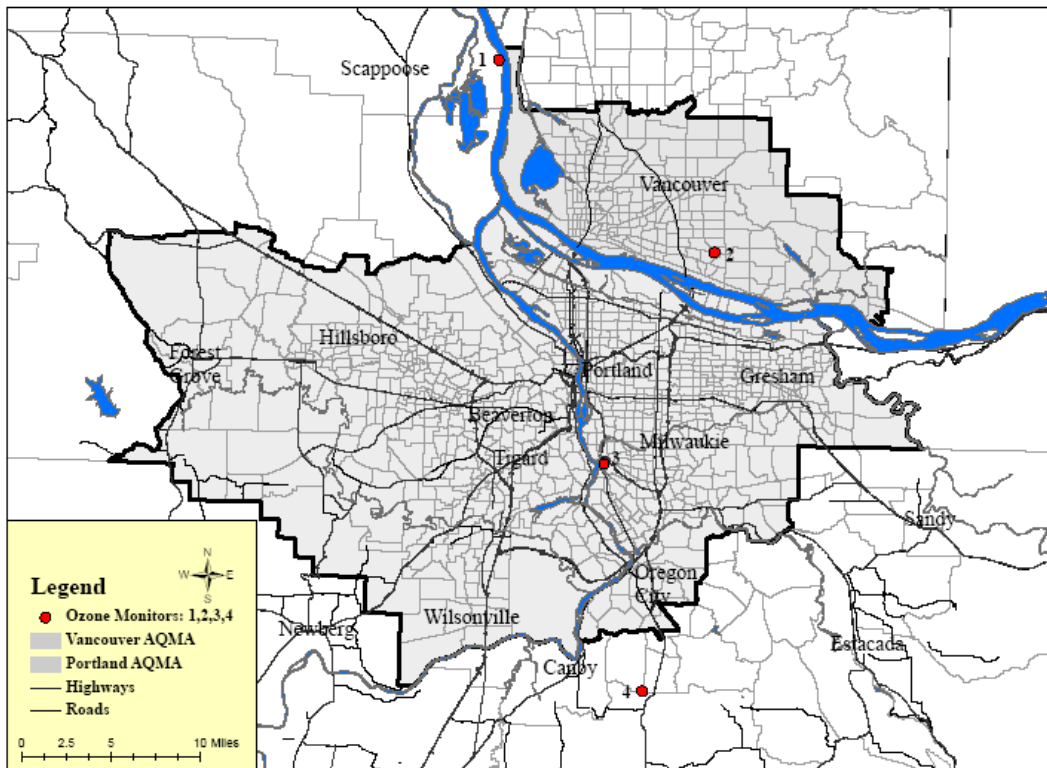
A violation of the one-hour ozone standard did occur in July 1998 at the Carus monitoring site (see Appendix D10-1). The violation occurred during a time when the one-hour ozone standard was temporarily revoked so it did not trigger the one-hour ozone contingency plan. DEQ’s analysis demonstrated that this violation occurred before all emission reduction measures had been fully implemented so no additional measures were needed. Since 1998, there have been no violations of the one-hour ozone standard, and no violations of the 8-hour ozone standard.

In 1997, the U. S. Environmental Protection Agency (EPA) revised the ozone standard from a one-hour average of 0.12 parts per million (ppm) to an 8-hour average of 0.08 ppm. After a lengthy legal challenge, the courts upheld the 8-hour ozone standard in 2002. EPA adopted rules to implement the 8-hour ozone standard on April 30, 2004, and revoked the one-hour standard effective June 15, 2005. EPA designated the State of Oregon “Unclassifiable/Attainment” with the 8-hour ozone standard, effective June 15, 2004 (69 FR 23858, April 30, 2004).

EPA rules to implement the 8-hour ozone standard (69 FR 23951, April 30, 2004) require DEQ to prepare this 2006 maintenance plan update for the Portland-Vancouver area to ensure continued compliance with the 8-hour ozone standard. In accordance with the same EPA rules, Oregon also requests that EPA remove the obligation to prepare a second one-hour ozone maintenance plan.

Meteorological and population growth factors over the past ten years indicate that the number of days with elevated ozone levels should have risen, but instead has remained relatively stable (see Appendix D10-2). Ozone levels have been going down slightly while the population and vehicle miles traveled continued to grow. An analysis that compared episodes with the highest ozone values in 1998 with episodes with similar meteorology in 2003 showed that maximum ozone values were lower in 2003 than 1998 despite similar temperatures, wind speeds and solar radiation levels. This stable ozone trend indicates that the ozone strategies that reduced emissions are working.

**Figure 1: Portland-Vancouver Interstate Air Quality Maintenance Area**

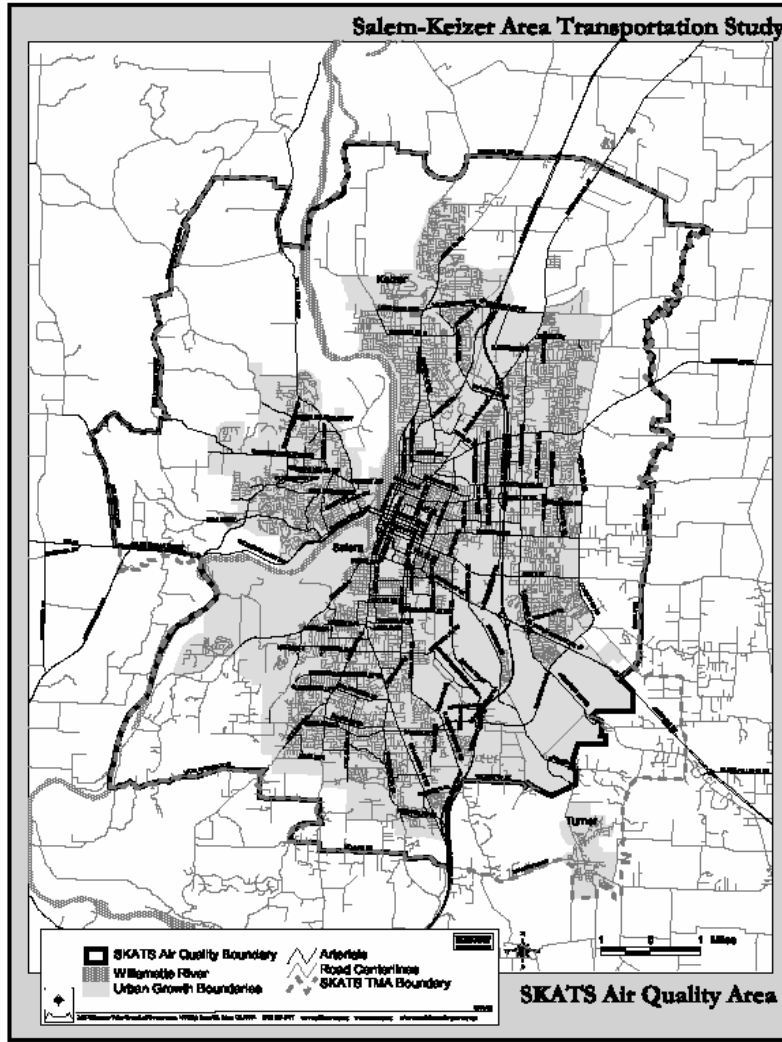


#### 4.50.1.2 Salem-Keizer Area Transportation Study (SKATS) Air Quality Area

The Salem area marginally violated the federal air quality standard for ozone in the 1970s and was designated an ozone nonattainment area on March 3, 1978 under the 1977 Clean Air Act Amendments. The Mid-Willamette Valley Council of Governments recommended the nonattainment area as the area within the Salem-Keizer Area Transportation Study boundary (SKATS) (see Figure 2). This includes portions of Marion and Polk County, including the cities of Salem and Keizer.

Salem's ozone concentrations are influenced by emissions of ozone precursors in the Portland area. In 1979 the Salem area was defined under EPA guidelines as a "rural" ozone nonattainment area, and an Attainment Plan was adopted by the EQC in September, 1980 and approved by EPA on April 12, 1982. Salem's attainment plan under the rural ozone policy consists of three elements: 1) controls on major existing sources of volatile organic compounds under Reasonably Available Control Technology (RACT) rules, 2) controls on major new VOC sources under Lowest Achievable Emission Rate (LAER) rules, and 3) an approved plan for the Portland-Vancouver AQMA, which is the major urban area upwind of Salem. All of these program elements remain in place.

Figure 2: Salem-Keizer Area Transportation Study Air Quality Area



DEQ had developed a maintenance plan and requested redesignation of the Salem SKATS to attainment in 1987, but EPA returned the plan because EPA did not believe it contained sufficient emission inventory data and forecasts. Due to low ambient ozone levels and agency budget cuts, DEQ discontinued the Salem ozone monitor from 1987 through 1994 and was not able to complete the necessary planning work for redesignation. Under the 1990 Clean Air Act Amendments, SKATS was designated a nonattainment area with incomplete data. In 1995, DEQ reinstated the ozone monitor to support development of a maintenance plan for Salem, but was unable to secure staffing resources to complete the plan.

No violations of the federal one-hour standard have been recorded at the Salem/Turner ozone monitoring site since 1996, and no violations of the 8-hour ozone standard have ever been recorded (see Figure 3 and Tables 1 and 2). Salem SKATS was designated in attainment with the 8-hour ozone NAAQS effective June 15, 2004 (69 FR 23858, April 30, 2004).

#### **4.50.2 Ozone Trends and Compliance with Standards**

Figure 3 shows the ozone trends measured at monitoring sites for the Portland, Vancouver, and Salem areas for the period 1997 through 2005. Table 1 shows the highest maximum 8-hour average ozone concentrations measured for 1998<sup>2</sup>, 2003, 2004, and 2005. While these peak values are important in assessing public health risk, they are not used to determine official compliance with the federal ozone standard. Compliance with the standard is based on a statistical method that looks at the three year average of the 4<sup>th</sup> highest (maximum 8-hr average) ozone value each year. If the three-year average of the 4<sup>th</sup> highest value at any monitoring site exceeds the standard, the area is in violation. Table 2 shows the rolling three-year average of 4<sup>th</sup> high values for 1998, 2003, 2004, and 2005. It is these “design values” that are compared to the 0.08 ppm ozone standard to determine compliance. Under EPA’s calculation convention, a value of 0.084 ppm would round down to 0.08 ppm (i.e. in compliance), while a value of 0.085 ppm or higher would be a violation.

Key ozone monitoring sites include the “Carus” site in Portland, “Mountain View” site in Vancouver, and the “Turner” site in Salem (see Appendix D10-1).

The values illustrated in Tables 1 and 2, together with the 2015 Maintenance Demonstration described in Section 4.50.5.4 show that ozone levels can still occasionally approach or exceed the 8-hour ozone standard in the Portland-Vancouver area, but that with the existing strategies in place, the region will maintain compliance with the 8-hour ozone standard. DEQ’s analysis in Section 4.50.5.4 suggests that there is not currently a need to add new ozone strategies for the Portland and Salem areas, but that existing emission reduction and growth management strategies should be continued with revisions described in Section 4.50.4.

---

<sup>2</sup> 1998 is included in the table because that year had the most recent violation of the 1-hour ozone standard in Portland and the July 1998 episode was used in the modeling analysis.



















































































