STATE IMPLEMENTATION PLAN REVISION FOR CARBON MONOXIDE IN THE MEDFORD URBAN GROWTH BOUNDARY

A PLAN FOR MAINTAINING THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR CARBON MONOXIDE

Adopted by the
Environment Quality Commission
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State of Oregon
Department of Environmental Quality
Air Quality Division
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4.52.0 ACKNOWLEDGMENT AND SUMMARY

4.52.0.1 Acknowledgments

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4.52.0.2 Executive Summary: The Medford Carbon Monoxide Maintenance Plan

Air quality monitoring results demonstrate that the Medford area (defined by the Urban Growth Boundary or UGB) meets the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO). In accordance with the 1990 federal Clean Air Act Amendments (CAA), the Department of Environmental Quality (DEQ) is requesting the Environmental Protection Agency (EPA) to redesignate the Medford area to "attainment" status for carbon monoxide. Accompanying this request is a carbon monoxide maintenance plan required by the CAA that demonstrates how the area will continue to maintain acceptable levels of carbon monoxide at least ten years after EPA's approval. After this Redesignation Request/Maintenance Plan is adopted by the Oregon Environmental Quality Commission (EQC) it will be submitted to EPA Region 10 as an amendment to Oregon's State Implementation Plan (SIP).

Redesignation to attainment and approval of this maintenance plan will allow impediments to industrial growth in the Medford area to be removed and will shield the Medford area from the potential withholding of federal transportation funds under the Clean Air Act. In addition, plan approval will allow the requirement for wintertime oxygenated fuel to be lifted in the Medford area while at the same time ensuring that healthful air quality is continued well into the future.

4.52.0.2.1 Background

What is Carbon Monoxide?

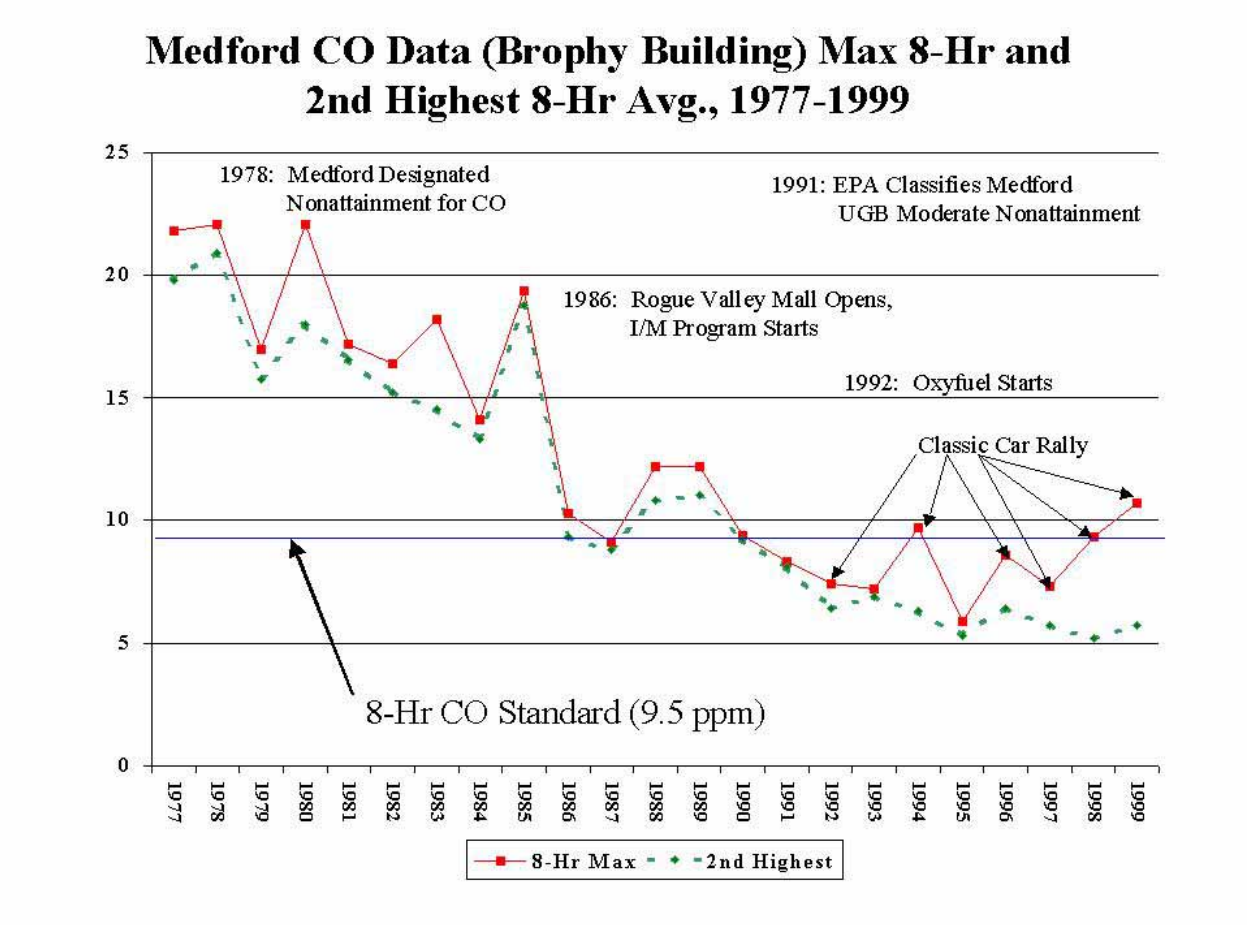
Carbon monoxide (CO) is a colorless, odorless, poisonous gas. It decreases the oxygen carrying capacity of the blood. High concentrations can severely impair the function of oxygen-dependent tissues, including the brain, heart and muscle. Prolonged exposure to even low levels of CO can aggravate existing conditions in people with heart disease or circulatory disorders. Motor vehicles are the predominant source of CO in Oregon, but another significant source includes wood stoves.

EPA established the NAAQS for carbon monoxide at 35 parts per million (ppm) for a 1-hour period and 9 ppm for an 8-hour period. Any measured CO concentration above these levels constitutes an exceedance of the CO standard under the Clean Air Act. (Due to the convention of "rounding off" fractional values, CO concentrations are considered to comply up through 9.4 ppm.) Two exceedances within one calendar year constitute a violation of the air quality standard. A violation, in turn, earns an area the designation of nonattainment for the given pollutant. Experience indicates the 8-hour CO standard is by far the more likely to be exceeded than its 1-hour counterpart.

Past CO Problem

The Medford area exceeded the 8-hour CO standard of 9 parts per million nearly every other day in the late 1970s. (During the same period, the 1-hour standard was not exceeded once.) Maximum 8-hour CO concentrations during that time were more than twice the standard allowed. By the 1980s, the frequency of exceedances declined dramatically, and maximum CO levels declined to the point where they exceeded the standard by approximately 50%. Measured concentrations continued to decline, and no violations have been recorded within the Medford nonattainment area since 1991. The trend in CO from the long-term Brophy Building CO monitor in downtown Medford is shown below in Figure 4.52.0.1.

Figure 4.52.0.1 Medford Downtown CO Trend



Success in Reducing CO

Carbon monoxide control strategies have been successful in bringing Medford into attainment with the 8-hour CO standard. Attainment was achieved at the Brophy Building site by 1990. Full compliance for the area was achieved in 1992 with no exceedances recorded at the Rogue Valley Mall CO monitor. Control strategies used to lower CO concentrations were:

Federal new car emission standards, DEQ vehicle inspection program, the Medford Parking and Traffic Circulation Plan (including the Bicycle Transportation Element) and the wintertime oxygenated fuel program that began in 1992.

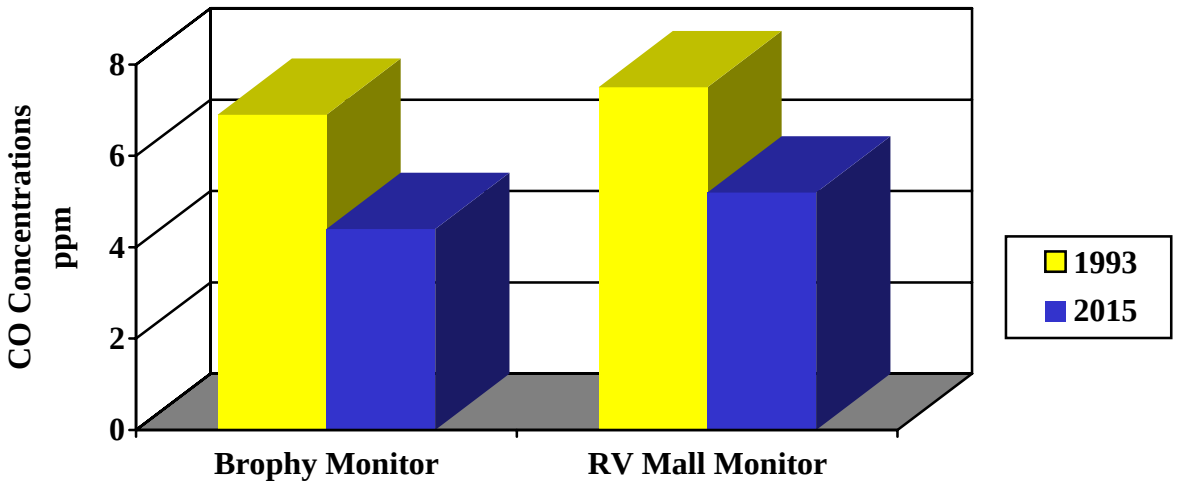
4.52.0.2.2 Need for a Maintenance Plan

Projections of Future CO Levels

Motor vehicle CO emission control equipment is projected to be increasingly effective at reducing air pollution in future years. Total emissions from on road motor vehicles are projected to decrease 61 percent from 1993 to 2015 despite the lifting of oxygenated fuel, and in spite of a 41 percent increase in the number of seasonal weekday vehicle miles traveled (VMT).

The travel forecast prepared for the Regional Transportation Plan (RTP) by the Rogue Valley Council Of Governments (RVCOG) was scaled to the Medford Urban Growth Boundary to determine the combined effect on carbon monoxide air quality of ,1) the increased efficiency of vehicle emission controls, and 2) the projected increases in growth and the number of vehicle miles traveled. Emissions were projected based on adopted population and employment forecasts in the long-range transportation plan. The Medford UGB is projected to increase by 18,719 residents between the years 1993 and 2015. Figure 4.52.0.2 shows the resulting CO concentrations projected through 2015. These concentrations reflect the influence of motor vehicles passing directly by the monitor and incorporate an estimated background level due to all other sources.

Figure 4.52.0.2 8-Hour CO Concentrations for Monitored Hot Spots



Benefits of Maintenance Plan

In order for the Environmental Protection Agency (EPA) to redesignate the Medford area from nonattainment to attainment, the Clean Air Act requires an enforceable maintenance plan to be adopted into the SIP that demonstrates how the area will continue to achieve the air quality standard for a minimum of ten additional years. EPA's approval of the Medford CO Maintenance Plan and redesignation to attainment will provide the following benefits:

Removal of the requirement for wintertime oxygenated fuel;

Assurance that the public will be protected from unhealthful levels of carbon monoxide;

The predictability of knowing what the regulatory requirements for carbon monoxide are likely to be for the next ten years;

The removal of industrial growth impediments (Lowest Achievable Emission Rate or LAER plus offsets).

4.52.0.2.3 Maintenance Plan Development Process

This Medford Carbon Monoxide Maintenance Plan was created in two stages. The initial plan was developed in 1998 as an outgrowth of the forecast in the Rogue Valley Council of Governments' long-range Regional Transportation Plan (RTP). Most of that work was done by Environ (a consulting firm) with the participation of the Department of Environmental Quality (DEQ) and the Rogue Valley Council of Governments (RVCOG). The work was done under the oversight of the Medford-Ashland Air Quality Plan Advisory Committee. The travel forecast at that time was done using a "quick response" travel modeling software package. This approach is

the simplest and least sophisticated level of analysis and one that relies heavily on national average travel survey data rather than customized data reflecting actual local conditions.

Results from the transportation plan provide basic inputs to the mobile emissions model. This includes detailed travel information on the speeds, routes and distances needed to estimate the amount of pollution contributed by motor vehicles in a given area. The transportation plan also provides population, employment and growth rate information that is used in a maintenance plan for inventorying and projecting pollution contributed by other sources of emissions: point sources, areas sources and nonroad motor vehicle sources.

The 1998 analysis of existing and projected future carbon monoxide emissions indicated the wintertime oxygenated fuel program had to be retained for the area to continue meeting the air quality standard. However, when the 1998 plan was developed, it was also understood that the computer models then in use overestimated future carbon monoxide emissions. This is because those models (Mobile 5a and Mobile 5b) overestimate the ability of oxygenated gasoline to reduce CO emissions, and underestimate how long motor vehicle pollution control equipment continues to work properly. It was also understood that new information regarding these factors would be incorporated into a new computer model of mobile emissions (Mobile 6) that was to be released by EPA in 1999. For this reason, the Advisory Committee recommended that the need for oxygenated fuel in the Medford area should be reevaluated when Mobile 6 became available.

With these considerations the original maintenance plan was adopted by the Oregon Environmental Quality Commission in August 1998 and submitted to EPA Region 10 for approval. At the Department's request, EPA assigned low priority to the processing of the Medford CO Maintenance Plan anticipating that a modified plan would be submitted shortly after the new Mobile 6 model was released. However, since then the release of Mobile 6 has been delayed repeatedly, and as of July of 2000, EPA did not expect the model to be officially available until 2001.

In order to avoid further delays, in the spring of 2000 EPA Region 10 approved the use of an interim computer model ("Mobile 5B Cold CO") for reevaluating the Medford CO Maintenance Plan. Mobile 5B Cold CO is a hybrid computer model developed as a stop gap mechanism to let cities with the worst carbon monoxide concentrations meet certain modeling and submittal requirements under the Clean Air Act. The hybrid model applies only to carbon monoxide. The model is a variation of the standard Mobile 5B—a variation that incorporates the algorithms used in the upcoming Mobile 6model. These algorithms reflect the updated understanding that future motor vehicle pollution control equipment will remain effective longer than previously thought, and that oxygenated gasoline (oxy fuel) will not lower CO emission reductions in the future as much as assumed in the past.

Therefore, in the spring of 2000, the Department began to use the Mobile 5b Cold CO model to reanalyze carbon monoxide emissions in both the 1993 baseline year and the projected future year of 2015. This new analysis was built on the results of a new Regional Transportation Plan recently completed for the Medford area. Although the new RTP was run on the same EMME 2 computer model as the previous transportation plan, it was improved to the level of a "best practices" model. The "best practices" designation indicates the revised analysis relied on

customized data collected from the local area rather than generalized data derived from national averages. This "best practices" approach produced a more sophisticated plan with different results for the population, and employment for the Medford area.

Combined, the revised Regional Transportation Plan and the updated mobile model produced dramatically different future projections for carbon monoxide emissions than had been forecasted by the 1998 analysis. More specifically, the 1998 analysis predicted carbon monoxide emissions in the year 2015 that were only slightly below the 1993 baseline or attainment year. By contrast, the revised analysis performed in 2000 showed CO emissions in 2015 to decline to 61% of the 1993 baseline emissions even with the removal of all requirements for oxygenated gasoline.

Since the area covered by the RTP is larger than the area encompassed by the Medford UGB, the RTP growth projections were scaled to the UGB on the basis of land use and zoning data. The Medford UGB was estimated to have a population of 54,644 in 1993. Based on the long-range forecast, the Medford UGB population is expected to grow to approximately 73,363 by 2015 (1.35 percent per year growth compounded annually).

In the 1998 effort, the Medford-Ashland Air Quality Plan Advisory Committee recommended the following key provisions:

- Continue the existing motor vehicle inspection program
- Continue the wintertime oxygenated fuel program
- Implement a Plant Site Emissions Limit management program (see Section 4.52.3.2.3)
- Amend existing New Source Review regulations
- Use a contingency plan that calls for implementation of additional measures to reduce CO if needed to reduce future elevated levels of the pollutant.

In the year 2000 reevaluation, the advisory committee recommended that the maintenance plan be modified three ways: 1) by removing the requirement for oxygenated fuel, 2) by adjusting the motor vehicle emissions budget to align it with vehicle emissions predicted by Mobile 5B Cold CO rather than the earlier model of Mobile 5A H, and 3) to adjust the emissions projections to accommodate the possible exemption of the four newest years of vehicles from the emissions inspection and maintenance program. In addition, the maintenance plan was revised to drop the Plan Site Emission Limit Management Program in light of the increasing margin of safety between the airshed capacity and the much lower amounts of emissions projected for the future.

4.52.0.2.4 Maintenance Plan Summary

This revision of the Medford Carbon Monoxide Maintenance Plan proposes to eliminate the wintertime oxygenated fuel program for Jackson County. Measures that will be relied upon to control carbon monoxide concentrations are as follow:

Federal New Car Program

The federal new car program has been and will continue to be the most effective CO emission reduction strategy. In contrast to other pollutants, vehicle CO emission controls have not experienced much deterioration of performance with increased age and mileage. An additional 37 percent reduction in the fleet average emission rate is expected between 1993 and 2015 as a result of federal requirements through the National Low Emission Vehicle regulations. Expected improvements in CO emission control technology include heated catalysts, which will help reduce the higher emissions from cold starts. The emission projections developed for the Medford CO Maintenance Plan do not rely on Tier II or any low sulfur fuel regulations.

Motor Vehicle Inspection Program

The basic vehicle inspection program will continue to operate. Gasoline powered and light duty diesel vehicles up to 20 years old and registered within the boundaries of the Medford-Ashland Air Quality Maintenance Area are subject to emissions testing and inspection at the time of registration renewal. This program, operating since 1986, has been effective in reducing CO pollution by promoting proper maintenance. The standards used in the program were selected on the basis of identifying vehicles that are operating outside their design limits. The standards and associated enforcement tolerances take into account a limited amount of engine wear and tear, but are not so lenient that "gross emitting" vehicles would pass an emissions test.

Woodstove Curtailment

Woodstove emission control efforts in the Rogue Valley have made significant strides in reducing particulate emissions through emission certification standards for new stoves, changeout programs to encourage removal of noncertified stoves and local ordinances to curtail burning during stagnant weather periods. The City of Medford revised its woodstove curtailment ordinance to align it with suggestions made by the Advisory Committee to improve overall effectiveness in reducing particulate emissions. All these efforts contribute to a decline of 20 percent in CO emissions from residential wood heating from 1993 to 2015.

CO Emissions Budgets

Transportation conformity regulations, required by the 1990 Federal Clean Air Act Amendments, provide for the creation/identification of motor vehicle emissions budgets in the State Implementation Plan (SIP). Emissions budgets establish a cap on emissions that may not be exceeded by predicted motor vehicle emissions. In the Medford area, RVCOG forecasts motor vehicle emissions as part of periodically updating the long-range, regional transportation plan (RTP) and the Transportation Improvement Program (TIP). RVCOG's emission forecast must be equal to or less than the SIP emissions budget(s).

Contingency Plan Elements

The maintenance plan must contain contingency measures that would be implemented either to prevent or correct a violation of the CO standard after the area has been redesignated to attainment. The Clean Air Act requires that measures in the original attainment plan be reinstated if a violation occurs. Under the contingency plan, adopted by the Advisory Committee, the DEQ would convene a planning group if the validated second highest (within one calendar year) 8-hour CO concentration equals or exceeds 8.1 ppm (90 percent of the 8-hour CO standard). A range of actions would be considered for implementation, each one designed to preserve air quality. However, if a violation of the 8-hour CO standard were to occur, control measures that would be restored include the requirement for oxygenated fuel, and requirements for Lowest Achievable Emission Rate (LAER) technology plus offsets for major new and modified industrial sources.

4.52.1 INTRODUCTION

4.52.1.1 Purpose of Redesignation Request and Maintenance Plan Document

This is a request for the Environmental Protection Agency to redesignate the Medford area to attainment for the pollutant carbon monoxide, and a Maintenance Plan that details how the area will continue to meet the carbon monoxide air quality standards into the future. This document complies with applicable 1990 Federal Clean Air Act (FCAA) and Environmental Protection Agency (EPA) guidance and policies.

4.52.1.2 History of CO Problem in Medford Area/Design Values

The Medford portion of the Medford-Ashland AQMA was designated by the Environmental Protection Agency (EPA) as a nonattainment area for carbon monoxide (CO) March 3, 1978. Pursuant to the 1977 Clean Air Act, a CO Control Strategy was submitted on June 20, 1979 with a request for an extension beyond 1982 to show attainment of the CO standard. At that time, the design value was 13.8 ppm, based on the Brophy Building air monitoring measurements from 1981 to 1983. This design value was established through a statistical procedure prescribed by the EPA guidance that was in effect at the time. EPA approved DEQ's 1979 plan and the extension, giving the Department until December 31, 1987 to bring the Medford portion of the Medford-Ashland AQMA CO nonattainment area into compliance. An updated control strategy was submitted in 1982 with a commitment to operate a locally run motor vehicle inspection program. In 1985 DEQ submitted a revised plan with the necessary adopted regulations to run a state operated inspection program.

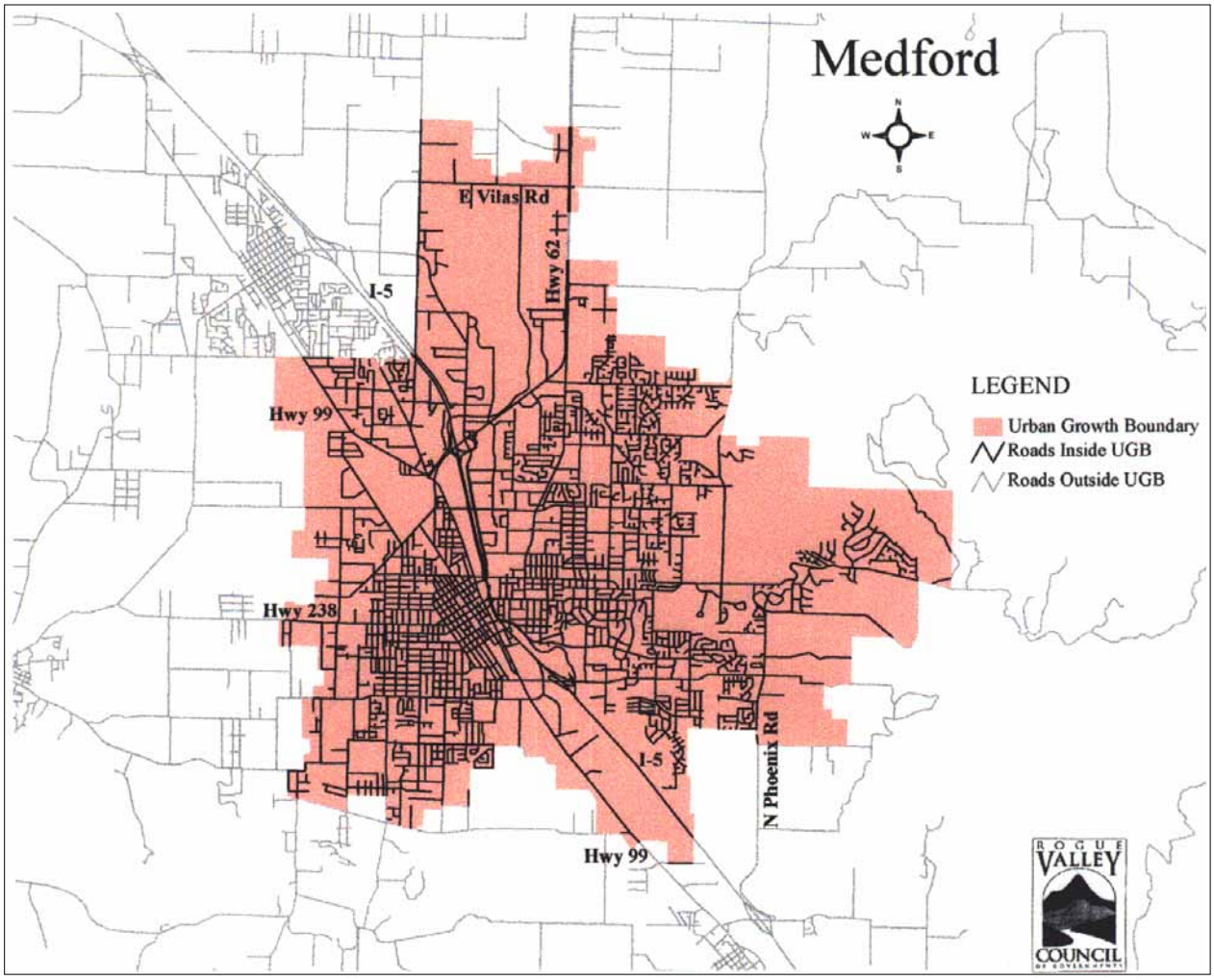
Following enactment of the 1990 Clean Air Act Amendments, the EPA classified the Medford area as a moderate CO nonattainment area based on a 1988-89 design value of 12.1 parts per million (ppm) recorded at the Rogue Valley Mall. Under the Act, moderate CO nonattainment areas were required to meet the National Ambient Air Quality Standard (NAAQS) for CO by December 31, 1995. The CO nonattainment boundary was defined as being the Medford, Oregon Urban Growth Boundary (UGB) which is the boundary used for comprehensive land use planning activities required by state law. (See Figure 4.52.1.1.) The current design value for the Medford CO nonattainment area is 7.5 ppm. As provided by EPA guidance, this design value is based on the annual second highest 8-hour CO concentration recorded during 1992 and 1993 at DEQ CO monitoring sites. The relevant design value was determined by the carbon monoxide monitoring conducted at the Medford Rogue Valley Mall.

Historically, several carbon monoxide monitoring sites in the Medford nonattainment area exceeded the 8-hour NAAQS for CO. Exceedances were recorded for approximately half of the year in the late 1970s. However, because the control measures in the State Implementation Plan (SIP) were effective at reducing CO emissions, Medford air quality has met the CO standard

since 1992. Given this evidence of compliance, the Medford area is eligible for redesignation to attainment under the terms of the 1990 Clean Air Act amendments.

4.52.1.3 National Ambient Air Quality Standards for Carbon Monoxide

Figure 4.52.1.1 Medford Carbon Monoxide Nonattainment Area



This Maintenance Plan addresses the ambient air quality standards for carbon monoxide defined in the federal Clean Air Act.

Carbon monoxide is a colorless, odorless gas that displaces oxygen in the body's red blood cells through normal respiration. Exposure to high levels of CO can slow reflexes, and cause

confusion and drowsiness. Sufficiently high doses or prolonged exposures to carbon monoxide are lethal. People with heart disease are more susceptible to develop chest pains when exposed to high levels of CO. The major human-caused source of CO is incomplete combustion of carbon-based fuels primarily through the use of gasoline-powered motor vehicles. How a motor vehicle is operated and maintained has an effect on the amount of CO emitted. For example, in stop-and-go driving conditions, CO emissions are increased. Other important sources of carbon monoxide emissions are woodstoves, open burning and industrial boilers. Most serious CO concentrations occur during winter in urban areas, when cooler temperatures promote incomplete combustion and the when CO emissions are trapped near the ground by atmospheric inversions.

EPA established the National Ambient Air Quality Standards (NAAQS) for carbon monoxide at 35 parts per million (ppm) for a 1-hour average and 9 ppm over an 8-hour average. Any CO value monitored above these levels (as defined by federal rules and guidance) is an exceedance. Two exceedances in one calendar year constitute an air quality violation. If an area violates the standard, EPA designates it as a nonattainment area. Experience demonstrates that the 8-hour average is by far the more likely of the two standards to be exceeded.

The formal statement of the national 8-hour standard contained in the Code of Federal Regulations (40 CFR part 50.8) is:

> *The national primary ambient air quality standards for carbon monoxide are: (1) 9 parts per million (10 milligrams per cubic meter) for an 8-hour average concentration not to be exceeded more than once per year...*

40 CFR part 50.8 also specifies reference methods for measuring CO concentrations in ambient air, procedures for averaging data to determine 8-hour concentrations, and requirements regarding presentation of data. In addition, EPA also issued guidance specifying that an area must demonstrate two consecutive years with no violations of the NAAQS before an area can be considered to have attained the standard.

40 CFR part 50.8 defines how ambient air quality monitoring data are to be compared to the applicable NAAQS. It states that all monitoring data should be expressed to one decimal place, and indicates that standards defined in parts per million should be compared "in terms of integers with fractional parts of 0.5 or greater rounding." This led to an interpretation by EPA that any 8-hour CO concentration of less than 9.5 ppm would be equivalent to attainment. This rounding convention is therefore used for CO monitoring data in this Maintenance Plan to demonstrate compliance with the CO NAAQS.

In general, demonstrating "attainment" requires monitoring ambient air quality using approved measuring instruments and procedures, and verifying the results with a formal quality assurance/quality control program. All monitored locations within an area must meet the standard. No monitor may exceed 9.4 ppm more than one day during either of the two most recent calendar years for an area to quality for redesignation. Air quality measurements in the Medford area satisfy this requirement as shown in Section 4.52.2 of this document.

4.52.1.4 Redesignation Criteria/Organization of Document

Section 107(d)(3)(E) and related provisions of the Clean Air Act (CAA)establish five key criteria that must be satisfied in order for a nonattainment area to be redesignated to attainment status:

- Attainment of NAAQS for CO: minimum 2 calendar years
- Full approval of the State Implementation Plan (SIP) under section 110(k)[1]
- Demonstration that air quality improvement is due to permanent and enforceable emission reductions (see section 4.52.2.4)
- Full approval of CO Maintenance Plan under section 175A
- Fulfillment of all applicable Section 110 and Part D requirements[2]

The following sections summarize these criteria and refer to additional discussion of each topic elsewhere in this document.

Attainment Verification

A nonattainment area seeking redesignation must have attained the applicable NAAQS. Attainment of the NAAQS for CO in the Medford area is discussed in Section 4.52.2, "Attainment Demonstration."

SIP Approval

EPA must have fully approved the applicable SIP for the area under Section 110(k) of the CAA. EPA approved the 1982 CO Attainment Plan, and subsequent 1985 revision, on February 13, 1987. This plan prescribed the control measures to lower carbon monoxide emissions enough for the area to meet the air quality standards.

The Jackson County Board of Commissioners adopted the CO Attainment Plan for the Medford-Ashland Air Quality Maintenance Area (AQMA) in August of 1982. This attainment plan identified the need for a motor vehicle inspection/maintenance (I/M) program and included a commitment to seek authorization from the Oregon Legislature to implement a biennial county-wide I/M program beginning January 1984. The Environmental Quality Commission adopted the attainment plan as part of the SIP in October 1982.

In February 1983 EPA proposed to approve the Medford CO plan upon county or state adoption of a specific I/M program, and the 1983 Oregon Legislature responded by granting Jackson County the necessary authorization.. The Jackson County Board of Commissioners adopted an

[1] Section 110(k) requires that the State satisfy all FCAA requirements applying to a specific nonattainment area in order to be redesignated.

[2] Section 110 contains general provisions needed in a SIP.

I/M ordinance in January 1984 subject to voter ratification. In March 1984 the Jackson County electorate voted not to establish a vehicle inspection/maintenance program..

Also in March 1984, EPA proposed to disapprove the Medford CO Attainment Plan and proposed a construction moratorium on major stationary sources of CO because the plan did not provide control measures adequate to achieve the air quality standard. In September 1984 EPA finalized the plan's disapproval, specifically because an inspection/maintenance program had not been implemented. This action also implemented the construction moratorium on major new sources of carbon monoxide. At the same time, EPA applied federal funding sanctions on transportation and sewage treatment projects Jackson County that went in effect in May 1985.

In June 1985, the Oregon Legislature established a state operated inspection/maintenance program for the Medford-Ashland AQMA and EPA rescinded the sanctions on Jackson County the same month.

The Oregon Environmental Quality Commission amended the Attainment Plan to include the state-run inspection/maintenance program on September 27, 1985, and EPA approved the amended plan February 13, 1987.

Amendments to the Clean Air Act enacted in 1990 required carbon monoxide nonattainment areas to submit revisions to the State Implementation Plan to provide the following: 1) an Emission Inventory for 1990; 2) a wintertime oxygenated fuel program; 3) changes to inspection/maintenance programs; 4) regulations for Transportation Conformity measures; 5) New Source Review Rules for major sources; and 6) provisions for a Contingency Plan.

These requirements were addressed as listed: 1) The draft 1990 Emission Inventory was submitted to EPA Region 10 in November 1992, revised in response to EPA comments and is expected to be in conjunction with redesignation to attainment. 2) Rules for the oxygenated fuel program were submitted in October 1992. 3) DEQ submitted changes to the vehicle inspection/maintenance program in 1993 and 1994, which were approved by EPA in 1994. 4) DEQ submitted transportation conformity rules to EPA in 1995. 5) DEQ submitted New Source Review Rule revisions in 1992. 6)The carbon monoxide Contingency Plan was submitted in November 1993. These SIP revisions and compliance with Section 110(k) of the CAA are discussed in Section 4.52.4.1, "SIP Requirements/Nonattainment Area Requirements."

Permanent and Enforceable Improvements in Air Quality

The improvement in air quality must be due to permanent and enforceable reductions in emissions resulting from the implementation of the applicable SIP, federal air pollution control regulations, and other permanent and enforceable reductions. The permanent and enforceable nature of the reductions in emissions, which are responsible for improvements in ambient CO concentrations in the Medford area are discussed in Section 4.52.2.4.

Maintenance Plan Elements

EPA must have fully approved a maintenance plan meeting the requirements of Section 175A of the Clean Air Act for an area to be redesignated to attainment. Concurrent approval of the maintenance plan and redesignation request is expected. There are five essential parts to a Maintenance Plan: an attainment inventory, a maintenance demonstration, a commitment to continued air quality monitoring, a commitment to continued verification of attainment and a contingency plan. These elements are outlined in Table 4.52.1.1 together with the remaining redesignation requirements.

Table 4.52.1.1 Summary of Redesignation Requirements

Required Element	Section of Plan	
Attainment Verification	Section 4.52.2:	ATTAINMENT DEMONSTRATION
SIP Approval	Section 4.52.4:	ADMINISTRATIVE REQUIREMENTS
Permanent and Enforceable Improvements in Air Quality	Section 4.52.2:	ATTAINMENT DEMONSTRATION
Nonattainment Area Requirements	Section 4.52.4:	ADMINISTRATIVE REQUIREMENTS

Maintenance Plan Elements		
Attainment Inventory	Section 4.52.3:	MAINTENANCE PLAN
Maintenance Demonstration	Section 4.52.3:	MAINTENANCE PLAN
Monitoring Network	Section 4.52.4:	ADMINISTRATIVE REQUIREMENTS
Verification of Continued Attainment	Section 4.52.4:	ADMINISTRATIVE REQUIREMENTS
Contingency Plan	Section 4.52.3:	MAINTENANCE PLAN

SIP Section 110 and Part D Requirements

A state must have met all requirements applicable to the nonattainment area under Section 110 and Part D of the Clean Air Act. Compliance with Section 110 and Part D of the Act is discussed in Section 4.52.4.1, "SIP Requirements/Nonattainment Area Requirements."

4.52.2 ATTAINMENT DEMONSTRATION

4.52.2.1 Ambient Air Quality Monitoring Data

The Medford area has two carbon monoxide monitoring sites (see Appendix[1] D3-2). One site is located at the Brophy Building in downtown Medford at 10 N. Central. The Brophy Building monitoring site is operated 12 months a year. The DEQ has monitored carbon monoxide air quality at this location since 1977. The second air quality monitor is located at the Rogue Valley Mall at 1502 N. Riverside. This site is operated seasonally from October through March, and replaced an the earlier monitoring location at Crater Music, at 1414 N Riverside, where sampling was conducted from 1984 through 1987.

During the wintertime CO monitoring season, monitors continuously test air quality and derive 1-hour and 8-hour averages electronically using data loggers and integrators. Once the results are reviewed and confirmed through formal quality assurance procedures, they are entered into the Aerometric Information Retrieval System (AIRS) which makes them accessible to EPA. These test results provide the basis for demonstrating that the carbon monoxide air quality standard has been achieved.

4.52.2.2 Attainment Years and Concentrations

Air quality in downtown Medford has complied with the NAAQS for CO for ten consecutive years. Air quality at the Rogue Valley Mall site has complied with the standard for eight consecutive years.

Below are the last violations recorded at each monitoring site:

Year	8-Hr 2nd High	Location
1989	11.0 ppm	Brophy Building
1991	10.5 ppm	Rogue Valley Mall
1987	9.5 ppm	Crater Music

The last wintertime exceedance of the NAAQS for CO in downtown Medford occurred on 12/19/89 (11.0 ppm) at the Brophy Building. The last exceedance at the Rogue Valley Mall monitor occurred on 01/05/91 (10.5 ppm). The five highest 8-hour CO concentrations for the last five year period from 1995 to 1999 are shown in Table 4.52.2.1.

[1]Note: All appendix references in this Maintenance Plan refer to Volume 3 of the Oregon State Implementation Plan, unless otherwise noted.

Table 4.52.2.1 Medford Carbon Monoxide: Five Highest Values from 1995 to 1999 (Non-Overlapping 8-Hour Averages in Parts Per Million)

Monitoring Site Concentrations	Date
Brophy Building	
10.6 ppm	06/19/99
9.4 ppm	06/20/98
8.6 ppm	06/15/96
7.3 ppm	06/14/97
6.4 ppm	01/12/96
Rogue Valley Mall	
6.8 ppm	01/05/99
6.7 ppm	11/01/96
6.6 ppm	01/03/96
6.4 ppm	12/27/99
6.3 ppm	01/06/99

For the five years reviewed, only a single sample at one of the monitors exceeded the standard. The two sites differ in the time of year when the highest values are obtained. The Rogue Valley Mall monitor typically records its highest concentrations during winter—the CO season. The Brophy monitor, on the other hand, sometimes records its highest concentrations during June, when an annual classic car rally is held in Medford. These data reveal the effectiveness of the federal emission control standards in reducing CO levels, but also point out the need to make sure the classic car rally does not cause future violations of the standard.

To that end, the Department and the city of Medford negotiated an agreement to ensure that all reasonable steps are taken to prevent the car rally from contributing to air quality violations. The agreement (outlined in Appendix D3-11) calls for changing the traffic signal pattern to flashing yellow during the car rally to encourage smooth traffic flow. The city and the Department will monitor and evaluate the effectiveness of this method to control high CO concentrations.

The long-term concentration trends for both monitoring sites are declining as shown in Figure 4.52.2.1 and Figure 4.52.2.2.

Figure 4.52.2.1 Medford 8-Hour CO Trend at Brophy Building

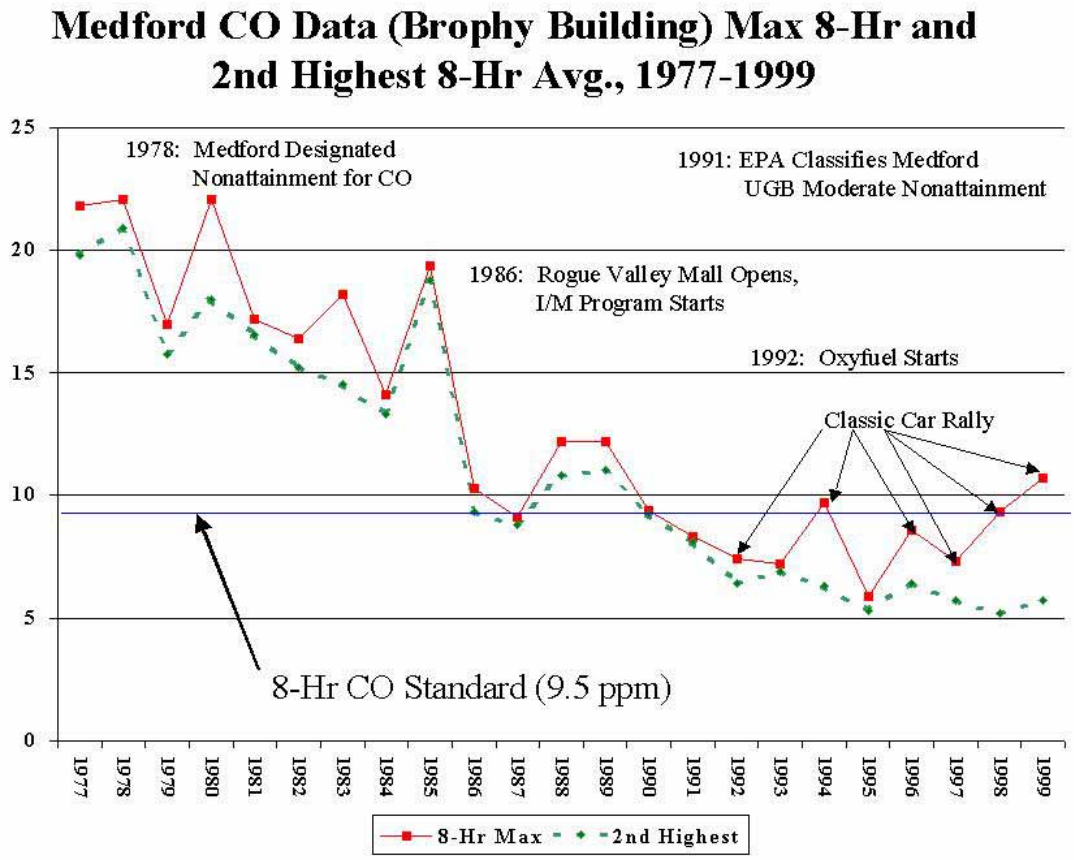
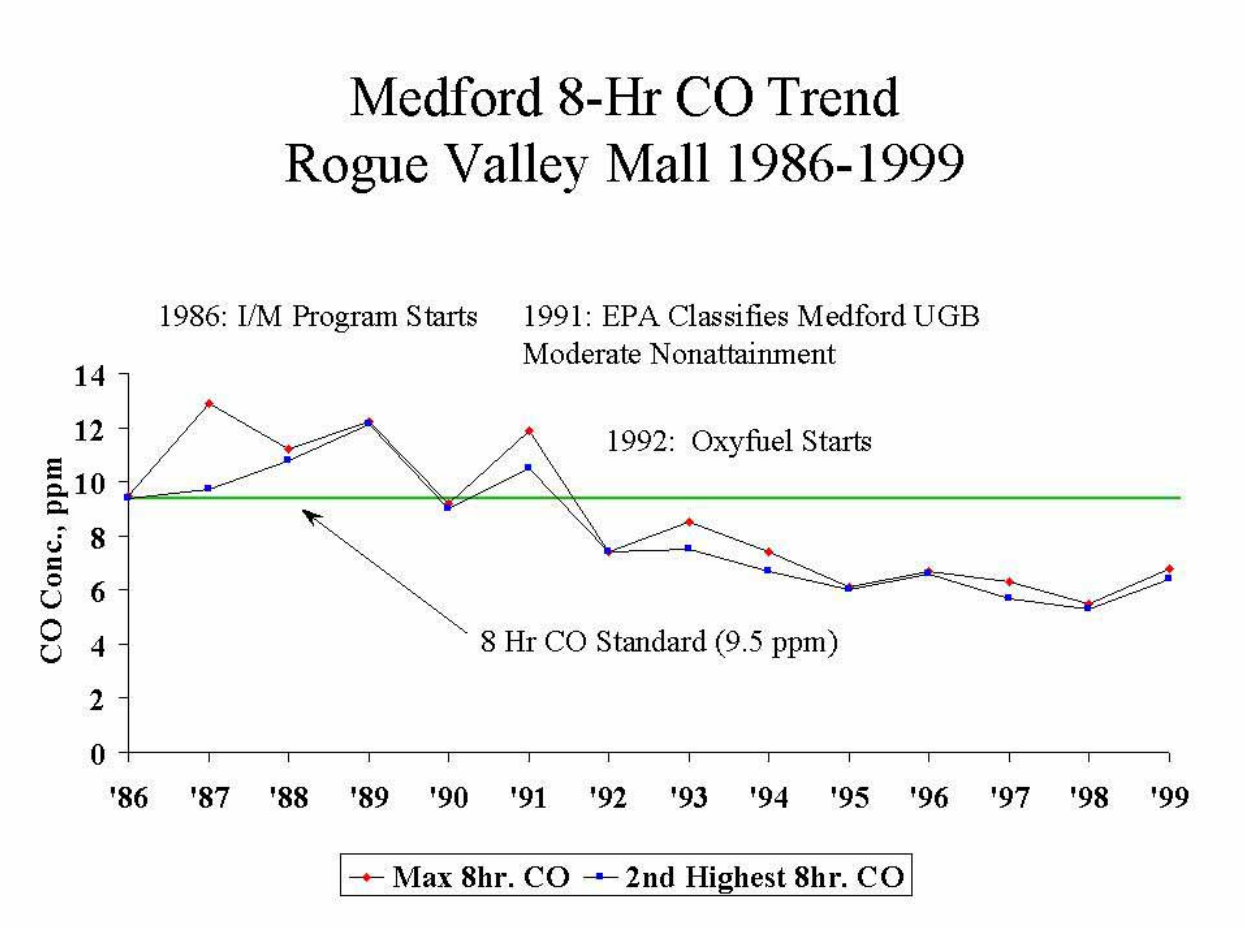


Figure 4.52.2.2 Medford 8-Hour CO Trend at Rogue Valley Mall



4.52.2.3 Summary of Ambient Air Quality Data

Table 4.52.2.2 below summarizes the second highest 8-hour CO concentrations that have been recorded since 1977 at DEQ's current and historic CO monitoring locations.

Table 4.52.2.2 Second High 8-Hour Carbon Monoxide Concentrations (1977-1999) (in Parts Per Million)

Year	Brophy Building	Crater Music	Rogue Valley Mall
1977	17.2		
1978	19.2		
1979	13.7		
1980	16.2		
1981	14.4		
1982	13.2		
1983	12.6		
1984	11.5	12.4	
1985	16.3	13.3	
1986	9.3	12.6	
1987	8.8	9.5	9.7
1988	10.8		10.8
1989	11.0		12.1
1990	8.2		9.0
1991	8.1		10.5
1992	6.4		7.4
1993	6.9		7.5
1994	6.3		6.7
1995	5.3		6.0
1996	6.4		6.6
1997	5.7		5.7
1998	5.2		5.3
1999	5.7		6.4

4.52.2.4 Permanent and Enforceable Improvement in Air Quality

For an area to be redesignated to attainment, EPA requires that air quality improvements must be reasonably attributable to emission reductions that are both permanent and enforceable. Economic downturns and unusual meteorology are factors cited that might temporarily lower CO concentrations and produce an "artificial" attainment record. Therefore, EPA asks that a redesignation request provide evidence demonstrating that an area did not achieve the air quality standards simply as a result of slowed economic activity or favorable weather conditions. This section addresses these issues.

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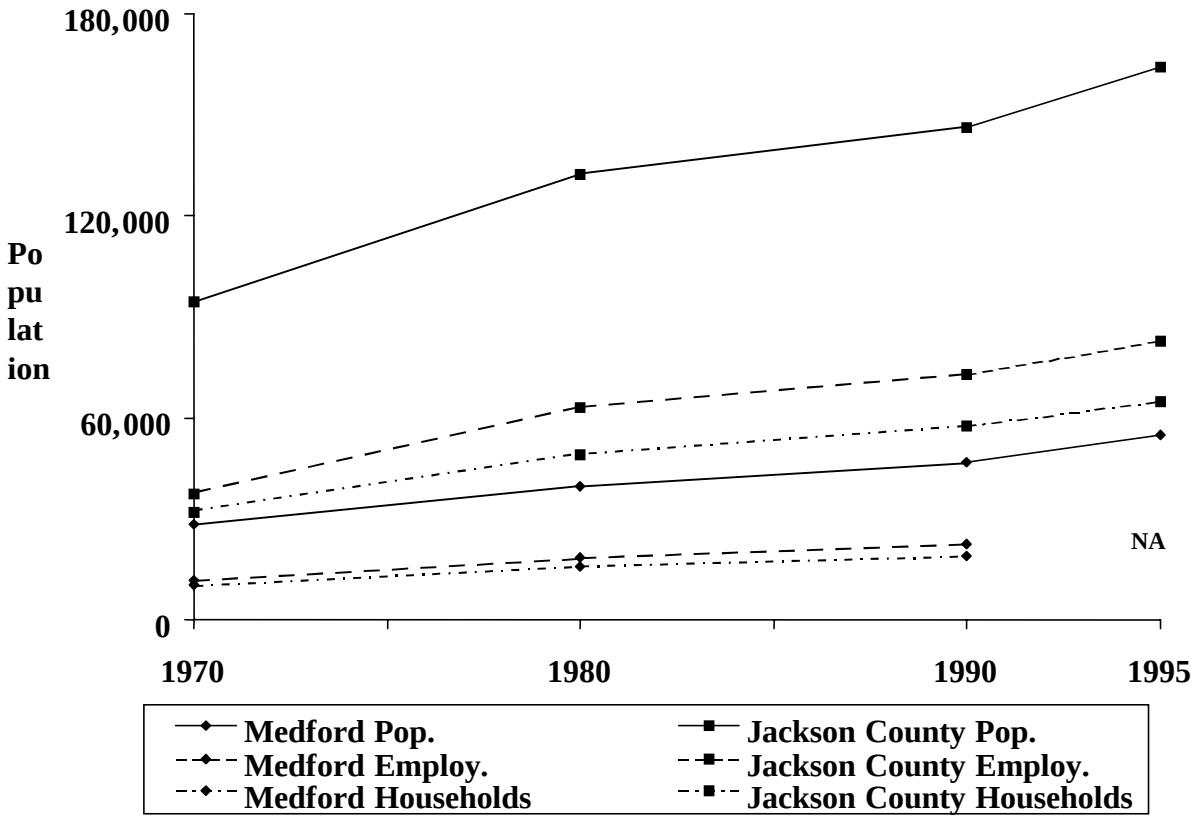
The Medford area reached attainment in 1992 when there was rapid growth occurring throughout the Rogue Valley. Attainment for CO was achieved despite this growth; therefore, the improvement in Medford's CO air quality has not been due to a downturn in economic conditions.

Meteorological Effects

Figure 4.52.2.3 Population, Employment, Housing in Medford and Jackson County



Source: Population: US Bureau of Census (1970, 1980, 1990); Portland State University estimate (July 1, 1995); Employment: US Bureau of Labor Statistics (Medford), Oregon Employment Department (Jackson County) Housing: US Bureau of Census

Peak carbon monoxide concentrations generally occur together with low wind speed. This section presents Medford wind speeds during the six month periods from October through March for the years 1985 to1996. Review of this data indicates that lower CO concentrations during recent years do not seem to be caused by atypical weather. The procedures and data for this meteorological analysis are summarized below.

Hourly wind speeds recorded at the Medford airport were collected for this analysis and are listed in Table 4.52.2.3 and Figure 4.52.2.4.

Table 4.52.2.3 Hours of Low Winds -- October through March

Recorded at Medford Airport

Year	Wind Speeds						
	0 - 4.0 MPH (Hrs.)	Rank - Most to Least Stagnant	4.1 - 5.0 MPH (Hrs.)	5.1 - 6.0 MPH (Hrs.)	Total Hours 0 - 6 MPH	Rank - Most to Least Stagnant	6.1+ MPH (Hrs.)
1985-86	2,264	7	773	520	3,557	10	811
1986-87	2,390	3	772	501	3,663	5	705
1987-88	2,390	4	801	443	3,634	6	734
1988-89	2,229	9	862	471	3,562	9	806
1989-90	2,556	1	806	482	3,844	1	524
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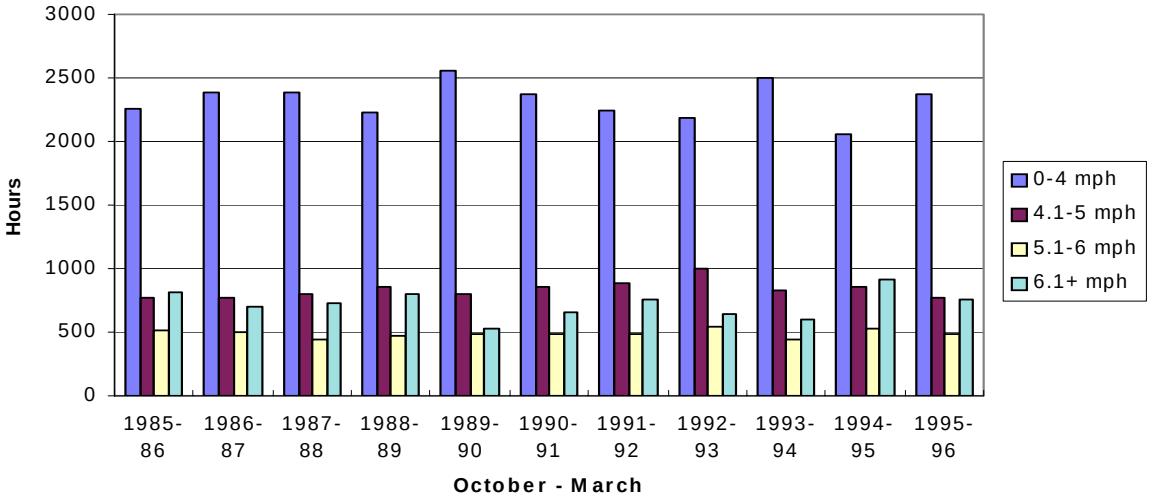
Wind variation from year to year is small and the trend toward air quality improvement is relatively stable. For the period covered here, the maximum number of low wind hours occurred in 1989-90 (2,556 hours) and the lowest number of low wind speed hours occurred in 1994-95 (2,057 hours). The data for only two of the eleven years fall outside one standard deviation of the entire eleven years reported. Most winters reported since 1985-86 had an amount of stagnation similar to that nonattainment year.

Figure 4.52.2.4 Wind Speed During Winter Season



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All these measures helped counteract the effects of increased activity of carbon monoxide sources in the Medford area and helped bring the area into attainment. A wintertime oxygenated fuel program was implemented in Medford during 1992, as required by the 1990 Clean Air Act amendments. The air quality data show that compliance with the National Ambient Air Quality

Standard was achieved in the Medford CO nonattainment area after the oxygenated fuel program began.

4.52.2.5 Demonstration that DEQ's CO Monitoring Sites Represent Worst Case Concentrations

Evidence presented in this section demonstrate that DEQ monitors CO at locations representing worst case or peak concentrations. Specific elements include:

- Wide ranging field sampling conducted by the DEQ in comprehensive efforts to identify areas with high peak CO levels.

- Screening techniques used to identify intersections with potential for high CO concentrations.

- Available historical field studies indicate that the DEQ CO site network tends to record higher CO concentrations than all of the screened intersections.

4.52.2.5.1 DEQ Has Conducted Comprehensive CO Field Studies

The DEQ made vigorous efforts to identify areas with the highest peak CO concentrations. It conducted studies that entailed monitoring at more than 15 different locations during the winters of 1979/80, 1983/84, 1985/86, and 1995/96. Based on this work DEQ concluded that the Brophy monitor best represents peak CO levels in Central Medford and provides historical trends for the area of the city that formerly had the highest CO levels. The studies also confirmed that North Medford remains the most critical CO problem area, especially after the opening of the Rogue Valley Mall. Although mean CO levels were higher at the Crater Music site, peak CO concentrations have been highest at the Rogue Valley Mall monitor. Peak CO concentrations are more important for comparison to the health standards and so the continuous gas monitor was established at the Rogue Valley Mall site in 1987. Saturation monitoring was also done in response to traffic signalization improvements to ensure that peak concentrations were still being recorded at the continuous gas monitoring locations. This work confirmed that the existing network is appropriately sited. This large body of work is evidence that the DEQ CO site network has been continually reevaluated and can reasonably be considered to represent worst case CO concentrations.

4.52.2.5.2 Screening Techniques Used To Identify Intersections With Potential For High CO Concentrations

A screening analysis was used to identify the three highest intersections by volume and the three highest intersections by congestion. The specific algorithm used as a measure of congestion was "V * V/C," or volume weighted by volume divided by capacity. The volume and capacity numbers were derived from Rogue Valley Council of Government's transportation model outputs for the former base year of 1990. The base year was subsequently updated to 1995

during 1999 and 2000. This is screening technique commonly used by CO planning organizations.

A value of V*V/C was determined for each intersection leg, and those values were totaled for the intersection node. Table 4.52.2.3 below lists the six intersections with the highest screening values in rank order.

Table 4.52.2.4 Six Highest Intersections Screened by Volume and Congestion Using RVCOG's 1990 Base Year[2]

Intersection	Screening Value by Volume
1. Crater Lake Hwy & Hwy 99 (Big Y)	45,088
2. Biddle Rd. & McAndrews	41,921
3. Riverside & McAndrews	38,497

Intersection	Screening Value by V*V/C
1. Crater Lake Hwy & Hwy 99 (Big Y)	34,751
2. Biddle Rd. & McAndrews	33,246
3. Riverside & McAndrews	32,130

(2. Figures in this table are based on RVCOG's 1998 transportation modeling.)

Each screening method resulted in the identification of the same intersections. In Section 4.52.2.5.3 below, analysis of special sampling study results is presented demonstrating that DEQ's network of CO sites experience higher peak concentrations than each of the above screened intersections. This provides further indication that the Department's monitoring network peak values represent "worst case" CO concentrations.

4.52.2.5.3 Available Field Studies Indicate DEQ's CO Monitoring Network Records CO Concentrations Higher Than Screened Intersections.

Evidence referred to in this section substantiates that DEQ's two CO monitors generally record concentrations higher than the two, non-monitored intersection locations with the highest screening values. Details underlying the conclusions discussed in this section are presented in Appendix D3-3.

Twelve sites were monitored for CO concentrations during the winter of 1995-1996. Sampling began December 19, 1995, and concluded February 1, 1996. A pair of bag samplers were co-located at the Rogue Valley Mall (Riverside and McAndrews) permanent monitoring site for quality assurance purposes. One of the screened intersections (Biddle Rd. and McAndrews Rd.) had a maximum 8-hour CO concentration of 5.1 parts per million (ppm) on January 3, 1996, which was the highest sampling day for this site. However, for this date and the same block of hours, the Brophy monitor and the Rogue Valley Mall monitor recorded maximum 8-hour CO concentrations of 6.0 ppm and 6.2 ppm, respectively. At the Rogue Valley Mall permanent

monitoring station, the annual second highest 8-hour maximum CO concentration (6.6 ppm) was recorded on January 3, 1996.

The Big Y intersection was not sampled in the 1995-1996 study, but was examined by comparing its 1993 CO emissions to 1993 CO emissions at the Riverside & McAndrews intersection in a proportional analysis, similar to the rollforward analysis (in Section 4.52.3.2.4). The proportional analysis resulted in an estimated 1993, 8-hour CO concentration of 6.3 parts per million (ppm) at the Big Y intersection, which was lower than the annual second highest 8-hour CO concentration (7.5 ppm) for 1993 recorded at the Rogue Valley Mall site.

Although the sampling period was characterized by milder and wetter conditions than normal, the sampling results supported a continuation of the existing CO monitoring network siting as representing maximum CO exposures.

4.52.2.6 Conclusions Regarding Demonstration of Attainment

This section 4.52.2 refers to monitoring data that shows the Medford area now attains the CO NAAQS, and it demonstrates that such data can be reasonably characterized as representing "worst case" peak concentrations. Economic data was cited to show attainment has not been attributable to a "downturn" in the Medford area economy. Meteorological data evaluation was presented to show recent year compliance was not attributable to especially favorable meteorology. Intersection screening analysis was used to identify intersections with high potential for peak CO concentrations. The Department's bag study of 1995-1996 was used together with some actual traffic volume data to demonstrate that the DEQ network of CO sites captures peak concentrations that are higher than the two screened intersections that are not monitored.

DEQ conducted field studies that sampled concentrations at more than 15 locations to identify locations with peak CO levels. New CO sites have been added when evidence indicated other locations were recording high peak values. Meteorological analysis was conducted to show that the meteorological conditions during the bagger studies included conditions commonly associated with high CO periods. This provides further evidence that the bag sampling studies effectively identified areas of maximum CO exposure. The comprehensive special studies, and the meteorological analysis demonstrate that the DEQ CO monitoring network samples worst case CO concentrations and that the data gathered by the monitoring network legitimately indicates the area currently attains the air quality standard.

4.52.2 ATTAINMENT DEMONSTRATION

4.52.2.1 Ambient Air Quality Monitoring Data

The Medford area has two carbon monoxide monitoring sites (see Appendix[1] D3-2). One site is located at the Brophy Building in downtown Medford at 10 N. Central. The Brophy Building monitoring site is operated 12 months a year. The DEQ has monitored carbon monoxide air quality at this location since 1977. The second air quality monitor is located at the Rogue Valley Mall at 1502 N. Riverside. This site is operated seasonally from October through March, and replaced an the earlier monitoring location at Crater Music, at 1414 N Riverside, where sampling was conducted from 1984 through 1987.

During the wintertime CO monitoring season, monitors continuously test air quality and derive 1-hour and 8-hour averages electronically using data loggers and integrators. Once the results are reviewed and confirmed through formal quality assurance procedures, they are entered into the Aerometric Information Retrieval System (AIRS) which makes them accessible to EPA. These test results provide the basis for demonstrating that the carbon monoxide air quality standard has been achieved.

4.52.2.2 Attainment Years and Concentrations

Air quality in downtown Medford has complied with the NAAQS for CO for ten consecutive years. Air quality at the Rogue Valley Mall site has complied with the standard for eight consecutive years.

Below are the last violations recorded at each monitoring site:

Year	8-Hr 2nd High	Location
1989	11.0 ppm	Brophy Building
1991	10.5 ppm	Rogue Valley Mall
1987	9.5 ppm	Crater Music

The last wintertime exceedance of the NAAQS for CO in downtown Medford occurred on 12/19/89 (11.0 ppm) at the Brophy Building. The last exceedance at the Rogue Valley Mall monitor occurred on 01/05/91 (10.5 ppm). The five highest 8-hour CO concentrations for the last five year period from 1995 to 1999 are shown in Table 4.52.2.1.

[1]Note: All appendix references in this Maintenance Plan refer to Volume 3 of the Oregon State Implementation Plan, unless otherwise noted.

Table 4.52.2.1 Medford Carbon Monoxide: Five Highest Values from 1995 to 1999 (Non-Overlapping 8-Hour Averages in Parts Per Million)

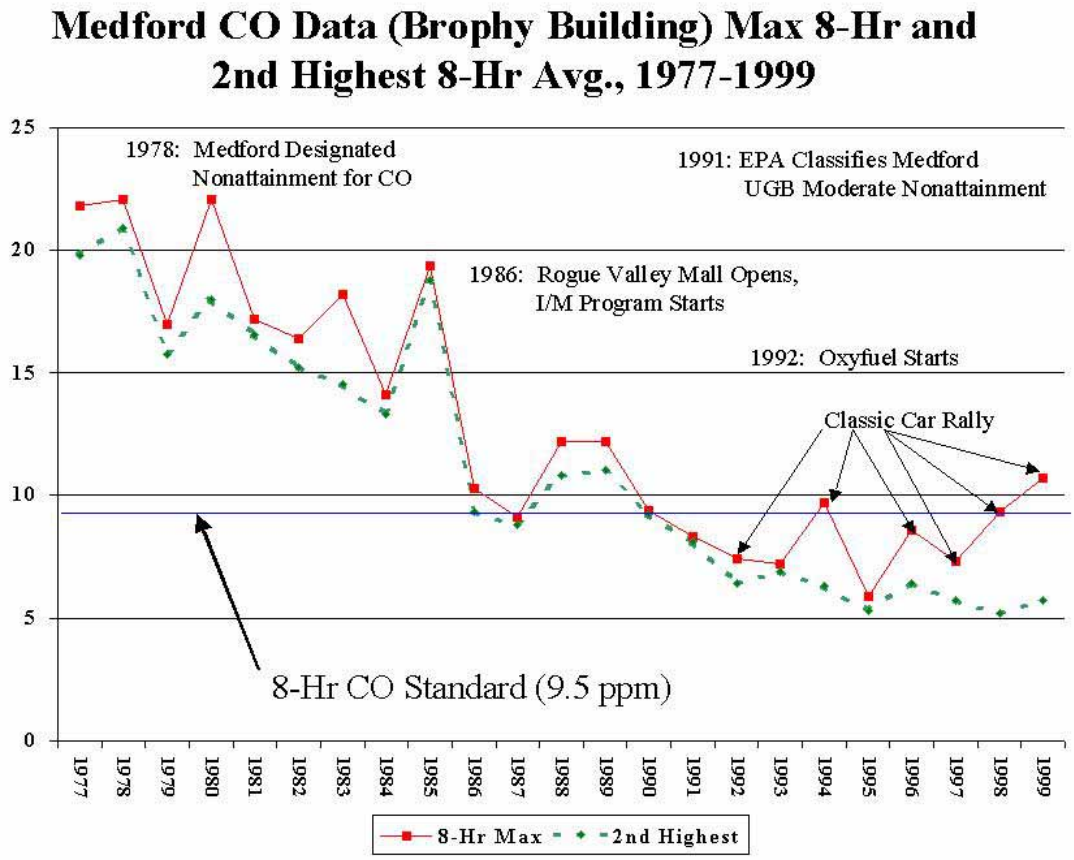
Monitoring Site Concentrations	Date
Brophy Building	
10.6 ppm	06/19/99
9.4 ppm	06/20/98
8.6 ppm	06/15/96
7.3 ppm	06/14/97
6.4 ppm	01/12/96
Rogue Valley Mall	
6.8 ppm	01/05/99
6.7 ppm	11/01/96
6.6 ppm	01/03/96
6.4 ppm	12/27/99
6.3 ppm	01/06/99

For the five years reviewed, only a single sample at one of the monitors exceeded the standard. The two sites differ in the time of year when the highest values are obtained. The Rogue Valley Mall monitor typically records its highest concentrations during winter—the CO season. The Brophy monitor, on the other hand, sometimes records its highest concentrations during June, when an annual classic car rally is held in Medford. These data reveal the effectiveness of the federal emission control standards in reducing CO levels, but also point out the need to make sure the classic car rally does not cause future violations of the standard.

To that end, the Department and the city of Medford negotiated an agreement to ensure that all reasonable steps are taken to prevent the car rally from contributing to air quality violations. The agreement (outlined in Appendix D3-11) calls for changing the traffic signal pattern to flashing yellow during the car rally to encourage smooth traffic flow. The city and the Department will monitor and evaluate the effectiveness of this method to control high CO concentrations.

The long-term concentration trends for both monitoring sites are declining as shown in Figure 4.52.2.1 and Figure 4.52.2.2.

Figure 4.52.2.1 Medford 8-Hour CO Trend at Brophy Building



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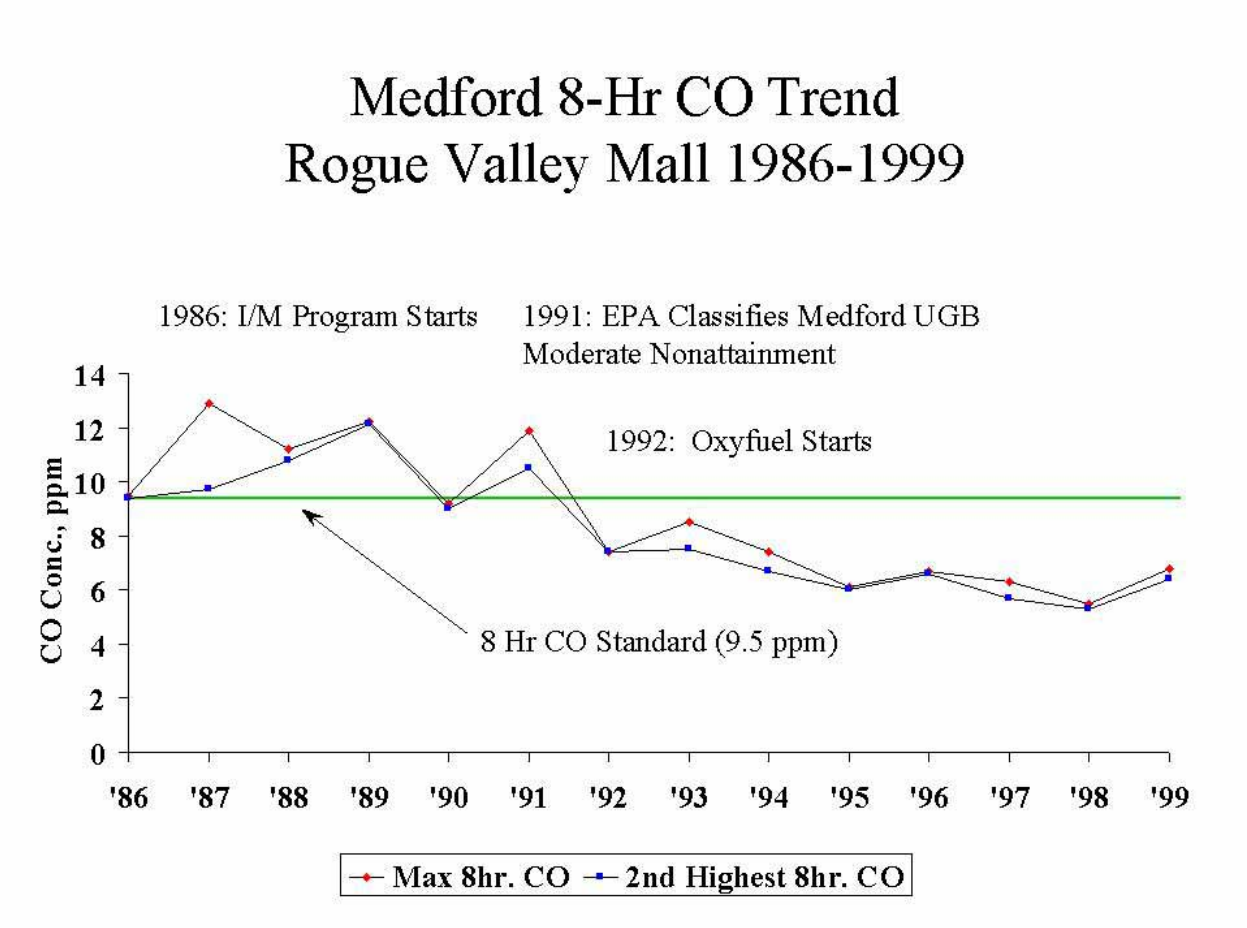

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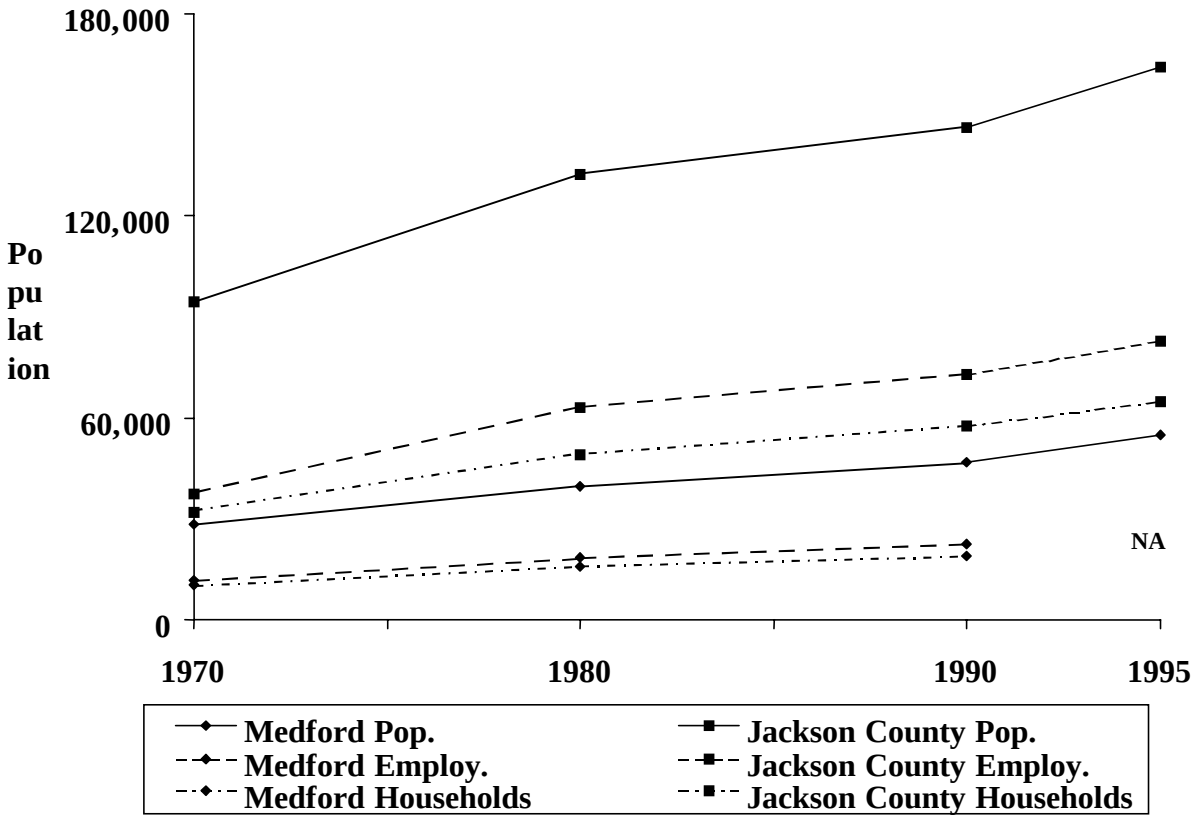

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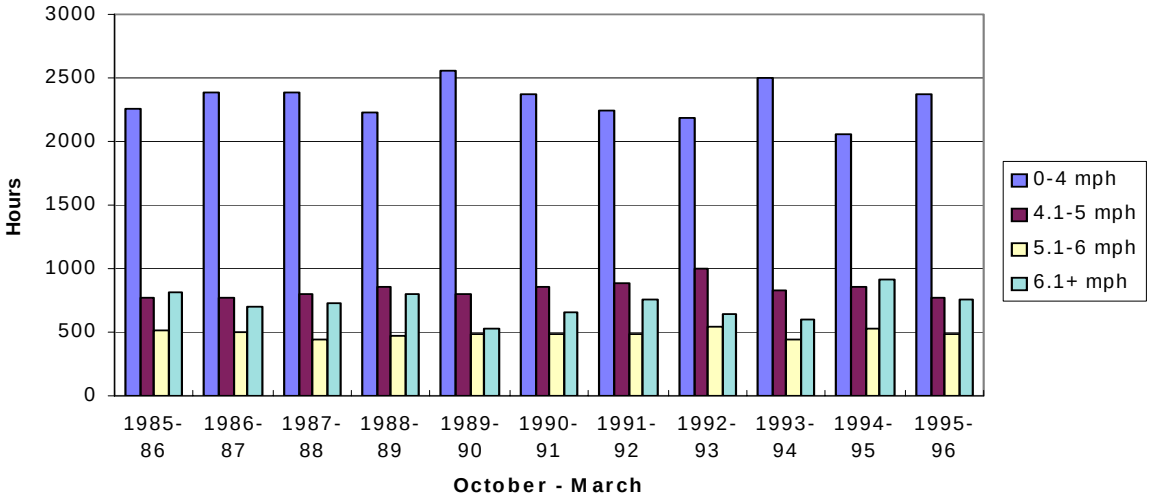

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A screening analysis was used to identify the three highest intersections by volume and the three highest intersections by congestion. The specific algorithm used as a measure of congestion was "V * V/C," or volume weighted by volume divided by capacity. The volume and capacity numbers were derived from Rogue Valley Council of Government's transportation model outputs for the former base year of 1990. The base year was subsequently updated to 1995

during 1999 and 2000. This is screening technique commonly used by CO planning organizations.

A value of V*V/C was determined for each intersection leg, and those values were totaled for the intersection node. Table 4.52.2.3 below lists the six intersections with the highest screening values in rank order.

Table 4.52.2.4 Six Highest Intersections Screened by Volume and Congestion Using RVCOG's 1990 Base Year[2]

Intersection	Screening Value by Volume
1. Crater Lake Hwy & Hwy 99 (Big Y)	45,088
2. Biddle Rd. & McAndrews	41,921
3. Riverside & McAndrews	38,497

Intersection	Screening Value by V*V/C
1. Crater Lake Hwy & Hwy 99 (Big Y)	34,751
2. Biddle Rd. & McAndrews	33,246
3. Riverside & McAndrews	32,130

(2. Figures in this table are based on RVCOG's 1998 transportation modeling.)

Each screening method resulted in the identification of the same intersections. In Section 4.52.2.5.3 below, analysis of special sampling study results is presented demonstrating that DEQ's network of CO sites experience higher peak concentrations than each of the above screened intersections. This provides further indication that the Department's monitoring network peak values represent "worst case" CO concentrations.

4.52.2.5.3 Available Field Studies Indicate DEQ's CO Monitoring Network Records CO Concentrations Higher Than Screened Intersections.

Evidence referred to in this section substantiates that DEQ's two CO monitors generally record concentrations higher than the two, non-monitored intersection locations with the highest screening values. Details underlying the conclusions discussed in this section are presented in Appendix D3-3.

Twelve sites were monitored for CO concentrations during the winter of 1995-1996. Sampling began December 19, 1995, and concluded February 1, 1996. A pair of bag samplers were co-located at the Rogue Valley Mall (Riverside and McAndrews) permanent monitoring site for quality assurance purposes. One of the screened intersections (Biddle Rd. and McAndrews Rd.) had a maximum 8-hour CO concentration of 5.1 parts per million (ppm) on January 3, 1996, which was the highest sampling day for this site. However, for this date and the same block of hours, the Brophy monitor and the Rogue Valley Mall monitor recorded maximum 8-hour CO concentrations of 6.0 ppm and 6.2 ppm, respectively. At the Rogue Valley Mall permanent

monitoring station, the annual second highest 8-hour maximum CO concentration (6.6 ppm) was recorded on January 3, 1996.

The Big Y intersection was not sampled in the 1995-1996 study, but was examined by comparing its 1993 CO emissions to 1993 CO emissions at the Riverside & McAndrews intersection in a proportional analysis, similar to the rollforward analysis (in Section 4.52.3.2.4). The proportional analysis resulted in an estimated 1993, 8-hour CO concentration of 6.3 parts per million (ppm) at the Big Y intersection, which was lower than the annual second highest 8-hour CO concentration (7.5 ppm) for 1993 recorded at the Rogue Valley Mall site.

Although the sampling period was characterized by milder and wetter conditions than normal, the sampling results supported a continuation of the existing CO monitoring network siting as representing maximum CO exposures.

4.52.2.6 Conclusions Regarding Demonstration of Attainment

This section 4.52.2 refers to monitoring data that shows the Medford area now attains the CO NAAQS, and it demonstrates that such data can be reasonably characterized as representing "worst case" peak concentrations. Economic data was cited to show attainment has not been attributable to a "downturn" in the Medford area economy. Meteorological data evaluation was presented to show recent year compliance was not attributable to especially favorable meteorology. Intersection screening analysis was used to identify intersections with high potential for peak CO concentrations. The Department's bag study of 1995-1996 was used together with some actual traffic volume data to demonstrate that the DEQ network of CO sites captures peak concentrations that are higher than the two screened intersections that are not monitored.

DEQ conducted field studies that sampled concentrations at more than 15 locations to identify locations with peak CO levels. New CO sites have been added when evidence indicated other locations were recording high peak values. Meteorological analysis was conducted to show that the meteorological conditions during the bagger studies included conditions commonly associated with high CO periods. This provides further evidence that the bag sampling studies effectively identified areas of maximum CO exposure. The comprehensive special studies, and the meteorological analysis demonstrate that the DEQ CO monitoring network samples worst case CO concentrations and that the data gathered by the monitoring network legitimately indicates the area currently attains the air quality standard.

4.52.3 MAINTENANCE PLAN

A Redesignation Request/Maintenance Plan under the federal Clean Air Act Section 175A(a), must demonstrate that the air quality standard will be maintained for at least 10 years after redesignation. This maintenance demonstration through the 2014/15 CO season is documented below. The maintenance demonstration shows that the National Ambient Air Quality Standard (NAAQS) for carbon monoxide (CO) will not be violated at least until the beginning of the 2015/2016 CO season or November 1, 2015.

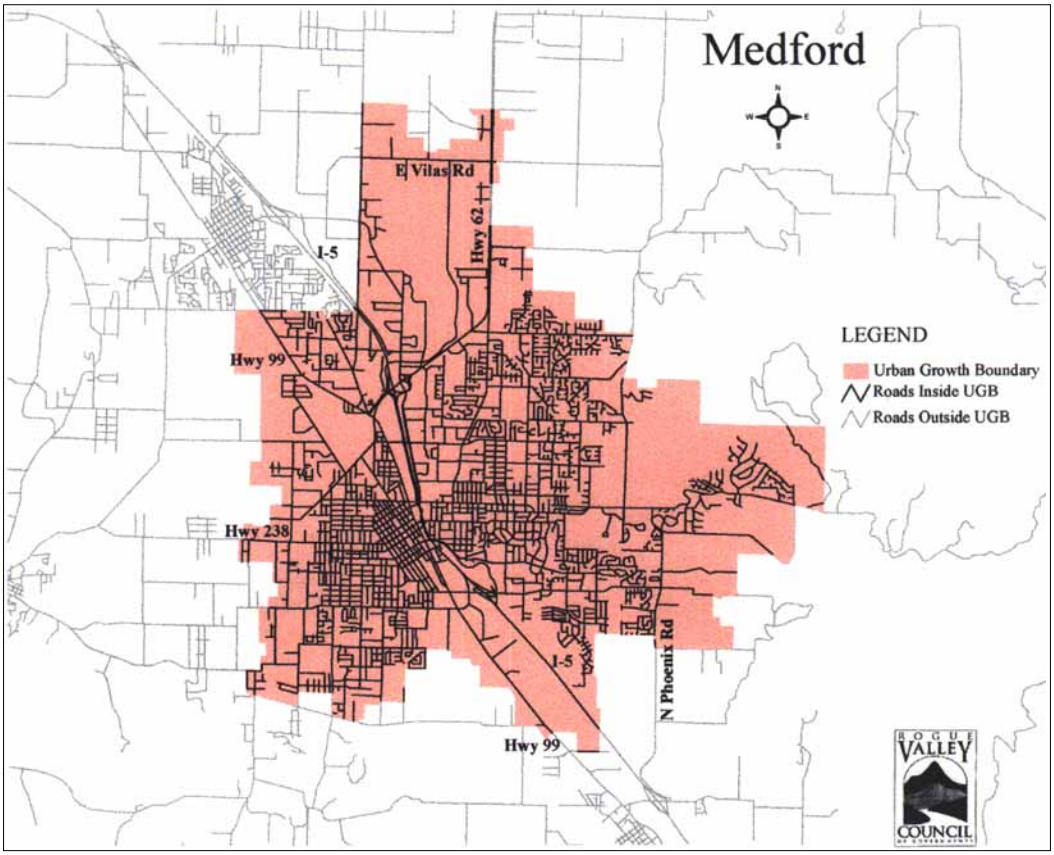
4.52.3.1 Attainment Inventory

As part of the Maintenance Plan an "attainment" emission inventory was developed. Future emission inventories must show that emissions remain at or below this attainment level. The attainment emission inventory attempts to represent emissions during the time the air quality standard is being attained. The year 1993 was chosen as Medford's attainment year since it fell within the attainment period and had meteorology more conducive to the build up of air pollution than other years since the standard had been achieved. As the meteorological analysis indicated, 1993 had similar conditions for the dispersion of air pollutants as any other year from 1985 to 1996. For a Maintenance Plan to be successful, and to be consistent with EPA guidance for CO Maintenance Plan approval, Medford area CO emissions must stay below 1993 emission levels.

An emission inventory consists of emission estimates from all sources of carbon monoxide. These sources include industrial sources, on-road mobile sources (e.g. cars and trucks) non-road mobile sources (e.g., construction equipment, recreational vehicles, lawn and garden equipment), and area sources (e.g., outdoor burning, woodstoves, wildfires). These emission sources are tabulated in terms of the number of pounds of CO emitted during a typical winter day.

An inventory of 1993 CO emissions was prepared for the Medford area as well as an inventory of future emissions projected to be emitted in the Medford area in the year 2015. These emissions are summarized in Table 4.52.3.1. together with emissions for three intermediate years which were estimated by straight line interpolation between the 1993 and 2015 analysis years. (Section 4.52.3.2.1 below, presents the 1993 inventory along with emission projections for four future years). Emissions for on-road mobile sources were calculated by applying EPA's "Mobile 5b Cold CO" emission factor computer program to the Rogue Valley Council of Governments' (RVCOG) model of Medford's transportation network. The procedures for calculating the attainment emission inventories and detailed results are presented in Appendix D3-4.

Figure 4.52.3.1: Medford Carbon Monoxide Nonattainment Area



4.52.3.2 Maintenance Demonstration

4.52.3.2.1 Inventory Projections

Figure 4.52.3.2 shows the Medford area CO emissions projected to the year 2015. Table 4.52.3.1 presents the 1993 emissions and projected future CO emissions in four major source categories. The procedures used for projecting these emissions and detailed results for individual sources are presented in Appendix D3-4.

Projected Results without Oxygenated Fuels

Regional emissions in the 1993 baseline year are inventoried at 112,051 pounds of CO per day with the effect of the required wintertime oxygenated fuel program. Regional emissions for the year 2015 are projected to fall to a total of 67,748 pounds per winter day. This is a projected 40% decrease in CO emissions from the 1993 level, and is largely due to the decreased emissions from on-road mobile sources. The emission reduction comes despite the lifting of the wintertime oxygenated fuel program and the potential modification of the vehicle inspection/maintenance program to remove the four newest years of vehicles from the program rather than the two newest years. In the event the vehicle inspection/maintenance program continues to "exempt" only the two newest years of vehicles, emissions in 2015 are projected to fall an additional 74 pounds of CO per winter day (to a total of 67,674 pounds per day).

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The dramatic decrease of CO emissions is primarily the result of new information on the "in use deterioration rate" of the pollution control equipment used on 1996 and newer vehicles. This new information reveals that current emission control equipment functions properly much longer than previously thought. This effect becomes increasingly pronounced as fleet turnover produces ever increasing fractions of the newer vehicles. Area Source emissions also decrease steadily over the maintenance period. Actual Point Source (industrial) emissions decrease sharply during the initial portion of the of the projected period due to plant closures and permanent changes in plant equipment. Following this initial drop, point source emissions grow slowly at the rate of industrial employment growth predicted for the area. Non-road mobile source emissions are projected to grow 41% percent during the 1993-2015 period primarily as a function of population growth.

In net, the large projected decrease of on-road mobile emissions dominates the total emissions projected for the future. These inventories show that total emissions in all years after 1993 stay well below the level of 1993 attainment emissions.

Figure 4.52.3.2 CO Emission Projections

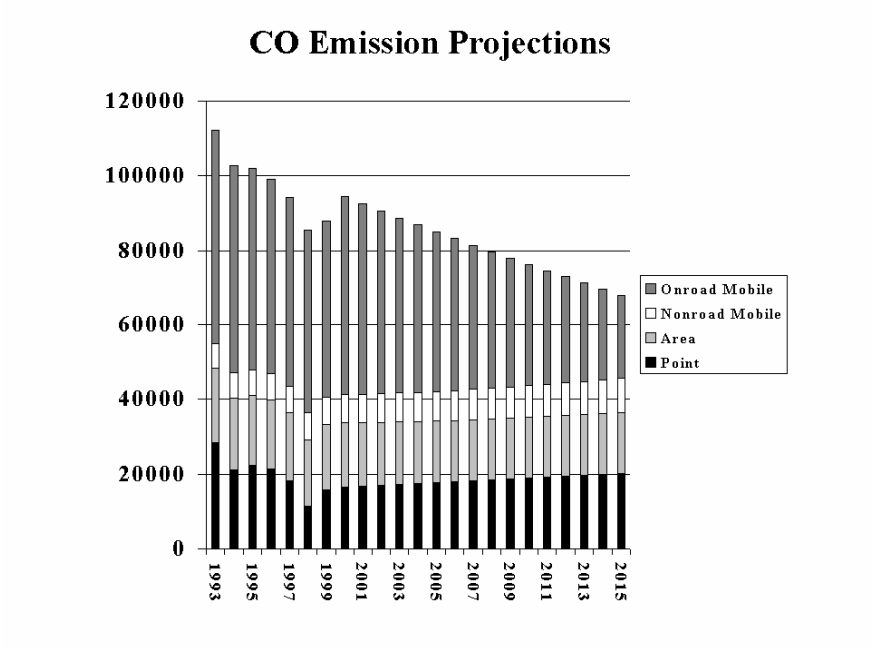

Table 4.52.3.1: CO Emissions Attainment and Projection Inventories*

CO Emissions: CO Nonattainment Area = Medford Urban Growth Boundary
(Pounds CO/Winter Day)

Year	1993	2000	2005	2010	2015
Area Sources	19,656	17,205	16,387	16,091	16,165
Non-Road Mobile Sources	6,536	7,411	7,926	8,543	9,186
Point Sources	28,517	16,485	17,708	18,930	20,153
On-Road Mobile Sources	57,342	53,217	42,893	32,568	22,244
Total	112,051	94,318	84,914	76,132	67,748

*The 1993 inventory represents a wintertime oxygenated fuel program and a "basic" I/M program. Remaining inventory years reflect no oxygenated fuel program and a basic I/M program which exempts the four newest years of vehicles.

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Deleted: 94,419
Deleted: 85,022
Deleted: 76,249
Deleted: 67,872

4.52.3.2.2 Transportation Emissions Budgets for Conformity

The federal and state transportation conformity regulations require that mobile source emissions resulting from implementation of the regional transportation plan (RTP) and transportation improvement program (TIP) meet certain criteria to ensure compliance with the Clean Air Act.

Prior to approval of the maintenance plan, a proposed Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP) must show it complies with either the build/no build test, or the "Less than 1990" test. The first test is a comparison of the proposed RTP and TIP (or "action scenario") to the existing situation (or "baseline scenario"). This test requires that the emissions from the action scenario do not exceed emissions from the baseline scenario. The second test is a comparison of emissions produced in the action scenario to the emissions produced in 1990.

After approval of the maintenance plan by the Environmental Quality Commission (EQC) an additional conformity test applies: the RTP and TIP must comply with the transportation emissions budgets specified in the plan. This test is designed to prevent violation of the NAAQS because transportation emissions are not allowed to exceed the amount relied upon in the maintenance demonstration. Upon EPA approval of the emissions budget, the requirements of the build/no-build test and the less than 1990 test will be eliminated, leaving only the budget test to assess regional carbon monoxide emissions. Requirements to assess localized or "hot-spot" carbon monoxide emissions will continue to apply independently throughout all periods.

The transportation conformity motor vehicle emissions budget for the area within the Medford Urban Growth Boundary (UGB) is shown in Table 4.52.3.2.

Table 4.52.3.2: On-Road Motor Vehicle Emissions Budget

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Medford Transportation CO Emissions Budget (Pounds CO/Winter Day)
(CO Non-Attainment Area = Medford UGB)

Year	2000	2015	2020 and after
Budget (1st 4 yrs I/M exempt)	63,860	26,693	32,640

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The Motor Vehicle Emission budgets for 2000 and 2015 (the maintenance plan period) are based on the emissions projected by EPA model Mobile 5B Cold CO together with the Rogue Valley Council of Governments' transportation model plus an additional 20%. The purpose of the additional 20% is to provide a margin of error between the amount of emissions currently projected under today's planning assumptions, and potentially greater emissions that may be projected under future assumptions and growth projections.

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This 20% buffer is also added with the recognition that future CO emissions will stay well below the Medford airshed's capacity. In fact, throughout the life of the maintenance plan, CO emissions continue to decrease strongly and steadily even with the additional buffer included.

The motor vehicle emissions budget for carbon monoxide is also extended out to the year 2020—beyond the maintenance plan horizon of 2015. However, given that the potential size of a projection error increases as the projection period lengthens, a different method was used to determine the emissions budget for the post plan period. The Motor Vehicle Emission budget for 2020 was set by increasing the budget for 2015 by 1.35% per year until 2030, then applying that value to the year 2020. That approach assumes that vehicle emissions per Vehicle Mile Traveled (VMT) stop decreasing in 2015, but that the population of the area continues to grow at the rate of 1.35% per year. Before this current CO maintenance plan is replaced by an approved successor in 2010, the Medford area will need to adopt several new Regional Transportation Plans or RTPs. Each RTP must address a 20 year future period and the last transportation plan that could be adopted under this maintenance plan would be an RTP addressing the 2010 to 2030 period. The above post plan emissions budget, therefore, should accommodate the amount of emissions reasonably anticipated through 2030. Increasing the CO emissions of 26,693 lbs./day 1.35% per year until 2030 yields 32,640 lbs. per day. To provide an extra margin of safety from unnecessarily violating conformity requirements, the 2030 value is assigned to the year 2020 and all years thereafter. DEQ anticipates that this margin will be adequate to provide some limit on future CO emissions while allowing a sufficient margin of error to accommodate possible variations in future growth.

Emissions budgets for intermediate analysis years (during either the maintenance plan or during the post plan period) should be determined by interpolating between 2000 and 2015 or 2015 and 2020. (Interpolated values for each intermediate year are shown below in Table 4.52.3.2a):

Table 4.52.3.2a (expanded): On-Road Motor Vehicle Emissions Budget
Medford On-Road Carbon Monoxide Emissions Budget
(Lbs. CO per Winter Day within the Medford CO Maintenance Area,
the region inside the Medford UGB – OAR 340-204-0010)

Year	Lbs./day
2000	63,860
2001	61,382
2002	58,904
2003	56,427
2004	53,949
2005	51,471
2006	48,993
2007	46,515
2008	44,038
2009	41,560
2010	39,082

Year	Lbs./day
2011	36,604
2012	34,126
2013	31,649
2014	29,171
2015	26,693
2016	27,882
2017	29,072
2018	30,261
2019	31,451
2020	32,640

Under state transportation conformity rules, localized CO analysis (hot-spot) is required for projects (regardless of their funding source) at the top three intersections when ranked by volume or congestion. These intersections are identified here so localized CO concentrations will be more likely to be considered and addressed prior to approval of projects affecting them. According to the 2015 traffic figures, the following intersections are the top three by volume and congestion (See Appendix D3-8 for further details):

1) Big Y (Hwy. 99 at Crater Lake Highway)
2) Highway 99 at Stewart
3) McAndrews at Biddle Rd.
4) Crater Lake Avenue at McAndrews

(Note that intersections 1 and 3 are in both the top three intersections by volume and the top three intersections by congestion.)

Appendix D3-5 describes DEQ's transportation conformity rules and the transportation conformity process in Oregon.

4.52.3.2.3 Control Measures

Emissions projections show a strong overall decrease without additional controls. The projections stop taking credit for emissions from the oxygenated fuel program in the year 2000.

Through RVCOG's planning process, and the Medford Air Quality Advisory Committee's review of proposed strategies, several control measures were identified to be incorporated into the CO maintenance plan. These measures are summarized below.

Federal New Car Program

The federal new car program has been and will continue to be the most effective CO emission reduction strategy. In contrast to other pollutants, vehicle CO emission controls have not experienced much deterioration of performance with increased age and mileage. A 60% percent reduction in projected total fleet emissions is expected between 1993 and 2015 despite a steady increase in vehicle miles traveled or VMT. Anticipated improvements in CO emission control technology include heated catalysts, which will help reduce the higher emissions from cold starts.

Motor Vehicle Inspection Program

The basic vehicle inspection program will continue to operate, however emission projections assume that in the future new motor vehicles will not be subject to testing for their first four years rather than just their first two years as is now required. Gasoline powered and light duty diesel vehicles up to 20 years old that are registered within the Medford-Ashland Air Quality Maintenance Area will continue to be subject to emissions testing and inspection at the time of vehicle registration renewal. This program, operating since 1986, has been effective in reducing

CO pollution by promoting proper maintenance. Standards used in the program were selected on the basis of identifying high emitting vehicles operating outside their design limits. The standards and associated enforcement tolerances take into account a limited amount of engine wear and tear, but are not so lenient that "gross emitting" vehicles would pass an emissions test.

Major New Source Review

Until the Medford Nonattainment Area is redesignated to attainment, proposed major sources and major modifications to existing sources will be are required to comply with nonattainment area New Source Review (NSR) rules, including the use of Lowest Achievable Emission Rate (LAER) control technology and offsets for CO. Carbon monoxide offsets must be provided within the area of significant air quality impact to provide a net air quality benefit.

After redesignation to attainment, the LAER requirement will be replaced by Best Available Control Technology (BACT) and requirements for either offsets (emission reduction credits or a growth allowance established in the plan) or modeling demonstrating no significant impact.

Woodstove Curtailment

Woodstove emission control efforts in the Rogue Valley have made significant strides in reducing particulate emissions through emission certification standards for new stoves, changeout programs to encourage removal of noncertified stoves and local ordinances to curtail burning during stagnant weather periods. The city of Medford will be revising its woodstove curtailment ordinance to align it with suggestions made by the Advisory Committee to improve overall effectiveness in reducing particulate emissions. All of these efforts will also contribute to a pronounced decline of CO emissions from residential wood heating from 1993 to 2015.

Additional Voluntary Control Measures

During initial development of this plan, other transportation control measures were identified that support the maintenance of CO air quality standards. However credits for emission reduction have not been requested within the maintenance plan for these projects. They are included here as indications of the region's support and willingness to address maintaining air quality standards. These projects include:

> Transit Oriented Design and Transit Corridor Development Studies: The Rogue Valley Council of Governments, with financial assistance from the Department of Land Conservation and Development, is studying measures to reduce reliance on the automobile that can be used to update the RTP. Efforts focus on the best way to incorporate Transit Oriented Development (TOD) principles in key areas. Work is underway to encourage much future growth into three TOD areas by amending land use plans, transportation plans and zoning ordinances as recommended by consulting experts.

The Southeast Medford Plan: Adopted as a revision to the Comprehensive Plan for the City of Medford, this plan covers approximately 1,000 acres within the Urban Growth Boundary, east of North Phoenix Road, north of Coal Mine Road and south of Hillcrest Road. The Plan that provides for a neotraditional development pattern has as its primary purposes to:

- achieve minimum housing densities by limiting residential areas to specific zoning districts;
- establish a special central core - the Village Center - with commercial, institutional and residential uses;
- preserve natural waterways while providing routes for pedestrian and bicycle travel;
- require approval of most development through the City's Planned Unit Development ordinance;
- establish special design and development standards for the use of greenways, alleys and street trees.

Compared to "contemporary" development plans that use single use zoning and a circulation system that feeds all traffic onto collector and arterial streets, this development pattern will reduce off-peak traffic within the area and produce trips of shorter length. Additionally, it could significantly increase pedestrian and bicycle trips within the development area.

4.52.3.2.4 Rollforward Analysis

To project future 8-hour average CO concentrations at the two permanent DEQ monitoring sites and other screened, potential hot spots in central Medford, a rollforward analysis was conducted. This is a simple technique based on the fact that CO is a relatively stable gas, and motor vehicles contribute most of the CO measured at traffic-oriented monitoring sites. The rollforward analysis consists of applying a ratio of future CO emissions (based on expected growth) to a baseline level of emissions and corresponding annual second highest 8-hour CO concentrations. Baseline CO emissions for a given intersection were calculated for the attainment year 1993 and then for 2015, based on expected traffic growth from the Emme/2 transportation model and EPA's Mobile emission factor model. The CO emissions in gm/mile were calculated for each leg of the intersection, based on estimated/calculated speeds (peak period and off-peak) and then summed for total intersection emissions. Carbon Monoxide emission factors were calculated using EPA's Mobile 5b Cold CO computer model for on-road emissions. This computer model is an interim instrument that incorporates new data on the in-use-deterioration rates of emission controls used on newer vehicles and a more accurate understanding of the future effectiveness of oxygenated fuels. The model approximates results expected to be produced by EPA's long delayed Mobile 6 emission factor model.

The non-monitored locations were selected on the basis of the same screening technique employed in the Attainment Demonstration (Section 4.52.2.5.2), i.e., using volume and congestion factors from RVCOG's Emme/2 transportation model to rank potential problem intersections in the year 2015. The following intersections were identified, based either on

volume alone, or a combination of volume and expected congestion (V*V/C, where V is the traffic volume and C is the capacity of one leg of the intersection).

Table 4.52.3.3 Selected Intersections and Ranking Factors

Location	Ranking Factor(s)
Riverside/Crater Lake Hwy (Big Y)	Volume and V*V/C
Biddle and McAndrews	Volume and V*V/C
Hwy 99 and Stewart	Volume
Crater Lake Ave. and McAndrews	V*V/C

The results of the rollforward analysis, as shown in Table 4.52.3.4, are based on a discontinuation of the wintertime oxygenated fuel program. This analysis indicated continued attainment at all four sites through the year 2015.

Table 4.52.3.4 2015 Second Highest Maximum 8-hour CO Concentrations at DEQ Monitoring Sites and Screened Intersections

Location	2015 8-Hr CO Concentration, ppm
Brophy Monitor	4.4
Rogue Valley Mall Monitor	5.2
Big Y	5.0
Biddle and McAndrews	5.6
Hwy 99 and Stewart	5.4
Crater Lake Ave. and McAndrews	5.0

The details of the rollforward methodology, including Mobile 5b Cold CO emission factor inputs and outputs and example calculations are contained in Appendix D3-8.

4.52.3.3 Contingency Plan

The Maintenance Plan must contain contingency measures that would be implemented in the event of: 1) a violation of the CO standard after the area has been redesignated to maintenance, or 2) other appropriate triggering protocol contained in the plan. Medford's contingency plan is outlined below.

The Clean Air Act Section 175A(d) requires that all control measures contained in the State Implementation Plan (SIP) prior to redesignation be retained as contingency measures in the Maintenance Plan. Therefore, the reinstatement of wintertime oxygenated fuel, Lowest Achievable Emission Rate (LAER) equipment and major industrial source offsets are required contingency measures in the CO Maintenance Plan.

Phase 1: Risk of Violation

If monitored (8-hour) CO levels at any site within the Medford Urban Growth Boundary (UGB) on the National Air Monitoring System or the State and Local Air Monitoring System registers a second high concentration equaling or exceeding 90 percent (equal to or greater than 8.1 ppm) of the National Ambient Air Quality Standard (NAAQS) level during a calendar year, then the DEQ will convene a planning group to recommend which of the following strategies should be considered for implementation. Within six months of the validated 90 percent second high CO concentration, the planning group will recommend a schedule of strategies to either prevent or correct any violation of the 8-Hour NAAQS for CO. This will allow a choice to be made to implement these measures before or after an actual violation has occurred.

Contingency strategies to be considered will include, but are not limited to:

(1) Improvements to parking and traffic circulation;
(2) Aggressive signal retiming program;
(3) Increased funding for transit;
(4) Enhanced vehicle inspection/maintenance program; and
(5) Accelerated implementation of bicycle and pedestrian networks.

In the event a second 8-hour CO concentration equaling or exceeding 8.1 ppm occurs in a calendar year, the planning group may also choose to conduct further studies to determine if additional measures are needed, or to determine if the problem was caused by an exceptional event requiring no further action. High values associated with the annual Classic Car Rally are not be considered as triggering the steps outlined above. Management of high CO concentrations associated with the Classic Car Rally will be controlled through an interagency agreement between the City of Medford and the Department of Environmental Quality.

Phase 2: Actual Violation

If a violation of the CO NAAQS occurs, and is validated by DEQ, the Department will automatically implement the following contingency measures (in addition to those measures specified under Phase 1):

(1) New Source Review requirements for proposed major sources and major modifications in the Maintenance Plan area (and the area of significant air quality impact) will be modified. The requirement to install Best Available Control Technology (BACT) will be replaced with a requirement to install Lowest Achievable Emission Rate (LAER) technology. These requirements will take effect upon validation of the violation. BACT may be reinstated if provided for in a new maintenance plan adopted and approved by EPA.

(2) The requirement for the wintertime use of oxygenated fuel in Jackson County will be reinstated in the event a carbon monoxide violation occurs.

1993 Attainment Year Emissions Inventory
SIP Volume 3
APPENDIX D3-4-2
APPENDIX D
On-Road Mobile Source Data

and

Information Relevant to
2015 Regional Emissions Forecast
APPENDIX D3-4-3

Appendix D, Table D-1: MOBILE 5B Cold CO Input Data
Appendix D, Table D-2: Compilation of Fleet-wide CO Emissions
Appendix D, Table D-3: CO Seasonal Adjustment Factors

Appendix D, Table D-1: MOBILE 5B Cold CO INPUT DATA

Appendix D, Table D-2: COMPILATION OF FLEET-WIDE CO EMISSIONS

Appendix D, Table D-3: CO SEASONAL ADJUSTMENT FACTORS

DETERMINATION OF ON-ROAD MOBILE SOURCE EMISSIONS

On-Road Mobile Emissions for the 1993 attainment year Emissions Inventory and the emissions projection year of 2015 were derived from the results of two computer models. The first is the travel demand model run by the Rogue Valley Council of Governments (RVCOG), and the second is the emissions factor model conducted by the Department.

The travel demand model used for the 2001 revisions to the Medford Carbon Monoxide Maintenance Plan is the EMME/2 "Best Practices" computer analysis created for the Rogue Valley Metropolitan Planning Organization's "Interim Regional Transportation Plan Update 2000-2020" adopted April 12, 2000. Like any travel model, this analysis was used to characterize traffic on highways within the Medford Urban Growth Boundary (UGB). To do this the travel model estimates the average speed and volume of traffic along all highway segments inside the UGB with the exception of local (neighborhood) streets. More specifically, the model describes traffic on more than 1800 highway sections (links) that represent all freeways, arterial streets and collector streets. The total number of vehicle miles traveled (VMT) determined by the model is then adjusted upward 10% to approximate the amount of additional traffic that occur on neighborhood streets. (Neighborhood traffic is further estimated to move at an average of 20 mph.) This model produces two results: 1) the amount of vehicle miles traveled on each highway link, and 2) the average speed of traffic on each link during a one-hour period.

The second computer model used to determine on-road motor vehicle emissions for the 2001 revisions of the Medford CO Maintenance Plan is EPA's Mobile emission factor model. Mobile emission factor models predict the amount of pollution produced per mile by the average vehicle used in the analysis area when operated at a designated speed. The appropriate emission factor for each speed is then multiplied by the VMT predicted by the travel model for each highway segment. The result is an estimate of the amount of pollutants produced by vehicles using that portion of roadway. The pollution produced by all segments is then summed to determine the total emissions of on-road motor vehicles. For the 2001 revisions to the Medford CO Maintenance Plan the output of the two models was combined in the Excel spreadsheet shown in Appendix D, Table D-2.

The particular emission factor model used for this plan revision is EPA's Mobile 5B Cold CO emissions model. Mobile 5B Cold CO was an unplanned variation of the Mobile 5 model series that was originally created as a means to allow the State of Alaska to demonstrate "reasonable further progress" in attaining the National Ambient Air Quality Standard for carbon monoxide (CO). The model is a hybrid that combines the structure of Mobile 5 with the algorithms of Mobile 6 (1999 draft version). The Mobile 5B Cold CO model was operated as prescribed by Sierra Research's Philip Heirigs in his draft letter to Alice Edwards of the Alaska Department of Environmental Conservation dated April 28, 1999 (Ref. #322).

Because Mobile 5B Cold CO is an unplanned hybrid it is unrefined. It is cumbersome to operate and requires more data manipulation than intentional variations of Mobile 5. One consequence of this is that Mobile 5B Cold CO must be run three times and the results arithmetically adjusted to determine each emission factor. These arithmetic adjustments were performed by the spreadsheet computations of Exhibits D-2.2, D-2.3, D-2.5 and D-2.6 of Table D-2.

The air quality analysis for this revised maintenance plan required that the amount of carbon monoxide from on-road motor vehicle emissions be determined for both the 1993 baseline year and

the future projection year of 2015. In addition, emissions for each of those years had to be determined under a variety of regulatory scenarios: first under the existing rules (with oxygenated fuel) and second under the conditions that will apply after the maintenance plan is approved by EPA (without oxygenated fuel). On-road motor vehicle emissions between 1993 and 2015 were determined by straight line interpolation. Projections that include a change from the existing (1993) regulations to the future (2015) regulations assume that the transition takes place in 2000.

The on-road motor vehicle emissions analyses consider three fractions of the Medford area fleet as each is subject to different emission reduction regulations. The first fraction is the 87% of the area's vehicles that are registered inside the Medford Urban Growth Boundary (UGB) and are therefore subject to both the vehicle Inspection/Maintenance (I/M) program, and wintertime oxygenated gasoline. The second fraction applies to 4% of the area's fleet located within Jackson County but outside the Medford UGB that gets oxygenated fuel in the winter but is not subject to the I/M program. The final fraction is the 9% of the fleet that originates outside Jackson County and does not have the emission reduction effects of either the oxygenated fuel or the I/M program. The total emissions compiled in the spreadsheets of Appendix D, Table D-2 are built up from the appropriate emissions factors applied to the differently regulated sections of the fleet. Electronic copies of the Table D-2 spreadsheets are provided on floppy disk to allow the formulas used in calculating the results to be inspected. The spreadsheets are titled "D-3-4-2, App D, Tbl D-2.xls" and use Microsoft's Excel 97 computer program.

On-road motor vehicle emissions are also adjusted to reflect an average carbon monoxide season (winter) workday. To do this, correction factors for each highway type (determined by Oregon Department of Transportation as shown in Table D-3) are applied to the traffic predicted by the model.

Final On-road motor vehicle emissions for each regulatory scenario are summarized in Appendix D, Table D-2 of the 1993 Emissions Inventory and of Table 2 of the Regional Emission Forecast of Appendix D3-4-3.

MOBILE 5B Cold CO INPUT DATA

A set of the MOBILE 5B Cold CO input files is provided in this appendix.

Table D-1 consists of Exhibits D-1.1 through D-1.18 which show the MOBILE 5B Cold CO input files used to determine the emission factors for the 1993 and the 2015 emissions analyses. Data for the vehicle fleet mix were derived from Oregon Division of Motor Vehicles registration records.

Table D-1:

Exhibit D-1.1	1993 Off-Cycle Run (w Off-Cycle OFF) without Oxy-Fuel
Exhibit D-1.2	1993 Off-Cycle Run (w Off-Cycle ON) without Oxy-Fuel
Exhibit D-1.3	1993 Off-Cycle Run (w Off-Cycle OFF) with Oxy-Fuel
Exhibit D-1.4	1993 Off-Cycle Run (w Off-Cycle ON) with Oxy-Fuel
Exhibit D-1.5	1993 Basic I/M with Oxy-Fuel (87% of vehicles)
Exhibit D-1.6	1993 No I/M with Oxy-Fuel (4% of vehicles)

Exhibit D-1.7	1993 No I/M without Oxy-Fuel (9% of vehicles)
Exhibit D-1.8	1993 Basic I/M without Oxy-Fuel
Exhibit D-1.9	1993 Basic I/M (w 1st 4 years exempt) without Oxy-Fuel
Exhibit D-1.10	2015 Off-Cycle Run (w Off-Cycle OFF) without Oxy-Fuel
Exhibit D-1.11	2015 Off-Cycle Run (w Off-Cycle ON) without Oxy-Fuel
Exhibit D-1.12	2015 Off-Cycle Run (w Off-Cycle OFF) with Oxy-Fuel
Exhibit D-1.13	2015 Off-Cycle Run (w Off-Cycle ON) with Oxy-Fuel
Exhibit D-1.14	2015 Basic I/M, OBD, ATP with Oxy-Fuel
Exhibit D-1.15	2015 No I/M with Oxy-Fuel
Exhibit D-1.16	2015 No I/M without Oxy-Fuel (13% of vehicles)
Exhibit D-1.17	2015 Basic I/M, OBD, ATP without Oxy-Fuel
Exhibit D-1.18	2015 Basic I/M (w 1st 4 years exempt), OBD, ATP without Oxy-Fuel

COMPILATION OF FLEET-WIDE CO EMISSIONS

Emission factors derived from Table D-1 are summarized in Table D-2, Exhibits D-2.1 and D-2.4. Those exhibits cite factors for the three fractions of the Medford fleet under different regulatory scenarios and different analysis years. Also included are Exhibits D-2.2, D-2.3, D-2.5 & D-2.6 which are spreadsheets that combine VMT and speed data to determine the amount of emissions produced by each link of the highway system.

Table D-2:

Exhibit D-2.1	1993 On-Road Emissions Factor Summary
Exhibit D-2.2	1993 On-Road Emissions Factor Computation: I/M Program (2 yr. exempt) with Oxy-Fuel
Exhibit D-2.3	1993 On-Road Emissions Factor Computation: I/M Program (4 yr. exempt) without Oxy-Fuel
Exhibit D-2.4	2015 On-Road Emissions Factor Summary
Exhibit D-2.5	2015 On-Road Emissions Factor Computation: I/M Program (2 yr. exempt) with Oxy-Fuel
Exhibit D-2.6	2015 On-Road Emissions Factor Computation: I/M Program (4 yr. exempt) without Oxy-Fuel

TABLE D-3 CO Seasonal Adjustment Factors .

Roadway Type	CO Season Adjustment Factor
Interstate	0.939
State Highway	0.907
Arterial	0.817
Collector	0.817
Residential Collector	0.817
Local	0.817

Technical Analysis Protocol
Medford Carbon Monoxide Redesignation Request and Maintenance Plan

August 4, 2000

This document is an agreement between the Oregon Department of Environmental Quality (ODEQ), and the Environmental Protection Agency (EPA) Region X for the modification of the Medford Carbon Monoxide (CO) Redesignation and Maintenance Plan submitted to EPA Nov. 19, 2000.

The original version of the Medford CO maintenance plan was developed in 1998 to meet the Clean Air Act's requirements for timely submittal of air quality plans. That plan was based on the results from a simplified ("quick response") regional transportation plan produced by the Rogue Valley Council of Governments (RVCOG) and EPA's "Mobile 5a H" computer model of mobile emissions. At that time, an analysis using those models indicated that the wintertime requirement for oxygenated fuel had to be retained for the Medford area to continue to meet the air quality standard in the future.

Since then, RVCOG upgraded the regional transportation model to the "best practices" level of sophistication, and EPA made an improved mobile emissions model available for use (Mobile 5b Cold CO). These models produce a more advanced estimate of emissions, and indicate that the carbon monoxide standard can be comfortably maintained in the future without oxygenated gasoline. As a consequence, the Medford Carbon Monoxide Maintenance Plan is being revised to incorporate the new emissions data and to remove oxygenated fuel as a measure to control CO emissions.

I. BACKGROUND INFORMATION

A. Design Value

Historically, carbon monoxide was monitored at two locations in Medford, Oregon. From 1977 to the present, the ODEQ monitored air quality in central Medford at the Brophy Building at 10 N. Central Ave. The department also monitored air quality at Crater Music located at 1414 N Riverside from 1984 through 1987. In 1987 this site was replaced by the Rogue Valley Mall monitor at 1502 N. Riverside .

Carbon Monoxide design values are discussed in terms of the 8-hour CO National Ambient Air Quality Standards (NAAQS), rather than the 1-hour NAAQS, because the 8-hour NAAQS is typically the standard of concern. To determine the design value, the maximum and second highest 8-hour CO concentrations at a site for the most recent two years are reviewed. The highest second-high value is the design value for the site. All design values within an area are reviewed and the highest of these serves as the design value for the area. Note that for each site, individual years of CO data are considered separately to determine the second maximum for each year--CO data are not combined from different years. Medford CO monitoring data for 1992 and 1993 were reviewed.

		(8-Hour Averages) MAX	2nd High
Medford Brophy Bldg.	1992	7.4	6.4
	1993	7.2	6.9

6.9 is the Design Value for the Brophy site.

Medford Rogue Valley Mall	1992	7.4	7.4
	1993	8.5	7.5

7.5 is the Design Value for the Rogue Valley Mall site.

7.5 ppm is the determined Design Value for the Medford area.

B. Attainment Year and Concentrations

Since 1991 the Medford area has attained the CO standard based on ODEQ ambient monitoring data. The maintenance plan will be based on a (revised) 1993 baseline attainment year since 1993 falls within the attainment time period. The highest CO monitored value in 1993 was 8.5 ppm on December 23; the second highest 7.5 ppm on November 24, 1993.

C. Control Strategies

The Medford area attained the standard during 1992 - 1993. Control measures implemented prior to 1982 were:

- Federal Motor Vehicle Control Program (FMVCP)
- Computerized signal system
- Roadway improvements
- Continued levels of carpools and transit usage
- Medford Bicycle Plan
- Maintained levels of staggered work hours

Control measures implemented after 1982:

- Downtown parking controls
- County-wide biennial inspection and maintenance program (I/M), contingent upon state enabling legislation

The Vehicle Inspection and Maintenance Program, adopted and submitted to EPA 1985, began in January 1986.

The Oxygenated Fuel Program, which began in November 1992, was required by the 1990 Clean Air Act Amendments.

II. POTENTIAL RISK FOR RENEWED NON-ATTAINMENT

As stated above the Medford area has two Carbon Monoxide monitoring sites, the Brophy Bldg. in downtown Medford and the Rogue Valley Mall location. Data from these sites indicate the area attained the air quality standard in calendar years 1992 - 1993. The last exceedance measured in Medford occurred June 20, 1999 with a value of 10.7 ppm. Prior to this reading, the last exceedance was June 18, 1994 with a value of 9.7 ppm.

Table 1 below shows the five highest values in the past three years at either the Brophy Building or Rogue Valley Mall locations.

Table 1

Concentration	Date	Location
10.7 ppm	June 20, 1999	Brophy Bldg.
9.3 ppm	June 20, 1998	Brophy Bldg.
7.3 ppm	June 14, 1997	Brophy Bldg.
6.8 ppm	January 5, 1999	Rogue Valley Mall
6.4 ppm	December 28, 1999	Rogue Valley Mall

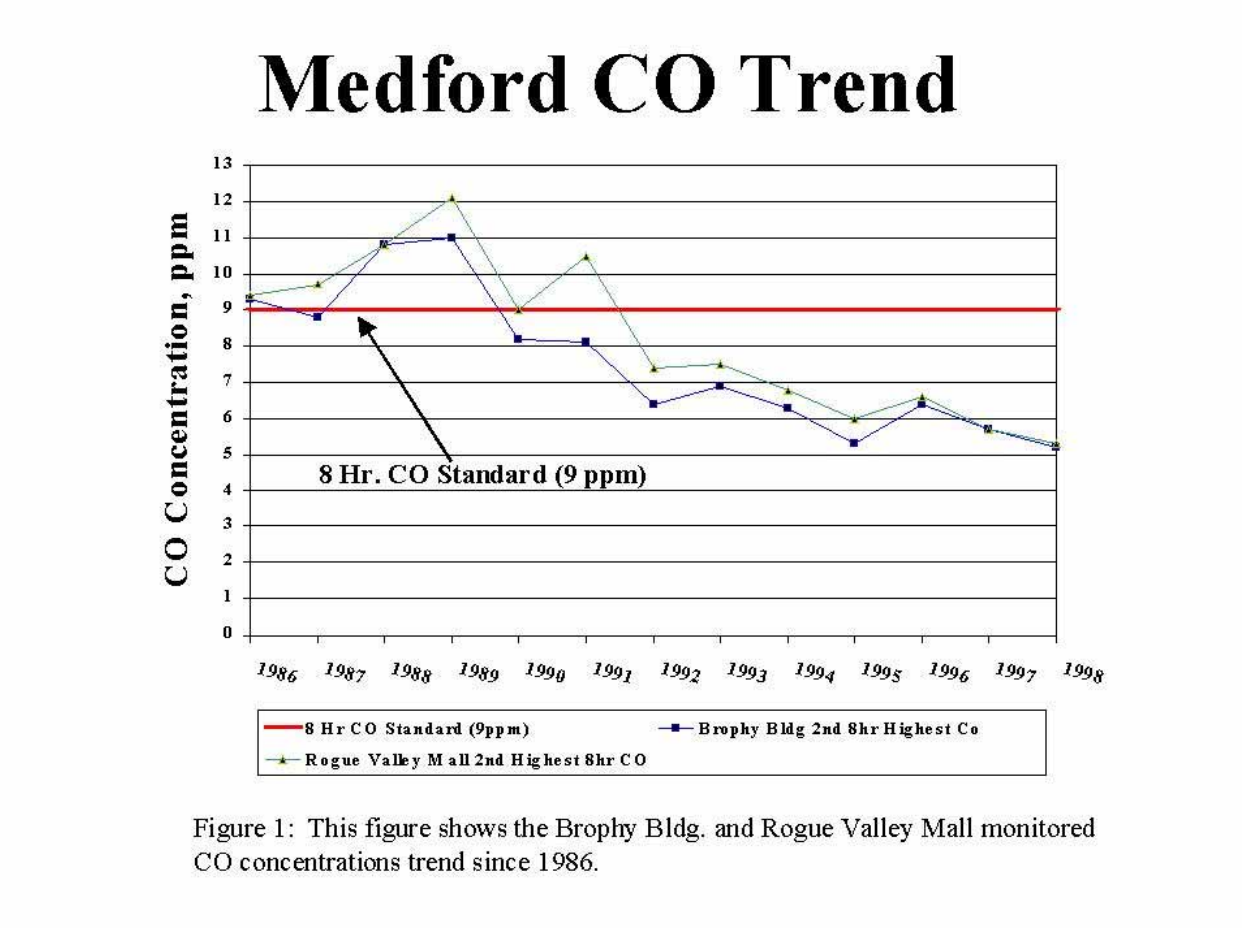

Figure 1: This figure shows the Brophy Bldg. and Rogue Valley Mall monitored CO concentrations trend since 1986.

Figure 1 reveals a downward trend in measured CO concentrations at both the Brophy Bldg. and Rogue Valley Mall sites. The actual Maintenance Plan will address the CO emission trend and

corresponding meteorology in more detail. The analysis was done by ODEQ and is documented in the Maintenance Plan.

In the winter of 1995-1996, a short-term bag sampling survey was conducted to test the effect that traffic engineering changes in the Medford area had on carbon monoxide levels at the two permanent monitors. The survey was also done to validate that the monitors are located at the highest impact sites in the Medford area. This investigation verified that the Brophy Bldg. and the Rogue Valley Mall sites are the worst case monitoring locations for the area.

ODEQ will revise area wide projections of CO emissions with and without oxygenated fuel together with continuation of the current vehicle inspection program. The revised projections for motor vehicles will be based on EPA's Mobile 5b Cold CO computer model (which uses Mobile 6 algorithms). DEQ will revise the Medford Carbon Monoxide Maintenance Plan based on revised (and more accurate) emission inventories for both the baseline and 2015 projection years. Growth rates for the maintenance period are shown in Table 2 and were derived from a recently reconstructed and improved transportation model.

Table 2: Growth Potential of Area [Revised figures not yet available.]

Population growth:	2.9% per year
Household growth:	2.5% per year
Employment:	2.8% per year
Regional VMT:	2.9% per year

Note: The population, household, employment and VMT growth rates that will be used for the Maintenance Plan revision are based on the Rogue Valley Council of Governments forecasts which resulted from the Interim Regional Transportation Plan (RTP) adopted April 12, 2000 and other locally derived data sources.

III. DEMONSTRATION OF ATTAINMENT OF NAAQS FOR CO

A. Monitored data

Monitored data from 1992 and 1993 will be used to show the area is in attainment; data from 1994 through 1996 will also be submitted with the final plan.

B. Other Attainment Documentation

ODEQ performed a CO validation survey during the winter of 1995-1996. The results provide further evidence that the area attains the NAAQS for carbon monoxide. The report of this study is submitted as Appendix D3-3 in the final Redesignation Request/Maintenance Plan. A meteorological analysis was conducted to demonstrate that the lower CO levels of recent years are not attributable to especially favorable

meteorological conditions. The analysis is summarized in Maintenance Plan section 4.52.2.4

IV. SUMMARY OF APPROVED SIP REVISION

A. Summary of Air Quality Attainment Plan/Dates

On March 3, 1978, the Environmental Protection Agency (EPA) designated the Medford-Ashland Air Quality Maintenance Area (AQMA) as nonattainment for carbon monoxide (CO). A CO analysis showed that implementation of all reasonably available transportation control measures would fail to meet the 8-hour CO standard by the federal deadline of December 31, 1982. Consequently, on June 20 1979, the ODEQ submitted a revised CO State Implementation Plan (SIP) for Medford to EPA with a request for an extension beyond 1982 for the attainment of the CO standard. The approval allowed for an extension of the Medford CO attainment date beyond December 31, 1982, with an attainment deadline of December 31, 1987. The Department submitted a revised SIP in 1982 with a commitment to implement a biennial motor vehicle and inspection and maintenance (I/M) program plus a request to change the nonattainment boundary to coincide with the central area of Medford. The failure to implement a locally operated I/M program led to a 1985 SIP revision to include a state-operated I/M program for the Medford area. This revision was submitted to EPA in October 1985. EPA approved the SIP revision (including the change to the nonattainment boundary) on February 13, 1987.

As required by the Clean Air Act Amendments of 1990 on March 15, 1991 Governor Barbara Roberts submitted a list of recommended boundary revisions for nonattainment areas within the State to EPA Region 10. The letter recommended an enlarged boundary for Medford CO to encompass the Medford Urban Growth Boundary (UGB). EPA approved this boundary change in the November 30, 1992, Federal Register.

All the requirements of the CAAA of 1990 have been met, with the exception of the periodic EI submittals. These will be prepared with growth factor analyses and submitted to EPA with the Medford CO Maintenance Plan. The oxygenated fuels program was implemented in November of 1992.

B. Description of Permanent and Enforceable Emission Reductions

The Medford area reached attainment in 1992 due to the implementation of SIP control measures, including the Federal Motor Vehicle Emissions Control Program, the motor vehicle inspection and maintenance (I/M) program and traffic operations improvements. Additionally, major roadway improvements were constructed as part of the Rogue Valley Mall project. As required by the CAAA of 1990, an oxygenated fuels program was implemented in 1992. Most of these permanent and enforceable reduction strategies from the attainment plan are being continued in the CO Maintenance Plan. The final strategies used will be documented in the plan.

C. Clean Air Act Section 110 and Part D Requirements

Sections 172(c), 176(c)(4), and 187(a) are the portions of section 110 and Part D that are applicable to the Medford CO nonattainment area.

1. 1977 CAA Amendments

   a. Basic I/M Program Rules submitted to EPA 5/6/85 and approved on 1/16/86; I/M Operating Rules and Test Procedures submitted 10/15/86 and approved 5/13/87.

   b. New Source Review and Plant Site Emission Limit Rules submitted to EPA on 9/9/81 and approved on 8/13/82.

2. 1990 CAA Amendments

   a. Amendments to the SIP, including oxygenated fuel rules adopted on 2/15/94 and a draft 1990 Medford carbon monoxide emission inventory submitted to EPA on 11/16/92.

   (NOTE: EPA comments on 1990 EI to be addressed concurrently with development of technical documentation.)

   b. Committal letter to adopt conformity procedures submitted to EPA 11/16/92.

   c. CO contingency provision and revisions to the I/M program submitted on 11/15/93 and approved by EPA on 06/28/94.

   (NOTE: Periodic Emission Inventory requirements will be addressed as part of the CO Maintenance Plan.)

   d. Transportation Conformity rules adopted by the EQC in 1995 and approved by EPA 05/16/96.

V. AIR QUALITY MAINTENANCE PLAN

A. Attainment Emission Inventory

The attainment year is 1993. DEQ included a 1993 attainment emission inventory with the Maintenance Plan submitted to EPA Region 10 11/19/98. Since then the Medford area has benefited by the implementation of a greatly improved transportation model, and EPA incorporated more accurate information on vehicle emissions performance into a revised computer model of mobile emissions. This new information will be used to develop a revised emission inventory for the 1993 baseline year. the amount of CO emitted during this baseline year will be used to define the airshed capacity for the Medford area.

Of note is the fact that the selected attainment demonstration year of 1993 had a second highest 8-Hour CO concentration of 7.5 ppm. That CO concentration is the highest wintertime second high CO concentration for the four-year period 1992 through 1995.

B. Maintenance Demonstration

The maintenance plan period will extend at least through a ten-year period following EPA approval. A revised emission inventory projection to 2015 based on the new modeling information cited above will be calculated for the area within the Medford Urban Growth Boundary (UGB) to show that projected emissions will stay at or below the 1993 attainment level. The requirement to use oxygenated fuel is included in the currently submitted Maintenance Plan, but it is likely to be removed from the revised Maintenance Plan if the demonstration shows it is not needed to keep the Medford (UGB) area in attainment through the end of the maintenance period. Control measures that are continued will be selected on the basis of emission reductions they produce and any needs that may be revealed by a roll forward analysis (explained below). The need for any emission reduction measures will be determined by comparing the revised inventory of baseline year (1993) CO emissions the revised projection of future year (2015) emissions. Control measures may be adjusted as necessary to demonstrate that future year emissions will be continuously maintained held at or below the 1993 level.

If needed, ODEQ will perform a revised roll forward analysis for the permanent monitoring sites and the most congested unmonitored intersections identified by a screening analysis. The Department will use the following indicator for screening intersections: "V*V/C," or traffic volume divided by capacity times volume. This algorithm weights volume by the corresponding level of capacity utilization. A value of "V*V/C" is determined for each intersection leg and the individual values are then summed to derive a screening indicator for the intersection as a whole.

Any modifications of the control measures selected to maintain the standard through 2015 (or ten years after EPA approval) will be developed in consultation with the Medford-Ashland Air Quality Advisory Committee, local governments and the Oregon Department of Transportation. The members of the committee consist of representatives from the Rogue Valley Council of Governments (RVCOG), ODEQ, industry, environmental groups and concerned citizens. If the revised modeling indicates that the area will maintain the CO standard through the duration of the planning period without oxygenated fuel, this group will evaluate whether the requirement should be lifted and recommend whether the plan should be revised accordingly.

This committee will also be asked to recommend the amount of carbon monoxide emissions that should be allocated to the motor vehicle emissions budget (for transportation conformity) the amount that should be dedicated to future industrial growth, or the amount that should be reserved as an additional margin (safety margin) of air quality.

C. Monitoring Network

The 1995-1996 Medford CO survey confirmed that the existing continuous monitors at the Brophy Building and Rogue Valley Mall are recording the highest CO values for the Medford area.

D. Verification of Continued Attainment/Tracking Methods

The CO monitors at the downtown Brophy Building and Rogue Valley Mall will continue to monitor CO in the area. A tracking method (i.e. a periodic emission inventory, evaluation of projection factors, or similar technique) will be evaluated and addressed in the final maintenance plan.

E. Contingency Measures

Two phases of contingency measures are established in the submitted Maintenance Plan. These will provide additional techniques to reduce the risk of future air quality violations. The contingency measures and their triggering mechanisms are described in section 4.52.3.3 of the submitted plan.

Schedule for Completion

- Technical work completed: October 23, 2000
- Topic Review Meeting: October 31, 2000
- Authorization for public hearings: November 14, 2000
- Submit Legal Notice for Bulletin: November 15, 2000
- Public Hearing: ~ January 5, 2001
- EQC adoption: March 9, 2001
- EPA submittal: April 10, 2001
- EPA approval (18 months): October 10, 2003

Oregon Department of Environmental Quality

Annette Liebe, Air Quality Planning Manager Date

Region 10 Environmental Protection Agency

Bonnie Thie, State & Tribal Programs Manager Date

Vehicle Emission Summaries in EPA-Required Formats

6/2/2000

Table 2.6.7: Summary of the 1993 and 2015 On-Road Mobile Source Carbon Monoxide Emissions Reported by Roadway Classification (Weekday)

		Emissions (Lbs/Day except Annual)						
Year	Inventory	Interstate	State Highway	Arterial	Collector	Freeway Ramp	Local	
1993	Annual (tons/year)	1,810	2,771	3,408	1,994	#REF!	1,482	#REF!
1993	CO Season Weekday	9,905	14,652	16,230	9,498	#REF!	7,057	#REF!

Table 2.6.6: Summary of the 1993 and 2015 On-Road Mobile Source Carbon Monoxide Emissions Reported by Vehicle Class (Weekday)

		Emissions (Lbs/Day except Annual)							
Year	Inventory	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC
1993	Annual (tons/year)								
1993	CO Season Weekday	24,195	6,845	3,770	3,846	11	5	977	224

CO Season Wkdy VMT:	958,407
Annual 7 Day Daily Ave. VMT:	1,108,179

Determination of Table 2.6.6.

1993 CO Emissions by Vehicle Type (at Composite Speed of 34 mph)									
	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	
Vehicle Type as % of All Fleets	0.607	0.19	0.091	0.034	0.005	0.002	0.063	0.008	
EF for 87% of All Fleets (gm/mi)	17.87	15.85	18.12	51.88	1.02	1.19	7.34	12.99	
EF for 4% of All Fleets (gm/mi)	21.9	21.06	24.69	55.44	1.02	1.19	7.34	12.99	
EF for 9% of All Fleets (gm/mi)	27.13	26.86	31.71	68.64	1.02	1.19	7.34	16.02	
Composite Emission Factor (gm/mi)	18.86	17.05	19.61	53.53	1.02	1.19	7.34	13.26	
Seas. Wkdy Emis/Veh. Grp. (lbs.)	24,195	6,845	3,770	3,846	11	5	977	224	39,872
Annual Emis/Veh. Grp. (Tons)	5,106	1,444	795	812	2	1	206	47	

Appendix D3-4-3
Regional Emission Forecast, Medford UGB

Introduction

This appendix forecasts carbon monoxide emissions for the Medford Urban Growth Boundary (UGB) area. The forecasts are based on the 1993 Carbon Monoxide Emission Inventory (E.I.) for the region (see Appendix D3-4-2). In particular, explanation of and worksheets for estimating On-Road vehicle emissions in 2015 are included with the 1993 E.I. Forecasts represent weekday conditions during the carbon monoxide season (November to January). Emissions are projected from 1993 to 2015, the duration of the maintenance plan.

The emission forecasts rely primarily on the following guidance documents:

- *Procedures for Preparing Emission Projections*, EPA Office of Air Quality Planning and Standards, EPA-450/4-91-019, July 1991.

- *Guidance on Projection of Nonroad Inventories to Future Years*, Memorandum from Philip Lorang, EPA Office of Mobile Sources, Emission Planning and Strategies Division, February 4, 1994.

In addition to the 1993 Emission Inventory, emission forecasts rely on projections of future emission causing activity levels and projections of future emission control requirements. Because these factors vary for each emission source category, the forecasts are presented by category in this appendix.

Projections of future activity levels are based on annual growth factors selected as appropriate growth indicators for each emission source category. The growth factors used for each category are summarized in Table 1.

The forecasts for CO emissions are summarized in Table 2. The table summarizes emissions from point, area, non-road mobile and on-road mobile sources. The forecast assumes that oxygenated fuel is continued only through the year 2000. The forecast also assumes that in the year 2000 the On-Road vehicle Inspection and Maintenance program changes to exclude the four newest years of vehicles.

Growth Factor Development

Since levels of growth are varied depending upon the type of CO source category, a variety of applicable growth factors were developed for application to the 2015 emission inventory. Rogue Valley Council of Governments, and the Oregon Department of Transportation assessed pertinent growth patterns within the Medford UGB. Oregon DEQ calculated the appropriate growth rates for population, households, employment,

and VMT. DEQ developed the growth rates for wood use based on analysis of woodheating surveys between 1985 and 1997.

Growth Factor Implementation

The selected growth rates were applied by DEQ staff for point, area, and non-road mobile source categories. Growth rates to the on-road mobile source category were derived by the newest Regional Transportation model. Point, area, and non-road mobile sources were grown at a simple, linear, non-compounding rate from 1993 to 2015 using the following formula (except the area source/residential wood combustion category):

1993 Attainment Year Value + ((Growth Rate) * (Number of Years from 1993) * (1993 Attainment Year Value))

For example, for a selected sub-category for the year 2015, with a 1993 value of 10 tons per year, and a growth rate of 1%:

10 tpy in 1993 + ((.01 growth) * (22 years) * (10 tpy in 1993)) = 12.2 tpy in 2015

The residential wood combustion category subsections were grown in two ways. Fireplace, certified woodstove, and pellet stove growth assumed a growth rate according to the estimate of new devices added to both the existing stock of housing units in 1993 and to new housing built or projected to be constructed after 1993, using the formula:

(1993 emissions) + (((emissions per device) * (No. of devices in existing RWC HUs))) + ((emissions per device) * (No. of devices in new RWC HUs)) * (No. of years from 1993)

Because of the decline in the population of the noncertified woodstove subcategory, a compounded negative growth rate was selected in order to prevent the premature elimination of all devices that would occur if a linear rate of decline was applied. The compound rate of decline is represented by the formula:

(previous year emissions) * (1 + (-6.7% growth rate))

Appendix D3-5
(Volume 3)
CONFORMITY PROCESS

[Note: This section is basically the same as the 1998 edition of the Medford CO Maintenance Plan with the exception that references to the revised rule numbering system are added.]

The transportation conformity process for Oregon is contained in OAR 340-020-0710 et. seq. . [Transportation Conformity rules were renumbered to OAR 340-252-0010 through 340-252-0290 in 1999.] The transportation conformity rules were adopted by the Environmental Quality Commission on March 3, 1995 and became effective on March 23, 1995. EPA approved the transportation conformity rules as a SIP revision on May 16, 1996. The state rules are more effective, more efficient and more equitable than the federal regulations because:

1. they require all transportation control measures to be implemented in a timely manner regardless of their eligibility for federal funding;
2. they require consistency with emissions budgets while EPA reviews maintenance plans for approval;
3. they require analysis of localized air quality impacts for some state and locally funded projects.

The conformity rules also establish interagency consultation procedures for making conformity determinations for Regional Transportation Plans and Transportation Improvement Programs and for developing transportation related provisions of the maintenance plan.

Appendix D3-5
(Volume 3)
CONFORMITY PROCESS

[Note: This section is basically the same as the 1998 edition of the Medford CO Maintenance Plan with the exception that references to the revised rule numbering system are added.]

The transportation conformity process for Oregon is contained in OAR 340-020-0710 et. seq. . [Transportation Conformity rules were renumbered to OAR 340-252-0010 through 340-252-0290 in 1999.] The transportation conformity rules were adopted by the Environmental Quality Commission on March 3, 1995 and became effective on March 23, 1995. EPA approved the transportation conformity rules as a SIP revision on May 16, 1996. The state rules are more effective, more efficient and more equitable than the federal regulations because:

1. they require all transportation control measures to be implemented in a timely manner regardless of their eligibility for federal funding;
2. they require consistency with emissions budgets while EPA reviews maintenance plans for approval;
3. they require analysis of localized air quality impacts for some state and locally funded projects.

The conformity rules also establish interagency consultation procedures for making conformity determinations for Regional Transportation Plans and Transportation Improvement Programs and for developing transportation related provisions of the maintenance plan.

Appendix D3-6
Historical and Projected
Population, Employment and Households
for the Medford UGB

	Population	Employment	Housing
1993 (extrapolated)	54,644	33,534	22,054
1995 (model)	56,122	34,498	22,652
2015[1] (interpolated)	73,363	39,322	29,606
2020 (model)	78,443	41,734	31,655

Note: Data are based on the travel model used for the Rogue Valley Metropolitan Planning Organization Regional Transportation Plan for fiscal years 2000 to 2020. Because that transportation plan does not provide figures for 1993 or 2015, values for those years are determined by straight-line interpolation or extrapolation from the values reported for the years 1995 and 2020.s

Appendix D3-7
(Volume 3)
New Source Review Program Changes

[Note: This section is unchanged from the 1998 edition of the Medford CO Maintenance Plan with the exception that references to the revised rule numbering system are added.]

The major New Source Review (NSR) program is required by the federal Clean Air Act to ensure that proposed major sources and modifications do not cause or contribute to a significant impact on air quality standards, increments or visibility. Oregon's NSR program, originally adopted in 1981, was amended in 1992 to address requirements of the 1990 Clean Air Act Amendments.

The NSR program contains requirements for sources in nonattainment areas (OAR 340-028-1930), sources in maintenance areas (OAR 340-028-1935) and Prevention of Significant Deterioration (PSD) requirements for sources in attainment areas (OAR 340-028-1940). [In 1999 the above rules were renumbered to OAR 340-224-0050, 340-224-0060 and 340-224-0070, respectively.]

Under the current program, new or expanding major industrial sources in maintenance areas are subject to Best Achievable Control Technology and any remaining emissions must be either accommodated within a growth allowance or offset by reductions elsewhere. In Medford a growth allowance is not available because projected future emissions are based on actual (not permitted) emission levels. In order to create a growth allowance, permitted emissions must be less than the attainment levels established in the maintenance plan. The Department proposed an amendment to the program to allow CO sources in maintenance areas the option of modeling the proposed emission increase to demonstrate no significant impact in lieu of obtaining offsets. The Environmental Quality Commission considered and approved this amendment at its August 7th, 1998 meeting.

DIVISION 28

STATIONARY SOURCE AIR POLLUTION CONTROL AND PERMITTING PROCEDURES

340-028-1935 [Renumbered to OAR 340-224-0050 in 1999]
Requirements for Sources in Maintenance Areas

Proposed major sources and major modifications that would emit a maintenance pollutant within a designated ozone or carbon monoxide maintenance area, including VOC or NO_x in a designated ozone maintenance area, must meet the requirements listed below:

(1) BACT. Except as provided in Section (7) of this rule, the owner or operator of the proposed major source or major modification shall apply BACT for each maintenance pollutant emitted at a significant emission rate. For a major modification, the requirement for BACT applies only to each new or modified emission unit that increases emissions. For phased construction projects, the determination of BACT must be reviewed at the latest reasonable time before commencement of construction of each independent phase.

(2) Source Compliance. The owner or operator of the proposed major source or major modification shall demonstrate that all major sources owned or operated by such person (or by an entity controlling, controlled by, or under common control with such person) in the state are in compliance or on a schedule for compliance with all applicable emission limitations and standards under the Act.

(3) Air Quality Protection:

(a) Offsets or Growth Allowance. Except as provided in Subsection (b) of this Section, the owner or operator of the proposed major source or major modification shall provide offsets as specified in OAR 340-028-1960 and 340-028-1970. Except as provided in Section (7) of this rule, the requirements of this Section may be met in whole or in part in an ozone or carbon monoxide maintenance area with an allocation by the Department from a growth allowance, if available, in accordance with Section (8) of this rule and the applicable maintenance plan in the SIP adopted by the Commission and approved by EPA. An allocation from a growth allowance used to meet the requirements of this Section is not subject to OAR 340-028-1960 and 340-028-1970.

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(b) Modeling. A proposed major source or modification which would emit carbon monoxide emissions within a carbon monoxide maintenance area is exempt from Subsection (b) of this Section providing it can demonstrate that the source or modification will not cause or contribute to a significant air quality impact equal to or greater than 0.5 mg/m^3 (8 hour average) and 2 mg/m^3 (1-hour average).

(4) Net Air Quality Benefit. If emission reductions or offsets are required, the applicant shall demonstrate that a net air quality benefit will be achieved in the affected area as described in OAR 340-028-1970. Applicants in an ozone maintenance area shall demonstrate that the proposed VOC or NO_x offsets will result in a 10% net reduction in emissions, as required by OAR 340-028-1970(3)(c) .

(5) Alternative Analysis:

(a) Except as provided in Subsection (c) of this Section, the owner or operator of the proposed major source or major modification shall conduct an alternative analysis;

(b) This analysis must include an evaluation of alternative sites, sizes, production processes, and environmental control techniques for such proposed source or modification which demonstrates that benefits of the proposed source or modification significantly outweigh the environmental and social costs imposed as a result of its location, construction or modification;

(c) This analysis is not required for a major source or major modification that is subject to this rule solely due to emissions of particulate matter in a designated TSP maintenance area.

(6) Additional Requirements For Listed Sources. In addition to other requirements of this rule, the following sources must comply with OAR 340-028-1940 for emissions of the maintenance pollutant:

(a) Sources with potential emissions of any regulated air pollutant equal to or greater than 250 tons/year; and

(b) Sources with potential emissions of any regulated air pollutant equal to or greater than 100 tons/year in the following source categories:

(A) Fossil fuel-fired steam electric plants of more than 250 million BTU/hour heat input;

(B) Coal cleaning plants with thermal dryers;

(C) Kraft pulp mills;

(D) Portland cement plants;

(E) Primary Zinc Smelters;

(F) Iron and Steel Mill Plants;

(G) Primary aluminum ore reduction plants;

(H) Primary copper smelters;

(I) Municipal Incinerators capable of charging more than 250 tons of refuse per day;

(J) Hydrofluoric acid plants;

(K) Sulfuric acid plants,

(L) Nitric acid plants;

(M) Petroleum Refineries;

(N) Lime plants;

(O) Phosphate rock processing plants;

(P) Coke oven batteries;

(Q) Sulfur recovery plants;

(R) Carbon black plants, furnace process;

(S) Primary lead smelters;

(T) Fuel conversion plants;

(U) Sintering plants;

(V) Secondary metal production plants;

(W) Chemical process plants;

(X) Fossil fuel fired boilers, or combinations thereof, totaling more than 250 million BTU per hour heat input;

(Y) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;

(Z) Taconite ore processing plants;

(AA) Glass fiber processing plants;

(BB) Charcoal production plants.

(7) Contingency plan requirements. If the contingency plan in an applicable maintenance plan is implemented due to a violation of an ambient air quality standard, this Section applies in addition to other requirements of this rule until the Commission adopts a revised maintenance plan and EPA approves it as a revision to the SIP.

(a) The requirement for BACT in Section (1) of this rule is replaced by a requirement for LAER.

(b) An allocation from a growth allowance may not be used to meet the requirement for offsets in Section (3) of this rule.

(c) The exemption provided in Subsection (b) of Section (3) of this rule for major sources or major modifications within a carbon monoxide maintenance area shall no longer apply.

(8) Growth Allowance Allocation.

(a) Medford-Ashland Ozone. The growth allowance in the Medford Maintenance Area for Ozone is allocated on a first-come-first-served basis depending on the date of submittal of a

complete permit application. No single source shall receive an allocation of more than 50% of any remaining growth allowance. The allocation of emission increases from the growth allowance is calculated based on the ozone season (May 1 to September 30 of each year).

(b) Portland Ozone and Carbon Monoxide. Procedures for allocating the growth allowances for the Oregon portion of the Portland-Vancouver Interstate Maintenance Area for Ozone and the Portland Maintenance Area for Carbon Monoxide are contained in OAR 340-030-0730 and 340-030-0740.

(9) Pending Redesignation Requests. This rule does not apply to a proposed major source or major modification for which a complete application to construct was submitted to the Department before the maintenance area was redesignated from nonattainment to attainment by EPA. Such a source is subject to OAR 340-028-1930.

[NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the EQC under OAR 340-020-0047.]

[Publications: The publication(s) referred to or incorporated by reference in this rule are available from the office of the Department.]

Stat. Auth.: ORS 468.020

Stats. Implemented: ORS 468A.025

Hist.: DEQ 26-1996, f. & cert. ef. 11-26-96

APPENDIX D3-8

Rollforward Analysis

The Department conducted rollforward analysis (proportional modeling) for the two Medford carbon monoxide (CO) DEQ "hot spot" monitoring sites and four other hot spot intersections listed below.

Central and Main (DEQ hot spot monitoring site)
McAndrews and Riverside (DEQ hot spot monitoring site)
Riverside/Crater Lake Highway (Big Y)
Biddle and McAndrews
Highway 99 and Stewart
Crater Lake Avenue and McAndrews

This report provides information on the general methodology employed, selection of background concentrations, example calculations, and a summary of the results. The following technical data is included: traffic counts (Oregon Department of Transportation), 1990 and 2015 transportation model link volumes and speeds (Rogue Valley Council of Governments--RVCOG), spreadsheet calculations of 8-hour CO emissions, and Mobile5b Cold CO input and output data sets.

General Methodology

The generalized rollforward formula is given below:

Prediction Yr. CO Conc. = [Base Yr. CO Conc. - Background Conc.]*
[Pred. Yr. Ems.]/[Base Yr. Ems.] +
Background Conc.,

Where Prediction Yr. CO Conc. is the predicted future estimated concentration, calculated in parts per million (ppm);

Base Yr. CO Conc. is the baseline or design concentration;

Background Conc. is the estimated concentration from sources other than the traffic-based emissions passing in close proximity to the prediction site;

Pred. Yr. Ems. is the estimate of CO emissions on the traffic links (street segments) directly impacting the prediction site for the prediction year;

Base Yr. Ems. is the estimate of CO emissions on the traffic links (street segments) directly impacting the prediction site

for the year corresponding to the baseline or design concentration.

For this analysis, 8-hour average CO concentrations were calculated using corresponding 8-hour CO emissions. Based on consultation with the U.S. Environmental Protection Agency Region 10 office, CO emission factors were calculated with a version of Mobile5, Mobile5b Cold CO, that incorporated the effects of oxygenated fuel to be included in the updated Mobile6 model. The 8-hour CO emission calculations were segmented into two parts: an off peak period portion and a peak period portion. The city of Medford's biennial traffic flow maps for the central area of Medford were used to establish baseline 1993, 24-hour traffic volumes for the analyzed intersections. Eight-hour factors were developed from ODOT-conducted manual counts. RVCOG's transportation model output link volumes (1990 and 2015) for the analyzed intersections were used to develop growth factors to apply to the 1993 traffic volumes. (The growth factors were based on RVCOG's modeling work performed in 1998. This modeling indicated VMT within the Urban Growth Boundary would increase by 2.6 percent per year. A subsequent modeling update in 2000 showed VMT increasing by 1.8 percent per year.)

For the Rogue Valley Mall area, an 8-hour period from 3:00 P.M. to 11:00 P.M. was selected based on CO monitoring data. For Central and Main (Brophy CO monitoring site), an 8-hour period from 10:00 A.M. to 6:00 P.M. was selected based on the monitoring data. The 8-hour CO emissions were segmented into two parts: an off peak period and a peak period. Based on traffic count data, which showed similar volumes for three hours, a peak period of three hours was used, except for the Highway 99/Stewart intersection where one hour was used. The following design concentrations were used:

Central and Main (Brophy)	6.9 ppm
McAndrews and Riverside (Rogue Valley Mall)	7.5 ppm.

Carbon monoxide emissions (8-hour) were calculated for each leg of the intersection in grams/mile and summed for an intersection total. In addition to the segmentation by time of day, the traffic volumes in the central area of Medford were assumed to have a mix of vehicle control technology, commensurate with the point of origin. Through traffic (nine percent), without an origin in the greater Medford area, was assumed to reflect only federal motor vehicle emission control technology. Traffic originating within the Medford-Ashland Air Quality Maintenance Area--AQMA (87 percent) was assumed to reflect the benefits of the motor vehicle inspection program and the emission reductions from the oxyfuel program (in 1993). Traffic originating in the county, but outside the AQMA and destined to the central area of Medford (four percent), was assumed to reflect the emission reductions from oxyfuel (in 1993), but not reflect the benefits of the motor vehicle inspection program.

For the 2015 intersection emission calculations, the Mobile5b Cold CO inputs reflected the maintenance strategy elimination of the oxygenated fuel program and the following changes to the motor vehicle inspection program: 1) exemption for vehicles up to four years old; and 2) inspection of on-board diagnostic systems installed in 1996 and newer vehicles.

Background CO Concentrations

Based on the 1995/1996 special DEQ CO bag sampling study, DEQ determined appropriate background levels to apply in the prediction formula. Two neighborhood scale sites were operated during the 1995/1996 study. One site was located in North Medford and the other site (known as the Washington School site) was located approximately one mile to the southwest of the downtown core area in a residential area. The North Medford site was located just to the north of the Big Y in Railroad Park, between Table Rock Rd. to the west, and Crater Lake Highway and I-5 to the south and east. For the sampling study, these two sites ranked lowest (out of a total of 13 sites) and second lowest in average concentration. The maximum 8-hour CO concentrations for the study duration at the two neighborhood scale sites occurred on January 3, 1996. The Railroad Park site in north Medford recorded a level of 3.8 ppm, and the Washington School site recorded a level of 3.0 ppm. This 3.0 ppm estimate of background for the Brophy site is approximately one-half the level of the 1996 annual second highest 8-hour maximum CO concentration (6.4 ppm) recorded at the site. The January 3, 1996, date turned out to be the day with the second highest 8-hour CO concentration for the permanent, DEQ Rogue Valley Mall CO monitoring site for the year 1996. Hence, the use of 3.8 ppm as the 8-hour CO background for the Rogue Valley Mall site appears to be a reasonable estimate of the upper level of background.

Non-monitored Hot Spots

Three of the non-monitored hot spot locations were located in the North Medford area, making the Rogue Valley Mall permanent monitoring site a reasonable baseline site for proportioning emissions to 2015. The Big Y intersection is located approximately one-third of a mile to the north of the Rogue Valley Mall monitor, with North Riverside the street common to both sites. The Biddle and McAndrews intersection is located approximately one-quarter mile directly to the east of the Rogue Valley Mall monitor, and the Crater Lake Avenue and McAndrews intersection is located approximately 0.8 mile east of the Rogue Valley Mall monitor.

The other non-monitored hot spot location, Highway 99 and Stewart is located near the south interchange with I-5. Although the downtown core area Brophy site is closer to this location than the Rogue Valley Mall site, the latter site was used for the baseline comparison because it is similar in character to the south interchange area.

Example Calculations (Brophy Monitor)

Calculations of 2015 estimated 8-hour CO concentrations are presented for the Brophy monitoring site at Central and Main. The first step was to obtain estimates of 1993, 24-hour traffic volumes for the intersection of Central and Main. Traffic flow maps for 1992 and 1994 from the city of Medford were used to determine 1993, 24-hour volumes. ODOT manual traffic counts were used to factor the 24-hour volumes into 8-hour estimates. The 8-hour traffic volumes were divided into a peak period segment and an off-peak segment. Based on the counts, the intersection was divided into a 3-hour peak period and a 5-hour off-peak period. The modeled traffic volumes for 1990 and 2015,

from the RVCOG application of EMME/2 were used to obtain growth factors by direction, i.e., east and west legs and north and south legs. The growth factors were applied to the 1993 volumes to yield estimated 2015 volumes.

Various sources, including speed run data, ODOT and RVCOG-provided data, were used to determine baseline speeds for 1993. The RVCOG model was based on a 24-hour period, so link speeds from the model were assumed to be representative of the off-peak period. ODOT conducted extensive speed runs in the central area of Medford in 1986, covering off-peak and peak conditions. Peak period speeds for 2015 were based on volume to capacity calculations. Given the fact that traffic volumes on Central showed no growth between 1978 (13,700 vehicles per day) and 1995 (13,500 vehicles per day), the 1986 speed run data was still assumed to be indicative of 1993 speed conditions on Central.

Based on monitoring data, the maximum 8-hour period for CO at the Brophy Building monitoring site was predominately centered on the time span of 10:00 A.M. to 6:00 P.M. The 1993 baseline traffic volumes, determined from the city of Medford traffic flow maps, were factored to this time span using ODOT's manual count from 11/16/93. The resulting 8-hour traffic volumes for the intersection were split into a peak period segment and an off-peak segment for the 2015 projection year. However, for the existing 1993 condition, Central Ave. was assumed to operate at 13.0 miles per hour for the entire 8-hour period, identical to the speed used by the transportation model for this segment of Central Ave. Similarly, Main St. was assumed to operate at 14.1 miles per hour for the entire 8-hour period in 1993, also based on the transportation model.

For the 2015 projections, DEQ factored the baseline 1993 traffic volumes using the RVCOG EMME/2 corresponding intersection leg traffic volumes for 1990 and 2015 to derive growth factors for each leg. Peak period speeds were determined by comparing corresponding volumes to approach capacity. The expected increase in traffic on Central Ave. would result in peak period volumes approaching its capacity. For 2015, Central Ave. was assumed to have a traffic flow of 1,500 vehicles per hour for a three-hour peak. The following arterial delay function was applied to determine the 2015 peak period speed:

$$\text{Delay} = 2 + [16(1 - .8298\ V/C)^2 + 1.3610]^{0.5} + 3.3192(V/C) - 5.1666$$

Delay factors were calculated for the baseline condition at 13.0 miles per hour (mph) and for 2015. The ratio of the delay factors yielded an estimated 2015 peak period speed of 11.0 mph on Central.

By contrast, there would be ample reserve capacity on Main St. to handle the expected traffic growth, so the future travel speed on Main St. was assumed to stay at the 1993 level. The 1993 and 2015 traffic volumes and speeds for the Central/Main intersection are tabulated below.

Central/Main Traffic Volumes and Speeds

Street Segment	1993 24-Hr Volume	2015 24-Hr Volume	1993 Peak Per. Speed, mph	1993 Off-Peak Speed, mph	2015 Peak Per. Speed, mph	2015 Off-Peak Speed, mph
Central North of Main	13,800	19,300	13.0	13.0	11.0	13.0
Central South of Main	13,600	19,100	13.0	13.0	11.0	13.0
Main East of Central	8,200	11,400	14.1	14.1	14.1	14.1
Main West of Central	9,800	13,600	14.3	14.3	14.3	14.3

The calculation of 1993, 8-hour CO emissions for Central and Main is shown below. The tabulated emission factors came from the Mobile5b Cold CO model and included the effects of off-cycle emissions.

Central and Main 1993, 8-Hour Volumes

Leg	24-Hour Vol.	24-Hr Vol. * 0.730	8-Hr Vol. * 0.87	8-Hr Vol. *0.04	8-Hr Vol. * 0.09
Central N of Main	13,800	10,074	8.764	403	907
Central S of Main	13,600	9,928	8,637	397	894
Main E of Central	8,200	5,986	5,208	239	539
Main W of Central	9,800	7,154	6,224	286	644

Central and Main 1993, 8-Hour CO Emissions
(Central at13.0 mph and Main at 14.1 mph)

Leg	1993 Vol.	1993 CO EF w/ Oxy + I/M	1993 CO EF w/ Oxy, No I/M	1993 CO EF No Oxy, No I/M	1993 CO Em's, gm/mi
Central N of Main	8,764	48.131			421,820
	403		57.684		23,247
	907			71.135	64,520
Central S of Main	8,637	48.131			415,707
	397		57.684		22,901
	894			71.136	63,596
Main E of Central	5,208	45.165			235,219
	239		54.007		12,908
	539			66.524	35,856
Main W of Central	6,224	44.676			278,063
	286		53.4		15,273
	644			65.763	42,351
Total Em's					1,631,461

Due to the significant growth factor (1.40 for the 1990 to 2015 period), which was based on the RVCOG transportation model output for Central, traffic volumes were assumed to spread beyond the existing 8-hour period. The 8-hour factor was lowered to 0.60, and the 3-hour peak period was assumed to operate at 1,500 vehicles per hour (90 percent of capacity). Main would have reserve capacity in 2015, so the 8-hour period was assumed to operate at the same speed as 1993. The segmented 2015, 8-hour volumes for Central are shown below, with the 5-hour volumes followed by the 3-hour volumes.

Central 2015, Segmented 8-Hr Volumes

Leg	5-Hr Vol.	5-Hr Vol. * 0.87	5-Hr Vol. * 0.04	5-Hr Vol. * 0.09
Central N of Main	7,100	6,177	284	639
Central S of Main	6,900	6,003	276	621

Leg	3-Hr Vol.	3-Hr Vol. * 0.87	3-Hr Vol. * 0.04	3-Hr Vol. * 0.09
Central N of Main	4,500	3,915	180	405
Central S of Main	4,500	3,915	180	405

Main 2015, 8-Hour Volumes

Leg	8-Hr Vol.	8-Hr Vol. * 0.87	8-Hr Vol. * 0.04	8-Hr Vol. * 0.09
Main E of Central	6,840	5,951	274	615
Main W of Central	8,170	7,108	327	735

The 2015 CO emission calculations for Central and Main are shown below. The tabulated emission factors came from the Mobile5b Cold CO model and included the effects of off-cycle emissions as well as the maintenance plan strategy for motor vehicles.

2015, 8-Hour CO Emissions for Central North of Main

Central N of Main	5-Hr Vol.	2015 CO EF w/o Oxy + I/M @ 13.0 mph	2015 CO EF w/o Oxy, No I/M @ 13.0 mph	2015, 5-Hr CO Em's, gm/mi
	6,177	15.322		94,644
	284		16.572	4,706
	639		16.572	10,590
	3-Hr Vol.	2015 CO EF w/o Oxy + I/M @ 11.0 mph	2015 CO EF w/o Oxy, No I/M @ 11.0 mph	2015, 3-Hr CO Em's, gm/mi
	3,915	16.905		66,183
	180		18.282	3,291
	405		18.282	7,404
Total				186,818

2015, 8-Hour CO Emissions for Central South of Main

Central S of Main	5-Hr Vol.	2015 CO EF w/o Oxy + I/M @ 13.0 mph	2015 CO EF w/o Oxy, No I/M @ 13.0 mph	2015, 5-Hr CO Em's, gm/mi
	6,003	15.255		91,576
	276		16.572	4,574
	621		16.572	10,291
	3-Hr Vol.	2015 CO EF w/o Oxy + I/M @ 11.0 mph	2015 CO EF w/o Oxy, No I/M @ 11.0 mph	2015, 3-Hr CO Em's, gm/mi
	3,915	16.831		65,893
	180		18.282	3,291
	405		18.282	7,404
Total				183,029

2015, 8-Hour CO Emissions for Main

Main E of Central	8-Hr Vol.	2015 CO EF w/o Oxy + I/M @ 14.1 mph	2015 CO EF w/o Oxy, No I/M @ 14.1 mph	2015, 8-Hr CO Em's, gm/mi
	5,951	14.625		87,033
	274		15.182	4,333
	615		15.182	9,724
Total				101,090
Main W of Central	8-Hr Vol.	2015 CO EF w/o Oxy + I/M @ 14.3 mph	2015 CO EF w/o Oxy, No I/M @ 14.3 mph	
	7,108	14.509		103,130
	327		15.692	5,131
	735		15.692	11,534
Total				119,795

Summing up the intersection leg CO emissions, the total 8-hour, 2015 CO emissions for the Central and Main intersection is 590,732 gm/mi. Using the rollforward formula, the estimated 2015, 8-hour CO concentration for Central and Main (without the oxygenated fuel program and the existing motor vehicle inspection program) is calculated as follows.

2015 8-Hr CO Conc. = (6.9 ppm - 3.0 ppm)(2015 8-Hr CO Ems)/
(1993 8-Hr CO Ems) + 3.0 ppm
= (3.9 ppm)(590,732 gm/mi)/(1,631,461 gm/mi)
+ 3.0 ppm
= 4.4 ppm

Rogue Valley Mall Monitoring Site

Traffic flow maps for 1992 and 1994 from the city of Medford were used to determine 1993, 24-hour volumes for McAndrews and Riverside. Based on monitoring data, the maximum 8-hour period for CO at the Rogue Valley Mall monitoring site predominately centered on the time span of 3:00 P.M. to 11:00 P.M. Daily traffic volumes at the intersection of McAndrews and Riverside were factored to this time span. The resulting 8-hour traffic volumes for the intersection were split into a peak period segment and an off-peak segment. Based on an ODOT 1991 manual traffic count, which covered a 16-hour period at the Big Y (just to the north of the monitoring site), a peak period of 3:00 P.M. to 6:00 P.M. was selected.

ODOT conducted a 1991 calendar year analysis of the Rogue Valley Mall monitoring site. ODOT's speed data from the analysis for 1991 was assumed to apply to the 1993

attainment year. DEQ factored the 1993 baseline traffic volumes on the basis of the 1990 and 2015 intersection volumes output by the RVCOG transportation model. Off-peak travel speeds for McAndrews and Riverside in the vicinity of the Rogue Valley Mall were determined on the basis of an evaluation of speed run data, EMME/2 output speeds, and the 1991 intersection data provided by ODOT. Peak period speeds were determined by comparing corresponding volumes to approach capacity. The 1993 and 2015 traffic volumes and speeds for the McAndrews/Riverside intersection are tabulated below.

McAndrews/Riverside Traffic Volumes and Speeds

Street Segment	1993 24-Hr Volume	2015 24-Hr Volume	1993 Peak Per. Speed, mph	1993 Off-Peak Speed, mph	2015 Peak Per. Speed, mph	2015 Off-Peak Speed, mph
Riverside North of McAndrews	21,400	28,000	24	34	20	34
Riverside South of McAndrews	19,100	27,100	21	28	17	28
McAndrews West of Riverside	21,200	24,500	18	23	18	23
McAndrews East of Riverside	25,000	28,300	18	23	18	23

The spreadsheet calculation of the 2015, 8-hour CO emissions at the Rogue Valley Mall monitoring site is contained in the Technical Data and Supporting Documentation.

Riverside/Crater Lake Highway (Big Y)

The Big Y is expected to be reconstructed by 2015. The project is included in the financially constrained 2015 network of the Transportation System Plan developed by the RVCOG. The basic design concept is to widen and realign Crater Lake Highway to the north to intersect the Rogue Valley Highway at a right angle. The Jacksonville Highway (Oregon 238) would be built on new alignment to the west of the Big Y and tie in directly opposite the realigned section of the Crater Lake Highway. ODOT provided DEQ with traffic data which is to be incorporated into an Environmental Impact Statement (EIS), under development in 1997. The ODOT EIS traffic volume data was slightly higher than the comparable volumes output by the RVCOG transportation model. The ODOT data included estimates of peak hour speeds, so DEQ utilized the ODOT EIS traffic data to estimate 2015, 8-hour CO emissions. The 2015 traffic volumes and speeds for the Big Y are tabulated below.

Big Y Traffic Volumes and Speeds

Street Segment	2015 24-Hr Volume	2015 Peak Hour Volume	2015 Off-Peak Speed, mph	2015 Peak Hour Speed, mph
Highway 99 NW	33,500	3,180	38	29
Court St. S	20,300	1,930	33	25
Riverside SE	22,100	2,100	35	35
Crater Lake Hwy NE	37,000	3,520	35	29
New OR 238	9,800	940	35	32

The 24-hour volumes were factored into 8-hour volumes for the period from 3:00 P.M. to 11:00 P.M. The ODOT-generated, peak hour speeds were assumed to apply to a three-hour period. CO emissions were computed for the above street segments for the 2015 forecast year. The spreadsheet calculation of the 2015, 8-hour CO emissions for the Big Y intersection is contained in the Technical Data and Supporting Documentation.

Biddle and McAndrews

Traffic flow maps for 1992 and 1994 from the city of Medford were used to determine 1993, 24-hour volumes for Biddle and McAndrews. DEQ factored the 1993 baseline traffic volumes on the basis of the 1990 and 2015 intersection volumes output by the RVCOG transportation model. The peak period speeds were estimated by calculating volume to capacity ratios for the intersection approaches and applying the same delay function shown in the example calculations. The 24-hour volumes were factored into a 3-hour peak period and a 5-hour off-peak period. The 2015 traffic volumes and speeds for the Biddle Rd. and McAndrews intersection are tabulated below.

Biddle Rd. and McAndrews Traffic Volumes and Speeds

Section	2015 24-Hr Volume	2015 5-Hr Volume	2015 5-Hr Speed	2015 3-Hr Volume	2015 3-Hr Speed
Biddle Rd. North of McAndrews	31,800	4,260	27.5	8,140	25.7
Biddle Rd. South of McAndrews	28,500	3,820	19.6	7,300	19.5
McAndrews West of Biddle Rd.	36,100	4,840	21.0	9,240	19.7
McAndrews East of Biddle Rd.	36,800	4,930	25.5	9,420	23.4

CO emissions were computed for the above street segments for the 2015 forecast year. The spreadsheet calculation of the 2015, 8-hour CO emissions for the Biddle Rd. and McAndrews intersection is contained in the Technical Data and Supporting Documentation.

Crater Lake Avenue and McAndrews

Traffic flow maps for 1992 and 1994 from the city of Medford were used to determine 1993, 24-hour volumes for Crater Lake Avenue and McAndrews. DEQ factored the 1993 baseline traffic volumes on the basis of the 1990 and 2015 intersection volumes output by the RVCOG transportation model. The peak period speeds were estimated by calculating volume to capacity ratios for the intersection approaches and applying the same delay function shown in the example calculations. The 24-hour volumes were factored into a 3-hour peak period and a 5-hour off-peak period. The 2015 traffic volumes and speeds for the Crater Lake Ave. and McAndrews intersection are tabulated below.

Crater Lake Ave. and McAndrews Traffic Volumes and Speeds

Section	2015 24-Hr Volume	2015 5-Hr Volume	2015 5-Hr Speed	2015 3-Hr Volume	2015 3-Hr Speed
Crater Lake Ave. North of McAndrews	28,213	3,780	29.5	7,220	26.6
Crater Lake Ave. South of McAndrews	32,992	4,420	24.9	8,450	21.7
McAndrews West of Crater Lake Ave.	23,425	3,140	27.7	6,000	25.9
McAndrews East of Crater Lake Ave.	20,383	2,730	27.5	5,220	26.0

CO emissions were computed for the above street segments for the 2015 forecast year. The spreadsheet calculation of the 2015, 8-hour CO emissions for the Crater Lake Ave. and McAndrews intersection is contained in the Technical Data and Supporting Documentation.

Highway 99 and Stewart

Traffic flow maps for 1992 and 1994 from the city of Medford were used to determine 1993, 24-hour volumes for Highway 99 and Stewart. DEQ factored the 1993 baseline traffic volumes on the basis of the 1990 and 2015 intersection volumes output by the RVCOG transportation model. Baseline off-peak speeds for Highway 99 were determined by speed runs conducted on March 5, 1998. Based on the speed runs, an off-peak speed of 23.0 mph was used for Highway 99. Stewart, which provides access to the South Gateway Center, was assumed to have an off-peak speed of 25 mph. No manual count data was available for this intersection, so the peak period was assumed to be one hour. The 2015 traffic volumes and speeds for Highway 99 and Stewart are tabulated below.

Highway 99 and Stewart Traffic Volumes and Speeds

Section	2015 24-Hr Volume	2015 7-Hr Volume	2015 7-Hr Speed	2015 1-Hr Volume	2015 3-Hr Speed
Highway 99 North of Stewart	35,000	10,150	23.0	3,500	17.0
Highway 99 South of Stewart	38,700	11,220	23.0	3,870	17.0
Stewart West of Highway 99	24,000	6,960	25.0	2,400	17.0
Stewart East of Highway 99	21,400	6,206	25.0	2,140	17.0

CO emissions were computed for the above street segments for the 2015 forecast year. The spreadsheet calculation of the 2015, 8-hour CO emissions for the Highway 99 and Stewart intersection is contained in the Technical Data and Supporting Documentation.

Projected 8-Hour CO Concentrations

The resulting estimated 8-hour CO concentrations for the DEQ monitoring sites and the screened intersections are tabulated below.

2015 Second Highest Maximum 8-Hour CO Concentrations

Location	2015 8-Hr CO Concentration, ppm
Brophy Monitor	4.4
Rogue Valley Mall Monitor	5.2
Big Y	5.0
Biddle and McAndrews	5.6
Highway 99 and Stewart	5.4
Crater Lake Ave. and McAndrews	5.0