State Implementation Plan for PM_{10}
Medford-Ashland Air Quality Maintenance Area (AQMA)

4.14.1.0 Introduction

On July 1, 1987, the U.S. Environmental Protection Agency (EPA) promulgated federal ambient air quality standards for particles less than or equal to 10 micrometers in aerodynamic diameter (PM_{10}) to replace the Total Suspended Particulate (TSP) standard[1]. The standard became effective 30 days later on July 31, 1987. On August 7, 1987, EPA classified the Medford-Ashland Air Quality Maintenance Area as a Group I PM_{10} nonattainment area (52 FR 29383). Group I areas were those which had a greater than 95 percent probability of exceeding the PM_{10} National Ambient Air Quality Standards (NAAQS). Air monitoring in the mid 1980's showed that air quality within the Medford-Ashland AQMA violated PM_{10} standards (NAAQS).

Section 110 of the federal Clean Air Act required States to adopt and submit plans (State Implementation Plans or SIPs) to EPA within nine months after the effective date of the standard. The plan must provide for attainment of the standard as expeditiously as practicable, but no later than the Clean Air Act deadline of December 31, 1994[2].

The initial Medford-Ashland PM_{10} Attainment Plan was developed in the late 1980's and submitted to EPA in 1991. It adopted a suite of emission reduction strategies that have been successful in brining air quality into compliance with PM_{10} standards by the Clean Air Act deadline. Strategies were developed jointly by the Department and local Air Quality Advisory Committee, and included a mandatory residential woodsmoke curtailment program, restrictions on open burning, and lower emissions limits for major wood products industry. The plan was successful in bringing the AQMA into compliance by the Clean Air Act deadline. There has not been an exceedance of the 24-hr average or annual average PM_{10} standard in the Medford-Ashland Air Quality Maintenance Area (AQMA) area since 1991.

In 1996, the Department began working with a local advisory committee to update the attainment plan and develop the required maintenance plan that will allow EPA to revise the legal standing of the AQMA from nonattainment to attainment for PM_{10}. This document includes a PM_{10} attainment and maintenance plan for the Medford-Ashland AQMA. The plans will be submitted for approval to the Environmental Protection Agency (EPA) along with a request that the legal status of the Medford-Ashland AQMA be revised from nonattainment to attainment for PM_{10}.

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[1] A micrometer (um) is a unit of length equal to about 1/25,000 of an inch. For comparison, the thickness of a human hair is about 100 to 200 micrometers.

[2] Clean Air Act Section 188 (c)(1).

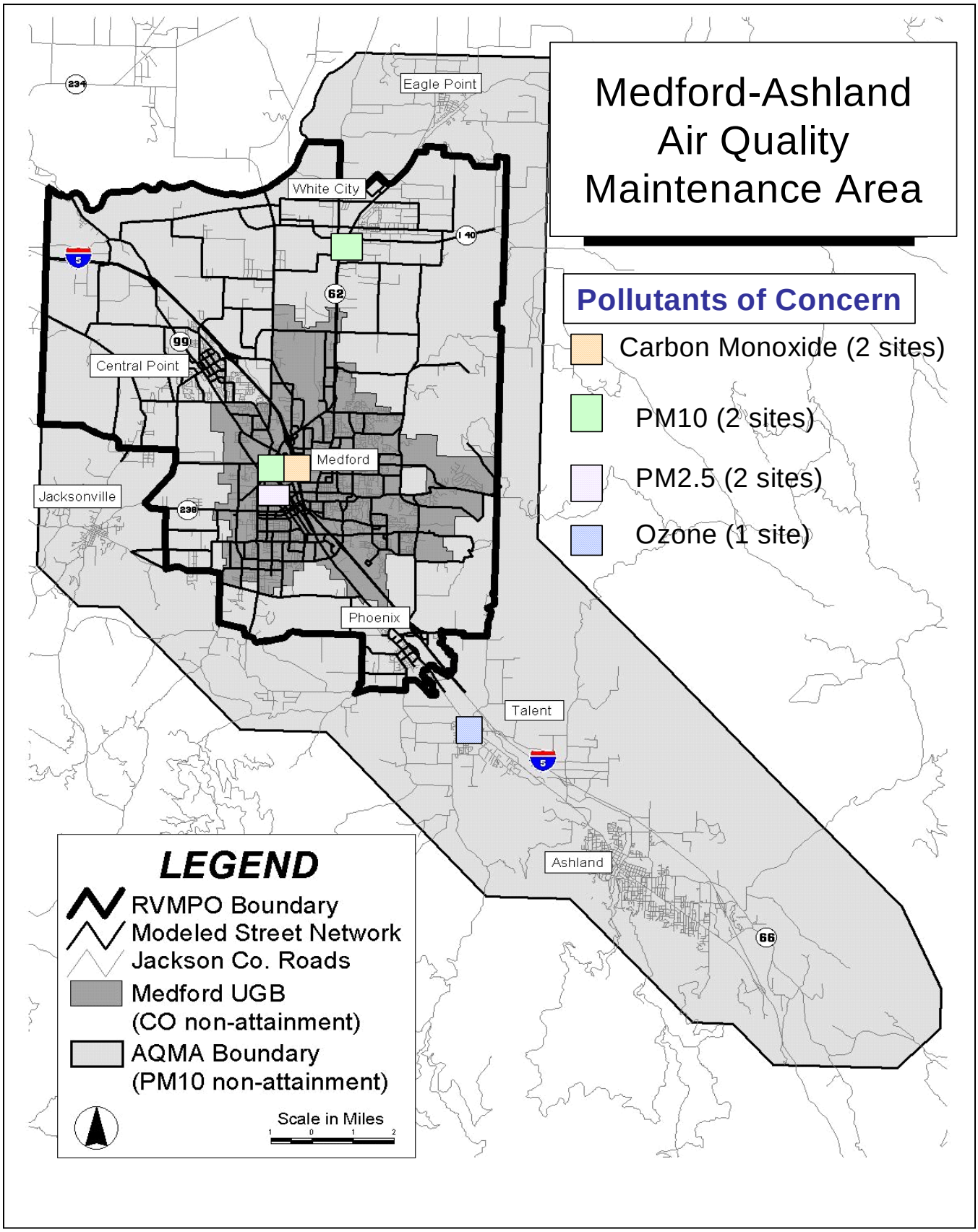
4.14.1.1 Area Description

The Medford-Ashland AQMA is located in a mountain valley formed by the Rogue River and one of its tributaries, Bear Creek. The major portion of the valley ranges in elevation from 1,300 to 1,400 feet above sea level. Mountains surround the valley on all sides: to the east, the Cascades, ranging up to 9,500 feet; to the south, the Siskiyous, ranging up to 7,600 feet; and to the west and north, the Coast Range and Umpqua Divide, ranging up to 5,500 feet above sea level.

The Medford-Ashland AQMA is outlined in Figure 8. The Figure also shows general monitoring locations for several criteria pollutants within the AQMA. The AQMA covers about 228 square miles and approximates the Bear Creek Basin. The area is also generally described as the Rogue Valley. The AQMA defines the current PM_{10} nonattainment area, and will continue to define the planning boundary for particulate control strategies adopted in this plan.

The PM_{10} nonattainment area must be large enough to include all of the local areas that may contribute to a violation of PM_{10} standards. The boundary must also be large enough to include potential future PM_{10} problem areas resulting from residential, industrial or transportation growth. The ambient monitoring network, as well as emission forecasts for the area indicate that the current AQMA boundary will continue to be the appropriate planning area for particulate in the Rogue Valley.

Figure 8: Map of Medford-Ashland AQMA



The AQMA boundary has been used for the special industrial air pollution control rules adopted in 1978, 1983 and 1989. The Department of Environmental Quality and Jackson County Health Department have also identified an area within the AQMA that is referred to as the critical PM_{10} control area. This area includes all of the PM_{10} problem areas, a significant portion of the AQMA population, and all the major industry in the AQMA.

Economy of the Rogue Valley.

The Rogue Valley's population and economy, once heavily dependant on natural resource-based industries has been undergoing substantial change[3]. The demographics of the Rogue Valley have been significantly influenced in recent years by in-migration from other areas in Oregon and from out of state. According to a 1999 Employment survey, the top three reasons for moving to the Rogue Valley were: (1) to be with family and friends, (2) quality of life, and (3) retirement. The valley's changing demographics has played a significant role in the changing local economy. The quality of life and retirement priorities of local citizens also highlights the value placed on the protection of air, water, and land quality.

Basic industries in the Rogue Valley include agriculture, manufacturing, and certain service-producing industries such as education, health care, tourism, and entertainment. These businesses support secondary industries, such as retail trade, services, construction, transportation, and others. After experiencing strong economic growth during most of the 1990's, SW Oregon has been experiencing an economic slowdown. Between 1990 and 2000, the lumber and wood products industry experienced a 29% decline in employment. However, during that same period employment in the rest of the manufacturing sector increased approximately 34%. In 2002, the wood products industry continued to decline while overall employment in other sectors of the economy has continued to grow.

Historically, the wood products industry has been one of the largest sources of particulate pollution in the AQMA. During the 1980 and 1990's, state-of-the art emission controls were installed in many facilities, significantly lowering air pollution from these sources. Emissions have continued to decrease somewhat in recent years as manufacturing processes improve and additional controls are brought on-line.

Growth in non-timber jobs, such as those in the service, retail, health care, trades, transportation, communications and technology sectors, has helped diversify the areas employment base, providing much more stability to the region's economy. The strongest growth is expected to continue in the trade and service sectors.

Population and employment growth generally leads to increased emissions as the area's mobility and commercial infrastructure expands. These trends are reflected in the 2015 PM_{10} emissions forecast and maintenance plan air quality modeling analysis.

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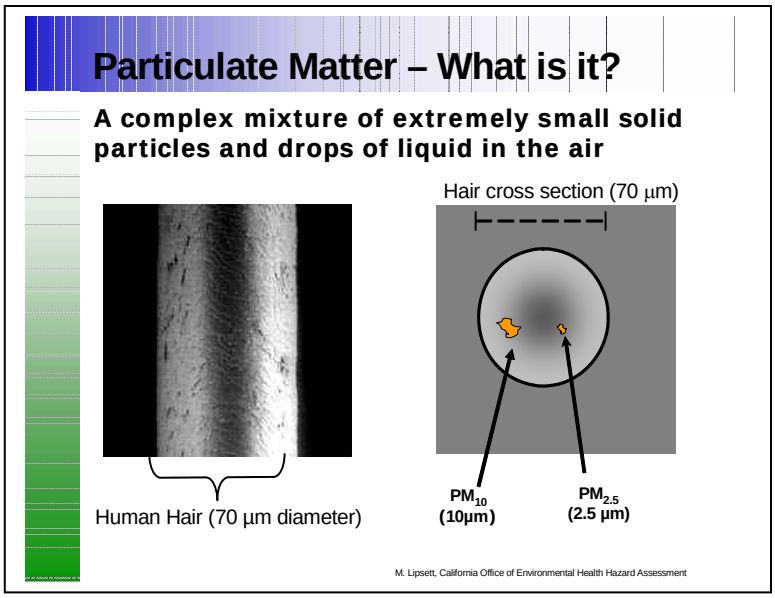
3 Local economic profile taken from Oregon Employment publication, 2002 Regional Economic Profile for Jackson and Josephine Counties.

4.14.1.2: Health Effects of PM_{10} and Woodsmoke

National ambient air quality standards are established by the U.S. Environmental Protection Agency (EPA) following extensive review by EPA's Clean Air Scientific Advisory Committee (CASAC) and the public. The Scientific Advisory Committee is a group of non-EPA scientists and medical experts that review the latest air quality studies and evaluate the health effects of particulate exposure. The CASAC then recommends air quality standards to EPA for protecting public health.

The CASAC's review of health effects information formed the basis for setting the PM_{10} standards in 1987 and the particulate standard review in 1997. Findings of the 1997 CASAC review, as well as other peer-reviewers on the health effects of particulate are listed in the document Review of National Ambient Air Quality Standards for Particulate Matter, Policy Assessment of Scientific and Technical Information, July, 1996, EPA-452\R-96-013. EPA and the CASAC are currently reviewing the latest studies on the health effects of particulate exposure. EPA intends to update the particulate standards for both PM_{10} and $PM_{2.5}$ in 2005.

"PM_{10}" (particulate matter measuring less than or equal to 10 micrometers-µm) is considered a risk to human health due to the body's inability to effectively filter out particles of this size. These particles can become lodged in the alveolar regions of the respiratory system where they trigger biochemical and morphological changes in the lungs.[4]



For example, constriction of air passages (i.e., reduced air flow) occurs rapidly upon exposure to PM_{10}. Episodic and continuous exposure aggravates chronic respiratory diseases such as asthma, bronchitis, and emphysema that in turn restrict the lung's ability to transfer oxygen into the bloodstream. Traditionally, children, the elderly, and cigarette smokers are the most susceptible to lung dysfunctions and are therefore at greatest risk from PM_{10} exposure.[5] Continuous exposure

[4] J. Koenig, T.V. Larson, P. Jenkins, D. Calvert, N. Maykut and W. Pierson, "Wood Smoke: Health Effects and Legislation," Health Effects of Woodsmoke, Northwest Center for Occupational Health and Safety, January 20, 1988.

[5] U.S. Environmental Protection Agency, Second Addendum to Air Quality Criteria for Particulate Matter and Sulfur Oxides (1982: Assessment of Newly Available Health Effects. EPA 600/8-86-020-F. NTIS # PB-87-176574.

can inhibit the body's defense mechanism thus increasing susceptibility to acute bacterial and viral infections. The increased stress on the pulmonary system caused by PM_{10} exposure is usually tolerable for those with healthy respiratory systems, however, it can lead to irreversible or fatal damage in people already suffering from cardiopulmonary disease, typically children, the elderly, the ill, and cigarette smokers.[8]

Among the sources of PM_{10} emissions, woodsmoke from residential heating is of particular concern in the Medford-Ashland AQMA because it is created at essentially ground level within residential areas. Woodsmoke particles are less than 1 μm in diameter and remain suspended in the air for long periods of time. Because of their small size and their ability to remain airborne, they are easily inhaled and lodged in the alveolar region of the lungs. These particles can also act as carriers for toxic chemicals that are transported deep into the respiratory system. Some of these toxic substances are then absorbed into the bloodstream.

Woodsmoke contains fourteen carcinogenic compounds including benzo(a)pyrene, benzo(a)anthracene, and other polycyclic organic materials.[6] Additionally, woodsmoke contains several other hazardous compounds such as aldehydes, phenols, carbon monoxide and volatile organic vapors. These compounds can cause or contribute to illness ranging from neurological dysfunctions and headaches to lung cancer. Because woodsmoke concentrations can be high in residential areas, a large segment of the population is routinely exposed to woodsmoke pollution in the winter months.

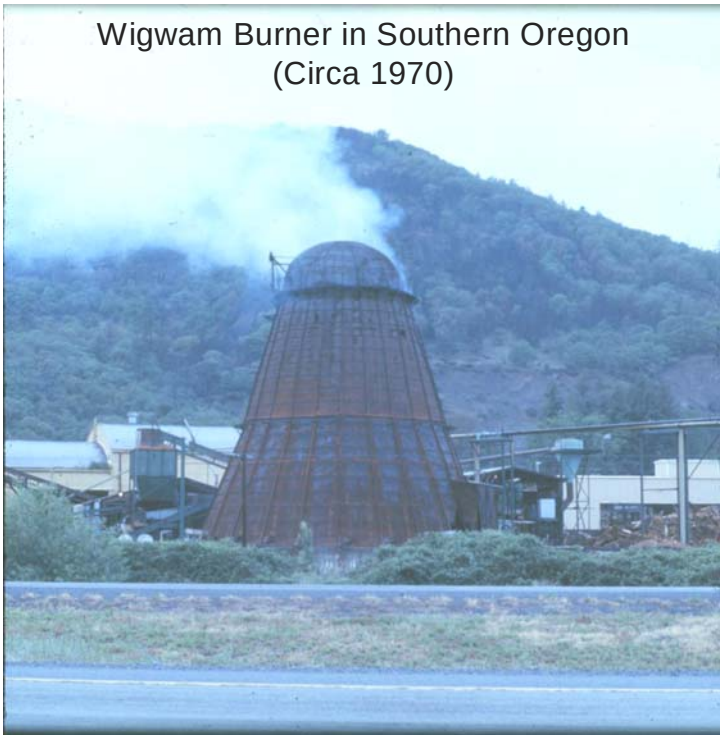
Other significant sources of particulate emissions in the Valley include some industrial processes and motor vehicle exhaust.

More information on the recent medical research and new particulate standards can be found at the following EPA Internet site: http://cfpub1.epa.gov/ncea/cfm/partmatt.cfm

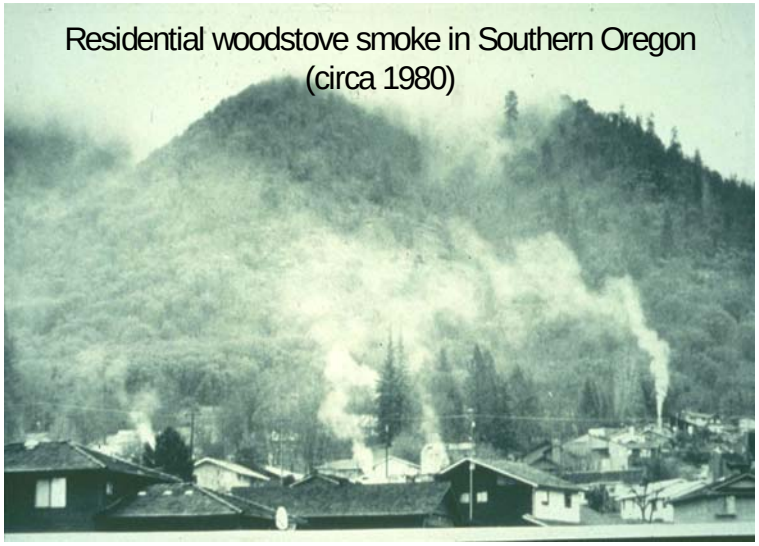
[6]P.G. Jenkins, Washington Wood Smoke: Emissions, Impacts and Reduction Strategies, Washington of Ecology, Olympia, Washington. December, 1986.

4.14.1.3 Brief History of Improving Air Quality in Rogue Valley Communities

Air quality in the AQMA has improved tremendously over the past several decades. The list below chronicles just some of the air quality accomplishments in the Rogue Valley (courtesy of the Jackson County air quality program staff).



1959-1960: The Medford City Council authorizes a joint study with DEQ (then the Oregon State Sanitary Authority) to investigate air quality conditions in Medford. The study confirms that Medford has a severe air pollution problem during certain periods. Orchard smudge pots, cinders from mills, automobiles, open burning, air stagnation, and other factors are cited as contributing to the problem.



1970's: Oregon Department of Forestry implements the Smoke Management Program to reduce smoke impacts from forest slash burning. Rogue Valley's air pollution problems are mostly attributed to the wood-products industry. The international oil embargo increases energy prices and more Rogue Valley residents turn to an abundant and affordable wood supply to heat their homes. Residential wood smoke pollution increases. In 1977, Jackson County and DEQ appoint the Medford-Ashland Air Quality Advisory Committee to identify

air pollution sources and develop strategies for improvement. In 1979, the Environmental Quality Commission adopts emission control measures for some major industries in the Rogue Valley.

1980-1985: In 1980, Total Suspended Particulate from smoke measures 449 micrograms per cubic meter, the highest level in the Rogue Valley since monitoring began in 1979. The highest PM_{10} reading ever recorded in the valley occurs on December 17th, 1985 (373 micrograms per cubic meter). In 1984-85, Jackson County implements a voluntary wood-burning ordinance designed to discourage residential wood-burning during air stagnation periods.

1986-1990: March 1988, DEQ and Jackson County work to obtain a $485,000 Community Development Block Grant to replace noncertified woodstoves in low income homes. Local programs provide $30,000 for weatherization. December 1988, Medford and Jackson County begin an updated voluntary wood heating curtailment program. In 1989, Medford and Central Point communities enact ordinances restricting residential open burning. Also in 1989, Medford and Central Point adopt the mandatory wood heating curtailment program. In 1990, grant funds continue to replace high polluting noncertified woodstoves in low income homes. Jackson County enacts an ordinance restricting residential woodheating on high pollution days. The program includes public education and outreach, compliance surveying, open burning and woodstove curtailment enforcement. Medford bans the installation of noncertified woodstoves. Jackson County Interagency Air Quality Team forms to focus on continued reductions in particulate pollution.

1991-2002: In 1991, the Oregon legislature bans the sale and installation of noncertified woodstoves statewide. A program is enacted linking agricultural burning to ventilation criteria. No burning is allowed on poor ventilation days. The Environmental Quality Commission adopts the Medford-Ashland PM_{10} Attainment Plan required under the Clean Air Act. The plan includes control strategies for open burning, residential woodheating, and major point sources that will attain and ensure compliance with PM_{10} standards. 1992 marks the first year since 1985 that Rogue Valley air quality does not violate federal PM_{10} air quality standards. Oxygenated fuels are first required in the Rogue Valley in 1993 to help comply with Carbon Monoxide (CO) standards. December 1994, the Rogue Valley accomplishes three consecutive years of clean air for PM_{10}, meeting the Clean Air Act compliance deadline. 1994-2002, PM_{10} and CO levels continue to decline in the Valley. In 1996, the Medford-Ashland Air Quality Committee is reformed to develop air quality plans for PM_{10} and CO that ensure long-term compliance with standards. EPA approval of these plans will change the legal status of the Rogue Valley from nonattainment (noncompliance) to attainment (in compliance).

4.14.1.4: PM_{10} Planning Process 1997-2003

In January, 1997, the Rogue Valley Council of Governments (RVCOG) completed an update to the Rogue Valley Regional Transportation Plan (RTP). The RTP defines the transportation systems for Medford, Central Point, Phoenix, White City, and that portion of Jackson County within the Metropolitan Planning Organization (MPO) boundary. The

RTP uses demographic information in conjunction with a travel-demand forecasting model to develop street network design options for regional automobile travel. Regional transportation plans in nonattainment and maintenance areas must also demonstrate that they will not conflict with air quality plans. This is accomplished through the transportation conformity program that ensures that future transportation emissions do not exceed the level of emissions allocated to the transportation sector during the air quality planning process. The RTP could not be adopted until transportation conformity was demonstrated.

During the conformity review process it was discovered that emission projections for the transportation planning horizon year of 2015 exceeded the emission projections for transportation identified in the 1991 PM_{10} Plan (in the 1991 plan transportation emissions were only projected to the year 2000). The RTP could therefore not demonstrate conformity under the applicable "emissions budget" test, and could not be adopted by the Rogue Valley Council of Governments.

It was agreed that the 1991 PM_{10} plan would be withdrawn from EPA[7] so that the attainment plan could be revised and a long term maintenance plan developed to ensure compliance with PM_{10} standards through the transportation planning horizon year of 2015. The temporary withdrawal of the plan allowed a different conformity test (Build/No-Build) to apply while the air quality plan was being revised. It also allowed the RTP to be adopted and for transportation funding to continue. The revised attainment and maintenance plan would re-establish an emissions budget for transportation conformity. Withdrawing the plan started a federal sanctions clock and imposed an 18 month deadline to resubmit a revised plan to EPA. The revised PM_{10} plan was due to EPA by December, 1998.

Changes in EPA Planning Requirements

While work on the revised plan was progressing, the EPA adopted new national ambient air quality standards (NAAQS) for particulate (July 18, 1997). EPA adopted new standards for particulate matter equal to or less than 2.5 microns in size (PM2.5), and also changed the method for determining compliance with the daily PM_{10} standard. EPA also issued new planning guidance for the implementation of the $PM_{2.5}$ and PM_{10} standards.

EPA's guidance (Interim Implementation Guidance - IIG) changed the long standing approach to PM_{10} planning in nonattainment areas. Under the policy, EPA no longer required that a long term maintenance plan be developed, or that compliance with PM_{10} standards be demonstrated through modeling. EPA's new policy allowed the AQMA's PM_{10} nonattainment area designation to be revoked once the Department submitted, and EPA concurred with, the following information: (1) monitored air quality data showing attainment for at least 3 years (1994-1996); (2) a letter from the Governor certifying that all of the control measures identified in the attainment plan are being implemented and

[7] All emission reduction strategies identified in the 1991 attainment plan were adopted by the state and implemented successfully. However, EPA did not take formal action to approve the 1991 plan. This allowed the plan to be administratively withdrawn from EPA in 1997.

will be continued; and (3) documentation verifying that DEQ has the authority and ability to implement the new and revised particulate standards.

After considering the planning options available under the guidance, the Medford Advisory Committee recommended that DEQ forego development of a formal maintenance plan, and re-submit the original 1991 PM_{10} control measures to EPA. The Committee also decided that additional control measures should be added to the plan to help protect future air quality. Submitting the original strategies was required to stop the plan withdrawal sanctions clock and as one of the necessary elements for redesignation to attainment. The additional measures focused on preventing future exceedances of the new PM_{10} and $PM_{2.5}$ NAAQS.

The original strategy measures identified in the 1991 PM_{10} plan include:

- A mandatory woodstove curtailment program.
- Control technology requirements for major wood products industry.
- Lower emission limits for select industrial processes.
- Local open burning ordinances.
- Use of cleaner road sanding materials and street cleaning program;
- Management of prescribed forestry burning year round and special protection for the nonattainment area during the winter months under the Oregon Smoke Management Program.
- Emission growth management requirements for new and expanding major industry under the New Source Review program.

Strategies adopted by the Committee in 1998 included:

- A unified mandatory woodstove curtailment ordinance. This applies consistent woodstove curtailment and open burning requirements in each town within the Jackson County woodstove curtailment area boundary.
- Targeted roadway paving projects in Medford and White City.
- An education program for orchard owners about reducing soil trackout onto roadways.
- Enhanced street cleaning program in White City; and,
- A commitment from a major wood products a facility (Timber Products) to reduce particleboard press emissions by at least 90 percent no later than November, 2003.

In addition to the new strategies above, Timber Products Co. agreed to temporarily "freeze" or "escrow" approximately 79 tons per year of allowable permitted PM_{10} emissions until particleboard press emissions at that facility are reduced by at least 90 percent.

A revised PM_{10} plan including these new strategies was submitted to EPA in August, 1998.

Revised Planning Approach

In 1998, EPA was sued by various interest groups on issues related to the adoption of the new $PM_{2.5}$ standards. An initial court ruling held that EPA had erred in setting the $PM_{2.5}$ standards and in relaxing the way in which PM_{10} compliance was determined. EPA has successfully defended the $PM_{2.5}$ standard in court (a process taking several years), but chose not to appeal the court ruling regarding the relaxation of the PM_{10} standard. EPA chose to reinstate the earlier compliance method for the PM_{10} standard and reinstate all previous planning guidance for PM_{10} areas. This means that a full maintenance plan, with air quality analysis of future PM_{10} levels, is required in order for EPA to redesignate the Medford-Ashland AQMA to attainment.

In 1999, the Department and Medford-Ashland Air Quality Committee began work again on a revised PM_{10} attainment and maintenance plan using EPA's final planning requirements. This new effort allowed the Department to update PM_{10} emission estimates for mobile sources (cars & trucks) by using a new travel-demand model developed for the Medford area by the Oregon Department of Transportation. The Department also took this opportunity to update the air quality dispersion model used to predict PM_{10} concentrations. The Department replaced the initial Oregon GRID model used in previous analysis with a state-of-the-art dispersion model (CalPuff). Of special importance is CalPuff's ability to better simulate particle deposition and the influence of air stagnation on wintertime PM_{10} levels. Several years have been required to develop and verify the new air quality dispersion model for use in the AQMA.

The revised PM_{10} attainment plan and PM_{10} maintenance plan were completed in 2003 and offered for public review and comment in the winter of 2003/2004.

4.14.1.5: PM_{10} Planning Requirements for the Medford-Ashland AQMA.

Summary of Attainment and Maintenance Analysis Approach

The Department must meet three planning and analysis requirements if the Medford-Ashland AQMA is to be redesignated to attainment status. First, the Department must demonstrate that the applicable Clean Air Act attainment deadline was successfully met. Secondly, EPA must approve an attainment analysis that evaluates contemporary PM_{10} levels under worst-case conditions in all locations in the AQMA[8]. Thirdly, EPA must approve a maintenance analysis that evaluates potential future PM_{10} levels in the AQMA, considering expected emissions growth. The maintenance analysis must evaluate emission growth for at least ten years beyond the time of EPA plan approval and redesignation. The Medford-Ashland PM_{10} Maintenance Plan uses the year 2015 for a future planning horizon.

The attainment and maintenance plan relies on both monitored PM_{10} data and modeling analysis to demonstrate current and future compliance with PM_{10} standards. Monitoring data at the two key monitoring locations (Welch & Jackson, and White City Post Office)

[8] The attainment and maintenance modeling analysis must show compliance with PM_{10} standards at all locations within the AQMA (not just the two hot-spot monitoring sites in Medford and White City).

show consistent compliance with PM_{10} standards since 1992. Section 4.14.2.0 summarizes PM_{10} monitoring trends in the AQMA. The attainment and maintenance modeling analysis demonstrate that the AQMA would remain in compliance, even under worst-case meteorology and worst-case emissions scenarios.

For the worst-case planning approach, the attainment and maintenance analysis must use maximum allowable permitted emission levels (not actual emissions) for major industry in order to reflect potential PM_{10} levels in the airshed. In addition, the analysis must evaluate airshed emissions under the extremely poor ventilation conditions often seen during winter air stagnation episodes.

The approach used to meet the three analysis requirements is summarized below:

1. Current Attainment (Actual Conditions): Monitoring data shows that the AQMA has been in compliance with PM_{10} standards since 1992, and demonstrates that the AQMA successfully met the 1994 Clean Air Act attainment deadline. The AQMA has continued in attainment to date.

2. Attainment Analysis Modeling (Current Worst-Case Potential): The attainment analysis must evaluate the current potential for PM_{10} impacts under "worst-case" conditions. The attainment analysis uses the 1998 emissions inventory, which is the Department's most accurate for the AQMA. Modeled emissions include legally allowable emissions from major industry (not actual emissions in 1998), and 1998, 1999, 2000 local meteorology (including stagnation events)[9]. The attainment modeling analysis (using worst-case conditions) shows that the Medford-Ashland area would be in compliance with PM_{10} standards at all locations in the AQMA even under worst-case conditions.

3. Maintenance Analysis Modeling (Future Worst-Case Potential): The maintenance analysis is based on an emissions projection to the year 2015. The emissions forecast reflects anticipated emissions growth resulting from changes in population, housing, employment, motor vehicle travel, and other factors. Again, major industrial sources are evaluated using their maximum allowable (permitted) emission levels. The 2015 analysis also uses the 1998-2000 worst-case stagnation meteorology.

Figure 9 shows estimated actual AQMA emissions for 1998, and the worst-case emission levels used in the attainment and maintenance analysis.

[9] Meteorology used in the modeling analysis reflects actual weather data measured in the AQMA in 1998, 1999, and 2000, and include several extended air stagnation episodes.

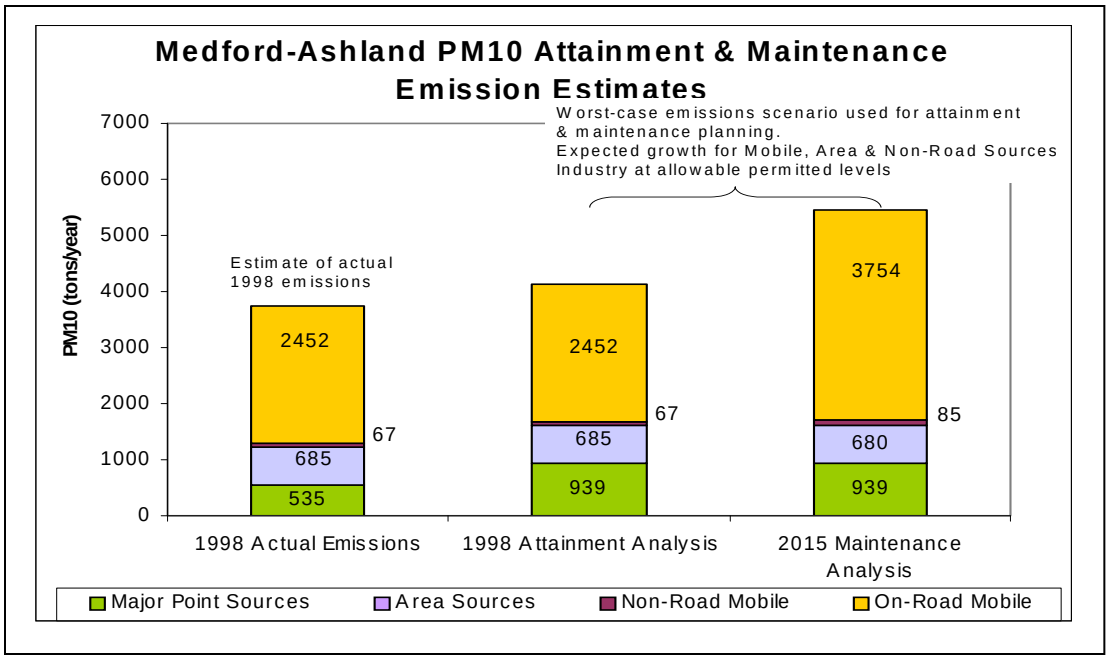


Figure 9: PM_{10} Emissions in the AQMA: Actual Emissions, Worst-Case Levels

- Major Point Sources: Are those industrial facilities with PM_{10} emissions greater than or equal to 5 tons per years.
- Area Sources: Include activities such as residential wood-heating, open burning, commercial space heating, etc.
- Non-Road Mobile Sources: Include sources such as small engines and construction equipment.
- On-Road Mobile Sources: Include cars and trucks, and reflects both exhaust (tailpipe) and road dust emissions.

4.14.1.6 Medford-Ashland Meteorology

The following description of climate and meteorology in the Medford-Ashland area is taken from the annual climatological summary prepared by the National Weather Service.[10]

Medford has a moderate climate of marked seasonal characteristics. Late fall, winter, and early spring months are damp, cloudy, and cool under the influence of marine air. Late spring, summer, and early fall are warm, dry, and sunny, due to the dry continental nature of the prevailing winds aloft that cross this area.

[10] "Local Climatological Data, 1987 Annual Summary with Comparative Data, Medford, Oregon," National Oceanic and Atmospheric Administration, National Climatic Data Center, Ashville, North Carolina.

The rain shadow afforded by the Siskiyous and Coast Range results in a relatively light annual rainfall, most of which falls during the winter season. Summertime rainfall is brought by thunderstorm activity. Snowfall is quite heavy in the surrounding mountains during the winter. Valley snowfall is light. Individual accumulations of snow seldom last more than 24 hours and present little hindrance to transportation on the valley floor.

Few extremes of temperatures occur. High temperatures in the summer months average slightly below 90 degrees. High temperatures are always accompanied by low humidity, and hot days give way to cold nights as cool air drains down the mountain slopes into the valley. The length of the growing season is about 170 days, from late April to mid-October. The last date of 32 degrees in the spring normally occurs in mid-June and the first date of 32 degrees in the fall occurs in mid-September.

Valley winds are usually very light, prevailing from the north or northwest much of the year. Winds exceeding 10 mph during the winter months nearly always come from the southwest. Highest wind velocities are reached when a well-developed storm off the northern California coast causes a north or "Chinook" wind off the Siskiyou Mountains to the south; speeds to 50 mph are common and gusts to 70 mph have been recorded occasionally. Summer thunderstorms produce gusty winds to 40 or 50 mph that may come from any direction.

Fog often fills the lower portion of the valley during the winter and early spring months, when rapid clearing of the sky after a storm allows nocturnal cooling of the entrapped moist air to the saturation point. Duration of the fog is seldom more than three days. Geographical and meteorological conditions contribute to a potential smoke problem during the fall, winter, and early spring months. Smoke from local sources occasionally reduces visibility to 1 to 3 miles under stable conditions.

Air Stagnation-Worst-Case Conditions

Generally, the highest PM_{10} concentrations in the AQMA occur during the winter when air stagnation and temperature inversion events trap particulate pollution near the ground. These stagnation events can persist for several days and increase particulate concentrations as air pollution builds up over time. Stagnation events occur regularly in the Rogue Valley and the PM_{10} attainment and maintenance analysis must reflect these "worst-case" meteorological conditions. This provides a conservative analysis demonstrating that compliance with standards will not be jeopardized, even during air stagnation episodes.

Until recently it was thought that the meteorology of December 1985 represented the most severe stagnation event. However, a new evaluation of meteorology from 1985-2000 has shown that the air stagnation events occurring in 1998-2000, and particularly those of December 1999, reflect meteorology that is as conservative in most respects as that of December 1985. The newer meteorology also provides a more complete and accurate data record of meteorology than does the record for 1985. After deliberation, the advisory committee recommended that the Department use the 1998-2000 stagnation meteorology for the attainment and maintenance analysis.

See Section 4.14.5.2 for a more detailed discussion of the stagnation meteorology used in the attainment and maintenance modeling analysis.

4.14.2.0 Ambient Air Quality

4.14.2.1 PM_{10} Monitoring in the AQMA

Particulate monitoring began for Total Suspended Particulate (TSP) in 1969 at the Jackson County Courthouse near Oakdale and Main Streets in Medford. TSP monitoring began in White City near Agate Rd. in 1977. The Medford Aerosol Characterization Study (MACS) was conducted during 1979-81 and used various air quality modeling techniques (dispersion and chemical mass-balance) to help identify significant sources contributing to particulate impacts. Integrated nephelometry was added to the monitoring network in the late 1970's to provide information on hourly variation in particulate levels.

PM_{10} monitoring began in Medford in 1983 and in White City in 1985. Based on measured violations of the PM_{10} standard during 1983-86, the Medford AQMA was listed as a Group-I PM_{10} area (area in non-compliance) in August 1987. The AQMA was subsequently designated as nonattainment for PM_{10} under the 1990 Clean Air Act Amendments.

PM_{10} monitors are placed in the areas of highest PM_{10} concentration (PM_{10} hot-spots), with the expectation that if PM_{10} standards are met at these locations, air quality throughout the AQMA will also be in compliance. A particulate gradient study was conducted from September 1985 to February 1986 to better characterize PM_{10} concentrations throughout the AQMA, identify areas of high PM_{10} concentration, and determine if additional monitoring sites should be established. The gradient study captured the extended air stagnation events of December 1985 which resulted in the highest PM_{10} levels measured to date in the Medford area. The study showed that PM_{10} concentrations were highest at the Jackson County Courthouse site, the Oak & Taft Street site, and the area of Haven & Holly Streets. As a result of the study, additional PM_{10} monitoring sites were located in Medford at Oak & Taft Streets and Welch & Jackson Streets. In White City, the study showed the highest PM_{10} concentrations near the White City Post Office. EPA reference monitors were installed at all of the peak PM_{10} impact sites in Medford & White City by December 1987. A subsequent gradient study in the winter of 1994/95 confirmed the placement of the monitoring network in the areas of highest PM_{10} impacts.

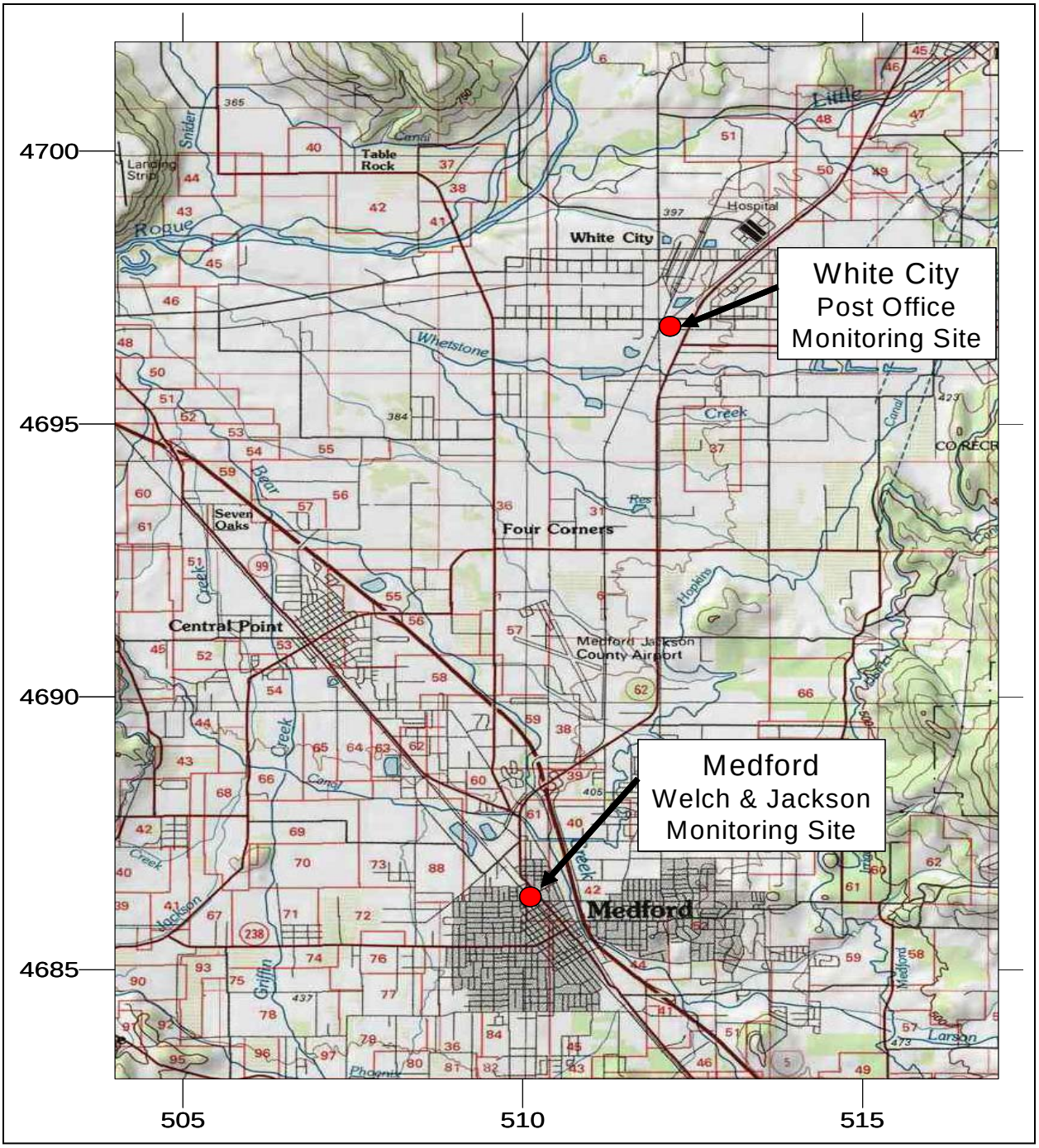
The design of the next PM_{10} gradient study will be evaluated after EPA completes its review and update of federal particulate standards (PM_{10} and PM2.5).

<u>Monitoring Locations</u>

Two EPA reference monitors are currently located in the AQMA: Welch & Jackson Street (Medford) and the White City Post Office. Figure 10 shows the location of the PM_{10} monitoring network.

Figure 10: PM_{10} Monitoring Locations in the AQMA

Quality Assurance



Data quality is evaluated in several ways. Each month, a systems audit is conducted in which each monitoring site is visited to evaluate whether the site location still meets established citing criteria, whether procedures are being followed, and to ensure that documentation is complete. Data quality is evaluated for precision (repeatability), accuracy, and completeness. Accuracy and precision are evaluated by calibrating the PM_{10} monitor performance against standardized reference equipment.

Appendix A-1 offers a more detailed description of the PM_{10} monitoring network and methodologies.

4.14.2.2: PM_{10} Concentrations: Summary and Trends

Medford: Welch & Jackson (Primary Monitoring Site)

The Welch & Jackson monitor is the main reference PM_{10} sampling site for Medford. Official sampling began in August 1989. Figure 11 shows all daily PM_{10} data from 1989-2003. Figure 12 shows the trend in the four highest daily (24-hour average) PM_{10} concentrations from 1989-2003. Figure 13 shows the number of "*expected exceedances*", which is used to determine compliance with the daily PM_{10} NAAQS. The number of expected exceedances can not exceed 1.0. The last exceedance of the daily PM_{10} standard (150 ug/m^3) at Welch & Jackson was in 1991.

Figure 11: PM_{10} Trend at Welch & Jackson Monitoring Site (1989-2003)

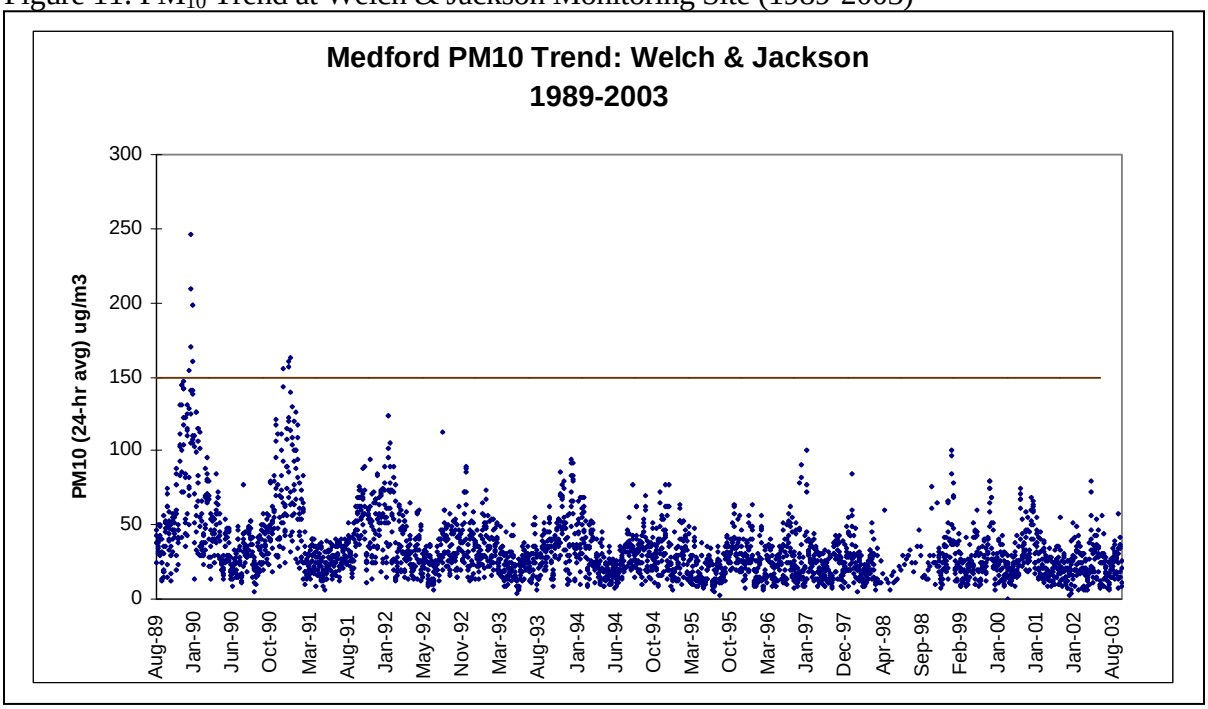


Figure 12: Trend in Peak Daily PM_{10} values 1989-2003

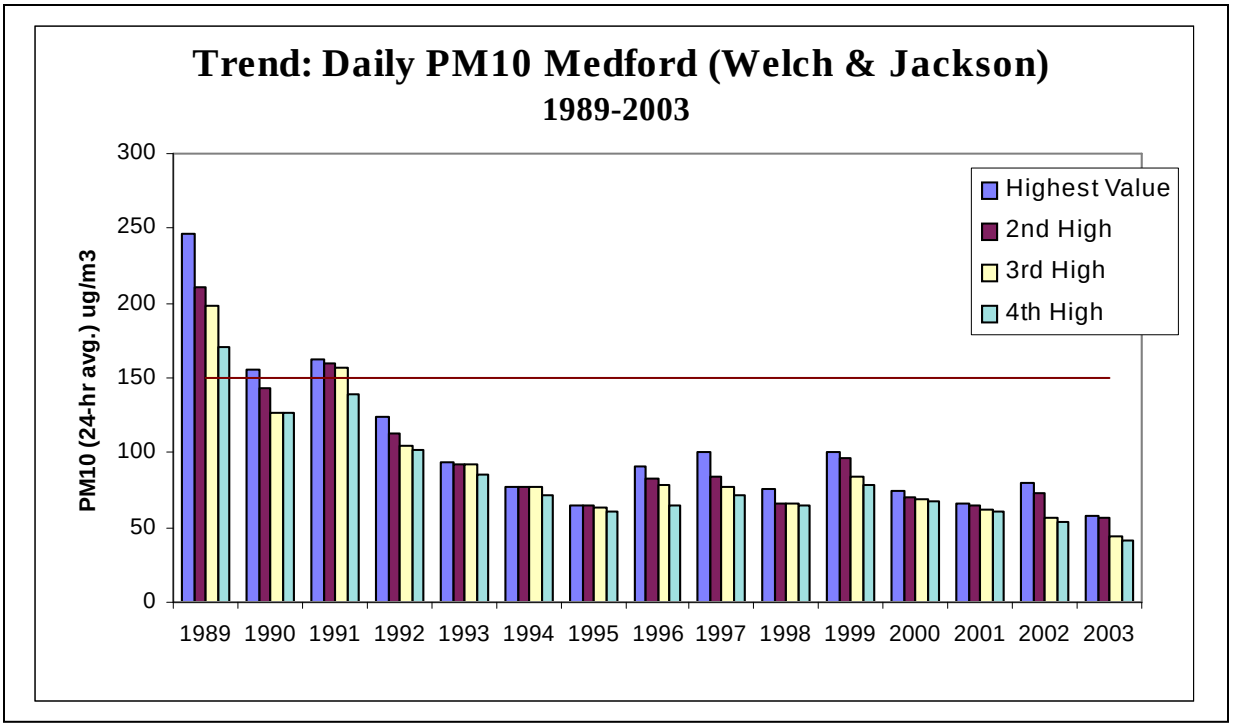


Figure 13: Number of Daily Exceedances & Expected Exceedances

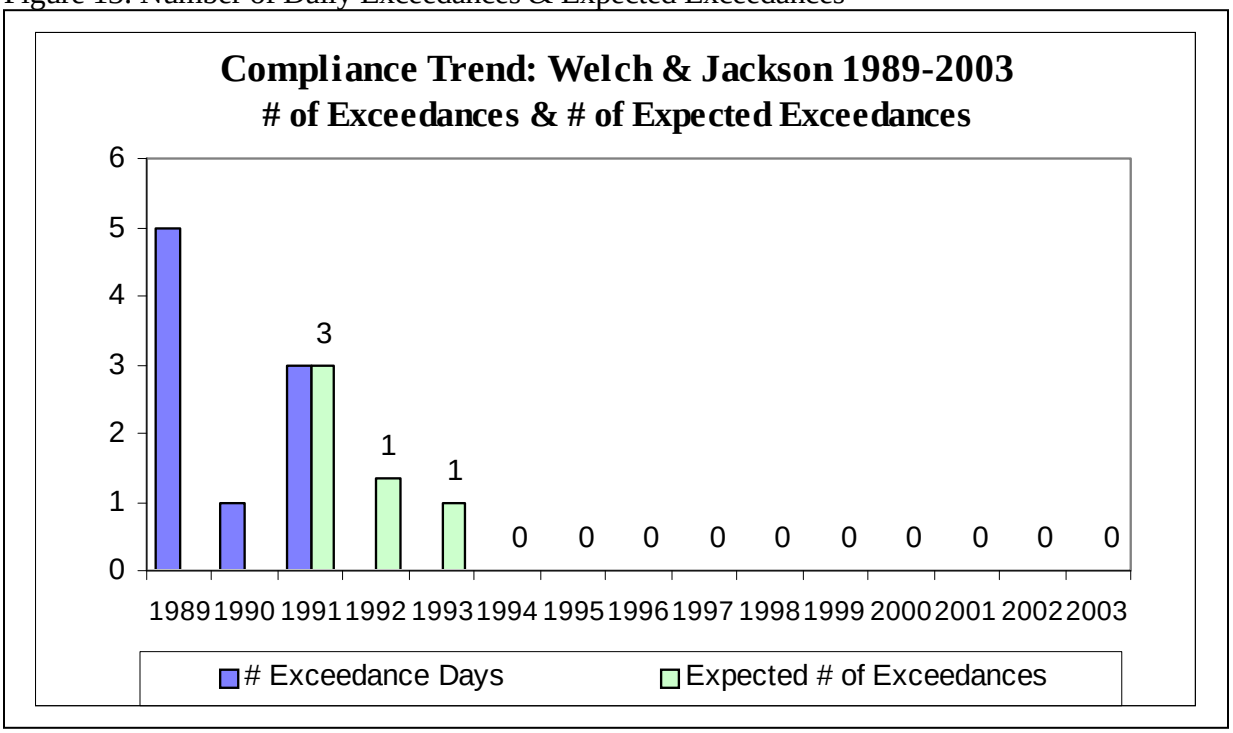
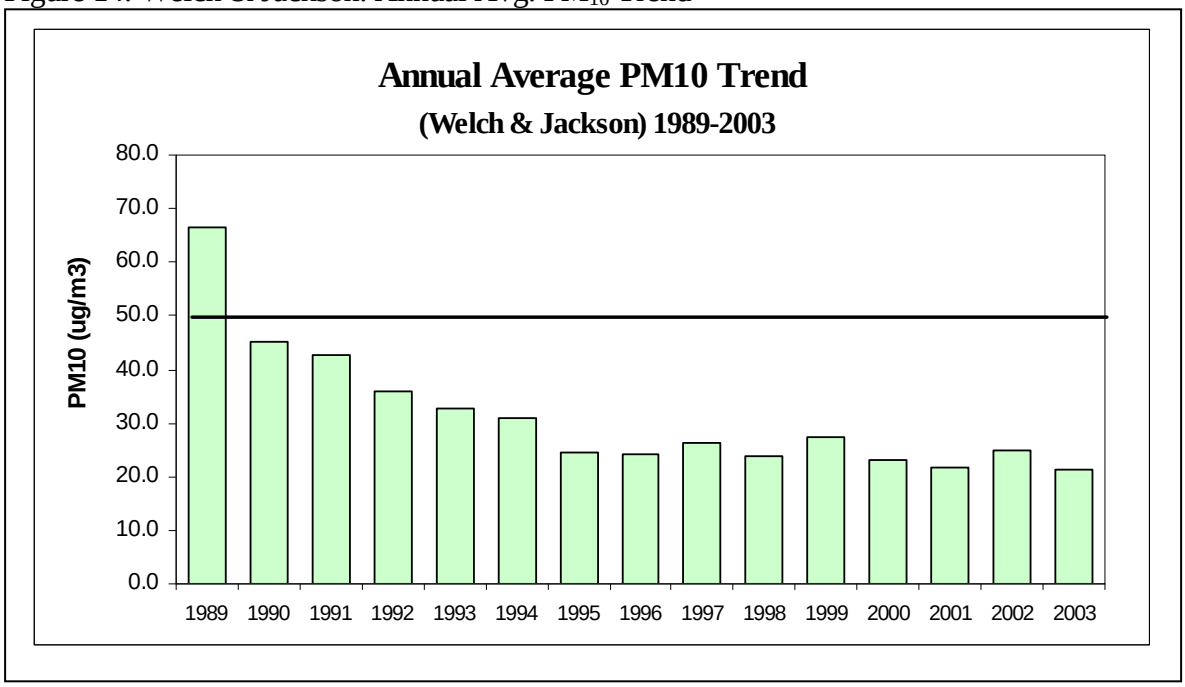


Figure 14 shows the trend in annual average PM_{10} concentrations from 1989-2003. The last exceedance of the annual average PM_{10} standard (50 ug/m^3) was in 1989.

Figure 14: Welch & Jackson. Annual Avg. PM_{10} Trend



White City: Post Office (Primary Monitoring Site)

The White City Post Office monitor is the main reference PM_{10} sampling site for the White City area. Official sampling began in fall 1985. Figure 15 shows all daily PM_{10} values from 1985-2003. Figure 16 shows the trend in the four highest daily (24-hour average) PM_{10} concentrations from 1985-2003. Figure 17 shows the number of expected exceedances, which is used to determine compliance with the daily PM_{10} NAAQS. The number of daily expected exceedances can not exceed 1.0. The last exceedance of the daily PM_{10} standard at White City occurred in 1991.

Figure 15: PM_{10} trend at White City Monitoring Site 1985-2002

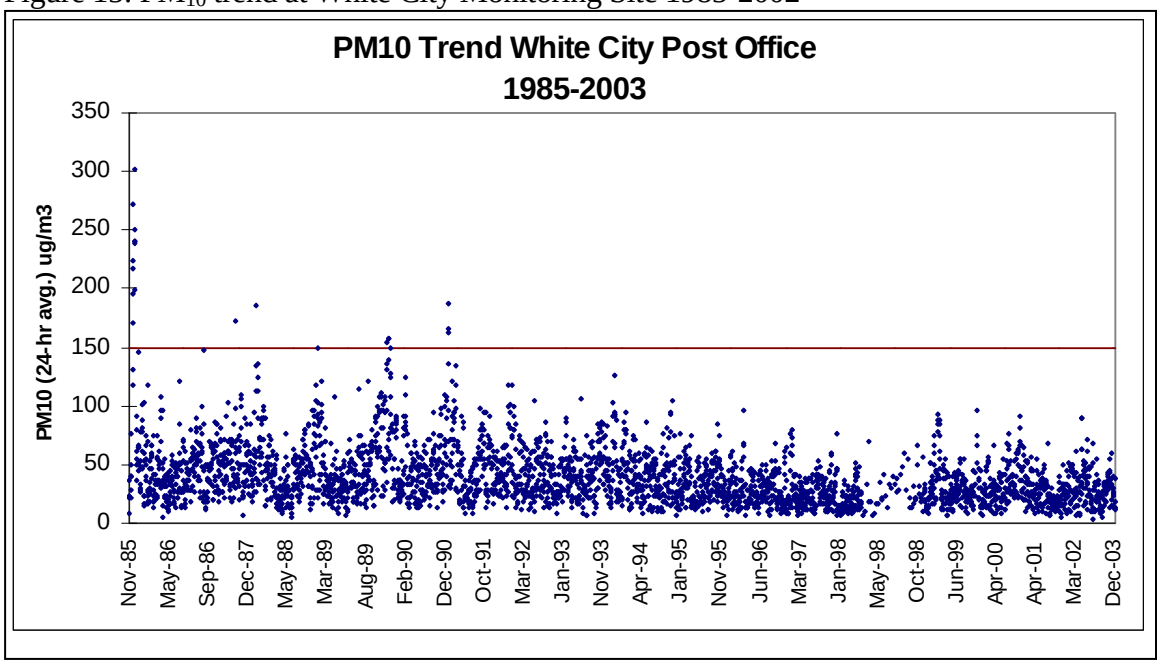


Figure 16: Trend in Peak Daily PM_{10} Values

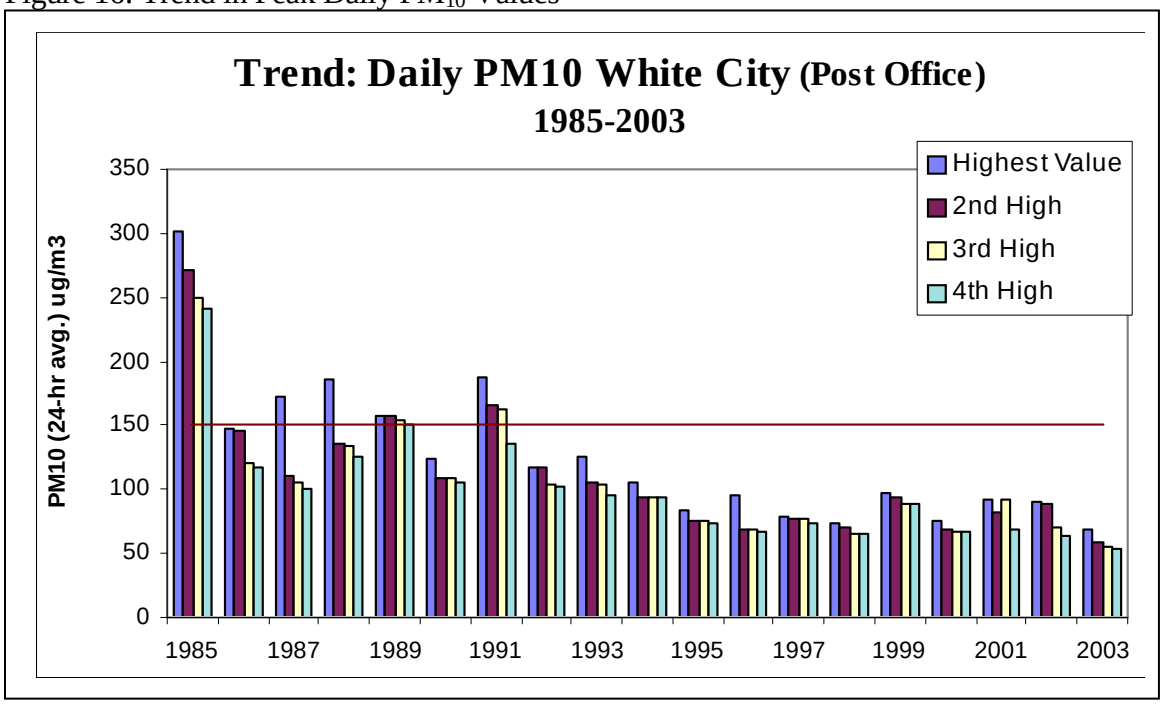


Figure 17: Number of Daily Exceedances & Expected Exceedances

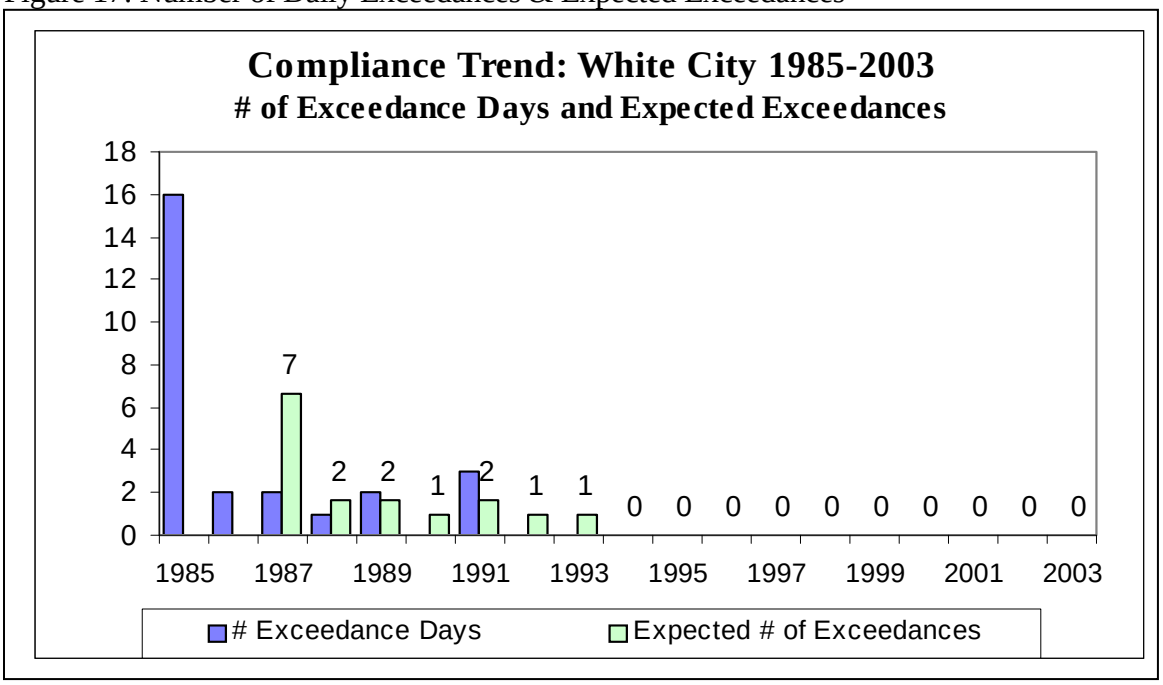
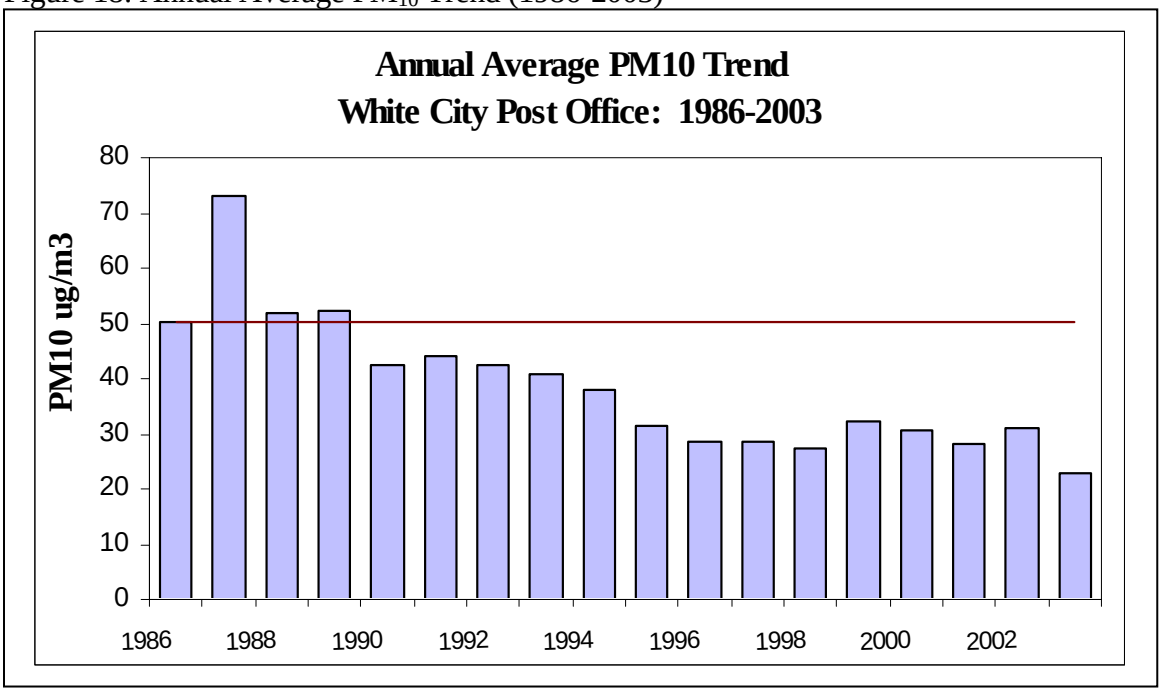


Figure 18 shows the trend in annual average PM_{10} concentrations from 1986-2003. The last exceedance of the annual average PM_{10} standard (50 ug/m^3) in White City was in 1989.

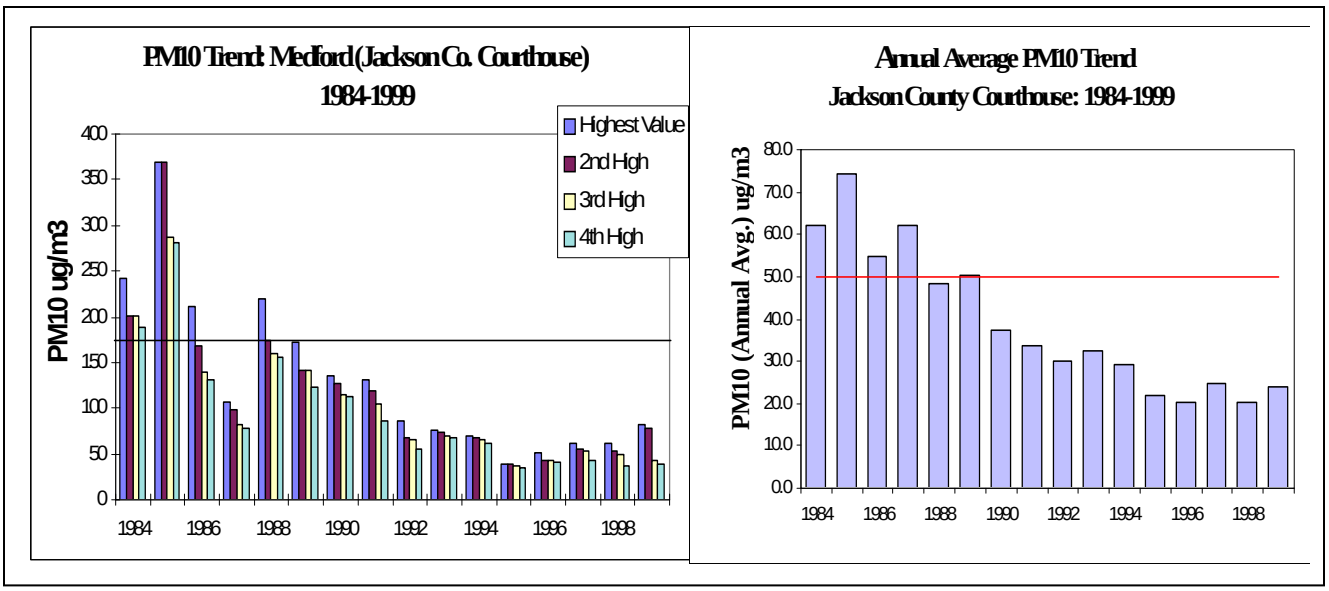
Figure 18: Annual Average PM_{10} Trend (1986-2003)



Jackson County Courthouse (Historic Monitoring Site)

The Jackson County Courthouse was one of the original particulate monitoring locations in Medford. PM_{10} values measured at the Courthouse were not as high as those measured at the Welch & Jackson site. Overtime, the Welch & Jackson site became the primary reference site for Medford, and the Courthouse site was discontinued in 1999 as part of DEQ and EPA's overall network reduction plan. Figure 19 shows the trend in the four highest daily (24-hour average) PM_{10} concentrations at the Courthouse from 1984-1999. The last exceedance of the daily PM_{10} standard (150 ug/m^3) at the Courthouse was in 1988. Figure 19 also shows the trend in annual average PM_{10} concentrations at the Courthouse from 1984-1999. The last exceedance of the annual average PM_{10} standard (50 ug/m^3) at the Courthouse was in 1987.

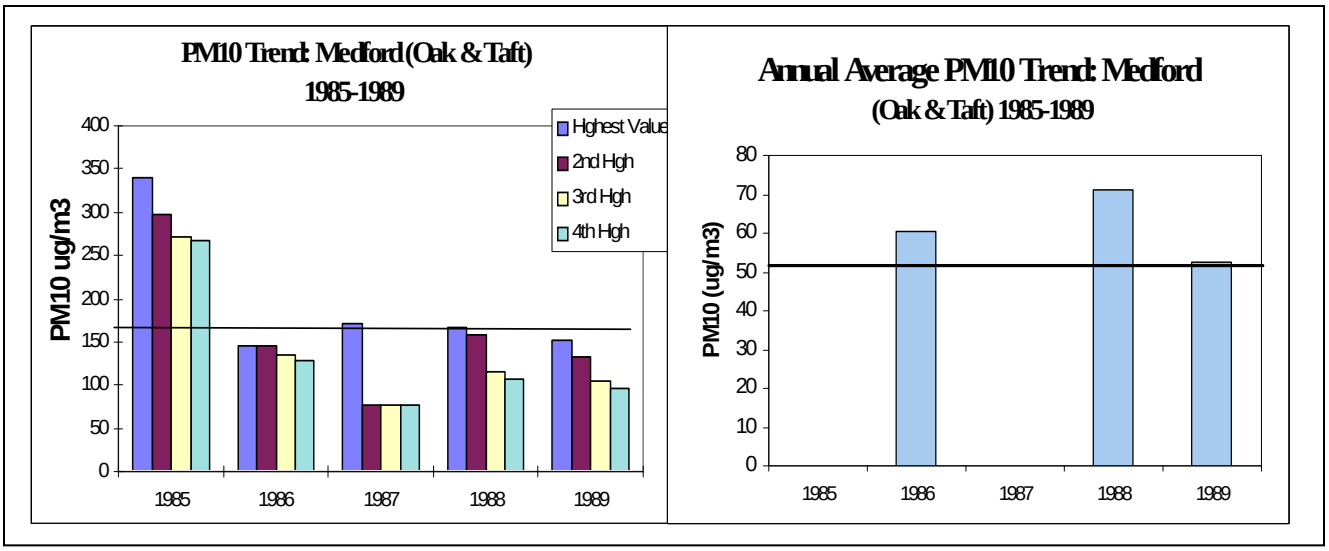
Figure 19: PM_{10} Trends at the Jackson Co. Courthouse Monitoring Site



Oak & Taft Street (Historic Monitoring Site)

The monitor at Oak & Taft Streets was part of the initial PM_{10} assessment of the Medford area in the mid-late 1980's. The site was discontinued in 1989 when Welch & Jackson became the official reference site for Medford. Figure 20 shows the trend in the four highest daily (24-hour average) PM_{10} concentrations at the Oak & Taft (1985-1989), and also the trend in annual average PM_{10} concentrations.

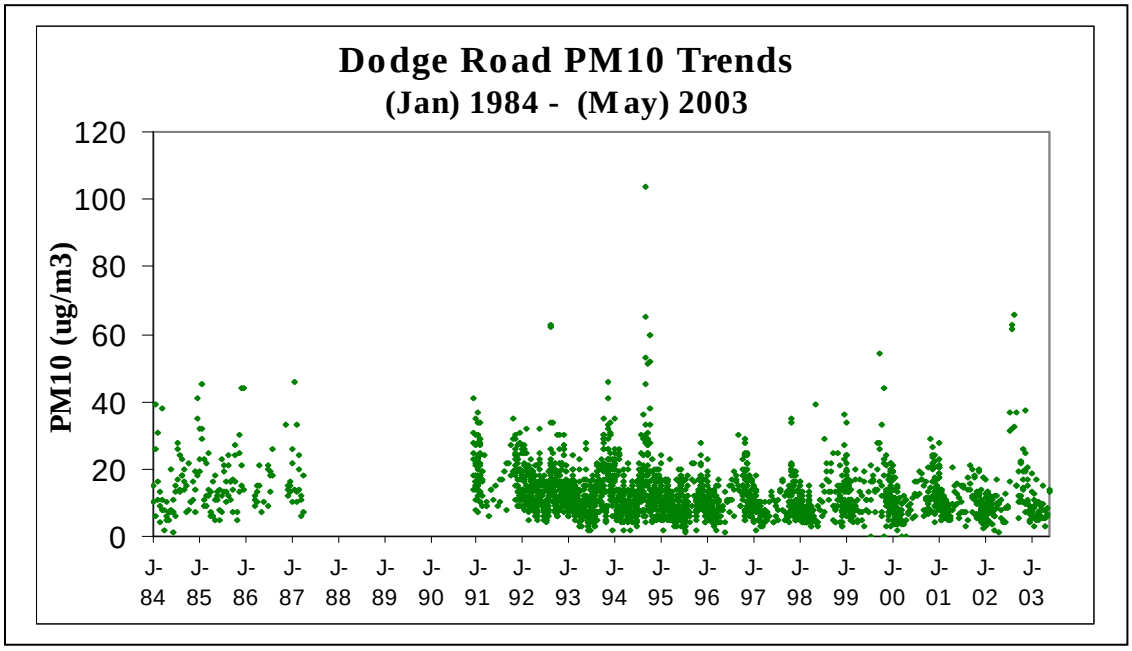
Figure 20: PM_{10} Trends at the Oak & Taft Monitoring Site



4.14.2.3: Background Air Quality

PM_{10} aerosols from sources outside the AQMA collectively contribute to measured PM_{10} levels in the Medford area when the regional airmass is transported into the Rogue Basin. Sources of air pollution such as wildfires, slash and agricultural burning, entrained fine soils, and some secondary aerosols are believed to be the principal contributors to background air quality. A background particulate monitor has been operated at Dodge Road in Sam's Valley (N-NW of the AQMA) since 1979. Figure 21 shows the trend in background PM_{10} concentrations since 1984. Generally, background PM_{10} values are quite low, commonly averaging about 12 ug/m^3. Occasional high values are documented and assigned a cause when known (such as wildfire impacts in 1994, 1999, 2002, etc.). Background PM_{10} values are used as part of the attainment and maintenance analysis. The use of background in the modeling analysis is discussed in more detail in Section 4.14.5.0, *Dispersion Modeling Analysis.* State budget reductions closed the Dodge Rd. monitoring site from April 1987 through December 1990.

Figure 21: PM_{10} Trend at the Dodge Road (Background) Monitoring Site



4.14.2.4: Reductions in peak PM_{10} levels since 1989

Air quality strategies adopted in the 1991 attainment plan were designed to reduce 24-hour concentrations of PM_{10} by at least 159 $\mu g/m^3$ (design value of 309 ug/m^3 - 150 $\mu g/m^3$) and the annual average by at least 18 $\mu g/m^3$ (design value of 68 ug/m^3 - 50 $\mu g/m^3$) by 1992. Emission reduction measures adopted in the attainment plan are legally enforceable; adequate to achieve the needed air quality improvements; and were designed to attain standards within the time frames prescribed by the Clean Air Act. Table 1 shows the affect of the strategy and the significant reduction in peak PM_{10} levels since 1989.

Table 1: Peak Levels: **24-Hour Average PM_{10} Particulate Summary ($\mu g/m^3$)**

	Welch & Jackson PM_{10} ($\mu g/m^3$)		White City PO PM_{10} ($\mu g/m^3$)	
Year	Maximum (date)	2nd Highest (date)	Maximum (date)	2nd Highest (date)
1989	246 (12/21)	210 (12/23)	158 (12/20)	157 (12/23)
1990	156 (12/09)	143 (12/08)	124 (02/27)	109 (02/24)
1991	163 (01/04)	160 (01/03)	188 (01/05)	166 (01/03)
1992	124 (01/15)	113 (08/05)	118 (01/15)	117 (01/24)
1993	94 (12/22)	92 (12/23)	126 (12/24)	106 (03/29)
1994	77 (08/12)	77 (12/09)	105 (12/23)	94 (02/03)
1995	64 (02/06)	64 (11/03)	84 (11/04)	76 (01/20)
1996	91 (12/19)	82 (12/18)	96 (02/13)	68 (02/12)
1997	101 (01/09)	85 (12/29)	78 (12/29)	77 (01/09)
1998	76 (10/20)	66 (12/23)	74 (12/23)	70 (12/22)
1999	98 (01/04)	93 (01/05)	89 (1/05)	84 (01/05)
2000	72 (11/18)	68 (11/20)	73 (11/20)	67 (11/17)
2001	64 (1/3)	63 (1/4)	89 (1/2)	80 (1/3)
2002	80 (7/31)	73 (8/12)	90 (8/12)	89 (7/31)
2003	58 (11/14)	57 (01/18)	68 (1/09)	59 (11/14)

Summary: Meeting the Clean Air Act Attainment Deadline and Redesignation To Attainment

Monitoring data demonstrates that the Medford-Ashland AQMA successfully met the 1994 Clean Air Act attainment deadline, and has continued in compliance since then. The *Attainment and Maintenance Modeling Analysis* demonstrate that the AQMA will continue in compliance with PM_{10} standards, even under worst-case conditions, through at least the year 2015.

These three demonstrations are sufficient for EPA to redesignate the Medford-Ashland AQMA to attainment for PM_{10}.