Oregon
John A. Kitzhaber, MD, Governor

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December 12, 2012

Dennis J. McLerran, Regional Administrator
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue
Mail Code: RA-140
Seattle, WA 98101

RE: Revision to the Oregon State Implementation Plan – Klamath Falls $PM_{2.5}$ attainment plan

Dear Mr. McLerran:

The Oregon Department of Environmental Quality (DEQ) requests approval of revisions to the Oregon State Implementation Plan (SIP) from the Office of Air, Waste, and Toxics, State and Tribal Air Programs Unit of the U.S. EPA, Region 10. Enclosed for your review is one hard copy of the amendments and one electronic copy of the amendments are saved on the disk included.

The Environmental Quality Commission adopted the revisions to the SIP under OAR 340-200-0040 on December 6, 2012. DEQ submits these revisions to EPA as part of the SIP and pursuant to 40 CFR 51.104.

I certify that public notices were published in a newspaper of general circulation on July 20, 2012 and in the Secretary of State's Oregon Bulletin on August 1, 2012. The notices included a statement that adoption of the rules would revise the SIP. I further certify two public hearings were held on August 21, 2012 in Klamath Falls, Oregon.

Thank you for your assistance with these revisions to Oregon's SIP. The staff contact for this submittal is Aida Biberic at (503) 229-5280 and Nicole Vick, SIP Coordinator at (503) 229-5946.

Sincerely,

Joni Hammond,
Deputy Director

Enclosures

cc Andrew Ginsburg, DEQ AQ Administrator
Paul Koprowski, EPA Oregon Operations office
Justin Spenillo, EPA, Region 10
Claudia Vaupel, EPA, Region 10
Nicole Vick, DEQ AQ SIP Coordinator

SIP Submittal Checklist		
Included	**Attachment**	**Title**
X	**1**	**Evidence the state has adopted the revision**
X	1.1	Staff Report, Agenda Item H of the December 6-7, 2012, EQC meeting Also see Certificate and Order for Filing Permanent Administrative Rules in Attachment 4.2
X	**2**	**Evidence that the state has the necessary legal authority**
X	2.1	See Attachment 1.1 "Commission Authority" (page #3 of Staff Report, Agenda Item H, December 6-7, 2012, EQC meeting)
X	**3**	**Provisions submitted for approval**
X	3.1	**Adopted and amended rules submitted to Secretary of State**
X	3.1a	General Air Pollution Procedures and Definitions: OAR **340-200-**: 0040. Effective December 11, 2012
X	3.1b	Designation of Air Quality Areas: OAR **340-204-**: 0010. Effective December 11, 2012
X	3.1c	Air Quality Analysis Requirements: OAR **340-225-**: 0090. Effective December 11, 2012
X	3.1d	Rules for Areas With Unique Air Quality Needs: OAR **340-240-**: 0010, 0030, 0500, 0510, 0520, 0530, 0540, 0550, 0560, 0570, 0580, 0610, 0620, 0630. Effective December 11, 2012
X	3.1e	Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices: OAR **340-262-**: 1000. Effective December 11, 2012
X	3.1f	Rules for Open Burning: OAR **340-264-**: 0040, 0078, 0080, 0100, 0175. Effective December 11, 2012
X	3.2	**Redline/strikeout version of adopted and amended rules submitted to Secretary of State**
X	3.2a	General Air Pollution Procedures and Definitions: OAR **340-200-**: 0040. Effective December 11, 2012
X	3.2b	Designation of Air Quality Areas: OAR **340-204-**: 0010. Effective December 11, 2012
X	3.2c	Air Quality Analysis Requirements: OAR **340-225-**: 0090. Effective December 11, 2012
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X	3.2f	Rules for Open Burning: OAR **340-264-**: 0040, 0078, 0080, 0100, 0175. Effective December 11, 2012
X	3.3	**Adopted attainment plan and appendices**
X	3.3a	Klamath Falls adopted $PM_{2.5}$ attainment plan
X	3.3b	Klamath Falls 1996-97 sat survey report appendix
X	3.3c	Klamath Falls 2000-01 $PM_{2.5}$ particulate survey report
X	3.3d1	Klamath Falls 2010-11 $PM_{2.5}$ survey
X	3.3d2	Klamath Falls 2010-11 $PM_{2.5}$ survey1
X	3.3e	Background monitor
X	3.3f	SANDWICH speciation
X	3.3g1	SOA box model description
X	3.3g2	SOA box model predictions for Klamath Falls
X	3.3h	Klamath Falls PMF report
X	3.3i	Klamath Falls economic situation in 2008 and trends
X	3.3j	Klamath Falls topography, winter meterology, consideration of 2008 as base year
X	3.3k1	Woodstove survey
X	3.3k2	Woodstove survey appendix A-1
X	3.3k3	Woodstove survey appendix A-2
X	3.3k4	Woodstove survey appendix B
X	3.3l	Emission inventory
X	3.3m	DEQ study - prescribed burning
X	3.3n	Effective emissions
X	3.3o	EI reductions - county ordinance
X	3.3p1	RACT - RACM

X	3.3p2	RACM analysis
X	3.3p3	Rejected RACT - RACM
X	3.3q	KAQAC report
X	3.3r1	Klamath County ordinance 2007
X	3.3r2	Klamath County ordinance 2012
X	3.3s	Klamath County draft IGA 2013
X	3.3t1	Designation of Air Quality Areas: OAR **340-204-**: 0010
X	3.3t2	Air Quality Analysis Requirements: OAR **340-225-**: 0090
X	3.3t3	Rules for Areas With Unique Air Quality Needs: OAR **340-240-**: 0010, 0030, 0500, 0510, 0520, 0530, 0540, 0550, 0560, 0570, 0580, 0610, 0620, 0630
X	3.3t4	Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices: OAR **340-262-**: 1000
X	3.3t5	Rules for Open Burning: OAR **340-264-**: 0040, 0078, 0080, 0100, 0175
X	3.3u	Wintersanding
X	3.3v	Design value
X	3.3w	AERMOD dispersion modeling
X	3.3x1	Rollback modeling
X	3.3x2	Rollback and emission reduction measures
X	3.3y	Unmonitored area analysis
X	3.3z	Conformity determination
X	3.3aa	References
X	**4**	**Evidence that the state followed the Administrative Procedures Act**
X	4.1	Public notice in the Secretary of State's Oregon Bulletin, August 1, 2012, publication
X	4.2	Certificate and Order for Filing Permanent Administrative Rules, filed December 11, 2012 and effective December 11, 2012
X	**5**	**Evidence of adequate public notice**
X	5.1	Affidavit of Publication: Herald and News, Notice of July 20, 2012 publication
X	**6**	**Certification of public hearing**
X	6.1	See paragraph #3 of cover letter and Attachment 7.1 and 7.2
X	**7**	**Compilation of public comment and department's response**
X	7.1	Presiding Officer's Report for rulemaking hearing on August 21, 2012, dated August 29,2012
X	7.2	Presiding Officer's Report for rulemaking hearing on August 21, 2012, dated August 29,2012
X	7.3	Summary of public comment and agency response, dated September 18, 2012

ATTACHMENTS

Attachment 1: Evidence the state has adopted the revision

1.1 Staff Report, Agenda Item H of the December 6-7, 2012, EQC meeting
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Attachment 2: Evidence that the state has the necessary legal authority

See Attachment 1.1 "Commission Authority" (page # 3 of Staff Report, Agenda Item H, December 6-7, 2012, EQC meeting)

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- 3.3a Klamath Falls $PM_{2.5}$ attainment plan
- 3.3b Klamath Falls 1996-97 sat survey appendix
- 3.3c Klamath Falls 2000-01 $PM_{2.5}$ particulate survey report
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- 3.3e Background monitor
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- 3.3g1 SOA box model description
- 3.3g2 SOA box model predictions for Klamath Falls
- 3.3h Klamath Falls PMF report
- 3.3i Klamath Falls economic situation in 2008 and trends
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- 3.3k1 Woodstove survey
- 3.3k2 Woodstove survey appendix A-1
- 3.3k3 Woodstove survey appendix A-2
- 3.3k4 Woodstove survey appendix B
- 3.3l Emission inventory
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- 3.3p1 RACT - RACM
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- 3.3p3 Rejected RACT - RACM
- 3.3q KAQAC report
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- 3.3t4 Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices: OAR **340-262**-: 1000
- 3.3t5 Rules for Open Burning: OAR **340-264**-: 0040, 0078, 0080, 0100, 0175
- 3.3u Wintersanding
- 3.3v Design value
- 3.3w AERMOD dispersion modeling
- 3.3x1 Rollback modeling
- 3.3x2 Rollback and emission reduction measures
- 3.3y Unmonitored area analysis
- 3.3z Conformity determination
- 3.3aa References

Attachment 4: **Evidence that the state followed the Administrative Procedures Act**

4.1 Public notice in the Secretary of State's Oregon Bulletin, August 1, 2012 publication

4.2 Certificate and Order for Filing Permanent Administrative Rules, filed December 11, 2012 and effective December 11, 2012

Attachment 5: **Evidence of adequate public notice**

5.1 Affidavit of Publication: Herald and News, Notice of July 20, 2012

Attachment 6: **Certification of public hearing**

See paragraph #3 of cover letter and Attachment 7.1 and 7.2

Attachment 7: **Compilation of public comment and department's response**

7.1 Presiding Officer's Report for rulemaking hearing on August 21, 2012, dated August 29, 2012

7.2 Presiding Officer's Report for rulemaking hearing on August 21, 2012, dated August 29, 2012

7.3 Summary of public comment and agency response, dated September 18, 2012

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Evidence the state has adopted the revision

1.1 Staff Report, Agenda Item H of the December 6-7, 2012, EQC meeting

Also see Certificate and Order for Filing Permanent Administrative Rules in Attachment 4.2

State of Oregon
Department of Environmental Quality — Memorandum

Date: Nov. 16, 2012

To: Environmental Quality Commission

From: Dick Pedersen, Director

Subject: Agenda item H, Action item, Rule proposal: Klamath Falls $PM_{2.5}$ Attainment Plan
Dec. 6-7, 2012, EQC meeting

Why this is important

This proposed rulemaking adopts an attainment plan that will reduce fine particulate pollution and protect the health of the residents in the Klamath Falls area. The plan and associated rules are designed to bring the area into compliance with National Ambient Air Quality Standards for fine particulate, $PM_{2.5}$, by the Dec. 2014 federal deadline.

DEQ recommendation and EQC motion

DEQ recommends that the Oregon Environmental Quality Commission adopt the proposed rule amendments as presented in attachment A, approve Klamath Falls $PM_{2.5}$ Attainment Plan and direct DEQ to submit the Klamath Falls $PM_{2.5}$ Attainment Plan to EPA as revisions to Oregon's Clean Air Act State Implementation Plan.

Background and need for rulemaking

History of particulate pollution in Klamath Falls
Klamath Falls has a 25-year history of exceeding and working to meet particulate pollution standards. In 1987, the U. S. Environmental Protection Agency designated Klamath Falls a nonattainment area for coarse particulate, PM_{10} pollution. DEQ developed a plan in 1991, with revisions in 1995 that included key strategies of a mandatory woodstove curtailment and a large-scale woodstove change-out program. As a result, the area was able to lower PM_{10} emissions and to meet the standards.

EPA revised the particulate standard in 1997 to include finer, more harmful particulate, $PM_{2.5}$, and established a daily standard of 65 micrograms per cubic meter. The attainment plan strategies to meet the PM_{10} standard were so successful that Klamath Falls met the 1997 $PM_{2.5}$ standard. EPA modified the daily $PM_{2.5}$ standard again in 2006, lowering it to 35 $\mu g/m^3$. Because high winter air pollution levels violated the daily $PM_{2.5}$ standard, EPA redesignated Klamath Falls as a nonattainment area in December 2009. The federal Clean Air Act requires Klamath Falls to reduce its particulate levels to comply with the $PM_{2.5}$ standard by December 2014.

The Klamath Air Quality Advisory Committee

DEQ, in collaboration with Klamath County, convened the Klamath Air Quality Advisory Committee in 2010 to help develop and recommend strategies to bring Klamath Falls into attainment with the standard. The committee met for more than a year to consider data, community values, and pollution reduction strategies with the highest chance of success in meeting the $PM_{2.5}$ standard. The result is a thoroughly evaluated emission reduction recommendations designed to bring the community into compliance by the federal deadline of December 2014. The committee also recommended two secondary contingency measures that would take effect if the 2014 deadline is not met. These recommendations formed the groundwork for the Board of Klamath County Commissioners to include emission reduction measures in ordinances and for DEQ to produce an attainment plan for EPA approval.

State Implementation Plan

The attainment plan, developed by DEQ in accordance with EPA's guidance, is a comprehensive document that identifies the emission sources of $PM_{2.5}$ and estimates the current and future year concentrations based on the emission inventory and measurements. The plan contains emission reduction strategies consisting of local ordinances, DEQ regulations, and non-regulatory elements including incentives and education. If the community fails to reduce particulate emissions by the 2014 deadline, the plan's contingency measures would take effect automatically and are designed to achieve rapid compliance with the $PM_{2.5}$ standard. The contingency measures function as a backstop until such time the plan can be reevaluated and corrected. The proposed attainment plan will help the state and the community control emissions to ensure clean air and protect public health in Klamath Falls.

Effect of rule

The majority of the harmful particulate emissions in Klamath Falls come from residential wood burning emissions. Most of the proposed particulate reductions would come from enhancements to the community's woodstove curtailment program, implemented through local ordinances. Other attainment strategies to reduce pollution from residential wood burning include continuing a program that replaces polluting uncertified woodstoves and a public awareness and education program.

New DEQ rules must require reasonably-available controls to reduce particulate for industrial sources. Specifically, the rules require sources to comply with new opacity and operating plan requirements. The proposed rules would also make it simpler for new or expanded industrial facilities in Klamath Falls by allowing them to offset their emissions by removing uncertified woodstoves from homes, thereby decreasing wood burning emissions. Historically, industry has only offset emissions by purchasing unused emission credits from other industrial facilities. Those credits are not widely available and that could limit economic growth in the area.

If the attainment plan fails to achieve the federal standard by December 2014, additional regulations in the contingency plan would become effective. The contingency measures would prohibit the use of all uncertified fireplaces inside the Air Quality Zone during the winter wood heating season and would require Title V sources to install continuous emission monitors.

The emission reduction measures in the proposed attainment plan are designed to meet the daily $PM_{2.5}$ standard by lowering daily emissions during the winter heating season to approximately 34 $\mu g/m^3$. Although the Klamath Air Quality Advisory Committee recommended additional reduction measures to achieve a greater buffer below the standard of 35 $\mu g/m^3$, DEQ and the Klamath County Commissioners ultimately chose fewer measures with a small margin of compliance to avoid further economic impacts in Klamath Falls during a slow recovery from the economic downturn. Because it achieves the vast majority of emission reductions, the effectiveness of the woodstove curtailment program is critical to successfully meet the $PM_{2.5}$ standard in Klamath Falls.

Commission authority

The commission has authority to take this action under ORS 468.020, 468A.025 and 468A.460.

Key issues

Economic impacts

During plan development and the public comment period, DEQ heard ongoing concerns about how the plan to reduce particulate could further harm an economically struggling region, or hinder recovery. DEQ, the advisory committee and the Klamath Board of County Commissioners were aware of and sensitive to this issue and chose strategies with the lowest fiscal impact on local businesses, the economy and residents.

In addition to minimizing local economic impacts, the proposed plan includes increased flexibility for new or expanded industries by streamlining procedures to use emission offsets from woodstove changeouts. When an area is designated as nonattainment, federal requirements automatically apply for industrial sources. These requirements include requiring the most stringent control equipment for new or expanding sources or reasonable control measures (such as opacity standards, operation and maintenance plans, and fugitive plans) for existing sources. While DEQ recognizes that these federal restrictions may prevent some industries from expanding or moving to Klamath Falls, they are designed to reduce pollution and ensure the health of all residents. DEQ expects that the attainment plan will achieve timely compliance with the standard, which will enable DEQ to begin the steps needed to lift the more stringent industrial restrictions.

If Klamath Falls meets the standard by 2014, DEQ will develop and submit a maintenance plan to EPA, with a request to re-designate the area to attainment. The maintenance plan can include provisions to ease the restrictions on industrial growth, depending on the implementation success of the existing attainment plan. This will have a positive economic impact on the community. Despite the existing stringent requirements, DEQ is aware of at least two proposals from new businesses planning to locate in the Klamath Falls area.

DEQ also received comments from industrial stakeholders that the industrial contingency strategies, that would apply if the area fails to achieve the standard in December 2014, are overly burdensome. In response, DEQ has proposed to delete the particle emission rate, known as "grain loading," and wood products dryer monitoring requirements for existing facilities since these measures are not critical to achieve further particulate reductions. However, if Klamath Falls does not meet the emission standard by 2014, DEQ has determined that it will be necessary to keep the requirements for opacity monitors to verify compliance with the opacity limit and the industrial contribution to the airshed. The contingency measures would be triggered only if the current plan fails and Klamath Falls does not meet the standard by December 2014. DEQ would re-open the plan and re-evaluate all the strategies discussed during the plan development and possibly include new strategies needed to meet the standard and protect health.

Evaluating compliance with the standard
Community members raised questions related to technical accuracy in determining whether Klamath Falls is above the particulate standard. Comments received stated that the Peterson School monitor should not be used to determine compliance because the location has the poorest air quality, and they argue that the area as a whole is not out of compliance with the standard. This argument is in conflict with EPA requirements mandating that the data to determine compliance must be taken from the highest violating monitor, which is located at the Peterson School. Monitoring studies and EPA regulations confirm that this location is the most appropriate place for a monitor. Over the last 25 years, DEQ has conducted numerous monitoring studies where

particulate samples have been taken throughout the Klamath Falls area. These studies show that particulate levels are consistently high at Peterson School. The Peterson School monitor complies with specific EPA requirements for the location of monitors and how to evaluate the measurements.

A number of comments expressed concerns about effects from a proposed biomass plant on air quality in Klamath Falls. The proposed plant, Klamath Bioenergy, is outside the nonattainment area and it is not addressed in this plan. An additional biomass facility, Klamath Generation, has been proposed for construction inside the nonattainment area, but DEQ has not yet received an application for that facility. DEQ must evaluate Klamath Generation through the permitting process to ensure that it will not have any negative effects on the nonattainment area.

DEQ also received comments that questioned the validity of the $PM_{2.5}$ standard. EPA sets this standard based on the current scientific evidence that indicates that fine particulate matter, when inhaled, is harmful to humans. EPA reviews the standard once every five years as required by law. For areas in violation of the current 35 $\mu g/m^3$ standard, the federal Clean Air Act requires the development of an attainment plan to reduce emissions and restore healthy air. DEQ expects that the proposed attainment plan will have a positive effect on the health of Klamath Falls residents. There are a number of studies linking $PM_{2.5}$ exposure with respiratory problems and cardiac diseases. U.S. and Canadian studies report statistically significant relationships between an increase in $PM_{2.5}$ and an increase in hospitalizations for all respiratory causes, including chronic obstructive pulmonary disease, pneumonia and asthma. In addition to the greatly expanded body of evidence on hospitalization or emergency department visits for cardiovascular diseases, new epidemiologic studies have also reported associations between more subtle physiological changes in the cardiovascular system and short-term exposures to $PM_{2.5}$ concentrations. In addition to harming public health, these impacts could result in days of missed work that would affect the economy.

Some residents of Klamath Falls expressed concerns about smoke impacts from forest fires and prescribed burns, and questioned why these pollution sources are not targeted as major contributors to particulate levels in the area. Forest fires are capable of emitting so much particulate that the air quality exceeds the standard; however, these events are isolated and infrequent compared to constant wintertime pollution from residential woodstoves. When Klamath Falls exceeds the standard, in nearly all cases this occurs during the winter months when stagnant air conditions are coupled with increased demand for home heating. During these stagnant air events, any contribution from outside the Klamath Falls basin is unlikely to have significant contribution. Prescribed forest burning is regulated by the Oregon Smoke Management Plan and administered by Oregon Department of Forestry. According to smoke management agreements, these burns must be conducted in such a way that avoids smoke impacts to Klamath Falls.

Woodstove emissions
Enforcement of the woodstove curtailment program is the key strategy that will help Klamath Falls comply with the standard. This includes a focus on habitually violating offenders, increased patrols on red and yellow days and increased awareness and public outreach regarding the curtailment program. The curtailment program already exists; however, effective enforcement is essential for success of the plan.

Some Klamath Fall residents were concerned about the impacts of more curtailment and contingency measures that would restrict use of all but the newer and cleaner-burning fireplaces during winter months. If the contingency plan is triggered under the proposed rules, only "certified" fireplaces, or those with particulate emissions below 5.1 grams per kilogram, may be used between November and March, with exceptions for holidays. DEQ understands that Klamath Falls residents have the burden of complying with curtailment ordinances to reach the standard. However, DEQ has worked with the local community to replace as many uncertified woodstoves as possible. DEQ will continue these efforts in the future since the only way to meet the standard is through reductions in residential wood combustion emissions. Fireplace emissions contribute significantly to particulate levels above the standard. Because residents generally do not rely on fireplaces for essential heating needs, they are the preferred source of emission reductions for a contingency measure.

Several comments submitted questioned why DEQ did not include in the attainment plan additional wood burning strategies that were recommended by the Klamath Falls Advisory Committee. DEQ collaborated with the Klamath County Commissioners to develop the best, most acceptable strategies for the community. While DEQ recommended adding strategies to achieve a greater margin of compliance, the Klamath County Commissioners decided that the strategies chosen were sufficient to achieve compliance with the standard. DEQ agrees the proposed strategies are sufficient but recognizes that by not adopting the full suite of strategies recommended by the advisory committee, the Klamath County

Commissioners have elected to reduce the safety margin for compliance with the $PM_{2.5}$ standard. A smaller safety margin or buffer for compliance increases the chance that the community will not achieve healthy air as scheduled and also experience the additional burdens of the contingency measures.

Public outreach

DEQ held two public hearings in Klamath Falls on Aug. 21, 2012, one during the day and one in the evening. Results of public input are provided in attachment C. In response to comments received during the public comment period, DEQ is proposing some changes to the rules and the plan. One change to the plan is prompted by EPA's comment on the effectiveness of the woodstove curtailment strategies. EPA believes that effectiveness is lower than what DEQ initially calculated, resulting in overall lower estimate of the final design value. This lower design value is still in compliance with the standard.

DEQ received a number of comments from industry and residents that expressed concerns about negative impacts on industry and the recovering economy. To minimize potential economic impacts of the proposed contingency measures, DEQ proposes to delete two of the industrial measures that are not critical for the contingency plan: the change in the grain loading emission limit from 0.2 grains per standard cubic foot to 0.1 grains per standard cubic foot, and the requirement to monitor operating conditions on wood products dryers. However, DEQ is maintaining the other contingency measure that requires continuous monitoring at wood fired boilers at large facilities. In case the attainment plan fails and DEQ must reconsider all the strategies and emission sources, this measure would be necessary to ensure compliance with industrial particulate limits and confirms the particulate contributions from industry.

Next steps

Plan implementation

If approved, DEQ would submit the revised rules to EPA as a revision to the Oregon Clean Air Act State Implementation Plan. DEQ will work closely with Klamath County Health Department to ensure its staff is aware of the importance of the curtailment strategies to the success of the attainment plan. DEQ will assist the Klamath County Health Department in designing public education materials and will continue to provide funding assistance to the county to implement the woodstove curtailment and information program. DEQ will continue to monitor for compliance with the $PM_{2.5}$ standard at the Peterson School site. DEQ will train Eastern Region staff on implementation of and compliance with new regulations affecting permitted industrial facilities, and staff will in turn communicate the new requirements to permittees. Finally, DEQ staff will continue to collaborate with Klamath area local government, elected officials and the public to track progress and implement a successful $PM_{2.5}$ reduction plan.

Attachments

A. Proposed rule revisions
B. Summary of public comments and agency responses
C. Presiding Officer's Report on Public Hearings
D. Relationship to Federal Requirements questions
E. Statement of Need and Fiscal and Economic Impact
F. Land Use Evaluation statement

Available upon request

1. Klamath Falls $PM_{2.5}$ Attainment Plan
2. Klamath Falls Advisory Committee Report
3. Legal Notice of Hearing
4. Written comments received

Approved:

Division: ____________________

Section: ____________________

Report prepared by: Rachel Sakata

Attachment 2

Evidence that the state has the necessary legal authority

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Attachment 3

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- 3.2d Rules for Areas With Unique Air Quality Needs: OAR **340-240-**: 0010, 0030, 0500, 0510, 0520, 0530, 0540, 0550, 0560, 0570, 0580, 0610, 0620, 0630. Effective December 11, 2012
- 3.2e Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices: OAR **340-262-:** 1000. Effective December 11, 2012
- 3.2f Rules for Open Burning: OAR **340-264-**: 0040, 0078, 0080, 0100, 0175. Effective December 11, 2012

3.3 **Adopted attainment plan and appendices**

3.3a Klamath Falls $PM_{2.5}$ attainment plan
3.3b Klamath Falls 1996-97 sat survey appendix
3.3c Klamath Falls 2000-01 $PM_{2.5}$ particulate survey report
3.3d1 Klamath Falls 2010-11 $PM_{2.5}$ survey
3.3d2 Klamath Falls 2010-11 $PM_{2.5}$ survey1
3.3e Background monitor
3.3f SANDWICH speciation
3.3g1 SOA box model description
3.3g2 SOA box model predictions for Klamath Falls
3.3h Klamath Falls PMF report
3.3i Klamath Falls economic situation in 2008 and trends
3.3j Klamath Falls topography, winter meterology, consideration of 2008 as base year
3.3k1 Woodstove survey
3.3k2 Woodstove survey appendix A-1
3.3k3 Woodstove survey appendix A-2
3.3k4 Woodstove survey appendix B
3.3l Emission inventory
3.3m DEQ study - prescribed burning
3.3n Effective emissions
3.3o EI reductions - county ordinance
3.3p1 RACT - RACM
3.3p2 RACM analysis
3.3p3 Rejected RACT - RACM
3.3q KAQAC report
3.3r1 Klamath County ordinance 2007
3.3r2 Klamath County ordinance 2012
3.3s Klamath County draft IGA 2013
3.3t1 Designation of Air Quality Areas: OAR **340-204**-: 0010
3.3t2 Air Quality Analysis Requirements: OAR **340-225**-: 0090
3.3t3 Rules for Areas With Unique Air Quality Needs: OAR **340-240**-: 0010, 0030, 0500, 0510, 0520, 0530, 0540, 0550, 0560, 0570, 0580, 0610, 0620, 0630
3.3t4 Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices: OAR **340-262**-: 1000
3.3t5 Rules for Open Burning: OAR **340-264**-: 0040, 0078, 0080, 0100, 0175
3.3u Wintersanding
3.3v Design value
3.3w AERMOD dispersion modeling
3.3x1 Rollback modeling
3.3x2 Rollback and emission reduction measures
3.3y Unmonitored area analysis
3.3z Conformity determination
3.3aa References

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 200

GENERAL AIR POLLUTION PROCEDURES AND DEFINITIONS

General

340-200-0040

State of Oregon Clean Air Act Implementation Plan

(1) This implementation plan, consisting of Volumes 2 and 3 of the State of Oregon Air Quality Control Program, contains control strategies, rules and standards prepared by the Department of Environmental Quality and is adopted as the state implementation plan (SIP) of the State of Oregon pursuant to the federal Clean Air Act, 42 U.S.C.A 7401 to 7671q.

(2) Except as provided in section (3), revisions to the SIP will be made pursuant to the Commission's rulemaking procedures in division 11 of this chapter and any other requirements contained in the SIP and will be submitted to the United States Environmental Protection Agency for approval. The State Implementation Plan was last modified by the Commission on December 6, 2012.

(3) Notwithstanding any other requirement contained in the SIP, the Department may:

(a) Submit to the Environmental Protection Agency any permit condition implementing a rule that is part of the federally-approved SIP as a source-specific SIP revision after the Department has complied with the public hearings provisions of 40 CFR 51.102 (July 1, 2002); and

(b) Approve the standards submitted by a regional authority if the regional authority adopts verbatim any standard that the Commission has adopted, and submit the standards to EPA for approval as a SIP revision.

NOTE: Revisions to the State of Oregon Clean Air Act Implementation Plan become federally enforceable upon approval by the United States Environmental Protection Agency. If any provision of the federally approved Implementation Plan conflicts with any provision adopted by the Commission, the Department shall enforce the more stringent provision.

Stat. Auth.: ORS 468.020, 468A.035 & 468A.070
Stats. Implemented: ORS 468A.035
Hist.: DEQ 35, f. 2-3-72, ef. 2-15-72; DEQ 54, f. 6-21-73, ef. 7-1-73; DEQ 19-1979, f. & ef. 6-25-79; DEQ 21-1979, f. & ef. 7-2-79; DEQ 22-1980, f. & ef. 9-26-80; DEQ 11-1981, f. & ef. 3-26-81; DEQ 14-1982, f. & ef. 7-21-82; DEQ 21-1982, f. & ef. 10-27-82; DEQ 1-1983, f. & ef. 1-21-83; DEQ 6-1983, f. & ef. 4-18-83; DEQ 18-1984, f. & ef. 10-16-84; DEQ 25-1984, f. & ef. 11-27-84; DEQ 3-1985, f. & ef. 2-1-85; DEQ 12-1985, f. & ef. 9-30-85; DEQ 5-1986, f. & ef. 2-21-86; DEQ 10-1986, f. & ef. 5-9-86; DEQ 20-1986, f. & ef. 11-7-86; DEQ 21-1986, f. & ef. 11-7-86; DEQ 4-1987, f. & ef. 3-2-87; DEQ 5-1987, f. & ef. 3-2-87; DEQ 8-1987, f. & ef. 4-23-87; DEQ 21-1987, f. & ef. 12-16-87; DEQ 31-1988, f. 12-20-88, cert. ef. 12-23-88; DEQ 2-1991, f. & cert. ef. 2-14-91; DEQ 19-1991, f. & cert. ef. 11-13-91; DEQ 20-1991, f. & cert. ef. 11-13-91; DEQ 21-1991, f. & cert. ef. 11-13-91; DEQ 22-1991, f. & cert. ef. 11-13-91; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 24-1991, f. & cert. ef. 11-13-91; DEQ 25-1991, f. & cert. ef. 11-13-91; DEQ 1-1992, f. & cert. ef. 2-4-92; DEQ 3-1992, f. & cert. ef. 2-4-92; DEQ 7-1992, f. & cert. ef. 3-30-92; DEQ 19-1992, f. & cert. ef. 8-11-92; DEQ 20-1992, f. & cert. ef. 8-11-92; DEQ 25-1992, f. 10-30-92, cert. ef. 11-1-92; DEQ 26-1992, f. & cert. ef. 11-2-92; DEQ 27-1992, f. & cert. ef. 11-12-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 8-1993, f. & cert. ef. 5-11-93; DEQ 12-1993, f. & cert. ef. 9-24-93; DEQ 15-1993, f. & cert. ef. 11-4-93; DEQ 16-1993, f. & cert. ef. 11-4-93; DEQ 17-1993, f. & cert. ef. 11-4-93; DEQ 19-1993, f. & cert. ef. 11-4-93; DEQ 1-1994, f. & cert. ef. 1-3-94; DEQ 5-1994, f. & cert. ef. 3-21-94; DEQ 14-1994, f. & cert. ef. 5-31-94; DEQ 15-1994, f. 6-8-94, cert. ef. 7-1-94; DEQ 25-1994, f. & cert. ef. 11-2-94; DEQ 9-1995, f. & cert. ef. 5-1-95; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 14-1995, f. & cert. ef. 5-25-95; DEQ 17-1995, f. & cert. ef. 7-12-95; DEQ 19-1995, f. & cert. ef. 9-1-95; DEQ 20-1995 (Temp), f. & cert. ef. 9-14-95; DEQ 8-1996(Temp), f. & cert. ef. 6-3-96; DEQ 15-1996, f. & cert. ef. 8-14-96; DEQ 19-1996, f. & cert. ef. 9-24-96; DEQ 22-1996, f. & cert. ef. 10-22-96; DEQ 23-1996, f. & cert. ef. 11-4-96; DEQ 24-1996, f. & cert. ef. 11-26-96; DEQ 10-1998, f. & cert. ef. 6-22-98; DEQ 15-1998, f. & cert. ef. 9-23-98; DEQ 16-1998, f. & cert. ef. 9-23-98; DEQ 17-1998, f. & cert. ef. 9-23-98; DEQ 20-1998, f. & cert. ef. 10-12-98; DEQ 21-1998, f. & cert. ef. 10-12-98; DEQ 1-1999, f. & cert. ef. 1-25-99; DEQ 5-1999, f. & cert. ef. 3-25-99; DEQ 6-1999, f. & cert. ef. 5-21-99; DEQ 10-1999, f. & cert. ef. 7-1-99; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-020-0047; DEQ 15-1999, f. & cert. ef. 10-22-99; DEQ 2-2000, f. 2-17-00, cert. ef. 6-1-01; DEQ 6-2000, f. & cert. ef. 5-22-00; DEQ 8-2000, f. & cert. ef. 6-6-00; DEQ 13-2000, f. & cert. ef. 7-28-00; DEQ 16-2000, f. & cert. ef. 10-25-00; DEQ 17-2000, f. & cert. ef. 10-25-00; DEQ 20-2000 f. & cert. ef. 12-15-00; DEQ 21-2000, f. & cert. ef. 12-15-00; DEQ 2-2001, f. & cert. ef. 2-5-01; DEQ 4-2001, f. & cert. ef. 3-27-01; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01; DEQ 15-2001, f. & cert. ef. 12-26-01; DEQ 16-2001, f. & cert. ef. 12-26-01; DEQ 17-2001, f. & cert. ef. 12-28-01; DEQ 4-2002, f. & cert. ef. 3-14-02; DEQ 5-2002, f. & cert. ef. 5-3-02; DEQ 11-2002, f. & cert. ef. 10-8-02; DEQ 5-2003, f. & cert. ef. 2-6-03; DEQ 14-2003, f. & cert. ef. 10-24-03; DEQ 19-2003, f. & cert. ef. 12-12-03; DEQ 1-2004, f. & cert. ef. 4-14-04; DEQ 10-2004, f. & cert. ef. 12-15-04; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 2-2005, f. & cert. ef. 2-10-05; DEQ 4-2005, f. 5-13-05, cert. ef. 6-1-05; DEQ 7-2005, f. & cert. ef. 7-12-05; DEQ 9-2005, f. & cert. ef. 9-9-05; DEQ 2-2006, f. & cert. ef. 3-14-06; DEQ 4-2006, f. 3-29-06, cert. ef. 3-31-06; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 4-2007, f. & cert. ef. 6-28-07; DEQ 8-2007, f. & cert. ef. 11-8-07; DEQ 5-2008, f. & cert. ef. 3-20-08; DEQ 11-2008, f. & cert. ef. 8-29-08; DEQ 12-2008, f. & cert. ef. 9-17-08; DEQ 14-2008,

f. & cert. ef. 11-10-08; DEQ 15-2008, f. & cert. ef 12-31-08; DEQ 3-2009, f. & cert. ef. 6-30-09; DEQ 8-2009, f. & cert. ef. 12-16-09; DEQ 2-2010, f. & cert. ef. 3-5-10; DEQ 5-2010, f. & cert. ef. 5-21-10; DEQ 14-2010, f. & cert. ef. 12-10-10; DEQ 1-2011, f. & cert. ef. 2-24-11; DEQ 2-2011, f. 3-10-11, cert. ef. 3-15-11; DEQ 5-2011, f. 4-29-11, cert. ef. 5-1-11; DEQ 18-2011, f. & cert. ef. 12-21-11; DEQ 1-2012, f. & cert. ef. 5-17-12

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 204

DESIGNATION OF AIR QUALITY AREAS

340-204-0010

Definitions

The definitions in OAR 340-200-0020 and this rule apply to this division. If the same term is defined in this rule and 340-200-0020, the definition in this rule applies to this division. Definitions of boundaries in this rule also apply to OAR 340 division 200 through 268 and throughout the State of Oregon Clean Air Act Implementation Plan adopted under 340-200-0040.

(1) “AQCR” means Air Quality Control Region.

(2) “AQMA” means Air Quality Maintenance Area.

(3) “CO” means Carbon Monoxide.

(4) “CBD” means Central Business District.

(5) “Criteria Pollutant” means any of the six pollutants set out by the Clean Air Act (sulfur oxides, particulate matter, ozone, carbon monoxide, nitrogen dioxide, and lead) for which the EPA has promulgated standards in 40 CFR 50.4 through 50.12 (July, 1993).

(6) “Eugene-Springfield UGB” means the area within the bounds beginning at the Willamette River at a point due east from the intersection of East Beacon Road and River Loop No.1; thence southerly along the Willamette River to the intersection with Belt Line Road; thence easterly along Belt Line Road approximately one-half mile to the intersection with Delta Highway; thence northwesterly and then northerly along Delta Highway and on a line north from the Delta Highway to the intersection with the McKenzie River; thence generally southerly and easterly along the McKenzie River approximately eleven miles to the intersection with Marcola Road; thence southwesterly along Marcola Road to the intersection with 42nd Street; thence southerly along 42nd Street to the intersection with the northern branch of US Highway 126; thence easterly along US Highway 126 to the intersection with 52nd Street; thence north along 52nd Street to the intersection with High Banks Road; thence easterly along High Banks Road to the intersection with 58th Street; thence south along 58th Street to the intersection with Thurston Road; thence easterly along Thurston Road to the intersection with the western boundary of Section 36, T17S, R2W; thence south to the southwest corner of Section 36, T17S, R2W; thence west to the Springfield City Limits; thence following the Springfield City Limits southwesterly to the intersection with the western boundary of Section 2, T18S, R2W; thence on a line southwest to the Private Logging Road approximately one-half mile away; thence southeasterly along the Private Logging Road to the intersection with Wallace Creek; thence southwesterly along Wallace Creek to the confluence with the Middle Fork of the Willamette River; thence generally northwesterly along the Middle Fork of the Willamette River approximately seven and one-half miles to the intersection with the northern boundary of Section 11, T18S, R3W; thence west to the northwest corner of Section 10, T18S, R3W; thence south to the intersection with 30th Avenue; thence westerly along 30th Avenue to the intersection with the Eugene City Limits; thence following the Eugene City Limits first southerly then westerly then northerly and finally westerly to the intersection with the northern boundary of Section 5, T18S, R4W; thence west to the intersection with Greenhill Road; thence north along Greenhill Road to the intersection with Barger Drive; thence east along Barger Drive to the intersection with the Eugene City Limits (Ohio Street); thence following the Eugene City Limits first north then east then north then east then south then east to the intersection with Jansen Drive; thence east along Jansen Drive to the intersection with Belt Line Road; thence northeasterly along Belt Line Road to the intersection with Highway 99; thence northwesterly along Highway 99 to the intersection with Clear Lake Road; thence west along Clear Lake Road to the intersection with the western boundary of Section 9, T17S, R4W; thence north to the intersection with Airport Road; thence east along Airport Road to the intersection with Highway 99; thence northwesterly along Highway 99 to the intersection East Enid Road; thence east

along East Enid Road to the intersection with Prairie Road; thence southerly along Prairie Road to the intersection with Irvington Road; thence east along Irvington Road to the intersection with the Southern Pacific Railroad Line; thence southeasterly along the Southern Pacific Railroad Line to the intersection with Irving Road; thence east along Irving Road to the intersection with Kalmia Road; thence northerly along Kalmia Road to the intersection with Hyacinth Road; thence northerly along Hyancinth Road to the intersection with Irvington Road; thence east along Irvington Road to the intersection with Spring Creek; thence northerly along Spring Creek to the intersection with River Road; thence northerly along River Road to the intersection with East Beacon Drive; thence following East Beacon Drive first east then south then east to the intersection with River Loop No.1; thence on a line due east to the Willamette River and the point of beginning.

(7) “Grants Pass CBD” means the area within the City of Grants Pass enclosed by “B” Street on the north, 8th Street to the east, “M” Street on the south, and 5th Street to the west.

(8) Grants Pass Control Area means the area of the state beginning at the northeast corner of Section 35, T35S, R5W; thence south to the southeast corner of Section 11, T37S, R5W; thence west to the southwest corner of Section 9, T37S, R6W; thence north to the northwest corner of Section 33, T35S, R6W; thence east to the point of beginning.

(9) “Grants Pass UGB” as shown on the Plan and Zoning maps for the City of Grants Pass as of Feb. 1, 1988 is the area within the bounds beginning at the NW corner of Sec. 7, T36S, R5W; thence south to the SW corner of Sec. 7; thence west along the southern boundary of Sec. 12, T36S, R5W approx. 2000 feet; thence south approx. 100 feet to the northern right of way of the Southern Pacific Railroad Line (SPRR Line); thence southeasterly along said right of way approx. 800 feet; thence south approx. 400 feet; thence west approx. 1100 feet; thence south approx. 700 feet to the intersection with the Hillside Canal; thence west approx. 100 feet; thence south approx. 550 feet to the intersection with Upper River Road; thence southeasterly along Upper River Road and continuing east along Old Upper River Road approx. 700 feet; thence south approx. 1550 feet; thence west approx. 350 feet; thence south approx. 250 feet; thence west approx. 1000 feet; thence south approx. 600 feet to the north end of Roguela Lane; thence east approx. 400 feet; thence south approx. 1400 feet to the intersection with Lower River Road; thence west along Lower River Road approx. 1400 feet; thence south approx. 1350 feet; thence west approx. 25 feet; thence south approx. 1200 feet to the south bank of the Rogue River; thence northwesterly along said bank approx. 2800 feet; thence on a line southwesterly and parallel to Parkhill Place approx. 600 feet; thence northwesterly at a 90 degree angle approximately 300 feet to the intersection with Parkhill Place; thence southwesterly along Parkhill Place approx. 250 feet; thence on a line southeasterly forming a 90 degree angle approximately 300 feet to a point even with Leonard Road; thence west approx. 1500 feet along Leonard Road; thence north approx. 200 feet; thence west to the west side of Schroeder Lane; thence north approx. 150 feet; thence west approx. 200 feet; thence south to the intersection with Leonard Road; thence west along Leonard Road approx. 450 feet; thence north approx. 300 feet; thence east approx. 150 feet; thence north approx. 400 feet; thence west approx. 500 feet; thence south approx. 300 feet; thence west to the intersection with Coutant Lane; thence south along Coutant Lane to the intersection with Leonard Road; thence west along Leonard Road to the intersection with Buena Vista Lane; thence north along the west side of Buena Vista Lane approx. 200 feet; thence west approx. 150 feet; thence north approx. 150 feet; thence west approx. 200 feet; thence north approx. 400 feet; thence west approx. 600 feet to the intersection with the western boundary of Sec. 23, T36S, R6W; thence south to the intersection with Leonard Road; thence west along Leonard Road approx. 300 feet; thence north approx. 600 feet to the intersection with Darneille Lane; thence northwesterly along Darneille Lane approx. 200 feet; thence west approx. 300 feet; thence south approx. 600 feet to the intersection with Leonard Road; thence west along Leonard Road approx. 700 feet; thence south approx. 1350 feet; thence east approx. 1400 feet to the intersection with Darneille Lane; thence south along Darneille Lane approx. 600 feet; thence west approx. 300 feet; thence south to the intersection with Redwood Avenue; thence east along Redwood Avenue to the intersection with Hubbard Lane and the western boundary of Sec. 23, T36S, R6W; thence south along Hubbard Lane approx. 1850 feet; thence west approx. 1350 feet ; thence south to the south side of U.S. Highway 199; thence westerly along U.S. 199 approx. 1600 feet to the intersection with the north-south midpoint of Sec. 27, T36S, R6W; thence south approx. 2200 feet; thence east approx. 1400 feet; thence north approx. 1000 feet; thence east approx. 300 feet; thence north approx. 250 feet to the intersection with the Highline Canal; thence northerly along the Highline Canal approx. 900 feet; thence east to the intersection with Hubbard Lane; thence north along Hubbard Lane approximately 600 feet; thence east approx. 200 feet; thence north approx. 400 feet to a point even with Canal Avenue; thence east approx. 550 feet; thence north to the south side of U.S. 199; thence easterly along the southern edge of U.S. 199 to the intersection with Willow Lane; thence south along Willow Lane to the intersection with Demaray Drive; thence easterly along Demaray Drive and continuing along the southern edge of U.S. 199 to the intersection with Dowell Road; thence south along Dowell Road approx. 550 feet; thence easterly approx. 750 feet; thence north to the intersection with the South Canal; thence easterly along the South Canal to the intersection with Schutzwohl Lane; thence south approx. 1300 feet to a point even with West Harbeck Road; thence east approx. 2000 feet to the intersection with Allen Creek; thence southerly along Allen Creek approx. 1400 feet to a

point even with Denton Trail to the west; thence west to the intersection with Highline Canal; thence southerly along Highline Canal to the intersection with the southern boundary of Sec. 25, T36S, R6W; thence east to the intersection with Allen Creek; thence southerly along Allen Creek to the intersection with the western boundary of Sec. 31, T36S, R5W; thence south to the SW corner of Sec. 31; thence east to the intersection with Williams Highway; thence southeasterly along Williams Highway approx. 1300 feet; thence east approx. 200 feet; thence north approx. 400 feet; thence east approx. 700 feet; thence north to the intersection with Espey Road; thence west along Espey Road approx. 150 feet; thence north approx. 600 feet; thence east approx. 300 feet; thence north approx. 2000 feet; thence west approx. 2100 feet; thence north approx. 1350 feet; thence east approx. 800 feet; thence north approx. 2800 feet to the east-west midline of Sec. 30, T36S, R5W; thence on a line due NE approx. 600 feet; thence north approx. 100 feet; thence east approx. 600 feet; thence north approx. 100 feet to the intersection with Highline Canal; thence easterly along Highline Canal approx. 1300 feet; thence south approx. 100 feet; thence east to the intersection with Harbeck Road; thence north along Harbeck Road to the intersection with Highline Canal; thence easterly along Highline Canal to a point approx. 250 feet beyond Skyway Road; thence south to the intersection with Skyway Road; thence east to the intersection with Highline Canal; thence southeasterly along Highline Canal approx. 1200 feet; thence on a line due SW to the intersection with Bluebell Lane; thence southerly along Bluebell Lane approx. 150 feet; thence east to the intersection with Sky Crest Drive; thence southerly along Sky Crest Drive to the intersection with Harper Loop; thence southeasterly along Harper Loop to the intersection with the east-west midline of Sec. 29, T36S, R5W; thence east approx. 400 feet; thence south approx. 1300 feet to a point even with Troll View Road to the east; thence east to the intersection with Hamilton Lane; thence north along Hamilton Lane to the intersection with the Highline Canal; thence northeasterly along the Highline Canal to the northern boundary of Sec. 28, T36S, R5W; thence east approx. 1350 feet to the transmission line; thence north to the intersection with Fruitdale Drive; thence southwesterly along Fruitdale Drive approx. 700 feet; thence north to the northern edge of U.S. 199; thence easterly along the northern edge of U.S. 199 approx. 50 feet; thence north to the north bank of the Rogue River; thence northeasterly along the north bank of the Rogue River approx. 2100 feet to a point even with Ament Road; thence north to Ament Road and following Ament Road to U.S. Interstate Highway 5 (U.S. I-5); thence continuing north to the 1200 foot contour line; thence following the 1200 foot contour line northwesterly approx. 7100 feet to the city limits and a point even with Savage Street to the west; thence north following the city limits approx. 400 feet; thence west to the intersection with Beacon Street; thence north along Beacon Street and the city limits approx. 250 feet; thence east along the city limits approx. 700 feet; thence north along the city limits approx. 2200 feet; thence southwesterly along the city limits approximately 800 feet to the intersection with the 1400 foot contour line; thence northerly and northwesterly along the 1400 foot contour line approx. 900 feet to the intersection with the northern boundary of Sec. 9, T36S, R5W; thence west along said boundary approx. 100 feet to the NW corner of Sec. 9; thence south along the western boundary of Sec. 9 approx. 700 feet; thence west approx. 1400 feet; thence north approx. 2400 feet; thence west approx. 1350 feet; thence north approx. 1100 feet to the city limits; thence following the city limits first west approx. 1550 feet, then south approx. 800 feet, then west approx. 200 feet, then south approx. 200 feet, then east approx. 200 feet, then south approx. 300 feet, and finally westerly approx. 1200 feet to the intersection with the western boundary of Sec. 5, T36S, R5W; thence south along said boundary to the northern side of Vine Avenue; thence northwesterly along the northern side of Vine Avenue approx. 3150 feet to the intersection with the west fork of Gilbert Creek; thence north to the intersection with the southern right of way of U.S. I-5; thence northwesterly along said right of way approx. 1600 feet; thence south to the intersection with Old Highland Avenue; thence northwesterly along Highland Avenue approx. 650 feet; thence west approx. 350 feet; thence south approx. 1400 feet; thence east approx. 700 feet; thence south approx. 1000 feet; thence on a line SW approx. 800 feet; thence south approx. 1400 feet to the intersection with the northern boundary of Sec. 7, T36S, R5W; thence west to the NW corner of Sec. 7, the point of beginning.

(10) Klamath Falls Control Area means the area of the state beginning at the northeast corner of Section 8, T38S, R10E, thence south to the southeast corner of Section 5, T40S, R10E; thence west to the southwest corner of Section 3, T40S, R8E; thence north to the northwest corner of Section 10, T38S, R8E; thence east to the point of beginning.

(11) “Klamath Falls Nonattainment Area” means the area of the state beginning at the northwest corner of Section 31, T37S, R9E; thence east approximately two miles to the northeast corner of Section 32; thence south approximately four miles to the southeast corner of Section 17, T38S, R9E; thence east approximately one mile to the southwest corner of Section 15,; thence north approximately one mile to the northwest corner of Section 15; thence east approximately 2 miles to the northeast corner of Section 14; thence south approximately one mile to the northwest corner of section 24; thence east approximately one mile to the northeast corner of Section 24; thence south approximately three miles to the southeast corner of Section 36; thence east approximately four miles to the northeast corner of Section 3, T39S, R10E; thence south approximately three miles to the southeast corner of Section 15; thence west approximately two miles to the southwest corner of Section16; thence south approximately two miles to the southeast corner of Section 29; thence west approximately five miles to the southwest corner of Section 27, T39S, R9E; thence north approximately one mile to the northeast corner of Section 27; thence west

approximately four miles to the southwest corner of Section 24, T39S R8E; thence north approximately two miles to the northeast corner of Section 13; thence west approximately one mile to the southwest corner of Section 11; thence north approximately four miles to the northwest corner of Section 26 T38S, R8E; thence west one mile to the southwest corner of Section 22; thence north approximately one mile to the northwest corner of Section 22; thence west approximately one mile to the southwest corner of Section 16; thence north approximately one mile to the northeast corner of Section 16; thence west approximately one mile to the southwest corner of Section 8; thence north approximately two miles to the northwest corner of Section 5; thence east to the northeast corner of Section 1; thence north approximately one mile to the point of beginning.

(12) “Klamath Falls UGB” means the area within the bounds beginning at the southeast corner of Section 36, Township 38 South, Range 9 East; thence northerly approximately 4500 feet; thence westerly approximately 1/4 mile; thence northerly approximately 3/4 mile into Section 25, T38S, R9E; thence westerly approximately 1/4 mile; thence northerly approximately 1/2 mile to the southern boundary of Section 24, T38S, R9E; thence westerly approximately 1/2 mile to the southeast corner of Section 23, T38S, R9E; thence northerly approximately 1/2 mile; thence westerly approximately 1/4 mile; thence northerly approximately 1/2 mile to the southern boundary of Section 14, T38S, R9E; thence generally northwesterly along the 5000 foot elevation contour line approximately 3/4 mile; thence westerly 1 mile; thence north to the intersection with the northern boundary of Section 15, T38S, R9E; thence west 1/4 mile along the northern boundary of Section 15, T38S, R9E; thence generally southeasterly following the 4800 foot elevation contour line around the old Oregon Institute of Technology Campus to meet with the westerly line of Old Fort Road in Section 22, T38S, R9E; thence southwesterly along the westerly line of Old Fort Road approximately 1 and 1/4 miles to Section 27, T38S, R9E; thence west approximately 1/4 mile; thence southwesterly approximately 1/2 mile to the intersection with Section 27, T38S, R9E; thence westerly approximately 1/2 mile to intersect with the Klamath Falls City Limits at the northerly line of Loma Linda Drive in Section 28, T38S, R9E; thence northwesterly along Loma Linda Drive approximately 1/4 mile; thence southwesterly approximately 1/8 mile to the Klamath Falls City Limits; thence northerly along the Klamath Falls City Limits approximately 1 mile into Section 21, T38S, R9E; thence westerly approximately 1/4 mile; thence northerly approximately 1 mile into Section 17, T38S, R9E; thence westerly approximately 3/4 mile into Section 17, T38S, R9E; thence northerly approximately 1/4 mile; thence westerly approximately 1 mile to the west boundary of Highway 97 in Section 18, T38S, R9E; thence southeasterly along the western boundary of Highway 97 approximately 1/2 mile; thence southwesterly away from Highway 97; thence southeasterly to the intersection with Klamath Falls City Limits at Front Street; thence westerly approximately 1/4 mile to the western boundary of Section 19, T38S, R9E; thence southerly approximately 1 and 1/4 miles along the western boundary of Section 19, T38S, R9E and the Klamath Falls City Limits to the south shore line of Klamath Lake; thence northwesterly along the south shore line of Klamath Lake approximately 1 and 1/4 miles across Section 25, T38S, R9E and Section 26, T38S, R9E; thence westerly approximately 1/2 mile along Section 26, T38S, R9E; thence southerly approximately 1/2 mile to Section 27, T38S, R9E to the intersection with eastern boundary of Orindale Draw, thence southerly along the eastern boundary of Orindale Draw approximately 1 and 1/4 miles into Section 35, T38S, R9E; thence southerly approximately 1/2 mile into Section 2, T39S, R8E; thence easterly approximately 1/4 mile; thence northerly approximately 1/4 mile to the southeast corner of Section 35, T38S, R8E and the Klamath Falls City Limits; thence easterly approximately 1/2 mile to the northern boundary of Section 1, T38S, R8E; thence southeasterly approximately 1/2 mile to Orindale Road; thence north 500 feet along the west side of an easement; thence easterly approximately 1 and 1/4 miles through Section 1, T38S, R8E to the western boundary of Section 6, T39S, R9E; thence southerly approximately 3/4 mile to the southwest corner of Section 6, T39S, R9E; thence easterly approximately 1/8 mile to the western boundary of Highway 97; thence southwesterly along the Highway 97 right-of-way approximately 1/4 mile; thence westerly approximately 1/2 mile to Agate Street in Section 7, T39S, R8E; thence northerly approximately 1/4 mile; thence westerly approximately 3/4 mile to Orindale Road in Section 12, T39S, R8E; thence northerly approximately 1/4 mile into Section 1, T39S, R8E; thence westerly approximately 3/4 mile to the Section 2, T39S, R8E boundary line; thence southerly approximately 3/4 mile along the Section 2, T39S, R8E boundary line to the northwest corner of Section 12, T39S, R8E; thence westerly approximately 1/8 mile into Section 11, T39S, R8E; thence southerly approximately 1/8 mile; thence northeasterly approximately 3/4 mile to the southern boundary of Section 12, T39S, R8E at Balsam Drive; thence southerly approximately 1/4 mile into Section 12, T39S, R8E; thence easterly approximately 1/4 mile to Orindale Road; thence southeasterly approximately 500 feet to Highway 66; thence southwesterly approximately 1/2 mile along the boundary of Highway 66 to Holiday Road; thence southerly approximately 1/2 mile into Section 13, T39S, R8E; thence northeasterly approximately 1/4 mile to the eastern boundary of Section 13, T39S, R8E; thence northerly approximately 1/4 mile along the eastern boundary of Section 13, T39S, R8E; thence westerly approximately 1/4 mile to Weyerhaeuser Road; thence northerly approximately 1/8 mile; thence easterly approximately 1/8 mile; thence northerly approximately 1/8 mile; thence westerly approximately 1/8 mile to Farrier Avenue; thence northerly approximately 1/4 mile; thence easterly approximately 1/4 mile to the eastern boundary of Section 13, T39S, R8E; thence northerly approximately 1/8 mile along the eastern boundary of Section 13, T39S, R8E; thence easterly approximately 1/4 mile along the northern section line of Section 18, T39S, R8E; thence southerly approximately 1/4 mile; thence easterly approximately 1/2 mile to the boundary of Highway 97; thence southerly approximately 1/3 mile to the Burlington Northern Right-of-Way; thence northeasterly approximately 1 and 1/3 miles along the high water line of the Klamath River to the Southside

Bypass in Section 8, T39S, R9E; thence southeasterly along the Southside Bypass to the Southern Pacific Right-of-Way in Section 9, T39S, R9E; thence southerly approximately 1/2 mile along the Southern Pacific Right-of-Way; thence southwesterly approximately 1/4 mile along the Midland Highway; thence southeasterly approximately 1/4 mile to the old railroad spur; thence easterly 1/4 mile along the old railroad spur; thence southerly approximately 1/4 mile in Section 16, T39S, R9E; thence westerly approximately 1/3 mile; thence southerly approximately 1/4 mile; thence easterly approximately 1/16 mile in Section 21, T39S, R9E; thence southerly approximately 1/8 mile to the Lost River Diversion Channel; thence southeasterly approximately 1/4 mile along the northern boundary of the Lost River Diversion Channel; thence easterly approximately 3/4 mile along Joe Wright Road into Section 22, T39S, R9E; thence southeasterly approximately 1/8 mile on the eastern boundary of the Southern Pacific Right-of-Way; thence southeasterly approximately 1 mile along the western boundary of the Southern Pacific Right-of-Way across Section 22, T39S, R9E and Section 27, T39S, R9E to a point 440 yards south of the northern boundary of Section 27, T39S, R9E; thence easterly to Kingsley Field; thence southeasterly approximately 3/4 mile to the southern boundary of Section 26, T39S, R9E; thence east approximately 1/2 mile along the southern boundary of Section 26, T39S, R9E to a pond; thence north-northwesterly for 1/2 mile following the Klamath Falls City Limits; thence north 840 feet; thence east 1155 feet to Homedale Road; thence north along Homedale Road to a point 1/4 mile north of the southern boundary of Section 23, T39S, R9E; thence west 1/4 mile; thence north 1 mile to the Southside Bypass in Section 14, T39S, R9E; thence east 1/2 mile along the Southside Bypass to the eastern boundary of Section 14, T39S, R9E; thence north 1/2 mile; thence east 900 feet into Section 13, T39S, R9E; thence north 1320 feet along the USBR 1-C 1-A to the southern boundary of Section 12, T39S, R9E; thence north 500 feet to the USBR A Canal; thence southeasterly 700 feet along the southern border of the USBR A Canal back into Section 13, T39S, R9E; thence southeast 1600 feet to the northwest parcel corner of an easement for the Enterprise Irrigation District; thence east-northeast 2200 feet to the eastern boundary of Section 13, T39S, R9E; thence north to the southeast corner of Section 12, T39S, R9E; thence along the Enterprise Irrigation Canal approximately 1/2 mile to Booth Road; thence east 1/2 mile to Vale Road; thence north 1 mile to a point in Section 6, T39S, R10E that is approximately 1700 feet north of the southern boundary of Section 6, T39S, R10E; thence west approximately 500 feet; thence south approximately 850 feet; thence west approximately 200 feet; thence north approximately 900 feet; thence west approximately1600 feet to the western boundary of Section 6, T39S, R10E; thence north approximately 1/2 mile to the southeast corner of Section 36, T38S, R9E, the point of beginning.

(13) “LaGrande UGB” means the area within the bounds beginning at the point where U.S. Interstate 84 (I-84) intersects Section 31, Township 2 South, Range 38 East; thence east along I-84 to the Union County Fairgrounds; thence north and then east on a line encompassing the Union County Fairgrounds to the intersection with Cedar Street; thence further east approximately 500 feet, encompassing two (2) residential properties; thence on a line south to the intersection with the northern bank of the Grande Ronde River; thence westerly along the northern bank of the Grande Ronde River to the intersection with the western edge of Mount Glenn Road and Riverside Park; thence north along the western edge of Mount Glenn Road and Riverside Park to the intersection with Fruitdale Road; thence east along Fruitdale Road and the northern boundary of Riverside Park to the eastern boundary of Riverside Park; thence south along the eastern boundary of Riverside Park to the north bank of the Grande Ronde River; thence on a line southeast to the intersection with the northern edge of I-84; thence easterly along the northern edge of I-84 to May Street; thence easterly along May Street to the intersection with State Highway 82; thence northeasterly along State Highway 82 to the a point approximately 1/4 mile from the eastern edge of Section 4, T3S, R38E; thence south to the intersection with Section 9, T3S, R38E, and the southern edge of Buchanan Avenue; thence west along the southern edge of Buchanan Avenue to the intersection with the northern edge of I-84; thence on a line south to the southern edge of I-84; thence southeasterly along the southern edge of I-84 approximately 2500 feet; thence on a line due west approximately 1400 feet; thence on a line due south to the intersection with the Union Pacific Railroad Line; thence southeasterly along the Union Pacific Railroad Line to the intersection with Gekeler Lane; thence west along Gekeler Lane to the intersection with U.S. Highway 30; thence southeast along U.S. Highway 30 to the intersection with the western boundary of Section 15, T3S, R38E; thence on a line west following existing property boundaries approximately 2900 feet; thence on a line north following existing property boundaries approximately 250 feet; thence on a line east following existing property boundaries approximately 650 feet; thence north on a line to the intersection with Gekeler Lane; thence west along Gekeler Lane to the intersection with 20th Avenue; thence south along 20th Avenue to the intersection with Foothill Road; thence southeasterly along Foothill Road approximately 2900 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line south following existing property boundaries approximately 1250 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line north following existing property boundaries approximately 450 feet to the intersection with the southernmost part of the La Grande City Limits; thence westerly and northwesterly along the southernmost part of the La Grande City Limits approximately 1100 feet to the intersection with the 3000 foot elevation contour line; thence westerly following the 3000 foot elevation contour line and existing property boundaries approximately 2200 feet; thence on a line north following existing property boundaries approximately 1900 feet; thence on a line west following existing property boundaries approximately 500 feet; thence on a line north to the La Grande City Limits; thence west along the La Grande City Limits and following existing property boundaries approximately 650 feet; thence on a line south following existing property boundaries

approximately 900 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line north to the intersection with the La Grande City Limits; thence west along the southern boundary of the La Grande City Limits to the intersection with the western boundary of the La Grande City Limits; thence north along the western boundary of the La Grande City Limits and following existing property lines approximately 500 feet; thence on a line west following existing property boundaries approximately 200 feet; thence on a line north following existing property boundaries approximately 700 feet; thence east to the first 3000 foot elevation contour line west of the La Grande City Limits; thence northerly following that 3000 foot elevation contour line to the intersection with Deal Canyon Road; thence easterly along Deal Canyon Road to the intersection with the western boundary of the La Grande City Limits; thence northerly along the western boundary of the La Grande City Limits to the intersection with U.S. Highway 30; thence northwesterly along U.S. Highway 30 and following existing property boundaries approximately 1400 feet; thence on a line west to the intersection with the western boundary of Section 6, T3S, R38E; thence north along the western boundaries of Section 6, T3S, R38E and Section 31, T2S, R38E to the point of beginning.

(14) “Lakeview UGB” means the area beginning at the corner common to sections 21, 22, 27, and 28, T39S, R20E; thence north on the section line between section 21 and 22 to the section corner common to section 15, 16, 21, and 22; thence west along the section line between section 21 and 16 to the section corner common to sections 16, 17, 20, and 21; thence north along the section line between section 16 and 17 approximately 3550 feet to the east branch of Thomas Creek; thence northwesterly along the east branch of Thomas Creek to the center line of Highway 140; thence east along the center line of Highway 140 to the section corner common to sections 8, 9, 16, and 17, T39S, R20E; thence north along the section line between sections 8 and 9 to the section corner common to sections 4, 5, 8, and 9, T39S, R20E; thence north along the section line between section 4 and 5 to the section corner common to section 4 and 5, T39S, R20E and sections 32 and 33, T38S, R20E; thence east along the section line between sections 4 and 33 to the section corner common to sections 3 and 4, T39S, R20E and sections 33 and 34, T38S, R20E; thence south along the eastern boundary of section 4 approximately 4,1318.6 feet; thence S 89 degrees, 11 minutes W 288.28 feet to the east right of way line of the old Paisley/Lakeview Highway; thence S 21 degrees, 53 minutes E along the eastern right of way of the old Paisley/Lakeview Highway 288.4 feet; thence S 78 degrees, 45 minutes W 1375 feet; thence S 3 degrees, 6 minutes, and 30 seconds W 200 feet; thence S 77 degrees, 45 minutes W 136 feet to the east right of way line of U.S. Highway 395; thence southeasterly along the east right of way line of U.S. Highway 395 53.5 feet; thence N 77 degrees, 45 minutes E 195.6 feet; thence S 38 degrees, 45 minutes E 56.8 feet; thence S 51 degrees, 15 minutes W 186.1 feet to the east right of way of U.S. Highway 395; thence southeast along the eastern right of way line of U.S. Highway 395 2310 feet; thence N 76 degrees, 19 minutes 544.7 feet; thence S 13 degrees, 23 minutes, 21 seconds E 400 feet; thence N 63 degrees, 13 minutes E 243.6 feet to the western line of the old American Forest Products Logging Road; thence southeast along the old American Forest Products Logging Road to the western line of the northeast quadrant of the northwest quadrant of section 10, T39S, R20E; thence southeast to a point on the south line of the northeast quadrant of the northwest quadrant of Section 10, T39S, R20E (this point also bears N 89 degrees, 33 minutes E 230 feet from the center line of U.S. Highway 395); thence south on a line parallel to the east right of way line of U.S. Highway 395 to the south line of the northwest quadrant of section 10, T39S, R20E; thence south 491 feet to the east right of way of U.S. Highway 395; thence southeasterly following the east right of way of U.S. Highway 395 255 feet to the south line of the northeast quadrant of the northeast quadrant of the southwest quadrant of section 10, T39S, R20E; thence east along that south line to the center line of section 10, T39S, R20E; thence continuing east along the same south line to the eastern boundary of section 10, T39S, R20E; thence south along the eastern boundary of section 10 to the section corner common to sections 10, 11, 14, and 15, T39S, R20E; thence south along the section line between section 14 and 15 to the section corner common to sections 14, 15, 22, and 23, T39S, R20E; thence west along the section line between sections 15 and 22 to the northwest corner of the northeast quadrant of the northeast quadrant of section 22, T39S, R20E; thence south along the eastern line of the western half of the eastern half of section 22 to the southern boundary of section 22, T39S, R20E; thence west along the southern boundary of section 22 to the point of beginning.

(15) “Maintenance Area” means any area that was formerly nonattainment for a criteria pollutant but has since met EPA promulgated standards and has had a maintenance plan to stay within the standards approved by the EPA pursuant to 40 CFR 51.110 (July, 1993).

(16) “Medford-Ashland Air Quality Maintenance Area” (AQMA) means the area defined as beginning at a point approximately two and quarter miles northeast of the town of Eagle Point, Jackson County, Oregon at the northeast corner of Section 36, Township 35 South, Range 1 West (T35S, R1W); thence South along the Willamette Meridian to the southeast corner of Section 25, T37S, R1W; thence southeast along a line to the southeast corner of Section 9, T39S, R2E; thence south-southeast along line to the southeast corner of Section 22, T39S, R2E; thence South to the southeast corner of Section 27, T39S, R2E; thence southwest along a line to the southeast corner of Section 33, T39S, R2E; thence West to the southwest corner of Section 31, T39S, R2E; thence northwest along a line to the

northwest corner of Section 36, T39S, R1E; thence West to the southwest corner of Section 26, T39S, R1E; thence northwest along a line to the southeast corner of Section 7, T39S, R1E; thence West to the southwest corner of Section 12, T39S, R1W, T39S, R1W; thence northwest along a line to southwest corner of Section 20, T38S, R1W; thence West to the southwest corner of Section 24, T38S, R2W; thence northwest along a line to the southwest corner of Section 4, T38S, R2W; thence West to the southwest corner of Section 6, T38S, R2W; thence northwest along a line to the southwest corner of Section 31, T37S, R2W; thence North and East along the Rogue River to the north boundary of Section 32, T35S, R1W; thence East along a line to the point of beginning.

(17) “Medford-Ashland CBD” means the area beginning at the intersection of Crater Lake Highway (Highway 62) south on Biddle Road to the intersection of Fourth Street, west on Fourth Street to the intersection with Riverside Avenue (Highway 99), south on Riverside Avenue to the intersection with Tenth Street, west on Tenth Street to the intersection with Oakdale Avenue, north on Oakdale Avenue to the intersection with Fourth Street, east on Fourth Street to the intersection with Central Avenue, north on Central Avenue to the intersection with Court Street, north on Court Street to the intersection with Crater Lake Highway (Highway 62) and east on Crater Lake Highway to the point of beginning, with extensions along McAndrews Road east from Biddle Road to Crater Lake Avenue, and along Jackson Street east from Biddle Road to Crater Lake Avenue.

NOTE: This definition also marks the area where indirect sources are required to have indirect source construction permits in the Medford area. See OAR 340-254-0040.

(18) “Medford UGB” means the area beginning at the line separating Range 1 West and Range 2 West at a point approximately 1/4 mile south of the northwest corner of Section 31, T36S, R1W; thence west approximately 1/2 mile; thence south to the north bank of Bear Creek; thence west to the south bank of Bear Creek; thence south to the intersection with the Medford Corporate Boundary; thence following the Medford Corporate Boundary west and southwesterly to the intersection with Merriman Road; thence northwesterly along Merriman Road to the intersection with the eastern boundary of Section 10, T36S, R2W; thence south along said boundary line approximately 3/4 mile; thence west approximately 1/3 mile; thence south to the intersection with the Hopkins Canal; thence east along the Hopkins Canal approximately 200 feet; thence south to Rossanely Drive; thence east along Rossanley Drive approximately 200 feet; thence south approximately 1200 feet; thence west approximately 700 feet; thence south approximately 1400 feet; thence east approximately 1400 feet; thence north approximately 100 feet; thence east approximately 700 feet; thence south to Finley Lane; thence west to the end of Finley Lane; thence approximately 1200 feet; thence west approximately 1300 feet; thence north approximately 150 feet; thence west approximately 500 feet; thence south to Highway 238; thence west along Highway 238 approximately 250 feet; thence south approximately 1250 feet to a point even with the end of Renault Avenue to the east; thence east approximately 2200 feet; thence south approximately 1100 feet to a point even with Sunset Court to the east; thence east to and along Sunset Court to the first (nameless) road to the south; thence approximately 850 feet; thence west approximately 600 feet; thence south to Stewart Avenue; thence west along Stewart Avenue approximately 750 feet; thence south approximately 1100 feet; thence west approximately 100 feet; thence south approximately 800 feet; thence east approximately 800 feet; thence south approximately 1000 feet; thence west approximately 350 feet to a point even with the north-south connector street between Sunset Drive and South Stage Road; thence south to and along said connecting road and continuing along South Stage Road to Fairlane Road; thence south to the end of Fairlane Road and extending beyond it approximately 250 feet; thence east approximately 250 feet; thence south approximately 250 feet to the intersection with Judy Way; thence east on Judy Way to Griffin Creek Road; thence north on Griffin Creek Road to South Stage Road; thence east on South Stage Road to Orchard Home Drive; thence north on Orchard Home Drive approximately 800 feet; thence east to Columbus Avenue; thence south along Columbus Avenue to South Stage Road; thence east along South Stage Road to the first road to the north after Sunnyview Lane; thence north approximately 300 feet; thence east approximately 300 feet; thence north approximately 700 feet; thence east to King’s Highway; thence north along King’s Highway to Experiment Station Road; thence east along Experiment Station Road to Marsh Lane; thence east along Marsh Lane to the northern boundary of Section 6, T38S, R1W; thence east along said boundary approximately 1100 feet; thence north approximately 1200 feet; thence east approximately 1/3 mile; thence north approximately 400 feet; thence east approximately 1000 feet to a drainage ditch; thence following the drainage ditch southeasterly approximately 500 feet; thence east to the eastern boundary of Section 31, T37S, R1W; thence south along said boundary approximately 1900 feet; thence east to and along the loop off of Rogue Valley Boulevard, following that loop to the Southern Pacific Railroad Line (SPRR); thence following SPRR approximately 500 feet; thence south to South Stage Road; thence east along South Stage Road to SPRR; thence southeasterly along SPRR to the intersection with the west fork of Bear Creek; thence northeasterly along the west fork of Bear Creek to the intersection with U.S. Highway 99; thence southeasterly along U.S. Highway 99 approximately 250 feet; thence east approximately 1600 feet; thence south to East Glenwood Road; thence east along East Glenwood Road approximately 1250 feet; thence north approximately 1/2 mile; thence west approximately 250 feet; thence north approximately 1/2 mile to the Medford City Limits; thence east along the city limits to Phoenix Road; thence south along Phoenix Road to Coal Mine Road; thence east along Coal Mine Road approximately 9/10

mile to the western boundary of Section 35, T37S, R1W; thence north to the midpoint of the western boundary of Section 35, T37S, R1W; thence west approximately 800 feet; thence north approximately 1700 feet to the intersection with Barnett Road; thence easterly along Barnett Road to the southeast corner of Section 27, T37S, R1W; thence north along the eastern boundary line of said section approximately 1/2 mile to the intersection with the 1800 foot contour line; thence east to the intersection with Cherry Lane; thence following Cherry Lane southeasterly and then northerly to the intersection with Hillcrest Road; thence east along Hillcrest Road to the southeast corner of Section 23, T37S, R1W; thence north to the northeast corner of Section 23, T37S, R1W; thence west to the midpoint of the northern boundary of Section 22; T37S, R1W; thence north to the midpoint of Section 15, T37S, R1W; thence west to the midpoint of the western boundary of Section 15, T37S, R1W; thence south along said boundary approximately 600 feet; thence west approximately 1200 feet; thence north approximately 600 feet; thence west to Foothill Road; thence north along Foothill Road to a point approximately 500 feet north of Butte Road; thence west approximately 300 feet; thence south approximately 250 feet; thence west on a line parallel to and approximately 250 feet north of Butte Road to the eastern boundary of Section 8, T37S, R1W; thence north approximately 2200 feet; thence west approximately 1800 feet; thence north approximately 2000 feet; thence west approximately 500 feet; thence north to Coker Butte Road; thence east along Coker Butte Road approximately 550 feet; thence north approximately 1250 feet; thence west to U.S. Highway 62; thence north approximately 3000 feet; thence east approximately 400 feet to the 1340 foot contour line; thence north approximately 800 feet; thence west approximately 200 feet; thence north approximately 250 feet to East Vilas Road; thence east along East Vilas Road approximately 450 feet; thence north approximately 2000 feet to a point approximately 150 feet north of Swanson Creek; thence east approximately 600 feet; thence north approximately 850 feet; thence west approximately 750 feet; thence north approximately 650 feet; thence west approximately 2100 feet; thence on a line southeast approximately 600 feet; thence east approximately 450 feet; thence south approximately 1600 feet; thence west approximately 2000 feet to the continuance of the private logging road north of East Vilas Road; thence south along said logging road approximately 850 feet; thence west approximately 750 feet; thence south approximately 150 feet; thence west approximately 550 feet to Peace Lane; thence north along Peace Lane approximately 100 feet; thence west approximately 350 feet; thence north approximately 950 feet; thence west approximately 1000 feet to the western boundary of Section 31, T36S, R1W; thence north approximately 1300 feet along said boundary to the point of beginning.

(19) “Nonattainment Area” means any area that has been designated as not meeting the standards established by the U.S. Environmental Protection Agency (EPA) pursuant to 40 CFR 51.52 (July, 1993) for any criteria pollutant.

(20) “O3” means Ozone.

(21) “Oakridge UGB” means the area enclosed by the following: Beginning at the northwest corner of Section 17, T21S, R3E and the city limits; thence south along the western boundary of Section 17, T21S, R3E along the city limits approximately 800 feet; thence southwesterly following the city limits approximately 750 feet; thence west along the city limits approximately 450 feet; thence northwesterly along the city limits approximately 450 feet; thence on a line south along the city limits approximately 250 feet; thence on a line east along the city limits approximately 100 feet; thence southwesterly along the city limits approximately 200 feet; thence on a line east along the city limits approximately 400 feet; thence on a line south along the city limits to the channel of the Willamette River Middle Fork; thence south-easterly up the Willamette River Middle Fork along the city limits approximately 7200 feet; thence exiting the Willamette River Middle Fork with the city limits in a northerly manner and forming a rough semicircle with a diameter of approximately one-half mile before rejoining the Willamette River Middle Fork; thence diverging from the city limits upon rejoining the Willamette River Middle Fork and moving southeasterly approximately 5600 feet up the Willamette River Middle Fork to a point on the river even with the point where Salmon Creek Road intersects with U.S. Highway 58; thence on a line east from the channel of the Willamette River Middle Fork across the intersection of Salmon Creek Road and U.S. Highway 58 to the intersection with the Southern Pacific Railroad Line; thence northerly along the Southern Pacific Railroad Line to the intersection with the northern boundary of Section 22, T21S, R3E; thence west along the northern boundary of Section 22, T21S, R3E to the intersection with Salmon Creek Road; thence on a line north to the intersection with the Southern Pacific Railroad Line; thence east along the Southern Pacific Railroad Line approximately 600 feet; thence on a line north to the intersection with High Prairie Road; thence on a line west approximately 400 feet; thence on a line north to the intersection with the northern boundary of Section 15, T21S, R3E; thence west along the northern boundary of Section 15, T21S, R3E to the intersection with the southeastern corner of Section 9, T21S, R3E; thence north along the eastern boundary of Section 9, T21S, R3E approximately 1300 feet; thence on a line west approximately 1100 feet; thence on a line south to the intersection with West Oak Road; thence northwesterly along West Oak Road approximately 2000 feet; thence on a line south to the intersection with the northern boundary line of the city limits; thence westerly and northwesterly approximately 8000 feet along the city limits to the point of beginning.

(22) “Particulate Matter” has the meaning given that term in OAR 340-200-0020(82).

(23) PM10: has the meaning given that term in OAR 340-200-0020(90).

(24) “PM2.5” has the meaning given that term in OAR 340-200-0020(91).

(25) “Portland AQMA” means the area within the bounds beginning at the point starting on the Oregon-Washington state line in the Columbia River at the confluence with the Willamette River, thence east up the Columbia River to the confluence with the Sandy River, thence southerly and easterly up the Sandy River to the point where the Sandy River intersects the Clackamas County-Multnomah County line, thence west along the Clackamas County-Multnomah County line to the point where the Clackamas County-Multnomah County line is intersected by H. Johnson Road (242nd), thence south along H. Johnson Road to the intersection with Kelso Road (Boring Highway), thence west along Kelso Road to the intersection with Deep Creek Road (232nd), thence south along Deep Creek Road to the point of intersection with Deep Creek, thence southeasterly along Deep Creek to the confluence with Clackamas River, thence easterly along the Clackamas River to the confluence with Clear Creek, thence southerly along Clear Creek to the point where Clear Creek intersects Springwater Road then to Forsythe Road, thence easterly along Forsythe Road to the intersection with Bradley Road, thence south along Bradley Road to the intersection with Redland Road, thence west along Redland Road to the intersection with Ferguson Road, thence south along Ferguson Road to the intersection with Thayler Road, thence west along Thayler Road to the intersection with Beaver Creek Road, thence southeast along Beaver Creek Road to the intersection with Henrici Road, thence west along Henrici Road to the intersection with State Highway 213 (Mollala Avenue), thence southeast along State Highway 213 to the point of intersection with Beaver Creek, thence westerly down Beaver Creek to the confluence with the Willamette River, thence southerly and westerly up the Willamette River to the point where the Willamette River intersects the Clackamas County-Yamhill County line, thence north along the Clackamas County-Yamhill County line to the point where it intersects the Washington County-Yamhill County line, thence west and north along the Washington County-Yamhill County line to the point where it is intersected by Mount Richmond Road, thence northeast along Mount Richmond Road to the intersection with Patton Valley Road, thence easterly and northerly along Patton Valley Road to the intersection with Tualatin Valley State Highway, thence northerly along Tualatin Valley State Highway to the intersection with State Highway 47, thence northerly along State Highway 47 to the intersection with Dilley Road, thence northwesterly and northerly along Dilley Road to the intersection with Stringtown Road, thence westerly and northwesterly along Stringtown Road to the intersection with Gales Creek Road, thence northwesterly along Gales Creek Road to the intersection with Tinmmerman Road, thence northerly along Tinmmerman Road to the intersection with Wilson River Highway, thence west and southwesterly along Wilson River Highway to the intersection with Narup Road, thence north along Narup Road to the intersection with Cedar Canyon Road, thence westerly and northerly along Cedar Canyon Road to the intersection with Banks Road, thence west along Banks Road to the intersection with Hahn Road, thence northerly and westerly along Hahn Road to the intersection with Mountaindale Road, thence southeasterly along Mountaindale Road to the intersection with Glencoe Road, thence east-southeasterly along Glencoe Road to the intersection with Jackson Quarry Road, thence north-northeasterly along Jackson Quarry Road to the intersection with Helvetia Road, thence easterly and southerly along Helvetia Road to the intersection with Bishop Road, thence southerly along Bishop Road to the intersection with Phillips Road, thence easterly along Phillips Road to the intersection with the Burlington Northern Railroad Track, thence northeasterly along the Burlington Northern Railroad Line to the intersection with Rock Creek Road, thence east-southeasterly along Rock Creek Road to the intersection with Old Cornelius Pass Road, thence northeasterly along Old Cornelius Pass Road to the intersection with Skyline Boulevard, thence easterly and southerly along Skyline Boulevard to the intersection with Newberry Road, thence northeasterly along Newberry Road to the intersection with State Highway 30 (St. Helens Road), thence northeast on a line over land across State Highway 30 to the Multnomah Channel, thence east-southeasterly up the Multnomah Channel to the diffluence with the Willamette River, thence north-northeasterly down the Willamette River to the confluence with the Columbia River and the Oregon-Washington state line (the point of beginning).

(26) “Portland Metropolitan Service District Boundary” or “Portland Metro” means the boundary surrounding the urban growth boundaries of the cities within the Greater Portland Metropolitan Area. It is defined in the Oregon Revised Statutes (ORS) 268.125 (1989).

(27) “Portland Vehicle Inspection Area” means the area of the state included within the following census tracts, block groups, and blocks as used in the 1990 Federal Census. In Multnomah County, the following tracts, block groups, and blocks are included: Tracts 1, 2, 3.01, 3.02, 4.01, 4.02, 5.01, 5.02, 6.01, 6.02, 7.01, 7.02, 8.01, 8.02, 9.01, 9.02, 10, 11.01, 11.02, 12.01, 12.02, 13.01, 13.02, 14, 15, 16.01, 16.02, 17.01, 17.02, 18.01, 18.02, 19, 20, 21, 22.01, 22.02, 23.01, 23.02, 24.01, 24.02, 25.01, 25.02, 26, 27.01, 27.02, 28.01, 28.02, 29.01, 29.02, 29.03, 30, 31, 32, 33.01, 33.02, 34.01, 34.02, 35.01, 35.02, 36.01, 36.02, 36.03, 37.01, 37.02, 38.01, 38.02, 38.03, 39.01, 39.02, 40.01, 40.02, 41.01, 41.02, 42, 43, 44, 45, 46.01, 46.02, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 57, 58, 59, 60.01. 60.02, 61, 62, 63, 64.01, 64.02, 65.01, 65.02, 66.01, 66.02, 67.01, 67.02, 68.01, 68.02, 69, 70, 71, 72.01, 72.02, 73, 74, 75, 76, 77, 78, 79, 80.01, 80.02, 81, 82.01, 82.02, 83.01, 83.02, 84, 85, 86, 87, 88, 89, 90, 91, 92.01, 92.02, 93, 94, 95,

96.01, 96.02, 97.01, 97.02, 98.01, 98.02, 99.01, 99.02, 99.03, 100, 101, 102, 103.01, 103.02, 104.02, 104.04, 104.05, 104.06, 104.07; Block Groups 1, 2 of Tract 105; Blocks 360, 361, 362 of Tract 105; that portion of Blocks 357, 399 of Tract 105 beginning at the intersection of the Oregon-Washington State Line ("State Line") and the northeast corner of Block Group 1 of Tract 105, thence east along the State Line to the intersection of the State Line and the eastern edge of Section 26, Township 1 North, Range 4 East, thence south along the section line to the centerline of State Highway 100 to the intersection of State Highway 100 and the western edge of Block Group 2 of Tract 105. In Clackamas County, the following tracts, block groups, and blocks are included: Tracts 201, 202, 203.01, 203.02, 204.01, 204.02, 205.01, 205.02, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216.01, 216.02, 217, 218, 219, 220, 221.01, 221.02, 222.02, 223, 224, 225, 226, 227.01, 227.02, 228, 229, 230, 231, 232, 233, 234.01, 234.02, , 235, 236, 237; Block Groups 1, 2 of Tract 241; Block Groups 1, 2, 3, 4 of Tract 242; Block Groups 1, 2 of Tract 243.02. In Yamhill County, the following tract is included: Tract 301, except those areas in Tract 301 that lie within the Newberg City Limits defined as of July 12, 1996, and the following blocks within Tract 301: 102B, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121D, 122B, 122C, 123, 126, and 127B. In Washington County the following tracts, block groups, and blocks are included: Tracts 301, 302, 303, 304.01, 304.02, 305.01, 305.02, 306, 307, 308.01, 308.02, 309, 310.03, 310.04, 310.05, 310.06, 311, 312, 313, 314.01, 314.02, 315.01, 315.04, 315.05, 315.06, 315.07, 315.08, 316.03, 316.04, 316.05, 316.06, 316.07, 317.02, 317.03, 317.04, 318.01, 318.02, 318.03, 319.01, 319.03, 319.04, 320, 321.01, 321.02, 322, 323, 324.02, 324.03, 324.04, 325, 326.01, 326.02, 328, 329, 330, 331, 332, 333; Block Groups 1, 2 of Tract 327; Block Group 1 of Tract 334; Block Group 2 of Tract 335; Block Group 1 of Tract 336. In Columbia County the following tracts, block groups, and blocks are included: Tract 9710.98; Block Groups 2, 3 of Tract 9709.98; Blocks 146B, 148, 152 of Tract 9709.98.

(28) "Rogue Basin" means the area bounded by the following line: Beginning at the NE corner of T32S, R2E, W.M., thence south along range line 2E to the SE corner of T39S; thence west along township line 39S to the NE corner of T40S, R7W; thence south to the SE corner of T40S, R7W; thence west to the SE corner of T40S, R9W; thence north on range line 9W to the NE corner of T39S, R9W; thence east to the NE corner of T39S, R8W; thence north on range line 8W to the SE corner of Section 1, T33S, R8W on the Josephine-Douglas County line; thence east on the Josephine-Douglas and Jackson-Douglas County lines to the NE corner of T32S, R1W; thence east along township line 32S to the NE corner of T32S, R2E to the point of beginning.

(29) "Salem-Keizer Area Transportation Study" or "SKATS" means the area within the bounds beginning at the intersection of U.S. Interstate Highway 5 (I-5) with Battle Creek Road SE and Wiltsey Road, south along I-5 to the intersection with the western boundary of Section 24, T8S, R3W; thence due south on a line to the intersection with Delaney Road; thence easterly along Delaney Road to the intersection with Sunnyside Road; thence north along Sunnyside Road to the intersection with Hylo Road SE; thence west along Hylo Road SE to the intersection with Liberty Road; thence north along Liberty Road to the intersection with Cole Road; thence west along Cole Road to the intersection with Bates Road; thence northerly and easterly along Bates Road to the intersection with Jory Hill Road; thence west along Jory Hill Road to the intersection with Stone Hill Avenue; thence north along Stone Hill Avenue to the intersection with Vita Springs Road; thence westerly along Vita Springs Road to the Willamette River; thence northeasterly downstream the Willamette River to a point adjacent to where the western boundary of Section 30, T7S, R3W intersects the Southern Pacific Railroad Line; thence westerly along the Southern Pacific Railroad Line to the intersection with State Highway 51; thence northeasterly along State Highway 51 to the intersection with Oak Grove Road; thence northerly along Oak Grove Road to the intersection with State Highway 22; thence west on State Highway 22 to the intersection with Oak Grove Road; thence north along Oak Grove Road to the intersection with Orchard Heights Road; thence east and north along Orchard Heights Road to the intersection with Eagle Crest Drive; thence northerly along Eagle Crest Drive to the intersection with Hunt Road; thence north along Hunt Road to the intersection with Fourth Road; thence east along Fourth Road to the intersection with Spring Valley Road; thence north along Spring Valley to the intersection with Oak Knoll Road; thence east along Oak Knoll Road to the intersection with Wallace Road; thence south along Wallace Road to the intersection with Lincoln Road; thence east along Lincoln Road on a line to the intersection with the Willamette River; thence northeasterly downstream the Willamette River to a point adjacent to where Simon Street starts on the East Bank; thence east and south along Simon Street to the intersection with Salmon; thence east along Salmon to the intersection with Ravena Drive; thence southerly and easterly along Ravena Drive to the intersection with Wheatland Road; thence northerly along Wheatland Road to the intersection with Brooklake Road; thence southeast along Brooklake Road to the intersection with 65th Avenue; thence south along 65th Avenue to the intersection with Labish Road; thence east along Labish Road to the intersection with the West Branch of the Little Pudding River; thence southerly along the West Branch of the Little Pudding River to the intersection with Sunnyview Road; thence east along Sunnyview Road to the intersection with 63rd Avenue; thence south along 63rd Avenue to the intersection with State Street; thence east along State Street to the intersection with 62nd Avenue; thence south along 62nd Avenue to the intersection with Deer Park Drive; thence southwest along Deer Park Drive to the intersection with Santiam Highway 22; thence southeast along Santiam Highway 22 to the point where it intersects the Salem Urban Growth Boundary (SUGB);

thence following the southeast boundary of the SUGB generally southerly and westerly to the intersection with Wiltsey Road; thence west along Wiltsey Road to the intersection with I-5 (the point of beginning).

(30) “UGB” means Urban Growth Boundary.

(31) “Umpqua Basin” means the area bounded by the following line: Beginning at the SW corner of Section 2, T19S, R9W, on the Douglas-Lane County lines and extending due south to the SW corner of Section 14, T32S, R9W, on the Douglas-Curry County lines, thence easterly on the Douglas-Curry and Douglas-Josephine County lines to the intersection of the Douglas, Josephine, and Jackson County lines; thence easterly on the Douglas-Jackson County line to the intersection of the Umpqua National Forest boundary on the NW corner of Section 32, T32S, R3W; thence northerly on the Umpqua National Forest boundary to the NE corner of Section 36, T25S, R2W; thence west to the NW corner of Section 36, T25S, R4W; thence north to the Douglas-Lane County line; thence westerly on the Douglas-Lane County line to the starting point.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468.020
Stats. Implemented: ORS 468A.025
Hist.: DEQ 14-1995, f. & cert. ef. 5-25-95; DEQ 18-1996, f. & cert. ef. 8-19-96; DEQ 1-1999, f. & cert. ef. 1-25-99; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-031-0500; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 5-2010, f. & cert. ef. 5-21-10; DEQ 18-2011, f. & cert. ef. 12-21-11

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 225

AIR QUALITY ANALYSIS REQUIREMENTS

340-225-0090

Requirements for Demonstrating a Net Air Quality Benefit

Demonstrations of net air quality benefit for offsets must include the following:

(1) Ozone areas (VOC and NOx emissions). For sources capable of impacting a designated ozone nonattainment or maintenance area;

(a) Offsets for VOC and NOx are required if the source will be located within the designated area or within the Ozone Precursor Distance.

(b) The amount and location of offsets must be determined in accordance with this subsection:

(A)For new or modified sources locating within a designated nonattainment area, the offset ratio is 1.1:1. These offsets must come from within either the same designated nonattainment area as the new or modified source or another ozone nonattainment area (with equal or higher nonattainment classification) that contributes to a violation of the NAAQS in the same designated nonattainment area as the new or modified source.

(B) For new or modified sources locating within a designated maintenance area, the offset ratio is 1.1:1. These offsets may come from within either the designated area or the ozone precursor distance.

(C) For new or modified sources locating outside the designated area, but within the ozone precursor distance, the offset ratio is 1:1. These offsets may come from within either the designated area or the ozone precursor distance.

(D) Offsets from outside the designated area but within the Ozone Precursor Distance must be from sources affecting the designated area in a comparable manner to the proposed emissions increase. Methods for determining offsets are described in the Ozone Precursor Offsets definition (OAR 340-225-0020(11)).

(c) In lieu of obtaining offsets, the owner or operator may obtain an allocation at the rate of 1:1 from a growth allowance, if available, in an applicable maintenance plan.

(d) Sources within or affecting the Medford Ozone Maintenance Area are exempt from the requirement for NOx offsets relating to ozone formation.

(e) Sources within or affecting the Salem Ozone Maintenance Area are exempt from the requirement for VOC and NOx offsets relating to ozone formation.

(2) Non-Ozone areas (PM2.5, PM10, SO2, CO, NOx, and Lead emissions):

(a) For a source locating within a designated nonattainment area, the owner or operator must comply with paragraphs (A) through (E) of this subsection:

(A) Obtain offsets from within the same designated nonattainment area for the nonattainment pollutant(s);

(B) Except as provided in paragraphs (C) of this subsection, provide a minimum of 1:1 offsets for each nonattainment pollutant and precursor with emission increases over the Netting Basis;

(C) For PM2.5; inter-pollutant offsets are allowed as follows:

(i) 1 ton of direct PM2.5 may be used to offset 40 tons of SO2;

(ii) 1 ton of direct PM2.5 may be used to offset 100 tons of NOx;

(iii) 40 tons of SO2 may be used to offset 1 ton of direct PM2.5;

(iv) 100 tons of NOx may be used to offset 1 ton of direct PM2.5.

(D) Except as provided in section (7) of this rule, provide a net air quality benefit within the designated nonattainment area. "Net Air Quality Benefit" means:

(i) Offsets obtained result in a reduction in concentration at a majority of the modeled receptors and the emission increases from the proposed source or modification will result in less than a significant impact level increase at all modeled receptors; or

(ii) For a small scale local energy project and any infrastructure related to that project located in the same area, a reduction of the nonattainment pollutant emissions equal to the ratio specified in this subsection, provided that the proposed major source or major modification would not cause or contribute to a violation of the national ambient air quality standard or otherwise pose a material threat to compliance with air quality standards in the nonattainment area.

(E) Provide offsets sufficient to demonstrate reasonable further progress toward achieving the NAAQS.

(b) For a source locating outside a designated nonattainment area but causing a significant air quality impact on the area, the owner or operator must provide offsets sufficient to reduce the modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the designated nonattainment area. These offsets may come from within or outside the designated nonattainment area. This requirement only applies to the emissions remaining after first deducting the offsets obtained in accordance with section (7) of this rule.

(c) For a source locating inside or causing a significant air quality impact on a designated maintenance area, the owner or operator must either provide offsets sufficient to reduce modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the designated maintenance area or obtain an allocation from an available growth allowance as allowed by an applicable maintenance plan. These offsets may come from within or outside the designated maintenance area. This requirement only applies to the emissions remaining after first deducting the offsets obtained in accordance with section (7) of this rule.

(A) Medford-Ashland AQMA: Proposed new major PM10 sources or major PM10 modifications locating within the AQMA that are required to provide emission offsets under OAR 340-224-0060(2)(a) must provide reductions in PM10 emissions equal to 1.2 times the emissions increase over the netting basis from the new or modified source, and must provide a net air quality benefit within the AQMA. "Net Air Quality Benefit" means:

(i) A reduction in concentration at a majority of the modeled receptors and less than a significant impact level increase at all modeled receptors; or

(ii) For a small scale local energy project and any infrastructure related to that project located in the same area, a reduction of the maintenance pollutant emissions equal to the ratio specified in this paragraph, provided that the proposed major source or major modification would not cause or contribute to a violation of the national ambient air quality standard or otherwise pose a material threat to compliance with air quality standards in the maintenance area.

(B) Medford-Ashland AQMA: Proposed new major PM10 sources or major PM10 modifications located outside the Medford-Ashland AQMA that cause a significant air quality impact on the AQMA must provide reductions in PM10

emissions sufficient to reduce modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the AQMA.

(3) Except as provided in paragraph (2)(a)(C) of this rule, the emission reductions used as offsets must be of the same type of pollutant as the emissions from the new source or modification. Sources of PM10 must be offset with particulate in the same size range.

(4) The emission reductions used as offsets must be contemporaneous, that is, the reductions must take effect before the time of startup but not more than two years before the submittal of a complete permit application for the new source or modification. This time limitation may be extended through banking, as provided for in OAR 340 division 268, Emission Reduction Credit Banking. In the case of replacement facilities, the DEQ may allow simultaneous operation of the old and new facilities during the startup period of the new facility, if net emissions are not increased during that time period. Any emission reductions must be federally enforceable at the time of the issuance of the permit.

(5) Offsets required under this rule must meet the requirements of Emissions Reduction Credits in OAR 340 division 268.

(6) Emission reductions used as offsets must be equivalent in terms of short term, seasonal, and yearly time periods to mitigate the effects of the proposed emissions.

(7) Offsets obtained in accordance with OAR 340-240-0550 and 340-240-0560 for sources locating within or causing significant air quality impact on the Klamath Falls PM2.5 nonattainment or PM10 maintenance areas are exempt from the requirements of paragraph (2)(a)(E) and sub-sections 2(b) and 2(c) of this rule provided that the proposed major source or major modification would not cause or contribute to a new violation of the national ambient air quality standard. This exemption only applies to the direct PM2.5 or PM10 offsets obtained from residential wood-fired devices in accordance with OAR 340-240-0550 and 340-240-0560. Any remaining emissions from the source that are offset by emission reductions from other sources are subject to the requirements of paragraph (2)(a)(E) or sub-sections (2)(b) or (2(c) of this rule, as applicable.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the EQC under OAR 340-200-0040.

Stat. Auth.: ORS 468.020
Stats. Implemented: ORS 468A.025
Hist.: DEQ 25-1981, f. & ef. 9-8-81; DEQ 5-1983, f. & ef. 4-18-83; DEQ 8-1988, f. & cert. ef. 5-19-88 (and corrected 5-31-88); DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 27-1992, f. & cert. ef. 11-12-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 12-1993, f. & cert. ef. 9-24-93, Renumbered from 340-020-0260; DEQ 19-1993, f. & cert. ef. 11-4-93; DEQ 4-1995, f. & cert. ef. 2-17-95; DEQ 26-1996, f. & cert. ef. 11-26-96; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-028-1970; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0111; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01, Renumbered from 340-224-0090 & 340-240-0260; DEQ 11-2002, f. & cert. ef. 10-8-02; DEQ 12-2002(Temp), f. & cert. ef. 10-8-02 thru 4-6-03; Administrative correction 11-10-03; DEQ 1-2004, f. & cert. ef. 4-14-04; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 10-2010(Temp), f. 8-31-10, cert. ef. 9-1-10 thru 2-28-11; Administrative correction, 3-29-11; DEQ 5-2011, f. 4-29-11, cert. ef. 5-1-11

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 240

RULES FOR AREAS WITH UNIQUE AIR QUALITY NEEDS

340-240-0010

Purpose

The purpose of this division is to address the air quality control needs of the Medford-Ashland AQMA and Grants Pass UGB (OAR 340-240-0100 through 340-240-0270), the La Grande UGB (340-240-0300 through 340-240-0360, the Lakeview UGB (340-240-0400 through 340-240-0440), and the Klamath Falls Nonattainment Area (340-240-0500 through 340-240-0630).

[NOTE: These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025
Hist.: DEQ 4-1978, f. & ef. 4-7-78; DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0005

340-240-0030

Definitions

The definitions in OAR 340-200-0020, 340-204-0010 and this rule apply to this division. If the same term is defined in this rule and 340-200-0020 or 340-204-0010, the definition in this rule applies to this division.

(1) "Air contaminant" means a dust, fume, gas, mist, odor, smoke, vapor, pollen, soot, carbon, acid or particulate matter, or any combination thereof.

(2) "Air Conveying System" means an air moving device, such as a fan or blower, associated ductwork, and a cyclone or other collection device, the purpose of which is to move material from one point to another by entrainment in a moving airstream.

(3) "Average Operating Opacity" means the opacity of emissions determined using EPA Method 9 on any three days within a 12-month period which are separated from each other by at least 30 days; a violation of the average operating opacity limitation is judged to have occurred if the

opacity of emissions on each of the three days is greater than the specified average operating opacity limitation.

(4) "Charcoal Producing Plant" means an industrial operation which uses the destructive distillation of wood to obtain the fixed carbon in the wood.

(5) "Collection Efficiency" means the overall performance of the air cleaning device in terms of ratio of weight of material collected to total weight of input to the collector.

(6) "Department" means Department of Environmental Quality.

(7) "Design Criteria" means the numerical as well as verbal description of the basis of design, including but not necessarily limited to design flow rates, temperatures, humidities, contaminant descriptions in terms of types and chemical species, mass emission rates, concentrations, and specification of desired results in terms of final emission rates and concentrations, and scopes of vendor supplies and owner-supplied equipment and utilities, and a description of any operational controls.

(8) "Domestic Waste" means combustible household waste, other than wet garbage, such as paper, cardboard, leaves, yard clippings, wood, or similar materials generated in a dwelling housing four (4) families or less, or on the real property on which the dwelling is situated.

(9) "Dry Standard Cubic Foot" means the amount of gas that would occupy a volume of one cubic foot, if the gas were free of uncombined water at standard conditions.

(10) "Emission" means a release into the outdoor atmosphere of air contaminants.

(11) "EPA Method 9" means the method for Visual Determination of the Opacity of Emissions From Stationary Sources described as Method (average of 24 consecutive observations) in the Department Source Sampling Manual (January, 1992).

(12) "Facility" means an identifiable piece of process equipment. A stationary source may be comprised of one or more pollutant-emitting facilities.

(13) “Fireplace” is defined in OAR 340-262-0450

(14) "Fuel Burning Equipment" means a device that burns a solid, liquid, or gaseous fuel, the principal purpose of which is to produce heat or power by indirect heat transfer. All stationary gas turbines are considered Fuel Burning Equipment. Marine installations and internal combustion engines are not considered Fuel Burning Equipment.

(15) "Fuel Moisture Content By Weight Greater Than 20 Percent" means bark, hogged wood waste, or other wood with an average moisture content of more than 20 percent by weight on a wet basis as used for fuel in the normal operation of a wood-fired veneer dryer as measured by ASTM D4442-84 during compliance source testing.

(16) "Fuel Moisture Content By Weight Less Than 20 Percent" means pulverized ply trim, sanderdust, or other wood with an average moisture content of 20 percent or less by weight on a wet basis as used for fuel in the normal operation of a wood-fired veneer dryer as measured by ASTM D4442-84 during compliance source testing.

(17) "Fugitive Emissions" means dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof not easily given to measurement, collection and treatment by conventional pollution control methods.

(18) "Grants Pass Urban Growth Area" and "Grants Pass Area" means the area within the Grants Pass Urban Growth Boundary as shown on the Plan and Zoning Maps for the City of Grants Pass as of 1 February 1988.

(19) "Hardboard" means a flat panel made from wood that has been reduced to basic wood fibers and bonded by adhesive properties under pressure.

(20) “Klamath Falls Nonattainment Area” means the area as defined in OAR 340-204-0010.

(21) "La Grande Urban Growth Area" means the area within the La Grande Urban Growth Boundary as shown on the Plan and Zoning Maps for the City of La Grande as of 1 October 1991.

(22) "Lakeview Urban Growth Area" means the area within the Lakeview Urban Growth Boundary as shown on the Plan and Zoning Maps for the Town of Lakeview as of 25 October 1993.

(23) "Liquefied petroleum gas" has the meaning given by the American Society for Testing and Materials in ASTM D1835-82, "Standard Specification for Liquid Petroleum Gases."

(24) "Lowest Achievable Emission Rate" or "LAER" is defined in OAR 340-200-0020.

(25) "Maximum Opacity" means the opacity as determined by EPA Method 9 (average of 24 consecutive observations).

(26) "Medford-Ashland Air Quality Maintenance Area" (AQMA) means the area defined as beginning at a point approximately two and quarter miles northeast of the town of Eagle Point, Jackson County, Oregon at the northeast corner of Section 36, Township 35 South, Range 1 West (T35S, R1W); thence South along the Willamette Meridian to the southeast corner of Section 25, T37S, R1W; thence southeast along a line to the southeast corner of Section 9, T39S, R2E; thence south-southeast along line to the southeast corner of Section 22, T39S, R2E; thence South to the southeast corner of Section 27, T39S, R2E; thence southwest along a line to the southeast corner of Section 33, T39S, R2E; thence West to the southwest corner of Section 31, T39S, R2E; thence northwest along a line to the northwest corner of Section 36, T39S, R1E; thence West to the southwest corner of Section 26, T39S, R1E; thence northwest along a line to the southeast corner of Section 7, T39S, R1E; thence West to the southwest corner of Section 12, T39S, R1W, T39S, R1W; thence northwest along a line to southwest corner of Section 20, T38S,

R1W; thence West to the southwest corner of Section 24, T38S, R2W; thence northwest along a line to the southwest corner of Section 4, T38S, R2W; thence West to the southwest corner of Section 6, T38S, R2W; thence northwest along a line to the southwest corner of Section 31, T37S, R2W; thence North and East along the Rogue River to the north boundary of Section 32, T35S, R1W; thence East along a line to the point of beginning.

(27) "Modified Source" means any source with a major modification as defined in OAR 340-200-0020.

(28) "Natural gas" means a naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in geologic formations beneath the earth's surface, of which the principal component is methane.

(29) "New Source" means any source not in existence prior to April 7, 1978 or any source not having a Permit as of April 7, 1978.

(30) "Odor" means that property of an air contaminant that affects the sense of smell.

(31) "Offset" is defined in OAR 340-200-0020.

(32) "Opacity" means the degree to which an emission reduces transmission of light and obscures the view of an object in the background as measured in accordance with the Department's Source Sampling Manual (January, 1992). Unless otherwise specified by rule, opacity must be measured in accordance with EPA Method 9. For all standards, the minimum observation period must be six minutes, though longer periods may be required by a specific rule or permit condition. Aggregate times (e.g. 3 minutes in any one hour) consist of the total duration of all readings during the observation period that exceed the opacity percentage in the standard, whether or not the readings are consecutive. Alternatives to EPA Method 9, such as a continuous opacity monitoring system (COMS), alternate Method 1 (LIDAR), or EPA Methods 22, or 203, may be used if approved in advance by the DEQ, in accordance with the Source Sampling Manual.

(33) "Open Burning" means burning conducted in such a manner that combustion air and combustion products may not be effectively controlled including, but not limited to, burning conducted in open outdoor fires, burn barrels, and backyard incinerators.

(34) "Particleboard" means matformed flat panels consisting of wood particles bonded together with synthetic resin or other suitable binders.

(35) "Particulate Matter" means all solid or liquid material, other than uncombined water, emitted to the ambient air as measured in accordance with the Department Source Sampling Manual. Particulate matter emission determinations must consist of the average of three separate consecutive runs. For sources tested using DEQ Method 5 or DEQ Method 7, each run must have a minimum sampling time of one hour, a maximum sampling time of eight hours, and a minimum sampling volume of 31.8 dscf. For sources tested using DEQ Method 8, each run must have a minimum sampling time of 15 minutes and must collect a minimum particulate sample of

100 mg. Wood waste boilers and charcoal producing plants must be tested with DEQ Method 5; veneer dryers, wood particle dryers, fiber dryers and press/cooling vents must be tested with DEQ Method 7; and air conveying systems must be tested with DEQ Method 8 (January, 1992).

(36) "Person" includes individuals, corporations, associations, firms, partnerships, joint stock companies, public and municipal corporations, political subdivisions, the state and any agencies thereof, and the federal government and any agencies thereof.

(37) "Press/Cooling Vent" means any opening through which particulate and gaseous emissions from plywood, particleboard, or hardboard manufacturing are exhausted, either by natural draft or powered fan, from the building housing the process. Such openings are generally located immediately above the board press, board unloader, or board cooling area.

(38) "Rebuilt Boiler" means a physical change after April 29, 1988, to a wood-waste boiler or its air-contaminant emission control system which is not considered a "modified source" and for which the fixed, depreciable capital cost of added or replacement components equals or exceeds fifty percent of the fixed depreciable cost of a new component which has the same productive capacity

(39) "Refuse" means unwanted material.

(40) "Refuse burning equipment" means a device designed to reduce the volume of solid, liquid, or gaseous refuse by combustion.

(41) “Wood Fuel-Fired Device” means a device or appliance designed for wood fuel combustion, including cordwood stoves, wood stoves and fireplace stove inserts, fireplaces, wood fuel-fired cook stoves, pellet stoves and combination fuel furnaces or boilers, which burn wood fuels.

(42) "Source" means any structure, building, facility, equipment, installation or operation, or combination thereof, which is located on one or more contiguous or adjacent properties and which is owned or operated by the same person, or by persons under common control.

(43) "Standard Conditions" means a temperature of 68° Fahrenheit (20° Celsius) and a pressure of 14.7 pounds per square inch absolute (1.03 Kilograms per square centimeter).

(44) "Standard cubic foot" means the amount of gas that would occupy a volume of one cubic foot, if the gas were free of uncombined water at standard conditions. When applied to combustion flue gases from fuel or refuse burning, "standard cubic foot" also implies adjustment of gas volume to that which would result at a concentration of 12% carbon dioxide or 50% excess air.

(45) "Veneer" means a single flat panel of wood not exceeding 1/4 inch in thickness formed by slicing or peeling from a log.

(46) "Veneer Dryer" means equipment in which veneer is dried.

(47) "Wood-fired Veneer Dryer" means a veneer dryer which is directly heated by the products of combustion of wood fuel in addition to or exclusive of steam or natural gas or propane combustion.

(48) "Wigwam Fired Burner" means a burner which consists of a single combustion chamber, has the general features of a truncated cone, and is used for the incineration of wastes.

(49) "Wood Waste Boiler" means equipment which uses indirect heat transfer from the products of combustion of wood waste to provide heat or power.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025
Hist.: DEQ 4-1978, f. & ef. 4-7-78; DEQ 9-1979, f. & ef. 5-3-79; DEQ 3-1980, f. & ef. 1-28-80; DEQ 14-1981, f. & ef. 5-6-81; DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 4-1995, f. & cert. ef. 2-17-95; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 3-1996, f. & cert. ef. 1-29-96; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0010; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01; DEQ 1-2005, f. & cert. ef. 1-4-05

Klamath Falls Nonattainment Area

340-240-0500

Applicability

OAR 340-240-0500 through 340-240-0630 apply in the Klamath Falls Nonattainment Area beginning January 1, 2013.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0510

Opacity Standard

(1) Except as provided in section (2) of this rule, no person conducting a commercial or industrial activity may cause or permit the emission of any air contaminant into the atmosphere from any stationary source including fuel or refuse burning equipment, that exhibits equal to or greater than 20% opacity for a period or periods aggregating more than three minutes in any one hour.

(2) Exceptions to section (1) of this rule:

(a) This rule does not apply to fugitive emissions.

(b) This rule does not apply where the presence of uncombined water is the only reason for failure of any source to meet the requirements of this rule.

(c) For wood-fired boilers that were constructed or installed prior to June 1, 1970 and not modified since that time, visible emissions during grate cleaning operations must not equal or exceed 40% opacity for a period or periods aggregating more than three minutes in any one hour.

(A) Beginning June 30, 2013, this exception will only apply if the owner or operator conducts the grate cleaning in accordance with a grate cleaning plan that has been approved by DEQ.

(B) The owner or operator must prepare a grate cleaning plan in consultation with DEQ and submit the plan to DEQ by June 1, 2013.

(3) Opacity is determined in accordance with EPA Method 9 of Appendix A to 40 CFR Part 60 or a continuous opacity monitoring system (COMS) installed and operated in accordance with Performance Specification 1 of Appendix B to 40 CFR Part 60.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468.020 & ORS 468A.025.

340-240-0520

Control of Fugitive Emissions

(1) All sawmills, plywood mills and veneer manufacturing plants, particleboard and hardboard plants, asphalt plants, rock crushers, animal feed manufacturers, and other major industrial facilities as identified by the DEQ, must prepare and implement site-specific plans for the control of fugitive emissions. The plan must be submitted to the DEQ for approval in accordance with paragraph (5) below.

(2) Fugitive emission-control plans must identify reasonable measures to prevent particulate matter from becoming airborne, and avoid the migration of material onto the public road system. Such reasonable measures may include, but are not limited to the following:

(a) Paving all roads and areas on which vehicular traffic occurs at the facility;

(b) Scheduled application of water, or other suitable chemicals on unpaved roads, log storage or sorting yards, materials stockpiles, and other surfaces which can create airborne dust. Dust suppressant material must not adversely affect water quality;

(c) Periodic sweeping or cleaning of paved roads and other areas as necessary to prevent migration of material onto the public road system;

(d) Full or partial enclosure of materials stockpiled or other best management practices in cases where application of oil, water, or chemicals are not sufficient to prevent particulate matter from becoming airborne;

(e) Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;

(f) Adequate containment during sandblasting or other similar operations;

(g) Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne; and

(h) Procedures for the prompt removal of earth or other material from paved streets.

(3) Reasonable measures may include landscaping and using vegetation to reduce the migration of material onto public and private roadways or from becoming airborne.

(4) The facility owner or operator must supervise and control fugitive emissions and material that may become airborne caused by the activity of outside contractors delivering or removing materials at the site.

(5) For existing sources, the site-specific fugitive emissions control plan must be submitted to the DEQ by July 1, 2013. For sources that obtain their initial permit after December 14, 2012, the site-specific fugitive emission control plan must be submitted within 60 days after permit issuance. For portable sources that move into the nonattainment area after December 14, 2012, the site-specific fugitive emission control plan must be submitted with the relocation notification. Unless otherwise notified by the DEQ, the fugitive emission control plan will be approved by default within 30 days after the plan is submitted to the DEQ. The DEQ may request revisions to the plan at any time if fugitive emissions are not adequately controlled as demonstrated by visible emissions.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0530

Requirement for Operation and Maintenance Plans

(1) With the exception of basic and general permit holders, a permit holder must prepare and implement Operation and Maintenance Plans for non-fugitive sources of particulate matter.

(2) The purposes of the operation and maintenance plans are to:

(a) Reduce the number of upsets and breakdowns in particulate control equipment;

(b) Reduce the duration of upsets and downtimes; and

(c) Improve the efficiency of control equipment during normal operations.

(3) The operation and maintenance plans should consider, but not be limited to, the following:

(a) Personnel training in operation and maintenance;

(b) Preventative maintenance procedures, schedule and records;

(c) Logging of the occurrence and duration of all upsets, breakdowns and malfunctions which result in excessive emissions;

(d) Routine follow-up evaluation of upsets to identify the cause of the problem and changes needed to prevent a recurrence;

(e) Periodic source testing of pollution control units as required by the permit;

(f) Inspection of internal wear points of pollution control equipment during scheduled shutdowns; and

(g) Inventory of key spare parts.

(4) Existing sources must submit an Operation and Maintenance Plan to the DEQ by July 1, 2013. Sources obtaining an initial permit after December 14, 2012 must submit the Operation and Maintenance Plan within 60 days of permit issuance. The DEQ will notify sources within 30 days of plan submittal only if the Operation and Maintenance Plan is not approved. The DEQ may request revisions to the plan at any time if plans are not sufficient.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

340-240-0540

Compliance Schedule for Existing Industrial Sources

(1) Except as provided in sections (2) and (3) of this rule, compliance with applicable requirements of OAR 340-240-0500 through 340-240-0540 for a source that is built and located in the Klamath Falls Nonattainment Area prior to December 14, 2012 must be demonstrated by the owner or operator of the source as expeditiously as possible, but in no case later than the following schedule:

(a) No later than June 15, 2013, the owner or operator must submit Design Criteria and a Notice of Intent to Construct for emission-control systems for complying with OAR 340-240-0510 through 340-240-0540 for DEQ review and approval; If the DEQ disapproves the Design Criteria, the owner or operator must revise the Design Criteria to meet the DEQ's objections and submit the revised Design Criteria to the DEQ no later than one month after receiving the DEQ's disapproval;

(b) No later than three months after receiving the DEQ's approval of the Design Criteria, the owner or operator must submit to the DEQ copies of purchase orders for any emission-control devices;

(c) No later than eight months after receiving the DEQ's approval of the Design Criteria, the owner or operator must submit to the DEQ vendor drawings as approved for construction of any emission-control devices and specifications of any other major equipment in the emission-control system in sufficient detail to demonstrate that the requirements of the Design Criteria will be satisfied;

(d) No later than nine months after receiving the DEQ's approval of the Design Criteria, the owner or operator must begin construction of any emission-control devices;

(e) No later than fourteen months after receiving the DEQ's approval of Design Criteria, the owner or operator must complete construction in accordance with the Design Criteria;

(f) No later than October 15, 2014, the owner or operator must demonstrate compliance with the applicable requirements identified in OAR 340-240-0500 through 0540. Compliance with 340-240-0510 must be demonstrated by conducting a source test. Compliance with 340-240-0520 and 0530 must be demonstrated by implementing the approved plans.

(2) Section (1) of this rule does not apply if the owner or operator of the source has demonstrated by September 15, 2014 that the source is capable of being operated and is operated in continuous compliance with applicable requirements of OAR 340-240-0500 through 340-240-0540 and the DEQ has agreed with the demonstration in writing. The DEQ may grant an extension until April

15, 2015 for a source to demonstrate compliance under this section. The applicable requirements will be incorporated in the Permit issued to the source.

(3) The DEQ may adjust the schedule specified in subsections (1)(a) through (e) of this rule if necessary to ensure timely compliance with subsection (1)(f) of this rule or if necessary to conform to an existing compliance schedule with an earlier compliance demonstration date.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0550

Requirements for New Sources When Using Residential Wood Fuel-Fired Device Offsets

(1) All new or modified sources subject to OAR 340-224-0050 or 340-224-0060 may opt to use wood fuel-fired device emission reductions from within the nonattainment or maintenance area to satisfy the offset requirements of OAR 340-225-0090(2):

(a) Offsets for decommissioning fireplaces and non-certified woodstoves (including fireplace inserts) are obtained at a ratio of at least 1:1 (i.e., one ton of emission reductions from fireplaces and non-certified wood stoves offsets one ton of emissions from a proposed new or modified industrial point source proposed to be located inside or impacting the non-attainment area or maintenance area);

(b) Offsets must be obtained from within the Klamath Falls Nonattainment Area and Maintenance Area; and

(c) The emission reductions offsets must be approved by the DEQ and comply with OAR 340-240-0560.

(2) The net air quality benefit analysis specified in OAR 340-225-0090(2)(a)(E) is not applicable to offsets meeting the criteria in (a) through (c) of section (1) of this rule.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

Real and Permanent $PM_{2.5}$ and PM_{10} Offsets

340-240-0560

(1) Annual emissions reductions offsets ($PM_{2.5}$ and PM_{10}) are determined as follows:

(a) For **fireplaces**, the emission reductions offsets for decommissioning the fireplace and replacing it with a:

(A) certified fireplace insert is 0.02 tons for each replaced device;

(B) pellet stove insert is 0.03 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.04 tons for each replaced device.

Note: As used in this rule, “Certified” includes catalytic and non-catalytic designs, unless otherwise specified.

(b) For **non-certified fireplace inserts**, the emission reduction for replacing the heating device with a:

(A) certified fireplace insert is 0.02 tons for each replaced device;

(B) pellet stove is 0.04 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.04 tons for each replaced device

(c) For **conventional (non-certified) woodstoves**, the emission reduction for replacing the heating device with a:

(A) certified woodstove (including both catalytic and non-catalytic designs) or certified fireplace insert is 0.03 tons for each replaced device; or

(B) pellet stove is 0.05 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.06 tons for each replaced device

(d) For **certified woodstoves** (including both catalytic and non-catalytic designs), the emission reduction for replacing the heating device with a:

(A) pellet stove is 0.03 tons for each replaced device; or

(B) alternative non-wood burning heating system is 0.04 tons for each replaced device

(2) For the emission reductions identified in section (1) to be considered permanent, the person responsible for taking credit for the emission reductions must obtain and maintain the following records for at least 5 years from the date that the proposed industrial point source commences operation:

(a) the address of the residence where the emission reduction occurred;

(b) the date that the emission reduction was achieved;

(c) purchase and installation records for certified woodstoves, certified inserts, or alternative non-wood burning heating systems;

(d) records for permanently decommissioning fireplaces, if applicable; and

(e) disposal records for non-certified woodstoves or fireplace inserts removed.

(3) The records identified in section (2) may be provided by a third party authorized and monitored by the DEQ to procure the emission reductions identified in section (1).

(4) All emission reductions must be achieved prior to startup of the proposed source using the emission reductions as offsets in the permitting action specified in OAR 340-224-0050 or 340-224-0060.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

Klamath Falls Nonattainment Area Contingency Measures

340-240-0570

Applicability

OAR 340-240-0570 through 340-240-0630 apply to the Klamath Falls Nonattainment Area for $PM_{2.5}$ should the area not achieve attainment by the applicable attainment date established pursuant to 42 U.S.C. 7502(a)(2).

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.480

340-240-0580

Existing Industrial Sources Control Efficiency

The owner or operator of an Oregon Title V Operating Permit program source, as defined in OAR 340-200-0020 may not remove or modify existing control devices unless the new control device has the same or better $PM_{2.5}$ control efficiency as the old device.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.480

340-240-0610

Continuous Monitoring for Industrial Sources

(1) The owner or operator of an Oregon Title V Operating Permit program source, as defined in OAR 340-200-0020 must install and operate instrumentation for measuring and recording emissions or the parameters that affect the emission of particulate matter from wood-fired boilers by June 1, 2015, to ensure that the sources and the air pollution control equipment are operated at all times at their full efficiency and effectiveness so that the emission of particulate matter is kept at the lowest practicable level. Continuous monitoring equipment and operation must be in accordance with the Department's Continuous Monitoring Manual.

(2) At a minimum, the monitoring required under paragraph (1) of this section must include:

(a) Continuous monitoring of control device parameters for any wood- fired boiler.

(b) Continuous monitoring of opacity for any wood- fired boiler not controlled by a wet scrubber.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

340-240-0620

Contingency Measures: New Industrial Sources

New industrial sources must comply with OAR 340-240-0570 through 340-240-0610 immediately upon receiving an Air Contaminant Discharge Permit or an Oregon Title V Operating Permit.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.025

340-240-0630

Contingency Enhanced Curtailment of Use of Solid Fuel Burning Devices and Fireplaces

(1) Beginning on November 1 of each year and continuing through and including February 28 of the following year, no fireplace, as defined by OAR 340-262-0450, may emit more than 5.1 grams per kilogram of particulate emissions. A fireplace shall be deemed in compliance with this emission standard if it has been certified either in accordance with ASTM international standard test method E2558 or by the DEQ pursuant to OAR 340-262-0500. A fireplace that is not certified as described in this rule shall be presumed not to comply with this rule.

(2) The DEQ may approve exemptions from compliance with section (1) of this rule on days when the DEQ or the Klamath County Health Department has issued a local Klamath Falls Advisory Call indicating that it is a good ventilation day (a “green day”) that are also state holidays or days that the county has designated as a “special occasion day”. Any person who wishes to receive such an exemption must file an exemption application with the DEQ and the DEQ must have approved the exemption request prior to the green day.

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.010 to 468A.025

DIVISION 262

HEAT SMART PROGRAM FOR RESIDENTIAL WOODSTOVES AND OTHER SOLID FUEL HEATING DEVICES

340-262-1000

Wood Burning Contingency Measures for PM2.5 Nonattainment Areas

(1) Applicability

This rule applies to any area classified as a nonattainment area for PM2.5 that does not achieve attainment by the applicable Clean Air Act deadline.

(2) No owner of a residential solid fuel burning device shall allow the appliance to burn creating opacity greater than 20% opacity for more than three minutes in any 60-minute period including startup time.

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.020, 468A.025 & 468A.460 - 468A.515

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 264

RULES FOR OPEN BURNING

340-264-0040

Exemptions, Statewide

Except for the provisions contained in OAR 340-264-0050 and 340-264-0060, this Division does not apply to:

(1) Recreational fires and ceremonial fires, for which a fire is appropriate.

(2) Barbecue equipment used in connection with any residence.

(3) Fires set or permitted by any public agency when such fire is set or permitted in the performance of its official duty for the purpose of weed abatement, prevention or elimination of a fire hazard, or a hazard to public health or safety, or for instruction of employees in the methods of fire fighting, which in the opinion of the public agency is necessary. Every effort will be made by the public agency to conduct this burning during good smoke dispersal conditions and specifically avoiding periods during Air Pollution Advisories. The agency will adjust its schedule for setting such fires for better smoke dispersal if necessary. Open burning fires otherwise exempt from the requirements of this division are still subject to the requirements and prohibitions of local jurisdictions and the State Fire Marshall.

(4) Agricultural open burning pursuant to ORS 468A.020. Agricultural open burning is still subject to the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(5) Open field burning, propane flaming, and stack and pile burning in the Willamette Valley between the crests of the Cascade and Coast Ranges pursuant to OAR chapter 340, division 266, Rules for Field Burning.

(6) Slash burning on forest land or within one-eighth mile of forest land permitted under the Oregon Smoke Management Program regulated by the Department of Forestry pursuant to ORS 477.515.

(7) Fires set pursuant to permit for the purpose of instruction of employees of private industrial concerns in methods of fire fighting, or for civil defense instruction.

(8) Fires set for the purpose of disposal of dry tumbleweed plants (typically Russian Thistle and Tumbleweed Mustard plants) that have been broken off, and rolled about, by the wind.

(9) Agricultural burning for disease or pest control when the fire is set or authorized in writing by the Department of Agriculture.

(10) When caused by an authorized representative of the Department of Agriculture, open burning of carcasses of animals that have died or been destroyed because of an animal disease emergency.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.

Stat. Auth.: ORS 468, 468A & 477
Stats. Implemented: ORS 468A.025
Hist.: DEQ 123, f. & ef. 10-20-76; DEQ 23-1979, f. & ef. 7-5-79; DEQ 27-1981, f. & ef. 9-8-81; DEQ 10-1984, f. 5-29-84, ef. 6-16-84; DEQ 6-1992, f. & cert. ef. 3-11-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0035; DEQ 21-2000, f. & cert. ef. 12-15-00; DEQ 12-2008, f. & cert. ef. 9-17-08

340-264-0078

Open Burning Control Areas

Generally, areas around the more densely populated locations in the state and valleys or basins that restrict atmospheric ventilation are designated "Open Burning Control Areas". The practice of open burning may be more restrictive in open burning control areas than in other areas of the state. The specific open burning restrictions associated with these open burning control areas are listed in OAR 340-264-0100 through 340-264-0170 by county. The general locations of open burning control areas are depicted in **Figures 2** through **5**. The open burning control areas of the state are defined as follows:

(1) All areas in or within three miles of the incorporated city limit of all cities with a population of 4,000 or more.

(2) The Coos Bay Open Burning Control Area is located in Coos County with boundaries as generally depicted in **Figure 3** of this rule. The area is enclosed by a line beginning at a point approximately 4-1/2 miles WNW of the City of North Bend, at the intersection of the north boundary of T25S, R13W, and the coastline of the Pacific Ocean; thence east to the NE corner of T25S, R12W; thence south to the SE corner of T26S, R12W; thence west to the intersection of the south boundary of T26S, R14W and the coastline of the Pacific Ocean, thence northerly and easterly along the coastline of the Pacific Ocean to its intersection with the north boundary of T25S, R13W, the point of beginning.

(3) The Rogue Basin Open Burning Control Area is located in Jackson and Josephine Counties with boundaries as generally depicted in Figure 4. The area is enclosed by a line beginning at a point approximately 4-1/2 miles NE of the City of Shady Cove at the NE corner of T34S, R1W, Willamette Meridian, thence south along the Willamette Meridian to the SW corner of T37S, R1W; thence east to the NE corner of T38S, R1E; thence south to the SE corner of T38S, R1E; thence east to the NE corner of T39S, R2E; thence south to the SE corner of T39S, R2E; thence west to the SW corner of T39S, R1E; thence NW along a line to the NW corner of T39S, R1W; thence west to the SW corner of T38S, R2W; thence north to the SW corner of T36S, R2W; thence west to the SW corner of T36S, R4W; thence south to the SE corner of T37S, R5W; thence west to the SW corner of T37S, R6W; thence north to the NW corner of T36S, R6W; thence east to the SW corner of T35S, R1W; thence north to the NW corner of T34S, R1W; thence east to the point of beginning.

(4) The Umpqua Basin Open Burning Control Area is located in Douglas County with boundaries as generally depicted in **Figure 5**. The area is enclosed by a line beginning at a point approximately four miles ENE of the City of Oakland, Douglas County, at the NE corner of T25S, R5W, Willamette Meridian, thence south to the SE corner of T25S, R5W; thence east to the NE Corner of T26S, R4W; thence south to the SE corner of T27S, R4W; thence west to the SE corner of T27S, R5W; thence south to the SE corner of T30S, R5W; thence west to the SW corner of T30S, R6W; thence north to the NW corner of T29S, R6W; thence west to the SW corner of T28S, R7W thence north to the NW corner of T27S, R7W; thence east to the NE corner of T27S, R7W; thence north to the NW corner of T26, R6W; thence east to the NE corner of T26S, R6W; thence north to the NW corner of T25S, R5W; thence east to the point of beginning.

(5) The boundaries of the Willamette Valley Open Burning Control Area are generally depicted in Figures 1 and 2. The area includes all of Benton, Clackamas, Linn, Marion, Multnomah, Polk, Washington and Yamhill Counties and that portion of Lane County east of Range 7 West.

(6) The Klamath Basin Open Burning Control Area is located in Klamath County with boundaries generally depicted in Figure 6. The area is enclosed by a line beginning at the corner common to northwest corner of Section 31, Township 37 South, Range 9 East of the Willamette Meridian and southwest corner of Section 30 T37S, R9E W.M.; thence east approximately two miles to the northeast corner of Section 32; thence south approximately four miles to the southeast corner of Section 17, T38S, R9E W.M.; thence east approximately one mile to the southwest corner of Section 15,; thence north approximately one mile to the northwest corner of Section 15; thence east approximately 2 miles to the northeast corner of Section 14; thence south approximately one mile to the northwest corner of section 24; thence east approximately one mile to the northeast corner of Section 24; thence south approximately three miles to the southeast corner of Section 36; thence east approximately four miles to the northeast corner of Section 3, T39S, R10E W.M.; thence south approximately three miles to the southeast corner of Section 15; thence west approximately two miles to the southwest corner of Section16; thence south approximately two miles to the southeast corner of Section 29; thence west approximately five miles to the southwest corner of Section 27, T39S, R9E; thence north approximately one mile to the northeast corner of Section 27; thence west approximately four miles to the southwest corner of Section 24, T39S R8E; thence north approximately two miles to the northeast corner of Section 13; thence west approximately one mile to the southwest corner of Section 11; thence north approximately four miles to the northwest corner of Section 26 T38S, R8E; thence west one mile to the southwest corner of Section 22; thence north approximately one mile to the northwest corner of Section 22; thence west approximately one mile to the southwest corner of Section 16; thence north approximately one mile to the northeast corner of Section 16; thence west approximately one mile to the southwest corner of Section 8; thence north approximately two miles to the northwest corner of Section 5; thence east to the northeast corner of Section 1; thence north approximately one mile to the point of beginning.

(7) "Special Open Burning Control Areas" are established around cities within the Willamette Valley Open Burning Control Area. The boundaries of these special open burning control areas are determined as follows:

(a) Any area in or within three miles of the boundary of any city of more than 1,000 but less than 45,000 population;

(b) Any area in or within six miles of the boundary of any city of 45,000 or more population;

(c) Any area between areas established by this rule where the boundaries are separated by three miles or less;

(d) Whenever two or more cities have a common boundary, the total population of these cities will determine the applicability of subsection (a) or (b) of this section and the municipal boundaries of each of the cities must be used to determine the limit of the special open burning control area.

(8) A domestic burning ban area around the Portland metropolitan area is generally depicted in **Figure 1A**. This area encompasses parts of the special control area in Clackamas, Multnomah and Washington Counties. Specific boundaries are listed in OAR 340-264-0120(5), 340-264-0130(5) and 340-264-0140(5). Domestic burning is prohibited in this area except as allowed pursuant to OAR 340-264-0180.

[**NOTE**: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

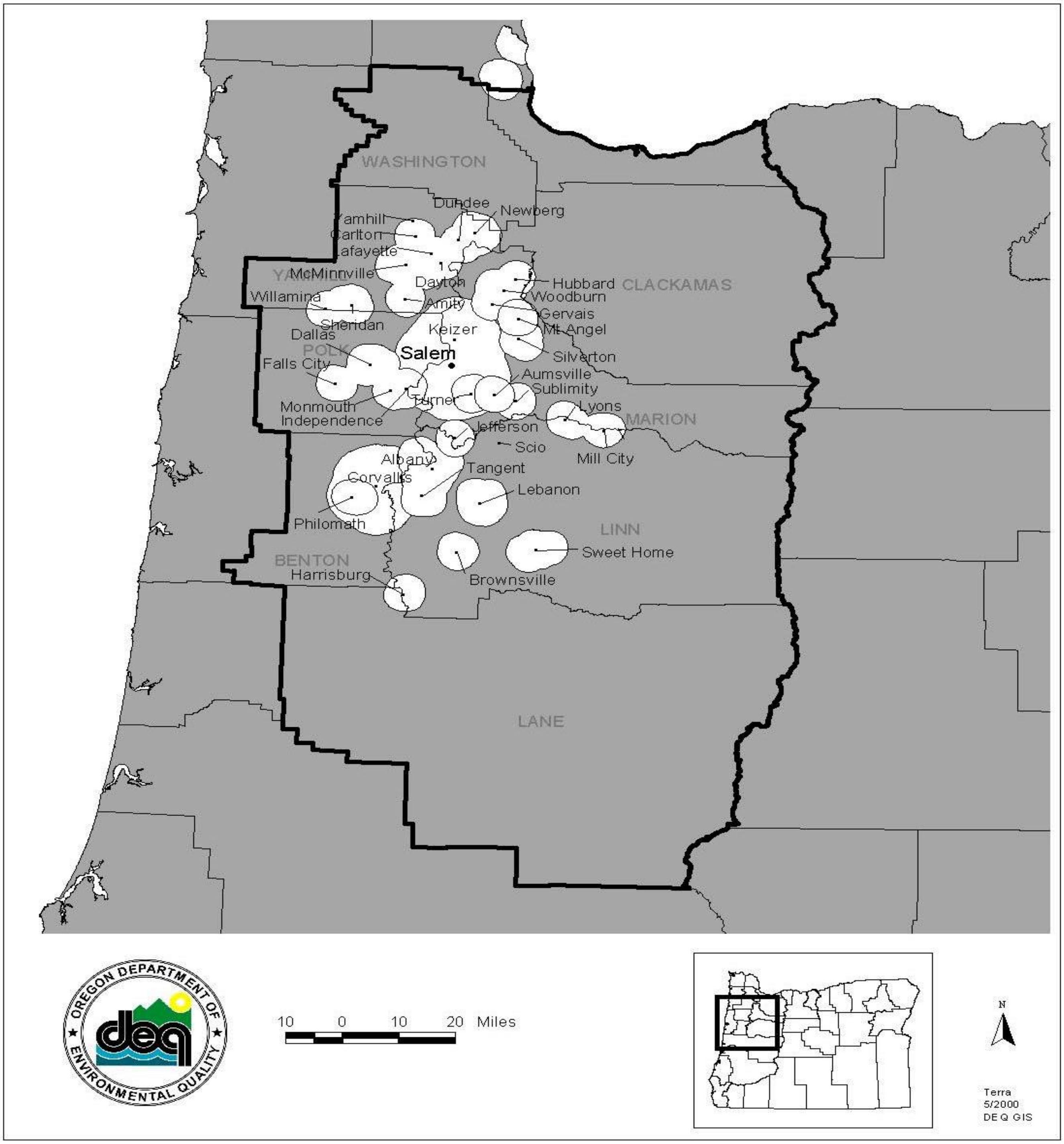
[ED. NOTE: The Figure(s) referenced in this rule is not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025
Hist.: DEQ 27-1981, f. & ef. 9-8-81; DEQ 10-1984, f. 5-29-84, ef. 6-16-84; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0115; DEQ 21-2000, f. & cert. ef. 12-15-00 Renumbered from 340-264-0200.

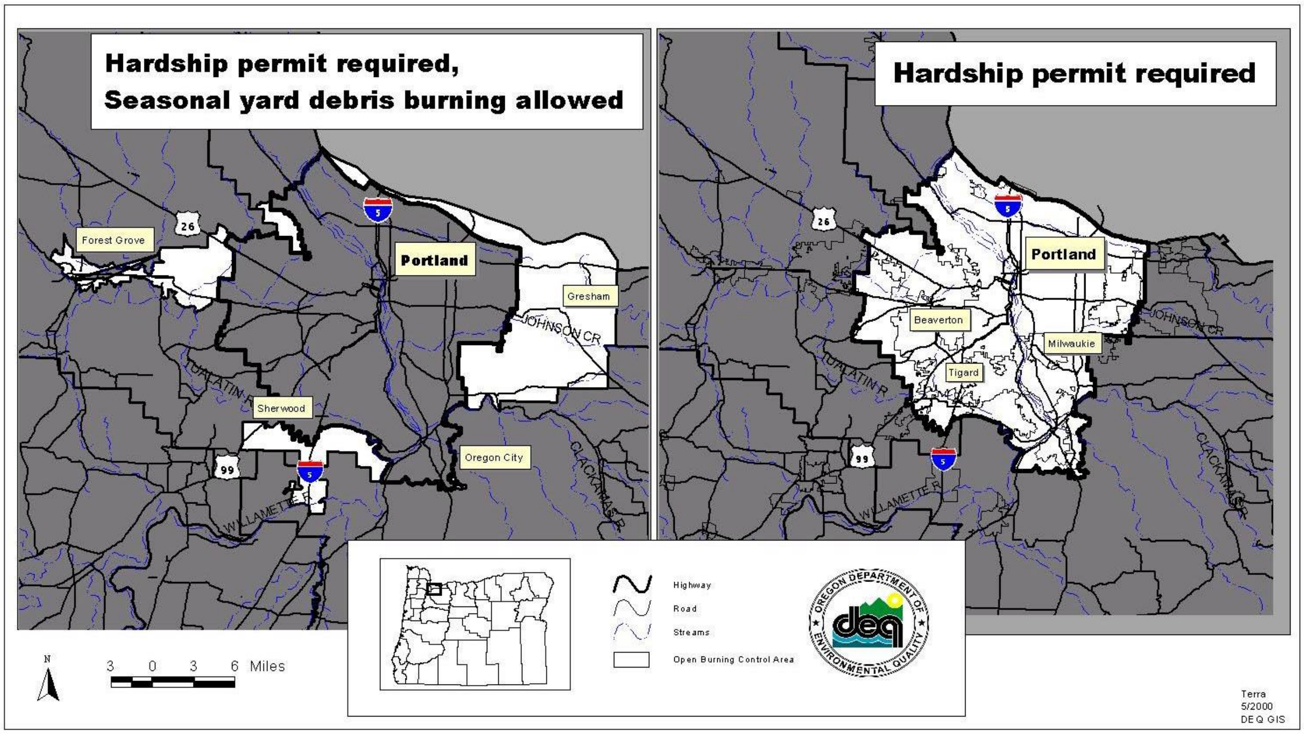
340-264-0078

Figure 1

WILLAMETTE VALLEY OPEN BURNING CONTROL AREA

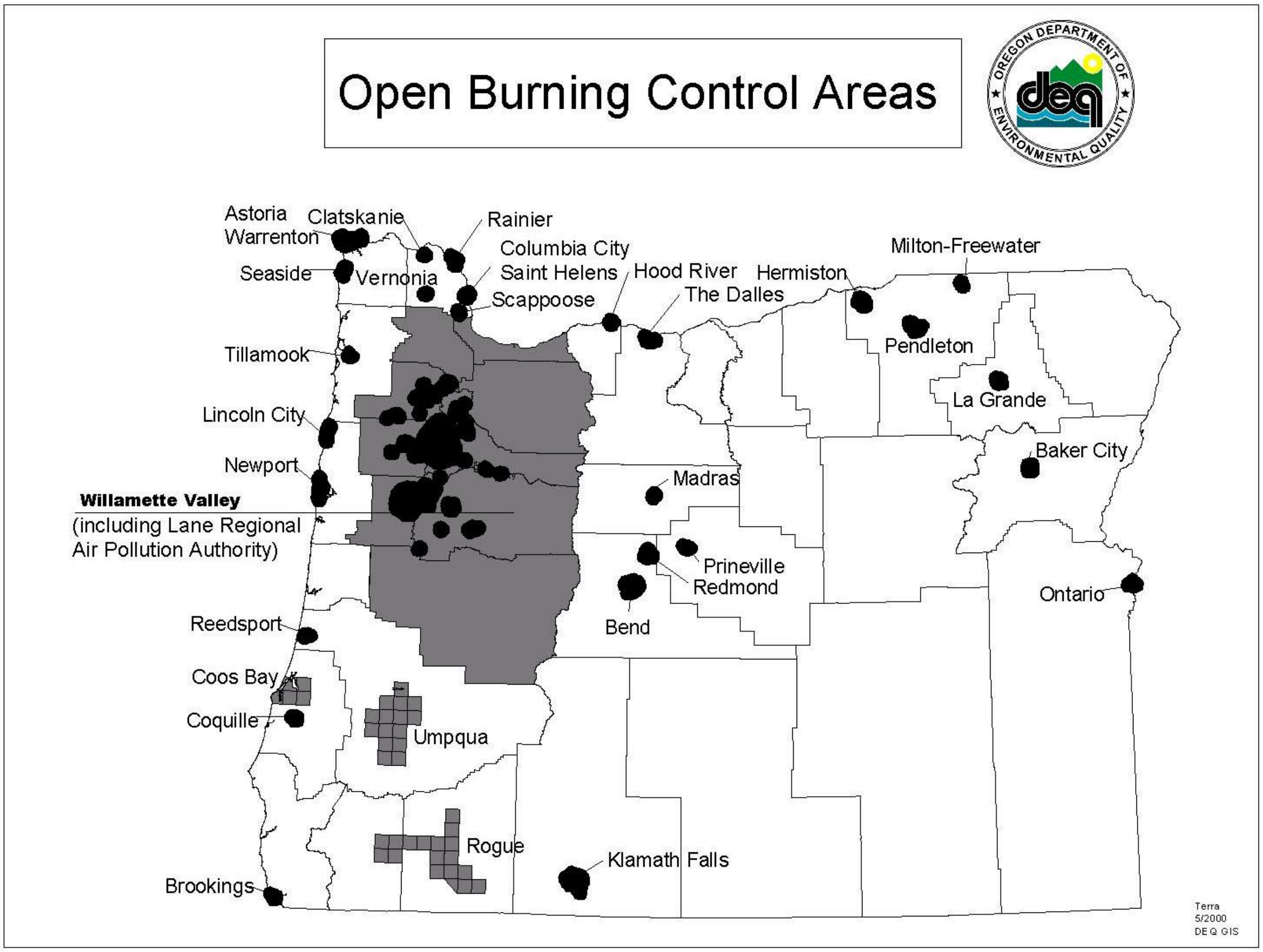


340-264-0078
Figure 1A
METROPOLITAN AREA BACKYARD BURNING BOUNDARIES

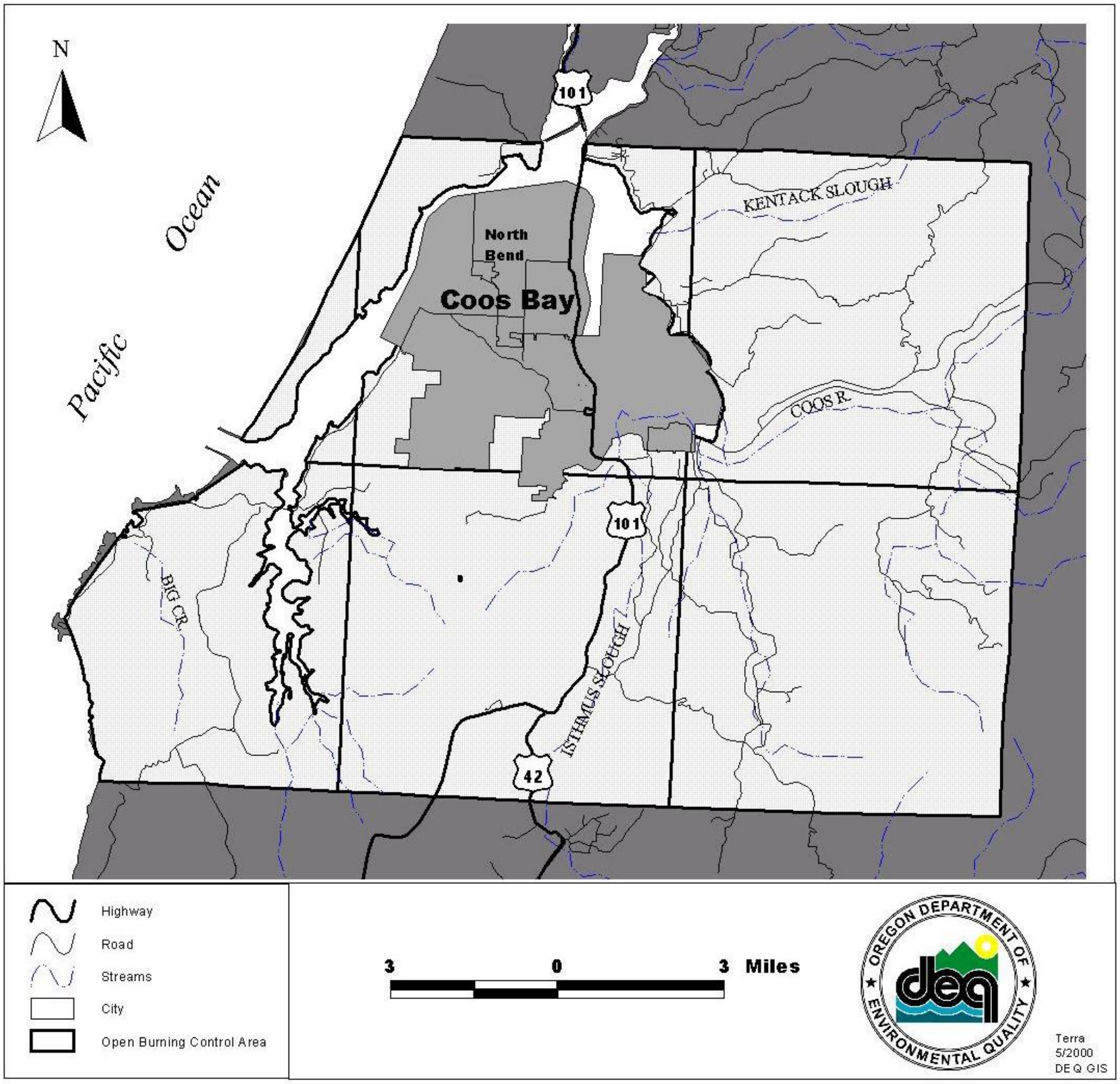


340-264-0078

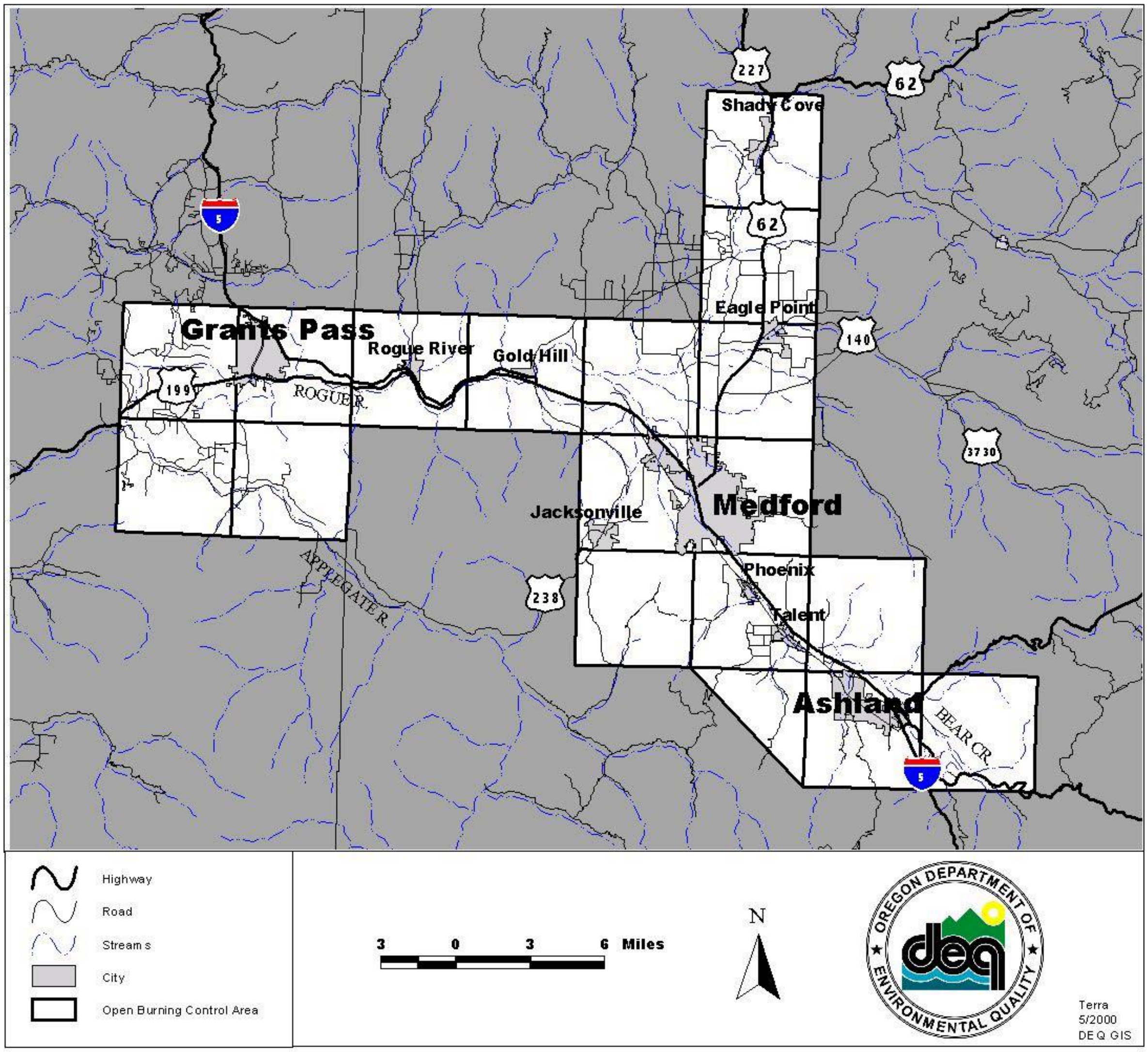
Figure 2



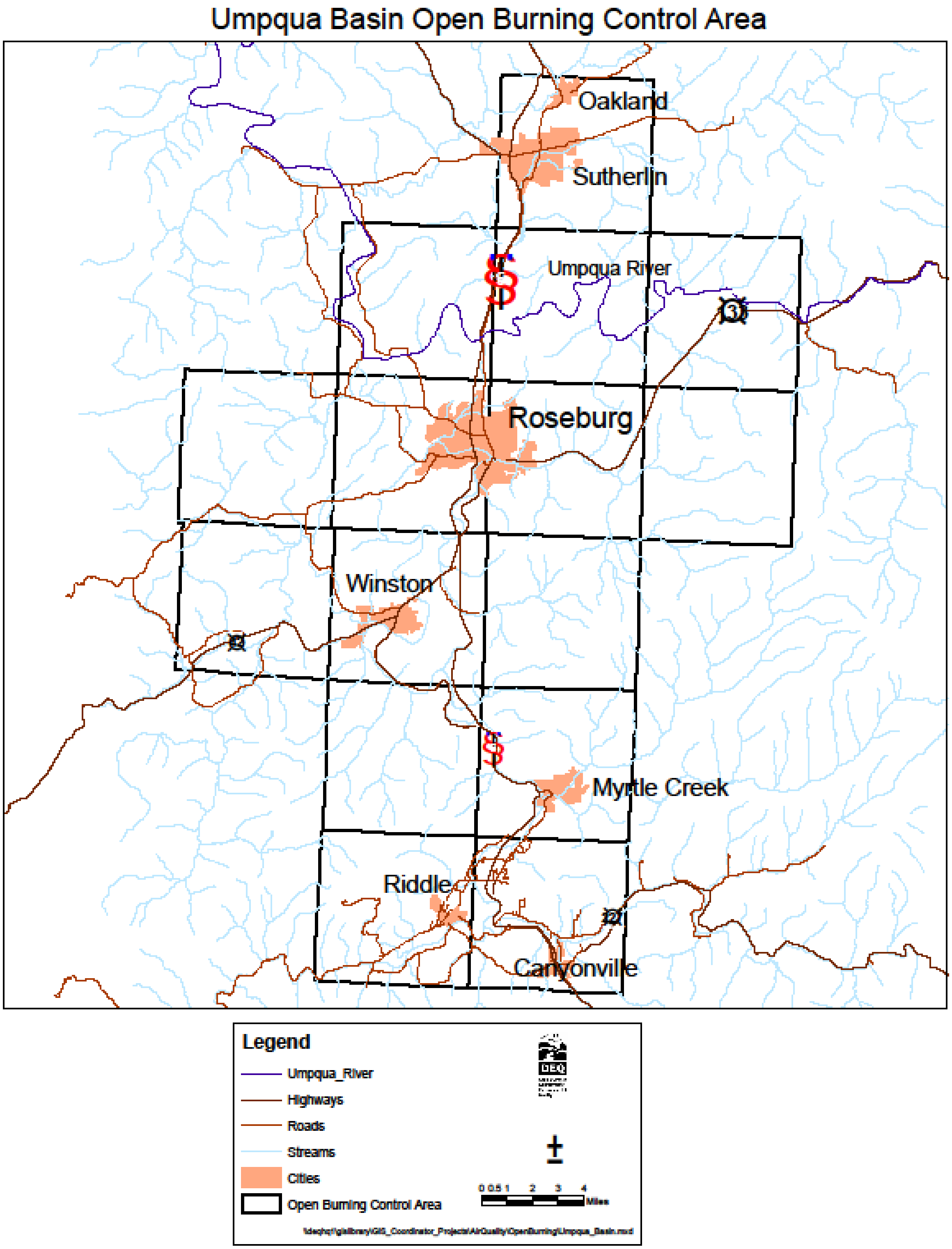
340-264-0078
Figure 3
COOS BAY OPEN BURNING CONTROL AREA



340-264-0078
Figure 4
ROGUE BASIN OPEN BURNING CONTROL AREA

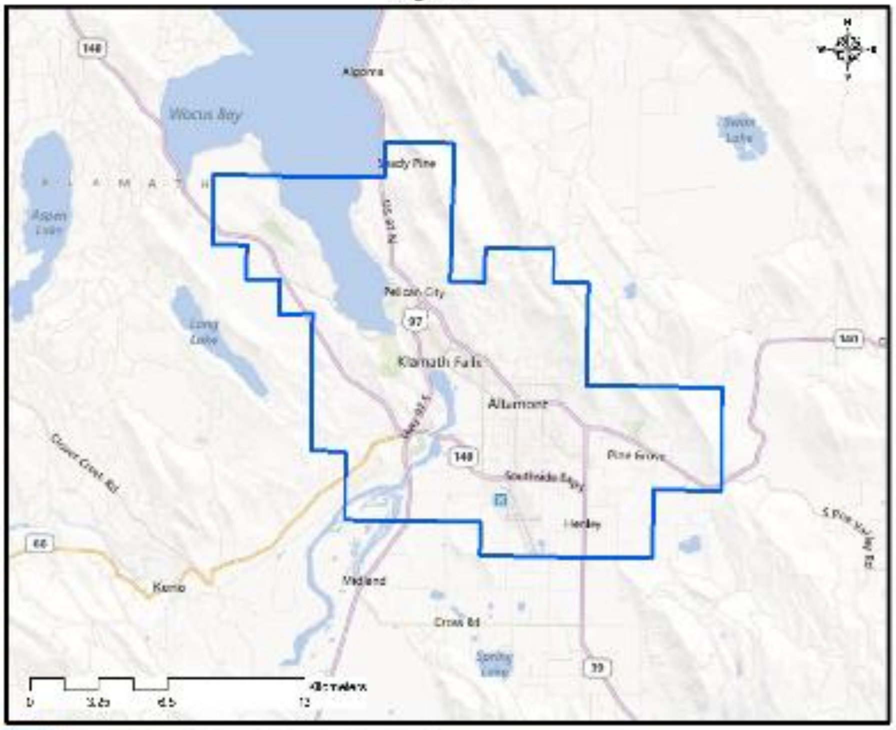


340-264-0078
Figure 5



340-264-0078

Figure 6



Klamath Basin Open Burning Control Area

340-264-0080

County Listing of Specific Open Burning Rules

Except as otherwise provided, in addition to the general requirements and prohibitions listed in OAR 340-264-0050 and 340-264-0060, specific prohibitions of Agricultural, Commercial, Construction, Demolition, Domestic, and Industrial open burning are listed in separate rules for each county. The following list identifies the rule containing prohibitions of specific types of open burning applicable to a given county:

(1) Baker County -- OAR 340-264-0100.

(2) Benton County -- OAR 340-264-0110.

(3) Clackamas County -- OAR 340-264-0120.

(4) Clatsop County -- OAR 340-264-0100.

(5) Columbia County -- OAR 340-264-0150.

(6) Coos County -- OAR 340-264-0170.

(7) Crook County -- OAR 340-264-0100.

(8) Curry County -- OAR 340-264-0100.

(9) Deschutes County -- OAR 340-264-0100.

(10) Douglas County -- OAR 340-264-0170.

(11) Gilliam County -- OAR 340-264-0100.

(12) Grant County -- OAR 340-264-0100.

(13) Harney County -- OAR 340-264-0100.

(14) Hood River County -- OAR 340-264-0100.

(15) Jackson County -- OAR 340-264-0170.

(16) Jefferson County -- OAR 340-264-0100.

(17) Josephine County -- OAR 340-264-0170.

(18) Klamath County -- OAR 340-264-0175.

(19) Lake County -- OAR 340-264-0100.

(20) Lane County -- OAR 340-264-0160.

(21) Lincoln County -- OAR 340-264-0100.

(22) Linn County -- OAR 340-264-0110.

(23) Malheur County -- OAR 340-264-0100.

(24) Marion County -- OAR 340-264-0110.

(25) Morrow County -- OAR 340-264-0100.

(26) Multnomah County -- OAR 340-264-0130.

(27) Polk County -- OAR 340-264-0110.

(28) Sherman County -- OAR 340-264-0100.

(29) Tillamook County -- OAR 340-264-0100.

(30) Umatilla County -- OAR 340-264-0100.

(31) Union County -- OAR 340-264-0100.

(32) Wallowa County -- OAR 340-264-0100.

(33) Wasco County -- OAR 340-264-0100.

(34) Washington County -- OAR 340-264-0140.

(35) Wheeler County-- OAR 340-264-0100.

(36) Yamhill County -- OAR 340-264-0110.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented ORS 468A.025
Hist.: DEQ 123, f. & ef. 10-20-76; DEQ 23-1979, f. & ef. 7-5-79; DEQ 1-1981(Temp), f. & ef. 1-9-81; DEQ 7-1981(Temp), f. & ef. 2-17-81; DEQ 8-1981(Temp), f. & ef. 3-13-81; DEQ 27-1981, f. & ef. 9-8-81; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0045; DEQ 21-2000, f. & cert. ef. 12-15-00

Open Burning Requirements

340-264-0100

Baker, Clatsop, Crook, Curry, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Lincoln, Malheur, Morrow, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco and Wheeler Counties

Open burning requirements for the counties of Baker, Clatsop, Crook, Curry, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Lincoln, Malheur, Morrow, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco and Wheeler:

(1) Industrial open burning is prohibited, except as provided in OAR 340-264-0180.

(2) Agricultural open burning is allowed subject to OAR 340-264-0050(5) and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(3) Commercial open burning:

(a) Commercial open burning is prohibited within Lincoln County except as provided in OAR 340-264-0180.

(b) Commercial open burning is allowed outside of open burning control areas subject to OAR 340-264-0050, 340-264-0060 and 340-264-0070, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal. Commercial open burning, unless authorized pursuant to 340-264-0180, is prohibited within three miles of the corporate city limits of the following open burning control areas. In addition, commercial open burning is prohibited in any area meeting the test in 340-264-0078(1):

(c) In Baker County, the City of Baker City;

(d) In Clatsop County, the Cities of Astoria, Seaside and Warrenton;

(e) In Crook County, the City of Prineville;

(f) In Curry County, the City of Brookings;

(g) In Deschutes County, the Cities of Bend and Redmond;

(h) In Hood River County, the City of Hood River;

(i) In Jefferson County, the City of Madras;

(j) In Malheur County, the City of Ontario;

(k) In Tillamook County, the City of Tillamook;

(l) In Umatilla County, the Cities of Hermiston, Milton-Freewater and Pendleton;

(m) In Union County, the City of La Grande;

(n) In Wasco County, the City of The Dalles.

(4) Construction and Demolition open burning outside of an open burning control area is allowed subject to the requirements and prohibitions of local jurisdictions, the State Fire Marshal, OAR 340-264-0050, 340-264-0060, and 340-264-0070. Construction and Demolition open burning, unless authorized pursuant to OAR 340-264-0180, is prohibited within three miles of the corporate city limits of the following open burning control areas. In addition, construction and demolition burning is prohibited in any area meeting the standard in OAR 340-264-0078(1):

(a) In Baker County, the City of Baker City;

(b) In Clatsop County, the Cities of Astoria, Seaside and Warrenton;

(c) In Crook County, the City of Prineville;

(d) In Curry County, the City of Brookings;

(e) In Deschutes County, the Cities of Bend and Redmond;

(f) In Hood River County, the City of Hood River;

(g) In Jefferson County, the City of Madras;

(h) In Lincoln County, the Cities of Lincoln City and Newport;

(i) In Malheur County, the City of Ontario;

(j) In Tillamook County, the City of Tillamook;

(k) In Umatilla County, the Cities of Hermiston, Milton-Freewater and Pendleton;

(l) In Union County, the City of La Grande;

(m) In Wasco County, the City of The Dalles.

(5) Domestic open burning is allowed subject to the requirements and prohibitions of local jurisdictions, the State Fire Marshal, and OAR 340-264-0050, 340-264-0060 and 340-264-0070.

(6) Slash burning on forest land within open burning control areas not regulated by the Department of Forestry under the Smoke Management Plan is prohibited, except as provided in OAR 340-264-0180.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025
Hist.: DEQ 27-1981, f. & ef. 9-8-81; DEQ 6-1992, f. & cert. ef. 3-11-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0055; DEQ 21-2000, f. & cert. ef. 12-15-00

340-264-0175

Klamath County

Open burning requirements for Klamath County:

(1) Open burning control areas:

(a) The Klamath Basin open burning control area as generally described in OAR 340-264-0078(6) and depicted in **Figure 6** is located in Klamath County;

(2) Industrial open burning is prohibited unless authorized pursuant to OAR 340-264-0180.

(3) Agricultural open burning is allowed subject to OAR 340-264-0050(5) and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(4) Commercial open burning is prohibited within the Klamath Basin open burning control areas and within three miles of the corporate city limits of other areas that meet the standard in OAR 340-264-0078(1), unless authorized pursuant to 340-264-0180. Commercial open burning is allowed in all other areas of this county subject to 340-264-0050, 340-264-0060 and 340-264-0070 and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(5) Construction and Demolition open burning is prohibited within the Klamath Basin open burning control areas and within three miles of the corporate city limits of other areas that meet the standard within OAR 340-264-0078(1), unless authorized pursuant to 340-264-0180. Construction and Demolition open burning is allowed in other areas of these counties subject to 340-264-0050, 340-264-0060 and 340-264-0070, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(6) Domestic open burning is allowed subject to OAR 340-264-0050, 340-264-0060, 340-264-0070 and section (7) of this rule, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(7) Slash burning on forest land within open burning control areas not regulated by the Department of Forestry under the Smoke Management Program is prohibited, except as provided in OAR 340-264-0180.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[ED. NOTE: The figures referenced in this rule are not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 200

GENERAL AIR POLLUTION PROCEDURES AND DEFINITIONS

General

340-200-0040

State of Oregon Clean Air Act Implementation Plan

(1) This implementation plan, consisting of Volumes 2 and 3 of the State of Oregon Air Quality Control Program, contains control strategies, rules and standards prepared by the Department of Environmental Quality and is adopted as the state implementation plan (SIP) of the State of Oregon pursuant to the federal Clean Air Act, 42 U.S.C.A 7401 to 7671q.

(2) Except as provided in section (3), revisions to the SIP will be made pursuant to the Commission's rulemaking procedures in division 11 of this chapter and any other requirements contained in the SIP and will be submitted to the United States Environmental Protection Agency for approval. The State Implementation Plan was last modified by the Commission on ~~February 16, 2012~~ December 6, 2012.

(3) Notwithstanding any other requirement contained in the SIP, the Department may:

(a) Submit to the Environmental Protection Agency any permit condition implementing a rule that is part of the federally-approved SIP as a source-specific SIP revision after the Department has complied with the public hearings provisions of 40 CFR 51.102 (July 1, 2002); and

(b) Approve the standards submitted by a regional authority if the regional authority adopts verbatim any standard that the Commission has adopted, and submit the standards to EPA for approval as a SIP revision.

NOTE: Revisions to the State of Oregon Clean Air Act Implementation Plan become federally enforceable upon approval by the United States Environmental Protection Agency. If any provision of the federally approved Implementation Plan conflicts with any provision adopted by the Commission, the Department shall enforce the more stringent provision.

Stat. Auth.: ORS 468.020, 468A.035 & 468A.070
Stats. Implemented: ORS 468A.035
Hist.: DEQ 35, f. 2-3-72, ef. 2-15-72; DEQ 54, f. 6-21-73, ef. 7-1-73; DEQ 19-1979, f. & ef. 6-25-79; DEQ 21-1979, f. & ef. 7-2-79; DEQ 22-1980, f. & ef. 9-26-80; DEQ 11-1981, f. & ef. 3-26-81; DEQ 14-1982, f. & ef. 7-21-82; DEQ 21-1982, f. & ef. 10-27-82; DEQ 1-1983, f. & ef. 1-21-83; DEQ 6-1983, f. & ef. 4-18-83; DEQ 18-1984, f. & ef. 10-16-84; DEQ 25-1984, f. & ef. 11-27-84; DEQ 3-1985, f. & ef. 2-1-85; DEQ 12-1985, f. & ef. 9-30-85; DEQ 5-1986, f. & ef. 2-21-86; DEQ 10-1986, f. & ef. 5-9-86; DEQ 20-1986, f. & ef. 11-7-86; DEQ 21-1986, f. & ef. 11-7-86; DEQ 4-1987, f. & ef. 3-2-87; DEQ 5-1987, f. & ef. 3-2-87; DEQ 8-1987, f. & ef. 4-23-87; DEQ 21-1987, f. & ef. 12-16-87; DEQ 31-1988, f. 12-20-88, cert. ef. 12-23-88; DEQ 2-1991, f. & cert. ef. 2-14-91; DEQ 19-1991, f. & cert. ef. 11-13-91; DEQ 20-1991, f. & cert. ef. 11-13-91; DEQ 21-1991, f. & cert. ef. 11-13-91; DEQ 22-1991, f. & cert. ef. 11-13-91; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 24-1991, f. & cert. ef. 11-13-91; DEQ 25-1991, f. & cert. ef. 11-13-91; DEQ 1-1992, f. & cert. ef. 2-4-92; DEQ 3-1992, f. & cert. ef. 2-4-92; DEQ 7-1992, f. & cert. ef. 3-30-92; DEQ 19-1992, f. & cert. ef. 8-11-92; DEQ 20-1992, f. & cert. ef. 8-11-92; DEQ 25-1992, f. 10-30-92, cert. ef. 11-1-92; DEQ 26-1992, f. & cert. ef. 11-2-92; DEQ 27-1992, f. & cert. ef. 11-12-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 8-1993, f. & cert. ef. 5-11-93; DEQ 12-1993, f. & cert. ef. 9-24-93; DEQ 15-1993, f. & cert. ef. 11-4-93; DEQ 16-1993, f. & cert. ef. 11-4-93; DEQ 17-1993, f. & cert. ef. 11-4-93; DEQ 19-1993, f. & cert. ef. 11-4-93; DEQ 1-1994, f. & cert. ef. 1-3-94; DEQ 5-1994, f. & cert. ef. 3-21-94; DEQ 14-1994, f. & cert. ef. 5-31-94; DEQ 15-1994, f. 6-8-94, cert. ef. 7-1-94; DEQ 25-1994, f. & cert. ef. 11-2-94; DEQ 9-1995, f. & cert. ef. 5-1-95; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 14-1995, f. & cert. ef. 5-25-95; DEQ 17-1995, f. & cert. ef. 7-12-95; DEQ 19-1995, f. & cert. ef. 9-1-95; DEQ 20-1995 (Temp), f. & cert. ef. 9-14-95; DEQ 8-1996(Temp), f. & cert. ef. 6-3-96; DEQ 15-1996, f. & cert. ef. 8-14-96; DEQ 19-1996, f. & cert. ef. 9-24-96; DEQ 22-1996, f. & cert. ef. 10-22-96; DEQ 23-1996, f. & cert. ef. 11-4-96; DEQ 24-1996, f. & cert. ef. 11-26-96; DEQ 10-1998, f. & cert. ef. 6-22-98; DEQ 15-1998, f. & cert. ef. 9-23-98; DEQ 16-1998, f. & cert. ef. 9-23-98; DEQ 17-1998, f. & cert. ef. 9-23-98; DEQ 20-1998, f. & cert. ef. 10-12-98; DEQ 21-1998, f. & cert. ef. 10-12-98; DEQ 1-1999, f. & cert. ef. 1-25-99; DEQ 5-1999, f. & cert. ef. 3-25-99;

DEQ 6-1999, f. & cert. ef. 5-21-99; DEQ 10-1999, f. & cert. ef. 7-1-99; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-020-0047; DEQ 15-1999, f. & cert. ef. 10-22-99; DEQ 2-2000, f. 2-17-00, cert. ef. 6-1-01; DEQ 6-2000, f. & cert. ef. 5-22-00; DEQ 8-2000, f. & cert. ef. 6-6-00; DEQ 13-2000, f. & cert. ef. 7-28-00; DEQ 16-2000, f. & cert. ef. 10-25-00; DEQ 17-2000, f. & cert. ef. 10-25-00; DEQ 20-2000 f. & cert. ef. 12-15-00; DEQ 21-2000, f. & cert. ef. 12-15-00; DEQ 2-2001, f. & cert. ef. 2-5-01; DEQ 4-2001, f. & cert. ef. 3-27-01; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01; DEQ 15-2001, f. & cert. ef. 12-26-01; DEQ 16-2001, f. & cert. ef. 12-26-01; DEQ 17-2001, f. & cert. ef. 12-28-01; DEQ 4-2002, f. & cert. ef. 3-14-02; DEQ 5-2002, f. & cert. ef. 5-3-02; DEQ 11-2002, f. & cert. ef. 10-8-02; DEQ 5-2003, f. & cert. ef. 2-6-03; DEQ 14-2003, f. & cert. ef. 10-24-03; DEQ 19-2003, f. & cert. ef. 12-12-03; DEQ 1-2004, f. & cert. ef. 4-14-04; DEQ 10-2004, f. & cert. ef. 12-15-04; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 2-2005, f. & cert. ef. 2-10-05; DEQ 4-2005, f. 5-13-05, cert. ef. 6-1-05; DEQ 7-2005, f. & cert. ef. 7-12-05; DEQ 9-2005, f. & cert. ef. 9-9-05; DEQ 2-2006, f. & cert. ef. 3-14-06; DEQ 4-2006, f. 3-29-06, cert. ef. 3-31-06; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 4-2007, f. & cert. ef. 6-28-07; DEQ 8-2007, f. & cert. ef. 11-8-07; DEQ 5-2008, f. & cert. ef. 3-20-08; DEQ 11-2008, f. & cert. ef. 8-29-08; DEQ 12-2008, f. & cert. ef. 9-17-08; DEQ 14-2008, f. & cert. ef. 11-10-08; DEQ 15-2008, f. & cert. ef 12-31-08; DEQ 3-2009, f. & cert. ef. 6-30-09; DEQ 8-2009, f. & cert. ef. 12-16-09; DEQ 2-2010, f. & cert. ef. 3-5-10; DEQ 5-2010, f. & cert. ef. 5-21-10; DEQ 14-2010, f. & cert. ef. 12-10-10; DEQ 1-2011, f. & cert. ef. 2-24-11; DEQ 2-2011, f. 3-10-11, cert. ef. 3-15-11; DEQ 5-2011, f. 4-29-11, cert. ef. 5-1-11; DEQ 18-2011, f. & cert. ef. 12-21-11; DEQ 1-2012, f. & cert. ef. 5-17-12

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 204

DESIGNATION OF AIR QUALITY AREAS

340-204-0010

Definitions

The definitions in OAR 340-200-0020 and this rule apply to this division. If the same term is defined in this rule and 340-200-0020, the definition in this rule applies to this division. Definitions of boundaries in this rule also apply to OAR 340 division 200 through 268 and throughout the State of Oregon Clean Air Act Implementation Plan adopted under 340-200-0040.

(1) “AQCR” means Air Quality Control Region.

(2) “AQMA” means Air Quality Maintenance Area.

(3) “CO” means Carbon Monoxide.

(4) “CBD” means Central Business District.

(5) “Criteria Pollutant” means any of the six pollutants set out by the Clean Air Act (sulfur oxides, particulate matter, ozone, carbon monoxide, nitrogen dioxide, and lead) for which the EPA has promulgated standards in 40 CFR 50.4 through 50.12 (July, 1993).

(6) “Eugene-Springfield UGB” means the area within the bounds beginning at the Willamette River at a point due east from the intersection of East Beacon Road and River Loop No.1; thence southerly along the Willamette River to the intersection with Belt Line Road; thence easterly along Belt Line Road approximately one-half mile to the intersection with Delta Highway; thence northwesterly and then northerly along Delta Highway and on a line north from the Delta Highway to the intersection with the McKenzie River; thence generally southerly and easterly along the McKenzie River approximately eleven miles to the intersection with Marcola Road; thence southwesterly along Marcola Road to the intersection with 42nd Street; thence southerly along 42nd Street to the intersection with the northern branch of US Highway 126; thence easterly along US Highway 126 to the intersection with 52nd Street; thence north along 52nd Street to the intersection with High Banks Road; thence easterly along High Banks Road to the intersection with 58th Street; thence south along 58th Street to the intersection with Thurston Road; thence easterly along Thurston Road to the intersection with the western boundary of Section 36, T17S, R2W; thence south to the southwest corner of Section 36, T17S, R2W; thence west to the Springfield City Limits; thence following the Springfield City Limits southwesterly to the intersection with the western boundary of Section 2, T18S, R2W; thence on a line southwest to the Private Logging Road approximately one-half mile away; thence southeasterly along the Private Logging Road to the intersection with Wallace Creek; thence southwesterly along Wallace Creek to the confluence with the Middle Fork of the Willamette River; thence generally northwesterly along the Middle Fork of the Willamette River approximately seven and one-half miles to the intersection with the northern boundary of Section 11, T18S, R3W; thence west to the northwest corner of Section 10, T18S, R3W; thence south to the intersection with 30th Avenue; thence westerly along 30th Avenue to the intersection with the Eugene City Limits; thence following the Eugene City Limits first southerly then westerly then northerly and finally westerly to the intersection with the northern boundary of Section 5, T18S, R4W; thence west to the intersection with Greenhill Road; thence north along Greenhill Road to the intersection with Barger Drive; thence east along Barger Drive to the intersection with the Eugene City Limits (Ohio Street); thence following the Eugene City Limits first north then east then north then east then south then east to the intersection with Jansen Drive; thence east along Jansen Drive to the intersection with Belt Line Road; thence northeasterly along Belt Line Road to the intersection with Highway 99; thence northwesterly along Highway 99 to the intersection with Clear Lake Road; thence west along Clear Lake Road to the intersection with the western boundary of Section 9, T17S, R4W; thence north to the intersection with Airport Road; thence east along Airport Road to the intersection with Highway 99; thence northwesterly along Highway 99 to the intersection East Enid Road; thence east

along East Enid Road to the intersection with Prairie Road; thence southerly along Prairie Road to the intersection with Irvington Road; thence east along Irvington Road to the intersection with the Southern Pacific Railroad Line; thence southeasterly along the Southern Pacific Railroad Line to the intersection with Irving Road; thence east along Irving Road to the intersection with Kalmia Road; thence northerly along Kalmia Road to the intersection with Hyacinth Road; thence northerly along Hyancinth Road to the intersection with Irvington Road; thence east along Irvington Road to the intersection with Spring Creek; thence northerly along Spring Creek to the intersection with River Road; thence northerly along River Road to the intersection with East Beacon Drive; thence following East Beacon Drive first east then south then east to the intersection with River Loop No.1; thence on a line due east to the Willamette River and the point of beginning.

(7) “Grants Pass CBD” means the area within the City of Grants Pass enclosed by “B” Street on the north, 8th Street to the east, “M” Street on the south, and 5th Street to the west.

(8) Grants Pass Control Area means the area of the state beginning at the northeast corner of Section 35, T35S, R5W; thence south to the southeast corner of Section 11, T37S, R5W; thence west to the southwest corner of Section 9, T37S, R6W; thence north to the northwest corner of Section 33, T35S, R6W; thence east to the point of beginning.

(9) “Grants Pass UGB” as shown on the Plan and Zoning maps for the City of Grants Pass as of Feb. 1, 1988 is the area within the bounds beginning at the NW corner of Sec. 7, T36S, R5W; thence south to the SW corner of Sec. 7; thence west along the southern boundary of Sec. 12, T36S, R5W approx. 2000 feet; thence south approx. 100 feet to the northern right of way of the Southern Pacific Railroad Line (SPRR Line); thence southeasterly along said right of way approx. 800 feet; thence south approx. 400 feet; thence west approx. 1100 feet; thence south approx. 700 feet to the intersection with the Hillside Canal; thence west approx. 100 feet; thence south approx. 550 feet to the intersection with Upper River Road; thence southeasterly along Upper River Road and continuing east along Old Upper River Road approx. 700 feet; thence south approx. 1550 feet; thence west approx. 350 feet; thence south approx. 250 feet; thence west approx. 1000 feet; thence south approx. 600 feet to the north end of Roguela Lane; thence east approx. 400 feet; thence south approx. 1400 feet to the intersection with Lower River Road; thence west along Lower River Road approx. 1400 feet; thence south approx. 1350 feet; thence west approx. 25 feet; thence south approx. 1200 feet to the south bank of the Rogue River; thence northwesterly along said bank approx. 2800 feet; thence on a line southwesterly and parallel to Parkhill Place approx. 600 feet; thence northwesterly at a 90 degree angle approximately 300 feet to the intersection with Parkhill Place; thence southwesterly along Parkhill Place approx. 250 feet; thence on a line southeasterly forming a 90 degree angle approximately 300 feet to a point even with Leonard Road; thence west approx. 1500 feet along Leonard Road; thence north approx. 200 feet; thence west to the west side of Schroeder Lane; thence north approx. 150 feet; thence west approx. 200 feet; thence south to the intersection with Leonard Road; thence west along Leonard Road approx. 450 feet; thence north approx. 300 feet; thence east approx. 150 feet; thence north approx. 400 feet; thence west approx. 500 feet; thence south approx. 300 feet; thence west to the intersection with Coutant Lane; thence south along Coutant Lane to the intersection with Leonard Road; thence west along Leonard Road to the intersection with Buena Vista Lane; thence north along the west side of Buena Vista Lane approx. 200 feet; thence west approx. 150 feet; thence north approx. 150 feet; thence west approx. 200 feet; thence north approx. 400 feet; thence west approx. 600 feet to the intersection with the western boundary of Sec. 23, T36S, R6W; thence south to the intersection with Leonard Road; thence west along Leonard Road approx. 300 feet; thence north approx. 600 feet to the intersection with Darneille Lane; thence northwesterly along Darneille Lane approx. 200 feet; thence west approx. 300 feet; thence south approx. 600 feet to the intersection with Leonard Road; thence west along Leonard Road approx. 700 feet; thence south approx. 1350 feet; thence east approx. 1400 feet to the intersection with Darneille Lane; thence south along Darneille Lane approx. 600 feet; thence west approx. 300 feet; thence south to the intersection with Redwood Avenue; thence east along Redwood Avenue to the intersection with Hubbard Lane and the western boundary of Sec. 23, T36S, R6W; thence south along Hubbard Lane approx. 1850 feet; thence west approx. 1350 feet ; thence south to the south side of U.S. Highway 199; thence westerly along U.S. 199 approx. 1600 feet to the intersection with the north-south midpoint of Sec. 27, T36S, R6W; thence south approx. 2200 feet; thence east approx. 1400 feet; thence north approx. 1000 feet; thence east approx. 300 feet; thence north approx. 250 feet to the intersection with the Highline Canal; thence northerly along the Highline Canal approx. 900 feet; thence east to the intersection with Hubbard Lane; thence north along Hubbard Lane approximately 600 feet; thence east approx. 200 feet; thence north approx. 400 feet to a point even with Canal Avenue; thence east approx. 550 feet; thence north to the south side of U.S. 199; thence easterly along the southern edge of U.S. 199 to the intersection with Willow Lane; thence south along Willow Lane to the intersection with Demaray Drive; thence easterly along Demaray Drive and continuing along the southern edge of U.S. 199 to the intersection with Dowell Road; thence south along Dowell Road approx. 550 feet; thence easterly approx. 750 feet; thence north to the intersection with the South Canal; thence easterly along the South Canal to the intersection with Schutzwohl Lane; thence south approx. 1300 feet to a point even with West Harbeck Road; thence east approx. 2000 feet to the intersection with Allen Creek; thence southerly along Allen Creek approx. 1400 feet to a

point even with Denton Trail to the west; thence west to the intersection with Highline Canal; thence southerly along Highline Canal to the intersection with the southern boundary of Sec. 25, T36S, R6W; thence east to the intersection with Allen Creek; thence southerly along Allen Creek to the intersection with the western boundary of Sec. 31, T36S, R5W; thence south to the SW corner of Sec. 31; thence east to the intersection with Williams Highway; thence southeasterly along Williams Highway approx. 1300 feet; thence east approx. 200 feet; thence north approx. 400 feet; thence east approx. 700 feet; thence north to the intersection with Espey Road; thence west along Espey Road approx. 150 feet; thence north approx. 600 feet; thence east approx. 300 feet; thence north approx. 2000 feet; thence west approx. 2100 feet; thence north approx. 1350 feet; thence east approx. 800 feet; thence north approx. 2800 feet to the east-west midline of Sec. 30, T36S, R5W; thence on a line due NE approx. 600 feet; thence north approx. 100 feet; thence east approx. 600 feet; thence north approx. 100 feet to the intersection with Highline Canal; thence easterly along Highline Canal approx. 1300 feet; thence south approx. 100 feet; thence east to the intersection with Harbeck Road; thence north along Harbeck Road to the intersection with Highline Canal; thence easterly along Highline Canal to a point approx. 250 feet beyond Skyway Road; thence south to the intersection with Skyway Road; thence east to the intersection with Highline Canal; thence southeasterly along Highline Canal approx. 1200 feet; thence on a line due SW to the intersection with Bluebell Lane; thence southerly along Bluebell Lane approx. 150 feet; thence east to the intersection with Sky Crest Drive; thence southerly along Sky Crest Drive to the intersection with Harper Loop; thence southeasterly along Harper Loop to the intersection with the east-west midline of Sec. 29, T36S, R5W; thence east approx. 400 feet; thence south approx. 1300 feet to a point even with Troll View Road to the east; thence east to the intersection with Hamilton Lane; thence north along Hamilton Lane to the intersection with the Highline Canal; thence northeasterly along the Highline Canal to the northern boundary of Sec. 28, T36S, R5W; thence east approx. 1350 feet to the transmission line; thence north to the intersection with Fruitdale Drive; thence southwesterly along Fruitdale Drive approx. 700 feet; thence north to the northern edge of U.S. 199; thence easterly along the northern edge of U.S. 199 approx. 50 feet; thence north to the north bank of the Rogue River; thence northeasterly along the north bank of the Rogue River approx. 2100 feet to a point even with Ament Road; thence north to Ament Road and following Ament Road to U.S. Interstate Highway 5 (U.S. I-5); thence continuing north to the 1200 foot contour line; thence following the 1200 foot contour line northwesterly approx. 7100 feet to the city limits and a point even with Savage Street to the west; thence north following the city limits approx. 400 feet; thence west to the intersection with Beacon Street; thence north along Beacon Street and the city limits approx. 250 feet; thence east along the city limits approx. 700 feet; thence north along the city limits approx. 2200 feet; thence southwesterly along the city limits approximately 800 feet to the intersection with the 1400 foot contour line; thence northerly and northwesterly along the 1400 foot contour line approx. 900 feet to the intersection with the northern boundary of Sec. 9, T36S, R5W; thence west along said boundary approx. 100 feet to the NW corner of Sec. 9; thence south along the western boundary of Sec. 9 approx. 700 feet; thence west approx. 1400 feet; thence north approx. 2400 feet; thence west approx. 1350 feet; thence north approx. 1100 feet to the city limits; thence following the city limits first west approx. 1550 feet, then south approx. 800 feet, then west approx. 200 feet, then south approx. 200 feet, then east approx. 200 feet, then south approx. 300 feet, and finally westerly approx. 1200 feet to the intersection with the western boundary of Sec. 5, T36S, R5W; thence south along said boundary to the northern side of Vine Avenue; thence northwesterly along the northern side of Vine Avenue approx. 3150 feet to the intersection with the west fork of Gilbert Creek; thence north to the intersection with the southern right of way of U.S. I-5; thence northwesterly along said right of way approx. 1600 feet; thence south to the intersection with Old Highland Avenue; thence northwesterly along Highland Avenue approx. 650 feet; thence west approx. 350 feet; thence south approx. 1400 feet; thence east approx. 700 feet; thence south approx. 1000 feet; thence on a line SW approx. 800 feet; thence south approx. 1400 feet to the intersection with the northern boundary of Sec. 7, T36S, R5W; thence west to the NW corner of Sec. 7, the point of beginning.

(10) Klamath Falls Control Area means the area of the state beginning at the northeast corner of Section 8, T38S, R10E, thence south to the southeast corner of Section 5, T40S, R10E; thence west to the southwest corner of Section 3, T40S, R8E; thence north to the northwest corner of Section 10, T38S, R8E; thence east to the point of beginning.

(11) "Klamath Falls Nonattainment Area" means the area of the state beginning at the northwest corner of Section 31, T37S, R9E; thence east approximately two miles to the northeast corner of Section 32; thence south approximately four miles to the southeast corner of Section 17, T38S, R9E; thence east approximately one mile to the southwest corner of Section 15,; thence north approximately one mile to the northwest corner of Section 15; thence east approximately 2 miles to the northeast corner of Section 14; thence south approximately one mile to the northwest corner of section 24; thence east approximately one mile to the northeast corner of Section 24; thence south approximately three miles to the southeast corner of Section 36; thence east approximately four miles to the northeast corner of Section 3, T39S, R10E; thence south approximately three miles to the southeast corner of Section 15; thence west approximately two miles to the southwest corner of Section16; thence south approximately two miles to the southeast corner of Section 29; thence west approximately five miles to the southwest corner of Section 27, T39S, R9E; thence north approximately one mile to the northeast corner of Section 27; thence west

approximately four miles to the southwest corner of Section 24, T39S R8E; thence north approximately two miles to the northeast corner of Section 13; thence west approximately one mile to the southwest corner of Section 11; thence north approximately four miles to the northwest corner of Section 26 T38S, R8E; thence west one mile to the southwest corner of Section 22; thence north approximately one mile to the northwest corner of Section 22; thence west approximately one mile to the southwest corner of Section 16; thence north approximately one mile to the northeast corner of Section 16; thence west approximately one mile to the southwest corner of Section 8; thence north approximately two miles to the northwest corner of Section 5; thence east to the northeast corner of Section 1; thence north approximately one mile to the point of beginning.

(12~~1~~) "Klamath Falls UGB" means the area within the bounds beginning at the southeast corner of Section 36, Township 38 South, Range 9 East; thence northerly approximately 4500 feet; thence westerly approximately 1/4 mile; thence northerly approximately 3/4 mile into Section 25, T38S, R9E; thence westerly approximately 1/4 mile; thence northerly approximately 1/2 mile to the southern boundary of Section 24, T38S, R9E; thence westerly approximately 1/2 mile to the southeast corner of Section 23, T38S, R9E; thence northerly approximately 1/2 mile; thence westerly approximately 1/4 mile; thence northerly approximately 1/2 mile to the southern boundary of Section 14, T38S, R9E; thence generally northwesterly along the 5000 foot elevation contour line approximately 3/4 mile; thence westerly 1 mile; thence north to the intersection with the northern boundary of Section 15, T38S, R9E; thence west 1/4 mile along the northern boundary of Section 15, T38S, R9E; thence generally southeasterly following the 4800 foot elevation contour line around the old Oregon Institute of Technology Campus to meet with the westerly line of Old Fort Road in Section 22, T38S, R9E; thence southwesterly along the westerly line of Old Fort Road approximately 1 and 1/4 miles to Section 27, T38S, R9E; thence west approximately 1/4 mile; thence southwesterly approximately 1/2 mile to the intersection with Section 27, T38S, R9E; thence westerly approximately 1/2 mile to intersect with the Klamath Falls City Limits at the northerly line of Loma Linda Drive in Section 28, T38S, R9E; thence northwesterly along Loma Linda Drive approximately 1/4 mile; thence southwesterly approximately 1/8 mile to the Klamath Falls City Limits; thence northerly along the Klamath Falls City Limits approximately 1 mile into Section 21, T38S, R9E; thence westerly approximately 1/4 mile; thence northerly approximately 1 mile into Section 17, T38S, R9E; thence westerly approximately 3/4 mile into Section 17, T38S, R9E; thence northerly approximately 1/4 mile; thence westerly approximately 1 mile to the west boundary of Highway 97 in Section 18, T38S, R9E; thence southeasterly along the western boundary of Highway 97 approximately 1/2 mile; thence southwesterly away from Highway 97; thence southeasterly to the intersection with Klamath Falls City Limits at Front Street; thence westerly approximately 1/4 mile to the western boundary of Section 19, T38S, R9E; thence southerly approximately 1 and 1/4 miles along the western boundary of Section 19, T38S, R9E and the Klamath Falls City Limits to the south shore line of Klamath Lake; thence northwesterly along the south shore line of Klamath Lake approximately 1 and 1/4 miles across Section 25, T38S, R9E and Section 26, T38S, R9E; thence westerly approximately 1/2 mile along Section 26, T38S, R9E; thence southerly approximately 1/2 mile to Section 27, T38S, R9E to the intersection with eastern boundary of Orindale Draw, thence southerly along the eastern boundary of Orindale Draw approximately 1 and 1/4 miles into Section 35, T38S, R9E; thence southerly approximately 1/2 mile into Section 2, T39S, R8E; thence easterly approximately 1/4 mile; thence northerly approximately 1/4 mile to the southeast corner of Section 35, T38S, R8E and the Klamath Falls City Limits; thence easterly approximately 1/2 mile to the northern boundary of Section 1, T38S, R8E; thence southeasterly approximately 1/2 mile to Orindale Road; thence north 500 feet along the west side of an easement; thence easterly approximately 1 and 1/4 miles through Section 1, T38S, R8E to the western boundary of Section 6, T39S, R9E; thence southerly approximately 3/4 mile to the southwest corner of Section 6, T39S, R9E; thence easterly approximately 1/8 mile to the western boundary of Highway 97; thence southwesterly along the Highway 97 right-of-way approximately 1/4 mile; thence westerly approximately 1/2 mile to Agate Street in Section 7, T39S, R8E; thence northerly approximately 1/4 mile; thence westerly approximately 3/4 mile to Orindale Road in Section 12, T39S, R8E; thence northerly approximately 1/4 mile into Section 1, T39S, R8E; thence westerly approximately 3/4 mile to the Section 2, T39S, R8E boundary line; thence southerly approximately 3/4 mile along the Section 2, T39S, R8E boundary line to the northwest corner of Section 12, T39S, R8E; thence westerly approximately 1/8 mile into Section 11, T39S, R8E; thence southerly approximately 1/8 mile; thence northeasterly approximately 3/4 mile to the southern boundary of Section 12, T39S, R8E at Balsam Drive; thence southerly approximately 1/4 mile into Section 12, T39S, R8E; thence easterly approximately 1/4 mile to Orindale Road; thence southeasterly approximately 500 feet to Highway 66; thence southwesterly approximately 1/2 mile along the boundary of Highway 66 to Holiday Road; thence southerly approximately 1/2 mile into Section 13, T39S, R8E; thence northeasterly approximately 1/4 mile to the eastern boundary of Section 13, T39S, R8E; thence northerly approximately 1/4 mile along the eastern boundary of Section 13, T39S, R8E; thence westerly approximately 1/4 mile to Weyerhaeuser Road; thence northerly approximately 1/8 mile; thence easterly approximately 1/8 mile; thence northerly approximately 1/8 mile; thence westerly approximately 1/8 mile to Farrier Avenue; thence northerly approximately 1/4 mile; thence easterly approximately 1/4 mile to the eastern boundary of Section 13, T39S, R8E; thence northerly approximately 1/8 mile along the eastern boundary of Section 13, T39S, R8E; thence easterly approximately 1/4 mile along the northern section line of Section 18, T39S, R8E; thence southerly approximately 1/4 mile; thence easterly approximately 1/2 mile to the boundary of Highway 97; thence southerly approximately 1/3 mile to the Burlington Northern Right-of-Way; thence northeasterly approximately 1 and 1/3 miles along the high water line of the Klamath River to the Southside

Bypass in Section 8, T39S, R9E; thence southeasterly along the Southside Bypass to the Southern Pacific Right-of-Way in Section 9, T39S, R9E; thence southerly approximately 1/2 mile along the Southern Pacific Right-of-Way; thence southwesterly approximately 1/4 mile along the Midland Highway; thence southeasterly approximately 1/4 mile to the old railroad spur; thence easterly 1/4 mile along the old railroad spur; thence southerly approximately 1/4 mile in Section 16, T39S, R9E; thence westerly approximately 1/3 mile; thence southerly approximately 1/4 mile; thence easterly approximately 1/16 mile in Section 21, T39S, R9E; thence southerly approximately 1/8 mile to the Lost River Diversion Channel; thence southeasterly approximately 1/4 mile along the northern boundary of the Lost River Diversion Channel; thence easterly approximately 3/4 mile along Joe Wright Road into Section 22, T39S, R9E; thence southeasterly approximately 1/8 mile on the eastern boundary of the Southern Pacific Right-of-Way; thence southeasterly approximately 1 mile along the western boundary of the Southern Pacific Right-of-Way across Section 22, T39S, R9E and Section 27, T39S, R9E to a point 440 yards south of the northern boundary of Section 27, T39S, R9E; thence easterly to Kingsley Field; thence southeasterly approximately 3/4 mile to the southern boundary of Section 26, T39S, R9E; thence east approximately 1/2 mile along the southern boundary of Section 26, T39S, R9E to a pond; thence north-northwesterly for 1/2 mile following the Klamath Falls City Limits; thence north 840 feet; thence east 1155 feet to Homedale Road; thence north along Homedale Road to a point 1/4 mile north of the southern boundary of Section 23, T39S, R9E; thence west 1/4 mile; thence north 1 mile to the Southside Bypass in Section 14, T39S, R9E; thence east 1/2 mile along the Southside Bypass to the eastern boundary of Section 14, T39S, R9E; thence north 1/2 mile; thence east 900 feet into Section 13, T39S, R9E; thence north 1320 feet along the USBR 1-C 1-A to the southern boundary of Section 12, T39S, R9E; thence north 500 feet to the USBR A Canal; thence southeasterly 700 feet along the southern border of the USBR A Canal back into Section 13, T39S, R9E; thence southeast 1600 feet to the northwest parcel corner of an easement for the Enterprise Irrigation District; thence east-northeast 2200 feet to the eastern boundary of Section 13, T39S, R9E; thence north to the southeast corner of Section 12, T39S, R9E; thence along the Enterprise Irrigation Canal approximately 1/2 mile to Booth Road; thence east 1/2 mile to Vale Road; thence north 1 mile to a point in Section 6, T39S, R10E that is approximately 1700 feet north of the southern boundary of Section 6, T39S, R10E; thence west approximately 500 feet; thence south approximately 850 feet; thence west approximately 200 feet; thence north approximately 900 feet; thence west approximately1600 feet to the western boundary of Section 6, T39S, R10E; thence north approximately 1/2 mile to the southeast corner of Section 36, T38S, R9E, the point of beginning.

(13~~2~~) “LaGrande UGB” means the area within the bounds beginning at the point where U.S. Interstate 84 (I-84) intersects Section 31, Township 2 South, Range 38 East; thence east along I-84 to the Union County Fairgrounds; thence north and then east on a line encompassing the Union County Fairgrounds to the intersection with Cedar Street; thence further east approximately 500 feet, encompassing two (2) residential properties; thence on a line south to the intersection with the northern bank of the Grande Ronde River; thence westerly along the northern bank of the Grande Ronde River to the intersection with the western edge of Mount Glenn Road and Riverside Park; thence north along the western edge of Mount Glenn Road and Riverside Park to the intersection with Fruitdale Road; thence east along Fruitdale Road and the northern boundary of Riverside Park to the eastern boundary of Riverside Park; thence south along the eastern boundary of Riverside Park to the north bank of the Grande Ronde River; thence on a line southeast to the intersection with the northern edge of I-84; thence easterly along the northern edge of I-84 to May Street; thence easterly along May Street to the intersection with State Highway 82; thence northeasterly along State Highway 82 to the a point approximately 1/4 mile from the eastern edge of Section 4, T3S, R38E; thence south to the intersection with Section 9, T3S, R38E, and the southern edge of Buchanan Avenue; thence west along the southern edge of Buchanan Avenue to the intersection with the northern edge of I-84; thence on a line south to the southern edge of I-84; thence southeasterly along the southern edge of I-84 approximately 2500 feet; thence on a line due west approximately 1400 feet; thence on a line due south to the intersection with the Union Pacific Railroad Line; thence southeasterly along the Union Pacific Railroad Line to the intersection with Gekeler Lane; thence west along Gekeler Lane to the intersection with U.S. Highway 30; thence southeast along U.S. Highway 30 to the intersection with the western boundary of Section 15, T3S, R38E; thence on a line west following existing property boundaries approximately 2900 feet; thence on a line north following existing property boundaries approximately 250 feet; thence on a line east following existing property boundaries approximately 650 feet; thence north on a line to the intersection with Gekeler Lane; thence west along Gekeler Lane to the intersection with 20th Avenue; thence south along 20th Avenue to the intersection with Foothill Road; thence southeasterly along Foothill Road approximately 2900 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line south following existing property boundaries approximately 1250 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line north following existing property boundaries approximately 450 feet to the intersection with the southernmost part of the La Grande City Limits; thence westerly and northwesterly along the southernmost part of the La Grande City Limits approximately 1100 feet to the intersection with the 3000 foot elevation contour line; thence westerly following the 3000 foot elevation contour line and existing property boundaries approximately 2200 feet; thence on a line north following existing property boundaries approximately 1900 feet; thence on a line west following existing property boundaries approximately 500 feet; thence on a line north to the La Grande City Limits; thence west along the La Grande City Limits and following existing property boundaries approximately 650 feet; thence on a line south following existing property boundaries

approximately 900 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line north to the intersection with the La Grande City Limits; thence west along the southern boundary of the La Grande City Limits to the intersection with the western boundary of the La Grande City Limits; thence north along the western boundary of the La Grande City Limits and following existing property lines approximately 500 feet; thence on a line west following existing property boundaries approximately 200 feet; thence on a line north following existing property boundaries approximately 700 feet; thence east to the first 3000 foot elevation contour line west of the La Grande City Limits; thence northerly following that 3000 foot elevation contour line to the intersection with Deal Canyon Road; thence easterly along Deal Canyon Road to the intersection with the western boundary of the La Grande City Limits; thence northerly along the western boundary of the La Grande City Limits to the intersection with U.S. Highway 30; thence northwesterly along U.S. Highway 30 and following existing property boundaries approximately 1400 feet; thence on a line west to the intersection with the western boundary of Section 6, T3S, R38E; thence north along the western boundaries of Section 6, T3S, R38E and Section 31, T2S, R38E to the point of beginning.

(14~~3~~) “Lakeview UGB” means the area beginning at the corner common to sections 21, 22, 27, and 28, T39S, R20E; thence north on the section line between section 21 and 22 to the section corner common to section 15, 16, 21, and 22; thence west along the section line between section 21 and 16 to the section corner common to sections 16, 17, 20, and 21; thence north along the section line between section 16 and 17 approximately 3550 feet to the east branch of Thomas Creek; thence northwesterly along the east branch of Thomas Creek to the center line of Highway 140; thence east along the center line of Highway 140 to the section corner common to sections 8, 9, 16, and 17, T39S, R20E; thence north along the section line between sections 8 and 9 to the section corner common to sections 4, 5, 8, and 9, T39S, R20E; thence north along the section line between section 4 and 5 to the section corner common to section 4 and 5, T39S, R20E and sections 32 and 33, T38S, R20E; thence east along the section line between sections 4 and 33 to the section corner common to sections 3 and 4, T39S, R20E and sections 33 and 34, T38S, R20E; thence south along the eastern boundary of section 4 approximately 4,1318.6 feet; thence S 89 degrees, 11 minutes W 288.28 feet to the east right of way line of the old Paisley/Lakeview Highway; thence S 21 degrees, 53 minutes E along the eastern right of way of the old Paisley/Lakeview Highway 288.4 feet; thence S 78 degrees, 45 minutes W 1375 feet; thence S 3 degrees, 6 minutes, and 30 seconds W 200 feet; thence S 77 degrees, 45 minutes W 136 feet to the east right of way line of U.S. Highway 395; thence southeasterly along the east right of way line of U.S. Highway 395 53.5 feet; thence N 77 degrees, 45 minutes E 195.6 feet; thence S 38 degrees, 45 minutes E 56.8 feet; thence S 51 degrees, 15 minutes W 186.1 feet to the east right of way of U.S. Highway 395; thence southeast along the eastern right of way line of U.S. Highway 395 2310 feet; thence N 76 degrees, 19 minutes 544.7 feet; thence S 13 degrees, 23 minutes, 21 seconds E 400 feet; thence N 63 degrees, 13 minutes E 243.6 feet to the western line of the old American Forest Products Logging Road; thence southeast along the old American Forest Products Logging Road to the western line of the northeast quadrant of the northwest quadrant of section 10, T39S, R20E; thence southeast to a point on the south line of the northeast quadrant of the northwest quadrant of Section 10, T39S, R20E (this point also bears N 89 degrees, 33 minutes E 230 feet from the center line of U.S. Highway 395); thence south on a line parallel to the east right of way line of U.S. Highway 395 to the south line of the northwest quadrant of section 10, T39S, R20E; thence south 491 feet to the east right of way of U.S. Highway 395; thence southeasterly following the east right of way of U.S. Highway 395 255 feet to the south line of the northeast quadrant of the northeast quadrant of the southwest quadrant of section 10, T39S, R20E; thence east along that south line to the center line of section 10, T39S, R20E; thence continuing east along the same south line to the eastern boundary of section 10, T39S, R20E; thence south along the eastern boundary of section 10 to the section corner common to sections 10, 11, 14, and 15, T39S, R20E; thence south along the section line between section 14 and 15 to the section corner common to sections 14, 15, 22, and 23, T39S, R20E; thence west along the section line between sections 15 and 22 to the northwest corner of the northeast quadrant of the northeast quadrant of section 22, T39S, R20E; thence south along the eastern line of the western half of the eastern half of section 22 to the southern boundary of section 22, T39S, R20E; thence west along the southern boundary of section 22 to the point of beginning.

(15~~4~~) “Maintenance Area” means any area that was formerly nonattainment for a criteria pollutant but has since met EPA promulgated standards and has had a maintenance plan to stay within the standards approved by the EPA pursuant to 40 CFR 51.110 (July, 1993).

(16~~5~~) “Medford-Ashland Air Quality Maintenance Area” (AQMA) means the area defined as beginning at a point approximately two and quarter miles northeast of the town of Eagle Point, Jackson County, Oregon at the northeast corner of Section 36, Township 35 South, Range 1 West (T35S, R1W); thence South along the Willamette Meridian to the southeast corner of Section 25, T37S, R1W; thence southeast along a line to the southeast corner of Section 9, T39S, R2E; thence south-southeast along line to the southeast corner of Section 22, T39S, R2E; thence South to the southeast corner of Section 27, T39S, R2E; thence southwest along a line to the southeast corner of Section 33, T39S, R2E; thence West to the southwest corner of Section 31, T39S, R2E; thence northwest along a line to the

northwest corner of Section 36, T39S, R1E; thence West to the southwest corner of Section 26, T39S, R1E; thence northwest along a line to the southeast corner of Section 7, T39S, R1E; thence West to the southwest corner of Section 12, T39S, R1W, T39S, R1W; thence northwest along a line to southwest corner of Section 20, T38S, R1W; thence West to the southwest corner of Section 24, T38S, R2W; thence northwest along a line to the southwest corner of Section 4, T38S, R2W; thence West to the southwest corner of Section 6, T38S, R2W; thence northwest along a line to the southwest corner of Section 31, T37S, R2W; thence North and East along the Rogue River to the north boundary of Section 32, T35S, R1W; thence East along a line to the point of beginning.

(17~~6~~) “Medford-Ashland CBD” means the area beginning at the intersection of Crater Lake Highway (Highway 62) south on Biddle Road to the intersection of Fourth Street, west on Fourth Street to the intersection with Riverside Avenue (Highway 99), south on Riverside Avenue to the intersection with Tenth Street, west on Tenth Street to the intersection with Oakdale Avenue, north on Oakdale Avenue to the intersection with Fourth Street, east on Fourth Street to the intersection with Central Avenue, north on Central Avenue to the intersection with Court Street, north on Court Street to the intersection with Crater Lake Highway (Highway 62) and east on Crater Lake Highway to the point of beginning, with extensions along McAndrews Road east from Biddle Road to Crater Lake Avenue, and along Jackson Street east from Biddle Road to Crater Lake Avenue.

NOTE: This definition also marks the area where indirect sources are required to have indirect source construction permits in the Medford area. See OAR 340-254-0040.

(18~~7~~) “Medford UGB” means the area beginning at the line separating Range 1 West and Range 2 West at a point approximately 1/4 mile south of the northwest corner of Section 31, T36S, R1W; thence west approximately 1/2 mile; thence south to the north bank of Bear Creek; thence west to the south bank of Bear Creek; thence south to the intersection with the Medford Corporate Boundary; thence following the Medford Corporate Boundary west and southwesterly to the intersection with Merriman Road; thence northwesterly along Merriman Road to the intersection with the eastern boundary of Section 10, T36S, R2W; thence south along said boundary line approximately 3/4 mile; thence west approximately 1/3 mile; thence south to the intersection with the Hopkins Canal; thence east along the Hopkins Canal approximately 200 feet; thence south to Rossanely Drive; thence east along Rossanley Drive approximately 200 feet; thence south approximately 1200 feet; thence west approximately 700 feet; thence south approximately 1400 feet; thence east approximately 1400 feet; thence north approximately 100 feet; thence east approximately 700 feet; thence south to Finley Lane; thence west to the end of Finley Lane; thence approximately 1200 feet; thence west approximately 1300 feet; thence north approximately 150 feet; thence west approximately 500 feet; thence south to Highway 238; thence west along Highway 238 approximately 250 feet; thence south approximately 1250 feet to a point even with the end of Renault Avenue to the east; thence east approximately 2200 feet; thence south approximately 1100 feet to a point even with Sunset Court to the east; thence east to and along Sunset Court to the first (nameless) road to the south; thence approximately 850 feet; thence west approximately 600 feet; thence south to Stewart Avenue; thence west along Stewart Avenue approximately 750 feet; thence south approximately 1100 feet; thence west approximately 100 feet; thence south approximately 800 feet; thence east approximately 800 feet; thence south approximately 1000 feet; thence west approximately 350 feet to a point even with the north-south connector street between Sunset Drive and South Stage Road; thence south to and along said connecting road and continuing along South Stage Road to Fairlane Road; thence south to the end of Fairlane Road and extending beyond it approximately 250 feet; thence east approximately 250 feet; thence south approximately 250 feet to the intersection with Judy Way; thence east on Judy Way to Griffin Creek Road; thence north on Griffin Creek Road to South Stage Road; thence east on South Stage Road to Orchard Home Drive; thence north on Orchard Home Drive approximately 800 feet; thence east to Columbus Avenue; thence south along Columbus Avenue to South Stage Road; thence east along South Stage Road to the first road to the north after Sunnyview Lane; thence north approximately 300 feet; thence east approximately 300 feet; thence north approximately 700 feet; thence east to King’s Highway; thence north along King’s Highway to Experiment Station Road; thence east along Experiment Station Road to Marsh Lane; thence east along Marsh Lane to the northern boundary of Section 6, T38S, R1W; thence east along said boundary approximately 1100 feet; thence north approximately 1200 feet; thence east approximately 1/3 mile; thence north approximately 400 feet; thence east approximately 1000 feet to a drainage ditch; thence following the drainage ditch southeasterly approximately 500 feet; thence east to the eastern boundary of Section 31, T37S, R1W; thence south along said boundary approximately 1900 feet; thence east to and along the loop off of Rogue Valley Boulevard, following that loop to the Southern Pacific Railroad Line (SPRR); thence following SPRR approximately 500 feet; thence south to South Stage Road; thence east along South Stage Road to SPRR; thence southeasterly along SPRR to the intersection with the west fork of Bear Creek; thence northeasterly along the west fork of Bear Creek to the intersection with U.S. Highway 99; thence southeasterly along U.S. Highway 99 approximately 250 feet; thence east approximately 1600 feet; thence south to East Glenwood Road; thence east along East Glenwood Road approximately 1250 feet; thence north approximately 1/2 mile; thence west approximately 250 feet; thence north approximately 1/2 mile to the Medford City Limits; thence east along the city limits to Phoenix Road; thence south along Phoenix Road to Coal Mine Road; thence east along Coal Mine Road approximately 9/10

mile to the western boundary of Section 35, T37S, R1W; thence north to the midpoint of the western boundary of Section 35, T37S, R1W; thence west approximately 800 feet; thence north approximately 1700 feet to the intersection with Barnett Road; thence easterly along Barnett Road to the southeast corner of Section 27, T37S, R1W; thence north along the eastern boundary line of said section approximately 1/2 mile to the intersection with the 1800 foot contour line; thence east to the intersection with Cherry Lane; thence following Cherry Lane southeasterly and then northerly to the intersection with Hillcrest Road; thence east along Hillcrest Road to the southeast corner of Section 23, T37S, R1W; thence north to the northeast corner of Section 23, T37S, R1W; thence west to the midpoint of the northern boundary of Section 22; T37S, R1W; thence north to the midpoint of Section 15, T37S, R1W; thence west to the midpoint of the western boundary of Section 15, T37S, R1W; thence south along said boundary approximately 600 feet; thence west approximately 1200 feet; thence north approximately 600 feet; thence west to Foothill Road; thence north along Foothill Road to a point approximately 500 feet north of Butte Road; thence west approximately 300 feet; thence south approximately 250 feet; thence west on a line parallel to and approximately 250 feet north of Butte Road to the eastern boundary of Section 8, T37S, R1W; thence north approximately 2200 feet; thence west approximately 1800 feet; thence north approximately 2000 feet; thence west approximately 500 feet; thence north to Coker Butte Road; thence east along Coker Butte Road approximately 550 feet; thence north approximately 1250 feet; thence west to U.S. Highway 62; thence north approximately 3000 feet; thence east approximately 400 feet to the 1340 foot contour line; thence north approximately 800 feet; thence west approximately 200 feet; thence north approximately 250 feet to East Vilas Road; thence east along East Vilas Road approximately 450 feet; thence north approximately 2000 feet to a point approximately 150 feet north of Swanson Creek; thence east approximately 600 feet; thence north approximately 850 feet; thence west approximately 750 feet; thence north approximately 650 feet; thence west approximately 2100 feet; thence on a line southeast approximately 600 feet; thence east approximately 450 feet; thence south approximately 1600 feet; thence west approximately 2000 feet to the continuance of the private logging road north of East Vilas Road; thence south along said logging road approximately 850 feet; thence west approximately 750 feet; thence south approximately 150 feet; thence west approximately 550 feet to Peace Lane; thence north along Peace Lane approximately 100 feet; thence west approximately 350 feet; thence north approximately 950 feet; thence west approximately 1000 feet to the western boundary of Section 31, T36S, R1W; thence north approximately 1300 feet along said boundary to the point of beginning.

(19~~8~~) “Nonattainment Area” means any area that has been designated as not meeting the standards established by the U.S. Environmental Protection Agency (EPA) pursuant to 40 CFR 51.52 (July, 1993) for any criteria pollutant.

(20~~19~~) “O3” means Ozone.

(21~~0~~) “Oakridge UGB” means the area enclosed by the following: Beginning at the northwest corner of Section 17, T21S, R3E and the city limits; thence south along the western boundary of Section 17, T21S, R3E along the city limits approximately 800 feet; thence southwesterly following the city limits approximately 750 feet; thence west along the city limits approximately 450 feet; thence northwesterly along the city limits approximately 450 feet; thence on a line south along the city limits approximately 250 feet; thence on a line east along the city limits approximately 100 feet; thence southwesterly along the city limits approximately 200 feet; thence on a line east along the city limits approximately 400 feet; thence on a line south along the city limits to the channel of the Willamette River Middle Fork; thence south-easterly up the Willamette River Middle Fork along the city limits approximately 7200 feet; thence exiting the Willamette River Middle Fork with the city limits in a northerly manner and forming a rough semicircle with a diameter of approximately one-half mile before rejoining the Willamette River Middle Fork; thence diverging from the city limits upon rejoining the Willamette River Middle Fork and moving southeasterly approximately 5600 feet up the Willamette River Middle Fork to a point on the river even with the point where Salmon Creek Road intersects with U.S. Highway 58; thence on a line east from the channel of the Willamette River Middle Fork across the intersection of Salmon Creek Road and U.S. Highway 58 to the intersection with the Southern Pacific Railroad Line; thence northerly along the Southern Pacific Railroad Line to the intersection with the northern boundary of Section 22, T21S, R3E; thence west along the northern boundary of Section 22, T21S, R3E to the intersection with Salmon Creek Road; thence on a line north to the intersection with the Southern Pacific Railroad Line; thence east along the Southern Pacific Railroad Line approximately 600 feet; thence on a line north to the intersection with High Prairie Road; thence on a line west approximately 400 feet; thence on a line north to the intersection with the northern boundary of Section 15, T21S, R3E; thence west along the northern boundary of Section 15, T21S, R3E to the intersection with the southeastern corner of Section 9, T21S, R3E; thence north along the eastern boundary of Section 9, T21S, R3E approximately 1300 feet; thence on a line west approximately 1100 feet; thence on a line south to the intersection with West Oak Road; thence northwesterly along West Oak Road approximately 2000 feet; thence on a line south to the intersection with the northern boundary line of the city limits; thence westerly and northwesterly approximately 8000 feet along the city limits to the point of beginning.

(22~~1~~) “Particulate Matter” has the meaning given that term in OAR 340-200-0020(82).

(23~~2~~) PM10: has the meaning given that term in OAR 340-200-0020(90).

(24~~3~~) “PM2.5” has the meaning given that term in OAR 340-200-0020(91).

(25~~4~~) “Portland AQMA” means the area within the bounds beginning at the point starting on the Oregon-Washington state line in the Columbia River at the confluence with the Willamette River, thence east up the Columbia River to the confluence with the Sandy River, thence southerly and easterly up the Sandy River to the point where the Sandy River intersects the Clackamas County-Multnomah County line, thence west along the Clackamas County-Multnomah County line to the point where the Clackamas County-Multnomah County line is intersected by H. Johnson Road (242nd), thence south along H. Johnson Road to the intersection with Kelso Road (Boring Highway), thence west along Kelso Road to the intersection with Deep Creek Road (232nd), thence south along Deep Creek Road to the point of intersection with Deep Creek, thence southeasterly along Deep Creek to the confluence with Clackamas River, thence easterly along the Clackamas River to the confluence with Clear Creek, thence southerly along Clear Creek to the point where Clear Creek intersects Springwater Road then to Forsythe Road, thence easterly along Forsythe Road to the intersection with Bradley Road, thence south along Bradley Road to the intersection with Redland Road, thence west along Redland Road to the intersection with Ferguson Road, thence south along Ferguson Road to the intersection with Thayler Road, thence west along Thayler Road to the intersection with Beaver Creek Road, thence southeast along Beaver Creek Road to the intersection with Henrici Road, thence west along Henrici Road to the intersection with State Highway 213 (Mollala Avenue), thence southeast along State Highway 213 to the point of intersection with Beaver Creek, thence westerly down Beaver Creek to the confluence with the Willamette River, thence southerly and westerly up the Willamette River to the point where the Willamette River intersects the Clackamas County-Yamhill County line, thence north along the Clackamas County-Yamhill County line to the point where it intersects the Washington County-Yamhill County line, thence west and north along the Washington County-Yamhill County line to the point where it is intersected by Mount Richmond Road, thence northeast along Mount Richmond Road to the intersection with Patton Valley Road, thence easterly and northerly along Patton Valley Road to the intersection with Tualatin Valley State Highway, thence northerly along Tualatin Valley State Highway to the intersection with State Highway 47, thence northerly along State Highway 47 to the intersection with Dilley Road, thence northwesterly and northerly along Dilley Road to the intersection with Stringtown Road, thence westerly and northwesterly along Stringtown Road to the intersection with Gales Creek Road, thence northwesterly along Gales Creek Road to the intersection with Tinmmerman Road, thence northerly along Tinmmerman Road to the intersection with Wilson River Highway, thence west and southwesterly along Wilson River Highway to the intersection with Narup Road, thence north along Narup Road to the intersection with Cedar Canyon Road, thence westerly and northerly along Cedar Canyon Road to the intersection with Banks Road, thence west along Banks Road to the intersection with Hahn Road, thence northerly and westerly along Hahn Road to the intersection with Mountaindale Road, thence southeasterly along Mountaindale Road to the intersection with Glencoe Road, thence east-southeasterly along Glencoe Road to the intersection with Jackson Quarry Road, thence north-northeasterly along Jackson Quarry Road to the intersection with Helvetia Road, thence easterly and southerly along Helvetia Road to the intersection with Bishop Road, thence southerly along Bishop Road to the intersection with Phillips Road, thence easterly along Phillips Road to the intersection with the Burlington Northern Railroad Track, thence northeasterly along the Burlington Northern Railroad Line to the intersection with Rock Creek Road, thence east-southeasterly along Rock Creek Road to the intersection with Old Cornelius Pass Road, thence northeasterly along Old Cornelius Pass Road to the intersection with Skyline Boulevard, thence easterly and southerly along Skyline Boulevard to the intersection with Newberry Road, thence northeasterly along Newberry Road to the intersection with State Highway 30 (St. Helens Road), thence northeast on a line over land across State Highway 30 to the Multnomah Channel, thence east-southeasterly up the Multnomah Channel to the diffluence with the Willamette River, thence north-northeasterly down the Willamette River to the confluence with the Columbia River and the Oregon-Washington state line (the point of beginning).

(26~~5~~) “Portland Metropolitan Service District Boundary” or “Portland Metro” means the boundary surrounding the urban growth boundaries of the cities within the Greater Portland Metropolitan Area. It is defined in the Oregon Revised Statutes (ORS) 268.125 (1989).

(27~~6~~) “Portland Vehicle Inspection Area” means the area of the state included within the following census tracts, block groups, and blocks as used in the 1990 Federal Census. In Multnomah County, the following tracts, block groups, and blocks are included: Tracts 1, 2, 3.01, 3.02, 4.01, 4.02, 5.01, 5.02, 6.01, 6.02, 7.01, 7.02, 8.01, 8.02, 9.01, 9.02, 10, 11.01, 11.02, 12.01, 12.02, 13.01, 13.02, 14, 15, 16.01, 16.02, 17.01, 17.02, 18.01, 18.02, 19, 20, 21, 22.01, 22.02, 23.01, 23.02, 24.01, 24.02, 25.01, 25.02, 26, 27.01, 27.02, 28.01, 28.02, 29.01, 29.02, 29.03, 30, 31, 32, 33.01, 33.02, 34.01, 34.02, 35.01, 35.02, 36.01, 36.02, 36.03, 37.01, 37.02, 38.01, 38.02, 38.03, 39.01, 39.02, 40.01, 40.02, 41.01, 41.02, 42, 43, 44, 45, 46.01, 46.02, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 57, 58, 59, 60.01. 60.02, 61, 62, 63, 64.01, 64.02, 65.01, 65.02, 66.01, 66.02, 67.01, 67.02, 68.01, 68.02, 69, 70, 71, 72.01, 72.02, 73, 74, 75, 76, 77, 78, 79, 80.01, 80.02, 81, 82.01, 82.02, 83.01, 83.02, 84, 85, 86, 87, 88, 89, 90, 91, 92.01, 92.02, 93, 94, 95, 96.01, 96.02, 97.01, 97.02, 98.01, 98.02, 99.01, 99.02, 99.03, 100, 101, 102, 103.01, 103.02, 104.02, 104.04, 104.05, 104.06, 104.07; Block Groups 1, 2 of Tract 105; Blocks 360, 361, 362 of Tract 105; that portion of Blocks 357, 399 of Tract 105 beginning at the intersection of the Oregon-Washington State Line (“State Line”) and the northeast corner of Block Group 1 of Tract 105, thence east along the State Line to the intersection of the State Line and the eastern edge of Section 26, Township 1 North, Range 4 East, thence south along the section line to the centerline of State Highway 100 to the intersection of State Highway 100 and the western edge of Block Group 2 of Tract 105. In Clackamas County, the following tracts, block groups, and blocks are included: Tracts 201, 202, 203.01, 203.02, 204.01, 204.02, 205.01, 205.02, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216.01, 216.02, 217, 218, 219, 220, 221.01, 221.02, 222.02, 223, 224, 225, 226, 227.01, 227.02, 228, 229, 230, 231, 232, 233, 234.01, 234.02, , 235, 236, 237; Block Groups 1, 2 of Tract 241; Block Groups 1, 2, 3, 4 of Tract 242; Block Groups 1, 2 of Tract 243.02. In Yamhill County, the following tract is included: Tract 301, except those areas in Tract 301 that lie within the Newberg City Limits defined as of July 12, 1996, and the following blocks within Tract 301: 102B, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121D, 122B, 122C, 123, 126, and 127B. In Washington County the following tracts, block groups, and blocks are included: Tracts 301, 302, 303, 304.01, 304.02, 305.01, 305.02, 306, 307, 308.01, 308.02, 309, 310.03, 310.04, 310.05, 310.06, 311, 312, 313, 314.01, 314.02, 315.01, 315.04, 315.05, 315.06, 315.07, 315.08, 316.03, 316.04, 316.05, 316.06, 316.07, 317.02, 317.03, 317.04, 318.01, 318.02, 318.03, 319.01, 319.03, 319.04, 320, 321.01, 321.02, 322, 323, 324.02, 324.03, 324.04, 325, 326.01, 326.02, 328, 329, 330, 331, 332, 333; Block Groups 1, 2 of Tract 327; Block Group 1 of Tract 334; Block Group 2 of Tract 335; Block Group 1 of Tract 336. In Columbia County the following tracts, block groups, and blocks are included: Tract 9710.98; Block Groups 2, 3 of Tract 9709.98; Blocks 146B, 148, 152 of Tract 9709.98.

(28~~7~~) “Rogue Basin” means the area bounded by the following line: Beginning at the NE corner of T32S, R2E, W.M., thence south along range line 2E to the SE corner of T39S; thence west along township line 39S to the NE corner of T40S, R7W; thence south to the SE corner of T40S, R7W; thence west to the SE corner of T40S, R9W; thence north on range line 9W to the NE corner of T39S, R9W; thence east to the NE corner of T39S, R8W; thence north on range line 8W to the SE corner of Section 1, T33S, R8W on the Josephine-Douglas County line; thence east on the Josephine-Douglas and Jackson-Douglas County lines to the NE corner of T32S, R1W; thence east along township line 32S to the NE corner of T32S, R2E to the point of beginning.

(2~~8~~9) “Salem-Keizer Area Transportation Study” or “SKATS” means the area within the bounds beginning at the intersection of U.S. Interstate Highway 5 (I-5) with Battle Creek Road SE and Wiltsey Road, south along I-5 to the intersection with the western boundary of Section 24, T8S, R3W; thence due south on a line to the intersection with Delaney Road; thence easterly along Delaney Road to the intersection with Sunnyside Road; thence north along Sunnyside Road to the intersection with Hylo Road SE; thence west along Hylo Road SE to the intersection with Liberty Road; thence north along Liberty Road to the intersection with Cole Road; thence west along Cole Road to the intersection with Bates Road; thence northerly and easterly along Bates Road to the intersection with Jory Hill Road; thence west along Jory Hill Road to the intersection with Stone Hill Avenue; thence north along Stone Hill Avenue to the intersection with Vita Springs Road; thence westerly along Vita Springs Road to the Willamette River; thence northeasterly downstream the Willamette River to a point adjacent to where the western boundary of Section 30, T7S, R3W intersects the Southern Pacific Railroad Line; thence westerly along the Southern Pacific Railroad Line to the intersection with State Highway 51; thence northeasterly along State Highway 51 to the intersection with Oak Grove Road; thence northerly along Oak Grove Road to the intersection with State Highway 22; thence west on State Highway 22 to the intersection with Oak Grove Road; thence north along Oak Grove Road to the intersection with Orchard Heights Road; thence east and north along Orchard Heights Road to the intersection with Eagle Crest Drive; thence northerly along Eagle Crest Drive to the intersection with Hunt Road; thence north along Hunt Road to the intersection with Fourth Road; thence east along Fourth Road to the intersection with Spring Valley Road; thence north along Spring Valley to the intersection with Oak Knoll Road; thence east along Oak Knoll Road to the intersection with Wallace Road; thence south along Wallace Road to the intersection with Lincoln Road; thence east along Lincoln Road on a line to the intersection with the Willamette River; thence northeasterly downstream the Willamette River to a point adjacent to where Simon Street starts on the East Bank; thence east and south along Simon Street to the intersection with Salmon; thence east along Salmon to the intersection with Ravena Drive; thence southerly and easterly along Ravena Drive to the intersection with Wheatland Road; thence northerly along Wheatland Road to the intersection with Brooklake Road; thence southeast along Brooklake Road to the intersection with 65th Avenue; thence south along 65th Avenue to the intersection with Labish Road; thence east along Labish Road to the intersection with the West Branch of the Little Pudding River; thence southerly along the West Branch of the Little Pudding River to the intersection with Sunnyview Road; thence east along Sunnyview Road to the intersection with 63rd Avenue; thence south along 63rd Avenue to the intersection with State Street; thence east along State Street to the intersection with 62nd Avenue; thence south along 62nd Avenue to the intersection with Deer Park Drive; thence southwest along Deer Park Drive to the intersection with Santiam Highway 22; thence southeast along Santiam Highway 22 to the point where it intersects the Salem Urban Growth Boundary (SUGB);

thence following the southeast boundary of the SUGB generally southerly and westerly to the intersection with Wiltsey Road; thence west along Wiltsey Road to the intersection with I-5 (the point of beginning).

(~~2~~30~~9~~) “UGB” means Urban Growth Boundary.

(31~~0~~) “Umpqua Basin” means the area bounded by the following line: Beginning at the SW corner of Section 2, T19S, R9W, on the Douglas-Lane County lines and extending due south to the SW corner of Section 14, T32S, R9W, on the Douglas-Curry County lines, thence easterly on the Douglas-Curry and Douglas-Josephine County lines to the intersection of the Douglas, Josephine, and Jackson County lines; thence easterly on the Douglas-Jackson County line to the intersection of the Umpqua National Forest boundary on the NW corner of Section 32, T32S, R3W; thence northerly on the Umpqua National Forest boundary to the NE corner of Section 36, T25S, R2W; thence west to the NW corner of Section 36, T25S, R4W; thence north to the Douglas-Lane County line; thence westerly on the Douglas-Lane County line to the starting point.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468.020
Stats. Implemented: ORS 468A.025
Hist.: DEQ 14-1995, f. & cert. ef. 5-25-95; DEQ 18-1996, f. & cert. ef. 8-19-96; DEQ 1-1999, f. & cert. ef. 1-25-99; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-031-0500; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 5-2010, f. & cert. ef. 5-21-10; DEQ 18-2011, f. & cert. ef. 12-21-11

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 225

AIR QUALITY ANALYSIS REQUIREMENTS

340-225-0090

Requirements for Demonstrating a Net Air Quality Benefit

Demonstrations of net air quality benefit for offsets must include the following:

(1) Ozone areas (VOC and NOx emissions). For sources capable of impacting a designated ozone nonattainment or maintenance area;

(a) Offsets for VOC and NOx are required if the source will be located within the designated area or within the Ozone Precursor Distance.

(b) The amount and location of offsets must be determined in accordance with this subsection:

(A)For new or modified sources locating within a designated nonattainment area, the offset ratio is 1.1:1. These offsets must come from within either the same designated nonattainment area as the new or modified source or another ozone nonattainment area (with equal or higher nonattainment classification) that contributes to a violation of the NAAQS in the same designated nonattainment area as the new or modified source.

(B) For new or modified sources locating within a designated maintenance area, the offset ratio is 1.1:1. These offsets may come from within either the designated area or the ozone precursor distance.

(C) For new or modified sources locating outside the designated area, but within the ozone precursor distance, the offset ratio is 1:1. These offsets may come from within either the designated area or the ozone precursor distance.

(D) Offsets from outside the designated area but within the Ozone Precursor Distance must be from sources affecting the designated area in a comparable manner to the proposed emissions increase. Methods for determining offsets are described in the Ozone Precursor Offsets definition (OAR 340-225-0020(11)).

(c) In lieu of obtaining offsets, the owner or operator may obtain an allocation at the rate of 1:1 from a growth allowance, if available, in an applicable maintenance plan.

(d) Sources within or affecting the Medford Ozone Maintenance Area are exempt from the requirement for NOx offsets relating to ozone formation.

(e) Sources within or affecting the Salem Ozone Maintenance Area are exempt from the requirement for VOC and NOx offsets relating to ozone formation.

(2) Non-Ozone areas (PM2.5, PM10, SO2, CO, NOx, and Lead emissions):

(a) For a source locating within a designated nonattainment area, the owner or operator must comply with paragraphs (A) through (E) of this subsection:

(A) Obtain offsets from within the same designated nonattainment area for the nonattainment pollutant(s);

(B) Except as provided in paragraphs (C) of this subsection, provide a minimum of 1:1 offsets for each nonattainment pollutant and precursor with emission increases over the Netting Basis;

(C) For PM2.5; inter-pollutant offsets are allowed as follows:

(i) 1 ton of direct PM2.5 may be used to offset 40 tons of SO2;

(ii) 1 ton of direct PM2.5 may be used to offset 100 tons of NOx;

(iii) 40 tons of SO2 may be used to offset 1 ton of direct PM2.5;

(iv) 100 tons of NOx may be used to offset 1 ton of direct PM2.5.

(D) Except as provided in section (7) of this rule, ~~P~~provide a net air quality benefit within the designated nonattainment area. "Net Air Quality Benefit" means:

(i) Offsets obtained result in a reduction in concentration at a majority of the modeled receptors and the emission increases from the proposed source or modification will result in less than a significant impact level increase at all modeled receptors; or

(ii) For a small scale local energy project and any infrastructure related to that project located in the same area, a reduction of the nonattainment pollutant emissions equal to the ratio specified in this subsection, provided that the proposed major source or major modification would not cause or contribute to a violation of the national ambient air quality standard or otherwise pose a material threat to compliance with air quality standards in the nonattainment area.

(E) Provide offsets sufficient to demonstrate reasonable further progress toward achieving the NAAQS.

(b) For a source locating outside a designated nonattainment area but causing a significant air quality impact on the area, the owner or operator must provide offsets sufficient to reduce the modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the designated nonattainment area. These offsets may come from within or outside the designated nonattainment area. This requirement only applies to the emissions remaining after first deducting the offsets obtained in accordance with section (7) of this rule.

(c) For a source locating inside or causing a significant air quality impact on a designated maintenance area, the owner or operator must either provide offsets sufficient to reduce modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the designated maintenance area or obtain an allocation from an available growth allowance as allowed by an applicable maintenance plan. These offsets may come from within or outside the designated maintenance area. This requirement only applies to the emissions remaining after first deducting the offsets obtained in accordance with section (7) of this rule.

(A) Medford-Ashland AQMA: Proposed new major PM10 sources or major PM10 modifications locating within the AQMA that are required to provide emission offsets under OAR 340-224-0060(2)(a) must provide reductions in PM10 emissions equal to 1.2 times the emissions increase over the netting basis from the new or modified source, and must provide a net air quality benefit within the AQMA. "Net Air Quality Benefit" means:

(i) A reduction in concentration at a majority of the modeled receptors and less than a significant impact level increase at all modeled receptors; or

(ii) For a small scale local energy project and any infrastructure related to that project located in the same area, a reduction of the maintenance pollutant emissions equal to the ratio specified in this paragraph, provided that the proposed major source or major modification would not cause or contribute to a violation of the national ambient air quality standard or otherwise pose a material threat to compliance with air quality standards in the maintenance area.

(B) Medford-Ashland AQMA: Proposed new major PM10 sources or major PM10 modifications located outside the Medford-Ashland AQMA that cause a significant air quality impact on the AQMA must provide reductions in PM10

emissions sufficient to reduce modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the AQMA.

(3) Except as provided in paragraph (2)(a)(C) of this rule, the emission reductions used as offsets must be of the same type of pollutant as the emissions from the new source or modification. Sources of PM10 must be offset with particulate in the same size range.

(4) The emission reductions used as offsets must be contemporaneous, that is, the reductions must take effect before the time of startup but not more than two years before the submittal of a complete permit application for the new source or modification. This time limitation may be extended through banking, as provided for in OAR 340 division 268, Emission Reduction Credit Banking. In the case of replacement facilities, the ~~Department~~ DEQ may allow simultaneous operation of the old and new facilities during the startup period of the new facility, if net emissions are not increased during that time period. Any emission reductions must be federally enforceable at the time of the issuance of the permit.

(5) Offsets required under this rule must meet the requirements of Emissions Reduction Credits in OAR 340 division 268.

(6) Emission reductions used as offsets must be equivalent in terms of short term, seasonal, and yearly time periods to mitigate the effects of the proposed emissions.

(7) Offsets obtained in accordance with OAR 340-240-0550 and 340-240-0560 for sources locating within or causing significant air quality impact on the Klamath Falls PM2.5 nonattainment or PM10 maintenance areas are exempt from the requirements of paragraph (2)(a)(E) and sub-sections 2(b) and 2(c) of this rule provided that the proposed major source or major modification would not cause or contribute to a new violation of the national ambient air quality standard. This exemption only applies to the direct PM2.5 or PM10 offsets obtained from residential wood-fired devices in accordance with OAR 340-240-0550 and 340-240-0560. Any remaining emissions from the source that are offset by emission reductions from other sources are subject to the requirements of paragraph (2)(a)(E) or sub-sections (2)(b) or (2(c) of this rule, as applicable.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the EQC under OAR 340-200-0040.

Stat. Auth.: ORS 468.020
Stats. Implemented: ORS 468A.025
Hist.: DEQ 25-1981, f. & ef. 9-8-81; DEQ 5-1983, f. & ef. 4-18-83; DEQ 8-1988, f. & cert. ef. 5-19-88 (and corrected 5-31-88); DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 27-1992, f. & cert. ef. 11-12-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 12-1993, f. & cert. ef. 9-24-93, Renumbered from 340-020-0260; DEQ 19-1993, f. & cert. ef. 11-4-93; DEQ 4-1995, f. & cert. ef. 2-17-95; DEQ 26-1996, f. & cert. ef. 11-26-96; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-028-1970; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0111; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01, Renumbered from 340-224-0090 & 340-240-0260; DEQ 11-2002, f. & cert. ef. 10-8-02; DEQ 12-2002(Temp), f. & cert. ef. 10-8-02 thru 4-6-03; Administrative correction 11-10-03; DEQ 1-2004, f. & cert. ef. 4-14-04; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 10-2010(Temp), f. 8-31-10, cert. ef. 9-1-10 thru 2-28-11; Administrative correction, 3-29-11; DEQ 5-2011, f. 4-29-11, cert. ef. 5-1-11

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 240

RULES FOR AREAS WITH UNIQUE AIR QUALITY NEEDS

340-240-0010

Purpose

The purpose of this ~~Division~~ division is to ~~deal specifically with the unique~~address the air quality control needs of the Medford-Ashland AQMA and Grants Pass UGB (OAR 340-240-0100 through 340-240-0270), the La Grande UGB (340-240-0300 through 340-240-0360, ~~and~~ the Lakeview UGB (340-240-0400 through 340-240-0440), and the Klamath Falls Nonattainment Area (340-240-0500 through 340-240-0630).

[NOTE: These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025
Hist.: DEQ 4-1978, f. & ef. 4-7-78; DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0005

340-240-0030

Definitions

The definitions in OAR 340-200-0020, 340-204-0010 and this rule apply to this division. If the same term is defined in this rule and 340-200-0020 or 340-204-0010, the definition in this rule applies to this division.

(1) "Air contaminant" means a dust, fume, gas, mist, odor, smoke, vapor, pollen, soot, carbon, acid or particulate matter, or any combination thereof.

(2) "Air Conveying System" means an air moving device, such as a fan or blower, associated ductwork, and a cyclone or other collection device, the purpose of which is to move material from one point to another by entrainment in a moving airstream.

(3) "Average Operating Opacity" means the opacity of emissions determined using EPA Method 9 on any three days within a 12-month period which are separated from each other by at least 30 days; a violation of the average operating opacity limitation is judged to have occurred if the opacity of emissions on each of the three days is greater than the specified average operating opacity limitation.

(4) "Charcoal Producing Plant" means an industrial operation which uses the destructive distillation of wood to obtain the fixed carbon in the wood.

(5) "Collection Efficiency" means the overall performance of the air cleaning device in terms of ratio of weight of material collected to total weight of input to the collector.

(6) "Department" means Department of Environmental Quality.

(7) "Design Criteria" means the numerical as well as verbal description of the basis of design, including but not necessarily limited to design flow rates, temperatures, humidities, contaminant descriptions in terms of types and chemical species, mass emission rates, concentrations, and specification of desired results in terms of final emission rates and concentrations, and scopes of vendor supplies and owner-supplied equipment and utilities, and a description of any operational controls.

(8) "Domestic Waste" means combustible household waste, other than wet garbage, such as paper, cardboard, leaves, yard clippings, wood, or similar materials generated in a dwelling housing four (4) families or less, or on the real property on which the dwelling is situated.

(9) "Dry Standard Cubic Foot" means the amount of gas that would occupy a volume of one cubic foot, if the gas were free of uncombined water at standard conditions.

(10) "Emission" means a release into the outdoor atmosphere of air contaminants.

(11) "EPA Method 9" means the method for Visual Determination of the Opacity of Emissions From Stationary Sources described as Method (average of 24 consecutive observations) in the Department Source Sampling Manual (January, 1992).

(12) "Facility" means an identifiable piece of process equipment. A stationary source may be comprised of one or more pollutant-emitting facilities.

(13) "Fireplace" is defined in OAR 340-262-0450

(14~~3~~) "Fuel Burning Equipment" means a device that burns a solid, liquid, or gaseous fuel, the principal purpose of which is to produce heat or power by indirect heat transfer. All stationary gas turbines are considered Fuel Burning Equipment. Marine installations and internal combustion engines are not considered Fuel Burning Equipment.

(15~~4~~) "Fuel Moisture Content By Weight Greater Than 20 Percent" means bark, hogged wood waste, or other wood with an average moisture content of more than 20 percent by weight on a wet basis as used for fuel in the normal operation of a wood-fired veneer dryer as measured by ASTM D4442-84 during compliance source testing.

(16~~5~~) "Fuel Moisture Content By Weight Less Than 20 Percent" means pulverized ply trim, sanderdust, or other wood with an average moisture content of 20 percent or less by weight on a wet basis as used for fuel in the normal operation of a wood-fired veneer dryer as measured by ASTM D4442-84 during compliance source testing.

(17~~6~~) "Fugitive Emissions" means dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof not easily given to measurement, collection and treatment by conventional pollution control methods.

(18~~7~~) "Grants Pass Urban Growth Area" and "Grants Pass Area" means the area within the Grants Pass Urban Growth Boundary as shown on the Plan and Zoning Maps for the City of Grants Pass as of 1 February 1988.

(19~~18~~) "Hardboard" means a flat panel made from wood that has been reduced to basic wood fibers and bonded by adhesive properties under pressure.

(20) “Klamath Falls Nonattainment Area” means the area as defined in OAR 340-204-0010.

(21~~19~~) "La Grande Urban Growth Area" means the area within the La Grande Urban Growth Boundary as shown on the Plan and Zoning Maps for the City of La Grande as of 1 October 1991.

(22~~0~~) "Lakeview Urban Growth Area" means the area within the Lakeview Urban Growth Boundary as shown on the Plan and Zoning Maps for the Town of Lakeview as of 25 October 1993.

(23~~1~~) "Liquefied petroleum gas" has the meaning given by the American Society for Testing and Materials in ASTM D1835-82, "Standard Specification for Liquid Petroleum Gases."

(24~~2~~) "Lowest Achievable Emission Rate" or "LAER" is defined in OAR 340-200-0020.

(25~~3~~) "Maximum Opacity" means the opacity as determined by EPA Method 9 (average of 24 consecutive observations).

(26~~4~~) "Medford-Ashland Air Quality Maintenance Area" (AQMA) means the area defined as beginning at a point approximately two and quarter miles northeast of the town of Eagle Point, Jackson County, Oregon at the northeast corner of Section 36, Township 35 South, Range 1 West (T35S, R1W); thence South along the Willamette Meridian to the southeast corner of Section 25, T37S, R1W; thence southeast along a line to the southeast corner of Section 9, T39S, R2E; thence south-southeast along line to the southeast corner of Section 22, T39S, R2E; thence South to the southeast corner of Section 27, T39S, R2E; thence southwest along a line to the southeast corner of Section 33, T39S, R2E; thence West to the southwest corner of Section 31, T39S, R2E; thence northwest along a line to the northwest corner of Section 36, T39S, R1E;

thence West to the southwest corner of Section 26, T39S, R1E; thence northwest along a line to the southeast corner of Section 7, T39S, R1E; thence West to the southwest corner of Section 12, T39S, R1W, T39S, R1W; thence northwest along a line to southwest corner of Section 20, T38S, R1W; thence West to the southwest corner of Section 24, T38S, R2W; thence northwest along a line to the southwest corner of Section 4, T38S, R2W; thence West to the southwest corner of Section 6, T38S, R2W; thence northwest along a line to the southwest corner of Section 31, T37S, R2W; thence North and East along the Rogue River to the north boundary of Section 32, T35S, R1W; thence East along a line to the point of beginning.

(27~~5~~) "Modified Source" means any source with a major modification as defined in OAR 340-200-0020.

(28~~6~~) "Natural gas" means a naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in geologic formations beneath the earth's surface, of which the principal component is methane.

(29~~7~~) "New Source" means any source not in existence prior to April 7, 1978 or any source not having a Permit as of April 7, 1978.

(30~~28~~) "Odor" means that property of an air contaminant that affects the sense of smell.

(31~~29~~) "Offset" is defined in OAR 340-200-0020.

(32~~0~~) "Opacity" means the degree to which an emission reduces transmission of light and obscures the view of an object in the background as measured in accordance with the Department's Source Sampling Manual (January, 1992). Unless otherwise specified by rule, opacity must be measured in accordance with EPA Method 9. For all standards, the minimum observation period must be six minutes, though longer periods may be required by a specific rule or permit condition. Aggregate times (e.g. 3 minutes in any one hour) consist of the total duration of all readings during the observation period that exceed the opacity percentage in the standard, whether or not the readings are consecutive. Alternatives to EPA Method 9, such as a continuous opacity monitoring system (COMS), alternate Method 1 (LIDAR), or EPA Methods 22, or 203, may be used if approved in advance by the ~~Department~~DEQ, in accordance with the Source Sampling Manual.

(33~~1~~) "Open Burning" means burning conducted in such a manner that combustion air and combustion products may not be effectively controlled including, but not limited to, burning conducted in open outdoor fires, burn barrels, and backyard incinerators.

(34~~2~~) "Particleboard" means matformed flat panels consisting of wood particles bonded together with synthetic resin or other suitable binders.

(35~~3~~) "Particulate Matter" means all solid or liquid material, other than uncombined water, emitted to the ambient air as measured in accordance with the Department Source Sampling Manual. Particulate matter emission determinations must consist of the average of three separate consecutive runs. For sources tested using DEQ Method 5 or DEQ Method 7, each run must have a minimum sampling time of one hour, a maximum sampling time of eight hours, and a minimum sampling volume of 31.8 dscf. For sources tested using DEQ Method 8, each run must have a minimum sampling time of 15 minutes and must collect a minimum particulate sample of 100 mg. Wood waste boilers and charcoal producing plants must be tested with DEQ Method 5; veneer dryers, wood particle dryers, fiber dryers and press/cooling vents must be tested with DEQ Method 7; and air conveying systems must be tested with DEQ Method 8 (January, 1992).

(36~~4~~) "Person" includes individuals, corporations, associations, firms, partnerships, joint stock companies, public and municipal corporations, political subdivisions, the state and any agencies thereof, and the federal government and any agencies thereof.

(37~~5~~) "Press/Cooling Vent" means any opening through which particulate and gaseous emissions from plywood, particleboard, or hardboard manufacturing are exhausted, either by natural draft or powered fan, from the building housing the process. Such openings are generally located immediately above the board press, board unloader, or board cooling area.

(38~~6~~) "Rebuilt Boiler" means a physical change after April 29, 1988, to a wood-waste boiler or its air-contaminant emission control system which is not considered a "modified source" and for which the fixed, depreciable capital cost of added or replacement components equals or exceeds fifty percent of the fixed depreciable cost of a new component which has the same productive capacity~~.~~

(39~~3~~) "Refuse" means unwanted material.

(~~3~~40) "Refuse burning equipment" means a device designed to reduce the volume of solid, liquid, or gaseous refuse by combustion.

(41) "Wood Fuel-Fired Device" means a device or appliance designed for wood fuel combustion, including cordwood stoves, wood stoves and fireplace stove inserts, fireplaces, wood fuel-fired cook stoves, pellet stoves and combination fuel furnaces or boilers, which burn wood fuels.

(42~~37~~) "Source" means any structure, building, facility, equipment, installation or operation, or combination thereof, which is located on one or more contiguous or adjacent properties and which is owned or operated by the same person, or by persons under common control.

(43~~38~~) "Standard Conditions" means a temperature of ~~60~~68° Fahrenheit (~~15.6~~20° Celsius) and a pressure of 14.7 pounds per square inch absolute (1.03 Kilograms per square centimeter).

(44) "Standard cubic foot" means the amount of gas that would occupy a volume of one cubic foot, if the gas were free of uncombined water at standard conditions. When applied to combustion flue gases from fuel or refuse burning, "standard cubic foot" also implies adjustment of gas volume to that which would result at a concentration of 12% carbon dioxide or 50% excess air.

(45~~39~~) "Veneer" means a single flat panel of wood not exceeding 1/4 inch in thickness formed by slicing or peeling from a log.

(46~~0~~) "Veneer Dryer" means equipment in which veneer is dried.

(47~~1~~) "Wood-fired Veneer Dryer" means a veneer dryer which is directly heated by the products of combustion of wood fuel in addition to or exclusive of steam or natural gas or propane combustion.

(48~~2~~) "Wigwam Fired Burner" means a burner which consists of a single combustion chamber, has the general features of a truncated cone, and is used for the incineration of wastes.

(49~~3~~) "Wood Waste Boiler" means equipment which uses indirect heat transfer from the products of combustion of wood waste to provide heat or power.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025
Hist.: DEQ 4-1978, f. & ef. 4-7-78; DEQ 9-1979, f. & ef. 5-3-79; DEQ 3-1980, f. & ef. 1-28-80; DEQ 14-1981, f. & ef. 5-6-81; DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 4-1995, f. & cert. ef. 2-17-95; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 3-1996, f. & cert. ef. 1-29-96; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0010; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01; DEQ 1-2005, f. & cert. ef. 1-4-05

Klamath Falls Nonattainment Area

340-240-0500

Applicability

OAR 340-240-0500 through 340-240-0630 apply in the Klamath Falls Nonattainment Area beginning January 1, 2013.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0510

Opacity Standard

(1) Except as provided in section (2) of this rule, no person conducting a commercial or industrial activity may cause or permit the emission of any air contaminant into the atmosphere from any stationary source including fuel or refuse burning equipment, that exhibits equal to or greater than 20% opacity for a period or periods aggregating more than three minutes in any one hour.

(2) Exceptions to section (1) of this rule:

(a) This rule does not apply to fugitive emissions.

(b) This rule does not apply where the presence of uncombined water is the only reason for failure of any source to meet the requirements of this rule.

(c) For wood-fired boilers that were constructed or installed prior to June 1, 1970 and not modified since that time, visible emissions during grate cleaning operations must not equal or exceed 40% opacity for a period or periods aggregating more than three minutes in any one hour.

(A) Beginning June 30, 2013, this exception will only apply if the owner or operator conducts the grate cleaning in accordance with a grate cleaning plan that has been approved by DEQ.

(B) The owner or operator must prepare a grate cleaning plan in consultation with DEQ and submit the plan to DEQ by June 1, 2013.

(3) Opacity is determined in accordance with EPA Method 9 of Appendix A to 40 CFR Part 60 or a continuous opacity monitoring system (COMS) installed and operated in accordance with Performance Specification 1 of Appendix B to 40 CFR Part 60.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468.020 & ORS 468A.025.

340-240-0520

Control of Fugitive Emissions

(1) All sawmills, plywood mills and veneer manufacturing plants, particleboard and hardboard plants, asphalt plants, rock crushers, animal feed manufacturers, and other major industrial facilities as identified by the ~~Department~~DEQ, must prepare and implement site-specific plans

for the control of fugitive emissions. The plan must be submitted to the ~~Department~~DEQ for approval in accordance with paragraph (5) below.

(2) Fugitive emission-control plans must identify reasonable measures to prevent particulate matter from becoming airborne, and avoid the migration of material onto the public road system. Such reasonable measures may include, but are not limited to the following:

(a) Paving all roads and areas on which vehicular traffic occurs at the facility;

(b) Scheduled application of water, or other suitable chemicals on unpaved roads, log storage or sorting yards, materials stockpiles, and other surfaces which can create airborne dust. Dust suppressant material must not adversely affect water quality;

(c) Periodic sweeping or cleaning of paved roads and other areas as necessary to prevent migration of material onto the public road system;

(d) Full or partial enclosure of materials stockpiled or other best management practices in cases where application of oil, water, or chemicals are not sufficient to prevent particulate matter from becoming airborne;

(e) Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;

(f) Adequate containment during sandblasting or other similar operations;

(g) Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne; and

(h) Procedures for the prompt removal of earth or other material from paved streets.

(3) Reasonable measures may include landscaping and using vegetation to reduce the migration of material onto public and private roadways or from becoming airborne.

(4) The facility owner or operator must supervise and control fugitive emissions and material that may become airborne caused by the activity of outside contractors delivering or removing materials at the site.

(5) For existing sources, the site-specific fugitive emissions control plan must be submitted to the ~~Department~~DEQ by July 1, 2013. For sources that obtain their initial permit after December 14, 2012, the site-specific fugitive emission control plan must be submitted within 60 days after permit issuance. For portable sources that move into the nonattainment area after December 14, 2012, the site-specific fugitive emission control plan must be submitted with the relocation notification. Unless otherwise notified by the ~~Department~~DEQ, the fugitive emission control plan will be approved by default within 30 days after the plan is submitted to the ~~Department~~DEQ. The ~~Department~~DEQ may request revisions to the plan at any time if fugitive emissions are not adequately controlled as demonstrated by visible emissions.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0530

Requirement for Operation and Maintenance Plans

(1) With the exception of basic and general permit holders, a permit holder must prepare and implement Operation and Maintenance Plans for non-fugitive sources of particulate matter.

(2) The purposes of the operation and maintenance plans are to:

(a) Reduce the number of upsets and breakdowns in particulate control equipment;

(b) Reduce the duration of upsets and downtimes; and

(c) Improve the efficiency of control equipment during normal operations.

(3) The operation and maintenance plans should consider, but not be limited to, the following:

(a) Personnel training in operation and maintenance;

(b) Preventative maintenance procedures, schedule and records;

(c) Logging of the occurrence and duration of all upsets, breakdowns and malfunctions which result in excessive emissions;

(d) Routine follow-up evaluation of upsets to identify the cause of the problem and changes needed to prevent a recurrence;

(e) Periodic source testing of pollution control units as required by the permit;

(f) Inspection of internal wear points of pollution control equipment during scheduled shutdowns; and

(g) Inventory of key spare parts.

(4) Existing sources must submit an Operation and Maintenance Plan to the ~~Department~~DEQ by July 1, 2013. Sources obtaining an initial permit after December 14, 2012 must submit the Operation and Maintenance Plan within 60 days of permit issuance. The ~~Department~~DEQ will notify sources within 30 days of plan submittal only if the Operation and Maintenance Plan is not

approved. The ~~Department~~DEQ may request revisions to the plan at any time if plans are not sufficient.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

340-240-0540

Compliance Schedule for Existing Industrial Sources

(1) Except as provided in sections (2) and (3) of this rule, compliance with applicable requirements of OAR 340-240-0500 through 340-240-0540 for a source that is built and located in the Klamath Falls Nonattainment Area prior to December 14, 2012 must be demonstrated by the owner or operator of the source as expeditiously as possible, but in no case later than the following schedule:

(a) No later than June 15, 2013, the owner or operator must submit Design Criteria and a Notice of Intent to Construct for emission-control systems for complying with OAR 340-240-0510 through 340-240-0540 for ~~Department~~DEQ review and approval; If the ~~Department~~DEQ disapproves the Design Criteria, the owner or operator must revise the Design Criteria to meet the ~~Department~~DEQ's objections and submit the revised Design Criteria to the ~~Department~~DEQ no later than one month after receiving the ~~Department~~DEQ's disapproval;

(b) No later than three months after receiving the ~~Department~~DEQ's approval of the Design Criteria, the owner or operator must submit to the ~~Department~~DEQ copies of purchase orders for any emission-control devices;

(c) No later than eight months after receiving the ~~Department~~DEQ's approval of the Design Criteria, the owner or operator must submit to the ~~Department~~DEQ vendor drawings as approved for construction of any emission-control devices and specifications of any other major equipment in the emission-control system in sufficient detail to demonstrate that the requirements of the Design Criteria will be satisfied;

(d) No later than nine months after receiving the ~~Department~~DEQ's approval of the Design Criteria, the owner or operator must begin construction of any emission-control devices;

(e) No later than fourteen months after receiving the ~~Department~~DEQ's approval of Design Criteria, the owner or operator must complete construction in accordance with the Design Criteria;

(f) No later than October 15, 2014, the owner or operator must demonstrate compliance with the applicable requirements identified in OAR 340-240-0500 through 0540. Compliance with 340-

240-0510 must be demonstrated by conducting a source test. Compliance with 340-240-0520 and 0530 must be demonstrated by implementing the approved plans.

(2) Section (1) of this rule does not apply if the owner or operator of the source has demonstrated by September 15, 2014 that the source is capable of being operated and is operated in continuous compliance with applicable requirements of OAR 340-240-0500 through 340-240-0540 and the ~~Department~~DEQ has agreed with the demonstration in writing. The ~~Department~~DEQ may grant an extension until April 15, 2015 for a source to demonstrate compliance under this section. The applicable requirements will be incorporated in the Permit issued to the source.

(3) The ~~Department~~DEQ may adjust the schedule specified in subsections (1)(a) through (e) of this rule if necessary to ensure timely compliance with subsection (1)(f) of this rule or if necessary to conform to an existing compliance schedule with an earlier compliance demonstration date.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0550

Requirements for New Sources When Using Residential Wood Fuel-Fired Device Offsets

(1) All new or modified sources subject to OAR 340-224-0050 or 340-224-0060 may opt to use wood fuel-fired device emission reductions from within the nonattainment or maintenance area to satisfy the offset requirements of OAR 340-225-0090(2):

(a) Offsets for decommissioning fireplaces and non-certified woodstoves (including fireplace inserts) are obtained at a ratio of at least 1:1 (i.e., one ton of emission reductions from fireplaces and non-certified wood stoves offsets one ton of emissions from a proposed new or modified industrial point source proposed to be located inside or impacting the non-attainment area or maintenance area);

(b) Offsets must be obtained from within the Klamath Falls Nonattainment Area and Maintenance Area; and

(c) The emission reductions offsets must be approved by the ~~Department~~DEQ and comply with OAR 340-240-0560.

(2) The net air quality benefit analysis specified in OAR 340-225-0090(2)(a)(E) is not applicable to offsets meeting the criteria in (a) through (c) of section (1) of this rule.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

Real and Permanent $PM_{2.5}$ and PM_{10} Offsets

340-240-0560

(1) Annual emissions reductions offsets ($PM_{2.5}$ and PM_{10}) are determined as follows:

(a) For **fireplaces**, the emission reductions offsets for decommissioning the fireplace and replacing it with a:

(A) certified fireplace insert is 0.02 tons for each replaced device;

(B) pellet stove insert is 0.03 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.04 tons for each replaced device.

Note: As used in this rule, "Certified" includes catalytic and non-catalytic designs, unless otherwise specified.

(b) For **non-certified fireplace inserts**, the emission reduction for replacing the heating device with a:

(A) certified fireplace insert is 0.02 tons for each replaced device;

(B) pellet stove is 0.04 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.04 tons for each replaced device

(c) For **conventional (non-certified) woodstoves**, the emission reduction for replacing the heating device with a:

(A) certified woodstove (including both catalytic and non-catalytic designs) or certified fireplace insert is 0.03 tons for each replaced device; or

(B) pellet stove is 0.05 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.06 tons for each replaced device

(d) For **certified woodstoves** (including both catalytic and non-catalytic designs), the emission reduction for replacing the heating device with a:

(A) pellet stove is 0.03 tons for each replaced device; or

(B) alternative non-wood burning heating system is 0.04 tons for each replaced device

(2) For the emission reductions identified in section (1) to be considered permanent, the person responsible for taking credit for the emission reductions must obtain and maintain the following records for at least 5 years from the date that the proposed industrial point source commences operation:

(a) the address of the residence where the emission reduction occurred;

(b) the date that the emission reduction was achieved;

(c) purchase and installation records for certified woodstoves, certified inserts, or alternative non-wood burning heating systems;

(d) records for permanently decommissioning fireplaces, if applicable; and

(e) disposal records for non-certified woodstoves or fireplace inserts removed.

(3) The records identified in section (2) may be provided by a third party authorized and monitored by the DEQ to procure the emission reductions identified in section (1).

(4) All emission reductions must be achieved prior to startup of the proposed source using the emission reductions as offsets in the permitting action specified in OAR 340-224-0050 or 340-224-0060.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

Klamath Falls Nonattainment Area Contingency Measures

340-240-0570

Applicability

OAR 340-240-0570 through 340-240-0630 apply to the Klamath Falls Nonattainment Area for $PM_{2.5}$ should the area not achieve attainment by the applicable attainment date established pursuant to 42 U.S.C. 7502(a)(2).

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.480

340-240-0580

Existing Industrial Sources Control Efficiency

The owner or operator of an Oregon Title V Operating Permit program source, as defined in OAR 340-200-0020 may not remove or modify existing control devices unless the new control device has the same or better $PM_{2.5}$ control efficiency as the old device.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.480

340-240-0610

Continuous Monitoring for Industrial Sources

(1) The owner or operator of an Oregon Title V Operating Permit program source, as defined in OAR 340-200-0020 must install and operate instrumentation for measuring and recording emissions or the parameters that affect the emission of particulate matter from wood-fired boilers by June 1, 2015, to ensure that the sources and the air pollution control equipment are operated at all times at their full efficiency and effectiveness so that the emission of particulate matter is kept at the lowest practicable level. Continuous monitoring equipment and operation must be in accordance with the Department's Continuous Monitoring Manual.

(2) At a minimum, the monitoring required under paragraph (1) of this section must include:

(a) Continuous monitoring of control device parameters for any wood- fired boiler.

(b) Continuous monitoring of opacity for any wood- fired boiler not controlled by a wet scrubber.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

340-240-0620

Contingency Measures: New Industrial Sources

New industrial sources must comply with OAR 340-240-0570 through 340-240-0610 immediately upon receiving an Air Contaminant Discharge Permit or an Oregon Title V Operating Permit.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.025

340-240-0630

Contingency Enhanced Curtailment of Use of Solid Fuel Burning Devices and Fireplaces

(1) Beginning on November 1 of each year and continuing through and including February 28 of the following year, no fireplace, as defined by OAR 340-262-0450, may emit more than 5.1 grams per kilogram of particulate emissions. A fireplace shall be deemed in compliance with this emission standard if it has been certified either in accordance with ASTM international standard test method E2558 or by the ~~Department~~DEQ pursuant to OAR 340-262-0500. A fireplace that is not certified as described in this rule shall be presumed not to comply with this rule.

(2) The ~~Department~~DEQ may approve exemptions from compliance with section (1) of this rule on days when the ~~Department~~DEQ or the Klamath County Health Department has issued a local Klamath Falls Advisory Call indicating that it is a good ventilation day (a “green day”) that are also state holidays or days that the county has designated as a “special occasion day”. Any person who wishes to receive such an exemption must file an exemption application with the ~~Department~~DEQ and the ~~Department~~DEQ must have approved the exemption request prior to the green day.

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.010 to 468A.025

DIVISION 262

HEAT SMART PROGRAM FOR RESIDENTIAL WOODSTOVES AND OTHER SOLID FUEL HEATING DEVICES

340-262-1000

Wood Burning Contingency Measures for PM2.5 Nonattainment Areas

(1) Applicability

This rule applies to any area classified as a nonattainment area for PM2.5 that does not achieve attainment by the applicable Clean Air Act deadline.

(2) No owner of a residential solid fuel burning device shall allow the appliance to burn creating opacity greater than 20% opacity for more than three minutes in any 60-minute period including startup time.

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.020, 468A.025 & 468A.460 - 468A.515

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 264

RULES FOR OPEN BURNING

340-264-0040

Exemptions, Statewide

Except for the provisions contained in OAR 340-264-0050 and 340-264-0060, this Division does not apply to:

(1) Recreational fires and ceremonial fires, for which a fire is appropriate.

(2) Barbecue equipment used in connection with any residence.

(3) Fires set or permitted by any public agency when such fire is set or permitted in the performance of its official duty for the purpose of weed abatement, prevention or elimination of a fire hazard, or a hazard to public health or safety, or for instruction of employees in the methods of fire fighting, which in the opinion of the public agency is necessary. Every effort will be made by the public agency to conduct this burning during good smoke dispersal conditions and specifically avoiding periods during Air Pollution Advisories. The agency will adjust its schedule for setting such fires for better smoke dispersal if necessary. Open burning fires otherwise exempt from the requirements of this division are still subject to the requirements and prohibitions of local jurisdictions and the State Fire Marshall.

(4) Agricultural open burning pursuant to ORS 468A.020. Agricultural open burning is still subject to the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(5) Open field burning, propane flaming, and stack and pile burning in the Willamette Valley between the crests of the Cascade and Coast Ranges pursuant to OAR chapter 340, division 266, Rules for Field Burning.

(6) Slash burning on forest land or within one-eighth mile of forest land permitted under the Oregon Smoke Management Program regulated by the Department of Forestry pursuant to ORS 477.515.

(7) Fires set pursuant to permit for the purpose of instruction of employees of private industrial concerns in methods of fire fighting, or for civil defense instruction.

(8) Fires set for the purpose of disposal of dry tumbleweed plants (typically Russian Thistle and Tumbleweed Mustard plants) that have been broken off, and rolled about, by the wind.

(9) Agricultural burning for disease or pest control when the fire is set or authorized in writing by the Department of Agriculture.

(10) When caused by an authorized representative of the Department of Agriculture, open burning of carcasses of animals that have died or been destroyed because of an animal disease emergency.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.

Stat. Auth.: ORS 468, 468A & 477
Stats. Implemented: ORS 468A.~~555~~025
Hist.: DEQ 123, f. & ef. 10-20-76; DEQ 23-1979, f. & ef. 7-5-79; DEQ 27-1981, f. & ef. 9-8-81; DEQ 10-1984, f. 5-29-84, ef. 6-16-84; DEQ 6-1992, f. & cert. ef. 3-11-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0035; DEQ 21-2000, f. & cert. ef. 12-15-00; DEQ 12-2008, f. & cert. ef. 9-17-08

340-264-0078

Open Burning Control Areas

Generally, areas around the more densely populated locations in the state and valleys or basins that restrict atmospheric ventilation are designated "Open Burning Control Areas". The practice of open burning may be more restrictive in open burning control areas than in other areas of the state. The specific open burning restrictions associated with these open burning control areas are listed in OAR 340-264-0100 through 340-264-0170 by county. The general locations of open burning control areas are depicted in **Figures 2** through **5**. The open burning control areas of the state are defined as follows:

(1) All areas in or within three miles of the incorporated city limit of all cities with a population of 4,000 or more.

(2) The Coos Bay Open Burning Control Area is located in Coos County with boundaries as generally depicted in **Figure 3** of this rule. The area is enclosed by a line beginning at a point approximately 4-1/2 miles WNW of the City of North Bend, at the intersection of the north boundary of T25S, R13W, and the coastline of the Pacific Ocean; thence east to the NE corner of T25S, R12W; thence south to the SE corner of T26S, R12W; thence west to the intersection of the south boundary of T26S, R14W and the coastline of the Pacific Ocean, thence northerly and easterly along the coastline of the Pacific Ocean to its intersection with the north boundary of T25S, R13W, the point of beginning.

(3) The Rogue Basin Open Burning Control Area is located in Jackson and Josephine Counties with boundaries as generally depicted in Figure 4. The area is enclosed by a line beginning at a point approximately 4-1/2 miles NE of the City of Shady Cove at the NE corner of T34S, R1W, Willamette Meridian, thence south along the Willamette Meridian to the SW corner of T37S, R1W; thence east to the NE corner of T38S, R1E; thence south to the SE corner of T38S, R1E; thence east to the NE corner of T39S, R2E; thence south to the SE corner of T39S, R2E; thence west to the SW corner of T39S, R1E; thence NW along a line to the NW corner of T39S, R1W; thence west to the SW corner of T38S, R2W; thence north to the SW corner of T36S, R2W; thence west to the SW corner of T36S, R4W; thence south to the SE corner of T37S, R5W; thence west to the SW corner of T37S, R6W; thence north to the NW corner of T36S, R6W; thence east to the SW corner of T35S, R1W; thence north to the NW corner of T34S, R1W; thence east to the point of beginning.

(4) The Umpqua Basin Open Burning Control Area is located in Douglas County with boundaries as generally depicted in **Figure 5**. The area is enclosed by a line beginning at a point approximately four miles ENE of the City of Oakland, Douglas County, at the NE corner of T25S, R5W, Willamette Meridian, thence south to the SE corner of T25S, R5W; thence east to the NE Corner of T26S, R4W; thence south to the SE corner of T27S, R4W; thence west to the SE corner of T27S, R5W; thence south to the SE corner of T30S, R5W; thence west to the SW corner of T30S, R6W; thence north to the NW corner of T29S, R6W; thence west to the SW corner of T28S, R7W thence north to the NW corner of T27S, R7W; thence east to the NE corner of T27S, R7W; thence north to the NW corner of T26, R6W; thence east to the NE corner of T26S, R6W; thence north to the NW corner of T25S, R5W; thence east to the point of beginning.

(5) The boundaries of the Willamette Valley Open Burning Control Area are generally depicted in Figures 1 and 2. The area includes all of Benton, Clackamas, Linn, Marion, Multnomah, Polk, Washington and Yamhill Counties and that portion of Lane County east of Range 7 West.

(6) The Klamath Basin Open Burning Control Area is located in Klamath County with boundaries generally depicted in Figure 6. The area is enclosed by a line beginning at the corner common to northwest corner of Section 31, Township 37 South, Range 9 East of the Willamette Meridian and southwest corner of Section 30 T37S, R9E W.M.; thence east approximately two miles to the northeast corner of Section 32; thence south approximately four miles to the southeast corner of Section 17, T38S, R9E W.M.; thence east approximately one mile to the southwest corner of Section 15,; thence north approximately one mile to the northwest corner of Section 15; thence east approximately 2 miles to the northeast corner of Section 14; thence south approximately one mile to the northwest corner of section 24; thence east approximately one mile to the northeast corner of Section 24; thence south approximately three miles to the southeast corner of Section 36; thence east approximately four miles to the northeast corner of Section 3, T39S, R10E W.M.; thence south approximately three miles to the southeast corner of Section 15; thence west approximately two miles to the southwest corner of Section16; thence south approximately two miles to the southeast corner of Section 29; thence west approximately five miles to the southwest corner of Section 27, T39S, R9E; thence north approximately one mile to the northeast corner of Section 27; thence west approximately four miles to the

southwest corner of Section 24, T39S R8E; thence north approximately two miles to the northeast corner of Section 13; thence west approximately one mile to the southwest corner of Section 11; thence north approximately four miles to the northwest corner of Section 26 T38S, R8E; thence west one mile to the southwest corner of Section 22; thence north approximately one mile to the northwest corner of Section 22; thence west approximately one mile to the southwest corner of Section 16; thence north approximately one mile to the northeast corner of Section 16; thence west approximately one mile to the southwest corner of Section 8; thence north approximately two miles to the northwest corner of Section 5; thence east to the northeast corner of Section 1; thence north approximately one mile to the point of beginning.

(7~~6~~) "Special Open Burning Control Areas" are established around cities within the Willamette Valley Open Burning Control Area. The boundaries of these special open burning control areas are determined as follows:

(a) Any area in or within three miles of the boundary of any city of more than 1,000 but less than 45,000 population;

(b) Any area in or within six miles of the boundary of any city of 45,000 or more population;

(c) Any area between areas established by this rule where the boundaries are separated by three miles or less;

(d) Whenever two or more cities have a common boundary, the total population of these cities will determine the applicability of subsection (a) or (b) of this section and the municipal boundaries of each of the cities must be used to determine the limit of the special open burning control area.

(8~~7~~) A domestic burning ban area around the Portland metropolitan area is generally depicted in **Figure 1A**. This area encompasses parts of the special control area in Clackamas, Multnomah and Washington Counties. Specific boundaries are listed in OAR 340-264-0120(5), 340-264-0130(5) and 340-264-0140(5). Domestic burning is prohibited in this area except as allowed pursuant to OAR 340-264-0180.

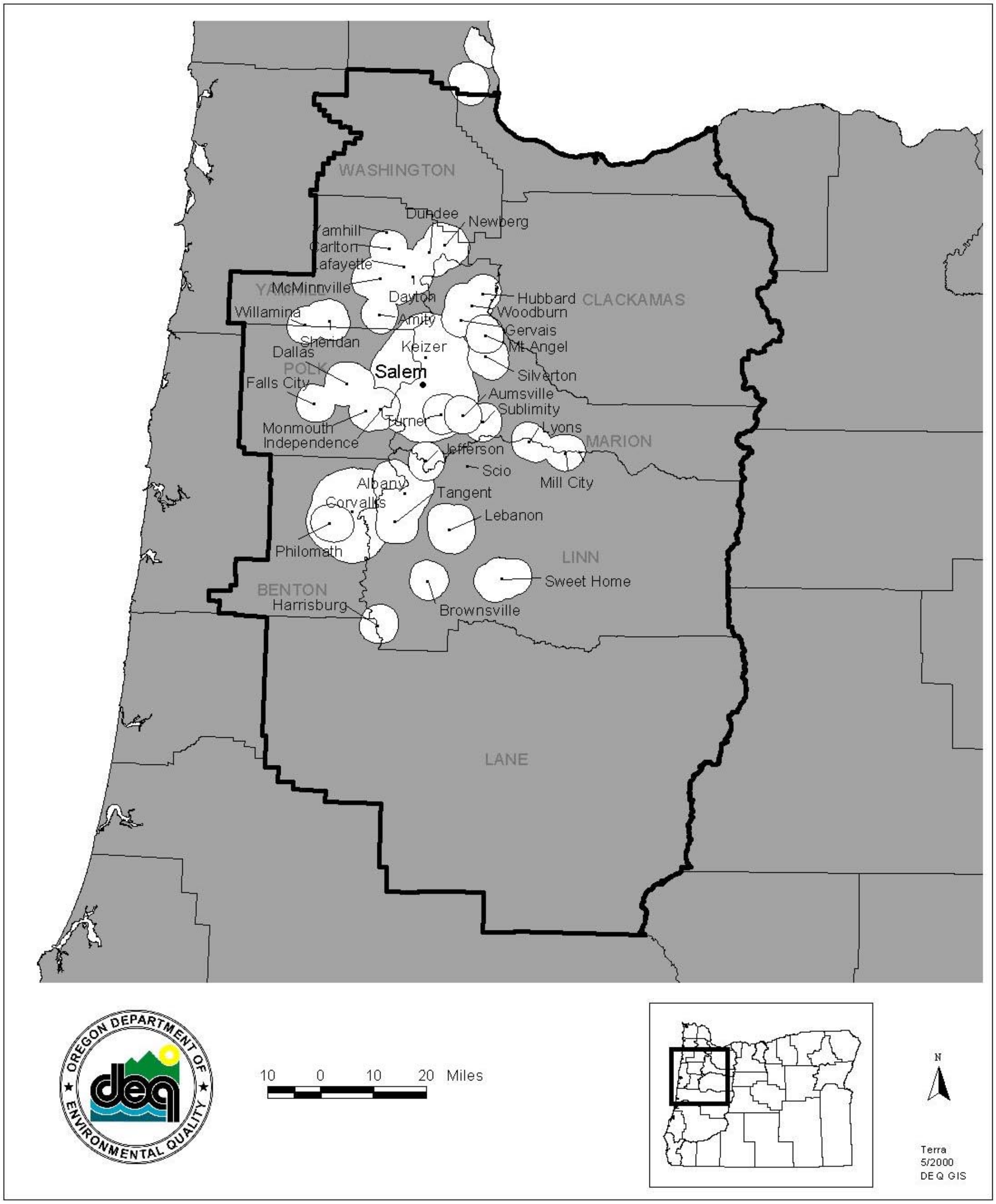
[**NOTE**: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[ED. NOTE: The Figure(s) referenced in this rule is not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.~~555~~025
Hist.: DEQ 27-1981, f. & ef. 9-8-81; DEQ 10-1984, f. 5-29-84, ef. 6-16-84; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0115; DEQ 21-2000, f. & cert. ef. 12-15-00 Renumbered from 340-264-0200.

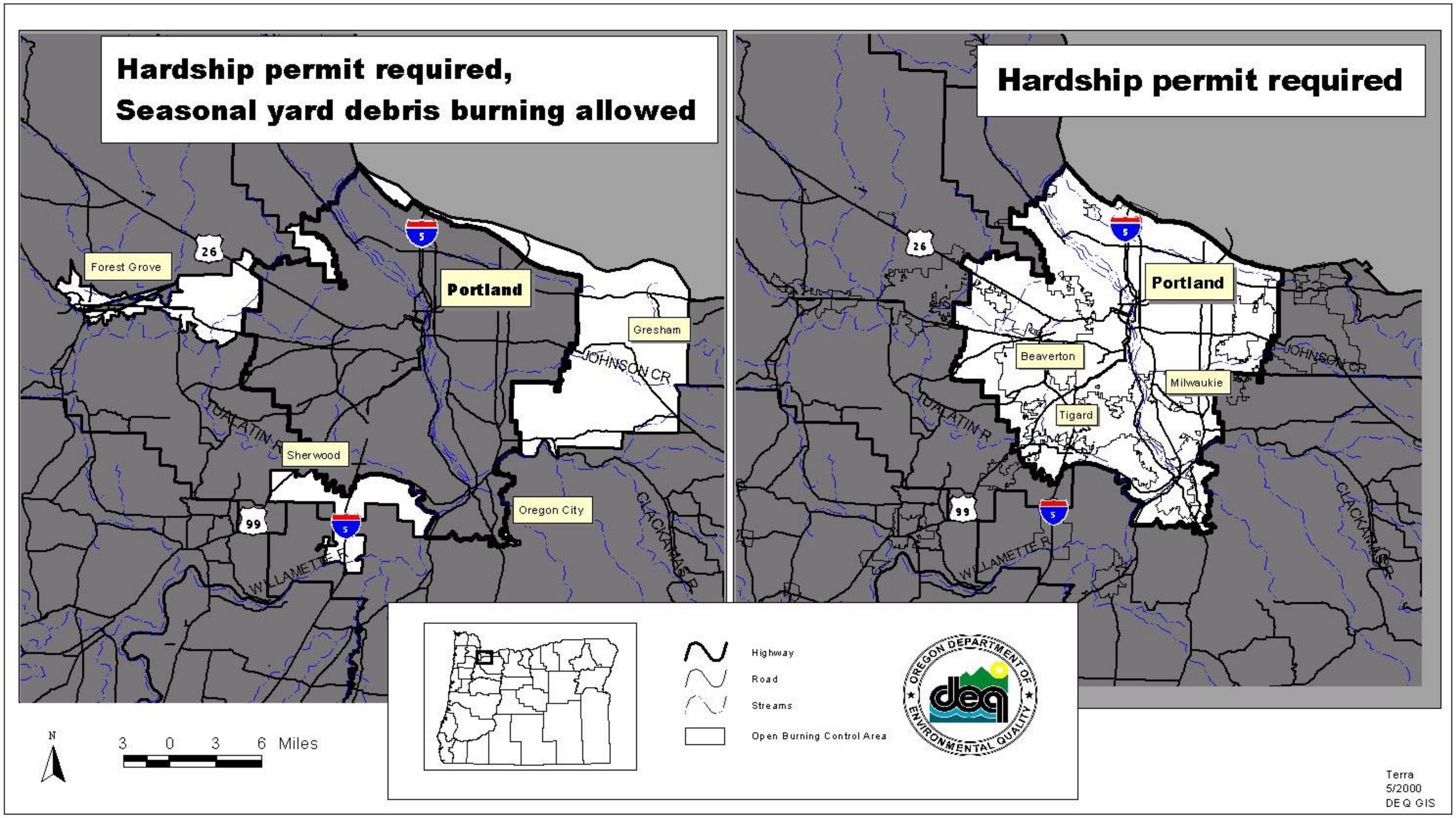
340-264-0078
Figure 1

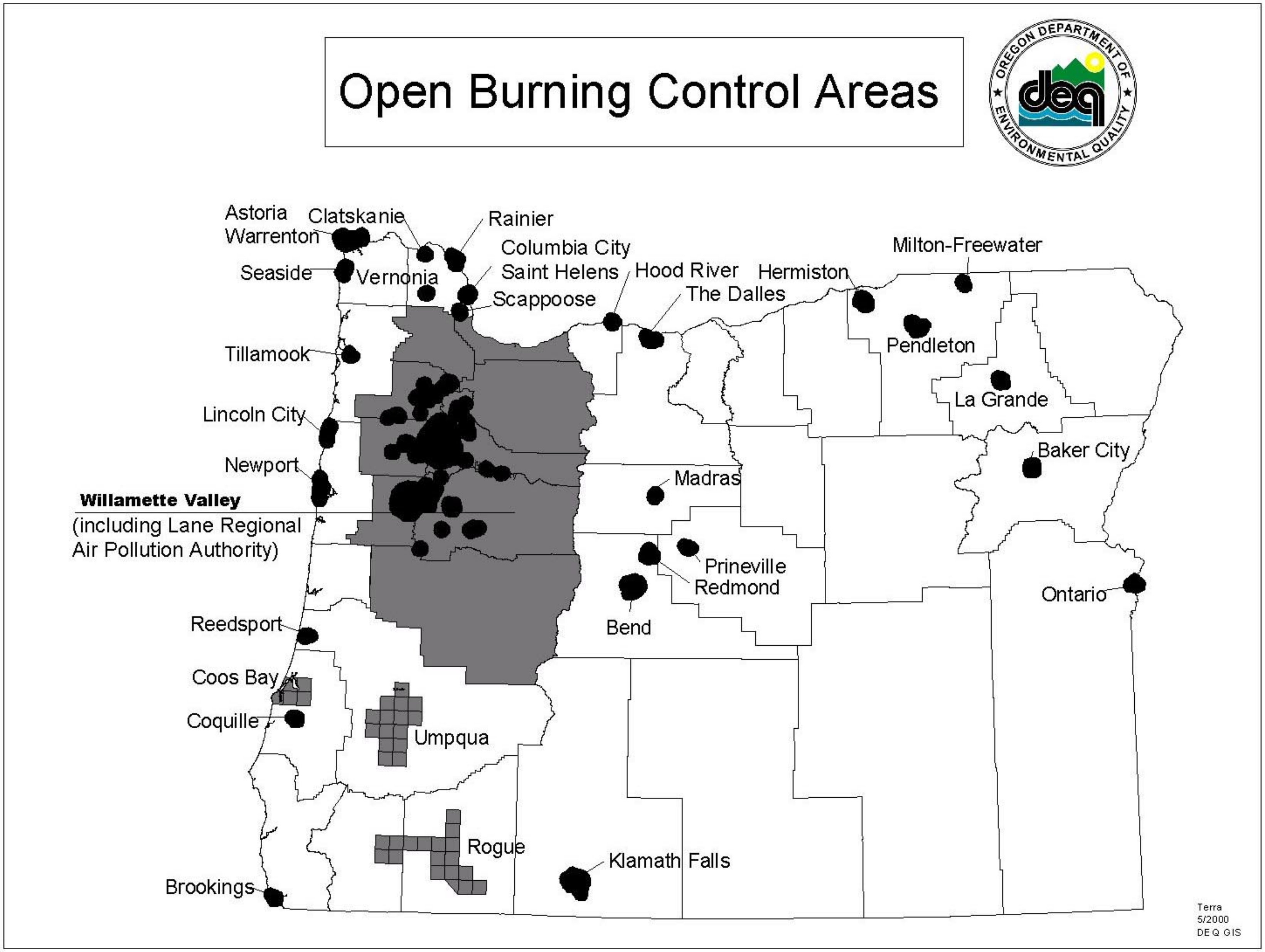
WILLAMETTE VALLEY OPEN BURNING CONTROL AREA



340-264-0078
Figure 1A

METROPOLITAN AREA BACKYARD BURNING BOUNDARIES





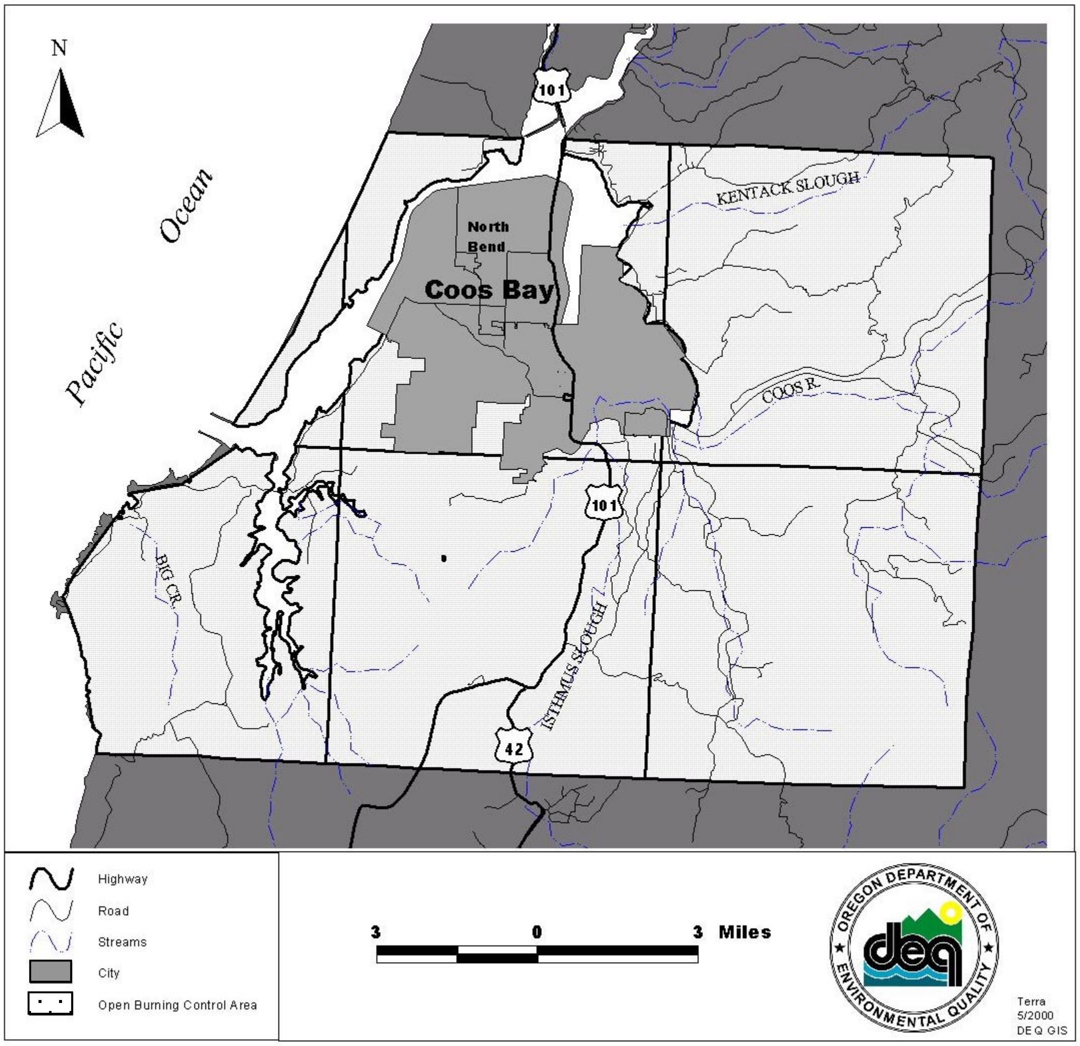
OPEN BURNING CONTROL AREAS

OUTSIDE OF WILLAMETTE VALLEY, CITIES EXCEEDING POPULATION OF 4,000

340-264-0078
Figure 2

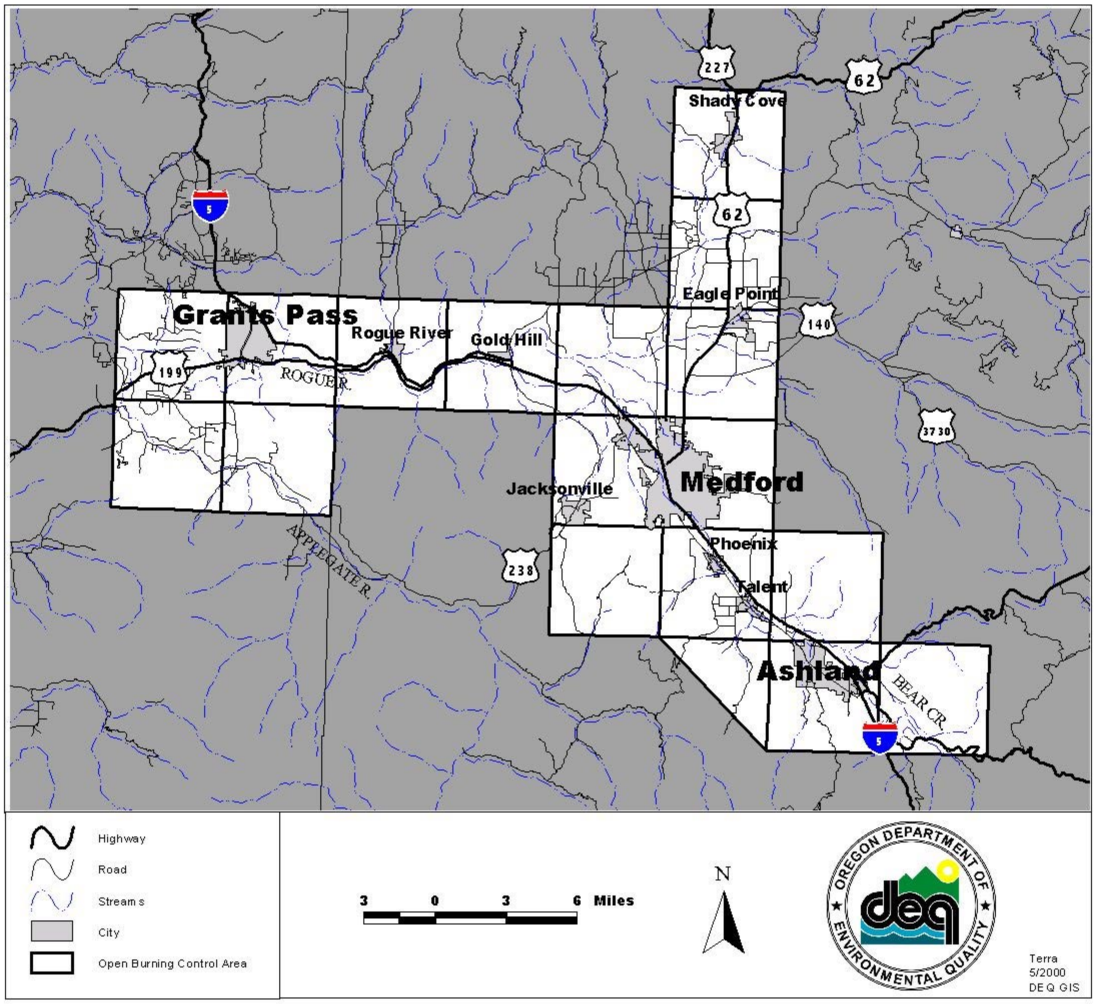
340-264-0078
Figure 3

COOS BAY OPEN BURNING CONTROL AREA



340-264-0078
Figure 4

ROGUE BASIN OPEN BURNING CONTROL AREA

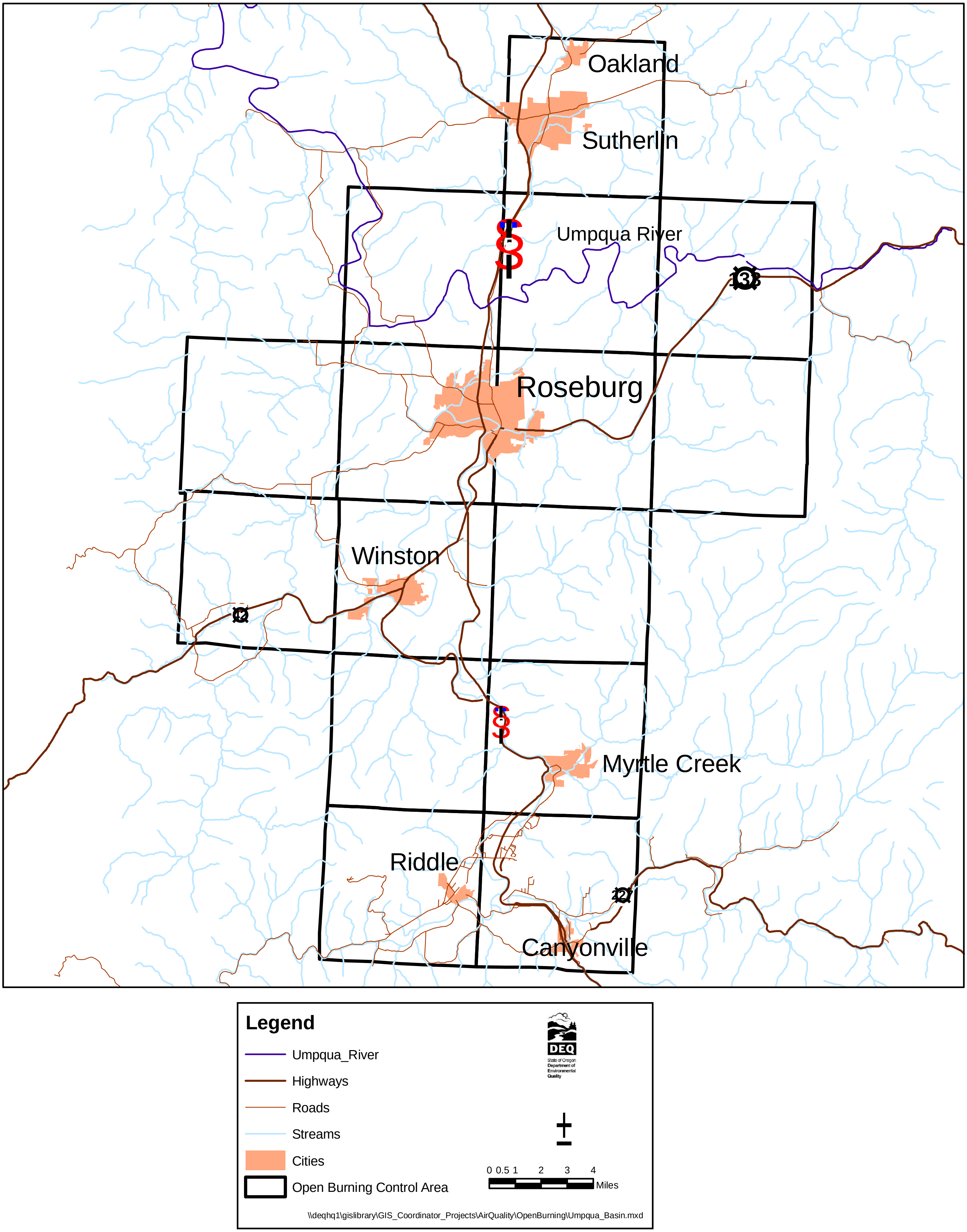


340-264-0078

Figure 5

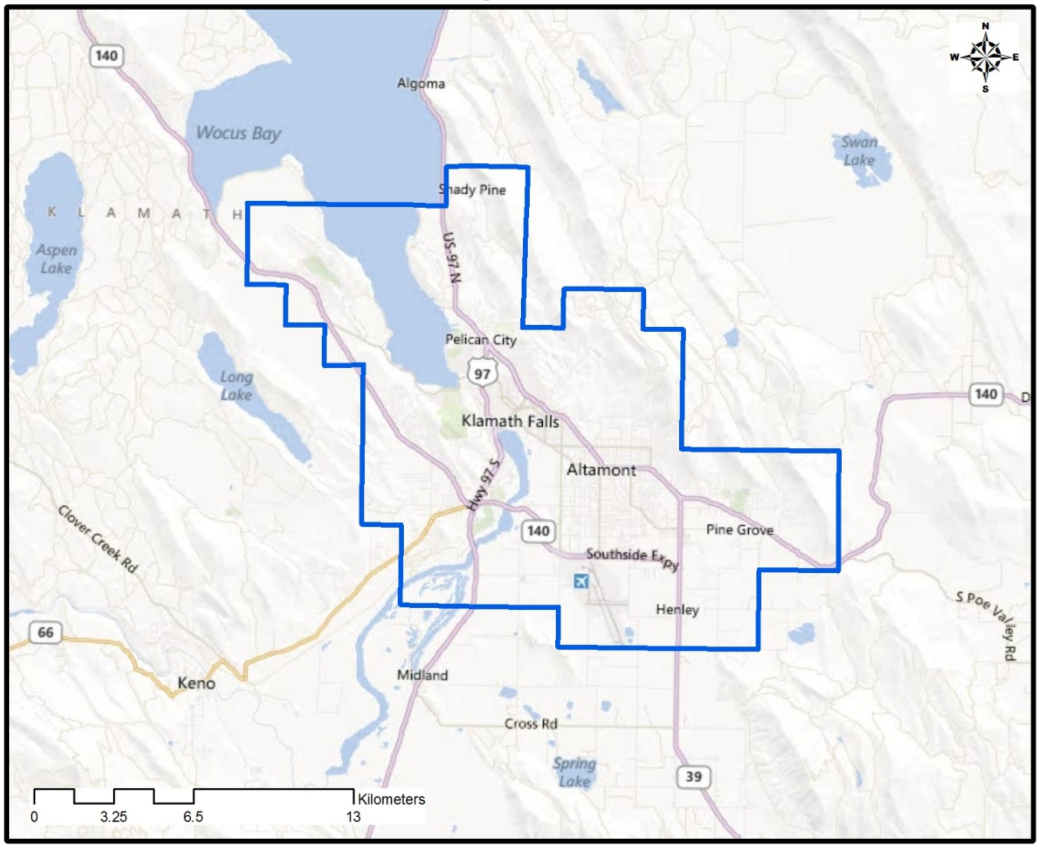
Attachment 3.2f, page 9

Umpqua Basin Open Burning Control Area



340-264-0078

Figure 6



Klamath Basin Open Burning Control Area

340-264-0080

County Listing of Specific Open Burning Rules

Except as otherwise provided, in addition to the general requirements and prohibitions listed in OAR 340-264-0050 and 340-264-0060, specific prohibitions of Agricultural, Commercial, Construction, Demolition, Domestic, and Industrial open burning are listed in separate rules for each county. The following list identifies the rule containing prohibitions of specific types of open burning applicable to a given county:

(1) Baker County -- OAR 340-264-0100.

(2) Benton County -- OAR 340-264-0110.

(3) Clackamas County -- OAR 340-264-0120.

(4) Clatsop County -- OAR 340-264-0100.

(5) Columbia County -- OAR 340-264-0150.

(6) Coos County -- OAR 340-264-0170.

(7) Crook County -- OAR 340-264-0100.

(8) Curry County -- OAR 340-264-0100.

(9) Deschutes County -- OAR 340-264-0100.

(10) Douglas County -- OAR 340-264-0170.

(11) Gilliam County -- OAR 340-264-0100.

(12) Grant County -- OAR 340-264-0100.

(13) Harney County -- OAR 340-264-0100.

(14) Hood River County -- OAR 340-264-0100.

(15) Jackson County -- OAR 340-264-0170.

(16) Jefferson County -- OAR 340-264-0100.

(17) Josephine County -- OAR 340-264-0170.

(18) Klamath County -- OAR 340-264-~~0100~~0175.

(19) Lake County -- OAR 340-264-0100.

(20) Lane County -- OAR 340-264-0160.

(21) Lincoln County -- OAR 340-264-0100.

(22) Linn County -- OAR 340-264-0110.

(23) Malheur County -- OAR 340-264-0100.

(24) Marion County -- OAR 340-264-0110.

(25) Morrow County -- OAR 340-264-0100.

(26) Multnomah County -- OAR 340-264-0130.

(27) Polk County -- OAR 340-264-0110.

(28) Sherman County -- OAR 340-264-0100.

(29) Tillamook County -- OAR 340-264-0100.

(30) Umatilla County -- OAR 340-264-0100.

(31) Union County -- OAR 340-264-0100.

(32) Wallowa County -- OAR 340-264-0100.

(33) Wasco County -- OAR 340-264-0100.

(34) Washington County -- OAR 340-264-0140.

(35) Wheeler County-- OAR 340-264-0100.

(36) Yamhill County -- OAR 340-264-0110.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented ORS 468A.~~555~~025
Hist.: DEQ 123, f. & ef. 10-20-76; DEQ 23-1979, f. & ef. 7-5-79; DEQ 1-1981(Temp), f. & ef. 1-9-81; DEQ 7-1981(Temp), f. & ef. 2-17-81; DEQ 8-1981(Temp), f. & ef. 3-13-81; DEQ 27-1981, f. & ef. 9-8-81; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0045; DEQ 21-2000, f. & cert. ef. 12-15-00

Open Burning Requirements

340-264-0100

Baker, Clatsop, Crook, Curry, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Lincoln, Malheur, Morrow, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco and Wheeler Counties

Open burning requirements for the counties of Baker, Clatsop, Crook, Curry, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Lincoln, Malheur, Morrow, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco and Wheeler:

(1) Industrial open burning is prohibited, except as provided in OAR 340-264-0180.

(2) Agricultural open burning is allowed subject to OAR 340-264-0050(5) and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(3) Commercial open burning:

(a) Commercial open burning is prohibited within Lincoln County except as provided in OAR 340-264-0180.

(b) Commercial open burning is allowed outside of open burning control areas subject to OAR 340-264-0050, 340-264-0060 and 340-264-0070, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal. Commercial open burning, unless authorized pursuant to 340-264-0180, is prohibited within three miles of the corporate city limits of the following open burning control areas. In addition, commercial open burning is prohibited in any area meeting the test in 340-264-0078(1):

(c) In Baker County, the City of Baker City;

(d) In Clatsop County, the Cities of Astoria, Seaside and Warrenton;

(e) In Crook County, the City of Prineville;

(f) In Curry County, the City of Brookings;

(g) In Deschutes County, the Cities of Bend and Redmond;

(h) In Hood River County, the City of Hood River;

(i) In Jefferson County, the City of Madras;

~~(j) In Klamath County, the City of Klamath Falls;~~

(j~~k~~) In Malheur County, the City of Ontario;

(~~l~~k) In Tillamook County, the City of Tillamook;

(l~~m~~) In Umatilla County, the Cities of Hermiston, Milton-Freewater and Pendleton;

(m~~n~~) In Union County, the City of La Grande;

(~~o~~n) In Wasco County, the City of The Dalles.

(4) Construction and Demolition open burning outside of an open burning control area is allowed subject to the requirements and prohibitions of local jurisdictions, the State Fire Marshal, OAR 340-264-0050, 340-264-0060, and 340-264-0070. Construction and Demolition open burning, unless authorized pursuant to OAR 340-264-0180, is prohibited within three miles of the corporate city limits of the following open burning control areas. In addition, construction and demolition burning is prohibited in any area meeting the standard in OAR 340-264-0078(1):

(a) In Baker County, the City of Baker City;

(b) In Clatsop County, the Cities of Astoria, Seaside and Warrenton;

(c) In Crook County, the City of Prineville;

(d) In Curry County, the City of Brookings;

(e) In Deschutes County, the Cities of Bend and Redmond;

(f) In Hood River County, the City of Hood River;

(g) In Jefferson County, the City of Madras;

~~(h) In Klamath County, the City of Klamath Falls;~~

(h~~i~~) In Lincoln County, the Cities of Lincoln City and Newport;

(i~~j~~) In Malheur County, the City of Ontario;

(j~~k~~) In Tillamook County, the City of Tillamook;

(k~~l~~) In Umatilla County, the Cities of Hermiston, Milton-Freewater and Pendleton;

(l~~m~~) In Union County, the City of La Grande;

(m~~n~~) In Wasco County, the City of The Dalles.

(5) Domestic open burning is allowed subject to the requirements and prohibitions of local jurisdictions, the State Fire Marshal, and OAR 340-264-0050, 340-264-0060 and 340-264-0070.

(6) Slash burning on forest land within open burning control areas not regulated by the Department of Forestry under the Smoke Management Plan is prohibited, except as provided in OAR 340-264-0180.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.~~555~~025
Hist.: DEQ 27-1981, f. & ef. 9-8-81; DEQ 6-1992, f. & cert. ef. 3-11-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0055; DEQ 21-2000, f. & cert. ef. 12-15-00

340-264-0175

Klamath County

Open burning requirements for Klamath County:

(1) Open burning control areas:

(a) The Klamath Basin open burning control area as generally described in OAR 340-264-0078(6) and depicted in **Figure 6** is located in Klamath County;

(2) Industrial open burning is prohibited unless authorized pursuant to OAR 340-264-0180.

(3) Agricultural open burning is allowed subject to OAR 340-264-0050(5) and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(4) Commercial open burning is prohibited within the Klamath Basin open burning control areas and within three miles of the corporate city limits of other areas that meet the standard in OAR 340-264-0078(1), unless authorized pursuant to 340-264-0180. Commercial open burning is allowed in all other areas of this county subject to 340-264-0050, 340-264-0060 and 340-264-0070 and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(5) Construction and Demolition open burning is prohibited within the Klamath Basin open burning control areas and within three miles of the corporate city limits of other areas that meet the standard within OAR 340-264-0078(1),

unless authorized pursuant to 340-264-0180. Construction and Demolition open burning is allowed in other areas of these counties subject to 340-264-0050, 340-264-0060 and 340-264-0070, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(6) Domestic open burning is allowed subject to OAR 340-264-0050, 340-264-0060, 340-264-0070 and section (7) of this rule, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(7) Slash burning on forest land within open burning control areas not regulated by the Department of Forestry under the Smoke Management Program is prohibited, except as provided in OAR 340-264-0180.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[ED. NOTE: The figures referenced in this rule are not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

State Implementation Plan Revision

KLAMATH FALLS FINE PARTICULATE MATTER ($PM_{2.5}$) ATTAINMENT PLAN
SECTION 4.62 OF THE
STATE IMPLEMENTATION PLAN

STATE OF OREGON
DEPARTMENT OF ENVIRONMENTAL QUALITY
811 SW SIXTH AVENUE
PORTLAND, OR 97204-1390

EXECUTIVE SUMMARY

Klamath Falls has a lengthy history of identifying and successfully working to solve problems with particulate air pollution. In the late 1980s Klamath Falls had particulate pollution that violated federal standards by more than five times. By January 1991 the community's particulate reduction strategies achieved federal standards, and the area was designated as "in attainment" in 2003.

In September 2006, the U.S. Environmental Protection Agency (EPA) revised the PM standard by establishing a daily (24-hr) $PM_{2.5}$ (fine particulate) standard of 35 $\mu g/m^3$ and retaining the annual $PM_{2.5}$ standard of 15 $\mu g/m^3$. Areas in violation of the $PM_{2.5}$ standard, based on the most recent three years of federal reference monitoring data, are designated as a "nonattainment area" by the EPA. Because high winter air pollution levels violated the daily $PM_{2.5}$ standard, EPA designated Klamath Falls as a nonattainment area in December 2009.

Fine particulate matter ($PM_{2.5}$) is a mixture of extremely small particles and droplets in the air and is known to cause or contribute to respiratory disease, asthma attacks, heart problems, and premature death. Unhealthy accumulation of $PM_{2.5}$ continues to be a wintertime phenomena in the Klamath Falls basin due to cold air inversions trapping emissions near the ground. The predominant source of particulate in Klamath Falls in the winter has been and continues to be residential wood heating. DEQ and Klamath Falls were required to develop an attainment plan to bring air quality into compliance with the standard as soon as possible, and submit this plan to EPA. EPA must approve the plan and publish its findings in the Federal Register. The proposed plan adoption will amend the State Clean Air Act Implementation Plan (SIP).The deadline for reducing pollution sufficiently to meet the standard is December 2014.

Attainment Plan Overview

The Klamath Air Quality Advisory Committee and Klamath County Commissioners have collaborated with DEQ to develop and recommend a plan to attain the $PM_{2.5}$ standard. The plan describes the proposed $PM_{2.5}$ reduction strategies, including what action will be taken, who will conduct the work, and when and how it will be done. It is a comprehensive mixture of emission reduction strategies consisting of local ordinances, DEQ regulations, interagency agreements and non-regulatory elements including incentives and education. The plan also includes additional strategies recommended by the advisory committee that, while not needed for $PM_{2.5}$ compliance, will benefit air quality in general. Based on its analysis, DEQ fully expects that the attainment plan will achieve the $PM_{2.5}$ standard by December 2014. However, should the community fail to meet the standard; automatic contingency measures identified in this plan will take effect.
DEQ will determine whether the attainment plan accomplishes its objective of meeting the federal PM2.5 standard deadline by tracking particulate monitoring data at the Peterson School monitor in Klamath Falls. This monitor is the established federal reference monitor and is located in an area where the highest levels of PM 2.5 accumulate in Klamath Falls. If the area does not meet the federal standard by the deadline, DEQ will continue to evaluate monitoring data for progress during implementation of the contingency measures. Designation back to attainment is possible only after Klamath Falls meets the standards for three consecutive years and a maintenance plan is drafted, adopted by the Environmental Quality Commission (EQC)

and approved by EPA. EPA may re-designate Klamath Falls back into attainment in the Federal Register.

Elements of the Attainment Plan

The Klamath Falls $PM_{2.5}$ attainment plan consists of early reduction strategies the community adopted between 2007 and 2009, and new strategies developed by DEQ and the advisory committee in 2012. Both sets of strategies are included in the attainment plan proposed for adoption. Because residential wood burning emissions continue to make up the majority of harmful particulate in Klamath Falls, the most significant proposed particulate reductions are from enhancements to the community's woodstove curtailment program. The curtailment program is one of the key elements in ensuring Klamath Falls will attain the $PM_{2.5}$ standard. DEQ performed an analysis of the reductions expected from the attainment plan using a proportional mathematical analysis or "rollback model". This model demonstrated that by continuing to implement the early reduction strategies Klamath Falls will meet the $PM_{2.5}$ standard by 2014 and that the new strategy reductions will provide an additional protective buffer to ensure compliance.

Current reduction strategies

Klamath County Clean Air Ordinance

In November 2007, Klamath County revised their Clean Air Ordinance to implement early particulate reductions, including:

- Revised woodstove curtailment levels to increase the number of days when burning is restricted or prohibited;
- Tightening enforcement of wood stove curtailment;
- Requiring removal of an uncertified woodstove upon sale of a home;
- Reducing by half the number of residential open burning days;
- Prohibiting use of burn barrels.

Woodstove changeouts

Utilizing funding from the EPA, city of Klamath Falls and federal American Recovery and Reinvestment Act (ARRA) stimulus money, 584 uncertified woodstoves were replaced with new, cleaner burning heating units such as certified woodstoves, pellet stoves, heat exchangers, and natural gas furnaces.

New reduction strategies

Additional $PM_{2.5}$ emission reduction measures recommended by the Klamath Air Quality Advisory Committee and approved by Klamath County Commissioners include residential wood burning, industrial and agricultural and forest burning measures.

Residential wood burning

Strategies to reduce emissions from residential wood burning include:

- Pursuing funds to continue offering woodstove change outs and fireplace conversions within the nonattainment area;
- A continued focus of enforcement on individuals habitually violating curtailment requirements;
- Amending the county building code to set a new residential construction requirement for installation of clean fireplaces that emit 5.1 g/kg or less as determined by ASTM International;
- Expansion of educational efforts to reduce $PM_{2.5}$ from wood smoke.

Industrial emissions

Although industrial emissions make up a smaller percentage of $PM_{2.5}$ measured in Klamath Falls, there are several proposed particulate reduction measures that are reasonably available:

- In DEQ rules, limit industrial boiler emissions to 20% opacity, a measure of particulate density;
- In DEQ rules for wood products and other major industrial facilities require controls on fugitive emissions, or particulates that escape from windows, doors, storage piles and roadways;
- In DEQ rules require industrial facilities to use best operations and maintenance practices to prevent breakdowns and ensure proper operation of pollution control equipment.
- Allowing woodstove offsets for new and expanding industrial facilities

Designation of the Klamath Falls area as nonattainment for $PM_{2.5}$ activated existing state and federal regulations for major industrial sources. These requirements, known as New Source Review rules, require strict $PM_{2.5}$ pollution controls on new and expanding industry, as well as the requirement that facilities offset $PM_{2.5}$ increases with decreases obtained from other area industrial facilities. An additional element of the attainment plan provides regulatory flexibility for new and expanding industry by allowing them to obtain particulate emission offsets and reduce air pollution by working with homeowners to remove and destroy dirty uncertified wood stoves. Facilities would be able to increase their emissions one ton for every one ton of particulate reduced through woodstove removal. This measure provides the dual benefit of further removing dirty uncertified woodstoves from the community and providing an additional opportunity for economic growth.

Elements of the Contingency Plan

In the event that the attainment measures fail to realize sufficient emission reductions to meet the $PM_{2.5}$ standard by December 2014, the Clean Air Act requires contingency measures to be fully adopted rules or control measures that are ready to be implemented quickly and take effect automatically. The contingency measures function as a backstop until such time as the plan can be reevaluated and corrected.

Residential wood burning

The attainment plan contingency strategies to reduce $PM_{2.5}$ emissions from wood burning would

- Prohibit the use of non-ASTM international certified fireplaces in the Klamath Falls area at all times.

Industrial emissions

The attainment plan includes two contingency strategies to reduce $PM_{2.5}$ from industrial facilities:

- Further limiting industrial emissions by decreasing the grain loading limit, a measurement of particulate density. The proposal would decrease the grain loading standard from 0.2 to 0.1 grains per standard cubic foot.
- Requiring installation and use of continuous emission monitoring equipment for wood – fired boilers.

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FIGURES

TABLES

BACKGROUND

Introduction

In September 2006, the U.S. Environmental Protection Agency (EPA) strengthened the daily (24-hr) $PM_{2.5}$ (fine particulate) standard by lowering the level from 65 µg/m3 to 35 µg/m3 and retained the annual $PM_{2.5}$ standard of 15 µg/m3. Fine particulate matter ($PM_{2.5}$) is a mixture of extremely small particles and droplets in the air and is known to cause or contribute to respiratory disease, asthma attacks, heart problems, and premature death. Areas in violation of the $PM_{2.5}$ standard (based on the most recent three years of federal reference monitoring data) are designated as a "nonattainment area" by the EPA. Klamath Falls has been designated as nonattainment for the daily $PM_{2.5}$ standard. DEQ and Klamath Falls must develop an attainment plan that will bring air quality into compliance by December 2014, and submit this plan to EPA.

What Is PM2.5?

This plan addresses the 24-hour ambient air quality standard for $PM_{2.5}$. Particulate matter (PM) is the general term used for a mixture of solid particles or liquid droplets found in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with an electron microscope. These particles come in a wide range of sizes ("fine" particles are less than $_{2.5}$ micrometers in diameter, $PM_{2.5}$, and coarser-sized particles, PM10, are larger than $_{2.5}$ micrometers), and originate from many different sources.
Fine particulate matter ($PM_{2.5}$) in the atmosphere is composed of a complex mixture of particles: sulfate, nitrate, and ammonium particles; particle-bound water; elemental carbon; a great variety of organic compounds (or volatile organic compounds (VOCs)); and crustal material. Fine particulate matter, also known as $PM_{2.5}$, is referred to as "primary" if it is directly emitted into the air as a solid or liquid particle and its chemical form is stable. $PM_{2.5}$ formed near its source by condensation processes in the atmosphere is also considered primary $PM_{2.5}$. Primary $PM_{2.5}$ includes soot from diesel engines, fuel combustion from residential fireplaces and woodstoves, pile and forest burning.

$PM_{2.5}$ that is formed by chemical reactions of gases in the atmosphere is referred to as "secondary" $PM_{2.5}$. These reactions form condensable matter that either form new particles or condense onto other particles in the air. Most of the sulfate and nitrate and a portion of the organic particles in the atmosphere are formed by such chemical reactions. As such, sulfur dioxide (SO2), oxides of nitrogen (NOx), some VOC, and ammonia can be considered $PM_{2.5}$ precursors. Secondary $PM_{2.5}$ formation depends on numerous factors including the concentrations of precursors; the concentrations of other gaseous reactive species, and the interactions of the precursors and pre-existing particles with cloud or fog droplets or with the liquid film on solid particles. EPA has established a policy regarding $PM_{2.5}$ precursors for planning and regulatory purposes in its 2007 $PM_{2.5}$ Implementation Rule that states must address SO2 and NOx as a $PM_{2.5}$ precursor and evaluate reasonable controls for these pollutants.

Health Effects of $PM_{2.5}$

$PM_{2.5}$ can accumulate in the respiratory system and are associated with numerous health effects. Sensitive groups that are at greatest risk include the elderly, individuals with cardiopulmonary disease such as asthma, and children. Both long- and short-term exposures to $PM_{2.5}$ cause adverse health effects. Long-term exposure to fine particulates, which is based on an annual standard, is linked to premature death, especially related to heart disease, cardiovascular effects, such as heart attacks and strokes; reduced lung development and chronic respiratory diseases, such as asthma, in children; and some studies suggest that long-term exposure to $PM_{2.5}$ may be linked to cancer and to harmful developmental and reproductive effects, such as infant mortality and low birth weight. Short-term exposure to fine particulates, which is based on a daily standard, include premature death, especially death related to heart and lung diseases; increased hospital admissions and emergency department visits for cardiovascular effects, such as non-fatal heart attacks and strokes. Short-term $PM_{2.5}$ exposures also are linked to increased hospital admissions and emergency department visits for respiratory effects, such as asthma attacks, as well as increased respiratory symptoms, such as coughing, wheezing and shortness of breath. In addition, short-term $PM_{2.5}$ exposures are linked to reduced lung function, especially in children and people with lung diseases, such as asthma.

National Ambient Air Quality Standards for $PM_{2.5}$

EPA has established National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$ as a mass-based concentration of airborne particulate matter with aerodynamic diameters less than 2.5 microns. The EPA standard is 35 micrograms per cubic meter (µg/m^3) for a daily (24-hour) average and 15 µg/m^3 as an annual average.

Annual $PM_{2.5}$ Standard

The annual standard for $PM_{2.5}$ is met whenever the three year average of the annual mean$PM_{2.5}$ concentrations for designated monitor is less than or equal to 15.0 µg/m^3. Klamath Falls has met this standard since the monitoring started at Peterson School, as shown below in Figure 1.

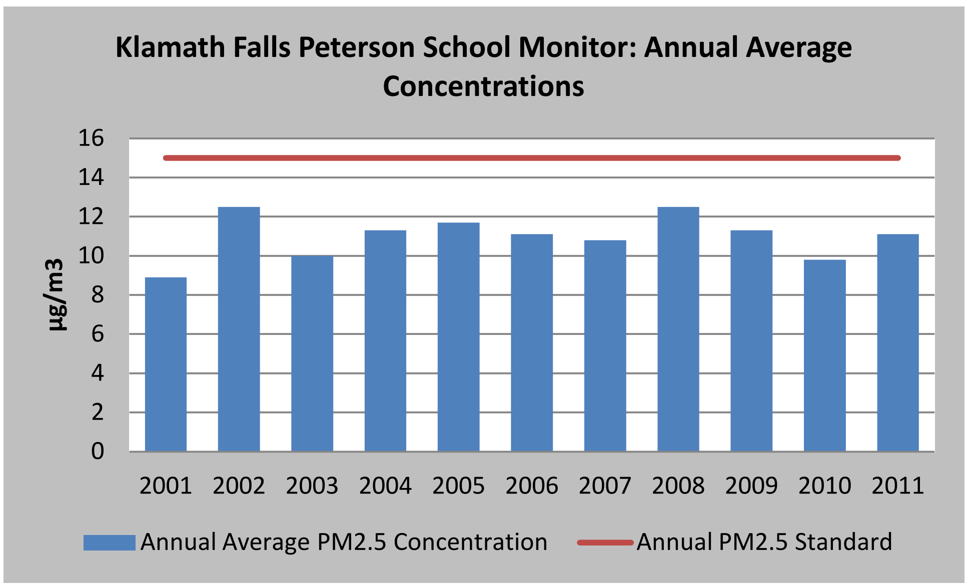

Figure 1: Average annual PM2.5 concentrations measured at Peterson School monitor

24 Hour $PM_{2.5}$ Standard

The 24 hour standard for $PM_{2.5}$ is met whenever the three year average of the annual 98th percentile of values at monitoring sites is less than or equal to 35 µg/m3. Figure 2shows the 98th percentile concentrations for each year from 2001 through 2011. After the $PM_{2.5}$ standard was revised to a more protective concentration in 2006, measurements at the Peterson School monitor indicated that Klamath Falls was not in compliance with the 24 hour standard.

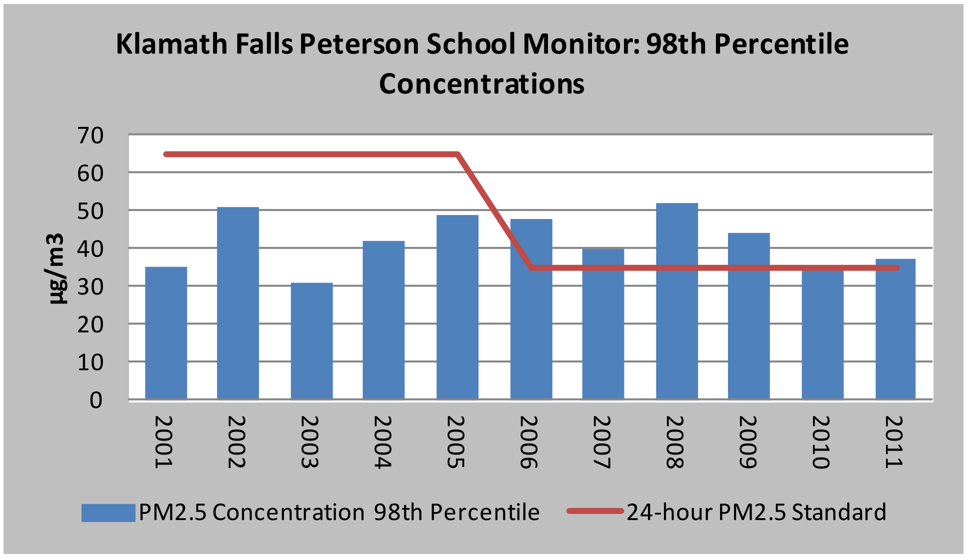

Figure 2: 98th percentile concentrations measured at Peterson School monitor[1]

Klamath Falls Area Description

Klamath Falls is located in south central Oregon at an elevation of 4,105 feet. The Klamath Falls nonattainment area as established by EPA and shown in figure 3 was estimated to have a population of 46,588 in 2008. Based on the long-range forecast, the Klamath Falls nonattainment area population is expected to grow to approximately 48,097 by 2014 (0.54 percent per year non-lineal compounded average growth). The City of Klamath Falls serves as an important commercial center for south central Oregon.

The Klamath Basin is a relatively flat area of an old high elevation lake-bed that is drained by the Klamath River. Occasional hills and a system of elongated ridges confine the basin and the greater Klamath Falls area to the east and west. Most of the Klamath Falls residential area, especially the south suburban area, is located on the lower elevation area. Because of these features, Klamath Falls can experience very strong and shallow nighttime inversions that break up with daytime solar heating. In the wintertime, frigid arctic air masses frequently move down Upper Klamath Lake and invade the Klamath Basin. Temperatures can remain well below freezing for several weeks at a time. Under these conditions, these strong inversions occur over the Klamath Basin concentrating emissions in the south suburban area of Klamath Falls.

[1] Current 98th percentile for 2011 is 37.1 µg/m3; however Klamath County Commissioners have requested the exceedance of 37.8 µg/m3 on December 14, 2011 be looked at as an exceptional event due to a hay fire started by spontaneous combustion that caused the exceedance. Should that exceedance be considered an exceptional event, the 2011 98th percentile would become 35.5 µg/m3.

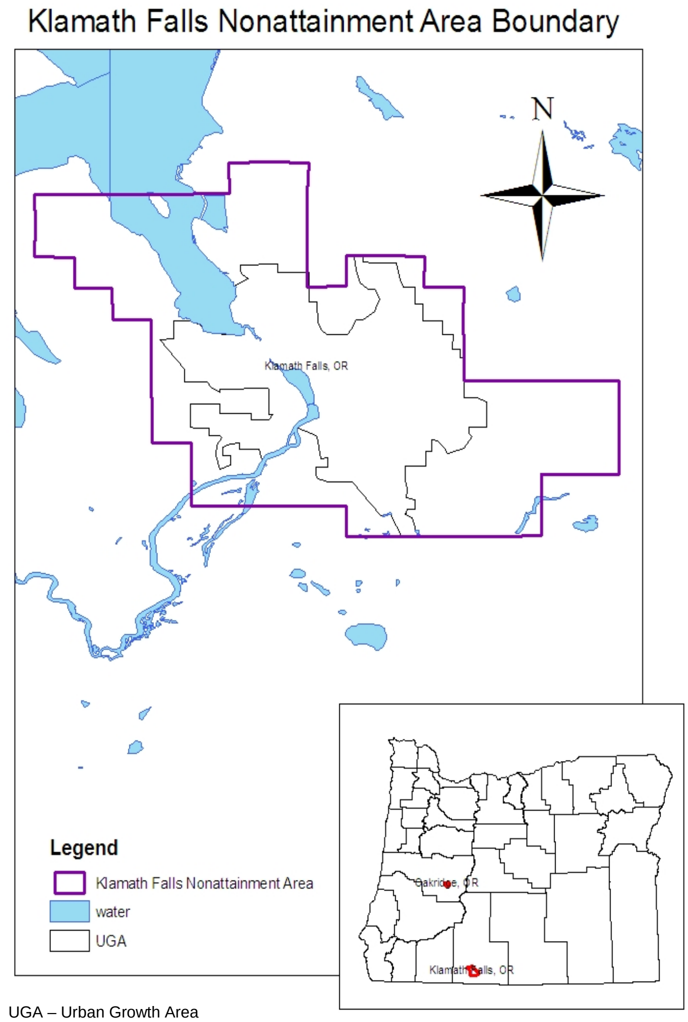

Figure 3*: Klamath Falls Nonattainment Area Boundary*

History of Efforts to Address Particulate Matter in Klamath Falls

This is not the first time Klamath Falls has struggled to meet air quality standards. In 1987, Klamath Falls was designated a nonattainment area by the Environmental Protection Agency (EPA) for PM_{10} – particulate matter 10 microns and smaller. A PM_{10} attainment plan was developed for the Klamath Falls Urban Growth Boundary (UGB) by 1991, however, at that time the area still had not met the standard. DEQ subsequently revised the PM_{10} plan and submitted an addendum to EPA in 1995. EPA approved both the attainment plan and the addendum on April 14, 1997. In 2002, DEQ submitted a maintenance plan for PM_{10}. The PM_{10} maintenance plan was approved by EPA and Klamath Falls was redesignated to attainment for PM_{10} on October 21, 2003. Both the attainment plan and maintenance plan included a key strategy of a mandatory woodstove curtailment program and a large woodstove change-out program. This was accomplished through citizen involvement in Klamath Falls and the citizenry addressing it at a local level both through ordinance and education of neighbor to neighbor. As a result, the area was able to meet and continues to meet the PM_{10} standards.

In 1997, EPA revised the particulate standard to include $PM_{2.5}$ and established a daily standard of 65 µg/m^3. The original PM_{10} strategies included in the attainment plan were so successful in maintaining clean air that Klamath Falls met the fine particulate ($PM_{2.5}$) standard. By 2006, however, EPA modified the $PM_{2.5}$ standard again based on the latest health effects data, lowering it to 35 µg/m^3. Klamath Falls has struggled to meet this new daily $PM_{2.5}$ standard. DEQ has measured particulate at the same location in the Klamath Falls UGB (Peterson School on Clinton Street) since 1996 and conducted numerous saturation surveys to confirm Peterson School is still the appropriate location for the monitor.

Purpose of the Attainment Plan

This document provides a pathway to return the Klamath Falls Nonattainment Area (NAA) to attainment for $PM_{2.5}$ (state classification will be "maintenance"). It also is a plan to ensure Klamath Falls meets the 24-hour and annual National Ambient Air Quality Standards for $PM_{2.5}$ and maintains these standards into the future. The attainment plan provides information on the emissions contributing to the area, emission reduction strategies, and a technical demonstration (rollback analysis) of how the strategies will ensure Klamath Falls meets the $PM_{2.5}$ standards by December 2014. A non attainment area can demonstrate attainment by meeting the standard for three consecutive years based on collected monitoring data. Should the community fail to meet the standard by 2014, automatic contingency measures will take effect and are clearly identified in this plan. This plan will be adopted by the state and then submitted for approval to EPA.

DEQ relied on the involvement of the local Klamath Air Quality Advisory Committee, the Klamath County Commissioners, and the Oregon Department of Transportation (ODOT) to develop the $PM_{2.5}$ attainment plan. The Advisory Committee prepared a report that was submitted to the Klamath County Commissioners and to DEQ for input into developing the plan.

MONITORING AND EMISSION INVENTORY

Ambient Air Quality Monitoring in Klamath Falls

The Klamath Falls area has one particulate ($PM_{2.5}$) monitoring site with the sampler located at 4856 Clinton Street, also known as Peterson School. DEQ has monitored at the Peterson School site since 1987 for PM_{10} and since 1999 for $PM_{2.5}$. The Peterson School represents one of the higher $PM_{2.5}$ concentration areas and is a representative area of where people live, work, and play. After rigorous quality assurance, the data from the Peterson School site is transferred to EPA's database. The data from the Peterson School monitor was used as the basis for the nonattainment determination and for determining compliance with the standard.

Figure 4*: Smoke inversion over south suburbs where Peterson School is located. Inversion showing particulate matter on the morning of December 8th, 2011*

Verification of Monitoring Location

DEQ has conducted field studies to verify that the location of the $PM_{2.5}$ monitor generally represents peak level $PM_{2.5}$ concentrations within the nonattainment area boundary. DEQ conducted three saturation surveys, one in 1996-1997, and another in 2000-2001, and most recently in 2010-2011. DEQ wanted to survey areas to the northwest of the Peterson School site to see if fine particulate was being transported into southeast Klamath Falls (referred to in this report as the Valley) from sources in that area or upwind of northwest Klamath Falls. Sources from northwest Klamath Falls were suspected because on days with elevated levels of $PM_{2.5}$, the wind was light but was from the northwest. The 2010-2011 $PM_{2.5}$ saturation survey results are shown in Figure 5 while methods and maps of the 1996-1997 survey and 2000-2001 survey are described in Appendix A-1 and A-2.

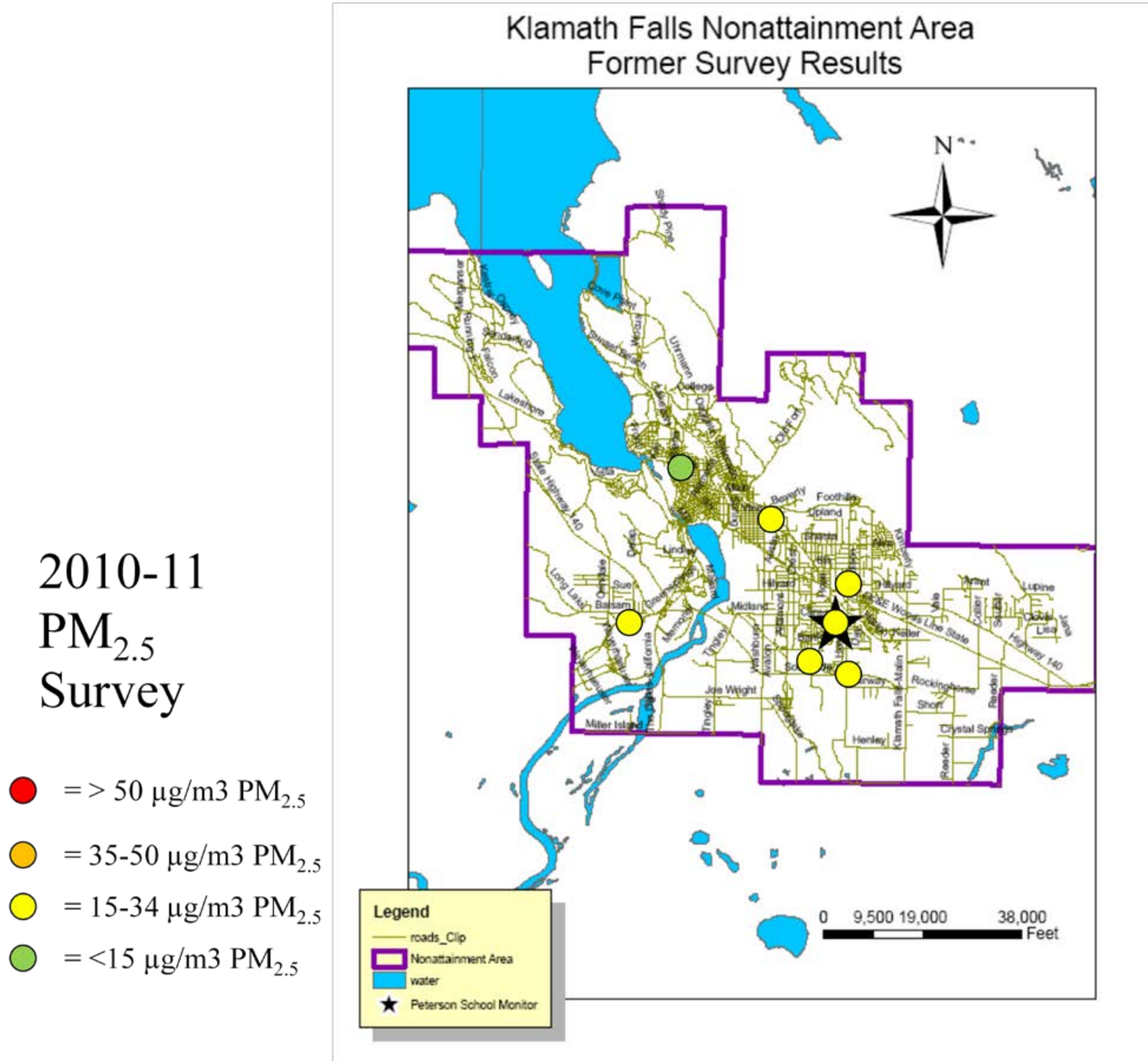

Figure 5*: Klamath Falls 2010-2011 Saturation Survey*

The survey results showed that the neighborhood in the Valley to the southeast of Klamath Falls had higher levels than the northwest part of the Klamath Falls. Within the valley the highest levels were at Peterson School, therefore it was confirmed that this site represents peak levels of $PM_{2.5}$ concentrations in Klamath Falls. In addition, the Peterson School monitor also represents an area where people live, work, and play, reconfirming the monitor location is the most appropriate for Klamath Falls. Details of the 2010-2011 Saturation Survey are available in A3-1 and A3-2.

Additional Monitoring

In addition, between January 2009 and October 2010, a background sampler was located at Stateline road on the California-Oregon border a couple of miles west of Merrill, Oregon. This monitor was put in place to provide comparison concentrations outside of the nonattainment area. The background sampler confirms emissions from far outside the nonattainment area as being low. From the results, DEQ concludes the bulk of the emissions affecting exceedance events are generated inside the nonattainment area. For more information about the background sampler results, please see Appendix A-4.

$PM_{2.5}$ and Precursor Emission Estimates

The analysis of $PM_{2.5}$ levels begins with an assessment of $PM_{2.5}$ and its precursor emissions occurring in Klamath Falls. Emissions are estimated for a wide variety of sources, and are summarized into four major categories. These include major point sources (industrial facilities), on-road mobile sources (e.g. car and truck exhaust, road dust), non-road mobile sources (e.g., construction equipment, recreational off road vehicles, lawn and garden equipment), and area sources (e.g., fugitive dust sources, outdoor burning, woodstoves).

$PM_{2.5}$ emissions are estimated using many sources of information, including industrial permits, population, housing, employment information, and estimates of motor vehicle travel in the nonattainment area. A “base year” emissions inventory (EI) was created to estimate actual $PM_{2.5}$ emissions occurring in the airshed. For the Klamath Falls area, the $PM_{2.5}$ base-year EI is 2008. The base year EI serves as the foundation for the 2014 future emissions forecast to help determine whether Klamath Falls will be in attainment with the standard.

An emission inventory consists of emission estimates from all sources that emit $PM_{2.5}$ or precursors within the Klamath Falls nonattainment area boundary. The emissions inventory data is essential in developing the attainment demonstration, as it helps identify the sources contributing to the air quality problem and the emission reduction strategies that will reduce pollution levels below the standard.

In addition to direct emissions, particulate matter is formed in the atmosphere from precursors. Sulfur oxides (SOX), nitrogen oxides (NOX), volatile organic compounds (VOC), and ammonia (NH3) all contribute to the formation of particulate matter. Under the EPA’s implementation rule for $PM_{2.5}$, SO2 must be evaluated and there is the presumption that NOx should be evaluated as part of the SIP for control measures, whereas ammonia and VOC are not required to be evaluated for strategies that will reduce $PM_{2.5}$ unless a state demonstrates that either or both of these pollutants are significant contributors to the $PM_{2.5}$ problem in an area (72 FR 20589-20597).

DEQ conducted an analysis of the $PM_{2.5}$ precursors in Klamath Falls to determine their contribution to the $PM_{2.5}$ nonattainment area and whether specific strategies needed to be developed to address precursor emissions. Although there is some contribution through secondary formation, analysis of filter samples and modeling shows on average that secondary formation is relatively small compared to the direct $PM_{2.5}$ emissions. DEQ focused its strategy development on those controls that directly address $PM_{2.5}$ emissions; however, many of these strategies also address precursor emissions. For more information on these strategies please refer to Section 5, Emission Reduction Measures.

Filter Sample and Modeling Analysis of Precursors

Speciated $PM_{2.5}$ samples were collected at Peterson School for the period 2007-to present. The samples showed the dominance of organic and elemental carbon, with secondary inorganic aerosol nitrate and sulfate comprising relatively minor concentrations of total $PM_{2.5}$. DEQ looked at the role of secondary organic aerosols (SOAs) as components of total organic carbon, and an additional analysis was conducted by a research scientist at Portland State University (PSU) in collaboration with DEQ to better understand the magnitude of these aerosols. The results of this analysis showed that the contributions from both biogenic and anthropogenic sources were minor (less than 1% and 3%, respectively, of total design value $PM_{2.5}$. Because all secondary aerosols were determined to be minor contributors to total $PM_{2.5}$, and their emissions are expected to decline from 2008 to 2014, these components and their concentrations are held constant in the rollback model and assigned a Relative Response Factor (RRF) of 1.0. NOx and SO2 strategies were analyzed but shown not to be needed as part of the modeling/attainment demonstration. The precursor emissions to secondary aerosols, including NOx, SO2, ammonia, and biogenic and anthropogenic VOCs, are not used in the attainment demonstration.

In addition to the study of secondary aerosols, a positive matrix factorization (PMF) study based on the speciated data from Peterson School was conducted by EPA Region 10 to identify likely sources of speciated $PM_{2.5}$. The study showed the importance of residential woodsmoke to the high levels of organic carbon, an estimated 60-70% of total PM concentrations.

The SANDWICH (Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous Material Balance Approach) speciation formulation, based on adjusted and corrected Peterson School speciation data, is used to speciate the measured design value (DV) for use in the rollback model. The SANDWICH approach uses a combination of speciation measurements and modeled estimates to represent $PM_{2.5}$ measurements. The goal is to reconstruct the measured speciated components so that they add up to the measured $PM_{2.5}$ mass. The SANDWICH analysis provides additional design value profile information by describing the components that contribute to $PM_{2.5}$ exceedances. This profile is shown in Figure 6 and shows that over 80% of total particulate matter is from organic and elemental carbon with smaller amounts of secondary inorganic aerosols, such as sulfate (2%) and nitrate (10%). The SOA study by Portland State University, the SANDWICH analysis, and the PMF study by EPA Region 10 are described in more detail in Appendix A-5, A-6-1, A-6-2, and A-7. Based on the evidence cited above, the primary sources contributing to nonattainment in Klamath Falls, are considered to be those that emit direct emissions of $PM_{2.5}$.

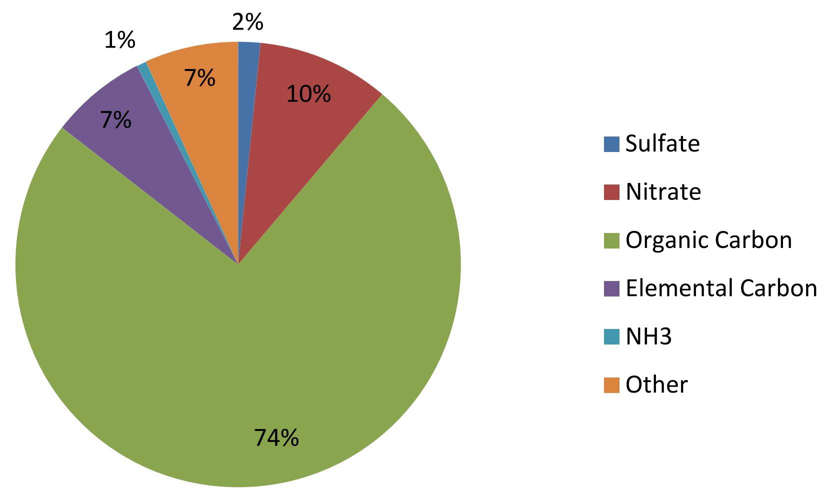

Figure 6*: Speciated Components of PM2.5 (using SANDWICH analysis)*

Base Year Emission Inventory (2008)

The base year emission inventory is used as the starting point for the attainment demonstration and serves as the foundation for the future emissions forecast (2014) to determine attainment with the standard. This inventory includes all sources in the nonattainment area and represents emissions from one of three years on which the area was designated nonattainment. DEQ analyzed a number of factors to determine the appropriate year for the base emission inventory.

Determining the Base Year Emission Inventory

DEQ selected 2008 as the base year for the Klamath Falls emission inventory. 2008 is a year for which DEQ completed the National Emission Inventory (NEI) and this information provided the most recent and robust data for Klamath Falls. In addition, 2008 is also the most recent of the three years used in evaluating whether Klamath Falls was nonattainment by EPA. The base year inventory is the primary inventory from which the modeling and attainment year (2014) inventories are derived.

DEQ also assessed meteorological and economic conditions for 2008. DEQ evaluated winter wind speeds, temperatures, and foggy days that might contribute to stagnation events and economic conditions might have an effect on emissions such as residential wood combustion. For more information about meteorological conditions and DEQ's analysis of economic factors, please see Appendix A-8 and A-9.

Source Category Distribution of 2008 Emission Inventory

Sources of $PM_{2.5}$ in Klamath Falls include major industry, on-road mobile sources (e.g. car and truck exhaust, road dust), non-road mobile sources (e.g., construction equipment), and area sources (e.g., woodstoves). The following sources represent the main emission sources in Klamath Falls.

Residential Wood Combustion

Residential wood combustion is a common way to heat homes in Oregon. To estimate emissions from wood burning, DEQ conducted a survey in 2007/2008 heating season in Klamath Falls area (See Appendix A-10-1, A-10-2, A-10-3, A-10-4). The survey provided DEQ with information on how many homes use a wide range of wood-heating devices, what species of wood residents burn, and the amount of wood burned.

Mobile and Nonroad Sources

Road dust and tailpipe emissions of $PM_{2.5}$ from motor vehicles were calculated by applying emission factors from the EPA MOVES computer program to total vehicle miles traveled in the nonattainment area. Estimated vehicle miles traveled are from the Oregon Department of Transportation's travel demand model. Emissions from rail, aircraft, construction and other non-road sources are estimated using the EPA NONROAD2008a emissions model.

Industrial Point Sources

DEQ maintains data on industrial point source emissions for all sources emitting 5 or more tons of criteria pollutants per year. Emissions information is compiled from each source's operating permit issued by DEQ. All permitted point sources within the one-mile buffer around the non-attainment area are included in the emissions inventory and shown in Figure 7.

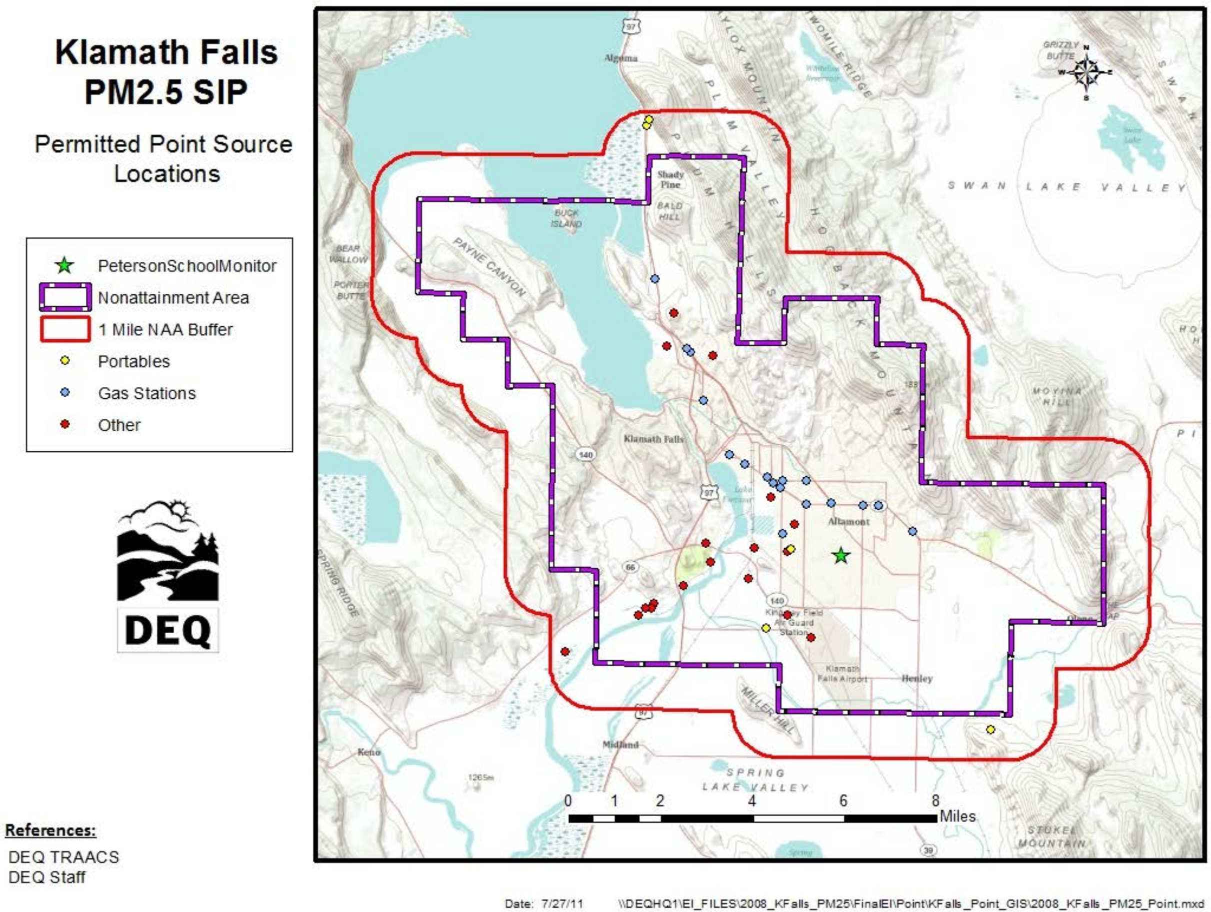

Figure 7*: Permitted Point Locations*

Emission estimates are developed for both annual and daily $PM_{2.5}$ emissions. Annual emissions are reported as tons per year (tpy), whereas typical season and worst-case day emissions are reported as pounds per day (lbs/day). A "worst-case" day is a day during the season when the maximum amount of emissions per day could occur. Daily emissions are adjusted to reflect a typical season and worst-case day during the year. The typical season and worst-case days occur in the winter (November through February). Historically, this is the time period when the daily $PM_{2.5}$ standard is most likely to be exceeded. For DEQ to run the attainment model, the goal is to develop an emissions inventory that closely matches the conditions under which the design value concentrations are measured. The design value is what is used to determine attainment, and the concentrations are calculated following EPA methodology and described in more detail in Section 5, "Attainment Demonstration".

For most source categories, this emissions inventory used for modeling purposes (referred to as design day emissions), are best represented by typical season day emissions. For some, such as residential wood burning, worst case day is a more representative choice. The design day emissions for area, on-road, and non-road sources are shown in Table 1.

Table 1: 2008 Design Day $PM_{2.5}$ Emissions for Area, On-Road, and Non-Road sources

	Design Day (lbs/day)
Stationary Area Sources	
Residential Wood Combustion: Fireplace(1)	989
Residential Wood Combustion: Non-Certified Woodstove/Insert(2)	869
All Other Res Wood Combustion(1)	315
Wildfire/Prescribed Burning	459
All Other Stationary Area Sources	172
On-Road Sources	
On-Road: Exhaust, Brake, Tire	364
Re-Entrained Road Dust	165
Nonroad Sources	
All Nonroad Vehicles & Equipment	79
Total, All Sources, lbs/day	**3,411**

(1) Design day = Advisory controlled

Design day emissions for point sources are estimated using data submitted in 2008 annual reports for all permitted facilities. The actual annual emissions are adjusted based on operating schedules or EPA temporal data specific to the process to estimate typical season day emissions for a facility. Design day emissions for point sources are used in modeling for 2008 are shown in Table 2.

Table 2: 2008 Estimated Design Day $PM_{2.5}$ Emissions for Permitted Point Sources

Permitted Point Source	**Design Day** (lbs/day)
Klamath Cogeneration	93
Jeld-Wen	106
Columbia Forest Products	268
Industrial Oil	17
Klamath Generation	0
Klamath Energy	3
Kingsley Field	3
Collins Products	265
Total All	------- **755**

For a detailed emission inventory report please refer to Appendix A-11.

The relative level of emissions for some source categories, as a percent of total emissions, did not correlate well with their estimated relative contribution to the measured concentrations at the Peterson School. Two of the categories that did not correlate well were point sources and prescribed fires. DEQ conducted an additional analysis (Appendix A-12) to assess the impacts of forest burning at the Peterson School monitor. DEQ concluded that prescribed burning has a minimal impact at Peterson School. For both prescribed burning and point sources, DEQ applied modeling to better evaluate the actual contributions of these sources to the monitored concentration, and the emissions were adjusted to establish an Effective Emission rate. Additional discussion about the effective emissions is described in Section 6, “Attainment Demonstration” and in Appendix A-12.

Attainment Year Emission Forecast (2014)

The attainment year inventory is an estimation of emissions for the year that the area is expected to attain the $PM_{2.5}$ standard. It includes projected emissions for the attainment year based on a number of different factors. Growth rates for population, employment, and VMT through 2014 were used to estimate 2014 emissions. DEQ also took credit for emissions reductions as a result of current strategies (or control measures) already being implemented but not accounted for in the 2008 emission inventory. As mentioned previously, these strategies were not included in the 2008 emission inventory because they had recently been adopted or implemented within the past few years. As a result, DEQ could determine if Klamath Falls would reach attainment with the $PM_{2.5}$ standard based on its estimated emissions and if not, what strategies it should develop in order to ensure compliance.

Determining the Attainment Year Emission Inventory

Growth Rates

Growth is expected to be low to moderate in Klamath Falls nonattainment area through 2014. Population, housing, and employment forecasts are expected to increase gradually. Oregon Executive Order 97-22 directs key state agencies such as DEQ and ODOT to use population and employment forecasts developed or approved by the Oregon Office of Economic Analysis (OEA). OEA county growth rates better suit the nonattainment area rather than Klamath Falls city growth rates since the city is expected to grow in part by annexation. OEA states that between 2008 and 2024 an estimated growth of 0.54 percent per year is anticipated. A similar population growth is expected between 2008 and 2014. DEQ will be using expected population growth to estimate number of households in Klamath Falls Nonattainment Area. Employment was also assessed by OEA. Overall employment growth is predicted at 0.85 percent per year. However, 2008 was a recession year and the years between 2008 and 2014 are likely to expand only by 0.03 percent per year. Due to the recession, the growth rate between 2008 and 2014 is predicted to be relatively flat. However, growth between 2014 and 2024 is predicted to be higher. Because Klamath Falls must continue to meet the standard into the future, DEQ has used the longer term growth rate from 2008 to 2024 that OEA provided. Employment growth will be used as estimated growth for industrial sources. OEA also recommended that DEQ utilize the Oregon Department of Transportation methodology to determine Vehicle Miles Traveled (VMT). VMT projections will be used to determine growth in transportation. VMT is expected to grow at 1.29 percent per year. Growth rates used to forecast future $PM_{2.5}$ emissions are shown in Table 3.

Table 3: Growth Rates Used in Estimating 2014 Emissions

Growth	Average Annual Growth Rate (AAGR)	Data Used to Establish Growth Rate
Population And Household	0.54%	OEA County estimate
Employment	0.03% 0.85%	2008-2014 2008-2024
VMT	1.29	Estimated by ODOT to 2014

A summary of emission projections and how the growth rate is applied to each source category is described in the Future Year Emission Inventory (2014) section in Appendix A-11.

Existing Control Measures (Strategies)

There are several existing strategies and regulations which will reduce emissions by 2014. Adjustments were made to the 2014 emission inventory to account for these strategies which are already in place, but were not fully implemented in time to affect the 2008 emission inventory. They include:

- Klamath County Clean Air Ordinance
- Woodstove Changeout Program in Klamath Falls
- Heat Smart: Statewide Stove Removal upon Sale of Home
- Maximum Achievable Control Technology (MACT) reductions
- Transportation and Fuel-Related Emissions
- Road Paving

These existing control measures are discussed in more detail in Section 5.

Source Category Distribution of the 2014 Emission Inventory

In order to demonstrate attainment, future year anticipated ambient concentrations must be lower than the National Ambient Air Quality Standards. Future year concentrations are based on the 2014 emission inventory that was developed using 2008 emissions, expected growth rates, and emission control measures that were or are being implemented between 2008 and 2014. As mentioned previously, DEQ applied growth factors to the 2008 inventory to forecast likely emissions in 2014; more specific information on emission growth for each source category are available in the emission inventory located in Appendix A-11. Similar to 2008, design day emissions were developed for 2014. The 2014 design day emissions from area, nonroad mobile and on-road mobile area are summarized in Table 4.

Table 4: 2014 Estimated Design Day $PM_{2.5}$ Emissions for Area, On-Road, and Non-Road sources

	Design Day (lbs/day)
Stationary Area Sources	
Residential Wood Combustion: Fireplace(1)	736
Residential Wood Combustion: Non-Certified Woodstove/Insert(1)	421
All Other Res Wood Combustion(1)	232
Wildfire/Prescribed Burning	459
All Other Stationary Area Sources	169
On-Road Sources	
On-Road: Exhaust, Brake, Tire	199
Re-Entrained Road Dust	156
Nonroad Sources	
All Nonroad Vehicles & Equipment	66
Total, All Sources, lbs/day	**2,437**

(1) Design day = Advisory controlled

For permitted point sources, the design day inventory is estimated using one of the following scenarios: actual emissions estimated from source annual reports, potential emissions (PTE) using 100% of the source permitted daily operating capacity, or permitted plant site emission limits (PSEL). DEQ developed these multiple emission scenarios representing the range of possible future activity. The design day emissions for point sources are based on the permitted plant site emission limits. Different future emission possibilities for point sources are shown in Table 5.

Table 5: 2014 Estimated Design Day, PSEL, and 100% Capacity $PM_{2.5}$ Emissions for Permitted Point Sources

Permitted Source	**Actual** **2014** TSD Emissions lbs/day	**PTE** **2014** WCSD (100% Capacity) lbs/day	**PSEL 2014** Permitted Limit lbs/day
Klamath Bioenergy(1)	98	122	137
Klamath Cogeneration	93	210	327
Jeld-Wen	67(2)	161	130
Columbia Forest Products	268	647	361
Industrial Oil	17	20	77
Klamath Generation	0	0	0
Klamath Energy	3	77	92
Kingsley Field	3	3	77
Collins Products	170(2)	400	532
	-------	-------	-------
Total All	**717**	**1,642**	**1,732**

(1) Klamath Bioenergy is a new facility, expected to be built and permitted by 2014. Actual emissions information is from the facility's construction permit.
(2) Reduction due to impact of MACT regulations on Hardboard and Particleboard Manufacturers

Comparison of 2008 to 2014 Emissions

The emission inventory shows an overall decrease in emissions for the attainment year (2014) based on the effectiveness of the existing strategies[2] listed above. The decrease in emissions for the design day is the most significant in residential wood combustion emissions. The ongoing implementation of existing strategies is expected to continue to reduce concentrations from wood combustion. Increased enforcement of the county ordinance and continued education will provide the reductions necessary to ensure Klamath Falls attains the standard. Figure 8 shows distribution of emission inventory for 2008 and for 2014 by source category.
The residential wood combustion reductions are primarily due to the required provisions in the county ordinance such as the mandatory compliance whenever an advisory call is issued and woodstove burning prohibitions. Appendix A-14 provides additional information on emissions

[2] Strategies currently implemented and effective as of December 31, 2011.

reductions as a result of the county ordinance. The ordinance and other existing strategies provide the basis for the attainment demonstration.

The annual emissions also decreased from 2008 to 2014, as a result of the current strategies targeting the worst case day. Although the community did not violate the annual NAAQS, further reductions in the annual emission inventory will provide a larger margin of safety to the public with reduced $PM_{2.5}$ emissions.

Actual permitted point source emissions decreased between 2008 and 2014 because of the hardboard and particle board Maximum Achievable Control Technology (MACT) requirements on Collins Products and Jeld-Wen. However, the point source emissions increased due to addition of the Klamath Falls Bioenergy facility that has been permitted and projected to be built by 2014.

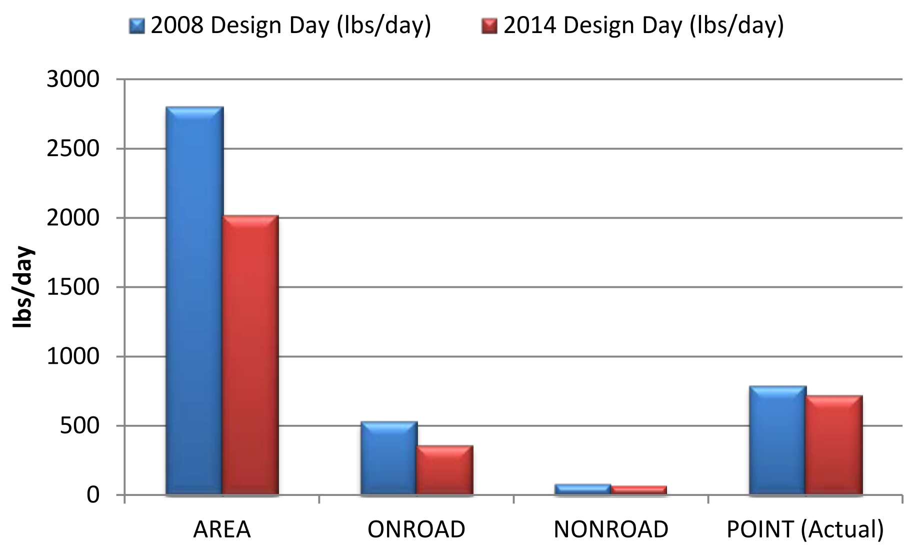

Figure 8*: Comparison of 2008 Base Year and 2014 Forecast Year Design Day PM2.5 Emissions*

ATTAINMENT STRATEGIES – EMISSION REDUCTION MEASURES

Over the years Klamath County and DEQ have developed effective strategies to manage particulate matter air pollution concentrations in the Klamath Falls area, based in part on its history of dealing with particulate pollution from the mid-1980s. The emission reduction measures identified in this section include actions to address residential wood smoke, emission limits on industries, transportation and fuel related controls and regulations, restrictions on residential open burning, and public education.

The $PM_{2.5}$ emission reduction measures identified are currently being implemented, or will be implemented at the local (Klamath County), state and federal level to achieve compliance with the 24 hour $PM_{2.5}$ standard. DEQ often uses the term "strategies" interchangeably with the terms Reasonable Available Control Measures (RACM) and Reasonably Available Control Technology (RACT). RACM will be implemented for a wide range of emission sources, whereas RACT is implemented for stationary or industrial sources (e.g., equipment to control emissions from polluting sources such as boilers).

The identified emission reduction measures (or strategies) are grouped in three categories:

1. Past strategies adopted and implemented before 2007 that were accounted for in the 2008 base year inventory. These strategies form the basis for the current and new strategies (or RACT/RACM) that were developed for Klamath Falls.
2. Current strategies adopted and implemented after 2007, that were not included in the 2008 base year inventory but provide benefits post 2007.
3. New strategies to be implemented ensuring Klamath Falls reaches attainment by 2014.

Table 6 provides a summary of these emission reduction measures that will ensure attainment of the standard.

Table 6: Summary of Emission Reduction Measures

Emission Reduction Measure	Sector	Pollutant Addressed
Past Strategies (mid-1980s to 2006), accounted for in the 2008 base year emission inventory		
Residential Wood Combustion		
Klamath Woodstove Curtailment Program (Clean Air Ordinance)	Area	$PM_{2.5}$
Certification of Woodstoves	Area	$PM_{2.5}$
Open Burning		
Prohibition on Burning except for Green Days (Klamath Clean Air Ordinance)	Area	$PM_{2.5}$

Road Dust		
Highway Road Sanding practices	Area	$PM_{2.5}$
<u>Current Strategies (2007 – present), currently implemented but not accounted for in the 2008 base year EI</u>		
Residential Wood Combustion		
Klamath Woodstove Curtailment Program – revised with lower thresholds & increased enforcement (Clean Air Ordinance)	Area	$PM_{2.5}$
Woodstove Changeout Programs	Area	$PM_{2.5}$
Heat Smart program removal of uncertified woodstoves upon sale of home	Area	$PM_{2.5}$
Open Burning		
Shortened Open Burning Window (Klamath Clean Air Ordinance)	Area	$PM_{2.5}$
Fuel and Transportation Related		
Low Emission Vehicle Program	Mobile	SOx, NOx
Road Paving	Area	$PM_{2.5}$
Diesel Retrofits	Mobile	$PM_{2.5}$
Fuel Economy	Mobile	SOx
Industrial Point Sources		
Maximum Achievable Control Technology (MACT) - hardboard and particleboard facilities	Point	$PM_{2.5}$, SOx
<u>New Strategies (post 2012), strategies on the way</u>		
Residential Wood Combustion		
Fireplace Standard	Area	$PM_{2.5}$
Public Awareness	Area	$PM_{2.5}$
Woodstove Changeouts and Fireplace Conversions[1]	Area	$PM_{2.5}$
Industrial Point Sources		
Opacity, Operation and Maintenance Plan Requirements	Point	$PM_{2.5}$
Offset Requirements[a]	Point	$PM_{2.5}$
Road Dust		
Highway Road Sanding practices	Area	$PM_{2.5}$

[1]DEQ is not taking credit for these strategies as they are dependent upon funding or industry interest.

Past Strategies (mid 1980s -2006)

Since the mid-1980s, DEQ and Klamath County developed strategies to address particulate matter in Klamath Falls, specifically to address PM10 pollution. These strategies were effective in reducing particulate levels in the area and provided a level of protection in addressing $PM_{2.5}$ pollution. The past strategies also formed the basis for current and future emission reduction measures that the county and DEQ could implement to ensure Klamath Falls reached attainment of the $PM_{2.5}$ standard by 2014. The reductions from these past strategies were accounted for in the 2008 base year inventory.

Residential Wood Combustion Strategies

Beginning in the mid-1980s the Klamath County Air Quality Task Force, DEQ, and Klamath County identified emission control measures or strategies for the Klamath Falls area. These strategies included measures that were implemented by the county, through a county clean air ordinance to reduce emissions from residential wood burning. During this time, the state of Oregon also began requiring the certification of woodstoves, which reduced the amount of $PM_{2.5}$ pollution emitted from new wood burning devices.

The Klamath County Clean Air Ordinance

When Klamath Falls was nonattainment for PM10, Klamath County established a 1991 ordinance to help the area meet the PM10 standard. The ordinance has been effective in significantly reducing emissions from woodstoves in Klamath Falls. The key piece of the ordinance was the woodstove curtailment program. Citizens were required to curtail all their residential wood combustion on red days (high pollution, high health risk days) and curtail their uncertified woodstove use on yellow days (moderate pollution days). In 2001, the ordinance was revised to update their curtailment program to meet the 1997 particulate standards. The main provisions of the ordinance include:

- Woodstove Curtailment - During the winter, advisory calls are made on a daily basis to alert the public as to the level of pollution and whether burning must be curtailed;
- Opacity standard - With the exception of startup, all emissions from woodstoves must meet a 20% opacity limitation when burning wood;
- Exemptions - Low income and sole source homeowners are allowed to burn even on yellow and red days[3].

Statewide Certification of Woodstoves

In 1986, the Oregon Legislature required the emissions certification of any new woodstove sold in Oregon. This requirement was subsequently adopted by EPA on a national basis in 1990. Additionally, the State Building Code Agency prohibits the installation of uncertified woodstoves. The dual effect of this certification and installation requirement resulted in reducing the amount of wood smoke pollution that was emitted from uncertified stoves.

[3] The sole source exemption terminated on December 31, 1992. Currently there are very few to no low income exemptions issued.

Open Burning Strategies

The 1991 Klamath County Ordinance also included provisions to address open burning. The ordinance prohibited open burning on yellow and red days and prohibited any agricultural burning within the nonattainment area.

Road Dust Strategies

The Oregon Department of Transportation (ODOT), the County Public Works Department, and the City of Klamath Falls Public Works Department made significant strides to reduce the amount of winter road sanding material placed on the roadway. All these agencies have utilized de-icing agents and salt instead of sand, increased plowing of roads and sweeping up of cinders during storms, and reduced sanding to intersections only. In addition, the area has made use of local geothermal energy to keep portions of streets free of ice in the winter.

Reasonably Available Control Technology (RACT)

Oregon's $PM_{2.5}$ reasonably available control technology (RACT) analysis was conducted pursuant to 42 U.S.C. § 7502(c)(1) (Section 172(c)(1) of the Clean Air Act), which requires states with nonattainment areas to submit State Implementation Plans (SIPs) implementing all reasonably available control measures (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology) as expeditiously as practicable to attain the NAAQS. Oregon's RACT analysis demonstrates that reductions of direct $PM_{2.5}$ emissions and its precursors, SO2 and NO_x, from several major industrial source categories, including hardboard and particleboard manufacturers and boiler operators are reasonable. Oregon's full RACT analysis is included in Appendix A-15-1.

Reasonably Available Control Measures (RACM) Analysis

A Reasonably Available Control Measure, or RACM, is defined by the EPA as any potential control measure for application to point, area, onroad, and nonroad emission source categories that is technologically and economically feasible, does not cause "substantial widespread and long-term adverse impacts", and is not "absurd, unenforceable, or impracticable". Oregon's $PM_{2.5}$ RACM analysis was conducted to fulfill the requirements of Section (c)(1) of the Clean Air Act. A total of 102 potential control measures were compiled and reviewed to determine whether or not any of these measures could be considered a RACM. DEQ and a local advisory committee evaluated the potential measures, and identified many that did not meet all the RACM criteria; those that did meet the criteria are identified below ("Current Strategies" and "New Strategies"). These reasonable measures that met the criteria do not result in severely disruptive socioeconomic impacts, particularly when addressing residential heating. For a description of the full RACM analysis please see Appendix A-15-1.

Current Strategies (2007 – Present)

In 2007, DEQ in conjunction with Klamath County identified "early emission reduction strategies" or RACM that targeted wood stove emissions just after the County became aware they were identified as a potential nonattainment area. There are a number of strategies and regulations recently implemented that will reduce $PM_{2.5}$ emissions and as described in Section 6, "Attainment Demonstration", show that the Klamath Falls area will reach attainment with the standard by 2014. These current strategies are a continuum of past strategies developed over the years that have been adjusted and updated to address the current $PM_{2.5}$ standard. Local efforts include revisions to the existing Klamath County clean air ordinance and woodstove changeouts. One of the most effective strategies has been the implementation of the revised Klamath County clean air ordinance, and in particular, the tighter levels and enhanced enforcement of the woodstove curtailment program. In addition, State and federal regulations recently implemented affect industrial sources, woodstoves, and transportation emissions. These strategies were not in place to affect the base year 2008 emission inventory but were accounted for in the 2014 emission inventory, as they are currently being implemented. All these current strategies provided emissions reductions for 2014. These strategies are permanent and enforceable; they are currently implemented and enacted by county ordinance, state, or federal rules. There are penalties for violating these ordinances or rules. Table 7 describes the emissions reductions anticipated from these strategies between 2008 and 2014.

Table 7: Reductions from Current Strategies, 2008 to 2014

Current Strategies (2007 – present), currently implemented but not accounted for in the 2008 base year EI	Source Category	Pollutant	2014 Projected Design Value Reduction at the Peterson School Monitor
Klamath Clean Air Ordinance (updated) • Woodstove curtailment – lower thresholds and increased enforcement • Shorter open burning window	Area	$PM_{2.5}$	9.2
Woodstove Changeout Programs	Area	$PM_{2.5}$	1.0
Heat Smart- changeout of uncertified stove upon sale of home	Area	$PM_{2.5}$	0.3
Maximum Achievable Control Technology (MACT) for particleboard and hardboard facilities	Point	$PM_{2.5}$,	0.2
Transportation and Fuel Related Emissions	Mobile and Nonroad	$PM_{2.5}$	minimal
• Diesel Retrofits			
• Low Emission Vehicle Program			
• Fuel Economy			
Road Paving	Area	$PM_{2.5}$	minimal

Residential Wood Combustion Strategies

The Klamath County Clean Air Ordinance

As mentioned previously, the Klamath County Board of Commissioners established a clean air ordinance for Klamath Falls that has been in effect since the 1990s. While the ordinance had been updated in the years since, a major revision occurred in 2007 to further existing strategies and address the revised $PM_{2.5}$ standard. (See Appendix A-17-1 for a copy of the 2007 ordinance.) All of the changes to the ordinance were fully implemented by 2009 and continue many of the existing requirements in place since the original ordinance was developed. The elements in the revised county ordinance are strategies or Reasonable Available Control Measures (RACM) that will bring the Klamath Falls nonattainment area back into compliance. The updated and more stringent requirements in the ordinance, specifically the woodstove curtailment program, provide the greatest emission reductions in Klamath Falls. Because woodstoves are the predominant source of particulate in Klamath Falls, the curtailment program is an effective tool to ensure Klamath Falls reaches attainment by 2014.

Woodstove Curtailment & Tightened enforcement

The existing residential woodburning advisory is calculated daily by assessing particulate concentrations and trends measured by the local nephelometer (located at Peterson School). Nephelometer data is used in combination with the local ventilation index and weather forecast to derive a predicted $PM_{2.5}$ value for the next 24 hours. Thresholds for the woodburning advisory are as follows:

Green day:	Predicted $PM_{2.5}$ level less than 16 µg/m3
Yellow day:	Predicted $PM_{2.5}$ level less than 30 µg/m3
Red day:	Predicted $PM_{2.5}$ level greater than 30 µg/m3

In Klamath Falls, advisory calls are made more frequently to address poor air quality days (red and yellow days). The daily advisory is made by Klamath County health and environment staff. The advisory is provided to the public every day during the wood heating season (October 15 – March 15). The county also maintains a phone number, website, and electronic message board at the County Fairgrounds so the public can call, look up, or see the daily advisory.

Klamath County has one full-time program staff person and two part time staff people who are responsible for providing the advisory calls, conducting patrols to see if anyone is not complying with the advisory, and enforcing the ordinance. The revised ordinance included provisions for tightened enforcement, which includes more patrols and following up with repeat violators through letters and home visits. The ordinance included the potential for court citations and fines if the homeowner continued to violate the woodstove curtailment. Existing resources were also reallocated to employ a full-time program staff person (who was previously part-time) to ensure the enforcement of the curtailment program.

There have already been some reductions in the design value from 2008-2012. These reductions have been a result of better compliance with the ordinance, and while the overall design values are going down, the reductions are not as great as might be expected. A number of factors have affected the effectiveness of the program including the recession in 2008 (causing more people to heat with wood to save money on energy costs), colder than average winter temperatures, and the need for continued education of the community regarding the provisions of the revised ordinance.

Since the 2007 ordinance went into effect, Klamath County has been issuing warning letters to residents who violated the woodstove curtailment program. There is similar program for open burning violations. When the warning letters didn't work, a County Health Official visit was made to the home of the violator. After the initial home visit, those violators did not continue to repeat, with only a few exceptions. In more recent years, compliance improved and there were fewer first time offenders who violated the woodstove curtailment. Beginning in 2011, the violator who receives a warning letter is required to contact the Environmental Health Program to discuss the violation. Now, if an initial offender receives one warning any additional offenses are referred directly to the codes enforcement officer. The county has the authority to cite and fine an individual by a codes enforcement officer. There was one fine issued in 2010-2011 and one in 2011-2012. If a fine is issued, it is adjudicated in the Justice Court (small claims and civil court). As shown in Table 8, compliance has improved over the years.

Table 8: Violations and Compliance with Woodstove Curtailment Program

Heating Season	Red Days	Violations	Repeat	Citations
2007-2008	22	138	4	0
2008-2009	33	158	3	0
2009-2010	29	77	0	0
2010-2011	39	62	1	1
2011-2012	38	42	1	1
Average per season	**32**	**95**	**2**	

Enforcement of and compliance with the ordinance is expected to continue to show better resolve and compliance over the next few years. For the upcoming wood heating season (2012-2013) Klamath County plans to conduct enforcement patrols on all red advisory days. For violators, the County plans to provide added awareness including how to burn properly in their wood stove. Increased awareness will also occur, as the electronic message board announcing the advisory was recently installed for the 2011-2012 season and will continue to be in place. Klamath County has also recently focused on new public outreach for the curtailment program. This effort includes the recent addition of an Air Quality Advisory flag program at the local elementary schools within the nonattainment area. The flag program involves hanging a red, yellow, or green flag in front of the school to notify the public of the local advisory. This provides additional awareness of the curtailment advisory in addition to the regular notification through the website, electronic message board, and phone. The County has received funding from Jeld-Wen to implement the program.

Funding for the program remains the same, although recent budget cuts in the county have led DEQ to commit $50,000 per biennium to ensure continued maintenance of the program. As part of this commitment, DEQ and the County have established targets for enforcement to ensure a low level of violators per month, and will identify steps to ensure better compliance if these targets are not met. These commitments are identified in the Interagency Agreement between Klamath County and DEQ, and are included as Appendix A-18.

Uncertified Stove Removal upon Sale of Home

The Klamath Clean Air Ordinance also included a provision to require the removal of an uncertified stove when a home is sold. This requirement facilitates the turnover of old uncertified stoves by ensuring any uncertified stove on the property being sold (including garages and outbuildings) is removed.

Rental Units and Woodstoves

Under the revised ordinance, rental units in Klamath Falls cannot have just wood heating as the sole source of heat for the home. The units must have alternate sources of heat.

Woodstove Changeout Program

Klamath Falls has had a long history (since the 1990s) of conducting woodstove changeouts by replacing old uncertified stoves with cleaner burning units. Recently, Klamath Falls was able to conduct multiple changeout programs with the assistance of approximately $1.5 million dollars in funds from EPA, the city of Klamath Falls, and federal American Recovery and Reinvestment Act (ARRA) stimulus money. Since 2008, 584 uncertified wood burning devices in Klamath Falls have been removed, destroyed, and replaced with cleaner burning heating units, such as certified woodstoves, pellet stoves, heat exchangers, or natural gas furnaces. The ARRA funding in particular, replaced 246 of the 305 uncertified stoves in low income homes. This effort in particular provided wood smoke reductions because low income wood burning homeowners are more likely to use older, high emitting stoves, have higher fuel consumption because older stoves are less efficient, and can receive a hardship exemption from the county during woodstove advisories. Table 9 shows the number of uncertified stoves changed out since 2008.

Table 9: Klamath Falls Woodstove Changeouts

Year	2008	2009	2010	2011
Number of uncertified wood burning units	2,783	2,599	2,397	2,199
Changeouts		184	202	198

Heat Smart: Stove Removal upon Sale of Home

In 2010, a statewide requirement mandating the removal of an uncertified stove at the time of home sale went into effect. This statewide rule closely mirrored the existing requirement in the Klamath County ordinance. Under the rule, all uncertified devices that are on the property being sold (including residences, shops, garages, and outbuildings) must be removed at the time of home sale. DEQ estimates that with the Heat Smart requirement and through the natural attrition of people wanting to upgrade or replace their old device on their own, there will continue to be old stoves replaced. Table 10 shows the projected numbers for 2012 through 2014 and details of these calculations are available in Appendix A-11 (Emission Inventory).

Table 10: Klamath Falls Projected Woodstove Changeouts

Year	2012 Projected	2013 Projected	2014 Projected
Number of uncertified wood burning units	2,126	2,063	2,004
Changeouts	73	63	59

Uncertified stoves required to be removed upon sale of home have several built-in mechanisms for compliance. Because it is against the law to sell a home with an uncertified wood stove, realtors, lenders, insurance companies, title companies and others involved in the sale do not want the liability of keeping the uncertified stove in the home and have an incentive to require the removal of the stove upon sale. Realtors will want to ensure their clients comply with the law. Title companies may not be able to verify that the stove has been removed making lenders reluctant to lend. Lenders and insurance agents have a major liability if the illegal uncertified stove causes a fire in the dwelling. In addition to the built-in mechanisms for compliance, DEQ requires every sale with an uncertified wood stove to be documented and that documentation submitted to the department. DEQ can monitor the sales and disclosures in Klamath Falls for compliance with the law. Should a violation be discovered, DEQ has a civil penalty for failure to remove the stove.

Open Burning Strategies

The Klamath County Clean Air Ordinance

The revised ordinance also included updated provisions regarding open burning. Open burning in the Klamath Falls nonattainment area is now restricted to just 15 days in the fall and 15 days in the spring. The county also has the option to not open a fall window at all, if conditions warrant it. In addition, the revised ordinance prohibits the use of burn barrels in the nonattainment area. In addition, the ordinance prohibits any agricultural burning on red and yellow days.

Klamath County’s health and environment staff monitor and enforce the open burning regulations as necessary. The open burning program also includes an effort for public outreach and education. Program staff makes field visits to homeowners to provide educational materials, warnings, and citations, as needed.

Industrial Point Source Strategies

Maximum Achievable Control Technology (MACT) reductions

EPA has adopted rules, Maximum Achievable Control Technology (MACT) requirements for certain industrial sources that have Title V permits. Specifically, the MACT requirements require particle board and hardboard manufacturers to reduce air toxics emissions. In Klamath Falls, Collins Forest Products and Jeld-Wen will need to reduce emissions in order to comply with the MACT requirements. MACT compliance was required by 2007, although both facilities applied for an extension and complied with the MACT by 2009. Although the control technology required under MACT was for toxic emissions, there were also reductions in $PM_{2.5}$ emissions. Under the MACT requirements, Collins will reduce $PM_{2.5}$ by 36 percent, and Jeld-Wen will reduce $PM_{2.5}$ by37 percent. The MACT requirements provide the reasonably available reductions for $PM_{2.5}$ for these sources, so DEQ considers this to be RACT. For additional discussion on the MACT/RACT analysis, please see Appendix A-15-1.

Mobile and Nonroad Vehicle Strategies

Transportation and Fuel-Related Emissions

Federal, state and local transportation regulations and programs recently implemented will reduce mobile and non-road emissions. These include:

- Federal regulations requiring increased fuel economy;
- Oregon regulations requiring low emissions vehicles beginning with model year 2009 and;
- Local programs implementing diesel retrofits of city and county buses.

Road Dust Strategies

Road Paving

$PM_{2.5}$ emissions generated by motor vehicle traffic have been reduced over the years through efforts to pave roads, minimize the use of sanding material, and to control mud and dirt track out from industrial, construction and agricultural operations. Six miles of unpaved road have been paved in the nonattainment area since 2008, resulting in reductions from re-suspended road dust.

New Strategies – Additional Control Measures

While the current strategies in place indicate Klamath Falls will reach attainment with the $PM_{2.5}$ standard by 2014, additional new strategies in Table 11 were identified by a local advisory committee to ensure compliance. For each strategy, a percent reduction is identified and the credit applied to the emission inventory for the future strategies. These strategy reductions are based on reasonably available control measures and EPA guidance on credit taken.

Table 11: Additional control measures

Strategy	Category	Pollutant	Reduction on Design Day µg/m3
Public awareness	Area	$PM_{2.5}$	0.6
New fireplace standards	Area	$PM_{2.5}$	0.2
Industrial requirements[1]	Point	$PM_{2.5}$	0.1

(1) RACT is required for existing sources emitting 10 or more tons of $PM_{2.5}$ per year. While fugitive dust and operation and maintenance plans will likely reduce $PM_{2.5}$ emissions, no credit is taken.

Klamath Air Quality Advisory Committee (KAQAC) Strategy Recommendations

In 2011, DEQ and the County convened an advisory committee to help develop additional "future strategies" or RACM to be implemented as soon as practicable but prior to January 1, 2013. The committee evaluated existing strategies and looked at how to potentially improve upon those strategies. The committee recognized that the current strategies in place (e.g. county ordinance, federal and state regulations) indicated the area will meet the standard by 2014; the KAQAC also identified other strategies to provide a cushion to ensure attainment by 2014. This committee analyzed 79 RACT/RACM measures for its technological and economic feasibility, the amount of reduction achieved, and its implementability. The committee identified and provided its recommendations of RACT/RACM measures that could be adopted to Klamath County and DEQ and is available in Appendix A-16. DEQ also identified separate, additional strategies to provide an additional buffer for Klamath Falls to meet the 2014 attainment date. These control measures are currently being adopted or are in the process of being implemented, as described below. Contingency measures are described in Attainment Demonstration.

Residential Wood Combustion Strategies

Public Awareness

Klamath County plans to continue and expand educational efforts regarding reducing $PM_{2.5}$ emissions from wood smoke. Education has had an impact and reduced wood smoke in the past and the county intends to enhance current educational strategies. DEQ has provided funding to the County, through an interagency agreement, to assist in educating the Klamath Falls community about proper use of woodstoves and reducing woodsmoke. Under the agreement, Klamath County will be required to provide programs such as hands-on demonstration of wood stove use, wood smoke health effects information dissemination, videos on public access and government websites, and outreach to teach homeowners about appropriate wood selection.

New Fireplace Standard

Klamath County plans to adopt a requirement, that fireplaces in new homes are built using the most stringent ASTM standard for fireplaces. Currently, there are no emission certification requirements for fireplaces; EPA does however, have a voluntary certification program in place for fireplace manufacturers who want to have their fireplaces tested. Under EPA's voluntary program, it recommends the use of ASTM test method E2558 to test for emissions and manufacturers that want their fireplace to be qualified under the program must have a fireplace that emits no more than 5.1 g/kg of $PM_{2.5}$. This would be a 2/3 reduction from current fireplace emissions. This requirement will be carried out by the Klamath County building codes department, as they issue permits for fireplace construction in new homes. Appendix A-17-2 includes the proposed changes to the county ordinance to incorporate this requirement.

Industrial Point Source Emissions

Opacity Standards and Operation and Maintenance Plan Requirements

New DEQ rules will require existing sources of industrial $PM_{2.5}$ emissions greater than 10 tons per year to comply with new opacity requirements, and other operating plan requirements. These rules are nonattainment area Reasonably Available Control Technology (RACT) requirements. All RACT control technology must be installed by July 1, 2013. Specifically, these rules require existing sources to retrofit their facilities to meet a 20% opacity limitation. In addition, each facility must have a fugitive emission plan and an operation and maintenance plan prepared during their next permit renewal cycle. These limitations will reduce the industrial contribution to pollution in Klamath Falls. See Appendix A-19-1, A-19-2, and A-19-3 for New Source Review and RACT rules as they relate to nonattainment areas in Oregon.

Additional Strategies for Which DEQ Is Not Taking Credit

DEQ and the Advisory Committee identified additional strategies to adopt as part of this attainment plan, but are not taking credit for these reductions because they are dependent upon funding or interest from the industry for them to be implemented or the emissions reductions are too minimal to quantify (See Table 12). These reductions, if implemented, will provide additional reductions but it will depend on the scope of the funding for woodstove conversions and on the number of conversions industry may choose to obtain offsets. These reductions cannot be quantified.

Table 12: Estimated reductions from additional strategies

Strategy	Category	Pollutant	Reduction on Worst Case Day ($\mu g/m^3$)
Wood stove conversions	Area	$PM_{2.5}$	Varies
Woodstove offsets	Point	$PM_{2.5}$	Varies
Winter road sanding	Area	$PM_{2.5}$	Minimal

Additional Woodstove Change Outs and Fireplace Conversions

Due to the effectiveness of this program in reducing woodstove emissions, the city, county, and DEQ will pursue funds to continue offering woodstove change outs and fireplace conversions within the nonattainment area. Implementation of this strategy will provide substantial reductions of $PM_{2.5}$ in the future. However, DEQ is not applying any emission credit for this strategy to the 2014 inventory as it is dependent upon the acquisition of funding, which in turn, affects the number of stoves that can be changed out.

Woodstove Offsets for Industry

Typically, a new or expanding industry in the Klamath Falls nonattainment area is required to obtain "offsets" if their $PM_{2.5}$ emissions are above a significant level. This has meant buying "offsets" from an industry that is not using them, or paying for emission reductions at another industrial facility. DEQ's rules (OAR 340-240-0550)[4], allow new or expanding industry seeking offsets to have the option of contributing to a woodstove change out program as a one-time cost to purchase offsets. This ratio is one ton of $PM_{2.5}$ offsets to one ton of emissions reduced directly from wood stoves in the airshed due to a change out program. For those offsets obtained directly from wood stove emissions, air dispersion modeling to meet Oregon's net air quality benefit requirements will not need to be conducted.

Highway Sanding

In 2012, the Oregon Department of Transportation (ODOT), the County Public Works Department, and the City of Klamath Falls Public Works Department renewed their commitment to minimize impacts of road dust and winter road sanding material and to utilize de-icing agents and salt instead of sand. The three major public works agencies have also committed to try and purchase highly efficient sweepers to sweep up cinders on roadways after winter storm events are completed. While the expected emissions reduction is minimal and DEQ is not taking credit for this reduction, these efforts will help mitigate the amount of winter road sanding material placed on the roadway. The winter sanding agreement with the agencies and DEQ is available as Appendix A-20.

[4] Subject to EQC approval. EQC consideration of these rules is in December, 2012.

ATTAINMENT PLAN AND DEMONSTRATION

Attainment Demonstration

The attainment demonstration shows how Klamath Falls will meet the $PM_{2.5}$ standard by 2014 through the implementation of control measures listed above. DEQ used a "proportional rollback/rollforward analysis" or rollback model to conduct the analysis. The attainment demonstration shows that future concentrations are less than the NAAQS at the Peterson School monitor and other unmonitored parts of the designated nonattainment area. The 2014 attainment demonstration also demonstrates that reasonable further progress (RFP) is achieved (40 CFR 51.1009).

Determination of Baseline Design Value

The demonstration starts with estimating the baseline concentration, or baseline design value, for $PM_{2.5}$. A design value is the mathematically determined pollutant concentration that describes the air quality status of a given area relative to the level of the National Ambient Air Quality Standards (NAAQS). Design values are expressed as a concentration instead of an exceedance count, thereby allowing a direct comparison to the $PM_{2.5}$ standard. The design value is based on data from the DEQ Peterson School monitor at which both the $PM_{2.5}$ federal reference monitor (FRM – the monitor used to determine attainment with the standard) and speciation monitors are located. The base year for the analysis is 2008, and the base monitoring period for constructing the design value includes the years 2006 – 2010. The calculated 2008 baseline design value is 45.1 $\mu g/m^3$, which was developed following the procedures cited in Clean Air Fine Particle Implementation Rule (72 FR 20607). The calculations on which these results are based are provided in the Appendix A-21, and summarized in Table 13, below.

Table 13: $PM_{2.5}$ values used to calculate baseline design value

Year	$PM_{2.5}$ ($\mu g/m^3$)
2006	47.5
2007	39.6
2008	52.2
2009	44.0
2010	34.6
Design Value (2008)	**45.1**

Speciation of the Design Value

Because $PM_{2.5}$ can be formed in the atmosphere from precursor pollutants such as SOx, NOx, ammonia, and volatile organic compounds, DEQ also investigated these components as part of the rollback analysis. Speciation of the measured $PM_{2.5}$ concentration used data from the co-located speciation monitor at Peterson School. The measured speciation data provides information that is used to distribute the total FRM mass into its constituent chemical species. These speciation data were adjusted and modified in the SANDWICH (sulfate, adjusted nitrate, derived water, inferred carbonaceous material balance approach) procedure. The result is a speciated design value mass that is the basis for speciation in the rollback model. Data used for the SANDWICH approach included all wintertime sample data with total mass greater than 25 $\mu g/m^3$ taken at the Peterson School monitor. Table 14 shows the results as percent contributions of the speciated components (sulfates, nitrates, organic carbon (OC), elemental carbon (EC), ammonia (NH3), and other primary particulate (OPP)).

Table 14: Contribution by speciated components. Results of SANDWICH analysis for winter (Oct-Mar)

% Sulfate	% Nitrate	% OC	% EC	% Water	% NH_3	% OPP
1.6	9.6	74.4	7.0	4.2	0.7	2.6

NO_3 and SO_4 represented small fractions of the speciated samples and it was decided to treat these secondary inorganic aerosols as constants in the rollback analysis, that is, they were given a Relative Response Factor (RRF) of 1.0. This is based on the assumption that total precursor emissions of NO_x and SO_2 decline between 2008 and 2014, which is the case for the Klamath Falls inventory. In addition, a conservatively high amount of nitrate was chosen to account for unlikely but possible increases in secondary nitrate as a result of control strategies. Detailed methods of the SANDWICH procedure and results are included in Appendix A-5.
The attainment demonstration will not take credit for the small emission reductions in primary nitrate and sulfate that are expected to occur. Pollution reduction strategies are focused on organic and elemental carbon. Thus, the attainment demonstration puts focus on these two components of $PM_{2.5}$.

SOA (Secondary Organic Aerosols) and Minor $PM_{2.5}$ Species

In addition to quantifying the species components to the design value mass, attention was paid to the sources of secondary organic aerosol (SOA) precursors to $PM_{2.5}$, and in particular to chemical processes in the atmosphere that might affect the dynamics of $PM_{2.5}$ formation. DEQ partnered with Portland State University (PSU) to examine the formation of these SOAs using a chemical box model. Biogenic precursors were estimated for the vegetative cover in the nonattainment area and adjusted to reflect wintertime temperatures. In the same model, anthropogenic SOA formation was estimated from benzene, toluene, and xylene precursor emissions primarily from on-road mobile sources. The results showed that anthropogenic SOAs contribute 3% and biogenic SOAs 1% of the total measured $PM_{2.5}$ mass, relatively minor components to total $PM_{2.5}$. For the rollback model, these components were assigned RRFs of 1.0 in the same fashion as the secondary inorganic aerosols.

Effective Emissions

As mentioned, DEQ is utilizing a rollback model based on a correlation between emissions and ambient air concentrations that assumes a relatively even distribution of emissions in an air basin with low concentrations gradients of pollutants across the most heavily populated portion of the non-attainment area. In Klamath Falls this assumption is considered generally representative with the exception of three emissions categories: industrial point sources, prescribed burning, and road dust. Two of these emission source categories are located either outside of the nonattainment area (prescribed burning) or at its edge (industrial points), at some distance from the Peterson School monitor which is sited at the approximate center of the nonattainment area. Although these sources may have local high concentrations near their emissions sources, their impact at the monitor is likely to be low with flat concentration gradients. In addition, emissions from road and fugitive dust appear high relative to the fugitive dust component of measured concentrations based on a Positive Matrix Factorization (PMF) analysis. (See Appendix A-7). The reasons for differences between emissions and concentrations for these three categories can be the result of plume dispersion, inaccurate emissions estimates, use of unrepresentative emission factors, or a combination of these factors.

In order to better provide a correlation between emissions and their contribution to measured concentrations at the monitor from these three source types, PMF and an air dispersion model (AERMOD) were used to develop what is termed “effective emissions.” (Please see Appendix A-22 for more information on the AERMOD model.) Effective emissions are defined as those emission rates from a given source category that are considered to proportionately correlate with measured concentrations of that same source category at the monitor For source categories whose emissions are relatively evenly distributed across the domain, effective emissions are considered to be their actual emissions. For source categories that are not evenly distributed, or require other adjustments, effective emissions are estimated using other models.

The contribution of industrial point source and prescribed burning emissions were estimated using the AERMOD air dispersion model. Industrial point sources contribute 1.0% of the baseline design value (45.1 $\mu g/m^3$), or about 0.45 $\mu g/m^3$. Prescribed burning emissions contribute a modeled contribution of 0.694 $\mu g/m^3$, or 1.75% of the baseline design value. Fugitive dust emissions from aggregate storage piles, road sanding operations, and re-entrained road dust were estimated to be about 3.5% (or 1.58 $\mu g/m^3$) using the PMF study conducted by EPA Region 10. These values for prescribed burning, fugitive dust, and industrial point sources have an effective emission rate calculated at a level that, together with the actual emission rates of the other source categories, will result in the percent contributions determined by dispersion and PMF modeling.

A detailed description of effective emissions and the models used in their estimation can be found in Appendix A-13.

Rollback Model

As noted, the method chosen to demonstrate attainment for Klamath Falls is a rollback/roll forward model that assumes a direct linear correlation between emissions and concentrations and that changes in emissions, such as reductions resulting from control strategies, will result in corresponding reductions in concentration.   As a result, concentrations in a future year (2014, for the Klamath Falls demonstration) can be predicted based on reductions in emissions, and their corresponding ambient concentrations, from a base year (2008). Rollback is a relatively simple model but depending on the characteristics of the modeling domain and emissions categories it may be just as appropriate as a complex regional grid model.

Rollback/forward was chosen over a regional grid model, such as CMAQ or CAMx, for the following reasons:

1) Photochemistry plays a minor role in $PM_{2.5}$ formation in Klamath Falls which is dominated by organic carbon (OC) primarily the result of winter season residential wood smoke, with highest measure concentrations occurring in evening hours during periods of high burning activity, frequent temperature inversions, and stagnant air,
2) Secondary $PM_{2.5}$, including sulfate, nitrate, and secondary organic aerosols (SOAs), are minor constituents of total PM mass,
3) The nonattainment area is small and bowl shaped – surrounded on three sides by elevated terrain. With low mixing heights and light winds during periods of high concentration, it is assumed pollutants are relatively well-mixed and concentration gradients low within the highly populated portion of the non-attainment area. A typical configuration for CMAQ or CAMx would not resolve the spatial patterns in $PM_{2.5}$ within the non-attainment area much more than the rollback/forward box model.
4) The relative ease of use of the rollback/forward model facilitated troubleshooting, quality control, and sensitivity testing.

The EPA Guideline on Air Quality models (40 CFR Part 51, Appendix W) addresses the choice of models for analyzing $PM_{2.5}$ concentrations, and in 5.2.2.1 a states:

> *Treating secondary components of $PM_{2.5}$, such as sulfates and nitrates, can be a highly complex and resource-intensive exercise. Control agencies with jurisdiction <u>over areas with secondary $PM_{2.5}$ problems are encouraged to use models which integrate chemical and physical processes</u> important in the formation, decay and transport of these species (e.g., Models-3/CMAQ 38 or REMSAD 41). <u>Primary components can be simulated using less resource-intensive techniques</u>.*

This language suggests that for nonattainment areas without secondary $PM_{2.5}$ problems, the attainment demonstration in which primary components are the major component can be made using simpler, less resource-intensive techniques. Though not stated explicitly in this section of the Guideline, this simpler technique could include a proportional rollback/rollforward model. In utilizing the rollback/rollforward model, DEQ can adequately demonstrate attainment with the $PM_{2.5}$ standard utilizing conservative assumptions.

Secondary $PM_{2.5}$, including sulfate, nitrate, and SOAs, will be included in the rollback model but as constants with a RRF of 1.0, that is, the level of secondary $PM_{2.5}$ species will not increase or decrease from the 2008 baseline year to the 2014 future year. As noted above, this approach assumes that precursor emissions will not increase over the attainment timeframe. This is considered a conservative approach as reductions in residential wood smoke with corresponding reductions in organic carbon (the target of control strategies to reach attainment) and reductions in motor vehicle emissions affecting the current fleet of cars from existing rules will also reduce emissions of anthropogenic secondary $PM_{2.5}$ precursors.

Rollback Source Categories

Multiple source categories were used in the rollback reflecting those source types considered to be significant in the analysis. Because residential wood heating is the largest $PM_{2.5}$ emissions source, based on its percentage of emissions from all sources, and because proposed controls of residential wood combustion could be selectively applied by type of wood heating appliance, residential wood heating emissions are defined by specific appliance. Details of residential wood combustion, the type of heating device used, and the methodologies for estimating their emissions are described in the Emissions Inventory section of this report.

Speciation Profiles

The rollback is based on a speciated emissions inventory as described previously. Emissions from source categories in the inventory were initially estimated as total $PM_{2.5}$, and source profiles were used to allocate emissions to individual $PM_{2.5}$ species. Organic Carbon, Elemental Carbon, and Other Primary Particulate (OPP, or PM Other) are the species identified in the speciation profiles, (EPA Speciate Version 4.2 and 4.3) and are the species used in the rollback model.

Compliance with the $PM_{2.5}$ Standard

Applying the Rollback Model

The speciated rollback as used for Klamath Falls, can predict multiple future year design values based on different modeling scenarios, including changes in the 2008 emissions estimates, and variations in future year emissions as a result of different control reductions and operating scenarios. Applying the current RACT/RACM strategies in place see Table 15 and factoring in emissions from industrial facilities operating at maximum permitted levels (PSELs), the 2014 future year design value is 35 µg/m^3 at Peterson School using a composite RRF of 0.717 (Table 16). Details of this analysis are available in Appendix A-23-1 and A-23-2.

Table 15: Design Value for 2014, Utilizing Current Strategies

Current Strategies (implemented since 2008)	Emission Reduction (µg/m^3)
Klamath Clean Air Ordinance (updated) • Woodstove curtailment – lower thresholds and increased enforcement • Shorter open burning window	9.6
Woodstove Changeout Programs	1.0
Heat Smart- woodstove changeout upon sale of home	0.3
Maximum Achievable Control Technology (MACT) particleboard and hardboard	0.1
Transportation and Fuel Related Emissions	minimal
• Diesel Retrofits	
• Low Emission Vehicle Program	
• Fuel Economy	
Road Paving	minimal

Table 16: Design Value for 2008 and 2014 based on Current Strategies

	2008 µg/m^3	2014 µg/m^3
Design Value (DV)	**45**	**35**[1]

(1) Using Plant Site Emission Limits (PSELs)

Since the future year 24-hour average concentration levels meet the NAAQS (35 µg/m3) at the Peterson School Monitor, the attainment of the standard is demonstrated at this location with the application of the current strategies in place.

Application of New Strategies

Including current strategies, the rollback model shows that Klamath Falls Area will achieve the standard of 35 µg/m^3. However at 35 µg/m^3 the attainment design value does not include much of a buffer for potential variation while still meeting the standard. To ensure continued compliance, and include a protective buffer, the Klamath Falls Advisory Committee developed and recommended to both DEQ and the County additional strategies to include in the attainment plan. After reviewing the recommendations, the County selected a few strategies, which ultimately will result in additional emission reductions and show further reduction in the attainment demonstration roll back model. The results of the rollback at Peterson School show a cumulative Relative Response Reduction Factor (RRF) of 0.667 with current and immediate strategies recommended by the committee. Table 17 shows how each strategy (RACT/RACM) will bring the area into attainment.

Table 17: New strategies and the 2014 design value

New Strategies	Emission Reduction[1] (µg/m^3)
Public awareness	0.6
New fireplace standards	0.1
RACT[2]	0.1

(1) Worst case day

(2) RACT is required for existing sources emitting 10 or more tons of $PM_{2.5}$ per year. While fugitive dust and operation and maintenance plans will likely reduce $PM_{2.5}$ emissions, no credit is taken

Once all the strategies are applied, the 2014 future year design value becomes 34 μg/m^3. Table 18 shows the demonstration design value based on all current and committee recommended attainment strategies:

Table 18: Design value for 2008 and 2014 based on future strategies

	2008 μg/m^3	2014 μg/m^3
Design Value (DV)	**45**	**34**[1]

(1) Using PSELs

This demonstrates Klamath Falls will attain the standard by 2014.

Attainment Demonstration in Unmonitored Areas

In addition to the Peterson School location, it was necessary to demonstrate that other areas within the nonattainment area also were in attainment for the future year. A second analysis, or unmonitored area analysis (UMAA), was used to evaluate future year design values in these areas. The UMAA was based on a saturation survey conducted by DEQ, combined with dispersion modeling of industrial point sources. DEQ evaluated the distribution of $PM_{2.5}$ concentrations across broad areas of the nonattainment area, assessed the representativeness of the Peterson School site as a neighborhood monitor for the nonattainment area, and developed representative 2014 background design values (that is, 2014 design values without industrial sources impacts) for areas of the nonattainment area.

In order to estimate the 2014 design value in areas near industrial facilities, AERMOD was run using 2014 permitted emissions (Plant Site Emission Limit, or PSEL) for the industrial facilities. In order to simulate neighborhood scale concentrations, 1.2 km grids were centered on the facilities and modeled concentrations at the corners and center of the grids (five values for each grid) were averaged. The results of the UMAA, using the approach described above, indicate that the areas surrounding the industrial facilities in Klamath Falls, at a neighborhood monitoring scale, have a maximum concentration of 30 μg/m^3, and are in attainment for the 2014 Future Year. This supplements the attainment demonstration for the Peterson School monitor that also shows attainment for 2014. A description of the UMAA including the saturation survey and dispersion modeling results is provided in Appendix A-24.

Contingency Plan

The attainment plan must contain contingency measures that would be implemented in the event that the Klamath Falls nonatttainment area fails to meet or violates the standard on or after December 2014. These contingency measures are designed to correct the violation of the $PM_{2.5}$ standards and be implemented immediately. EPA requires that any contingency measures must equal one year's worth of reasonable further progress (RFP). In Klamath Falls, RFP would equal about 2.0 micrograms per cubic meter of further required reduction. In order to achieve reasonable further progress, DEQ, in coordination with the Klamath Air Quality Advisory Committee has identified and adopted the following contingency strategies for Klamath Falls in this plan.

Phase 1: Continuing Violation

If Klamath Falls fails to meet or violates the standard on or after December 2014, the following contingency measures that would be implemented starting March 1, 2015.

Prohibition of Fireplaces

DEQ rules 340-240-0630 prohibits the use of all fireplaces, except those that are ASTM certified (fireplaces that emit less than 5.1 g/kg) inside the AQZ during the winter woodheating season. These devices could not be used unless the homeowner has applied for a short-term exemption allowing use on holidays or special occasions on green advisory days. The prohibition on the use of fireplaces would essentially eliminate the use of non-ASTM certified fireplaces. This addresses background (lingering) smoke in the airshed, particularly when there could be opportunities for a buildup of smoke on poor ventilation days.

Table 19 provides the relative reduction achieved from these contingency strategies.

Table 19: Reductions from Contingency Strategies

Contingency Strategy	Rule	Reduction on Worst Case Day Lbs/day	Reduction on Worst Case Day in $\mu g/m^3$
Prohibit use of fireplaces with emissions greater than 5.1 g/kg	Klamath Clean Air Ordinance and DEQ Div 240	528	5.0
Total			5.0

Using this contingency strategy will result in additional emission reductions and show further reduction for reasonable further progress. A reduction of 5.0 $\mu g/m^3$ is anticipated from these contingency strategies; this is above the target needed to meet the reasonable further progress test requested by EPA.

Additional Measures

The following strategies will not be in effect immediately due to the time necessary to install, operate, and show compliance for specific equipment if the contingency requirements were triggered. Therefore DEQ is not claiming credit for these strategies as contingency measures but is still requiring them should Klamath Falls not meet the standard by 2014. The reductions achieved through implementation of these measures will provide an additional buffer to ensure Klamath Falls achieves the necessary reductions to meet the $PM_{2.5}$ standard.

RACT

DEQ is requiring the following RACT strategy that must be installed and operating with a source demonstration test by December 15, 2016. DEQ is revising Divisions 200, 225, 240 to reflect continuous emission monitors (CEM) or continuous operational monitors (COM) requirements for Title V sources for fuel and refuse burning equipment[5]. As mentioned previously, DEQ is not claiming credit for this strategy in the attainment demonstration.

[5] These rule revisions are being considered for adoption by the Environmental Quality Commission on December 2012.

Table 20: Reductions from Contingency Strategies

Additional Measures	Rule	Reduction on Worst Case Day in $\mu g/m^3$
Reasonably Available Control Technologies[1] (RACT) for industry (CEM)	DEQ Div 240	No Credit Taken[2]

(1) RACT is required for existing sources emitting 10 or more tons of $PM_{2.5}$ per year.
If Klamath Falls meets the EPA Clean Air Act 2014 deadline for meeting the standard, the contingency plan will not be enacted.

(2) The emission reduction after all controls are in place will be a minimal reduction. Because it will take a while for the installation of the equipment to meet this reduction, no credit is taken for these RACT.

Phase 2: Significant Continued Violation

DEQ, in consultation with the County, will convene a planning group of City, County and DEQ personnel to develop an action plan if ambient concentrations continue to equal or exceed 110% of the NAAQS concentration of $PM_{2.5}$ (38.5 $\mu g/m^3$ for the 24 hour average or 16.5 $\mu g/m^3$ for an annual average at a ninety eighth percentile) at Peterson School. The planning group will prepare an action plan that includes a schedule for implementation of additional strategies. The schedule will be presented to the County Commissioners, the City Council and DEQ within one year. The new plan will bring the community back into attainment with the $PM_{2.5}$ standards within three years. The plan will adopt concrete actions that will occur by ordinance or agreement that are permanent and enforceable. The actions will be placed in a schedule for implementation. This schedule will include automatic implementation of more stringent requirements.

ADDITIONAL PLAN ELEMENTS AND IMPLEMENTATION

Transportation Conformity

Transportation conformity is the regulatory program that links transportation and air quality planning processes together so that emissions from motor vehicles (both now and in the future) do not jeopardize air quality standards. Under conformity, emissions resulting from a transportation plan cannot exceed the allowable emissions level established for transportation in the air quality plan.

DEQ requested EPA to determine that emissions from transportation sources were insignificant for regional emissions analysis. EPA could not make that determination because their policy states that this determination can only be made when an area meets the standards. Therefore, the request has been denied. The request is described in Appendix A-25.

Transportation Emissions Budgets for Conformity

Since regional conformity is required, an emissions budget for on-road motor vehicle emissions in the Klamath Falls nonattainment area is based on emissions from 2014 as they are predicted to 2037. The transportation emissions budgets for selected years are shown in Table 25 and Table 26[6].

Table 21: Motor Vehicle Emissions Budget Through 2037

Klamath Falls Motor Vehicle $PM_{2.5}$ Emissions Budget
Worst Case Winter $PM_{2.5}$ Season (lbs/day)

Pollutant	Pounds per Day
PM2.5	699
NOx	4,834

[6] The motor vehicle emission budget for Klamath Falls is based on the emissions in 2014 because they are the highest emissions of the years 2014 through 2037. DEQ predicts Klamath Falls will meet attainment in 2014. DEQ used the MOVES model that includes Transportation Demand VMT and other criteria for projections to 2037. VMT and other criteria used in the MOVES model can be found in Appendix 11 or by contacting DEQ Technical Services Section of Air Quality. While NOx is not considered a substantive contributor to the PM2.5 problem, DEQ included a budget for NOx only because the addition of a second pollutant is not much more of a workload when running the MOVES model and it satisfies all aspects of EPA's requirements identified in 40CFR93.102(b)(2)(iv).

Table 22: Motor Vehicle Emissions Budget Through 2037

Klamath Falls Motor Vehicle $PM_{2.5}$ Emissions Budget
Annual $PM_{2.5}$ Season (tons/yr)

Pollutant	Tons per Year
PM2.5	60.7
NOx	860.6

The transportation emissions budgets were developed based on the Oregon Department of Transportation (ODOT) travel demand model. The budget amount for each year is the projected on-road mobile emissions for each year as calculated in the emission inventory projections. See Appendix 11a. The emissions are based on vehicle miles traveled (VMT) and other criteria from the transportation demand model then modeled by MOVES as identified the emission in Appendix 11a and 11b. The emission inventory projections include transportation projects in the statewide transportation plan that are funded. The projections do not include projects planned but without funding. DEQ's transportation conformity rules and the transportation conformity process can be found in Oregon Administrative Rule 340, Division 240.

Rules Regulations and Commitments

The following rules and commitments have been adopted to assure the enforceability of the control strategies.

State of Oregon Rules

The Oregon Revised Statutes (ORS) 468.020, 468A, and 468.305 authorize the Oregon Environmental Quality Commission to adopt programs necessary to meet and maintain state and federal standards. The mechanisms for implementing these programs are the Oregon Administrative Rules (OAR). Table 27 lists applicable Oregon regulations.

Table 23: Specific air pollution rules applicable to the Klamath Falls nonattainment area are included in Section 4.62 of the Oregon State Implementation Plan

OAR	Subject
340-240-0500	Applicability
340-240-0510	Opacity Standard
340-240-0520	Control of Fugitive Emissions
340-240-0530	Requirement for Operation and Maintenance Plans
340-240-0540	Compliance Schedule for Existing Industrial Sources
340-240-0550	Requirements for New Sources When Using Residential Wood Fuel-Fired Device Offsets
340-240-0560	Real and Permanent $PM_{2.5}$ and PM_{10} Offsets
340-240-0570 to 0630	Klamath Falls Nonattainment Area Contingency Measures
340-225-0090	Air Quality Analysis Requirements
340-262-1000	Wood Burning Contingency Measures for $PM_{2.5}$ Nonattainment Areas
340-264-0078 and 0175	Open Burning

Emergency Action Plan Provisions

OAR 340 Division 206 describes Oregon's Emergency Action Plan. The rule is intended to prevent the excessive accumulation of air contaminants during periods of air stagnation which, if unchecked could result in concentrations of pollutants which could cause significant harm to public health. The rules establish criteria for identifying and declaring air pollution episodes below the significant harm level and were adopted pursuant to requirements of the Clean Air Act. The action levels found in the plan were established by the EPA and subsequently by DEQ. The 24-hour average emergency action levels for $PM_{2.5}$ are as follows: significant harm level of 350 $\mu g/m^3$, emergency level of 280.5 $\mu g/m^3$; warning level of 210.5 $\mu g/m^3$; and alert level of 140.5 $\mu g/m^3$.

The $PM_{2.5}$ levels, coupled with meteorological forecasts for continuing air stagnation, trigger the Emergency Action Plan. $PM_{2.5}$ concentrations have never been measured at the alert, warning, emergency, or significant harm level in the Klamath Falls nonattainment area.

Authority for the Department to regulation air pollution sources during emergency episodes is provided under Oregon Revised Statute Chapter 468, including emissions from woodstoves.

When there is an imminent and substantial endangerment to public health, ORS 468.115 authorizes the Department, at the direction of the Governor, to enforce orders requiring any person to cease and desist actions causing the pollution. State and local police are directed to cooperate in the enforcement of such orders.

PUBLIC INVOLVEMENT & ADMINISTRATIVE REQUIREMENTS

Public Involvement

Development of the Klamath Falls $PM_{2.5}$ attainment plan included several areas of public involvement including a citizen advisory committee, public participation at hearings on proposed industrial source rules, and attendance at hearings conducted by the Klamath County Boards of Commissioners.

Citizen Advisory Committee

DEQ, in collaboration with Klamath County, convened the Klamath Air Quality Advisory Committee to help develop and recommend strategies to bring Klamath Falls back into attainment with the 24-hour $PM_{2.5}$ standard. The committee met in February 2011 and continued to meet for over a year to consider data, community values, and pollution reduction strategies with the highest chance of success in meeting the $PM_{2.5}$ standard. The committee provided recommendations to the Board of Klamath County Commissioners to include emission reduction measures in ordinances and to DEQ to produce an attainment plan for EPA approval.
The Committee membership includes representatives from the following interests:

- Private citizen
- Local Business
- Klamath County Environmental Health Department
- U.S. Fish and Wildlife
- Klamath County Fire District
- Editor – Chimney Sweep News
- Former Klamath County Commissioner
- Former Klamath Falls City Manager
- Former U.S. Forest Service employee
- Physician

Public Notice

Public notice of proposed rule revisions is done through mailing lists by the Department. This is accomplished through notifications sent by electronic mail, notifications published in local newspapers, and through Department press releases.

Public Hearings

A public hearing was held August 21, 2012 in Klamath Falls to receive public testimony on the proposed attainment plan. Briefings on the draft attainment plan were provided to the Klamath Falls City Council and the Klamath County Board of Commissioners.

Intergovernmental Review

Public hearing notices regarding adoption of this revision to the State Implementation Plan will be distributed for public and state agency review prior to adoption by the Environmental Quality Commission.

Administrative Requirements

The criteria that must be satisfied for a nonattainment area to be redesignated to attainment include several administrative requirements related to compliance with Clean Air Act provisions. Each of these elements is described below.

State Implementation Plan Requirements

The Klamath Falls $PM_{2.5}$ Attainment Plan meets all state implementation requirements specified in Section 110 and Part D of the Clean Air Act. In summary, Section 110 requires that the state submit a plan that becomes part of the SIP, and provides for the implementation, attainment, and enforcement of an air quality standard. Part D of the Clean Air Act outlines specific plan requirements for nonattainment areas.

Approved State Implementation Plan

The 2012 Klamath Falls $PM_{2.5}$ attainment plan contains emission reduction and emission growth management strategies needed to achieve and maintain compliance with the $PM_{2.5}$ standards. The $PM_{2.5}$ plan has been adopted as a revision to the State of Oregon Clean Air Act Implementation Plan (SIP).

1990 Clean Air Act Requirements and Status

The Klamath Falls Nonattainment Area has met the requirements for $PM_{2.5}$ nonattainment areas included in the 1990 Clean Air Act Amendments. The area successfully met the applicable Clean Air Act attainment deadline of December 14, 2012.

Monitoring Network and Commitments

DEQ is responsible for the operation of the permanent ambient $PM_{2.5}$ monitor in the Klamath Falls nonattainment area. DEQ oversees the quality control and quality assurance program for the $PM_{2.5}$ data.

DEQ will continue to comply with the air monitoring requirements of Title III, Section 319, of the Clean Air Act. The monitoring site will also continue to be operated in compliance with EPA monitoring guidelines set forth in 40 CFR Part 58. "Ambient Air Quality Surveillance" and Appendices A through G of Part 58. In addition, DEQ will continue to comply with the "Ambient Air Quality Monitoring Program" specified in Volume 2, Section 6 of the SIP. Further, DEQ will continue to operate and maintain the network of state and local air monitoring stations and national air monitoring stations in accordance with the terms of the State/EPA Agreement.

DEQ in consultation with EPA will also periodically conduct saturation studies to verify that existing monitors are recording the appropriate $PM_{2.5}$ concentrations in the area. DEQ will commit to conducting a re-evaluation survey in the event of major changes that may impact $PM_{2.5}$ emissions as practicable after identifying any such changes. Based on $PM_{2.5}$ monitoring data and other considerations such as special project funding availability, DEQ in consultation with EPA may reach agreement that the periodic survey is unnecessary, or should be delayed.

Verification of Continued Compliance

DEQ will analyze on an annual basis the $PM_{2.5}$ air quality monitoring data to verify continued attainment of the $PM_{2.5}$ standard, in accordance with 40 CFR Part 50 and EPA's redesignation guidance. This data, along with the previous year's data, will provide the necessary information for determining whether the Klamath Falls nonattainment area continues to comply with the National Ambient Air Quality Standards for $PM_{2.5}$.

The Clean Air Act requires the state to submit a maintenance plan eight years after the redesignation request is approved by EPA. The revision will provide for continued attainment of standards for an additional ten years following the first ten-year period.

For the interim period between EPA approval of this plan and the required plan update, DEQ will rely on ambient monitoring data to track progress of the attainment plan. Growth projections for Klamath Falls are modest. As long as ambient monitoring data can show a downward trend in concentration, a mid-term emission inventory update or emissions tracking program will not be necessary. If $PM_{2.5}$ concentrations increase over current levels, then an evaluation of growth and other planning assumptions will be necessary.

If Phase 1 of the contingency plan is triggered, DEQ will prepare an analysis of future growth factors to determine if planning assumptions have changed. The analysis will include a review of emission factors, growth rate assumptions, traffic data, and other significant assumptions used to develop the attainment plan. If there are significant changes, DEQ will consult with EPA to determine if a more extensive periodic emission inventory update, or other action, is warranted.

Attainment Plan Commitments

As part of the $PM_{2.5}$ Attainment Plan, DEQ commits to evaluate growth and other planning assumptions if $PM_{2.5}$ concentrations significantly increase over current levels.

RECOGNITION AND ACKNOWLEDGMENTS

In Memory
This plan is dedicated to Rosemary Bell of Klamath Falls. She enjoyed quilting, sewing, camping and spending time with family and friends. She is survived by her husband and three children, Jennifer, Brian and Michael.

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The Klamath Falls community has rallied behind this plan and numerous individuals have made this supplement to the Oregon State Implementation Plan possible. Special appreciation goes to:

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John Elliott	Private citizen
Edward Fenner	Private citizen
Jim Gillam	Editor, Chimney Sweep News
Charles Massie	Klamath County Chamber of Commerce
Ann McGill	Private citizen
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Special Study Report

Klamath Falls PM10 and PM2.5 Survey

Winter 1996/1997

Oregon Department of Environmental Quality
Air Quality Division

Signature & date

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DEQ Laboratory Quality Control: ______________________

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INTRODUCTION:

During the winter of 1995/1996 the Oregon Department of Environmental Quality (DEQ) conducted a study to measure relative particulate levels in the Klamath Falls area. The primary purpose of the study was to verify that the highest particulate levels in Klamath Falls were still likely to occur at or near the existing PM_{10} sampler at Peterson school. DEQ relocated the sampler to Peterson school following a similar 1985/1986 PM_{10} study[1] which identified the southeast suburbs of Klamath Falls as the most polluted area. Prior to the 1985/1986 survey, DEQ had sampled particulate matter at the downtown fire station.

A secondary purpose of the study was to compare $PM_{2.5}$ samplers with PM_{10} samplers and a nephelometer to learn more about DEQ's new $PM_{2.5}$ sampling equipment and methodology. This preliminary $PM_{2.5}$ study was conducted in anticipation of the EPA's revised particulate matter standard announced on July, 1 1997. The EPA required DEQ to establish a $PM_{2.5}$ network, but before DEQ can comply, it must ascertain the accuracy and precision of the samplers available and the methods it hopes to use.

In an attempt to validate the current Peterson School sampling site, DEQ surveyed ten locations around Klamath Falls for PM_{10} in conjunction with the Peterson school site. In concert with this survey, DEQ placed $PM_{2.5}$ samplers at five of these survey sites to sample for correlation to the PM_{10} samplers and nephelometer.

PROCEDURE:

Site location

The ten survey sites were selected by DEQ's ambient air sampling group based on neighborhood layout, topography and terrain, meteorology and suspected impacts from wood space heating, traffic, proximity to commercial businesses and sites selected in the 1985/86 survey. Five of the sites were located in the residential area southeast of Klamath Falls where the highest PM_{10} levels are suspected. One sampler each was sited in industrial areas in the southwest and northwest sections of town. The two remaining samplers were placed just southeast of the central business district. A map of Klamath Falls showing the site locations is shown in Figure 1. Note that Site # 9 was dropped prior to the start of the survey.

Sampling Schedule

Sampling occurred during the winter of 1996 and 1997 on days likely to have high ground level particulate levels. The sampling days where forecasted when poor ventilation of pollutants and high particulate accumulation was likely. The forecasts were made by DEQ's meteorologist. On each of the sampling days, all survey samplers ran from approximately 12:00 the day of the sample to 12:00 the following day. The sampling days are included in Table 1.

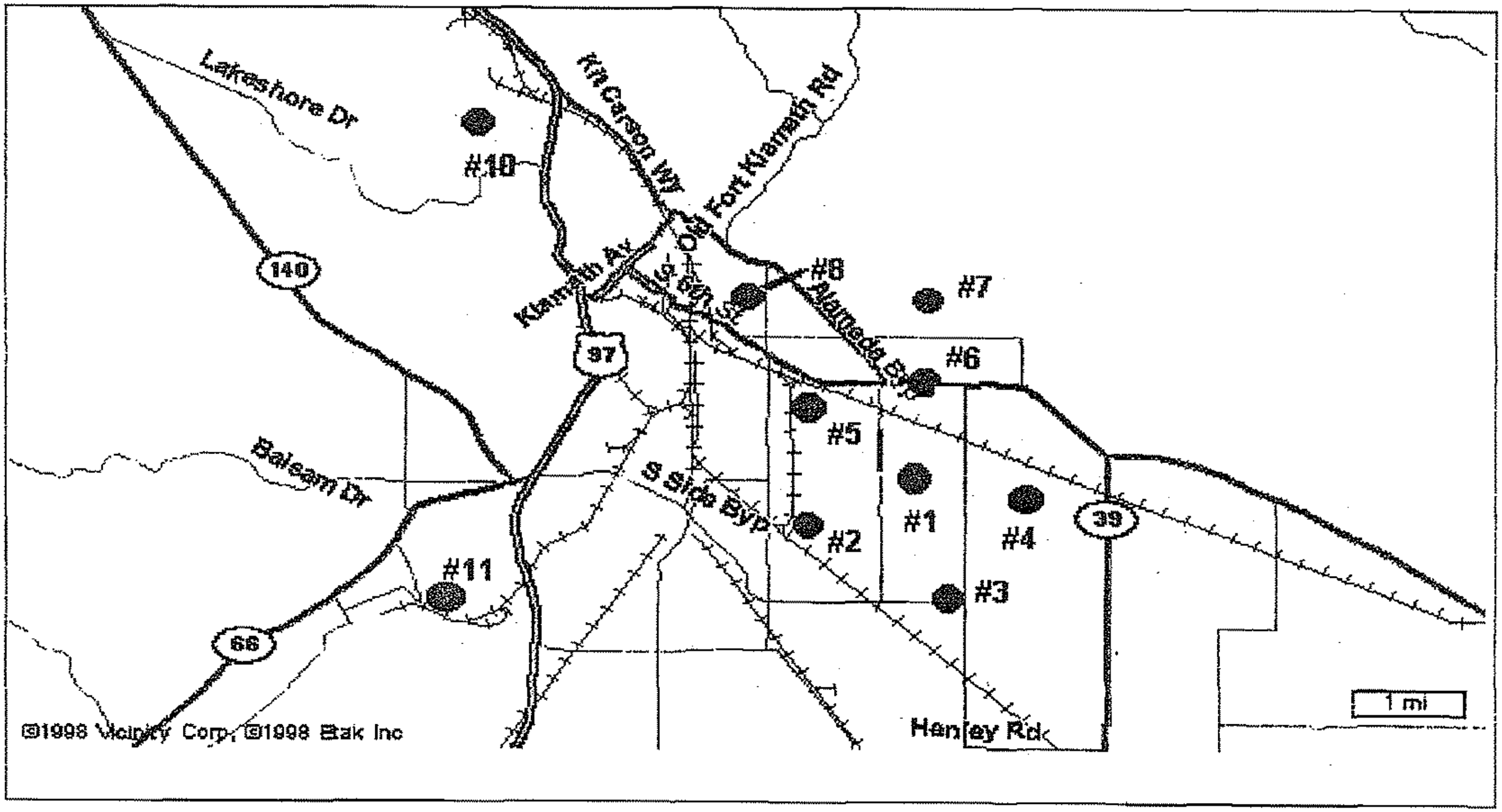


Figure 1. A large scale map of the Klamath Falls survey sites.

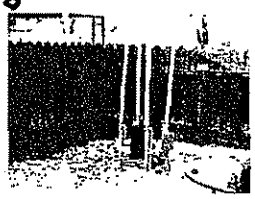
Installation

Samplers were installed using standard DEQ sampler installation protocol meeting current EPA particulate siting criteria cited in CFR Title 40, Vol. 3, Part 58.12, Appendix E. Each of these sites had a 10 micron survey sampler and five of these sites also had $PM_{2.5}$ samplers. The Peterson School site was used as the benchmark and duplicate site consisting of daily medium volume sampling for both PM_{10} and $PM_{2.5}$ and co-located PM_{10} samplers. The nephelometer was also located at Peterson school. A photograph of each site is shown in Figure 2.

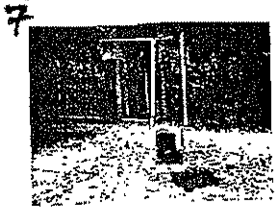
SITE: LINVILLE 96-18-110 **SITE:** MULLANY 96-18-108 **SITE:** LESTER 96-18-107

#10

#8

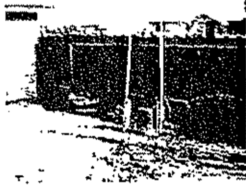


#7



SITE: Mc Bride 96-18-104 **SITE:** HOPE ST 96-18-106 **SITE:** PETERSON SCHOOL 18-CO-05

#4



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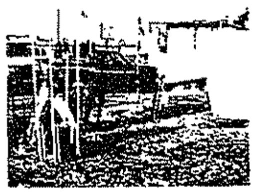
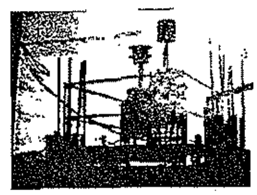


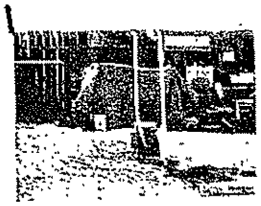
#1



SITE: PETERSON SCHOOL 96-18-101 **SITE:** GRAY 96-18-102 **SITE:** TOPPERS TAVERN 96-18-111

#2

#11



SITE: **SITE:** **SITE:**

NOTE: PHOTOS NOT AVAILABLE FOR SITE # 96-18-103 Schmeck #3
and SITE # 96-18-105 Klamath Ind. Supply. #5

#- number on Map

Sampling Equipment

The survey samplers consisted of a Thomas model 107A pump mounted on a plywood platform, see Figure 3. The pump drew air through a filter which was held 2 meters above the ground in a PVC tube. The pump was covered with a plastic 5 gallon pail to protect it from the weather (absent from Figure 3). The samplers were equipped with a two-valve solenoid and time clock system which allowed the operator to simultaneously begin sampling at the ten survey sites and Peterson School. If the solenoid time clock was inoperable, the sampler had to be manually started with start times anywhere between 1100 to 1300. The PM_{10} samplers were run using 10 micron low-flow (15 Lpm) AirMetrics survey inlets. The $PM_{2.5}$ samplers were run with low-flow (5 Lpm) inlets also from AirMetrics. A calibrated low flow orifice with a magnahelic gauge which accurately read the desired low sample flow rate was used to check start and stop flows for each sample filter. The $PM_{2.5}$ inlets were cleaned and greased about three times as instructed in the Air Metrics manual, depending on loading throughout the survey.

Quality Control

Survey method precision came from a co-located pair of duplicate samplers (one pair each of PM_{10} and $PM_{2.5}$ samplers) placed at Peterson school. Accuracy of the survey samplers came from dupes located a Peterson school with both a PM_{10}reference method Medium Volume sampler and a $PM_{2.5}$ non-reference method Medium Volume sampler. The $PM_{2.5}$ sampler used a Unico cyclone for size separation. Standard quality control and quality assurance procedures were followed using *Oregon Department of Environmental Quality Air Monitoring Procedures Manual*[2] and the *Oregon Department of Environmental Quality Air Monitoring Quality Control Manual*[3].

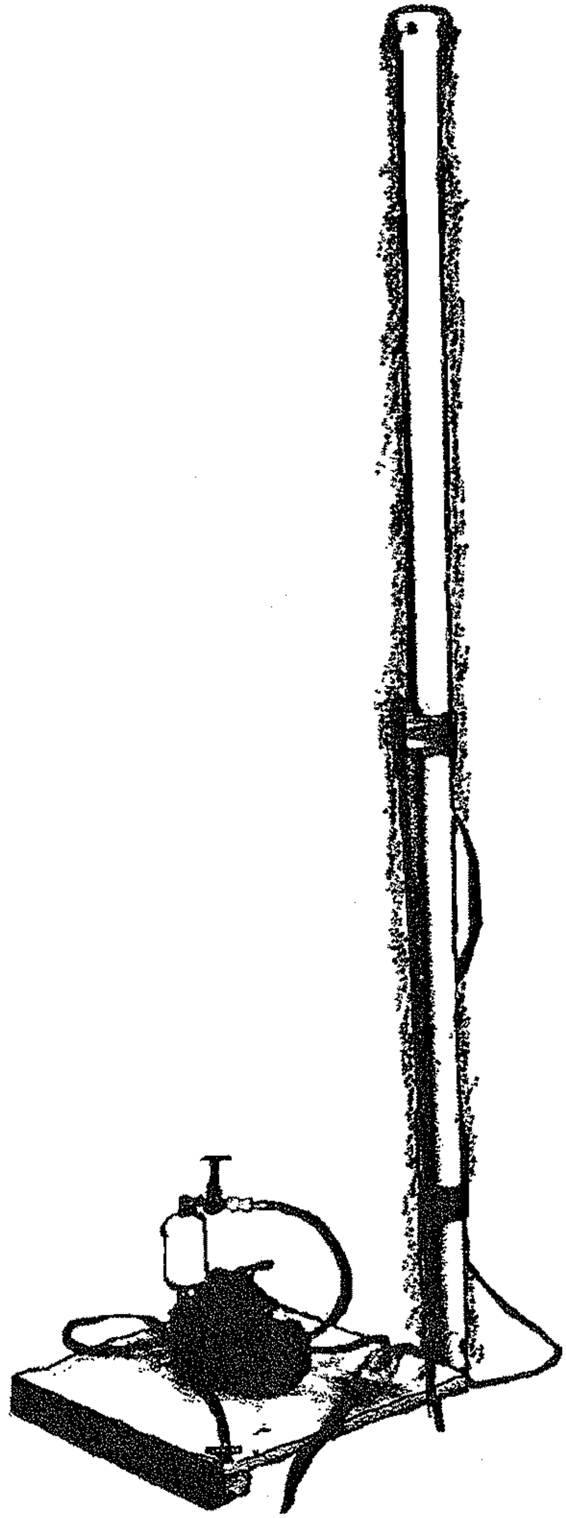


Figure 3. DEQ survey sampler using a Thomas model 107A pump and a low flow inlet mounted 2 meters above the ground on a PVC pipe.

RESULTS AND DISCUSSION:

Of the eleven sites surveyed (including Peterson school), the Hope Street site (#106) had the highest particulate levels, followed by Peterson school (#101), and the Avalon Street site(#102), see Figure 4. Overall, the sites in the residential southeastern suburbs of Klamath Falls had higher PM_{10} levels than the sites in the central business district or the industrial areas to the north and west. The results of the PM_{10} survey are given in Table 1.

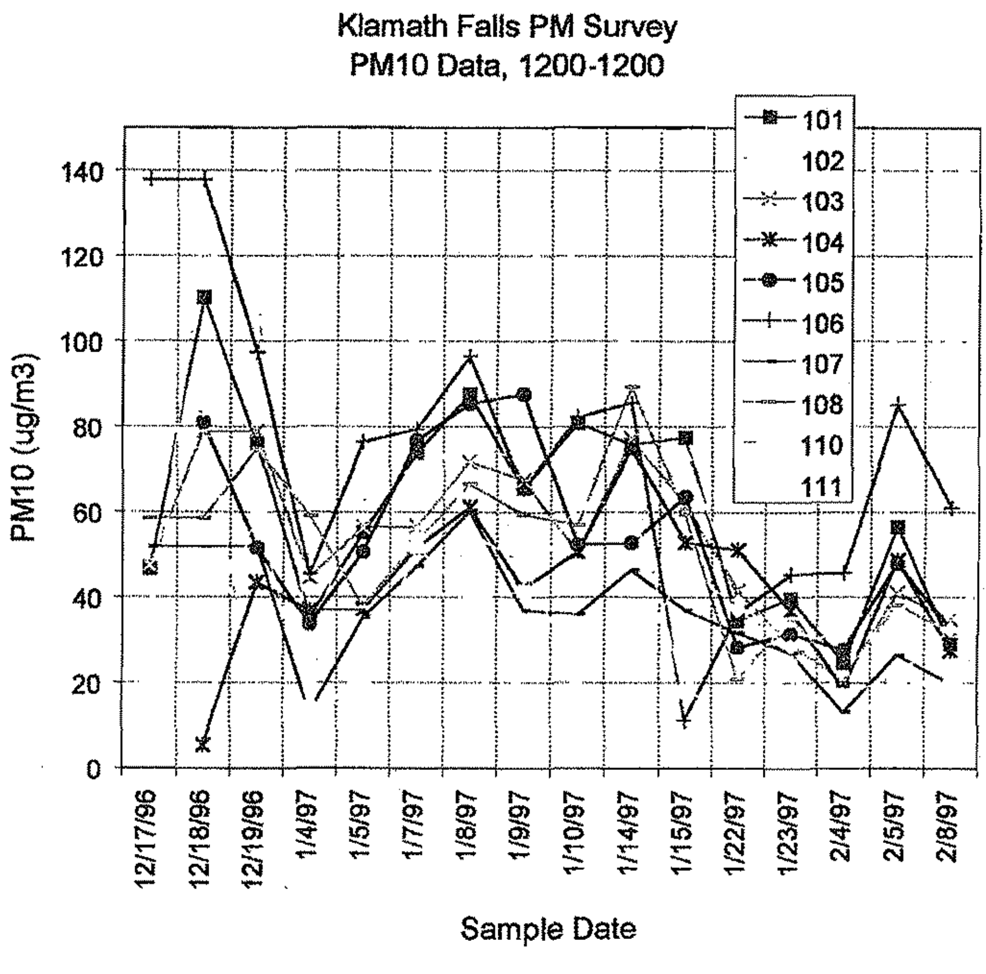


Figure 4 displays the PM_{10} data for the ten survey sites and the Peterson school MV fixed site.

KLAMATH FALLS PARTICULATE SURVEY. Dec 1996 - Feb 1996

Survey Site #'s PM_{10} (ug/m^3) All samples from 1200-1200

Date	KFP MV	101	102	103	104	105	106	107	108	110	111
12/17/96		46.7	34	48			138	52	59		18.4
12/18/96	104.5	110.2	122	79	5.4	**81**	138	52	59	83.9	22.4
12/19/96	72.6	76.1	108	79	44	**52**	97	52.0	75	11.7	60.0
1/4/97	30.3	35.5	30	45	37.0	*34	45	13.0	59	10.3	14.1
1/5/97	48.6	55.2	64	56	37	**51**	76	35	38	19.7	19.2
1/7/97	69.6	73.8	71	57	52	77	79	47	53.0	25.5	51.8
1/8/97	71.2	87.7	75	72	61	85	97	60	67	55.0	39.6
1/9/97	82.0	65.6	73	67	42	*88	65	37	59	*48.1	*41.3
1/10/97	73.4	80.8	73	50	51	**52**	82	36	57	**21.6**	**62**
1/14/97	74.0	75.8	56	77	75	53	*86	*46	89	*21.8	62.5
1/15/97	82.0	77.5	74	62	53	64	11	**37**	**59**	**48.1**	17.9
1/22/97	33.8	34.6	41	42	51	28	36	32	21.0	37.2	13.9
1/23/97	40.4	39.8	25	29	37	31	45	27.0	35	28.6	24.1
2/4/97	*27.9	24.7	*34	20	19	28	46	13	22	17.2	9.6
2/5/97	45.9	56.6	39	41	49	48	85	27	38	21.4	19.4
2/8/97	19.2	29.1	23	35	28	33	61	20	32.0	32.7	20.3

1) Most values are actual data meeting the 24 hour +/- 1 hour sampling schedule
2) Underlined* values are B data - data collected outside the 24 hour +/- 1 hour schedule
3) **Bold** values are pseudo data - data was not collected but is generated based on a ratio using the sampler with the closest PM loading
4) Shaded values are averaged data - data was collect on two filters over 48 hours and averaged.

Table 1. The PM_{10} survey results at the 10 survey sites and the Peterson school fixed sampler.

The data completeness of the survey was 85% which is acceptable. The first day of the survey was not included in the ranking process because the reference method medium volume sampler did not have a valid 24 hour sample. On the second day, five samplers had start problems but only one of these samplers failed to collect data. The other four samplers did not switch filters at the correct time so 48 hours worth of data was collected mostly on one filter. A second filter did start collecting sometime into the second day and stopped at the scheduled time. The two filters were averaged for a 24 hour loading. Other missing data was sporadic and was caused by sampler malfunctions.

The sites were ranked for overall maximum particulate loading in two ways. The ranking was first done by using all the data that was collected. However, with the small data sample size, this ranking is biased against sites with missing data. To include all the sites on all the days, ranking was also done using both actual collected data and "psuedo data". Psuedo data is generated by ratioing the sampler's missing data to data collected on a day with a similar loading using the MV sampler data for relative comparison. See the Appendix for a more detail discussion on ranking.

The site ranking for all data (actual & psuedo) and actual data only is shown in Table 2.

2a

RANKING OF SITES WITH MAXIMUM PARTICULATE LEVELS

Relative Concentration Rank

Survey Site #'s — PM10 (ug/m3) — All samples from 1200-1200

W/ Psudo & actual data	101	102	103	104	105	106	107	108	110	111
1st ×3	2	1	0	1	1	8	0	2	0	0
2nd ×2	3	5	2	1	1	3	0	0	0	0
3rd ×1	4	2	4	1	3	0	0	1	1	0
Ranking Value	**16**	**15**	**8**	**6**	**8**	**30**	**0**	**7**	**1**	**0**

2b Relative Concentration Rank

Survey Site #'s — PM10 (ug/m3) — All samples from 1200-1200

W/ Actual Values	101	102	103	104	105	106	107	108	110	111
1st ×3	2	2	0	1	1	7	0	2	0	0
2nd ×2	3	5	2	1	1	3	0	0	0	0
3rd ×1	3	2	3	1	5	0	0	1	1	0
Ranking Value	**15**	**18**	**7**	**6**	**10**	**27**	**0**	**7**	**1**	**0**
Data Completeness	100%	93%	87%	100%	60%	87%	80%	87%	73%	87%

Table 2: The PM_{10} survey sites ranking. The site which had the most days with the highest particulate loading in the survey has the highest ranking. The sites in 2 a are ranked using actual data, data generated from averaging of 48 hour sampling, and data which was ratioed using a sampler with similar loading. The sites in 2b ranked using only the actual data, days where a site did not collect data were ignored. Highest concentrations (1st) were multiplied by 3. 2nd highest number of days (2nd) were multiplied by 2. Sites with the third highest concentration were multiplied by 1.

In the second part of this study, DEQ compared the $PM_{2.5}$ samplers to the PM_{10} samplers, and to the nephelometer. The $PM_{2.5}$ sampler correlated well with both PM_{10} samplers and the nephelometer during periods of high particulate loading. During low particulate loading, however, the $PM_{2.5}$ sampler occasionally had a higher 24 hr average mass than the PM_{10} samplers. Table 3 shows the results of the $PM_{2.5}$ survey. $PM_{2.5}$, PM_{10}, and nephelometer levels are compared in Figure 5.

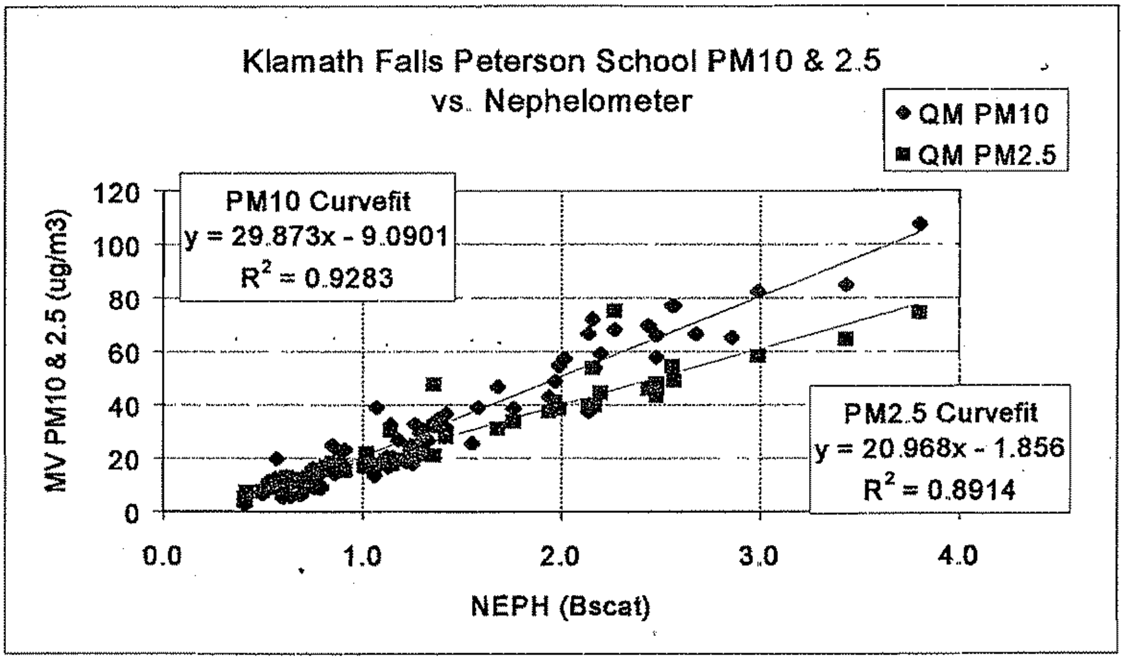


Figure 5 compares Nephelometry, MV PM_{10} and MV $PM_{2.5}$ data from the Peterson school fixed site.

		Survey Site #'s	$PM_{2.5}$ (ug/m^3)				All samples from 1200-1200				
Date	**KFP MV**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**110**	**111**
12/17/96		36.4		35.9			**189.7**		**71.7**		
12/18/96	80.4	76.5		89.4			**2.7**		**8.6**	57.1	
12/19/96	45.9	48.4		5.3			**81.7**		**34.9**	5.2	
1/4/97	17.8	24.9		29.5			36.1		23.2	7.7	
1/5/97	33.7	40.2		35.0			52.9		29.9	**14.0**	
1/7/97	51.3	53.3		39.9			64.9		33.2	15.4	
1/8/97	45.1	61.3		46.6			62.4		45.6	27.2	
1/9/97	49.9	56.9		51.1			53.6		42.6	**27.4**	
1/10/97	39.6	52.8		30.9			58.8		37.1		
1/14/97	46.6	47.8		55.9			**54.7**		35.5	**13.4**	
1/15/97	52.1	47.8		39.4							
1/22/97	38.0	36.2		18.9			27.5		16.8	19.5	
1/23/97	35.9	24.5		29.9			36.2		19.3	22.6	
2/4/97	15.5	17.1		21.0			31.8		13.3	19.8	
2/5/97	31.1	38.4		29.9			55.1		24.9	14.2	
2/8/97	14.3	20.9		15.6			33.6		24.5	28.1	
Bolded values are B data - data collected outside the 24 hour +/- 1 hour schedule											

Table 3. $PM_{2.5}$ survey data from the 5 survey sites and the Peterson school fixed MV $PM_{2.5}$ sampler.

CONCLUSION:

The ranking of the Hope Street (site #106) as the site with the highest average PM_{10} levels and Peterson school (site #101) and Avalon St. (site #102) as the sites with the second highest levels verifies that the current PM_{10} sampler at Peterson school represents the highest particulate levels in Klamath Falls and is appropriately located. The three sites are located in close proximity to one another and share the same neighborhood layout, topography and terrain, meteorology and suspected impacts from wood space heating, and traffic. The Hope Street site had the highest particulate levels but is not a practical location for a sampler because of its proximity to the State Highway (6th Street) which is regularly sanded during PM_{10} season. The nearest appropriate site is, in fact, Peterson school which is about one mile north of the Hope Street site. The Peterson school site has no road sanding impact because it is located next to neighborhood streets. PM_{10} sampling for the Klamath Falls area should continue at Peterson School.

The results from the $PM_{2.5}$ portion of the survey demonstrates that the $PM_{2.5}$ Airmetrics sampler DEQ used in this survey did not accurately measure particulate at 2.5 microns or lower. On some sample days, January 1 in particular, the $PM_{2.5}$ loading even exceeded the PM_{10} loading measured by the federal reference Medium Volume sampler. This of course should not occur because the PM_{10} consists of particles 10 microns and lower including the fraction of particles 2.5 microns and smaller. DEQ concluded from these data that the Airmetrics $PM_{2.5}$ sampler did not separate large and small particles effectively. Soon after the survey, DEQ isolated the cause of the poor particle size separation to the Airmtrics low-flow (5 Lpm) inlet.

The winter of 1996/1997 did not have highly stagnant air and cold days, conditions which are conducive to high particulate levels. As a result, DEQ could not verify that the Peterson school site would continue to measure the highest ambient particulate levels in Klamath Falls during a winter when these levels may approach the National Ambient Air Quality Standards. For this reason and because of the questionable $PM_{2.5}$ data, DEQ may decide to re-survey Klamath Falls prior to the Winter of 2006/07.

REFERENCES

1. Erickson S., Special Study Report, Klamath Falls Particulate Survey (Winter of 1985/86), The Oregon Department of Environmental Quality, Air Quality, Technical Services. Report No. 87-7, June, 1987.

2. Air Monitoring Procedures Manual, Oregon Department of Environmental Quality, Laboratories and Applied Research, Manual 109, Doc B, 1988.

3. Air Quality Control Procedures Manual, Oregon Department of Environmental Quality, Laboratories and Applied Research, Manual No. 109. Doc. C, 1988.

APPENDIX

Evaluation of Results

With the statistically small data set collected in the survey and the randomness of missing survey days, sites with missing data could have strongly effected the ranking outcome had they been operational. By simply ignoring the holes in the data where samples were missing and analyzing just the data successfully collected as a complete set, one could potentially yield results not reflective of actual conditions. Therefore, it is necessary to fill in the missing data. Before beginning analysis of the data, the following rationale was used to create a complete data set.

Data Completion

The Peterson school reference method medium volume (MV) sampler continuously operated during the survey (except on the first day) and had a valid, complete set of data. Because the MV sampler is a federal reference method and had complete data it was used as a benchmark site to "fill in the blanks" in the survey data. When a survey site had missing data on a sample day, the MV sampler data for that day was compared to MV sampler data taken on the closest (+ or -) successful day. The survey filter loading on the closest successful day (+ or -) was compared to the missing day using the ratio of the MV sampler's data on both days. See Equation 1 for example.

Equation 1: Estimation of the missing data for January 5, 1997 for Sampler #105 using the closest MV loading on 2/5/97 to ratio with.

$$\frac{\text{Missing 1/5/97 \#105 data}}{\text{1/5/97 MV data}} = \frac{\text{2/5/97 \#105 data}}{\text{2/5/97 MV data}}$$

Ranking

During each sampling period, the site with the highest average 24 hour concentration of PM_{10} for a given day was assigned three points. The site with the second highest 24 hour average on a given day was assigned two points and the site with the third highest 24 hour average on a given day was assigned one point. In the case of ties, each tied site was given the points appropriate to their position in the ranking. The points were summed for each site.

SITE LISTING FOR KLAMATH FALLS PARTICULATE SURVEY WINTER 1996-97

Site Name/Address/Equipment	Site #	Comments
Peterson School 4856 Clinton St MV 10µ, MV 2.5µ, Survey 10µ - Primary & Dupe, Survey 2.5µ - Primary & Dupe	96-18-101	(Routine site KFP 18-00-005)
Laura and John Gray 4443 Avalon (541) 882-4702 Survey 10µ	96-18-102	
Ron Schmeck 5164 Ankenny St. (541) 882-9935 Survey 2.5µ & 10µ	96-18-103	
Joe McBride 5829 Southgate Survey 10µ	96-18-104	
Klamath Industrial Supply Jerry Peacore, owner 2800 Crosby Ave (541) 883-8333 Survey 10µ	96-18-105	
Hope St. CO site (Routine site KFH 18-00-010) Survey 2.5µ & 10µ	96-18-106	
Gladys Lester 4327 Freida Ave Survey 10µ	96-18-107	
Mrs. Pat Mullany 1133 Division St. Survey 2.5µ & 10µ	96-18-108	
Site 109 not used in survey (Original choice for site dropped because of power question, site dropped from survey.) Survey 10µ	96-18-109	
Everett and Mickey Linville 710 Wocus St. (541) 884-7018 Survey 2.5µ & 10µ	96-18-110	
Topper's Tavern 5125 Weyerhauser (541) 882-7855 Survey 10µ	96-18-111	

State of Oregon
Department of
Environmental
Quality

KLAMATH FALLS, OREGON
$PM_{2.5}$ PARTICULATE SITE VALIDATION STUDY

2000 - 2001

Conducted By

The Oregon Department Of Environmental Quality

Laboratories And Applied Research Division

Air Quality Monitoring Section

Sampling by: Pegeen Fitzpatrick

Report by: Mark Hansen, and Jeff Smith

August, 2001

Review by:_____________________________ **Date:** ___________________

Review by:_____________________________ **Date:** ___________________

Review by:_____________________________ **Date:** ___________________

WORK PLAN

1. PURPOSE:

This study is being conducted in conjunction with the establishment of a new Federal Reference Method (FRM) $PM_{2.5}$ particulate sampling site in Klamath Falls on Clinton Street at Peterson Elementary School. Data from this fine particulate study will help determine if the FRM $PM_{2.5}$ sampler is optimally placed to characterize neighborhood scale $PM_{2.5}$ levels in Klamath Falls. If the study validates the selection of the Peterson School site $PM_{2.5}$ measurements from there will be used to determine if the Klamath Falls area air shed meets the new National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$ particulates.

2. HOW ACCOMPLISHED:

The study will begin in mid-Spring 2000 and continue for one year. The survey samplers have been successfully tested and their sampling precision and accuracy documented. Two types of $PM_{2.5}$ survey samplers are available for use in this study. Both samplers are low volume devices using an inertial greased impactor as the particulate size separation method. Both use the same 47 mm diameter Teflon filter. One is a battery powered sampler, the “Mini-Vol”, operating at 5 lpm (liters per minute). The filter attaches to the top of the sampler by means of a special fitting. The other samplers uses a 110 VAC pump to pull 15 lpm of ambient air through the filter. The filter is “Quik” connected to a 2 meter piece of PVC pipe which is attached to the pump with tygon tubing. Both types of samplers have been used in many studies in the past and both have been recently re-tested at selected sites for their precision and accuracy. Test results are on file at the ODEQ laboratory. The AC powered 15 lpm samplers will be used in the Klamath Falls, primarily due to their more reliable operation during cold weather and their better precision results.

The samplers will run on the national EPA every 6th day schedule, the same as other particulate samplers located statewide. Sites will be serviced by the Portland DEQ Lab air monitoring staff as required. The filters will be returned to the Oregon DEQ laboratory for analysis and determination of their $PM_{2.5}$ mass loadings.

3. SITE SELECTION:

Survey sites have been located to the north, south, east and west of the FRM $PM_{2.5}$ benchmark sampler at Peterson School with surroundings approximately similar to the FRM site and to each other. Effort was made to select sites with no known major fine particulate point sources nearby. The survey sites are within 1-2 kilometers of the benchmark FRM site.

See the site photos and network map (figure 1) below for more information about the sites.

Klamath Falls PM2.5 Survey Sites.

BENCHMARK SITE
Peterson Elementary School
4856 Clinton Street
Lat./Long. 42° 11’ 42.4” / 121° 43’ 54.47”
Site ID# 10118

NORTH
Klamath Falls – Hope Street
2326 Hope Street
Lat./Long 42° 12’ 22” / 121° 43’ 44”
Site ID #: 10119

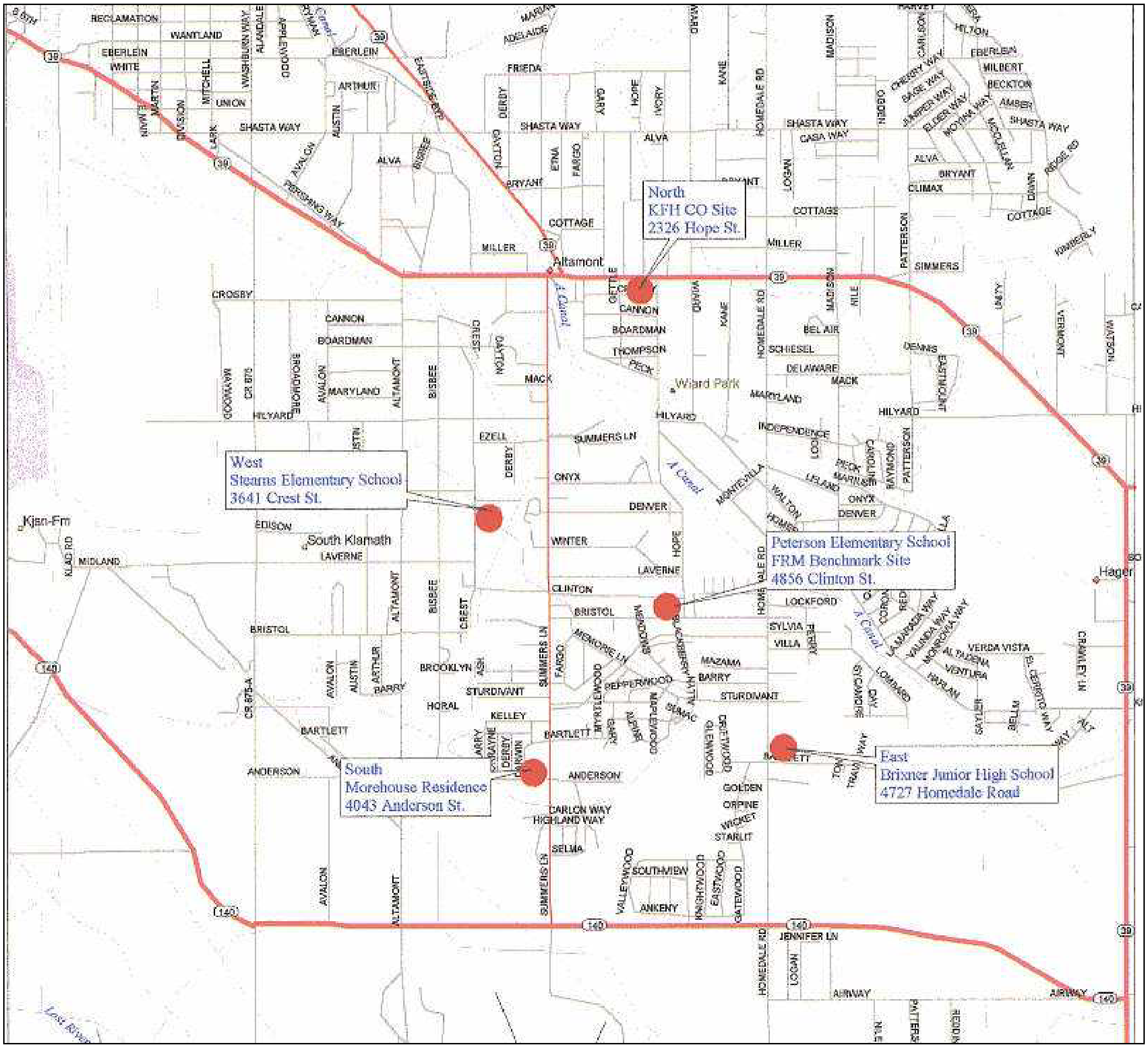
WEST
Stearns Elementary School
3641 Crest Street
Lat./Long 42° 11’ 35.91” / 121° 44’ 28.87”
Site ID #: 23733

SOUTH
Morehouse Residence
4043 Anderson Street
Lat./Long 42° 10’ 52.24” / 121° 44’ 19.2”
Site ID #: 23735

EAST
Brixner Junior High School
4727 Homedale Road
Lat./Long 42° 10’ 57.77” / 121° 43’ 15.58
Site ID #: 23734

KLAMATH FALLS $PM_{2.5}$ SURVEY SITES MAP

Figure 1 ↑North



4. NETWORK QA/QC:

The Rupprecht & Patashnick (R&P) model 2025 sequential FRM $PM_{2.5}$ sampler is an EPA certified reference method sampler for the measurement of $PM_{2.5}$. It is a proven and reliable method of measuring fine particulate and will be the benchmark device for this study. It samples at the Peterson School benchmark site. Two $PM_{2.5}$ survey samplers will be co-located at the benchmark site where they will provide data used to determine the precision and accuracy of the study results.

All of the survey samplers will be subjected to periodic independent flow audits performed by DEQ Lab staff during regularly scheduled (monthly) network reviews. The performance of the local operator will also be reviewed during these visits.

The operator will maintain a "journal" of the project, noting significant events (equipment problems, unusual weather, etc.), and document the required cleaning and regreasing of the $PM_{2.5}$ impactor inlets.

Additional standard Quality Control activities will occur at the laboratory during the review of the samples, field data sheets, and analytical mass determination.

5. FUND CODE:

This study is part of the calendar year 2000 work plan for the state wide $PM_{2.5}$ network. It is funded under an EPA 103 grant. The internal DEQ Lab fund code is 9811.

6. SUMMARY AND REPORT:

A report detailing the results of this study will be generated at the end of the one year project. The report will include all of the sampling data from all 5 sites. The data from the co-located survey samplers (primary and duplicate) at the benchmark site will be analyzed to determine the precision of the survey samplers. The accuracy of the survey method will be determined by comparing the results of the co-located survey and FRM samplers. The results of the 4 survey sites will be compared to that of the benchmark site. A conclusion will be made as to the suitability of the current $PM_{2.5}$ siting in Klamath Falls.

7. PROJECT SCHEDULE:

Activity	Date
Develop work plan.	January, 2000
Site search and procurement.	February-March, 2000
Equipment preparation and testing.	April, 2000
Begin sampling.	May, 2000
End sampling.	June 2001
Final report.	August 2001

PROJECT IMPLEMENTATION

1. NETWORK QA/QC:

All sampler and flow orifices used in the survey were calibrated at the ODEQ Lab using a National Institute of Standards and Technology (NIST) traceable roots meter.

Prior to startup of the actual survey, the 15 lpm inlets were tested as a group at a site in Portland. Three 24 hour samples were collected. This was to test each sampler's operation as well as to compare the performance of the $PM_{2.5}$ inlets used in the survey. Results of the group testing showed that the inlets compared favorably to one another although they tended to over-collect $PM_{2.5}$ as compared to the reference method sampler (FRM). The results of this test are on file at the ODEQ laboratory.

Network Quality Control (QC) audits were performed on 7/2/00, 8/7/00, 8/27/00, 9/26/00, 10/30/00, 12/6/00, 1/11/01, 2/8/01, 3/7/01, 4/4/01 and 5/2/01. A review of audit records indicated that, with only one marginal exception, all of the samplers operated within 10% of the ideal design flow (assuring a proper particulate size cut by the inlets). The one exception was a single audit of one sampler that showed a flow slightly below the 10% limit. This flow was corrected. The operator's flow orifice used for the survey was also regularly audited and found to be well within the 10% limit. According to the operator's records all of the $PM_{2.5}$ impactor inlets were cleaned at their regularly scheduled (monthly) intervals during the survey.

The benchmark $PM_{2.5}$ FRM sampler was subject to regular monthly QC audits. All sensor and flow audits performed during the duration of the survey were within EPA established limits. Additional quarterly Quality Assurance (QA) audits of the $PM_{2.5}$ FRM sampler performed by the DEQ Laboratory QA section were all within EPA limits, confirming these results.

As a result of all of these efforts, we believe that the data quality objectives for this project were met and are confident in the quality of the data generated by this survey.

2. RESULTS:

Results of the Klamath Falls $PM_{2.5}$ survey are shown in the following tables and graphs. Table 1 contains all of the survey sampling data from the study. At the bottom of Table 1 is the key for the codes used to indicate missing samples. Table 2 is a summary of the data. Figure 1 is a graph of all the results for the entire project.

The precision and accuracy (P&A) of the R&P $PM_{2.5}$ FRM sampler was not tested as part of this study. P&A data for this sampler is routinely developed at a number of regular $PM_{2.5}$ sampling sites across the state. This information is available from the DEQ Lab and from EPA.

Data on the precision of the survey samplers was generated by co-locating (primary and duplicate) samplers at the benchmark site. This data is displayed in Table 3 and its accompanying graph. The statistical correlation between the two was 0.9914. The corresponding R squared value is 0.9829. The average difference between the primary and duplicate samplers was 0.35 ug/m3 with a maximum difference of 4.7 ug/m3. The sigma value between the two was 1.43. This data is based on only 51 of the possible 62 valid matched filter pairs. Of the eleven missing sample pairs, six were due to the operator's failure to remove the inlet impactor stages from a damaged inlet housing and install them in the replacement housing.

Fortunately, this occurred during the last six samples of the survey when PM2.5 levels were near their lowest.

Survey sampler accuracy is determined by comparing the average of the co-located survey samplers against the benchmark PM2.5 FRM sampler. In instances where either the primary or duplicate survey sample is missing, the single good value is used to represent the survey sampler average. This data is displayed in Table 4 and its accompanying graph. The survey samplers tended to over collect particulate as compared to the benchmark FRM sampler by an average of 1.5 ug/m3 with a maximum difference of 7.7 ug/m3. The correlation between the two was 0.9699 (R squared value of 0.9407). The sigma value between the two was 2.46. Note, the linear curve fit of the accuracy data has a slope of .936, which would indicate that the FRM collects more PM than does the survey sampler. This contrary conclusion is the result of a single data pair at the high end of the curve that is skewing the fit.

All of the survey sites generated varied but consistent results. The data is displayed as a graph in figure 1. Survey averages from the five sites ranged from 10.4 to 13.6 ug/m3. The North site had the highest, and the East and South sites the lowest survey averages. The results from the survey samplers at the current FRM benchmark site (KFP) were comfortably in the middle of the range. These annual average values are comfortably below the annual $PM_{2.5}$ NAAQS of 15 ug/m3.

The highest single value from the entire survey was 54.2 ug/m3 and occurred at the West site on 12-8-00, followed by 51.9 ug/m3 at the South site on the same date. These are both below the NAAQS 24 hour standard of 65 ug/m3.

3. CONCLUSIONS:

The survey results indicate that the current $PM_{2.5}$ monitoring station at the Peterson School site is suitably located to characterize neighborhood scale $PM_{2.5}$ levels in Klamath Falls. When comparing the survey averages from each site, the Peterson School site ranks virtually tied for second with the West site. Its PM values are right between the values from the highest and lowest sites. The North site generated the highest individual survey average, and on days of elevated PM2.5 levels, one or two of the other sites would occasionally report values exceeding those from the Peterson School site. The North site at Hope Street, was much closer to the Hwy. 39 corridor and business district. This may explain it's higher readings. Conversely, the two lowest survey averages (East and South sites) were further removed from the business district and in more residential settings.

Although three years of monitoring data are required in order to determine compliance with the new PM2.5 NAAQS, based on the results of this one year survey it is reasonable to project that Klamath Falls has a good chance of complying with these standards.

Table 1. Klamath Falls PM2.5 Survey Results (all values in ug/m^3)

Date	North Hope St	East Brixner	South Morehouse	West Stearns	KFP Prim	KFP Dupe	KFP P&D avg	KFP FRM
7-Jun-00	5.0	5.2	5.5	4.8	3.9	5.5	4.7	3.5
11-Jun-00	3.7	3.3	2.6	4.2	2.8	2.6	2.7	3.2
17-Jun-00	6.5	4.2	3.9	4.3	3.4	3.4	3.4	2.6
23-Jun-00	6.6	5.1	4.6	6.7	5.7	5.0	5.4	3.9
29-Jun-00	7.6	9.1	11.0	8.7	8.5	8.5	8.5	10.2
5-Jul-00	3.7	2.6	7.6	5.1	3.6	2.7	3.2	2.7
11-Jul-00	7.3	5.2	6.7	6.9	6.4	**OE**	6.4	5.6
17-Jul-00	7.7	6.5	7.4	3.8	6.2	6.9	6.6	6.1
23-Jul-00	5.3	4.7	4.4	5.7	4.2	5.7	5.0	3.9
29-Jul-00	6.7	4.8	4.9	6.3	5.0	5.1	5.1	4.7
4-Aug-00	6.7	7.6	7.0	6.5	6.5	6.5	6.5	**IM**
10-Aug-00	7.4	4.7	4.6	5.5	5.9	4.7	5.3	4.6
16-Aug-00	9.6	5.8	6.5	6.2	5.4	6.0	5.7	5.6
22-Aug-00	10.0	**IM**	9.1	9.5	9.2	9.4	9.3	8.2
28-Aug-00	5.4	7.3	5.4	6.4	7.6	4.7	6.2	3.8
3-Sep-00	4.5	3.2	3.2	3.3	5.5	4.4	5.0	2.0
9-Sep-00	6.5	7.3	4.4	6.2	4.4	5.6	5.0	3.3
15-Sep-00	6.9	4.4	6.2	7.9	4.4	4.3	4.4	5.3
21-Sep-00	5.0	4.6	4.9	3.4	3.7	3.7	3.7	4.3
27-Sep-00	10.0	8.6	8.4	10.7	8.9	8.5	8.7	8.1
3-Oct-00	7.3	7.2	6.2	6.6	7.0	6.9	7.0	6.6
9-Oct-00	7.2	7.9	6.3	8.4	**IM**	7.0	7.0	6.9
15-Oct-00	13.8	11.4	16	18.8	**IM**	**IM**	12	16.9
17-Oct-00	**NA**	**NA**	**NA**	**NA**	12.2	11.7	12.0	12.9
21-Oct-00	3.5	2.7	4.0	5.2	3.4	2.7	3.1	2.9
27-Oct-00	11.5	10.5	13.1	14.4	12.5	11.6	12.1	14.6
2-Nov-00	21.2	10.7	14.8	15.5	18.6	14.2	16.4	16.2
8-Nov-00	8.2	6.2	6.7	5.0	5.4	5.8	5.6	5.9
14-Nov-00	19.8	13.2	13.7	18.3	19.0	19.0	19.0	19.8
20-Nov-00	36.4	27.9	28.1	30.1	30.2	29.8	30.0	32.4
26-Nov-00	17.4	14.6	20.5	20.0	21.4	20.7	21.1	21.8
2-Dec-00	34.7	21.2	23.1	20.8	23.7	23.5	23.6	24.4
8-Dec-00	40.8	39.8	51.9	54.2	48.7	47.4	48.1	53.6
14-Dec-00	10.7	6.7	8.1	6.9	7.1	7.8	7.5	6.4
20-Dec-00	22.8	23.9	25.9	29.4	22.9	22.9	22.9	24.7
26-Dec-00	32.6	23.8	19.9	25.1	29.9	27.1	28.5	21.8
1-Jan-01	42.5	39.2	32.1	33.8	40.0	41.0	40.5	36.7
7-Jan-01	24.3	14.1	12.8	12.5	17.8	17.6	17.7	11.6
13-Jan-01	13.7	6.5	7.0	8.7	10.0	10.2	10.1	7.8
19-Jan-01	35.3	**OE**	26.4	29.3	35.1	30.4	32.8	26.9
25-Jan-01	11.1	5.0	9.9	8.0	6.9	6.3	6.6	4.5
31-Jan-01	39.1	31.4	31.8	34	34.3	31.4	32.9	31.9
6-Feb-01	16.3	8.3	6.3	4.6	6.0	6.6	6.3	2.7
12-Feb-01	14.3	7.2	14.5	12.1	11.2	11.5	11.4	10.3
18-Feb-01	4.0	3.1	3.7	2.8	3.0	2.9	3.0	1.9
24-Feb-01	12.9	10.8	17.5	12.9	19.4	16.0	17.7	13.0

Date	North Hope St	East Brixner	South Morehouse	West Stearns	KFP Prim	KFP Dupe	KFP P&D avg	KFP FRM
2-Mar-01	16.9	7.1	12.4	8.1	11.8	11.3	11.6	IM
8-Mar-01	**FC**	8.2	8.3	13.6	9.0	8.9	9.0	7.5
14-Mar-01	24	11.0	15.0	18.5	17.8	20.8	19.3	11.6
20-Mar-01	14.8	10.4	12.6	13.8	14.1	14.1	14.1	11.0
26-Mar-01	12.4	7.7	9.7	14.5	11.3	10.7	11.0	8.8
1-Apr-01	11	9.4	8.5	9.3	7.3	9.6	8.5	6.3
7-Apr-01	9.1	3.7	3.9	6.6	5.5	5.8	5.7	1.8
13-Apr-01	10.0	7.5	6.6	7.5	7.9	7.7	7.8	4.6
19-Apr-01	7.3	4.3	5.7	5.2	**IBO**	**IBO**		2.9
25-Apr-01	10.9	9.3	10.0	11.4	8.8	**IM**	8.8	6.5
1-May-01	8.5	6.0	6.0	**OE**	9.3	**OE**	9.3	3.1
7-May-01	12.0	10.6	10.1	10.9	11.1	**OE**	11.1	7.0
13-May-01	12.4	9.3		11.7	11.0	**OE**	11	5.9
19-May-01	10.6	14.2	7.9	8.0	9.7	**OE**	9.7	6.0
25-May-01	11.5	13.9	9.4	9.4	10.0	**OE**	10.0	7.1
31-May-01	8.9	8.1	6.0	6.7	5.5	**OE**	5.5	3.0
Average	13.6	10.1	11.2	11.9	12.0	12.0	11.8	10.3
Count	60	59	60	60	59	52	60	60

Code key for missing samples:

IM instrument malfunction
OE operator error
FC filter contaminated
PD power disconnected
IBO instrument blown over
NA not a sample day

Table 2. Summary of Results

Site	# samples (62 possible)	Survey Avg ug/m3	Highest ug/m3	Days > 15 ug/m3
North	60	13.6	42.5	15
East	59	10.4	39.8	7
South	60	11.2	51.9	11
West	60	11.8	54.2	13
KFP-P	59	12.0	48.7	14
KFP-D	52	12.0	47.4	12
Avg of P&D *	60	11.7	48.1	14
KFP FRM	60	10.3	53.6	11

* using available numbers when either Pri or Dup sample is missing

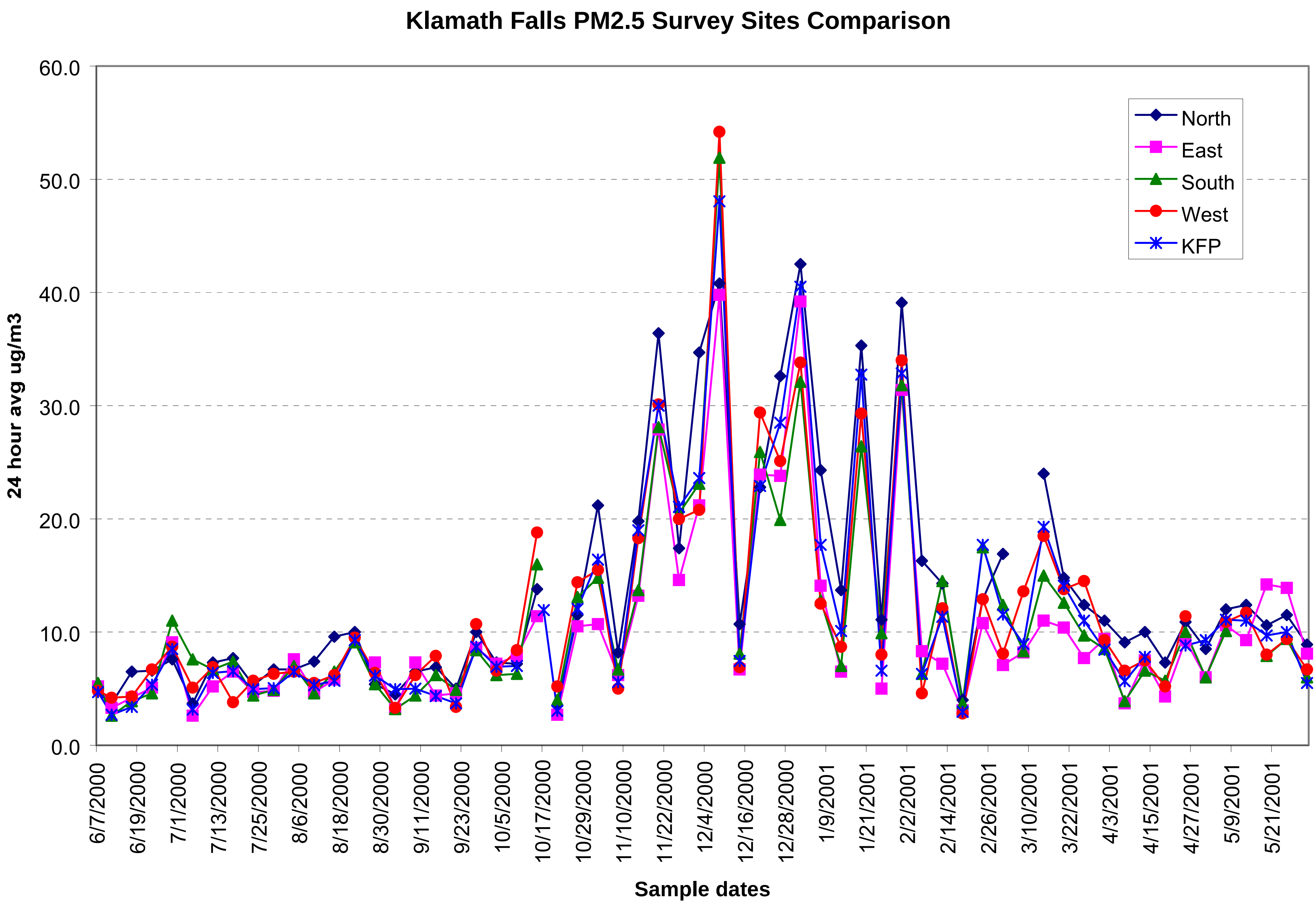

Klamath Falls PM2.5 Survey Sites Comparison
24 hour avg ug/m3
60.0
50.0
40.0
30.0
20.0
10.0
0.0
North
East
South
West
KFP
6/7/2000
6/19/2000
7/1/2000
7/13/2000
7/25/2000
8/6/2000
8/18/2000
8/30/2000
9/11/2000
9/23/2000
10/5/2000
10/17/2000
10/29/2000
11/10/2000
11/22/2000
12/4/2000
12/16/2000
12/28/2000
1/9/2001
1/21/2001
2/2/2001
2/14/2001
2/26/2001
3/10/2001
3/22/2001
4/3/2001
4/15/2001
4/27/2001
5/9/2001
5/21/2001
Sample dates

Figure 1

Table 3. Precision Data: Co-Located survey samplers at the Benchmark Site

All values in ug/m3.

Date	Pri	Dup	Pri - Dup
7-Jun-00	3.9	5.5	-1.6
11-Jun-00	2.8	2.6	0.2
17-Jun-00	3.4	3.4	0
23-Jun-00	5.7	5	0.7
29-Jun-00	8.5	8.5	0
5-Jul-00	3.6	2.7	0.9
17-Jul-00	6.2	6.9	-0.7
23-Jul-00	4.2	5.7	-1.5
29-Jul-00	5	5.1	-0.1
4-Aug-00	6.5	6.5	0
10-Aug-00	5.9	4.7	1.2
16-Aug-00	5.4	6	-0.6
22-Aug-00	9.2	9.4	-0.2
28-Aug-00	7.6	4.7	2.9
3-Sep-00	5.5	4.4	1.1
9-Sep-00	4.4	5.6	-1.2
15-Sep-00	4.4	4.3	0.1
21-Sep-00	3.7	3.7	0
27-Sep-00	8.9	8.5	0.4
3-Oct-00	7	6.9	0.1
17-Oct-00	12.2	11.7	0.5
21-Oct-00	3.4	2.7	0.7
27-Oct-00	12.5	11.6	0.9
2-Nov-00	18.6	14.2	4.4
8-Nov-00	5.4	5.8	-0.4
14-Nov-00	19	19	0
20-Nov-00	30.2	29.8	0.4
26-Nov-00	21.4	20.7	0.7

Date	Pri	Dup	Pri - Dup
2-Dec-00	23.7	23.5	0.2
8-Dec-00	48.7	47.4	1.3
14-Dec-00	7.1	7.8	-0.7
20-Dec-00	22.9	22.9	0
26-Dec-00	29.9	27.1	2.8
1-Jan-01	40	41	-1
7-Jan-01	17.8	17.6	0.2
13-Jan-01	10	10.2	-0.2
19-Jan-01	35.1	30.4	4.7
25-Jan-01	6.9	6.3	0.6
31-Jan-01	34.3	31.4	2.9
6-Feb-01	6	6.6	-0.6
12-Feb-01	11.2	11.5	-0.3
18-Feb-01	3	2.9	0.1
24-Feb-01	19.4	16	3.4
2-Mar-01	11.8	11.3	0.5
8-Mar-01	9	8.9	0.1
14-Mar-01	17.8	20.8	-3
20-Mar-01	14.1	14.1	0
26-Mar-01	11.3	10.7	0.6
1-Apr-01	7.3	9.6	-2.3
7-Apr-01	5.5	5.8	-0.3
13-Apr-01	7.9	7.7	-0.2
Average =	12.5	12.1	0.35
Count =			51
Correlation =			0.9914
Sigma =			1.43
Max diff =			4.7

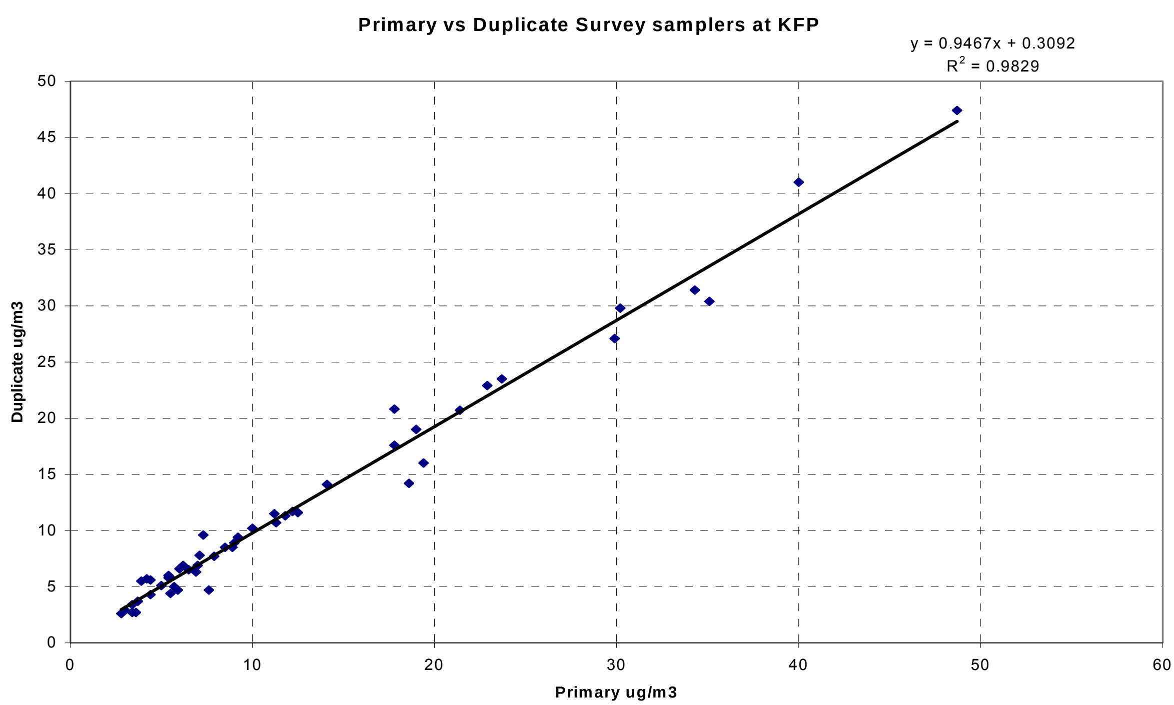
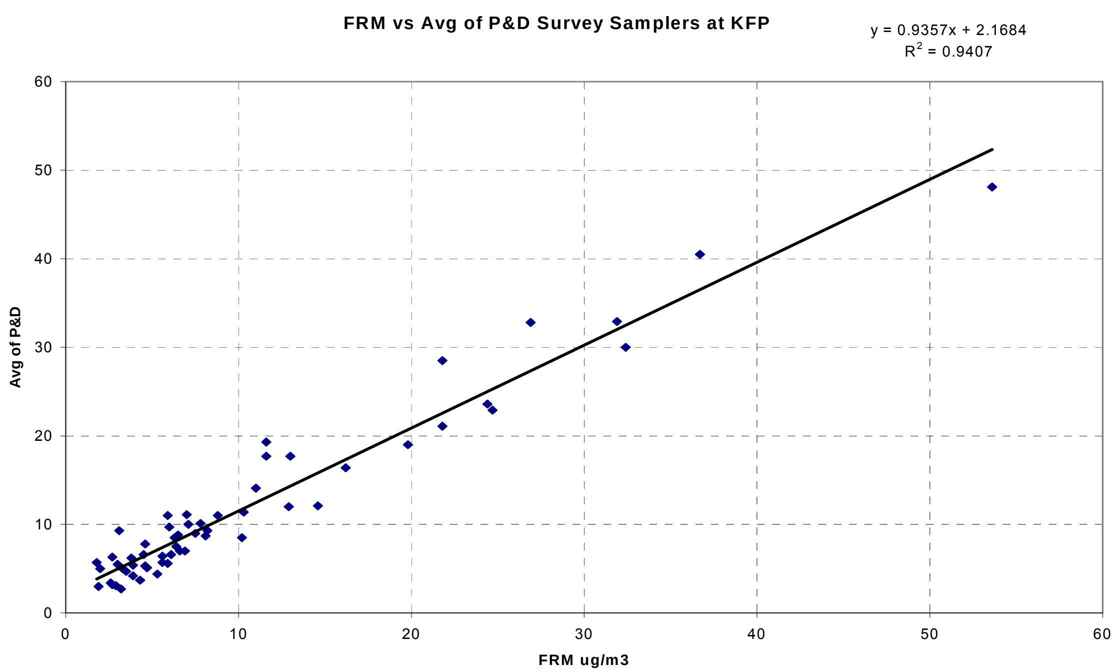


Table 4. Accuracy Data: FRM versus Survey at Benchmark Site (KFP)

All values in ug/m3.

Date	FRM	P&D Avg	FRM-Avg	Date	FRM	P&D Avg	FRM-Avg
7-Jun-00	3.5	4.7	-0.8	20-Dec-00	24.7	22.9	1.8
11-Jun-00	3.2	2.7	0.5	26-Dec-00	21.8	28.5	-6.7
17-Jun-00	2.6	3.4	-0.8	1-Jan-01	36.7	40.5	-3.8
23-Jun-00	3.9	5.4	-1.5	7-Jan-01	11.6	17.7	-6.1
29-Jun-00	10.2	8.5	1.7	13-Jan-01	7.8	10.1	-2.3
5-Jul-00	2.7	3.2	-0.5	19-Jan-01	26.9	32.8	-5.9
11-Jul-00	5.6	6.4	-0.8	25-Jan-01	4.5	6.6	-2.1
17-Jul-00	6.1	6.6	-0.5	31-Jan-01	31.9	32.9	-1
23-Jul-00	3.9	4.2	-0.3	6-Feb-01	2.7	6.3	-3.6
29-Jul-00	4.7	5.1	-0.4	12-Feb-01	10.3	11.4	-1.1
10-Aug-00	4.6	5.3	-0.7	18-Feb-01	1.9	3	-1.1
16-Aug-00	5.6	5.7	-0.1	24-Feb-01	13	17.7	-4.7
22-Aug-00	8.2	9.3	-1.1	8-Mar-01	7.5	9	-1.5
28-Aug-00	3.8	6.2	-2.4	14-Mar-01	11.6	19.3	-7.7
3-Sep-00	2	5	-3	20-Mar-01	11	14.1	-3.1
9-Sep-00	3.3	5	-1.7	26-Mar-01	8.8	11	-2.2
15-Sep-00	5.3	4.4	-0.9	1-Apr-01	6.3	8.5	-2.2
21-Sep-00	4.3	3.7	0.6	7-Apr-01	1.8	5.7	-3.9
27-Sep-00	8.1	8.7	-0.6	13-Apr-01	4.6	7.8	-3.2
3-Oct-00	6.6	7	-0.4	25-Apr-01	6.5	8.8	-2.3
9-Oct-00	6.9	7	-0.1	1-May-01	3.1	9.3	-6.2
17-Oct-00	12.9	12	0.9	7-May-01	7	11.1	-4.1
21-Oct-00	2.9	3.1	-0.2	13-May-01	5.9	11	-5.2
27-Oct-00	14.6	12.1	2.5	19-May-01	6	9.7	-3.7
2-Nov-00	16.2	16.4	-0.2	25-May-01	7.1	10	-2.9
8-Nov-00	5.9	5.6	0.3	31-May-01	3	5.5	-2.5
14-Nov-00	19.8	19	0.8	Average =	10.34	11.85	-1.51
20-Nov-00	32.4	30	2.4	Count =			58
26-Nov-00	21.8	21.1	0.8	Correlation =			0.9699
2-Dec-00	24.4	23.6	0.8	Sigma =			2.46
8-Dec-00	53.6	48.1	5.5	Max diff =			7.7
14-Dec-00	6.4	7.5	-1.1				



Report Draft

Klamath Falls 2010-2011 $PM_{2.5}$ Survey

Submitted to: File
By: Anthony Barnack
January 2012

State of Oregon
Department of Environmental Quality

Air Quality Monitoring Manager ______________________
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Air Quality Planning Manager ______________________
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Eastern Regional AQ Manager ______________________
Mark Bailey

Last Updated: 01/12/12
By: Anthony Barnack
DEQ 03-??-###

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey

State of Oregon
Department of Environmental Quality

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey

State of Oregon
Department of Environmental Quality

Table of Contents

1. Executive Summary

Oregon DEQ and the Klamath County Health Department conducted a seven site $PM_{2.5}$ survey around the community of Klamath Falls, in the winter of 2010/2011, to determine whether the current monitoring site at Petersen School was representative of the area and whether intrusions were coming from other parts of the Klamath Falls Basin during elevated days.

The survey results showed that the neighborhood in the valley to the southeast of Klamath Falls had higher levels than the NW part of Klamath Falls. Within the valley the highest levels were at Petersen School, but Brixner and Stearns Schools were similar to Petersen. The one site located west of town at the Fire Department #4 was the lowest site.

ODEQ has concluded that Petersen School is representative of the valley area and higher than the NW downtown area. The Petersen School Air Quality Index will be protective of health in all areas of town and monitoring will remain at Petersen School.

2. Introduction

In 1997 EPA released a National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$ equal to 65ug/m3. In 1998 ODEQ installed a sampler in Klamath Falls at Peterson School to collect data for comparison to the NAAQS. In 2000 and 2001, ODEQ performed a five site, one year, $PM_{2.5}$ monitoring survey in the area surrounding Peterson School. Based on the results of that survey, ODEQ concluded that the Peterson School site was representative of Klamath Falls and continued to monitor at that location.

In 2010, 10 years since the previous survey, EPA requested that ODEQ resurvey the area to see if there had been any changes in the representativeness of the site. In addition, ODEQ wanted to survey areas to the northwest of the Peterson School site to see if fine particulate was being transported into SE Klamath Falls (referred to in this report as the Valley) from sources in that area or upwind of NW Klamath Falls. Sources from NW Klamath Falls were suspected because on days with elevated levels of $PM_{2.5}$, the wind was light but was from the northwest. Finally ODEQ wanted to survey a site southwest of Klamath Falls in a more rural neighborhood to get a baseline of levels before a new industrial source is to be built nearby. This source could potentially contribute to fine particulate levels in the air shed.

3. Method

The survey was done using well established siting, sampling, and analysis methods. When possible, ODEQ followed the Federal Reference Method (FRM) guidance.

3.1 Siting

The survey sites were selected with input from ODEQ regional office and Klamath County Health staff and were installed following EPA siting criteria as much as possible. Primary and duplicate survey samplers were installed at the Petersen School site for comparison to each other and to the FRM $PM_{2.5}$ sampler already at the site. Three survey locations were selected within one mile of Peterson School (Brixner School, Stearns School, and Fergusen School). These sites were chosen to surround the Petersen site to determine if Petersen was representative of the very local area in the SE Klamath Falls

Valley area. Two sites were selected to the northwest of the Valley. One site, Mills School, was located in a residential neighborhood closer to the city center. The second site, Pelican School, is on the far northwest part of Klamath Falls in a neighborhood adjacent to the JELD-WEN Industrial complex. The purpose of this site was to determine what impact JELD-WEN has on the residential area near Pelican School. The last site was to the west of Klamath Falls at the intersection of Highways 66, 142, and 97. This site was in a small rural neighborhood isolated from any other sources aside from vehicle traffic. The purpose of this site was to get a background $PM_{2.5}$ level relative to the rest of Klamath Falls prior to the installation of an industrial source to the south. Maps of the sites are shown in Figures 1 and 2.

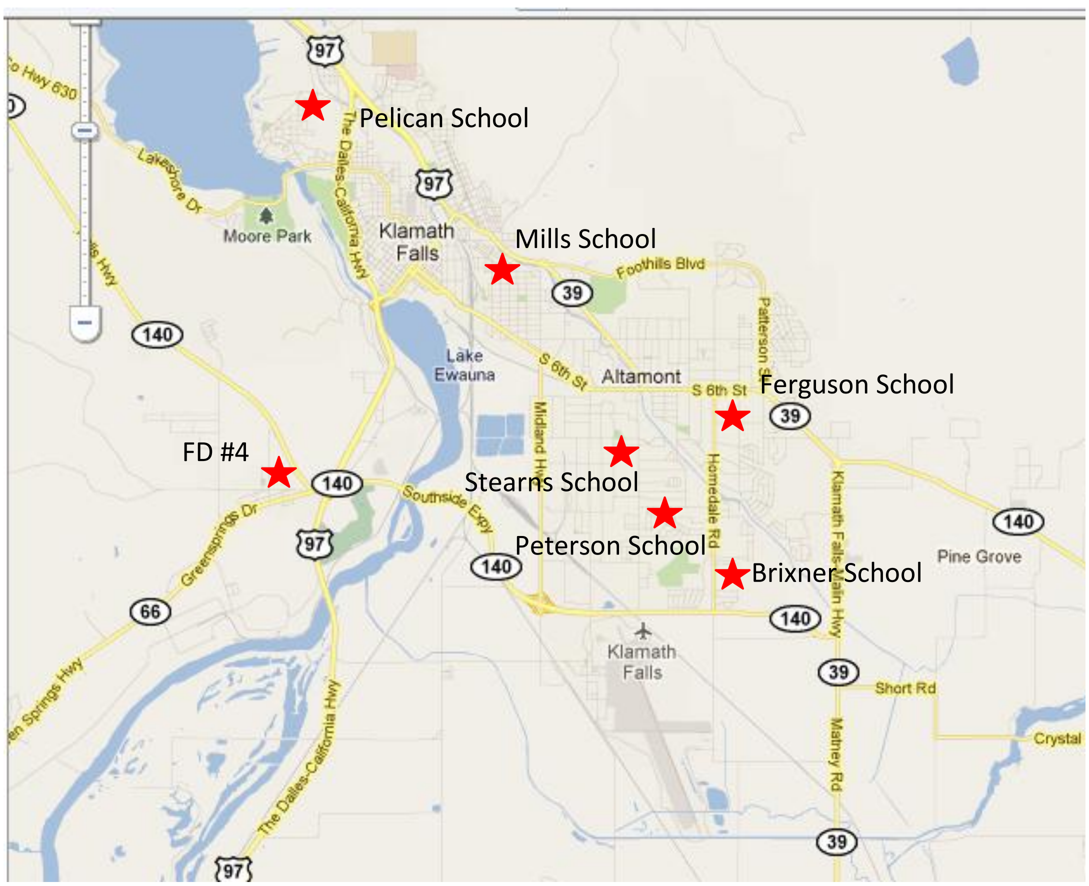


Figure 1. Map of Klamath Falls Survey Sites.

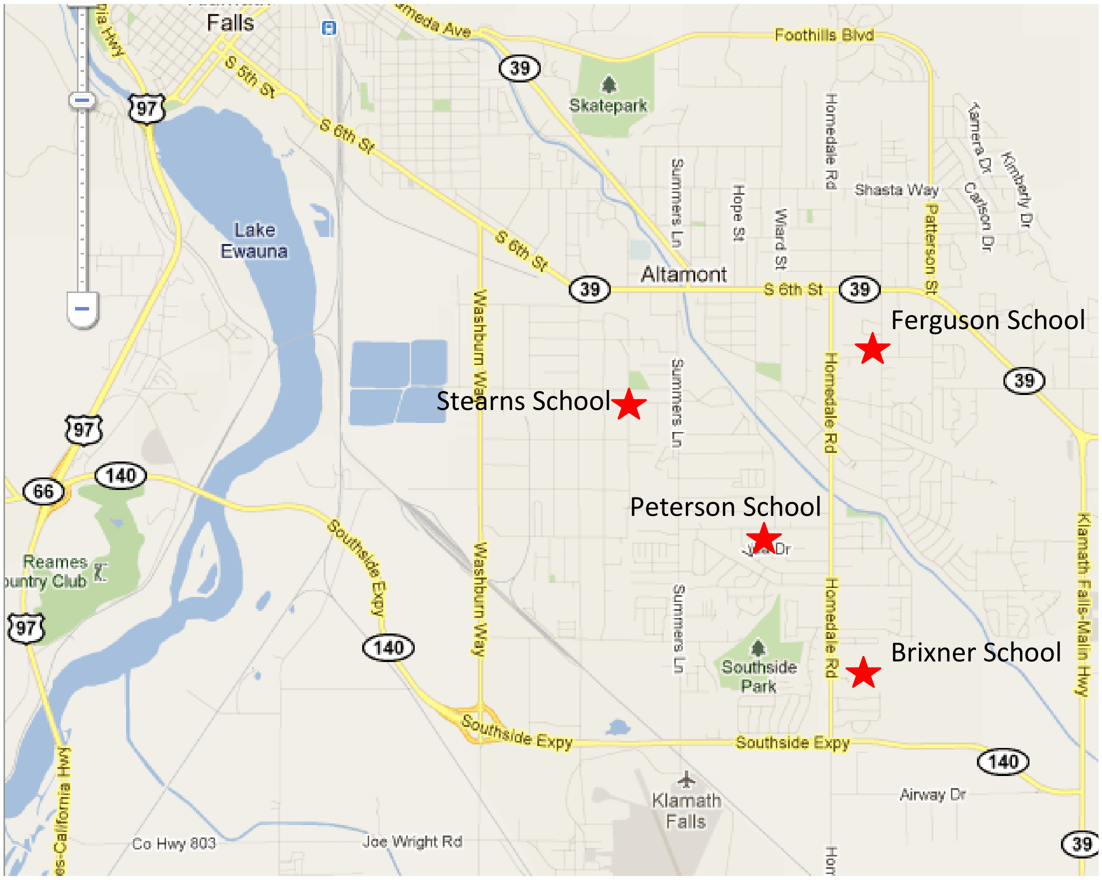


Figure 2. Map of Valley survey sites.

3.2 Site installation:
All sites used the same survey sampler mounted with the AirMetrics™ $PM_{2.5}$ sample inlets. All inlet heights were 2 to 3 meters above the ground and away from any obstructions.

3.3 Sampler
The data was collected by pulling ambient air through a filter for 24 hours (midnight to midnight). The filter was pre-weighed at the ODEQ Laboratory and Environmental Assessment Division (LEAD) facilities in Hillsboro, Oregon. Following sampling, the filter was reweighed to determine the loading. Filter weighing followed standard Federal Reference Method (FRM) procedures required for $PM_{2.5}$ monitoring.

The survey samplers were made by ODEQ and consist of a linear vacuum pump, a flow adjustment valve, a start and stop time clock, a flow time totalizer, a probe line, and an Airmetrics™ $PM_{10}/PM_{2.5}$ inlet. The pump draws air through the inlet, through the filter, into the probe line, past the flow adjuster valve. The valve is adjusted at the time of the filter installation to be 16.7 liters per minute. The survey sampler is shown in Figure 3.

Figure 3. Survey Sampler (without inlet).

<u>Inlet design</u>

The inlet was designed following the $PM_{2.5}$ FRM inlet design. The inlet separated particulate into PM_{10}, then $PM_{2.5}$ fractions at 16.7 liters per minute +/- 5%. The PM_{10} portion of the inlet consisted of a funnel with a jet at the bottom. Large particulates exited out of the funnel and impacted onto a greased plate while the smaller, lighter $PM_{2.5}$ particles stayed in the air flow and continued down one of the three jets. A manometer was connected to a quick connect fitting below the jets to measure the pressure drop created by the restricted air flow through the jets. The air flow versus pressure drop for each of the inlets used at the survey sites was determined at the DEQ Lab. The sample filter was placed in a holder in the bottom of the inlet. Figure 4 shows the inlet design.

<u>Calibrating the Inlets</u>

Each inlet is calibrated using the ODEQ lab Rootsmeter and Marion Smart manometer. As the flow rate increases, the vacuum below the inlets orifice gets higher. The vacuum is recorded, and the ambient temperature and pressure are used to convert the vacuum/flow table to Standard Temperature and Pressure (1 atm, 25ºC). In the field the vacuum is taken and a look up table is used to determine the standard flow. The ambient temperature and pressure are used to convert the flow from standard to local temperature and pressure.

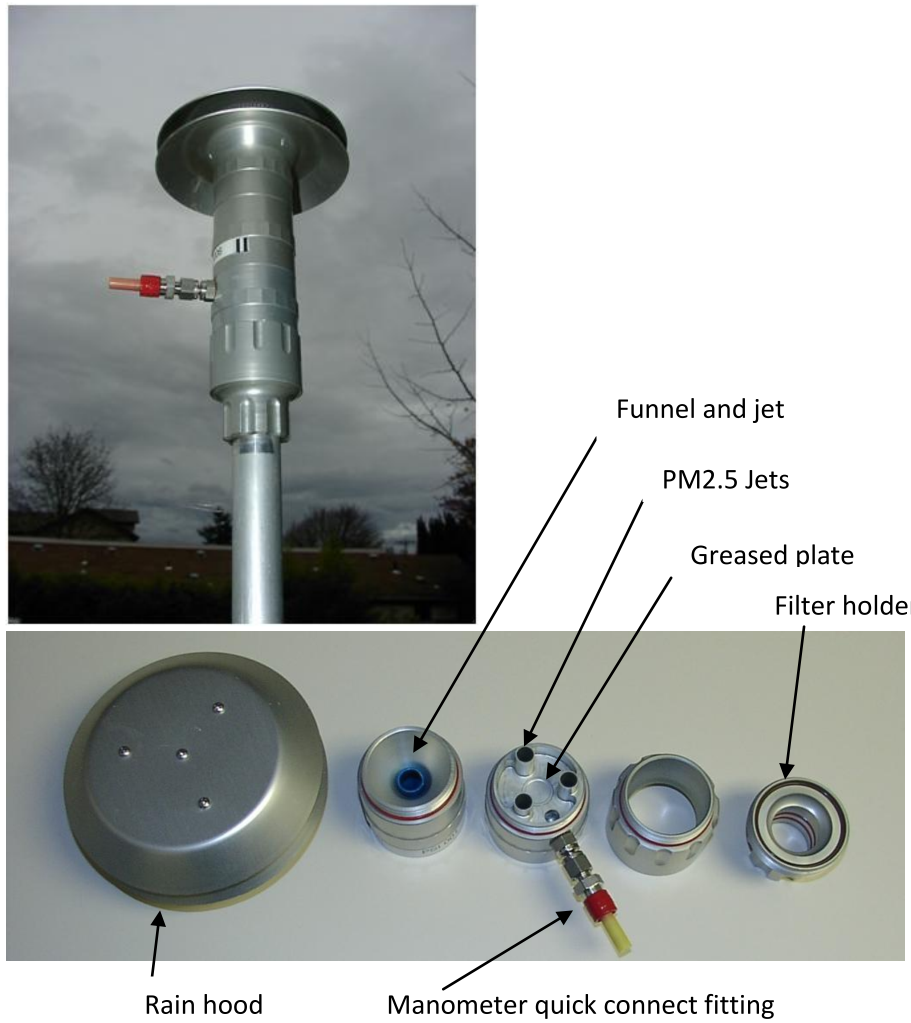


Figure 4. $PM_{2.5}$ Inlet with smart manometer connection.
The jets created enough restriction that flow could be measured by vacuum below the jets.

<u>Sample collection</u>

The filter is installed in the inlet below the $PM_{2.5}$ separator at the time of set up. With the filter in place, the vacuum is measured with a manometer from the inlet tap below the $PM_{2.5}$ separator. The vacuum is converted to flow and the sampler is adjusted to 16.7 liters per minute (LTP). Within seven days after the sample is run, the end flow is measured in the same way. The start and end flows are averaged to get the flow during the sample.

The run is started when a time clock turns on the line voltage and starts the pump. After 24 hours the clock turns off the line voltage and the pump stops. The time totalizer measures the minutes that the voltage is on.

The volume is calculated by multiplying the average of the start and stop flow rates by the operating time taken from the time totalizer.

The concentration is calculated by dividing the filter mass by the volume.

3.4 Operators

The survey samplers and filters were provided by ODEQ to Klamath County Health. ODEQ trained Klamath County Health staff on site operation and provided technical support. Klamath County Health staff operated the survey samplers.

The $PM_{2.5}$ FRM sampler at Petersen School was operated by the local ODEQ contractor following standard FRM procedures.

3.5 Filter Handling

The filters were shipped, stored, and handled following $PM_{2.5}$ FRM protocol. The unsampled survey filters were shipped to Klamath County and FRM filters were shipped to the ODEQ contract operator. Once sampled, the survey filters were stored with the FRM filters in the same temperature monitored refrigerator at the Petersen School site, and shipped back with the FRM filters, by the ODEQ contract operator, in a temperature monitored cooler. At the lab they were stored and weighed using the same protocol as the FRM filters.

3.6 Lab Analysis

The survey samplers used the same 47mm Teflon™ filters that the FRM samplers use. The filter prep, storage, weighing, shipping, and handling were identical to the FRM filters. All procedures followed the $PM_{2.5}$ Field and lab Standard Operating Procedures.

4. Quality Control

<u>Precision</u>

Two survey samplers were collocated at Petersen School to collect precision data. The samplers shared a time clock but where otherwise separate. The inlets were located about one meter apart. The filters were loaded and removed at the same time, by the same operator, and were handled, shipped, and weighed following the same protocol.

<u>Accuracy</u>

The primary and duplicate survey samplers were collocated at Petersen School with a Rupprecht and Pataschnick 2025 Partisol $PM_{2.5}$ (FRM) sampler. The FRM sampler was audited monthly following the monitoring QAPP protocol. The FRM sampler is far more sophisticated with a mass flow controller, temperature and pressure sensors, and a data logger. The FRM sampler is the EPA approved method for the measurement of PM2.5, and thus the data from this sampler is deemed the official benchmark. The results from the survey samplers are compared against this benchmark.

5. Results and Discussion

5.1 Quality Assurance

The primary and duplicate survey samplers at Petersen School had 13 samples days. Of these, seven had values where either sampler was above 15 µg/m^3 (an indication of elevated particulate).

Precision
For these days above 15 µg/m^3, the average percent difference between the primary and duplicate values was 4% ±7%. For comparison, the FRM primary and duplicate in Medford had a 2005 to 2010 average percent difference of 0% ± 2% on days greater than 15µg/m^3. The maximum percent difference was 14% for the survey samplers and 5% for the Medford primary and duplicate FRMs. This comparison indicates that on days greater than 15µg/m^3 there is a 4% variation between sites because of variations in the survey samplers design. This is not unexpected because the survey samplers have simpler critical flow orifices whereas the FRMs have active mass-flow controllers.

Accuracy
The survey sampler accuracy as compared to the FRM at Peterson School was -14% ±7% with a maximum difference of -29% when using data over 15µg/m^3. This indicates that the survey samplers were under collecting $PM_{2.5}$. The precision and accuracy data summaries are shown in Figure 5 and Table 1 showing the bias of the sampling.

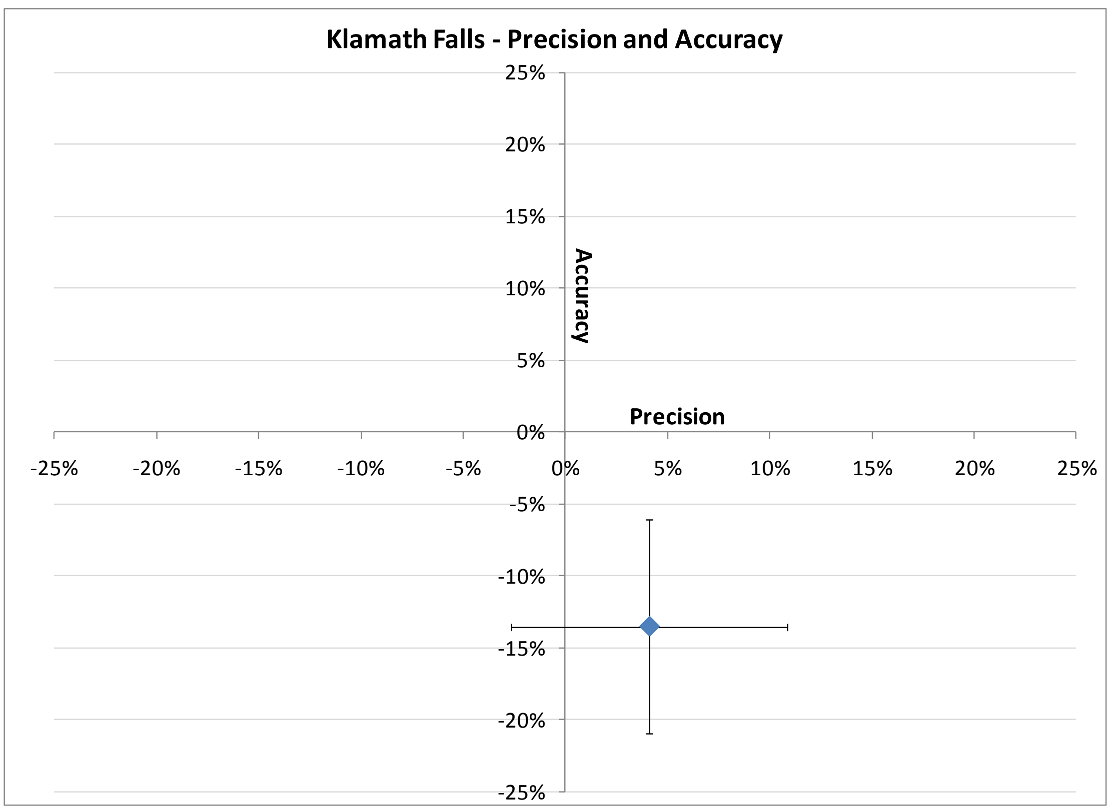


Figure 5. Survey sampler vs. Federal Reference Sampler Precision and Accuracy.

Chart description:
1. The y-axis shows the percent accuracy of the survey samplers compared to the FRM. The survey samplers were -14% lower, on average, than FRM samplers for days greater than 15µg/m^3. The vertical error bars show the accuracy uncertainty and are ±7%.

2. The x-axis shows the percent relative precision of the co-located KFP survey samplers. The samplers had an average relative difference of 4%. The horizontal error bars show the precision uncertainty and are ±7%.

Table 1. Survey sampler vs. Federal Reference Sampler Precision and Accuracy.

	Peterson School Survey		Medford
	Accuracy	Precision	Precision
aver	-14%	4%	0%
stdev	7%	7%	2%
max	-4%	14%	5%
min	-29%	-7%	-4%
median	-13%	5%	0%
count	8	8	40

5.2 Survey results

All Data

The results for all the sites are included in Table 2. Several sites missed a lot of samples due to instrument malfunctions or power fails. Many of the Ferguson samples were downgraded to estimates because the sample run time was 25 hours instead of 24 hours. This was accounted for in the volume but the highest particulate levels occur in the evening so the filters may have been exposed for an extra hour during a high $PM_{2.5}$ concentration.

Table 2. All results for all sites.

	Peterson	Brixner	Fergusen	FD #4	Mills	Pelican	Sterns
12/4/10	8.4	9.2	9.7	Cancelled	5	2.6	9.3
12/10/10	9.8	1.7	8	2.7	5.8	2.1	Void
12/16/10	25.1	25.7	20.3	12.2	11.3	7.8	25.6
12/22/10	19	18	Void	7.4	12.8	4.6	15.4
12/25/10	2.1	1.5	Void	2.8est	3	0.8	<0.7
12/28/10	Void	5.7	Void	2.6	5	1.9	7.8
1/3/11	Void	Void	Void	Void	Void	Void	Void
1/6/11	Void	Void	Void	Void	Void	Void	Void
1/9/11	29.6	19.9	17.1est	10.1	7.5	1.5	26
1/15/11	22.6	14.6	14.6est	10.3	8.5	8.7	21
1/21/11	21	18.6	16.9est	11.6	25.9	9.8	Void
1/27/11	20.9	16	Void	14.7	19.6	10.2	27.7
2/2/11	28	24.1	21.1est	19.3	14.2	10.8	9.7
2/8/11	7.4	3.5	Void	2.5est	4.8	1	4.8
2/14/11	Void	3.6	Void	4.2	13.2	4.3	Void
2/20/11	5.9	3.7	Void	3.4	3.8	<0.7	3.2
2/26/11	14.7	2.4	Void	8.2	14	6.3	14.4

The survey had two main purposes:

- to see how the Valley compares to the northwest and west part of Klamath Falls and
- a survey within the Valley to see if the Peterson School site is representative of that area.

Additional information was also gained showing the baseline levels in Western Klamath Falls prior to the installation of a new industrial facility.

Figure 6 displays Peterson School and the other sites to the northwest and west of the Valley area. Peterson School is higher than the other areas on most elevated days. One day Mills School was the highest. Mills School is to the northwest of the Valley but still in a residential area. The site to the west (FD#4) was higher than Pelican School most of the time but lower than Mills School during the highest days.

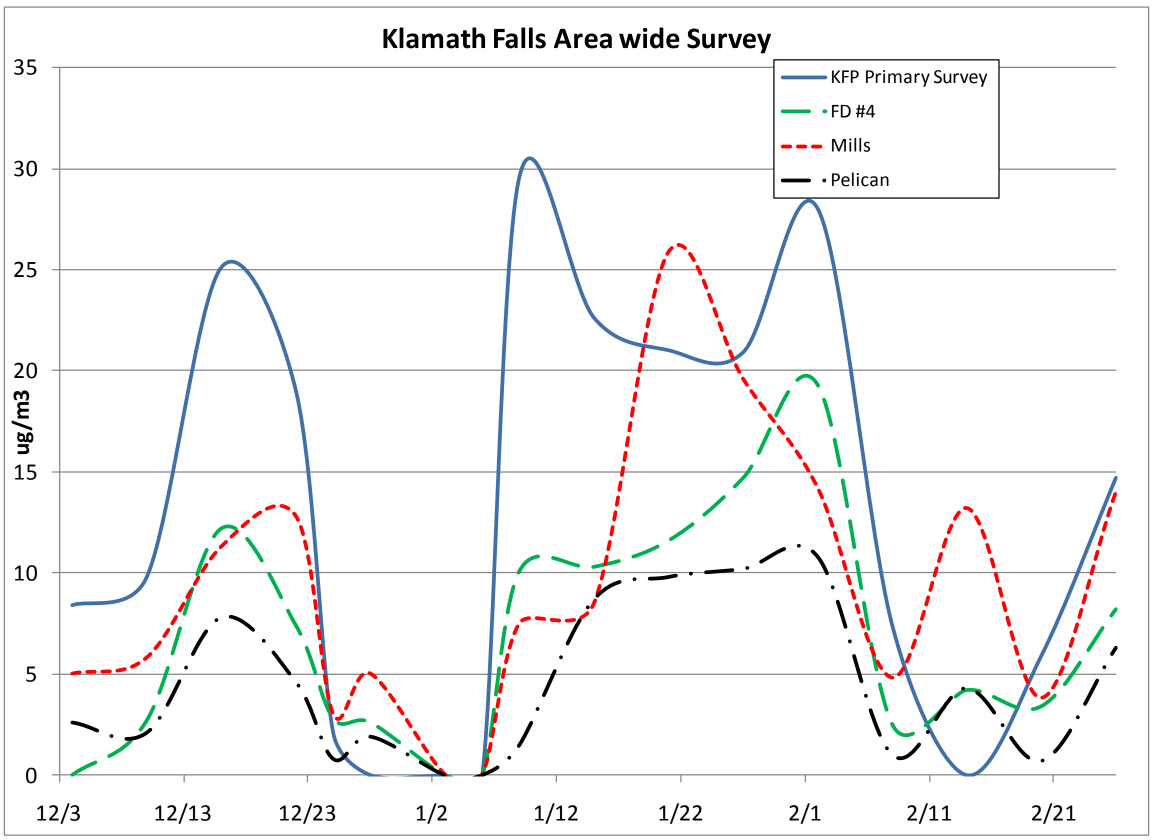


Figure 6. Greater Klamath Falls survey comparison.
Peterson School vs. survey sites outside of the Valley.

The other goal of the survey was to determine if Peterson School represented the Valley area. Figure 7 shows the data for the four Valley area sites. Stearns, Peterson, and Brixner have relatively close values on elevated $PM_{2.5}$ days but Peterson is usually the highest. The Fergusen site missed many samples but was the lowest site on the days with data.

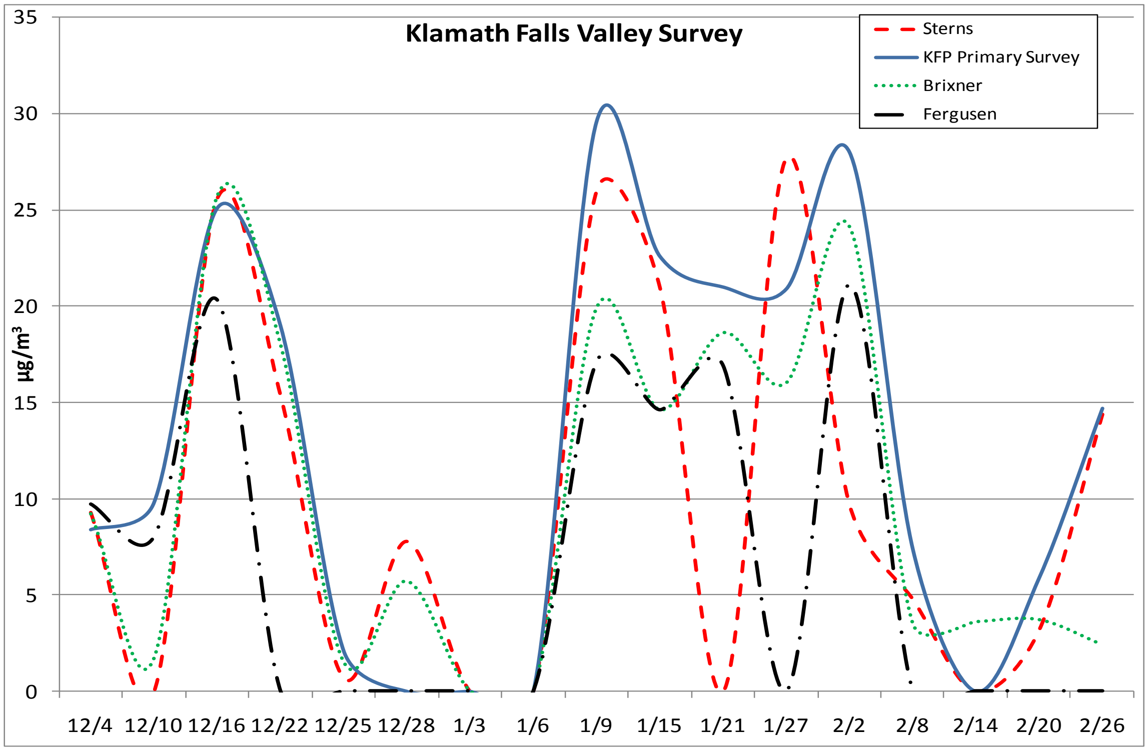
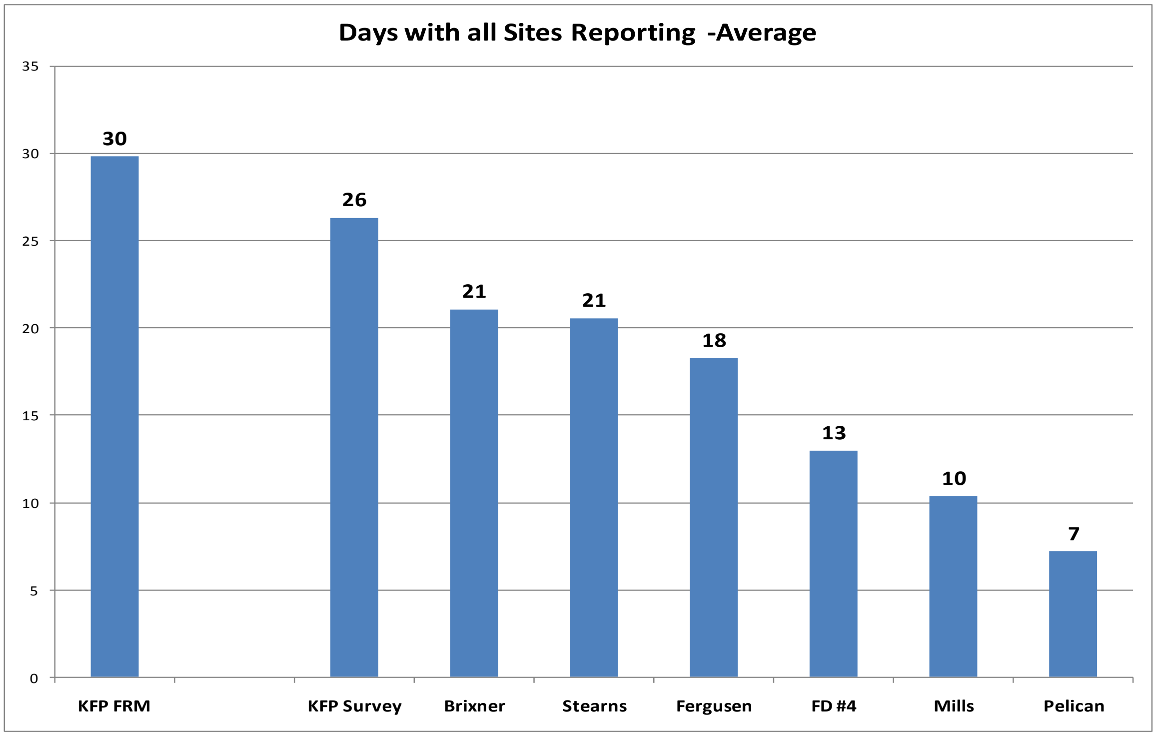


Figure 7. Klamath Falls Valley survey comparison.
Peterson School vs. survey sites inside the Valley.

Highest days with all sites

Days with all sites reporting in the survey were selected for site comparison. Of these, only days above 15µg/m^3 where selected for further analysis because that is the lower break point for moderate days and only moderate and unhealthy days are of concern. There were four days that met both these criteria: Dec 12th, Jan 9th, Jan 15th, and Feb 2nd. When only these days are averaged for each site and compared, the Valley sites are the highest and of these, Petersen School is the highest (Figure 8).



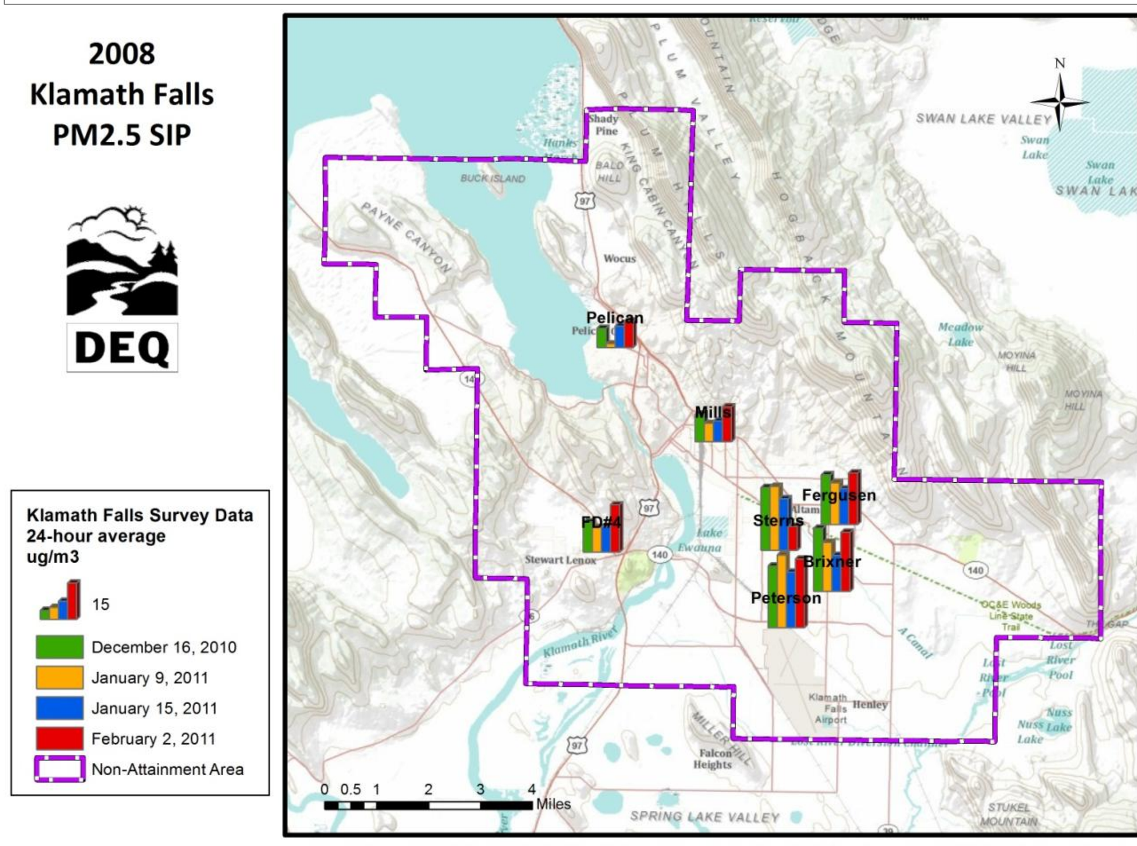
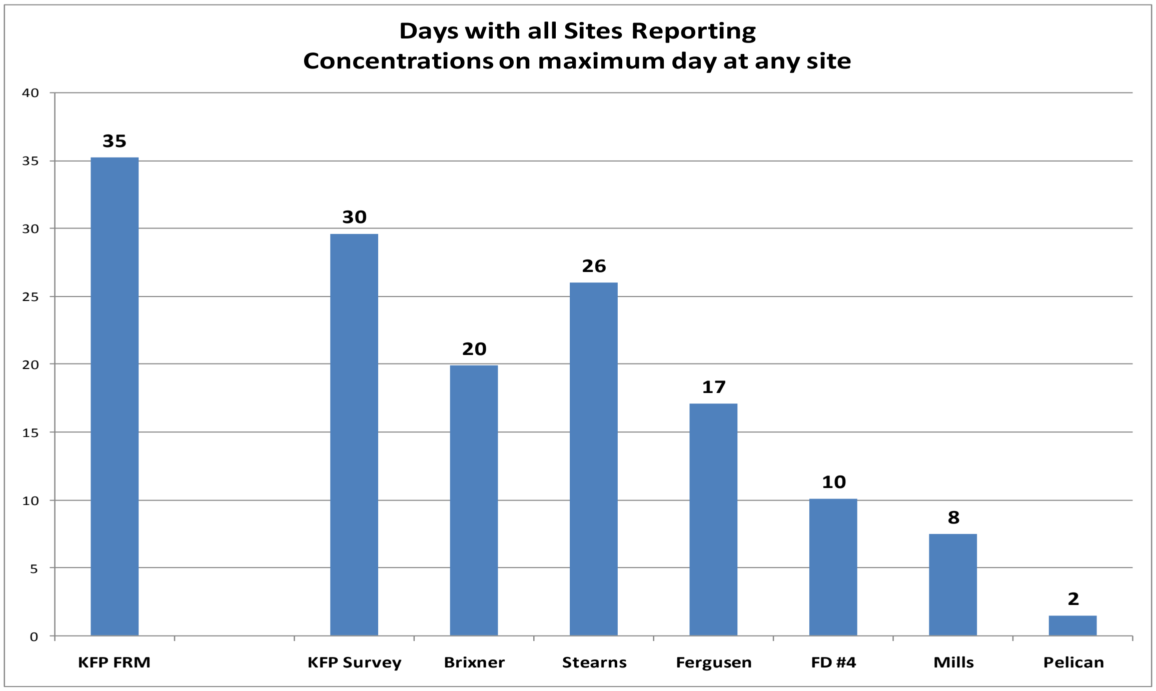


Figure 8. Average $PM_{2.5}$ concentration on days when all sites reported data (4 days). The days are: 12/16,10, 1/9/11, 1/15/11, 2/2/11.

On the highest day of the survey, Jan 9th, the Valley sites are more polluted than the sites to the west. Of the Valley sites, Petersen is the maximum, but Stearns is second highest not Brixner (Figure 9) which is higher on other elevated days.



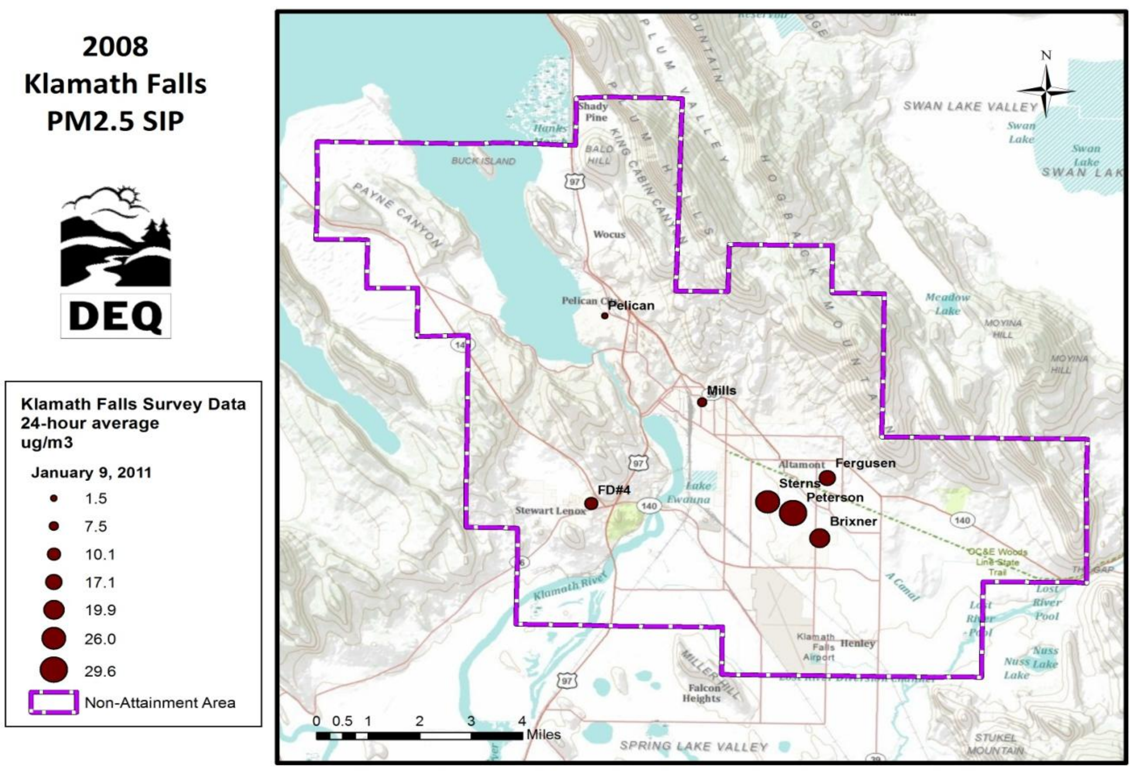


Figure 9. Average $PM_{2.5}$ concentration on the maximum concentration day (Jan 9th).

On the other three days over 15µg/m^3 with all sites reporting, the Valley remains the most polluted part of Klamath Falls (Figure 10 -12). On all four days, Petersen School has the highest concentration three times and Brixner once. Stearns is second highest three out of four days, and Fergusen is the lowest twice.

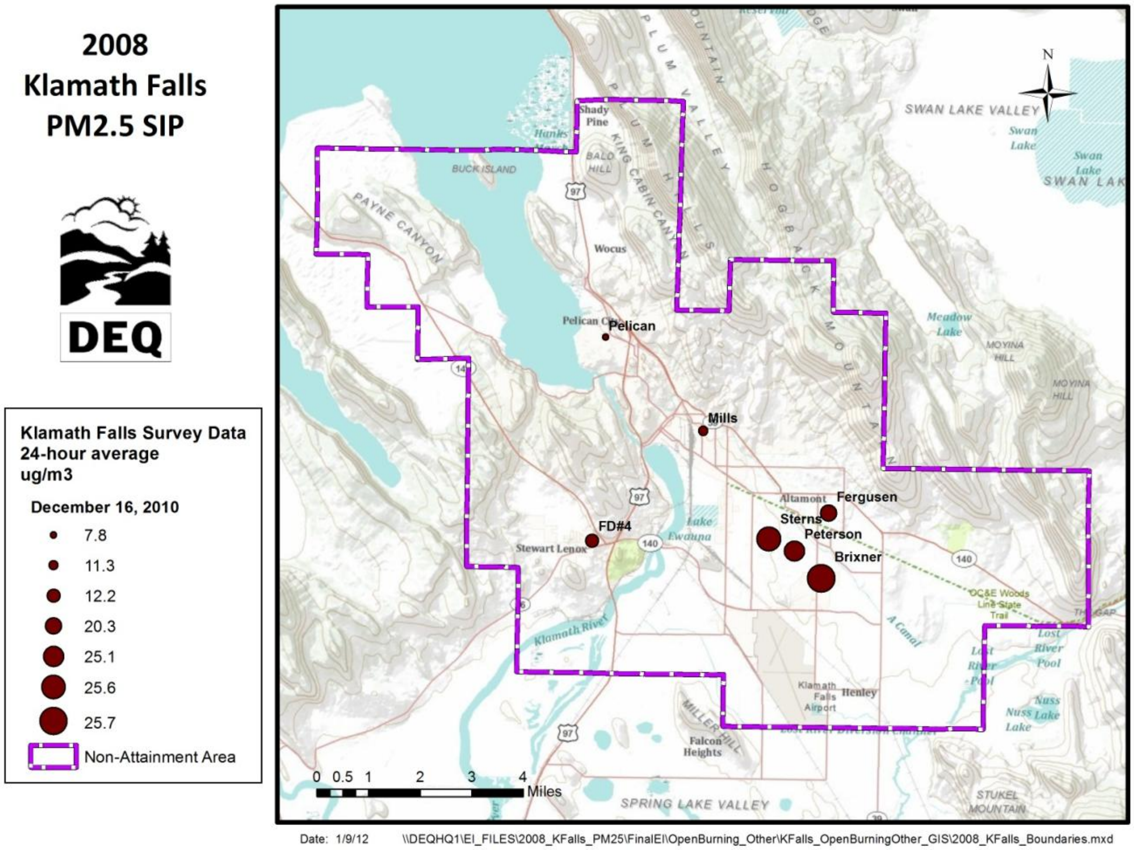


Figure 10. Concentration map for December 16, 2010.

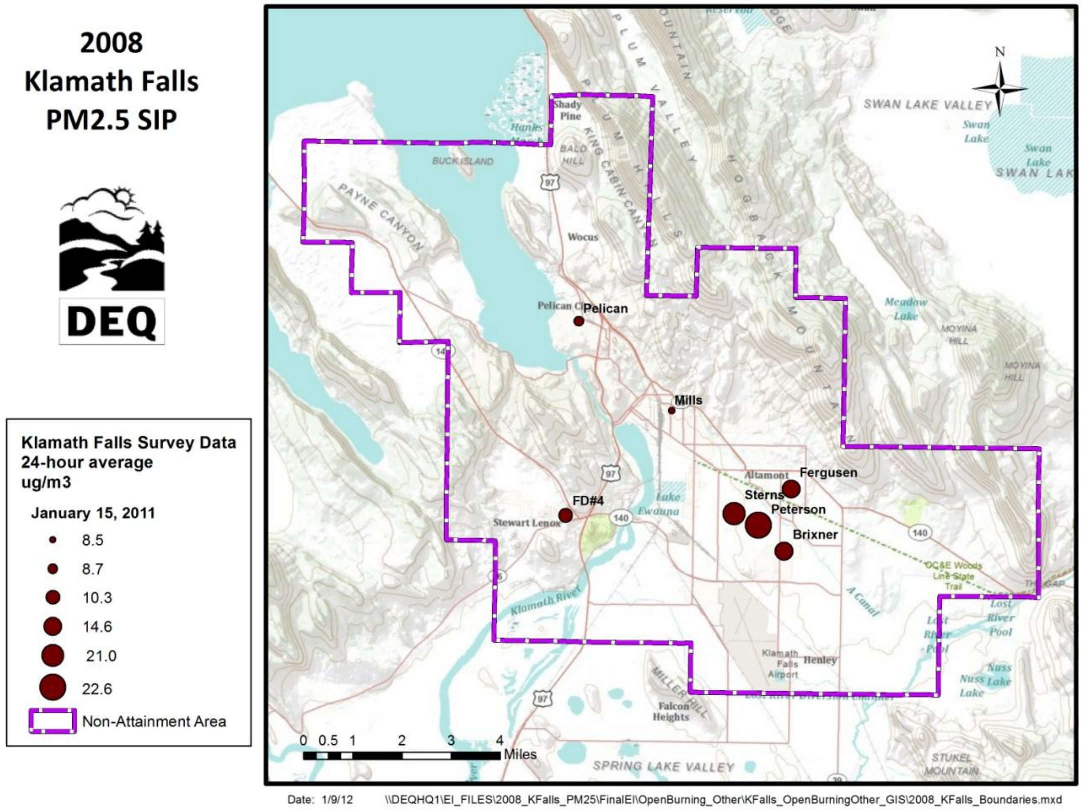


Figure 11. Concentration map for January 15, 2011.

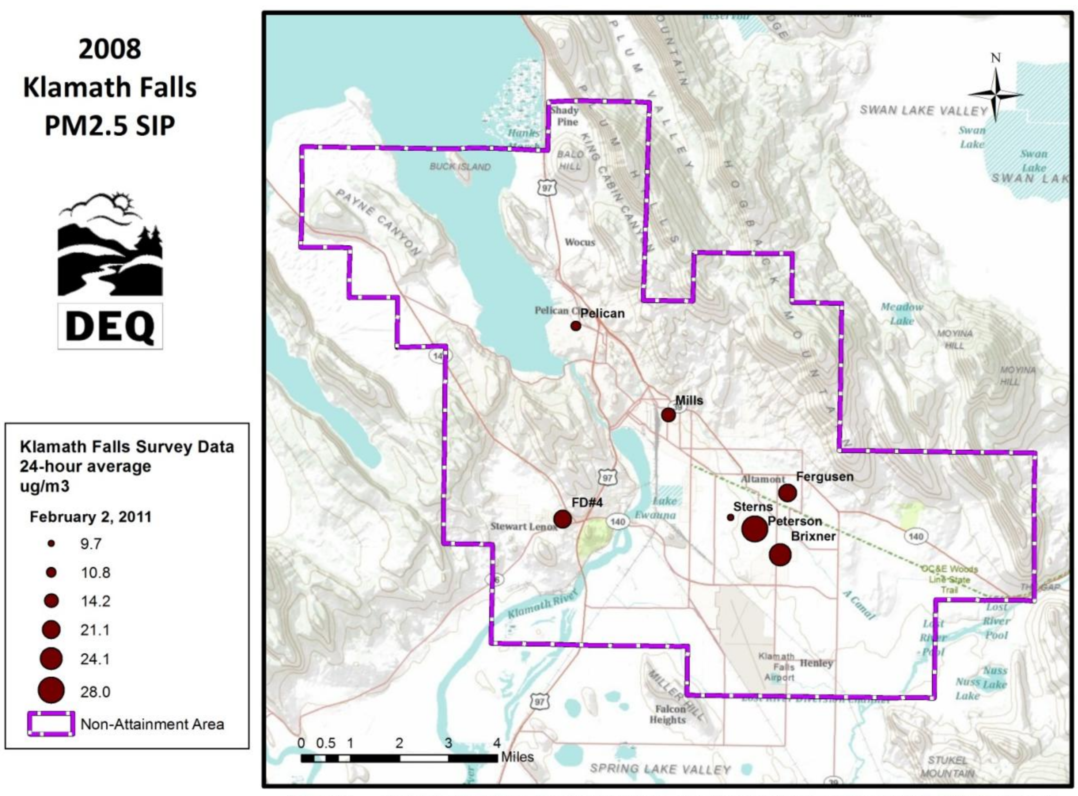


Figure 12. Concentration map for February 2, 2011.

The wind direction during the highest four days was below 4 mph and from the northwest and southeast (Figure 13). This shows that if the $PM_{2.5}$ were coming from the northwest it would have been transported during these days and the Mills and Pelican School sites should be elevated. Since the Mills and Pelican School sites were much lower than the Valley sites, transport from the northwest seems unlikely.

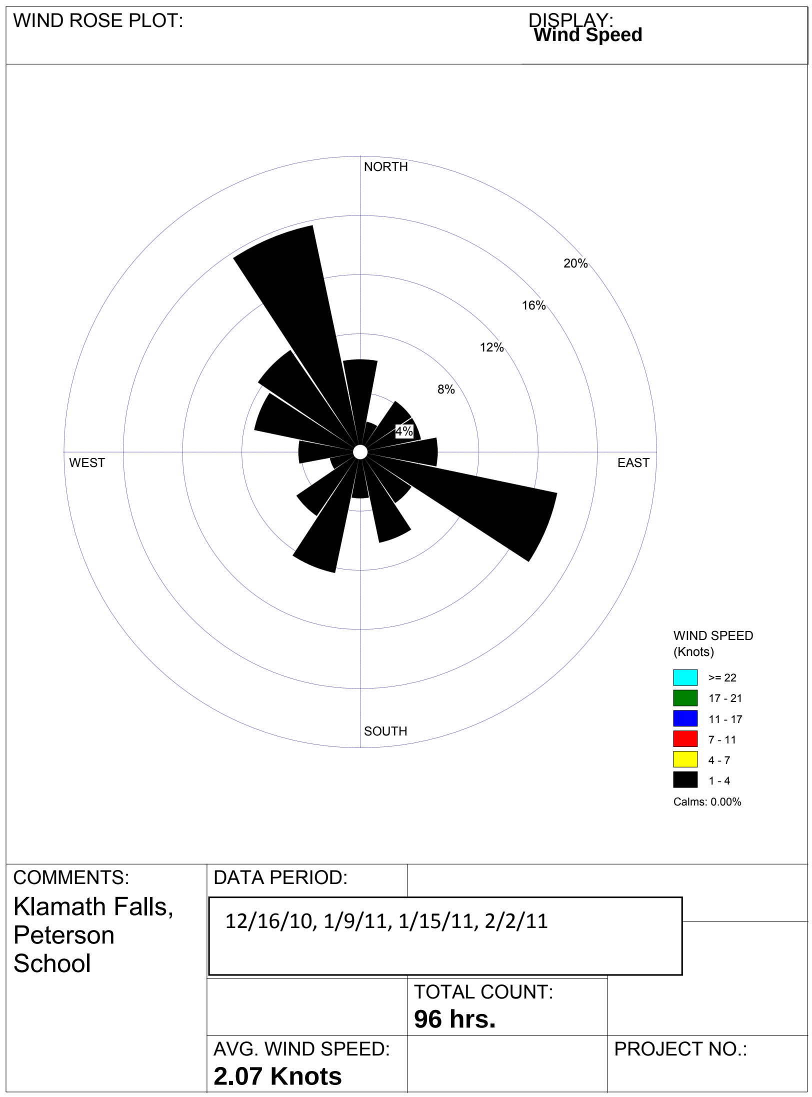


Figure 13. Wind rose on four highest days with all sites reporting.

The principal contributing meteorological factor for elevated $PM_{2.5}$ is an inversion. The National Weather Service has stated that inversions can persist when wind speeds are below 5 mph. During the four survey days considered here, the wind speed never exceeded 4 mph (Figure 13). If the Petersen School delta temperature (inversion) and hourly $PM_{2.5}$ (estimated from the nephelometer) are compared during the maximum survey day, the inversion and the $PM_{2.5}$ track each other well (Figure

14). Since air movement is very slight during an inversion, and the maximum site was at Petersen School, the likelihood is that the $PM_{2.5}$ was generated by very, localized sources.

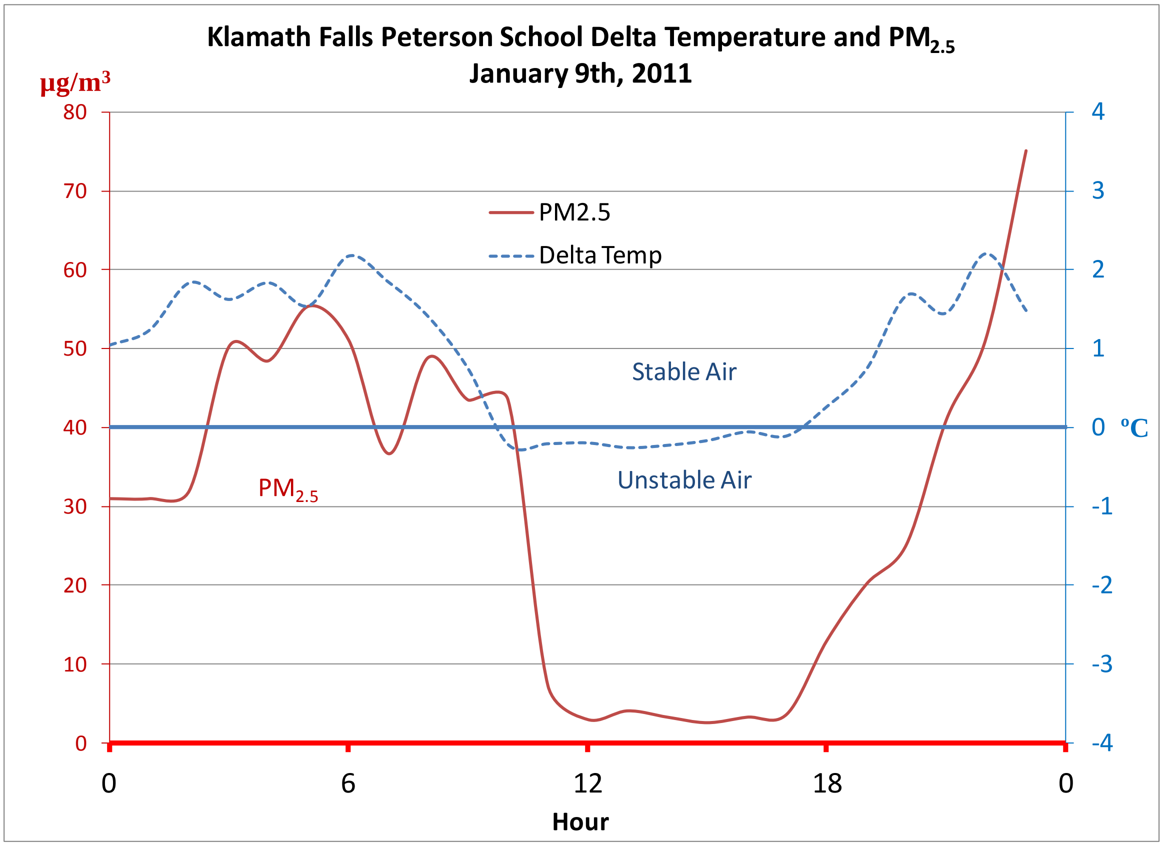


Figure 14. $PM_{2.5}$ and delta temperature hourly values.

The highest $PM_{2.5}$ occurred in the morning and evening when the inversion occurred (air is stable). $PM_{2.5}$ levels start to drop at 6 a.m. then go back up even though the inversion is breaking up. This indicates a new infusion of $PM_{2.5}$ at 6 a.m.

6. Conclusion

This survey shows SE Klamath Falls (A.K.A the Valley) to have higher levels of $PM_{2.5}$ than the Pelican and Mills School locations. This indicates that the source of the $PM_{2.5}$ is generated in the Valley and not transported from the northwest. This also shows that to be more protective, the monitor needs to be located in the Valley. A monitor around Mills School may not show unhealthy readings while they actually existed in the Valley.

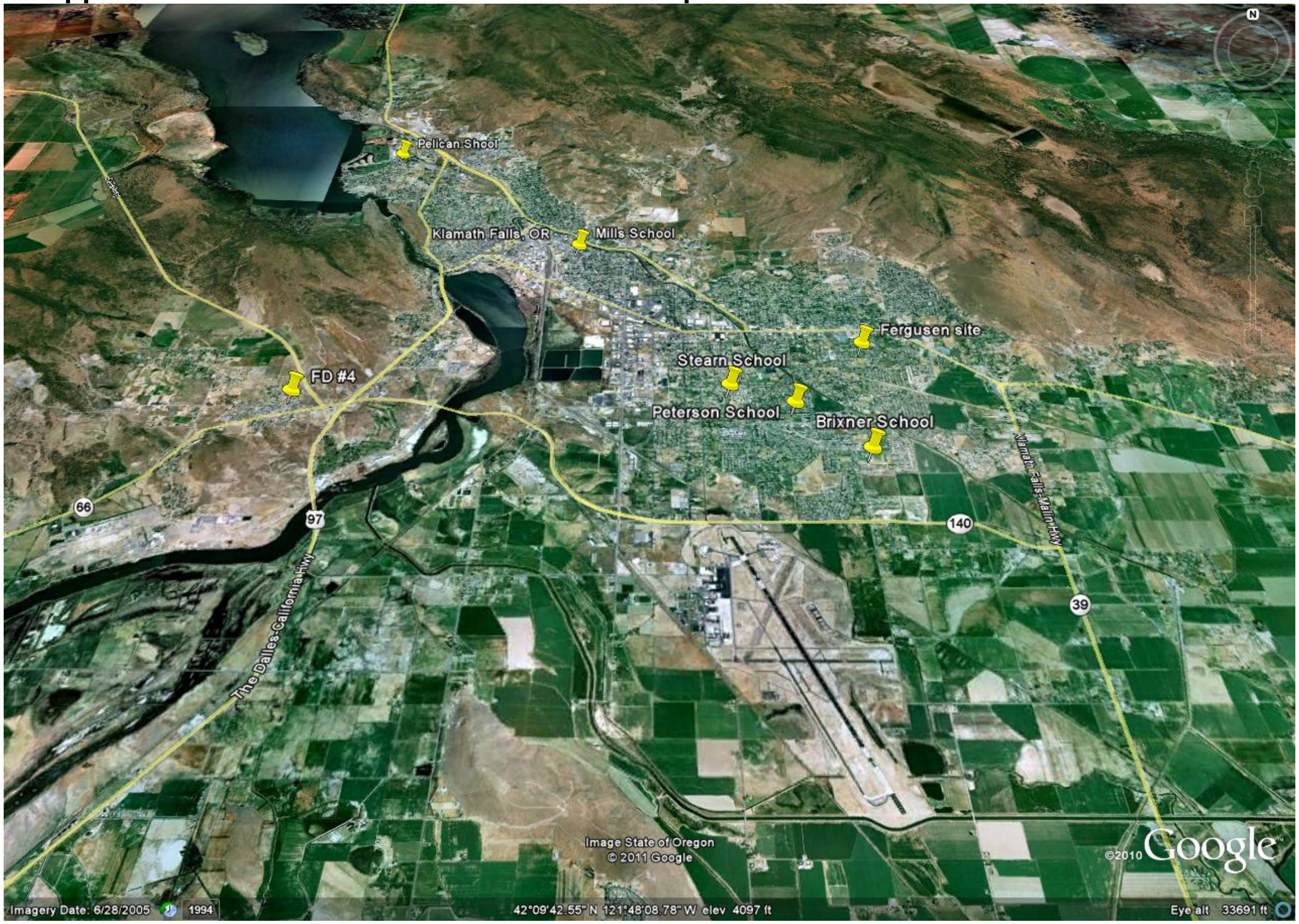
Within the Valley, the survey shows that Peterson School is the best location for the monitor. It had the highest values on most days but was not that different from Stearns and Brixner Schools. It is centrally located so it will monitor the particulate levels no matter which way the wind is blowing, while the other school are on the edges of the Valley and may miss a high $PM_{2.5}$ event if the wind is from the wrong direction. Granted there is very low wind during high $PM_{2.5}$ events.

Finally, the FD#4 site outside of Klamath Falls was the lowest. This was expected and no further monitoring is needed at this time. When this area of town develops, future monitoring can be compared to this survey for trending information.

7. References

1. Hansen, M., Smith J., Klamath Falls, Oregon $PM_{2.5}$ Particulate Site Validation Study, Oregon Department of Environmental Quality, August, 2001.
2. Smith J., Quality Assurance Project Plan Document: Ambient Air Quality Monitoring for Criteria Air Pollutants (Clean Air Act), DEQ09-LAB-0004-QAPP, May, 2010.
3. Standard Operating Procedure: Gravimetric Analysis of Particulate Collected with R&P Partisol Samplers and Met One SASS Samplers, DEQ03-LAB-0027-SOP, June, 2003.

Appendix A: Site aerial views and directional photos.



1. Brixner School Site:

Brixner Shool – Directions:

North

Northeast

East

Southeast

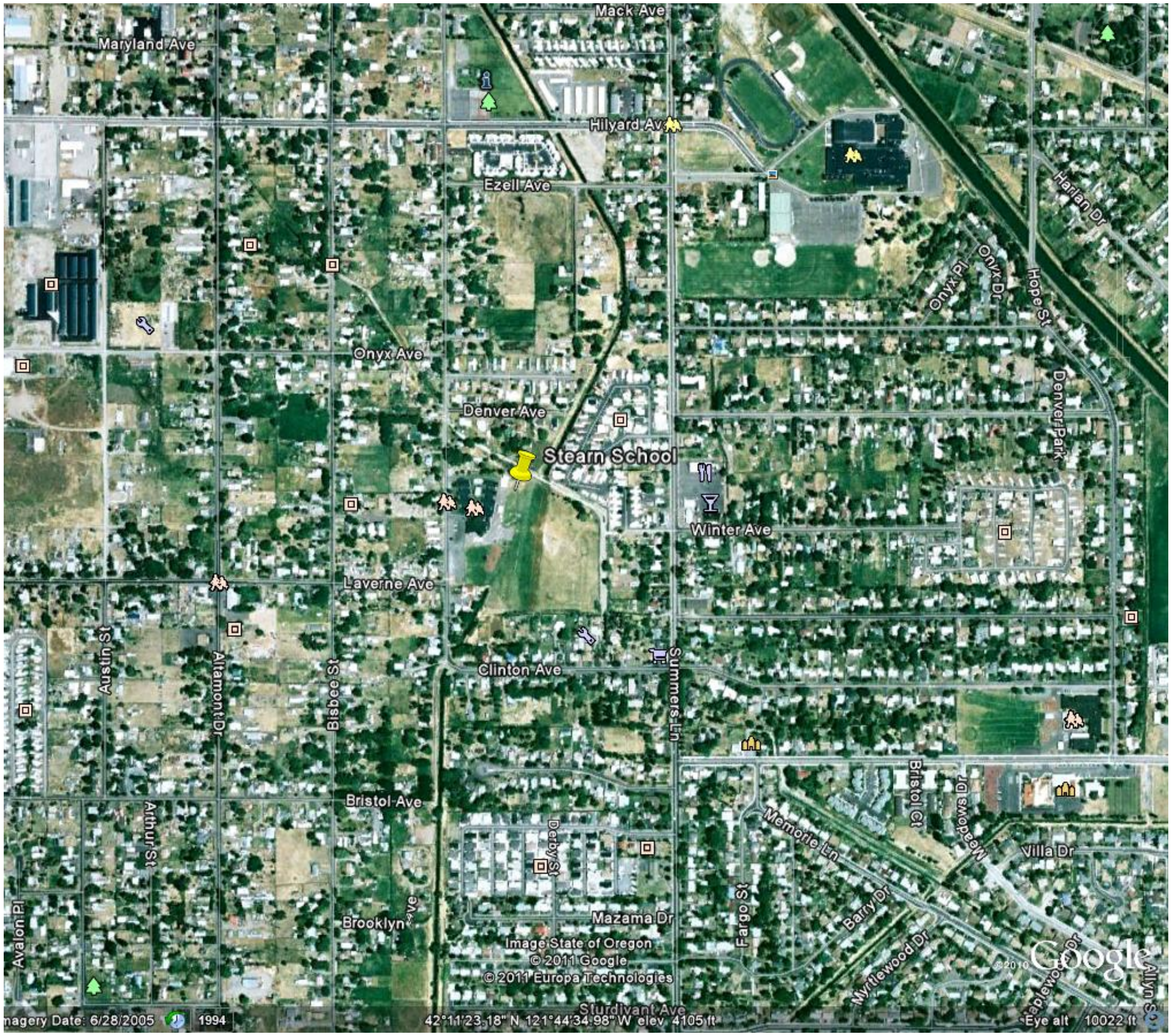
South

Southwest

West

Northwest

2. Stearns School Site:



Stearns School

North

Northeast

East

Southeast

South

Southwest

Northwest

West

3. Pelican School

Pelican School Directions

North

Northeast

East

Southeast

South

Southwest

Northwest

West

1. Mills School

Mills School Directions:

North Northeast East Southeast

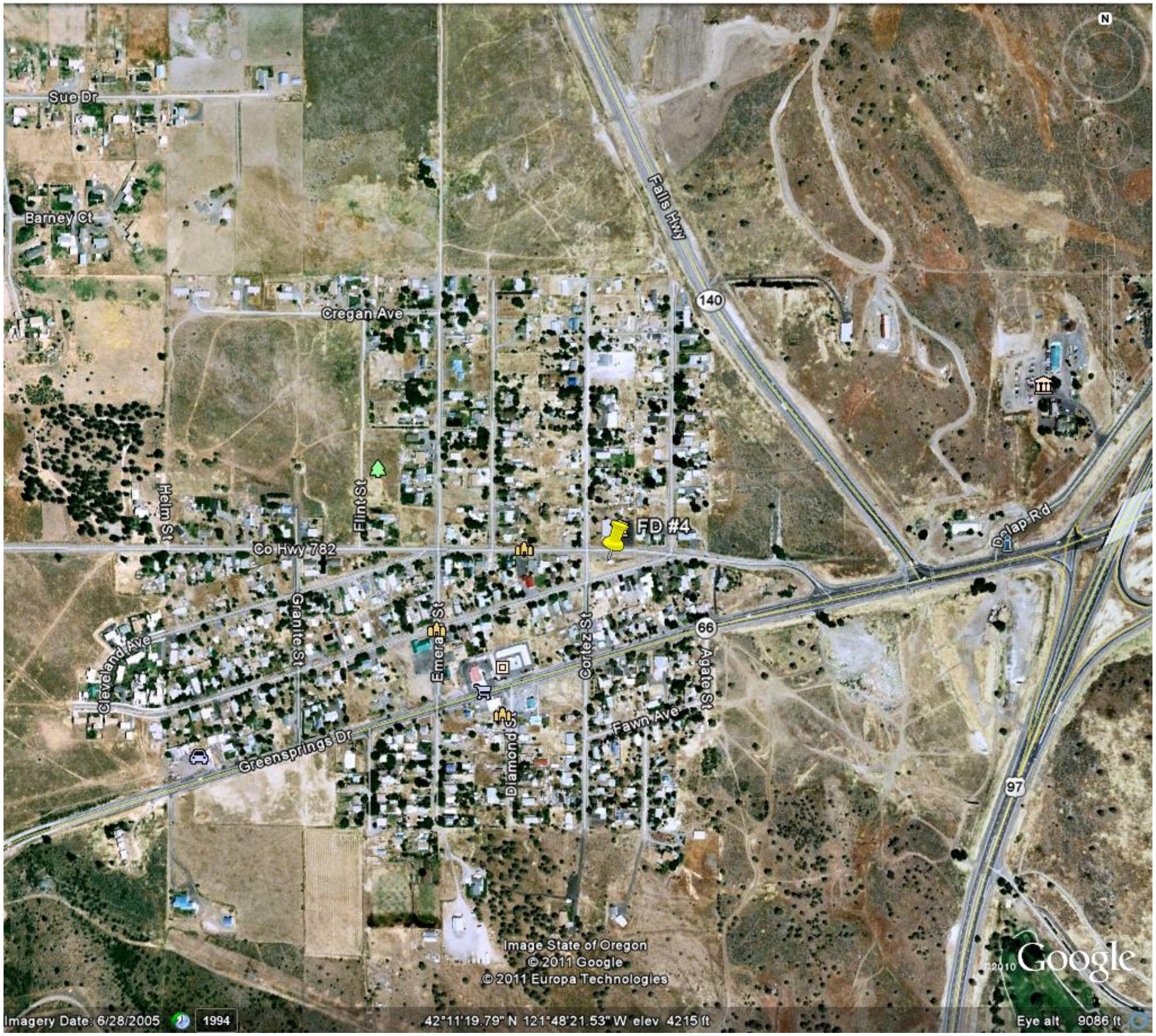
South Southwest Northwest West

2. Ferguson School

Ferguson School Directions:

North	Northeast	East	Southeast
	Photo Not Available	Photo Not Available	Photo Not Available
South	**Southwest**	**West**	**Northwest**
Photo Not Available		Photo Not Available	

3. Fire Department #4



Fire Department #4 Directions:

North

Northeast

East

Southeast

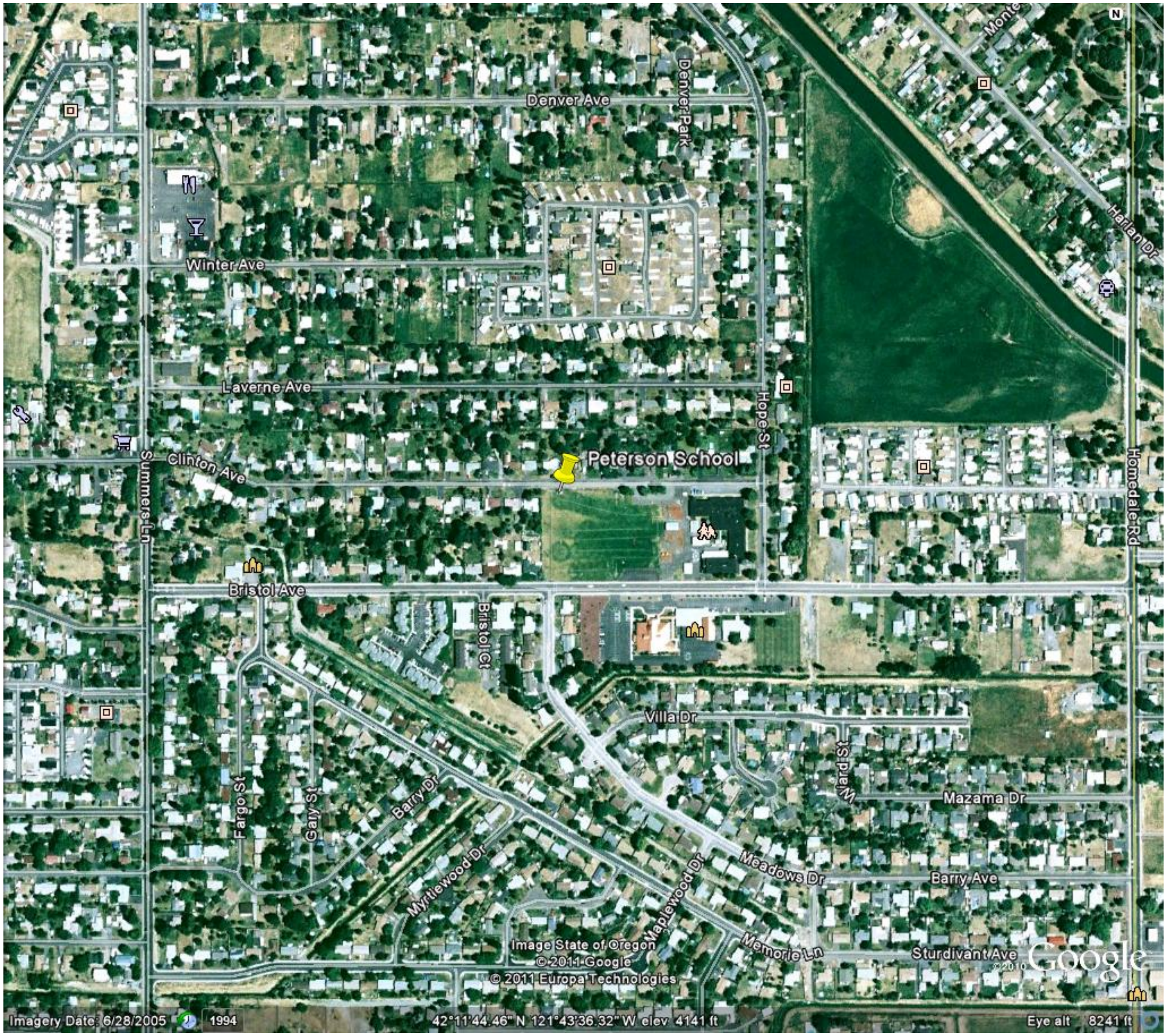
South

Southwest

Northwest

West

4. Peterson School



Peterson School Directions:

North

Northeast

East

Southeast

South

Southwest

Northwest

West

Report

DEQ

State of Oregon
Department of Environmental Quality

Klamath Falls PM2.5 Levels Compared to the Background Concentrations

Submitted to: EPA

By: Anthony Barnack and Larry Calkins

July 2012

Last Updated: xx/xx/xx
By: Anthony Barnack
DEQ 03-??-###

This report prepared by:

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Klamath Falls Nonattainment Area Background Site Report

Table of Contents

State of Oregon
Department of Environmental Quality

Klamath Falls Background Site Report

Executive Summary

Introduction

Klamath Falls, Oregon has PM2.5 levels that violate the National Ambient Air Quality Standard (NAAQS) during the winter months. The PM2.5 is either generated locally or is transported into Klamath Falls from outside areas. A background site south of Klamath Falls was established to determine which of these scenarios is occurring or if a combination of these is occurring.

The background site was selected based on early plume modeling which showed winds from the south during the highest PM2.5 levels. The site was located at the California/Oregon border at the Lower Klamath Refuge Maintenance Facility on stateline road. Figure 1 shows the location of the Klamath Falls Petersen School monitor and the background monitor.

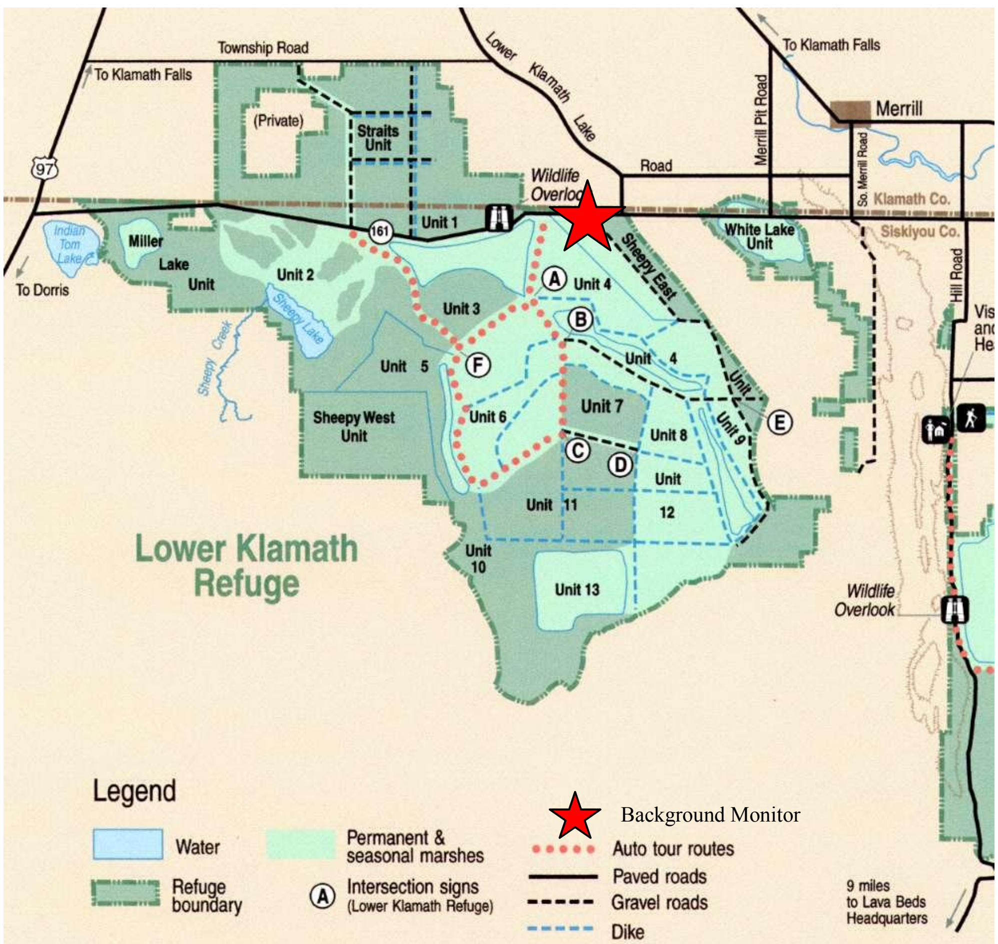


Figure 1: Background Monitor: Lower Klamath Refuge Maintenance Area Location.

This report will show if $PM_{2.5}$ is seen at outside of Klamath Falls in the surrounding area.

Method

Klamath Falls Petersen School site is a well established site which contains PM2.5 Federal Reference Monitoring, hourly visibility monitoring (Nephelometry), and meteorology. The back ground site contained hourly visibility monitoring (Nephelometry), and meteorology. Hourly nephelometry data was collected and converted to PM2.5 estimates using the linear squared correlation equation derived from comparing the 24 hour average FRM PM2.5 data with the 24 hour average nephelometry (BScat) values. The correlation equation converted hourly BScat averages into hourly PM2.5 estimates in ug/m3.

Results

The Department of Environmental Quality (DEQ) conducted a special study to determine the impact of PM2.5 outside the nonattainment area. The purpose was to determine if any emissions from the south of Klamath Falls were transported into the community. DEQ determined that the air along the California-Oregon border was a very low concentration. In no case did the ambient PM2.5 rise above the national standard of 15 micrograms per cubic meter except in the middle of the summer. Winter concentrations were all less than 12 micrograms per cubic meter. Only in August did concentrations rise as high as 18 micrograms per cubic meter likely due to wildfire smoke. The chart (figure 1) below shows the data.

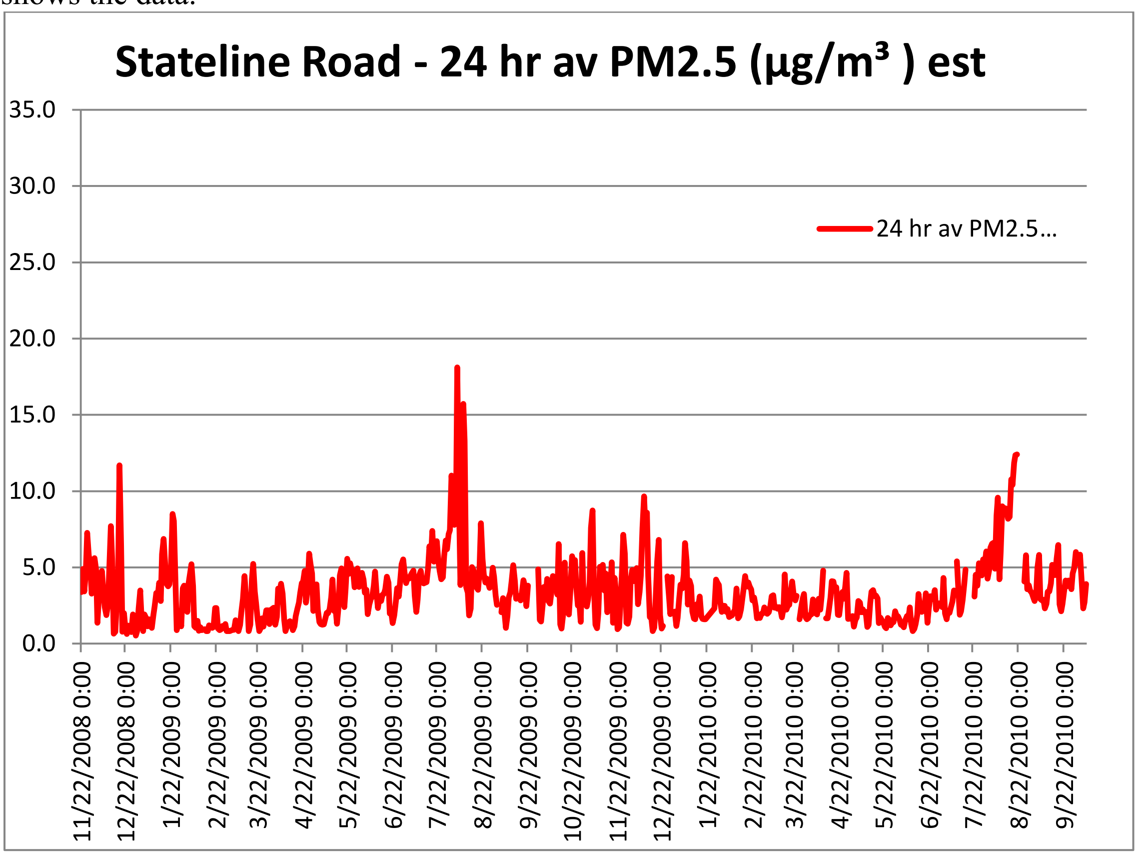


Figure 2. Average Daily $PM_{2.5}$ Estimates

Hourly values where compared on days that where the FRM sampler was above the NAAQS and the nephelometers at Petersen School and the background sites were operating for at least 18 hours. The day before and after these exceedances were also included to include the elevated values which are known to occur over the evening/morning hours. The diurnal hourly average was calculated for each site and compared in Figure 3.

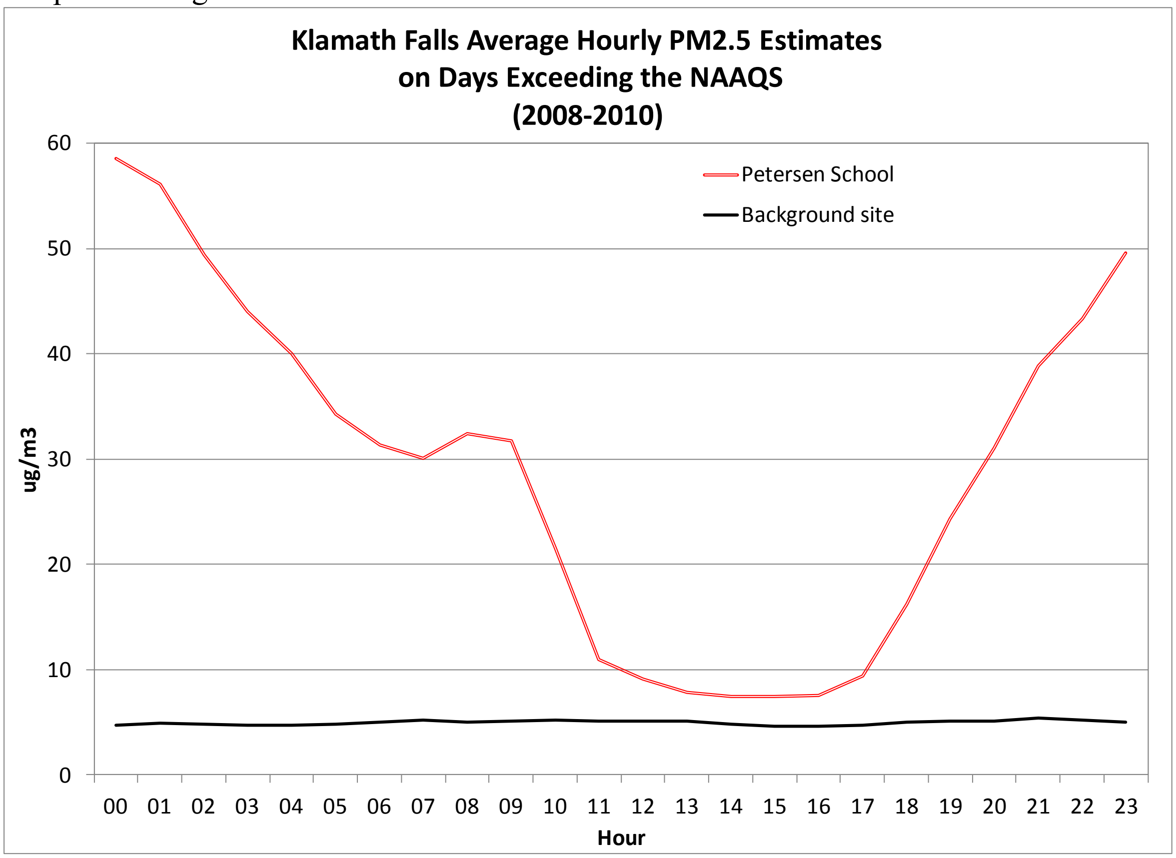


Figure 3. Average Hourly $PM_{2.5}$ Estimates on days when the PM2.5 > NAAQS

The Department views data in terms of the NAAQS. The 98th percentile average for the three years including 2008-10 was 8.6 micrograms per cubic meter, although the three years took data from different times of the year and only 2009 was a complete set of data. The following table (Table 1)shows the distribution.

	Average concentration Micrograms/Cu. Mtr.	Maximum concentration Micrograms/Cu. Mtr	98th percentile concentration Micrograms/Cu. Mtr.
2008 Nov - Dec	3.4	11.7 (12/18/08)	7.7 (12/12/08)
2009 Jan – Dec	3.5	18.1 (08/05/09)	8.6 (12/12/09)
2010 Jan - Oct	3.3	12.4 (08/21/10)	9.6 (08/08/10)

Table 1: The average, maximum and 98th percentile concentration

Klamath Falls Background Site Report

The wind roses on these days was generated (Figure 4) and shows very low wind speeds mostly emanating from the northwest and the southeast. For the most part the wind speeds where below four mph which would allow an inversion to persist.

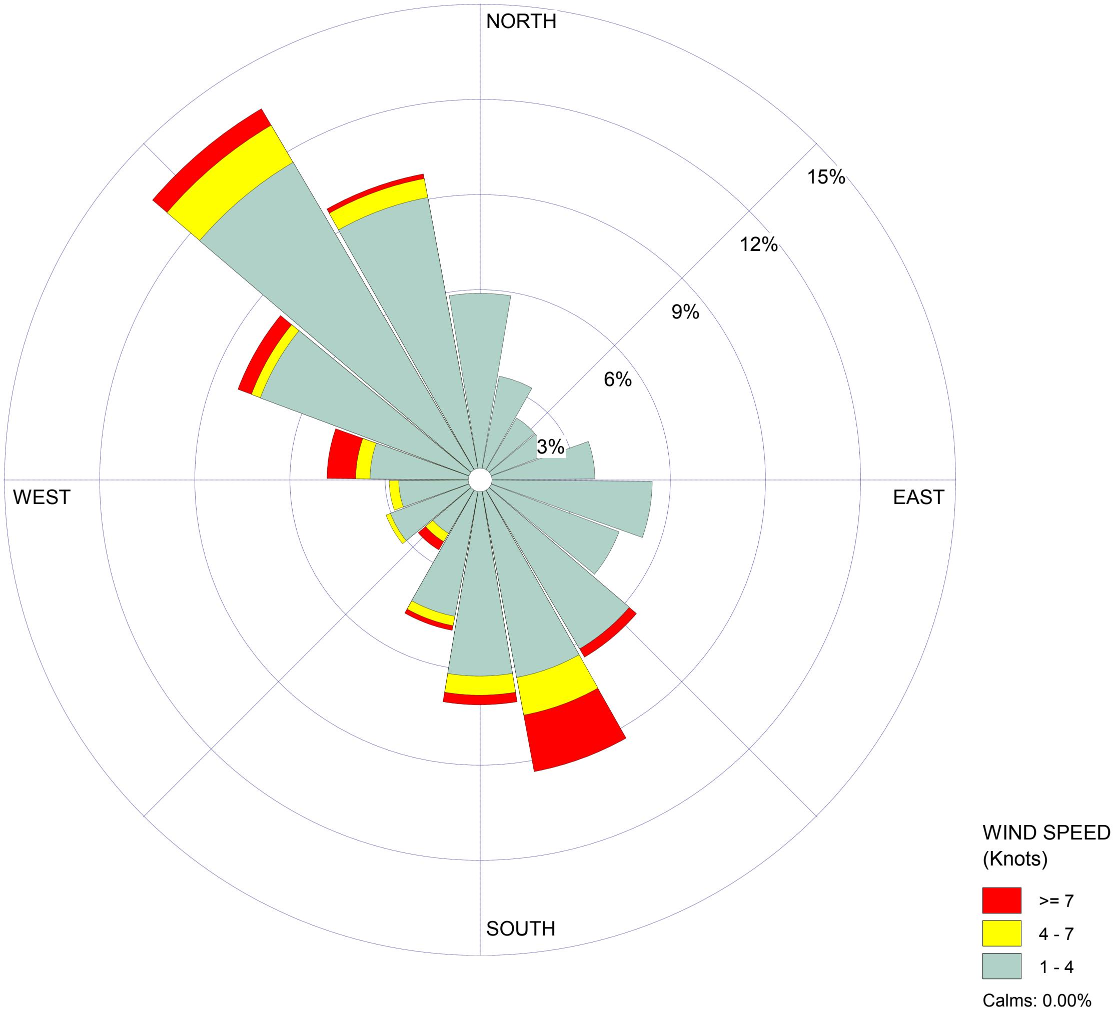


Figure 4. Petersen School Windrose on Days when the $PM_{2.5}$ > NAAQS

Discussion

The background site was consistently low during the most elevated $PM_{2.5}$ days at the Klamath Falls Petersen School site. The background site showed no variation by time of day and was very near the clean air level of 2ug/m3 that the nephelometer at when fed very clean air. The Petersen School site showed the familiar diurnal pattern associated with overnight inversions and evening emissions. The Klamath Falls site also shows a morning bump which could possibly be associated with increased emission activity when people combustion processes after waking up.

The wind was very low during these days and inversions persisted overnight. The air parcel around Petersen school did not move far and based on the nephelometry did not come from the back ground site even though much of the wind rose shows wind direction from the southeast.

Conclusion

The background levels around Klamath Falls are low and do not show any $PM_{2.5}$ impact on Klamath Falls Petersen School during the days where the Federal Reference Method Sampler measured $PM_{2.5}$ above the NAAQS.

Appendix A-5

SANDWICH Analysis and Speciation

Speciation of the FRM measured PM2.5 data used the co-located STN speciation data following the SANDWICH approach (sulfate, adjusted nitrate, derived water, inferred carbonaceous material balance approach) (U.S.EPA, 2007; Frank, 2006). The Peterson School STN data was compiled for 2006-2010, and sample data for total mass greater than 25 ug/m3 was used as the basis for the SANDWICH approach.

An examination of the STN speciated data showed that carbonaceous mass (OC and EC) was the predominant component and that SO4 and NO3 were relatively minor contributors to total mass. Because control strategies for emissions reductions would be focused on OC and EC, primarily from residential wood heating, and to simplify the roll back model, it was considered effective to conservatively estimate SO4 and NO3 and hold these components constant in the rollback.

An NO3 concentration of 3.0 ug/m3 was chosen based on the average STN monitor concentration for the first annual quarter (Q1), adjusted upwards to reflect a high standard deviation. An SO4 concentration of 0.5 ug/m3 was based on the average of quarters 1 and 2 (Q1 and Q2), also adjusted upwards to be on the conservative side. These values for NO3 and SO4 were proposed to EPA to be used in the SANDWICH speciation, and in the rollback given a Relative Response Factor (RRF) of 1.0. The attainment demonstration will not take credit for the small emission reductions in nitrate and sulfate that are expected to occur during the period from 2008 to 2014. Pollution reductions strategies and the attainment demonstration are focused on the organic and elemental carbon components of $PM_{2.5}$.

A Crustal material (OPP) concentration of 0.8 ug/m3 was estimated from the average of Q1 and Q2 concentrations.

In preparation for SANDWICH, the speciated data was adjusted to estimate retained NO3 mass, NH4 associated with SO4 and NO3 mass, particle bound water, and other primary PM2.5 (OPP). Most of this preparation was done by DEQ in concert with EPA Region 10. The results of the SANDWICH process, in which organic carbon (OC) is calculated by mass balance as the remainder from total mass less all other components, are shown in the table below.

							SANDWICH										
	FRM ug/m3	Blank ug/m3	Non-blank ug/m3	Sulfate ug/m3	Nitrate ug/m3	OC ug/m3	EC ug/m3	Water ug/m3	NH3 ug/m3	OPP ug/m3	Sulfate %	Nitrate %	OCM %	EC %	Water %	NH3 %	OPP %
Q1	30.42	0.5	29.92	0.50	3.00	21.30	1.94	2.14	0.12	0.92	1.7	10.0	71.2	6.5	7.1	0.4	3.1
Q2	10.89	0.5	10.39	1.30	0.00	6.53	0.44	0.47	0.44	1.21	12.6	0.0	62.9	4.2	4.5	4.3	11.6
Q3	11.88	0.5	11.38	0.52	0.00	9.32	0.33	0.16	0.17	0.87	4.6	0.0	81.9	2.9	1.4	1.5	7.7
Q4	33.54	0.5	33.04	0.50	3.00	25.64	2.50	0.43	0.30	0.68	1.5	9.1	77.6	7.6	1.3	0.9	2.1
Mean Q1+Q2	**31.98**	0.50	31.48	0.50	3.00	23.47	2.22	1.28	0.21	0.80	**1.6**	**9.6**	**74.4**	**7.0**	**4.2**	**0.7**	**2.6**

a. SOAs and minor PM2.5 species

In addition to quantifying the species components to the DV mass, as shown in the SANDWICH table, attention was paid to the sources of precursors to PM2.5, and in particular to chemical processes in the atmosphere that might affect the dynamics of PM2.5 formation. The focus of this effort was the formation of biogenic and anthropogenic secondary organic aerosols (SOA). DEQ partnered with a research associate (Dr. Kelly Barsanti) at Portland State University (PSU) to examine the formation of these SOAs using chemical box models in which biogenic emissions as precursors to Biogenic SOA were estimated for the vegetative cover in the Nonattainment area (NAA) and adjusted to reflect wintertime temperatures. In the same model, anthropogenic SOA formation was estimated from benzene, toluene, and xylene precursor emissions from On Road Mobile sources in the NAA. The results of that work are included in the Appendix A-6-1 and A-6-2, and show that these contributions to total OC are relatively low, as shown below.

Other mechanisms (pathways) of PM2.5 formation were not addressed in the attainment demonstration, because of their complexity, uncertain science, and the probability that their contribution to total PM2.5 is small. They include:

aqueous phase chemistry
partitioning of POA
aging of SOA/POA
oligomerization
precursor emissions of compounds of intermediate volatility Because of the complexity of
nighttime SOA chemistry
gas phase inorganic chemistry of SO2 and NOx

Finally, background EC and OC concentrations are derived from the average concentrations for Q1 and Q4 for the period 1/3/2007 to 3/30/2010, which represents all available data, from the IMPROVE sites at Crater Lake (CRLA), Kalmiopsis (KALM), and Lava Beds (LABE).

As shown in the list below, these species, and background, were treated as constants in the rollback model, and their concentrations will be assigned a Relative Reduction Factor (RRF) = 1.0:

Biogenic SOA = 0.5 ug/m3 (1% of the PM2.5 DV).
Anthropogenic SOA = 1.4 ug/m3 (3% of the DV)
SO4 = 0.5 ug/m3
NO3 = 3.0 ug/m3
Background EC = 0.1 ug/m3
Background OC = 0.6 ug/m

Appendix A-6-1

Secondary Organic Aerosols

The Secondary Organic Aerosol (SOA) values used in the Klamath Falls rollback attainment demonstration are based on a chemical box model analysis by Kelley Barsanti of Portland State University.

In this study, biogenic emissions as precursors to Biogenic SOA were estimated for the vegetative cover in the Nonattainment area (NAA) and adjusted to reflect wintertime temperatures. In the same model, anthropogenic SOA formation was estimated from benzene, toluene, and xylene precursor emissions from On Road Mobile sources in the NAA.

A 0-D box model was used to estimate the potential contribution of secondary organic aerosol (SOA) to PM2.5 in the Nonattainment area (NAA). The contribution was assessed in relative terms to the emissions of primary PM2.5 in the same area. For the box model volume, it was assumed that the area of influence around the Peterson School Monitor was a 15 x 15 km square and that the height of the mixing layer was 200 m (based on wintertime observations in the region). Seasonally adjusted emissions of the following SOA precursors were provided by C. Swab in units of lbs/season day: benzene, toluene, xylene, isoprene, monoterpenes, and sesquiterpenes. Emissions from anthropogenic sources (specifically ORM and WRC) were adjusted to reflect activity patterns in the NAA and emissions from biogenic sources were adjusted to reflect spatial coverage in the NAA and wintertime temperatures. Standard reaction rate constants, corrected for temperature, were used to calculate the amount of reacted precursors in a 12-hr “daytime” period by reaction with hydroxyl radical, ozone, and nitrogen oxides. Two regimes were considered: high NOx/precursor ratio and low NOx/precursor ratio, with the former deemed most relevant for the NAA.

In the box model, SOA formation was predicted using the “traditional two-product approach”, in which up to two-products are used to represent the oxidation products of each volatile organic compound (VOC) precursor. The traditional approach neglects: partitioning of VOCS of intermediate volatility, partitioning/oxidation of primary organic aerosol, oligomerization, and aqueous-phase chemistry. The partitioning parameters for the representative oxidation products were based on CMAQv4.71 (the most current version). Parameters for some of the reaction pathways considered are not available in CMAQv4.71 (biogenic precursors in the high NOx regime), thus partitioning parameters were based on Pye et al., 2010 and Barsanti et al., in preparation. The amount of SOA from anthropogenic precursors formed in the high NOx regime is dependent on the amount of “background organic mass” into which compounds can condense. For that purpose, it was assumed that 75% of primary PM2.5 was organic, which was then set as the “background organic mass” into which SOA could condense. For the conditions deemed most representative of the NAA, the box model yielded an anthropogenic SOA value of ~3% (1.4 $\mu g\ m^{-3}$) of the daily value and a biogenic SOA value of ~1% (0.5 $g\ m^{-3}$) of the daily value.

Discussions on the Potential Contribution of Secondary Organic Aerosol (including organonitrates) to $PM_{2.5}$ in Klamath Falls

Kelley Barsanti, Abdullah Mahmud
Civil & Environmental Engineering
Center for Climate and Aerosol Research
Portland State University

Outline

- Goal: To use thermodynamic modeling to assess the potential of secondary organic aerosol formation, relative to primary PM2.5 emissions, in Klamath Falls, OR
- Introduction to SOA modules in chemical transport models
- Approach
- Results

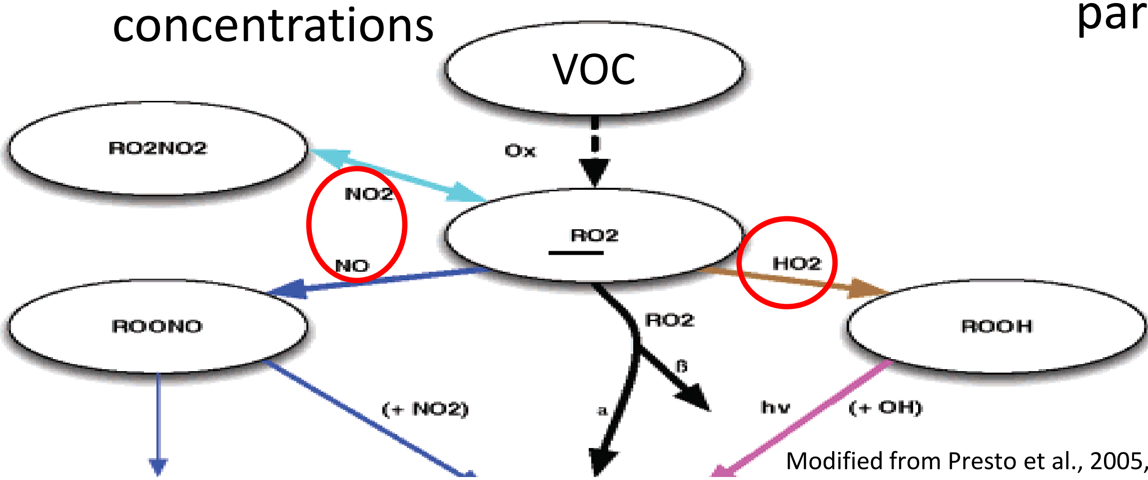
Overview of Relevant Gas-Phase Chemistry

Day: $\underbrace{\text{OH, O}_3}_{\text{"Ox"}}$ (HO_2, NO_x)

- Anthropogenic precursors: react w/OH
- Biogenic precursors
  - Isoprene reacts w/OH
  - Monoterpenes and sesquiterpenes react w/OH+O_3
- Then…branching based on NOx concentrations

Night: O_3, NO_3

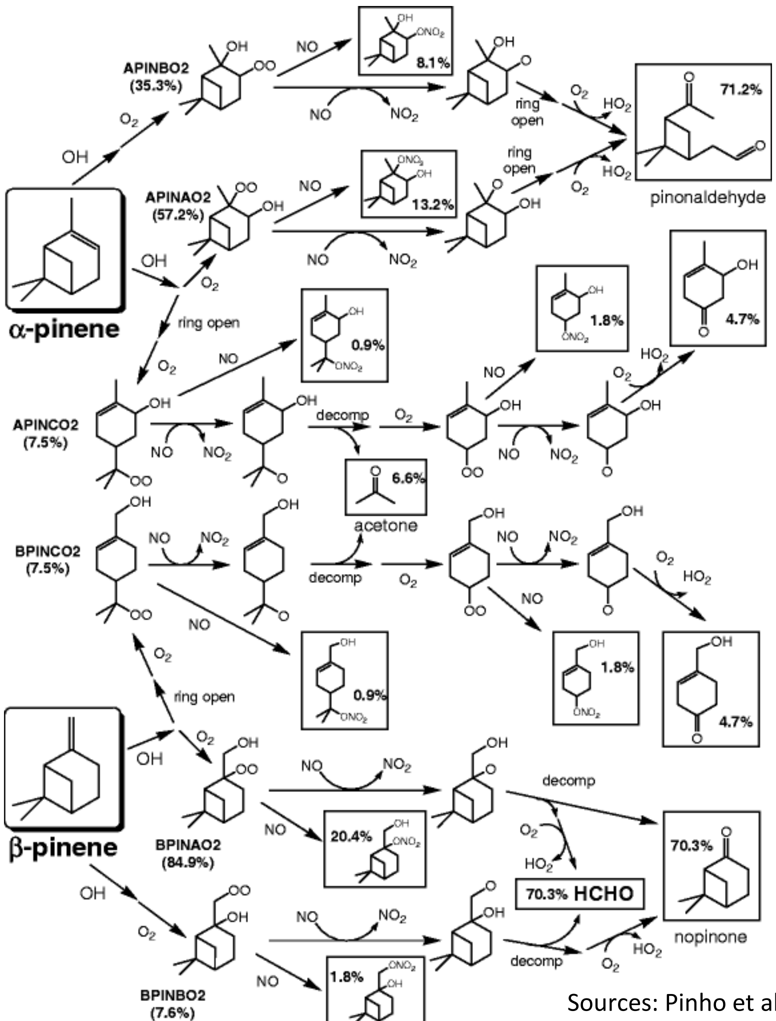
- Typically anthropogenic SOA precursors (benzene, xylene, toluene) react slowly with NO_3 slow.
- Biogenic precursors react w/NO_3
  - Isoprene, on order of reaction w/OH
  - Reactions w/α-,β-pinene particularly fast



Modified from Presto et al., 2005, *ES&T*

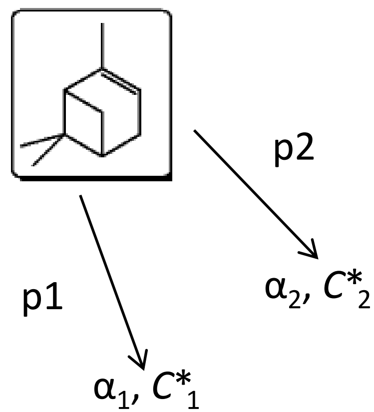
Overview of SOA Model Approaches: Two-Product (2p) and Volatility Basis Set (VBS)

α,β-Pinene + OH (first generation)



α,β-Pinene + OH (lumped compounds)

2 products (2p)

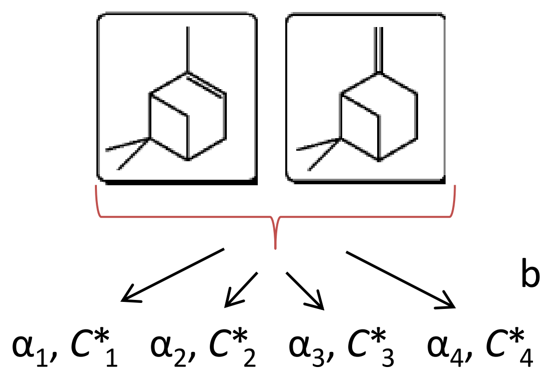


N hydrocarbons (HC)

Products tracked
= 2 x *N*

Fit chamber data to obtain $\alpha_{1,2}$ and $C^*_{1,2}$ values

volatility basis set (VBS)



Products tracked
= *j* or *j* x *N*

bins 1 to *j* (usually 4)

Fix C^*_i, fit chamber data to obtain α_i values

Sources: Pinho et al., *J. Atmos. Chem.*; Odum et al., *ES&T; Donahue et al., ES&T*

SOA in CMAQv4.7 (2p)

No NO_x dependence; No independent NO_3 pathway

NO_x dependence

TABLE 1. Parameters in CMAQv4.7 SOA Module

gaseous precursor (model species)	oxidants	semivolatile products	α_i^f	$c^{*\,g}$ (μg m^{-3})	ΔH_{vap} (kJ mol^{-1})	SOA species	M (g mol^{-1})	OM/OC ratio
		Semivolatile SOA						
isoprene (ISOP[a] or ISOPRENE[b])	·OH	SV_ISO1	0.232	116.01	40	AISO1	96	1.6
		SV_ISO2	0.0288	0.617	40	AISO2	96	1.6
monoterpenes (TERP[a] or TRP1[b])	·OH, O(^{3}P)[e],	SV_TRP1	0.1393	14.792	40	ATRP1	168	1.4
	O_3, ·NO_3	SV_TRP2	0.4542	133.7297	40	ATRP2	168	1.4
sesquiterpenes (SESQ[a,b])	O_3, ·OH, ·NO_3	SV_SQT	1.537	24.984	40	ASQT	378	2.1
long alkanes (ALK5[b])	·OH	SV_ALK	0.0718	0.020	40	AALK	150	1.56
high-yield aromatics (TOL[a] or ARO1[b])		SV_TOL1	0.0758	2.326	18	ATOL1	168	2.0
	·OH/NO	SV_TOL2	0.1477	21.277	18	ATOL2	168	2.0
low-yield aromatics (XYL[a] or ARO2[b])		SV_XYL1	0.0386	1.314	32	AXYL1	192	2.0
	·OH/NO	SV_XYL2	0.1119	34.483	32	AXYL2	192	2.0
benzene (BENZENE[a,b])		SV_BNZ1	0.0942	0.302	18	ABNZ1	144	2.0
	·OH/NO	SV_BNZ2	1.162	111.11	18	ABNZ2	144	2.0
		Nonvolatile SOA						
high-yield aromatics[c]	·OH/·HO_2		0.471	[h]	[h]	ATOL3	168	2.0
low-yield aromatics[c]	·OH/·HO_2		0.373	[h]	[h]	AXYL3	192	2.0
benzene[c]	·OH/·HO_2		0.484	[h]	[h]	ABNZ3	144	2.0
isoprene	H^+			[h]	[h]	AISO3	162	2.7
aged aerosol	time			[h]	[h]	AOLGA	176.4	2.1
						AOLGB	252	2.1
glyoxal, methylglyoxal (GLY[a], MGLY[a,b,d])	·OH		0.04	[h]	[h]	AORGC	177	2.0

Carlton et al., *ES&T*, 2010

SOA in GEOS-Chem (VBS)

NO_x dependence mono- and sesquiterpenes

Independent NO_3 pathway for all terpenes

Table 1. SOA Yield Parameterizations at 298 K.

Parent HC	Oxidant	α for C* (C* in μg/m³)					RMSE[a]	Yield at	Data
		nonvolatile	0.1	1	10	100	[μg/μg]	10 μg/m³	
Monoterpenes and sesquiterpenes									
LIMO	OH,O_3; NO	0	0	0.474	0.117	1.419	0.145	0.62	dark high-NO_x limonene ozonolysis (Zhang et al., 2006), refit using a density of 1.3 g/cm³
MTPA/O	OH,O_3; NO	0	0.04	0.0095	0.09	0.015	NA	0.09	based on low-NO_x fit, adjusted for NO_x based on Ng et al. (2007a) and Pathak et al. (2007)
SESQ	OH,O_3; NO	0	0	0.000	1.146	2.981	NA	0.84	based on low-NO_x fit, adjusted for NO_x based on Ng et al. (2007a)
LIMO	OH,O_3; HO_2	0	0	0.366	0.321	0.817	0.068	0.57	dark low-NO_x limonene ozonolysis (Zhang et al., 2006), refit using a density of 1.3 g/cm³
MTPA/O	OH,O_3; HO_2	0	0.08	0.019	0.18	0.03	0.016	0.19	dark α-pinene ozonolysis (Shilling et al., 2008), not wall loss corrected
SESQ	OH,O_3; HO_2	0	0	0.000	0.574	1.489	0.037	0.42	β-caryophyllene and α-humulene [VOC/NO_x]>3ppbC/ppb (Griffin et al., 1999a), fit using a density of 1.3 g/cm³
all terpenes	NO_3	0	0	0.000	0.321	1.083	0.057	0.26	β-pinene+NO_3 (Griffin et al., 1999a), fit using a density of 1.3 g/cm³
Isoprene									
ISOP	NO_3	0	0	0.000	0.217	0.092	0.023	0.12	Ng et al. (2008)
ISOP	OH	0	0	0.031	0.000	0.095	0.003	0.04	low-NO_x photooxidation (Kroll et al., 2006)
Aromatics									
BENZ	OH; NO	0	0	0.078	0.000	0.793	0.005	0.14	benzene high-NO_x photooxidation (Ng et al., 2007b)
TOLU	OH; NO	0	0	0.032	0.094	0.080	0.001	0.08	toluene high-NO_x photooxidation (Ng et al., 2007b)
XYLE	OH; NO	0	0	0.025	0.036	0.090	0.002	0.05	xylene high-NO_x photooxidation (Ng et al., 2007b)
BENZ	OH; HO_2	0.37	0	0	0	0	NA	0.37	benzene low-NO_x photooxidation (Ng et al., 2007b)
TOLU	OH; HO_2	0.36	0	0	0	0	NA	0.36	toluene low-NO_x photooxidation (Ng et al., 2007b)
XYLE	OH; HO_2	0.30	0	0	0	0	NA	0.30	xylene low-NO_x photooxidation (Ng et al., 2007b)
IVOCs									
NAP	OH; NO	0	0	0.039	0.296	0.235	0.036	0.20	naphthalene high-NO_x photooxidation (Chan et al., 2009)
NAP	OH; HO_2	0.73	0	0	0	0	NA	0.73	naphthalene low-NO_x photooxidation (Chan et al., 2009)

Pye et al., 2010

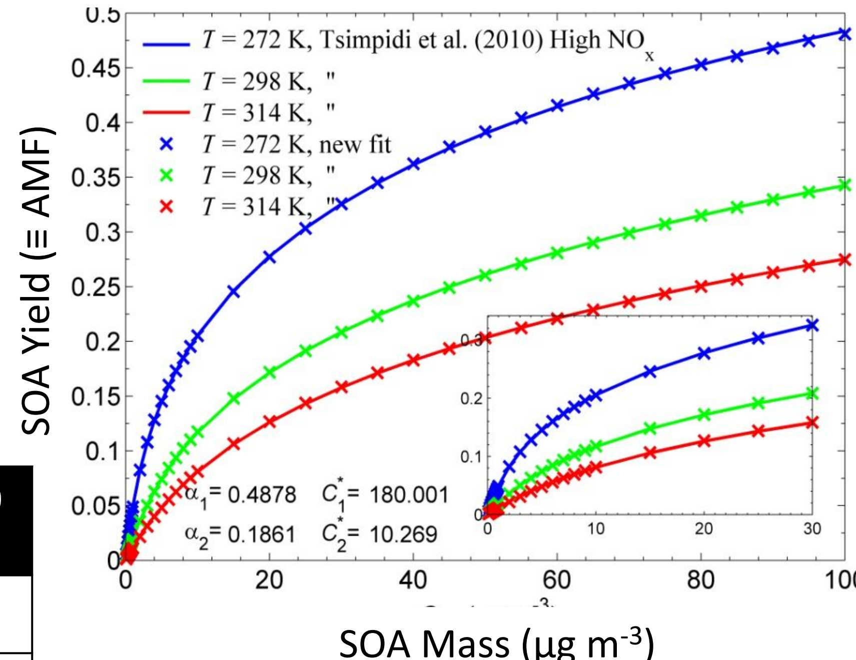
"2p-VBS"

2p-VBS parameters: take advantage of the VBS fitting approach and collation of new and old chamber data

- Used VBS (Tsimpidi et al., 2010) to generate "data" points at each of 3 temperatures; fit "data" points
- Generated two-product parameters for all precursors in CMAQ, added parameters for NOx dependent pathway for biogenic precursors

Precursor (w/OH, high NOx)	Yield @ ΔHC = 10 ug m^{-3}, 2p-VBS	Yield @ ΔHC = 10 ug m^{-3}, VBS
BENZ	0.12	0.14
TOL	0.07	0.08
XYL	0.04	0.05
ISO	0.01	n/a
MTRP	0.09	0.09
SQT	0.84	0.84

VBS and 2p-VBS Parameterizations of Aromatic 1/Toluene



Example fit above. To left, comparison of predicted yields using 2p-VBS parameterization with yield using a VBS parameterization (Pye et al., 2010).

Barsanti, Carlton, Chung in preparation

Assumptions and Approach

Goal: To evaluate the potential importance of SOA formation in Klamath Falls non-attainment area by comparing predicted SOA with primary $PM_{2.5}$ emissions in a fully-closed box model.

Case 1: Klamath County: 1.6×10^4 km^2

Case 2: Area approximating area of influence around monitoring site: 225 km^2

Height of Mixing Layer (winter): 200 m

Average Winter Daytime Temp.: 40°F (278K); Average Winter Nighttime Temp.: 20°F (267K)

Duration of Simulation: 12 hours

Daytime chemistry: 12-hr average OH: 2.0×10^6 molecules/cm$^{3;}$ 24-hr average O_3: 7.0×10^{11} molecules/cm^3

No NO/HO2 assumptions, consider one pathway at a time

Nighttime chemistry: 12-hr average NO_3: 2.5×10^8 molecules/cm^3

Breakdown of biogenic terpene emissions: 31% sesquiterpenes (sqt); 69% monoterpenes (mtrp)

Seasonally-averaged emissions from C. Swab, ODEQ.

SOA parameters based on Carlton et al. (2010), Pye et al. (2010), Barsanti et al. (in prep.)

Summary of Estimated SOA Formation

Case 1 and variations used to demonstrate sensitivity to inputs (assumed PM2.5 50% organic)

Precursor contribution to SOA (high to low) :

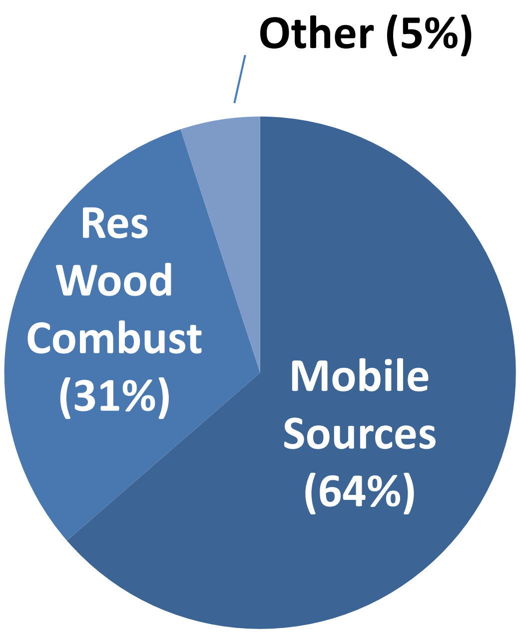
toluene, benzene, xylene (low NOx)

benzene, toluene, xylene (high NOx)

Precursor (w/OH, high NOx)	Anthropogenic SOA(μg/m³), % of total PM2.5	Biogenic SOA (μg/m³), % of total PM2.5	Total PM2.5 (primary + SOA)
Case 1: low-NOx	0.08, 2.5%	1.6, 52%	3.1
Case 1: low-NOx, *T* correction on biogenic emissions	0.08, 3.3%	0.9, 38%	2.4
Case 1: high-NOx	0.02, <0.5%	3.5, 71%	4.9
Case 1: NO_3 (nighttime chemistry)	n/a	4.3, 75%	5.7
Case 2: low-NOx, 20% organic	6.9, 9%	2.3, 4%	52
Case 2: low-NOx, 50% organic	7.6, 9%	3.0, 6%	53
Case 2: high-NOx, 20% organic	5.4, 4%	3.2, 6%	50
Case 2: high-NOx, 50% organic	7.1, 6%	4.3, 8%	52

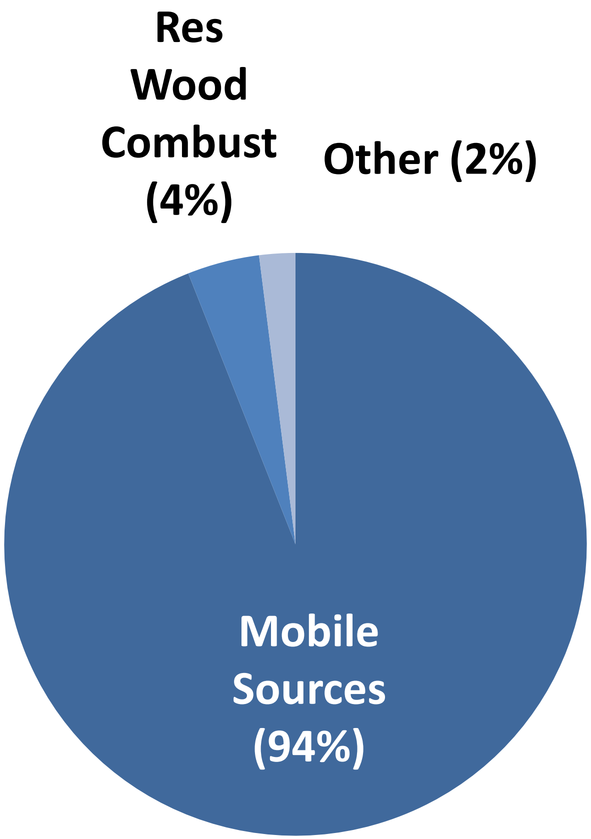
Notes: Predicted SOA depends on background organic $PM_{2.5}$ loading; assumed primary $PM_{2.5}$ was 20-50% organic as noted. For case 2, anthropogenic field burning emissions omitted and biogenic emissions reduced by half.

Seasonally-Adjusted Benzene Emissions (≥ 1 % of Total)



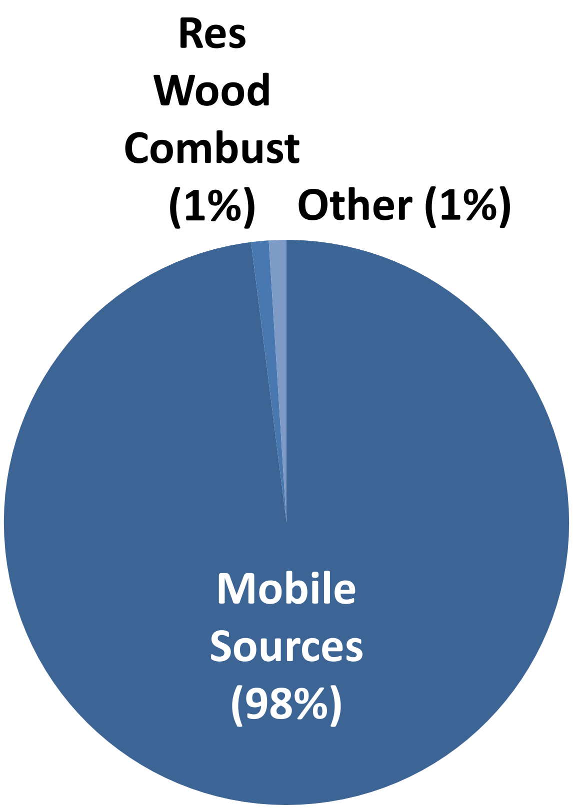
Data Category	Group	% Contribution to Total Benzene Emissions
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Vehicles (LDGV)	0.267
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Trucks 1 & 2 (M6) = LDGT1 (M5)	0.170
Nonpoint	Residential Wood Combustion: Woodstove_NotCertified	0.098
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Trucks 3 & 4 (M6) = LDGT2 (M5)	0.070
Nonroad	Mobile Sources/Pleasure Craft/Gasoline 2-Stroke	0.063
Nonpoint	Residential Wood Combusiont: Insert_NonCertified	0.051
Nonpoint	Residential Wood Combustion: Woodstove_Certified_Catalytic	0.039
Nonpoint	Residential Wood Combustion: Woodstove_Certified_NonCatalytic	0.036
Nonpoint	Residential Wood Combustion: Central_Furnace	0.032
Nonpoint	Residential Wood Combusiont: Insert_Certified_NonCatalytic	0.025
Nonpoint	Residential Open Burning: Municipal Waste (check SCC)	0.025
Nonpoint	Storage and Transport/Petroleum and Petroleum Product Storage/Gasoline Service Stations	0.023
Nonroad	Mobile Sources/Off-highway Vehicle Gasoline, 2-Stroke/Recreational Equipment	0.017
Nonpoint	Residential Wood Combustion: Insert_Certified_Catalytic	0.016
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	0.015

Seasonally-Adjusted Toluene Emissions (≥ 1 % of Total)



Data Category	Group	% Contribution to Total Toluene Emissions
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Vehicles (LDGV)	0.315
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Trucks 1 & 2 (M6) = LDGT1 (M5)	0.202
Nonroad	Mobile Sources/Pleasure Craft/Gasoline 2-Stroke	0.164
Nonroad	Mobile Sources/Off-highway Vehicle Gasoline, 2-Stroke/Recreational Equipment	0.089
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Trucks 3 & 4 (M6) = LDGT2 (M5)	0.083
Nonpoint	Residential Wood Combustion: Woodstove_NotCertified	0.024
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	0.022
Nonpoint	Storage and Transport/Petroleum and Petroleum Product Storage/Gasoline Service Stations	0.018
Nonpoint	Residential Wood Combusiont: Insert_NonCertified	0.012

Seasonally-Adjusted Xylene Emissions (≥ 1 % of Total)



Data Category	Group	% Contribution to Total Xylene Emissions
Nonroad	Mobile Sources/Pleasure Craft/Gasoline 2-Stroke	0.282
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Vehicles (LDGV)	0.266
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Trucks 1 & 2 (M6) = LDGT1 (M5)	0.170
Nonroad	Mobile Sources/Off-highway Vehicle Gasoline, 2-Stroke/Recreational Equipment	0.096
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Light Duty Gasoline Trucks 3 & 4 (M6) = LDGT2 (M5)	0.070
Onroad	Mobile Sources/Highway Vehicles - Gasoline/Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	0.019
Nonpoint	Storage and Transport/Petroleum and Petroleum Product Storage/Gasoline Service Stations	0.011
Nonpoint	Residential Wood Combustion: Woodstove_NotCertified	0.010

Take Home Points

Seasonally-Adjusted Emissions Summary

Seasonally-Adjusted Primary $PM_{2.5}$ Emissions (≥ 1 % of Total)

Data Category	Group	% Contribution to Total Primary $PM_{2.5}$
Nonpoint	Prescribed Burning: ANTHROPOGENIC	0.547
Nonpoint	Mobile Sources/Unpaved Roads/unknown (fugitive dust: vehicle related)	0.071
Nonpoint	Residential Wood Combustion: Woodstove_NotCertified	0.066
Nonpoint	Residential Wood Combusiont: Insert_NonCertified	0.034
Nonpoint	Residential Wood Combustion: Woodstove_Certified_NonCatalytic	0.031
Nonpoint	Residential Open Burning: Brush	0.023
Nonpoint	Residential Wood Combustion: Woodstove_Certified_Catalytic	0.023
Nonpoint	Residential Wood Combusiont: Insert_Certified_NonCatalytic	0.022
Nonpoint	Mobile Sources/Paved Roads/All Paved Roads (fugitive dust: vehicle related)	0.021
Nonpoint	CAFO: Beef Cattle: Total (non-permitted sources)	0.017
Nonpoint	Residential Wood Combustion: Central_Furnace	0.014
Point	Industrial Processes/Pulp and Paper and Wood Products/Plywood Operations	0.013
Nonpoint	Residential Wood Combusiont: Fireplace	0.012
Point	External Combustion Boilers/Industrial/Wood/Bark Waste	0.012
Nonpoint	Residential Wood Combustion: Insert_Certified_Catalytic	0.010

Report on PM2.5 receptor modeling for Klamath Falls, Oregon.

This receptor modeling analysis was conducted by Robert Kotchenruther, EPA Region 10 (206-553-6218, Kotchenruther.Robert@epa.gov). Draft modeling report dated November 22, 2011.

The goal of this receptor modeling analysis by EPA R10 is to better understand sources of PM2.5 in Klamath Falls, Oregon. One question in particular is whether receptor modeling can help inform the extent of point source impacts at the monitor. Analysis of emissions inventories by Oregon DEQ attributed roughly 24% of winter season PM2.5 emissions in the nonattainment area to point source emissions. However, preliminary plume dispersion modeling of major point sources suggests a much smaller impact at the Peterson school monitor on winter days with elevated PM2.5. Receptor modeling is an additional tool that can be used to estimate source impacts at the Peterson school monitor and possibly narrow the discrepancy between emissions analysis and plume dispersion modeling.

Summary of Analysis and Results

Two separate receptor modeling analyses were conducted for PM2.5 data from Klamath Falls Oregon. The first modeling scenario used approximately 4 years of speciated PM2.5 data, but the carbon data available for that time period was only the total measured organic carbon (OC) and elemental carbon (EC). The second modeling scenario used the most recent 2 years of the 4 year period of the previous scenario and used the more detailed carbon data available from the IMPROVE method thermal evolution protocol. Throughout this report the first modeling scenario is called the ‘Bulk OC&EC scenario’ and the second is called the ‘OC&EC fractions scenario’.

The Positive Matrix Factorization (PMF) model was used for these analyses. The modeling resulted in a 4-factor solution for the Bulk OC&EC scenario and a 6-factor solution for the OC&EC fractions scenario. Common factors resolved in both scenarios were Wood Smoke, Nitrate Rich, Fugitive Dust, and Sulfate Rich. The OC&EC fractions scenario resolved two additional factors labeled in this analysis as OP Rich and Urban/Industrial. While source category (or otherwise descriptive) names have been assigned to each factor, there is overlap and factor names should not be taken too literally. For example, it is likely that industrial sources contribute at least partially to the factors: Urban/Industrial, OP Rich, Nitrate Rich, and Sulfate Rich. It is also likely that wood smoke contributes to the OP Rich factor as well as the Wood Smoke factor.

Results for both modeling scenarios were aggregated to winter days when total PM2.5 was above 25 ug/m3. For this subset of the data, wood smoke was determined to be 71.7% and 64.6% of total PM2.5 mass for the Bulk OC&EC scenario and OC&EC fractions scenario, respectively. For the OC&EC fractions scenario with the above data aggregation, the OP Rich factor was found to be 23.3% of PM2.5. The author believes the OP Rich factor represents aged or otherwise more highly oxidized sources of organic carbon, so it is likely wood smoke also contributes somewhat to this factor. Based on the times series of mass impacts and the chemical composition of factors, it is thought that the Wood Smoke factor from the OC&EC fractions scenario is a better estimate of fresh wood smoke impacts and some portion of the OP Rich factor represents the impact of aged organic carbon from wood smoke.

The Nitrate Rich factor mass allocation was significantly different between the two modeling scenarios, 12.1% and 4.7% for the Bulk OC&EC scenario and OC&EC fractions scenario, respectively, but can likely be explained by the different time periods modeled and higher specificity of chemical species in the OC&EC fractions scenario. Other factors were found to contribute individually less than 5% each to total PM2.5 mass for winter days over 25 ug/m3.

Unfortunately, this receptor modeling analysis does not clearly delineate point source impacts at the monitor. However, it may be possible to use these results in conjunction with other analyses to better constrain the impact of various emissions categories at the monitor. EPA R10 will collaborate with Oregon DEQ about what further analyses might be possible.

1. Monitoring Site and Data Information.

1.1. Map of the monitoring location used in this analysis:

Figure 1.1 shows a map of the Klamath Falls area and the location of the PM2.5 monitor. EPA's AQS site number for the monitor is 410350004, the site latitude is 42.188889 and longitude is -121.7225.

Figure 1.1. Map of the Klamath Falls area showing the location of the PM2.5 FRM and speciation monitor (red dot).

1.2. Metadata information:

- The data source was the EPA AQS database and data were downloaded on 10/28/2011. The data reports used were AMP350 raw data report and AMP503 sample blank report. No sample blanks were recorded in the AQS database for the Klamath Falls site, so the average sample blank data from 4 sites in California (AQS identifiers 060190008, 060670006, 060850005, 061112002) were used. These California sites were chosen because they were on the same schedule for carbon sampler replacement, and therefore had sample blank data coincident with the entire Klamath Falls dataset.

- The date range of data extracted was 10/15/2007 – 3/28/2011, which was all of the available speciation sampler data at the time of data extraction.
- The total number of filter samples extracted was 187.
- Chemical species used in this modeling analysis were Al, Br, Ca, Cr, Cu, Cl, Fe, Pb, Mn, Ni, Ti, Si, Zn, S, K, NH4, Na, NO3, EC, EC1, EC2, EC3, OC, OC1, OC2, OC3, OC4, OP. EC and OC data were from both MetOne SASS and URG 3000N (see below), OC and EC fraction data were from the URG 3000N only, and OP data is based on the optical reflectance method (TOR).

1.3. Impact of carbon sampling and analysis methodology changes during this study period

Around the middle of the period of study in this analysis, on 7/12/09, the carbon sampling and analysis methodology was changed from a MetOne SASS carbon sampler using the NIOSH analysis method to a URG 3000N carbon sampler using the IMPROVE analysis method. The major differences between samplers are that the URG 3000N has a much higher flow rate and smaller filter size than the MetOne SASS. The change in sample analysis methodology from NIOSH to IMPROVE changed the temperature cut points for both organic and elemental carbon as well as changed how organic carbon pyrolosis is quantified from the optical transmittance to the optical reflectance method. All of these changes mean that the OC and EC thermal fraction data and bulk OC and EC data before and after the method change are not directly comparable. This creates difficulties for including carbon data in a receptor modeling analysis that spans the full data record.

While the change in carbon sampling and analysis methodology presents some difficulties, it is possible to convert bulk OC and EC measurements from one method to the other. This is because bulk OC and EC data have been shown to be well correlated in studies where co-located data have been compared (USEPA 2009). There are a number of studies where correlations have been derived, but ideally for the Klamath Falls dataset one wants a correlation developed from a winter wood smoke impacted area. Sierra Research under contract with the State of Alaska conducted a search of speciated PM2.5 databases in the US to find sites with collocated MetOne SASS and URG 3000N monitors (or MetOne SASS and collocated IMPROVE monitors) that also have significant winter wood smoke impacts. Sierra Research determined the best site with collocated data and wood smoke impacts was in Fresno California. The linear correlations for bulk OC and EC between IMPROVE and SASS instruments for Fresno California was determined by Sierra Research to be

$$OC(IMPROVE) = 0.6581 * OC(SASS) - 0.3594 \qquad r2 = 0.94$$
$$EC(IMPROVE) = 1.3107 * EC(SASS) + 0.151 \qquad r2 = 0.75$$

Previous work by EPA has documented that IMPROVE and URG monitors are very well correlated for both OC (r2=0.97) and EC (r2=0.95) with slopes close to 1.0 (USEPA 2009), so in this work we use the above Fresno correlations to convert bulk OC and EC data collected prior to 7/12/09 from the MetOne SASS to their approximate URG 3000N values. A similar transformation of OC and EC thermal fraction data was not done. It is assumed that due to significant differences in thermal evolution protocols between the NIOSH and IMPROVE methodologies, OC and EC fraction data are too different to compare meaningfully even though the bulk OC and EC measurements are well correlated.

The transformation of bulk OC and EC data prior to 7/12/09 to be 'URG-like' means that the entire dataset from 10/15/2007 – 3/28/2011 has a consistent set of data for bulk OC and EC and can be used for receptor modeling. However, OC and EC thermal fraction data are only available from 7/12/09 - 3/28/2011.

Because OC and EC thermal fraction data are of significant value for source identification, two separate receptor modeling analyses were performed with the available dataset. The first analyses used the entire dataset 10/15/2007 – 3/28/2011 (187 samples) and used only bulk OC and EC data (with corrected data prior to 7/12/09). The second analyses used only the data from 7/12/09 – 3/28/2011 (87 samples), used the OC and EC thermal fraction data, but discarded the bulk OC and EC data to avoid species double counting in the model. Table 1.1 lists the major differences between receptor modeling scenarios explored in this analysis.

Table 1.1. Major differences in receptor modeling scenarios explored in this study.

Receptor Modeling Scenario	Date Range	Number of Samples	Chemical Species Used
Bulk OC&EC Scenario	10/15/2007 - 3/28/2011	187	Al, Br, Ca, Cr, Cu, Cl, Fe, Pb, Mn, Ni, Ti, Si, Zn, S, K, NH4, Na, NO3, EC, OC.
OC&EC Fractions Scenario	7/12/2009 - 3/28/2011	87	Al, Br, Ca, Cr, Cu, Cl, Fe, Pb, Mn, Ni, Ti, Si, Zn, S, K, NH4, Na, NO3, EC1, EC2, EC3, OC1, OC2, OC3, OC4, OP(TOR).

Each scenario has advantages and weaknesses. The advantages of the Bulk OC&EC Scenario is, first, it is a significantly longer dataset that includes 4 winter periods as opposed to only 2 in the OC&EC Fractions Scenario and second, the larger number of samples in the Bulk OC&EC Scenario is expected to reduce the uncertainty of the modeling result. The weakness of the Bulk OC&EC Scenario is that chemical fraction data from thermal evolution analysis has been found to significantly improve the delineation and identification of carbon emitting sources, organic carbon is the chemical species with the highest mass impacts during winter high PM2.5 days in Klamath Falls, and this Scenario does not use chemical fraction data.

The advantage of the OC&EC Fractions Scenario is that it does include the chemical fraction data, but its weakness is that there are relatively fewer samples and the number of samples approaches the minimum number of samples recommended for this model.

2. Data Preparation Methodology

Except as noted below the measured values, uncertainties, sample blank correction, and method detection limits for each chemical species were obtained and prepared as recommended in the EPA Region 10 guidance document "EPA Region 10 Guidance for the Use of Receptor Models to Support Policy and Regulatory Decisions", dated 12/17/2009 (Kotchenruther, 2009).

In preparing the model input data, deviations from the 2009 guidance were as follows. The recommendation to discard chemical species with more than 70% of data below the MDL was relaxed to 97%. This was done to retain potentially important species such as EC3 for combustion sources, Ti for the identification of soils, and Pb, Ni, Cr, Mn, and Cu as common tracers for various anthropogenic sources. Similar relaxation of this recommendation for modeling in Tacoma Washington and Salt Lake City Utah was found to be beneficial (Kotchenruther, 2011a; Kotchenruther, 2011b).

Other data processing choices included:

- To avoid double counting, the following chemical species were removed from the datasets: SO4 (S was retained), Na (Na+ was retained), K+ (K was retained), and OP via the TOT method (OP is reported by two measurement methods, TOT and TOR, here OP via TOR was retained). The chemical species that were retained were chosen based on either higher data completeness or higher S/N ratio.
- Data from July 4 and 5 were removed to mitigate the influence of fireworks on the modeling result.

3. Modeling

The model used in this receptor modeling analysis was the Positive Matrix Factorization (PMF) model. The PMF model version used was EPA PMF v4.0 beta. The current publically available version is 3.0 (http://www.epa.gov/heasd/products/pmf/pmf.html). However, for the purposes of this modeling analysis, v4.0 beta is identical to the publically available v3.0.

User setting for modeling scenarios in this work were as follows:

- PM2.5 mass data was set as the 'Total Variable', which allows the model to estimate each factor contribution to total mass. Setting total PM2.5 as the 'Total Variable' increases its uncertainty to down weight its influence in the model solution.
- For each scenario, 20 model runs were made to find the best least-squares minimum with the 'seed' variable set to 10 ('seed' determines where the model begins looking for a solution, setting a specific number rather than using the 'random' setting allows the user to reproduce the model results exactly).
- The optimum number of factors for each scenario was determined somewhat subjectively based on the interpretation of model results, but also from the quality of the least-squares fit (analysis of Q values) in the model output.

4. Modeling Results and Analysis

4.1. Resulting PMF Factors and Factor Classification

The PMF model uses a form of factor analysis where the underlying co-variability of many variables (e.g., sample to sample variation in particulate matter chemical species) is described by a smaller set of factors (e.g., particulate matter sources) to which the original variables are related.

The interpretation/classification of factors output by the PMF model is a subjective process. It can depend on the experience of the modeler, availability of current source profiles and literature references, availability of supplementary information about the airshed, and an understanding of the range of possible sources impacting the monitoring location. A PMF factor could represent the impact on the monitor of a single source (e.g. industrial facility), a source category (e.g. a bunch of sources that have very similar chemical fingerprints and emissions patterns such as cars, trucks, wood burning sources), or multiple sources or source categories grouped together (PMF may group together multiple sources because of insufficient variability in emissions, chemical fingerprint, and/or temporal/spatial resolution).

It should be also noted that the factors determined in a PMF analysis are not necessarily mutually exclusive. For example, a factor identified as predominantly nitrate aerosol is likely from a combination of multiple combustions sources including gasoline vehicles, diesel engines, and industrial facilities, even though these sources may also have separately identified PMF factors. Hence, caution should be used in interpreting factor classifications too literally or with exclusivity.

The optimal results for the two scenarios explored in this analyses was a 4-factor solution for the Bulk OC&EC Scenario and a 6-factor solution for the OC&EC Fraction Scenario. Table 4.1 lists the factors found for each scenario. Factors are given source category names for ease of reference.

Table 4.1. PMF based Factors found for two Klamath Falls modeling scenarios (factors are here given source category names for ease of reference).

Factors for this study	Bulk OC&EC Scenario (187 samples, 10/2007 - 3/2011)	OC&EC Fractions Scenario (87 samples, 7/2009 - 3/2011)
Wood Smoke	✓	✓
OP Rich	Not found	✓
Nitrate Rich	✓	✓
Fugitive Dust	✓	✓
Sulfate Rich	✓	✓
Urban/Industrial	Not found	✓

The range of factors found in each scenario is consistent with the current conceptual understanding of the range of aerosol sources in this airshed and similar to factors found in other airsheds in the Pacific Northwest. Further discussion of factor identification and classification can be found in Sections 4.3 and 5 of this report.

4.2. Factor Contributions on Winter (Quarter 1 and 4, October – March) Season Days with Elevated PM2.5

Figure 4.1 depicts the average percent contribution of each PMF factor during the winter season (October through March) when total PM2.5 was measured at greater than 25 ug/m3. Error bars in Figure 4.1 represent the standard deviation around the mean. Table 4.2 is the tabulated data corresponding to Figure 4.1. ‘Unattributed mass’ in Figure 4.1 and Table 4.2 is the average amount of mass either under or over attributed by the model compared to the observed PM2.5. The model result for the Bulk OC&EC Scenario on average left 10.0% of the total mass unattributed to a factor for those winter dates when PM2.5 was greater than 25 ug/m3. The model result for the OC&EC Fractions Scenario allocated on average 1.2% too much mass to winter samples greater than 25 ug/m3.

Figure 4.1. Average percent contributions of PMF derived factors to PM2.5 and standard deviations on winter season days with PM2.5 > 25 ug/m3 (25 and 14 samples for model Bulk OC&EC and OC&EC Fractions modeling scenarios, respectively).

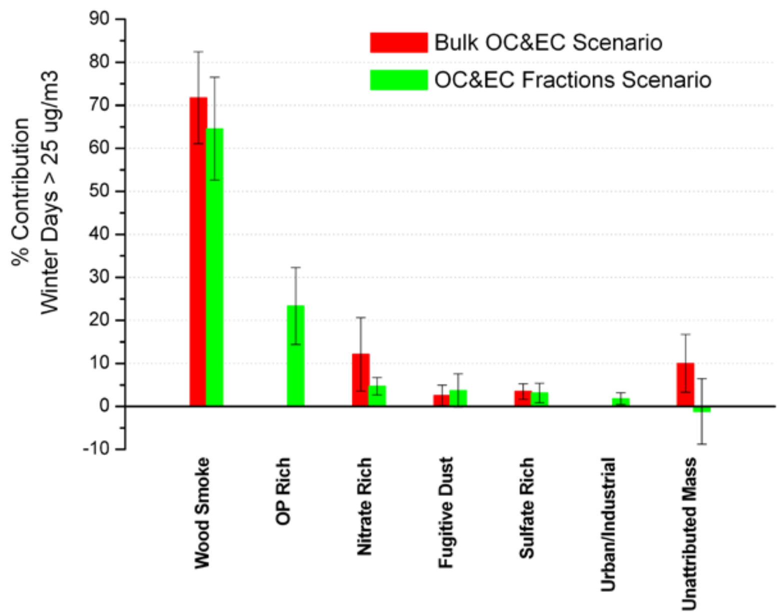


Table 4.2. Average percent contributions of PMF derived factors to PM2.5 on winter season days with PM2.5 > 25 ug/m3 (25 and 14 samples for Bulk OC&EC and OC&EC Fractions modeling scenarios, respectively).

Model Factors	Bulk OC&EC Scenario (%)	OC&EC Fractions Scenario (%)
Wood Smoke	71.7	64.6
OP Rich		23.3
Nitrate Rich	12.1	4.7
Fugitive Dust	2.6	3.7
Sulfate Rich	3.5	3.1
Urban/Industrial		1.8
Unattributed Mass(+)/ Over attributed mass(-)	10.0	-1.2

Table 4.3. Average mass contributions of PMF derived factors to PM2.5 on winter season days with PM2.5 > 25 ug/m3 (25 and 14 samples for Bulk OC&EC and OC&EC Fractions modeling scenarios, respectively).

Model Factors/PM2.5	Bulk OC&EC Scenario (ug/m3)	OC&EC Fractions Scenario (ug/m3)
PM2.5	35.2	34.2
Wood Smoke	25.0	22.7

OP Rich		7.6
Nitrate Rich	4.6	1.6
Fugitive Dust	0.8	1.1
Sulfate Rich	1.3	1.2
Urban/Industrial		0.5
Unattributed Mass(+)/ Over attributed mass(-)	3.5	-0.6

4.3. Comparison and discussion of Factors found in the Bulk OC&EC Scenario vs. the OC&EC Fractions Scenario.

Section 5 of this report discusses in more detail each PMF factor, how the source classification names were determined, the chemical profile for each factor, the time series of mass impacts for each factor, the monthly average impact of each factor, and examples of similar factor chemical profiles from PMF analyses conducted in other areas of the Pacific Northwest.

The reader will see in Section 5 bar plots that represent the chemical profile/composition for each factor. Because these bar plots can be difficult to interpret, the following describes how to read them. Along the x-axes are the chemical species input into the model. The vertical blue bars match to the left y-axes and represent the percent contribution of each chemical species to the factor's overall chemical composition. The left y scale is on a log basis to better represent trace element contributions. The red squares match to the right y-axes and can be interpreted as representing how important each chemical species was to the models' identification of that factor (e.g., for the Wood Smoke factors, red squares are elevated for OC, EC, and K).

Differences in average factor mass attribution in the two scenarios as seen in Figure 4.1 and Table 4.2 can be explained largely by (1) the higher specificity in carbon species used in the OC&EC Fractions Scenario, (2) the differing time periods covered in each analysis (4 winters in the Bulk OC&EC Scenario vs. 2 in the OC&EC Fractions Scenario and the possibility that the average meteorology effecting PM2.5 and/or source strengths over the respective time periods shifted), and (3) the effect of the differing number of samples on model results.

Four factors are directly comparable between the two modeling scenarios; Wood Smoke, Nitrate Rich, Fugitive Dust, and Sulfate Rich. Of these, the percent contributions from Fugitive Dust and the Sulfate Rich factors are similar between the two scenarios. However, the Nitrate Rich factor is significantly less in the OC&EC Fractions Scenario vs. the Bulk OC&EC Scenario, representing 4.7% and 12.1% of the total winter mass above 25 ug/m3, respectively. This can be partially explained by the differing time periods in each Scenario. Specifically, the 4-winter Bulk OC&EC Scenario has two dates with over 8 ug/m3 of measured nitrate, significantly higher than any measured nitrate values in the 2-winter OC&EC Fractions Scenario. If we subset the data in the Bulk OC&EC Scenario to match the dates of the OC&EC Fractions Scenario and recalculate percent impacts, then the Nitrate Rich factor in the Bulk OC&EC Scenario drops from 12.1% to 8.8%. However, 8.8% is still about double the 4.7% Nitrate Rich factor contribution found for the OC&EC Fractions Scenario. Section 5.3 contains a plot of the chemical profile for the Bulk OC&EC Scenario Nitrate Rich factor. Inspection of this plot shows that the two highest mass species in this factor are NO3 followed by EC. EC is also important in the Wood Smoke factor. Since both the Nitrate Rich factor and Wood Smoke factor have higher impacts in winter, it is possible that some degree of co-linearity between the two factors may have caused an over-allocation of EC to the nitrate factor in this scenario. The higher specificity of OC and EC in the OC&EC Fractions Scenario may help to mitigate the possible co-linearity of these two factors, and therefore allocates less mass to the Nitrate Rich factor.

Wood Smoke was attributed to 71.7% and 64.6% of winter PM2.5 greater than 25ug/m3 for the Bulk OC&EC and OC&EC Fractions scenarios, respectively. However, for the OC&EC Fractions scenario, 23.3% of the aerosol mass was attributed to the OP Rich factor and some portion of this factor is probably also related to wood smoke emissions. OP (organic pyrolosis) is the portion of organic carbon that chars and converts to elemental carbon during the temperature ramped measurement of organic carbon fractions. A number of other urban/suburban wood smoke impacted areas in the Pacific Northwest have also had a separate 'OP Rich' factor identified during PMF receptor modeling (Kotchenruther 2011a, Kotchenruther 2011b). These other areas include two monitoring sites in Tacoma Washington and three sites near Salt Lake City Utah.

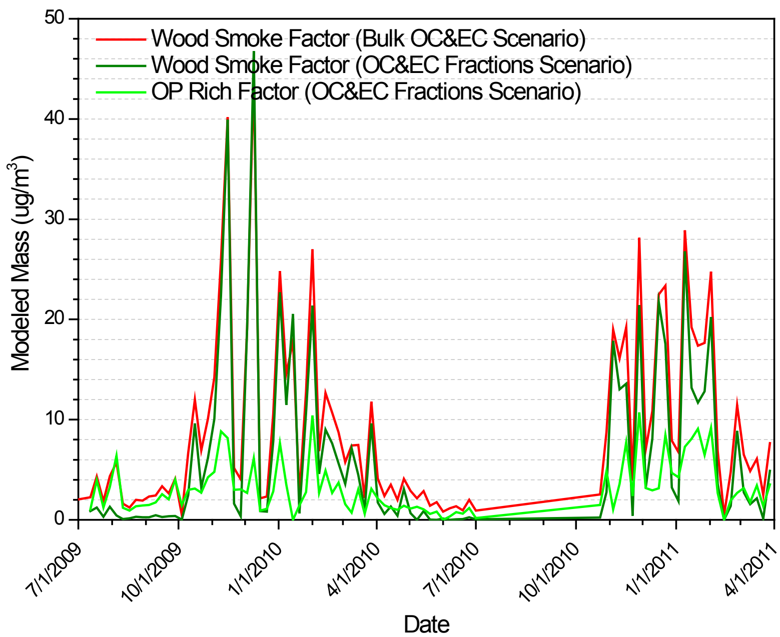
The current hypothesis by this author is that the OP Rich factor represents organic carbon sources that have been aged, or are otherwise more highly oxidized, relative to primary organic carbon sources such as fresh wood smoke. The rational for this hypothesis is that as organic carbon ages in the atmosphere it generally becomes more oxidized from reactions with OH and O3, and more oxidized organics have lower volatility and may be more likely to pyrolize rather than volatilize when subjected to heating. This hypothesis is supported by the chemical profile of the OP Rich factors found in Klamath Falls and in other locations in the Pacific Northwest (see section 5.2). In each OP Rich chemical profile there is very little EC2 or EC3 attributed to the factors and in most cases EC1 is approximately equal to OP (note, EC1 measurements include OP even though OP is also reported separately, so we expect that EC1 should be at least equal to OP when OP is present). The relative lack of EC unassociated with OP within OP Rich factors suggests that secondary organic carbon may be a significant component, rather than fresh primary combustion emissions which are known to contain varying but significant EC. It should also be noted that the locations where OP Rich factors have been identified, the Wood Smoke factors also identified at those locations have had no OP component (see section 5.1).

Further support for this hypothesis comes from a separate PMF analysis of rural IMPROVE sites throughout the Pacific Northwest (24 sites; Kotchenruther, 2011c). In that analysis it was found that every IMPROVE site had a single PMF factor that was a combination of biomass combustion (probably mostly wildfire emissions) plus secondary organic carbon aerosol (SOA). All of the IMPROVE analysis biomass combustion+SOA factors contained a significant OP component and no separate OP Rich factors were identified. Since the expectation is that most aerosols impacting IMPROVE sites are well aged, the significant OP component of the IMPROVE biomass combustion+SOA factors jibes with the hypothesis that OP is an indication of organic aerosol aging.

The Wood Smoke factor and OP Rich factor are not well correlated for winter data (r2=0.37), but generally have the same seasonal pattern of higher impacts in winter and lower impacts in summer. It is interesting to look at time series plot of the two scenarios' Wood Smoke factors and OP Rich factor, which are all plotted together in Figure 4.2. The Wood Smoke factor from the OC&EC factions scenario is much closer to zero ug/m3 in the non heating season than the

Wood Smoke factor from the Bulk OC&EC scenario, as one would expect from a more resolved fresh wood smoke emissions attribution in the OC&EC factions scenario. Also, the OP Rich factor has non-zero mass allocation throughout the year but with higher impacts in the winter. This is consistent with the hypothesis that the OP Rich factor is a conglomeration of secondary organic carbon sources, likely including wood smoke, but also probably including other biogenic and anthropogenic SOA. The Wood Smoke factor from the Bulk OC&EC scenario has non-zero mass allocations outside of the heating season, as one might expect from a less specific factor that is to some extent a combination of fresh wood smoke plus secondary organic aerosols from multiple sources.

Figure 4.2. Time series of mass impacts from the Wood Smoke factors and OP Rich factor.



5. PMF Factor Details

5.1. Wood Smoke Factor

Factor identification: This factor was identified (1) by the chemical composition, in particular the importance of OC, EC & K for the Bulk OC&EC Scenario and OC1, EC1, and K for the OC&EC Fractions Scenario, (2) the seasonal pattern of mass impacts, and (3) similarities to Wood Smoke factor composition identified by Kim et al. 2004 and Maykut et al. 2003 (and others) and the authors experience with PMF profiles from other wood smoke impacted sites in the Western US (Kotchenruther 2011a, Kotchenruther 2011b).

Figure 5.1.1. Factor Chemical Composition Bulk OC&EC Scenario

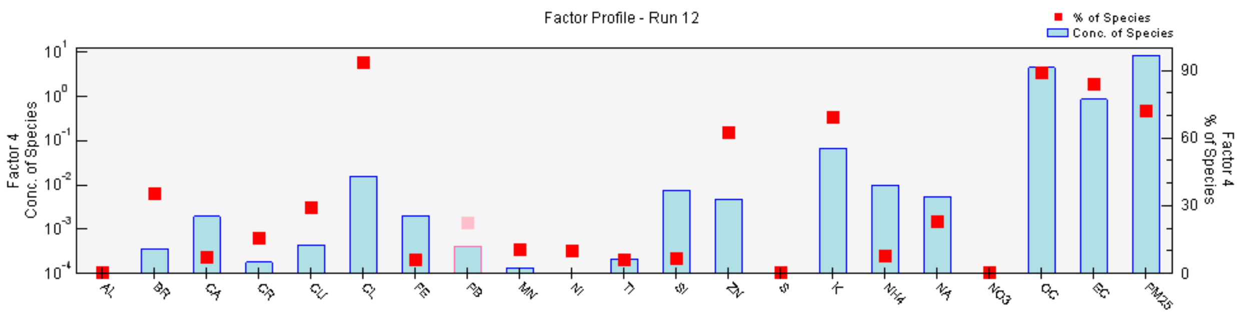


Figure 5.1.2. Factor Chemical Composition OC&EC Fractions Scenario

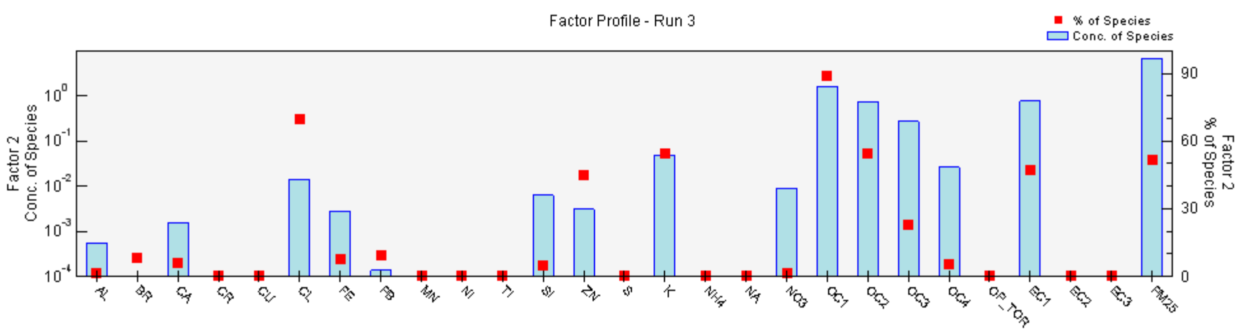


Figure 5.1.3. Time series of Wood Smoke factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

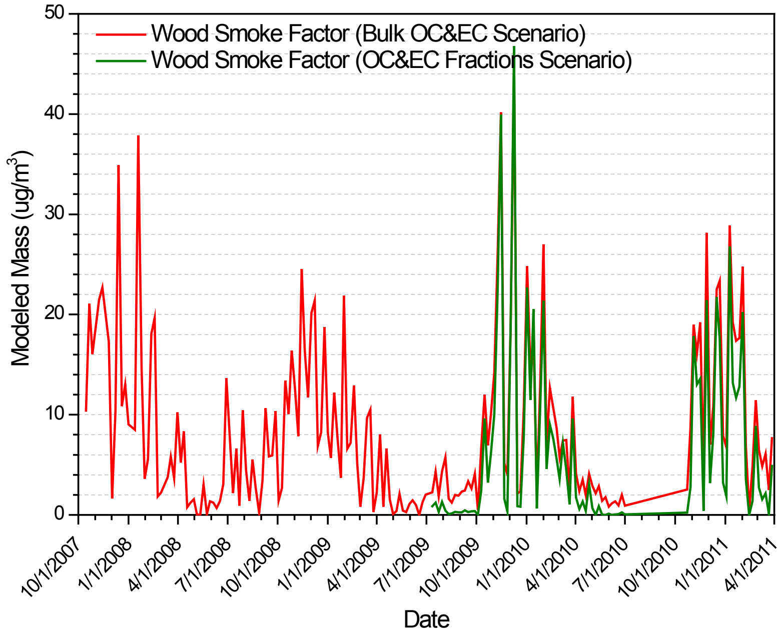


Figure 5.1.4. Monthly mean Wood Smoke factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

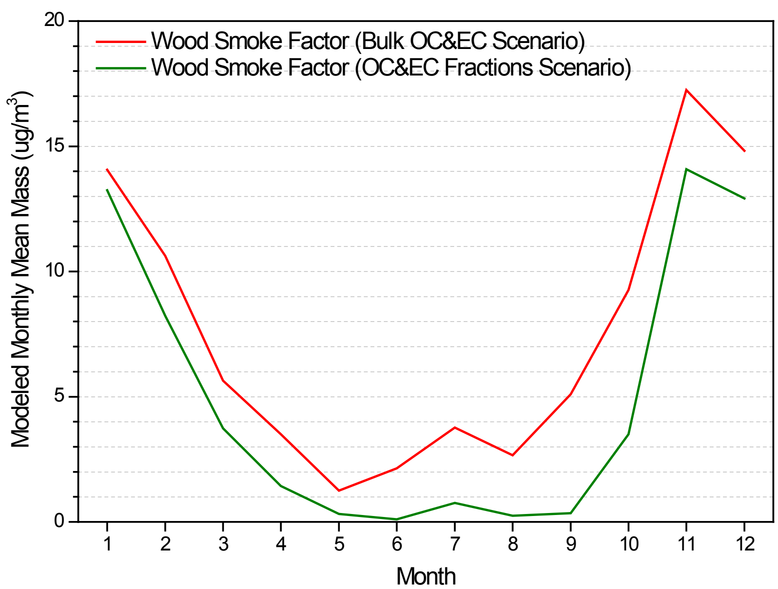
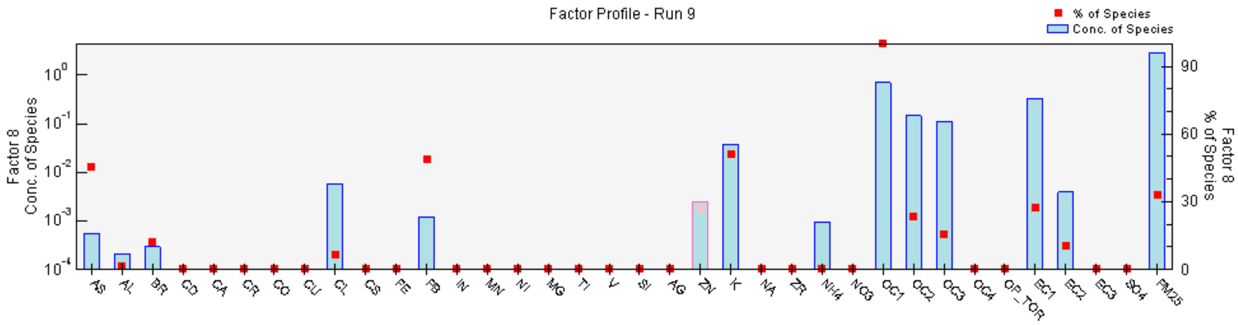
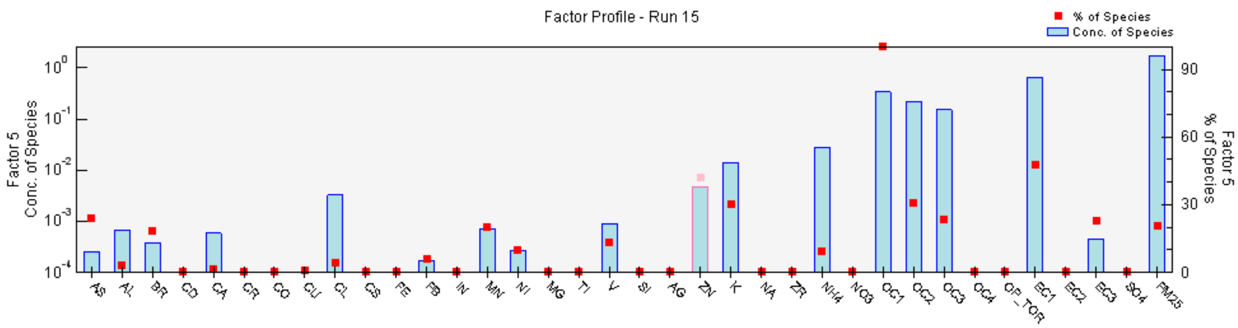


Figure 5.1.5. Comparative Wood Smoke factor profiles from other areas:

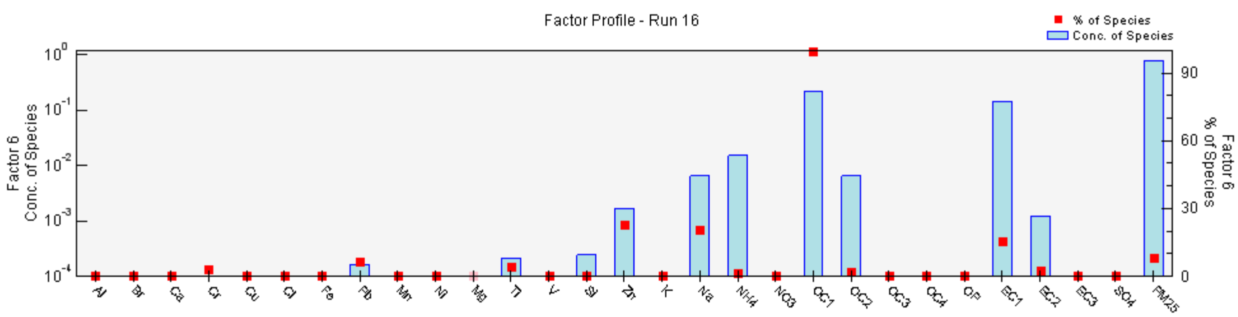
(a) Tacoma, WA South L Street



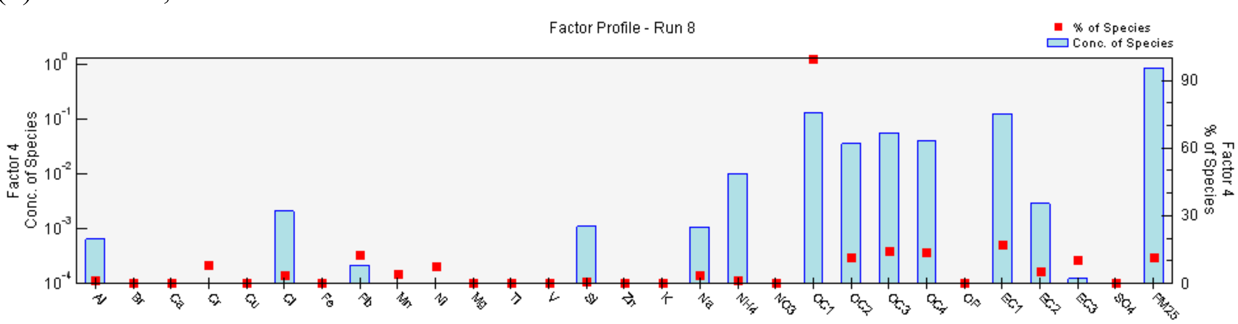
(b) Tacoma, WA Alexander Ave



(c) Salt Lake City, UT



(d) Bountiful, UT



5.2. OP Rich Factor

Factor identification: This factor was identified by the importance of OP in the factor composition. Similar OP Rich factors were identified in unpublished reports by Kotchenruther (2011a, 2011b) that describe the results of a PMF analysis of monitoring sites in Tacoma, WA and sites near Salt Lake City, UT. It is believed that this factor represents sources of organic aerosol that have been aged or are otherwise more oxidized. See section 4.3 of this report for further discussion.

Figure 5.2.1. Factor Chemical Composition OC&EC Fractions Scenario

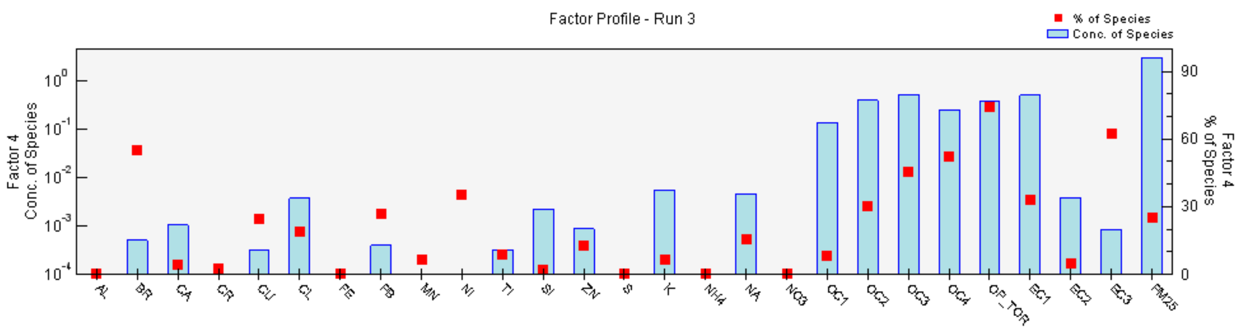


Figure 5.2.2. Time series of OP Rich factor mass impacts for the OC&EC Fractions Scenarios

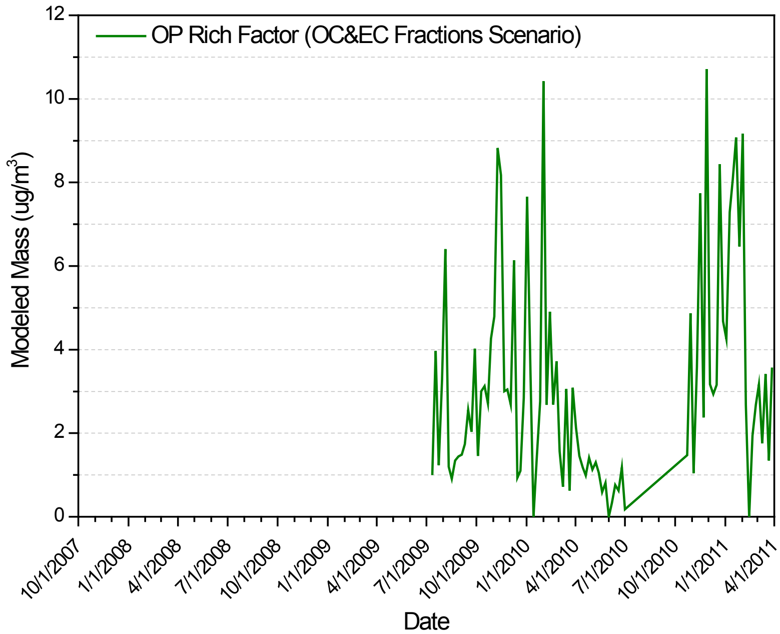


Figure 5.2.3. Monthly mean OP Rich factor mass impacts for the OC&EC Fractions Scenarios

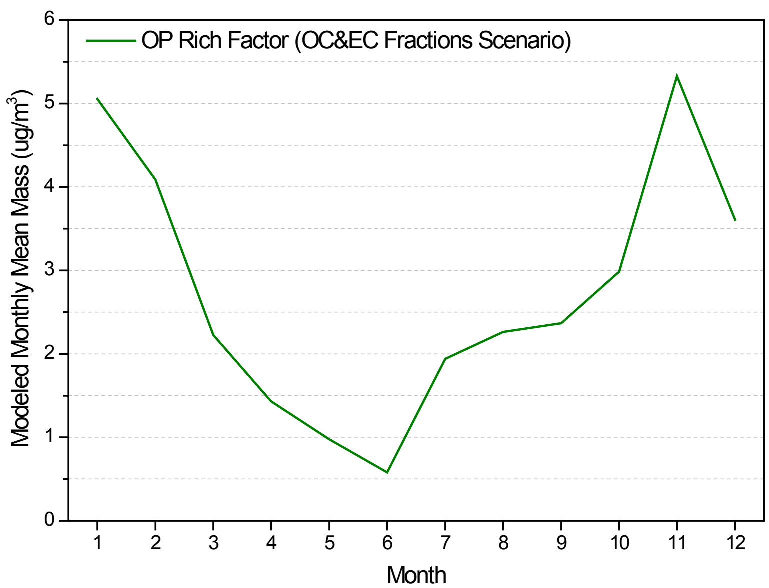
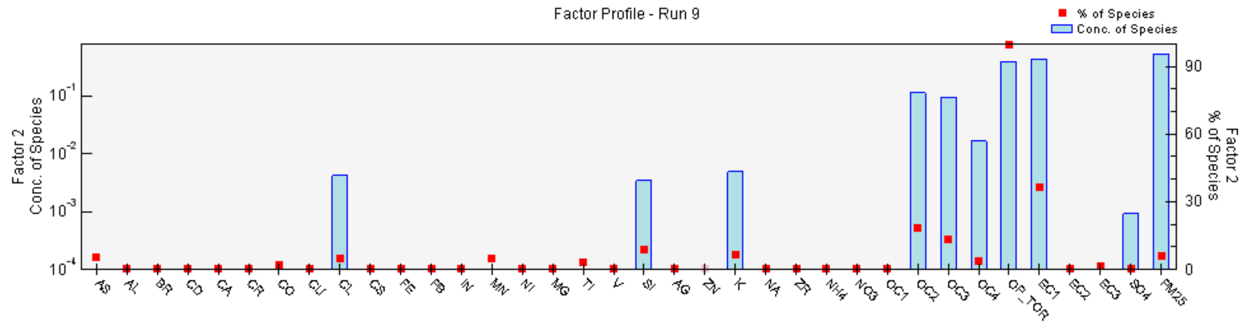
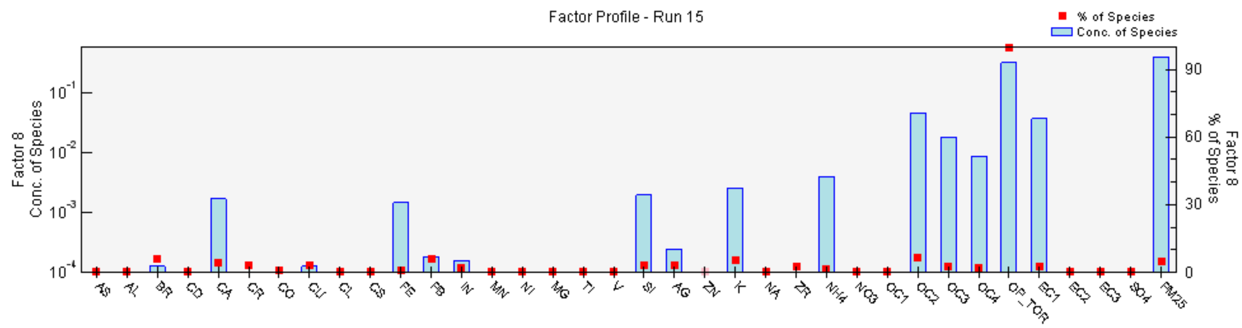


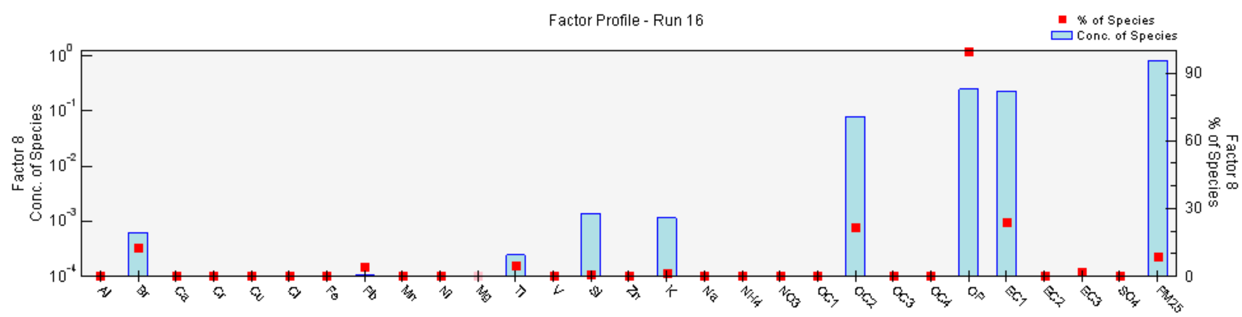
Figure 5.2.4. Comparative OP Rich factor profiles from other areas:
(a) Tacoma, WA South L Street



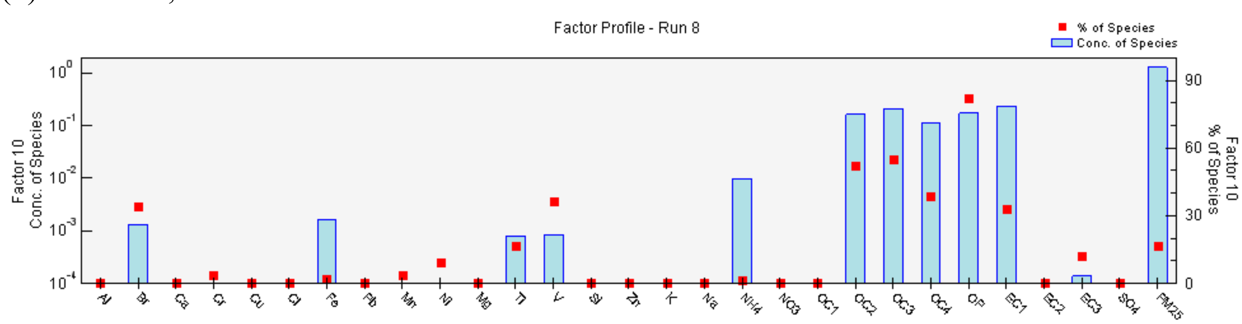
(b) Tacoma, WA Alexander Ave



(c) Salt Lake City, UT



(d) Bountiful, UT



5.3. Nitrate Rich Factor

Factor identification: This factor was identified by the importance of NO3 in the factor composition and the seasonal pattern of mass impacts.

Figure 5.3.1. Factor Chemical Composition Bulk OC&EC Scenario

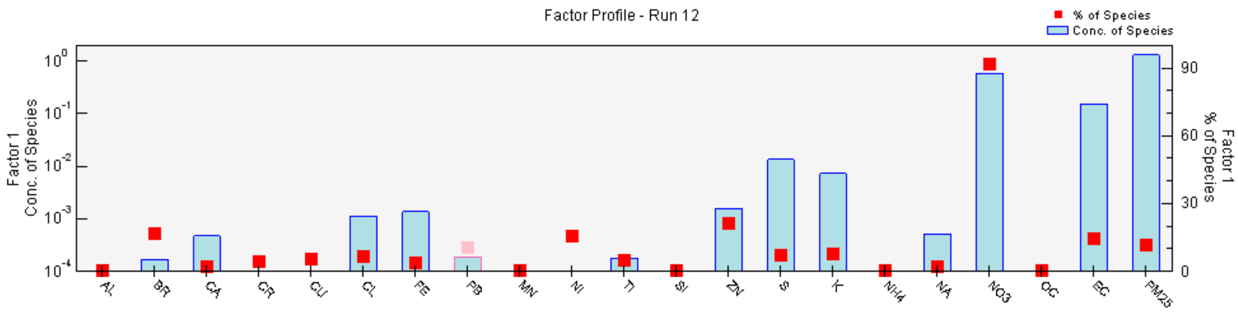


Figure 5.3.2. Factor Chemical Composition OC&EC Fractions Scenario

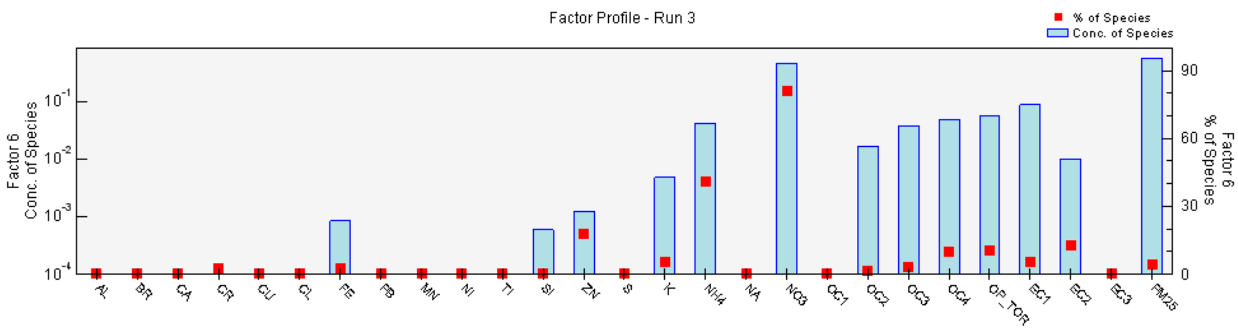


Figure 5.3.3. Time series of Nitrate Rich factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

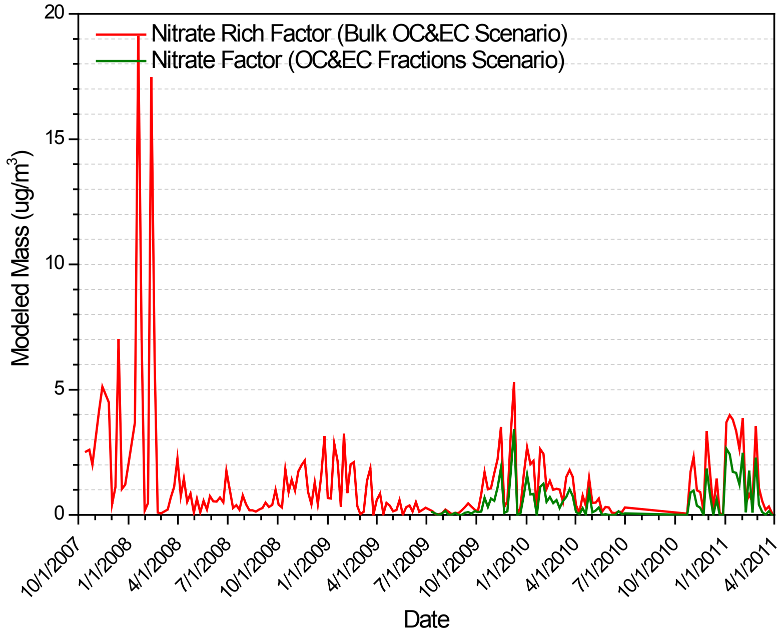


Figure 5.3.4. Monthly mean Nitrate Rich factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

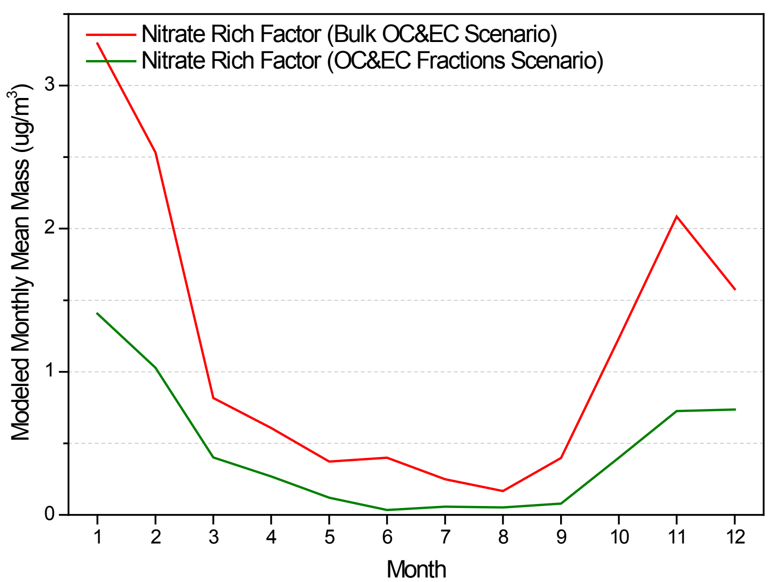
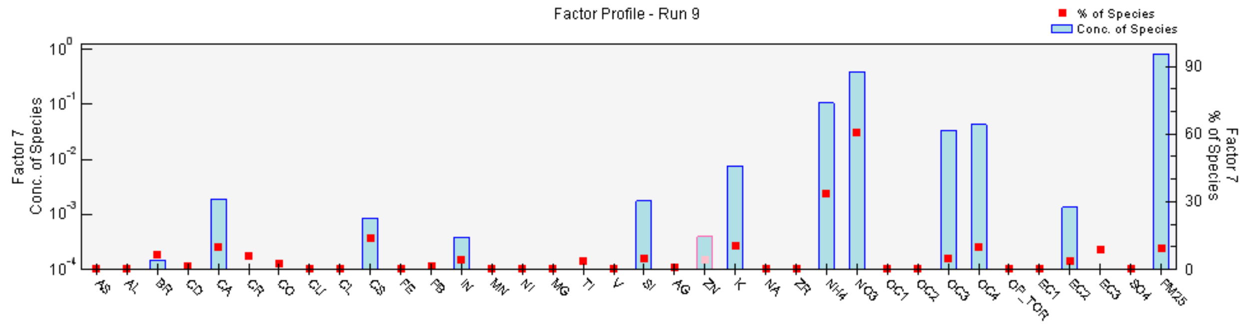
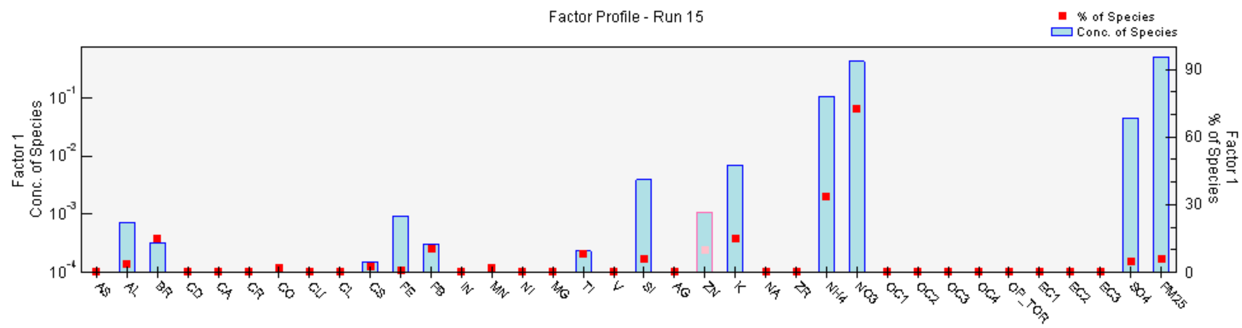


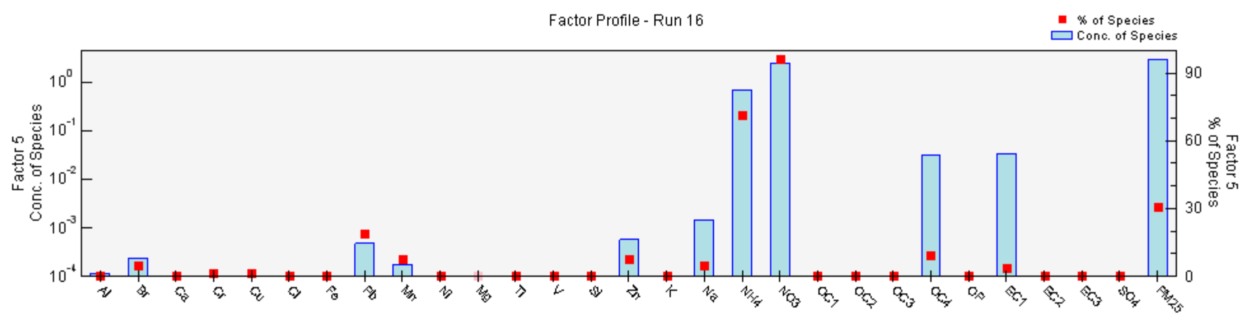
Figure 5.3.5. Comparative Nitrate Rich factor profiles from other areas:
(a) Tacoma, WA South L Street



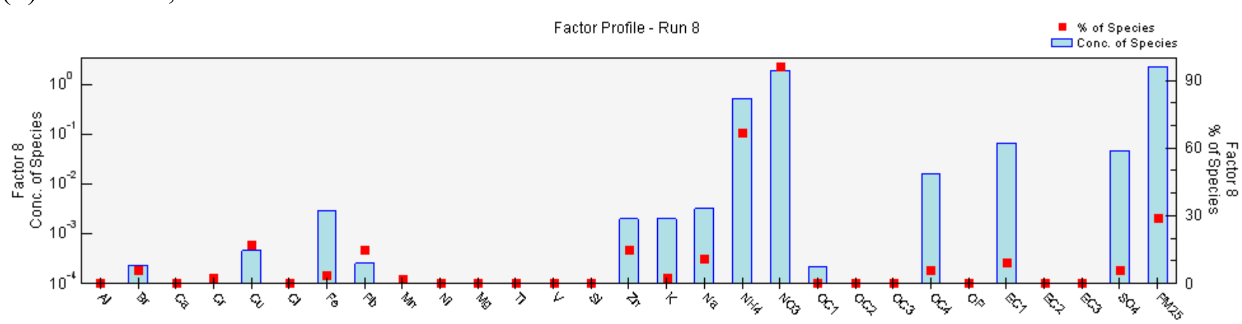
(b) Tacoma, WA Alexander Ave



(c) Salt Lake City, UT



(d) Bountiful, UT



5.4. Sulfate Rich Factor

Factor identification: This factor was identified by the importance of S (assumed mostly SO4) & NH4 in the factor composition.

Figure 5.4.1. Factor Chemical Composition Bulk OC&EC Scenario

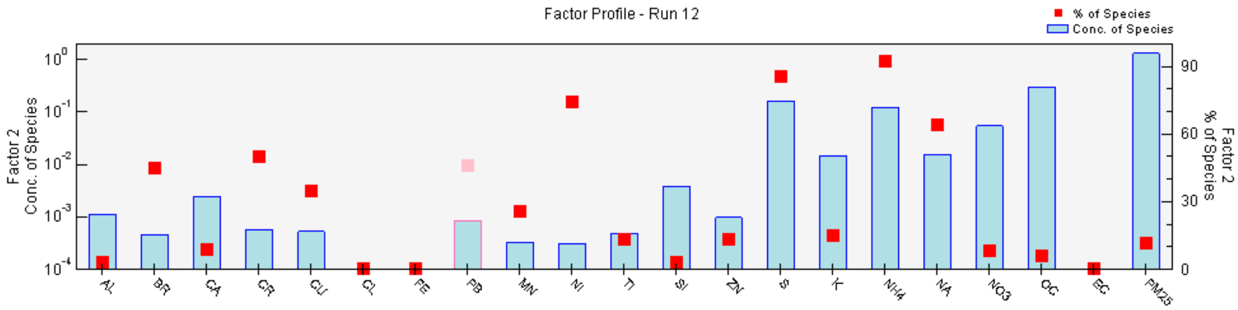


Figure 5.4.2. Factor Chemical Composition OC&EC Fractions Scenario

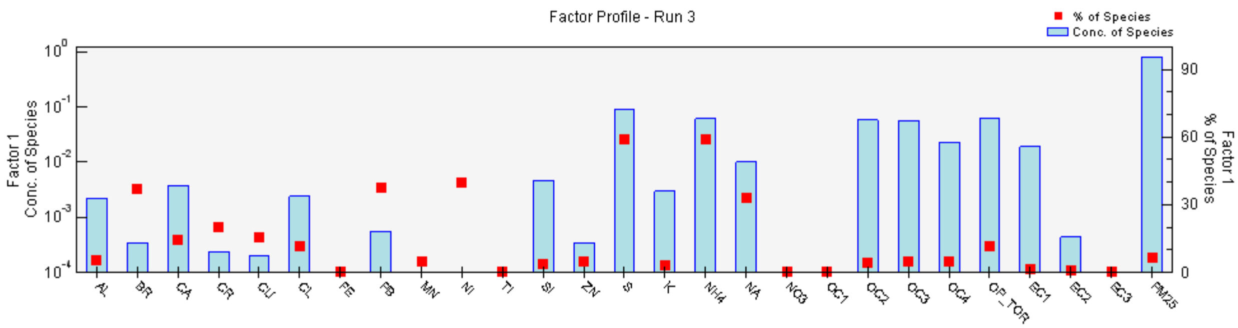


Figure 5.4.3. Time series of Sulfate Rich factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

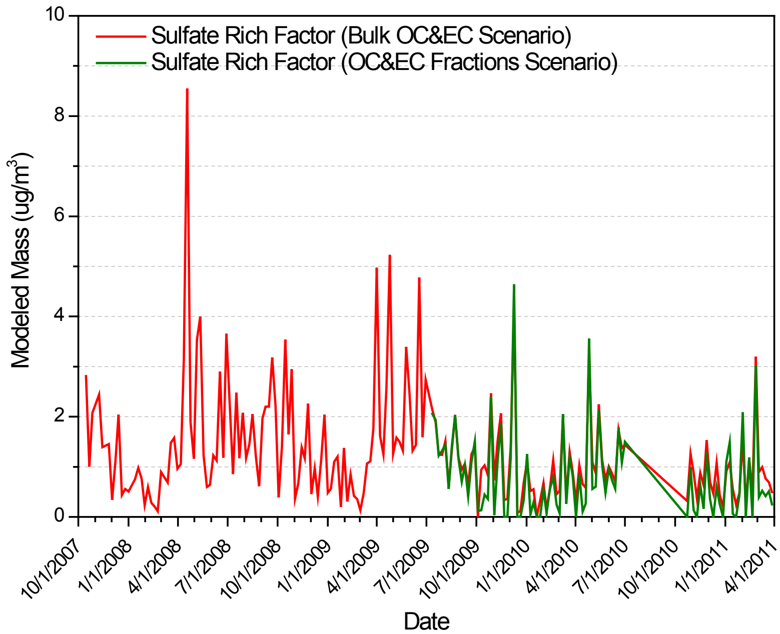


Figure 5.4.4. Monthly mean Sulfate Rich factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

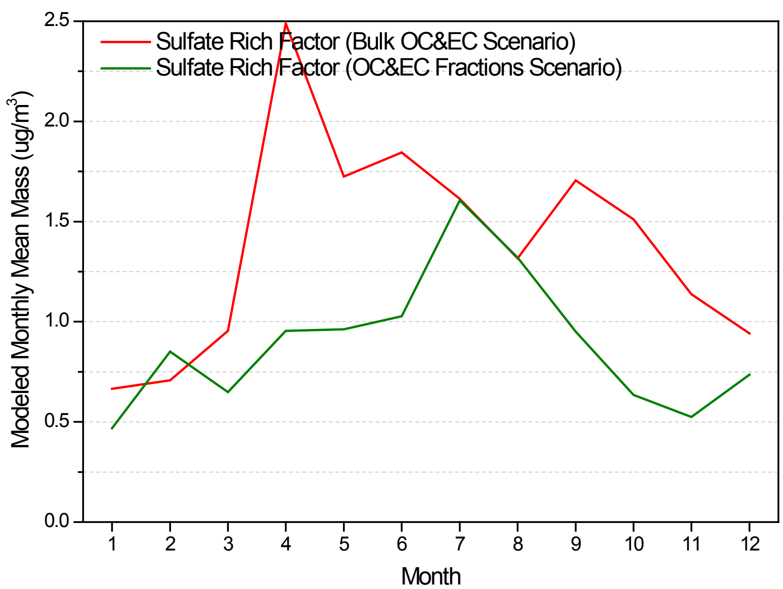
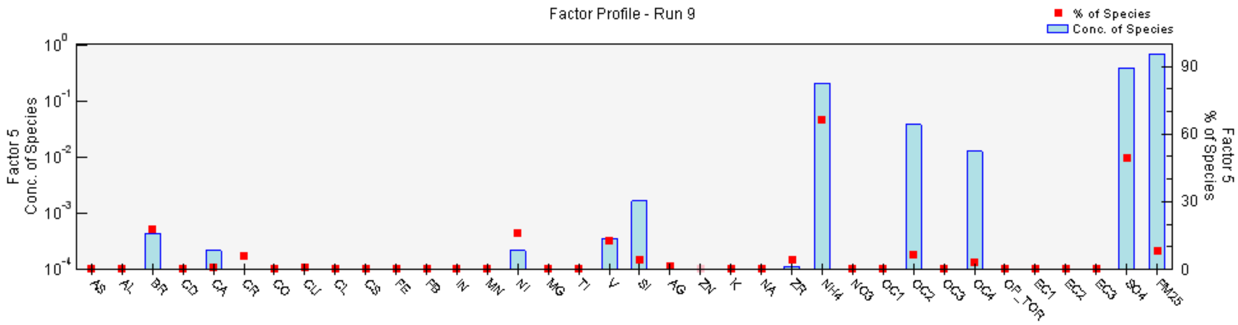
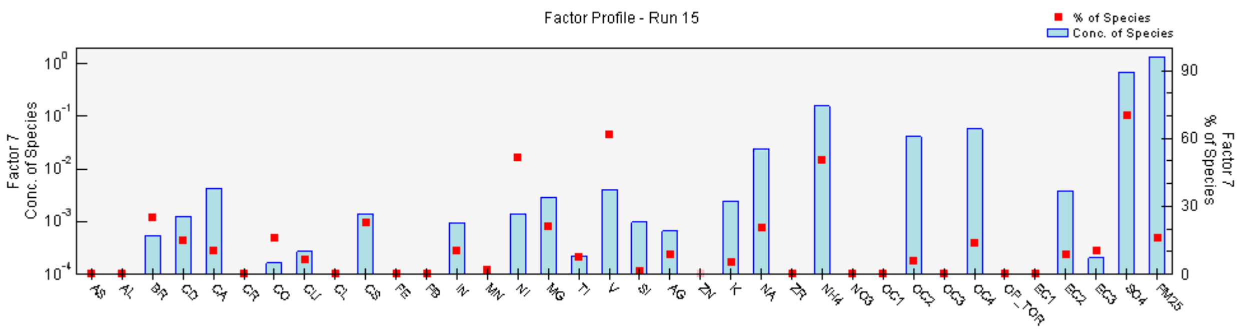


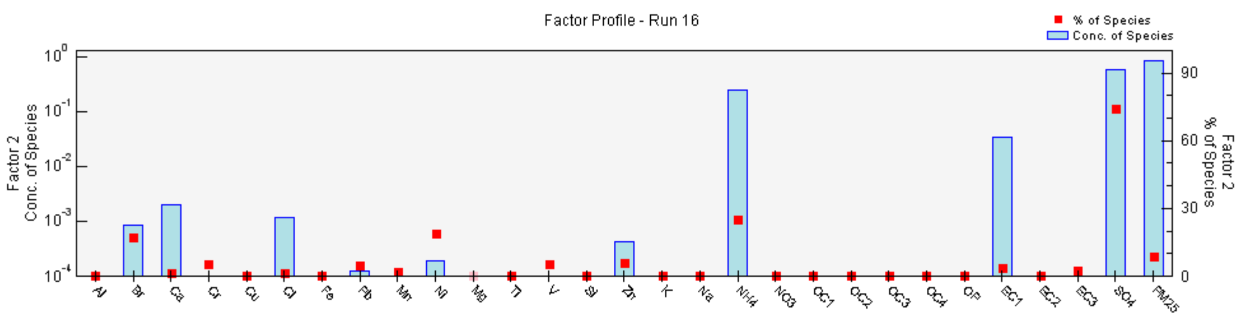
Figure 5.4.5. Comparative Sulfate Rich factor profiles from other areas:
(a) Tacoma, WA South L Street



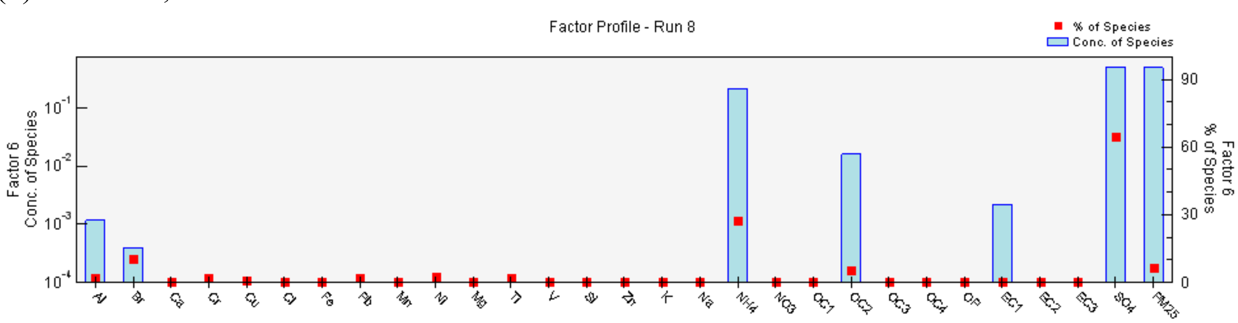
(b) Tacoma, WA Alexander Ave



(c) Salt Lake City, UT



(d) Bountiful, UT



5.5. Fugitive Dust Factor

Factor identification: This factor was identified by the importance of Al, Ca, Fe, Ti, and Si in the factor composition.

Figure 5.5.1. Factor Chemical Composition Bulk OC&EC Scenario

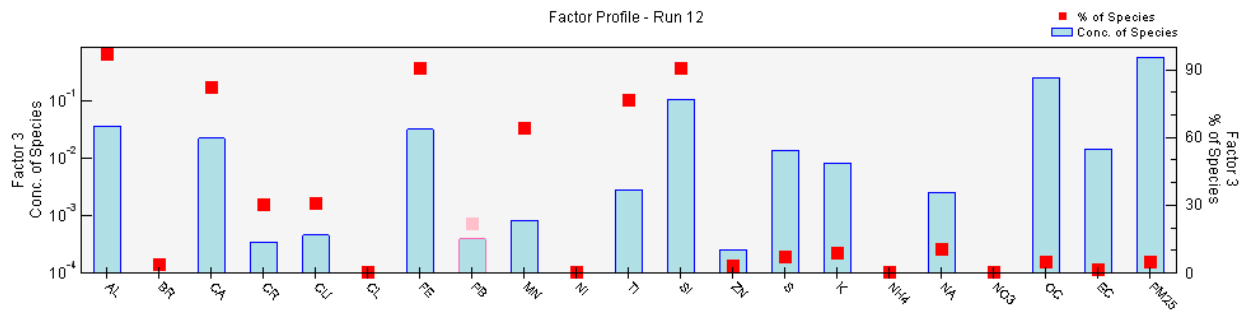


Figure 5.5.2. Factor Chemical Composition OC&EC Fractions Scenario

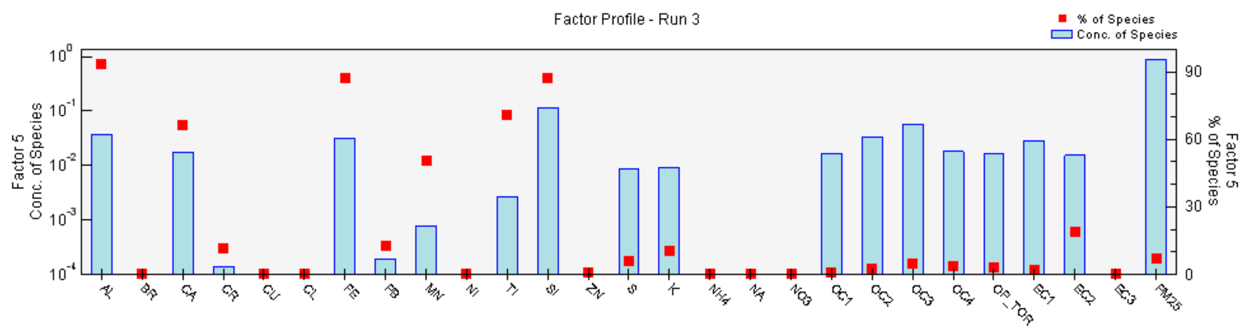


Figure 5.5.3. Time series of Fugitive Dust factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

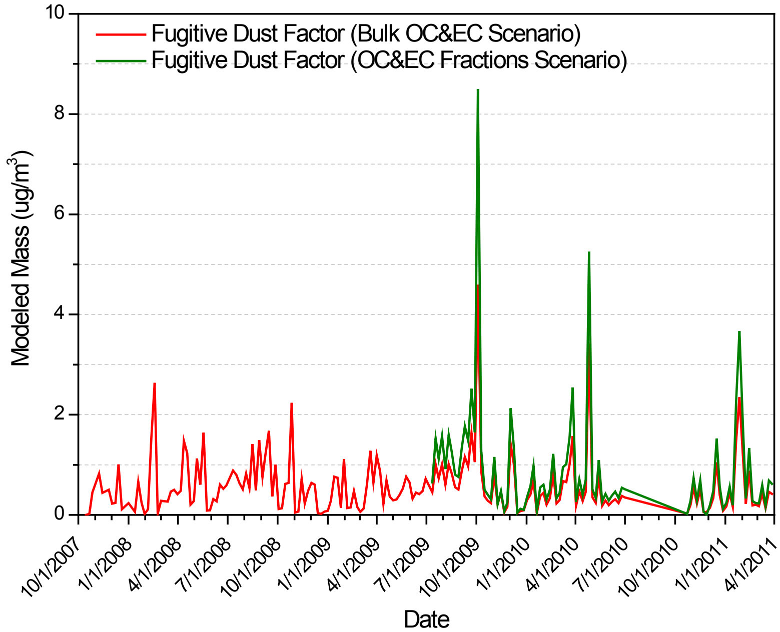


Figure 5.5.4. Monthly mean Fugitive Dust factor mass impacts for the Bulk OC&EC and OC&EC Fractions Scenarios

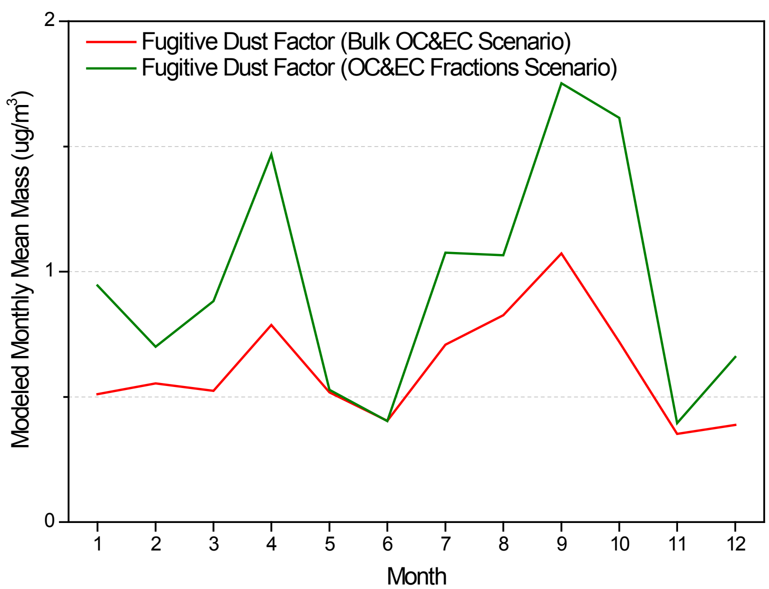
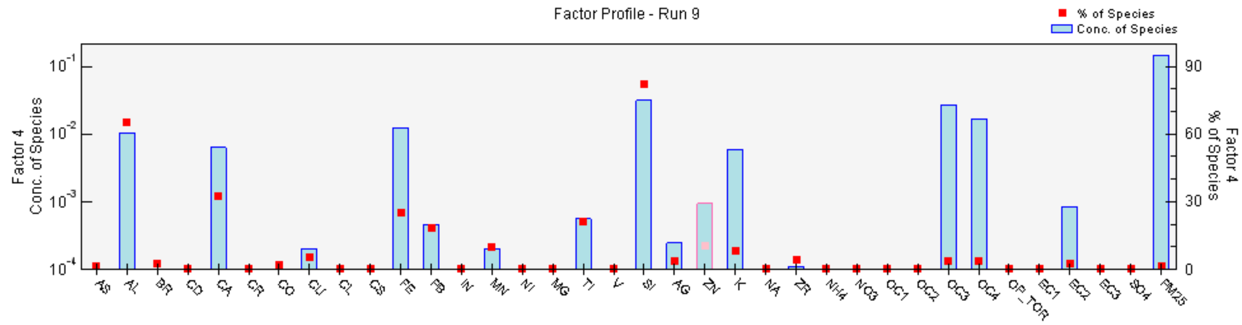
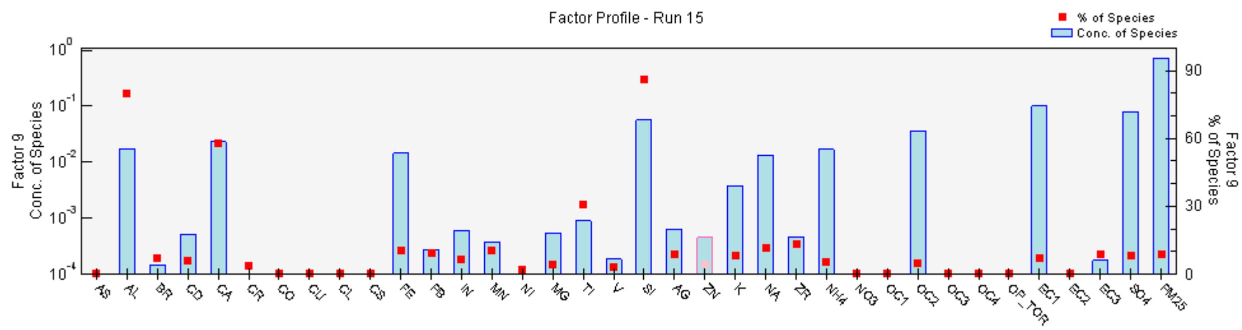


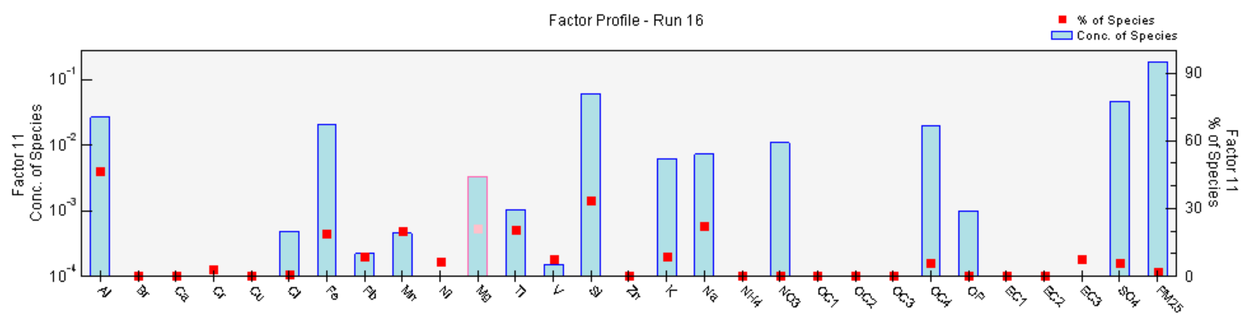
Figure 5.5.5. Comparative Fugitive Dust factor profiles from other areas:
(a) Tacoma, WA South L Street



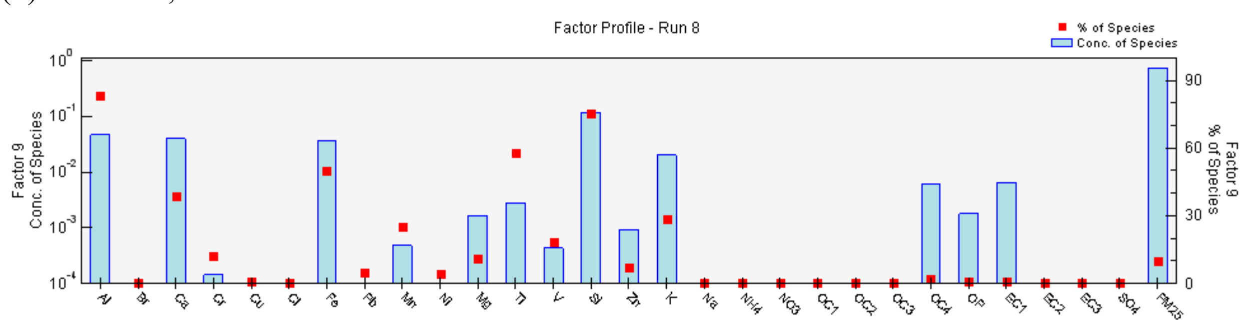
(b) Tacoma, WA Alexander Ave



(c) Salt Lake City, UT



(d) Bountiful, UT



5.6. Urban/Industrial Factor

Factor identification: This factor was identified by the importance of SO4, NO3, EC fractions and trace metals such as chromium (Cr), copper (Cu), manganese (Mn), and sodium (Na) in the factor composition.

Figure 5.6.1. Factor Chemical Composition OC&EC Fractions Scenario

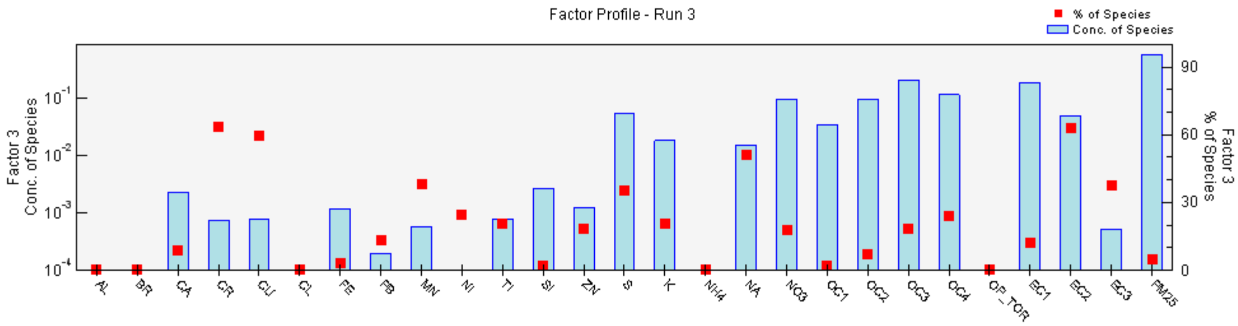


Figure 5.6.2. Time series of Urban/Industrial factor mass impacts for the OC&EC Fractions Scenarios

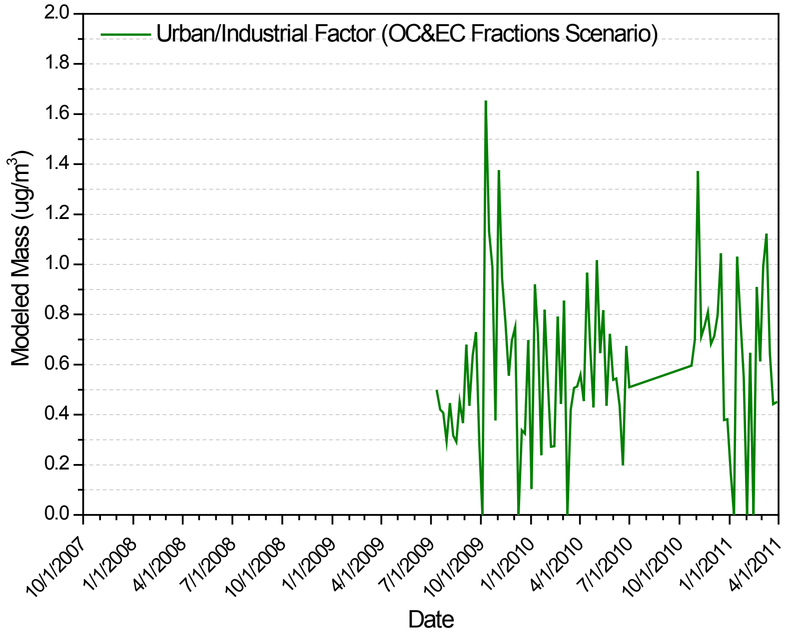


Figure 5.6.3. Monthly mean Urban/Industrial factor mass impacts for the OC&EC Fractions Scenarios

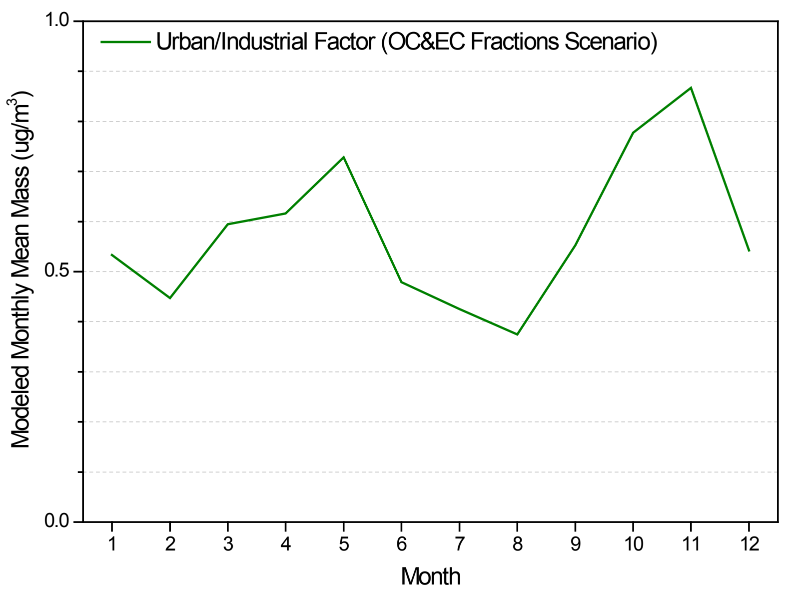
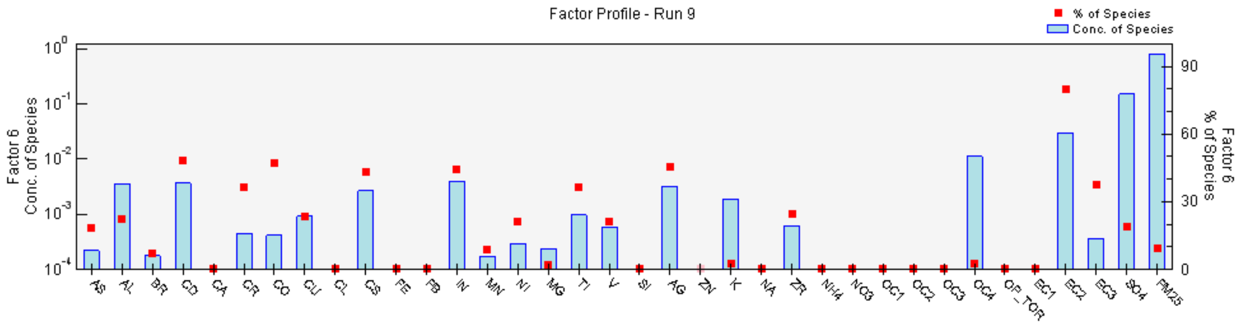
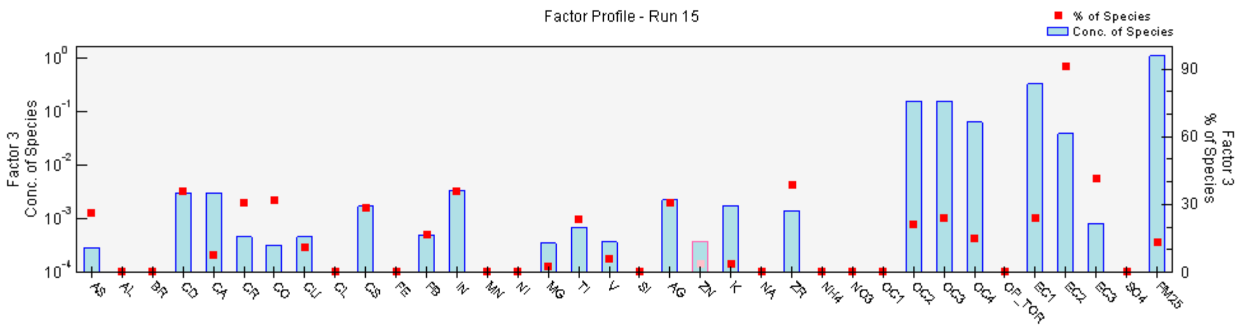


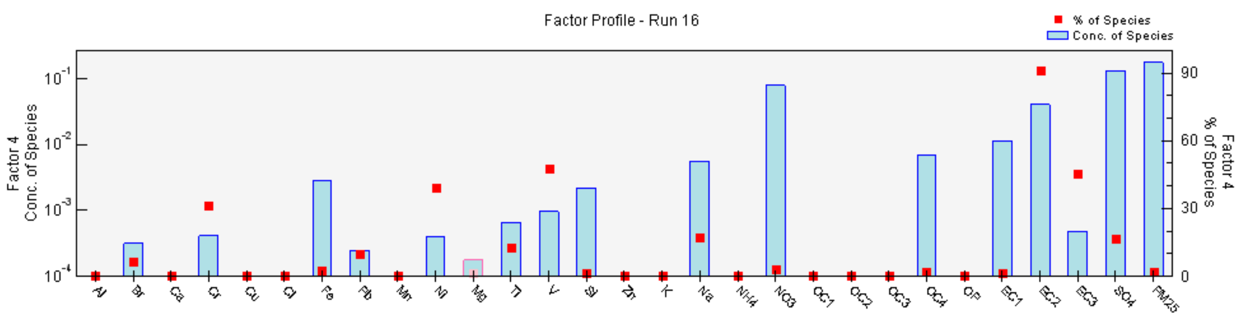
Figure 5.6.4. Comparative similar factor profiles from other areas:
(a) Tacoma, WA South L Street [called ‘Sulfate Rich’ in that analysis]



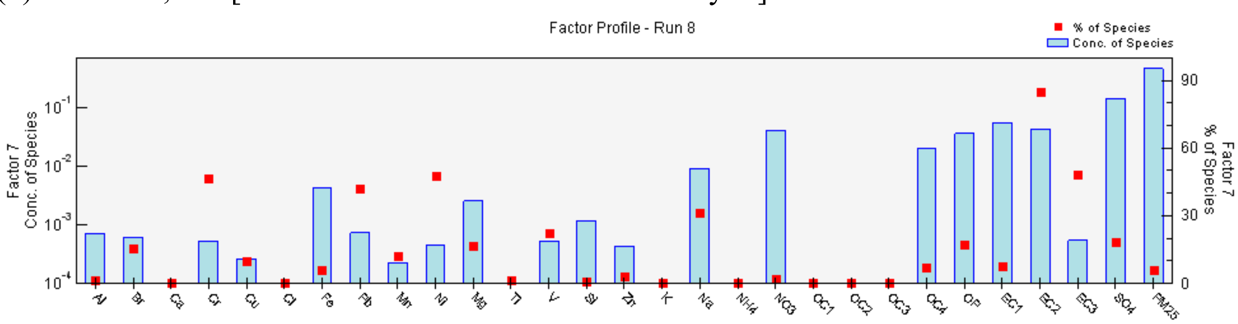
(b) Tacoma, WA Alexander Ave [called ‘Diesel 1’ in that analysis]



(c) Salt Lake City, UT [called ‘Urban/Industrial’ in that analysis]



(d) Bountiful, UT [called ‘Urban/Industrial’ in that analysis]



5.0 References

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Kotchenruther, Robert, Source Apportionment of Aerosols at Rural IMPROVE Monitoring Locations Throughout the Pacific Northwest, presented at the 2011 annual NW-AIRQUEST meeting, Pullman Washington, 2011(c).

Maykut, N., J. Lewtas, E. Kim, and T. Larson, Source Apportionment of PM2.5 at an Urban IMPROVE Site in Seattle, Washington, Environ. Sci. Technol., 37, 5135-5142, 2003.

PM2.5 Speciation Network Newsletter, U.S. EPA, Issue 6, Summer 2009.

Klamath Falls – Economy in 2008

Economic Trends in Klamath

The 2008 base year and how economic trends influence $PM_{2.5}$ emissions in the Greater Klamath Falls Area.

Summary
DEQ explored the economic conditions in Klamath Falls in 2008 and found that the economic downturn may have contributed to increased woodstove emissions and decreased industrial and vehicle emissions. Much of the $PM_{2.5}$ impact is from wood combustion and not from industrial or commercial activities, based on the DEQ's analysis of emissions.

DEQ used 2008 as a base year for the emission inventory. Is the 2008 base year an appropriate year to use based on the economic conditions in Klamath Falls? Does the base year bias the results because the economy was doing better or worse than expected in Klamath Falls? To understand how to answer the questions, DEQ reviewed trends and the types of emissions we found in Klamath Falls.

Generally, Klamath Falls was in a recessionary period in 2008, 2009 and 2010. Although the economy was in recession the main source of emissions causing the nonattainment area problem in Klamath Falls was residential wood combustion emissions, not industry. Industrial sources were not producing the type of emissions they would normally produce during a more productive time but were not contributing substantially to the emission concentrations at the monitor either.

Residential wood combustion caused more emissions during stressed economic times and better reflects the worst conditions for air pollution in Klamath Falls. Industrial source emissions have experienced a decline due to the economic downturn, but these emissions have a very small impact of about than 1% of the monitored $PM_{2.5}$ concentrations[1]. Residential wood combustion, was shown to have an impact of over 70% of the monitored pollution at Peterson School[2].

2008

The year 2008 was a poor year for economic growth in Klamath Falls. Conditions were ripe for high emissions from residential wood combustion because individual homeowners were looking for a way to reduce their economic stressors and one of those was utilizing wood burning appliances. Contrastingly, industrial emissions were slightly lower than the norm. Population slightly declined and unemployment rose.

According to Oregon Work Labor Market Information System, unemployment rates began in January at 7.6 percent and increased by December to 12.0 percent unemployment in Klamath County. Unemployment is one indicator of how the economy is performing, however it lags slightly behind other economic indicators. In 2009, unemployment peaked at 14.6 percent and remained above 12 percent through the end of 2011.

Economic Growth Factors

DEQ uses the Oregon Office of Economic Assessment (OEA) data as a base for population growth and as a consequence household growth. Economic growth indicators are based on Oregon Labor and Market Information System (OMLIS) and the Bureau of Economic Assessment (BEA).

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[1] See main Appendix 7, Rollback regarding industrial source emissions.

[2] See main Appendix 7, Rollback, for more details. Also, based on the PMF study, Appendix F to this Appendix below.

Caption. Looking at haze on December 8, 2001 during an inversion in Klamath Falls. Haze caused by residential wood combustion and not industrial pollution. Mount Shasta is in the background

Population and employment are key indices of the overall level of economic activity and growth, reflecting changes in industrial activity and vehicle miles traveled. Information on the population and household projections used in developing this attainment plan is presented in Appendix F. Klamath Falls is the largest city within the Klamath County and statistics from both the county and city were used to characterize the Klamath Nonattainment Area. Employment is displayed in Figure 1. The employment in Klamath County has remained between 20 and 25 thousand people with a generally increasing trend over the 20 years since 1988. The last three to four years have seen a downward trend. A spike in unemployment was seen in 2009 at 13.9%. Population and per capita income trends are displayed in Figure 2. A general increasing trend is seen in both population and per capita income. Major employment sector trends are in Figure 3. Private employment has fluctuated over the last 20 years whereas public and farm employment has remained relatively steady albeit low during the same time period.

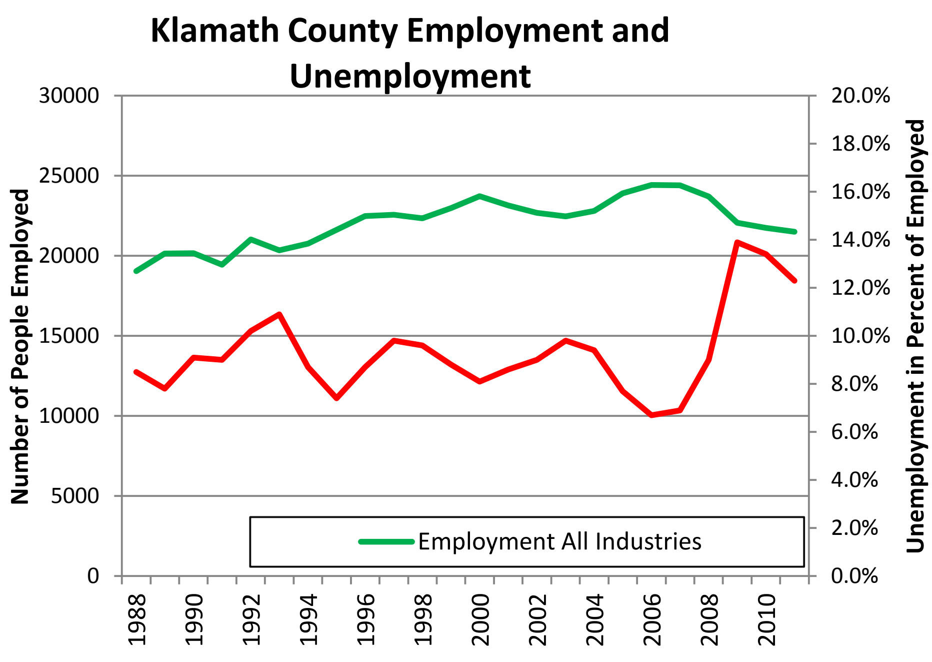

Figure 1: Employment and Unemployment in Klamath County[3]

[3] 2009 data incomplete

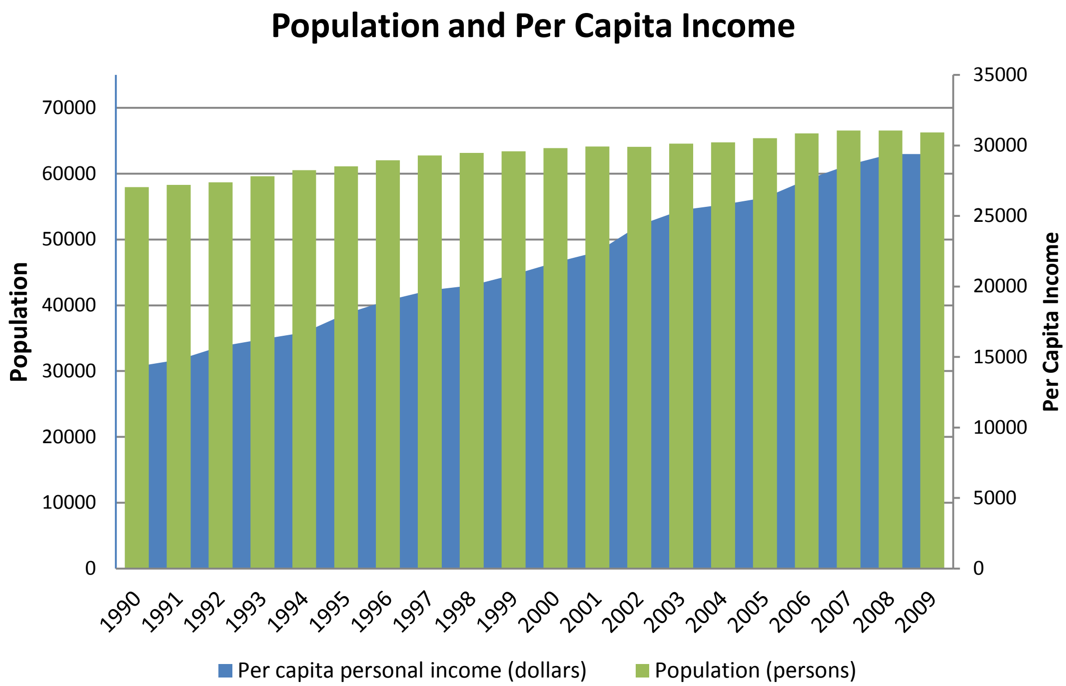

Figure 2: Population and Per Capita Income

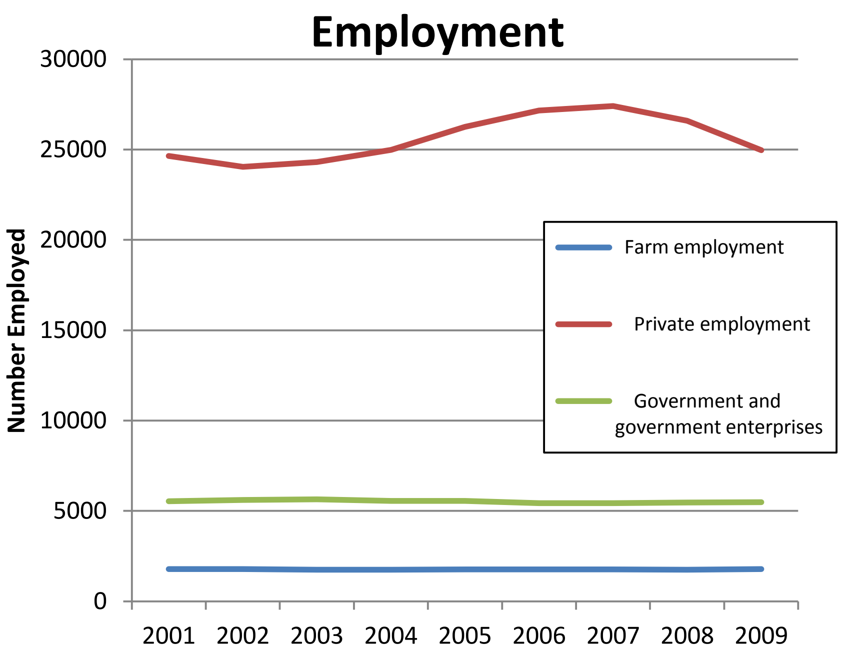

Figure 3: Employment by Major Industry Trend[4]

Employment generally increased since 2001 but began decreasing in 2006 and spiked in unemployment in 2009. The county has been losing jobs since 2006, one year longer than the state and most other counties in the state. In 2011, jobs loss was small compared to the

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4 Oregon Employment Department changed the way they counted employment in 2001. Categories changed, but total employment figures should be the same.

previous year's but still adds to the county's employment losses which now total over 2,500 jobs lost (over 10 percent of the county's 2006 employment).[5] Klamath County is beginning to recover from their high unemployment rate.

DEQ believes there is a link between poor economic health and increased use of wood stoves in Klamath Falls in winter of 2008. There was a spike in the heating fuel prices in that year (Figure 17) accompanied by higher than average heating degree days (Figure 13). It is presumed that such conditions compel residents of Klamath Falls to use wood as a more affordable heating resource.

Economic downturn in Klamath Falls is expected to increase, rather than decrease, PM2.5 emissions since majority of PM2.5 impact is from wood combustion and not from industrial or commercial activities. Industrial source emissions have experienced decline due to economic downturn, but these emissions have very small impact of about 1% on monitored PM2.5 concentrations. Residential wood combustion, that causes more than 70% of the monitored pollution, is likely to increase during economic decline.

Correspondingly, the number of people unemployed have been steady in Klamath Falls until 2009 when they increased by over 1000. See Figure 4.

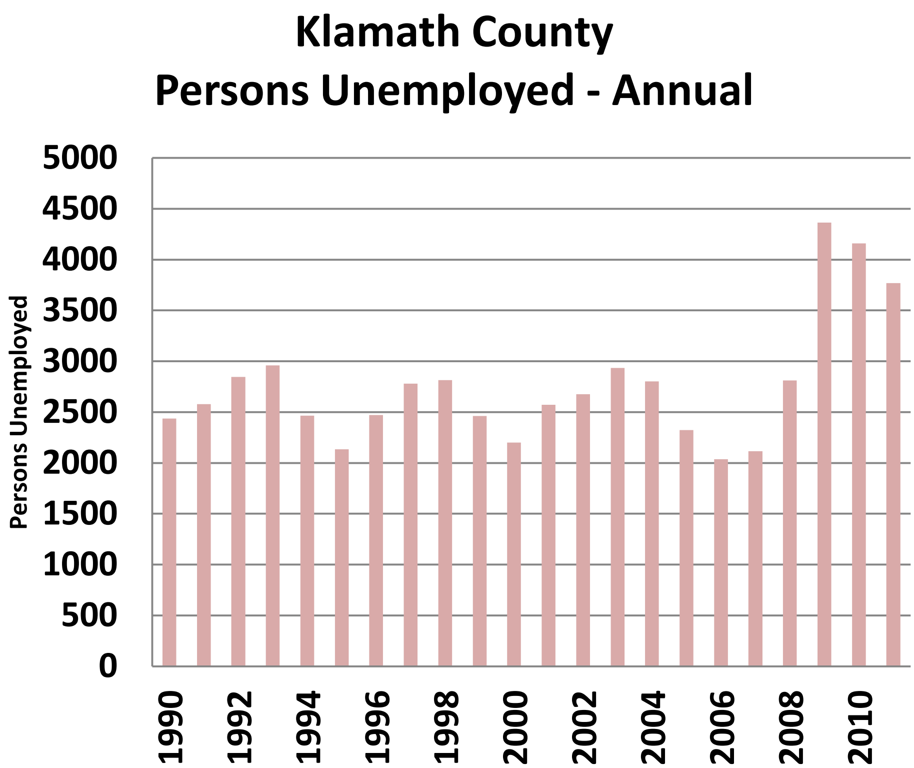


Figure 4: Number of persons unemployed in Klamath County (OMLIS)

Personal income is the accumulation of all income in the community. It reflects the economic health of the community over time, but also indicates the increase in annual wages overall of the entire workforce. Klamath County has a sustaining increase in wages over time, although in 2008 there was a modest decrease in the trend. See Figure 5.

5 "More Ups Than Downs in Counties on the High Desert and in the Klamath Basin" by Carolyn B Eagan, Published May 5, 2011, Oregon Labor Market Information System.

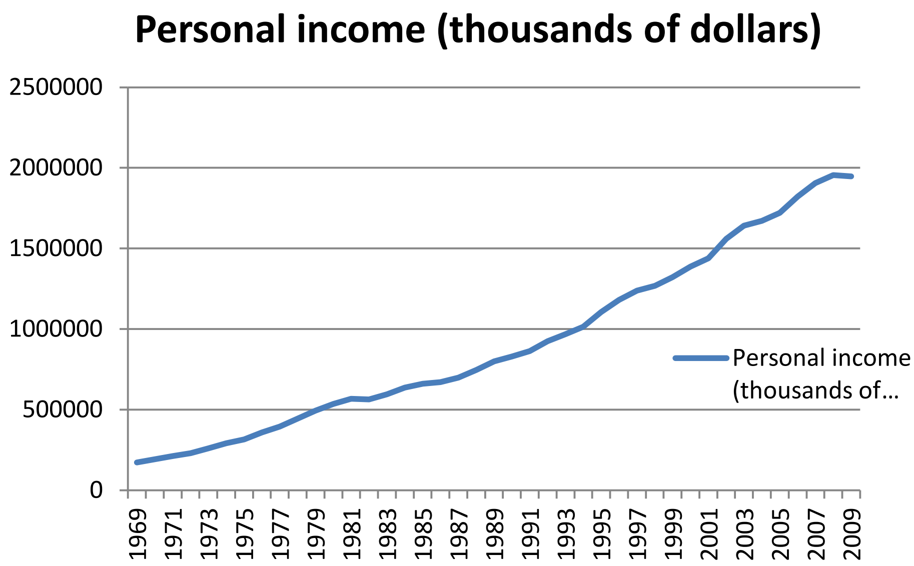


Figure 5: Personal income over time through 2009 (BEA)

Compensation of employees by industry reflects the various industry sectors that were affected and their relative compensation by industry type. Manufacturing and forestry and construction appear to have taken the largest impacts to the economy earliest in 2008. Other sectors followed in 2009. Generally, there were not large dips in the economy in 2008 and 2009, but their cumulative effect had a significant impact on the economy in Klamath County. See details in Figure 6.

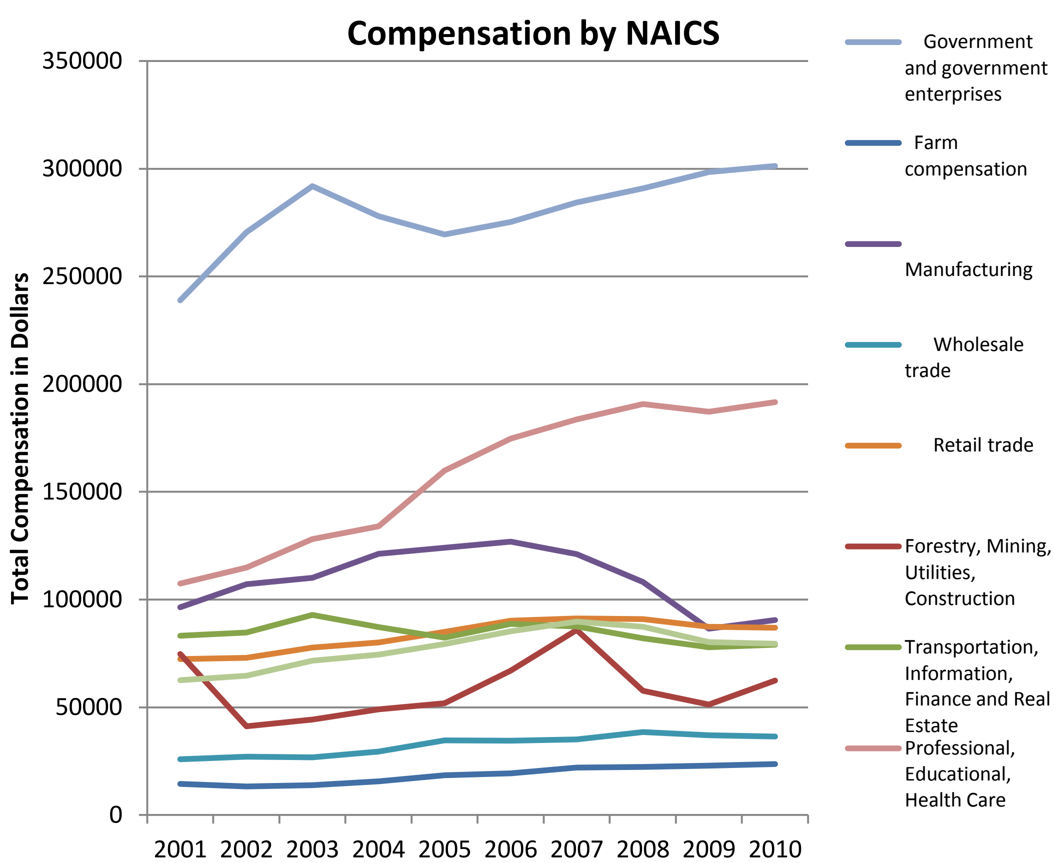


Figure 6: Compensation of employees by NAICS industry type in Klamath County (BEA)

There have been a steady increase in wages over the years, but a recent decrease in the numbers of jobs in Klamath County. Figure 7 shows the trend.

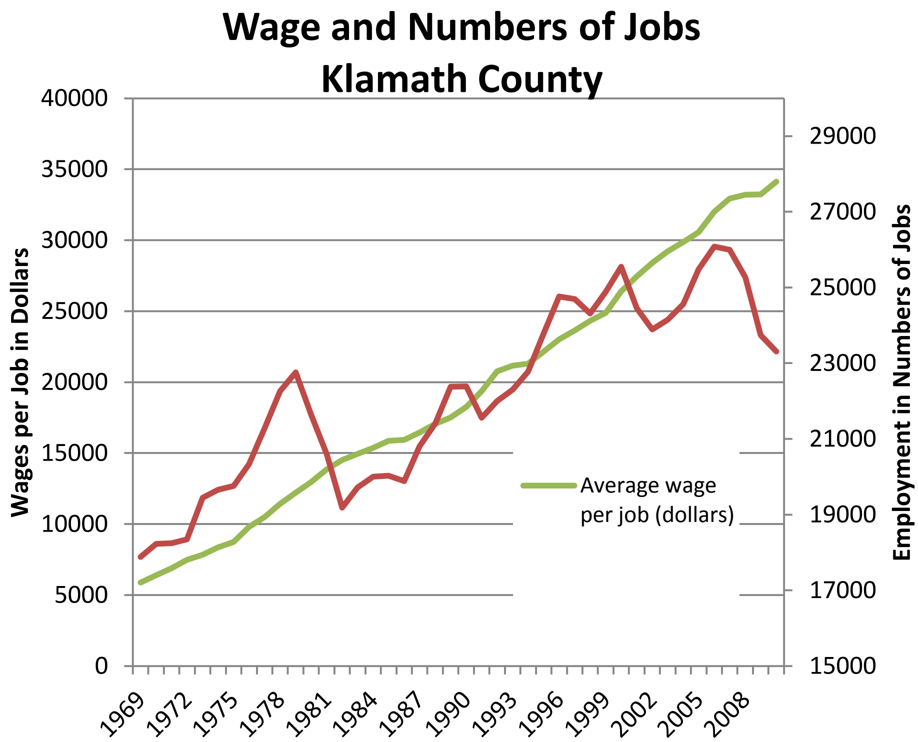


Figure 7: Wage per job and numbers of jobs in Klamath County (BEA)

The wood products manufacturing industry is the largest industrial emitter of PM2.5. The Oregon Labor and Market Information System (OMLIS) has issued a report that describes this industry sector in Klamath County. Figure 8 depicts the employment rate from this source and Appendix H provides a description of the economic situation in this industry.

Figure 8: Wood Products Manufacturing Sector employment for Klamath County**.**

Three major wood products sources are located within the Klamath Nonattainment Area, Jeld Wen (JW), Collins and Columbia Plywood (Col Ply). Jeld Wen has four major operations, a sawmill (TLC), a millwork (JWO), a door skinning facility (JWF) and a metal fabrication facility (BF). Collins has two major operations, a hardboard facility (HB) and a particleboard facility (PB). Columbia Plywood only has the plywood facility. Collins and Columbia Plywood clearly have operated their facility about half the hours and production in recent years as in the past. Jeld Wen has operated their metal fabrication facility at a lower rate than past but the other operations appear to fluctuate be relatively steady except for lower production in 2008. The operating hours for each facility are listed in figures 9 and 10 below.

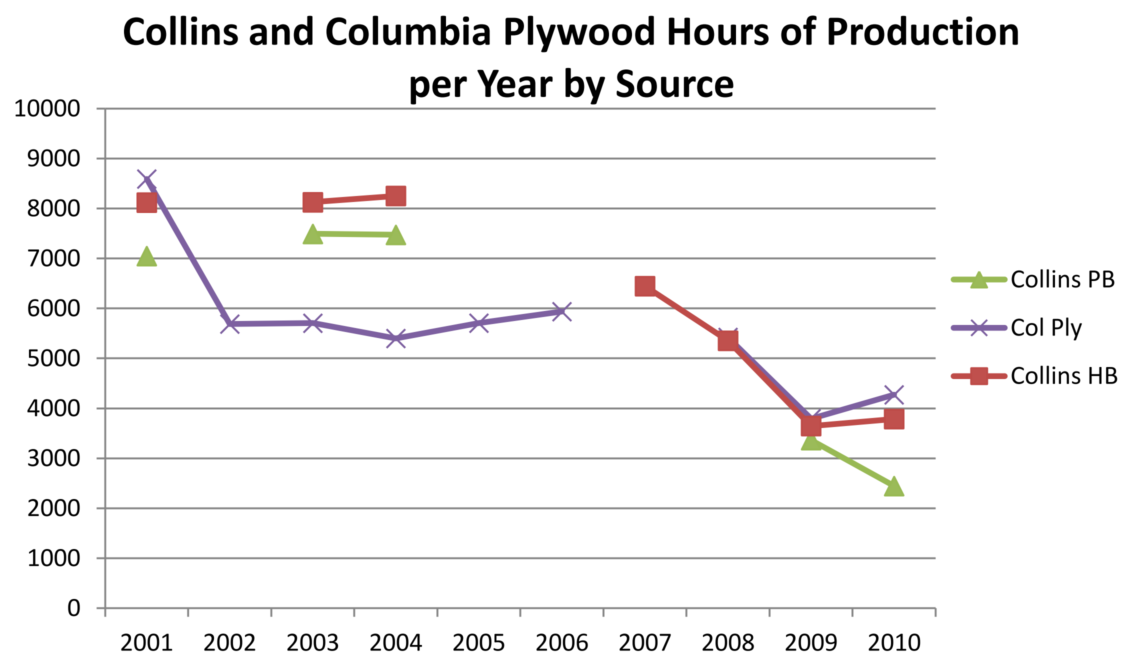


Figure 9: Collins Products (Collins PB and Collins HB) and Columbia Plywood (Col Ply) show declining productive hours in recent years, based on data in DEQ's file.

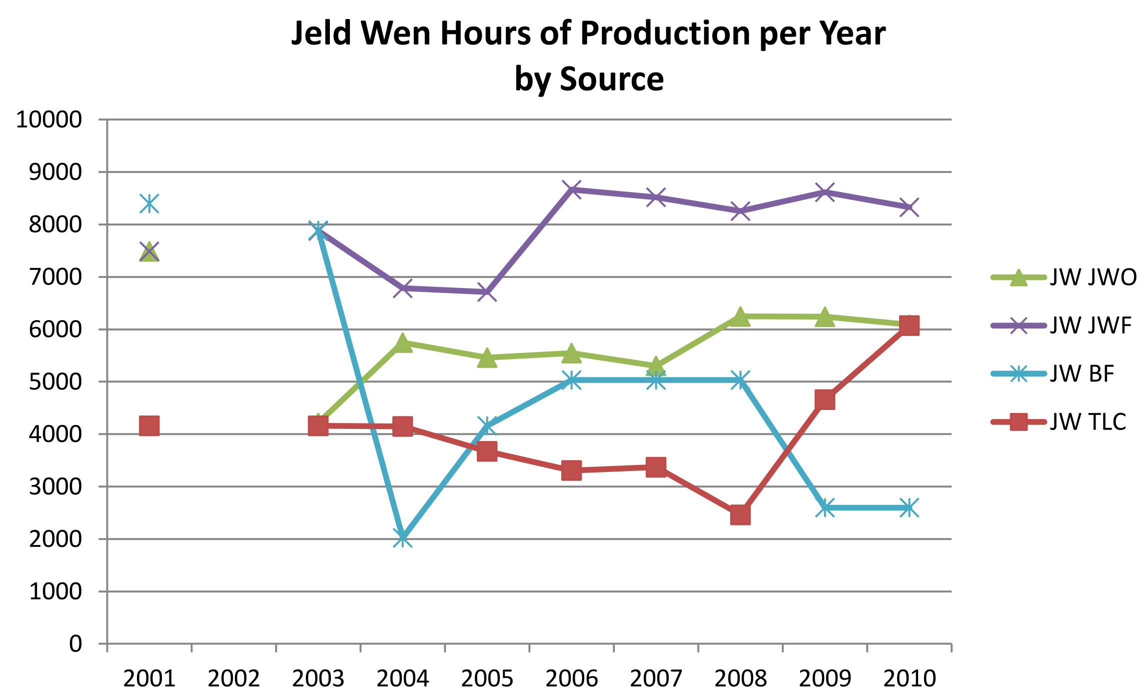


Figure 10: Jeld Wen (JW) have four facilities showing hours worked over the last decade, based on data in DEQ's file

While the wood products industry shows poor performance in 2008, 2009, 2010 and 2011, this source of emissions is relatively low compared to the amount of emissions from residential wood combustion.

How does the population and work environment within the Nonattainment area reflect County Statistics?
Klamath County is the best predictor of what the economic situation was like in the Klamath Nonattainment Area. Over 70 percent of the population of Klamath County lives in the Klamath Falls Nonattainment Area. Most of the economic growth in Klamath County occurs within the nonattainment area.

Klamath Falls by contrast is a small area within the urban area and represents about 32 percent of the County's population. Therefore, the best economic analysis is countywide. Most of the land mass outside of the nonattainment area is forest, range or agricultural land. Much of that land is federally managed. Figure 11 shows the population growth in Klamath Falls from 2000 to present and predicts the growth to 2014.

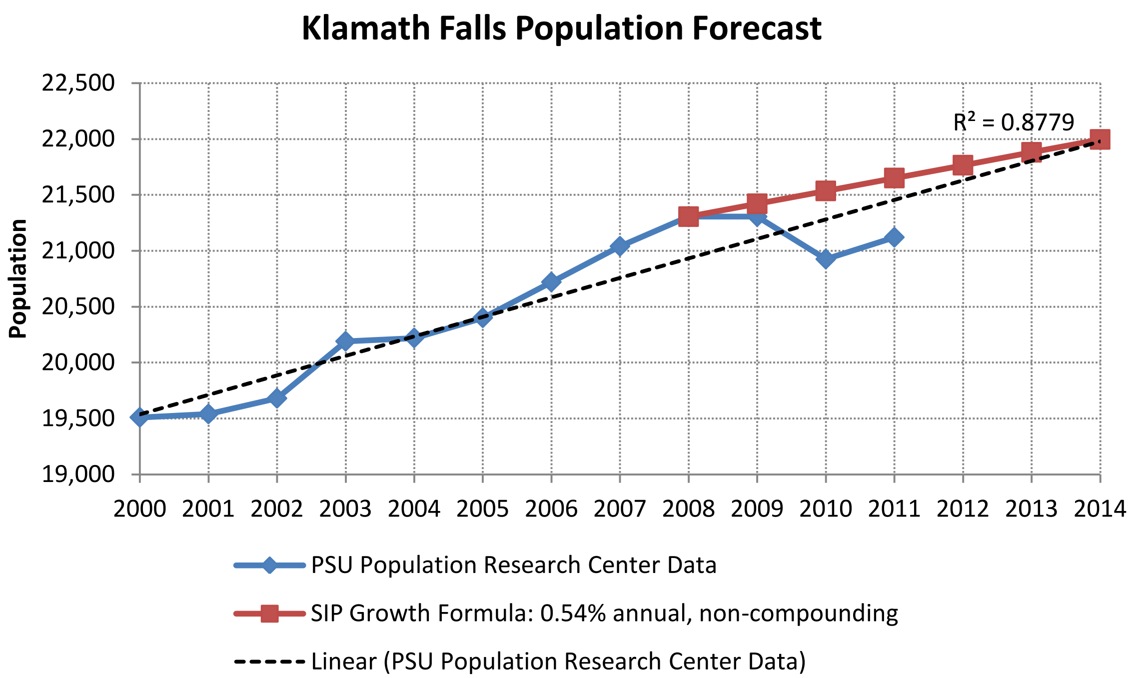


Figure 11: Population Forecast for Klamath Falls City Limits

What Does this Mean in terms of Emissions?
Emissions in the Klamath Nonattainment Area are predominately from woodstoves on a worst case day. Industrial Emissions represent 25-30 percent of the emission inventory but impact the filter sample at Peterson School less than 5% of the weight of the filter sample. Dust is also less than 5 percent of the filter sample. Vehicle tailpipe and vehicle wear represent roughly 9 percent of emission inventory.

Filter sample results show that 85 percent of the filter sample from six quarters beginning the fourth quarter of 2007 and ending the first quarter of 2009 are from organic carbon or elemental carbon deposits on the filter. Nitrates are seven percent. Crustal material is about three percent of the total. The highest concentrations are in the first and fourth quarters or the winter months. The lowest concentrations are in the second and third quarters of 2008 or the summer months. Carbon species are the largest contribution in all months but more pronounced in the winter. Nitrates, sulfates and crustal components are less than 2 micrograms per cubic meter in all months of the year. See Figure 12.

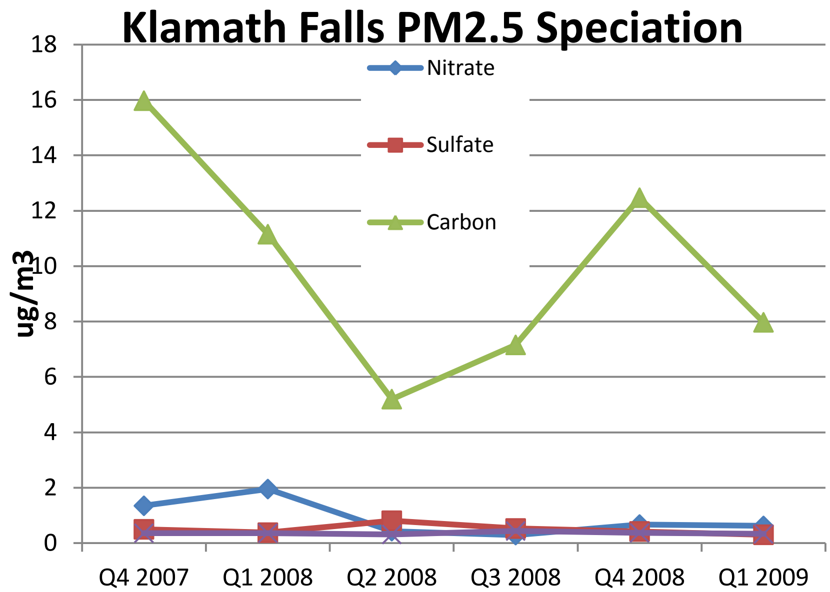


Figure 12: Speciation of mass on filter sample at Peterson School Sampler in Klamath Falls[6].

A series of 12 filter samples were analyzed in Klamath Falls by EPA that show a similar result. It shows that 86 percent of the filter samples are total carbonaceous mass (TCM) with one percent crustal and eight percent nitrate. See Figure 13.

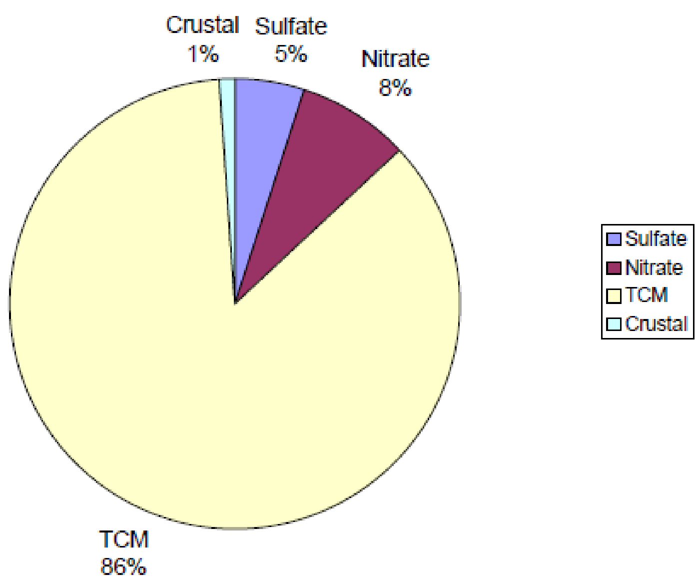


Figure 13: Speciation of mass on a filter sample at Peterson School in Klamath Falls[7].

The Emission Inventory for a worst case day in Klamath Falls in 2008 is displayed in Figure 14. It shows that 53 percent is from area sources mostly from residential wood combustion, 28 percent is from industrial emissions and 17 percent is from vehicle emissions including re-entrained road dust.

[6] Speciation based on 86 samples over 6 quarters beginning the fourth quarter of 2007 and ending the first quarter of 2009

[7] Speciation base on 12 filter samples collected between January 2004 and December 2006

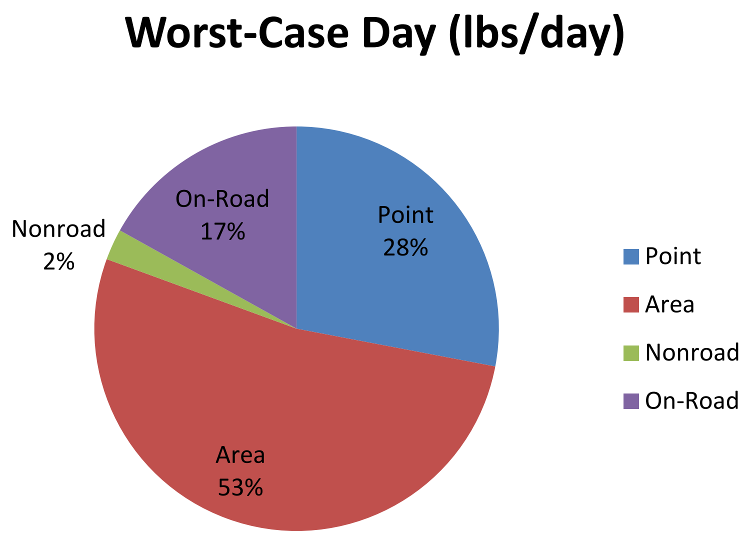


Figure 14: 2008 emission inventory for Klamath Falls Nonattainment Area

EPA conducted a Positive Matrix Factorization (PMF) study to determine the possible sources or contributors of emissions to the filter sample at Peterson School in Klamath Falls. Two separate data sets were used to determine the possible source contributions and different sampling and analytical methodologies. Four positive source categories were found with the first method and the second method yielded six different positive source categories. There was also an undetermined mass contribution in both methodologies. Wood smoke was the most prevalent mass in each methodology and the labeled "OP Rich" fraction is considered aged organic carbon from wood smoke according to the author. Fugitive dust, urban/industrial and sulfate rich are a small fraction of the result. Nitrate rich had two distinctive different results base on the methodology or sample results. One method was 12 percent and the other 5 percent. See figure 15.

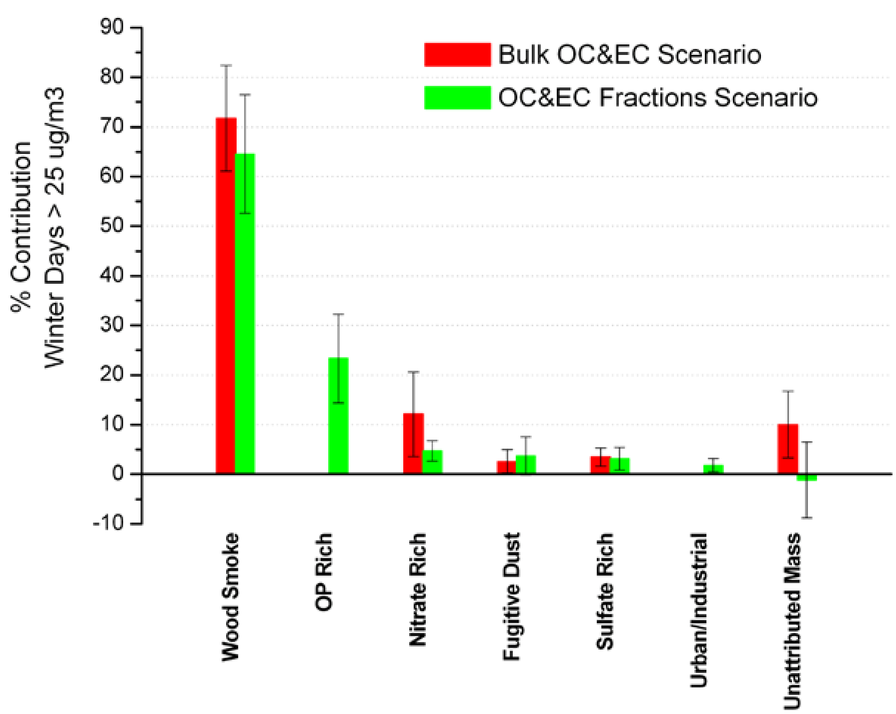


Figure 15: PMF study results conducted by EPA for Klamath Falls Nonattainment Area.

DEQ conducted an emission inventory with existing strategies. The emission inventory showed that despite an increase in population that all types of emission sources decreased their emissions by 2014. As an example, residential wood combustion is predicted to have emissions reduced by over 200 pounds per day given a worst case day in the winter. This is due primarily to improvements in the woodstove advisory and enforcement activities. Other contributing factors to the decrease include the woodstove change out programs over the last few years and the natural attrition of uncertified stoves being replaced by certified stoves or other heating devices. Figure 16 shows the emission inventory prediction result.

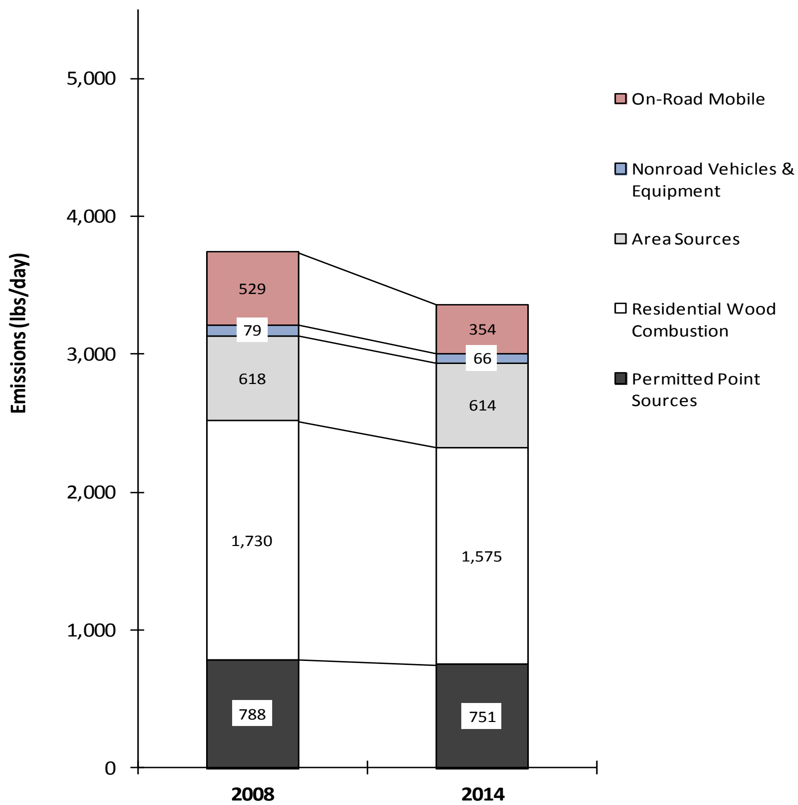


Figure 16: Projection DEQ's emission inventory - reduction in emissions from all sources including residential wood combustion in the nonattainment area.

Fuel oil costs sharply spiked in 2008 and may have led home heating oil users to move away from a traditional furnace and use wood. Homeowners in DEQ's residential wood combustion survey stated they keep an old wood stove as a backup source of heat. Many of these homeowners switched their usage to a primary source of heat by 2009. Figures 17 shows the spike in oil prices in the stock market in 2008. Other energy pricing went up in 2008 also but not as stark as heating oil.

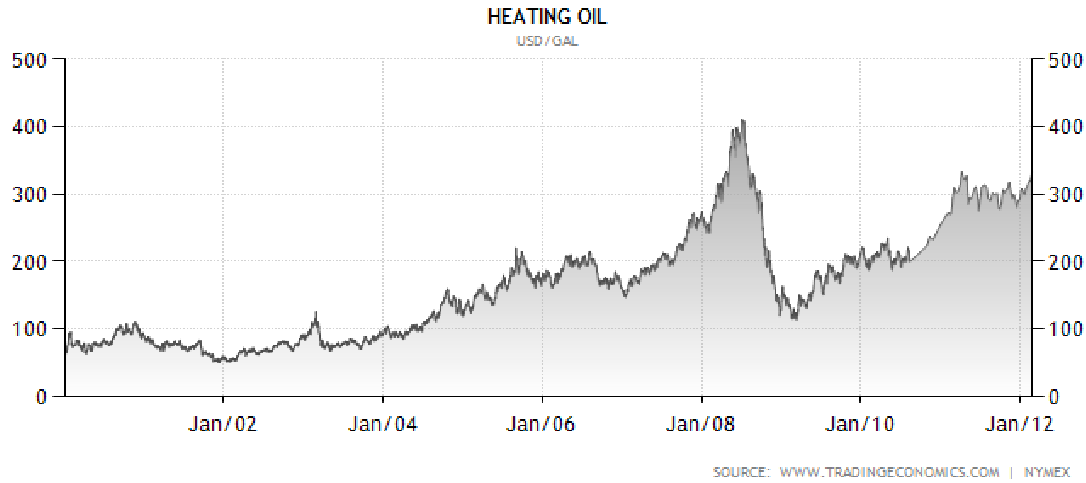


Figure 17: Heating oil costs in last ten years as traded on the New York Stock Exchange

DEQ theorizes that there is a link between Klamath Falls' poor economic health and an increased use of wood stoves during the winter of 2008. There was a spike in the heating fuel prices in that year (Figure 17) accompanied by higher than average heating degree days (Figure 18). It is presumed that such conditions compel residents of Klamath Falls to use wood as a more affordable heating resource, and could help further explain why Klamath Falls did not achieve the standard. Residents could also have been spending more time in their homes rather than in workplaces, causing an increase in the need for daytime home heating.

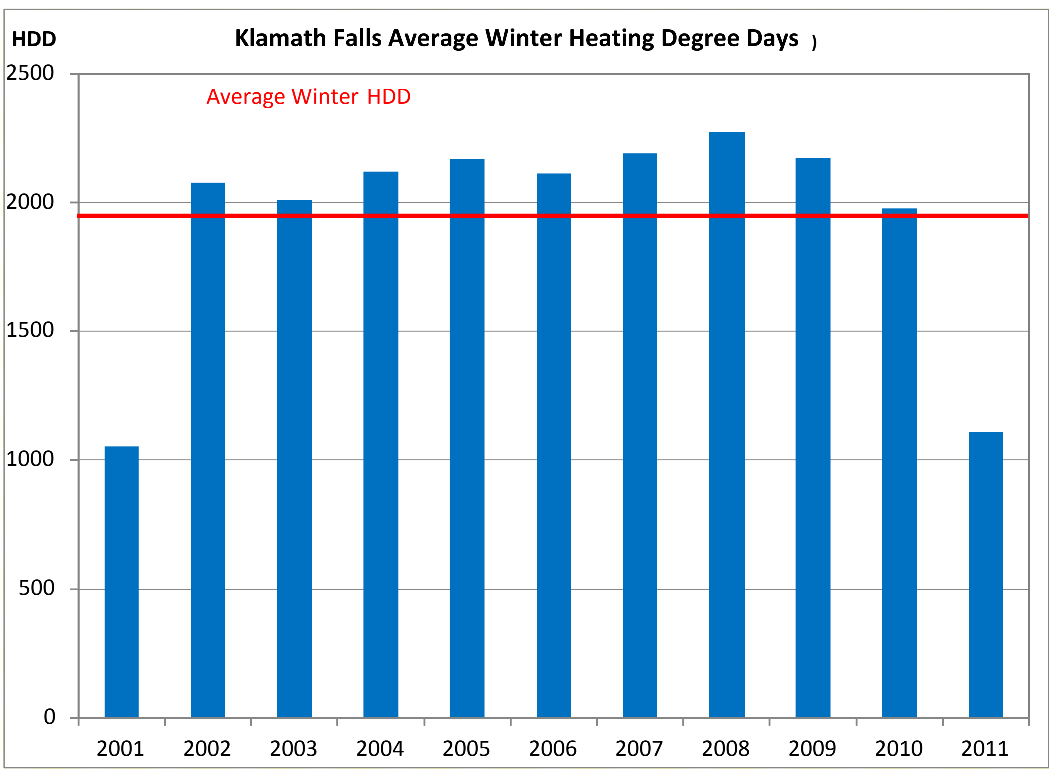


Figure 18: Klamath Falls winter heating degree days.

While the 2008 industrial emissions were smaller than in previous years due to the economic downturn, the overall industrial contribution to $PM_{2.5}$ pollution is relatively small compared to wood combustion emissions. These reduced industrial emissions in 2008 do not have a major impact on the nonattainment area analysis.

Conclusion

DEQ believes wood smoke is the most dominant source of emissions in the Klamath Nonattainment Area. Due to the poor economy in 2008 and 2009 residential wood combustion is more prevalent and reflects higher emissions than most years. Still DEQ predicts and the data shows that despite the increased in wood burning activity in 2008 emissions are decreasing in all sectors including residential wood combustion. The community has taken an active role in reducing emissions from residential wood combustion through the county ordinance mandatory curtailment program to replacing their uncertified woodstoves and inserts with more efficient and less polluting models. As the economy improves in Klamath Falls so should the emission concentrations if residential wood combustion is reduced. Industrial sources and off and on road vehicle emissions are less significant than residential wood combustion. As all sources of emissions decrease so should the ambient concentrations. 2008 was one of the worst years due to economic conditions, and future years whether a good or bad economy should still result in fewer emissions from all sources including residential wood combustion use.

For more information please contact:

Larry Calkins, Eastern Region, (541) 278-4612.

APPENDICES to Appendix 3

A Unemployment Rate (BEA)
B Personal Income and Employment Summary (BEA)
C Compensation of employees by NAICS industry (BEA)
D Personal income by major source and earnings by NAICS industry (BEA)
E Oregon and Klamath County Comparison – Average and Per Capita Earnings (BEA)
F Population Forecast
G Positive Matrix Factorization
H Wood Products Manufacturing description
I Major Wood Products Industry Production Trend
J Spot prices on Heating oil

APPENDIX 3-A – Unemployment Rate
Bureau of Economic Analysis

Labor Force Data

Unemployment Rate
Klamath (County)
Not Seasonally Adjusted Data

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1990	9	10	10.7	9.1	7.7	8.5	9.4	8.8	8.7	7.4	8.4	9	8.9
1991	11.2	13	12.7	10.1	8.7	9	8.4	8.7	8.2	7.5	8.2	9.4	9.6
1992	11.5	12.2	12.3	9.9	8.8	9.7	9.4	9	9	8.9	9.9	10.6	10.1
1993	12.7	13.8	13.1	11.2	9.3	9.8	9.7	9.5	8.7	8.7	8.9	9.2	10.4
1994	12.1	12.7	12.1	9.7	7.8	8.2	7.4	7.3	6.8	6.2	6.8	7.4	8.7
1995	9.7	10.2	9.6	8.4	7.5	7.4	6.7	6.3	5.8	5.4	6.5	6.7	7.5
1996	9.8	10.3	10.1	8.8	7.1	7.1	7.5	7.2	6.9	7	9	9.1	8.3
1997	11.8	12.2	11.7	9.9	8	8.4	8.5	8.7	8.1	7.8	8.6	9.3	9.4
1998	12.1	12.5	12.6	10.2	8.9	9.2	8.8	8.4	7.9	7.3	8.8	9.8	9.7
1999	11.2	11.9	11.3	9.1	7.2	7.7	7.4	7.5	7	6.4	6.9	8.1	8.5
2000	9	9.4	9.1	7.5	6.6	6.4	6.5	6.7	6	6.2	7.7	7.9	7.4
2001	9.8	9.8	10.1	9.2	7.6	7.8	7.8	7.9	7.3	7.5	8.6	9.8	8.6
2002	11.2	11.4	10.9	9.6	7.9	8.2	8.1	8	7.5	7.6	8.5	9	9
2003	11.3	11.5	11	10.1	9.4	9.4	9.2	9	8.4	8.6	9.5	10.1	9.8
2004	12.1	12.3	12.3	9.7	8.6	8.9	8.5	8.1	7.4	7.7	8.3	8.7	9.4
2005	9.6	10	9.2	8	7.1	7.1	7	6.7	6.4	6.1	7.2	7.8	7.7
2006	8.8	8.9	8.3	7.1	5.7	6	6.2	5.9	5.3	5.3	6	6.9	6.7
2007	8.7	9	8.2	6.7	5.8	6.2	6.2	6.1	5.6	6	6.8	7.9	6.9
2008	9.6	9.8	9.7	8.1	7.3	7.5	8	8.6	8.4	9.2	10.6	12.5	9.1
2009	15.3	16.5	16.5	14.3	13.4	13.5	13.5	12.8	12.3	12.3	12.7	14	13.9
2010	15.8	15.9	15.5	13.7	12.5	12.5	12.8	12.3	11.6	11.8	13	13.6	13.4
2011	14.4	14.2	13.5	12.5	11.5	11.9	11.6	11.7	10.9	10.9	11.3	12	12.2

Appendix 3-B – Personal Income and Employment Summary

CA04 Personal income and employment summary

Klamath County

Bureau of Economic Analysis

Description	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Income (thousands of dollars)											
Personal income (thousands of dollars)	1E+06	1E+06	1E+06	2E+06	2E+06	2E+06	2E+06	2E+06	2E+06	2E+06	2E+06
Nonfarm personal income 1/	1E+06	1E+06	1E+06	2E+06	2E+06	2E+06	2E+06	2E+06	2E+06	2E+06	2E+06
Farm income 2/	11429	7904	-4007	23129	27566	33658	31021	23067	34213	34612	17091
Population (persons) 3/	63396	63893	64110	64097	64549	64753	65402	66095	66562	66543	66247
Per capita personal income (dollars) 4/	20840	21709	22458	24345	25414	25809	26302	27570	28625	29395	29387
Derivation of personal income											
Earnings by place of work	887985	940866	945300	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06	1E+06
Less: Contributions for government 5/	112095	121496	120891	123242	127919	134987	144547	155875	158680	156246	151662
Employee and self-employed	54126	56789	57873	59533	61610	65283	70683	77475	80194	79586	76849
Employer contributions for government	57969	64707	63018	63709	66309	69704	73864	78400	78486	76660	74813
Plus: Adjustment for residence 6/	-8971	-11104	-14517	-8695	-9026	-8500	-8689	-10665	-10319	-7372	-6079
Equals: Net earnings by place of residence	766919	808266	809892	890403	937992	961823	993516	1E+06	1E+06	1E+06	971019
Plus: Dividends, interest, and rent	273176	284146	293480	301454	317780	318760	319565	341355	373594	409083	395960
Plus: Personal current transfer receipts	281070	294663	336440	368576	384707	390615	407108	435165	461131	506573	579823
Components of earnings by place of work (K dollars)											
Wage and salary disbursements	619114	674116	671072	678711	705337	733241	778697	834675	855893	838054	788182
Supplements to wages and salaries	151776	158758	172040	205608	227872	218338	210734	218830	219668	220688	221278
Employer contributions for pension	93807	94051	109022	141899	161563	148634	136870	140430	141182	144028	146465
Employer contributions for government	57969	64707	63018	63709	66309	69704	73864	78400	78486	76660	74813
Proprietors' income	117095	107992	102188	138021	141728	153731	157321	158763	164060	145245	119300
Farm proprietors' income	-1861	-5398	-17165	11022	14819	19306	13726	5175	13955	14118	-4459
Nonfarm proprietors' income	118956	113390	119353	126999	126909	134425	143595	153588	150105	131127	123759
Employment (number of jobs)											
Total employment	31941	32837	31962	31426	31686	32298	33579	34353	34610	33820	32224
Wage and salary employment	24886	25550	24450	23889	24146	24557	25479	26082	25995	25269	23706
Proprietors employment	7055	7287	7512	7537	7540	7741	8100	8271	8615	8551	8518

Legend / Footnotes:

1/ Nonfarm personal income is total personal income less farm income.

2/ Farm income is farm earnings less farm employer contributions for social insurance.

3/ Census Bureau midyear population estimates. Estimates for 2000-2009 reflect county population estimates available as of April 2010. For more information see the explanatory note at: http://www.bea.gov/regional/docs/popnote.cfm.

4/ Per capita personal income is total personal income divided by total midyear population.

5/ Contributions for government social insurance are included in earnings by type and industry, but they are excluded from personal income.

6/ The adjustment for residence is the net inflow of the earnings of interarea commuters. For the United States, it consists of adjustments for border workers and for certain temporary and migratory workers: Wage and salary disbursements to U.S disbursements to foreign residents commuting or working temporarily inside U.S. borders.

All state and local area dollar estimates are in current dollars (not adjusted for inflation).

Last updated: April 21, 2011 - new estimates for 2009; revised estimates for 2001-2008.

Appendix 3-C – Compensation of employees by NAICS industry

CA06N Compensation of employees by NAICS industry

Klamath County

Bureau of Economic Analysis

Description	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total compensation of employees (K dollars)										
Compensation of employees, received 1/	843112	884319	933209	951579	989431	1053505	1075561	1059892	1007211	1019097
Total wage and salary disbursements	671072	678711	705337	733241	778697	834675	855893	839024	788940	795333
Total supplements to wages and salaries	172040	205608	227872	218338	210734	218830	219668	220868	218271	223764
Total average compensation per job (dollars) 2/	34483	37018	38649	38750	38833	40392	41376	41936	42430	43723
Compensation of employees by industry										
Farm compensation	14433	13315	13786	15594	18498	19327	22049	22349	22915	23696
Nonfarm compensation	828679	871004	919423	935985	970933	1034178	1053512	1037543	984296	995401
Private compensation	589752	600399	627544	657996	701366	758943	769164	746645	685778	694095
Forestry, fishing, and related activities	(D)	(D)	(D)	(D)	(D)	(D)	17391	(D)	(D)	12817
Mining	(D)	(D)	(D)	(D)	(D)	(D)	691	(D)	(D)	621
Utilities	6409	7025	7637	12134	12062	13156	13583	15370	14698	15113
Construction	68302	34122	36598	36849	39862	53817	54262	42252	36618	33858
Manufacturing	96422	107098	110167	121194	124054	126927	121032	108152	86446	90571
Durable goods manufacturing	82347	93547	(D)	107145	111090	114672	110160	98786	78362	82313
Nondurable goods manufacturing	14075	13551	(D)	14049	12964	12255	10872	9366	8084	8258
Wholesale trade	25890	27000	26844	29376	34572	34537	35123	38559	37023	36494
Retail trade	72449	73019	77666	80101	84969	90239	91201	90961	87329	86859
Transportation and warehousing	37667	35330	36175	38058	39413	41520	39311	36138	35407	35851
Information	10454	10144	10318	9953	10676	11529	11463	10140	8035	8171
Finance and insurance	28886	33632	40826	32944	24758	27787	29208	29236	28425	29076
Real estate and rental and leasing	6275	5563	5512	6343	7435	7820	7580	6567	6048	5891
Professional, scientific, and technical services	15303	15688	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Management of companies and enterprises	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Administrative and waste management services	(D)	(D)	18049	13396	28813	34254	37011	37560	37444	36410
Educational services	3371	3727	3832	2983	3057	3402	3805	4375	4203	3628
Health care and social assistance	88813	95488	106182	117701	128010	137101	142802	148893	145529	151604
Arts, entertainment, and recreation	4024	4100	4816	5054	5881	6708	10995	8883	8245	8025
Accommodation and food services	35460	36498	40954	41472	44185	47059	45453	45146	40441	40224
Other services, except public administration	23157	24036	25919	27939	29331	31509	33262	33297	31636	31258
Government and government enterprises	238927	270605	291879	277989	269567	275235	284348	290898	298518	301306
Federal, civilian	59222	59983	64834	69064	71303	73938	76226	75015	79817	83536
Military	3462	5105	7186	7387	8294	8568	8656	9291	11105	11059
State and local	176243	205517	219859	201538	189970	192729	199466	206592	207596	206711

Legend / Footnotes:

1/ The estimates of compensation for 2001-2006 are based on the 2002 North American Industry Classification System (NAICS). The estimates for 2007 forward are based on the 2007 NAICS.

2/ Total average compensation per job is compensation of employees received divided by total full-time and part-time wage and salary employment.

3/ Under the 2007 NAICS, internet publishing and broadcasting was reclassified to other information services.

All dollar estimates are in current dollars (not adjusted for inflation).

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

(NA) Data not available for this year.

Last updated: December 14, 2011 - new estimates for 2010; revised estimates for 2008-2009.

Appendix 3-D – Personal income by major source and earnings by NAICS industry

CA05N Personal income by major source and earnings by NAICS industry 1/

Klamath County

Bureau of Economic Analysis

Description	2001	2002	2003	2004	2005	2006	2007	2008	2009
Personal income	1439812	1560433	1640479	1671198	1720189	1822248	1905347	1956025	1946802
Per capita personal income (dollars)	22458	24345	25414	25809	26302	27570	28625	29395	29387
Derivation of personal income									
Earnings by place of work	945300	1022340	1074937	1105310	1146752	1212268	1239621	1203987	1128760
less: Contributions for government social insurance 3/	120891	123242	127919	134987	144547	155875	158680	156246	151662
Employee and self-employed contributions for government social insurance	57873	59533	61610	65283	70683	77475	80194	79586	76849
Employer contributions for government social insurance	63018	63709	66309	69704	73864	78400	78486	76660	74813
plus: Adjustment for residence 4/	-14517	-8695	-9026	-8500	-8689	-10665	-10319	-7372	-6079
equals: Net earnings by place of residence	809892	890403	937992	961823	993516	1045728	1070622	1040369	971019
plus: Dividends, interest, and rent 5/	293480	301454	317780	318760	319565	341355	373594	409083	395960
plus: Personal current transfer receipts	336440	368576	384707	390615	407108	435165	461131	506573	579823
Earnings by place of work									
Components of earnings									
Wage and salary disbursements	671072	678711	705337	733241	778697	834675	855893	838054	788182
Supplements to wages and salaries	172040	205608	227872	218338	210734	218830	219668	220688	221278
Employer contributions for employee pension and insurance funds	109022	141899	161563	148634	136870	140430	141182	144028	146465
Employer contributions for government social insurance	63018	63709	66309	69704	73864	78400	78486	76660	74813
Proprietors' income 6/	102188	138021	141728	153731	157321	158763	164060	145245	119300
Farm proprietors' income	-17165	11022	14819	19306	13726	5175	13955	14118	-4459
Nonfarm proprietors' income	119353	126999	126909	134425	143595	153588	150105	131127	123759
Earnings by industry									
Farm earnings	-2732	24337	28605	34900	32224	24502	36004	36341	18765
Nonfarm earnings	948032	998003	1046332	1070410	1114528	1187766	1203617	1167646	1109995
Private earnings	709105	727398	754453	792421	844961	912531	919269	876222	810611
Forestry, fishing, and related activities	(D)	(D)	(D)	(D)	(D)	(D)	28859	(D)	(D)
Mining	(D)	(D)	(D)	(D)	(D)	(D)	789	(D)	(D)
Utilities	6482	7058	7682	12195	12110	13263	13668	15054	14609
Construction	86857	50511	52841	53328	58231	73939	71945	57288	48778
Manufacturing	97949	109720	113039	125314	127960	131978	126666	113329	92358
Durable goods manufacturing	83079	94985	(D)	109197	113016	117140	112323	100503	80854
Nondurable goods manufacturing	14870	14735	(D)	16117	14944	14838	14343	12826	11504
Wholesale trade	26951	27734	27715	30268	35624	35660	36399	39582	38091
Retail trade	82192	84052	90142	94746	101132	108209	107329	102429	97675
Transportation and warehousing	58593	59524	56383	61354	64487	66010	68496	59439	57181
Information	10928	10515	10670	10319	11157	12119	12040	10824	8739
Finance and insurance	31677	36496	44084	36678	28701	32202	33634	33413	32618
Real estate and rental and leasing	16459	13172	13529	14849	15355	16139	13825	13484	11986
Professional, scientific, and technical services	30954	29119	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Management of companies and enterprises	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Administrative and waste management services	(D)	(D)	22063	17386	33178	39066	41490	41425	40624
Educational services	3654	3878	4010	3197	3244	3636	4027	4571	4456
Health care and social assistance	99657	105528	115590	127268	136827	146233	152390	158425	155173

Arts, entertainment, and recreation	4680	4875	5660	5970	6663	7498	11430	10014	8649
Accommodation and food services	38998	39557	44518	45341	47373	50363	48554	47456	43285
Other services, except public administration	37977	45110	46722	48250	54630	57970	59683	54890	53051
Government and government enterprises	238927	270605	291879	277989	269567	275235	284348	291424	299384
Federal, civilian	59222	59983	64834	69064	71303	73938	76226	75007	80059
Military	3462	5105	7186	7387	8294	8568	8656	9229	11049
State government	49204	57283	60663	69635	50828	51820	54968	58343	58679
Local government	127039	148234	159196	131903	139142	140909	144498	148845	149597

Legend / Footnotes:

1/ The estimates of earnings for 2001-2006 are based on the 2002 North American Industry Classification System (NAICS). The estimates for 2007 forward are based on the 2007 NAICS.

2/ Census Bureau midyear population estimates. Estimates for 2001-2009 reflect county population estimates available as of April 2010.

3/ Contributions for government social insurance are included in earnings by type and industry but they are excluded from personal income.

4/ The adjustment for residence is the net inflow of the earnings of interarea commuters. For the United States, it consists of adjustments for border workers: Wage and salary disbursements to U.S. residents commuting to Canada less wage and salary disbursements to Canadian and Mexican residents commuting into the United States.

5/ Rental income of persons includes the capital consumption adjustment.

6/ Proprietors' income includes the inventory valuation adjustment and capital consumption adjustment.

7/ Under the 2007 NAICS, internet publishing and broadcasting was reclassified to other information services.

All state and local area dollar estimates are in current dollars (not adjusted for inflation).

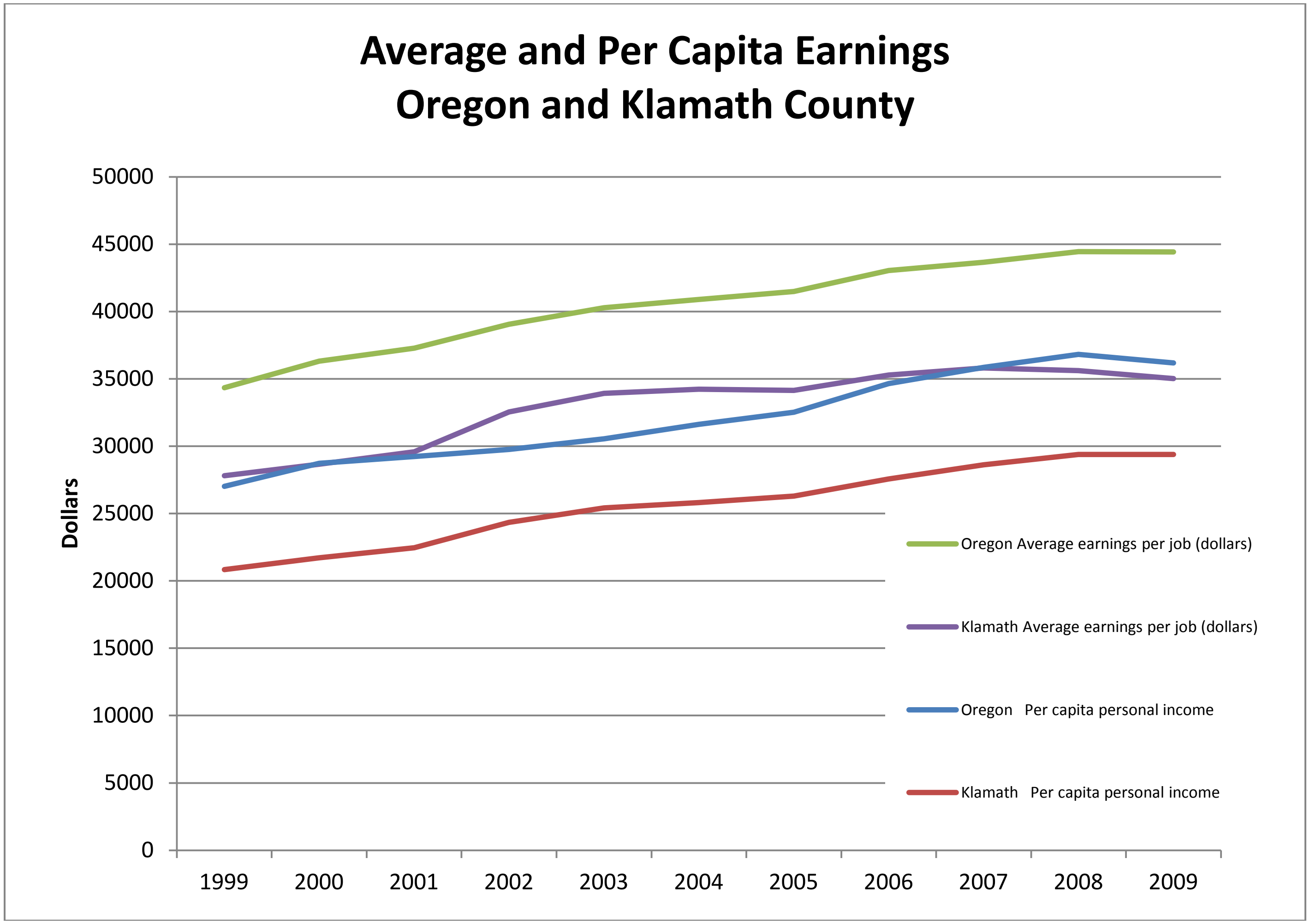
(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

(L) Less than $50,000, but the estimates for this item are included in the totals.

(NA) Data not available for this year.

Last updated: April 21, 2011 - new estimates for 2009; revised estimates for 2001-2008.

Appendix 3- E - Oregon and Klamath County Comparison – Average and Per Capita Earnings



CA30 Regional economic profiles

Oregon vs Klamath Profile

Bureau of Economic Analysis

Area	Description	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Oregon	Net earnings 1/	59866633	64737474	66438356	68997306	71951679	74709930	77863073	83044554	86195647	87218123	83352455
Oregon	Dividends, interest, and rent	19469522	20789481	20304788	19998679	20386457	21633533	21988587	25405934	27217289	29341456	28181017
Oregon	Per capita personal income	27016	28718	29230	29766	30558	31614	32515	34644	35849	36824	36191
Oregon	Average earnings per job (dollars)	34345	36319	37284	39043	40277	40897	41476	43041	43657	44449	44426
Klamath	Net earnings 1/	766919	808266	809892	890403	937992	961823	993516	1045728	1070622	1040369	971019
Klamath	Dividends, interest, and rent	273176	284146	293480	301454	317780	318760	319565	341355	373594	409083	395960
Klamath	Per capita personal income	20840	21709	22458	24345	25414	25809	26302	27570	28625	29395	29387
Klamath	Average earnings per job (dollars)	27801	28653	29576	32532	33925	34222	34151	35289	35817	35600	35029

Legend / Footnotes:

1/ Total earnings less contributions for government social insurance adjusted to place of residence.

2/ Consists largely of supplemental security income payments, family assistance, general assistance payments, food stamp payments, and other assistance payments, including emergency assistance.

4/ Type of income divided by population yields a per capita measure for that type of income.

All state and local area dollar estimates are in current dollars (not adjusted for inflation).

Last updated: April 21, 2011 - new estimates for 2009; revised estimates for 2001-2008.

Appendix 3-F – Population Forecast

Klamath Falls: Source = PSU Population Research Center Certified numbers used for 2010 & 2011

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
PSU Population Research Center Data	19,510	19,540	19,680	20,190	20,220	20,400	20,720	21,040	21,305	21,305	20,925	21,120			
SIP Growth Formula: 0.54% annual, non-compounding									21,305	21,420	21,535	21,650	21,765	21,880	21,995

	July 1 Population Estimates									Census Population, April 1	
County and Cities	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**2000**	**1990**
OREGON	**3,791,075**	**3,745,455**	**3,690,505**	**3,631,440**	**3,582,600**	**3,541,500**	**3,504,700**	**3,471,700**	**3,436,750**	**3,421,399**	**2,842,321**
KLAMATH COUNTY	66,180	65,815	65,455	65,055	64,800	64,600	64,550	64,200	63,900	63,775	57,702
Klamath Falls City Limits	21,305	21,040	20,720	20,400	20,220	20,190	19,680	19,540	19,510	19,460	17,737
Nonattainment Area (including Klamath Falls)	46,588	46,331	46,077	45,796	45,616	45,475	45,440	45,194	44,983		
Bonanza, Chiloquin, Malin, Merril	2,880	2,880	2,875	2,860	2,850	2,850	2,850	2,840	2,670		
Unincorporated	41,995	41,895	41,860	41,795	41,730	41,560	42,020	41,820	41,720	41,648	37,407

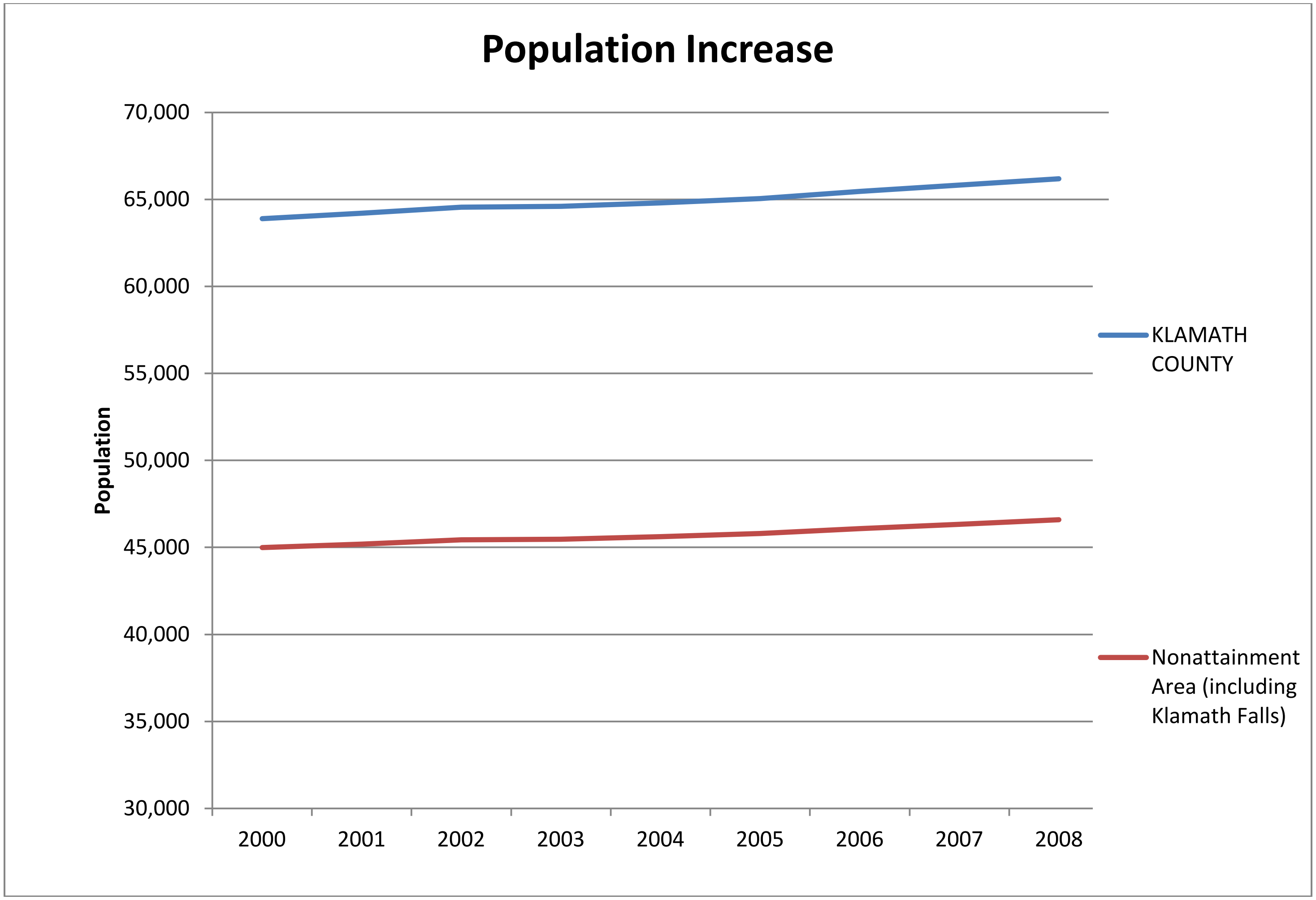
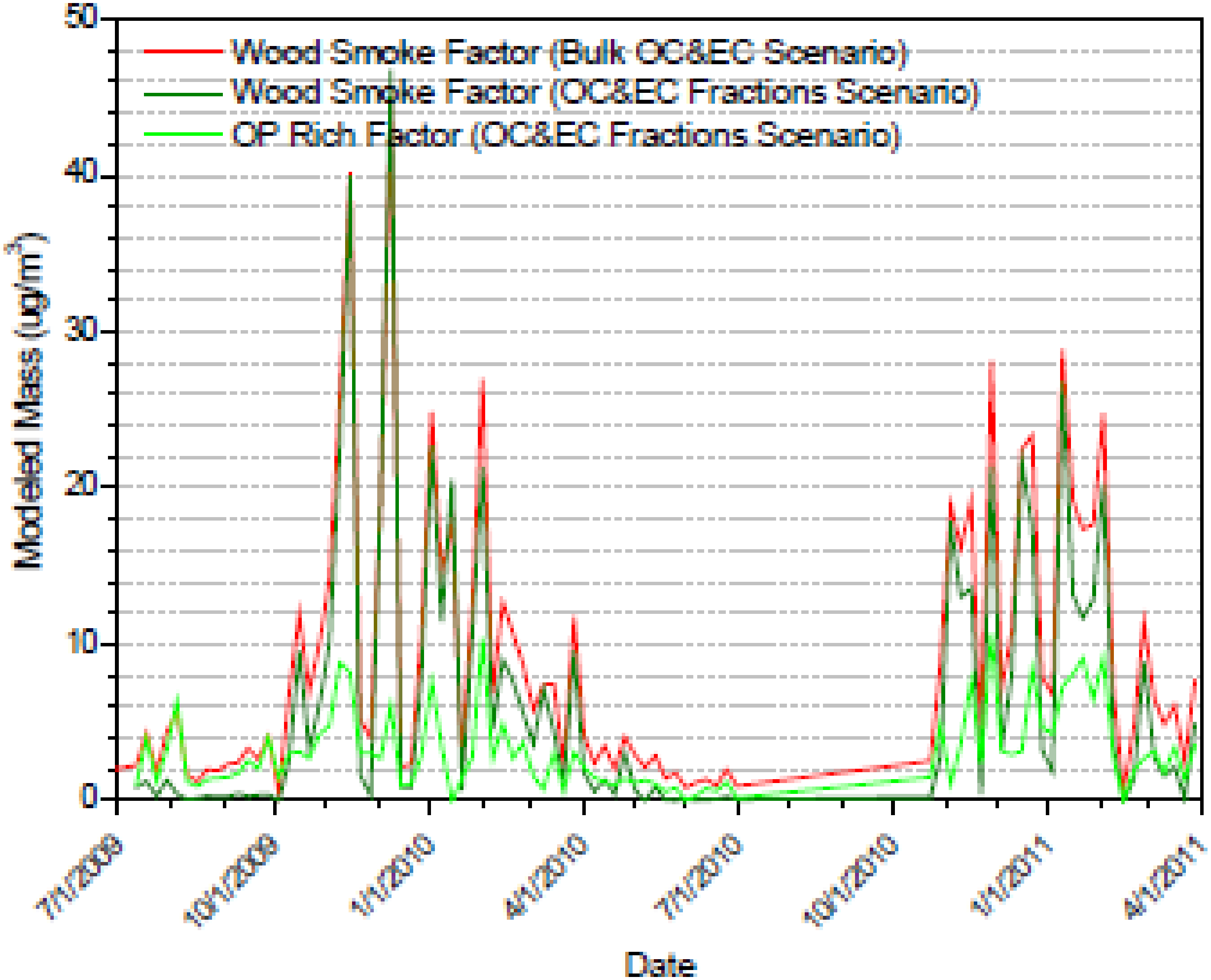

Population Increase
70,000
65,000
60,000
55,000
50,000
45,000
40,000
35,000
30,000
Population
2000
2001
2002
2003
2004
2005
2006
2007
2008
KLAMATH COUNTY
Nonattainment Area (including Klamath Falls)

Table 4.2. Average percent contributions of PMF derived factors to PM2.5 on winter season days with PM2.5 > 25 ug/m3 (25 and 14 samples for Bulk OC&EC and OC&EC Fractions modeling scenarios, respectively).

Model Factors	Bulk OC&EC Scenario (%)	OC&EC Fractions Scenario (%)
Wood Smoke	71.7	64.6
OP Rich		23.3
Nitrate Rich	12.1	4.7
Fugitive Dust	2.6	3.7
Sulfate Rich	3.5	3.1
Urban/Industrial		1.8
Unattributed Mass(+)/ Over attributed mass(-)	10.0	-1.2

Table 4.3. Average mass contributions of PMF derived factors to PM2.5 on winter season days with PM2.5 > 25 ug/m3 (25 and 14 samples for Bulk OC&EC and OC&EC Fractions modeling scenarios, respectively).

Model Factors/PM2.5	Bulk OC&EC Scenario (ug/m3)	OC&EC Fractions Scenario (ug/m3)
PM2.5	35.2	34.2
Wood Smoke	25.0	22.7
OP Rich		7.6
Nitrate Rich	4.6	1.6
Fugitive Dust	0.8	1.1
Sulfate Rich	1.3	1.2
Urban/Industrial		0.5
Unattributed Mass(+)/ Over attributed mass(-)	3.5	-0.6



Wood Smoke Factor (Bulk OC&EC Scenario)
Wood Smoke Factor (OC&EC Fractions Scenario)
OP Rich Factor (OC&EC Fractions Scenario)
Modeled Mass (ug/m3)
50
40
30
20
10
0
7/1/2009
10/1/2009
1/1/2010
4/1/2010
7/1/2010
10/1/2010
1/1/2011
4/1/2011
Date

Appendix 3-H – Wood Products Manufacturing description
Source OMLIS

Klamath County lost jobs in 2010. The county has been losing jobs since 2006, one year longer than the state and most other counties in the state. This year's 330 job loss was small compared to last year's, but still adds to the losses, which now total over 2,500 jobs (over 10 percent of Klamath County's 2006 employment). Over half of the jobs loss was in leisure and hospitality, which dropped 200 jobs (-8.1%). Two other industries contributed to the other portion of job loss: trade, transportation and utilities (-120 jobs), and manufacturing (-70 jobs).

Three private-sector industries added jobs in 2010: education and health services; mining and logging; and nondurable goods manufacturing. Information, which includes publishing, broadcasting and telecommunications, was the only industry to have no change in employment between 2009 and 2010.

Outdoor recreation, such as hiking, hunting, and world-class trout fishing, as well as Oregon's only National Park at Crater Lake, also contribute to the area's economy. A complex of six National Wildlife Refuges--the Klamath Basin National Wildlife Refuges Complex--seasonally draws some of the largest concentrations of waterfowl in North America. The area is world-renowned as a birdwatcher's paradise.

The county's annual average wages in 2010 were $33,166, well below the statewide average of $41,667. *Updated 10/04/2011*

Industry Information for Wood Product Manufacturing

Employment, Payroll and Business Establishments

for Wood Product Manufacturing in Klamath County

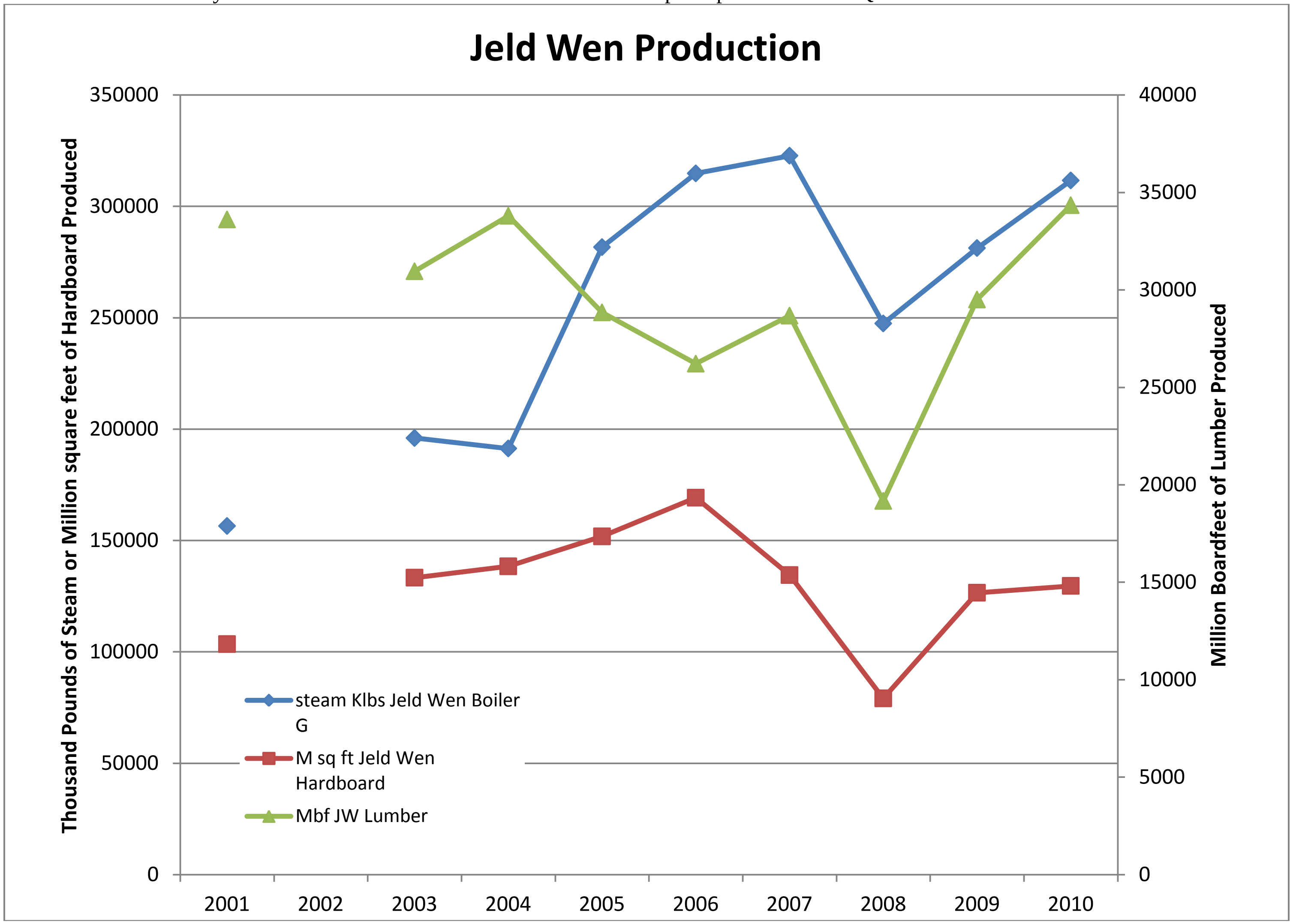
Year	Average Employment	Total Payroll	Avg Pay per Worker	Business Estabs.
2001	1,439	$49,352,260	$34,296	15
2002	1,378	$49,913,787	$36,222	13
2003	1,347	$51,426,387	$38,178	14
2004	1,419	$61,175,960	$43,112	16
2005	1,478	$62,325,209	$42,169	17
2006	1,479	$64,178,380	$43,393	19
2007	1,415	$58,903,549	$41,628	19
2008	1,297	$51,503,858	$39,710	19
2009	954	$38,848,191	$40,721	19
2010	936	$41,140,398	$43,953	20

The above data is taken from quarterly unemployment tax records. Business establishments does not equal the number of businesses because one business may have a number of establishments or multiple establishments in one location.

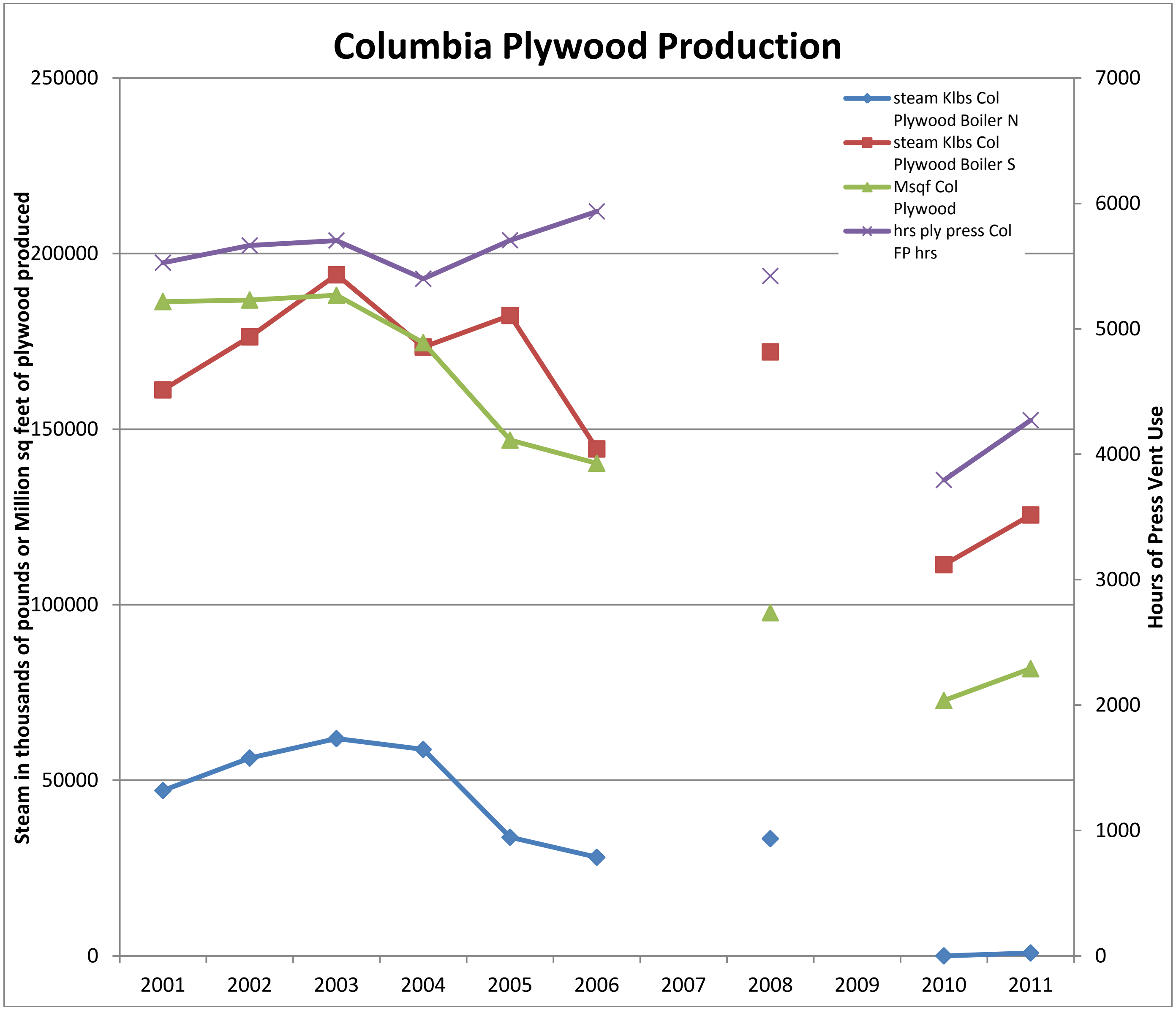
Employment changes between December and January of each year may be due in part to changes in industry classification and/or geographic classification of some firms.

Source: Oregon Employment Department

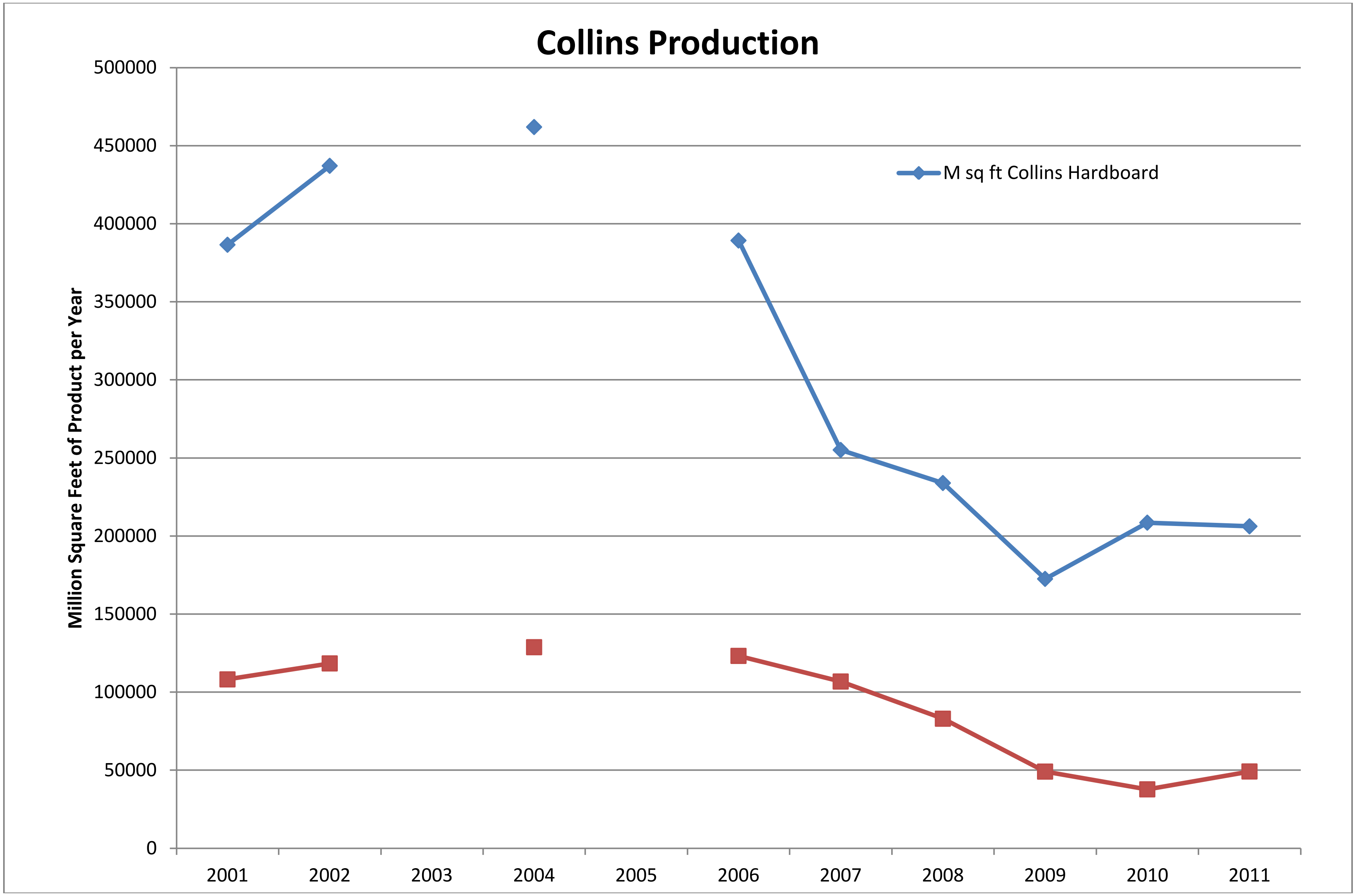
Appendix 3-I
Wood Products Industry Production in Klamath Falls based on annual reports provided to DEQ



Three Units of Production at Jeld Wen
1 Boiler G that reports steam in thousand pound units per year
2 Hardboard production that reports production in million square feet produced
3 Lumber that reports production in million board feet produced



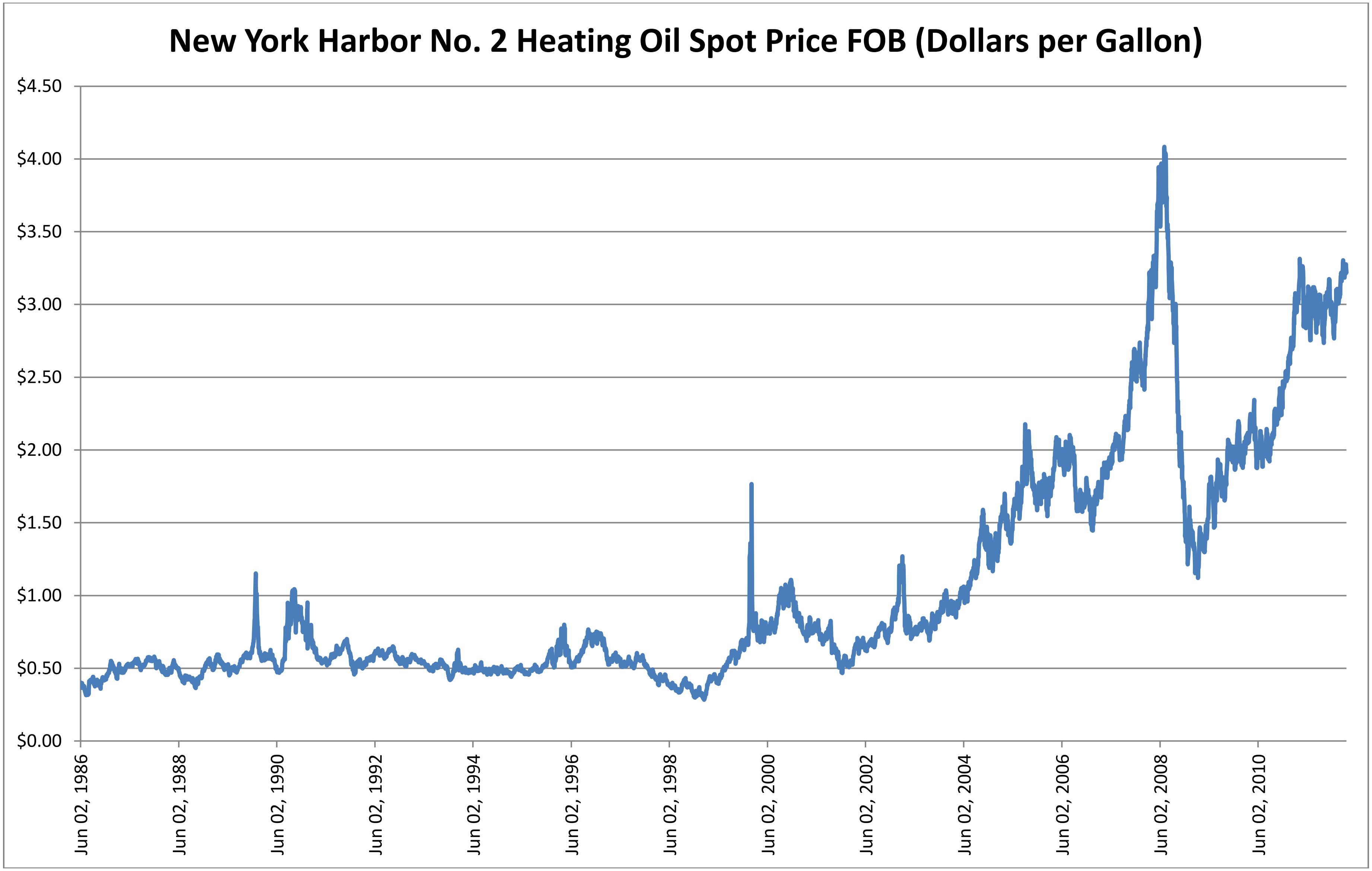
Four Units of Production at Columbia Plywood
1 Boiler N that reports steam in thousand pound units per year
2 Boiler S that reports steam in thousand pound units per year
3 Plywood production that reports production in million square feet produced
4 Hours of press vent usage



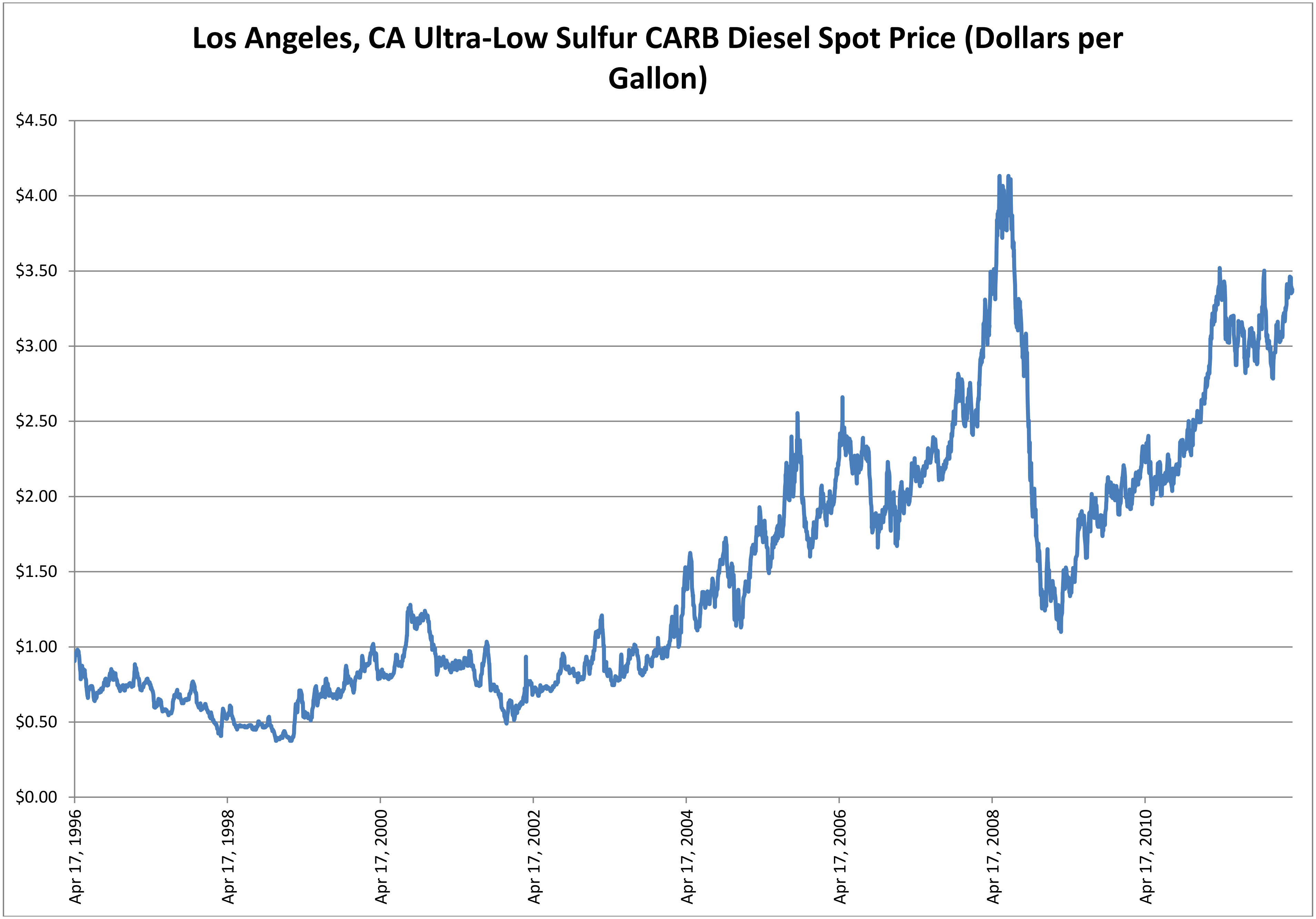
Two Units of Production at Columbia Plywood
1 Hardboard production that reports production in million square feet produced
2 Particleboard production that reports production in million square feet produced

Appendix 3-J – Spot Pricing on Heating Oil - Other sources of information on heating oil price trends

A long term look at heating oil spot prices with a similar spike in 2008 – source U.S. Department of Energy



A long term pricing for Ultra-low Sulfur Diesel spot prices – Source U.S. Department of Energy



Report

How Klamath Falls' Topography and Winter Meteorology Elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

State of Oregon
Department of Environmental Quality

Submitted to: File

By: Anthony Barnack

Feb 2012

Last Updated: 02/29/12
By: Anthony Barnack
DEQ 12- AQ-022

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

This report prepared by:

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How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

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How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

1.0 Executive Summary

Klamath Falls has the highest $PM_{2.5}$ levels of any community monitored in Oregon. Klamath Falls has similar winter temperatures and heating degree days as other Eastern Oregon communities, however, their topography is unique. Klamath Falls is in a basin surrounded by mountains on three sides and a large lake on the forth. Sitting in the basin reduces wind speeds and discourages vertical mixing. When the surface cools in the evening the cold air is trapped. In addition, cold air from the nearby surface of the slopes slides down into the basin displacing warmer air. In some instances, cold air off of the large frozen lake flows in to the basin further strengthening the inversion.

Oregon DEQ, the Klamath County Health Department, and the EPA are working with the community to create a State Implementation Plan to lower $PM_{2.5}$ levels in Klamath Falls. The SIP requires a baseline year to improve from and 2008 was selected as the base year.

The 2008 winter was the coldest year on average over the past decade resulting in the highest heating degree day value during that time. More heating demand resulted in more wood combustion. At the same time, heating oil prices peaked adding even more incentive for wood heating. 2008 was also more stagnant than the past 10 year average, recording more foggy days than any year since 2004. These factors contributed to the highest $PM_{2.5}$ 98^{th} percentile in the past 10 years.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

2.0 Introduction

Klamath Falls, Oregon sits in a basin east of the Cascade Range. It has steep sloped mountains nearby and is adjacent to Klamath Lake, Oregon's largest lake. This topography contributes to surface inversions during the winter which results in elevated $PM_{2.5}$ concentrations.

Surface inversions typically form in three ways:

1) Nighttime or radiation inversions form during calm, clear, winter nights when surface heat loss cools the air just above the ground. Air is a poor heat conductor and the air above the surface air remains warm. With calm winds, the cold surface air and warmer upper air don't mix and stagnation occurs. Clear skies increase the rate of cooling at the Earth's surface and the long winter nights allow for the cooling of the ground to continue over a longer period of time, resulting in a greater temperature decrease at the surface and a more severe inversion.

   In valleys and basins the inversion is exacerbated by cool surface air flowing down from the surrounding slopes displacing warmer air.

   During the daylight hours, surface inversions normally weaken and disappear as the sun warms the Earth's surface. Snow and fog delay surface warming.

2) Advective inversions are formed from cool air moving in from a nearby lake or ocean, often during the afternoon when onshore breezes form.

3) Subsidence inversions form during prolong, stable high pressure systems. High pressure systems cause downward movement of air and the lowering of the inversion layer over time. Subsidence inversions are typically very strong and can keep fog trapped at the surface. The fog prevents daytime warming and limits or prevents the inversion from lifting.

   In mountain valleys, air pollution is trapped from above by the inversion and from the sides by the mountains.

Figures 1 and 2 show nighttime and subsidence inversion (provided by the National Weather Service).

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

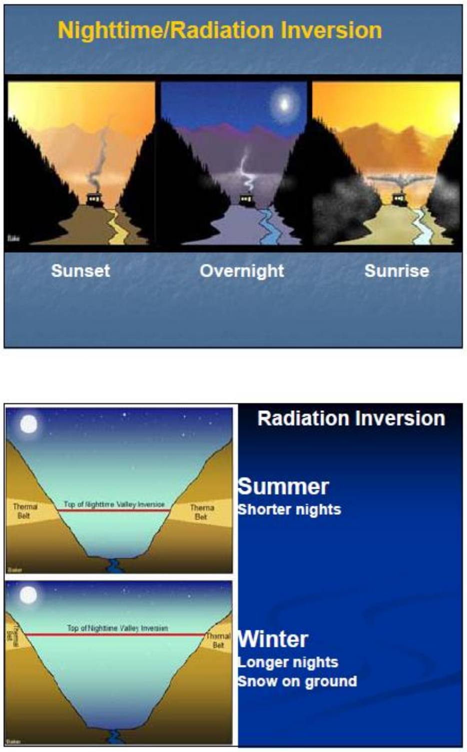


Figure 1. Nighttime/Radiation inversion.

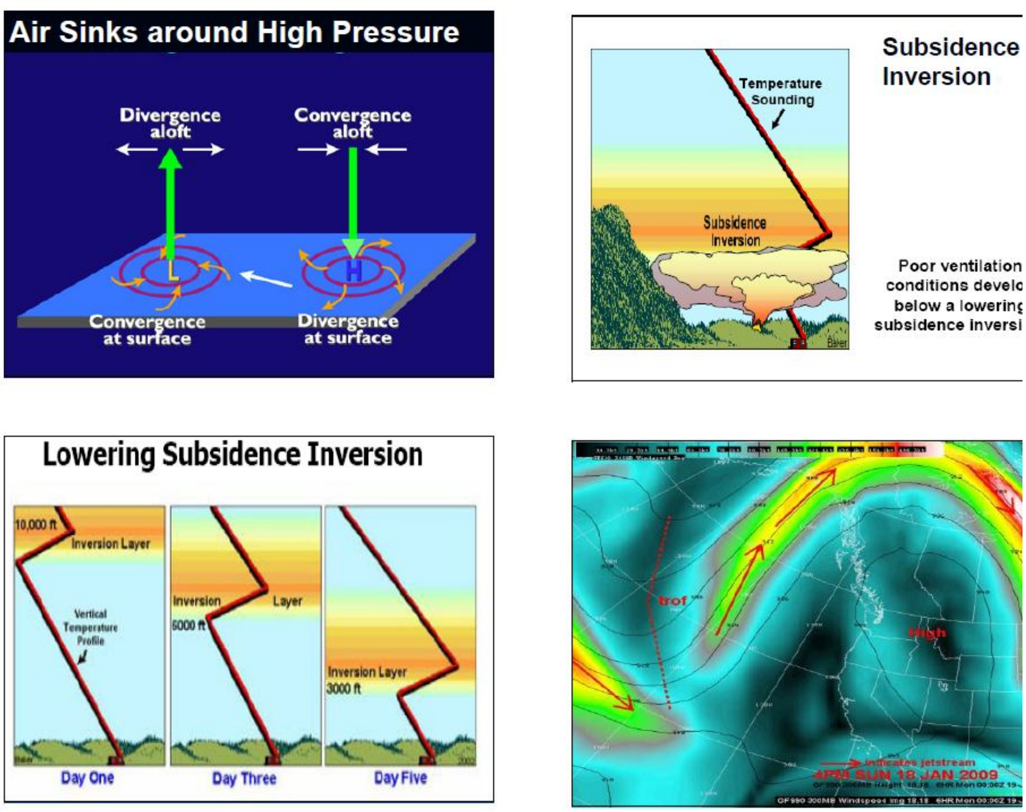


Figure 2. Subsidence inversion.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

Klamath Falls has many of the elements needed to form winter inversions. It often has calm winds and cold, clear evenings during the winter. It often has snow on the ground which slows surface heating. It has a very large lake next to it which promotes advective inversions. It often experiences prolong winter high pressure systems which result in subsidence inversions. It is in a basin with steep mountains directly to the north and east and other mountains further away to the south and west which result in down slope flow of cool air and helps to trap cold air from subsidence inversions.

The purpose of this report is to demonstrate how Klamath Falls' topography and winter meteorology elevate $PM_{2.5}$ levels and to compare. A second purpose is to show that the winter meteorology in 2008 (the SIP baseline year) resulted in higher $PM_{2.5}$ winter concentration than other years during the last decade.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

3.0 Topography

Klamath Falls sits in Klamath Basin at around 4100 foot elevation. Klamath Falls is bordered by mountains on all sides. Hogback Mountain borders it to the North and Northeast at over 5000ft. Stukel Mountail lies to the Southeast at over 6000ft. The Klamath Hills sit to the south rising to over 5000ft. Hills to the west rise quickly to 4700ft. The topography is shown in Figures 3 through 5.

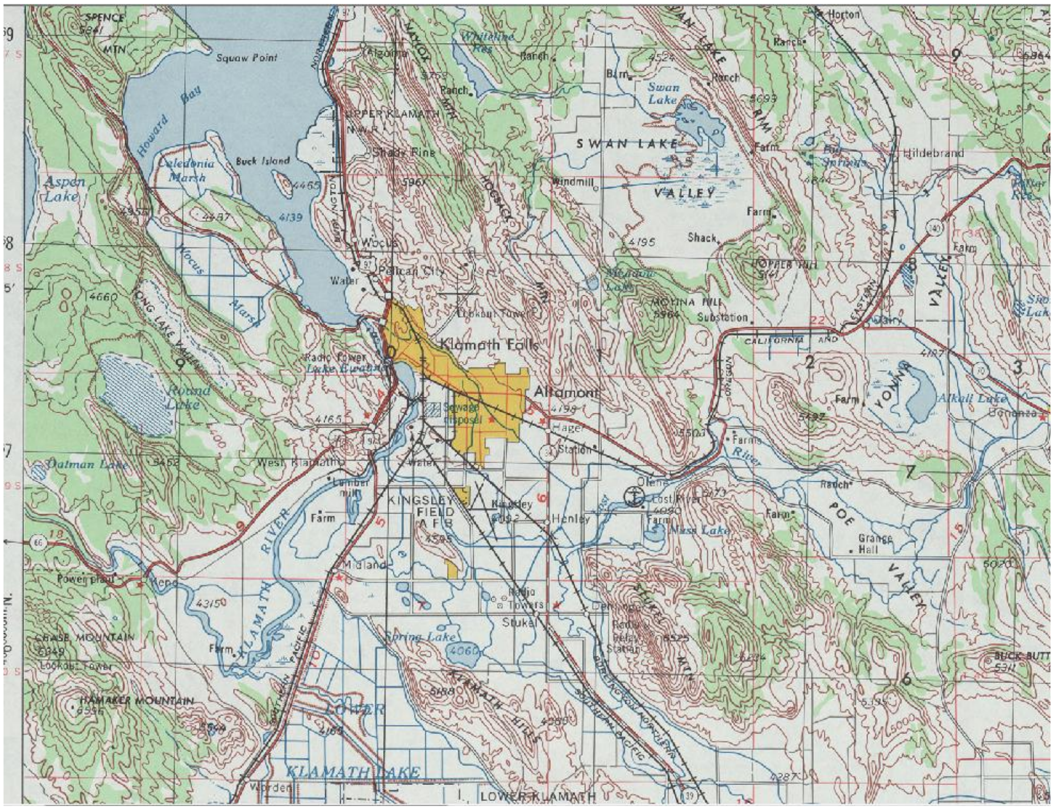


Figure 3. USGS topographical map showing the Klamath Falls Basin.

The contour lines indicate elevation change, and show that there are steep mountains just to the north and east of Klamath Falls (The city is shown in yellow). There are also steep mountains much further to the south. The Cascade foothills start to the west of Klamath Falls.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

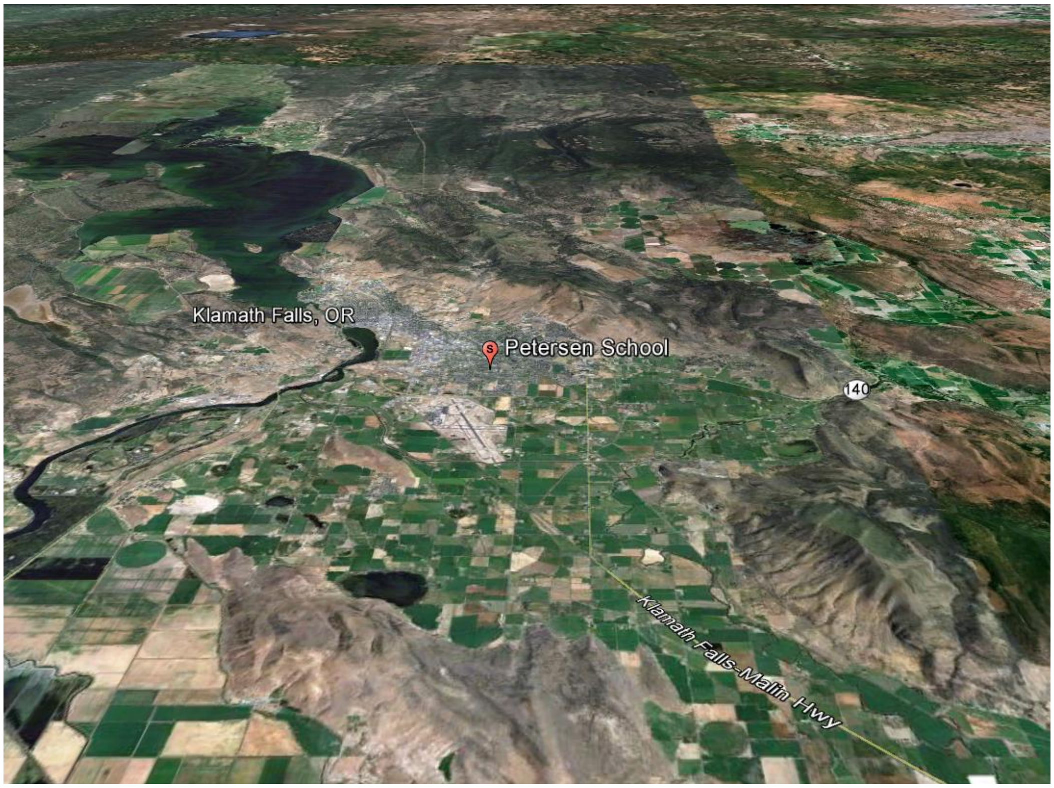


Figure 4. 3-D satellite image showing the Klamath Falls Basin.
The air quality monitor is located at Peterson School. Google Earth™
The Satellite image provides a good image of the basin, the locations of the mountains and the steepness of the slopes. It also shows the location of the lake in comparison to Peterson School.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

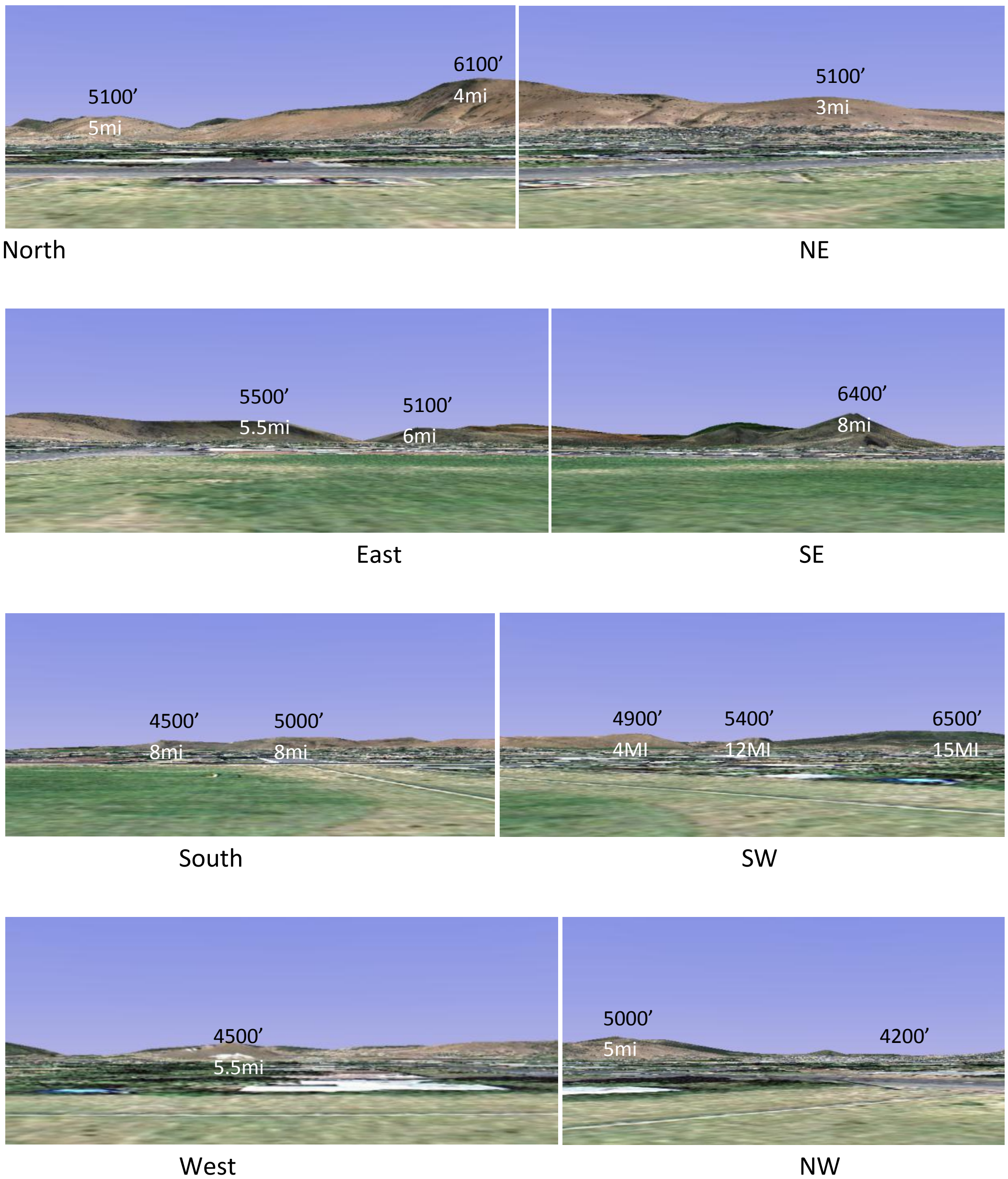


Figure 5. Ground level images showing the Klamath Falls Basin.
The observation point is at Peterson School (at 4100ft). The elevation and distances are taken from Google Earth™. The height is in feet, the distance is in miles.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

4.0 Winter Temperatures

Comparison to Other Cities

Klamath Falls is in Eastern Oregon, which in general experiences colder, dryer winters than Western Oregon for comparison (Figures 6 & 7). The Cascade Range is to the west of Eastern Oregon and blocks much of the cloud cover from the Pacific Ocean. Much of Eastern Oregon is also at a higher elevation than Western Oregon. These factors result in cool, clear evenings and sunny days. Klamath Falls has a similar average winter temperature as compared to other Eastern Oregon Cities.

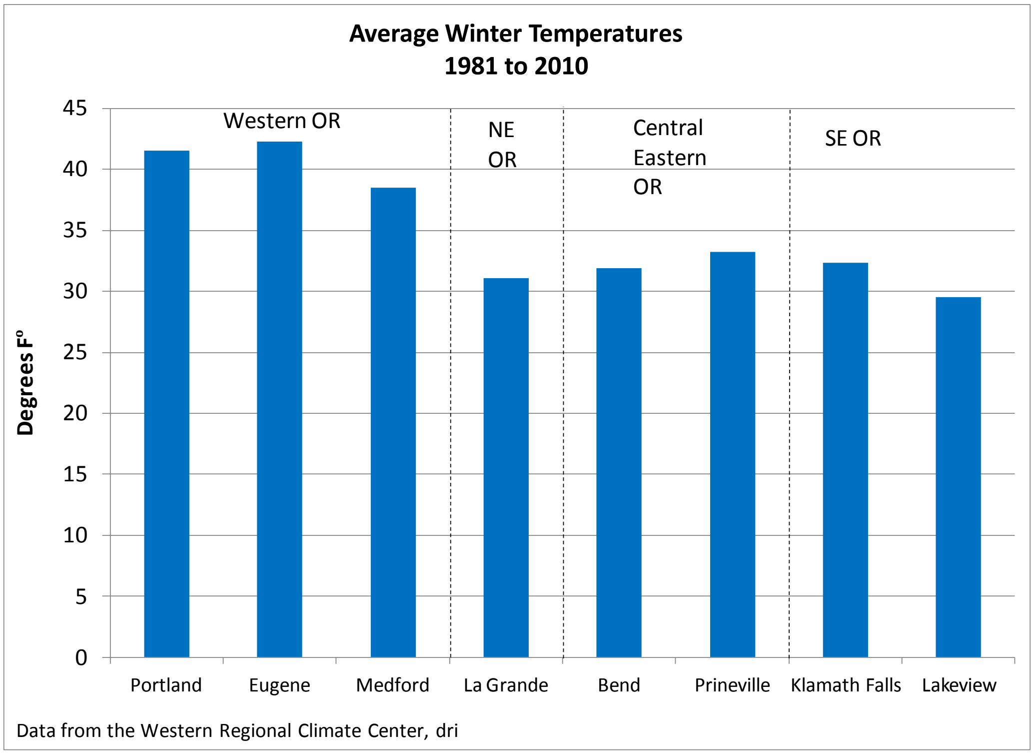


Figure 6. Oregon cities average winter temperatures.
Winter is defined as Dec & Jan.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

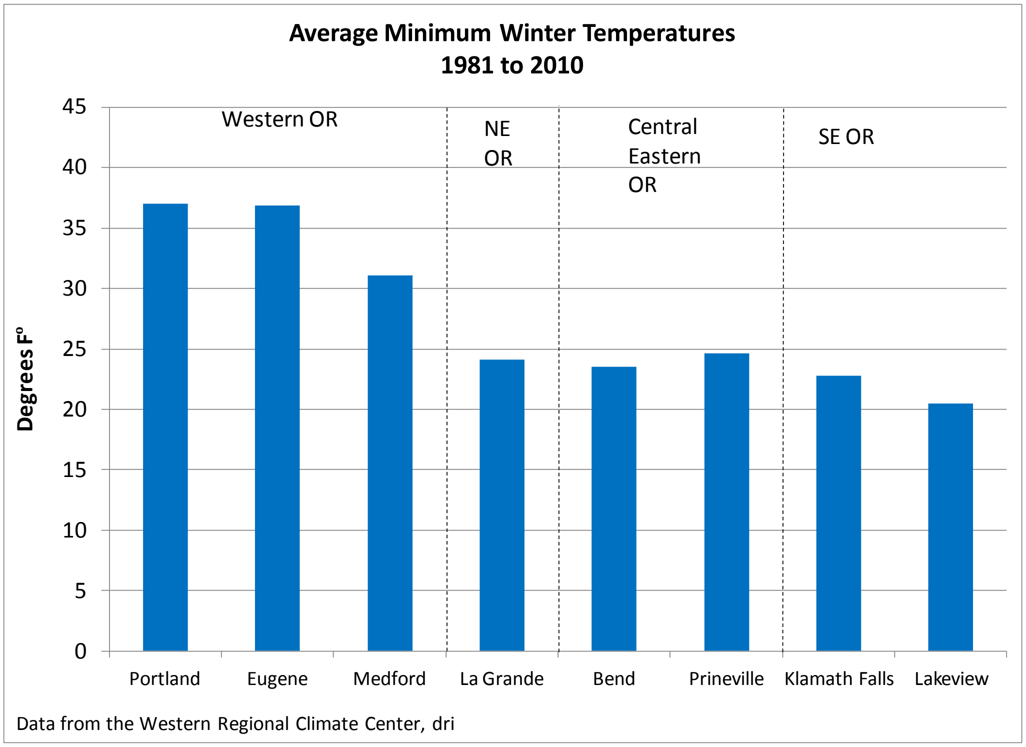


Figure 7. Oregon cities average minimum winter temperatures.
Winter is defined as Dec & Jan

<u>Diurnal Winter Temperature</u>

Klamath Falls has an average winter, nightly low temperature of -2.4ºC and an average winter daytime high of 4.8 ºC (Figure 8). 2008 has the lowest winter average temperature in the past decade (Figures 9 & 10).

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

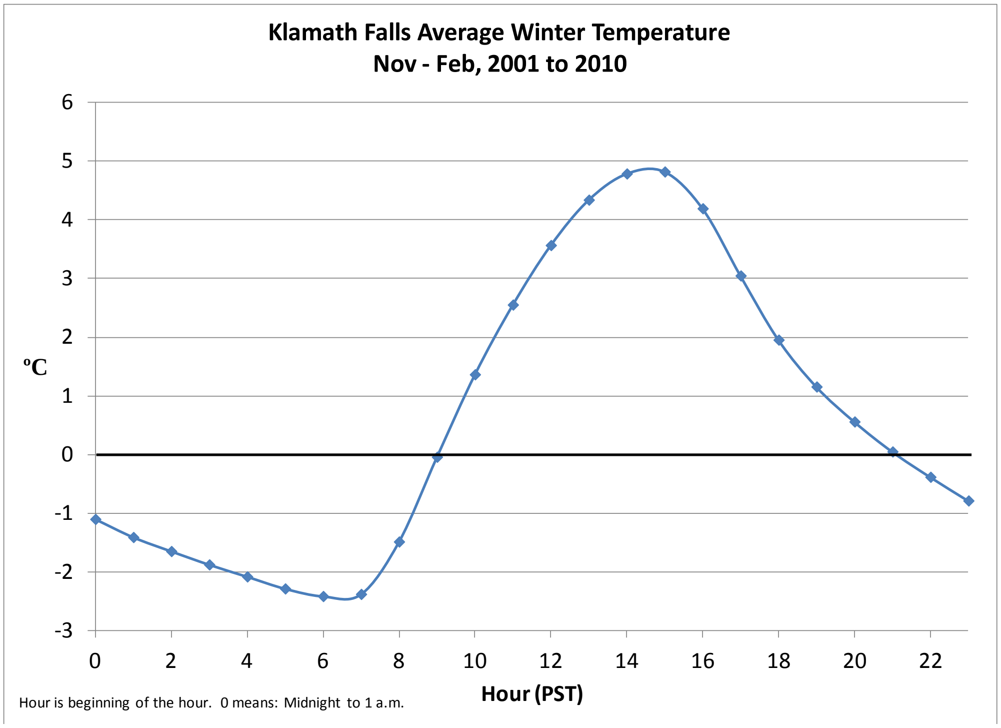


Figure 8. Klamath Falls average winter diurnal temperatures.

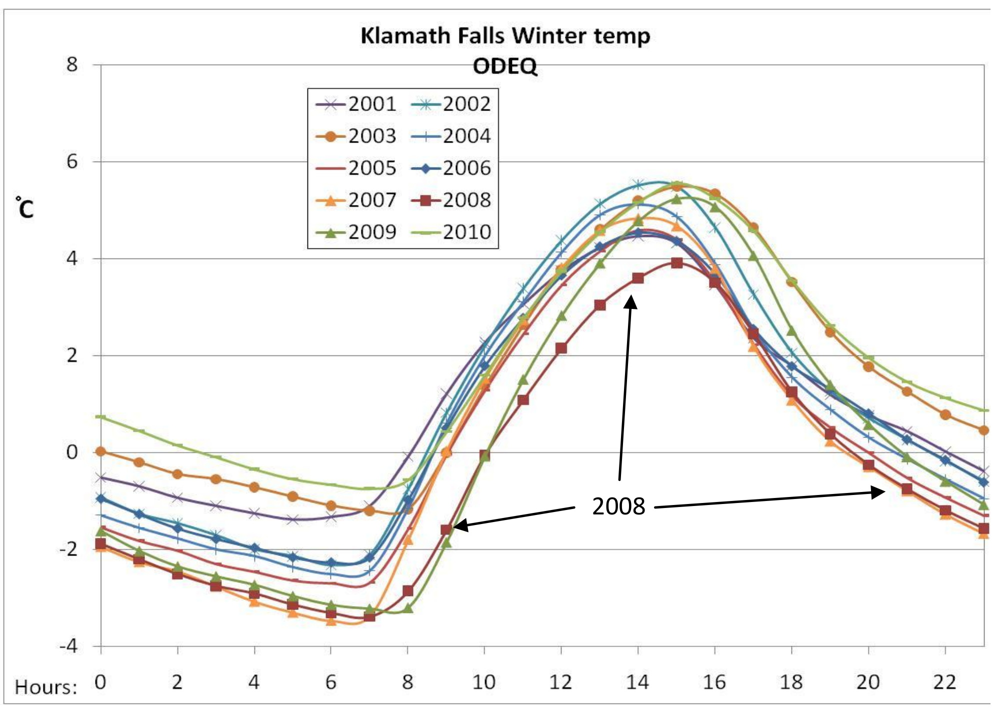


Figure 9. 2001-2010 Klamath Falls average, winter diurnal temperatures.

2008 has a lower diurnal average temperature than the other years showing that it had both colder days and evenings. Colder temperatures result in more building heating from wood heating combustion and more $PM_{2.5}$ emissions. *Winter is defined as Nov-Feb.*

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

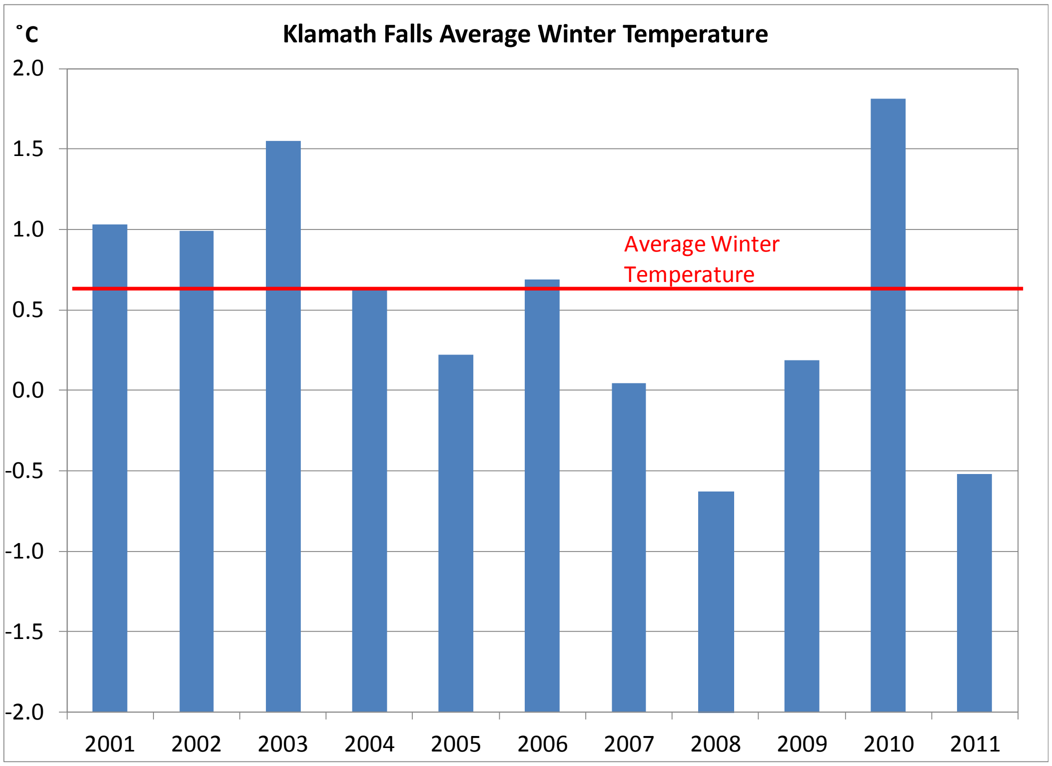


Figure 10. Klamath Falls 2001-2011 average, winter temperatures.
Winter is defined as Nov-Feb.

5.0 Heating degree days

The heating degree days measure was designed to determine the relative amount of heating required to keep a building at 65ºF. This is useful for determining residential wood heating demand which is often met by residential wood combustion, a major $PM_{2.5}$ source. Figure 11 shows the heating degree days for Klamath Falls by month. As expected November through February have the highest heating degree days.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

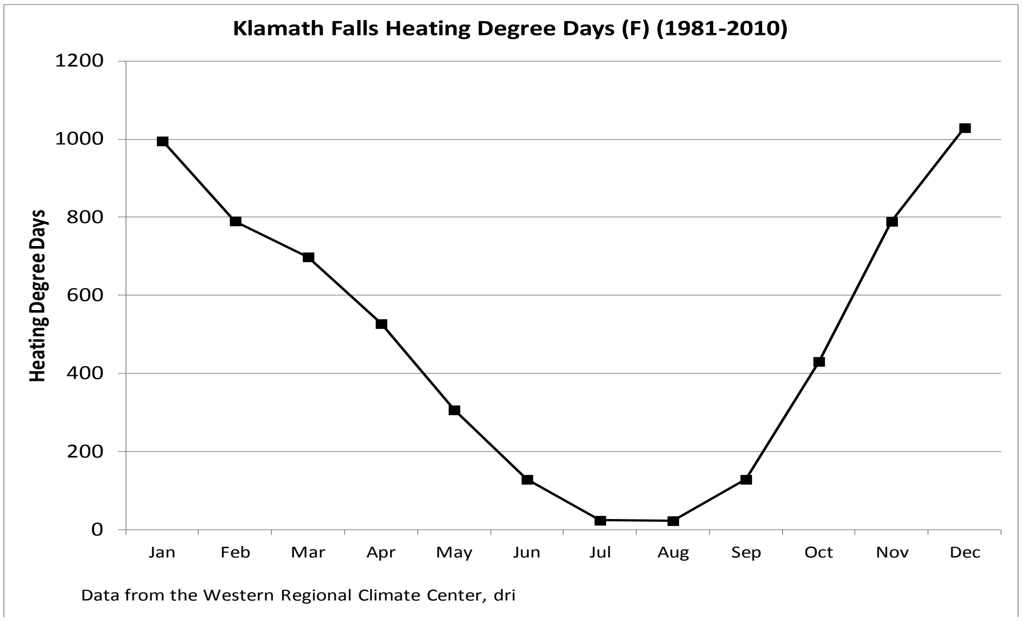


Figure 11. Klamath Falls Heating Degree Day averages.

<u>Comparison to Other Cities</u>

Figure 12 shows the winter heating degree days for various cities in Oregon where data was available. Klamath Falls has a comparable number of heating degree days as other Eastern Oregon cities, therefore, heating degree days by itself does not explain why Klamath Falls has more elevated $PM_{2.5}$ levels than other areas.

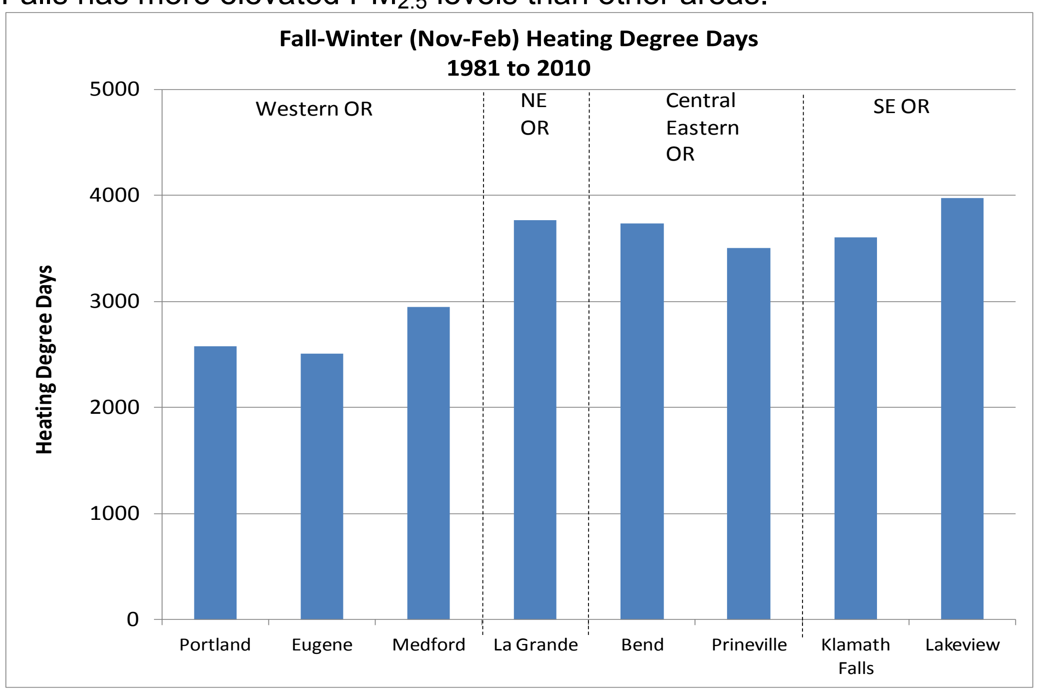


Figure 12 Oregon cities average, winter heating degree days.
Winter is defined as Nov-Feb.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

Comparison by year

When compared to other years in the decade, 2008 had the highest heating degree day value (Figure 13). This means that in 2008 more heat was required to keep a building at 65ºF than during other years. The level was not dramatically higher than most other years however.

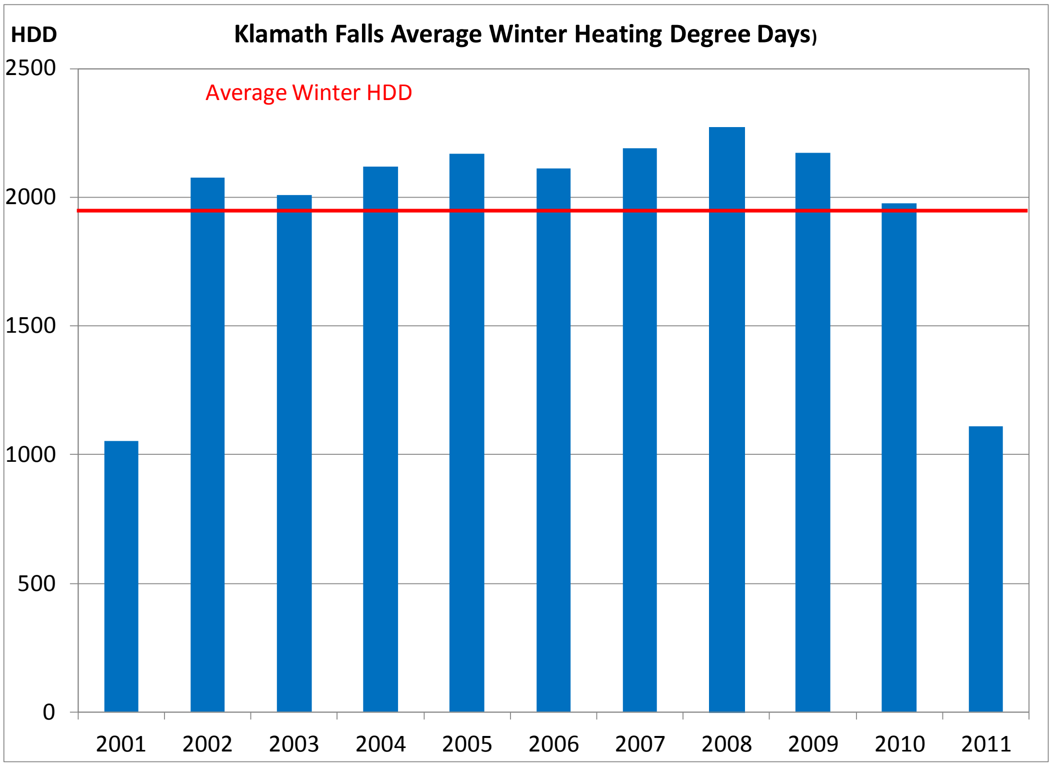


Figure 13. Klamath Falls' 2001 – 2011 winter Heating Degree Days. 2008 had the highest HDD value in the past 10 years suggesting the most wood heating also occurred. *Winter is defined as Nov-Feb.*

2008 not only had the highest HDD in ten years but it also had the highest heating oil prices (Figure 14). The combination of the need for more heat and the high fuel prices encouraged more wood heating combustion, and elevated the $PM_{2.5}$ levels.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

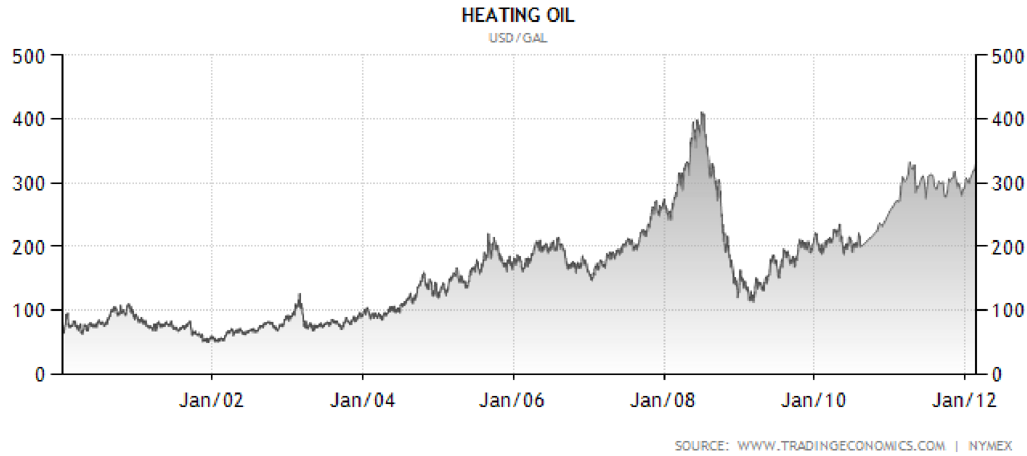


Figure 14. Fuel Oil Prices in US Dollar (cents)/gal.
The fuel prices peaked in 2008, likely encouraging many people to heat with wood combustion.

6.0 Wind

6.1 Wind Speed

Wind speeds impact air quality by influencing the amount of vertical mixing. Low wind speeds often are conducive to inversions and elevated $PM_{2.5}$ concentrations. The Medford National Weather Service approximated that sustained winds below 5mph allow inversions to persist.

Klamath Falls, average winter wind speed is classified as a "Light Breeze" using the Beaufort wind scale. The average wind speed at Klamath Falls, Peterson School is 4.6mph for Nov-Feb from 2001 to 2010. For the same period, the average wind speed at Kingsley Field Airport south of Klamath Falls was 6.0 mph. Table 1 shows wind speed averages and percentages.

Table 1. Klamath Falls winter wind speed statistics.

	Average	% hrs ≤5mph
Peterson School	4.4	71%
Kingsley Field	6.0	55%

Comparison by year
When compared to other years in the decade, Peterson School's 2008 wind speed was among the lowest (Figure 15). The wind speed difference is not very large but there are a lot of hours in the average and a slightly lower average wind speed can indicate a winter with more stagnation events.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

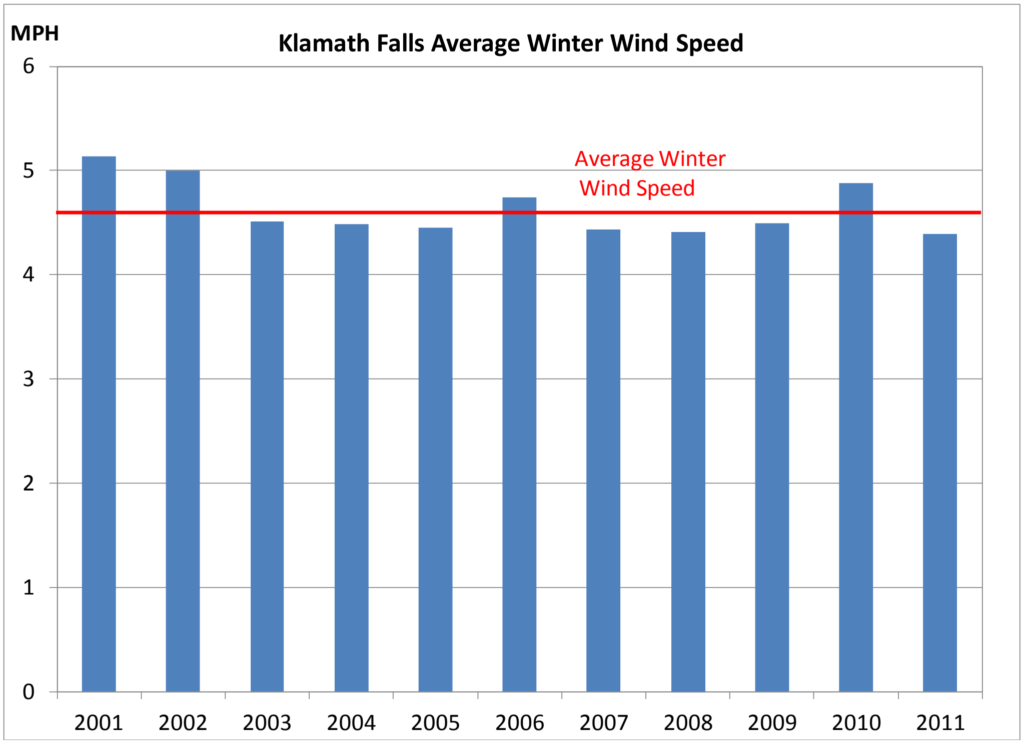


Figure 15. Klamath Falls 2001-2011 average, winter wind speed.
Winter is defined as Nov-Feb.

Kingsley field provides a second source of wind speed data. In 2008 the average winter wind speed was at the 10 year average (Figure 16). The two locations show that the 2008 wind speed was at or below average indicating better than average chance of stagnant conditions and poor air quality.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

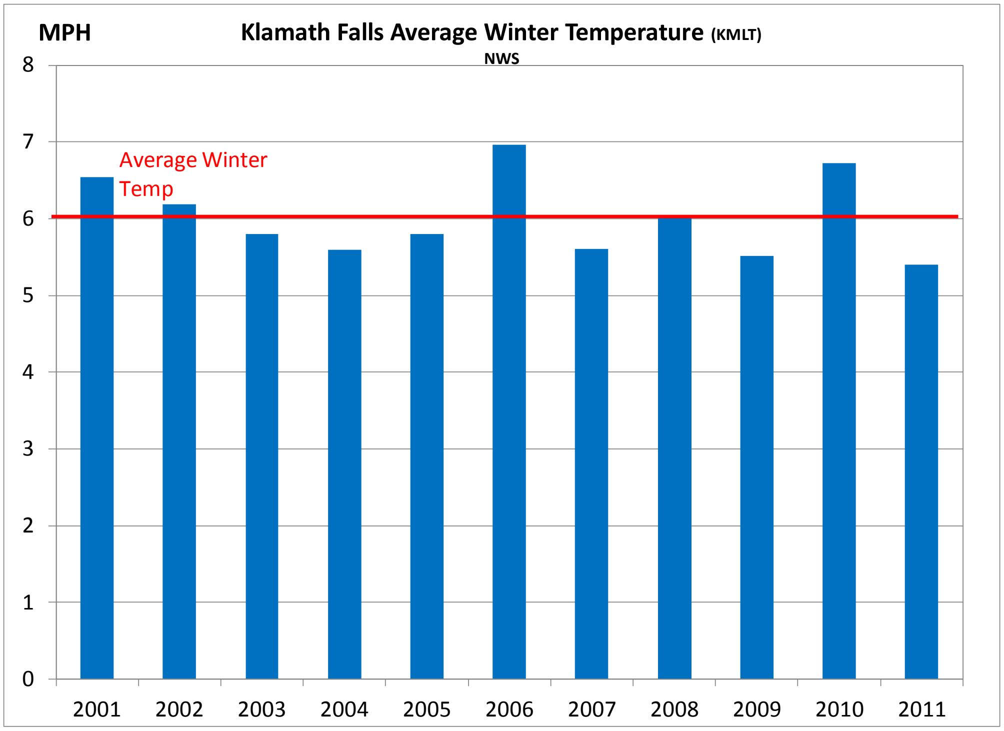


Figure 16. Klamath Falls Kingsley Field 2001-2011 average, winter wind speed.

Low wind speeds often co-exists with stable atmospheric conditions and no vertical mixing which can lead to elevated $PM_{2.5}$ levels. In fact, during hours with estimated $PM_{2.5}$ averages >35µg/m^3, the average wind speed was only 2.2 mph. This can be demonstrated further, by looking at the wind speed during an elevated $PM_{2.5}$ episode. Figure 17 shows the $PM_{2.5}$ estimates and corresponding wind speeds during the week of February 7th, 2011. This episode shows elevated $PM_{2.5}$ during low wind speeds. When the wind speed is above 5mph, the $PM_{2.5}$ levels drop.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

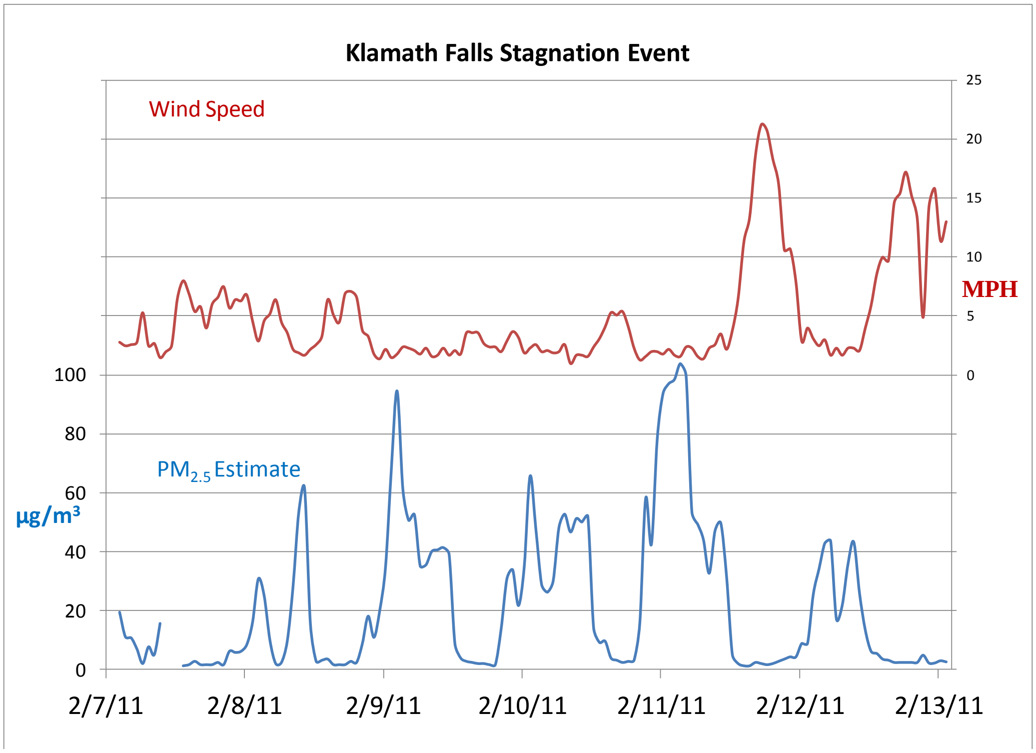


Figure 17. Klamath Falls example of wind speeds relationship to $PM_{2.5}$.

Elevated $PM_{2.5}$ is only present during low wind speeds. Wind speeds above 5mph prevent high $PM_{2.5}$ concentrations. Low wind speeds don't necessarily result in elevated $PM_{2.5}$ because an inversion must also be present.

6.2 Wind Direction

The wind direction is usually variable during low wind speeds, however, in Klamath Falls there is often a northwest flow when $PM_{2.5}$ levels are elevated. Figure 18 shows the wind rose during the high $PM_{2.5}$ event shown in Figure 17. The wind direction during this event has a northwest component during low wind speeds.

The slight northwest air flow which occurs during elevated $PM_{2.5}$ events could be bringing the colder air off of Klamath Lake which may strengthen the inversion.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$ and Consideration of 2008 as a base year.

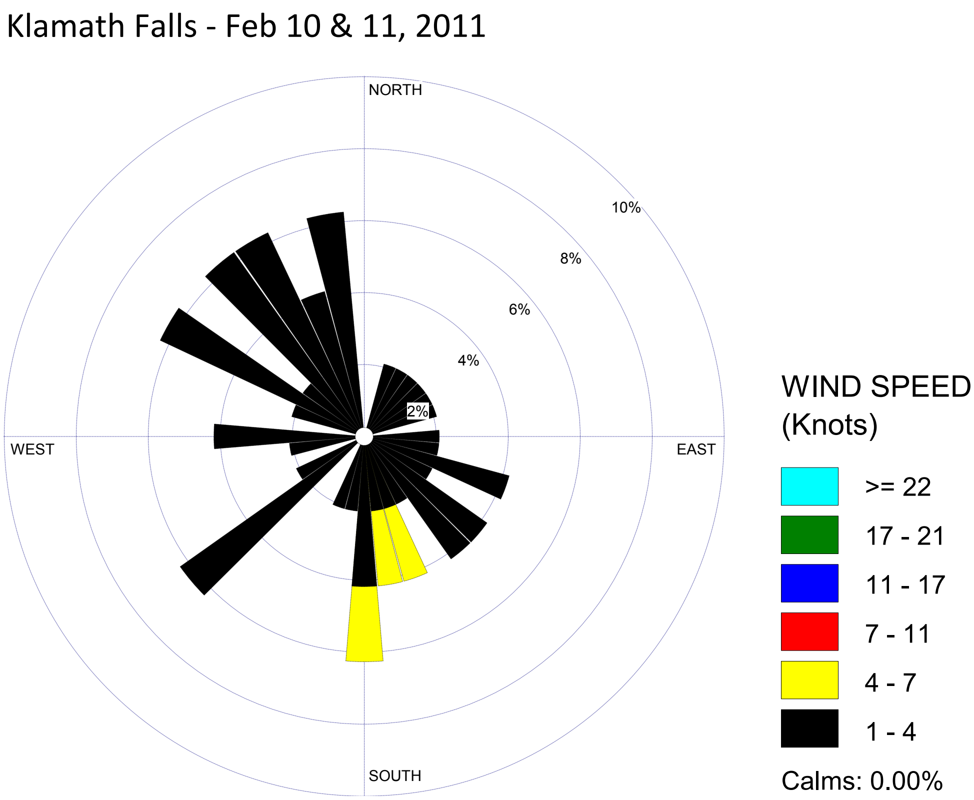


Figure 18. Klamath Falls wind rose on elevated $PM_{2.5}$ day.

The slight northwest flow is not bringing in $PM_{2.5}$ from outside the Valley. A monitoring survey conducted during the winter of 2010/2011 compare $PM_{2.5}$ concentrations around Klamath Falls (Barnack, 2012) showed that the highest levels were at or near Peterson School. The areas to the northwest were lower than other areas in the Klamath Falls Valley. This indicates that the $PM_{2.5}$ levels at Peterson School are from very, localized sources.

7.0 Inversions

Inversions occur when cold air is below warm air with no wind and results in stable atmospheric conditions (no air movement). Inversions can be measured using temperature differences (Delta T) at the surface and at elevation. The Delta temperature can be combined with wind speed to calculate atmospheric stability conditions. Under a stable atmospheric condition, $PM_{2.5}$ cannot move away from the surface and concentrations rise over time.

7.1 Delta T

Delta temperature was measured in Klamath Falls between 2001 and 2011 but the data between 2006 through 2009 was not used because the upper temperature aspirator was not functioning properly resulting in higher temperatures when the sun was out. The diurnal delta

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

temperature averages for the remaining years show a similar pattern of evening inversions followed by daily mixing (Figure 19).

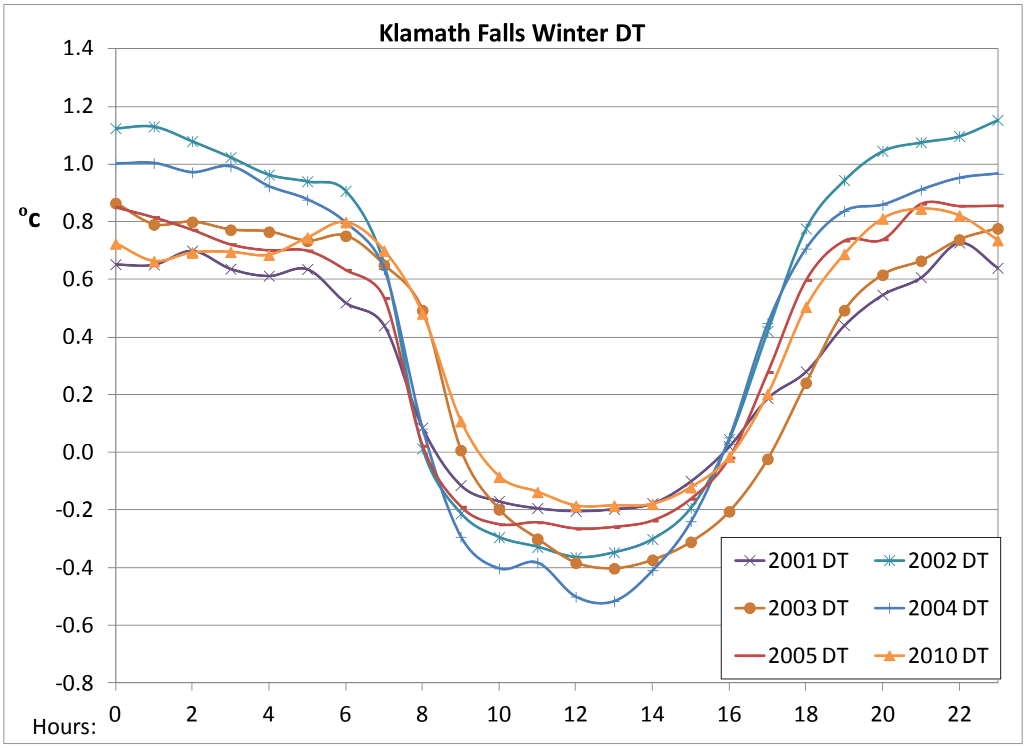


Figure 19. Klamath Falls' diurnal average, winter delta temperatures.
The delta temperatures show warmer air aloft from about 4 PM to 8 AM. All years show a similar pattern. *Winter is defined as Nov-Feb.*

Elevated $PM_{2.5}$ levels occur during these evening inversions and levels remain high until the inversions lift. This is illustrated during a 2011 stagnation period shown in Figure 20 and in more detail in Figure 21. The $PM_{2.5}$ concentrations are elevated during the evening when the Delta temperature is most positive (positive Delta temperature indicates an inversion). When the Delta temperature becomes negative (indicating mixing), the $PM_{2.5}$ levels drop.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

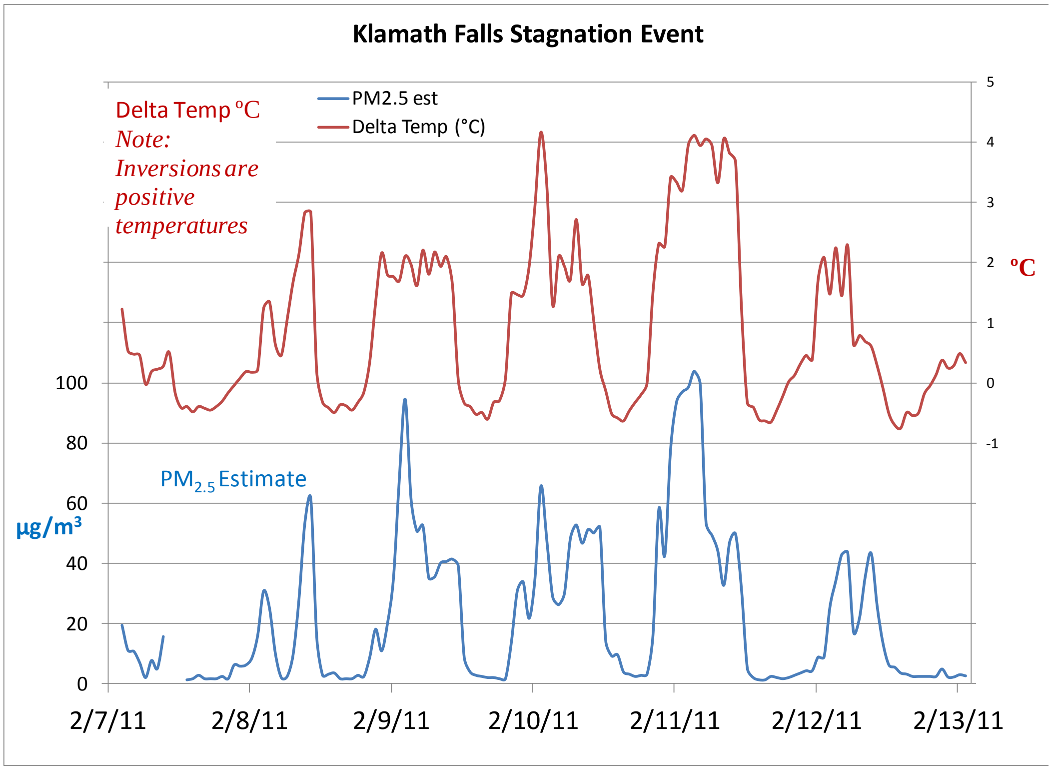


Figure 20. Klamath Falls $PM_{2.5}$ relationship to inversions.

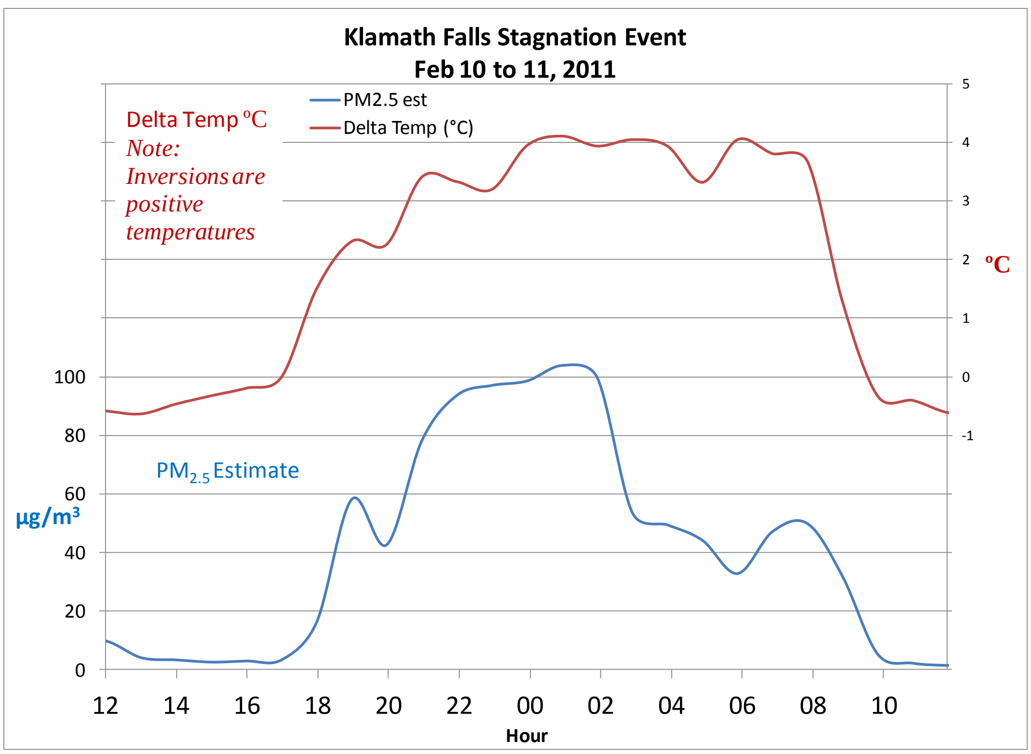


Figure 21. $PM_{2.5}$ relationship to inversions. Zoomed in.

Positive delta temperatures indicate inversions. The inversions coincide with elevated $PM_{2.5}$ levels very closely, indicating that inversions are the major meteorological factor exacerbating high $PM_{2.5}$ levels.

7.2 Stability Ratio

Delta temperature by itself can indicate an inversion but it is subjective; the more positive the temperature, the stronger the inversion. A more quantitative approach to measuring the strength of an inversion is to calculate its stability class ratio. Stability class ratios are a measure of the atmospheric stability calculated using the delta temperature and the wind speed. The ratio can be compared to a stability class scale to determine the strength of an inversion. The scale is divided into very stable, stable, neutral, and unstable. Appendix A provides the calculation and the scale for determining the stability class.

The Klamath Falls average winter diurnal stability ratios were calculated for 2001 - 2005, and 2010 (Figure 22). Again, the delta temperature was unavailable for 2006 through 2009 so stability couldn't be calculated.

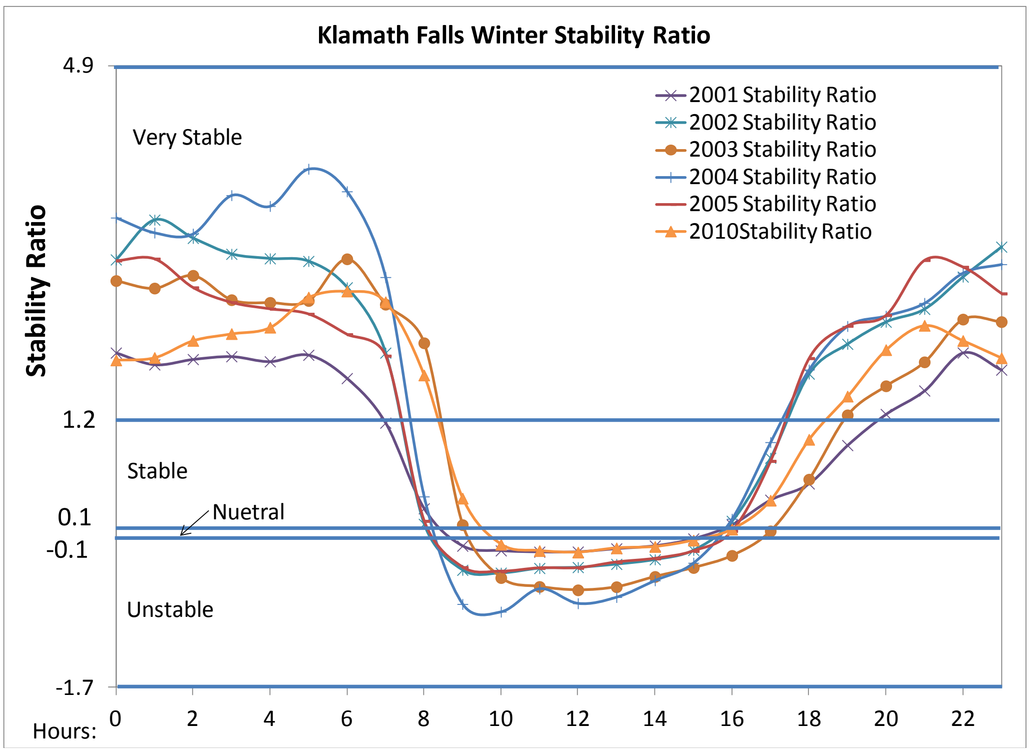


Figure 22. Klamath Falls average winter, diurnal stability ratios, 2001-2005 & 2010.

The stability class ratios show that on average Klamath Falls has very stable winter conditions during the evening and unstable during the day. *Winter is defined as Nov-Feb.*

The average daily, winter stability profile for these years was compared to the profile on the days with $PM_{2.5}$ estimates > 35ug/m^3 (Figure 23). As expected the atmosphere is much more stable during the maximum $PM_{2.5}$ nights and mornings.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

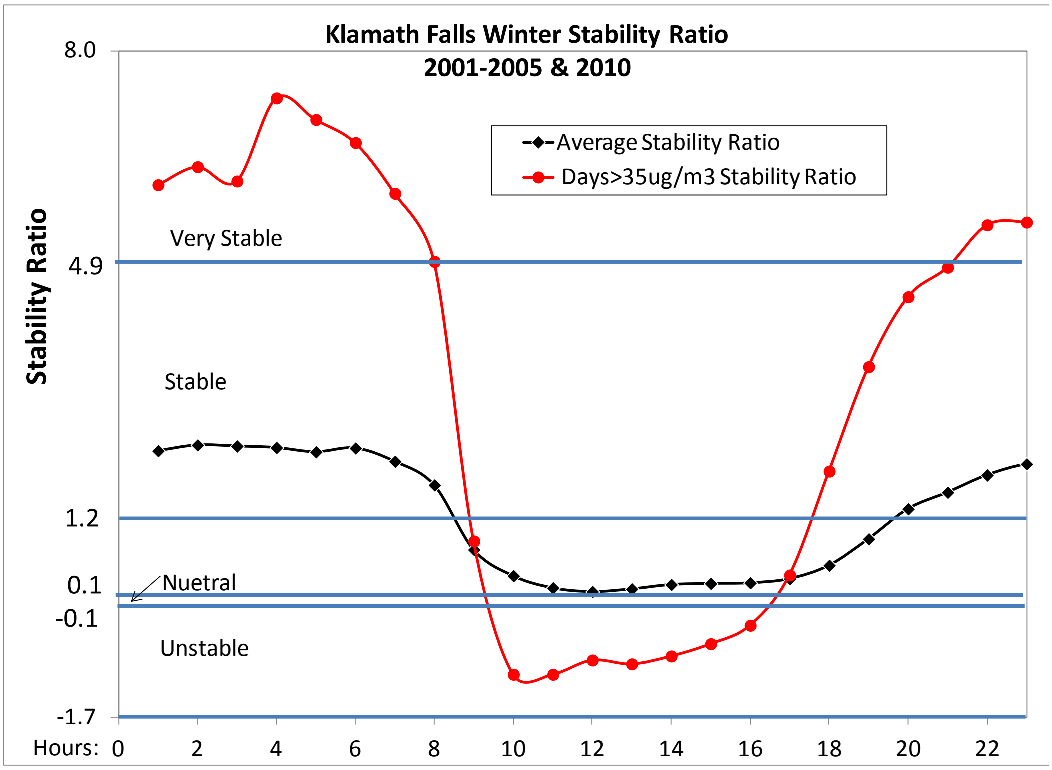


Figure 23. Klamath Falls' average, winter stability ratios – diurnal.
The surface atmosphere is much more stable on days with elevated $PM_{2.5}$ when compared to the average diurnal, winter stability profile. *Winter is defined as Nov-Feb.*

7.3 Fog

Inversions also trap fog near the surface and surrogates like foggy days can be used to get an idea about when inversions are present. Figure 24 shows the number of foggy, winter days per year recorded by the National Weather Service at the Kingsley Field airport. According to this data, 2008 had an above average number of foggy days and evenings and the most number of foggy days since 2004. This indicates that there were an above average number of days with inversions in 2008 causing more elevated $PM_{2.5}$ days than normal.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

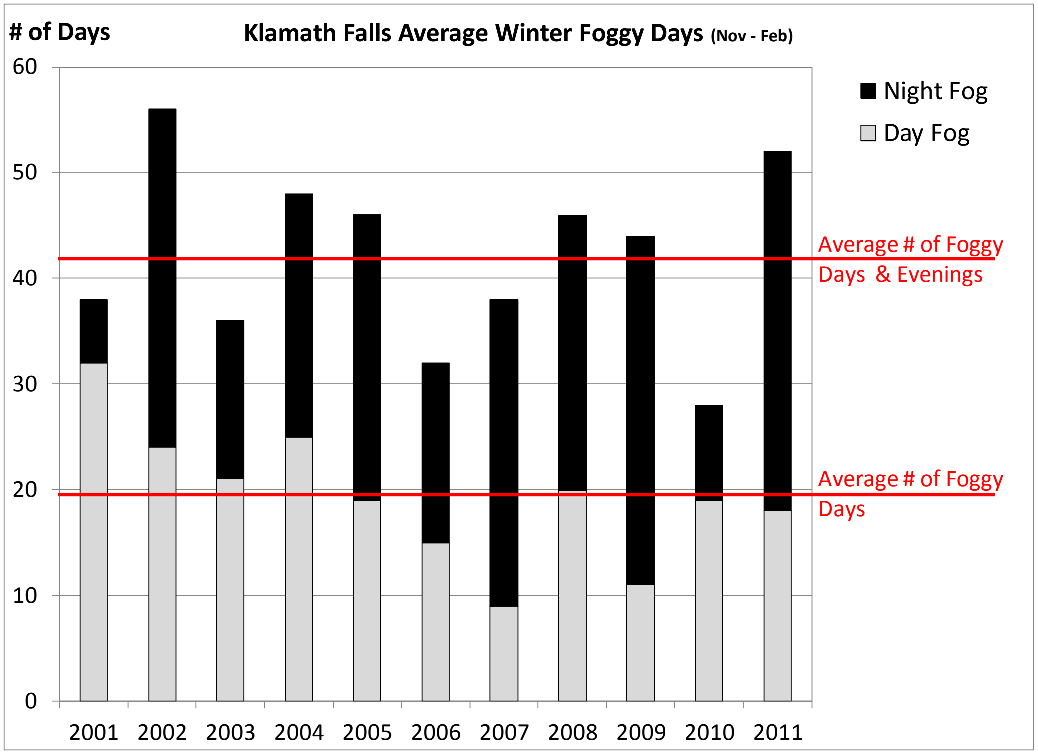


Figure 24. Number of days with fog in Klamath Falls from 2001-2011.

Fog often occurs during inversions and can be used as a surrogate. 2008 had more foggy days and evenings than average and more foggy days than average. The data was compiled by the NWS at Kingsley Field and appears and is subjective in nature.

8.0 Conclusion

Klamath Falls has similar winter temperatures and heating degree days as other Eastern Oregon Communities that have much lower $PM_{2.5}$ levels. The difference is that Klamath Falls' has a unique topography. Klamath Falls lies in a basin with mountains on three sides and a large lake to the north. This topography is conducive to surface inversion formation. The surrounding mountains keep the wind speeds low, and cold air slides down the slopes into the valley during the evening. Cold air from the frozen surface of Klamath Lake can also drift southeast into town.

Surface inversions are most directly measured using delta temperature and the atmospheric stability derived from it. Both show a strong diurnal pattern of overnight inversions followed by daytime mixing. On average, winter inversions form around 4 P.M. and break up between 8 to 10 A.M.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5.}$ and Consideration of 2008 as a base year.

2008 Comparison
Unfortunately, delta temperature was unavailable for 2008 so determining this year's suitability as a baseline year has to be done using other meteorological parameters such as temperature, wind speed, and fog.

The 2008 average winter temperature was the lowest of the past decade which resulted in the highest heating degree day value (most heating required) for this same period. The low temperatures do not necessarily imply that inversions were present, but do lead to more woodstove heating. The 2008 wind speed was below the ten year average, indicating that 2008 was more stagnant than other years. The 2008 wind speed average was similar to many other years however and by itself does not indicate an unusually stagnant year. The number of foggy days in 2008 was above average. This is an indicator of inversions and would suggest that there were more days with inversion than typical.
With lower than normal temperatures and wind speeds, and more foggy days than usual, 2008 appears to be a more cold and stagnant winter than average resulting in higher $PM_{2.5}$ levels.

9.0 References

Barnack, A., Klamath Falls Winter 2010-2011, $PM_{2.5}$ Survey, Oregon Department of Environmental Quality, Jan, 2012.

How Klamath Falls' Topography and Winter Meteorology elevate $PM_{2.5}$. and Consideration of 2008 as a base year.

Appendix Inversions

Background:

In the atmosphere, air cools as elevation increases. A measure of the temperature change relative to the elevation is the lapse rate. The adiabatic lapse rate is the change in temperature of a parcel of air as it moves upwards (or downwards) without exchanging heat with its surroundings. This is the ideal lapse rate. The actual lapse rate is the actual change in temperature with elevation that is occurring. When the actual lapse rate is less than the adiabatic lapse rate, stable atmospheric conditions exist and an inversion is formed. In simple terms, the air cools with elevation, and if the air aloft is warmer than the air below, the air and the pollution it contains do not rise.

Stability Class:

A useful method to measure the strength of an inversion is to use the atmospheric stability ratio. The American Society of Agricultural Engineers (ASAE, 1983) recommends using the stability ratio developed by Yates et al. (1974) to determine atmospheric stability which impacts spray drift. The stability ratio is derived using the equation:

$$\text{Stability Ratio} = \frac{TZ2 - TZ1}{U^2} * 10^5 \quad \text{(Munn, 1966)}$$

Where: TZ2 = Temperature (ºC) at 10meters
TZ1 = Temperature (ºC) at 2.5meters
U = The wind speed (cm/S) at 5meters

The sensor heights used in the equation were recommended by the ASAE. ODEQ has sensors in Klamath Falls at:

TZ2 = Temperature (ºC) at 15 meters
TZ1 = Temperature (ºC) at 2 meters
U = The wind speed (cm/S) at15 meters

Because the Klamath Falls meteorology data heights are different than the ASAE calculation recommended heights, there may some discrepancy in what the stability ratios would be if compared to ASAE values. For this report, relative stability ratios from year to year and for different days are compared, so those discrepancies are not important. Once the stability ratios are calculated for Klamath Falls, they can be compared to the stability classes in Table 2 (Yates et al.) to determine the severity of the inversion.

Table 2. Atmospheric Stability Condition Stability Ratio Range

Unstable	-1.7 to -0.1
Neutral	-0.1 to 0.1
Stable	0.1 to 1.2
Very Stable	1.2 to 4.9

KLAMATH FALLS

2008 OREGON WOODHEATING SURVEY

FINAL OVERVIEW REPORT

January 2009

Prepared by Oregon Institute of Technology
For the Oregon Department of Environmental Quality Air Quality Division

Table of Contents

Section I: Introduction and Survey Methods

Introduction

The U. S. Environmental Protection Agency (EPA), in response to the Clean Air Act (1970), established the first national air quality standards for particulate matter (PM) in 1971. In 1987 the EPA modified the standard to regulate only inhalable particles smaller in diameter than 10 µm, designated as PM_{10}. In 1997, while initial standards were set for $PM_{2.5}$ (i.e., "fine particles" whose diameters are < 2.5 µm) due to lengthy studies indicating their link to heart and lung disease, the agency also revised PM_{10} standards to regulate "inhalable coarse particles" whose diameter fell within the 2.5 – 10 µm range.

In 2006 EPA tightened the 24-hour standard for $PM_{2.5}$ from 65 to 35 µg/m^3, but left unchanged the $PM_{2.5}$ annual standard of 15 µg/m^3. At the same time, EPA revoked the annual PM_{10}, standard, but retained its 24-hour standard of 150 µg/m^3. In December, 2007, the Klamath Falls area was designated as a "non-attainment" area for $PM_{2.5}$.

Fine particles, i.e., $PM_{2.5}$, are generated from combustion processes such as forest fires, wood stoves, but can also be formed from gases emitted from power plants, industries and automobiles.

Over the past decade the Oregon Department of Environmental Quality (DEQ) has conducted several surveys of Oregon residents to better ascertain the nature and frequency of private woodburning practices. Residents of the Klamath Falls area were surveyed in 1993 and1999, while residents of La Grande were surveyed in 2002. The 1993 survey also included the communities of Portland, Grants Pass, Medford-Ashland, Lakeview, Bend, Prineville, Pendleton, La Grande, Roseburg, and Sisters.

During the summer of 2008, Oregon Institute of Technology (OIT) mailed questionnaires to 2800 residences selected at random in the Klamath Falls, OR area to ascertain their woodburning practices. This survey is intended to provide Oregon Department of Environmental Quality (DEQ) with information regarding:

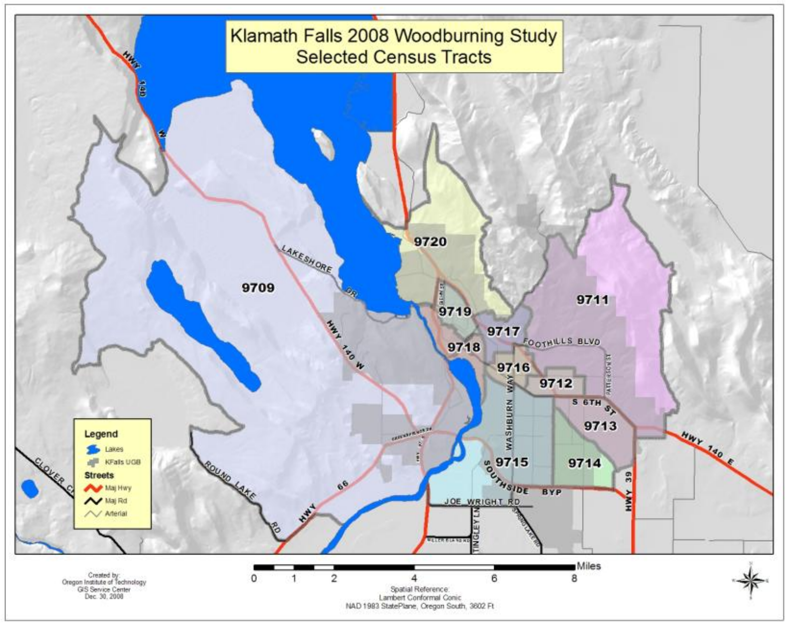
- Primary and secondary sources of home heating in Klamath Falls
- Use of woodburning devices
    - Frequency
    - Type
    - Amount
- Outdoor burning practices

This report consists of a selection of highlights from the Klamath Falls survey considered to be of interest to the Klamath Falls community as well as DEQ. This information will aid DEQ in preparing emission inventory estimates and will be useful for planning purposes.

Compared with a similar survey in 1999, a smaller percentage of households in the Klamath Falls area are using wood for their primary heating source in 2008. This reduction in woodburning is a positive sign for reducing PM_{10} and $PM_{2.5}$ in the Klamath Falls area.

Survey Methods

Surveys were distributed to 2800 residences within the Klamath Falls area. A process involving Geographic Information Systems (GIS) was used to select residences from a uniform, random distribution across the 11 census tracts spanning the spatial extent of the Klamath Falls area. Figure 1 illustrates the juxtaposition of the Klamath Falls Urban Growth area upon the selected census tracts.



Candidate residences were determined by first selecting those ownership parcels within each of the census tracts that had a viable street address (as per data obtained from the Klamath County Assessor's office). Data from the Klamath Falls Planning office were then used to eliminate businesses from the list of candidate addresses. Finally, apartment complexes were also eliminated from the list. Based on the intent of distributing a total of 2800 surveys, a proportional number of residences were selected from each census tract based on the number of residences it contained.

The spatial distributions of viable candidate parcels (i.e., addresses) as well as the targeted parcels for each census tract are displayed in Appendix A, Figures A1-11.

Only 2.4% of the distributed surveys were returned as 'undeliverable' whereas 10% is a more typical value for mass mailings such as required for this study (Heather Bunker, IKON Print Services Manager/OIT).

Survey results indicated an average return from all census tracts of 16.3% with a low return of 8.8% from census tract 9716. In an effort to maintain consistency in the data across all census tracts, a follow-up survey was conducted with the expressed objective of increasing the amount of data from tract 9716.

On November 22, 2008 a follow-up, personal survey was conducted in the neighborhood of tract 9716. Participants were shown a copy of the map shown in Figure 2, depicting the major streets in the area pertaining to tract 9716. If the participant indicated that they resided within the census tract, they were asked following questions:

1. Do you burn wood inside your home?
2. What type of wood heating device do you use?
3. How much wood do you burn?

4. How many people are in your household?
5. Do you rent or own your house?

The follow-up survey gathered five more responses for census tract 9716, increasing the final percentage response for the tract to 11.8%. Graph 1 shows the % response per census tract for the study and includes the data gathered from the follow-up survey.

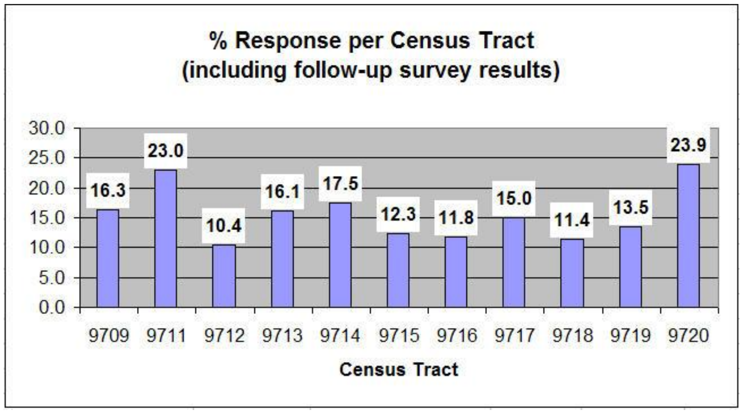


Table 1 displays, for each census tract, the number of addresses selected, the number and percentage of invalid addresses, as well as the number and percentage of surveys returned per census tract for this study (including the data obtained from the follow-up survey).

Census Tract	# of Selected Addresses	# of Invalid Addresses	% Invalid Addresses	# of Surveys Returned	% Return
9709	381	29	7.6	62	16.3
9711	326	7	2.1	75	23.0
9712	154	2	1.3	16	10.4
9713	355	4	1.1	57	16.1
9714	343	2	0.6	60	17.5
9715	243	2	0.8	30	12.3
9716	148	1	0.7	13	11.8
9717	220	8	3.6	33	15.0
9718	132	4	3.0	15	11.4
9719	230	3	1.3	31	13.5
9720	268	5	1.9	64	23.9
	2800	67	2.4	456	16.3

Section II: Summary of Results

2008 Klamath Falls Woodheating and Open Burning Survey (mail-in)

Indoor Burning Questions (2008-9)

1. What is the main source of heat for your home? Please check only one (454 responded)

   8.1% Wood; 61.7% Natural Gas; 9.5% Oil; 14.1% Electricity;

   7.9% Other (list) 6.4% geothermal; 1.3% heat pump; pellet stove, propane, other

2. Do you have a backup source for heating your home? Check one (437 responded)

   24.3% Wood; 9.8% Natural Gas; 2.1% Oil; 19.5% Electricity;

   39.6% None; 4.8% Other (see responses in table to right)

Question #2 - 'Other'	
Count	*Response*
4	Propane
4	Gas fireplace insert
3	Pellet stove
3	Did not answer
1	Heat pump
1	geothermal
1	Fireplace insert
1	Fireplace insert
1	Electric/oil floor heater
1	Electric heat pump
1	Electricity
21	

3. This question asks what types of heating devices you use to burn wood. (223 responded)

Q3:
Please see attachment.

   Homeowners sometimes confuse a fireplace with a fireplace insert. An insert is a woodstove that sits within a fireplace. An insert has either an all-metal door, or a non-folding glass and metal door that hinges at the side. Fireplaces often have other types of doors such as all-glass doors or non-hinged, folding metal and glass doors. If you are unsure whether or not the device you own is an insert or a fireplace with doors, please refer to the attachment that came with this survey that shows figures of each.

   Indicate the number of heating devices you use to burn wood or wood pellets in your home.

   37.2% Fireplace

   22.9% Fireplace Insert

   25.1% Woodstove

   5.4% Pellet stove

   6.7% Central furnace

   2.7% Other (see responses in table to right)

Question #3 - 'Other'	
Count	*Response*
1	Can't read
1	Pellet furnace
1	Catalytic stove
1	Fireplace with gas heating
1	Natural gas
1	Earth stove insert
6	

4. Please choose the response which best describes your household: (337 responded)

   58.2% Split wood, wood pellets, or artificial logs are NEVER BURNED in my home. (If you choose this answer, please skip to the Outdoor Burning section, starting at question 18.)

   41.8% Split wood, wood pellets, or artificial logs are BURNED in my home. (If you choose this answer, please continue with question 5.)

5. Have you burned split wood, wood pellets, or artificial logs in your household within the last year? If not, proceed to question 18. (96 responded) 66.7% Yes; 33.3% No

Q6:
Please see attachment

6. If you own a woodstove or insert is it certified? For examples of DEQ and EPA certification labels, please see the attachment. (103 responded)

   45.6% yes 28.2% no 26.2% don't know

   Approximately how old is your woodstove or insert? (89 responded)

   33.7% made before 1984

   23.6% made between 1984 and 1990

   36.9% made after 1990

7. **DO YOU PLAN** to purchase a new heating system in the next few years? 15.2%yes 84.8% no. (184 responded)

   If yes (31 responded), what type? 35.5% gas, 0% propane, 29.0% wood, 12.9% electric, 3.2% oil,

   19.4% other (see responses in table to right)

   What is the main reason for the purchase? (see responses in table to right)

   When are you thinking of purchasing the new heating system? (29 responded)

   62.1% one to two years 24.1% three to five years 13.8% more than five years

Question #7 - 'Other'	
Count	*Response*
2	Solar panels
1	Don't know
1	Pellet Stove
1	Geothermal
1	Heat pump
6	

Question #7 - 'Reason for purchase'	
Count	*Response*
7	Age of current system
5	More efficient
4	environmental concerns
4	DNA
3	In case of power outage
3	Cheaper heat
1	County requirements
1	More practical
1	added comfort
29	

8. Would you replace your woodstove or insert with a new, cleaner, more efficient heating system if financial assistance were available? (104 responded)

   58.7% yes 41.3% no

If yes, what type of assistance would most help you? (56 responded)

32.1% Retailer discount (money off at time of sale)

28.6% interest-free loan (extended payment schedule at no extra cost)

39.3% incentive: how much incentive is needed (see responses in table to right)

Question #8 - 'Incentive needed'	
Count	*Response*
1	$50
1	$500
1	$750
1	$1,000
2	$2,000
1	40%
4	50%+
1	50-60% off price and installation
1	75% of total cost
4	full cost of upgrade
2	Tax incentive (several hundred)
1	Near-even trade for current stove
1	A Lot
1	Not sure
22	

Q9: Please see attachment

9. Is there a catalyst present in your woodstove or insert? (see attachment for pictures of catalytic vs. non-catalytic stoves/inserts) (94 responded)

18.1% yes 56.4% no 25.5% don't know

If yes, when was it last changed? 4 <= 2 yrs; 11 didn't answer or didn't know

10. This question asks how much wood you burn, and what device(s) the wood is burned in.

Q10: Please see attachment

Homeowners are often unsure as to the size of a cord of wood. The attachment shows examples of wood measurement in cords. If you burned split wood, please refer to the attachment to help with the accuracy of your answer. Answers such as "1/4" and "3.5" are OK, but be as accurate as possible. If you have more than one of the same type of heating device (for example: two fireplaces), total the amount of wood or pellets burned.

How much wood do you typically burn in your wood heating device(s) per year?

	Split Wood		Artificial	Pellets	
Heating Device	Cords*	Bundles†	Logs	40 lb bags	Tons
Fireplace	49.1	36	16	0	0
Insert	82.65	0	4	20	0
Woodstove	119.33	0	20	0	0
Pellet Stove	3.5	210	0	690	11.5
Central Furnace	0	0	0	0	0
Other					
*See attachment sizes and definitions					
†Six to eight pieces of wood bundled or shrink-wrapped, commonly sold in grocery stores					

Note: Shaded entries shown above are suspect. These two entries correspond to two separate residences, but don't correspond to the 'nature' of split wood

11. How much of the following varieties of split wood do you burn in a typical year?

Juniper	56.875 cords	3 bundles
Lodgepole Pine	126 cords	7 bundles
Pine (Ponderosa or yellow)	37 cords	0 bundles
Fir	13 cords	0 bundles
Don't know	14.725 cords	5 bundles

Other (see responses in table below)

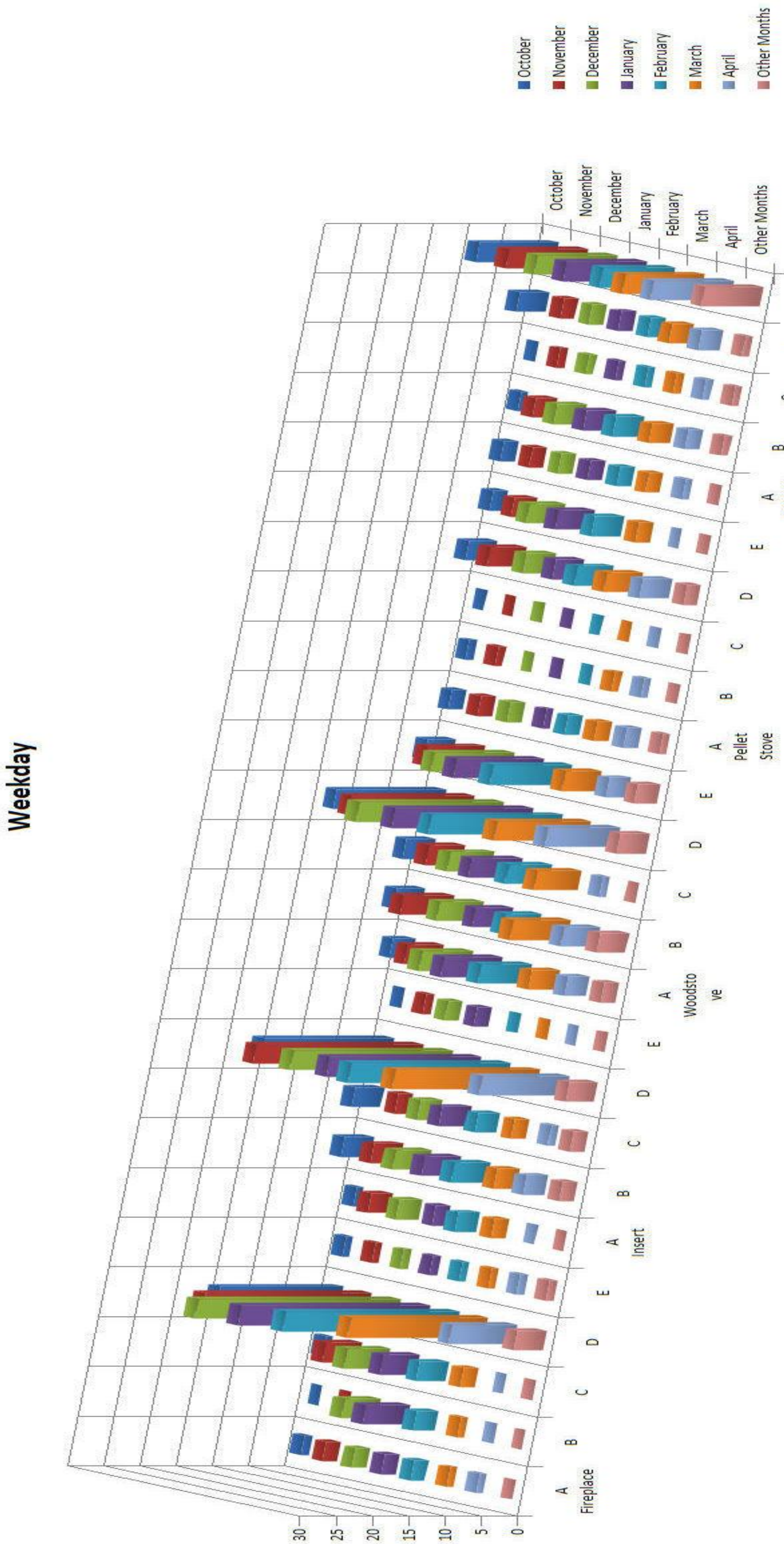
Question #11 - 'Other varieties of wood burned'		
Type	*# of cords*	*# of bundles*
Chinese Elm	1	
Oak	1	8
Cherry & cedar	0.25	
Various	0.25	
Scrap wood	1	
Elm	1	
Assorted hard woods	1	
	5.5	8

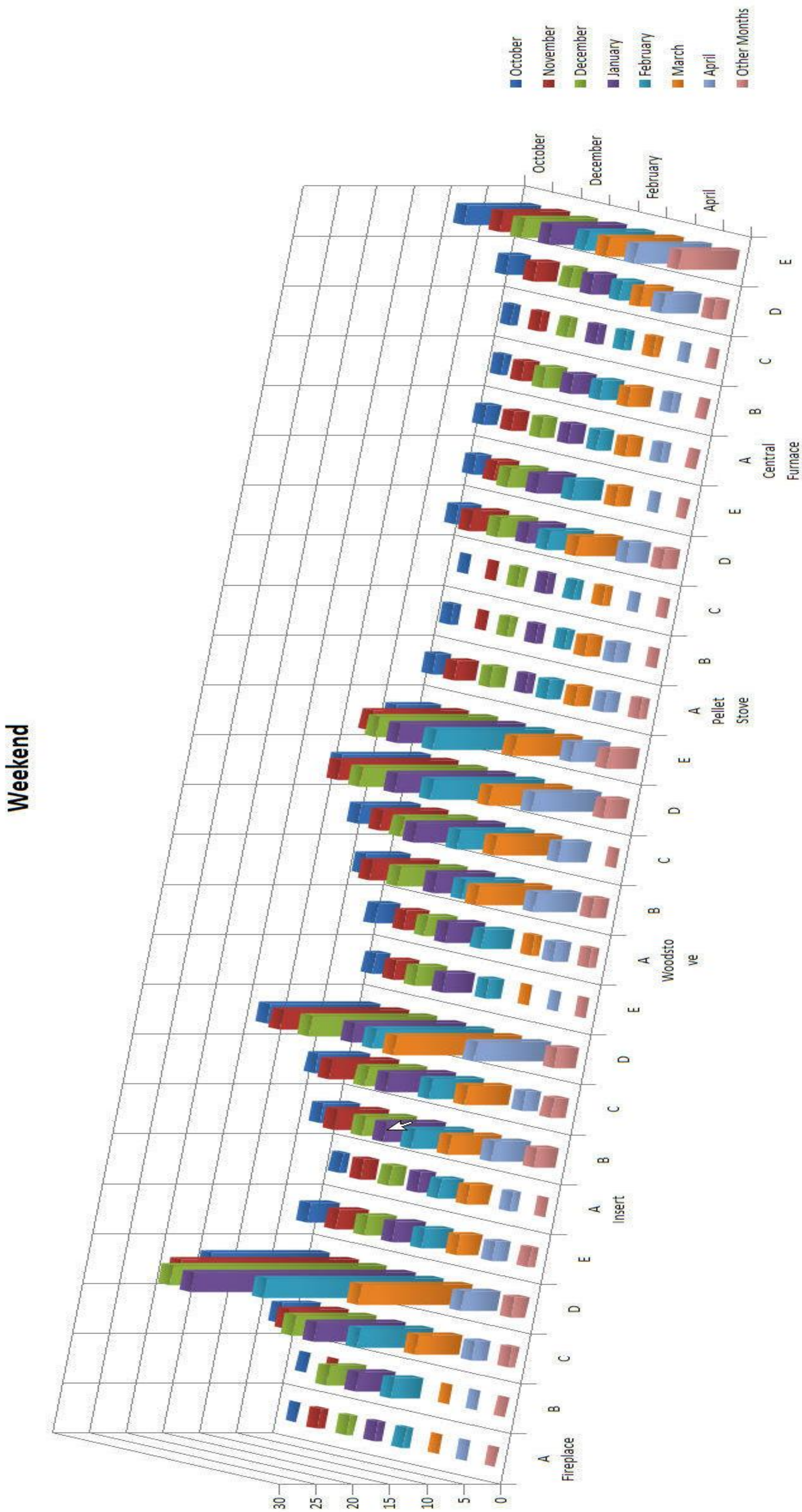
12. About when do you use the woodburning devices in your home?

Use the following designations and fill in the table where applicable.
Use more than one letter if needed.

A = midnight to 6:00 AM
B = 6:00 AM to noon
C = noon to 6:00 PM
D = 6:00 PM to midnight
E = 24 hours of the day

The following two charts illustrate the diurnal use of various woodburning devices as a function of month for weekdays and weekends (respectively)


Weekday
0
5
10
15
20
25
30
A B C D E
Fireplace
A B C D E
Insert
A B C D E
Woodsto ve
A B C D E
Pellet Stove
A B C D E
Central Furnace
October
November
December
January
February
March
April
Other Months



Weekend
October
November
December
January
February
March
April
Other Months
0
5
10
15
20
25
30
A
B
C
D
E
Fireplace
Insert
Woodstove
Pellet Stove
Central Furnace
October
December
February
April

13. From the time your wood is cut, how long is your wood stored before it is burned? (116 responded)

    15.5% Three months or less; 28.4%Four to six months; 23.3% Seven to 12 months; 32.8% more than a year

14. Where do you store most of your firewood? (120 responded)

    27.5% Inside a building (e.g. home, garage, shed)

    61.7% Outside, covered

    8.3% Outside, uncovered

15. Is there a program in your community to reduce woodburning on days with stagnant air?

    70.9% Yes; 3.3% No; 25.8% Don't know. (151 responded)

16. If such a program already exists in your community, did you participate during the last heating season? (105 responded)

    75.2% Yes; 24.8% No.

17. Have you ever done a cost comparison between home heating options?

    46.5% yes; 53.5% no (144 responded)

    If no, would this type of information be useful? 66.7% yes; 33.3% no (75 responded)

++

OUTDOOR BURNING QUESTIONS

18. Please choose the response which best describes your household: (416 responded)

68.7% Outdoor burning never occurs at my home. (If you choose this answer, please skip to question 24.)

31.3% Outdoor burning occurs at my home. (If you choose this answer, please continue with question 19.)

19. What steps do you take to get ready for an outdoor burn? (Check any that apply) (235 responses)

21.7% Visually check for good smoke ventilation prior to burning;

8.1% Get permit from Klamath County Environmental Health Department (Air Quality);

11.5% Get permit from local fire department;

49.8% Check local burn advisory;

2.1% None of the above;

6.8% Other (see responses in table to the right)

Question #19 - 'Other'	
Count	*Response*
6	Open burn times listed in paper or on T.V./ news
3	Wet area around
2	Have water hose handy
1	2' of snow, no wind
1	Comment "Clean around area site"
1	Fire pot on patio
1	I barbecue
1	Use best judgement for determining day
16	

20. What type of woodburning device do you use outdoors? (154 responses)

0% Wood-fired hydronic heater (outdoor boiler)

22.7% Burn barrel

10.4% Chimnea (outdoor fireplace)

61.7% On the ground (example: firepit, no enclosure)

5.2% Other (see responses in table to the right)

Question #20 - 'Other'	
Count	*Response*
1	None
1	Brush piles
1	Fire pit
1	Firepit with enclosure
1	Fireplace
1	Full outdoor fireplace with chimney
1	None
1	On patio
8	

Q21: Please see attachment

21. This question asks how much split wood you burn outdoors per year. If you do not burn split wood outdoors, please skip to question 22.

Homeowners are often unsure as to the size of a cord of wood. The attachment that came with this survey shows examples of wood measurement in cords. If you burned split wood, please refer to the attachment to help with the accuracy of your answer. Answers such as "1/4" and "3.5" are OK, but be as accurate as possible. If you have more than one of the same type of heating device (for example: two chimneas), total the amount of wood burned.

How much wood do you typically burn in your outdoor wood heating device(s) per year?

	Spring		Summer		Fall		Winter	
Heating Device	Cords*	Bundles†	Cords*	Bundles†	Cords*	Bundles†	Cords*	Bundles†
Hydronic Heater	0	0	0	0	0	0	0	0
Burn Barrel	0	5	0	7	0	8	0	3
Chimnea	0	5	0.3125	7	0	9	0	10
On the Ground (no enclosure)	2.2	7	0	4	0.4	10	0	2
Other								
fireplace/pit	0.25	4	0	0	0	4	0	0
full outdoor fireplace	0	1	0	0	0	2	0	0
	2.45	22	0.3125	18	0.4	33	0	15
*See attachment sizes and definitions								
†Six to eight pieces of wood bundled or shrink-wrapped, commonly sold in grocery stores								

22. Do you burn any other material besides cord wood outdoors? (check all that apply)

	Material					
Device	Leaves/ Grass	Paper	Cardboard	Branches	Plastics	
Burn Barrel	16	17	8	21	1	63
Chimnea	0	4	2	6	0	12
On the Ground (no enclosure)	57	12	14	86	0	169
Other						0
firepit with enclosure	1	0	0	1	0	2
	74	33	24	114	1	

	Material		
Device	Brush	Shrubs	Other
Burn Barrel	6	4	
Chimnea	2	1	
On the Ground (no enclosure)	69	45	pallets, pine needles & cones, yard debris, trimmings & yard waste
Other			

23. About when do you burn the material in Question 22 outdoors? (check all that apply)

September	Weekday	8
	Weekend	19
October	Weekday	17
	Weekend	43
November	Weekday	14
	Weekend	25
December	Weekday	6
	Weekend	11
January	Weekday	5
	Weekend	10
February	Weekday	5
	Weekend	9
Spring	Weekday	32
	Weekend	58
Summer	Weekday	11
	Weekend	15

==

THE ANSWERS TO THE FOLLOWING QUESTIONS WILL BE USED FOR STATISTICAL PURPOSES ONLY.

24. Do you live within the city limits? 48.6% Yes 51.4% No (453 responded)

25. Do you live within the Klamath Falls Urban Growth Boundary? 57.8% Yes 7.7% No 35.7% Don't Know (412 responded)

26. What type of building do you live in? (448 responded)
93.3% Single family house; 2.0% Duplex or multiplex; .2% Apartment or townhouse; 4.5% Mobile home or trailer

Do you own or rent your home? 91.3% Own or buying; 8.7% Rent (446 responded)

27. What was you total household income last year before taxes? (409 responded)
16.9% Less than $25,000; 13.4% $25,000-$30,999; 7.8% $31,000-$39,999;

13.0% $40,000-$49,999; 22.2% $50,000-$79,999; 26.7% over $80,000

How many people are in your household? ______ (423 responded)

Number in HH	Responses	%
1	100	23.6
2	218	51.4
3	44	10.6
4	43	10.1
5	12	2.8
6	4	.9
7	2	.5

Section III: Univariate Analysis

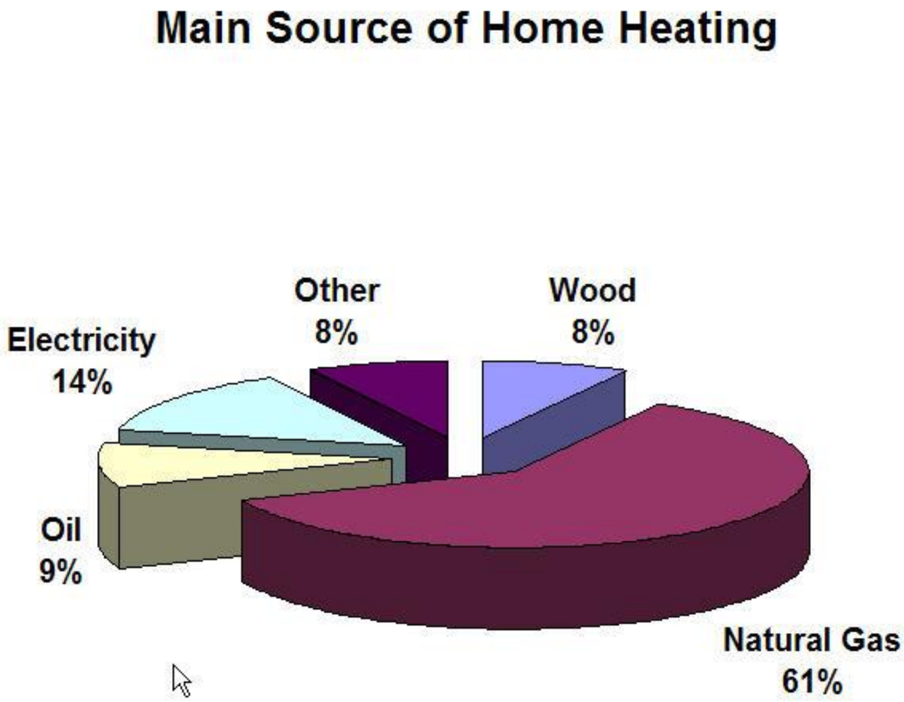


Fig 1. Main source of home heating. Derived from responses to question #1.

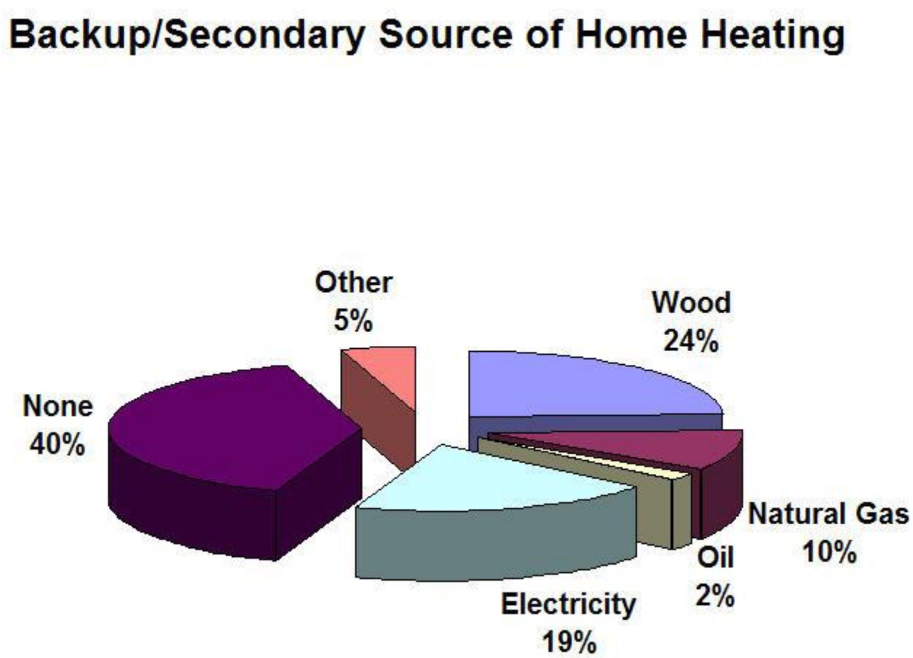


Fig. 2 Backup/Secondary source of home heating. Derived from responses to question #3.

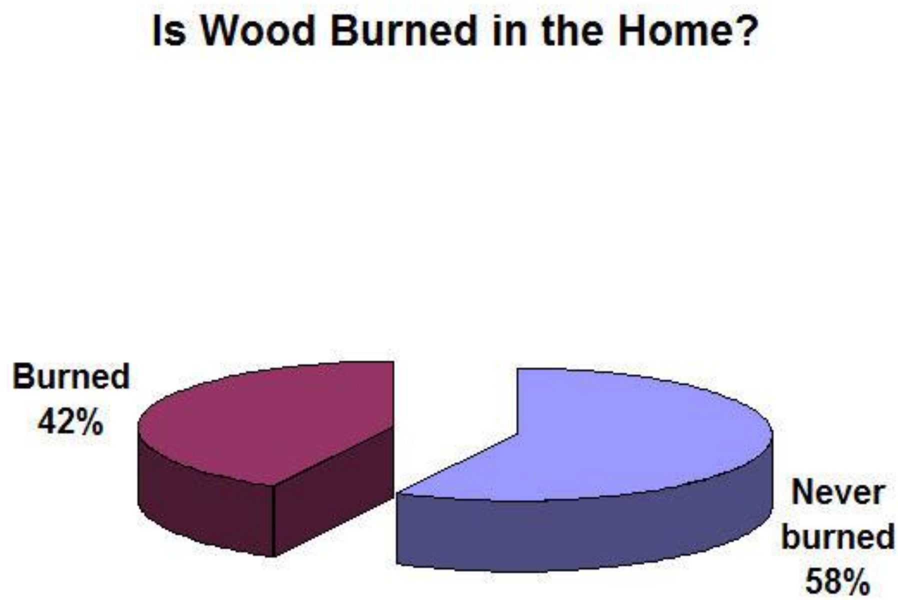


Fig. 3 Wood burning in the home. Derived from responses to question #4.

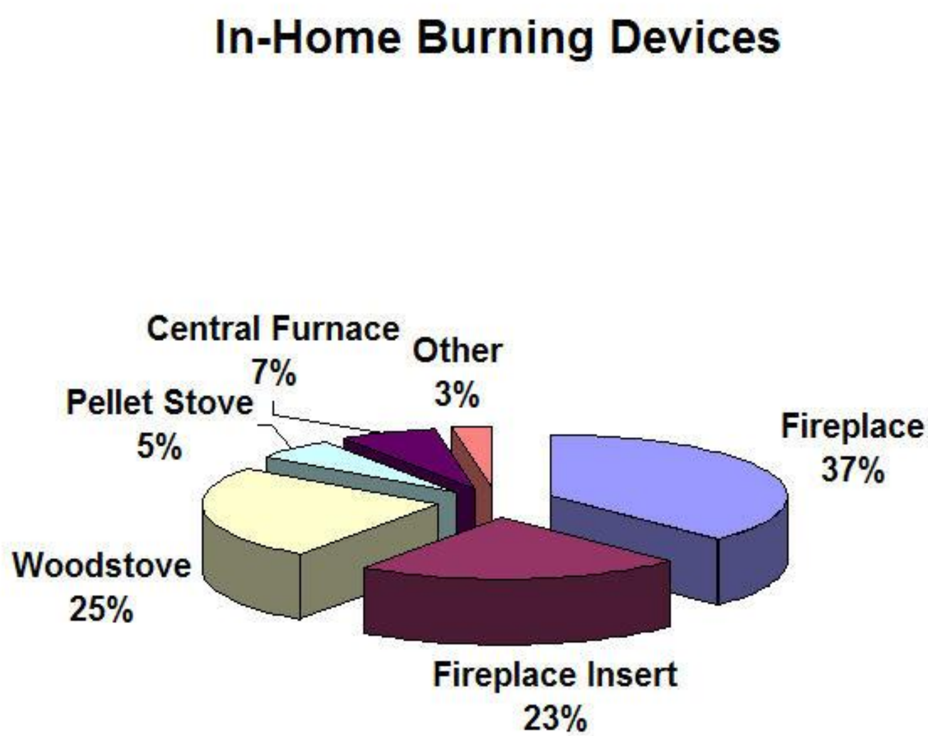


Fig. 4 In-home burning devices. Derived from responses to question #3

Fig. 5 Replacement of woodstove or insert if financial assistance were available. Derived from responses to question #8

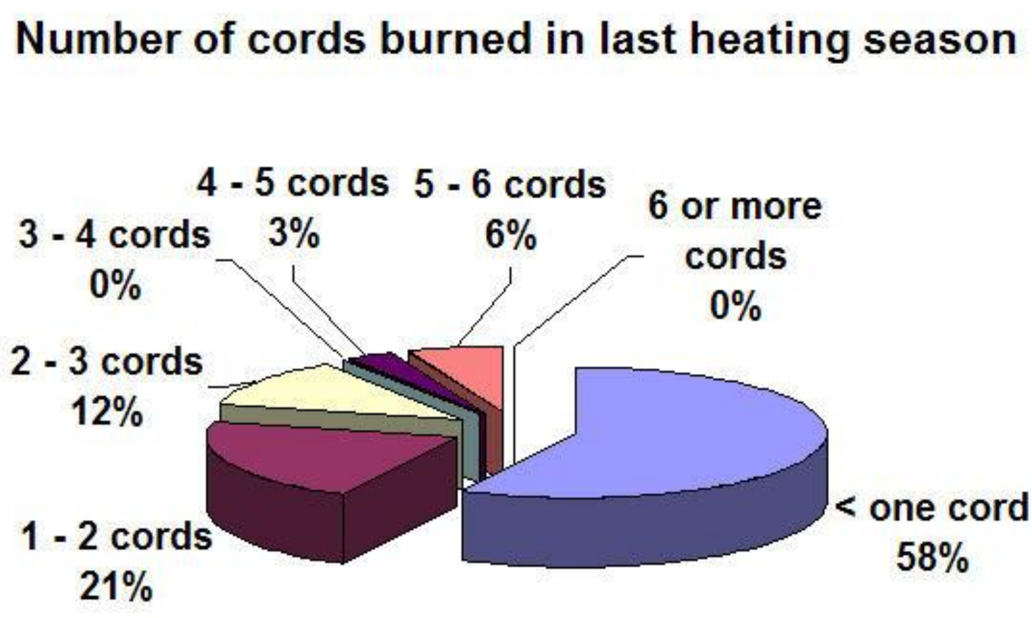


Fig. 6 Number of cords burned in the last heating season. Derived from responses to question #10.

Section IV: Cross-tabulations

This section presents some of the key cross tabulations from this survey. Cross tabulations allow the reader to see relations and distributions within certain defined categories of interest. The cross tabulations allow the sample to be restricted to particular areas of interest. For example, we can observe the distribution in the number of cords burned when wood is the primary heating source or the distribution of the main heating sources across different income groups. These relationships help clarify important differences in woodheating behavior as income, type of residence, type of woodheating device and other household characteristics vary.

Note: It is important to remember that cross tabulations often present results based on small sub-samples of the data. As such, they may not be representative of the entire population. Each cross tabulation presented shows the size of the entire sub-sample but any one entry within that sub-sample may be based on a very limited number of observations.

Main Heating Source by Income

Natural gas is the preferred heating source across all income groups in the Klamath Falls area. The relatively high percentage of “other” heating sources reflects the availability of geothermal heating in some neighborhoods.

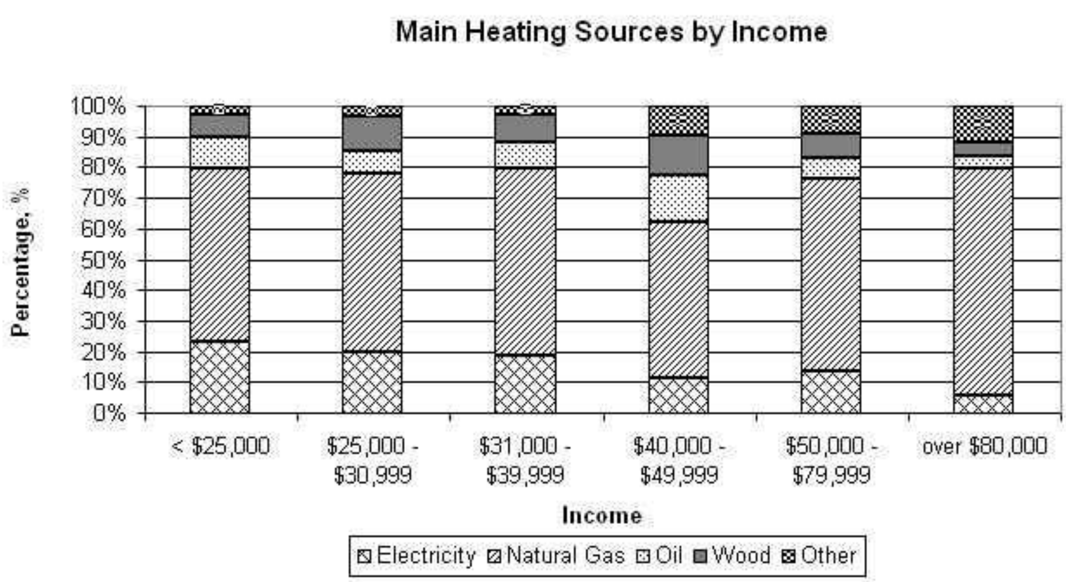


Fig. 7 Cross-tabulation of home heating source (question #1) with income (question #27)

Backup Heating Source by Income

Although woodburning and electricity appear to be significant backup heat devices, a substantial number of residences surveyed indicate that they do not have a backup source for heat.

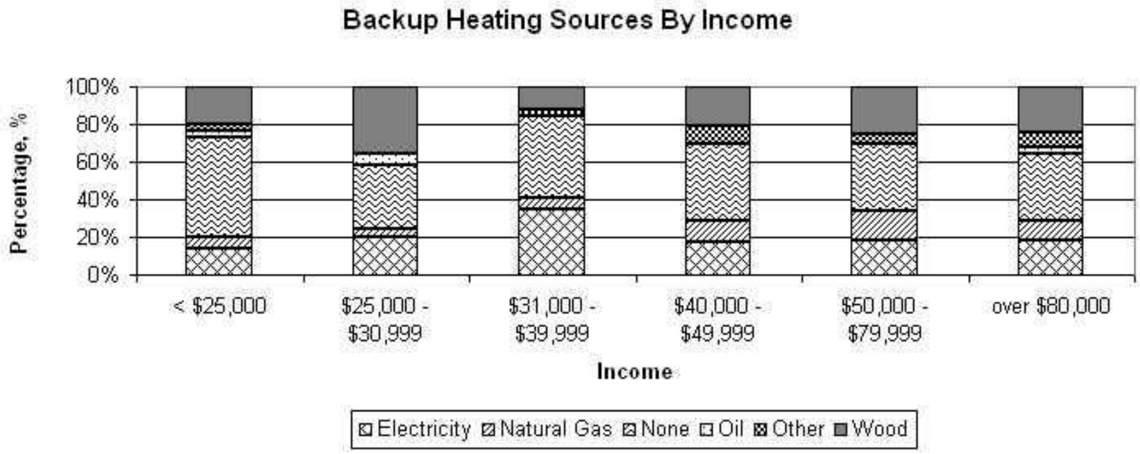


Fig. 8 Cross-tabulation of home backup heating source (question #2) with income (question #27)

Cords Burned by Income

The data seem to indicate that the higher income brackets have a greater tendency to burn two or less cords (possibly for aesthetics) while the lower income bracket households have a greater tendency to burn five or more cords (direct heat).

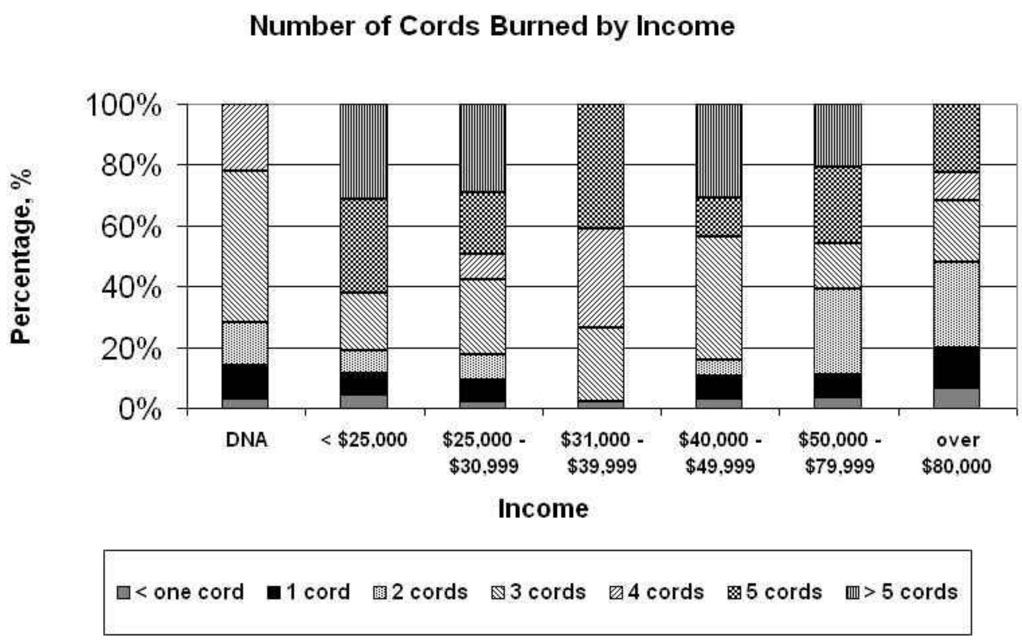


Fig. 9 Cross-tabulation of cords burned (question #10) with income (question #27)

Woodburning by Heating Device

Households burn an average of approximately 1.9 cords in fireplaces. For those households burning five or less cords of wood, an average of 2.6 cords are burnt using an insert and 2.7 cords using a woodstove.

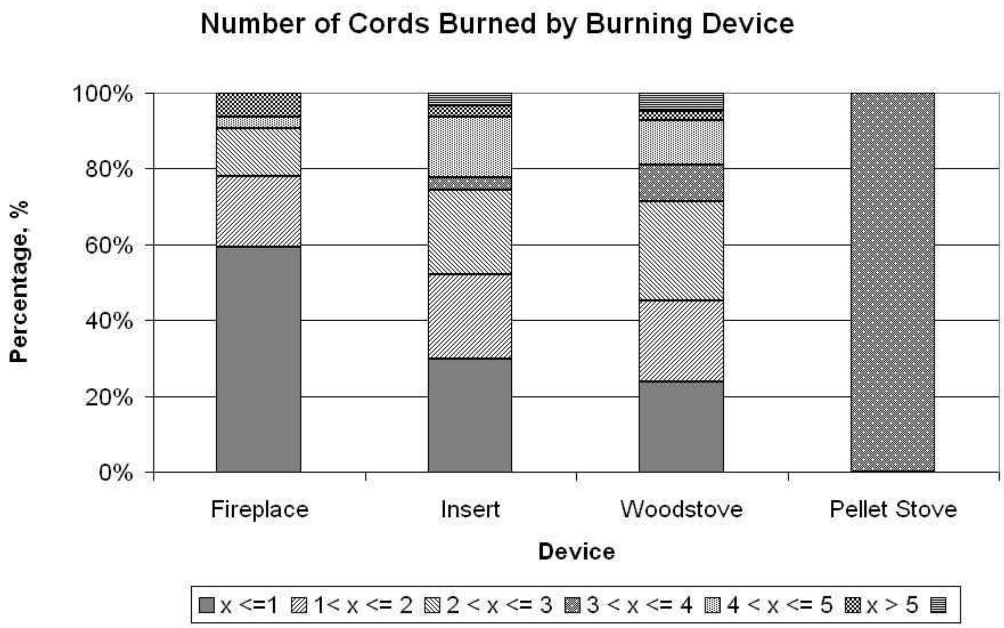


Fig. 10 Cross-tabulation of cords burned (question #10) with burning device (question #10)

Heating Device by Residence Type

Our sampling shows that mobile home/trailers have the greatest diversity of heating devices. The dominant heating device in single family homes and duplex/multiplex residences was natural gas. The survey was not administered to apartment complexes.

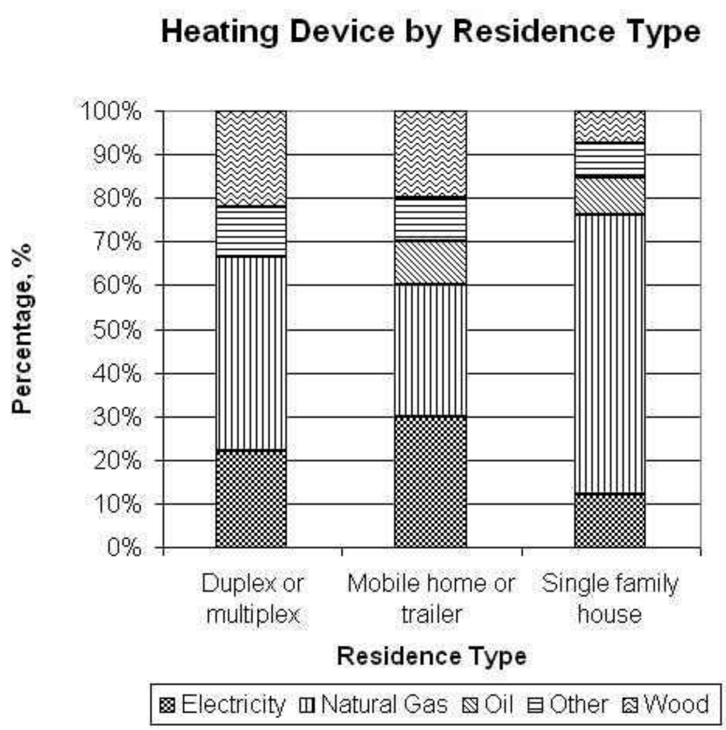


Fig. 11 Cross-tabulation of heating device used (question #1) with residence type (question #26)

Outdoor Burning by Ownership

Results from the survey indicate that the percentage split between owning/renting is approximately the same regardless of whether or not outdoor burning occurs at the residence.

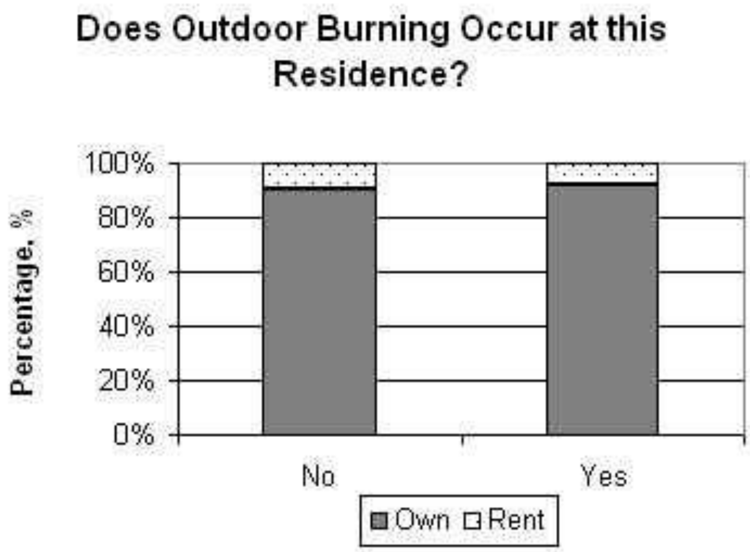


Fig. 12 Cross-tabulation of outdoor burning (question #18) with ownership (question #26)

Outdoor Burning by Location (Census Tract)

As shown in the following graph and accompanying map, the survey results indicate that most of the outdoor burning occurs in the outlying areas of the urban area. See Fig. B-1 for a cartographic display of these data.

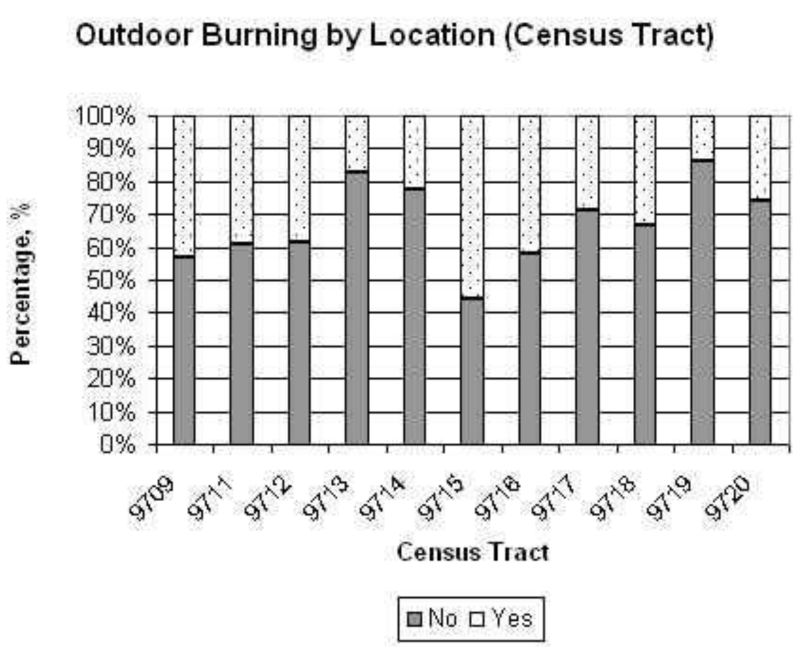


Fig. 13 Cross-tabulation of outdoor burning (question #18) with census tract

Outdoor Burning by Income

Although the survey results seem to indicate a slight increase in outdoor burning for the $30,000 - $39,999 income bracket, there doesn't seem to be an overall, direct relationship between income and the practice of outdoor burning.

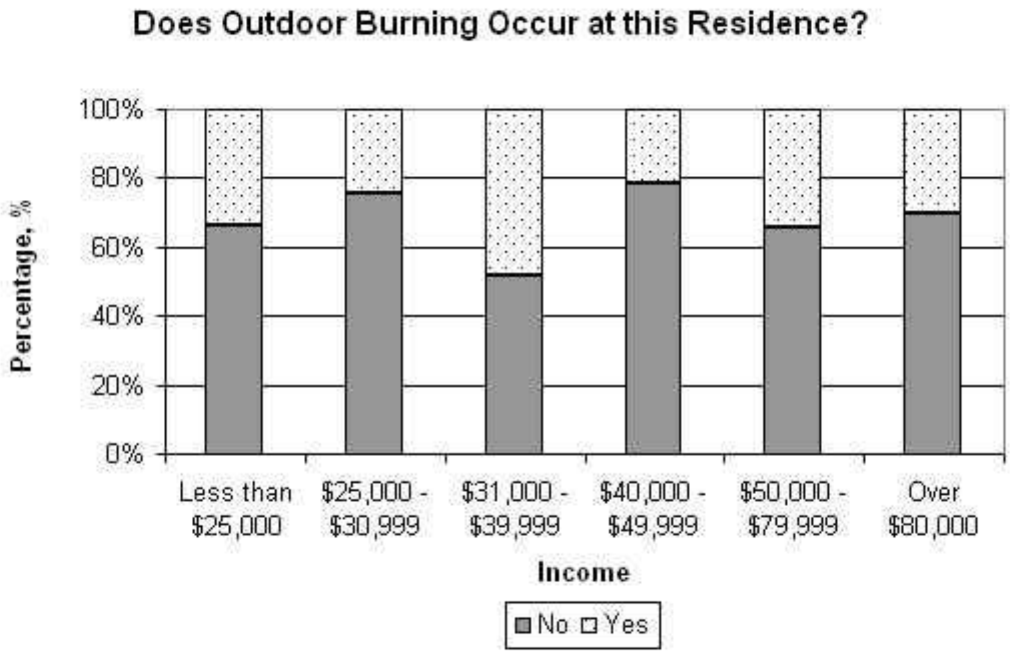


Fig. 14 Cross-tabulation of outdoor burning (question #18) with income (question #27)

Main Heating Source by Location

Survey data seem to indicate that wood is the main heating source used for census tract 9715, which lies in the south-central area of concern. Very little wood burning is used as the primary heat source for census tract 9720 (north-central area). See a cartographic representation of these data in Fig. B-2.

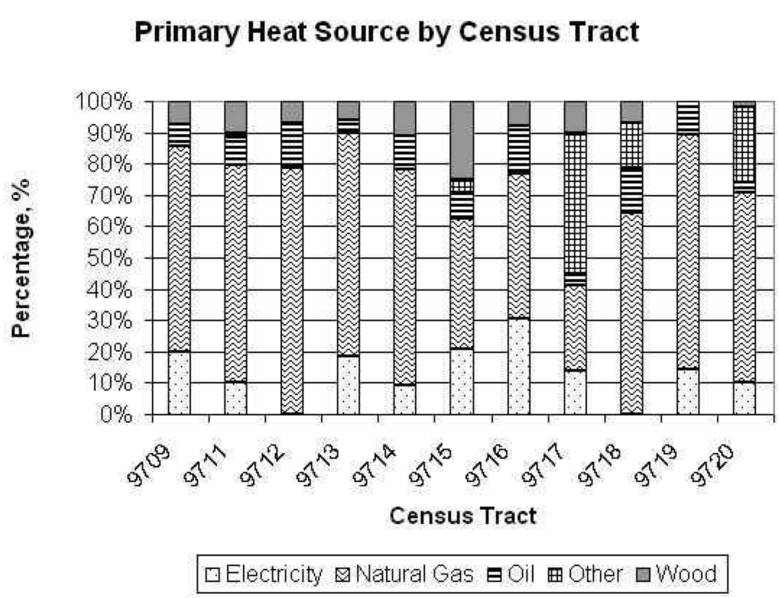


Fig. 15 Cross-tabulation of main heating source (question #1) with census tract

Section V: Data Handling and Adjustments

Survey data were entered into a Microsoft Access database using a custom-built user interface. Upon completion of the data entry phase of the project a random sampling of 50 surveys were selected for use in a verification project. Data from these surveys were compared to the corresponding values as recorded in the database. This comparison indicated virtually no difference between the data as recorded in the database and the hard-copies of the surveys.

As mentioned in Section I (Introduction and Survey Methods), a follow-up survey was conducted in order to increase the data from census tract 9716. The following questions were asked in the survey:

1. Do you burn wood inside your home?
2. What type of wood heating device do you use?
3. How much wood do you burn?
4. How many people reside in your household?
5. Do you own or rent your home?

Questions 2-5 were only asked if the response to question #1 was 'Yes.'

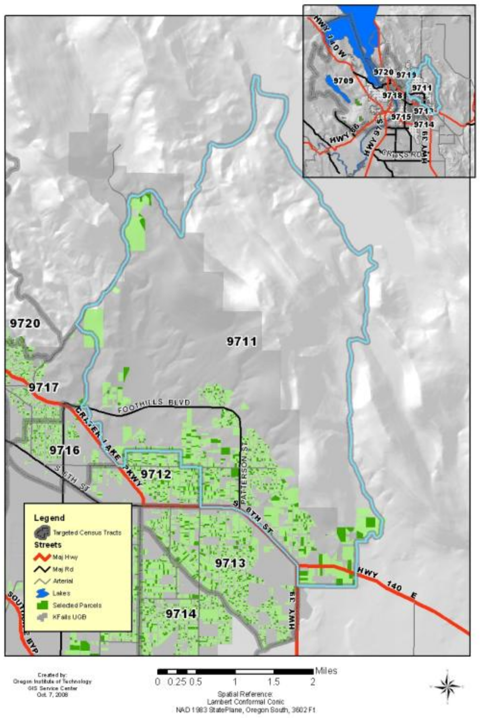
There were five recorded responses. Only one of which indicated that wood was indeed burned in their residence. These responses affected the results of the following survey questions:

#3 – Types of heating devices used to burn wood
#4 – Whether or not wood was ever burned in the home
#5 – Whether or not wood had been burned in the home during the last year
#10 – How much wood was burned and which woodburning device was used
#24 – Whether they lived in the city limits
#25 – Whether they lived within the Klamath Falls Urban Growth Boundary
#26 – Do you own or rent your home?
#27 – How many people are in your household?

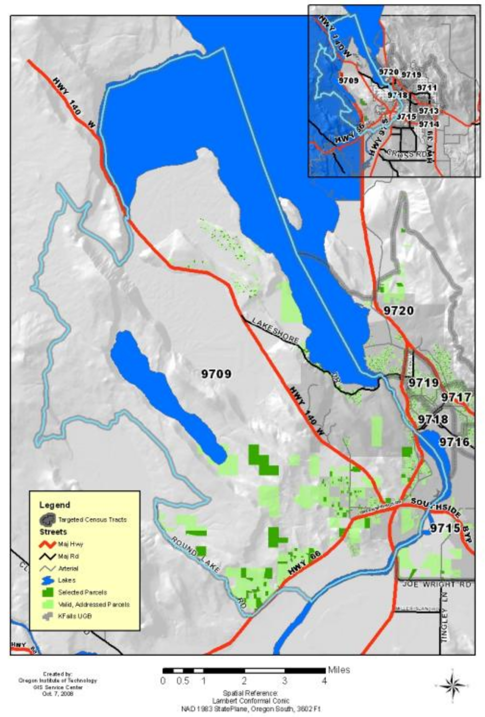
Data for these five responses were added to the database.

Appendix A
Cartographic Analysis of the Distribution of Viable and Selected Parcels Per Census Tract

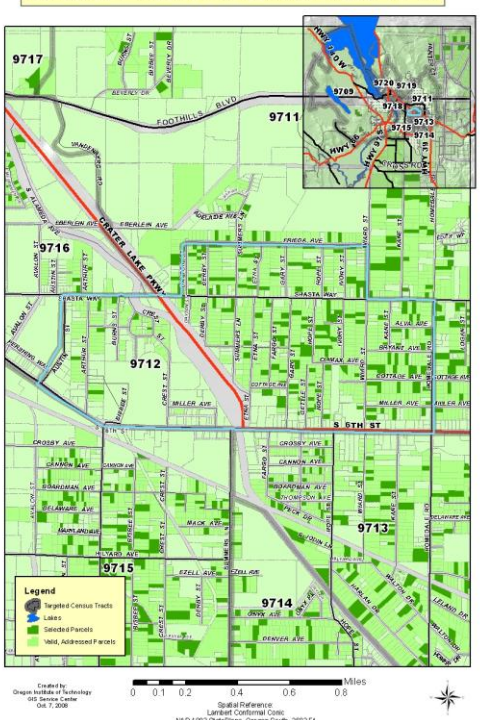
Selected Parcels Per Census Tract: 9711



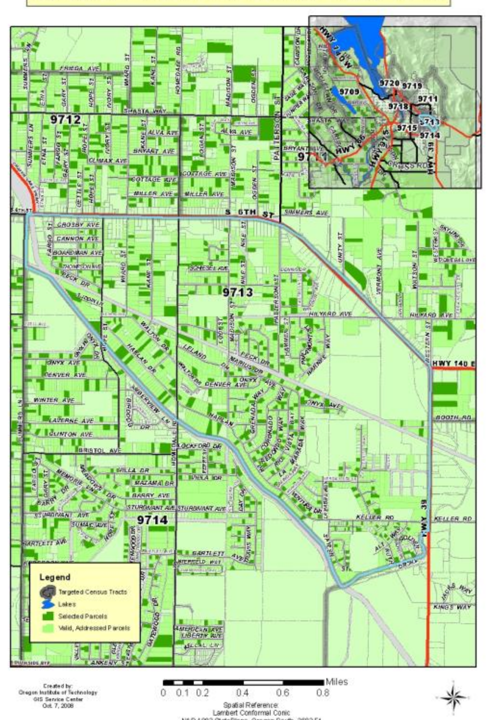
Selected Parcels Per Census Tract: 9709



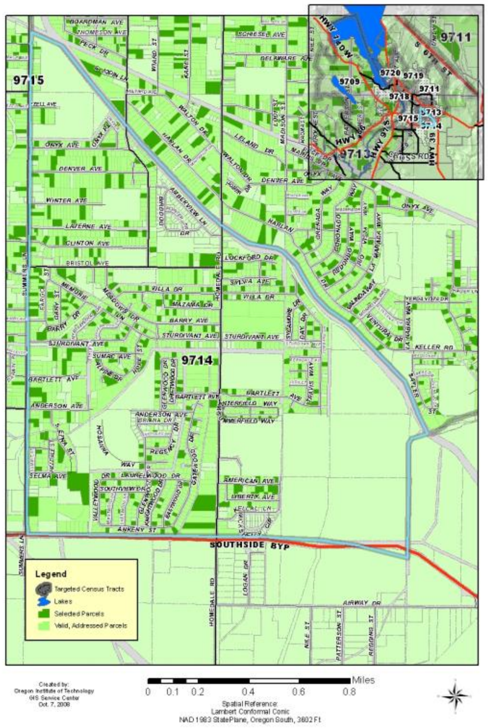
Selected Parcels Per Census Tract: 9712



Selected Parcels Per Census Tract: 9713

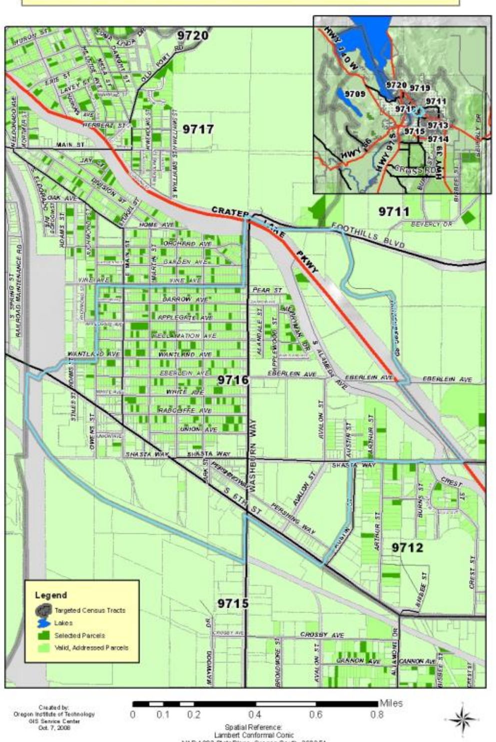


Selected Parcels Per Census Tract: 9714

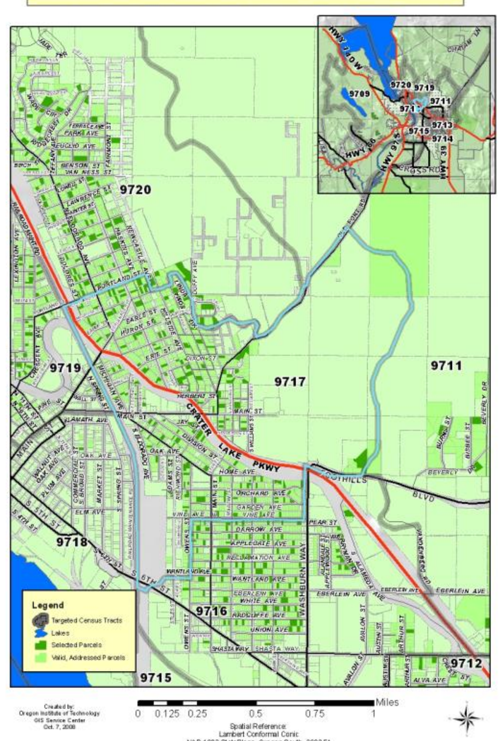


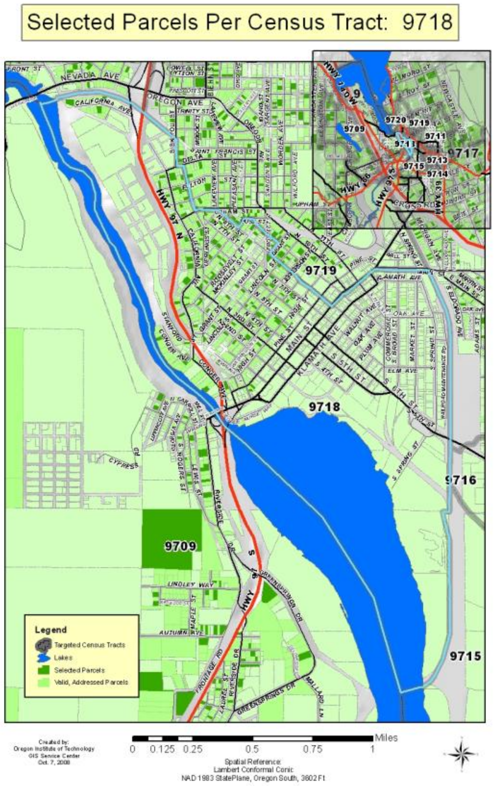
Selected Parcels Per Census Tract: 9715

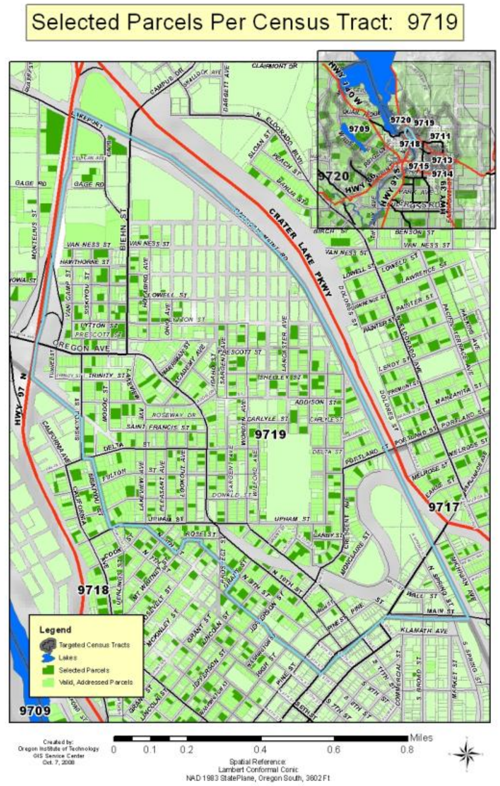
Selected Parcels Per Census Tract: 9716

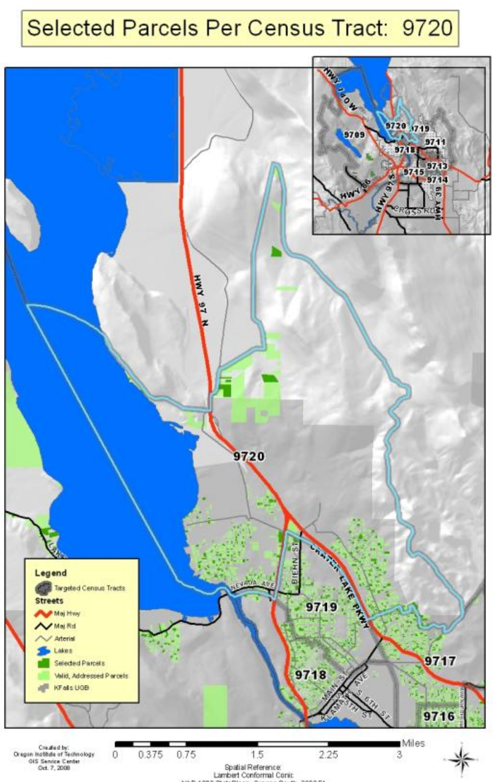


Selected Parcels Per Census Tract: 9717




Selected Parcels Per Census Tract: 9718
9719
9718
9716
9709
9715
Legend
Targeted Census Tracts
Lakes
Selected Parcels
Valid, Addressed Parcels
Created by:
Oregon Institute of Technology
GIS Service Center
Oct. 7, 2008
Miles
0 0.125 0.25 0.5 0.75 1
Spatial Reference:
Lambert Conformal Conic
NAD 1983 StatePlane, Oregon South, 3602 Ft


Selected Parcels Per Census Tract: 9719
CRATER LAKE PKWY
9720
9719
9717
9718
9709
Legend
Targeted Census Tracts
Lakes
Selected Parcels
Valid, Addressed Parcels
Created by:
Oregon Institute of Technology
GIS Service Center
Oct. 7, 2008
Miles
0 0.1 0.2 0.4 0.6 0.8
Spatial Reference:
Lambert Conformal Conic
NAD 1983 StatePlane, Oregon South, 3602 Ft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HWY 97 N
9720
9719
9718
9717
9716
Legend
Targeted Census Tracts
Streets
Maj Hwy
Maj Rd
Arterial
Lakes
Selected Parcels
Valid, Addressed Parcels
KFalls UGB
Created by:
Oregon Institute of Technology
GIS Service Center
Oct. 7, 2008
Miles
0 0.375 0.75 1.5 2.25 3
Spatial Reference:
Lambert Conformal Conic
NAD 1983 StatePlane, Oregon South, 3602 Ft

Appendix B
Cartographic Representations of Spatially Focused Cross-tabulations

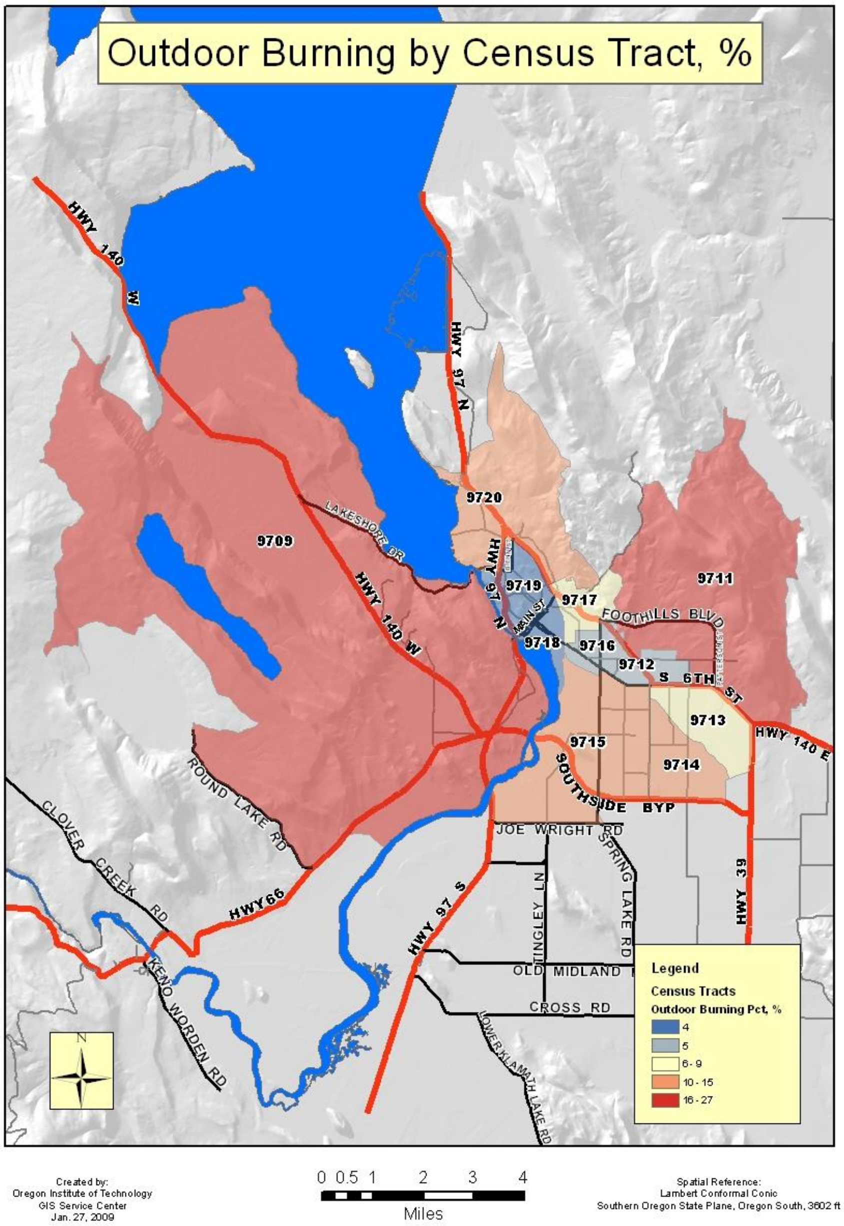


Fig. B-1 Cartographic representation of results from a cross-tabulation of outdoor burning (question #18) with census tract

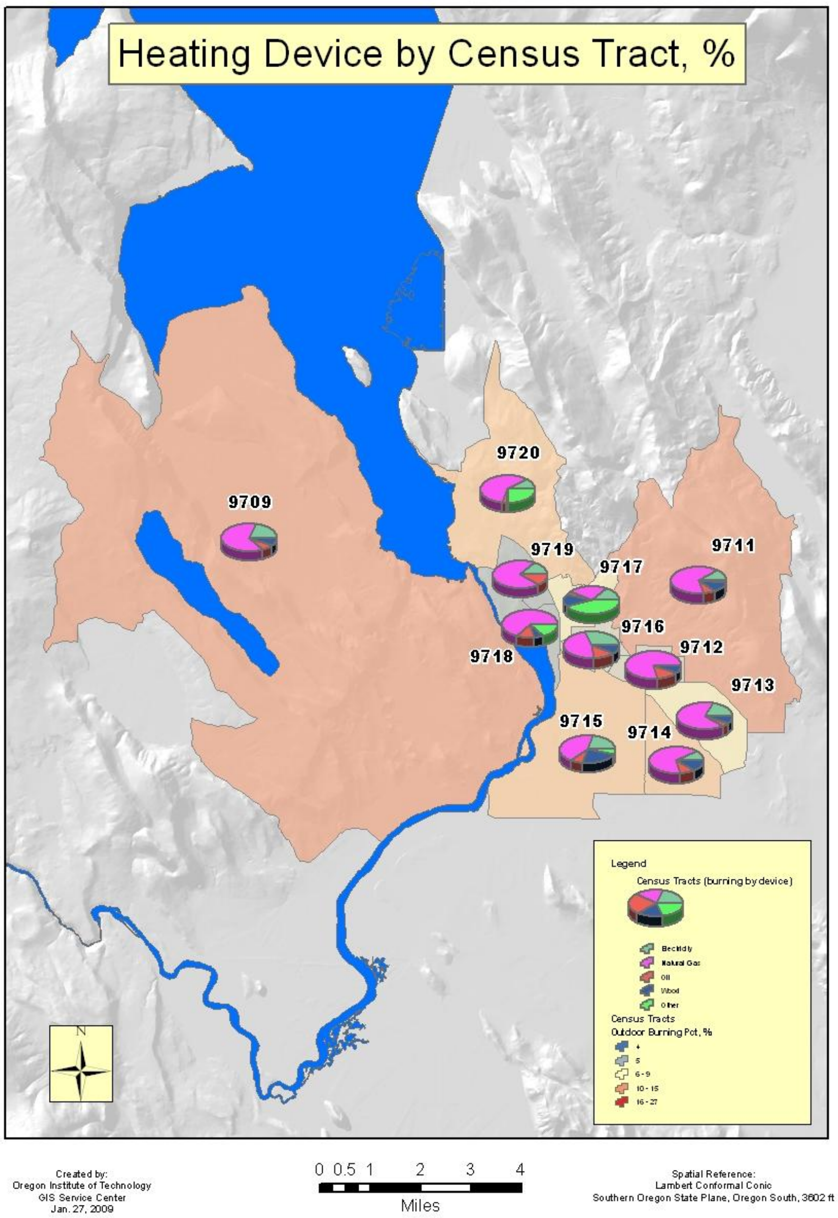


Fig. B-2 Cartographic representation of results from a cross-tabulation of heating device (question #1) with census tract

STATE OF OREGON AIR QUALITY CONTROL PROGRAM, VOLUME 3: STATE IMPLEMENTATION PLAN APPENDICES

SECTION 4.56: KLAMATH FALLS AREA

Appendix D6: Klamath Falls Nonattainment Area PM2.5
D6-4: Emission Inventory and Forecast

State of Oregon
2008 Base Year
&
2014 Attainment Year
SIP Emission Inventory
For Particulate Matter 2.5 Microns and Smaller
($PM_{2.5}$)

KLAMATH FALLS NONATTAINMENT AREA

March 2012

Oregon Department of Environmental Quality
Air Quality Division
811 SW 6th Avenue
Portland, Oregon 97204

EXECUTIVE SUMMARY

Title I of the Clean Air Act Amendments of 1990 (CAAA) contains provisions on the required development of emission inventories for designated areas that failed or have failed in the past to meet the National Ambient Air Quality Standards (NAAQS). The Klamath Falls Nonattainment Area (NAA) is a designated NAAQS $PM_{2.5}$ attainment area with a maintenance plan. In compliance with published EPA requirements this emission inventory is provided as a part of the State's revisions to its State Implementation Plan (SIP) to formulate a strategy to maintain the NAAQS. The principal components for development and documentation for the 2014 Maintenance Plan Update inventories have been addressed in this inventory, which includes stationary permitted point sources, stationary area (non-permitted) sources, non-road mobile sources, on-road mobile sources, quality assurance implementation, and emissions summaries. Inventory years include a base year of 2008 and the 2014 maintenance year. The geographic boundary for each inventory is the Klamath Falls NAA, as defined by the NAA boundary.

In conformance to 40 CFR §51.1002(c), this inventory includes emissions estimates for the following pollutants; $PM_{2.5}$, NO_X, SO_2 (SO_X), VOC, and NH_3.

In this document the terms *annual*, *typical season day*, and *worst-case season day* emissions are used to categorize the estimated emissions for a particular time period. The annual emissions are a total amount of emissions for the source category that occurred throughout the year, represented in tons per year (tpy). The typical season day emissions represent an average daily emission value occurring from November 1st through the end of February. This four month time period is considered to be the PM season, and is when the PM standard is usually violated. The worst-case season day emissions are the highest daily emissions estimated for the PM season, and represent a day during the PM season when emissions generating activity is at its highest. Typical season and worst-case season day emissions are represented in pounds per day (lbs/day).

Executive Summary Table 1 summarizes contributions, by source category, for the 2008 annual and worst-case season day emissions estimates for the Klamath Falls NAA for 2008. Executive Summary Table 2 details 2008 typical season day and worst-case day $PM_{2.5}$ emissions, grouped and summed to show contribution by major source group. Executive Summary Figure 1 shows 2008 typical season day and worst-case day $PM_{2.5}$ emissions by major source group. Executive Summary Figure 2 shows 2008 typical season day and worst-case day $PM_{2.5}$ emissions contribution by major source group.

The 2014 emissions from stationary point, stationary area, non-road mobile, and on-road mobile are summarized below in Table 3. The emissions are further summarized in the figures that follow. The 2014 emissions are compared to the 2008 base year in the final two figures.

Executive Summary, Table 1. 2008 Estimated Emissions Contribution by Source Category

Source Category	Annual (tpy)	Percent Of Total	Worst-Case Day (lbs/day)	Percent Of Total
$PM_{2.5}$				
Point(1)	143.4	22%	1,517	28%
Area(2)	403.0	62%	2,851	53%
Nonroad	16.1	2%	135	2%
On-Road	92.2(3)	14%	917	17%
Total	**654.7**		**5,420**	
NO_X				
Point(1)	329.3	15%	3,247	21%
Area(2)	114.3	5%	1,391	9%
Nonroad	360.9	16%	2,855	18%
On-Road	1,431.6	64%	7,990	52%
Total	**2,236.1**		**15,483**	
VOC				
Point(1)	997.2	34%	10,301	45%
Area(2)	972.9	33%	6,483	30%
Nonroad	246.0	8%	876	4%
On-Road	694.2	24%	4,734	21%
Total	**2,910.4**		**22,754**	
NH_3				
Point(1)	70.4	29%	1,453	64%
Area(2)	161.9	66%	772	34%
Nonroad	--	--	--	--
On-Road	11.4	5%	62	3%
Total	**243.7**		**2,287**	
SO_X				
Point(1)	47.8	44%	357	34%
Area(2)	49.1	45%	546	52%
Nonroad	6.6	6%	108	10%
On-Road	6.4	6%	36	3%
Total	**109.9**		**1,046**	

(1) Worst-case day = 80% permitted daily operating capacity
(2) Area source residential wood combustion worst-case day = advisory controlled
(3) Re-entrained dust + (MOVES typical season day * 365 days)

Updated, CLS 2/17/12

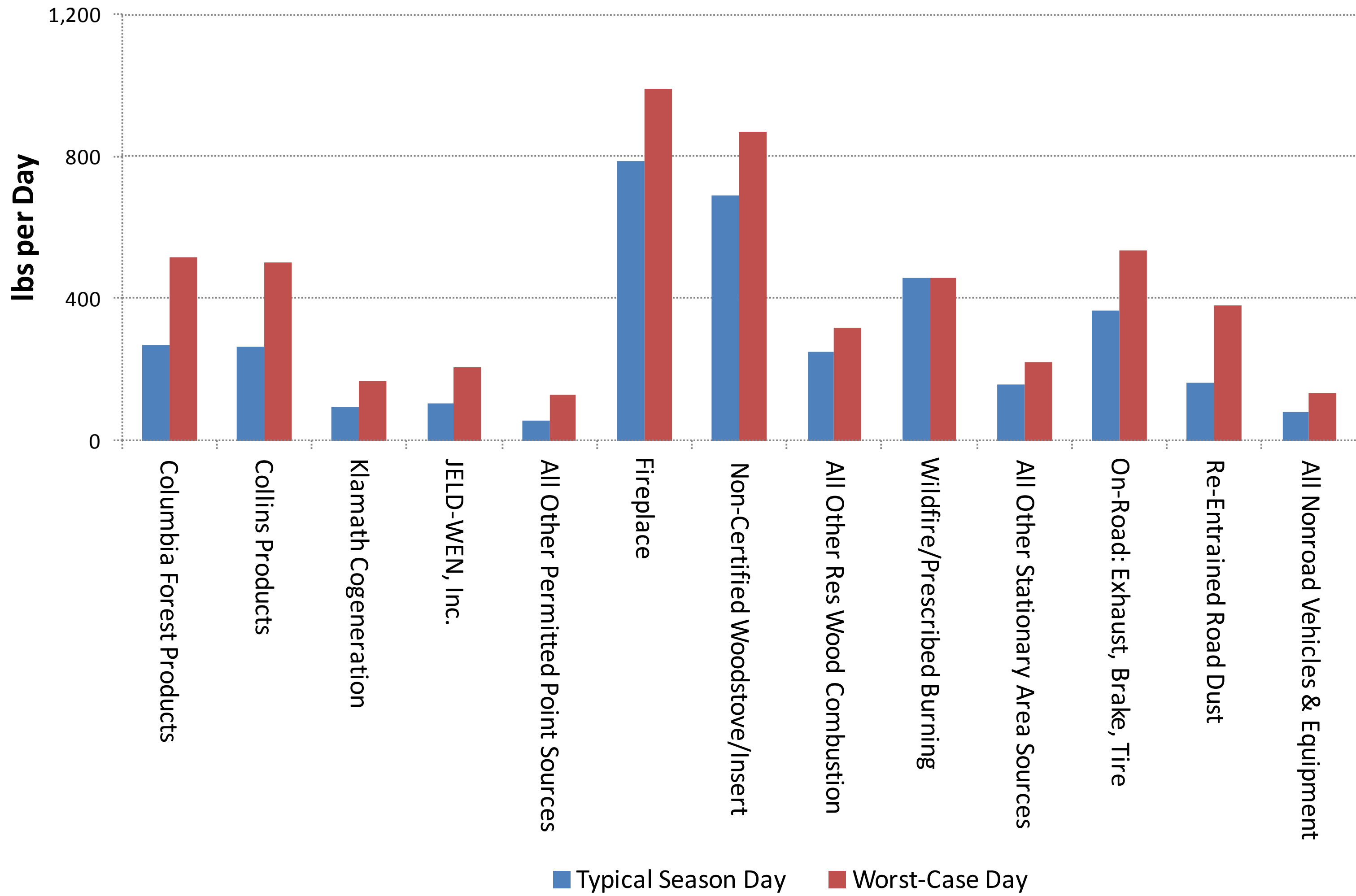
Executive Summary, Table 2. 2008 Estimated Typical Season Day and Worst-Case Day $PM_{2.5}$ Emissions, Grouped and Summed to Show Contribution by Major Source Group

	-- lbs/per day --		Percent of Total NAA Emissions	
	Typical Season Day	Worst-Case Day	Typical Season Day	Worst-Case Day
Permitted Point Sources[1]				
Columbia Forest Products	268	518	7%	10%
Collins Products	265	500	7%	9%
Klamath Cogeneration	93	168	2%	3%
JELD-WEN, Inc.	106	204	3%	4%
All Other Permitted Point Sources	56	126	1%	2%
Stationary Area Sources				
Residential Wood Combustion: Fireplace[2]	787	989	21%	18%
Residential Wood Combustion: Non-Certified Woodstove/Insert[2]	692	869	18%	16%
All Other Res Wood Combustion[2]	251	315	7%	6%
Wildfire/Prescribed Burning	459	459	12%	8%
All Other Stationary Area Sources	159	219	4%	4%
On-Road Sources				
On-Road: Exhaust, Brake, Tire	364	537	10%	9%
Re-Entrained Road Dust	165	380	4%	7%
Nonroad Sources				
All Nonroad Vehicles & Equipment	79	135	2%	2%
	------	------		
Total, All Sources, lbs/day	**3,743**	**5,420**		

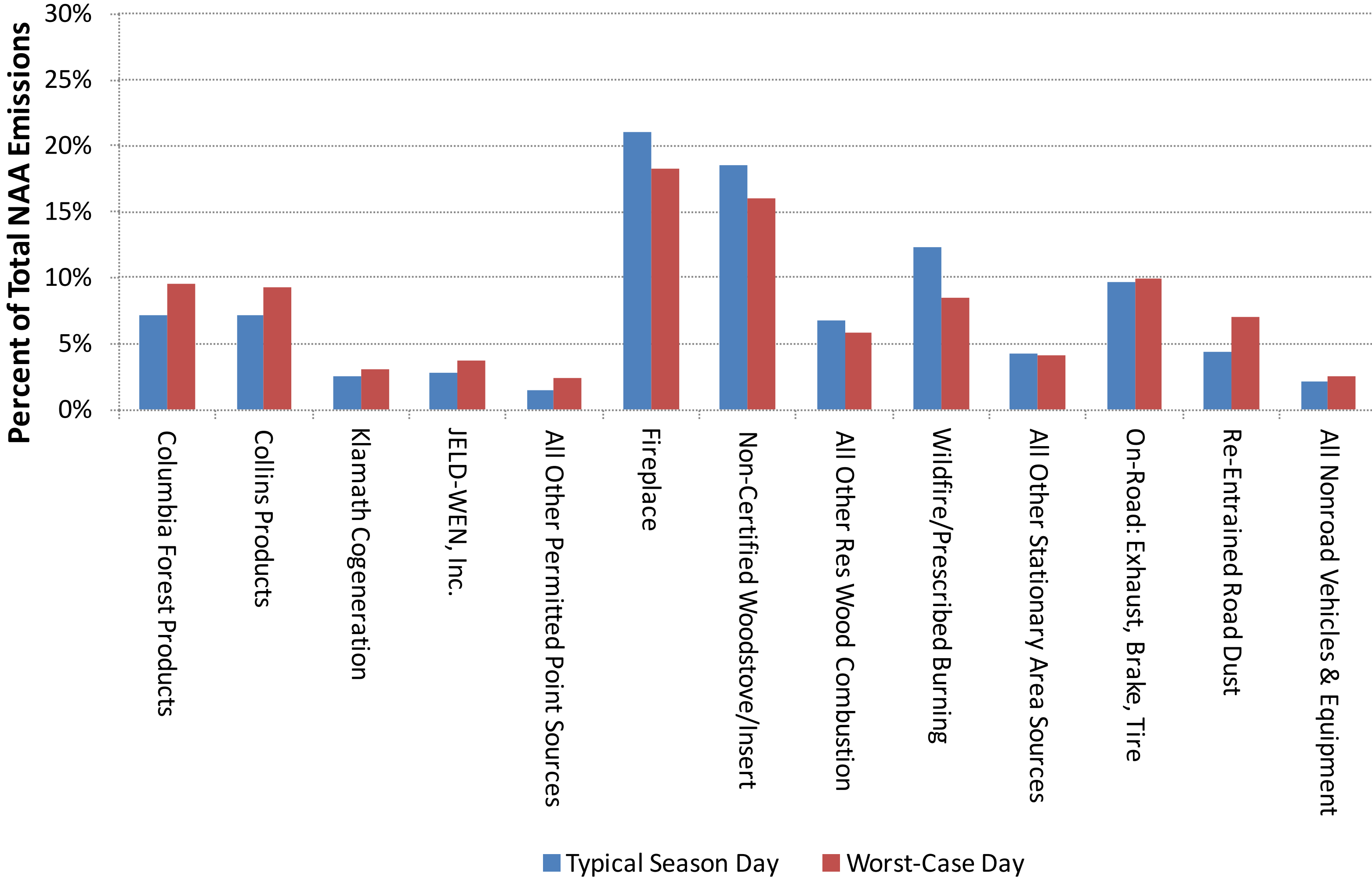
(1) Worst-case day = 80% permitted daily operating capacity

Updated, CLS 2/13/12

(2) Worst-case day = Advisory controlled



Executive Summary, Figure 1. 2008 Klamath Falls NAA Typical Season Day and Worst-Case Day $PM_{2.5}$ Emissions by Major Source Group



Executive Summary, Figure 2. 2008 Klamath Falls NAA Typical Season Day and Worst-Case Day $PM_{2.5}$ Emissions Contribution by Major Source Group

Executive Summary, Table 3. 2014 Estimated Emissions Contribution by Source Category

Source Category	Annual (tpy)	Percent Of Total	Worst-Case Day (lbs/day)	Percent Of Total
$PM_{2.5}$				
Point(1)	137.4	23%	1,378	32%
Area(2)	389.2	65%	2,066	48%
Nonroad	13.2	2%	123	3%
On-Road	60.7(3)	10%	699	16%
Total	**600.5**		**4,266**	
NO_X				
Point(1)	522.4	29%	4,517	34%
Area(2)	116.3	6%	1,354	10%
Nonroad	311.0	17%	2,586	19%
On-Road	860.6	48%	4,834	36%
Total	**1,810.4**		**13,291**	
VOC				
Point(1)	1,017.6	38%	10,430	51%
Area(2)	957.4	36%	5,944	29%
Nonroad	194.4	7%	793	4%
On-Road	475.3	18%	3,337	16%
Total	**2,644.7**		**20,504**	
NH_3				
Point(1)	73.2	30%	1,471	65%
Area(2)	163.5	66%	736	33%
Nonroad	--	--	--	--
On-Road	10.3	4%	56	2%
Total	**246.9**		**2,263**	
SO_X				
Point(1)	80.0	59%	568	46%
Area(2)	50.7	37%	556	45%
Nonroad	2.6	2%	89	7%
On-Road	2.9	2%	17	1%
Total	**136.3**		**1,230**	

(1) Worst-case day = 80% permitted daily operating capacity
(2) Area source residential wood combustion worst-case day = advisory controlled
(3) Re-entrained dust + (MOVES typical season day * 365 days):

Updated, CLS 2/17/12

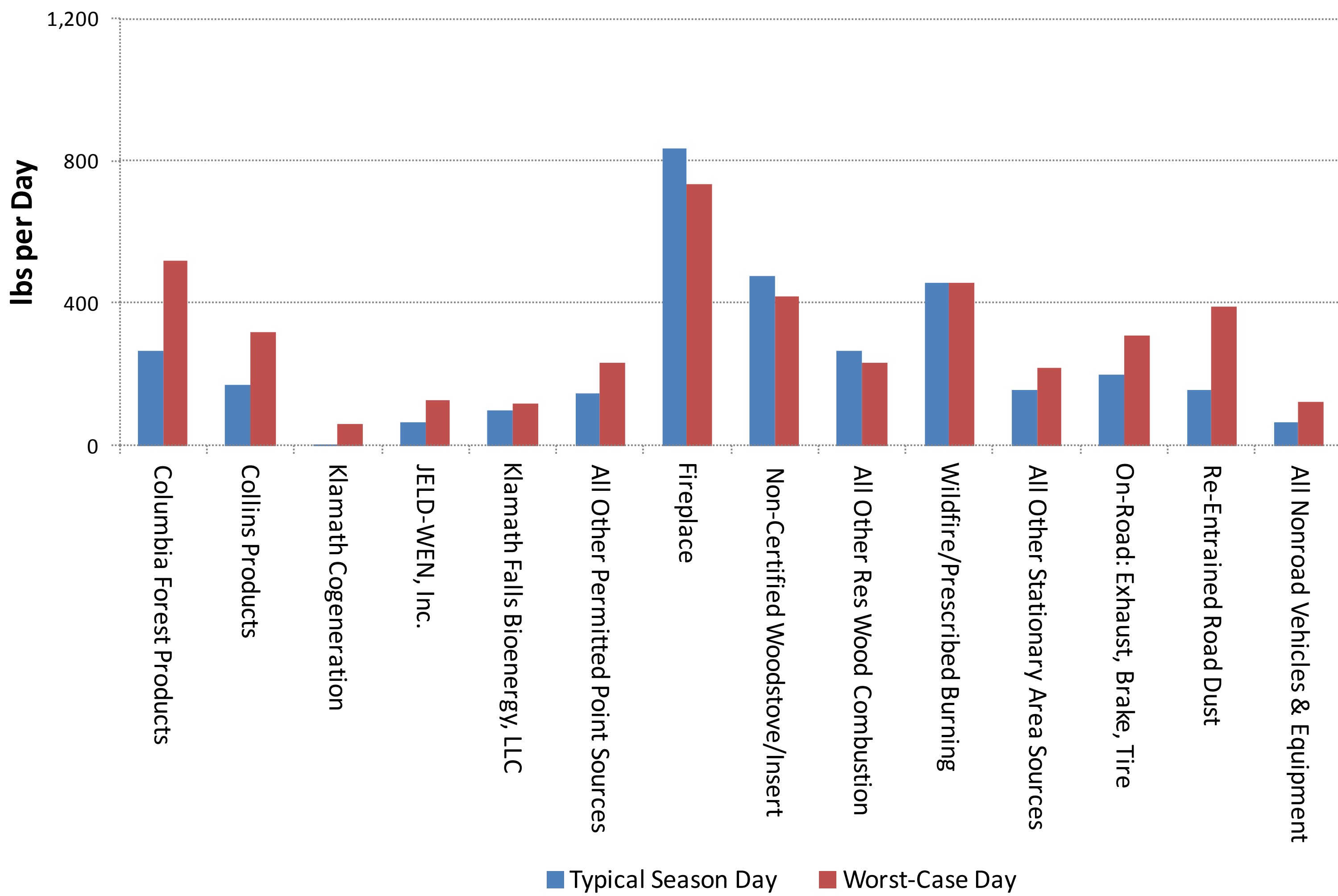
Executive Summary, Table 4. 2014 Estimated Typical Season Day and Worst-Case Day $PM_{2.5}$ Emissions, Grouped and Summed to Show Contribution by Major Source Group

	-- lbs/per day --		Percent of Total NAA Emissions	
	Typical Season Day	Worst-Case Day	Typical Season Day	Worst-Case Day
Permitted Point Sources[1]				
Columbia Forest Products	268	518	8%	12%
Collins Products	170	320	5%	8%
Klamath Cogeneration	3	62	0.1%	1%
JELD-WEN, Inc.	67	129	2%	3%
Klamath Falls Bioenergy, LLC	98	117	3%	3%
All Other Permitted Point Sources	145	233	4%	5%
Stationary Area Sources				
Residential Wood Combustion: Fireplace[2]	835	736	25%	17%
Residential Wood Combustion: Non-Certified Woodstove/Insert[2]	477	421	14%	10%
All Other Residential Wood Combustion[2]	263	232	8%	5%
Wildfire/Prescribed Burning	459	459	14%	11%
All Other Stationary Area Sources	156	219	5%	5%
On-Road Sources				
On-Road: Exhaust, Brake, Tire	199	307	6%	7%
Re-Entrained Road Dust	156	392	5%	9%
Nonroad Sources				
All Nonroad Vehicles & Equipment	66	123	2%	3%
	------	------		
Total, All Sources, lbs/day	**3,361**	**4,266**		

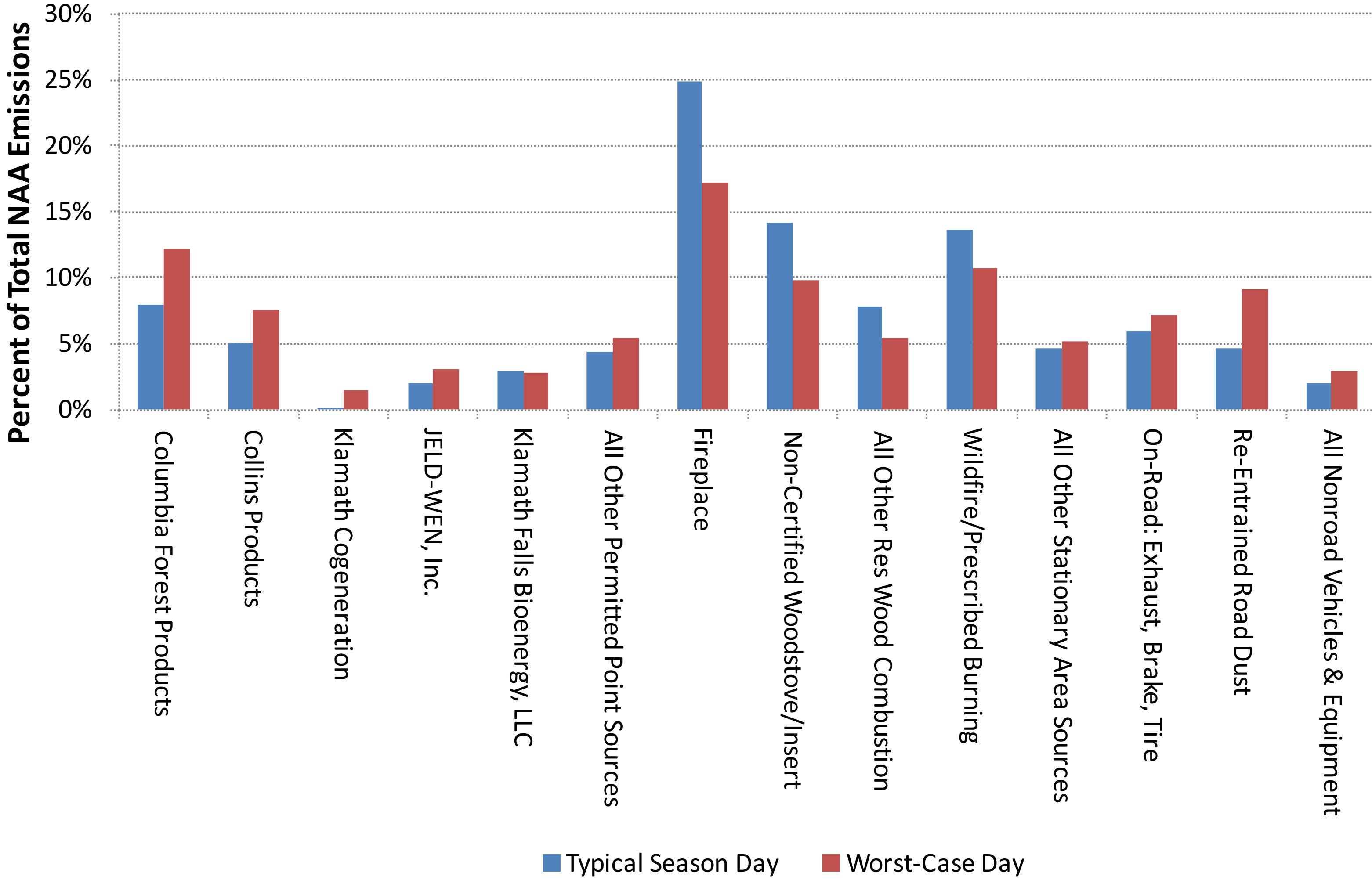
(1) Worst-case day = 80% permitted daily operating capacity

Updated, CLS 2/17/12

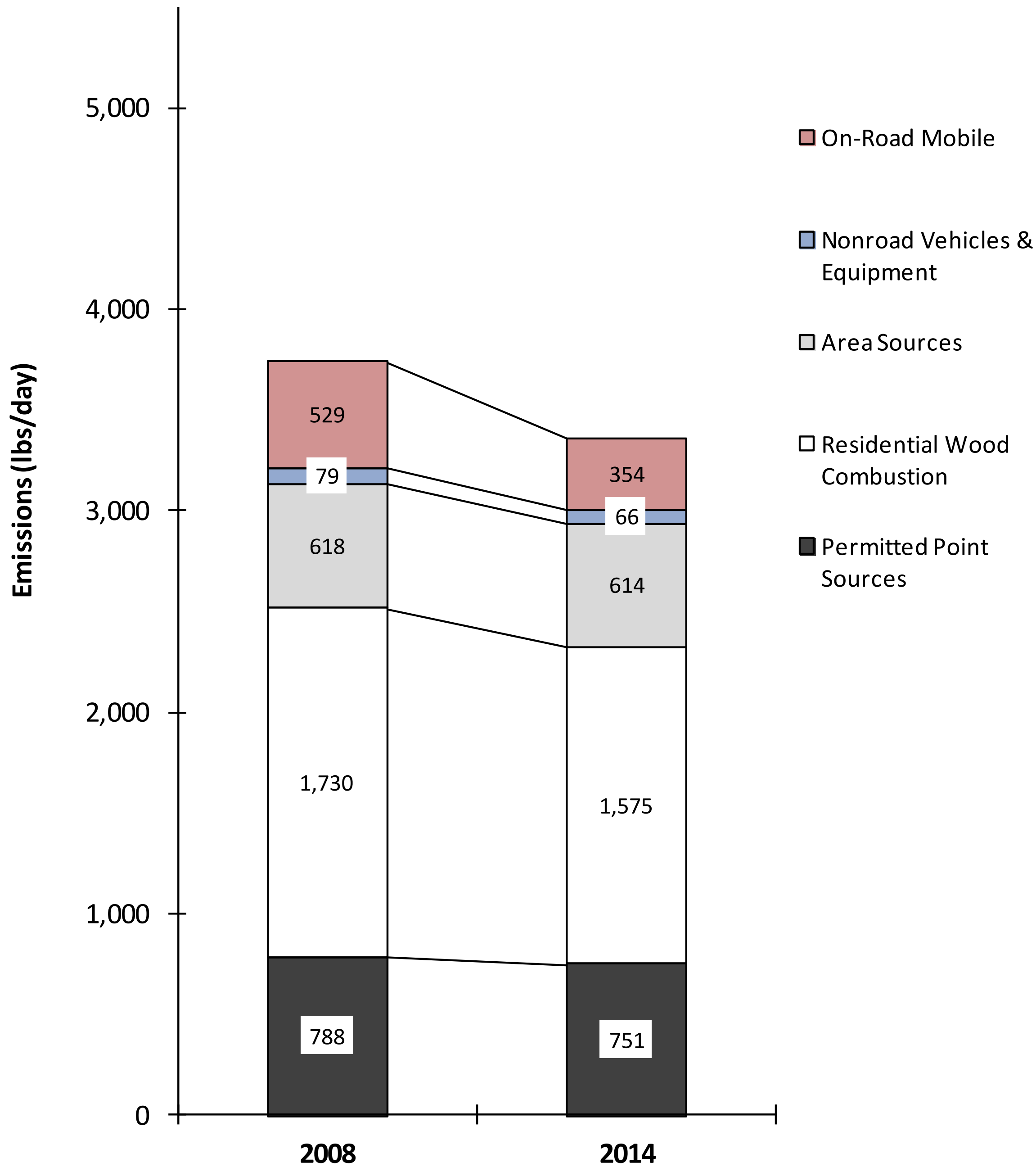
(2) Worst-case day = Advisory controlled



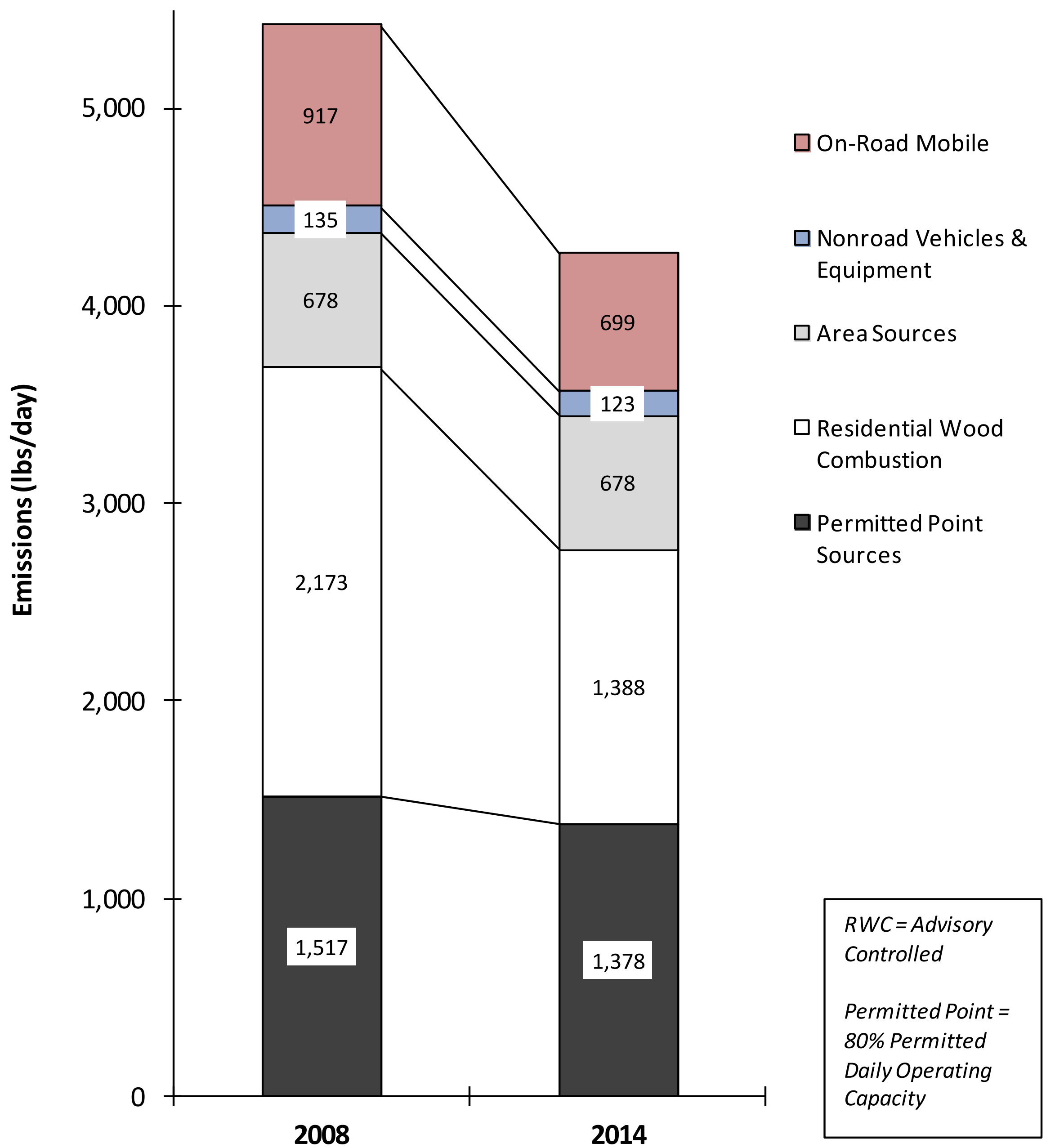
Executive Summary, Figure 3. 2014 Klamath Falls NAA Typical Season Day and Worst-Case Day $PM_{2.5}$ Emissions by Major Source Group



Executive Summary, Figure 4. 2014 Klamath Falls NAA Typical Season Day and Worst-Case Day $PM_{2.5}$ Emissions Contribution by Major Source Group



Executive Summary, Figure 5. Comparison of 2008 Base Year and 2014 Forecast Year Typical Season Day Emissions



Executive Summary, Figure 6. Comparison of 2008 Base Year and 2014 Forecast Year Worst-Case Season Day Emissions

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1 INTRODUCTION TO THE REPORT

1.1 Purpose of the Report

The 2008 $PM_{2.5}$ Nonattainment Area State Implementation Plan (SIP) emissions inventory for Klamath Falls has been developed in response to requirements specified in the Clean Air Act Amendments of 1990. In conformance to 40 CFR §51.1002(c), this inventory includes emissions estimates for particulate matter less than 2.5 microns in size ($PM_{2.5}$), oxides of nitrogen (NO_X), sulfur dioxide (SO_2 or SO_X, depending upon data availability), volatile organic compounds (VOC), and ammonia (NH_3) from point, area, and mobile emission sources.

The Clean Air Act Amendments (CAAA) of 1990 authorized the U.S. Environmental Protection Agency (EPA) to designate nonattainment areas with respect to the National Ambient Air Quality Standards (NAAQS). Under the 1990 CAAA, pre-enactment $PM_{2.5}$ nonattainment areas have been classified. The Klamath Falls Nonattainment Area (NAA) was designated as a moderate nonattainment area for $PM_{2.5}$ for the the 24-hour standard on October 8th, 2009.

The 24- hour NAAQS limit for $PM_{2.5}$ is 35 micrograms per cubic meter ($\mu g/m^3$). The annual NAAQS for $PM_{2.5}$ is 15 $\mu g/m^3$. One exceedance of the 24-hour standard in one year is considered a violation of the NAAQS. The calculation of one exceedance, also known as the design value, is based on quarterly averages, and reviewed over a three-year data collection period. A violation is roughly equivalent to 4 exceedances in three years. Table 1-1 shows current data (2008-2010) NAAQS and Klamath Falls NAA design values.

Table 1.1.1. Klamath Falls NAA PM $_{2.5}$ NAAQS and Current Design Value

	24-Hour ($\mu g/m^3$)	Annual ($\mu g/m^3$)
NAAQS	35	15
Klamath Falls NAA Design Value	45	11.2

This document fulfills the EPA requirements for preparing the 2008 Base Year and 2014 Attainment Year emission inventories, as specified in the provisions of the 1990 CAAA, and EPA guidance documents. The purpose of this report is to establish baseline emissions for the Klamath Falls NAA in 2008 and project emissions to 2014. These emissions are then used to determine whether the area will reach attainment by 2014. This determination is documented in the 2008 Klamath Falls NAA $PM_{2.5}$ Attainment Plan, of which this is an appendix.

The 2008 $PM_{2.5}$ Nonattainment Area SIP emission inventory for Klamath Falls is considered a Level II inventory, based on guidance provided by the Emission Inventory Improvement Program (EIIP)[321]. It is a Level II inventory because it will provide supportive data for strategic decision making.

1.2 Description of Inventory and Area Covered

The 2008 Base Year emission inventory and 2014 Attainment Year emission forecast cover $PM_{2.5}$ emissions for the Klamath Falls NAA. Emissions are reported as annual, typical season day, and worst-case day. Typical season day emissions are the daily rate of emissions for the four-month PM season, defined as the period from the beginning of January through the end of February and beginning of November through the end of December. Worst-case day emissions represent the highest ambient $PM_{2.5}$ accumulations on a single day during the four-month PM season. Annual emissions are reported as tons per year (tpy), whereas typical season and worst-case day emissions are reported as lbs per day.

The $PM_{2.5}$ NAA boundary was expanded from the Klamath Falls Woodstove and Open Burning Ordinance Boundary, also called the Air Quality Zone (AQZ), and finalized by the US EPA after collaboration with DEQ. The NAA and AQZ boundaries, along with the Klamath Falls Urban Growth Boundary (included for comparison) are shown in Figure 1.2.1.

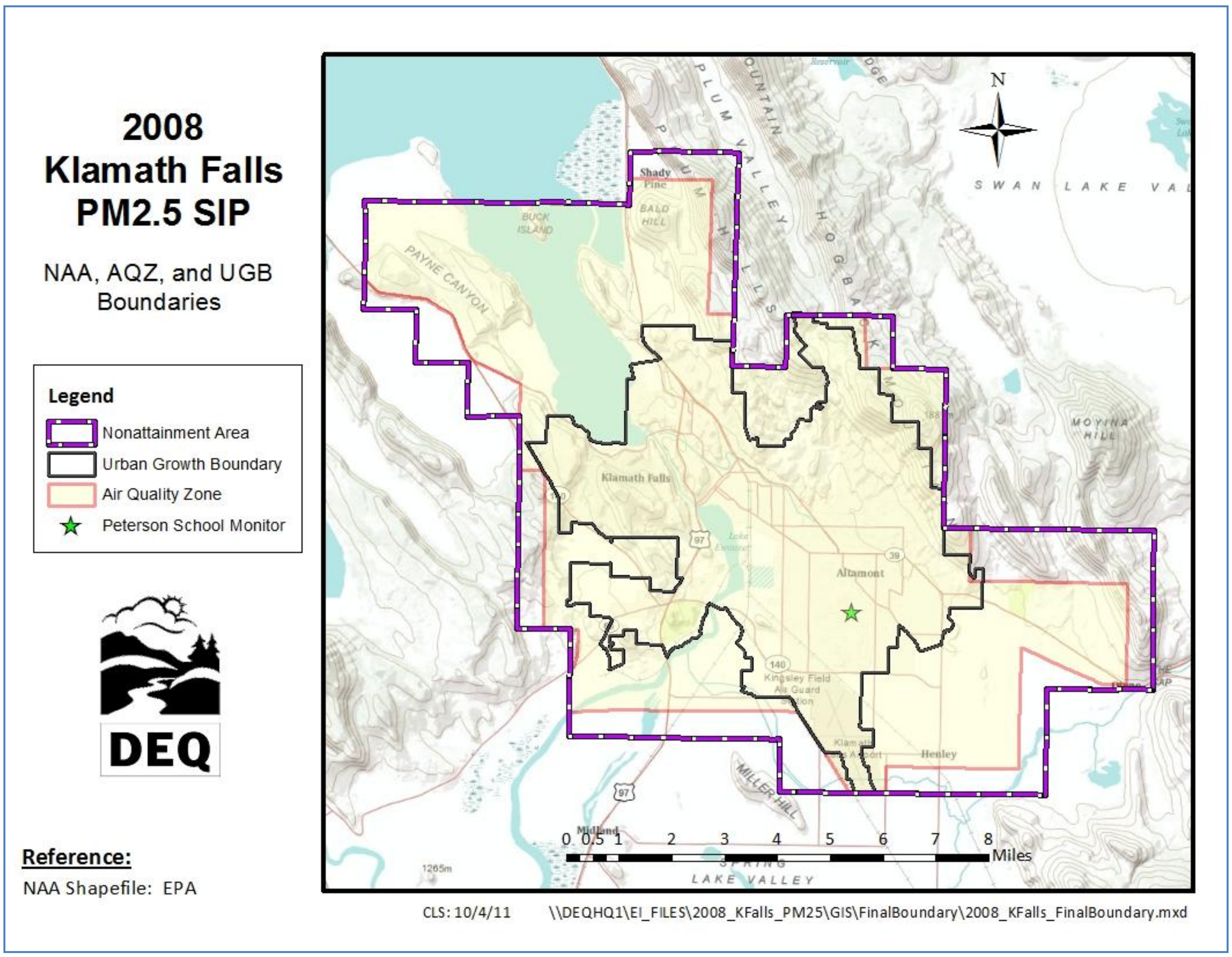

Figure 1.2-1. Klamath Falls $PM_{2.5}$ Nonattainment Area, Air Quality Zone, and Urban Growth Boundaries

1.3 Contents

The Report is divided into the following parts:

Part 1: Introduction to the Report
Part 2: Base Year Emission Inventory (2008)
Part 3: Attainment Year Emission Forecast (2014)
Part 4: Design Day Emission Inventory (2014)
Part 5: Emission Inventory for Transportation Conformity Analysis (2037)
Part 6: Quality Assurance and Quality Control
Part 7: References
Part 8: Appendices

Part 1 provides an introduction to this Report and its purpose. The contents of the Report are briefly described. Information concerning emission inventory information systems, including descriptions of DEQ inventory data systems are included. A summary of the sources excluded from the inventory is presented with rationale for the exclusions. EPA procedure and guidance documents used in preparing the inventory are described. Finally, information on the personnel responsible for the preparation for the inventory is outlined.

Part 2 describes in detail the methodologies and approaches taken to estimate emissions in the Klamath Falls NAA for the 2008 Base Year inventory. Part 2 is divided into sections describing the inventory process and the types of emission sources that are addressed in the inventory, as follows:

Section 1.0 provides a map of the Klamath Falls NAA inventory and Open Burning Control areas, with written descriptions of each area.

Section 2.0 contains summary tables for stationary point, stationary area, non-road mobile, and on-road mobile sources in the Klamath Falls NAA.

Section 3.0 contains a discussion of the stationary point source emission category methodology and emissions estimate approach. Tables summarizing point source emissions estimates follow the discussion.

Section 4.0 addresses stationary area sources and contains a discussion of the approaches used in estimating emissions. Each area source category inventoried is described in detail, including the methodology used in making the calculations. Tables summarizing the emissions estimates from stationary area sources follow the discussion.

Section 5.0 provides a discussion of the approach and methodology used in evaluating emissions from non-road mobile sources. Tables summarizing the emissions estimate from non-road mobile sources follow the discussion.

Section 6.0 provides a description of the approach and methodology used in evaluating emissions from on-road mobile sources. Tables summarizing the emissions estimate from on-road mobile sources follow the discussion.

Part 3 provides future year growth rates and associated emission projections through the 2014 attainment year and also for forecast year 2024.

Part 4 discusses the design day emission inventory, used for Rollback Modeling analysis. This inventory incorporates either typical season or worst-case day emissions estimates, depending on emissions category.

Part 5 provides a brief outline of the methodology used to estimate on-road emissions for the 2037 transportation conformity year, along with details of the 2037 on-road inventory as compared to the 2014 attainment year for area, nonroad, and point sources.

Part 6 describes the Quality Assurance program and Quality Control procedures utilized in preparing the 2008 base year and 2014 attainment year inventories.

Part 7 contains the list of references cited in this document.

Part 8 includes appendices with supplemental data used to estimate emissions.

1.3.1 Description of Emission Inventory Information Systems

The inventory has been assembled by the staff of the Technical Services Section, Air Quality Division and Eastern Region of the Oregon Department of Environmental Quality (DEQ). Permitted point source emissions were drawn and revised in part from the DEQ Tracking Reporting and Administration of Air Contaminant Sources (TRAACS) database, which is used for tracking compliance with plant site emission limits and for reporting compliance status to the EPA EIS system. Various area source emissions were taken from the EPA 2008 National Emissions Inventory (NEI), general purpose release v.1.5., or from the DEQ Area Mobile Emissions Estimates (AMEE) database. All other emissions were either modeled or inventoried by DEQ staff specifically for this project.

1.3.2 Sources Not Inventoried

All sources of $PM_{2.5}$ in the Klamath Falls NAA were considered for inclusion in the emission inventory. Sources were omitted for one of the following reasons; 1) point, area, non-road or mobile sources did not emit significant amounts of $PM_{2.5}$ annually or during the winter months, and, 2) the activity did not occur within the Klamath Falls NAA. A discussion of omitted area sources can be found in section 2.4.4.6.

1.3.3 Guidance Documents

The inventory was conducted using all current and applicable EPA procedure and guidance documents. As mentioned previously, many area source emissions estimates were taken directly from the EPA 2008 NEI, general purpose release v.1.5. Emission factors were taken from the EPA Procedures Document[2], the *Compilation of Air Pollutant Emission Factors*, hereinafter referred to as AP-42[8]. Localized emission factors were used when documentation existed to support their accuracy (e.g., source test reports). These and other information sources are cited in the text, as appropriate.

1.3.4 Contact Personnel for the Inventory

DEQ staff, Christopher Swab, Larry Calkins, Wes Risher, Brandy Albertson, and Miyoung Park performed most of the required source calculations. For transportation (on-road mobile) sources, activity in the form of vehicle miles travelled (VMT) was obtained from the Oregon Department of Transportation (ODOT).

The abbreviated list of those conducting or assisting with the Klamath Falls 2008 Base Year and 2014 Maintenance Year SIP emission inventories is shown below:

Oregon Department of Environmental Quality: Air Quality Division
Andy Ginsburg, Division Administrator
- Jeffrey Stocum, Technical Services Manager
  - *Emission Inventory*
    - Christopher Swab, Senior Emission Inventory Analyst
    - Brandy Albertson, Emission Inventory Analyst
    - Miyoung Park, Emission Inventory Specialist
    - Wesley Risher, Emission Inventory Analyst
  - *Air Quality Information Systems*
    - Brian Fields, Information Systems Specialist
  - *LandGEM Modeling*
    - Colin McConnaha, Greenhouse Gas Audit Specialist
  - *Design Day Inventory Consultation*
    - Phil Allen, Senior Air Quality Modeler
  - *Quality Assurance*
    - Anthony Barnack, Air Monitoring Coordinator
- Mark Bailey, Air Quality Manager, DEQ Eastern Region (Bend Office)
    - Larry Calkins, Nonattainment Area Coordinator
- David Collier, Air Quality Planning & Development Manager
    - Rachel Sakata, Air Quality Planner
    - Sue Langston, Air Quality Planner
    - Sarah Armitage, Air Quality Planner

Oregon State Department of Transportation

Transportation Development, Transportation Planning Analysis Unit (TPAU)

Richard D. Arnold, PE, Senior Transportation Analyst

Christina McDaniel-Wilson, Transportation Analyst

Highway Division, Technical Services, Air Quality Program

Marina Orlando, Air Quality Program Coordinator

2 2008 KLAMATH FALLS NONATTAINMENT AREA PM2.5 EMISSION INVENTORY

2.1 Nonattainment Area (NAA) and Open Burning Control Area Descriptions

A map showing the Klamath Falls $PM_{2.5}$ NAA, along with the Klamath Falls Urban Growth Boundary and Air Quality Zone, is shown in Figure 1.2-1. For this emission inventory, emissions were estimated within the NAA boundary, which was expanded from the AQZ. A map showing the NAA, along with the Open Burning Control area, is shown in Figure 2.1-1.

2.1.1 Legal Descriptions

2.1.1.1 Legal Description of Klamath Falls NAA

The legal description of the Klamath Falls NAA defines the nonattainment area boundary, and can be found in Oregon Administrative Rules (OAR) 340, Division 204, Section 0030(3).

> *The Klamath Falls Nonattainment Area for PM2.5 is as follows: Townships and ranges defined by T37S R9E Sections 31-32. T38S R8E Sections 1-5, 8-16, 22-26, 35-36. T38S R9E Sections 5-8, 14-15, 17-36. T39S R8E Sections 1-2, 11-13, 24. T39S R9E Sections 1-27. T39S R10E Sections 3-10, 15-20, 29-30.*

2.1.1.2 Legal Description of the Open Burning Control Area

In addition to the NAA, DEQ has specific rules that address open burning for commercial, demolition, construction and industrial open burning. These rules are identified for densely populated locations in the state as cities over 4,000 people in population and within three miles of the corporate city limits of these cities and are termed Open Burning Control Areas. These rules are located in 340-264-0100 and are summarized below.

> *Generally areas around the more densely populated locations in the state and valleys or basins which restrict atmospheric ventilation are designated open burning control areas. The practice of open burning may be more restrictive in open burning control areas than in other areas of the state. The specific open burning restrictions associated with these Open Burning Control Areas are listed in OAR 340-264-0080 through 340-264-0200 by county. The Open Burning Control Areas of the eastern part of the state are defined as follows:*
>
> *All areas in or within three miles of the incorporated city limit of all cities with a population of 4,000 or more.*

Figure 2.1-1 shows the Klamath Falls $PM_{2.5}$ Nonattainment Area and Open Burning Control Area boundaries.

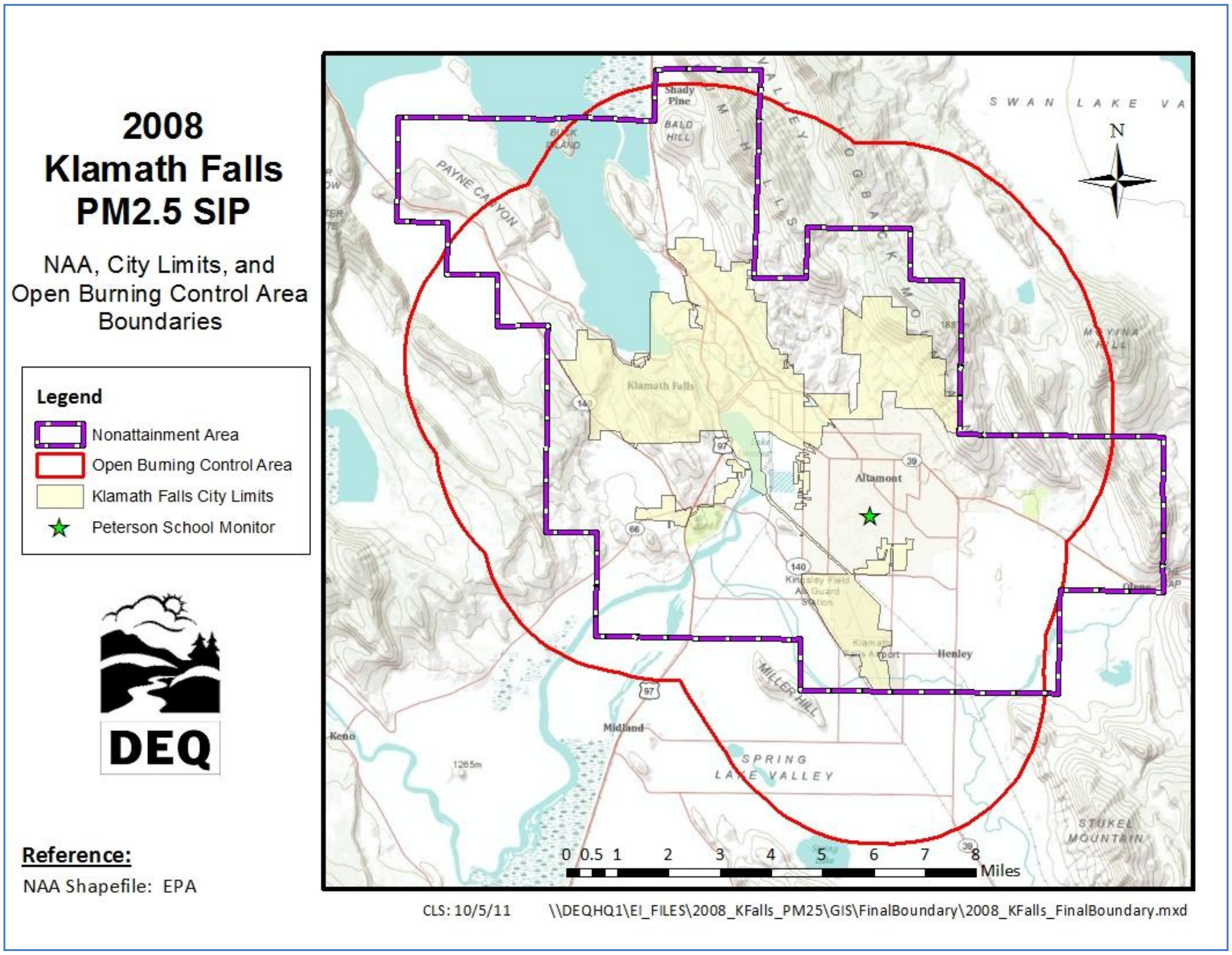

Figure 2.1-1. Klamath Falls PM2.5 Nonattainment Area, City Limits, and Open Burning Control Area Boundaries

2.2 Summary of Emissions Data

Table 2.2.1 includes summary emissions estimates from stationary point sources, stationary area sources, non-road mobile sources, and on-road mobile sources. Summary emissions are expressed as graphs in the following Figures.

Table 2.2.1. Klamath Falls NAA 2008 Summary of Emissions By Source Type

Source Category	Annual (tpy)	Percent Of Total	Worst-Case Day (lbs/day)	Percent Of Total
$PM_{2.5}$				
Point(1)	143.4	22%	1,517	28%
Area(2)	403.0	62%	2,851	53%
Nonroad	16.1	2%	135	2%
On-Road	92.2(3)	14%	917	17%
Total	**654.7**		**5,420**	
NO_X				
Point(1)	329.3	15%	3,247	21%
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VOC				
Point(1)	997.2	34%	10,301	45%
Area(2)	972.9	33%	6,843	30%
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Total	**2,910.4**		22,754	
NH_3				
Point(1)	70.4	29%	1,453	64%
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SO_X				
Point(1)	47.8	44%	357	34%
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Nonroad	6.6	6%	108	10%
On-Road	6.4	6%	36	3%
Total	**109.9**		**1,046**	

(1) Worst-case day = 80% permitted daily operating capacity

(2) Area source residential wood combustion worst-case day = advisory controlled

(3) Re-entrained dust + (MOVES typical season day * 365 days):

11/18/11, *Updated, CLS 2/17/12*

2.3 Stationary Permitted Point Sources

2.3.1 Introduction and Scope

Stationary point source emissions and compliance data is maintained in the DEQ Tracking Reporting and Administration of Air Contaminant Sources (TRAACS) database. There are two major permit classifications: (1) A2 and/or synthetic minor sources emitting 5 to 99 tons of criteria pollutants per year, and (2) Title V sources emitting 100 tons or more criteria pollutants per year. Point sources in this database were mapped using ArcGIS 10 in order to eliminate sources located outside of a one-mile buffer zone of the Klamath Falls NAA. The locations of permitted point sources relative to the one-mile buffer zone are shown in Appendix A, Figure A-1.

Permitted point sources within the buffer zone included industrial and non-industrial sources, gas stations, crematories, and portable sources such as rock crushers and asphalt plants. Non-permitted stationary point source emissions estimates are covered in the area source section of this inventory; please see sections 2.4.4.2, 2.4.4.6.2, 2.4.4.6.9, and 2.4.4.6.10 for details on non-permitted point source emissions estimates from fuel combustion and other processes.

2.3.2 Methodology and Approach

Permitted point source annual emissions were estimated at the process level for each source. Seasonal emissions were estimated from annual emissions using seasonal adjustment factors (SAFs), developed from operating schedules or from EPA temporal data specific to process.

2.3.2.1 Activity

Activity data was collected from 2008 annual reports for all permitted facilities. Facilities must fulfill permit conditions for annual reporting by submitting emission estimates for criteria and/or some hazardous air pollutant emissions. The activity data was used to verify existing 2008 emissions estimates from the reports as well as to calculate PM2.5 emissions not typically reported by the facilities themselves.

2.3.2.2 Emission Factors

$PM_{2.5}$ emission factors were developed using the tables from EPA's PM Calculator, downloaded from the EPA Technology Transfer Network, Clearinghouse for Inventories & Emissions Factors webpage[795]. The PM calculator is stand-alone software developed by EPA, consisting of specific tables used to estimate PM emissions. The tables provide particle size distribution information to determine the percentage of PM2.5-filterable emissions that make up PM10-filterable emissions for specific SCCs and control technologies. These tables are populated with particle size distribution data from AP-42[8], appendices B1 & B2 and data specific to AP-42 chapters and sections.

For criteria pollutants other than $PM_{2.5}$, emission factors used to calculate permitted pollutant levels in the various permit types were based on: 1) methods and procedures given in AP-42[8], 2) the result of detailed local studies or experience, 3) source tests, or 4) chemical mass balance calculations. The Emission Inventory Group, Technical Services Section, Air Quality Division of the Oregon DEQ reviews these emission factors during the annual update of the annual statewide emission inventory, completed in compliance with Federal Rules.

2.3.2.3 Annual Emissions Calculations

Data used in the annual emissions estimates includes emission factors, annual throughput or process rate from source submitted annual reports, and operation schedule. The emission factors, together with the annual production levels, are used to estimate annual emissions.

2.3.2.4 Seasonal Emissions Calculations

Typical season day emissions for point sources were estimated by applying a seasonal adjustment factor (SAF) to annual emissions estimates. SAF data, specific to source process, was calculated from EPA temporal allocation data: Temporal Profile – CAIR Platform – MS Excel, February 2005[760]. The EPA temporal data, in the form of annual activity by month, was used in the SAF formula:

SAF = *((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*[2].

Days per week activity levels were taken from source permits, TRAACS, or annual reports. Activity level was then used along with SAF to estimate typical season day (TSD) emissions as follows:

*TSD = (Annual Emissions, tons/year * 2000 lbs/ton) * SAF) / (Activity Level, days/wk * 52 weeks/yr)*

Worst-case season day (WCD) emissions were estimated using an 80% design capacity for emissions processes at each source. The design capacity for equipment or processes (production activity per day) was taken from current permit review reports or emissions detail sheets. 80% of this capacity was used as the maximum activity that could occur on any day of the year, in or out of season. The 80% capacity (activity level) was then multiplied by pollutant emission factors to estimate worst-case season day emissions, with the assumption that maximum activity may occur during the PM season.

2.3.2.5 Control Efficiency, Rule Effectiveness, and Rule Penetration

Permitted point source emission factors were considered to include the efficiency of control devices for this inventory. As per EPA guidance, DEQ has chosen the option of not applying rule effectiveness to this $PM_{2.5}$ SIP emission inventory (EPA-454/R-05-001, p.18, paragraph 3, DEQ Ref. 627). Rule penetration at each point source was considered to be 1.

2.3.2.6 Gasoline Service Stations

To assure that all gasoline service stations within the NAA were included in the inventory, the location of each gas station in Klamath County was mapped using ArcGIS. Appendix A, Figure A-2 shows the location of all permitted gasoline service stations within the NAA.

Control equipment and annual throughput data for gasoline service stations in Klamath County were taken from the DEQ TRAACS database. To estimate fugitive VOC emissions, throughput data was multiplied by VOC emission factors from AP-42[8]. VOC emissions estimates for Stage I, Stage II, UST/AST breathing & emptying, and spillage are all included in station total operations emissions estimates. No stations in the Klamath Falls NAA are equipped with Stage II controls (gasoline pump vapor recovery, also known as Vapor Recovery Systems, or VRS). As such, there was no need to account for the effect of on-board refueling vapor recovery (ORVR) incompatibility with VRS during vehicle refueling. Due to the complexity of the emissions calculations, a complete description of the gasoline station emissions estimation methodology is included in Appendix A, *Methodology: Gasoline Service Stations*.

EPA temporal profile data indicate that gasoline service station activity is considered uniform throughout the week and year. As such, service station typical and worst-case season day emissions were estimated to be 1/365th of annual emissions.

2.3.3 Summary of Stationary Permitted Point Source Emissions Estimates

Table 2.3.1 summarizes point source emissions by firm, and Table 2.3.2 summarizes point source $PM_{2.5}$ emissions by facility primary North American Industry Classification System (NAICS) code. Additionally, Figures 2.3.1 through 2.3.4 show the breakdown of emissions in bar chart format. The contribution of pollutants contributing to the secondary formation of $PM_{2.5}$ is considered minimal[7,8,9], and as such *Figures* representing the distribution and percentages of pollutants contributing to secondary formation of $PM_{2.5}$ are not included in this EI. Emissions from all pollutants are represented in tables in this document.

The locations of all permitted point sources relative to the one-mile buffer are shown in Appendix A, Figure A-1. Individual reports detailing emissions for each permitted source (excluding gasoline stations) may be found in Appendix A following Figure A-1. A detailed description of the gasoline service station emission inventory methodology is found in Appendix A following the individual source reports. Appendix A, Table A-1 provides a detailed breakdown of the gasoline services station VOC emissions estimates.

Table 2.3.1. Klamath Falls NAA Summary of 2008 Point Source Emissions by Firm

		------- $PM_{2.5}$ -------			------- NO_X -------			----- SO_2 -----			----- VOC -----			----- NH_3 -----		
			--- Season Day ---			--- Season Day ---			--- Season Day ---			--- Season Day ---			--- Season Day ---	
Source Number	Source Name	Annual (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	Annual (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	Annual (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	Annual (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	Annual (tpy)	Typical (lbs/day)	Worst Case (lbs/day)
Stationary																
18-0003	Klamath Energy LLC Klamath Cogeneration Proj	39.3	190	301	172.2	830	1,506	19.5	94	145	82.5	398	588	68.9	331	1,368
18-0006	JELD-WEN, Inc. dba JELD-WEN	17.3	106	206	37.6	232	370	1.9	11	16	165.9	1,018	1,996	0.3	2	3
18-0013	Collins Products LLC Weyerhaeuser	48.4	265	500	9.4	52	274	0.1	0.4	2	529.8	2,903	5,365	0.03	0.2	3
18-0014	Columbia Forest Products, Inc.	48.9	268	548	53.5	294	494	1.4	8	13	41.2	226	627	0.3	1	2
18-0018	Pyramid Cremations	0.1	0.3	0.4	6.E-04	3.E-03	4.E-03	1.E-05	5.E-05	6.E-05	3.E-05	2.E-04	2.E-04	---	---	---
18-0020	Oil Re-Refining Company Industrial Oil	3.1	17	20	5.2	28	34	20.9	115	138	1.4	7	9	0.1	0.3	0.4
18-0022	Electro Scientific Industries, Inc.	1.E-02	6.E-02	7.E-02	0.4	2	3	1.E-02	6.E-02	8.E-02	2.E-02	1.E-01	2.E-01	1.E-02	8.E-02	9.E-02
18-0031	Reach, Inc.	0.2	1	1	---	---	---	---	---	---	0.9	5	6	---	---	---
18-0032	Klamath Energy, LLC Klamath Generation Peakers	0.6	3	62	1.9	9	173	0.1	0.5	10	0.5	2.4	48	0.8	3.7	75
18-0056	Sky Lakes Medical Center, Inc.	0.02	0.1	0.1	0.6	3	4	1.E-02	6.E-02	7.E-02	3.E-02	2.E-01	2.E-01	2.E-02	1.E-01	1.E-01
18-0070	Jefferson State Redi Mix, Inc.	0.1	1	1	---	---	---	---	---	---	---	---	---	---	---	---
18-0086	Down River LLC	1.E-04	1.E-03	1.E-03	---	---	---	---	---	---	3.0	24	29	---	---	---
18-0087	Funeral	2.E-02	1.E-01	1.E-01	---	---	---	---	---	---	---	---	---	---	---	---
18-0088	O'Hair & Riggs Funeral Chapel Klamath Cremation	2.E-02	9.E-02	1.E-01	---	---	---	---	---	---	---	---	---	---	---	---
18-0093	Masco Bath Corporation Masco Bath	1.1	12	13	1.1	13	53	1.0	11	13	34.1	387	869	4.E-04	5.E-03	1.E-01
18-0097	Kingsley Field Air National Guard Base	0.5	3	3	7.3	40	48	0.2	1	1	0.7	4	5	---	---	---
18-9542	Klamath Falls Bioenergy, LLC	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Portable																
37-0209	CPM Development Corporation dba Klamath Pacific Company	3.0	16.3	19.5	36.3	197	236	2.6	14	17	3.6	20	24	0.1	0.4	1
37-0438	CPM Development Corporation dba Klamath Pacific Company	0.6	7.4	8.9	3.7	44	53	0.2	3	3	0.3	4	4	9.E-03	1.E-01	1.E-01
37-0625	CPM Development Corporation dba Klamath Pacific Company	0.0	0.2	0.2	---	---	---	---	---	---	---	---	---	---	---	---
37-0667	Rocky Mountain Construction, LLC	0.1	0.5	0.6	---	---	---	---	---	---	---	---	---	---	---	---
37-0675	Rocky Mountain Construction, LLC	0.1	0.4	0.4	---	---	---	---	---	---	---	---	---	---	---	---

Table 2.3.1, continued

Source Number	Source Name	PM2.5 Annual (tpy)	PM2.5 Season Day Typical (lbs/day)	PM2.5 Season Day Worst Case (lbs/day)	NOx Annual (tpy)	NOx Season Day Typical (lbs/day)	NOx Season Day Worst Case (lbs/day)	SO2 Annual (tpy)	SO2 Season Day Typical (lbs/day)	SO2 Season Day Worst Case (lbs/day)	VOC Annual (tpy)	VOC Season Day Typical (lbs/day)	VOC Season Day Worst Case (lbs/day)	NH3 Annual (tpy)	NH3 Season Day Typical (lbs/day)	NH3 Season Day Worst Case (lbs/day)
Gasoline Service Stations																
18-9506	Ezell Suty Fuel Incorporated	---	---	---	---	---	---	---	---	---	7.4	41	41	---	---	---
18-9509	AMA Mini Mart, Inc.	---	---	---	---	---	---	---	---	---	5.4	30	30	---	---	---
18-9510	AMA Mini Mart, Inc.	---	---	---	---	---	---	---	---	---	5.1	28	28	---	---	---
18-9511	AMA Mini Mart, Inc.	---	---	---	---	---	---	---	---	---	7.7	42	42	---	---	---
18-9512	Joey's Gas & Mini Mart	---	---	---	---	---	---	---	---	---	7.9	43	43	---	---	---
18-9513	New Albertson's, Inc.	---	---	---	---	---	---	---	---	---	10.6	58	58	---	---	---
18-9519	Clough Oil Company	---	---	---	---	---	---	---	---	---	7.4	41	41	---	---	---
18-9520	Clough Oil Company	---	---	---	---	---	---	---	---	---	1.4	8	8	---	---	---
18-9521	Clough Oil Company	---	---	---	---	---	---	---	---	---	5.0	27	27	---	---	---
18-9522	Clough Oil Company	---	---	---	---	---	---	---	---	---	5.8	32	32	---	---	---
18-9523	Clough Oil Company	---	---	---	---	---	---	---	---	---	2.5	14	14	---	---	---
18-9527	Fred Meyer Stores, Inc.	---	---	---	---	---	---	---	---	---	24.4	134	134	---	---	---
18-9528	Klamath Falls Kampground Inc	---	---	---	---	---	---	---	---	---	7.4	41	41	---	---	---
18-9529	Truax Corporation	---	---	---	---	---	---	---	---	---	12.9	71	71	---	---	---
18-9530	Colvin Oil Company	---	---	---	---	---	---	---	---	---	4.6	25	25	---	---	---
18-9531	American Energy, Inc.	---	---	---	---	---	---	---	---	---	3.6	20	20	---	---	---
18-9534	Oregon Avenue Food Mart	---	---	---	---	---	---	---	---	---	6.5	35	35	---	---	---
18-9543	Ferrell's Fuel Network, Inc.	---	---	---	---	---	---	---	---	---	7.4	41	41	---	---	---
		-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Totals		**163.5**	**891**	**1,687**	**329.3**	**1,744**	**3,247**	**47.8**	**259**	**357**	**997.2**	**5,728**	**10,301**	**70.4**	**340**	**1,453**

Table 2.3.2. Klamath Falls NAA Summary of 2008 Point Source Emissions by Industry Classification

NAICS_Code		$PM_{2.5}$ Annual (tpy)	$PM_{2.5}$ Season Day Typical (lbs/day)	$PM_{2.5}$ Season Day Worst Case (lbs/day)	NO_X Annual (tpy)	NO_X Season Day Typical (lbs/day)	NO_X Season Day Worst Case (lbs/day)	SO_2 Annual (tpy)	SO_2 Season Day Typical (lbs/day)	SO_2 Season Day Worst Case (lbs/day)	VOC Annual (tpy)	VOC Season Day Typical (lbs/day)	VOC Season Day Worst Case (lbs/day)	NH_3 Annual (tpy)	NH_3 Season Day Typical (lbs/day)	NH_3 Season Day Worst Case (lbs/day)
321219	Reconstituted Wood Product Manufacturing	65.7	371	706	47.0	284	644	1.9	12	18	695.7	3,921	7,361	0.4	2	6
321211	Hardwood Veneer and Plywood Manufacturing	48.9	268	548	53.5	294	494	1.4	8	13	41.2	226	627	0.3	1	2
221119	Other Electric Power Generation	39.3	189.7	301	172.2	829.6	1,506	19.5	94.4	145	82.5	397.6	588	68.9	331.2	1,368
423930	Recyclable Material Merchant Wholesalers	3.1	17	20	5.2	28	34	20.9	115	138	1.4	7	9	0.1	0.3	0.4
324121	Asphalt Paving Mixture and Block Manufacturing	3.0	16	20	36.3	197	236	2.6	14	17	3.6	20	24	0.1	0.4	1
326191	Plastics Plumbing Fixture Manufacturing	1.1	12	13	1.1	13	53	1.0	11	13	34.1	387	869	4.E-04	5.E-03	0.15
212321	Construction Sand and Gravel Mining	0.8	8	10	3.7	44	53	0.2	3	3	0.3	4	4	0.01	0.10	0.12
221112	Fossil Fuel Electric Power Generation	0.6	3	62	1.9	9	173	0.1	0	10	0.5	2	48	0.8	4	75
928110	National Security	0.5	3	3	7.3	40	48	0.2	1	1	0.7	4	5			
321918	Other Millwork (including Flooring)	0.2	1	1							3.9	29	35			
327320	Ready-Mix Concrete Manufacturing	0.2	1	1												
812220	Cemeteries and Crematories	0.1	1	1	6.E-04	3.E-03	4.E-03	1.E-05	5.E-05	6.E-05	3.E-05	2.E-04	2.E-04			
221330	Steam and Air-Conditioning Supply	0.02	0.08	0.10	0.6	3	4	0.01	0.06	0.07	0.03	0.18	0.22	0.02	0.11	0.13
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	0.01	0.06	0.07	0.4	2	3	0.01	0.06	0.08	0.02	0.1	0.2	0.01	0.08	0.09
447190	Gasoline Service Stations										133.2	730	730			
		-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
	Totals	**163.5**	**891**	**1,687**	**329.3**	**1,744**	**3,247**	**47.8**	**259**	**357**	**997.2**	**5,728**	**10,301**	**70.4**	**340**	**1,453**

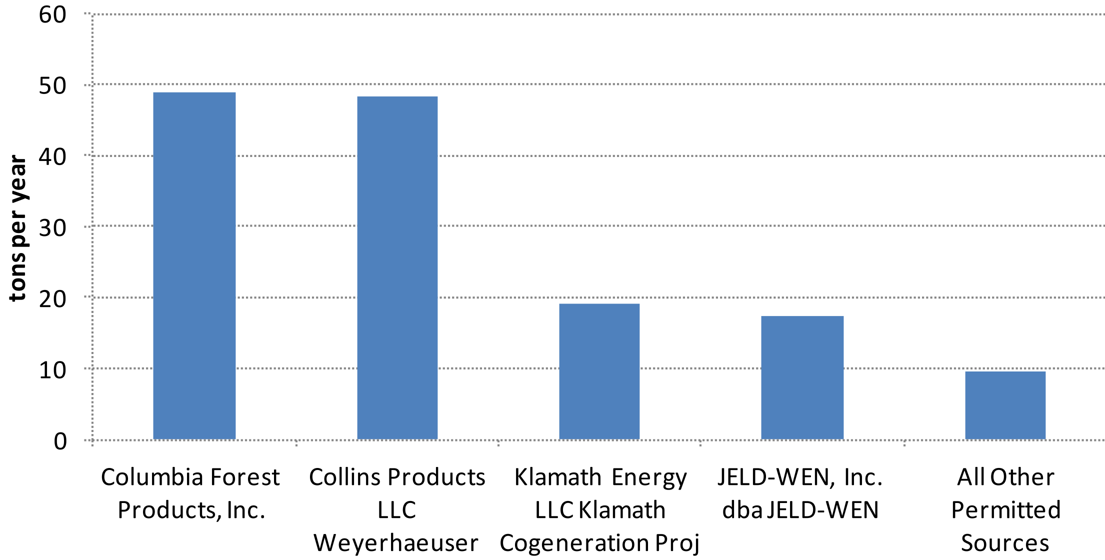

Figure 2.3-1. Klamath Falls NAA Summary of 2008 Point Source Annual $PM_{2.5}$ Emissions by Firm

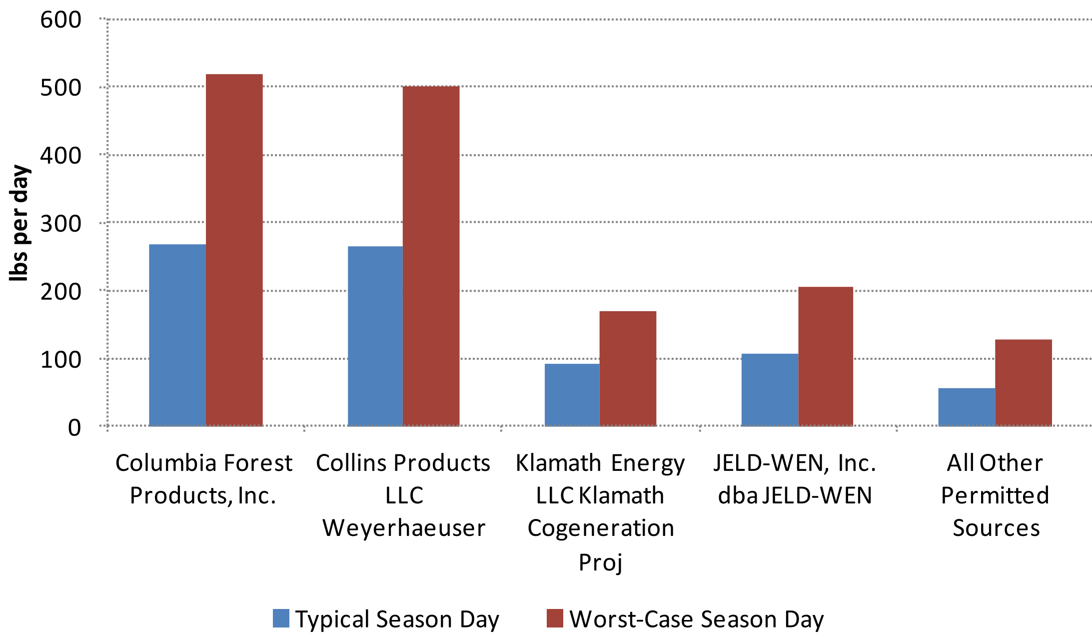

Figure 2.3-2. Klamath Falls NAA Summary of 2008 Point Source Season Day $PM_{2.5}$ Emissions by Firm

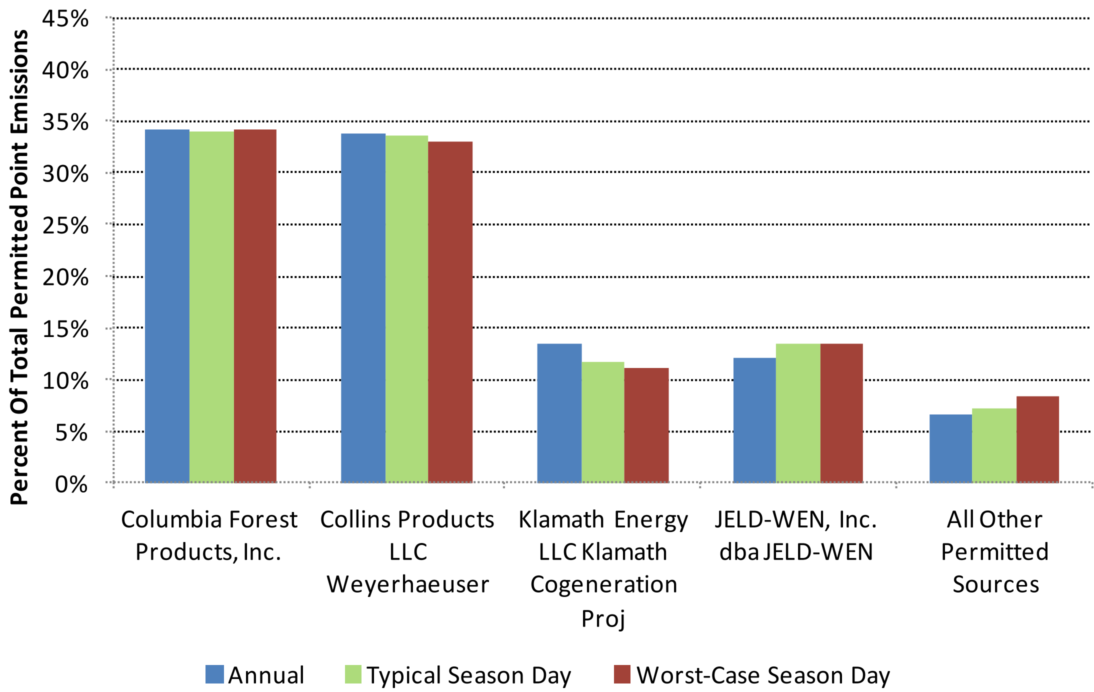

Figure 2.3-3. Klamath Falls NAA Summary of 2008 Point Source $PM_{2.5}$ Emissions By Firm: Annual, Typical Season Day, and Worst-Case Day Emissions Percentages

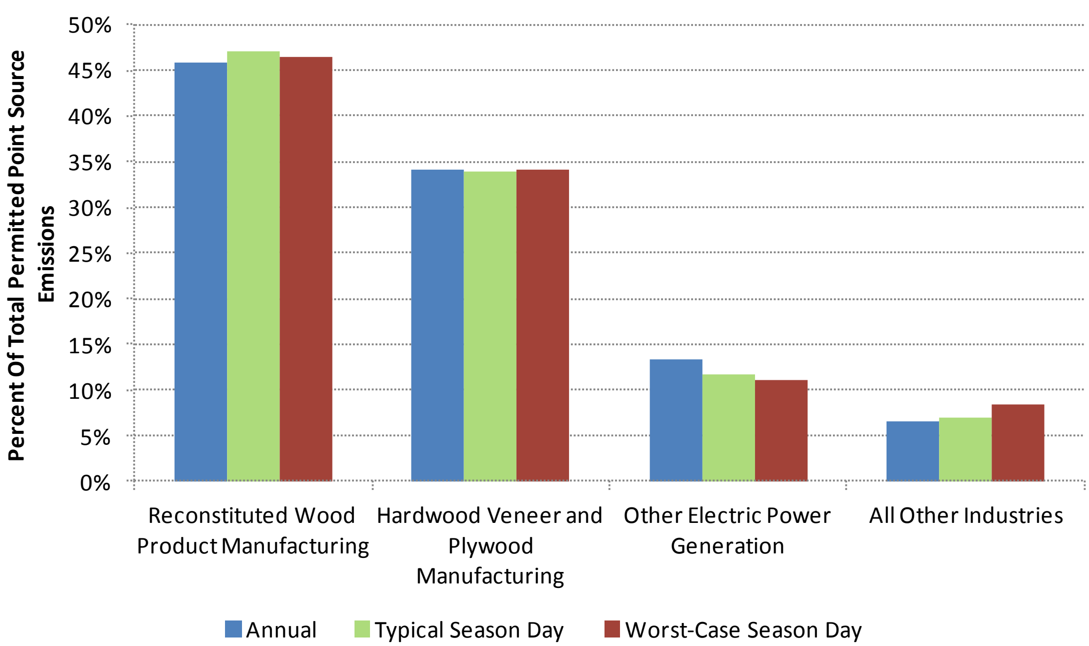

Figure 2.3-4. Klamath Falls NAA Summary of 2008 Point Source $PM_{2.5}$ Emissions By Industrial Classification: Annual, Typical Season Day, and Worst-Case Day Emissions Percentages

2.4 Stationary Area Sources

2.4.1 Introduction and Scope

This section describes the development of the emissions inventory for stationary area sources in the Klamath Falls NAA for the 2008 Base Year. Area sources included in this inventory are stationary and collectively represent relatively small and numerous individual sources. Included in the area source category are six broad groups of area source emission contributors:

- Waste disposal, treatment and recovery
- Small stationary fossil fuel combustion: residential, commercial/institutional, industrial
- Residential wood combustion (RWC)
- Miscellaneous area sources
- Fugitive dust
- Evaporative/off-gassing emissions sources – includes sources emitting VOC and NH_3

Table 2.4.1 lists the procedures used to develop the emission estimates for the various categories of area source $PM_{2.5}$ emissions included in the Klamath Falls NAA inventory. Estimated emissions represented in this inventory occur on an annual basis and on a worst-case day during the four month PM season of January, February, November, and December of 2008.

2.4.2 Methodology and Approach

2.4.2.1 Data Resources and Seasonal Emission Estimate Methodology

Discussion of guidance documents and broad methodology used to calculate stationary area source emissions can be found in Part 1. The list of stationary area sources included in the inventory was based on the EPA Procedures Document[2], *PM_{10} Emission Inventory Requirements*[163], and *Emission Inventory Guidance for Implementation of Ozone and Particulate Matter national Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations*[627]. These area sources were compared to sources evaluated in the *1996 Klamath Falls CO Maintenance Plan*[487] *and the Medford 1998 Base Year Emission Inventory*[486], and previously completed Oregon statewide triennial emissions inventories.

Emission factors were taken from a variety of sources, including the EPA Procedures Document[2], the Compilation of Air Pollution Emission Factors (AP-42)[8], EPA workgroup results, and the EPA 2008 NEI, v.1.5. Any errors in estimated emissions could occur in the multiplier values used, in the accuracy of calculations, or in mistakes in the construction of equations. Therefore, estimated emissions were checked for reasonableness by a number of approaches: 1) using alternative multiplier values when possible; 2) comparing estimates with the results of earlier area source inventories; and 3) performing independent checks on the accuracy of the multiplier values, the methodologies, documentation and references, and emission calculations.

Typical season day emissions for area sources were estimated by applying a seasonal adjustment factor (SAF) to annual emissions estimates. For many source categories, SAF data, specific to EPA Source Classification Code (SCC), was calculated from EPA temporal allocation data: Temporal Profile – CAIR

Platform – MS Excel, February 2005(760). The EPA temporal data, in the form of annual activity by month, was used in the SAF formula, found on p. 5-22 of the EPA procedures document[2]:

SAF = *((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

For some area source categories, worst-case season day emissions were assumed equal to typical season day emissions. However, the references for some categories were detailed enough to estimate emissions from the highest amount of activity for a specific season day. The worst-case day emissions for the largest area source category, residential wood combustion, were estimated based survey results.

2.4.2.2 Prevention of Double-Counting

Special care was taken to prevent double counting of emissions and emission sources associated with both area and point sources. Area sources were first reviewed to identify categories already counted in the point source inventory. Area source categories that overlap the permitted point source category include non-permitted industrial/commercial fuel use and surface coating and degreasing. For each of these categories, 2008 NAICS employee data by census tract for the Klamath Falls area, obtained from the Oregon Employment Dept (OED), sent to DEQ by ODOT[733] was used to estimate area source emissions. *The ODOT facility name and location were checked against DEQ permitting data to ensure that all activity data was for non-permitted point source activity.*

2.4.2.3 Sources Not Included

2.4.2.3.1 Industrial Open Burning & Commercial Institutional On-Site Incineration

Both industrial open burning and commercial/institutional on-site incineration were determined to be insignificant through DEQ permitting and complaints records. These two categories, included in the previous Klamath Falls PM SIP EI, were not included in this inventory.

2.4.2.3.2 Residential Solid Waste Incineration

Oregon Administrative Rules (Chapter 340, Division 230) define refuse burning equipment as a device designed to reduce the volume of solid, liquid, or gaseous refuse by combustion. The cost of applications and fees is considered prohibitive for a residential application of this type of municipal waste disposal. Residential solid waste disposal in the Klamath Falls UGB occurs through commercial waste collection, on-site combustion in open burn barrels, and in some cases, within wood stoves and fireplaces. Emissions from this category of burning are captured in the open burning sections.

2.4.2.3.3 Orchard Heaters and Orchard Prunings Burning

There are no known orchards within the Klamath Falls NAA. This is due to the high elevation and colder temperatures. The Oregon State University Extension Service, Oregon Agricultural Information Network (OAIN) shows no orchard acreage (tree fruits & nuts) for Klamath County in 2008.

2.4.3 Summary of Stationary Area Source Emissions

A summary of the stationary area source inventory is shown in Table 2.4.2 for the major area source categories. Annual emissions and worst case day emissions are shown. Summary area source emissions are expressed as graphs in Figures 11 through 15.

2.4.4 Discussion of Area Source Categories

Each of the major area source categories, as shown in Tables 2.4.1 through 2.4.6, is comprised of area source types. Detailed descriptions of the emission estimation process for these categories are provided in Tables 2.4.7 through 2.4.59. Supporting documentation is provided in Appendix B. Discussion of data sources, emission factors, seasonal adjustment factors, and activity levels that affect the area source are included for each area source type. Applicable state regulations pertinent to a specific area source emission category are included in the notes on each category summary table. The following sections describe these major categories; subsections corresponding to individual area source types are included.

2.4.4.1 Waste Disposal, Treatment, and Recovery

This category includes disposal of solid wastes by open burning from industrial, commercial / institutional, and residential sources in open outdoor fires or outdoor devices such as burn barrels which do not meet DEQ emission limits, or burn in a manner in which combustion air is not effectively controlled and combustion products do not vent through a stack or chimney.

2.4.4.1.1 Residential Open Burning

Residential open burning is prohibited inside the Klamath Falls city limits during the PM season, and is restricted in the rural areas of the Klamath Falls UGB. Outside the city limits of Klamath Falls, but inside the UGB, the Klamath County Fire District #1 and Environmental Health Department prohibits residential open burning during fire season, typically July 1 through mid-October. Permits are issued for residential open burning in rural parts of the Klamath Falls UGB on days outside the fire season when the woodstove advisory is green. Open burning is also banned on yellow and red days regulated by the Klamath County Health Department during the wood stove curtailment season, usually during October - February.

The Klamath Falls Residential Wood Combustion Survey was completed in January 2009[695]. The survey was conducted within the Klamath Falls NAA, by census tract. The survey included questions regarding outdoor burning, the results of which were used to estimate emissions from residential open burning. Questions included

- Does outdoor burning occur at this residence?
- What steps do you take to get ready for an outdoor burn?
- What type of wood burning device to you use outdoors?
- How much wood do you typically burn in your outdoor wood burning device(s) per year?
- Do you burn any other type of material besides cord wood outdoors?
- About when do you burn the material outdoors (incl. month, weekday, weekend day)

For the purpose of this EI, it was assumed that all respondents were both honest and complete in their answers regarding their outdoor burning habits. As such, no distinction was made between illegal and legal residential open burning that occurred throughout the year. Survey results indicate that outdoor burning occurred both during and outside of the PM season. Survey results were used to estimate annual tonnage material burned (split wood, grass/leaves, brush, and municipal waste), and to develop a seasonal adjustment factor for seasonal emissions estimates.

Methodology, information sources, and a summary of estimated emissions from residential open burning are shown in Tables 2.4.7 through 2.4.11. Supporting documentation, including survey results, is shown in Appendix B, Tables B-15 through B-34.

2.4.4.1.2 Commercial/Institutional and Land Clearing Debris Open Burning

This category encompasses open burning of solid material including grass, brush, vegetation, and wood. Activity is based upon specific permits issued by DEQ, for the Open Burning Control Area. Appendix B, Figure B-1 shows the locations of the open burn permit locations issued by the DEQ for 2008. In addition, illegal burning was estimated through complaints received by the DEQ[765]. Methodology, information sources, and a summary of estimated emissions from this category are shown in Tables 2.4.12 through 2.4.14.

2.4.4.2 Small Stationary Fossil Fuel Combustion

This category includes industrial, commercial, institutional, and residential emission sources. Fuels include residual and distillate oil, kerosene, compressed natural gas (CNG), and liquid petroleum gas (LPG).

2.4.4.2.1 Fuel Oil Combustion

Fuel oil emissions from industrial/commercial/institutional sources are from fuel consumption in large or small boilers, furnaces, heaters, and other heating devices. Residential fuel oil emission sources are primarily from fuel consumption in furnaces, heaters, and other heating devices. For this inventory, industrial and commercial fuel oil consumption includes residual oil, distillate oil, and kerosene use; residential fuel oil consumption includes distillate and kerosene use only.

Industrial/commercial/institutional fuel oil consumption estimates are based on the U.S. Department of Energy/Energy Information Administration[741], population data from the PSU Population Research Center, US Economic Census Data[742], and NAA employment data[733]. Fuel oil use estimates for all sources have been adjusted by proportioning Klamath Falls NAA NAICS employee populations to state-wide NAICS employee populations and applying the ratio to state-wide fuel oil use. Emission factors for industrial and commercial sources are from EPA AP-42[8], Tables 1.3-5,6, & 7 with the exception of the emission factors for industrial distillate fuel oil which are assumed to be the same as those for commercial distillate fuel oil.

Fuel oil use emissions estimates for residential sources are calculated using Department of Energy/Energy Information Administration[741] and population data from the PSU Population Research Center. Fuel oil use estimates for residential sources have been adjusted by proportioning Klamath

Falls NAA housing units using fuel oil to state-wide housing units using fuel oil and applying the ratio to state-wide residential fuel oil use.

For industrial/commercial/institutional fuel use categories, care was taken to avoid double-counting with permitted point source activity; See the previous section 2.4.2.2 for details on how double-counting of fuel use activity was avoided. For industrial fuel use, emissions were seasonally adjusted as described in section 2.4.2.1*: Data Resources and Seasonal Estimation Methodology*. Residential and commercial/institutional fuel use was seasonally allocated using meteorological Heating Degree Day (HDD) data[93].

Fuel oil consumption estimates are summarized in Appendix B, Table B-12. A summary of the emissions estimates and assumptions for all categories of fuel oil use are shown in Tables 2.4.15 through 2.4.19.

2.4.4.2.2 Natural Gas (NG) and Liquefied Petroleum Gas (LPG)

NG and LPG emissions from industrial and commercial sources are from fuel consumption in large or small boilers, furnaces, heaters, and other heating devices. Residential NG/LPG emission sources are primarily from fuel consumption in furnaces, heaters, and other heating devices.

Industrial/commercial/institutional NG/LPG consumption estimates are based on the U.S. Department of Energy/Energy Information Administration[741], population data from the PSU Population Research Center, US Economic Census Data[742], and NAA employment data[733]. NG/LPG use estimates for all sources have been adjusted by proportioning Klamath Falls NAA NAICS employee populations to state-wide NAICS employee populations and applying the ratio to state-wide NG/LPG use. Emission factors for NG were taken from from EPA AP-42[8], Tables 1.4-2. Emission factors for LPG are from E.H. Pechan documentation[743].

NG/LPG use emissions estimates for residential sources are calculated using Department of Energy/Energy Information Administration[741] and population data from the PSU Population Research Center. Population estimates can be found in Appendix B, Table B-5. NG/LPG use estimates for residential sources have been adjusted by proportioning Klamath Falls NAA housing units using NG/LPG to state-wide housing units using NG/LPG and applying the ratio to state-wide residential NG/LPG use. Emission factors for NG were taken from from EPA AP-42[8], Tables 1.4-2. Emission factors for LPG are from E.H. Pechan documentation[743].

For industrial/commercial/institutional fuel use categories, care was taken to avoid double-counting with permitted point source activity; See the previous section 2.4.2.2 for details on how double-counting of fuel use activity was avoided. For industrial fuel use, emissions were seasonally adjusted as described in section 2.4.2.1*: Data Resources and Seasonal Estimation Methodology*. Residential and commercial/institutional fuel use was seasonally allocated using meteorological Heating Degree Day (HDD) data[93].

NG/LPG consumption estimates are summarized in Appendix B, Table B-12. A summary of the emissions estimates and assumptions for all categories of fuel oil use are shown in Tables 2.4.20 through 2.4.29.

2.4.4.3 Residential Wood Combustion

Wood is an important residential space-heating source in Oregon. As a heating source, wood contributes a significant percentage of pollutants to the airshed when compared to fuel oil and NG/LPG. Because the PM season in Klamath Falls occurs during the winter months when residential wood combustion is at its height, emissions from residential wood burning are considered to be, and have been estimated to be, significant in the Klamath Falls NAA.

Information on wood use for the Klamath Falls NAA was taken from the results of a residential wood heating survey conducted within the Klamath Falls area in 2008[695]. The survey covers estimated usage during the 2007/2008 heating season. The survey provided DEQ with information on the percentage of homes in the Klamath Falls NAA that used a wide range of wood-heating devices, and an estimate of the average mass of wood burned during the 2008 heating season in those devices, along with the type and species of wood burned. The survey was restricted to census tracts within the NAA. To estimate the amount of wood burning activity within the NAA, the total tonnage wood burned was calculated using the following formula:

*Total tonnage residential wood burned = A * B * C * D,*

where

A = Number of housing units (HU) within each census tract

B = % HU burning wood, by device type

C = Avg. volume of wood burned, cordwood or pellets, by HU and device type

D = Avg. density of wood burned in tons per cord or tons of pellets

The emission factors used for all devices were compiled and reviewed by the EPA residential wood combustion workgroup in 2008[623, 686, 700]. Emission factors used are specific to device type. For seasonal emissions, a seasonal adjustment factor (SAF) calculated from survey results was applied. The SAF was estimated using the number of survey respondents who indicated that they burned wood during the PM season. A worst-case season day multiplier was calculated based on Peterson School monitoring results: PM season average $\mu g/m^3$ vs $\mu g/m^3$ at the 98%ile of monitoring data. Based on monitoring results, the worst-case day multiplier was calculated to be 2.4 times the typical season day value.

Reductions from Advisory Call effectiveness and Advisory Enforcement effectiveness were applied to worst-case day emissions estimates. For controlled emissions, call effectiveness was assumed to represent Control Efficiency (CE), and enforcement effectiveness was assumed to represent Rule Effectiveness (RE). Rule Penetration (RP) is represented by 100 exempt burners within the NAA. The formula used to estimate advisory call effectiveness =

$$E_{AC} = E_{UC} * (1-(CE*RE*RP))$$

Where

E_{AC} = 2008 Advisory Controlled Emissions
E_{UC} = 2008 Emissions with no advisory call controls applied
CE = Control Efficiency = Advisory call effectiveness
RE = Rule Effectiveness = Advisory call Enforcement effectiveness
RP = Rule Penetration = impact from wood burning housing units exempted from the Advisory (approximately 100 burners)

Results, calculations, and detailed information about data sources and assumptions are shown in Tables 2.4.30 through 2.4.34. Supplementary and supporting material are found in Appendices B and E, including

- B-4: Survey results
- B-5: Survey results: Cord Equivalency and mass wood burned
- B-6: Survey results: wood species burned
- B-7: Survey results: woodstove/insert breakdown
- B-8: RWC Seasonal Adjustment Factor (SAF) calculations
- B-9: RWC worst-case day multiplier calculations
- E-22: Advisory Call Reductions Estimates
  (please note that in order to meet planning requirements, advisory call reductions are only applied to PM2.5 estimates in this document)

2.4.4.4 Miscellaneous Area Sources

The area sources described in this section are combustion sources or related to fuel combustion, and may result from anthropogenic activity or natural causes. Source types include forest wildfires, prescribed burning, structural fires, agricultural field burning and commercial food preparation. These sources contribute to air pollutant levels which may be intermittent in nature or may be the result from forestry activity. Intermittent emission sources include forest wild fires and structural fires; for this inventory, wildfires and prescribed burning have been grouped within the same category due to limitations in the reference data.

2.4.4.4.1 Wildfires and Prescribed Burning

For this inventory, the reference source for all wildfire and prescribed burning activity and emissions was EPA documentation[762]. For the purposes of improving wildland fire EI data, EPA contracted Sonoma Technology, Inc. to develop a methodology for wildland fire emission inventories for the 2006-2008 years[764]. Among the benefits of incorporating the EPA data for this inventory are that the information is in event format, meaning that emissions estimates are specific to date and location. This enabled DEQ staff to use ArcGIS to map emissions locations relative to the NAA. It also enabled DEQ staff to determine what burning events were specific to the PM season.

Fire events for 2008 were mapped to within a 15km radius of the Peterson School Monitor. The results indicate that five fires occurred within the 15km radius throughout the year. Of these five fires, two occurred during the PM season. To estimate seasonal emissions, a seasonal adjustment factor was calculated using annual emissions and the emissions from fires occurring over the PM season. The SAF was applied to the annual emissions to estimate both typical season day and worst-case season day emissions, i.e. worst-case day was assumed equal to typical day. The decision to set worst-case day equal to typical season day was based on local knowledge of the area and meteorology, and the unlikely event that wildfires/prescribed burning caused past exceedances.

Summary data and emissions estimates for prescribed burning and wildfires are given in Table 2.4.35. Wildfire/prescribed burning locations and dates are shown in Appendix B, Figure B-2.

2.4.4.4.2 Structure Fires

Information on the annual number of structural fires within the Klamath Falls NAA was provided by the State of Oregon Fire Marshals' Office on a monthly basis for 2008[729]. Fires occurred in the city of Klamath Falls, and in the communities of Henley and Olene. Fire data was specified as either residential or non-residential. Weekly activity was assumed to be uniform, and seasonal adjustment factors for each category of structure were calculated using the date and number of fires.

Estimates of the amount of material burned were made using EPA EIIP Guidance[321]. EIIP recommends a fuel loading factor of 1.15 tons of combustible material per structure fire, and provides total particulate emission factors for burning structures. Emissions estimates were assumed to be 100% $PM_{2.5}$ to provide a conservative-high estimate of emissions. Typical season day emissions were obtained by multiplying the annual tons material burned by the seasonal adjustment factors, and worst-case day emissions were assumed to be equal to typical day.

Summary data and emissions estimates for structure fires are given in Tables 2.4.36 through 2.4.38.

2.4.4.4.3 Agricultural Burning

For this inventory, the reference source for all agricultural burning activity and emissions was EPA documentation[763]. For the purposes of improving wildland fire EI data, EPA contracted Sonoma Technology, Inc. to develop a methodology for wildland fire emission inventories for the 2006-2008 years[764]. The project included all satellite detects of fires in Oregon, and from the satellite data EPA was able to classify certain fires as agricultural based on land-cover. Among the benefits of using the EPA data for this inventory are that the information is in event format, meaning that fire emissions estimates are specific to date and location. This enabled DEQ staff to use ArcGIS to map emissions locations relative to the NAA. It also enabled DEQ staff to determine what burning events were specific to the PM season.

Fire events for 2008 were mapped to within a 15km radius of the Peterson School Monitor. The results indicate that six fires occurred within the 15km radius throughout the year. Of these six fires, two occurred during the PM season. To estimate seasonal emissions, a seasonal adjustment factor was calculated using annual emissions and the emissions from fires occurring over the PM season. The SAF was applied to the annual emissions to estimate both typical season day and worst-case season day emissions, i.e. worst-case day was assumed equal to typical day. The decision to set worst-case day equal to typical season day was based on local knowledge of the area and meteorology, and the unlikely event that agricultural burning caused past exceedances. Emissions estimates are in close agreement with the previous Klamath Falls UGB PM_{10} SIP emissions inventory[699].

Summary data and emissions estimates for agricultural burning are given in Table 2.4.39. Agricultural burning locations and dates are shown in Appendix B, Figure B-3.

2.4.4.4.4 Commercial Food Preparation

For this inventory, the reference source for commercial cooking emissions was EPA documentation[759]. Emissions are from the cooking of meat – for emissions from non-permitted natural gas use, please refer to section 2.4.2.2. Emission sources included conveyorized and under-fired charbroiling, and deep fat, clamshell griddle, and flat-griddle frying. EPA county-wide emissions estimates were allocated to the NAA based on NAICS 722 and 7222 NAA to county employee ratio. Employee population data was taken from the US Economic Census[742] and Oregon Employment Department estimates[733].

According to restaurant owners and managers surveyed in Medford and Ashland, approximately 60 % of annual business is accrued during the six months of "summer season," the remaining 40% of annual income is realized during the alternative six month "winter season."[699]. Based on this information, PM season activity is estimated to be 30% of the annual total. Typical Day and Worst Case Day Emissions were assumed to be the equal, due to uniform activity and lack of applicable restrictions.

Summary data and emissions estimates for commercial cooking are given in Tables 2.4.40 and 2.4.41.

2.4.4.5 Fugitive Dust

The fugitive dust category includes sources such as storage piles, road sanding, construction activity, agricultural tilling, wind erosion, and animal husbandry operations. The soil moisture content in Klamath Falls is typically too high to generate dust during the PM season[465]. As such, seasonal emissions estimates for categories where soil disturbance contributes to fugitive dust have been set to 0.

2.4.4.5.1 Aggregate Storage Piles

This category encompasses emissions estimates for windblown dust occurring during loading and unloading operations at piles of road sanding material used by ODOT and Klamath County. The material consists primarily of crushed rock or cinders. Information for 2008 on the number, size, coverage, wetting, and material of the piles, as well as loading/unloading operations, was provided by ODOT[775] and Klamath County[775].

The $PM_{2.5}$ emissions from the piles were estimated by using the AP-42[8], Section 13.2.4 methodology. This method estimates the $PM_{2.5}$ emissions from a storage pile during unloading and loading operations. The effects of wind speed, material moisture content, and control (pile coverage and/or wetting) are taken into account by the most recent AP-42 equation, Chapter 13, p. 13.2.4-4, Equation (1). Typical and worst-case day emissions were estimated based on daily amounts of material loaded during the PM season. Emissions estimates and details are shown in Table 2.4.42.

2.4.4.5.2 Road Sanding

Though this category is similar to re-entrained road dust (see Section 2.6), emissions from road sanding occur during the application of the sanding material, and not from on-road motor vehicle activity.

2008 road sanding material seasonal and annual application rates were provided by ODOT and Klamath County[775]. Unfortunately, detailed road sanding log information was not available. As such, log information from the most recent Klamath Falls PM_{10} SIP was used as a surrogate. The surrogate data enabled the calculation of both a seasonal adjustment factor and the average annual activity in days per week, both of which were used for seasonal emissions estimates.

Emission factors were calculated based upon information resulting from abrasion tests on cinder and road sand samples taken from Klamath Falls and LaGrande respectively[160], and were used in combination with emission factors from EPA-450/4-88-003, *Gap Filling PM_{10} Emission Factors For Selected Open Area Dust Sources*[156]. The emission factors incorporated material silt content in conjunction with the fraction of PM_{10} in the silt. Carb documentation was used to fractionate PM_{10} into $PM_{2.5}$[655]. Emissions estimates and details are shown in Table 2.4.43.

2.4.4.5.3 Construction

Subcategories of construction within this category include residential, industrial/commercial/institutional, and road construction. 2008 county-wide emissions estimates were taken from EPA data[759]. Emissions were based on acreage of soil disturbed during construction. County-wide annual emissions estimates were allocated to the NAA using the ratio of construction employees, NAA to county, for each subcategory. Though a significant tonnage of annual emissions were estimated, seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM season[465]. Table 2.4.44 shows the calculations, references, assumptions, and emissions estimates for construction.

2.4.4.5.4 Agricultural Tilling

Agricultural tilling emissions were taken from EPA data, provided to the DEQ as annual emissions estimates for the 2002 National Emissions Inventory. The methodology EPA used to estimate the emissions can be found in *Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants*, Appendix A, p. A-4[623]. From the text:

> *"Emissions from this category are all filterable, there are no condensable emissions. The…particulate matter emissions are calculated using a database containing county-level data on the number acres planted by type of tilling and crop type that was purchased by EPA from the Conservation Technology Information Center at Purdue University. ….emissions from agricultural tilling are a function of the acres planted, the PM emission factors, the silt content of the surface soil, and the number of passes or tillings in a year."*

EPA grew 1998 estimates to 2002 using economic indicators, and 2002 data is represented in this inventory.

County-wide annual emissions were allocated to the NAA via GIS analysis of county land zoned for agricultural crop production. As in other soil-related fugitive dust categories, seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM season[465]. Table 2.4.45 shows the calculations, references, assumptions, and emissions estimates for construction. Appendix B, Figure B-4 shows agriculturally zoned land, primarily farm and cropland, in relation to the NAA. Appendix C, Table C-19 details GIS allocation results for cropland (GIS ID 1).

2.4.4.5.5 Geogenic (fallow field) Wind Erosion

Agricultural wind erosion emissions resulting from wind entrained dust were calculated based on GIS analysis of the cropland acreage within the NAA. Total cropland acreage within the NAA was used for a conservative-high estimate from geogenic dust, as it was not known if or when any of the acreage lay fallow in 2008.

A composite emission factor for agricultural wind erosion was taken from *Agricultural Activities Influencing Fine Particulate Matter Emissions*[255]. The largest wind emission factors were chosen from this document in table 5-1 for corn and wheat to apply to the crops grown in the Klamath NAA. However, the Texas crop factors were eliminated from the calculation based on climatic and topographical considerations. The decision of which emission factor to apply to each crop was made through the assumption of the type of bare field conditions leading to the wind erosion as either more similar to a corn field or a wheat field. As in other soil-related fugitive dust categories, seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM season[465]. Table 2.4.46 shows the calculations, references, assumptions, and emissions estimates for geogenic field wind erosion. Appendix B, Figure B-4 shows agriculturally zoned land, primarily farm and cropland, in relation to the NAA. Appendix C, Table C-19 details GIS allocation results for cropland (GIS ID 1).

2.4.4.5.6 Animal Husbandry

Animal husbandry refers to livestock production; domesticated animals intentionally reared for the production of food, fiber, or other goods or for the use of their labor. Livestock in this category includes beef and dairy cattle, goats, horses, poultry, sheep, and swine. All types of animal husbandry operations are incorporated, including Concentrated Animal Feeding Operations (CAFOs). Animal waste from livestock operations generates airborne pollutants such as VOC and ammonia. Particulate matter in the form of fugitive dust may come from animal movement in confined areas, the land application of solid manure, and the storage and treatment of manure.

2008 Klamath County animal husbandry emissions were originally calculated by DEQ staff for the 2008 National Emissions Inventory[769]. To obtain emissions estimates, the number of animals per county was multiplied by emissions factors specific to pollutant and animal. Klamath County animal populations were obtained from the OSU extension service or the USDA. DEQ conducted a literature search and selected the best available emission factors from a variety of EPA and other documentation.

The allocation of county-wide emissions to the NAA was completed via GIS analysis of farm land zoning. The allocation of emissions from beef cattle, horses, sheep, and goats was made using mixed crop and grazing zoning. Dairy, swine, and poultry county-wide emissions were allocated to the NAA using cropland plus mixed crop and grazing zones.

Typical season day emissions for animal husbandry were estimated by applying a seasonal adjustment factor (SAF) to annual emissions estimates. The SAF data, specific to EPA Source Classification Code (SCC), was calculated from EPA temporal allocation data: Temporal Profile – CAIR Platform – MS Excel, February 2005[(760)]. The EPA temporal data, in the form of annual activity by month, was used in the SAF formula, found on p. 5-22 of the EPA procedures document[2]:

SAF = *((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

Emissions calculations, references, and assumptions for animal husbandry are detailed in Tables 2.4.47 through 2.4.49. Appendix B, Figure B-5 shows agriculturally zoned land, primarily farm, cropland, and grazing land, in relation to the NAA. Due to the complexity of the emissions calculations, a complete description of the CAFO emissions estimation methodology is included in Appendix B, under *Methodology: Concentrated Animal Feeding Operations*.

2.4.4.6 Evaporative/Off-Gassing Emission Sources: Sources Emitting VOC and NH_3

In conformance to 40 CFR §51.1002(c), in addition to $PM_{2.5}$, this inventory includes emissions estimates for the following pollutants; NO_X, SO_2 (SO_X), VOC, and NH_3. This section concerns area sources that emit VOC and/or NH_3 only. The sources of the emissions may be evaporative or off-gassing. Categories in this section include commercial fertilizer and pesticide application, small non-permitted source solvent use, non-industrial asphalt application, consumer solvent use, architectural surface coating, traffic markings, portable fuel containers, truck transport of gasoline, domestic sewage and wastewater treatment, and municipal landfills.

2.4.4.6.1 Commercial Fertilizer Application

For this inventory, the reference source for emissions from commercial fertilizer application was EPA 2008 county-wide emissions estimates[759]. Fertilizer in this category refers to any nitrogen-based compound, or mixture containing such a compound, that is applied to land to improve plant fitness. The pollutant of concern for commercial fertilizer application is ammonia. County-wide NH_3 emissions were supplied to DEQ by EPA. The county-wide emissions data was then allocated to the NAA through GIS analysis; NAA farm and cropland zoned acreage was divided by county farm and cropland acreage to ratio the emissions to the NAA.

Typical season day emissions for commercial fertilizer application were estimated by applying a seasonal adjustment factor (SAF) to annual emissions estimates. The SAF data, specific to EPA Source Classification Code (SCC), was calculated from EPA temporal allocation data: Temporal Profile – CAIR Platform – MS Excel, February 2005[(760)]. The EPA temporal data, in the form of annual activity by month, was used in the SAF formula, found on p. 5-22 of the EPA procedures document[2]:

SAF = *((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

Emissions calculations, references, and assumptions for commercial fertilizer application are detailed in Table 2.4.50. Appendix B, Figure B-4 shows agriculturally zoned land, primarily farm and cropland, in relation to the NAA. Appendix C, Table C-19 details GIS allocation results for cropland (GIS ID 1).

2.4.4.6.2 Small, Non-Permitted Point Sources: Solvent Use

This category encompasses VOC emissions estimates from solvent use by small, non-permitted point sources, namely small businesses. EPA Source Classification Codes (SCC) and descriptions for the emissions sources within this category are:

- 24-01-005-000: Surface Coating /Auto Refinishing /Total: All Solvent Types
- 24-01-015-000: Surface Coating /Factory Finished Wood /Total: All Solvent Types
- 24-01-025-000: Surface Coating /Metal Furniture /Total: All Solvent Types
- 24-01-035-000: Surface Coating /Plastic Parts /Total: All Solvent Types
- 24-01-055-000: Surface Coating /Machinery & Equipment /Total: All Solvent Types
- 24-01-070-000: Surface Coating /Motor Vehicles /Total: All Solvent Types
- 24-01-080-000: Surface Coating /Marine /Total: All Solvent Types
- 24-01-090-000: Surface Coating /Misc Manufacturing /Total: All Solvent Types
- 24-15-000-000: Degreasing /All Processes/All Industries /Total: All Solvent Types
- 24-25-000-000: Graphic Arts /All Processes /Total: All Solvent Types

Activity data, in the form of NAICS employees by business and location, was obtained from ODOT[733]. Facility location was mapped via GIS, and only those employees from business within the NAA were counted. Business name and location was checked against DEQ permitting info to avoid the double-counting of emissions.

Emission factors used for emissions calculations were taken from EPA/EH Pechan documentation[734]. Typical season day emissions for small, non-permitted point sources were estimated by applying a seasonal adjustment factor (SAF) to annual emissions estimates. The SAF data, specific to SCC, was calculated from EPA temporal allocation data: Temporal Profile – CAIR Platform – MS Excel, February 2005[(760)]. The EPA temporal data, in the form of annual activity by month, was used in the SAF formula, found on p. 5-22 of the EPA procedures document[2]:

SAF = *((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

SAF values for two processes, 21-04-005-000 and 21-04-015-000, were taken from previous DEQ estimates[634].

Emissions estimates, assumptions, and calculations, including the effects of Rule Effectiveness (RE), Control Efficiency (CE), and Rule Penetration (RP) are shown in Table 2.4.51. Appendix B, Tables B-10 and B-11 contain SAF and activity supporting documentation. Appendix B, Figure B-6 shows the locations of the small, non-permitted point sources inventoried.

2.4.4.6.3 Commercial Pesticide Application

VOCs are the emissions of concern from Agricultural Pesticide Application, which include application of insecticides, herbicides, fungicides and other chemicals. These chemicals are applied to protect crops from insect pests, limit competition from other growing plants, and prevent reduction in quality from fungus growth. Formulations of pesticides are made through the combination of pest-killing material, referred to as the active ingredient, and various solvents acting as carriers for the pest-killing material, referred to as the inert ingredient. Both types of ingredients contain volatile organic compounds (VOCs) that can potentially be emitted to the air either during application or as a result of evaporation.

Agricultural applications of pesticides can be from the ground or from the air, and can be applied as sprays, dusts, pellets, fogs, or through other dispersion techniques.

2008 Klamath County commercial pesticide application emissions were originally calculated by DEQ staff for the 2008 National Emissions Inventory[768]. Activity, in the form of pesticide applied (pounds of active ingredient) was obtained from the Oregon Department of Agriculture (ODA) for each water basin. The water basin data was then spatially allocated to the county-level via GIS by DEQ. The GIS data was obtained from the Drinking Water Protection Program. The VOC emissions were based on the amount of active ingredient applied. The ODA active ingredient chemical list for pesticides were considered to be representative of the chemicals applied on that water basin in Oregon. The VOC emissions were calculated by combining the application rate from ODA, and emission factors for the active and inert ingredients based on information from the EPA Emission Inventory Improvement Program[(321)] and other information.

Typical season day emissions for commercial pesticide application were estimated by applying a seasonal adjustment factor (SAF) to annual emissions estimates. The SAF data, specific to EPA Source Classification Code (SCC), was calculated from EPA temporal allocation data: Temporal Profile – CAIR Platform – MS Excel, February 2005[(760)]. The EPA temporal data, in the form of annual activity by month, was used in the SAF formula, found on p. 5-22 of the EPA procedures document[2]:

SAF = *((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

Worst case season day emissions were assumed equal to typical season day due to lack of applicable restrictions.

The final allocation of county-wide emissions to NAA was done via GIS analysis of county cropland vs. cropland within the NAA. Emissions calculations, references, and assumptions for commercial pesticide application are detailed in Table 2.4.52. Appendix B, Figure B-4 shows agriculturally zoned land, primarily farm and cropland, in relation to the NAA. Appendix C, Table C-19 details GIS allocation results for cropland (GIS ID 1). Due to the complexity of the emissions calculations, a complete description of the commercial pesticide emissions estimation methodology is included in Appendix B, under *Methodology: Commercial Pesticide Application*.

2.4.4.6.4 Non-Industrial Asphalt Application

Sources included in this category are the application of roofing, emulsified, and cutback asphalt. Emulsified and cutback asphalt are asphalts used in paving operations, and the source for paving asphalt emissions was EPA 2008 county-wide data[759]. EPA 2008 county-wide cutback and emulsified asphalt emissions estimates were allocated to the NAA through GIS analysis of roadway length and location.

Roofing asphalt emissions were estimated by DEQ staff[758]. The calculation methodology is from the EIIP Area Source Category Method Abstract - *Asphalt Roofing Kettles*[321]. Emissions from roofing asphalt application are generated through the heating of liquid asphalt that is then applied to roofing sheets (squares), and final surface coating of the roof. Statewide asphalt roofing sales data, in the form of asphalt product purchases, was obtained from the Asphalt Roofing Manufacturers Association (ARMA)[514], and used as the basis for emissions producing activity. The VOC emission factor was taken from EIIP[321].

The final allocation of county-wide paving asphalt emissions estimates to NAA was done via GIS analysis of county and NAA roadway mileage. The allocation of county roofing asphalt emissions estimates to NAA was calculated by using a ratio of NAA to county-wide roofing asphalt employees, (NAICS 238160), obtained from US Economic Census data[742].

Typical season day emissions for non-industrial asphalt application were estimated by applying a seasonal adjustment factor (SAF) to annual emissions estimates. The SAF data, specific to EPA Source Classification Code (SCC), was calculated from EPA temporal allocation data: Temporal Profile – CAIR Platform – MS Excel, February 2005[(760)]. The EPA temporal data, in the form of annual activity by month, was used in the SAF formula, found on p. 5-22 of the EPA procedures document[2]:

SAF = *((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

Worst case season day emissions were assumed equal to typical season day due to lack of applicable restrictions. Emissions estimates and details are shown in Table 2.4.53. Appendix B, Figure B-7 shows results of the GIS roadway mapping; used to allocate paving asphalt emissions.

2.4.4.6.5 Consumer Solvent Use

Emissions data for this category were taken from EPA 2008 county-wide estimates[759]. EPA Source Classification Codes (SCC) and descriptions for the VOC emissions sources within this category are:

- 24-60-100-000: All Personal Care Products - Total: All Solvent Types
- 24-60-200-000: All Household Products - Total: All Solvent Types
- 24-60-400-000: All Auto Aftermarket Products - Total: All Solvent Types
- 24-60-500-000: All Coatings & Related Products -Total: All Solvent Types
- 24-60-600-000: All Adhesives & Sealants -Total: All Solvent Types
- 24-60-800-000: All FIFRA Related Products -Total: All Solvent Types
- 24-60-900-000: Misc Products -Total: All Solvent Types

EPA 2008 Klamath County emissions estimates for consumer solvent use were apportioned to the NAA through NAA to county housing unit (HU) ratio. Information from EPA temporal allocation profiles[760] indicated that activity for consumer solvent categories is considered uniform throughout the year. As such, typical and worst-case day emissions were set equal to 1/365th of the annual emissions. Emissions calculations, assumptions, and results are shown in Table 2.4.54.

2.4.4.6.6 Architectural Surface Coating and Traffic Markings Coating

Architectural surface coating includes paints, stains, varnishes, and other protective and decorative coatings used for the coating of buildings and curbs. The traffic markings category covers the application of roadway markings, paint or other, to facilitate the safe movement of vehicles, bicyclists, and pedestrians. 2008 county-wide VOC emissions data for both categories was taken from EPA 2008 county-wide estimates[759]. EPA architectural coating data was allocated to the NAA through NAA to county housing unit ratio. EPA traffic markings data was allocated to NAA through GIS analysis, specifically NAA to county roadway length ratio. Information from EPA temporal allocation profiles[760] indicated that activity for both categories is considered uniform throughout the year. As such, typical and worst-case day emissions were set equal to 1/365th of the annual emissions. Emissions calculations, assumptions, and results are shown in Table 2.4.55. Appendix B, Figure B-7 shows results of the GIS roadway mapping; used to allocate traffic marking emissions.

2.4.4.6.7 Portable Fuel Containers

Emissions data for portable fuel containers (PFCs) were taken from EPA 2008 county-wide estimates[759]. The category encompasses evaporative VOC emissions estimates from residential and commercial portable gas cans. Emissions producing processes related to PFCs include permeation, evaporation, spillage during transport, vapor displacement at the pump, and spillage at the pump.

EPA 2008 Klamath County emissions estimates for residential PFCs were apportioned to the NAA through county to NAA population ratio. County commercial PFC emissions were apportioned to the NAA through GIS analysis of county to zoning ratio. Zones associated with commercial PFCs included an average of commercial, industrial, and recreational zones in the NAA and county[757]. Emissions were seasonally adjusted based on previous DEQ estimates[699] and the assumption that refueling activity could occur on any day of the week. A summary of the VOC emissions estimates and assumptions for PFC use are shown in Table 2.4.56. Zoning choices used for GIS allocation of commercial PFC county-wide emissions to NAA is detailed in the endnotes of Table 2.4.56.

2.4.4.6.8 Truck Transport of Gasoline

Stage I gasoline marketing includes the distribution of gasoline to bulk plants and retail outlets via tanker truck. The category includes evaporative loss (fugitive emissions) from gasoline tanker trucks during this segment of the distribution. Activity, in the form of total gasoline dispensed at service stations within the NAA, was obtained from the DEQ TRAACS database and DEQ Air Quality Program Operations staff[719]. Only service stations within the NAA were included for the emissions estimates – please see Section 2.3.2.6 for further details on service station locations in relation to the NAA.

The VOC EF methodology is from EIIP Vol II, Chapt 11, eqn. 11.4-2[321]. Total gasoline tank truck emissions (TTE),

*TTE, tons = ((TGD * LEF * GTA) + (TGD * UEF * GTA)) / 2000*

where

TGD = Total Gasoline Dispensed in the Inventory Region (1,000 gal)
LEF = Loaded tank truck in-transit EF (lbs/1000 gal)
UEF = Unloaded tank truck in-transit EF (lbs/1000 gal)
GTA = Gasoline transportation adjustment factor = 1.25

Information from EPA temporal allocation profiles[760] indicated that activity for gasoline dispensing is considered uniform throughout the year. As such, typical and worst-case day emissions were set equal to 1/365th of the annual emissions.

To assure that all gasoline dispensed within the NAA was included in the throughput for this category, the location of each gas station in Klamath County was mapped using ArcGIS and only the throughput for those stations within the NAA were included. Emissions calculations, assumptions, and results for emissions from truck transport of gasoline are shown in Table 2.4.57. Appendix A, Figure A-1 shows the location of all permitted gasoline service stations within the NAA.

2.4.4.6.9 Domestic On-Site Sewage and Wastewater Treatment

VOC and NH_3 emissions from domestic sewage and wastewater treatment come from a variety of processes, including sewers, preliminary and primary treatment, dissolved air flotation, biological systems/activated sludge, fixed film processes, and biosolids/dewatering.

Location and facility name of treatment facilities in Klamath County were obtained by querying the DEQ Facility Profiler for NPDES (Domestic Wastewater Treatment) and WPCF (Domestic On-Site Sewage System) Water Quality permits. The locations were then mapped in GIS to exclude any treatment facilities located outside the NAA. Dry-weather design flow rates for facilities within the NAA were taken from DEQ permits[776].

Emission factors from EPA/EH Pechan documentation[777] were used to estimate emissions from flow rates. Information from EPA temporal allocation profiles[760] indicated that sewage and wastewater treatment is considered uniform throughout the year. As such, typical and worst-case day emissions were set equal to 1/365th of the annual emissions. Emissions calculations, assumptions, and results are shown in Table 2.4.58. Appendix B, Figure B-8 shows the location of domestic wastewater/sewage treatment facilities within the NAA.

2.4.4.6.10 Municipal Landfills (Klamath Falls Landfill)

Only one municipal landfill is located within the Klamath Falls NAA: Klamath Falls Landfill. To estimate VOC and NH_3 emissions, the Landfill Gas Emissions Model 3.02 (LandGEM) was run for the Klamath Falls Landfill. LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. LandGEM is considered a screening tool — the better the input data, the better the estimates.

The model inputs for the Klamath Falls Landfill run included year opened (1971), waste acceptance rates (1971-2008). Figure 4 below shows LandGEM landfill gas emissions results for the Klamath Falls Landfill model run.

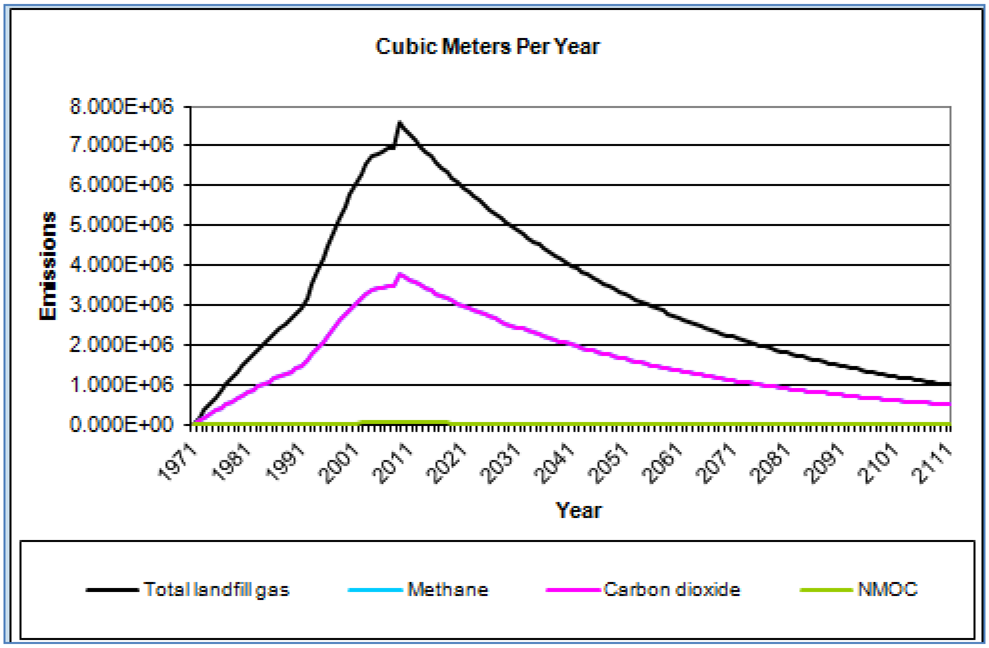

Figure 2.4-1. LandGEM Results: Klamath Falls Landfill Gas Emissions, Current and Projected

LandGEM output included 2008 emissions in short tons for a wide variety of specific VOCs. The specific VOCs were summed to estimate the total VOC emissions from the landfill. Ammonia emissions were based on the VOC total; A conservative low estimate was used as the Klamath Falls Landfill is currently permitted for construction and demolition debris only, though it did accept organic waste in the past[772]. Information from EPA temporal allocation profiles[760] indicated that municipal landfill emissions are considered uniform throughout the year. As such, typical and worst-case day emissions were set equal to 1/365th of the annual emissions. Emissions calculations, assumptions, and results are shown in Table 2.4.59. Appendix B, Figure B-8 shows the location of the Klamath Falls Municipal Landfill.

2.4.5 Stationary Area Source Comparison

The area source categories listed in Section 2.4.4 are compared and summarized in Figures 2.4.2 through 2.4.11, and in Tables 2.4.1 and 2.4.2. The contribution of pollutants contributing to the secondary formation of $PM_{2.5}$ is considered minimal[789], and as such *Figures* representing the distribution and percentages of pollutants contributing to secondary formation of $PM_{2.5}$ are not included in this EI. Emissions from all pollutants are represented in tables in this document.

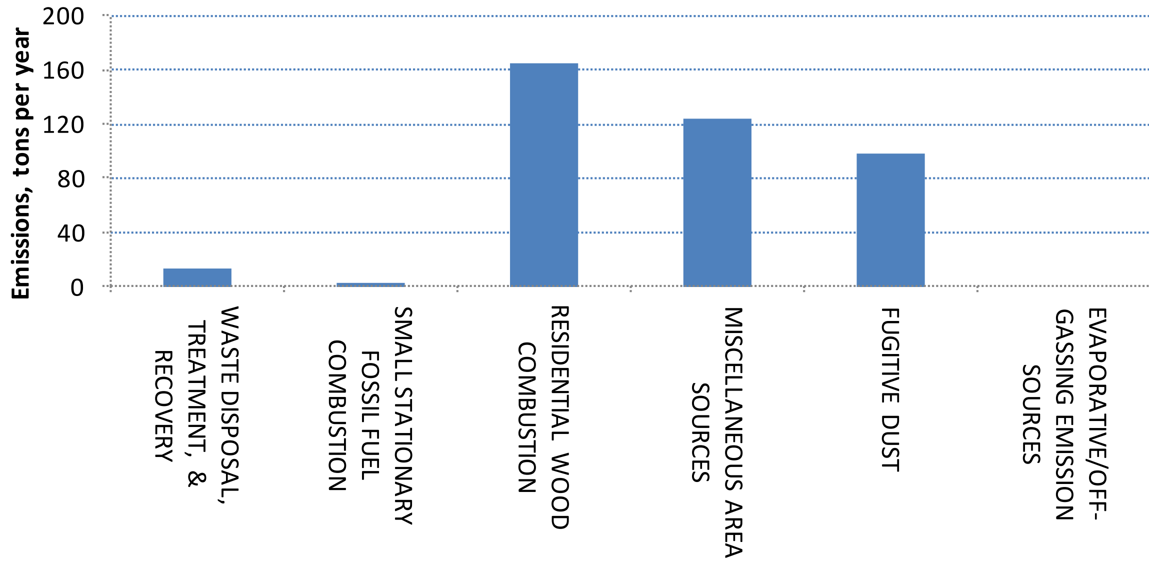

Figure 2.4-2: Distribution of NAA Annual Stationary Area Source PM $_{2.5}$ Emissions, 2008.

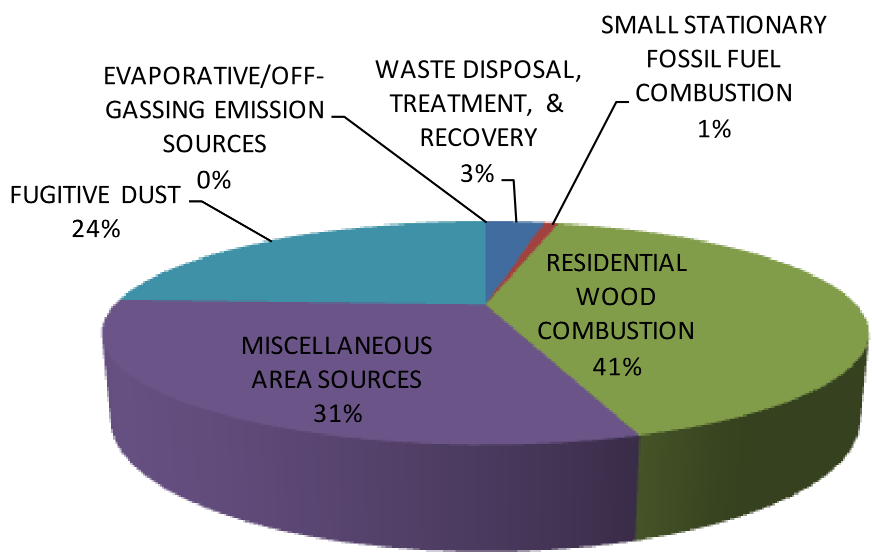

Figure 2.4-3: Percentage of NAA Annual Stationary Area $PM_{2.5}$ Source Emissions, 2008.

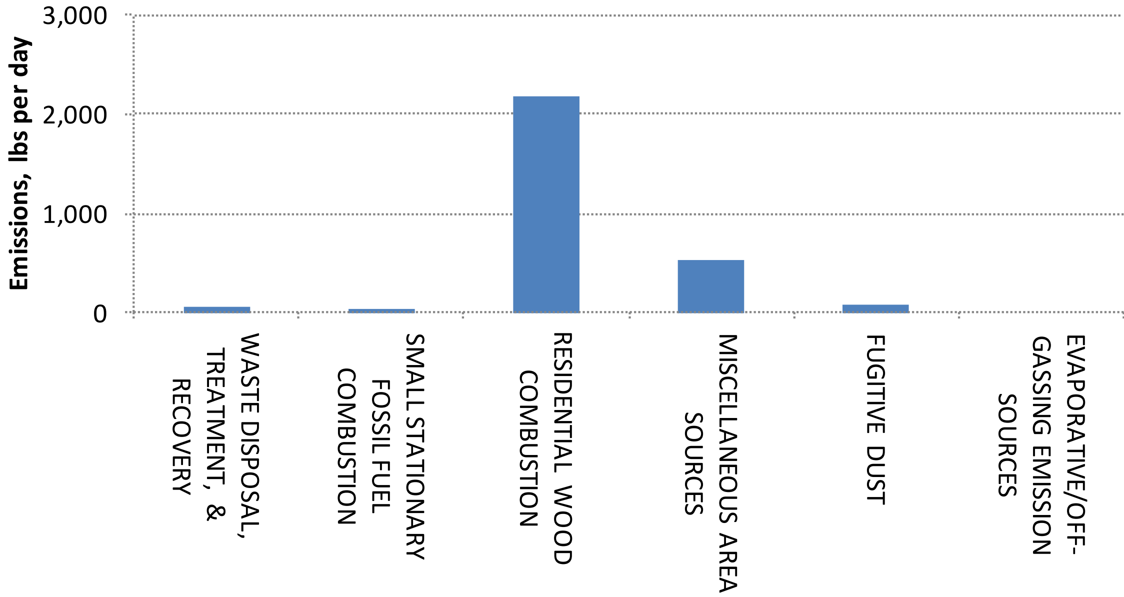

Figure 2.4-4: Distribution of NAA Worst-Case Day Seasonal Stationary Area Source $PM_{2.5}$ Emissions, 2008

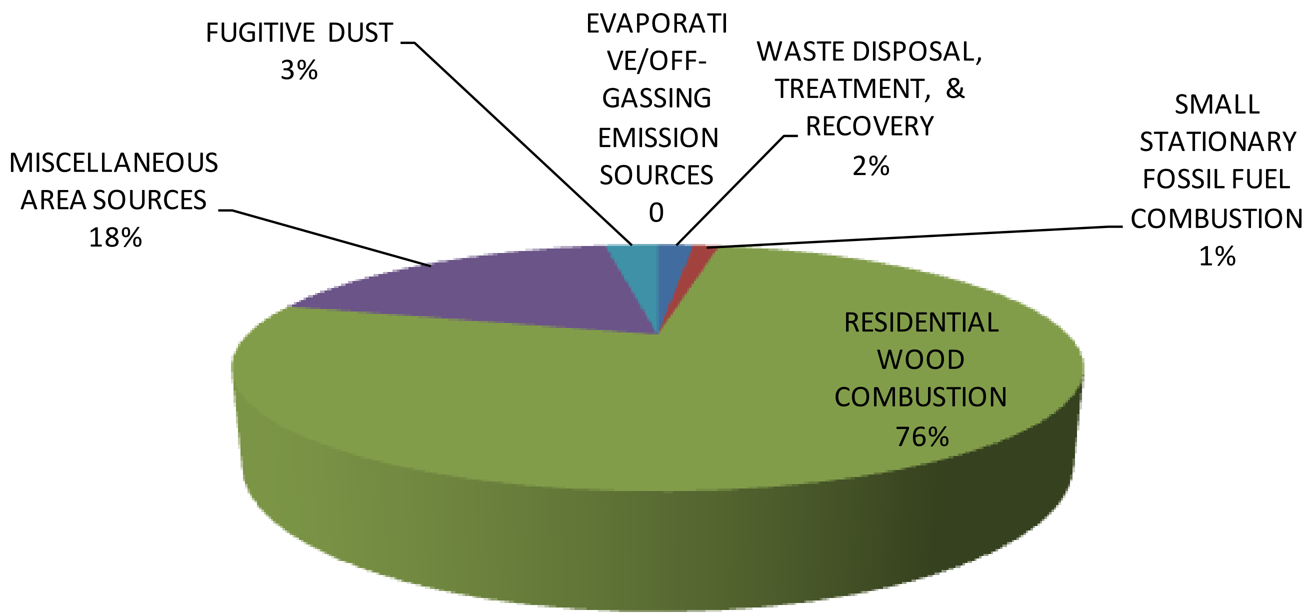

Figure 2.4-5: Percentage of NAA Worst-Case Seasonal Stationary Area Source $PM_{2.5}$ Emissions, 2008

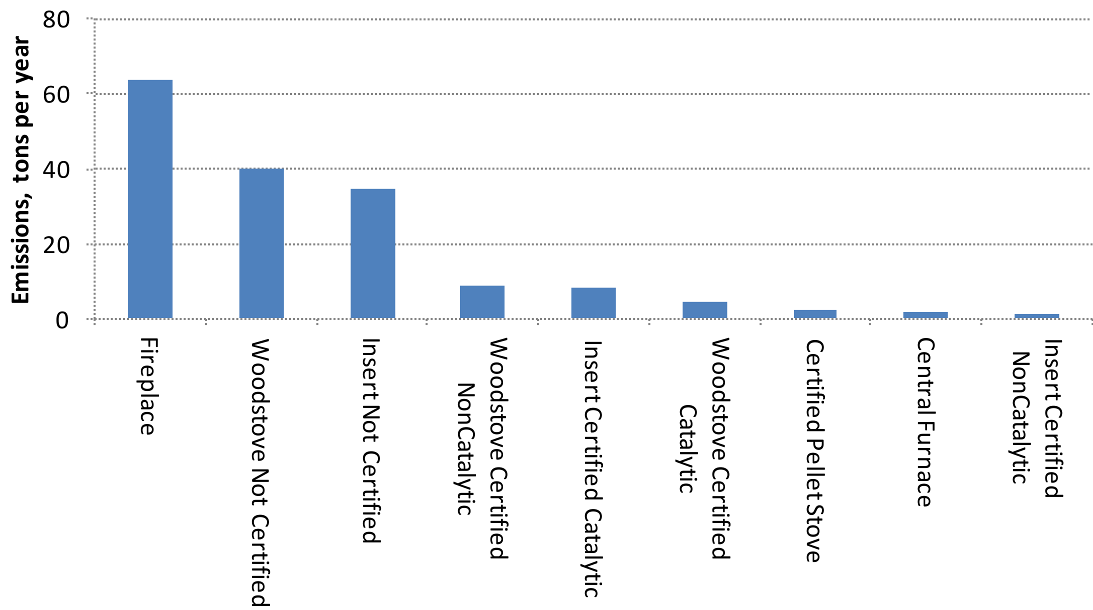

Figure 2.4-6: NAA Annual PM $_{2.5}$ Emissions, Residential Wood Combustion, By Woodburning Device

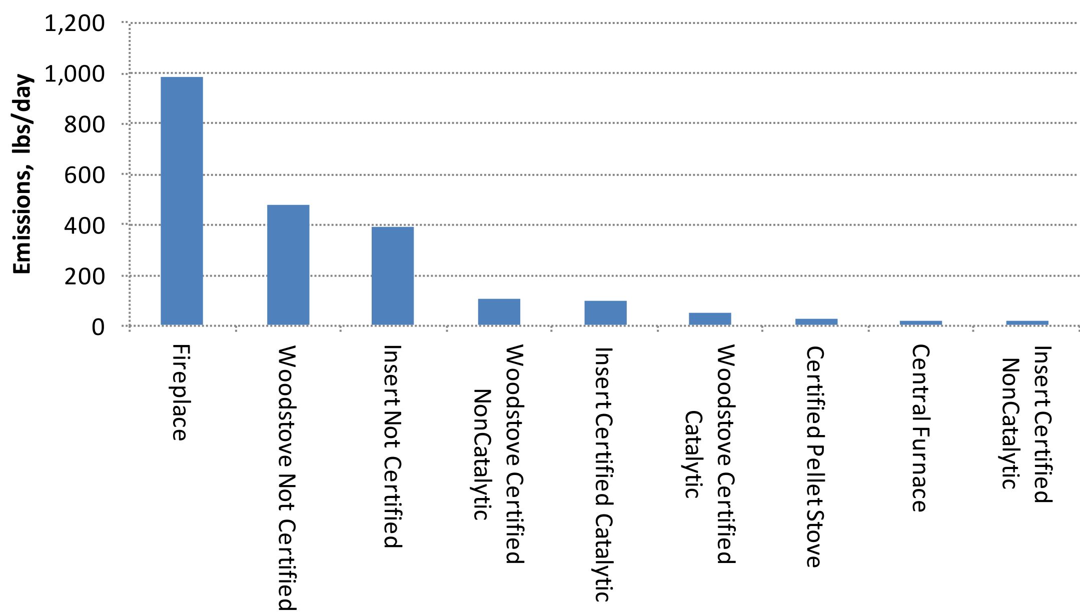

Figure 2.4-7: NAA Worst-Case Day Seasonal PM $_{2.5}$ Emissions, Residential Wood Combustion, By Woodburning Device

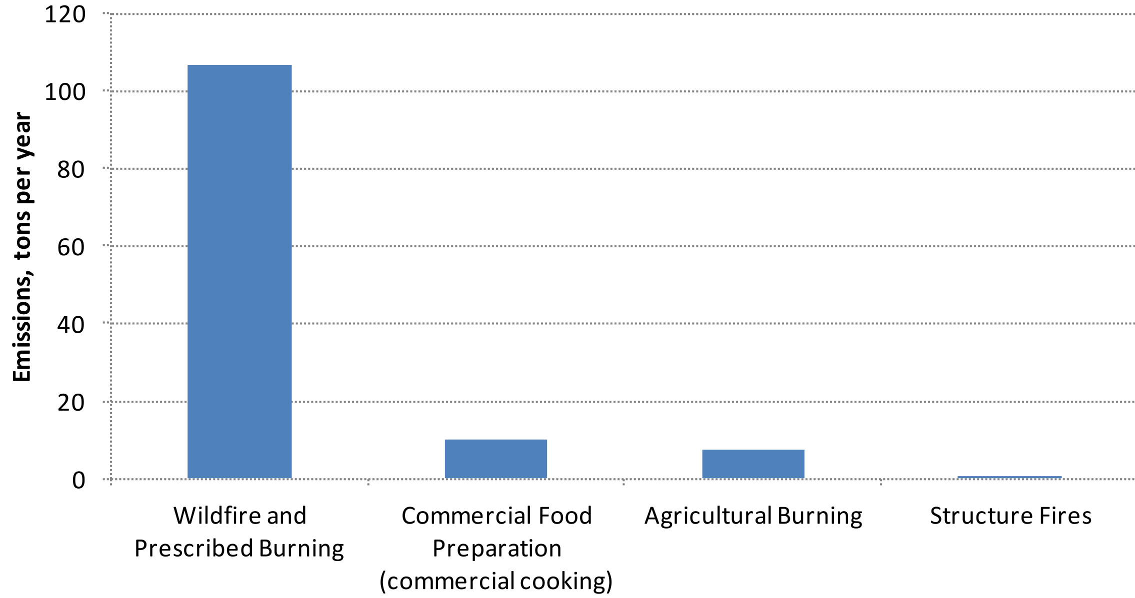

Figure 2.4-8: NAA Annual $PM_{2.5}$ Emissions, Miscellaneous Area Sources, By Emission Category

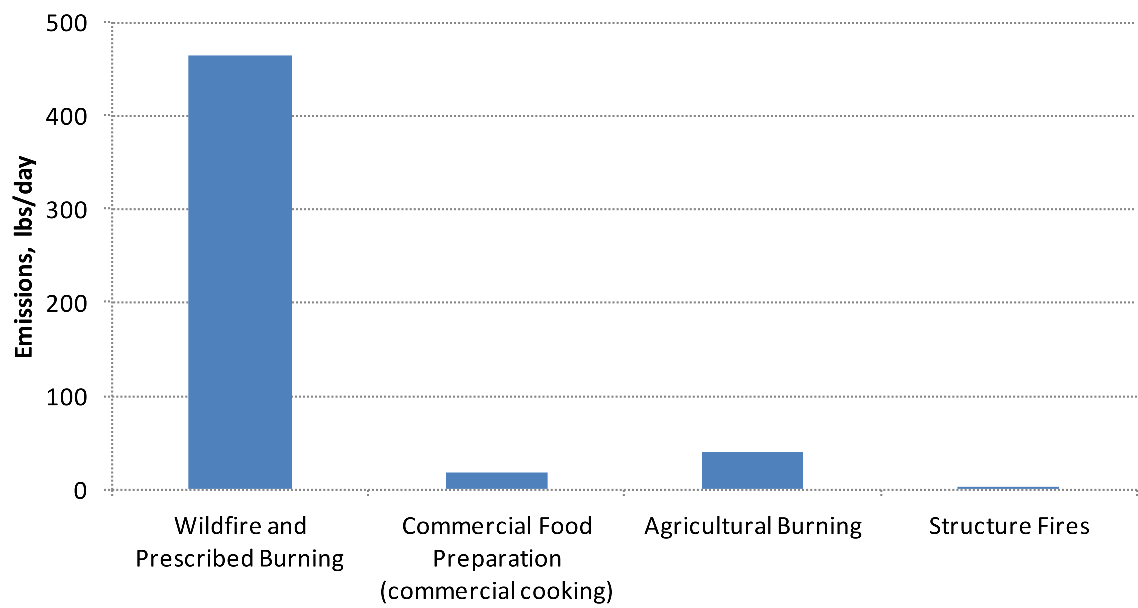

Figure 2.4-9: NAA Worst-Case Day Seasonal $PM_{2.5}$ Emissions, Miscellaneous Area Sources, By Emission Category

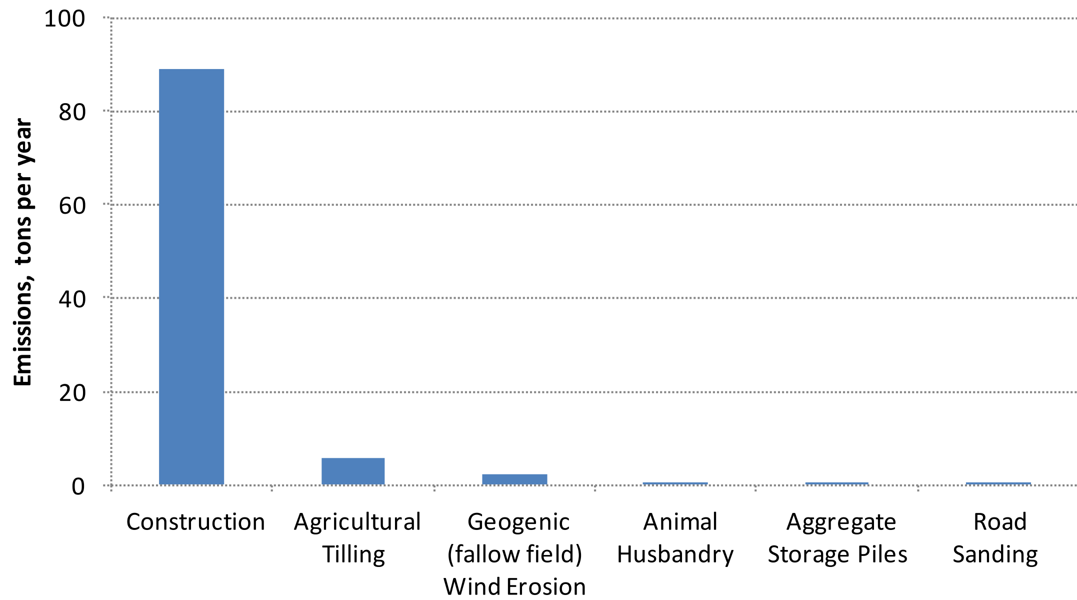

Figure 2.4-10: NAA Annual $PM_{2.5}$ Emissions, Fugitive Dust, By Emission Category

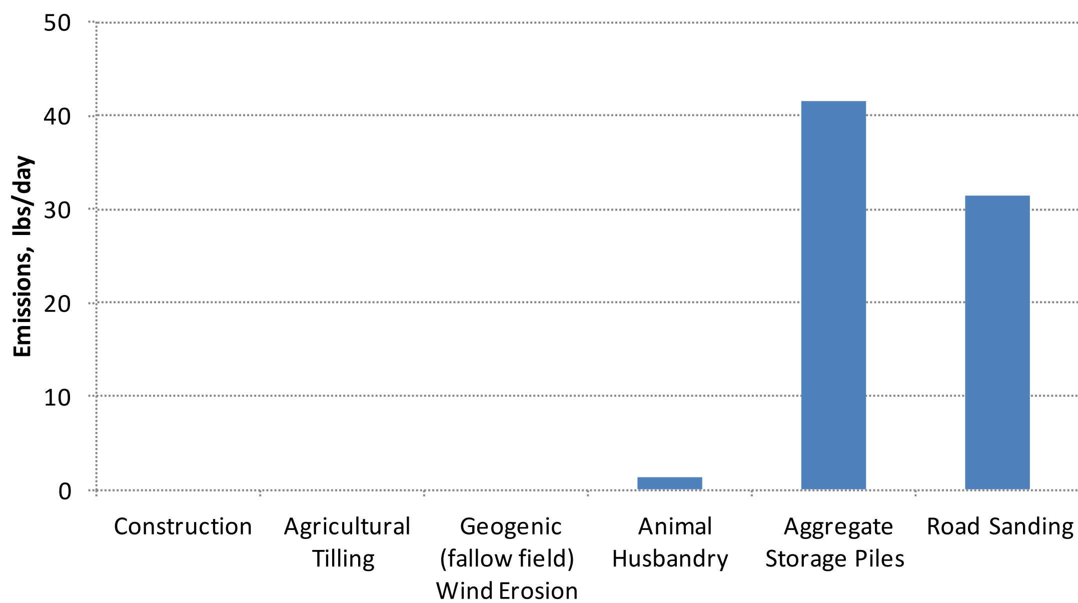

Figure 2.4-11: NAA Seasonal $PM_{2.5}$ Emissions, Fugitive Dust, By Emission Category

Table 2.4.1 Klamath Falls NAA PM Season: Summary of Estimation Procedures for Area Sources

Source Description	Table Number	SCC	Estimation Approach
WASTE DISPOSAL, TREATMENT, & RECOVERY			
Residential Open Burning: Split Wood	2.4.7-11	21-04-008-700	Survey
Residential Open Burning: Leaves & Grass	2.4.7-11	26-10	Survey
Residential Open Burning: Brush	2.4.7-11	26-10-000-400	Survey
Residential Open Burning: Municipal	2.4.7-11	26-10-030-000	Survey
Industrial Open Burning	--	Not Significant	(1)
Commercial / Institutional Open Burning	2.4.12-14	26-10-020-000	Activity Level
Commercial / Institutional On-Site Incineration	--	Not Significant	(1)
Open Burning; Land Clearing Debris	2.4.12-14	26-10-000-500	Activity Level
SMALL STATIONARY FOSSIL FUEL COMBUSTION			
Industrial Distillate/Kerosene Fuel Oil	2.4.15-19	21-02-004-000	Commodity-Consumption
Industrial Residual Fuel Oil	2.4.15-19	21-02-005-000	Commodity-Consumption
Industrial Natural Gas Combustion	2.4.20-24	21-02-006-000	Commodity-Consumption
Industrial Liquid Petroleum Gas Combustion	2.4.25-29	21-02-007-000	Commodity-Consumption
Commercial/Institutional Distillate/Kerosene Fuel Oil	2.4.15-19	21-03-004-000	Commodity-Consumption
Commercial/Institutional Residual Fuel Oil	2.4.15-19	21-03-005-000	Commodity-Consumption
Commercial/Institutional Natural Gas Combustion	2.4.20-24	21-03-006-000	Commodity-Consumption
Commercial/Institutional Liquid Petroleum Gas Combustion	2.4.25-29	21-03-007-000	Commodity-Consumption
Residential Distillate/Kerosene Fuel Oil	2.4.15-19	21-04-004-000	Commodity-Consumption
Residential Natural Gas Combustion	2.4.20-24	21-04-006-000	Commodity-Consumption
Residential Liquid Petroleum Gas Combustion	2.4.25-29	21-04-007-000	Commodity-Consumption
RESIDENTIAL WOOD COMBUSTION			
Fireplace	2.4.30-34	21-04-008-100	Survey
Insert Not Certified	2.4.30-34	21-04-008-210	Survey
Insert Certified NonCatalytic	2.4.30-34	21-04-008-220	Survey
Insert Certified Catalytic	2.4.30-34	21-04-008-230	Survey
Woodstove Not Certified	2.4.30-34	21-04-008-310	Survey
Woodstove Certified NonCatalytic	2.4.30-34	21-04-008-320	Survey
Woodstove Certified Catalytic	2.4.30-34	21-04-008-330	Survey
Certified Pellet Stove	2.4.30-34	21-04-008-400	Survey
Central Furnace	2.4.30-34	21-04-008-510	Survey
MISCELLANEOUS AREA SOURCES			
Wildfire and Prescribed Burning	2.4.35	28-10	EPA Estimate (2)
Structure Fires	2.4.36-38	28-10-030-000	Activity Level
Agricultural Burning	2.4.39	28-11-500-000	EPA Estimate (3)
Commercial Food Preparation (commercial cooking)	2.4.40-41	23-02	EPA Estimate (3)

Table 2.4.1 Klamath Falls NAA PM Season: Summary of Estimation Procedures for Area SourcesContinued

Source Description	Table Number	SCC	Estimation Approach
FUGITIVE DUST			
Aggregate Storage Piles	2.4.42	25-30-000-060	Survey
Road Sanding	2.4.43	22-94-000-002	Survey
Construction	2.4.44	22-11-010-000	EPA Estimate (3)
Agricultural Tilling	2.4.45	28-01-000-003	EPA Estimate (4)
Geogenic (fallow field) Wind Erosion	2.4.46	27-30-100-000	Activity Level
Animal Husbandry	2.4.47-49	28-05	Activity Level
EVAPORATIVE/OFF-GASSING EMISSION SOURCES - SOURCES EMITTING VOC AND NH3			
Commercial Fertilizer Application	2.4.50	28-01	EPA Estimate (3)
Small, Non-Permitted Point Sources: Solvent Use	2.4.51	24-01, 24-15, 24-25	Employee Population
Commercial Pesticide Application	2.4.52	24-61-850-000	Activity Level
Non-Industrial Asphalt Application	2.4.53	24-61	Activity Level & EPA Estimate (3)
Consumer Solvent Use	2.4.54	24-60	EPA Estimate (3)
Architectural Surface Coating	2.4.55	24-01-001-000	EPA Estimate (3)
Traffic Markings	2.4.55	24-01-008-000	EPA Estimate (3)
Portable Fuel Containers	2.4.56	25-01-011, 25-01-012	EPA Estimate (3)
Truck Transport of Gasoline	2.4.57	25-05-030-120	Activity Level
Domestic Sewage and Wastewater Treatment	2.4.58	26-30-000-000	Activity Level
Municipal Landfills	2.4.59	26-20-030-000	Modeled (5)

Notes:

(1) Determined to be insignificant through DEQ permitting and complaints records.

(2) EPA 2008 Oregon/California prescribed burning and wildfire emissions estimates, EIS event format. From Venkatesh Rao (EPA) to C. Swab. August 3, 2011.

(3) Data are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759). County data allocated to NAA.

(4) EPA generated data, using 1998 activity data, grown to 2002 using an economic indicator. County data allocated to NAA.

(5) LandGEM Landfill Gas Emissions Model, v. 3.02., 2008 Klamath Falls Landfill results (DEQ Ref. 771).

Table 2.4.2 Klamath Falls NAA 2008 Annual & PM Season: Summary $PM_{2.5}$ Emissions from Stationary Area Sources

Source Description	Table Number	SCC	$PM_{2.5}$ Annual (tpy)	$PM_{2.5}$ Worst-Case Day (lbs/day)
WASTE DISPOSAL, TREATMENT, & RECOVERY				
Residential Open Burning: Split Wood	2.4.7	21-04-008-700	0.3	4.E-01
Residential Open Burning: Leaves & Grass	2.4.7	26-10	3.4	15
Residential Open Burning: Brush	2.4.7	26-10-000-400	4.9	23
Residential Open Burning: Municipal	2.4.7	26-10-030-000	1.3	7
Commercial / Institutional Open Burning	2.4.12	26-10-020-000	2.5	0
Open Burning; Land Clearing Debris	2.4.12	26-10-000-500	0.3	5
Category Subtotal			**12.8**	**50**
SMALL STATIONARY FOSSIL FUEL COMBUSTION				
Industrial Distillate/Kerosene Fuel Oil	2.4.15	21-02-004-000	3.E-02	2.E-01
Industrial Residual Fuel Oil	2.4.15	21-02-005-000	0.1	1
Industrial Natural Gas Combustion	2.4.20	21-02-006-000	1.3	7
Industrial Liquid Petroleum Gas Combustion	2.4.25	21-02-007-000	2.E-03	1.E-02
Commercial/Institutional Distillate/Kerosene Fuel Oil	2.4.15	21-03-004-000	0.2	4
Commercial/Institutional Residual Fuel Oil	2.4.15	21-03-005-000	2.E-02	4.E-01
Commercial/Institutional Natural Gas Combustion	2.4.20	21-03-006-000	1.3	22
Commercial/Institutional Liquid Petroleum Gas Combustion	2.4.25	21-03-007-000	3.E-03	6.E-02
Residential Distillate/Kerosene Fuel Oil	2.4.15	21-04-004-000	0.1	1
Residential Natural Gas Combustion	2.4.20	21-04-006-000	3.E-02	1
Residential Liquid Petroleum Gas Combustion	2.4.25	21-04-007-000	2.E-03	4.E-02
Category Subtotal			**3.1**	**36**
				Advisory Call
RESIDENTIAL WOOD COMBUSTION				***Controlled***
Fireplace	2.4.30	21-04-008-100	63.7	989
Insert Not Certified	2.4.30	21-04-008-210	34.5	394
Insert Certified NonCatalytic	2.4.30	21-04-008-220	1.5	17
Insert Certified Catalytic	2.4.30	21-04-008-230	8.3	95
Woodstove Not Certified	2.4.30	21-04-008-310	39.8	475
Woodstove Certified NonCatalytic	2.4.30	21-04-008-320	8.9	106
Woodstove Certified Catalytic	2.4.30	21-04-008-330	4.3	51
Certified Pellet Stove	2.4.30	21-04-008-400	2.4	30
Central Furnace	2.4.30	21-04-008-510	1.7	17
Category Subtotal			**165.0**	**2,173**
MISCELLANEOUS AREA SOURCES				
Wildfire and Prescribed Burning	2.4.35	28-10	107.0	459
Structure Fires	2.4.36	28-10-030-000	0.3	1
Agricultural Burning	2.4.39	28-11-500-000	7.2	39
Commercial Food Preparation (commercial cooking)	2.4.40	23-02	9.9	18
Category Subtotal			**124.4**	**518**

Table 2.4.2 Klamath Falls NAA 2008 Annual & PM Season: Summary PM2.5 Emissions from Stationary Area Sources***Continued***

Source Description	Table Number	SCC	---------- $PM_{2.5}$ ---------- Annual (tpy)	Worst-Case Day (lbs/day)
FUGITIVE DUST				
Aggregate Storage Piles	2.4.42	25-30-000-060	0.3	41
Road Sanding	2.4.43	22-94-000-002	0.3	31
Construction	2.4.44	22-11-010-000	89.3	0
Agricultural Tilling	2.4.45	28-01-000-003	5.5	0
Geogenic (fallow field) Wind Erosion	2.4.46	27-30-100-000	2.0	0
Animal Husbandry	2.4.47	28-05	0.4	1
Category Subtotal			**97.7**	**74**
EVAPORATIVE/OFF-GASSING EMISSION SOURCES - SOURCES EMITTING VOC AND NH3				
Commercial Fertilizer Application	--	28-01	--	--
Small, Non-Permitted Point Sources: Solvent Use	--	24-01, 24-15, 24-25	--	--
Commercial Pesticide Application	--	24-61-850-000	--	--
Non-Industrial Asphalt Application	--	24-61	--	--
Consumer Solvent Use	--	24-60	--	--
Architectural Surface Coating	--	24-01-001-000	--	--
Traffic Markings	--	24-01-008-000	--	--
Portable Fuel Containers	--	25-01-011, 25-01-012	--	--
Truck Transport of Gasoline	--	25-05-030-120	--	--
Domestic Sewage and Wastewater Treatment	--	26-30-000-000	--	--
Municipal Landfills	--	26-20-030-000	--	--
Category Subtotal			**0.0**	**0**
AREA SOURCE $PM_{2.5}$ TOTAL			**403.0**	**2,851**

Table 2.4.3. Klamath Falls NAA 2008 Annual & PM Season: Summary NO_X Emissions from Stationary Area Sources

Source Description	Table Number	SCC	---------- NOX ---------- Annual (tpy)	Worst-Case Day (lbs/day)
WASTE DISPOSAL, TREATMENT, & RECOVERY				
Residential Open Burning: Split Wood	2.4.8	21-04-008-700	3.E-02	5.E-02
Residential Open Burning: Leaves & Grass	2.4.8	26-10	0.8	3
Residential Open Burning: Brush	2.4.8	26-10-000-400	1.8	8
Residential Open Burning: Municipal	2.4.8	26-10-030-000	0.2	1
Commercial / Institutional Open Burning	2.4.13	26-10-020-000	0.7	0
Open Burning; Land Clearing Debris	2.4.13	26-10-000-500	0.1	1
Category Subtotal			**3.6**	**14**
SMALL STATIONARY FOSSIL FUEL COMBUSTION				
Industrial Distillate/Kerosene Fuel Oil	2.4.17	21-02-004-000	2.5	14
Industrial Residual Fuel Oil	2.4.17	21-02-005-000	1.2	6
Industrial Natural Gas Combustion	2.4.22	21-02-006-000	17.6	97
Industrial Liquid Petroleum Gas Combustion	2.4.27	21-02-007-000	3.E-03	2.E-02
Commercial/Institutional Distillate/Kerosene Fuel Oil	2.4.17	21-03-004-000	5.1	89
Commercial/Institutional Residual Fuel Oil	2.4.17	21-03-005-000	0.6	10
Commercial/Institutional Natural Gas Combustion	2.4.22	21-03-006-000	17.0	294
Commercial/Institutional Liquid Petroleum Gas Combustion	2.4.27	21-03-007-000	5.E-03	8.E-02
Residential Distillate/Kerosene Fuel Oil	2.4.17	21-04-004-000	2.5	44
Residential Natural Gas Combustion	2.4.22	21-04-006-000	26.0	449
Residential Liquid Petroleum Gas Combustion	2.4.27	21-04-007-000	2.7	46
Category Subtotal			**75.2**	**1,049**
				Advisory Call
RESIDENTIAL WOOD COMBUSTION				***Controlled***
Fireplace	2.4.31	21-04-008-100	7.0	109
Insert Not Certified	2.4.31	21-04-008-210	3.2	36
Insert Certified NonCatalytic	2.4.31	21-04-008-220	0.2	2
Insert Certified Catalytic	2.4.31	21-04-008-230	0.8	9
Woodstove Not Certified	2.4.31	21-04-008-310	3.6	43
Woodstove Certified NonCatalytic	2.4.31	21-04-008-320	1.0	12
Woodstove Certified Catalytic	2.4.31	21-04-008-330	0.4	5
Certified Pellet Stove	2.4.31	21-04-008-400	3.0	38
Central Furnace	2.4.31	21-04-008-510	0.1	1
Category Subtotal			**19.3**	**256**
MISCELLANEOUS AREA SOURCES				
Wildfire and Prescribed Burning	2.4.18	28-10	13.7	59
Structure Fires	2.4.37	28-10-030-000	4.0E-02	1.4E-01
Agricultural Burning	2.4.39	28-11-500-000	2.4	13
Commercial Food Preparation (commercial cooking)	--	23-02	--	--
Category Subtotal			**16.1**	**72**

Table 2.4.3 Continued

Source Description	Table Number	SCC	NOX Annual (tpy)	NOX Worst-Case Day (lbs/day)
FUGITIVE DUST				
Aggregate Storage Piles	--	25-30-000-060	--	--
Road Sanding	--	22-94-000-002	--	--
Construction	--	22-11-010-000	--	--
Agricultural Tilling	--	28-01-000-003	--	--
Geogenic (fallow field) Wind Erosion	--	27-30-100-000	--	--
Animal Husbandry	--	28-05	--	--
Category Subtotal			**0**	**0**
EVAPORATIVE/OFF-GASSING EMISSION SOURCES - SOURCES EMITTING VOC AND NH3				
Commercial Fertilizer Application	--	28-01	--	--
Small, Non-Permitted Point Sources: Solvent Use	--	24-01, 24-15, 24-25	--	--
Commercial Pesticide Application	--	24-61-850-000	--	--
Non-Industrial Asphalt Application	--	24-61	--	--
Consumer Solvent Use	--	24-60	--	--
Architectural Surface Coating	--	24-01-001-000	--	--
Traffic Markings	--	24-01-008-000	--	--
Portable Fuel Containers	--	25-01-011, 25-01-012	--	--
Truck Transport of Gasoline	--	25-05-030-120	--	--
Domestic Sewage and Wastewater Treatment	--	26-30-000-000	--	--
Municipal Landfills	--	26-20-030-000	--	--
Category Subtotal			**0.0**	**0**
AREA SOURCE NOX TOTAL			**114.3**	**1,391**

Table 2.4.4. Klamath Falls NAA 2008 Annual & PM Season: Summary VOC Emissions from Stationary Area Sources

Source Description	Table Number	SCC	VOC Annual (tpy)	VOC Worst-Case Day (lbs/day)
WASTE DISPOSAL, TREATMENT, & RECOVERY				
Residential Open Burning: Split Wood	2.4.10	21-04-008-700	0.2	3.E-01
Residential Open Burning: Leaves & Grass	2.4.10	26-10	2.6	11
Residential Open Burning: Brush	2.4.10	26-10-000-400	5.5	25
Residential Open Burning: Municipal	2.4.10	26-10-030-000	0.3	2
Commercial / Institutional Open Burning	2.4.14	26-10-020-000	1.7	0
Open Burning; Land Clearing Debris	2.4.14	26-10-000-500	0.2	3
Category Subtotal			**10.6**	**42**
SMALL STATIONARY FOSSIL FUEL COMBUSTION				
Industrial Distillate/Kerosene Fuel Oil	2.4.18	21-02-004-000	3.E-02	1.E-01
Industrial Residual Fuel Oil	2.4.18	21-02-005-000	7.E-03	4.E-02
Industrial Natural Gas Combustion	2.4.23	21-02-006-000	1.0	5
Industrial Liquid Petroleum Gas Combustion	2.4.28	21-02-007-000	3.E-02	2.E-01
Commercial/Institutional Distillate/Kerosene Fuel Oil	2.4.18	21-03-004-000	0.1	2
Commercial/Institutional Residual Fuel Oil	2.4.18	21-03-005-000	1.E-02	2.E-01
Commercial/Institutional Natural Gas Combustion	2.4.23	21-03-006-000	0.9	16
Commercial/Institutional Liquid Petroleum Gas Combustion	2.4.28	21-03-007-000	4.E-02	8.E-01
Residential Distillate/Kerosene Fuel Oil	2.4.18	21-04-004-000	0.1	2
Residential Natural Gas Combustion	2.4.23	21-04-006-000	1.5	26
Residential Liquid Petroleum Gas Combustion	2.4.28	21-04-007-000	0.1	2
Category Subtotal			**3.8**	**54**
RESIDENTIAL WOOD COMBUSTION				***Advisory Call Controlled***
Fireplace	2.4.33	21-04-008-100	51.0	792
Insert Not Certified	2.4.33	21-04-008-210	59.8	682
Insert Certified NonCatalytic	2.4.33	21-04-008-220	0.9	10
Insert Certified Catalytic	2.4.33	21-04-008-230	6.1	69
Woodstove Not Certified	2.4.33	21-04-008-310	69.0	823
Woodstove Certified NonCatalytic	2.4.33	21-04-008-320	5.4	65
Woodstove Certified Catalytic	2.4.33	21-04-008-330	3.1	37
Certified Pellet Stove	2.4.33	21-04-008-400	0.03	0.4
Central Furnace	2.4.33	21-04-008-510	0.7	7
Category Subtotal			**196.1**	**2,486**
MISCELLANEOUS AREA SOURCES				
Wildfire and Prescribed Burning	2.4.18	28-10	299.3	1,284
Structure Fires	2.4.38	28-10-030-000	0.3	1
Agricultural Burning	2.4.39	28-11-500-000	5.4	30
Commercial Food Preparation (commercial cooking)	2.4.41	23-02	1.5	3
Category Subtotal			**306.6**	**1,318**

Table 2.4.4 Continued

Source Description	Table Number	SCC	VOC Annual (tpy)	VOC Worst-Case Day (lbs/day)
FUGITIVE DUST				
Aggregate Storage Piles	--	25-30-000-060	--	--
Road Sanding	--	22-94-000-002	--	--
Construction	--	22-11-010-000	--	--
Agricultural Tilling	--	28-01-000-003	--	--
Geogenic (fallow field) Wind Erosion	--	27-30-100-000	--	--
Animal Husbandry	2.4.48	28-05	11.8	41
Category Subtotal			**11.8**	**41**
EVAPORATIVE/OFF-GASSING EMISSION SOURCES - SOURCES EMITTING VOC AND NH3				
Commercial Fertilizer Application	--	28-01	--	--
Small, Non-Permitted Point Sources: Solvent Use	2.4.51	24-01, 24-15, 24-25	153.6	865
Commercial Pesticide Application	2.4.52	24-61-850-000	15.2	169
Non-Industrial Asphalt Application	2.4.53	24-61	1.1	13
Consumer Solvent Use	2.4.54	24-60	175.3	963
Architectural Surface Coating	2.4.55	24-01-001-000	62.8	696
Traffic Markings	2.4.55	24-01-008-000	1.3	7
Portable Fuel Containers	2.4.56	25-01-011, 25-01-012	23.5	128
Truck Transport of Gasoline	2.4.57	25-05-030-120	0.0	0
Domestic Sewage and Wastewater Treatment	2.4.58	26-30-000-000	0.0	0
Municipal Landfills	2.4.59	26-20-030-000	11.3	62
Category Subtotal			**444.1**	**2,902**
AREA SOURCE VOC TOTAL			**972.9**	**6,843**

Table 2.4.5. Klamath Falls NAA 2008 Annual & PM Season: Summary Ammonia Emissions from Stationary Area Sources

Source Description	Table Number	SCC	---------- NH_3 ---------- Annual (tpy)	Worst-Case Day (lbs/day)
WASTE DISPOSAL, TREATMENT, & RECOVERY				
Residential Open Burning: Split Wood	2.4.11	21-04-008-700	2.E-02	3.E-02
Residential Open Burning: Leaves & Grass	2.4.11	26-10	0.2	1
Residential Open Burning: Brush	2.4.11	26-10-000-400	0.4	2
Residential Open Burning: Municipal	2.4.11	26-10-030-000	--	--
Commercial / Institutional Open Burning	--	26-10-020-000	--	--
Open Burning; Land Clearing Debris	--	26-10-000-500	--	--
Category Subtotal			**0.6**	**2**
SMALL STATIONARY FOSSIL FUEL COMBUSTION				
Industrial Distillate/Kerosene Fuel Oil	2.4.19	21-02-004-000	0.1	1
Industrial Residual Fuel Oil	2.4.19	21-02-005-000	2.E-02	1.E-01
Industrial Natural Gas Combustion	2.4.24	21-02-006-000	3.5	19
Industrial Liquid Petroleum Gas Combustion	2.4.29	21-02-007-000	2.E-03	1.E-02
Commercial/Institutional Distillate/Kerosene Fuel Oil	2.4.19	21-03-004-000	0.2	4
Commercial/Institutional Residual Fuel Oil	2.4.19	21-03-005-000	8.E-03	1.E-01
Commercial/Institutional Natural Gas Combustion	2.4.24	21-03-006-000	3.4	59
Commercial/Institutional Liquid Petroleum Gas Combustion	2.4.29	21-03-007-000	4.E-03	7.E-02
Residential Distillate/Kerosene Fuel Oil	2.4.19	21-04-004-000	0.1	2
Residential Natural Gas Combustion	2.4.24	21-04-006-000	5.5	96
Residential Liquid Petroleum Gas Combustion	2.4.29	21-04-007-000	9.E-03	2.E-01
Category Subtotal			**12.9**	**181**
				Advisory Call
RESIDENTIAL WOOD COMBUSTION				***Controlled***
Fireplace	2.4.34	21-04-008-100	4.9	75
Insert Not Certified	2.4.34	21-04-008-210	1.9	22
Insert Certified NonCatalytic	2.4.34	21-04-008-220	0.1	1
Insert Certified Catalytic	2.4.34	21-04-008-230	0.4	4
Woodstove Not Certified	2.4.34	21-04-008-310	2.2	26
Woodstove Certified NonCatalytic	2.4.34	21-04-008-320	0.4	5
Woodstove Certified Catalytic	2.4.34	21-04-008-330	0.2	2
Certified Pellet Stove	2.4.34	21-04-008-400	0.2	3
Central Furnace	2.4.34	21-04-008-510	0.1	1
Category Subtotal			**10.4**	**140**
MISCELLANEOUS AREA SOURCES				
Wildfire and Prescribed Burning	2.4.18	28-10	20.8	89
Structure Fires	--	28-10-030-000	--	--
Agricultural Burning	2.4.39	28-11-500-000	--	--
Commercial Food Preparation (commercial cooking)	--	23-02	--	--
Category Subtotal			**20.8**	**89**

Table 2.4.5 Continued

Source Description	Table Number	SCC	NH_3 Annual (tpy)	NH_3 Worst-Case Day (lbs/day)
FUGITIVE DUST				
Aggregate Storage Piles	--	25-30-000-060	--	--
Road Sanding	--	22-94-000-002	--	--
Construction	--	22-11-010-000	--	--
Agricultural Tilling	--	28-01-000-003	--	--
Geogenic (fallow field) Wind Erosion	--	27-30-100-000	--	--
Animal Husbandry	2.4.49	28-05	76.2	264
Category Subtotal			**76.2**	**264**
EVAPORATIVE/OFF-GASSING EMISSION SOURCES - SOURCES EMITTING VOC AND NH3				
Commercial Fertilizer Application	2.4.50	28-01	31.6	43
Small, Non-Permitted Point Sources: Solvent Use	--	24-01, 24-15, 24-25	--	--
Commercial Pesticide Application	--	24-61-850-000	--	--
Non-Industrial Asphalt Application	--	24-61	--	--
Consumer Solvent Use	--	24-60	--	--
Architectural Surface Coating	--	24-01-001-000	--	--
Traffic Markings	--	24-01-008-000	--	--
Portable Fuel Containers	--	25-01-011, 25-01-012	--	--
Truck Transport of Gasoline	--	25-05-030-120	--	--
Domestic Sewage and Wastewater Treatment	2.4.58	26-30-000-000	romethane -	0
Municipal Landfills	2.4.59	26-20-030-000	9.5	52
Category Subtotal			**41.1**	**95**
AREA SOURCE NH_3 TOTAL			**161.9**	**772**

Table 2.4.6. Klamath Falls NAA 2008 Annual & PM Season: Summary SO_X Emissions from Stationary Area Sources

Source Description	Table Number	SCC	---------- SO_X ---------- Annual (tpy)	Worst-Case Day (lbs/day)
WASTE DISPOSAL, TREATMENT, & RECOVERY				
Residential Open Burning: Split Wood	2.4.9	21-04-008-700	5.E-03	7.E-03
Residential Open Burning: Leaves & Grass	2.4.9	26-10	0.1	4.E-01
Residential Open Burning: Brush	2.4.9	26-10-000-400	0.5	2
Residential Open Burning: Municipal	2.4.9	26-10-030-000	4.E-02	2.E-01
Commercial / Institutional Open Burning	--	26-10-020-000	--	--
Open Burning; Land Clearing Debris	--	26-10-000-500	--	--
Category Subtotal			**0.6**	**3**
SMALL STATIONARY FOSSIL FUEL COMBUSTION				
Industrial Distillate/Kerosene Fuel Oil	2.4.16	21-02-004-000	5.4	30
Industrial Residual Fuel Oil	2.4.16	21-02-005-000	8.7	48
Industrial Natural Gas Combustion	2.4.21	21-02-006-000	0.1	1
Industrial Liquid Petroleum Gas Combustion	2.4.26	21-02-007-000	3.E-03	2.E-02
Commercial/Institutional Distillate/Kerosene Fuel Oil	2.4.16	21-03-004-000	10.9	187
Commercial/Institutional Residual Fuel Oil	2.4.16	21-03-005-000	3.5	61
Commercial/Institutional Natural Gas Combustion	2.4.21	21-03-006-000	0.1	2
Commercial/Institutional Liquid Petroleum Gas Combustion	2.4.26	21-03-007-000	5.E-03	8.E-02
Residential Distillate/Kerosene Fuel Oil	2.4.16	21-04-004-000	7.8	135
Residential Natural Gas Combustion	2.4.21	21-04-006-000	0.2	3
Residential Liquid Petroleum Gas Combustion	2.4.26	21-04-007-000	1.E-02	2.E-01
Category Subtotal			**36.8**	**467**
				Advisory Call
RESIDENTIAL WOOD COMBUSTION				***Controlled***
Fireplace	2.4.32	21-04-008-100	1.1	17
Insert Not Certified	2.4.32	21-04-008-210	0.5	5
Insert Certified NonCatalytic	2.4.32	21-04-008-220	0.03	0.3
Insert Certified Catalytic	2.4.32	21-04-008-230	0.2	2
Woodstove Not Certified	2.4.32	21-04-008-310	0.5	6
Woodstove Certified NonCatalytic	2.4.32	21-04-008-320	0.2	2
Woodstove Certified Catalytic	2.4.32	21-04-008-330	0.1	1
Certified Pellet Stove	2.4.32	21-04-008-400	0.2	3
Central Furnace	2.4.32	21-04-008-510	0.1	1
Category Subtotal			**2.9**	**38**
MISCELLANEOUS AREA SOURCES				
Wildfire and Prescribed Burning	2.4.18	28-10	8.4	36
Structure Fires	--	28-10-030-000	--	--
Agricultural Burning	2.4.39	28-11-500-000	0.4	2
Commercial Food Preparation (commercial cooking)	--	23-02	--	--
Category Subtotal			**8.8**	**38**

Table 2.4.6 Continued

Source Description	Table Number	SCC	---------- SO_X ---------- Annual (tpy)	Worst-Case Day (lbs/day)
FUGITIVE DUST				
Aggregate Storage Piles	--	25-30-000-060	--	--
Road Sanding	--	22-94-000-002	--	--
Construction	--	22-11-010-000	--	--
Agricultural Tilling	--	28-01-000-003	--	--
Geogenic (fallow field) Wind Erosion	--	27-30-100-000	--	--
Animal Husbandry	--	28-05	--	--
Category Subtotal			**0**	**0**
EVAPORATIVE/OFF-GASSING EMISSION SOURCES - INCLUDES SOURCES EMITTING VOC AND NH3				
Commercial Fertilizer Application	--	28-01	--	--
Small, Non-Permitted Point Sources: Solvent Use	--	24-01, 24-15, 24-25	--	--
Commercial Pesticide Application	--	24-61-850-000	--	--
Non-Industrial Asphalt Application	--	24-61	--	--
Consumer Solvent Use	--	24-60	--	--
Architectural Surface Coating	--	24-01-001-000	--	--
Traffic Markings	--	24-01-008-000	--	--
Portable Fuel Containers	--	25-01-011, 25-01-012	--	--
Truck Transport of Gasoline	--	25-05-030-120	--	--
Domestic Sewage and Wastewater Treatment	--	26-30-000-000	--	--
Municipal Landfills	--	26-20-030-000	--	--
Category Subtotal			**0.0**	**0**
AREA SOURCE SOX TOTAL			**49.1**	**546**

Table 2.4.7. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Residential Open Burning

SCC / Material	(1) 2008 Material Burned (tons/yr)	(2) $PM_{2.5}$ EF (lbs/ton)	(3) SAF	(4) Activity (days/wk)	(5) -------- $PM_{2.5}$ Emissions -------- Annual (tons/yr)	(6) ---- PM Season ---- Typical Day (lb/day)	(7) Worst Case Day (lb/day)
21-04-008-700							
Split Wood	23.8 (a)	23.6 (a)	0.27 (a)	7	0.3	0.4	0.4
26-10-000-100 & 26-10-000-300							
Leaves & Grass	266.8 (b)	25.4 (b)	0.80 (b)	7	3.4	14.8	14.8
26-10-000-400							
Brush	581.4 (c)	17.0 (a)	0.84 (c)	7	4.9	22.8	22.8
26-10-030-000							
Municipal	77.5 (d)	34.8 (c)	0.99 (d)	7	1.3	7.4	7.4
					--------	--------	--------
Total					**10.0**	**45**	**45**

Notes:

(1) (a) From Appendix B, Table B-15
(b) From Appendix B, Table B-23
(c) From Appendix B, Table B-27
(d) From Appendix B, Table B-31

(2) (a) US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants (DEQ ref. 623)
(b) US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants (DEQ ref. 623)
PM2.5 EF, lb/ton leaves burned = 38
CARB Project No. A932-126, Tables 4.1.1, 4.1.4, and 4.5.7. Avg. of barley and wheat stubble. (DEQ ref. 522)
PM2.5 EF, lb/ton grass burned = 12.9
Avg EF, lb/ton leaves & grass burned = 25.4
(c) Emission Inventory Improvement Program Table 16.4-1. (DEQ ref. 321)

(3) (a) From Appendix B, Table B-22
(b) From Appendix B, Table B-26
(c) From Appendix B, Table B-30
(d) From Appendix B, Table B-34

(4) EPA-450/4-91-016, Page 5-18. (DEQ ref. 2)

(5) Annual tpy = (Material Burned, tpy) * (PM2.5 EF, lbs/ton) / (2000 lbs/ton)

(6) Typical Day, lbs/day = [(Annual tpy) * (2000 lbs/ton) * (PM2.5 SAF)] / [(Activity, days/wk) * (52 wks/yr)]

(7) Assumed equal to typical day emissions

Table 2.4.8. Klamath Falls NAA 2008 Area Source NO_X Emissions From Residential Open Burning

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
					-------- NO_X Emissions --------		
	2008					---- PM Season ----	
	Material	NO_X				Typical	Worst Case
SCC	Burned	EF		Activity	Annual	Day	Day
Material	(tons/yr)	(lbs/ton)	SAF	(days/wk)	(tons/yr)	(lb/day)	(lb/day)
21-04-008-700							
Split Wood	23.8 (a)	2.6 (a)	0.27 (a)	7	0.03	0.05	5.E-02
26-10-000-100 & 26-10-000-300							
Leaves & Grass	266.8 (b)	5.6 (b)	0.80 (b)	7	0.8	3.3	3
26-10-000-400							
Brush	581.4 (c)	6.2 (c)	0.84 (c)	7	1.8	8.3	8
26-10-030-000							
Municipal	77.5 (d)	6.0 (d)	0.99 (d)	7	0.2	1.3	1
					--------	--------	--------
Total					**2.8**	**13**	**13**

Notes:

(1) (a) From Appendix B, Table B-15
(b) From Appendix B, Table B-23
(c) From Appendix B, Table B-27
(d) From Appendix B, Table B-31

(2) (a) US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants (DEQ ref. 623)
(b) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
NOX EF, lb/ton leaves burned = 6.2
CARB Project No. A932-126, Tables 4.1.1, 4.1.4, and 4.5.7. Avg. of barley and wheat stubble. (DEQ ref. 522)
NOX EF, lb/ton grass burned = 5.1
Avg EF, lb/ton leaves & grass burned = 5.6
(c) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
(d) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 12. (DEQ ref. 713)

(3) (a) From Appendix B, Table B-22
(b) From Appendix B, Table B-26
(c) From Appendix B, Table B-30
(d) From Appendix B, Table B-34

(4) EPA-450/4-91-016, Page 5-18. (DEQ ref. 2)

(5) Annual tpy = (Material Burned, tpy) * (NOX EF, lbs/ton) / (2000 lbs/ton)

(6) Typical Day, lbs/day = [(Annual tpy) * (2000 lbs/ton) * (PM2.5 SAF)] / [(Activity, days/wk) * (52 wks/yr)]

(7) Assumed equal to typical day emissions

Table 2.4.9. Klamath Falls NAA 2008 Area Source SO_2 Emissions From Residential Open Burning

SCC / Material	(1) 2008 Material Burned (tons/yr)	(2) SO_2 EF (lbs/ton)	(3) SAF	(4) Activity (days/wk)	(5) SO_2 Emissions: Annual (tons/yr)	(6) SO_2 Emissions, PM Season: Typical Day (lb/day)	(7) SO_2 Emissions, PM Season: Worst Case Day (lb/day)
21-04-008-700							
Split Wood	23.8 (a)	0.4 (a)	0.27 (a)	7	0.005	0.01	0.01
26-10-000-100 & 26-10-000-300							
Leaves & Grass	266.8 (b)	0.6 (b)	0.80 (b)	7	0.1	0.4	0.4
26-10-000-400							
Brush	581.4 (c)	1.7 (c)	0.84 (c)	7	0.5	2.2	2.2
26-10-030-000							
Municipal	77.5 (d)	1.0 (d)	0.99 (d)	7	0.04	0.2	0.2
					--------	--------	--------
Total					**0.6**	**3**	**3**

Notes:

(1) (a) From Appendix B, Table B-15
(b) From Appendix B, Table B-23
(c) From Appendix B, Table B-27
(d) From Appendix B, Table B-31

(2) (a) US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants (DEQ ref. 623)
(b) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
SO2 EF, lb/ton leaves burned = 0.8
CARB Project No. A932-126, Tables 4.1.1, 4.1.4, and 4.5.7. Avg. of barley and wheat stubble. (DEQ ref. 522)
SO2 EF, lb/ton grass burned = 0.5
Avg EF, lb/ton leaves & grass burned = $\boxed{0.6}$
(c) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
(d) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 12. (DEQ ref. 713)

(3) (a) From Appendix B, Table B-22
(b) From Appendix B, Table B-26
(c) From Appendix B, Table B-30
(d) From Appendix B, Table B-34

(4) EPA-450/4-91-016, Page 5-18. (DEQ ref. 2)

(5) Annual tpy = (Material Burned, tpy) * (SO2 EF, lbs/ton) / (2000 lbs/ton)

(6) Typical Day, lbs/day = [(Annual tpy) * (2000 lbs/ton) * (PM2.5 SAF)] / [(Activity, days/wk) * (52 wks/yr)]

(7) Assumed equal to typical day emissions

Table 2.4.10. Klamath Falls NAA 2008 Area Source VOC Emissions From Residential Open Burning

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
					-------- VOC Emissions --------		
	2008					---- PM Season ----	
	Material	VOC				Typical	Worst Case
SCC	Burned	EF		Activity	Annual	Day	Day
Material	(tons/yr)	(lbs/ton)	SAF	(days/wk)	(tons/yr)	(lb/day)	(lb/day)
21-04-008-700							
Split Wood	23.8 (a)	18.9 (a)	0.27 (a)	7	0.2	3.E-01	3.E-01
26-10-000-100 & 26-10-000-300							
Leaves & Grass	266.8 (b)	19.5 (b)	0.80 (b)	7	2.6	11	11
26-10-000-400							
Brush	581.4 (c)	19.0 (c)	0.84 (c)	7	5.5	25	25
26-10-030-000							
Municipal	77.5 (d)	8.6 (d)	0.99 (d)	7	0.3	2	2
					--------	--------	--------
Total					**8.7**	**39**	**39**

Notes:

(1) (a) From Appendix B, Table B-15
(b) From Appendix B, Table B-23
(c) From Appendix B, Table B-27
(d) From Appendix B, Table B-31

(2) (a) Houck, James E., Eagle, Brian N. Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region. Prepared for MARAMA. December 19, 2006. (DEQ ref. 700)
(b) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
VOC EF, lb/ton leaves burned = 28
CARB Project No. A932-126, Tables 4.1.1, 4.1.4, and 4.5.7. Avg. of barley and wheat stubble. (DEQ ref. 522)
VOC EF, lb/ton grass burned = 10.99
Avg EF, lb/ton leaves & grass burned = $\boxed{19.5}$
(c) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
(d) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 12. (DEQ ref. 713)

(3) (a) From Appendix B, Table B-22
(b) From Appendix B, Table B-26
(c) From Appendix B, Table B-30
(d) From Appendix B, Table B-34

(4) EPA-450/4-91-016, Page 5-18. (DEQ ref. 2)

(5) Annual tpy = (Material Burned, tpy) * (VOC EF, lbs/ton) / (2000 lbs/ton)

(6) Typical Day, lbs/day = [(Annual tpy) * (2000 lbs/ton) * (PM2.5 SAF)] / [(Activity, days/wk) * (52 wks/yr)]

(7) Assumed equal to typical day emissions

Table 2.4.11. Klamath Falls NAA 2008 Area Source NH_3 Emissions From Residential Open Burning

SCC / Material	(1) 2008 Material Burned (tons/yr)	(2) NH_3 EF (lbs/ton)	(3) SAF	(4) Activity (days/wk)	(5) NH_3 Emissions Annual (tons/yr)	(6) NH_3 Emissions PM Season Typical Day (lb/day)	(7) NH_3 Emissions PM Season Worst Case Day (lb/day)
21-04-008-700							
Split Wood	23.8 (a)	1.8 (a)	0.27 (a)	7	0.02	0.03	0.03
26-10-000-100 & 26-10-000-300							
Leaves & Grass	266.8 (b)	1.3 (b)	0.80 (b)	7	0.2	0.7	0.7
26-10-000-400							
Brush	581.4 (c)	1.3 (c)	0.84 (c)	7	0.4	1.7	1.7
26-10-030-000							
Municipal	77.5 (d)	N/A (d)	0.99 (d)	7	--	--	--
					--------	--------	--------
Total					**0.6**	**2**	**2**

Notes:

(1) (a) From Appendix B, Table B-15
(b) From Appendix B, Table B-23
(c) From Appendix B, Table B-27
(d) From Appendix B, Table B-31

(2) (a) Houck, James E., Eagle, Brian N. Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region. Prepared for MARAMA. December 19, 2006. (DEQ ref. 700)
(b) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
NH3 EF, lb/ton leaves burned = 1.26
CARB Project No. A932-126, Tables 4.1.1, 4.1.4, and 4.5.7. Avg. of barley and wheat stubble. (DEQ ref. 522)
NH3 EF, lb/ton grass burned = --
Avg EF, lb/ton leaves & grass burned = $\boxed{1.26}$
(c) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 13. (DEQ ref. 713)
(d) Open Burning in Residential Areas, Emissions Inventory Development Report Prepared for MANE-VU by E.H. Pechan and Associates. Table 12. (DEQ ref. 713)

(3) (a) From Appendix B, Table B-22
(b) From Appendix B, Table B-26
(c) From Appendix B, Table B-30
(d) From Appendix B, Table B-34

(4) EPA-450/4-91-016, Page 5-18. (DEQ ref. 2)

(5) Annual tpy = (Material Burned, tpy) * (NH3 EF, lbs/ton) / (2000 lbs/ton)

(6) Typical Day, lbs/day = [(Annual tpy) * (2000 lbs/ton) * (PM2.5 SAF)] / [(Activity, days/wk) * (52 wks/yr)]

(7) Assumed equal to typical day emissions

Table 2.4.12. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Open Burning: Land Clearing and Commercial Open Burning

(1)	(1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8)
SCC & Description							Seasonal	----- PM2.5 Emissions -----		
		Material		Material	Material		Adjustment		Typical	Worst-Case
Permit	Date	Burned	Pile Size	Density	Burned	PM2.5 EF	Factor	Annual	Season	Season
Number	Issued	(description)	(cu yd)	(ton/cu yd)	(tons)	(lbs/ton)	(SAF)	tpy	(lbs/dy)	(lbs/dy)
26-10-000-500: Open Burning /All Categories /Land Clearing Debris										
33-B-08-009	4/8/08	Grass/Brush	15 (a)	0.125	1.82	17	0	2.E-02	0	0
18-B-08-010	4/15/08	Brush	60 (b)	0.125	7.45	17	0	6.E-02	0	0
18-B-08-004	6/11/08	Brush (a)	37 (c)	0.125	4.63	17	0	4.E-02	0	0
Non-Permitted	not given	Brush (a)	148 (d)	0.125	18.53	17	1.90	0.2	5	5
*26-10-020-000: Open Burning /Commercial/Institutional /Total**										
18-B-08-015	not given	Vegetation	1,185 (e)	0.125	148.15	17	0	1.3	0	0
18-B-08-016	not given	Wood/Vegetation	1,185 (f)	0.125	148.15	17	0	1.3	0	0
								------	------	------
Total								**2.8**	**5**	**5**

These two burns are for irrigation canal burning

Notes

(1) Permit number, date issued, and material burned courtesy of Bonnie Hough, DEQ Bend office (DEQ Ref. 765)
Please see Appendix B, Figure B-1 for permit locations.
(a) Material burned not provided - assumed brush

(2) Pile size reference as in note (1)
(a) Pile size is described as "3 ten foot piles": Each pile assumed conical and 5 ft. in height.
Volume of a cone, cu yd = (1/3)*π* (r^2, ft) * (0.037 cu yd/cu ft)
(b) Pile size is described as "2 sixteen foot piles.... 12 feet tall). Each pile assumed conical.
Volume of a cone, cu yd = (1/3)*π* (r^2, ft) * (0.037 cu yd/cu ft)
(c) No pile size given: pile(s) assumed conical, and an average of (a) and (b) used for permitted land clearing burn.
(d) Four illegal burns reported in 2008 (DEQ Ref. 765). Pile size as in (c), multiplied by four.
(e) Irrigation canal burn: volume burned described as "200 feet by 40 feet, by 3 to 5 feet high":
volume, cu yd = ((200 * 40 * 4) feet) * (0.037 cu yd/ cu ft)
(f) Irrigation canal burn: no volume burned given, set equal to (d) for canal burn

(3) Density is from OAR 340-097-0110 (7) (b) (E) (iv), the density of uncompacted yard debris. Assumed to contain brush, vegetation, grass. (DEQ Ref. 540)

(4) Material Burned, tons = (pile size, cu yd) * (material density, tons/cu yd)

(5) 2008 NEI methodology, Open Burning - Land Clearing. E.H. Pechan and Assocates, Table 4. (DEQ Ref. 770)

(6) PM season = November 1 through February 28: Seasonal adjustment factor =
([season activity] * [12 months]) / ([annual activity] * [season months])
Dated permits SAF = 0, fire took place outside of season. Canal burning SAF = 0, typically occurs in October.
Non-permitted (illegal) monthly activity is from EPA temporal allocation profiles, DEQ Ref. 760.

Jan	1,244		Jul	616
Feb	1,306		Aug	602
Mar	1,916		Sep	658
Apr	840		Oct	616
May	371		Nov	686
Jun	475		Dec	664

Shaded cells indicate the PM season. The SAF is calculated as follows:
Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
= ([1244+1306+686+664] * 12) / ([sum(all activity)] * 4) = 1.90

(7) Annual Emissions [tons/yr] = (Material Burned, tons) * (PM2.5 EF, lbs/ton)

(8) Typical Day and Worst Case Day Emissions are the assumed the same
Typical Day and Worst Case Day Emissions =
[(Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)] / (120 days/PM season)

Table 2.4.13. Klamath Falls NAA 2008 Area Source NO_X Emissions From Open Burning: Land Clearing and Commercial Open Burning

(1)	(1)	(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(8)
SCC & Description								Seasonal	--- NOX Emissions ---		
		Material			Material	Material		Adjustment		Typical	Worst-Case
Permit	Date	Burned	Pile Size		Density	Burned	NOX EF	Factor	Annual	Season	Season
Number	Issued	(description)	(cu yd)		(ton/cu yd)	(tons)	(lbs/ton)	(SAF)	tpy	(lbs/dy)	(lbs/dy)
26-10-000-500: Open Burning /All Categories /Land Clearing Debris											
33-B-08-009	4/8/08	Grass/Brush	15	(a)	0.125	1.82	5	0	5.E-03	0	0
18-B-08-010	4/15/08	Brush	60	(b)	0.125	7.45	5	0	2.E-02	0	0
18-B-08-004	6/11/08	Brush (a)	37	(c)	0.125	4.63	5	0	1.E-02	0	0
Non-Permitted	not given	Brush (a)	148	(d)	0.125	18.53	5	1.90	0.0	1	1
*26-10-020-000: Open Burning /Commercial/Institutional /Total**											
18-B-08-015	not given	Vegetation	1,185	(e)	0.125	148.15	5	0	0.4	0	0
18-B-08-016	not given	Wood/Vegetation	1,185	(f)	0.125	148.15	5	0	0.4	0	0
									------	------	------
Total									**0.8**	**1**	**1**

These two burns are for irrigation canal burning

Notes

(1) Permit number, date issued, and material burned courtesy of Bonnie Hough, DEQ Bend office (DEQ Ref. 765)
Please see Appendix B, Figure B-1 for permit locations.
(a) Material burned not provided - assumed brush

(2) Pile size reference as in note (1)
(a) Pile size is described as "3 ten foot piles": Each pile assumed conical and 5 ft. in height.
Volume of a cone, cu yd = (1/3)*π* (r^2, ft) * (0.037 cu yd/cu ft)
(b) Pile size is described as "2 sixteen foot piles.... 12 feet tall). Each pile assumed conical.
Volume of a cone, cu yd = (1/3)*π* (r^2, ft) * (0.037 cu yd/cu ft)
(c) No pile size given: pile(s) assumed conical, and an average of (a) and (b) used for permitted land clearing burn.
(d) Four illegal burns reported in 2008 (DEQ Ref. 765). Pile size as in (c), multiplied by four.
(e) Irrigation canal burn: volume burned described as "200 feet by 40 feet, by 3 to 5 feet high":
volume, cu yd = ((200 * 40 * 4) feet) * (0.037 cu yd/ cu ft)
(f) Irrigation canal burn: no volume burned given, set equal to (d) for canal burn

(3) Density is from OAR 340-097-0110 (7) (b) (E) (iv), the density of uncompacted yard debris. Assumed to contain brush, vegetation, grass. (DEQ Ref. 540)

(4) Material Burned, tons = (pile size, cu yd) * (material density, tons/cu yd)

(5) 2008 NEI methodology, Open Burning - Land Clearing. E.H. Pechan and Assocates, Table 4. (DEQ Ref. 770)

(6) PM season = November 1 through February 28: Seasonal adjustment factor =
([season activity] * [12 months]) / ([annual activity] * [season months])
Dated permits SAF = 0, fire took place outside of season. Canal burning SAF = 0, typically occurs in October.
Non-permitted (illegal) monthly activity is from EPA temporal allocation profiles, DEQ Ref. 760.

Jan	1,244		Jul	616
Feb	1,306		Aug	602
Mar	1,916		Sep	658
Apr	840		Oct	616
May	371		Nov	686
Jun	475		Dec	664

Shaded cells indicate the PM season. The SAF is calculated as follows:
Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
= ([1244+1306+686+664] * 12) / ([sum(all activity)] * 4) = 1.90

(7) Annual Emissions [tons/yr] = (Material Burned, tons) * (PM2.5 EF, lbs/ton)

(8) Typical Day and Worst Case Day Emissions are the assumed the same
Typical Day and Worst Case Day Emissions =
[(Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)] / (120 days/PM season)

Table 2.4.14. Klamath Falls NAA 2008 Area Source VOC Emissions From Open Burning: Land Clearing and Commercial Open Burning

(1) *SCC & Description* Permit Number	(1) Date Issued	(1) Material Burned (description)	(2) Pile Size (cu yd)	(3) Material Density (ton/cu yd)	(4) Material Burned (tons)	(5) VOC EF (lbs/ton)	(6) Seasonal Adjustment Factor (SAF)	(7) --- VOC Emissions --- Annual tpy	(8) Typical Season (lbs/dy)	(8) Worst-Case Season (lbs/dy)
26-10-000-500: Open Burning /All Categories /Land Clearing Debris										
33-B-08-009	4/8/08	Grass/Brush	15 (a)	0.125	1.82	11.6	0	1.E-02	0	0
18-B-08-010	4/15/08	Brush	60 (b)	0.125	7.45	11.6	0	4.E-02	0	0
18-B-08-004	6/11/08	Brush (a)	37 (c)	0.125	4.63	11.6	0	3.E-02	0.E+00	0
Non-Permitted	not given	Brush (a)	148 (d)	0.125	18.53	11.6	1.90	0.1	3	3
*26-10-020-000: Open Burning /Commercial/Institutional /Total**										
18-B-08-015	not given	Vegetation	1,185 (e)	0.125	148.15	11.6	0	0.9	0	0
18-B-08-016	not given	Wood/Vegetation	1,185 (f)	0.125	148.15	11.6	0	0.9	0	0
								------	------	------
Total								**1.9**	**3**	**3**

**These two burns are for irrigation canal burning*

Notes

(1) Permit number, date issued, and material burned courtesy of Bonnie Hough, DEQ Bend office (DEQ Ref. 765)
Please see Appendix B, Figure B-1 for permit locations.
(a) Material burned not provided - assumed brush

(2) Pile size reference as in note (1)
(a) Pile size is described as "3 ten foot piles": Each pile assumed conical and 5 ft. in height.
Volume of a cone, cu yd = (1/3)*π* (r^2, ft) * (0.037 cu yd/cu ft)
(b) Pile size is described as "2 sixteen foot piles.... 12 feet tall). Each pile assumed conical.
Volume of a cone, cu yd = (1/3)*π* (r^2, ft) * (0.037 cu yd/cu ft)
(c) No pile size given: pile(s) assumed conical, and an average of (a) and (b) used for permitted land clearing burn.
(d) Four illegal burns reported in 2008 (DEQ Ref. 765). Pile size as in (c), multiplied by four.
(e) Irrigation canal burn: volume burned described as "200 feet by 40 feet, by 3 to 5 feet high":
volume, cu yd = ((200 * 40 * 4) feet) * (0.037 cu yd/ cu ft)
(f) Irrigation canal burn: no volume burned given, set equal to (d) for canal burn

(3) Density is from OAR 340-097-0110 (7) (b) (E) (iv), the density of uncompacted yard debris. Assumed
to contain brush, vegetation, grass. (DEQ Ref. 540)

(4) Material Burned, tons = (pile size, cu yd) * (material density, tons/cu yd)

(5) 2008 NEI methodology, Open Burning - Land Clearing. E.H. Pechan and Assocates, Table 4. (DEQ Ref. 770)

(6) PM season = November 1 through February 28: Seasonal adjustment factor =
([season activity] * [12 months]) / ([annual activity] * [season months])
Dated permits SAF = 0, fire took place outside of season. Canal burning SAF = 0, typically occurs in October.
Non-permitted (illegal) monthly activity is from EPA temporal allocation profiles, DEQ Ref. 760.

Jan	1,244	Jul	616
Feb	1,306	Aug	602
Mar	1,916	Sep	658
Apr	840	Oct	616
May	371	Nov	686
Jun	475	Dec	664

Shaded cells indicate the PM season. The SAF is calculated as follows:
Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
= ([1244+1306+686+664] * 12) / ([sum(all activity)] * 4) = 1.90

(7) Annual Emissions [tons/yr] = (Material Burned, tons) * (PM2.5 EF, lbs/ton)

(8) Typical Day and Worst Case Day Emissions are the assumed the same
Typical Day and Worst Case Day Emissions =
[(Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)] / (120 days/PM season)

Table 2.4.15. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Fuel Oil Use

KLAMATH FALLS NONATTAINMENT AREA Area	SCC Code	(1) 2008 Fuel Oil Use (10^3 gal)	(2) PM2.5 Emission Factor (lbs/10^3 gal)	(3) SAF	(4) Activity Level (d/wk)	(5) ---------- PM2.5 Emissions ---------- Annual (tons/yr)	(6) Typical Day (lb/day)	(7) Worst Case Day (lb/day)
Residential Use								
Distillate Oil	21-04-004-000	275	0.4	1.7	7	5.5E-02	0.5	1.0
Residual Oil	21-04-005-000	0	N/A	N/A	N/A	N/A	N/A	N/A
Kerosene	21-04-011-000	6	0.4	1.7	7	1.2E-03	1.1E-02	2.1E-02
						----------	----------	----------
Total Residential Fuel Oil Emissions						0.1	1	1
Non-Permitted Commrcl./Inst. Use								
Distillate Oil	21-03-004-000	509	0.83	1.7	7	2.1E-01	2.0	3.6
Residual Oil	21-03-005-000	20	2.30	1.7	7	2.3E-02	2.2E-01	4.0E-01
Kerosene	21-03-000-000	5.3	0.83	1.7	7	2.2E-03	2.1E-02	3.8E-02
						----------	----------	----------
Total Commercial/Institutional Fuel Oil Emissions						2.4E-01	2	4
Non-Permitted Industrial Use								
Distillate Oil	21-02-004-000	254	0.25	1.0	7	3.2E-02	1.7E-01	1.7E-01
Residual Oil	21-02-005-000	49	5.60	1.0	7	1.4E-01	7.6E-01	7.6E-01
Kerosene	21-02-000-000	0.3	0.25	1.0	7	3.4E-05	1.9E-04	1.9E-04
						----------	----------	-----------
Total Industrial Fuel Oil Emissions						1.7E-01	1	1
Total Area Source Fuel Oil PM2.5 Emissions						0.5	4	6

Notes for Table 2.4.15

1) Klamath Falls NA Fuel Oil Use estimates from Appendix B, Table B-12.
2) Emission Factors (EFs) are from the EPA Procedures Document, AP-42; (Ref. 8), except where noted.

Category	**Fuel Oil type**	**EF Source/Comments**
All:	Kerosene	AP-42 does not contain specific EFs for Kerosene. EFs for #2 Distillate Oil were applied to kerosene combustion due to similarity of fuel type and gross heating value (approx. 140,000 BTU/gal) and use as a space heating oil.
Residential :	Distillate & Kerosene	EF from Table 1.3-1(pg. 1.3-12); Residential furnace, Filterable PM
Commercial:	Distillate & Kerosene	Cumulative EF for PM2.5 from Table 1.3-7(pg. 1.3-17); Commercial Boilers
	Residual	Cumulative EF for PM2.5 from Table 1.3-7(pg. 1.3-17); Commercial Boilers
		Residual Oil (ASTM #5) equation: 1.92A where A= 1.2 = 2.3 lb/10^3 gal.
Industrial:	Distillate & Kerosene	Cumulative EF for PM10 from Table 1.3-6 (pg. 1.3-17); Industrial Boilers
	Residual	Cumulative EF for PM10 from Table 1.3-5(pg. 1.3-16); Industrial Boilers
		Residual Oil (ASTM #5) equation: 4.67A where A= 1.2 = 5.6 lb/10^3 gal.
		Distillate and Residual oil assumed to be constant process; Kerosene assumed used for space heating

3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
   Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	----------	----------
	6,871	3,983

   PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
   PM SAF = $\boxed{1.7}$

   Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref, 760)
   The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles, (DEQ Ref. 760)
   Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = Fuel oil use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM_{10} Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
   Heating Degree Day (HDD)data from Appendix C, Table C-2.
   Worst Case Day Emissions [lbs/day] =
   (((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

	PM Season Maximum HDD	Season Average HDD
	----------	----------
	60	33
Res/Comm Worst Case Day multiplier =		$\boxed{1.8}$

Table 2.4.16. Klamath Falls NAA 2008 Area Source SO_2 Emissions From Fuel Oil Use

KLAMATH FALLS NONATTAINMENT AREA Area	SCC Code	(1) 2008 Fuel Oil Use (10^3 gal)	(2) SO2 Emission Factor (lbs/10^3 gal)	(3) SAF	(4) Activity Level (d/wk)	(5) ---------- SO2 Emissions ---------- Annual (tons/yr)	(6) Typical Day (lb/day)	(7) Worst Case Day (lb/day)
Residential Use								
Distillate Oil	21-04-004-000	275	56.8	1.7	7	7.8	75	135
Residual Oil	21-04-005-000	0	N/A	N/A	N/A	N/A	N/A	N/A
Kerosene	21-04-011-000	6	5.7	1.7	7	1.7E-02	0.2	0.3
						----------	----------	----------
Total Residential Fuel Oil Emissions						7.8	75	135
Non-Permitted Commrcl./Inst. Use								
Distillate Oil	21-03-004-000	509	42.6	1.7	7	10.8	104	187
Residual Oil	21-03-005-000	20	353.25	1.7	7	3.5	34	61
Kerosene	21-03-000-000	5.3	5.7	1.7	7	1.5E-02	1.4E-01	2.6E-01
						----------	----------	----------
Total Commercial/Institutional Fuel Oil Emissions						14.4	137	249
Non-Permitted Industrial Use								
Distillate Oil	21-02-004-000	254	42.6	1.0	7	5.4	30	30
Residual Oil	21-02-005-000	49	353.25	1.0	7	8.7	48	48
Kerosene	21-02-000-000	0.3	5.68	1.0	7	7.7E-04	4.2E-03	4.2E-03
						----------	----------	-----------
Total Industrial Fuel Oil Emissions						14.2	78	78
Total Area Source Fuel Oil PM10 Emissions						36.4	290	462

Notes for Table 2.4.16.

1) Klamath Falls NA Fuel Oil Use estimates from Appendix B, Table B-12.
2) Emission Factors (EFs) are from the EPA Procedures Document, AP-42; (Ref. 8), except where noted.

Category	Fuel Oil type	EF Source/Comments
All:	Kerosene	AP-42 does not contain specific EFs for Kerosene. EFs for #2 Distillate Oil were applied to kerosene combustion due to similarity of fuel type and gross heating value (approx. 140,000 BTU/gal) and use as a space heating oil.
Residential :	Distillate & Kerosene	EF from Table 1.3-1(pg. 1.3-12); Residential furnace: EF = 142S where S = wt% of sulfur in the fuel: The regulatory limit for % sulfur for #1 and #2 oil sold in Oregon is 0.3 to 0.5. EF = 142*0.4 = 56.8 Kerosene sulfur assumed to be 400 ppm = 0.04 wt% (EPA 2004): EF = 142*0.04 = 5.7 EPA kerosene ppm http://www.epa.gov/diesel/presentations/keroseneblding.pdf
Commercial & Industrial:	Distillate & Kerosene Residual	Distillate and residual EFs from EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743). Kerosene EF estimated as in residential kerosene EF.

3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	----------	----------
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)

PM SAF = $\boxed{1.7}$

Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref, 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.

4) Weekly activity is from EPA temporal allocation profiles, (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = Fuel oil use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM_{10} Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
----------	----------
60	33

Res/Comm Worst Case Day multiplier = $\boxed{1.8}$

Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.17. Klamath Falls NAA 2008 Area Source NO_X Emissions From Fuel Oil Use

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
						---------- NOX Emissions ----------		
KLAMATH FALLS NONATTAINMENT AREA		2008 Fuel Oil	NOX Emission		Activity		Typical	Worst Case
Area	SCC Code	Use (10^3 gal)	Factor (lbs/10^3 gal)	SAF	Level (d/wk)	Annual (tons/yr)	Day (lb/day)	Day (lb/day)
Residential Use								
Distillate Oil	21-04-004-000	275	18	1.7	7	2.5	24	43
Residual Oil	21-04-005-000	0	N/A	N/A	N/A	N/A	N/A	N/A
Kerosene	21-04-011-000	6	18	1.7	7	5.4E-02	0.5	0.9
						----------	----------	----------
Total Residential Fuel Oil Emissions						2.5	24	44
Non-Permitted Commrcl./Inst. Use								
Distillate Oil	21-03-004-000	509	20	1.7	7	5.1	49	88
Residual Oil	21-03-005-000	20	55	1.7	7	0.6	5	10
Kerosene	21-03-000-000	5.3	20	1.7	7	5.3E-02	5.0E-01	9.1E-01
						----------	----------	----------
Total Commercial/Institutional Fuel Oil Emissions						5.7	54.4	3
Non-Permitted Industrial Use								
Distillate Oil	21-02-004-000	254	20	1.0	7	2.5	14	14
Residual Oil	21-02-005-000	49	47	1.0	7	1.2	6	6
Kerosene	21-02-000-000	0.3	20	1.0	7	2.7E-03	1.5E-02	1.5E-02
						----------	----------	-----------
Total Industrial Fuel Oil Emissions						3.7	20	20
Total Area Source Fuel Oil PM10 Emissions						11.9	99	67

Notes for Table 2.4.17:

1) Klamath Falls NA Fuel Oil Use estimates from Appendix B, Table B-12.
2) Emission Factors (EFs) are from the EPA Procedures Document, AP-42; (Ref. 8), except where noted.

Category	Fuel Oil type	EF Source/Comments
All:	Kerosene	AP-42 does not contain specific EFs for Kerosene. EFs for #2 Distillate Oil were applied to kerosene combustion due to similarity of fuel type and gross heating value (approx. 140,000 BTU/gal) and use as a space heating oil.
Residential :	Distillate & Kerosene	EF from Table 1.3-1(pg. 1.3-12); Residential furnace
Commercial & Industrial:	Distillate & Kerosene Residual	Distillate EF from Table 1.3-1(pg. 1.3-12); Distillate Oil: Boilers < 100 million BTU Residual EFs from EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743). Kerosene EF estimated as in residential kerosene EF.

3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:

Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	----------	----------
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)

PM SAF = 1.7

Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref, 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.

4) Weekly activity is from EPA temporal allocation profiles, (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = Fuel oil use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM_{10} Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
----------	----------
60	33

Res/Comm Worst Case Day multiplier = 1.8

Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.18. Klamath Falls NAA 2008 Area Source VOC Emissions From Fuel Oil Use

KLAMATH FALLS NONATTAINMENT AREA Area	SCC Code	(1) 2008 Fuel Oil Use (10^3 gal)	(2) VOC Emission Factor (lbs/10^3 gal)	(3) SAF	(4) Activity Level (d/wk)	(5) VOC Emissions Annual (tons/yr)	(6) VOC Emissions Typical Day (lb/day)	(7) VOC Emissions Worst Case Day (lb/day)
Residential Use								
Distillate Oil	21-04-004-000	275	0.7	1.7	7	0.1	1	2
Residual Oil	21-04-005-000	0	N/A	N/A	N/A	N/A	N/A	N/A
Kerosene	21-04-011-000	6	0.7	1.7	7	2.0E-03	0.0	0.0
						----------	----------	----------
Total Residential Fuel Oil Emissions						0.1	1	2
Non-Permitted Commrcl./Inst. Use								
Distillate Oil	21-03-004-000	509	0.34	1.7	7	8.6E-02	8.3E-01	1.5E+00
Residual Oil	21-03-005-000	20	1.13	1.7	7	1.1E-02	1.1E-01	2.0E-01
Kerosene	21-03-000-000	5.3	0.34	1.7	7	9.0E-04	8.6E-03	1.6E-02
						----------	----------	----------
Total Commercial/Institutional Fuel Oil Emissions						9.9E-02	9.4E-01	3
Non-Permitted Industrial Use								
Distillate Oil	21-02-004-000	254	0.2	1.0	7	2.5E-02	1.4E-01	1.4E-01
Residual Oil	21-02-005-000	49	0.28	1.0	7	6.9E-03	3.8E-02	3.8E-02
Kerosene	21-02-000-000	0.3	0.2	1.0	7	2.7E-05	1.5E-04	1.5E-04
						----------	----------	-----------
Total Industrial Fuel Oil Emissions						3.2E-02	1.8E-01	1.8E-01
Total Area Source Fuel Oil PM10 Emissions						0.2	2	5

Notes for Table 2.4.18:

1) Klamath Falls NA Fuel Oil Use estimates from Appendix B, Table B-12.

2)

Category	**Fuel Oil type**	**EF Source/Comments**
Residential :	All	EFs from EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
Commercial & Industrial:	All	EFs from EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743). Kerosene EF set equal to distillate oil EF. AP-42 does not contain specific EFs for Kerosene. EFs for #2 Distillate Oil were applied to kerosene combustion due to similarity of fuel type and gross heating value (approx. 140,000 BTU/gal) and use as a space heating oil.

3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:

Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	----------	----------
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)

PM SAF = 1.7

Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref, 760)

The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.

4) Weekly activity is from EPA temporal allocation profiles, (DEQ Ref. 760)

Temporal profile data shows activity for all days of the week for all SCCs in this category.

5) Annual Emissions [tons/yr] = Fuel oil use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])

6) Typical PM_{10} Season Day Emissions [lbs/day] =

((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])

7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days

Heating Degree Day (HDD)data from Appendix C, Table C-2.

Worst Case Day Emissions [lbs/day] =

(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)

Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
----------	----------
60	33

Res/Comm Worst Case Day multiplier = 1.8

Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.19. Klamath Falls NAA 2008 Area Source NH_3 Emissions From Fuel Oil Use

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
						---------- NH3 Emissions ----------		
KLAMATH FALLS NONATTAINMENT AREA Area	SCC Code	2008 Fuel Oil Use (10^3 gal)	NH3 Emission Factor (lbs/10^3 gal)	SAF	Activity Level (d/wk)	Annual (tons/yr)	Typical Day (lb/day)	Worst Case Day (lb/day)
Residential Use								
Distillate Oil	21-04-004-000	275	1	1.7	7	0.1	1	2
Residual Oil	21-04-005-000	0	N/A	N/A	N/A	N/A	N/A	N/A
Kerosene	21-04-011-000	6	1	1.7	7	3.0E-03	2.8E-02	5.1E-02
						----------	----------	----------
			Total Residential Fuel Oil Emissions			0.1	1	2
Non-Permitted Commrcl./Inst. Use								
Distillate Oil	21-03-004-000	509	0.8	1.7	7	2.0E-01	1.9E+00	3.5E+00
Residual Oil	21-03-005-000	20	0.8	1.7	7	8.0E-03	7.6E-02	1.4E-01
Kerosene	21-03-000-000	5.3	0.8	1.7	7	2.1E-03	2.0E-02	3.6E-02
						----------	----------	----------
			Total Commercial/Institutional Fuel Oil Emissions			2.1E-01	2.0E+00	3
Non-Permitted Industrial Use								
Distillate Oil	21-02-004-000	254	0.8	1.0	7	1.0E-01	5.6E-01	5.6E-01
Residual Oil	21-02-005-000	49	0.8	1.0	7	2.0E-02	1.1E-01	1.1E-01
Kerosene	21-02-000-000	0.3	0.8	1.0	7	1.1E-04	6.0E-04	6.0E-04
						----------	----------	-----------
			Total Industrial Fuel Oil Emissions			1.2E-01	6.7E-01	6.7E-01
			Total Area Source Fuel Oil PM10 Emissions			0.5	4	6

Notes for Table 2.4.19:

1) Klamath Falls NA Fuel Oil Use estimates from Appendix B, Table B-12.

2)

Category	Fuel Oil type	EF Source/Comments
Residential :	All	EFs from EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
Commercial & Industrial:	All	EFs from EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743). Commercial kerosene EF set equal to Industrial kerosene EF.

3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	----------	----------
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
PM SAF = 1.7

Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref, 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.

4) Weekly activity is from EPA temporal allocation profiles, (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.

5) Annual Emissions [tons/yr] = Fuel oil use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])

6) Typical PM_{10} Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])

7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
----------	----------
60	33

Res/Comm Worst Case Day multiplier = 1.8

Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.20. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Natural Gas Use

KLAMATH FALLS NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 NG Use (10^6 ft^3)	(2) PM2.5 Emission Factor lb/(10^6 ft^3)	(3) SAF	(4) Activity Level (days/wk)	(5) PM2.5 Emissions Annual (tons/yr)	(6) PM2.5 Emissions PM Season Typical Day (lb/day)	(7) PM2.5 Emissions PM Season Worst Case Day (lb/day)
Residential Use	21-04-006-000	554	0.11	1.7	7	3.0E-02	2.9E-01	5.3E-01
Non-Permitted Commercial/Institutional Use	21-03-006-000	340	7.6	1.7	7	1.3	12	22
Non-Permitted Industrial Use	21-02-006-000	352	7.6	1.0	7	1.3	7	7
Total NAA NG Emissions						2.7	20	30

Notes:
1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744). EF is for filterable PM2.5.
Industrial/Commercial EFs are from AP-42, Table 1.4-2 (Ref. 8).
Total PM (filterable and condensable) EFs used.
EF represents small industrial boiler (10-100 10^6 Btu/hr).
It is assumed that large industrial boilers usage is included in point source inventory.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
PM SAF = 1.7
Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

Res/Comm Worst Case Day multiplier = 1.8
Industrial Activity is uniform: Worst Case Day = Typical Day

2.4.21. Klamath Falls NAA 2008 Area Source SO_2 Emissions From Natural Gas Use

KLAMATH FALLS NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 NG Use (10^6 ft^3)	(2) SO2 Emission Factor lb/(10^6 ft^3)	(3) SAF	(4) Activity Level (days/wk)	(5) SO2 Emissions Annual (tons/yr)	(6) SO2 Emissions PM Season Typical Day (lb/day)	(7) SO2 Emissions PM Season Worst Case Day (lb/day)
Residential Use	21-04-006-000	554	0.6	1.7	7	0.2	2	3
Non-Permitted Commercial/Institutional Use	21-03-006-000	340	0.6	1.7	7	0.1	1	2
Non-Permitted Industrial Use	21-02-006-000	352	0.6	1.0	7	0.1	1	1
					Total NAA NG Emissions	0.4	3	5

Notes:
1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
Industrial/Commercial EFs are from AP-42, Table 1.4-2 (Ref. 8).
EF represents small industrial boiler (10-100 10^6 Btu/hr).
It is assumed that large industrial boilers usage is included in point source inventory.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
PM SAF = $\boxed{1.7}$
Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

Res/Comm Worst Case Day multiplier = $\boxed{1.8}$
Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.22. Klamath Falls NAA 2008 Area Source NO_X Emissions From Natural Gas Use

KLAMATH FALLS NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 NG Use (10^6 ft^3)	(2) NOX Emission Factor lb/(10^6 ft^3)	(3) SAF	(4) Activity Level (days/wk)	(5) NOX Emissions Annual (tons/yr)	(6) NOX Emissions PM Season Typical Day (lb/day)	(7) NOX Emissions PM Season Worst Case Day (lb/day)
Residential Use	21-04-006-000	554	94	1.7	7	26.0	249	449
Non-Permitted Commercial/Institutional Use	21-03-006-000	340	100	1.7	7	17.0	163	294
Non-Permitted Industrial Use	21-02-006-000	352	100	1.0	7	17.6	97	97
					Total NAA NG Emissions	60.6	508	840

Notes:

1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
   Industrial/Commercial EFs are from AP-42, Table 1.4-1 (Ref. 8).
   EF represents small, uncontrolled industrial boiler (<100 10^6 Btu/hr).
   It is assumed that large industrial boilers usage is included in point source inventory.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
   Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

   PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
   PM SAF = 1.7
   Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
   The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
   Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
   Heating Degree Day (HDD)data from Appendix C, Table C-2.
   Worst Case Day Emissions [lbs/day] =
   (((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

   Res/Comm Worst Case Day multiplier = 1.8
   Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.23. Klamath Falls NAA 2008 Area Source VOC Emissions From Natural Gas Use

KLAMATH FALLS NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 NG Use (10^6 ft^3)	(2) VOC Emission Factor lb/(10^6 ft^3)	(3) SAF	(4) Activity Level (days/wk)	(5) VOC Emissions Annual (tons/yr)	(6) VOC Emissions PM Season Typical Day (lb/day)	(7) VOC Emissions PM Season Worst Case Day (lb/day)
Residential Use	21-04-006-000	554	5.5	1.7	7	1.5	15	26
Non-Permitted Commercial/Institutional Use	21-03-006-000	340	5.5	1.7	7	0.9	9	16
Non-Permitted Industrial Use	21-02-006-000	352	5.5	1.0	7	1.0	5	5
					Total NAA NG Emissions	3.4	29	48

Notes:

1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
   Industrial/Commercial EFs are from AP-42, Table 1.4-2 (Ref. 8).
   EF represents small industrial boiler (10-100 10^6 Btu/hr).
   It is assumed that large industrial boilers usage is included in point source inventory.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
   Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	----------	----------
	6,871	3,983

   PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
   PM SAF = $\boxed{1.7}$
   Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
   The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
   Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
   Heating Degree Day (HDD)data from Appendix C, Table C-2.
   Worst Case Day Emissions [lbs/day] =
   (((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
----------	----------
60	33

   Res/Comm Worst Case Day multiplier = $\boxed{1.8}$
   Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.24. Klamath Falls NAA 2008 Area Source NH_3 Emissions From Natural Gas Use

KLAMATH FALLS NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 NG Use (10^6 ft^3)	(2) NH3 Emission Factor lb/(10^6 ft^3)	(3) SAF	(4) Activity Level (days/wk)	(5) Annual (tons/yr)	(6) NH3 Emissions, PM Season, Typical Day (lb/day)	(7) NH3 Emissions, PM Season, Worst Case Day (lb/day)
Residential Use	21-04-006-000	554	20	1.7	7	5.5	53	96
Non-Permitted Commercial/Institutional Use	21-03-006-000	340	20	1.7	7	3.4	33	59
Non-Permitted Industrial Use	21-02-006-000	352	20	1.0	7	3.5	19	19
					Total NAA NG Emissions	12.5	105	174

Notes:
1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
Industrial/Commercial EFs set equal to Residential EF.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	----------	----------
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
PM SAF = $\boxed{1.7}$
Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
----------	----------
60	33

Res/Comm Worst Case Day multiplier = $\boxed{1.8}$
Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.25. Klamath Falls NAA 2008 Area Source PM2.5 Emissions From Liquified Petroleum Gas Use

KLAMATH FALLS NA NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 LPG Use (10^3 gals)	(2) PM2.5 Emission Factor (lbs/10^3 gal)	(3) SAF	(4) Activity Level (days/wk)	(5) ---------- PM2.5 Emissions ---------- Annual (tons/yr)	(6) PM Season Typical Day (lb/day)	(7) PM Season Worst Case Day (lb/day)
Residential Use	21-04-007-000	400	1.04E-02	1.7	7	2.1E-03	2.0E-02	3.6E-02
Non-Permitted Commercial/Institutional Use	21-03-007-000	169	0.04	1.7	7	3.4E-03	3.3E-02	5.9E-02
Non-Permitted Industrial Use	21-02-007-000	107	0.04	1.0	7	2.2E-03	1.2E-02	1.2E-02
					Total NA LPG Emissions	7.7E-03	6.5E-02	1.1E-01

Notes:

1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744). EF is for filterable PM2.5.
   Industrial EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743).
   Commercial EF set equal to industrial EF.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
   Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

   PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
   PM SAF = 1.7
   Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
   The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
   Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
   Heating Degree Day (HDD)data from Appendix C, Table C-2.
   Worst Case Day Emissions [lbs/day] =
   (((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

   Res/Comm Worst Case Day multiplier = 1.8
   Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.26. Klamath Falls NAA 2008 Area Source SO_2 Emissions From Liquified Petroleum Gas Use

KLAMATH FALLS NA NONATTAINMENT AREA		(1)	(2)	(3)	(4)	(5)	(6)	(7)
						---------- SO2 Emissions ----------		
							PM Season	
Category Description	SCC Code	2008 LPG Use (10^3 gals)	SO2 Emission Factor (lbs/10^3 gal)	SAF	Activity Level (days/wk)	Annual (tons/yr)	Typical Day (lb/day)	Worst Case Day (lb/day)
Residential Use	21-04-007-000	400	5.7E-02	1.7	7	1.1E-02	1.1E-01	2.0E-01
Non-Permitted Commercial/Institutional Use	21-03-007-000	169	0.06	1.7	7	4.8E-03	4.6E-02	8.3E-02
Non-Permitted Industrial Use	21-02-007-000	107	0.06	1.0	7	3.0E-03	1.7E-02	1.7E-02
					Total NA LPG Emissions	0.0	0	0

Notes:
1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
Industrial EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743).
Commercial EF set equal to industrial EF.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
PM SAF = 1.7
Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

Res/Comm Worst Case Day multiplier = 1.8
Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.27. Klamath Falls NAA 2008 Area Source NO_X Emissions From Liquified Petroleum Gas Use

KLAMATH FALLS NA NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 LPG Use (10^3 gals)	(2) NOX Emission Factor (lbs/10^3 gal)	(3) SAF	(4) Activity Level (days/wk)	(5) NOX Emissions Annual (tons/yr)	(6) NOX Emissions PM Season Typical Day (lb/day)	(7) NOX Emissions PM Season Worst Case Day (lb/day)
Residential Use	21-04-007-000	400	13.4	1.7	7	2.7	26	46
Non-Permitted Commercial/Institutional Use	21-03-007-000	169	0.06	1.7	7	4.8E-03	4.6E-02	8.3E-02
Non-Permitted Industrial Use	21-02-007-000	107	0.06	1.0	7	3.0E-03	1.7E-02	1.7E-02
					Total NA LPG Emissions	2.7	26	46

Notes:
1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
Industrial EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743).
Commercial EF set equal to industrial EF.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
PM SAF = 1.7
Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
Heating Degree Day (HDD)data from Appendix C, Table C-2.
Worst Case Day Emissions [lbs/day] =
(((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

Res/Comm Worst Case Day multiplier = 1.8
Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.28. Klamath Falls NAA 2008 Area Source VOC Emissions From Liquified Petroleum Gas Use

KLAMATH FALLS NA NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 LPG Use (10^3 gals)	(2) VOC Emission Factor (lbs/10^3 gal)	(3) SAF	(4) Activity Level (days/wk)	(5) VOC Emissions: Annual (tons/yr)	(6) VOC Emissions PM Season: Typical Day (lb/day)	(7) VOC Emissions PM Season: Worst Case Day (lb/day)
Residential Use	21-04-007-000	400	0.5	1.7	7	0.1	1	2
Non-Permitted Commercial/Institutional Use	21-03-007-000	169	0.52	1.7	7	4.4E-02	4.2E-01	7.6E-01
Non-Permitted Industrial Use	21-02-007-000	107	0.52	1.0	7	2.8E-02	1.5E-01	1.5E-01
					Total NA LPG Emissions	0.2	2	3

Notes:

1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
   Industrial EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743).
   Commercial EF set equal to industrial EF.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
   Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

   PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)
   PM SAF = 1.7
   Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
   The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.
4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
   Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
   Heating Degree Day (HDD)data from Appendix C, Table C-2.
   Worst Case Day Emissions [lbs/day] =
   (((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

   Res/Comm Worst Case Day multiplier = 1.8
   Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.29. Klamath Falls NAA 2008 Area Source NH_3 Emissions From Liquified Petroleum Gas Use

KLAMATH FALLS NA NONATTAINMENT AREA Category Description	SCC Code	(1) 2008 LPG Use (10^3 gals)	(2) NH3 Emission Factor (lbs/10^3 gal)	(3) SAF	(4) Activity Level (days/wk)	(5) NH3 Emissions Annual (tons/yr)	(6) NH3 Emissions PM Season Typical Day (lb/day)	(7) NH3 Emissions PM Season Worst Case Day (lb/day)
Residential Use	21-04-007-000	400	4.6E-02	1.7	7	9.3E-03	8.9E-02	1.6E-01
Non-Permitted Commercial/Institutional Use	21-03-007-000	169	0.05	1.7	7	3.9E-03	3.8E-02	6.8E-02
Non-Permitted Industrial Use	21-02-007-000	107	0.05	1.0	7	2.5E-03	1.4E-02	1.4E-02
					Total NA LPG Emissions	1.6E-02	1.4E-01	2.4E-01

Notes:

1) Klamath Falls NAA Fuel Use estimates from Appendix B, Table B-12.
2) Residential EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 744).
   Industrial EF is from the EPA 2008 NEI "tools" categories documentation (DEQ Ref. 743).
   Commercial EF set equal to industrial EF.
3) Seasonal Adjustment Factor (SAF) for Residential and Commercial calculated based upon 2008 HDD by DEQ as follows:
   Heating Degree Days (HDD) from Appendix C, Table C-2. Data represents an average of 2005, 2008, and 2009 data.

PM SAF	Average Annual HDD Total	Average Seasonal HDD Total
	6,871	3,983

PM SAF = (Peak Season HDD Total * 12 months) / (Annual HDD Total * 4 months)

PM SAF = 1.7

Industrial SAF estimated from EPA temporal allocation profiles (DEQ Ref. 760)
The industrial fuel use monthly temporal profiles shows activity as uniform throughout the year.

4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
   Temporal profile data shows activity for all days of the week for all SCCs in this category.
5) Annual Emissions [tons/yr] = LPG use [10^3 gal] * EF [lb/10^3 gal] / (2000 [lbs/ton])
6) Typical PM Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr])
7) Residential and Commercial Worst Case Day emissions estimated using a worst-case day multiplier based on Heating Degree Days
   Heating Degree Day (HDD)data from Appendix C, Table C-2.
   Worst Case Day Emissions [lbs/day] =
   (((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day PM season multiplier = (2005 PM Season Maximum HDD / 2008 Season Average HDD)

PM Season Maximum HDD	Season Average HDD
60	33

Res/Comm Worst Case Day multiplier = 1.8

Industrial Activity is uniform: Worst Case Day = Typical Day

Table 2.4.30. Klamath Falls NAA 2008 Area Source PM2.5 Emissions From Residential Wood Combustion

(1) Woodburning Device	(2) 2008 Wood Fuel Use (tons/yr)	(3) $PM_{2.5}$ EF (lbs/ton)	(4) SAF	(5) Activity (days/wk)	$PM_{2.5}$ Emissions Annual (6) Annual (tons/yr)	PM Season (7) Typical Day (lb/day)	(8) Worst Case Day (lb/day)	(9) Worst Case Day Advisory Controlled (lbs/day)
Klamath Falls NAA								
21-04-008-100 Fireplace without Insert	5,395.2	23.6	2.25	7	63.7	787	1,889	989
21-04-008-320 Certified Non-Cat Wood-Stove	906.1	19.6	1.73	7	8.9	84	202	106
21-04-008-330 Certified Cat Wood-Stove	417.6	20.4	1.73	7	4.3	40	97	51
21-04-008-310 Conv Wood Stove	2,602.9	30.6	1.73	7	39.8	378	908	475
21-04-008-230 Fireplace Insert Cert Catalyst	812.4	20.4	1.65	7	8.3	75	181	95
21-04-008-220 Fireplace Insert Cert Non-Cat	153.1	19.6	1.65	7	1.5	14	33	17
21-04-008-210 Fireplace Insert Conv.	2,257.4	30.6	1.65	7	34.5	314	753	394
21-04-008-400 Exempt Pellet Stove	1,555.5	3.1	1.84	7	2.4	24	58	30
21-04-008-510 Central Furnace	123.1	27.6	1.41	7	1.7	13	32	17
Total	14,223.2				165.0	1,730	4,152	**2,173**

Notes:

1) Woodburning Device categories are from the 2008 Klamath Falls Wood Burning Survey Results (DEQ Ref. 695)
2) Wood fuel use estimates from Appendix B, Table B-4. Based upon 2008 Klamath Falls Wood Stove Survey results.
3) Residential Wood Combustion PM2.5 emission factors and references:

scc	factor, lb/ton fuel burned	DEQ Ref.
2104008100	23.6	623: App. A
2104008210	30.6	623: App. A
2104008220	19.6	623: App. A
2104008230	20.4	623: App. A
2104008310	30.6	623: App. A
2104008320	19.6	623: App. A
2104008330	20.4	623: App. A
2104008400	3.06	700
2104008510	27.6	700
2104008610	27.6	700
2104008700	23.6	623: App. A
2104009000	28.4	686

DEQ ref. 623: US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants

DEQ ref. 686: Li, Victor S., and Rosenthal, Steven. "Content and emissions characteristics of Artificial Wax Firelogs." Paper presented at the 15th International Emission Inventory Conference. New Orleans, Lousiana. May 15th-18th, 2006.

DEQ ref. 700: Houck, James E., Eagle, Brian N. Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region. Prepared for MARAMA. December 19, 2006.

4) Seasonal Adjustment Factor estimated from Klamath Falls NAA 2008 Residential Wood Heating Survey Results: See Appendix B, Table B-8.
5) Survey results indicate activity occurs throughout the week.
6) Annual emissions [tons/year] = (2008 Survey Wood Fuel Use [tons/year] * emission factor [lbs/ton]) / 2000 [lbs/ton] and with a weighted total for all Census Tracts. Calculations from Appendix B, Table B-4.
7) Typical PM_{10} Season Day Emissions [lbs/day] =

((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]) without a weight for day of week fuel burned

8) Worst Case Day Emissions [lbs/day] typical season day * worst-case day multiplier.

((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)

Worst Case Day Multiplier = 2.4

Worst Case Day Multiplier calculations are based on monitoring data. Please see Appendix B, Table B-9 for multiplier calculations.

(9) Advisory controlled emissions, NAA total = 2,173 lbs/day. From Appendix E, Table E-28.

Advisory controlled emissions per device type = (Advisory controlled emissions, NAA total) * (Device type WCD emissions/Total WCD emissions)

Please see Appendix E, Tables E-19 through E-28 for details of how the impacts of controls were applied to RWC emissions estimates.

Table 2.4.31. Klamath Falls NAA 2008 Area Source NOX Emissions From Residential Wood Combustion

(1) Woodburning Device	(2) 2008 Wood Fuel Use (tons/yr)	(3) NOX EF (lbs/ton)	(4) SAF	(5) Activity (days/wk)	NOX Emissions Annual (6) Annual (tons/yr)	PM Season (7) Typical Day (lb/day)	(8) Worst Case Day (lb/day)	(9) Worst Case Day Advisory Controlled (lbs/day)
Klamath Falls NAA								
21-04-008-100 Fireplace without Insert	5,395.2	2.6	2.25	7	7.0	87	208	109
21-04-008-320 Certified Non-Cat Wood-Stove	906.1	2.3	1.73	7	1.0	10	24	12
21-04-008-330 Certified Cat Wood-Stove	417.6	2.0	1.73	7	0.4	4	10	5
21-04-008-310 Conv Wood Stove	2,602.9	2.8	1.73	7	3.6	35	83	43
21-04-008-230 Fireplace Insert Cert Catalyst	812.4	2.0	1.65	7	0.8	7	18	9
21-04-008-220 Fireplace Insert Cert Non-Cat	153.1	2.3	1.65	7	0.2	2	4	2
21-04-008-210 Fireplace Insert Conv.	2,257.4	2.8	1.65	7	3.2	29	69	36
21-04-008-400 Exempt Pellet Stove	1,555.5	3.8	1.84	7	3.0	30	72	38
21-04-008-510 Central Furnace	123.1	1.8	1.41	7	0.1	1	2	1
Total	14,223				19.3	204	489	**256**

Notes:

1) Woodburning Device categories are from the 2008 Klamath Falls Wood Burning Survey Results (DEQ Ref. 695)
2) Wood fuel use estimates from Appendix B, Table B-4. Based upon 2008 Klamath Falls Wood Stove Survey results.
3) Residential Wood Combustion NOX emission factors and references:

scc	factor, lb/ton fuel burned	data_source
2104008100	2.6	623
2104008210	2.8	623
2104008220	2.28	700
2104008230	2	623
2104008310	2.8	623
2104008320	2.28	700
2104008330	2	623
2104008400	3.8	700
2104008510	1.8	700
2104008610	1.8	700
2104008700	2.6	623
2104009000	7.684	686

DEQ ref. 623: US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants

DEQ ref. 686: Li, Victor S., and Rosenthal, Steven. "Content and emissions characteristics of Artificial Wax Firelogs." Paper presented at the 15th International Emission Inventory Conference. New Orleans, Lousiana. May 15th-18th, 2006.

DEQ ref. 700: Houck, James E., Eagle, Brian N. Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region. Prepared for MARAMA. December 19, 2006.

4) Seasonal Adjustment Factor estimated from Klamath Falls NAA 2008 Residential Wood Heating Survey Results: See Appendix B, Table B-8.
5) Survey results indicate activity occurs throughout the week.
6) Annual emissions [tons/year] = (2008 Survey Wood Fuel Use [tons/year] * emission factor [lbs/ton]) / 2000 [lbs/ton] and with a weighted total for all Census Tracts. Calculations from Appendix B, Table B-4.
7) Typical PM_{10} Season Day Emissions [lbs/day] =

   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]) without a weight for day of week fuel burned
8) Worst Case Day Emissions [lbs/day] typical season day * worst-case day multiplier.

   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)

   Worst Case Day Multiplier = 2.4

   Worst Case Day Multiplier calculations are based on monitoring data. Please see Appendix B, Table B-9 for multiplier calculations.

(9) Advisory controlled emissions, NAA total = 256 lbs/day. From Appendix E, Table E-28.

Advisory controlled emissions per device type = (Advisory controlled emissions, NAA total) * (Device type WCD emissions/Total WCD emissions)

Please see Appendix E, Tables E-19 through E-28 for details of how the impacts of controls were applied to RWC emissions estimates.

Table 2.4.32. Klamath Falls NAA 2008 Area Source SO2 Emissions From Residential Wood Combustion

(1) Woodburning Device	(2) 2008 Wood Fuel Use (tons/yr)	(3) SO2 EF (lbs/ton)	(4) SAF	(5) Activity (days/wk)	SO2 Emissions Annual (6) Annual (tons/yr)	PM Season (7) Typical Day (lb/day)	PM Season (8) Worst Case Day (lb/day)	(9) Worst Case Day Advisory Controlled (lbs/day)
Klamath Falls NAA								
21-04-008-100 Fireplace without Insert	5,395.2	0.4	2.25	7	1.1	13	32	17
21-04-008-320 Certified Non-Cat Wood-Stove	906.1	0.4	1.73	7	0.2	2	4	2
21-04-008-330 Certified Cat Wood-Stove	417.6	0.4	1.73	7	0.1	1	2	1
21-04-008-310 Conv Wood Stove	2,602.9	0.4	1.73	7	0.5	5	12	6
21-04-008-230 Fireplace Insert Cert Catalyst	812.4	0.4	1.65	7	0.2	1	4	2
21-04-008-220 Fireplace Insert Cert Non-Cat	153.1	0.4	1.65	7	0.0	0	1	0
21-04-008-210 Fireplace Insert Conv.	2,257.4	0.4	1.65	7	0.5	4	10	5
21-04-008-400 Exempt Pellet Stove	1,555.5	0.3	1.84	7	0.2	3	6	3
21-04-008-510 Central Furnace	123.1	2.0	1.41	7	0.1	1	2	1
Total	14,223				2.9	30	72	**38**

Notes:

1) Woodburning Device categories are from the 2008 Klamath Falls Wood Burning Survey Results (DEQ Ref. 695)
2) Wood fuel use estimates from Appendix B, Table B-4. Based upon 2008 Klamath Falls Wood Stove Survey results.
3) Residential Wood Combustion SO2 emission factors and references:

scc	factor, lb/ton fuel burned	data_source
2104008100	0.4	623
2104008210	0.4	623
2104008220	0.4	700
2104008230	0.4	623
2104008310	0.4	623
2104008320	0.4	700
2104008330	0.4	623
2104008400	0.32	700
2104008510	2.03	700
2104008610	2.03	700
2104008700	0.4	623
2104009000	unknown	--

DEQ ref. 623: US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants

DEQ ref. 686: Li, Victor S., and Rosenthal, Steven. "Content and emissions characteristics of Artificial Wax Firelogs." Paper presented at the 15th International Emission Inventory Conference. New Orleans, Lousiana. May 15th-18th, 2006.

DEQ ref. 700: Houck, James E., Eagle, Brian N. Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region. Prepared for MARAMA. December 19, 2006.

4) Seasonal Adjustment Factor estimated from Klamath Falls NAA 2008 Residential Wood Heating Survey Results: See Appendix B, Table B-8.
5) Survey results indicate activity occurs throughout the week.
6) Annual emissions [tons/year] = (2008 Survey Wood Fuel Use [tons/year] * emission factor [lbs/ton]) / 2000 [lbs/ton] and with a weighted total for all Census Tracts. Calculations from Appendix B, Table B-4.
7) Typical PM_{10} Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]) without a weight for day of week fuel burned
8) Worst Case Day Emissions [lbs/day] typical season day * worst-case day multiplier.
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day Multiplier = 2.4
   Worst Case Day Multiplier calculations are based on monitoring data. Please see Appendix B, Table B-9 for multiplier calculations.

(9) Advisory controlled emissions, NAA total = 38 lbs/day. From Appendix E, Table E-28.
Advisory controlled emissions per device type = (Advisory controlled emissions, NAA total) * (Device type WCD emissions/Total WCD emissions)
Please see Appendix E, Tables E-19 through E-28 for details of how the impacts of controls were applied to RWC emissions estimates.

Table 2.4.33. Klamath Falls NAA 2008 Area Source VOC Emissions From Residential Wood Combustion

(1)	(2)	(3)	(4)	(5)	VOC Emissions			(9)
					Annual	PM Season		Worst Case
	2008				(6)	(7)	(8)	Day
	Wood Fuel	VOC				Typical	Worst Case	Advisory
Woodburning	Use	EF		Activity	Annual	Day	Day	Controlled
Device	(tons/yr)	(lbs/ton)	SAF	(days/wk)	(tons/yr)	(lb/day)	(lb/day)	(lbs/day)
Klamath Falls NAA								
21-04-008-100 Fireplace without Insert	5,395.2	18.9	2.25	7	51.0	630	1,513	792
21-04-008-320 Certified Non-Cat Wood-Stove	906.1	12.0	1.73	7	5.4	52	124	65
21-04-008-330 Certified Cat Wood-Stove	417.6	15.0	1.73	7	3.1	30	71	37
21-04-008-310 Conv Wood Stove	2,602.9	53.0	1.73	7	69.0	655	1,572	823
21-04-008-230 Fireplace Insert Cert Catalyst	812.4	15.0	1.65	7	6.1	55	133	69
21-04-008-220 Fireplace Insert Cert Non-Cat	153.1	12.0	1.65	7	0.9	8	20	10
21-04-008-210 Fireplace Insert Conv.	2,257.4	53.0	1.65	7	59.8	543	1,304	682
21-04-008-400 Exempt Pellet Stove	1,555.5	0.0	1.84	7	0.0	0	1	0
21-04-008-510 Central Furnace	123.1	11.7	1.41	7	0.7	6	13	7
Total	14,223				196.1	1,979	4,751	**2,486**

Notes:

1) Woodburning Device categories are from the 2008 Klamath Falls Wood Burning Survey Results (DEQ Ref. 695)
2) Wood fuel use estimates from Appendix B, Table B-4. Based upon 2008 Klamath Falls Wood Stove Survey results.
3) Residential Wood Combustion VOC emission factors and references:

scc	factor, lb/ton fuel burned	data_source
2104008100	18.9	623
2104008210	53	623
2104008220	12	700
2104008230	15	623
2104008310	53	623
2104008320	12	700
2104008330	15	623
2104008400	0.041	700
2104008510	11.7	700
2104008610	11.7	700
2104008700	18.9	623
2104009000	39.56	686

DEQ ref. 623: US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants

DEQ ref. 686: Li, Victor S., and Rosenthal, Steven. "Content and emissions characteristics of Artificial Wax Firelogs." Paper presented at the 15th International Emission Inventory Conference. New Orleans, Lousiana. May 15th-18th, 2006.

DEQ ref. 700: Houck, James E., Eagle, Brian N. Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region. Prepared for MARAMA. December 19, 2006.

4) Seasonal Adjustment Factor estimated from Klamath Falls NAA 2008 Residential Wood Heating Survey Results: See Appendix B, Table B-8.
5) Survey results indicate activity occurs throughout the week.
6) Annual emissions [tons/year] = (2008 Survey Wood Fuel Use [tons/year] * emission factor [lbs/ton]) / 2000 [lbs/ton] and with a weighted total for all Census Tracts. Calculations from Appendix B, Table B-4.
7) Typical PM_{10} Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]) without a weight for day of week fuel burned
8) Worst Case Day Emissions [lbs/day] typical season day * worst-case day multiplier.
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day Multiplier = 2.4
   Worst Case Day Multiplier calculations are based on monitoring data. Please see Appendix B, Table B-9 for multiplier calculations.

(9) Advisory controlled emissions, NAA total = 2,486 lbs/day. From Appendix E, Table E-26.
Advisory controlled emissions per device type = (Advisory controlled emissions, NAA total) * (Device type WCD emissions/Total WCD emissions)
Please see Appendix E, Tables E-17 through E-26 for details of how the impacts of controls were applied to RWC emissions estimates.

Table 2.4.34. Klamath Falls NAA 2008 Area Source NH_3 Emissions From Residential Wood Combustion

(1) Woodburning Device	(2) 2008 Wood Fuel Use (tons/yr)	(3) NH3 EF (lbs/ton)	(4) SAF	(5) Activity (days/wk)	NH3 Emissions Annual (6) Annual (tons/yr)	PM Season (7) Typical Day (lb/day)	PM Season (8) Worst Case Day (lb/day)	(9) Worst Case Day Advisory Controlled (lbs/day)
Klamath Falls NAA								
21-04-008-100 Fireplace without Insert	5,395.2	1.8	2.25	7	4.9	60	144	75
21-04-008-320 Certified Non-Cat Wood-Stove	906.1	0.9	1.73	7	0.4	4	9	5
21-04-008-330 Certified Cat Wood-Stove	417.6	0.9	1.73	7	0.2	2	4	2
21-04-008-310 Conv Wood Stove	2,602.9	1.7	1.73	7	2.2	21	50	26
21-04-008-230 Fireplace Insert Cert Catalyst	812.4	0.9	1.65	7	0.4	3	8	4
21-04-008-220 Fireplace Insert Cert Non-Cat	153.1	0.9	1.65	7	0.1	1	2	1
21-04-008-210 Fireplace Insert Conv.	2,257.4	1.7	1.65	7	1.9	17	42	22
21-04-008-400 Exempt Pellet Stove	1,555.5	0.3	1.84	7	0.2	2	6	3
21-04-008-510 Central Furnace	123.1	1.8	1.41	7	0.1	1	2	1
Total	14,223				10.4	111	267	**140**

Notes:

1) Woodburning Device categories are from the 2008 Klamath Falls Wood Burning Survey Results (DEQ Ref. 695)
2) Wood fuel use estimates from Appendix B, Table B-4. Based upon 2008 Klamath Falls Wood Stove Survey results.
3) Residential Wood Combustion NH3 emission factors and references:

scc	factor, lb/ton fuel burned	data_source
2104008100	1.8	623
2104008210	1.7	623
2104008220	0.9	700
2104008230	0.9	623
2104008310	1.7	623
2104008320	0.9	700
2104008330	0.9	623
2104008400	0.3	700
2104008510	1.8	700
2104008610	1.8	700
2104008700	1.8	623
2104009000	--	

DEQ ref. 623: US EPA. Documentation For The 2002 Base Year National Emission Inventory For Hazardous Air Pollutants

DEQ ref. 686: Li, Victor S., and Rosenthal, Steven. "Content and emissions characteristics of Artificial Wax Firelogs." Paper presented at the 15th International Emission Inventory Conference. New Orleans, Lousiana. May 15th-18th, 2006.

DEQ ref. 700: Houck, James E., Eagle, Brian N. Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region. Prepared for MARAMA. December 19, 2006.

4) Seasonal Adjustment Factor estimated from Klamath Falls NAA 2008 Residential Wood Heating Survey Results: See Appendix B, Table B-8.
5) Survey results indicate activity occurs throughout the week.
6) Annual emissions [tons/year] = (2008 Survey Wood Fuel Use [tons/year] * emission factor [lbs/ton]) / 2000 [lbs/ton] and with a weighted total for all Census Tracts. Calculations from Appendix B, Table B-4.
7) Typical PM_{10} Season Day Emissions [lbs/day] =
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]) without a weight for day of week fuel burned
8) Worst Case Day Emissions [lbs/day] typical season day * worst-case day multiplier.
   ((Annual Emissions [tons/year] * 2000 [lbs/ton]) * SAF) / (Activity Level [days/wk] * 52 [weeks/yr]))*(worst case day multiplier)
   Worst Case Day Multiplier = 2.4
   Worst Case Day Multiplier calculations are based on monitoring data. Please see Appendix B, Table B-9 for multiplier calculations.

(9) Advisory controlled emissions, NAA total = 140 lbs/day. From Appendix E, Table E-28.
   Advisory controlled emissions per device type = (Advisory controlled emissions, NAA total) * (Device type WCD emissions/Total WCD emissions)
   Please see Appendix E, Tables E-19 through E-28 for details of how the impacts of controls were applied to RWC emissions estimates.

Table 2.4.35. Klamath Falls NAA 2008 Area Source Emissions From Wildfires and Prescribed Burning

28-10-0xx-xxx: Forest Wildfires + Managed Burning/Prescribed Burning

Emissions estimates for 2008 fire events occurring within 15 km of the Peterson School Monitor[(1)]

Event Date	Event ID	Lat. (DD)	Long. (DD)	PM2.5 (tpy)	NOx (tpy)	NH3 (tpy)	SO2 (tpy)	VOC (tpy)
12-Mar-08	425616	42.1460	-121.6050	1.3	0.3	0.2	0.1	3.5
21-Aug-08	958819	42.2360	-121.8630	38.9	4.2	7.7	2.8	110.6
23-Oct-08	1015197	42.1390	-121.8350	38.8	4.1	7.7	2.8	110.2
16-Dec-08	*1093423*	*42.3100*	*-121.7210*	*14.0*	*2.5*	*2.6*	*1.3*	*37.5*
17-Dec-08	*1094772*	*42.2950*	*-121.6890*	*14.0*	*2.5*	*2.6*	*1.3*	*37.5*
				-------	-------	-------	-------	-------
Total				**107.0**	**13.7**	**20.8**	**8.4**	**299.3**

Italicised data indicates fires occuring over the PM season

Typical and Worst-Case Day Emissions Estimates

	(2) SAF	(3) PM2.5 (lbs/day)	(3) NOx (lbs/day)	(3) NH3 (lbs/day)	(3) SO2 (lbs/day)	(3) VOC (lbs/day)
Total	0.78	**459**	**59**	**89**	**36**	**1,284**

Notes

(1) EPA 2008 Oregon/California prescribed burning and wildfire emissions estimates, EIS event format. August 3, 2011. DEQ Ref. 762.

(2) Seasonal Adjustment Factor (SAF) = (Seasonal Activity * 12 months) / (Annual Activity * Season Months)
SAF, based on PM2.5 emissions = (28 tpy * 12 months) / (107 tpy * 4 months) = $\boxed{0.78}$

(3) Typical and Worst-Case Season Day emissions =
((Annual Emissions, tpy) * (2000 lbs/ton) * SAF) / (365 days/yr)

Table 2.4.36. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Structure Fires

Klamath Falls NAA, comprising the city of Klamath Falls, and the communities of Henley and Olene	(1) 2008 Annual # of Fires	(1) 2008 PM Season # of Fires	(2) Fuel Loading Factor (tons/fire)	(3) Annual Tons Burned	(4) Particulate (PT) EF (lbs/ton)	(5) PM2.5 in Particulate (%)	(6) Activity (days/wk)	(7) Seasonal Adjustment Factor (SAF)	(8) ----- PM2.5 Emissions ----- Annual (tons/yr)	(9) PM Season Typical Day (lbs/day)	(10) PM Season Worst Case Day (lbs/day)
SCC Code: **28-10-030-000**											
Residential	38	18	1.15	43.7	10.8	100%	7	1.4	0.2	1	1
Non-Residential	12	5	1.15	13.8	10.8	100%	7	1.3	0.1	0.2	0.2
									--------	--------	--------
Total									**0.3**	**1**	**1**

Notes:

(1) Number of fires, by specific date & city, provided by the State Fire Marshal for 2008. Ref. 729.

Note: The database linked to the raw data is located here:

\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Structure_Fires\Structure_Fires.mdb

The number of fires is for those fires designated as building fires only.

(2) Since the information about the structure size and the extent of the material burned in each fire was not collected, the default fuel loading factor of 1.15 [tons/fire] from the EIIP, Ref. 321, Chapter 18, page18.4-2 was used.

(3) Annual tons burned = (number of structural fires) * (fuel loading factor [tons/fire])

(4) Particulate emission factor is from EIIP, Ref. 321, Chapter 18, Table 18.4-1.

(5) DEQ staff were unable to find a size fraction breakdown of total particulate from structure fires. Assumed 100% PM2.5 for a conservative est.

(6) Activity level (days/wk) is from the EPA Procedures Document, Table 5.8-1, p. 5-18. (Ref. 2)

(7) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

Based on the number of fires:	Residential SAF = (18*12) / (38*4) =	1.4
	Non-Res. SAF = (5*12) / (12*4) =	1.3

(8) Annual Emissions, tpy = (Annual Tons Burned) * (Particulate EF, lbs/ton) * (PM2.5 in Particulate, %) / (2000 lbs/ton)

(9)Typical Day, lbs/day = (Seasonal Fires * fuel loading factor * PT EF * % PM2.5 in Particulate * SAF) / (Activity, days/week * 52 weeks/yr)

(9) PM Season Worst Case Day[lbs/day] is assumed to be the same as typical day.

Table 2.4.37. Klamath Falls NAA 2008 Area Source NO_X Emissions From Structure Fires

Klamath Falls NA, comprising the city of Klamath Falls, and the communities of Henley and Olene	(1) 2008 Annual # of Fires	(1) 2008 PM Season # of Fires	(2) Fuel Loading Factor (tons/fire)	(3) Annual Tons Burned	(4) NOX EF (lbs/ton)	(5) Activity (days/wk)	(6) Seasonal Adjustment Factor (SAF)	(7) ----- NOX Emissions ----- Annual (tons/yr)	(8) PM Season Typical Day (lbs/day)	(9) PM Season Worst Case Day (lbs/day)
SCC Code: **28-10-030-000**										
Residential	38	18	1.15	43.7	1.4	7	1.4	3.1E-02	1.1E-01	1.1E-01
Non-Residential	12	5	1.15	13.8	1.4	7	1.3	9.7E-03	2.8E-02	2.8E-02
								--------	--------	--------
Total								**4.0E-02**	**1.4E-01**	**1.4E-01**

Notes:

(1) Number of fires, by specific date & city, provided by the State Fire Marshal for 2008. Ref. 729.

Note: The database linked to the raw data is located here:

\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Structure_Fires\Structure_Fires.mdb

The number of fires is for those fires designated as building fires only.

(2) Since the information about the structure size and the extent of the material burned in each fire was not collected, the default fuel loading factor of 1.15 [tons/fire] from the EIIP, Ref. 321, Chapter 18, page18.4-2 was used.

(3) Annual tons burned = (number of structural fires) * (fuel loading factor [tons/fire])

(4) Particulate emission factor is from EIIP, Ref. 321, Chapter 18, Table 18.4-1.

(5) Activity level (days/wk) is from the EPA Procedures Document, Table 5.8-1, p. 5-18. (Ref. 2)

(6) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

Based on the number of fires:	Residential SAF = (18*12) / (38*4) =	1.4
	Non-Res. SAF = (5*12) / (12*4) =	1.3

(7) Annual Emissions, tpy = (Annual Tons Burned) * (NOX EF, lbs/ton) / (2000 lbs/ton)

(8)Typical Day, lbs/day = (Seasonal Fires * fuel loading factor * NOX EF * SAF) / (Activity, days/week * 52 weeks/yr)

(9) PM Season Worst Case Day[lbs/day] is assumed to be the same as typical day.

Table 2.4.38. Klamath Falls NAA 2008 Area Source VOC Emissions From Structure Fires

Klamath Falls NA, comprising the city of Klamath Falls, and the communities of Henley and Olene	(1) 2008 Annual # of Fires	(1) 2008 PM Season # of Fires	(2) Fuel Loading Factor (tons/fire)	(3) Annual Tons Burned	(4) VOC EF (lbs/ton)	(5) Activity (days/wk)	(6) Seasonal Adjustment Factor (SAF)	(7) ----- VOC Emissions ----- Annual (tons/yr)	(8) PM Season Typical Day (lbs/day)	(9) PM Season Worst Case Day (lbs/day)
SCC Code: **28-10-030-000**										
Residential	38	18	1.15	43.7	11	7	1.4	0.2	0.9	0.9
Non-Residential	12	5	1.15	13.8	11	7	1.3	0.1	0.2	0.2
								--------	--------	--------
Total								**0.3**	**1.1**	**1.1**

Notes:

(1) Number of fires, by specific date & city, provided by the State Fire Marshal for 2008. Ref. 729.

Note: The database linked to the raw data is located here:

\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Structure_Fires\Structure_Fires.mdb

The number of fires is for those fires designated as building fires only.

(2) Since the information about the structure size and the extent of the material burned in each fire was not collected, the default fuel loading factor of 1.15 [tons/fire] from the EIIP, Ref. 321, Chapter 18, page18.4-2 was used.

(3) Annual tons burned = (number of structural fires) * (fuel loading factor [tons/fire])

(4) Particulate emission factor is from EIIP, Ref. 321, Chapter 18, Table 18.4-1.

(5) Activity level (days/wk) is from the EPA Procedures Document, Table 5.8-1, p. 5-18. (Ref. 2)

(6) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

Based on the number of fires:	Residential SAF = (18*12) / (38*4) =	1.4
	Non-Res. SAF = (5*12) / (12*4) =	1.3

(7) Annual Emissions, tpy = (Annual Tons Burned) * (VOC EF, lbs/ton) / (2000 lbs/ton)

(8)Typical Day, lbs/day = (Seasonal Fires * fuel loading factor * VOC EF * SAF) / (Activity, days/week * 52 weeks/yr)

(9) PM Season Worst Case Day[lbs/day] is assumed to be the same as typical day.

Table 2.4.39. Klamath Falls NAA 2008 Area Source Emissions From Agricultural Burning

28-11-500-000: Agricultural Field Burning/ Unspecified Crop Type and Burn Method

Emissions estimates for 2008 fire events occurring within 15 km of the Peterson School Monitor (1)

Event Date	Lat. (DD)	Long. (DD)	PM2.5 (tpy)	NOx (tpy)	SO2 (tpy)	VOC (tpy)
5/8/2008	42.0730	-121.8020	1.2	0.4	0.06	0.9
8/21/2008	42.1600	-121.8960	1.2	0.4	0.06	0.9
9/2/2008	42.1090	-121.7710	1.2	0.4	0.06	0.9
10/23/2008	42.0600	-121.7570	1.2	0.4	0.06	0.9
11/15/2008	*42.1580*	*-121.7180*	*1.2*	*0.4*	*0.06*	*0.9*
11/16/2008	*42.1000*	*-121.7965*	*1.2*	*0.4*	*0.06*	*0.9*
			-------	-------	-------	-------
Total			**7.2**	**2.4**	**0.4**	**5.4**

Italicised data indicates fires occuring over the PM season

Typical and Worst-Case Day Emissions Estimates

	(2) SAF	(3) PM2.5 (lbs/day)	(3) NOx (lbs/day)	(3) SO2 (lbs/day)	(3) VOC (lbs/day)
Total	1.00	**39**	**13**	**2**	**30**

Notes

(1) EPA 2008 Oregon/California agricultural burning emissions estimates, EIS event format. August 3, 2011. DEQ Ref. 763.

(2) Seasonal Adjustment Factor (SAF) = (Seasonal Activity * 12 months) / (Annual Activity * Season Months)

SAF, based on PM2.5 emissions = (2.4 tpy * 12 months) / (7.2 tpy * 4 months) = 1.00

(3) Typical and Worst-Case Season Day emissions =

((Annual Emissions, tpy) * (2000 lbs/ton) * SAF) / (365 days/yr)

Table 2.4.40. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Commercial Cooking

SCC and Category Description	(1) 2008 Annual PM2.5 County Emissions [tons/yr]	(2) NAA to County Employee Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	(5) 2008 Annual Emissions [tons/yr]	(6) PM Season Typical Day Emissions [lbs/day]	(6) PM Season Worst Case Day Emissions [lbs/day]
23-02-002-100: Conveyorized Charbroiling							
	1.6	63%	0.3	7	1.0	1.8	1.8
23-02-002-200: Under-fired Charbroiling							
	11.3	63%	0.3	7	7.1	13.0	13.0
23-02-003-000: Deep Fat Fying							
	--	--	--	--	--	--	--
23-02-003-100: Flat Griddle Frying							
	2.6	63%	0.3	7	1.6	3.0	3.0
23-02-003-200: Clamshell Griddle Frying							
	0.2	63%	0.3	7	0.1	0.2	0.2
Total NAA PM2.5					**9.9**	**18**	**18**

* EPA estimates, based on emissions from cooking meat. Emissions from NG use for commercial cooking are included in Tables 2.4.20-2.4.24: Area source emissions from NG use.

Notes for Table 2.4.40:

(1) Emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759)

(2) NA to County Employee Ratio based on employee populations

NA	1,701	2008 Klamath Falls NAA NAICS Commercial population estimate from ODOT. DEQ Ref. 733.
County	2,708	US Economic Census Data, Klamath County, NAICS 722 & 7222 (Ref. 742).

NA/County	63%	

Ref. 733: mdb found here, dupes removed and culled to NAA:

\\DEQHQ1\EI_FILES\2008_KFalls_PM25\ODOT data\Final_Data_Proprietary\K_Falls_EMP_POP_ODOT.mdb

Specific query resulting in 1701 employees found here:

\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Cooking\Cooking.mdb

(3) Seasonal Adjustment Factor (SAF) =

According to restaurant owners and managers surveyed in Medford and Ashland, approx. 60 % of annual business is accrued during the six months of "summer season," the remaining 40% of annual income is realized during the alternative six month "winter season."

Summer season SAF = May - October =	0.7
Winter season SAF = November - February =	0.3
year total	1

(4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)

Temporal profile data shows activity for all days of the week for all SCCs in this category.

(5) 2008 Annual Emissions [tons/yr] =

(2008 Annual County Emissions, tpy) * (NA to County Employee Ratio)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.41. Klamath Falls NAA 2008 Area Source VOC Emissions From Commercial Cooking

SCC and Category Description	(1) Annual PM2.5 County Emissions [tons/yr]	(2) NA to County Employee Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	(5) Annual Emissions [tons/yr]	(6) PM Season Typical Day Emissions [lbs/day]	(6) PM Season Worst Case Day Emissions [lbs/day]
23-02-002-100: Conveyorized Charbroiling							
	0.4	63%	0.3	7	0.3	0.5	0.5
23-02-002-200: Under-fired Charbroiling							
	1.4	63%	0.3	7	0.9	1.6	1.6
23-02-003-000: Deep Fat Fying							
	0.4	63%	0.3	7	0.3	0.5	0.5
23-02-003-100: Flat Griddle Frying							
	0.2	63%	0.3	7	0.1	0.2	0.2
23-02-003-200: Clamshell Griddle Frying							
	0.01	63%	0.3	7	4.8E-03	8.8E-03	8.8E-03
Total NAA VOC					**1.5**	**3**	**3**

* Emissions produced from cooking meat. Emissions from NG use for commercial cooking are included in Tables 2.4.20-2.4.24: Area source emissions from NG use.

Notes for Table 2.4.41:

(1) Emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759)

(2) NA to County Employee Ratio based on employee populations

NA	1,701	2008 Klamath Falls NA NAICS Commercial population estimate from ODOT. DEQ Ref. 733.
County	2,708	US Economic Census Data, Klamath County, NAICS 722 & 7222 (Ref. 742).

NA/County	63%	

Ref. 733: mdb found here, dupes removed and culled to NAA:

\\DEQHQ1\EI_FILES\2008_KFalls_PM25\ODOT data\Final_Data_Proprietary\K_Falls_EMP_POP_ODOT.mdb

Specific query resulting in 1701 employees found here:

\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Cooking\Cooking.mdb

(3) Seasonal Adjustment Factor (SAF) =

According to restaurant owners and managers surveyed in Medford and Ashland, approx. 60 % of annual business is accrued during the six months of "summer season," the remaining 40% of annual income is realized during the alternative six month "winter season." (DEQ Ref. 699)

Summer season SAF = May - October =	0.7
Winter season SAF = November - February =	0.3
year total	1

(4) Weekly activity is from EPA temporal allocation profiles, found at:(DEQ Ref. 760)

http://www.epa.gov/ttnchie1/emch/temporal/

Temporal profile data shows activity for all days of the week for all SCCs in this category.

(5) Annual Emissions [tons/yr] =

(Annual County Emissions, tpy) * (NA to County Employee Ratio)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (2000 lbs/ton)* (SAF)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.42. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Aggregate Storage Piles, Load In/Load Out Operations Only

Agency / Operation	(1) Transferred Quantity (Cu Yd)	(2) Transferred Quantity (tons)	(3) PM2.5 Emission Factor Calculation Parameters *k*	(4) *U*	(5) *M*	(6) PM2.5 Emission Factor (lbs/ton)	(7) Control Efficiency (CE)	(8) PM2.5 Emissions Annual (tons/yr)	(9) Typical Day PM Season (lbs/day)	(9) Worst Case Day PM Season (lbs/day)
25-30-000-060: Bulk Materials Storage /All Storage Types /Crushed Stone										
Klamath County: Cinders										
Annual										
Load-In	1,210	1,210	0.053	5.9	12.9%	0.036	0.11	2.E-02	--	--
Load-Out	1,210	1,210	0.053	5.9	12.9%	0.036	0.11	2.E-02	--	--
Typical Season Day										
Load-Out	19.6	19.6	0.053	5.8	12.9%	0.034	0.11	--	1	--
Worst Case Season Day										
Load-Out	30.6	30.6	0.053	21.0	12.9%	0.184	0.11	--	--	5
ODOT: Crushed Rock										
Annual										
Load-In	1,646	2,058	0.053	5.9	2.63%	0.329	0.62	1.E-01	--	--
Load-Out	1,646	2,058	0.053	5.9	2.63%	0.329	0.62	1.E-01	--	--
Typical Season Day										
Load-Out	28.9	36.1	0.053	5.8	2.63%	0.318	0.62	--	4	--
Worst Case Season Day										
Load-Out	45.0	56.2	0.053	21.0	2.63%	1.700	0.62	--	--	36
								------	------	------
Totals								**0.3**	**5**	**41**

Notes for Table 2.4.42:

(1) Annual and typical season day Material (aggregate) Transferred is from Appendix B, Table B-13.

Material loaded in/out assumed equal to material applied. Daily estimates assume load-out only.

? Klamath County Worst Case Day (severe snow day) is from DEQ Ref. 775b, E-mail from Stan Strickland, Klamath County

? ODOT Worst case day = typical day * Klamath County worst case day multiplier, where

Worst case day multiplier = (Klamath County cu yd applied, severe snow day) / (Klamath County cu yd applied, typical day)

cu yd applied, severe snow day =	30.6	(DEQ Ref. 775b)
cu yd applied, typical day =	19.6	(from Appendix B, Table B-13, end note 3)
Worst case day multiplier =	1.56	

(2) (2008 transferred, tons) = (2008 transferred, cu yd) * (material density, lb.cu yd) / (2000 lbs/ton)

Density of crushed rock and cinder, lbs/cu yd, is from OAR 340-097-0110 (DEQ Ref. 540)

Density of cinders =	2,000	density of ash and slag
Density of crushed rock =	2,500	density of mining waste

(3) k = particle size multiplier (dimensionless) = 0.053 (AP-42, Chapt. 13, p. 13.2.4-4, DEQ Ref. 8)

(4) U = mean wind speed, meters per second (m/s) (miles per hour [mph]), is from Appendix B, Table B-14

Average Annual =	5.9	mph
Average Seasonal =	5.8	mph
Avg. Max Seasonal =	21.0	mph

(5) M = material moisture content (%)

Cinder stockpile =	12.9%	(DEQ Ref. 160: MRI Oregon Fugitive Dust Emission Inventory, Table 2: avg value)
Crushed Rock stockpile =	2.63%	(DEQ Ref. 160: MRI Oregon Fugitive Dust Emission Inventory, Tables 1 & 3 sand stockpiles used as surrogate)

(6) PM2.5 EF, lb/ton material loaded = k * (0.0032) * ((U/5)^1.3 / (M/5)^1.4). AP-42, Chapter 13, p. 13.2.4-4, Equation (1). DEQ Ref. 8.

(7) Control Efficiency, CE = (pile covered) / (pile uncovered), where

Agency	covered	uncovered	Units	CE	
Klamath County =	103	927	cu yd	0.11	DEQ Ref. 775b: Correspondence with Stan Strickland, Klamath County)
ODOT =	4,352	7,040	sq. yd	0.62	(DEQ Ref. 775a. Correspondence with Charles Brannan, ODOT)

(8) Annual Emissions, tpy = ((Transferred Quantity, tons) * (PM2.5 EF, lbs/ton) / (2000 lbs/ton)) * (1-CE)

(9) Typical and Worst-Case Season Day Emissions, lbs/day = (Transferred Quantity, tons) * (PM2.5 EF, lbs/ton) * (1-CE)

Table 2.4.43. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Road Sanding Operations

Area / Agency / Material	(1) 2008 material applied [CuYds]	(2) 2008 material applied [Tons]	(3) PM2.5 Emission Factor [lbs/ton]	(4) Seaonal Adjustment Factor (SAF)	(4) activity level [days]	(5) PM2.5 2008 annual emissions [tons/yr]	(6) 2008 PM Season Emissions Typical Day (lbs/day)	(7) Worst Case day [lbs/day]
22-94-000-002: Paved Roads /All Paved Roads /Total: Sanding/Salting - Fugitives								
Klamath County								
Cinders	1,210	1,210	0.166	2.59	1.3	0.1	8	12
ODOT								
Crushed Rock	1,646	2,058	0.152	2.59	1.3	0.2	12	19
Total, NAA						**0.3**	**20**	**31**

Notes:

(1) Material (aggregate) Applied is from Appendix B, Table B-13.

(2) (2008 material applied, tons) = (2008 material applied, cu yd) * (material density, lb.cu yd) / (2000 lbs/ton)

Density of crushed rock and cinder, lbs/cu yd, is from OAR 340-097-0110 (DEQ Ref. 540)

Density of cinders =	2,000	density of ash and slag
Density of crushed rock =	2,500	density of mining waste

(3) PM2.5 EF, lb/ton = 2000 f (s/100). Gap Filling PM10 Emission Factors for Selected Open Dust Sources.

EPA-450/4-88-003: p 45, lb/ton sand applied. (DEQ Ref. 156).

	(a) s	(b) f	(c) PM10 EF	(d) fraction PM2.5	(e) PM2.5 EF
Cinder	7.79	0.0026	0.405	0.41	**0.166**
Crushed Rock	7.09	0.0026	0.369	0.41	**0.152**

(a) s = avg. silt content:

Cinder = Average silt content of cinder samples from Klamath Falls stockpiles which were subjected to abrasion test. (Ref. 160, p. 43.)

Crushed Rock = Average silt content of road sand samples from La Grande stockpiles which were subjected to abrasion test. (Ref. 160, p.43)

(b) f = PM10 in the silt fraction = default value of 0.0026. Ref. 156, p.45

(c) PM10 EF = 2000 f (s/100): DEQ Ref. 156.

(d) = CARB documentation: Size Fraction and Chemical Speciation Profile Updates:

"Windblown dust-unpaved areas", DEQ Ref. 655.

(e) PM2.5 EF = PM10 EF * fraction PM2.5

(4) Seasonal Adjustment Factor and Activity in days/wk are estimated in Appendix B, Table B-13.

(5) Annual Emissions, tpy = (2008 Material Applied, tons) * (PM2.5 Emission Factor, lbs/ton) / (2000 lbs/ton)

(6) Typical Day, lbs/day = [(Annual Emissions, tons) * (SAF) * (2000 lbs/ton)] / [(Activity, dy/wk) * 52 weeks/yr]

(7) Worst case day = typical day * worst case day multiplier, where

Worst case day multiplier = (cu yd applied, severe snow day) / (cu yd applied, typical day)

cu yd applied, severe snow day =	30.6	(DEQ Ref. 755b)
cu yd applied, typical day =	19.6	(from Appendix B, Table B-13, end note 3)
Worst case day multiplier =	1.56	

Table 2.4.44. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Soil Disturbance Caused By Construction Activity

SCC and Category Description	(1) 2008 Annual PM2.5 Statewide Emissions [tons/yr]	(2) NA to State Employee Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	(5) 2008 Annual Emissions [tons/yr]	(6) PM Season Typical Day Emissions [lbs/day]	(6) PM Season Worst Case Day Emissions [lbs/day]
23-11-010-000: Construction: SIC 15 - 17 /Residential /Total (NAICS 2361)							
	80.4	3.1%	0	7	2.5	0	0
23-11-020-000: Construction: SIC 15 - 17 /Industrial/Commercial/Institutional /Total (NAICS 23621-2)							
	1,494.4	4.1%	0	7	60.8	0	0
23-11-030-000: Construction: SIC 15 - 17 /Road Construction /Total (NAICS 23731)							
	582.7	4.5%	0	7	26.0	0	0
					--------	--------	--------
Total NAA					**89.3**	**0**	**0**

* EPA estimates, based on acreage disturbed

Notes for Table 2.4.44:

(1) Emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759)

(2) NAA to County Employee Ratio based on employee populations

NAICS	2361	23621-2	237310
NA	255	210	135
State	8,335	5,160	3,023
	--------	--------	--------
NAA/County	3.1%	4.1%	4.5%

2008 Klamath Falls NAA NAICS Commercial population estimate from ODOT. DEQ Ref. 733.
(Please note that the source data is proprietary)
US Economic Census Data, Klamath County, NAICS 722 & 7222 (Ref. 742).
Ref. 733: mdb found here, dupes removed and culled to NAA:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\ODOT data\Final_Data_Proprietary\K_Falls_EMP_POP_ODOT.mdb
Specific queries resulting in employees found here:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Construction\Construction.mdb
Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)

(3) In telephone conversation with Richard Roseburg, Chief Agronomist with OSU Extension Service, (Ref 465), the soil moisture content in Klamath Falls is typically too high to generate dust from construction activity from November through February. Therefore, there are no days (typical or worst case) where wintertime dust is generated between November through February.

(4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.

(5) Annual Emissions [tons/yr] =
(2008 Annual Statewide Emissions, tpy) * (NAA to State Employee Ratio)

(6) 1 applicable restrictions.
Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.45. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Agricultural Tilling

	(1)	(2)	(3)	(4)	(5)	(6)	(6)
					----- Nonattainment Area -----		
SCC and Category Description	2002 Annual PM2.5 County Emissions [tons/yr]	NA to County Cropland Ratio (%)	Seasonal Adjustment Factor [SAF]	Activity [days/wk]	Annual Emissions [tons/yr]	PM Season Typical Day Emissions [lbs/day]	PM Season Worst Case Day Emissions [lbs/day]
28-01-000-003: Agriculture/ Crops/ Tilling							
Total	133.5	4.1%	0	7	**5.5**	**0**	**0**

Notes:

(1) 2002 Annual emissions are EPA estimates. The data source code provided by EPA indicates "EPA generated data, using 1998 activity data, grown to 2002 using an economic indicator." This is the latest available data for this category. The EPA data is stored in the DEQ Area Mobile Emissions Estimates (AMEE) database. The Access file used to query the database is located here: \\DEQHQ1\EI_FILES\AMEE\AMEE_OnProduction.mdb

(2) Nonattainment Area cropland acreage estimated via GIS analysis. Please see Appendix C, Table C-19. The ID matched to ag. wind erosion is ID 1 = Agriculturally Zoned: Primarily Farm and Cropland. Cropland acreage in relation to the NAA is shown in Appendix B, Figure B-3.

(3) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months) In a telephone conversation with Richard Roseburg, Chief Agronomist with OSU Extension Service, (Ref 465), the soil moisture content in Klamath Falls is typically too high to generate dust from construction activity (i.e. acreage disturbed) from November through February. Therefore, it is assumed that there are no days (typical or worst case) when wintertime dust is generated between November through February from acreage disturbed through agricultural field operations.

(4) Wind activity assumed to be uniform (no controls applicable).

(5) Annual Emissions [tons/yr] = (Annual County Emissions, tpy) * (NA to County Cropland Ratio)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.46. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Geogenic (fallow field) Wind Erosion

	(1)	(2)	(3)	(4)	(5)	(6)	(6)
					----- Nonattainment Area -----		
SCC and Category Description	NAA Cropland Acres	Composite PM EF (lbs/acre-yr)	Seasonal Adjustment Factor [SAF]	Activity [days/wk]	Annual Emissions [tons/yr]	PM Season Typical Day Emissions [lbs/day]	PM Season Worst Case Day Emissions [lbs/day]
27-30-100-000: *Geogenic/ Wind Erosion*							
	13,329	0.301	0	7	**2.0**	**0**	**0**

Notes:

(1) Nonattainment Area cropland acreage estimated via GIS analysis. Please see Appendix C, Table C-19.
The ID matched to ag. wind erosion is ID 1 = Agriculturally Zoned: Primarily Farm and Cropland.
Cropland acreage in relation to the NAA is shown in Appendix B, Figure B-3.

(2) Wind erosion emission factor calculations:

Crop	State	(a) Median EF Wind Erosion (lb/acre)
corn	Indiana	0.569
corn	Iowa	0.109
wheat	N Dakota	0.099
wheat	Kansas	0.428

Average:		**0.301**

(a) Composite Emission Factors for wind erosion taken from *Agricultural Activities Influencing Fine Particulate Matter Emissions*, by MRI, March 25, 1996. (Ref. 255)
The EF is an average of factors taken from Table 5-1, p. 5-2. Corn and wheat EFs were assumed to apply to crops grown within the NA. Conventional farming data used, and the EFs were assumed to represent annual rates.

(3) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)
In a telephone conversation with Richard Roseburg, Chief Agronomist with OSU Extension Service, (Ref 465), the soil moisture content in Klamath Falls is typically too high to generate dust from construction activity (i.e. acreage disturbed) from November through February. Therefore, it is assumed that there are no days (typical or worst case) when wintertime dust is generated between November through February from wind erosion of fallow fields.

(4) Wind activity assumed to be uniform (no controls applicable).

(5) Annual Emissions [tons/yr] = (NA cropland acres) * (Composite PM EF, lb/acre-yr) / (2000 lb/acre)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.
Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.47. Klamath Falls NAA 2008 Area Source $PM_{2.5}$ Emissions From Animal Husbandry

SCC and Category Description	(1) Number Animals County-wide	(1) Emission Factor per animal (Kg/hd-yr)	(1) 2008 Annual PM10 County Emissions [tons/yr]	(2) NAA to County Mixed Crop and Grazing Land Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	(5) PM10 to PM2.5 ratio (Size Fraction)	(6) ----- Nonattainment Area ----- $PM_{2.5}$ Annual Emissions [tons/yr]	(7) PM Season Typical Day Emissions [lbs/day]	(7) PM Season Worst Case Day Emissions [lbs/day]
28-05-019-100: Dairy	5,059	1.90	10.6	4.3%	0.6	7	11%	0.1	0.2	0.2
28-05-001-000: Beef Cattle	142,000	1.0864	170.0	1.6%	0.6	7	11%	0.3	1	1
28-05-025-000: Swine	500	1.6	0.9	4.3%	0.6	7	11%	4.E-03	2E-02	2E-02
28-05-030-003: Poultry - Layers	600	0.0373	2E-02	4.3%	0.6	7	11%	1.E-04	4E-04	4E-04
28-05-030-004: Poultry - Broilers	0	0.0373	0	--	--	--	--	--	--	--
28-05-035-000: Horses	6,000	--	--	--	--	--	--	--	--	--
28-05-040-000: Sheep & Lambs	6,000	--	--	--	--	--	--	--	--	--
28-05-045-001: Goats	650	--	--	--	--	--	--	--	--	--
NAA: Total PM2.5								**0.4**	**1**	**1**

Notes:

(1) 2008 Klamath County emissions estimates for CAFOs.(DEQ Ref. 769). See Appendix B, Methodology: Concentrated Animal Feeding Operations Emissions (tons/yr) = Products (Kg/Head-year) * Emission Facto(Kg/hd-yr)/2000* 2.20462

(2) Allocation of county-wide emissions to NAA completed via GIS analysis of farm land zoning acres in Klamath County:

	(a) Beef Cattle, Horses, Sheep,	(b) Dairy, Swine, Poultry	
NAA	3,814	13,329	acres
County	244,383	309,852	acres
	----------	----------	
NAA/County	1.6%	4.3%	

(a) mixed crop and grazing zoning

(b) cropland plus mixed crop and grazing zones

See Appendix B, Figure B-4 for the GIS mapping results, showing zones used in relation to NAA, for this category.

(3) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

Monthly activity is from EPA temporal allocation profiles, DEQ Ref. 760:

The monthly temporal profile, Pinder dairy cow average over counties for Oregon, profile # 1541.

Jan	330	Jul	791
Feb	398	Aug	849
Mar	685	Sep	949
Apr	1197	Oct	1224
May	1386	Nov	703
Jun	809	Dec	673

Shaded cells indicate the PM season. The SAF is calculated as follows:

Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

SAF= 0.6

Dairy SAF assumed to represent all animal husbandry categories.

(4) Activity considered uniform throughout the year. (reference: see note 3 above)

(5) PM10 to PM2.5 size fraction, Feedlot/Dairy Cattle: from CARB documentation, DEQ Ref. 655

Feedlot/Dairy cattle fractionation assumed to represent all animal husbandry categories.

(6) Annual Emissions [tons/yr] =

(Annual County Emissions, tpy) * (NAA to County Grazing Land Ratio (%))

(7) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.48. Klamath Falls NAA 2008 Area Source VOC Emissions From Animal Husbandry

SCC and Category Description	(1) Number Animals County-wide	(1) Emission Factor per animal (Kg/hd-yr)	(1) 2008 Annual VOC County Emissions [tons/yr]	(2) NAA to County Mixed Crop and Grazing Land Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	----- Nonattainment Area ----- (5) Annual Emissions [tons/yr]	(6) PM Season Typical Day Emissions [lbs/day]	(6) PM Season Worst Case Day Emissions [lbs/day]
28-05-019-100: Dairy	5059	8.750	48.8	4.3%	0.6	7	2.1	7	7
28-05-001-000: Beef Cattle	142,000	3.955	619.0	1.6%	0.6	7	9.7	34	34
28-05-025-000: Swine	500	0.436	0.24	4.3%	0.6	7	1E-02	4E-02	4E-02
28-05-030-003: Poultry - Layers	600	0.087	0.06	4.3%	0.6	7	2E-03	9E-03	9E-03
28-05-030-004: Poultry - Broilers	0	0.087	0	--	--	--	--	--	--
28-05-035-000: Horses	6,000	--	--	--	--	--	--	--	--
28-05-040-000: Sheep & Lambs	6,000	--	--	-- --	--	--	--	--	--
28-05-045-001: Goats	650	--	--	-- --	--	--	--	--	--
NAA: Total VOC							**11.8**	**41**	**41**

Notes:

(1) 2008 Klamath County emissions estimates for CAFOs.(DEQ Ref. 769). See Appendix B, Methodology: Concentrated Animal Feeding Operations Emissions (tons/yr) = Products (Kg/Head-year) * Emission Facto(Kg/hd-yr)/2000* 2.20462

(2) Allocation of county-wide emissions to NA completed via GIS analysis of farm land zoning acres in Klamath County:

	(a) Beef Cattle, Horses, Sheep, Goats	(b) Dairy, Swine, Poultry
NAA	3,814	13,329
County	244,383	309,852
	----------	----------
NAA/County	1.6%	4.3%

(a) mixed crop and grazing zoning

(b) cropland plus mixed crop and grazing zones

See Appendix B, Figure B-4 for the GIS mapping results, showing zones used in relation to NAA, for this category.

(3) Seasonal adjustment factor =([season activity] * [12 months])/([annual activity] * [season months])

Monthly activity is from EPA temporal allocation profiles, found at:

http://www.epa.gov/ttnchie1/emch/temporal/

The monthly temporal profile, Pinder dairy cow average over counties for Oregon, profile # 1541.

Jan	330		Jul	791
Feb	398		Aug	849
Mar	685		Sep	949
Apr	1197		Oct	1224
May	1386		Nov	703
Jun	809		Dec	673

Shaded cells indicate the PM season. The SAF is calculated as follows:

Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

SAF= 0.6

Dairy SAF assumed to represent all animal husbandry categories.

(4) Activity considered uniform throughout the year. (reference: see note 3 above)

(5) Annual Emissions [tons/yr] =

(Annual County Emissions, tpy) * (NAA to County Grazing Land Ratio (%))

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.49. Klamath Falls NAA 2008 Area Source NH_3 Emissions From Animal Husbandry

SCC and Category Description	(1) Number Animals County-wide	(1) Emission Factor per animal (Kg/hd-yr)	(1) 2008 Annual NH3 County Emissions [tons/yr]	(2) NAA to County Grazing Land Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	(5) ----- Nonattainment Area ----- Annual Emissions [tons/yr]	(6) PM Season Typical Day Emissions [lbs/day]	(6) PM Season Worst Case Day Emissions [lbs/day]
28-05-019-100: Dairy									
	5059	96.97	540.8	4.3%	0.6	7	23.3	81	81
28-05-001-000: Beef Cattle									
	142,000	20.91	3,273.6	1.6%	0.6	7	51.1	177	177
28-05-025-000: Swine									
	500	5.76	3.2	4.3%	0.6	7	0.1	5E-01	5E-01
28-05-030-003: Poultry - Layers									
	600	0.42	0.3	4.3%	0.6	7	1.2E-02	4E-02	4E-02
28-05-030-004: Poultry - Broilers									
	0	0.20	0	--	--	--	--	--	--
28-05-035-000: Horses									
	6,000	12.23	80.9	1.6%	0.6	7	1.3	4	4
28-05-040-000: Sheep & Lambs									
	6,000	3.38	22.3	1.6%	0.6	7	0.3	1	1
28-05-045-001: Goats									
	650	3.38	2.4	1.6%	0.6	7	0.0	1E-01	1E-01
NAA: Total NH3							**76.2**	**264**	**264**

Notes:

(1) 2008 Klamath County emissions estimates for CAFOs.(DEQ Ref. 769). See Appendix B, Methodology: Concentrated Animal Feeding Operations. Emissions (tons/yr) = Products (Kg/Head-year) * Emission Factor (Kg/hd-yr)/2000* 2.20462

(2) Allocation of county-wide emissions to NA completed via GIS analysis of farm land zoning acres in Klamath County:

	(a) Beef Cattle, Horses,	(b) Dairy, Swine, Poultry	
NAA	3,814	13,329	acres
County	244,383	309,852	acres
	----------	----------	
NAA/County	1.6%	4.3%	

(a) mixed crop and grazing zoning

(b) cropland plus mixed crop and grazing zones

See Appendix B, Figure B-4 for the GIS mapping results, showing zones used in relation to NAA, for this category.

(3) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

Monthly activity is from EPA temporal allocation profiles,DEQ Ref.760.

The monthly temporal profile, Pinder dairy cow average over counties for Oregon, profile # 1541.

Jan	330		Jul	791
Feb	398		Aug	849
Mar	685		Sep	949
Apr	1197		Oct	1224
May	1386		Nov	703
Jun	809		Dec	673

Shaded cells indicate the PM season. The SAF is calculated as follows:

Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

SAF= 0.6

Dairy SAF assumed to represent all animal husbandry categories.

(4) Activity considered uniform throughout the year. (reference: see note 3 above)

(5) Annual Emissions [tons/yr] =

(Annual County Emissions, tpy) * (NAA to County Grazing Land Ratio (%))

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.50. Klamath Falls NAA 2008 Area Source NH_3 Emissions From Commercial Fertilizer Application

SCC and Category Description	(1) 2008 Annual NH3 County Emissions [tons/yr]	(2) NAA to County Cropland Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	(5) ----- Nonattainment Area ----- Annual Emissions [tons/yr]	(6) PM Season Typical Day Emissions [lbs/day]	(6) PM Season Worst Case Day Emissions [lbs/day]
28-01-700-001: Anhydrous Ammonia							
	39.1	4.1%	0.25	7	1.6	2	2
28-01-700-002: Aqueous Ammonia							
	1.0	4.1%	0.25	7	4.1E-02	6.E-02	6.E-02
28-01-700-003: Nitrogen Solutions							
	86.4	4.1%	0.25	7	3.6	5	5
28-01-700-004: Urea							
	498.3	4.1%	0.25	7	20.5	28	28
28-01-700-005: Ammonium Nitrate							
	1.3	4.1%	0.25	7	0.1	7.E-02	7.E-02
28-01-700-006: Ammonium Sulfate							
	92.0	4.1%	0.25	7	3.8	5	5
28-01-700-007: Ammonium Thiosulfate							
	1.6	4.1%	0.25	7	0.1	9.E-02	9.E-02
28-01-700-010: N-P-K (multi-grade nutrient fertilizers)							
	0	4.1%	0.25	7	0	0	0
28-01-700-011: Calcium Ammonium Nitrate							
	0.8	4.1%	0.25	7	3.3E-02	5.E-02	5.E-02
28-01-700-012: Potassium Nitrate							
	0.03	4.1%	0.25	7	1.3E-03	2.E-03	2.E-03
28-01-700-013: Diammonium Phosphate							
	0.1	4.1%	0.25	7	3.8E-03	5.E-03	5.E-03
28-01-700-014: Monoammonium Phosphate							
	14.9	4.1%	0.25	7	0.6	1	1
28-01-700-015: Liquid Ammonium Polyphosphate							
	1.0	4.1%	0.25	7	4.1E-02	6.E-02	6.E-02
28-01-700-099: Miscellaneous Fertilizers							
	30.3	4.1%	0.25	7	1.2	2	2
					----------	----------	----------
NAA Total NH3					**31.6**	**43**	**43**

Notes for Table 2.4.50:

(1) Emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759)

(2) Allocation of county-wide emissions to NAA completed via GIS analysis. Please see Appendix C, Table C-19.

The ID matched to fertilizer application is ID 1 = Agriculturally Zoned: Primarily Farm and Cropland.

NAA percent of county acreage is 4.1%. Cropland acreage in relation to the NAA is shown in Appendix B, Figure B-3.

(3) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

Monthly activity is from EPA temporal allocation profiles (DEQ Ref. 760)

The monthly temporal profile, specific to Oregon, for SCCs 28-01-700-001 through 010 is

Jan	18
Feb	35
Mar	268
Apr	175
May	85
Jun	63
Jul	26
Aug	81
Sep	165
Oct	54
Nov	15
Dec	14

Shaded cells indicate the PM season. The SAF is calculated as follows:

Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

= ([18+35+15+4] * 12) / ([18+35+268+175+85+63+26+81+165+54+15+14] * 4) = $\boxed{0.25}$

SAF assumed to represent the remaining SCCs of 28-01-007-011 through 099.

(4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)

Temporal profile data shows activity for all days of the week for all SCCs in this category.

(5) Annual Emissions [tons/yr] =

(Annual County Emissions, tpy) * (NA to County Cropland Ratio)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.51. Klamath Falls NAA 2008 Area Source VOC Emissions From Small, Non-Permitted Point Sources: Solvent Use

(1) 2008 Annual Activity (Avg Number of Employees)	(2) VOC EF (lbs/employee)	(3) SAF	(4) Activity (days/wk)	(5) CE	(5) RE	(5) RP	(6) VOC Emissions: Annual (tons/yr)	(7) VOC Emissions: PM$_{2.5}$ Season: Typical Day (lb/day)	(8) VOC Emissions: PM$_{2.5}$ Season: Worst Case Day (lb/day)
24-01-005-000: Surface Coating /Auto Refinishing /Total: All Solvent Types									
45	89	1.00	7	1.0	0.8	0.8	2.0	4	4
24-01-015-000: Surface Coating /Factory Finished Wood /Total: All Solvent Types									
393	43	1.00	7	NA	NA	NA	8.5	46	46
24-01-025-000: Surface Coating /Metal Furniture /Total: All Solvent Types									
29	772	1.02	7	0.9	0.8	1.0	11.1	20	20
24-01-035-000: Surface Coating /Plastic Parts /Total: All Solvent Types									
45	10.4	0.99	7	0	0	0	0.2	1	1
24-01-055-000: Surface Coating /Machinery & Equipment /Total: All Solvent Types									
38	109	1.00	7	0.9	0.8	1.0	2.1	4	4
24-01-070-000: Surface Coating /Motor Vehicles /Total: All Solvent Types									
8	164	0.98	7	0.9	0.8	1.0	0.7	1	1
24-01-080-000: Surface Coating /Marine /Total: All Solvent Types									
1	198	1.00	7	NA	NA	NA	0.1	0.3	0.3
24-01-090-000: Surface Coating /Misc Manufacturing /Total: All Solvent Types									
4	136	1.00	7	0.9	0.8	1.0	0.3	0.5	0.5
24-15-000-000: Degreasing /All Processes/All Industries /Total: All Solvent Types									
728	30.5	1.00	7	0.6	0.8	1.0	11.1	33	33
24-25-000-000: Graphic Arts /All Processes /Total: All Solvent Types									
159	1,482	1.00	6	NA	NA	NA	117.6	754	754
--------							--------	--------	--------
1,450						**NAA Total Emissions:**	**153.6**	**865**	**865**

Notes for Table 2.4.51:

(1) 2008 average annual number of employees within the Klamath Falls NAA is from ODOT. DEQ ref. 733. Note: The data is proprietary. Facility name and location checked against DEQ permit information to avoid double-counting. Employee population data and calculations are found here:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Point\Small_NonPermitted\NonPermitted_Point_Emissions.mdb

(2) Emission factors are from DEQ ref. 734: Updated data from E.H. Pechan & Associates, EXCEPT 24-01-035-000: Calculated from EPA documentation - see DEQ ref. 735, Table 6.

(3) Seasonal Adjustment Factors are from Appendix B, Table B-10

(4) Activity in days per week is from Appendix B, Table B-11.

(5) Control Efficiency, Rule Effectiveness, and Rule Penetration are estimated as follows:

SCC	**CE**	**RE**
24-01-005-000	No credit taken for CE.	EPA default
24-01-040-000	AP-42, section 4.2.2. (DEQ ref. 561, p. 115)	EPA default
24-01-045-000		
24-01-050-000		
24-01-055-000		
24-01-065-000		
24-01-070-000		
24-01-090-000		
24-15-000-000	AP-42, section 4.6 (solvent degreasing), avg of values on Table 4.6-3, p 4.6-5. (DEQ ref. 561, p 121)	

SCC	**RP**
24-01-005-000	OR DEQ estimates 80% RP based on ecological business program outreach.
24-01-040-000	Assumed RP is 97%, based upon the length of time the rule has been in place. The rule has been in effect since 1982 and requires RACT level controls. Regulations are specific to surface coating in mfg and identify limitation based upon specific mfg process types. Adopted rule change in 1991 by increaseing record keeping requirement.
24-01-045-000	
24-01-050-000	
24-01-055-000	
24-01-065-000	
24-01-070-000	
24-01-090-000	
24-15-000-000	DEQ estimate, based upon rules in place since 1986 and NESHAP rule adopted by reference.

Notes: (a) Misc. Metals, Metal Cans, Metal Coils used as surrogate for Metal Furniture.
(b) Misc. Metals used as a surrogate for Misc. Manufacturing
(c) For Plastic Parts Coating:
NSPS applies only to business machine parts coating; category encompasses many coating activities. CE, RE, RP assumed to be 0 for a conservative emissions estimate. (NSPS - coating of plastic business machines: 40CFR Part 60, subpart TTT)
(d) Graphic Arts: Control Efficiency, Rule Effectiveness, and Rule Penetration are not applicable (340-232-0230 specific to sources emitting 100 tpy VOC or greater).

(6) Annual emissions, tpy = (Avg. # of employees) * (EF, lb/employee) / (2000 lbs/ton)

(7) Typical Day, lbs/day =
(Annual tpy * 2000 lbs/ton * PM2.5 SAF) / (Activity, days/wk * 52 wks/yr) * (1-(CE*RE*RP))

(8) Assumed equal to typical day emissions

Table 2.4.52. Klamath Falls NAA 2008 Area Source VOC Emissions From Commercial Pesticide Application

	(1)	(2)	(3)	(4)	(5)	(6)	(6)
					----- Nonattainment Area -----		
SCC and Category Description	2008 Annual County VOC Emissions [tons/yr]	NAA to County Cropland Ratio (%)	Seasonal Adjustment Factor [SAF]	Activity [days/wk]	Annual Emissions [tons/yr]	PM Season Typical Day Emissions [lbs/day]	PM Season Worst Case Day Emissions [lbs/day]
24-61-850-000 : Commercial_Pesticide Application Agricultural: All Processes							
	369.1	4.1%	2.02	7	15.2	169	169
Total VOC					**15.2**	**169**	**169**

Notes:

(1) 2008 Oregon pesticide application emissions estimates. (DEQ Ref. 768). For a complete detailing of the commercial pesticide emission inventory methodology, please see Appendix B, Methodology: Commercial Pesticide Application

(2) Allocation of county-wide emissions to NAA completed via GIS analysis.
Please see Appendix C, Table C3.The ID matched to fertilizer application is
ID 1 = Agriculturally Zoned: Primarily Farm and Cropland. NA percent of county acreage is 4.1%.

(3) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
Monthly activity is from EPA temporal allocation profiles, DEQ Ref. 760.

Jan	83		Jul	84
Feb	83		Aug	84
Mar	82		Sep	85
Apr	82		Oct	85
May	82		Nov	85
Jun	84		Dec	83

Shaded cells indicate the PM season. The SAF is calculated as follows:
Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
= ([83+83+83+85] * 12) / ([83+83+82+82+82+84+84+84+85+85+85+83] * 4) = 2.02
SAF assumed to represent the remaining SCCs of 28-01-007-011 through 099.

(4) Weekly activity is from EPA temporal allocation profiles, DEQ Ref. 760.
Temporal profile data shows activity for all days of the week for all SCCs in this category.

(5) Annual Emissions [tons/yr] =
(Annual County Emissions, tpy) * (NAA to County Cropland Ratio)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.
Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.53. Klamath Falls NAA 2008 Area Source VOC Emissions From Non-Industrial Asphalt Application and Use

SCC and Category Description	(1) 2008 Annual VOC Emissions [tons/yr]	(2) Spatial Allocation Method	(3) NAA Ratio [%]	(4) Seasonal Adjustment Factor [SAF]	(5) Activity [days/wk]	(6) ----- Nonattainment Area ----- Annual Emissions [tons/yr]	(7) PM Season Typical Day Emissions [lbs/day]	(7) PM Season Worst Case Day Emissions [lbs/day]
	County							
24-61-021-000: Misc Non-industrial: Commercial /Cutback (Paving) Asphalt /Total: All Solvent Types								
	6.1	Roadway	3.5%	2.0	7	0.2	2	2
24-61-022-000: Misc Non-industrial: Commercial /Emulsified (Paving) Asphalt /Total: All Solvent Types								
	25.6	Roadway	3.5%	2.0	7	0.9	10	10
	Statewide							
24-61-023-000: Misc Non-industrial: Commercial /Asphalt Roofing /Total: All Solvent Types								
	1.4	Employee	1.3%	2.0	7	2.E-02	2.E-01	2.E-01
						------	------	------
NAA Total						**1.1**	**13**	**13**

Notes for Table 2.4.53

(1) Paving asphalt emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759)
Roofing asphalt emissions estimated by DEQ staff, DEQ Ref. 758, Table 3, p. 10.

(2) Paving asphalt allocation to NAA based on road mileage. Roofing asphalt based on employee populations.

(3) Roads: Allocation by GIS:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Asphalt\KFalls_Asphalt_GIS\KFalls_Asphalt.mxd

NAA Roads: Miles	460
County Roads: Miles	13,026

NAA to County Ratio	3.5%

Please see the map: Appendix B, Figure B-6.

Roofing asphalt: Employees, NAICS 238160: Roofing contractors. US Census Data and County Business Patterns

NAA Employees	45	(US Census, County Business Patterns, 2008, DEQ. Ref. 742)
State Employees	3,395	(2007 US Economic Census, DEQ Ref. 742)

NAA to State Ratio	1.3%	

(4) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
Monthly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Monthly profile number 258: specific to asphalt application:

Month	Cutback	Emulsified	Roofing		Month	Cutback	Emulsified	Roofing
Jan	83	83	83		Jul	84	84	84
Feb	83	83	83		Aug	84	84	84
Mar	82	82	82		Sep	85	85	85
Apr	82	82	82		Oct	85	85	85
May	82	82	82		Nov	85	85	85
Jun	84	84	84		Dec	83	83	83

Shaded cells indicate the PM season. The SAF is calculated as follows:
Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
= ([83+83+85+83] * 12) / ([83+83+82+82+82+84+84+84+85+85+85+83] * 4) = 2.02
SAF assumed to represent the remaining SCCs of 28-01-007-011 through 099.

(5) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)
Temporal profile data shows activity for all days of the week for all SCCs in this category.

(6) Annual Emissions [tons/yr] = (Annual County Emissions, tpy) * (NAA to County Ratio)

(7) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.
Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.54. Klamath Falls NAA 2008 Area Source VOC Emissions From Consumer Solvent Use

SCC and Category Description	(1) 2008 Annual County VOC Emissions [tons/yr]	(2) NAA to County Population Ratio (%)	(3) Seasonal Adjustment Factor [SAF]	(4) Activity [days/wk]	(5) ----- Nonattainment Area ----- Annual Emissions [tons/yr]	(6) PM Season Typical Day Emissions [lbs/day]	(6) PM Season Worst Case Day Emissions [lbs/day]
24-60-100-000: All Personal Care Products - Total: All Solvent Types							
	63.1	63%	1	7	39.5	217	217
24-60-200-000: All Household Products - Total: All Solvent Types							
	59.8	63%	1	7	37.4	206	206
24-60-400-000: All Auto Aftermarket Products - Total: All Solvent Types							
	45.2	63%	1	7	28.3	155	155
24-60-500-000: All Coatings & Related Products -Total: All Solvent Types							
	31.6	63%	1	7	19.8	109	109
24-60-600-000: All Adhesives & Sealants -Total: All Solvent Types							
	18.9	63%	1	7	11.9	65	65
24-60-800-000: All FIFRA Related Products -Total: All Solvent Types							
	59.1	63%	1	7	37.0	203	203
24-60-900-000: Misc Products -Total: All Solvent Types							
	2.3	63%	1	7	1.5	8	8
NAA Total					**175**	**963**	**963**

(1) Emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759)

(2) HU Ratio:

NAA Housing Units	18,767	(from Appendix B, Table B1)
County Housing Units	29,972	(from Appendix B, Table B3)

NAA to County Ratio	63%	

(3) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
Monthly activity is from EPA temporal allocation profiles (DEQ Ref. 760)

The monthly temporal profile

Jan	83	Jul	83
Feb	83	Aug	83
Mar	83	Sep	83
Apr	83	Oct	83
May	83	Nov	83
Jun	83	Dec	83

Shaded cells indicate the PM season. The SAF is calculated as follows:

Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])

SAF= 1.00

SAF assumed to represent the remaining SCCs of 28-01-007-011 through 099.

(4) Weekly activity is from EPA temporal allocation profiles (DEQ Ref. 760)

Temporal profile data shows activity for all days of the week for all SCCs in this category.

(5) Annual Emissions [tons/yr] = (Annual County Emissions, tpy) * (NAA to County Ratio)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.55. Klamath Falls NAA 2008 Area Source VOC Emissions From Architectural and Traffic Marking Surface Coating

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(7)
						----- Nonattainment Area -----		
SCC and Category Description	2008 County-Wide Annual VOC Emissions [tons/yr]	Spatial Allocation Method	NAA Ratio [%]	Seasonal Adjustment Factor [SAF]	Activity [days/wk]	Annual Emissions [tons/yr]	PM Season Typical Day Emissions [lbs/day]	PM Season Worst Case Day Emissions [lbs/day]
24-01-001-000: Surface Coating /Architectural Coatings /Total: All Solvent Types								
	100.3	HU	62.6%	2.02	7	62.8	696	696
24-01-008-000: Surface Coating /Traffic Markings /Total: All Solvent Types								
	36.3	Roadway	3.5%	1.00	7	1.3	7	7
						------	------	------
NAA Total						**64.1**	**704**	**704**

Notes for Table 2.4.55

(1) Emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759).

(2) Arch Surface Coating emissions allocated based on housing units (HU)
Traffic markings coatings emissions allocated based on road mileage.

(3) HU allocation:

NAA Housing Units	18,767	(from Appendix B, Table B-1)
County Housing Units	29,972	(from Appendix B, Table B-3)

NAA to County Ratio	63%	

(3) Roads: Allocation by GIS:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Asphalt\KFalls_Asphalt_GIS\KFalls_Asphalt.mxd

NAA Roads: Miles	460
County Roads: Miles	13,026

NAA to County Ratio	3.5%

Please see the map: Appendix B, Figure B-6.

(4) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
Monthly activity is from EPA temporal allocation profiles, DEQ Ref. 760.

Month	Arch. Surf.	Traf. Mark.	Month	Arch. Surf.	Traf. Mark.
Jan	82	83	Jul	85	83
Feb	82	83	Aug	85	83
Mar	81	83	Sep	85	83
Apr	81	83	Oct	85	83
May	81	83	Nov	85	83
Jun	85	83	Dec	82	83

Shaded cells indicate the PM season. The SAF is calculated as follows:
Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
Arch. Surface Coatings =
([82+82+85+82] * 12) / ([82+82+81+81+81+85+85+85+85+85+85+82] * 4) = 2.02
Traffic Marking Coatings activity considered uniform throughout the year.

(5) Weekly activity is from EPA temporal allocation profiles, DEQ Ref. 760.
Temporal profile data shows activity for all days of the week for all SCCs in this category.

(6) Annual Emissions [tons/yr] = (Annual County Emissions, tpy) * (NAA to County Ratio)

(7) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.
Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.56. Klamath Falls NAA 2008 Area Source VOC Emissions From Portable Fuel Containers (PFCs)

SCC and Category Description	(1) 2008 Annual County VOC Emissions [tons/yr]	(2) Spatial Allocation: Housing Units (HU) or Zoning	(3) NAA to County Ratio [%]	(4) Seasonal Adjustment Factor [SAF]	(5) Activity [days/wk]	(6) ----- Nonattainment Area ----- Annual Emissions [tons/yr]	(7) PM Season Typical Day Emissions [lbs/day]	(7) PM Season Worst Case Day Emissions [lbs/day]
25-01-011-011: Residential Portable Gas Cans /Permeation								
	10.8	HU	63%	0.99	7	6.8	37	37
25-01-011-012: Residential Portable Gas Cans /Evaporation (includes Diurnal losses)								
	21.1	HU	63%	0.99	7	13.2	72	72
25-01-011-013: Residential Portable Gas Cans /Spillage During Transport								
	2.7	HU	63%	0.99	7	1.7	9	9
25-01-011-014: Residential Portable Gas Cans /Refilling at the Pump - Vapor Displacement								
	0.9	HU	63%	0.99	7	0.5	3	3
25-01-011-015: Residential Portable Gas Cans /Refilling at the Pump - Spillage								
	0.1	HU	63%	0.99	7	4.7E-02	3.E-01	3.E-01
25-01-012-011: Commercial Portable Gas Cans /Permeation								
	0.3	Zoning	20%	0.99	7	0.1	4.E-01	4.E-01
25-01-012-012: Commercial Portable Gas Cans /Evaporation (includes Diurnal losses)								
	0.7	Zoning	20%	0.99	7	0.1	1	1
25-01-012-013: Commercial Portable Gas Cans /Spillage During Transport								
	3.6	Zoning	20%	0.99	7	0.7	4	4
25-01-012-014: Commercial Portable Gas Cans /Refilling at the Pump - Vapor Displacement								
	1.6	Zoning	20%	0.99	7	0.3	2	2
25-01-012-015: Commercial Portable Gas Cans /Refilling at the Pump - Spillage								
	0.1	Zoning	20%	0.99	7	2.8E-02	2.E-01	2.E-01
						----------	----------	----------
NAA Total						**23.5**	**128**	**128**

Notes for Table 2.4.56:

(1) Emissions are from the EPA 2008 NEI, v.1.5: Klamath County (DEQ Ref. 759)

(2) Residential PFCs associated with Housing Units (HU).

Commercial PFCs associated with the following nonroad categories that are fueled using PFCs:

Commercial, industrial, lawn & garden, logging, recreational.

EPA 420-R-07-001, Appendix A-1. (DEQ Ref. 757)

(3) Ratio of county-wide to NAA emissions as follows:

HU Ratio:	NAA Housing Units	18,767	(from Appendix B, Table B-1)
	County Housing Units	29,972	(from Appendix B, Table B-3)

	NAA to County Ratio	63%	

Commercial ratio is an average of the following zones (see note 2).

commercial	39.4%	(Appendix C, Table C-19, GIS ID 3)
industrial	37.8%	(Appendix C, Table C-19, GIS ID 5)
lawn & garden	17.2%	(Appendix C, Table C-19, GIS ID 9)
logging	0.3%	(Appendix C, Table C-19, GIS ID 6)
recreational	4.2%	(Appendix C, Table C-19, GIS ID 7)

Avg. NAA to County Ratio	20%	

GIS ID mapping and development is discussed in Part 2.5 of this document, with Maps shown in Appendix C.

(4) Seasonal Adjustment Factor (SAF) for PFC use is assumed equal to vehicle/equipment categories being refueled. SAF values are taken from the Klamath Falls SIP Appendices. *Appendix D6: Klamath Falls UGB PM10, Appendix D6-4: Emission Inventory and Forecast* . Oregon DEQ. October 2002. Appendix C, Table C1. (DEQ Ref. 699)

(5) DEQ staff assumption: assumes refueling activity could occur on any day of the week.

(6) Annual Emissions [tons/yr] = (Annual County Emissions, tpy) * (NAA to County Ratio)

(7) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.57. Klamath Falls NAA 2008 Area Source VOC Emissions From Truck Transport of Gasoline

(1)			(2)		(3)	(4)		(5) --- Nonattainment Area ---	(6)	(6)
Permit No.	Facility Name	Street Address	Final 2008 Total Annual (gal)	2008 Truck Transport Thruput (1000 gal)	EF (lb/10^3 gal)	Seasonal Adjustment Factor [SAF]	Activity [days/wk]	Annual Emissions [tons/yr]	Season Typical Day Emissions [lbs/day]	Season Worst Case Day Emissions [lbs/day]
SCC 25-05-030-120: Petrol & Petrol Product Transport /Truck /Gasoline										
18-9506	Ezell Suty Fuel Incorporated	2360 S 6TH ST	257,500	322	0.06	1	7	1E-02	5E-02	5E-02
18-9509	AMA Mini Mart, Inc.	7255 S 6TH ST	862,501	1,078	0.06	1	7	3E-02	2E-01	2E-01
18-9510	AMA Mini Mart, Inc.	5350 HWY 97	811,574	1,014	0.06	1	7	3E-02	2E-01	2E-01
18-9511	AMA Mini Mart, Inc.	522 S. 6TH STREET	1,219,357	1,524	0.06	1	7	5E-02	3E-01	3E-01
18-9512	Joey's Gas & Mini Mart	2566 S 6TH ST	1,559,053	1,949	0.06	1	7	6E-02	3E-01	3E-01
18-9513	New Albertson's, Inc.	5400 SOUTH 6TH STREET	2,086,674	2,608	0.06	1	7	8E-02	4E-01	4E-01
18-9519	Clough Oil Company	3303 WASHBURN WAY	412,690	516	0.06	1	7	2E-02	9E-02	9E-02
18-9520	Clough Oil Company	3620 N HWY 97	225,946	282	0.06	1	7	8E-03	5E-02	5E-02
18-9521	Clough Oil Company	3730 HWY 97N	791,908	990	0.06	1	7	3E-02	2E-01	2E-01
18-9522	Clough Oil Company	5800 S 6TH ST	921,805	1,152	0.06	1	7	3E-02	2E-01	2E-01
18-9523	Clough Oil Company	978 S SPRING ST	402,492	503	0.06	1	7	2E-02	8E-02	8E-02
18-9527	Fred Meyer Stores, Inc.	2655 SHASTA WAY	4,805,903	6,007	0.06	1	7	2E-01	1	1E+00
18-9528	Klamath Falls Kampground In	3435 SHASTA WAY	209,291	262	0.06	1	7	8E-03	4E-02	4E-02
18-9529	Truax Corporation	4315 S 6TH ST	2,550,000	3,188	0.06	1	7	1E-01	1	5E-01
18-9530	Colvin Oil Company	3434 S 6TH ST	911,798	1,140	0.06	1	7	3E-02	2E-01	2E-01
18-9531	American Energy, Inc.	2104 S 6TH ST	707,703	885	0.06	1	7	3E-02	1E-01	1E-01
18-9534	Oregon Avenue Food Mart	2075 OREGON AVE	1,022,686	1,278	0.06	1	7	4E-02	2E-01	2E-01
18-9543	Ferrell's Fuel Network, Inc.	977 S SPRING ST	24,190	30	0.06	1	7	9E-04	5E-03	5E-03
NAA Total				**24,729**				**0.7**	**4**	**4**

Notes for Table 2.4.57:

(1) Stations within the NAA mapped via ArcGIS. Please see Appendix A, Figure A-1.

(2) Raw data is from the AQ TRAACS database: Data received from Jerry Ebersole in March 2011.
Sources are active for 2008/2010.(DEQ Ref. 718).
2008 Klamath County emissions estimates for Gasoline Trucks in Transit (DEQ Ref.773.)
Truck Transport Thruput, gal = (2008 Fuel Dispensed Into UST's at Gas Stations, gal) * 1.25(a)
(a) DEQ Ref 321. Vol. III, Chapter 11, page 11.5-3&7

(3) VOC EF methodology is from DEQ Ref 321, EIIP Vol II, Chapt 11, eqn. 11.4-2
Total gasoline tank truck emissions ***(TTE), tons = ((TGD * LEF * GTA) + (TGD * UEF * GTA)) / 2000***
Where TGD = Total Gasoline Dispensed in the Inventory Region (1,000 gal): from Table 1
LEF = Loaded tank truck in-transit EF (lbs/1000 gal), from Table 11.3-1 = **0.005**
UEF = Unloaded tank truck in-transit EF (lbs/1000 gal), from Table 11.3-1 = **0.055**
GTA = Gasoline transportation adjustment factor = 1.25 (default factor given in EIIP),
this factor has already been used in the thruput calculations (Table 1).

VOC EF, lb/1000 gal transported = ***0.06***

EIIP. Table 11.3-1 VOC Emission Factor for Gasoline Marketing Activities (a)

Emission Source	mg/Liter Throughput	lb/1000 gal Throughput
Gasoline Tank Trucks in Transit		
Vapor-filled Tank Trucks (b)	6.5	0.055
Gas-filled Tank Trucks (c)	0.5	0.005

(a) Source: AP-42 Tables 5.2-5, 5.2-7.
(b) Midpoint of typical range provided in AP-42. Under extreme conditions, the upper end of the range is 0.37 lb/1000 gal (44.0 mg/L).
(c) Midpoint of typical range provided in AP-42. Under extreme conditions, the upper end of the range is 0.08 lb/1000 gal (9.0 mg/L).

(4) Seasonal adjustment factor (SAF) = ([season activity] * [12 months]) / ([annual activity] * [season months])
Monthly activity is from EPA temporal allocation profiles, DEQ Ref. 760.

Jan	**83**		Jul	83
Feb	**83**		Aug	83
Mar	83		Sep	83
Apr	83		Oct	83
May	83		**Nov**	**83**
Jun	83		**Dec**	**83**

Shaded cells indicate the PM season. The SAF is calculated as follows:
Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
SAF= 1.0

(5) Annual Emissions [tons/yr] = 2008 Truck Transport Thruput (1000 gal) * EF (lb/103 gal)

(6) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.
Typical Day and Worst Case Day Emissions =
((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

Table 2.4.58. Klamath Falls NAA 2008 Area Source VOC and NH_3 Emissions From Domestic Sewage and Wastewater Treatment

(1) DEQ Facility Profiler ID	(1) Facility Name	(1) Street Address	(2) -- Dry Weather -- --- Design Flow --- (GPD)	(3) (MGD)	(4) VOC EF (lb/10^6GAL)	(4) NH3 EF (lb/10^6GAL)	(5) Seasonal Adjustment Factor (SAF)	(5) Activity (dy/wk)	(6) Annual Emissions VOC (tpy)	(6) NH3 (tpy)	(7) --- Seasonal Emissions --- --- VOC --- TSD (lb/day)	(7) WCD (lb/day)	(7) --- NH3 --- TSD (lb/day)	(7) WCD (lb/day)
26-30-000-000: Wastewater Treatment /All Categories /Total Processed														
7831	KLAMATH COUNTY SCHOOL DISTRICT(a)	8245 HWY 39		0.695	0.85	0.169	1	7	0.1	2.E-02	6.E-01	6.E-01	1.E-01	1.E-01
34122	MAY-SLADE OIL COMPANY	8600 HIGHWAY 97 S	1,200	0.0012	0.85	0.169	1	7	2.E-04	4.E-05	1.E-03	1.E-03	2.E-04	2.E-04
34119	LEE HAROLD	6767 TINGLEY LANE	17,000	0.017	0.85	0.169	1	7	3.E-03	5.E-04	1.E-02	1.E-02	3.E-03	3.E-03
90156	TOPPERS TAVERN	5125 WEYERHAEUSER RD.	850	0.00085	0.85	0.169	1	7	1.E-04	3.E-05	7.E-04	7.E-04	1.E-04	1.E-04
789	COLUMBIA PLYWOOD CORPORATION	HWY 97 SOUTH	1,920	0.0019	0.85	0.169	1	7	3.E-04	6.E-05	2.E-03	2.E-03	3.E-04	3.E-04
78737	SHASTA VIEW ANIMAL CLINIC	1652 DITCH RIDER ROAD	1,256	0.0013	0.85	0.169	1	7	2.E-04	4.E-05	1.E-03	1.E-03	2.E-04	2.E-04
15727	UNITARIAN UNIVERSALIST FELLOWSHIP OF KLAMATH COUNT	9669 HWY 140 EAST	850	0.00085	0.85	0.169	1	7	1.E-04	3.E-05	7.E-04	7.E-04	1.E-04	1.E-04
15360	WAMPLER BENNIE J.	6805 HWY 39	1,500	0.0015	0.85	0.169	1	7	2.E-04	5.E-05	1.E-03	1.E-03	3.E-04	3.E-04
81050	RABANCO LTD	4005 TINGLEY LANE	< 200	0.0002	0.85	0.169	1	7	3.E-05	6.E-06	2.E-04	2.E-04	3.E-05	3.E-05
13316	SOUTH SUBURBAN SANITARY DISTRICT	2980 MAYWOOD DR	2.3E+06	2.3	0.85	0.169	1	7	0.4	0.1	2	2	4.E-01	4.E-01
13174	KLAMATH FALLS CITY OF	1200 S SPRING ST	6.0E+06	6.0	0.85	0.169	1	7	0.9	0.2	5	5	1	1
59845	COCULA RESTAURANT	5500 HWY 97 N.	4,800	0.0048	0.85	0.169	1	7	7.E-04	1.E-04	4.E-03	4.E-03	8.E-04	8.E-04
15433	SOYLAND AUDIE; SOYLAND LINDA	OREGON MOTEL 8 RV PARK 5225 HWY 97 N	5,520	0.0055	0.85	0.169	1	7	9.E-04	2.E-04	5.E-03	5.E-03	9.E-04	9.E-04
									------	------	------	------	------	------
Totals									**1.4**	**0.3**	**8**	**8**	**2**	**2**

Notes for Table 2.4.58

(1) DEQ Facility Profiler: http://deq12.deq.state.or.us/fp20/

Water Quality permits are NPDES (Domestic Wastewater Treatment) and
WPCF (Domestic On-Site Sewage System)

(2) Dry-weather design flow, gallons per day (GPD) is from DEQ permits: DEQ Ref. 776.

(3) Dry-weather design flow, million gallons per day (MGD) = (flowrate, GPD) / (1000000)

(a) Klamath County School District = average of all other facilities.

(4) EPA 2008 NEI data, DEQ Ref. 777.

(5) Activity is considered uniform throughout the year (EPA Temporal Profiles, DEQ Ref. 760)

(6) Annual emissions, tpy =
(Dry Weather Design Flow, MGD) (Emission Factor, lb/million gal) * (365 days/yr) / (2000 lbs/ton)

(7) Typical Season Day (TSD) and Worst-Case Day (WCD) considered equal since activity is considered uniform throughout the year (see note 5).
Typical and worst case season day emissions, lbs/day =
[(Annual Emissions, tpy) * (SAF) / (2000 lb/ton)] / [(Activity, day/wk) * (52 weeks/yr)]

Table 2.4.59. Klamath Falls NAA 2008 Area Source VOC and NH_3 Emissions From the Klamath Falls Municipal Landfill

26-20-030-000: Landfills /Municipal /Total	(1)		(2)	(2)	(3)	(3)
					---- PM Season ----	
Landfill Gas Pollutant	2008 Annual Emissions (tons/yr)		Seasonal Adjustment Factor (SAF)	Activity (dy/wk)	Typical Day Emissions (lb/day)	Worst Case Day Emissions (lb/day)
NAA Total VOC	**11.3**	(a)	1.0	7	**62**	**62**
NAA Total Ammonia	**9.5**	(b)	1.0	7	**52**	**52**

Notes for Table 2.4.59.

(1) LandGEM Landfill Gas Emissions Model, v. 3.02., 2008 Klamath Falls Landfill results. DEQ Ref. 771.

(a) VOC total = ∑ landfill gas pollutants

Landfill Gas Pollutant	2008 tpy
1,1,2,2-Tetrachloroethane - HAP/VOC	6.E-02
1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	8.E-02
1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	6.E-03
1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	1.E-02
1,2-Dichloropropane (propylene dichloride) - HAP/VOC	6.E-03
2-Propanol (isopropyl alcohol) - VOC	1.E+00
Acrylonitrile - HAP/VOC	1.E-01
Benzene - No or Unknown Co-disposal - HAP/VOC	5.E-02
Benzene - Co-disposal - HAP/VOC	3.E-01
Bromodichloromethane - VOC	2.E-01
Butane - VOC	9.E-02
Carbon disulfide - HAP/VOC	1.E-02
Carbon tetrachloride - HAP/VOC	2.E-04
Carbonyl sulfide - HAP/VOC	9.E-03
Chlorobenzene - HAP/VOC	9.E-03
Chlorodifluoromethane	4.E-02
Chloroethane (ethyl chloride) - HAP/VOC	3.E-02
Chloroform - HAP/VOC	1.E-03
Chloromethane - VOC	2.E-02
Dichlorobenzene - (HAP for para isomer/VOC)	1.E-02
Dichlorofluoromethane - VOC	8.E-02
Dichloromethane (methylene chloride) - HAP	4.E-01
Dimethyl sulfide (methyl sulfide) - VOC	2.E-01
Ethanol - VOC	4.E-01
Ethyl mercaptan (ethanethiol) - VOC	5.E-02
Ethylbenzene - HAP/VOC	2.E-01
Ethylene dibromide - HAP/VOC	6.E-05
Fluorotrichloromethane - VOC	3.E-02
Hexane - HAP/VOC	2.E-01
Hydrogen sulfide	4.E-01
Mercury (total) - HAP	2.E-05
Methyl ethyl ketone - HAP/VOC	2.E-01
Methyl isobutyl ketone - HAP/VOC	6.E-02
Methyl mercaptan - VOC	4.E-02
Pentane - VOC	8.E-02
Perchloroethylene (tetrachloroethylene) - HAP	2.E-01
Propane - VOC	2.E-01
t-1,2-Dichloroethene - VOC	9.E-02
Toluene - No or Unknown Co-disposal - HAP/VOC	1.E+00
Toluene - Co-disposal - HAP/VOC	5.E+00
Trichloroethylene (trichloroethene) - HAP/VOC	1.E-01
Vinyl chloride - HAP/VOC	1.E-01
Xylenes - HAP/VOC	4.E-01
Total	**11.3**

(b) Ammonia emissions estimated from landfill gas total emissions:

Landfill gas total emissions =	9,514.3	tpy (DEQ Ref. 771)
Percent Ammonia =	0.1%	(i)

Total Ammonia Emissions	**9.5**	tpy

(i) 0.1% of the landfill gas total is a conservative low estimate (DEQ Ref. 772).

A conservative low estimate was used as the Klamath Falls Landfill is currently permitted for construction and demolition debris only, though it did accept organic waste in the past.

(2) Seasonal and weekly activity are from EPA temporal allocation files, DEQ Ref. 760

DEQ data shows that POTW activity is uniform throughout both the week and year.

(3) Typical Day and Worst Case Day Emissions are the assumed the same due to uniform activity & lack of applicable restrictions.

Typical Day and Worst Case Day Emissions =

((Annual Emissions, tons/yr) * (SAF)* (2000 lbs/ton)) / ((activity [days/wk]) * (52 [wks/yr]))

2.5 Nonroad Mobile Sources

2.5.1 Introduction and Scope

Within the Klamath Falls NAA, non-road mobile emission source categories inventoried include gasoline and diesel-powered vehicles and equipment, aircraft, recreational marine vessels, and rail. Commercial marine vessels were not inventoried due to lack of suitable environment and little to no documented activity.

2.5.2 EPA NONROAD2008a Emissions Model

With the exception of aircraft and locomotive emissions, emissions for nonroad vehicles and equipment were modeled using the EPA NONROAD2008a emissions model, downloaded from *http://www.epa.gov/oms/nonrdmdl.htm.* The model was used to generate emissions from all 2-stroke, 4-stroke, diesel, CNG, and LPG nonroad vehicles and equipment, including recreational marine vessels. Model inputs included parameters for temperature, fuel, time period, inventory area, and emission sources. The model generated emissions data for annual, typical season day, and worst-case season day, depending upon input parameters entered.

2.5.2.1 NONROAD2008a: Inputs, GIS Allocation, and Results

The following sections detail the inputs used for the NONROAD2008a runs, the vehicle and equipment types covered by the model, and how county-wide model output was allocated to the NAA.

2.5.2.1.1 Gasoline RVP, Sulfur Content, and Ethanol Content

Gasoline parameters were taken from the EPA National County Database (NCD)[791], and are specific to Klamath County, Oregon. The following bullets describing NCD gasoline parameter data are taken from EPA documentation[790]:

- Gasoline properties in the NCD were determined by the Eastern Research Group, Inc., (ERG) under contract to EPA using gasoline survey data from several surveys.
- Market share within the NCD for oxygenated gasolines was obtained from the EPA Oxygenate Type Analysis Tables and the Federal Highway Administration website.
- All gasoline properties are area-wide averages, except for oxygenates, which are allowed to have market shares. Three fuels (winter, summer, and spring/fall) are determined for each county and assigned to months by season. Months representing seasons vary by location. Spring/fall gasoline properties are derived from summer and winter fuels by interpolation.

2.5.2.1.2 Gasoline Ethanol Market Share

As of July 15, 2008, all retail, nonretail, or wholesale dealers within Klamath County may only sell or offer for sale gasoline that contains 10% EtOH by volume[739]. Exempt marina dealers are estimated to represent 2% of the total market. Previous to July 15, 2008, a market share of 30% has been estimated by DEQ[580a].

2.5.2.1.3 Gasoline Oxygen Weight Percent

Gasoline oxygen wt% is based on a formula provided in EPA NONROAD2008a download documentation:

*Gasoline Oxygen wt% = (EtOH blend market %) * (EtOH volume %) * 0.35 * 0.01*

2.5.2.1.4 Fuel Sulfur Weight Percent
Land diesel fuel parameters are from the EPA National County Database (NCD), and are specific to Klamath County, Oregon[791]. Marine diesel sulfur content was taken from EPA-420-B-09-018, *Suggested Nationwide Fuel Properties*[738]. CNG/LPG sulfur content is a conservative high estimate (maximum amount allowable) of 123 ppm for HD5 propane (LPG) rated for engine use[512e].

2.5.2.1.5 Temperature
Average, average high, and average low temperature values for Kingsley Field Airport were downloaded from the NOAA National Climatic Data Center website[792]. The data was imported into an MS Access database, and average, average maximum, and average minimum temperatures were annually and seasonally calculated using the database.

2.5.2.1.6 Stage II Controls: Vapor Recovery Systems (VRS) at the Pump
Stage II controls are not implemented in Klamath Falls; as such, model input was set to 0 for Stage II Controls.

2.5.2.1.7 Model Source Categories and Examples of Vehicles and Equipment
NONROAD2008a output is specific to vehicles and equipment. The major source categories covered by the model are shown below, along with some examples of vehicles and equipment within each category:

- *Recreational:* All Terrain Vehicles (ATV's), Mini-bikes, Off-Road Motorcycles, Golf Carts, Snowmobiles, Specialty Vehicle Carts
- *Construction*: Asphalt Pavers, Tampers/Rammers, Plate Compactors, Concrete Pavers, Rollers, Scrapers, Paving Equipment, Surfacing Equipment, Signal Boards, Trenchers, Bore/Drill Rigs, Excavators, Concrete/Industrial Saws, Cement and Mortar Mixers, Cranes, Graders, Off-Highway Trucks, Crushing/Proc. Equip., Rough Terrain Forklifts, Rubber Tired Loaders, Rubber Tired Dozers, Tractors/Loaders/Backhoes, Crawlers, Skid Steer Loaders, Off-Highway Tractors, Dumpers/Tenders, Other Construction Equipment
- *Industrial*: Aerial Lifts, Forklifts, Sweepers/Scrubbers, Other General Industrial Equipment, Other Material Handling Equipment
- *Lawn & Garden*: Trimmers/Edgers/Brush Cutters, Lawn Mowers, Leaf Blowers/Vacuums, Rear Engine Riding, Mowers, Front Mowers, Chainsaw < 4 HP, Shredder <5 HP, Tillers < 5 HP, Lawn & Garden Tractors, Wood Splitters, Snowblowers, Chippers/Stump Grinders, Commercial Turf Equipment, Other Lawn & Garden Equipment
- *Agricultural*: 2-Wheel Tractors, Agricultural Tractors, Agricultural Mowers, Combines, Sprayers, Balers, Tillers >5 HP, Swathers, Hydropower Units, Irrigation Equipment
- *Light Commercial*: Generator Sets, Pumps, Air Compressors, Gas Compressors, Welders, Pressure Washers
- *Logging*: Chainsaws >4 HP, Shredders >5 HP, Skidders, Fellers/Bunchers
- *Recreational Marine*: 2-stroke, 4-stroke, and diesel engines. Outboard, personal watercraft, and inboard/sterndrive vessels
- *Railway Maintenance*: Diesel, 4-stroke, and LPG railway maintenance vehicles and equipment

2.5.2.1.8 Allocation of Model Output: County to NAA

For all categories except recreational marine and railway maintenance equipment, ArcGIS 10 was used to allocate NONROAD2008a county-wide emissions estimates to the NAA. A Klamath County zoning shapefile was obtained from Klamath County MIS, and equipment and vehicle categories were matched to one or more of the following zones or zone mixes;

- GIS ID 1. Agricultural: primarily farm and cropland
- GIS ID 2. Agricultural: farm, cropland, and grazing
- GIS ID 3. Commercial
- GIS ID 4. Construction: commercial/residential/industrial zoning mix
- GIS ID 5. Industrial
- GIS ID 6. Forest
- GIS ID 7. Golf Course
- GIS ID 8. Recreational: farm zoning and low-density housing zoning mix
- GIS ID 9. Commercial Lawn and Garden: residential and commercial zoning mix
- GIS ID 10. Residential Lawn and Garden: residential zoning

Acreages for each of the zones and zone mixes for both the county and the NAA were calculated using ArcGIS 10. Model output was then allocated to NAA using the following formula:

*NAA Emissions = County Emissions * ((NAA Zone Acreage) / (County Zone Acreage))*

County-wide recreational marine emissions estimates were allocated to the NAA using Oregon State Marine Board survey results for recreational boating waterbody use[342e]. A ratio of use days on upper Klamath Lake, including Pelican Marina, the Klamath Yacht Club, and Moore Park Marina II , vs. county-wide use days was used to apportion county-wide recreational marine emissions estimates to the NAA. County-wide railway maintenance equipment emissions were allocated to the NAA via GIS analysis of track length.

2.5.2.1.9 Results

NONROAD2008a emissions output results for all vehicles and equipment except railway maintenance and recreational marine, allocated to NAA, are detailed in Tables 2.5.5 through 2.5.20. NONROAD2008a emissions output for railway maintenance equipment are included in the rail emissions estimates; please see section 2.5.4. NONROAD2008a emissions output for recreational marine vessels are shown in Tables 2.5.29 through 2.5.32. Model inputs, output, and GIS allocation are further detailed in Appendix C, Tables C-1 through C-20, and Figures C-1 through C-9.

2.5.3 Aircraft and Airport Operations Emissions

This emission inventory includes aircraft emissions from Klamath Falls International Airport (Kingsley Field); the only airport within the Klamath Falls NAA that has an FAA operated control tower. Emissions categories within the airport include aircraft, ground support equipment (GSE), aircraft auxliliary power units (APUs), and aircraft refueling (fugitive VOC emissions only).

2.5.3.1 Aircraft
In its most basic form, the equation that is used for estimating aircraft emissions is:

*Aircraft Emissions = (LTO) * (EF)*

Where LTO = activity in the form of aircraft Landing/TakeOff cycles
EF = pollutant Emission Factor, lbs/LTO; specific to either a) aircraft model and engine, or b) aircraft fleet type and/or engine type

The vertical mixing height for each LTO cycle is considered to be 3,000 ft., ie. emissions are estimated for aircraft operating within an altitude of 3,000 ft of the airport. Emissions from aircraft at cruising altitude are not included in the inventory.

In conformance with EPA guidance[91], aircraft emissions for Kingsley Field were inventoried, grouped, and summed by aircraft fleet type. The four aircraft fleet types present at Kingsley Field are commercial aviation, general aviation, air taxi, and military aircraft. Commercial aviation consists primarily of large jet aircraft carrying passengers or freight. General aviation is comprised of smaller aircraft that are used mostly for business purposes. Air taxis fly scheduled service carrying passengers and/or freight, but are usually smaller aircraft that operate on a more limited basis than commercial aircraft. For Kingsley Field, military aircraft are comprised almost exclusively of F-15 fighter jets.

LTO activity data for military, general aviation, and air taxi activity at Kingsley Field was obtained from the Federal Aviation Administration (FAA) Air Traffic Activity Data System (ATADS). Commercial aircraft LTOs were provided by the US Dept. of Transportation Research and Innovative Technology Administration[749]. Emission factors per LTO were taken from EPA documentation; *Documentation for the Aircraft Component of the National Emissions Inventory Methodology, Appendix A, Generic Aircraft Emission Factors/ Speciation Profiles*[745].

Typical and worst-case season day aircraft emissions were estimated using fleet and date specific LTO data. An average number of daily LTOs throughout the PM season was used to estimate typical season day emissions, whereas the highest number of daily LTOs during the season was used to estimate the worst-case day emissions.

2.5.3.2 Aircraft Ground Support Equipment and Auxiliary Power Units
Emissions estimates for airport ground support equipment (GSE) and aircraft auxiliary power units (APUs) were modeled using the Emissions Dispersion and Modeling System (EDMS) 5.1.3. The EDMS model is the model required by the FAA to perform air quality analysis on aircraft and aircraft related sources. The model was selected as it generates emissions estimates for APUs, and provides more accurate output for GSE than the NONROAD2008a. Kingsley Field was selected as the airport, and aircraft LTOs and aircraft type specific to the airport were input for the model run. Aircraft LTO data was used to develop the GSE/APU seasonal adjustment factor, and to adjust GSE/APU emissions to worst-case day.

2.5.3.3 Aircraft Refueling and Fuel Storage

Emissions from stage I and stage II aircraft refueling and fugitive emissions from aircraft fuel storage are included in the VOC emissions estimates for Kingsley Field. Data for aviation gas and jet fuel sold in 2008 were obtained from the Oregon Fuel Tax Group[794]. Emission factors used were obtained from the EPA Emission Inventory Improvement Program[321], EPA NEI documentation[623], and US Air Force documentation[793]. Aircraft LTO data was used to develop the refueling/fuel storage seasonal adjustment factors, and to adjust refueling/fuel storage emissions to worst-case day.

Emissions estimates and supporting documentation and calculations for Klamath Falls International Airport are shown in Tables 2.5.21 through 2.5.24. Appendix C, Tables C-21 through C-23 further detail source data and methodology.

2.5.4 Rail

Class 1 and Class 2 and 3 railroads were considered for the emission inventory. Three Class 1 railroads operated within the Klamath Falls NAA in 2008; Burlington Northern Santa Fe (BNSF), Union Pacific (UP), and Amtrak. The sole Class 2 & 3 railroad operating in Klamath County was Klamath Northern Railroad, and this railroad does not operate in the NAA[422]. Locomotive activity considered for this category included line haul (road) and switching (yard) operations.

Line-haul and switching county-wide fuel consumption data were provided to DEQ by UP, Amtrak, and BNSF[704]. The NAA annual fuel consumption for BNSF and UP was estimated using NAA to county track length through ArcGIS mapping. The allocation to NAA for each railroad was possible as track length and ownership data are included in the DEQ GIS library rail shapefile. Amtrak county-wide track mileage was provided by Amtrak, and the allocation to NAA was also done via ArcGIS mapping. Through GIS mapping, it was verified that the only rail yard located within the NAA is the BNSF Klamath Falls yard. Fuel consumption for the Klamath Falls yard was provided by BNSF[704].

Emission factors were taken from EPA's *Emission Factors for Locomotives*[715]. PM_{10} emissions estimates were speciated to $PM_{2.5}$ using the suggested ratio from NONROAD2008a supporting documentation (EPA420-P-04-009,April 2009, page.23). The locomotive emission factors used for the inventory are specific to line-haul freight, line-haul passenger, and yard, and account for fleet penetration of Tier 1 through Tier 4 locomotives through 2008.

Railway maintenance equipment emissions estimates were generated by EPA NONROAD2008a; please see section 2.5.2.1 for further details. Locomotive activity is considered uniform throughout the year, and as such typical season day emissions were set equal to 1/365th of the annual estimates. Worst-case day emissions were assumed equal to typical season day emissions.

Emissions estimates and supporting documentation and calculations for locomotive and railway maintenance equipment are shown in Tables 2.5.25 through 2.5.28. Appendix C, Figure C-10 shows the ArcGIS mapping of rail lines and yards in relation to the NAA.

2.5.5 Commercial Marine Vessels

There are two bodies of water in Klamath County that fall within the NAA boundary; Lake Ewana and Upper Klamath Lake. However, these waterbodies only support recreational activities such as fishing, and pleasure boating. As such, no emissions estimates for commercial marine vessels are included in this inventory.

2.5.6 Nonroad Vehicles and Equipment Source Comparison

The nonroad source categories listed above are compared and summarized in Figures 2.5-1 through 2.5-4, and Tables 2.5.1 through 2.5.4. Each category is summarized independently in Tables 2.5.5 through 2.5.34. The contribution of pollutants contributing to the secondary formation of $PM_{2.5}$ is considered minimal[789], and as such *Figures* representing the distribution and percentages of pollutants contributing to secondary formation of $PM_{2.5}$ are not included in this EI. Emissions from all pollutants are represented in tables in this document.

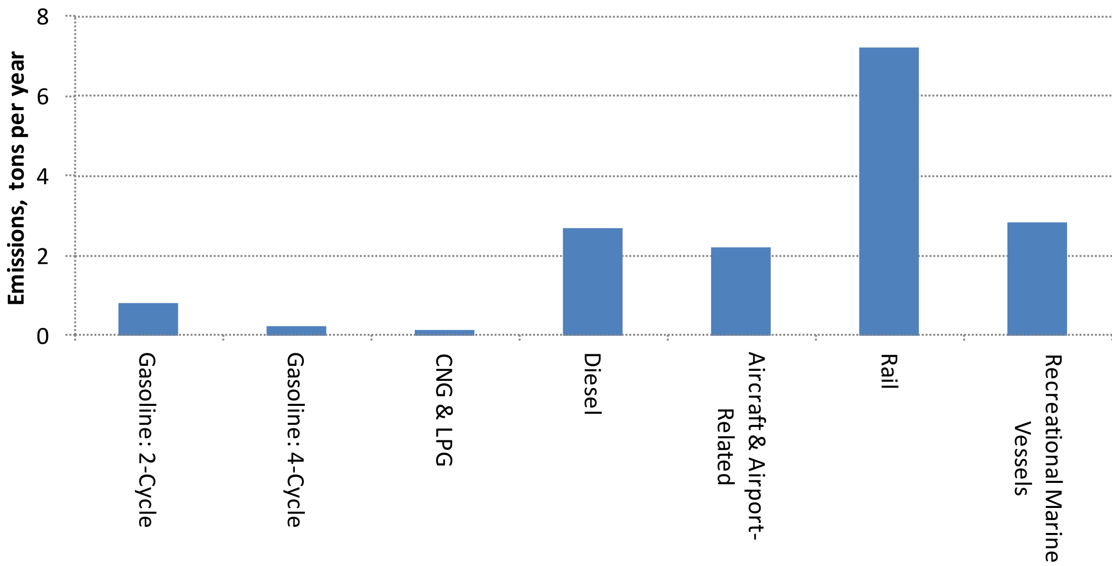

Figure 2.5-1. Distribution of NAA Annual Nonroad Source PM $_{2.5}$ Emissions, 2008

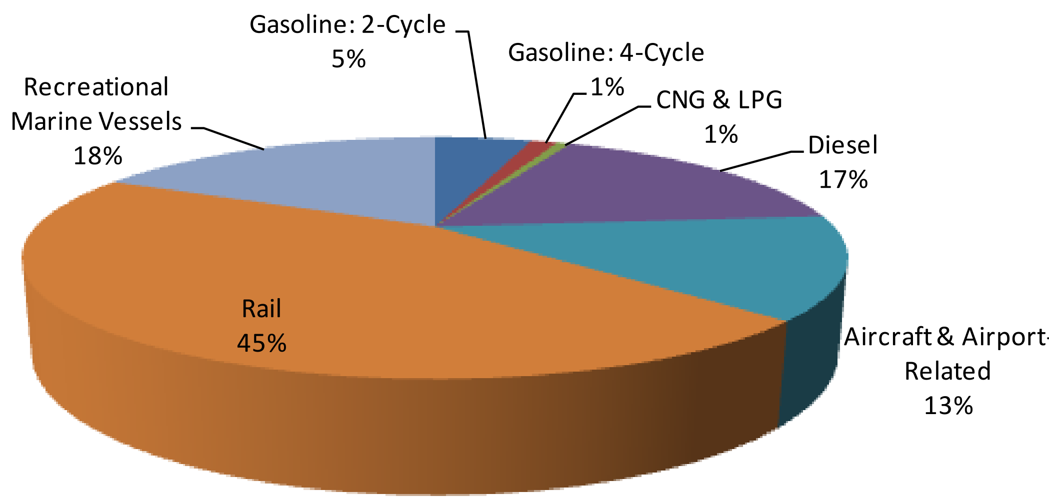

Figure 2.5-2. Percentage of NAA Annual Nonroad $PM_{2.5}$ Source Emissions, 2008

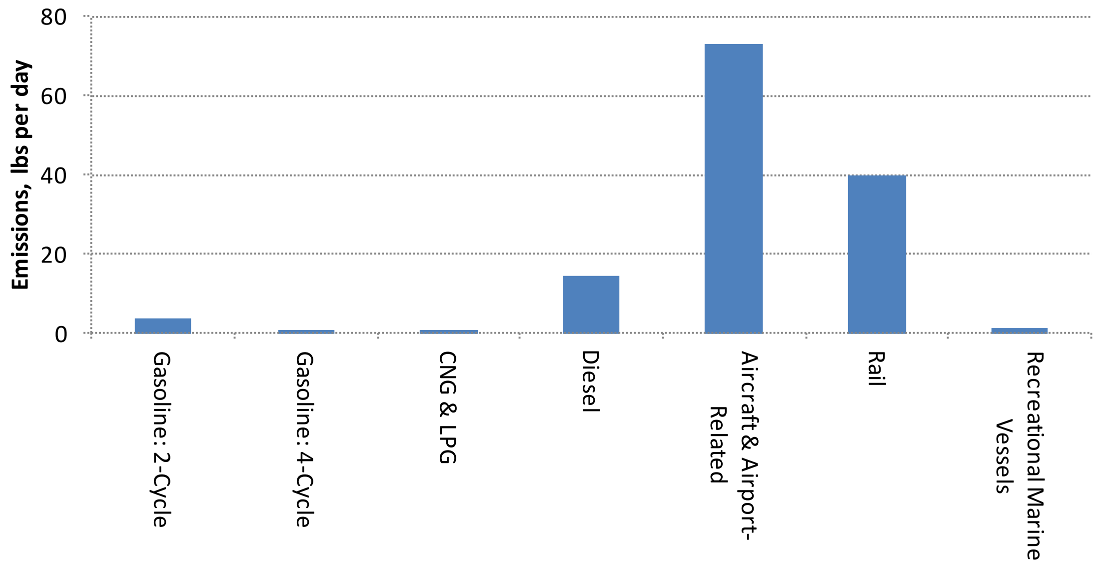

Figure 2.5-3. Distribution of NAA Worst-Case Season Day Nonroad Source PM $_{2.5}$ Emissions, 2008

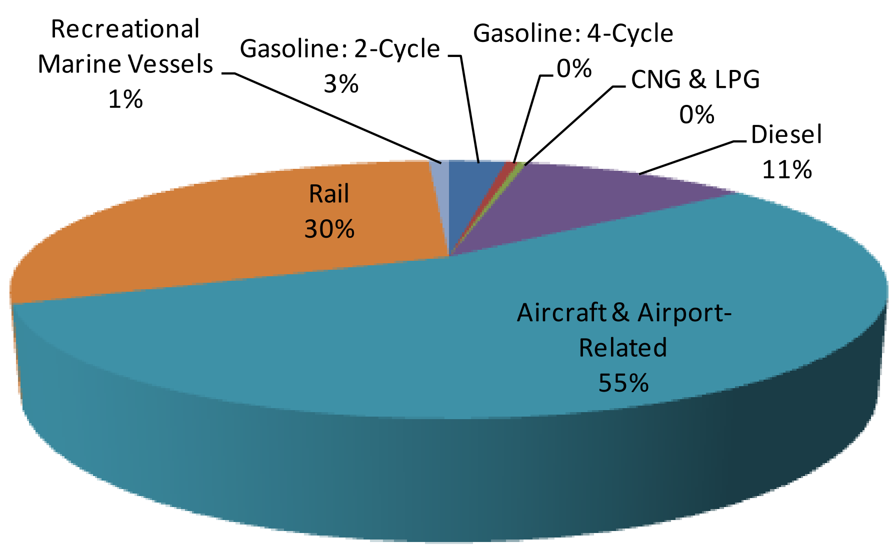

Figure 2.5-4. Percentage of NAA Worst-Case Season Day Nonroad $PM_{2.5}$ Source Emissions, 2008

Table 2.5.1. Klamath Falls NAA 2008 Annual & PM Season: Summary $PM_{2.5}$ Emissions from Nonroad Sources

Source Description	Table Number	SCC	---------- $PM_{2.5}$ ---------- Annual (tpy)	Worst-Case Day (lbs/day)
NONROAD VEHICLES AND EQUIPMENT				
Gasoline: 2-Cycle		22-60-000		
Recreational	2.5.5	22-60-001-000	0.4	2
Construction	2.5.5	22-60-002-000	0.1	3.E-01
Industrial	2.5.5	22-60-003-000	5.E-04	3.E-03
Lawn & Garden	2.5.5	22-60-004-000	0.2	1
Agricultural	2.5.5	22-60-005-000	7.E-04	1.E-03
Light Commercial	2.5.5	22-60-006-000	0.1	5.E-01
Logging	2.5.5	22-60-007-000	7.E-03	4.E-02
Subtotal 2- Cycle Gas			**0.8**	**4**
Gasoline: 4-Cycle		22-65-000		
Recreational	2.5.9	22-65-001-000	0.1	1.E-01
Construction	2.5.9	22-65-002-000	4.E-03	2.E-02
Industrial	2.5.9	22-65-003-000	8.E-03	4.E-02
Lawn & Garden	2.5.9	22-65-004-000	0.1	8.E-02
Agricultural	2.5.9	22-65-005-000	1.E-03	2.E-03
Light Commercial	2.5.9	22-65-006-000	0.1	1
Logging	2.5.9	22-65-007-000	1.E-04	8.E-04
Subtotal 4- Cycle Gas			**0.2**	**1**
CNG & LPG		22-67/68		
Recreational	2.5.13	22-67/68-001-000	1.E-05	3.E-05
Construction	2.5.13	22-67/68-002-000	4.E-04	2.E-03
Industrial	2.5.13	22-67/68-003-000	1.E-01	5.E-01
Lawn & Garden	2.5.13	22-67/68-004-000	8.E-05	1.E-04
Agricultural	2.5.13	22-67/68-005-000	1.E-05	2.E-05
Light Commercial	2.5.13	22-67/68-006-000	9.E-03	6.E-02
Logging	2.5.13	22-67/68-007-000	--	--
Subtotal CNG/LPG			**0.1**	**1**
Diesel		22-70-000		
Recreational	2.5.17	22-70-001-000	4.E-03	9.E-03
Construction	2.5.17	22-70-002-000	1.5	8
Industrial	2.5.17	22-70-003-000	0.7	3
Lawn & Garden	2.5.17	22-70-004-000	2.E-02	3.E-02
Agricultural	2.5.17	22-70-005-000	2.E-02	3.E-02
Light Commercial	2.5.17	22-70-006-000	0.5	3
Logging	2.5.17	22-70-007-000	--	--
Subtotal Diesel			**2.7**	**14**

Table 2.5.1 Continued

Source Description	Table Number	SCC	---------- $PM_{2.5}$ ---------- Annual (tpy)	Worst-Case Day (lbs/day)
AIRPORT/RAIL/MARINE				
Kingsley Field Airport				
Military Aircraft	2.5.21	22-75-001-000	0.2	4
Commercial Aircraft	2.5.21	22-75-020-000	1.1	44
General Aviation	2.5.21	22-75-050-000	0.1	3
Air Taxi	2.5.21	22-75-060-001	0.1	2
Ground Support Equipment	2.5.21	22-XX-008-000	0.6	19
Auxiliary Power Units (APU)	2.5.21	22-75-070-000	4.E-02	1
Subtotal Airport			**2.2**	**74**
Rail				
Line Haul Locomotives: Class I	2.5.25	22-85-002-006	6.3	34
Line Haul Locomotives: Class II & III	2.5.25	22-85-002-007	0	0
Line Haul Locomotives: Passenger	2.5.25	22-85-002-008	0.3	2
Yard Locomotives	2.5.25	22-85-002-010	0.6	3
Maintenance Eqpmt: Gas, 2-Stroke	2.5.25	22-85-002-015	0.1	1
Maintenance Eqpmt: Gas, 4-Stroke	2.5.25	22-85-004-015	4.E-04	3.E-03
Maintenance Eqpmt: LPG	2.5.25	22-85-006-015	1.E-05	7.E-05
Subtotal Rail			**7.2**	**40**
Recreational Marine Vessels				
Gas, 2-Stroke: Outboard	2.5.29	22-82-005-010	2.0	1
Gas, 2-Stroke: Personal Water Craft	2.5.29	22-82-005-015	0.7	3.E-01
Gas, 4-Stroke: Inboard/Sterndrive	2.5.29	22-82-010-005	0.1	2.E-02
Diesel: Inboard/Sterndrive	2.5.29	22-82-020-005	0.1	6.E-02
Diesel: Outboard	2.5.29	22-82-020-010	3.E-03	2.E-03
Subtotal Recreational Marine			**2.8**	**1**
Nonroad Vehicles and Equipment Total PM2.5			**16.1**	**135**

Table 2.5.2. Klamath Falls NAA 2008 Annual & PM Season: Summary NO_X Emissions from Nonroad Sources

Source Description	Table Number	SCC	---------- NO_X ---------- Annual (tpy)	Worst-Case Day (lbs/day)
NONROAD VEHICLES AND EQUIPMENT				
Gasoline: 2-Cycle		22-60-000		
Recreational	2.5.7	22-60-001-000	0.1	1
Construction	2.5.7	22-60-002-000	8.E-03	5.E-02
Industrial	2.5.7	22-60-003-000	1.E-04	8.E-04
Lawn & Garden	2.5.7	22-60-004-000	0.1	3.E-01
Agricultural	2.5.7	22-60-005-000	2.E-04	4.E-04
Light Commercial	2.5.7	22-60-006-000	2.E-02	1.E-01
Logging	2.5.7	22-60-007-000	1.E-03	7.E-03
Subtotal 2- Cycle Gas			**0.2**	**1**
Gasoline: 4-Cycle		22-65-000		
Recreational	2.5.11	22-65-001-000	1.7	4
Construction	2.5.11	22-65-002-000	0.2	1
Industrial	2.5.11	22-65-003-000	0.5	4
Lawn & Garden	2.5.11	22-65-004-000	1.8	3
Agricultural	2.5.11	22-65-005-000	0.1	2.E-01
Light Commercial	2.5.11	22-65-006-000	2.6	22
Logging	2.5.11	22-65-007-000	6.E-03	5.E-02
Subtotal 4- Cycle Gas			**6.9**	**35**
CNG & LPG		22-67/68		
Recreational	2.5.15	22-67/68-001-000	2.E-03	5.E-03
Construction	2.5.15	22-67/68-002-000	0.1	3.E-01
Industrial	2.5.15	22-67/68-003-000	10.8	56
Lawn & Garden	2.5.15	22-67/68-004-000	9.E-03	1.E-02
Agricultural	2.5.15	22-67/68-005-000	2.E-03	3.E-03
Light Commercial	2.5.15	22-67/68-006-000	1.0	6
Logging	2.5.15	22-67/68-007-000	--	--
Subtotal CNG/LPG			**11.9**	**63**
Diesel		22-70-000		
Recreational	2.5.19	22-70-001-000	3.E-02	6.E-02
Construction	2.5.19	22-70-002-000	18.1	97
Industrial	2.5.19	22-70-003-000	8.3	41
Lawn & Garden	2.5.19	22-70-004-000	0.2	4.E-01
Agricultural	2.5.19	22-70-005-000	0.2	3.E-01
Light Commercial	2.5.19	22-70-006-000	4.5	29
Logging	2.5.19	22-70-007-000	--	--
Subtotal Diesel			**31.3**	**168**

Table 2.5.2. Continued

Source Description	Table Number	SCC	---------- NO_X ---------- Annual (tpy)	Worst-Case Day (lbs/day)
AIRPORT/RAIL/MARINE				
Kingsley Field Airport				
Military Aircraft	2.5.24	22-75-001-000	0.4	9
Commercial Aircraft	2.5.24	22-75-020-000	19.9	776
General Aviation	2.5.24	22-75-050-000	0.3	7
Air Taxi	2.5.24	22-75-060-001	0.2	4
Ground Support Equipment	2.5.24	22-XX-008-000	11.5	375
Auxiliary Power Units (APU)	2.5.24	22-75-070-000	0.2	7
Subtotal Airport			**32.5**	**1,177**
Rail				
Line Haul Locomotives: Class I	2.5.28	22-85-002-006	214.0	1,176
Line Haul Locomotives: Class II & III	2.5.28	22-85-002-007	0	0
Line Haul Locomotives: Passenger	2.5.28	22-85-002-008	12.6	69
Yard Locomotives	2.5.28	22-85-002-010	26.8	147
Maintenance Eqpmt: Gas, 2-Stroke	2.5.28	22-85-002-015	0.8	5
Maintenance Eqpmt: Gas, 4-Stroke	2.5.28	22-85-004-015	1.E-02	1.E-01
Maintenance Eqpmt: LPG	2.5.28	22-85-006-015	1.E-03	1.E-02
Subtotal Rail			**254.2**	**1,398**
Recreational Marine Vessels				
Gas, 2-Stroke: Outboard	2.5.31	22-82-005-010	6.1	3
Gas, 2-Stroke: Personal Water Craft	2.5.31	22-82-005-015	2.2	1
Gas, 4-Stroke: Inboard/Sterndrive	2.5.31	22-82-010-005	8.7	5
Diesel: Inboard/Sterndrive	2.5.31	22-82-020-005	6.9	3
Diesel: Outboard	2.5.31	22-82-020-010	3.E-02	1.E-02
Subtotal Recreational Marine			**24.0**	**13**
Nonroad Vehicles and Equipment Total NOX			**360.9**	**2,855**

Table 2.5.3. Klamath Falls NAA 2008 Annual & PM Season: Summary VOC Emissions from Nonroad Sources

			---------- VOC ----------	
Source Description	Table Number	SCC	Annual (tpy)	Worst-Case Day (lbs/day)
NONROAD VEHICLES AND EQUIPMENT				
Gasoline: 2-Cycle		22-60-000		
Recreational	2.5.8	22-60-001-000	13.1	69
Construction	2.5.8	22-60-002-000	0.4	2
Industrial	2.5.8	22-60-003-000	4.E-03	2.E-02
Lawn & Garden	2.5.8	22-60-004-000	3.2	20
Agricultural	2.5.8	22-60-005-000	6.E-03	8.E-03
Light Commercial	2.5.8	22-60-006-000	0.6	4
Logging	2.5.8	22-60-007-000	0.1	3.E-01
Subtotal 2- Cycle Gas			**17.4**	**95**
Gasoline: 4-Cycle		22-65-000		
Recreational	2.5.12	22-65-001-000	5.8	11
Construction	2.5.12	22-65-002-000	0.4	2
Industrial	2.5.12	22-65-003-000	0.6	3
Lawn & Garden	2.5.12	22-65-004-000	7.9	13
Agricultural	2.5.12	22-65-005-000	0.2	3.E-01
Light Commercial	2.5.12	22-65-006-000	8.2	48
Logging	2.5.12	22-65-007-000	1.6E-02	9.4E-02
Subtotal 4- Cycle Gas			**23.0**	**77**
CNG & LPG		22-67/68		
Recreational	2.5.16	22-67/68-001-000	7.E-04	1.E-03
Construction	2.5.16	22-67/68-002-000	2.E-02	8.E-02
Industrial	2.5.16	22-67/68-003-000	2.9	15
Lawn & Garden	2.5.16	22-67/68-004-000	3.E-03	4.E-03
Agricultural	2.5.16	22-67/68-005-000	8.E-05	1.E-04
Light Commercial	2.5.16	22-67/68-006-000	0.2	1
Logging	2.5.16	22-67/68-007-000	--	--
Subtotal CNG/LPG			**3.0**	**16**
Diesel		22-70-000		
Recreational	2.5.20	22-70-001-000	8.E-03	2.E-02
Construction	2.5.20	22-70-002-000	1.9	10
Industrial	2.5.20	22-70-003-000	0.8	4
Lawn & Garden	2.5.20	22-70-004-000	3.E-02	5.E-02
Agricultural	2.5.20	22-70-005-000	2.E-02	3.E-02
Light Commercial	2.5.20	22-70-006-000	0.7	4
Logging	2.5.20	22-70-007-000	--	--
Subtotal Diesel			**3.4**	**18**

Table 2.5.3 Continued

Source Description	Table Number	SCC	---------- VOC ---------- Annual (tpy)	Worst-Case Day (lbs/day)
AIRPORT/RAIL/MARINE				
Kingsley Field Airport				
Military Aircraft	2.5.23	22-75-001-000	3.8	75
Commercial Aircraft	2.5.23	22-75-020-000	6.3	245
General Aviation	2.5.23	22-75-050-000	0.7	17
Air Taxi	2.5.23	22-75-060-001	0.2	4
Ground Support Equipment	2.5.23	22-XX-008-000	1.2	38
Auxiliary Power Units (APU)	2.5.23	22-75-070-000	3.E-02	48
Aircraft Refueling and Fuel Storage	2.5.23	22-XX-XXX-XXX	2.0	50
Subtotal Airport			**14.3**	**479**
Rail				
Line Haul Locomotives: Class I	2.5.27	22-85-002-006	12.0	66
Line Haul Locomotives: Class II & III	2.5.27	22-85-002-007	0	0
Line Haul Locomotives: Passenger	2.5.27	22-85-002-008	0.6	3
Yard Locomotives	2.5.27	22-85-002-010	1.7	9
Maintenance Eqpmt: Gas, 2-Stroke	2.5.27	22-85-002-015	3.E-02	1
Maintenance Eqpmt: Gas, 4-Stroke	2.5.27	22-85-004-015	4.E-02	15
Maintenance Eqpmt: LPG	2.5.27	22-85-006-015	3.E-03	4.E-03
Subtotal Rail			**14.3**	**95**
Recreational Marine Vessels				
Gas, 2-Stroke: Outboard	2.5.32	22-82-005-010	123.6	72
Gas, 2-Stroke: Personal Water Craft	2.5.32	22-82-005-015	39.8	19
Gas, 4-Stroke: Inboard/Sterndrive	2.5.32	22-82-010-005	7.0	5
Diesel: Inboard/Sterndrive	2.5.32	22-82-020-005	0.3	1.E-01
Diesel: Outboard	2.5.32	22-82-020-010	7.E-03	3.E-03
Subtotal Recreational Marine			**170.7**	**97**
Nonroad Vehicles and Equipment Total VOC			**246.0**	**876**

Table 2.5.4. Klamath Falls NAA 2008 Annual & PM Season: Summary SO_X Emissions from Nonroad Sources

Source Description	Table Number	SCC	---------- SOX ---------- Annual (tpy)	Worst-Case Day (lbs/day)
NONROAD VEHICLES AND EQUIPMENT				
Gasoline: 2-Cycle		22-60-000		
Recreational	2.5.6	22-60-001-000	2.E-03	2.E-02
Construction	2.5.6	22-60-002-000	1.E-04	6.E-04
Industrial	2.5.6	22-60-003-000	2.E-06	9.E-06
Lawn & Garden	2.5.6	22-60-004-000	9.E-04	4.E-03
Agricultural	2.5.6	22-60-005-000	3.E-06	4.E-06
Light Commercial	2.5.6	22-60-006-000	2.E-04	2.E-03
Logging	2.5.6	22-60-007-000	1.E-05	9.E-05
Subtotal 2- Cycle Gas			**3.E-03**	**3.E-02**
Gasoline: 4-Cycle		22-65-000		
Recreational	2.5.10	22-65-001-000	1.E-02	2.E-02
Construction	2.5.10	22-65-002-000	8.E-04	4.E-03
Industrial	2.5.10	22-65-003-000	2.E-03	8.E-03
Lawn & Garden	2.5.10	22-65-004-000	1.E-02	2.E-02
Agricultural	2.5.10	22-65-005-000	4.E-04	6.E-04
Light Commercial	2.5.10	22-65-006-000	1.E-02	9.E-02
Logging	2.5.10	22-65-007-000	3.E-05	2.E-04
Subtotal 4- Cycle Gas			**4.E-02**	**1.E-01**
CNG & LPG		22-67/68		
Recreational	2.5.14	22-67/68-001-000	1.E-05	2.E-05
Construction	2.5.14	22-67/68-002-000	4.E-04	2.E-03
Industrial	2.5.14	22-67/68-003-000	8.E-02	4.E-01
Lawn & Garden	2.5.14	22-67/68-004-000	7.E-05	1.E-04
Agricultural	2.5.14	22-67/68-005-000	8.E-06	1.E-05
Light Commercial	2.5.14	22-67/68-006-000	7.E-03	5.E-02
Logging	2.5.14	22-67/68-007-000	--	--
Subtotal CNG/LPG			**0.1**	**5.E-01**
Diesel		22-70-000		
Recreational	2.5.18	22-70-001-000	6.E-04	1.E-03
Construction	2.5.18	22-70-002-000	0.4	2
Industrial	2.5.18	22-70-003-000	0.2	1
Lawn & Garden	2.5.18	22-70-004-000	5.E-03	9.E-03
Agricultural	2.5.18	22-70-005-000	4.E-03	6.E-03
Light Commercial	2.5.18	22-70-006-000	0.1	1
Logging	2.5.18	22-70-007-000	--	--
Subtotal Diesel			**0.8**	**4**

Table 2.5.4. Continued

Source Description	Table Number	SCC	---------- SOX ---------- Annual (tpy)	Worst-Case Day (lbs/day)
AIRPORT/RAIL/MARINE				
Kingsley Field Airport				
Military Aircraft	2.5.22	22-75-001-000	0.0	1
Commercial Aircraft	2.5.22	22-75-020-000	1.9	74
General Aviation	2.5.22	22-75-050-000	5.E-02	1
Air Taxi	2.5.22	22-75-060-001	2.E-02	4.E-01
Ground Support Equipment	2.5.22	22-XX-008-000	0.2	7
Auxiliary Power Units (APU)	2.5.22	22-75-070-000	4.E-02	1
Subtotal Airport			**2.3**	**85**
Rail				
Line Haul Locomotives: Class I	2.5.26	22-85-002-006	2.8	15
Line Haul Locomotives: Class II & III	2.5.26	22-85-002-007	0	0
Line Haul Locomotives: Passenger	2.5.26	22-85-002-008	0.1	1
Yard Locomotives	2.5.26	22-85-002-010	0.2	1
Maintenance Eqpmt: Gas, 2-Stroke	2.5.26	22-85-002-015	1.E-02	1.E-01
Maintenance Eqpmt: Gas, 4-Stroke	2.5.26	22-85-004-015	8.E-05	6.E-04
Maintenance Eqpmt: LPG	2.5.7b	22-85-006-015	9.E-06	6.E-05
Subtotal Rail			**3.2**	**18**
Recreational Marine Vessels				
Gas, 2-Stroke: Outboard	2.5.30	22-82-005-010	4.E-02	2.E-02
Gas, 2-Stroke: Personal Water Craft	2.5.30	22-82-005-015	2.E-02	8.E-03
Gas, 4-Stroke: Inboard/Sterndrive	2.5.30	22-82-010-005	2.E-02	8.E-03
Diesel: Inboard/Sterndrive	2.5.30	22-82-020-005	0.2	7.E-02
Diesel: Outboard	2.5.30	22-82-020-010	9.E-04	4.E-04
Subtotal Recreational Marine			**0.2**	**1.E-01**
Nonroad Vehicles and Equipment Total SOX			**6.6**	**108**

Table 2.5.5. Klamath Falls NAA 2008 $PM_{2.5}$ Emissions: NONROAD2008a Output, 2-stroke Gasoline

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County PM2.5 Emissions ----			Spatial Allocation		------ NAA PM2.5 Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-60-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	9.7	44	44	7	4.2%	0.4	1.8	1.8
22-60-002-000: Construction								
	0.3	1	1	4	19.5%	0.1	0.3	0.3
22-60-003-000: Industrial								
	0.0013	0.007	0.007	5	37.8%	4.9E-04	0.003	0.003
22-60-004-000: Lawn & Garden								
Commercial	0.6	3	3	9	17.2%	0.1	0.5	0.5
Residential	0.9	3	3	10	16.1%	0.1	0.5	0.5
22-60-005-000: Agricultural								
Farm and Cropland	0.018	0.03	0.03	1	4.1%	0.001	0.001	0.001
Farm, Cropland, & Grazing	--	--	--	2	2.9%	--	--	--
22-60-006-000: Light Commercial								
	0.2	1	1	3	39.4%	0.1	0.5	0.5
22-60-007-000: Logging								
	2.3	15	15	6	0.3%	0.01	0.04	0.04
	-------	-------	-------			-------	-------	-------
NAA Total	*13.9*	*67*	*67*			**0.8**	**4**	**4**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.5

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C4-C6

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.6. Klamath Falls NAA 2008 SO_2 Emissions: NONROAD2008a Output, 2-stroke Gasoline

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County SO2 Emissions ----			Spatial Allocation		------ NAA SO2 Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-60-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	0.1	0.6	0.6	7	4.2%	2.1E-03	2.3E-02	2.3E-02
22-60-002-000: Construction								
	6.E-04	3.E-03	3.E-03	4	19.5%	1.1E-04	5.9E-04	5.9E-04
22-60-003-000: Industrial								
	5.E-06	2.E-05	2.E-05	5	37.8%	1.8E-06	9.4E-06	9.4E-06
22-60-004-000: Lawn & Garden								
Commercial	2.E-03	9.E-03	9.E-03	9	17.2%	3.0E-04	1.5E-03	1.5E-03
Residential	4.E-03	1.E-02	1.E-02	10	16.1%	5.7E-04	2.1E-03	2.1E-03
22-60-005-000: Agricultural								
Farm and Cropland	7.E-05	1.E-04	1.E-04	1	4.1%	2.8E-06	4.4E-06	4.4E-06
Farm, Cropland, & Grazing	--	--	--	2	2.9%	--	--	--
22-60-006-000: Light Commercial								
	6.E-04	4.E-03	4.E-03	3	39.4%	2.5E-04	1.6E-03	1.6E-03
22-60-007-000: Logging								
	5.E-03	3.E-02	3.E-02	6	0.3%	1.3E-05	8.6E-05	8.6E-05
	-------	-------	-------			-------	-------	-------
Total	*0.1*	*1*	*1*			**3E-03**	**2.9E-02**	**2.9E-02**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.6

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C4-C6

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.7. Klamath Falls NAA 2008 NO_X Emissions: NONROAD2008a Output, 2-stroke Gasoline

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County NOX Emissions ----			Spatial Allocation		------ NAA NOX Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-60-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	2.3	20	23	7	4.2%	9.6E-02	8.3E-01	9.6E-01
22-60-002-000: Construction								
	0.04	0.2	0.3	4	19.5%	8.1E-03	4.4E-02	5.1E-02
22-60-003-000: Industrial								
	3.5E-04	1.9E-03	2.2E-03	5	37.8%	1.3E-04	7.0E-04	8.1E-04
22-60-004-000: Lawn & Garden								
Commercial	0.1	0.6	0.7	9	17.2%	2.2E-02	1.0E-01	1.2E-01
Residential	0.2	0.8	0.9	10	16.1%	3.8E-02	1.3E-01	1.5E-01
22-60-005-000: Agricultural								
Farm and Cropland	5.0E-03	7.9E-03	9.1E-03	1	4.1%	2.0E-04	3.2E-04	3.7E-04
Farm, Cropland, & Grazing	--	--	--	2	2.9%	--	--	--
22-60-006-000: Light Commercial								
	0.05	0.3	0.4	3	39.4%	1.8E-02	1.2E-01	1.4E-01
22-60-007-000: Logging								
	0.3	2	3	6	0.3%	9.6E-04	6.3E-03	7.3E-03
	-------	-------	-------			-------	-------	-------
Total	*3.1*	*24*	*27*			**2E-01**	**1**	**1**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.7

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C4-C6

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.8. Klamath Falls NAA 2008 VOC Emissions: NONROAD2008a Output, 2-stroke Gasoline

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County VOC Emissions ----			Spatial Allocation		------ NAA VOC Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-60-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	310.5	1,651	1,637	7	4.2%	13.1	70	69
22-60-002-000: Construction								
	2.0	11	10	4	19.5%	0.4	2	2
22-60-003-000: Industrial								
	0.01	0.05	0.05	5	37.8%	0.004	0.02	0.02
22-60-004-000: Lawn & Garden								
Commercial	6.0	45	45	9	17.2%	1.0	8	8
Residential	13.5	75	74	10	16.1%	2.2	12	12
22-60-005-000: Agricultural								
Farm and Cropland	0.1	0.2	0.2	1	4.1%	0.01	8.7E-03	8.5E-03
Farm, Cropland, & Grazing	--	--	--	2	2.9%	--	--	--
22-60-006-000: Light Commercial								
	1.6	10	10	3	39.4%	0.6	4	4
22-60-007-000: Logging								
	17.9	116	115	6	0.3%	0.1	3.4E-01	3.4E-01
	-------	-------	-------			-------	-------	-------
Total	*351.5*	*1,907*	*1,892*			**17.4**	**96**	**95**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.8

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C4-C6

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.9. Klamath Falls NAA 2008 $PM_{2.5}$ Emissions: NONROAD2008a Output, 4-stroke Gasoline

(1) Vehicle & Equipment Type	(2) ---- County PM2.5 Emissions ---- Annual Emissions (tpy)	(2) - Season Day Emissions - Typical (lbs/day)	(2) Worst Case (lbs/day)	(3) Spatial Allocation GIS ID	(4) NAA % of County	(5) ------ NAA PM2.5 Emissions ------ Annual Emissions (tpy)	(5) -- Season Day -- Typical Day (lbs/day)	(5) Worst Case (lbs/day)
22-65-001-000: Recreational								
Golf Carts	0.04	0.1	0.1	8	100%	0.04	0.1	0.1
All Others	0.6	1.2	1.2	7	4.2%	0.03	0.1	0.1
22-65-002-000: Construction								
	0.02	0.1	0.1	4	19.5%	0.004	0.022	0.022
22-65-003-000: Industrial								
	0.02	0.1	0.1	5	37.8%	7.9E-03	0.041	0.041
22-65-004-000: Lawn & Garden								
Commercial	0.1	0.2	0.2	9	17.2%	1.4E-02	0.03	0.03
Residential	0.3	0.3	0.3	10	16.1%	4.3E-02	0.1	0.1
22-65-005-000: Agricultural								
Farm and Cropland	0.03	0.04	0.04	1	4.1%	0.001	0.002	0.002
Farm, Cropland, & Grazing	0.01	0.01	0.01	2	2.9%	0.0	0.0	0.0
22-65-006-000: Light Commercial								
	0.2	1.3	1.3	3	39.4%	0.1	0.5	0.5
22-65-007-000: Logging								
	0.04	0.3	0.3	6	0.3%	1.3E-04	0.001	0.001
	-------	-------	-------			-------	-------	-------
Total	*1.3*	*4*	*4*			**0.2**	**0.8**	**0.8**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.9

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C7-C9

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.10. Klamath Falls NAA 2008 SO_2 Emissions: NONROAD2008a Output, 4-stroke Gasoline

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County SO2 Emissions ----			Spatial Allocation		------ NAA SO2 Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-65-001-000: Recreational								
Golf Carts	8.5E-03	1.6E-02	1.6E-02	8	100%	8.5E-03	1.6E-02	1.6E-02
All Others	6.3E-02	1.2E-01	1.2E-01	7	4.2%	2.6E-03	5.1E-03	5.1E-03
22-65-002-000: Construction								
	4.0E-03	2.2E-02	2.2E-02	4	19.5%	7.8E-04	4.2E-03	4.2E-03
22-65-003-000: Industrial								
	4.3E-03	2.2E-02	2.2E-02	5	37.8%	1.6E-03	8.4E-03	8.4E-03
22-65-004-000: Lawn & Garden								
Commercial	1.4E-02	3.3E-02	3.3E-02	9	17.2%	2.5E-03	5.6E-03	5.6E-03
Residential	4.9E-02	7.3E-02	7.3E-02	10	16.1%	8.0E-03	1.2E-02	1.2E-02
22-65-005-000: Agricultural								
Farm and Cropland	7.1E-03	1.1E-02	1.1E-02	1	4.1%	2.9E-04	4.5E-04	4.5E-04
Farm, Cropland, & Grazing	2.2E-03	3.5E-03	3.5E-03	2	2.9%	6.4E-05	1.0E-04	1.0E-04
22-65-006-000: Light Commercial								
	3.6E-02	2.3E-01	2.3E-01	3	39.4%	1.4E-02	9.2E-02	9.2E-02
22-65-007-000: Logging								
	1.1E-02	7.1E-02	7.1E-02	6	0.3%	3.2E-05	2.1E-04	2.1E-04
	-------	-------	-------			-------	-------	-------
Total	*0.2*	*1*	*1*			**4.E-02**	**0.1**	**0.1**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.10

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C7-C9

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.11. Klamath Falls NAA 2008 NO_X Emissions: NONROAD2008a Output, 4-stroke Gasoline

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County NOX Emissions ----			Spatial Allocation		------ NAA NOX Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-65-001-000: Recreational								
Golf Carts	1.4	3	4	8	100%	1.4	3	4
All Others	6.4	14	16	7	4.2%	0.3	1	1
22-65-002-000: Construction								
	0.8	5	6	4	19.5%	0.2	1	1
22-65-003-000: Industrial								
	1.4	9	10	5	37.8%	0.5	3	4
22-65-004-000: Lawn & Garden								
Commercial	2.5	6	6	9	17.2%	0.4	1	1
Residential	8.5	13	15	10	16.1%	1.4	2	2
22-65-005-000: Agricultural								
Farm and Cropland	1.8	3	4	1	4.1%	0.1	1.4E-01	1.5E-01
Farm, Cropland, & Grazing	0.9	2	2	2	2.9%	0.02	4.4E-02	5.0E-02
22-65-006-000: Light Commercial								
	6.5	48	56	3	39.4%	2.6	19	22
22-65-007-000: Logging								
	2.0	15	17	6	0.3%	0.01	4.3E-02	5.0E-02
	-------	-------	-------			-------	-------	-------
Total	*32.3*	*118*	*135*			**6.9**	**30**	**35**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.11

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C7-C9

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.12. Klamath Falls NAA 2008 VOC Emissions: NONROAD2008a Output, 4-stroke Gasoline

(1) Vehicle & Equipment Type	(2) ---- County VOC Emissions ---- Annual Emissions (tpy)	(2) - Season Day Emissions - Typical (lbs/day)	(2) Worst Case (lbs/day)	(3) Spatial Allocation GIS ID	(4) NAA % of County	(5) ------ NAA VOC Emissions ------ Annual Emissions (tpy)	(5) -- Season Day -- Typical Day (lbs/day)	(5) Worst Case (lbs/day)
22-65-001-000: Recreational								
Golf Carts	3.8	7	7	8	100%	3.8	7	7
All Others	48.4	93	88	7	4.2%	2.0	4	4
22-65-002-000: Construction								
	1.9	10	9	4	19.5%	0.4	2	2
22-65-003-000: Industrial								
	1.5	8	7	5	37.8%	0.6	3	3
22-65-004-000: Lawn & Garden								
Commercial	8.1	19	19	9	17.2%	1.4	3	3
Residential	40.4	64	60	10	16.1%	6.5	10	10
22-65-005-000: Agricultural								
Farm and Cropland	3.7	6	6	1	4.1%	0.2	0.2	0.2
Farm, Cropland, & Grazing	0.6	1	1	2	2.9%	0.02	0.03	0.03
22-65-006-000: Light Commercial								
	20.7	128	122	3	39.4%	8.2	50	48
22-65-007-000: Logging								
	5.5	34	32	6	0.3%	0.02	0.1	0.1
	-------	-------	-------			-------	-------	-------
Total	*134.7*	*370*	*351*			**23.0**	**81**	**77**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.12

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C7-C9

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.13. Klamath Falls NAA 2008 $PM_{2.5}$ Emissions: NONROAD2008a Output, CNG and LPG

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County PM2.5 Emissions ----			Spatial Allocation		------ NAA PM2.5 Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-67/68-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	3.3E-04	6.3E-04	6.3E-04	7	4.2%	1.4E-05	2.7E-05	2.7E-05
22-67/68-002-000: Construction								
	2.3E-03	1.2E-02	1.2E-02	4	19.5%	4.4E-04	2.4E-03	2.4E-03
22-67/68-003-000: Industrial								
	2.5E-01	1.3E+00	1.3E+00	5	37.8%	9.5E-02	5.0E-01	5.0E-01
22-67/68-004-000: Lawn & Garden								
Commercial	4.9E-04	7.4E-04	7.4E-04	9	17.2%	8.5E-05	1.3E-04	1.3E-04
Residential	--	--	--	10	16.1%	--	--	--
22-67/68-005-000: Agricultural								
Farm and Cropland	--	--	--	1	4.1%	--	--	--
Farm, Cropland, & Grazing	3.6E-04	5.6E-04	5.6E-04	2	2.9%	1.0E-05	1.6E-05	1.6E-05
22-67/68-006-000: Light Commercial								
	2.2E-02	1.5E-01	1.5E-01	3	39.4%	8.8E-03	5.7E-02	5.7E-02
22-67/68-007-000: Logging								
	--	--	--	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*0.3*	*1*	*1*			**0.1**	**0.6**	**0.6**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.13

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C10-C12

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.14. Klamath Falls NAA 2008 SO_2 Emissions: NONROAD2008a Output, CNG & LPG

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County SO2 Emissions ----			Spatial Allocation		------ NAA SO2 Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-67/68-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	3.0E-04	5.8E-04	5.8E-04	7	4.2%	1.3E-05	2.4E-05	2.4E-05
22-67/68-002-000: Construction								
	1.9E-03	1.0E-02	1.0E-02	4	19.5%	3.7E-04	2.0E-03	2.0E-03
22-67/68-003-000: Industrial								
	2.1E-01	1	1	5	37.8%	7.9E-02	4.1E-01	4.1E-01
22-67/68-004-000: Lawn & Garden								
Commercial	4.1E-04	6.1E-04	6.1E-04	9	17.2%	7.0E-05	1.0E-04	1.0E-04
Residential	--	--	--	10	16.1%	--	--	--
22-67/68-005-000: Agricultural								
Farm and Cropland	--	--	--	1	4.1%	--	--	--
Farm, Cropland, & Grazing	2.7E-04	4.1E-04	4.1E-04	2	2.9%	7.6E-06	1.2E-05	1.2E-05
22-67/68-006-000: Light Commercial								
	1.9E-02	1.2E-01	1.2E-01	3	39.4%	7.3E-03	4.7E-02	4.7E-02
22-67/68-007-000: Logging								
	--	--	--	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*0.2*	*1*	*1*			**0.1**	**0.5**	**0.5**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.14

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C10-C12

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.15. Klamath Falls NAA 2008 NO_X Emissions: NONROAD2008a Output, CNG & LPG

(1) Vehicle & Equipment Type	(2) ---- County NOX Emissions ---- Annual Emissions (tpy)	(2) - Season Day Emissions - Typical (lbs/day)	(2) Worst Case (lbs/day)	(3) Spatial Allocation GIS ID	(4) NAA % of County	(5) ------ NAA NOX Emissions ------ Annual Emissions (tpy)	(5) -- Season Day -- Typical Day (lbs/day)	(5) Worst Case (lbs/day)
22-67/68-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	0.06	0.1	0.1	7	4.2%	2.5.E-03	4.7.E-03	4.7.E-03
22-67/68-002-000: Construction								
	0.3	1	1	4	19.5%	0.05	0.3	0.3
22-67/68-003-000: Industrial								
	29	149	149	5	37.8%	11	56	56
22-67/68-004-000: Lawn & Garden								
Commercial	0.05	0.1	0.1	9	17.2%	0.01	0.01	0.01
Residential	--	--	--	10	16.1%	--	--	--
22-67/68-005-000: Agricultural								
Farm and Cropland	--	--	--	1	4.1%	--	--	--
Farm, Cropland, & Grazing	0.07	0.1	0.1	2	2.9%	2.0E-03	3.0E-03	3.0E-03
22-67/68-006-000: Light Commercial								
	2.5	16	16	3	39.4%	1.0	6	6
22-67/68-007-000: Logging								
	--	--	--	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*31.5*	*167*	*167*			**11.9**	**63**	**63**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.15

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C10-C12

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.16. Klamath Falls NAA 2008 VOC Emissions: NONROAD2008a Output, CNG & LPG

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County VOC Emissions ----			Spatial Allocation		------ NAA VOC Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-67/68-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	0.02	0.03	0.03	7	4.2%	6.8.E-04	1.3.E-03	1.3.E-03
22-67/68-002-000: Construction								
	0.08	0.4	0.4	4	19.5%	0.02	0.1	0.1
22-67/68-003-000: Industrial								
	7.6	39	39	5	37.8%	3	15	15
22-67/68-004-000: Lawn & Garden								
Commercial	0.01	0.02	0.02	9	17.2%	2.5E-03	3.8E-03	3.8E-03
Residential	--	--	--	10	16.1%	--	--	--
22-67/68-005-000: Agricultural								
Farm and Cropland	--	--	--	1	4.1%	--	--	--
Farm, Cropland, & Grazing	2.8E-03	4.4E-03	4.4E-03	2	2.9%	8.0E-05	1.2E-04	1.2E-04
22-67/68-006-000: Light Commercial								
	0.4	2.8	2.8	3	39.4%	0.2	1	1
22-67/68-007-000: Logging								
	--	--	--	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*8.1*	*43*	*43*			**3.0**	**16**	**16**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.16

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C10-C12

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.17. Klamath Falls NAA 2008 $PM_{2.5}$ Emissions: NONROAD2008a Output, Diesel

(1) Vehicle & Equipment Type	(2) ---- County PM2.5 Emissions ---- Annual Emissions (tpy)	(2) - Season Day Emissions - Typical (lbs/day)	(2) Worst Case (lbs/day)	(3) Spatial Allocation GIS ID	(4) NAA % of County	(5) ------ NAA PM2.5 Emissions ------ Annual Emissions (tpy)	(5) -- Season Day -- Typical Day (lbs/day)	(5) Worst Case (lbs/day)
22-70-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	0.1	0.2	0.2	7	4.2%	4.5E-03	8.5E-03	8.5E-03
22-70-002-000: Construction								
	7.7	41	41	4	19.5%	1.5	8	8
22-70-003-000: Industrial								
	1.7	9	9	5	37.8%	0.7	3	3
22-70-004-000: Lawn & Garden								
Commercial	0.1	0.2	0.2	9	17.2%	1.9E-02	3.3E-02	3.3E-02
Residential	--	--	--	10	16.1%	--	--	--
22-70-005-000: Agricultural								
Farm and Cropland	21.4	33	33	1	4.1%	--	--	--
Farm, Cropland, & Grazing	0.6	1	1	2	2.9%	1.8E-02	2.9E-02	2.9E-02
22-70-006-000: Light Commercial								
	1.2	8	8	3	39.4%	0.5	3	3
22-70-007-000: Logging								
	3.4	22	22	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*36.3*	*114*	*114*			**2.7**	**14.4**	**14.4**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.17

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C13-C-15

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.18. Klamath Falls NAA 2008 SO_2 Emissions: NONROAD2008a Output, Diesel

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County SO2 Emissions ----			Spatial Allocation		------ NAA SO2 Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-70-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	0.01	0.03	0.03	7	4.2%	6.0E-04	1.2E-03	1.2E-03
22-70-002-000: Construction								
	2.2	11.9	11.9	4	19.5%	0.4	2.3	2.3
22-70-003-000: Industrial								
	0.6	2.8	2.8	5	37.8%	0.2	1	1
22-70-004-000: Lawn & Garden								
Commercial	0.03	0.05	0.05	9	17.2%	4.8E-03	8.8E-03	8.8E-03
Residential	--	--	--	10	16.1%	--	--	--
22-70-005-000: Agricultural								
Farm and Cropland	4.7	7.2	7.2	1	4.1%	--	--	--
Farm, Cropland, & Grazing	0.1	0.2	0.2	2	2.9%	4.1E-03	6.3E-03	6.3E-03
22-70-006-000: Light Commercial								
	0.2	1.6	1.6	3	39.4%	0.1	1	1
22-70-007-000: Logging								
	1.4	9.4	9.4	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*9.3*	*33*	*33*			**0.8**	**4.0**	**4.0**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.18

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C13-C-15

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.19. Klamath Falls NAA 2008 NO_X Emissions: NONROAD2008a Output, Diesel

(1) Vehicle & Equipment Type	(2) ---- County NOX Emissions ---- Annual Emissions (tpy)	(2) - Season Day Emissions - Typical (lbs/day)	(2) Worst Case (lbs/day)	(3) Spatial Allocation GIS ID	(4) NAA % of County	(5) ------ NAA NOX Emissions ------ Annual Emissions (tpy)	(5) -- Season Day -- Typical Day (lbs/day)	(5) Worst Case (lbs/day)
22-70-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	0.7	1	1	7	4.2%	0.03	5.7E-02	5.7E-02
22-70-002-000: Construction								
	92.5	498	498	4	19.5%	18.1	97	97
22-70-003-000: Industrial								
	21.9	107	107	5	37.8%	8.3	41	41
22-70-004-000: Lawn & Garden								
Commercial	1.3	2	2	9	17.2%	0.2	4.2E-01	4.2E-01
Residential	--	--	--	10	16.1%	--	--	--
22-70-005-000: Agricultural								
Farm and Cropland	227.4	354	354	1	4.1%	--	--	--
Farm, Cropland, & Grazing	7.0	11	11	2	2.9%	0.2	3.1E-01	3.1E-01
22-70-006-000: Light Commercial								
	11.5	75	75	3	39.4%	4.5	29	29
22-70-007-000: Logging								
	49.7	322	322	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*412.0*	*1,371*	*1,371*			**31.3**	**168**	**168**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.19

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C13-C-15

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.20. Klamath Falls NAA 2008 VOC Emissions: NONROAD2008a Output, Diesel

(1)	(2)	(2)	(2)	(3)	(4)	(5)	(5)	(5)
	---- County VOC Emissions ----			Spatial Allocation		------ NAA VOC Emissions ------		
		- Season Day Emissions -					-- Season Day --	
Vehicle & Equipment Type	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	GIS ID	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
22-70-001-000: Recreational								
Golf Carts	--	--	--	8	100%	--	--	--
All Others	0.2	0.4	0.4	7	4.2%	0.01	1.6E-02	1.6E-02
22-70-002-000: Construction								
	9.6	52	52	4	19.5%	1.9	10	10
22-70-003-000: Industrial								
	2.0	10	10	5	37.8%	0.8	4	4
22-70-004-000: Lawn & Garden								
Commercial	0.2	0.3	0.3	9	17.2%	0.03	4.6E-02	4.6E-02
Residential	--	--	--	10	16.1%	--	--	--
22-70-005-000: Agricultural								
Farm and Cropland	22.8	35	35	1	4.1%	--	--	--
Farm, Cropland, & Grazing	0.7	1	1	2	2.9%	0.02	3.3E-02	3.3E-02
22-70-006-000: Light Commercial								
	1.7	11	11	3	39.4%	0.7	4	4
22-70-007-000: Logging								
	3.7	24	24	6	0.3%	--	--	--
	-------	-------	-------			-------	-------	-------
Total	*40.9*	*134*	*134*			**3.4**	**18**	**18**

* Excludes airport ground support, railway maintenance, and recreational marine.

Airport Ground Support Equipment (GSE): Detailed in Tables 2.5.21-24

Railway Maintenance Equipment: Detailed in Tables 2.5.25-28

Recreational Marine: Detailed in Tables 2.5.29-32

Notes For Table 2.5.20

(1) Vehicle & Equipment Categories have been grouped to best match Klamath County Zoning

(2) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Tables C1, C13-C-15

(3) GIS ID dependent upon SCC match to Klamath County zoning: Please see Appendix C, Table C19

(4) NAA % of County is based on Klamath County zoning: Please see Appendix C, Table C-19.

(5) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.21. Klamath Falls NAA 2008 $PM_{2.5}$ Emissions From Klamath Falls International Airport

SCC and Category Description	(1) LTOs	(2) Emission Factors (tons/LTO)	(3) Activity (days/week)	(4) Seasonal Adjustment Factor	(5) ----- Nonattainment Area ----- Annual Total Emissions (t/yr)	(6) Typical Day (lbs/day)	(7) Worst Case Day (lbs/day)
SCC 22-75-001-000: Military Aircraft							
	5,646	0.000039	7	0.7	0.2	1	4
SCC 22-75-020-000: Commercial Aircraft							
	2,142	0.000526	7	2.0	1.1	12	44
SCC 22-75-050-000: General Aviation							
	9,304	0.000015	7	0.5	0.1	4E-01	3
SCC 22-75-060-001: Air Taxi							
	2,455	0.000039	7	1.0	0.1	1	2
SCC 22-XX-008-000: Ground support equipment							
	EDMS MODEL		7	1.3	0.6 **(8)**	4	19
SCC 22-75-070-000: Auxiliary Power Unit							
	EDMS MODEL		7	1.3	4E-02 **(8)**	3E-01	1
Airport Total					**2.2**	**19**	**74**

Notes:

(1) The acronym LTOs stands for "landings and takeoffs."
Klamath Falls International Airport Annual Landings & Takeoffs (LTOs) from Appendix C, Table C-21.

(2) Documentation for Aircraft Component of the National Emissions Inventory Methodology, Appendix A,Generic Aircraft Emission Factors/ Speciation Profiles.(January 27, 2011). Ref 745.

(3) Activity assumed to be uniform at 7 days per week.

(4) Seasonal Adjustment Factor (SAF) calculated based upon 2008 Landings & Take-Offs (LTOs) by DEQ as follows: EPA Seasonal Adjustment Factor formula [Ref. 2, pg. 5-22] = (Peak Season activity * 12 months) / (Annual activity * season months)

Aircraft Category	2008 LTOs (a) Annual	(b) PM Season	(c) SAF
Military Aircraft	5,646	1,244	0.7
Commercial Aircraft	2,142	1,424	2.0
General Aviation	9,304	1,669	0.5
Air Taxi	2,455	816	1.0
All Aircraft Categories	19,547	5,153	0.8

a) Data for 2008 Annual Landings and Take-Offs from Table 2.5.21

b) Data for 2008 Season Landings and Take-Offs from Appendex C, Table C-21.
Adjusted 2008 Season LTOs

c) Seasonal Adjustment Factor = (2008 Season LTOs * 12 months) / (2008 Annual LTOs * 4 months)

Notes for Table 2.5.21, Continued

(5) Annual Emissions (Tons/yr) = ((LTOs per Year) * (EF [lbs/LTO]))

(6) Typical Season Day Emissions [Lbs per Day] =
((Annual Emission,t/yr *2000 lb/ton)*Seasonal Adjustment Factor)/(52*Activity, days/week)

(7) Worst Case Day Emissions [lbs/day] = (typical season day emissions) *(worst case day multiplier)

Worst Case Day Multiplier calculations

	2008 LTOs		
Aircraft Category	(a) 2008 PM Season Maximum	(a) 2008 PM Season Average	(b) PM Season Worst Case Day Multiplier
Military Aircraft	56	10	5
Commercial Aircraft	42	12	4
General Aviation	114	14	8
Air Taxi	24	7	4
All Aircraft Categories	181	43	4

a) PM2.5 Season Avg. and Maximum Landings and Take-Offs from Appendix C, Table C-21

b) Worst Case Day multiplier = (2008 Season Maximum LTOs / 2008 Season Average LTOs)

(8) EDMS 5.1.3 Emissions Inventory Report (DEQ Ref. 746)

Emissions Inventory Summary

Study: LMT

Scenario- Airport:2008 - Klamath Falls

Input data: Commercial Aircraft type from Reference 749. See Appendix C, Table C-21, Endnote 8.
Military data from Appendix C, Table C-21.

Units: Short tons per year

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Military Aircraft +Commercial aircraft

Category	PM-2.5
---------------	--------
GSE	0.6
APUs	0.04
---------------	--------
Total	0.6

Table 2.5.22. Klamath Falls NAA 2008 SO_X Emissions From Klamath Falls International Airport

SCC and Category Description	(1) LTOs	(2) Emission Factors (tons/LTO)	(3) Activity (days/week)	(4) Seasonal Adjustment Factor	(5) ----- Nonattainment Area ----- Annual Total Emissions (t/yr)	(6) Typical Day (lbs/day)	(7) Worst Case Day (lbs/day)
SCC 22-75-001-000: Military Aircraft							
	5,646	0.000008	7	0.66	4E-02	0.2	0.8
SCC 22-75-020-000: Commercial Aircraft							
	2,142 (8)	0.000891	7	1.99	1.9	21	74
SCC 22-75-050-000: General Aviation							
	9,304	0.000005	7	0.54	5.E-02	0.1	1.1
SCC 22-75-060-001: Air Taxi							
	2,455	0.000008	7	1.00	2.E-02	0.1	0.4
SCC 22-65-008-000: Ground support equipment							
	EDMS MODEL		7	1.3	0.2 (9)	2	7
SCC 22-75-070-000: Auxiliary Power Unit							
	EDMS MODEL		7	1.3	4E-02 (9)	0.3	1.4
Airport Total					**2.3**	**23**	**85**

Notes:
(1) The acronym LTOs stands for "landings and takeoffs."
Klamath Falls International Airport Annual Landings & Takeoffs (LTOs) from Appendix C, Table C-21.
Commercial Aircraft LTOs obtained from Ref. 748.
For the EI purposes, LTOs = Total operations/2.
(2) Documentation for Aircraft Component of the National Emissions Inventory Methodology,
Appendix A,Generic Aircraft Emission Factors/ Speciation Profiles.(January 27, 2011). Ref 745.
(3) Activity assumed to be uniform at 7 days per week.
(4) Seasonal Adjustment Factor(SAF) calculated based upon 2008 Landings & Take-Offs (LTOs) by DEQ as follows:
EPA Seasonal Adjustment Factor formula [Ref. 2, pg. 5-22] =
(Peak Season activity * 12 months) / (Annual activity * season months)

Aircraft Category	2008 LTOs (a) Annual	(b) SOX Season	(c) SAF
Military Aircraft	5,646	1,244	0.7
Commercial Aircraft	2,142	1,424	2.0
General Aviation	9,304	1,669	0.5
Air Taxi	2,455	816	1.0
All Aircraft Categories	19,547	5,153	0.8

a) Data for 2008 Annual Landings and Take-Offs from Table 2.5.22
b) Data for 2008 Season Landings and Take-Offs from Appendex C, Table C-21.
c) Seasonal Adjustment Factor = (2008 Season LTOs * 12 months) / (2008 Annual LTOs * 4 months)

Notes for 2.5.22, Cont'd.

(5) Annual Emissions (Tons/yr) = ((LTOs per Year) * (EF [lbs/LTO])) / 2000 lbs/ton

(6) Typical Season Day Emissions [Lbs per Day] =
((Annual Emission(t/yr)) *2000)*Seasonal Adjustment Factor))/(52*Activity (days/week))

(7) Worst Case Day Emissions [lbs/day] = (typical season day emissions) *(worst case day multiplier)

Worst Case Day Multiplier calculations

Aircraft Category	2008 LTOs		
	(a) 2008 SOX Season Maximum	(a) 2008 SOX Season Average	(b) SOX Season Worst Case Day Multiplier
Military Aircraft	56	10	5
Commercial Aircraft	42	12	4
General Aviation	114	14	8
Air Taxi	24	7	4
All Aircraft Categories	181	43	4

a) SOX Season Landings and Take-Offs from Appendix C, Table C-21

b) Worst Case Day SOX multiplier = (2008 Season Maximum LTOs / 2008 Season Average LTOs)

(8). LTOs for Klamath Falls (Kingsley field) (Ref. 749.)

Type of Aircraft	LTOs
Boeing 737-800	2
Boeing 737-900	1
CESSNA 208	798
EMB-120 BRASILIA	1,341
----------------------	---------------
Total:	***2,142***

Ref. 749. - Jennifer Fabrizi , (RITA, U.S. Department of Transportation's research and Innovative Technology Administration T100 Data Administrator), email: jennifer.fabrizi@dot.gov

(9).Emissions and Dispersion Modeling System.

EDMS 5.1.3 Emissions Inventory Report (DEQ Ref. 746)

Emissions Inventory Summary

Input data: Aircraft type from Reference 749. See Appendix C, Table C-21, Endnote 8.
Military data from Appendix C, Table C-21.

Study: LMT

Scenario- Airport:2008 - Klamath Falls

Units: Short tons per year

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Military Aircraft +Commercial aircraft

Category	SOx
---------------	--------
GSE	0.2
APUs	0.043
---------------	--------
Grand Total	7.4

Table 2.5.23. Klamath Falls NAA 2008 VOC Emissions From Klamath Falls International Airport

AIRCRAFT	(1)		(2)	(3)	(4)	(5)		(6)	(7)
						----- Nonattainment Area -----			
SCC and Category Description	LTOs		Emission Factors (tons/LTO)	Activity (days/week)	Seasonal Adjustment Factor	Annual Total Emissions (t/yr)		Typical Day (lbs/day)	Worst Case Day (lbs/day)
SCC 22-75-001-000: Military Aircraft									
	5,646		0.000682	7	0.66	3.8		14	75
SCC 22-75-020-000: Commercial Aircraft									
	2,142	(8)	0.002934	7	1.99	6.3		69	245
SCC 22-75-050-000: General Aviation									
	9,304		0.000075	7	0.54	0.7		2	17
SCC 22-75-060-001: Air Taxi									
	2,455		0.000085	7	1.00	2E-01		1	4
SCC 22-65-008-000 : Ground support equipment									
	EDMS MODEL			7	1.33	1.18	(9)	9	38
SCC 22-75-070-000 : Auxiliary Power Unit									
	EDMS MODEL			7	1.3	3E-02	(9)	11	48
Aircraft Total						12.2		105	428

REFUELING & FUEL STORAGE	(10)	(10)	(3)	(4)	(5)		(6)	(7)
					----- Nonattainment Area -----			
SCC	Throughput (1000gal)	EF (lb/1000gal)	Activity (days/week)	Seasonal Adjustment	Annual Total Emissions		Typical Day (lbs/day)	Worst Case Day (lbs/day)
SCC 25-01-080-050: Airports : Aviation Gasoline /Stage 1: Total								
	34	2.2E-04	7	0.5	4E-06	(10)	1E-05	9E-05
	8.9		7	1.0	1E-06	(10)	5E-06	2E-05
SCC 25-01-080-100: Airports : Aviation Gasoline /Stage 2: Total								
	34	1.4E-05	7	0.5	2E-07	(10)	7E-07	6E-06
	8.9		7	1.0	6E-08	(10)	3E-07	1E-06
SCC 22-75-900-202: Aircraft /Refueling: All Fuels /Underground Tank: Breathing and Emptying (AvGas)								
	34	7.8E-04	7	0.5	1E-05	(10)	4E-05	3E-04
	8.9		7	1.0	3E-06	(10)	2E-05	2E-05
SCC 25-01-000-150: All Storage Types: Breathing Loss /Jet Naphtha								
	2,853	3.8E-01	7	2.0	5E-01	(10)	6	21
	7,521		7	0.7	1E+00	(10)	5	28
SCC 25-01-995-150: All Storage Types: Working Loss /Jet Naphtha								
	2,853	0.01	7	2.0	8E-03	(10)	9E-02	3E-01
	7,521		7	0.7	2E-02	(10)	8E-02	4E-01
Refueling Total					2.0		11	50
Airport Total:					**14.3**		**117**	**479**

Notes for Table 2.5.23.

(1) The acronym LTOs stands for "landings and takeoffs."
Klamath Falls International Airport Annual Landings & Takeoffs (LTOs) from Appendix C, Table C-21
Commercial Aircraft LTOs obtained from Ref. 748.
For the EI purposes, LTOs = Total operations/2.

(2) Documentation for Aircraft Component of the National Emissions Inventory Methodology,
Appendix A,Generic Aircraft Emission Factors/ Speciation Profiles.(January 27, 2011). Ref 745.

Pollutant	Commercial Aircraft	Air Taxi	General Aviation	Military
VOC	0.002934	0.000085	0.000075	0.000682

Units: (Tons/LTO)
http://www.epa.gov/ttn/chief/net/2008_nei/aircraft_report_final.pdf

(3) Activity assumed to be uniform at 7 days per week.

(4) Seasonal Adjustment Factor (SAF) calculated based upon 2008 Landings & Take-Offs (LTOs) by DEQ as follows:
EPA Seasonal Adjustment Factor formula [Ref. 2, pg. 5-22] = (Peak Season activity * 12 months)/(Annual activity * season months)

Aircraft Category	2008 LTOs		
	(a) Annual	(b) VOC Season	(c) SAF
Military Aircraft	5,646	1,244	0.7
Commercial Aircraft	2,142	1,424	2.0
General Aviation	9,304	1,669	0.5
Air Taxi	2,455	816	1.0
All Aircraft Categories	19,547	5,153	0.8

a) Data for 2008 Annual Landings and Take-Offs from Table 2.5.23
b) Data for 2008 Season Landings and Take-Offs from Appendex C, Table C-21.
c) Seasonal Adjustment Factor = (2008 Season LTOs * 12 months) / (2008 Annual LTOs * 4 months)

(5) Annual Emissions (Tons/yr) = ((LTOs per Year) * (EF [lbs/LTO])) / 2000 lbs/ton

(6) Typical Season Day Emissions [Lbs per Day] =
((Annual Emission(t/yr)) *2000)*Seasonal Adjustment Factor))/(52*Activity (days/week))

(7) Worst Case Day Emissions [lbs/day] = (typical season day emissions) *(worst case day multiplier)
Worst Case Day Multiplier calculations

Aircraft Category	2008 LTOs		
	(a) VOC PM Season Maximum	(a) 2008 VOC Season Average	(b) VOC Season Worst Case Day Multiplier
Military Aircraft	56	10	5
Commercial Aircraft	42	12	4
General Aviation	114	14	8
Air Taxi	24	7	4
All Aircraft Categories	181	43	4

a) VOC Season Landings and Take-Offs from Appendix C, Table C-21
b) Worst Case Day VOC multiplier = (2008 Season Maximum LTOs / 2008 Season Average LTOs)

Notes for Table 2.5.23, Continued

(8). LTOs for Klamath Falls (Kingsley field) (Ref. 749.)

Type of Aircraft	LTOs
Boeing 737-800	2
Boeing 737-900	1
CESSNA 208	798
EMB-120 BRASILIA	1,341
----------------------	---------------
Total:	***2,142***

Ref. 749. - Jennifer Fabrizi , (RITA, U.S. Department of Transportation's research and Innovative Technology Administration T100 Data Administrator), email: jennifer.fabrizi@dot.gov
Address: RITA, BTS, 1200 New Jersey Avenue, SE., Washington, DC 20590-0001,
Telephone Number (202) 366-8513, Fax Number (202) 366-3383

(9) EDMS 5.1.3 Emissions Inventory Report (DEQ Ref. 746)

Emissions Inventory Summary
Study: LMT
Scenario- Airport:2008 - Klamath Falls
Input data: Commercial Aircraft type from Reference 749. See Appendix C, Table C-21, Endnote 8.
Military data from Appendix C, Table C-21.
Units: Short tons per year
Generated:7/15/2011. 2:24:14 PM

Military Aircraft +Commercial aircraft

Category	VOC
---------------	--------
GSE	1.2
APUs	0.03
---------------	--------
Grand Total	1.2

(10). Annual Emissions (tons/yr) =
((Kingsley field airport aviation gas sold, gal (a)) * (EF [lbs/gal])) / (2000 [lbs/Ton]) Ref.766 and Ref.767
Annual Emissions (tons/yr) = ((Kingsley field airport Jet fuel sold, gal **(a)**) * (EF **(b)** [lbs/gal])) / (2000 [lbs/Ton])
(a). Fuel Sold in Oregon for 2008 was obtain from the Oregon Fuel Tax Group,
Website:http://www.oregon.gov/ODOT/CS/FTG/tdreports.shtml#BM2 (DEQ Ref. 794)
(b) Emission Factor

SCC	EF Source
25-01-080-050	Ref. 623 :EPA, 2002 NEI. Appendix C
25-01-080-100	Ref. 623:EPA, 2002 NEI. Appendix C
25-01-080-201	Ref. 321:EIIP Chapter 11 Gasoline Marketing
25-01-000-150	Back-calculated EF, lbs/LTO = (total emissions, lbs/yr) /(Total storage tank throughput): DEQ Ref. 793.
25-01-995-150	AP-42 Chapter 5.2 :Transport and Marketing of Petroleum Liquids, page 5.2-7.

Table 2.5.24. Klamath Falls NAA 2008 NO_X Emissions From Klamath Falls International Airport

Aircraft SCC and Category Description	(1) LTOs	(2) Emission Factors (tons/LTO)	(3) Activity (days/week)	(4) Seasonal Adjustment Factor	(5) Nonattainment Area: Annual Total Emissions (t/yr)	(6) Nonattainment Area: Typical Day (lbs/day)	(7) Nonattainment Area: Worst Case Day (lbs/day)
SCC 22-75-001-000: Military Aircraft							
	5,646	0.000079	7	0.66	0.4	2	9
SCC 22-75-020-000: Commercial Aircraft							
	2,142 **(8)**	0.009288	7	1.99	20	218	776
SCC 22-75-050-000: General Aviation							
	9,304	0.000033	7	0.54	0.3	9E-01	7
SCC 22-75-060-001 Air Taxi							
	2,455	0.000079	7	1.00	0.2	1	4
SCC 22-65-008-000: Ground support equipment							
	EDMS MODEL		7	1.3	11.5 (9)	84	375
SCC 22-75-070-000: Auxiliary Power Unit							
	EDMS MODEL		7	1.3	0.2 (9)	1	7
Airport Total					32.5	307	1,177

Notes:

(1) The acronym LTOs stands for "landings and takeoffs."

Klamath Falls International Airport Annual Landings & Takeoffs (LTOs) from Appendix C, Table C-21

Commercial Aircraft LTOs obtained from Ref. 748.

For the EI purposes, LTOs = Total operations/2.

(2) Documentation for Aircraft Component of the National Emissions Inventory Methodology, Appendix A,Generic Aircraft Emission Factors/ Speciation Profiles.(January 27, 2011). Ref 745.

Pollutant	Commercial Aircraft	Air Taxi	General Aviation	Military
NOx	0.009288	0.000079	0.000033	0.000079

Units: (Tons/LTO)

Web site: http://www.epa.gov/ttn/chief/net/2008_nei/aircraft_report_final.pdf

(3) Activity assumed to be uniform at 7 days per week.

(4) Seasonal Adjustment Factor (SAF) calculated based upon 2008 Landings & Take-Offs (LTOs) by DEQ as follows:
EPA Seasonal Adjustment Factor formula [Ref. 2, pg. 5-22] =
(Peak Season activity * 12 months) / (Annual activity * season months)

Aircraft Category	2008 LTOs (a) Annual	2008 LTOs (b) PM Season	(c) SAF
Military Aircraft	5,646	1,244	0.7
Commercial Aircraft	2,142	1,424	2.0
General Aviation	9,304	1,669	0.5
Air Taxi	2,455	816	1.0
All Aircraft Categories	19,547	5,153	0.8

a) Data for 2008 Annual Landings and Take-Offs from Table 2.5.24

b) Data for 2008 NOx Season Landings and Take-Offs from Appendix C, Table C-21.

c) Seasonal Adjustment Factor = (2008 NOx Season LTOs * 12 months) / (2008 Annual LTOs * 4 months)

Notes for Table 2.5.24, Continued

(5) Annual Emissions (Tons/yr) = ((LTOs per Year) * (EF [lbs/LTO])) / 2000 lbs/ton

(6) Typical Season Day Emissions [Lbs per Day] =
((Annual Emission(t/yr)) *2000)*Seasonal Adjustment Factor))/(52*Activity (days/week))

(7) Worst Case Day Emissions [lbs/day] = (typical season day emissions) *(worst case day multiplier)
Worst Case Day Multiplier calculations

Aircraft Category	2008 LTOs		
	(a) 2008 NOx Season Maximum	(a) 2008 NOx Season Average	(b) NOx Season Worst Case Day Multiplier
Military Aircraft	56	10	5
Commercial Aircraft	42	12	4
General Aviation	114	14	8
Air Taxi	24	7	4
All Aircraft Categories	181	43	4

a) NOX Season Landings and Take-Offs from Appendix C, Table C-21
b) Worst Case Day NOx multiplier = (2008 NOx Season Maximum LTOs / 2008 NOx Season Average LTOs)

(8). LTOs for Klamath Falls (Kingsley field) (Ref. 749.)

Type of Aircraft	LTOs
Boeing 737-800	2
Boeing 737-900	1
CESSNA 208	798
EMB-120 BRASILIA	1,341
----------------------	---------------
Total:	***2,142***

Ref. 749. - Jennifer Fabrizi , (RITA, U.S. Department of Transportation's research and Innovative Technology Administration T100 Data Administrator), email: jennifer.fabrizi@dot.gov
Address: RITA, BTS, 1200 New Jersey Avenue, SE., Washington, DC 20590-0001,
Telephone Number (202) 366-8513, Fax Number (202) 366-3383

(9) EDMS 5.1.3 Emissions Inventory Report (DEQ Ref. 746)

Emissions Inventory Summary
Study: LMT
Scenario- Airport:2008 - Klamath Falls
Input data: Aircraft type from Reference 749. See Appendix C, Table C-21, Endnote 8.
Military data from Appendix C, Table C-21.
Units: Short tons per year
Generated:7/15/2011. 2:24:14 PM

Military Aircraft +Commercial aircraft

Category	NOx
---------------	--------
GSE	11.5
APUs	0.2
---------------	--------
Grand Total	11.7

Table 2.5.25. Klamath Falls NAA 2008 $PM_{2.5}$ Emissions From Locotives and Railway Maintenance Equipment

Locomotives	(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)
						------ NAA PM2.5 Emissions ------		
	2008 Annual Fuel Consumption		PM2.5 Emission Factor	Weekly Activity	Seasonal Adjustment Factor		-- Season Day Emissions --	
	County (gal)	NA (gal)	(lbs/gal)	(d/wk)	(SAF)	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-006								
Line Haul: Class I (BNSF + UP)	4,709,078	1,148,293	0.0109	7	1.0	6.3	34.4	34.4
22-85-002-007								
Line Haul: Class II & III (KN RR)	14,018	0	--	--	--	0	0	0
22-85-002-008								
Line Haul: Passenger (Amtrak)	219,701	53,573	0.0109	7	1.0	0.3	2	2
22-85-002-010								
Yard (BNSF)	100,000	100,000	0.0118	7	1.0	0.6	3.2	3.2
	----------	----------				----------	----------	----------
Locomotive Total	**5,042,797**	**1,301,867**				**7.1**	**39**	**39**

Railway Maintenance Equipment	(8)	(8)	(8)	(9)	(9)	(9)
	---- County PM2.5 Emissions ----			------ NAA PM2.5 Emissions ------		
		-- Season Day Emissions --			-- Season Day Emissions --	
	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-015						
Diesel	0.5	3.4	3.4	0.09	0.7	0.7
22-85-004-015						
Gasoline, 4-Stroke	2.E-03	0.014	0.014	4.E-04	3.E-03	3.E-03
22-85-006-015						
LPG	5.E-05	4.E-04	4.E-04	1.E-05	7.E-05	7.E-05
				----------	----------	----------
Maintenance Equipment Total				**0.09**	**0.7**	**0.7**
				----------	----------	----------
TOTAL Klamath Falls PM10 Emissions from RAILROADS				**7.2**	**40**	**40**

Notes For Table 2.5.25

(1) Fuel consumption provided to DEQ by UP, Amtrak, and BNSF (DEQ Ref. 704). Union Pacific Railroad fuel consumption data is confidential business information. As such, Class I line haul fuel consumption has been totaled for BNSF and UP railroads for the county and non-attainment area. Klamath Northern RR is the only non-Class I RR in Klamath County. Klamath Northern fuel consumption provided to DEQ as a total dollar amount by the rail road (DEQ Ref. 549)

(2) Nonattainment area annual fuel consumption estimated using county to NAA track length.
NAA Fuel consumption, gal = (Length NAA track) / (Length of county track)
County to Nonattainment area breakdown, by track length and ownership, is as follows:

RR_LINE	STATUS	Length (miles) County	NAA Total	NAA % of Track	Notes
Class 1 Line-Haul	active	302.7	73.8	24.4%	Track ownership and length from DEQ GISLibrary
Class II & III (Klamath Northern)	active	11.0	0	0%	Track ownership and length from DEQ GISLibrary
Class I Passenger (Amtrak)	active	125.4	11	9%	County track total from Ref. 704, NAA track total estimated using ARCGIS
Yard (BNSF)	active	--	--	100%	BNSF Klamath Falls Yard located within Klamath Falls NA

Please see Appendix C, Figure C-10 for GIS mapping of county to NAA rail lines.

(3)

SCC	(a) PM10 (g/gal)	(b) PM10 (lb/gal)	(c) PM25 (lb/gal)
2285002006	5.1	0.0112	0.0109
2285002008	5.1	0.0112	0.0109
2285002010	5.5	0.0121	0.0118

(a) From EPA-420-F-09-025, Table 6. DEQ ref. 715, Table 6.

(b) EF, lb/gal = (EF, g/gal) * (0.002205 lb/gram)

(c) PM25 = (PM10)*0.97 : From EPA420-P-04-009,April 2009.(page.23):

(4) Coast Starlight (Amtrak) operates daily as of 2011. Freight locomotives considered to operate daily (DEQ Ref. 760)

(5) Annual Emissions [t/yr] = ((gallons fuel burned) * (EF)) / (2000 [lbs/ton])

(6) Seasonal Emissions [lbs/day] = (Annual Emissions [t/yr]) * (2000 [lbs/t]) * SAF / ([weekly activity] * [52 weeks/yr])

(7) Worst case season day emissions = typical season day emissions, as railroad activity is considered uniform throughout the year (see endnote 5)

(8) Results generated using the EPA NONROAD2008a emissions model. For model inputs, see Appendix C, Table C1, output = Tables C-16 through C-18..

(9) County totals allocated to NA using track length, as in Note (2):

RR_LINE	STATUS	Length (miles) County	NAA Total	NAA % of Track
Class 1 Line-Haul	active	302.7	73.8	
Class II & III (Klamath Northern)	active	11.0	0	
Class I Passenger (Amtrak)	active	125.4	11	
Total		**439.13**	**85.20**	**19.4%**

Table 2.5.26. Klamath Falls NAA 2008 SO_2 Emissions From Locomotives and Railway Maintenance Equipment

Locomotives	(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)
						------ NAA SO2 Emissions ------		
	2008 Annual Fuel Consumption		SO2 Emission Factor	Weekly Activity	Seasonal Adjustment Factor	Annual Emissions	-- Season Day Emissions --	
	County (gal)	NA (gal)	(lbs/gal)	(d/wk)	(SAF)	(tpy)	Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-006								
Line Haul: Class I (BNSF + UP)	4,709,078	1,148,293	0.0049	7	1.0	2.8	15.5	15.5
22-85-002-007								
Line Haul: Class II & III (KN RR)	14,018	0	--	--	--	0	0	0
22-85-002-008								
Line Haul: Passenger (Amtrak)	219,701	53,573	0.0049	7	1.0	0.1	1	1
22-85-002-010								
Yard (BNSF)	100,000	100,000	0.0049	7	1.0	0.2	1.3	1.3
	----------	----------				----------	----------	----------
Locomotive Total	**5,042,797**	**1,301,867**				**3.2**	**17.5**	**17.5**

Railway Maintenance Equipment	(8)	(8)	(8)	(9)	(9)	(9)
	---- County SO2 Emissions ----			------ NAA SO2 Emissions ------		
	Annual Emissions	-- Season Day Emissions --		Annual Emissions	-- Season Day Emissions --	
	(tpy)	Typical (lbs/day)	Worst Case (lbs/day)	(tpy)	Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-015						
Diesel	0.1	0.5	0.5	0.01	0.1	0.1
22-85-004-015						
Gasoline, 4-Stroke	4.E-04	0.003	0.003	8.E-05	6.E-04	6.E-04
22-85-006-015						
LPG	5.E-05	3.E-04	3.E-04	9.E-06	6.E-05	6.E-05
				----------	----------	----------
Maintenance Equipment Total				**0.01**	**0.1**	**0.1**
				----------	----------	----------
TOTAL Klamath Falls SO2 Emissions from RAILROADS				**3.2**	**18**	**18**

Notes For Table 2.5.26

(1) Fuel consumption provided to DEQ by UP, Amtrak, and BNSF (DEQ Ref. 704). Union Pacific Railroad fuel consumption data is confidential business information. As such, Class I line haul fuel consumption has been totaled for BNSF and UP railroads for the county and non-attainment area. Klamath Northern RR is the only non-Class I RR in Klamath County. Klamath Northern fuel consumption provided to DEQ as a total dollar amount by the rail road (DEQ Ref. 549)

(2) Nonattainment area annual fuel consumption estimated using county to NAA track length.
NAA Fuel consumption, gal = (Length NAA track) / (Length of county track)
County to Nonattainment area breakdown, by track length and ownership, is as follows:

RR_LINE	STATUS	Length (miles) County	Length (miles) NAA Total	NAA % of Track	Notes
Class 1 Line-Haul	active	302.7	73.8	24.4%	Track ownership and length from DEQ GISLibrary
Class II & III (Klamath Northern)	active	11.0	0	0%	Track ownership and length from DEQ GISLibrary
Class I Passenger (Amtrak)	active	125.4	11	9%	County track total from Ref. 704, NAA track total estimated using ARCGIS
Yard (BNSF)	active	--	--	100%	BNSF Klamath Falls Yard located within Klamath Falls NA

Please see Appendix C, Figure C-10 for GIS mapping of county to NAA rail lines.

(3) The SO2 EF calculation is as follows: SO2 (g/gal) = (fuel density) × (conversion factor) × (64 g SO2/32 g s) × (s content of fuel): DEQ Ref. 715, p. 5.

SCC	(a) Diesel Fuel Density (g/gal)	(a) Fraction of Fuel Sulfur Converted to SO2	(a) Conversion Factor (g SO2 / g S)	(b) Fuel Sulfur Content (ppm)	(c) SO2 EF (g/gal)	(d) SO2 EF (lb/gal)
2285002006	3200	0.978	2	355	2.22	0.0049
2285002008	3200	0.978	2	355	2.22	0.0049
2285002010	3200	0.978	2	355	2.22	0.0049

(a) DEQ Ref. 715, equation shown on p. 5

(b) 2008 land diesel sulfer ppm obtained from the EPA 2008 National County Database (DEQ Ref. 791)

(c) SO_2 (g/gal) = (diesel fuel density) * (Fractionof Fuel Sulfur Converted to SO2) * (64 g SO2/32 g S)) * (Fuel Sulfur Content, ppm* (10^-6))

(d) EF, lb/gal = (EF, g/gal) * (0.002205 lb/gram)

(4) Coast Starlight (Amtrak) operates daily as of 2011. Freight locomotives considered to operate daily (DEQ Ref. 760)

(5) Annual Emissions [t/yr] = ((gallons fuel burned) * (EF)) / (2000 [lbs/ton])

(6) Seasonal Emissions [lbs/day] = (Annual Emissions [t/yr]) * (2000 [lbs/t]) * SAF / ([weekly activity] * [52 weeks/yr])

(7) Worst case season day emissions = typical season day emissions, as railroad activity is considered uniform throughout the year (see endnote 5)

(8) Results generated using the EPA NONROAD2008a emissions model. For model inputs, see Appendix C, Table C1, output = Tables C-16 through C-18..

(9) County totals allocated to NA using track length, as in Note (2):

RR_LINE	STATUS	Length (miles) County	Length (miles) NAA Total	NAA % of Track
Class 1 Line-Haul	active	302.7	73.8	
Class II & III (Klamath Northern)	active	11.0	0	
Class I Passenger (Amtrak)	active	125.4	11	
Total		**439.13**	**85.20**	**19.4%**

Table 2.5.27. Klamath Falls NAA 2008 VOC Emissions From Locomotives and Railway Maintenance Equipment

Locomotives	(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)
						------ NAA VOC Emissions ------		
	2008 Annual Fuel Consumption		VOC Emission Factor	Weekly Activity	Seasonal Adjustment Factor	Annual Emissions	-- Season Day Emissions --	
	County (gal)	NA (gal)	(lbs/gal)	(d/wk)	(SAF)	(tpy)	Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-006								
Line Haul: Class I (BNSF + UP)	4,709,078	1,148,293	0.021	7	1.0	12.0	65.9	65.9
22-85-002-007								
Line Haul: Class II & III (KN RR)	14,018	0	--	--	--	0	0	0
22-85-002-008								
Line Haul: Passenger (Amtrak)	219,701	53,573	0.022	7	1.0	0.6	3	3
22-85-002-010								
Yard (BNSF)	100,000	100,000	0.034	7	1.0	1.7	9.2	9.2
	----------	----------				----------	----------	----------
Locomotive Total	**5,042,797**	**1,301,867**				**14.3**	**78.3**	**78.3**
Railway Maintenance Equipment			(8)	(8)	(8)	(9)	(9)	(9)
			---- County VOC Emissions ----			------ NAA VOC Emissions ------		
			Annual Emissions (tpy)	-- Season Day Emissions -- Typical (lbs/day)	Worst Case (lbs/day)	Annual Emissions (tpy)	-- Season Day Emissions -- Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-015								
Diesel			0.15	5	5	0.03	1.0	1.0
22-85-004-015								
Gasoline, 4-Stroke			0.19	84	79	4.E-02	2.E+01	2.E+01
22-85-006-015								
LPG			1.E-02	2.E-02	2.E-02	3.E-03	4.E-03	4.E-03
						----------	----------	----------
Maintenance Equipment Total						**0.07**	**17.2**	**16.2**
						----------	----------	----------
TOTAL Klamath Falls SO2 Emissions from RAILROADS						**14.3**	**96**	**95**

Notes For Table 2.5.27

(1) Fuel consumption provided to DEQ by UP, Amtrak, and BNSF (DEQ Ref. 704). Union Pacific Railroad fuel consumption data is confidential business information. As such, Class I line haul fuel consumption has been totaled for BNSF and UP railroads for the county and non-attainment area. Klamath Northern RR is the only non-Class I RR in Klamath County. Klamath Northern fuel consumption provided to DEQ as a total dollar amount by the rail road (DEQ Ref. 549)

(2) Nonattainment area annual fuel consumption estimated using county to NAA track length.
NAA Fuel consumption, gal = (Length NAA track) / (Length of county track)
County to Nonattainment area breakdown, by track length and ownership, is as follows:

RR_LINE	STATUS	Length (miles) County	Length (miles) NAA Total	NAA % of Track	Notes
Class 1 Line-Haul	active	302.7	73.8	24.4%	Track ownership and length from DEQ GISLibrary
Class II & III (Klamath Northern)	active	11.0	0	0%	Track ownership and length from DEQ GISLibrary
Class I Passenger (Amtrak)	active	125.4	11	9%	County track total from Ref. 704, NAA track total estimated using ARCGIS
Yard (BNSF)	active	--	--	100%	BNSF Klamath Falls Yard located within Klamath Falls NA

Please see Appendix C, Figure C-10 for GIS mapping of county to NAA rail lines.

(3)

SCC	(a) HC (g/gal)	(b) VOC (g/gal)	(c) VOC (lb/gal)
2285002006	9	9.5	0.021
2285002008	9.3	9.8	0.022
2285002010	14.5	15.3	0.034

(a) From EPA-420-F-09-025, Table 7. DEQ ref. 715

(b) VOC EF = (HC EF)* 1.053 : From EPA-420-F-09-025, p. 4. DEQ ref. 715

(c) EF, lb/gal = (EF, g/gal) * (0.002205 lb/gram)

(4) Coast Starlight (Amtrak) operates daily as of 2011. Freight locomotives considered to operate daily (DEQ Ref. 760)

(5) Annual Emissions [t/yr] = ((gallons fuel burned) * (EF)) / (2000 [lbs/ton])

(6) Seasonal Emissions [lbs/day] = (Annual Emissions [t/yr]) * (2000 [lbs/t]) * SAF / ([weekly activity] * [52 weeks/yr])

(7) Worst case season day emissions = typical season day emissions, as railroad activity is considered uniform throughout the year (see endnote 5)

(8) Results generated using the EPA NONROAD2008a emissions model. For model inputs, see Appendix C, Table C1, output = Tables C-16 through C-18..

(9) County totals allocated to NA using track length, as in Note (2):

RR_LINE	STATUS	Length (miles) County	Length (miles) NAA Total	NAA % of Track
Class 1 Line-Haul	active	302.7	73.8	
Class II & III (Klamath Northern)	active	11.0	0	
Class I Passenger (Amtrak)	active	125.4	11	
Total		**439.13**	**85.20**	**19.4%**

Table 2.5.28. Klamath Falls NAA 2008 NO_X Emissions From Locomotives and Railway Maintenance Equipment

Locomotives	(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)
						------ NAA NOX Emissions ------		
	2008 Annual Fuel Consumption		NOX Emission Factor	Weekly Activity	Seasonal Adjustment Factor	Annual Emissions	-- Season Day Emissions --	
	County (gal)	NA (gal)	(lbs/gal)	(d/wk)	(SAF)	(tpy)	Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-006 Line Haul: Class I (BNSF + UP)	4,709,078	1,148,293	0.37	7	1.0	214	1,176	1,176
22-85-002-007 Line Haul: Class II & III (KN RR)	14,018	0	--	--	--	0	0	0
22-85-002-008 Line Haul: Passenger (Amtrak)	219,701	53,573	0.47	7	1.0	13	69	69
22-85-002-010 Yard (BNSF)	100,000	100,000	0.54	7	1.0	27	147	147
	----------	----------				----------	----------	----------
Locomotive Total	**5,042,797**	**1,301,867**				**253**	**1,392**	**1,392**
Railway Maintenance Equipment			(8)	(8)	(8)	(9)	(9)	(9)
			---- County NOX Emissions ----			------ NAA NOX Emissions ------		
			Annual Emissions	-- Season Day Emissions --		Annual Emissions	-- Season Day Emissions --	
			(tpy)	Typical (lbs/day)	Worst Case (lbs/day)	(tpy)	Typical (lbs/day)	Worst Case (lbs/day)
22-85-002-015 Diesel			3.9	27	27	0.76	5.3	5.3
22-85-004-015 Gasoline, 4-Stroke			0.08	0.6	0.7	1.E-02	1.E-01	1.E-01
22-85-006-015 LPG			8.E-03	5.E-02	5.E-02	1.E-03	1.E-02	1.E-02
						----------	----------	----------
Maintenance Equipment Total						**0.78**	**5.4**	**5.5**
						----------	----------	----------
TOTAL Klamath Falls SO2 Emissions from RAILROADS						**254.2**	**1,398**	**1,398**

Notes For Table 2.5.28

(1) Fuel consumption provided to DEQ by UP, Amtrak, and BNSF (DEQ Ref. 704). Union Pacific Railroad fuel consumption data is confidential business information. As such, Class I line haul fuel consumption has been totaled for BNSF and UP railroads for the county and non-attainment area. Klamath Northern RR is the only non-Class I RR in Klamath County. Klamath Northern fuel consumption provided to DEQ as a total dollar amount by the rail road (DEQ Ref. 549)

(2) Nonattainment area annual fuel consumption estimated using county to NAA track length.
NAA Fuel consumption, gal = (Length NAA track) / (Length of county track)
County to Nonattainment area breakdown, by track length and ownership, is as follows:

RR_LINE	STATUS	Length (miles) County	NAA Total	NAA % of Track	Notes
Class 1 Line-Haul	active	302.7	73.8	24.4%	Track ownership and length from DEQ GISLibrary
Class II & III (Klamath Northern)	active	11.0	0	0%	Track ownership and length from DEQ GISLibrary
Class I Passenger (Amtrak)	active	125.4	11	9%	County track total from Ref. 704, NAA track total estimated using ARCGIS
Yard (BNSF)	active	--	--	100%	BNSF Klamath Falls Yard located within Klamath Falls NA

Please see Appendix C, Figure C-10 for GIS mapping of county to NAA rail lines.

(3)

SCC	(a) VOC (g/gal)	(b) VOC (lb/gal)
2285002006	169	0.37
2285002008	214	0.47
2285002010	243.0	0.54

(a) From EPA-420-F-09-025, Table 5. DEQ ref. 715

(b) EF, lb/gal = (EF, g/gal) * (0.002205 lb/gram)

(4) Coast Starlight (Amtrak) operates daily as of 2011. Freight locomotives considered to operate daily (DEQ Ref. 760)

(5) Annual Emissions [t/yr] = ((gallons fuel burned) * (EF)) / (2000 [lbs/ton])

(6) Seasonal Emissions [lbs/day] = (Annual Emissions [t/yr]) * (2000 [lbs/t]) * SAF / ([weekly activity] * [52 weeks/yr])

(7) Worst case season day emissions = typical season day emissions, as railroad activity is considered uniform throughout the year (see endnote 5)

(8) Results generated using the EPA NONROAD2008a emissions model. For model inputs, see Appendix C, Table C1, output = Tables C-16 through C-18..

(9) County totals allocated to NA using track length, as in Note (2):

RR_LINE	STATUS	Length (miles) County	NAA Total	NAA % of Track
Class 1 Line-Haul	active	302.7	73.8	
Class II & III (Klamath Northern)	active	11.0	0	
Class I Passenger (Amtrak)	active	125.4	11	
Total		**439.13**	**85.20**	**19.4%**

Table 2.5.29. Klamath Falls NAA 2008 $PM_{2.5}$ Emissions From Recreational Marine Vessels

	(1)	(1)	(1)	(2)	(2)	(2)	(3)	(3)	(3)
	---- County PM2.5 Emissions ----			---- Recreational ----			------ NAA PM2.5 Emissions ------		
		- Season Day Emissions -		---- Boating Days ----				-- Season Day --	
	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	County Total	NAA Total	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
Gasoline, 2-Stroke: Outboard									
22-82-005-010	18.2	8	8	101,175	10,859	10.7%	2.0	1	1
Gasoline, 2-Stroke: Personal Water Craft									
22-82-005-015	6.5	3	3	101,175	10,859	10.7%	0.7	3.1E-01	3.1E-01
Gasoline, 4-Stroke: Inboard/Sterndrive									
22-82-010-005	0.5	0.2	0.2	101,175	10,859	10.7%	0.1	2.3E-02	2.3E-02
Diesel: Inboard/Sterndrive									
22-82-020-005	1.3	0.6	0.6	101,175	10,859	10.7%	0.1	6.1E-02	6.1E-02
Diesel: Outboard									
22-82-020-010	0.03	0.01	0.01	101,175	10,859	10.7%	0.0	1.5E-03	1.5E-03
	-------	-------	-------				-------	-------	-------
Total	*26.5*	*12*	*12*				**2.8**	**1**	**1**

Notes For Table 2.5.29

(1) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Table C1 and Tables C-16 through C-18.

(2) NAA % of County is based on OSMB data for boating day use, Klamath County: Please see Appendix C, Table C-20.

(3) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.30. Klamath Falls NAA 2008 SO_2 Emissions From Recreational Marine Vessels

	(1) ---- County SO2 Emissions ----	(1)	(1)	(2) ---- Recreational ----	(2)	(2)	(3) ------ NAA SO2 Emissions ------	(3)	(3)
		- Season Day Emissions -		---- Boating Days ----				-- Season Day --	
	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	County Total	NAA Total	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
Gasoline, 2-Stroke: Outboard									
22-82-005-010	0.4	0.2	0.2	101,175	10,859	10.7%	3.9E-02	1.7E-02	1.7E-02
Gasoline, 2-Stroke: Personal Water Craft									
22-82-005-015	0.2	0.1	0.1	101,175	10,859	10.7%	1.7E-02	7.6E-03	7.6E-03
Gasoline, 4-Stroke: Inboard/Sterndrive									
22-82-010-005	0.2	0.1	0.1	101,175	10,859	10.7%	1.9E-02	8.5E-03	8.5E-03
Diesel: Inboard/Sterndrive									
22-82-020-005	1.4	0.6	0.6	101,175	10,859	10.7%	1.5E-01	6.9E-02	6.9E-02
Diesel: Outboard									
22-82-020-010	0.01	0.004	0.004	101,175	10,859	10.7%	8.5E-04	3.8E-04	3.8E-04
	-------	-------	-------				-------	-------	-------
Total	*2.1*	*1*	*1*				**0.2**	**0.1**	**0.1**

Notes For Table 2.5.30

(1) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Table C1 and Tables C-16 through C-18.

(2) NAA % of County is based on OSMB data for boating day use, Klamath County: Please see Appendix C, Table C-20.

(3) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.31. Klamath Falls NAA 2008 NO_X Emissions From Recreational Marine Vessels

	(1) ---- County NOX Emissions ----	(1)	(1)	(2) ---- Recreational ---- ---- Boating Days ----	(2)	(2)	(3) ------ NAA NOX Emissions ------	(3)	(3)
		- Season Day Emissions -						-- Season Day --	
	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	County Total	NAA Total	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
Gasoline, 2-Stroke: Outboard									
22-82-005-010	56.9	26	30	101,175	10,859	10.7%	6.1	3	3
Gasoline, 2-Stroke: Personal Water Craft									
22-82-005-015	20.9	10	11	101,175	10,859	10.7%	2.2	1	1
Gasoline, 4-Stroke: Inboard/Sterndrive									
22-82-010-005	81.1	42	48	101,175	10,859	10.7%	8.7	4	5
Diesel: Inboard/Sterndrive									
22-82-020-005	64.0	29	29	101,175	10,859	10.7%	6.9	3	3
Diesel: Outboard									
22-82-020-010	0.3	0.1	0.1	101,175	10,859	10.7%	3.1E-02	1.4E-02	1.4E-02
	-------	-------	-------				-------	-------	-------
Total	*223.1*	*106*	*118*				**24.0**	**11**	**13**

Notes For Table 2.5.31

(1) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Table C1 and Tables C-16 through C-18.

(2) NAA % of County is based on OSMB data for boating day use, Klamath County: Please see Appendix C, Table C-20.

(3) NAA Emissions = (County Emissions) * (NAA % of County)

Table 2.5.32. Klamath Falls NAA 2008 VOC Emissions From Recreational Marine Vessels

	(1)	(1)	(1)	(2)	(2)	(2)	(3)	(3)	(3)
	---- County VOC Emissions ----			---- Recreational ----			------ NAA VOC Emissions ------		
		- Season Day Emissions -		---- Boating Days ----				-- Season Day --	
	Annual Emissions (tpy)	Typical (lbs/day)	Worst Case (lbs/day)	County Total	NAA Total	NAA % of County	Annual Emissions (tpy)	Typical Day (lbs/day)	Worst Case (lbs/day)
Gasoline, 2-Stroke: Outboard									
22-82-005-010	1,151.2	708	675	101,175	10,859	10.7%	123.6	76	72
Gasoline, 2-Stroke: Personal Water Craft									
22-82-005-015	371.0	182	180	101,175	10,859	10.7%	39.8	20	19
Gasoline, 4-Stroke: Inboard/Sterndrive									
22-82-010-005	65.2	58	48	101,175	10,859	10.7%	7.0	6	5
Diesel: Inboard/Sterndrive									
22-82-020-005	2.6	1	1	101,175	10,859	10.7%	0.3	1.3E-01	1.3E-01
Diesel: Outboard									
22-82-020-010	0.1	0.03	0.03	101,175	10,859	10.7%	6.7E-03	3.0E-03	3.0E-03
	-------	-------	-------				-------	-------	-------
Total	*1,590.0*	*949*	*903*				**170.7**	**102**	**97**

Notes For Table 2.5.32

(1) For complete EPA NONROAD2008a emissions model output, and model input parameters, please see Appendix C, Table C1 and Tables C-16 through C-18.

(2) NAA % of County is based on OSMB data for boating day use, Klamath County: Please see Appendix C, Table C-20.

(3) NAA Emissions = (County Emissions) * (NAA % of County)

2.6 On-Road Mobile Sources

2.6.1 Introduction and Scope

The 2008 Klamath Falls NAA $PM_{2.5}$ emission inventories from on-road mobile sources were completed in accordance with the current EPA emission inventory preparatory guidelines for state implementation plans and transportation conformity[796]. This component of the emission inventory was completed by DEQ, but incorporated several key elements and contributions from the ODOT and other local participants. At various points in this section, reference is made to the material assembled into Appendix D and Appendix E of this report. Appendix D provides supplemental, technical detail related to the development of the 2008 on-road motor vehicle emission inventory. Supplemental technical detail related to the development of the 2014 on-road motor vehicle emission inventory can be found in Appendix E.

2.6.2 Methodology: Exhaust, Brake, and Tire

Figure 2.6-1 provides an overview of the methodology for the on-road mobile exhaust, brake, and tire emission estimates. As shown in the figure, the two main steps in developing the vehicle exhaust, brake and tire inventory were (1) the generation of link-based activity estimates using the transportation network travel demand model (TDM), and (2) the modeling of fleet $PM_{2.5}$ and other criteria pollutant emission factors using EPA's MOVES2010a emissions model.

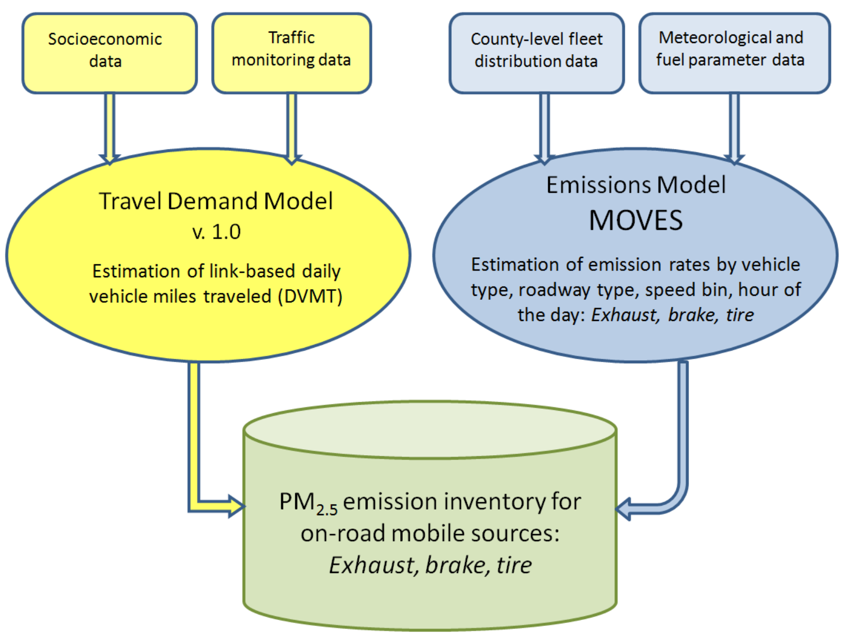

Figure 2.6-1. Overview of the Main Processing Steps and Software Used for the On-Road Mobile Exhaust, Brake, and Tire Emissions Inventory

2.6.2.1 Vehicle Activity Data

2.6.2.1.1 ODOT Methodology: Estimating Daily VMT by Link

2008 daily VMT by link was provided to DEQ by ODOT; An ODOT Interoffice Memo[806] from Richard Arnold, Senior Transportation Analyst, detailing the Klamath Falls Travel Demand Model Update for Air Quality PM2.5 Non-Attainment Area Analysis may be found in Appendix D: Estimating Vehicle Activity Documentation. This memo discusses the generation of link-based DVMT in detail.

2.6.2.1.2 ODOT DVMT Apportionment to NAA

ODOT supplied DVMT to DEQ by links within Travel Analysis Zones (TAZ). The total area for DVMT supplied was slightly larger than the NAA; as such ArcGIS10 was used to clip the ODOT data down to the NAA. Link distance was re-calculated, and VMT re-estimated for the clipped links.

2.6.2.1.3 ODOT DVMT Apportionment to Source Type

ODOT Daily VMT was apportioned to MOVES vehicle type using Oregon motor vehicle registration data, DMV data, Klamath Falls School District, and Klamath County School District data. The ODOT DVMT apportionment to MOVES vehicle type is detailed in Appendix D, Table D-1.

2.6.2.1.4 ODOT DVMT Temporal Allocation – Hour VMT Fraction

The ODOT DVMT was mapped via ArcGIS10, and a MOVES roadway type was assigned to each link based on ODOT speed bin and link location. The ODOT DVMT data was also assigned a MOVES speed bin ID; fortunately ODOT and MOVES speed bins aligned. ODOT daily VMT values were then adjusted to hourly VMT using MOVES default data, specifically the MOVES default hourly VMT Excel database input table “HourVMTFraction”. The input table breaks down daily activity into hourly activity fractions by MOVES roadway and source types.

2.6.2.2 MOVES2010a: Emission Factor Modeling, Exhaust, Brake, and Tire

2.6.2.2.1 2008 Inputs and Scenarios

Onroad mobile source emission rates were modeled using EPA's MOVES model. Three model runs were conducted for the NAA; typical season day, worst-case day, and annual. Temperature profiles were specific to each model run. The model was run at the county scale for Klamath County. The runs included all vehicle and road types and the pollutants PM2.5, SO2, NOx, VOC, NH3, and PM2.5 speciated pollutants. The model was run in emission rate mode to output emission factors for each road type, fuel type, day type, hour, speed bin, and process. The MOVES modeling Run Spec(s) are detailed in Tables 2.6.1 and 2.6.2 in the context of the Panel settings and County Data Manager datasets.

Table 2.6.1. MOVES Panel Settings, Base Year 2008

Panel Item	**Settings:** Typical Season Day (TSD) and Worst-Case Day (WCD)	**Settings:** Annual
Description	Typical Season Day, Worst-Case Day	Annual
Scale		
Scale	Klamath County (41035)	Klamath County (41035)
Calculation Type	Emission Rates	Emission Rates
Time Spans		
Aggregation	Hour	Hour
Year	2008	2008
Months	December	January, April, July, October
Days	Weekday	Weekend and Weekday
Hours	24	
Geographic Bounds	Klamath County	Klamath County
Vehicles/Equipment	All Gas and Diesel Vehicles/Equipment	All Gas and Diesel Vehicles/Equipment
Road Type	All	All
Pollutants and Processes		
Pollutants	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation
Processes	All	All
Manage Input Datasets	N/A	N/A
Strategies	None	None
Output		
General Output	Mass units = grams, Distance units = miles	Mass units = grams, Distance units = miles
Emissions Detail	Rates by pollutant, process, source type, roadtype, speedBin	Rates by pollutant, process, source type, roadtype, speedBin
Advanced Performance Features	N/A	N/A

Table 2.6.2. MOVES County Data Manager Inputs, Base Year 2008

Dataset(s)	**Information Sources**
Source Type Population	See Appendix D, Table D-1
Vehicle Type VMT	ODOT for K Falls NAA with vehicle split as detailed in Appendix D, Table D-1
Temporal Allocation	MOVES default
I/M Programs	N/A
Fuel	MOVES default with local regulations and ethanol amounts
Meteorology Data	*Temperature data*: specific to December (TSD) and December 23rd (WCD). WCD temperatures are consistent with residential wood combustion emissions estimate methodology where WCD estimates and temperatures are dependent upon 98th percentile monitoring data (see Appendix B, Table B-9 for monitoring data) *Humidity data*: MOVES default
Ramp Fraction	MOVES default
Road Type Distribution	ODOT with MOVES default vehicle split (see section 2.6.2.1.4)
Age Distribution	ODOT DMV vehicle Klamath County registration data (Ref. 814) was used to distribute source type 21 and 31 vehicle population data by age. All other source types = default data, National County Database
Average Speed Distribution	MOVES default

2.6.3 Final Emission Inventory, Exhaust, Brake, and Tire

All MOVES-generated rate data and ODOT VMT data were migrated to the MOVES Output Storage and Transformation (MOST) database on DEQ's SQL Server. Data was manipulated using Transact Structured Query Language (T-SQL). The steps taken to link the MOVES rates to the ODOT VMT and generate emissions estimates for exhaust, brake, and tire are detailed in the following outline:

A. Moves Rate Per Distance (RPD) Output to ODOT VMT

1. ODOT data = VMT by link, roadway type, and speed bin
2. Migrated MOVES output and ODOT data to SQL Server.
3. Overview: Queries written to accommodate MOVES output table insertion
   - A. Two template scripts
   - B. Script use depends upon which set of MOVES output data to be inserted (typical season vs. worst-case day, 2008 vs 2014, etc)
   - C. $PM_{2.5}$ Scripts written for rate per distance and rate per vehicle tables
   - D. Query output inserted into a final SQL Server Results table, with columns for specific scenario/pollutant (records specific to each link)
4. ODOT data matched to MOVES output
   - A. MovesHourVmtFraction used to split ODOT data by link into data by hour by link (via scalar)
   - B. MOVES output filtered to pollutant of interest (example: Pollutant IDs 116, 117, 110)
   - C. ODOT link data by hour, VMT, roadway type, speed bin multiplied by MOVES vehicle type percentage VMT by link
     - i. ODOT did not supply link VMT by vehicle type
     - ii. Vehicle type percentage developed from ODOT Klamath County (county-wide) data
5. ODOT VMT multiplied by MOVES rate per distance output by VMT/hour percentage.
   - A. Tables linked on day, hour, roadway type, and speed bin
   - B. Conversion factor to lbs (0.0022046 lb/kg)
   - C. Output by brake, tire, exhaust = process ID
6. Output grouped and summed by roadway type, speed bin, source type (vehicle type), link (fnode, tnode), and day ID (2 or 5)
7. Output summed by link
8. Summed output inserted into final SQL Server Results table

B. MOVES Rate Per Vehicle (RPV) and Rate Per Profile (RPP) data and Final Typical Day and Worst-Case Day Results

1. RPP and RPV Rate output from MOVES
   - A. Multiplied by conversion factor (kg to lb)
   - B. Multiplied by NAA % vehicle type population (see Appendix D, Table D-1)
     - i. Note – this data represents emissions from the vehicles, not from vehicle activity
   - C. Result = NAA daily emissions by source type (vehicle type)
2. Sum of NAA daily emissions by source type (vehicle type)
   - A. Multiplied by a ratio of

(Daily VMT by link and source type) / (NAA total daily VMT by source type)

B. Result = NAA total emissions for startup, idle, cool-down

C. Sums final results for RPV + RPD + RPP

1. Sets results field for each scenario (examples WCD08EmissionRate, TSD14EmissionRate) of dbo.Results to
2. (RPD query results) + (RPV query results)

D. Annual Emissions Estimates

1. MOVES annual run: Weekday and weekend day for all four seasons of the year
2. Estimate emissions as in (A) and (B) above for all MOVES runs.
3. Multiply seasonal weekday emissions by the number of weekdays within the season
4. Multiply season weekend day emissions by the number of weekend days within the season
5. Sum weekday and weekend day emissions for the year

2.6.4 Re-Entrained Road Dust

Re-Entrained road dust emissions were estimated using vehicle activity data in the form of vehicle miles traveled (VMT) provided by ODOT, and emission factors developed using EPA AP-42[8] emission factor formulas. Of particular interest are the calculations for worst-case day emissions; the worst-case day is defined as the time period immediately following a snow or ice event, when roadway has been sanded or cindered. Under these conditions, the silt-loading factor to the roadway surface increases dramatically from normal seasonal conditions, and as such the resulting emissions estimates for paved road re-entrained dust are elevated. However, Klamath County has purchased sweepers that comply with strict California standards, based upon FHwA's estimates for high efficiency machines at 99.6% removal efficiency and 90% of the area covered. DEQ has therefore applied a control efficiency (CE) of 90% to paved road re-entrained dust worst-case day emissions estimates, resulting in large reduction in the final estimates. In addition to paved road dust estimates, this category also includes emissions from unpaved roads, which are estimated to apply to 5% of the roadway in the NAA.

2.6.5 Summary of On-Road Mobile Source Emissions

On-road mobile source emissions have been summarized in the following Figures and Tables by vehicle and roadway type for annual, typical day, and worst-case day.

On-road mobile emissions summaries are provided in Tables 2.6.1 and 2.6.2, and Figures 2.6-2 through 2.6-4. On-road emissions estimates are further detailed in Tables 2.6.4 through 2.6.7. Emissions estimates show that the majority of on-road mobile source emissions originate from

- urban, unrestricted access roadways,
- vehicle exhaust,
- passenger cars and trucks,
- long-haul and short-haul trucking

Table 2.6.3. Klamath Falls 2008 NAA On-Road Mobile PM2.5 Emissions by Roadway Type

	Urban Unrestricted Access	Rural Unrestricted Access	Urban Restricted Access	Rural Restricted Access	**Total**	Units
Annual	77.4	12.8	1.7	0.4	92.2	tpy
Typical Season Day	443	73	10	2	529	lbs/day
Worst Case Season Day	764	133	17	4	917	lbs/day

Table 2.6.4. Klamath Falls 2008 NAA On-Road Mobile PM2.5 Emissions by Process

	Exhaust	Re-Entrained Road Dust	Brake	Tire	**Total**	Units
Annual	63.9	25.8	2.1	0.5	92.2	tpy
Typical Season Day	350	165	11	3	529	lbs/day
Worst Case Season Day	523	380	11	3	917	lbs/day

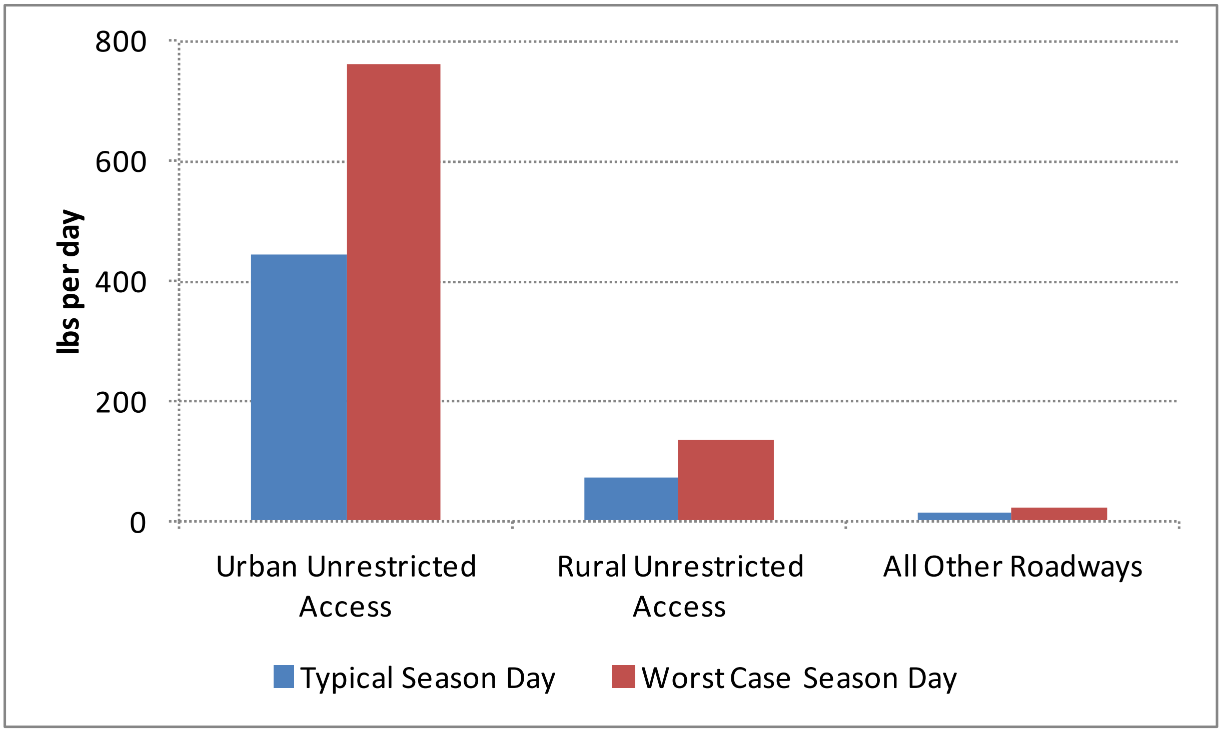

Figure 2.6-2. Klamath Falls 2008 NAA On-Road Mobile PM2.5 Emissions by Roadway Type

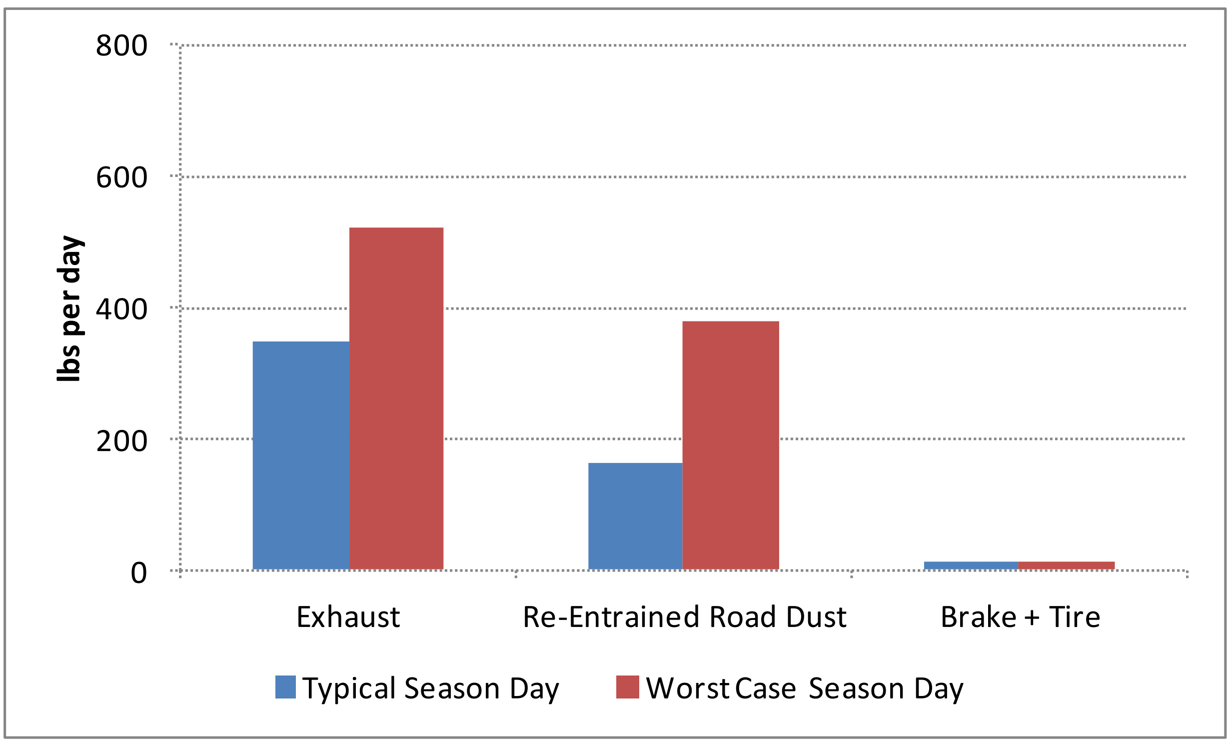

Figure 2.6-3. Klamath Falls 2008 NAA On-Road Mobile PM2.5 Emissions by Process

Table 2.6.5. Klamath Falls 2008 NAA On-Road PM2.5 Emissions and Emission Factors by Source

	(1a)	(1)	(1)	(2a)	(2)	(2)	(3a)	(3)	(3)
On-Road				---- **PM2.5 Emissions** ----			-- **PM2.5 Emission Factor** --		
Vehicles	--------------- **VMT** ---------------			Annual	TSD	WCD	Annual	TSD	WCD
	Annual	TSD	WCD	(tpy)	(lb/day)	(lb/day)	(lb/VMT)	(lb/VMT)	(lb/VMT)
Passenger Vehicles									
Passenger Car	67,419,704	184,712	184,712	6.3	35	77	0.00019	0.00019	0.00042
Passenger Truck	110,001,254	301,373	301,373	18.3	100	223	0.00033	0.00033	0.00074
Total: Passenger Vehicles	177,420,958	486,085	486,085	24.6	135	300	--	--	--
Trucking									
Single Unit Long-Haul Truck	16,570,313	45,398	45,398	4.5	25	25	0.0005	0.0005	0.0006
Single Unit Short-haul Truck	16,570,313	45,398	45,398	5.2	28	30	0.0006	0.0006	0.0007
Combination Long-Haul Truck	16,578,971	45,422	45,422	15.3	84	84	0.0018	0.0018	0.0018
Combination Short-Haul Truck	16,570,313	45,398	45,398	14.4	79	79	0.0017	0.0017	0.0017
Light Commercial Truck	10,380,254	28,439	28,439	0.7	4	5	0.0001	0.0001	0.0002
Total: Trucking	76,670,164	210,055	210,055	40.0	219	223	--	--	--
Other Vehicles									
Intercity Bus	0	0	0	0	0	0	--	--	--
Motor Home	4,179,556	11,451	11,451	0.9	5	6	0.0004	0.0004	0.0005
Motorcycle	6,964,899	19,082	19,082	0.5	3	5	0.0001	0.0001	0.0003
Refuse Truck	73,588	202	202	0.1	0.3	0.3	0.0015	0.0015	0.0015
School Bus	441,529	1,210	1,210	0.2	1	1	0.0010	0.0010	0.0010
Transit Bus	181,806	498	498	0.1	1	1	0.0016	0.0016	0.0016
Total: Other Vehicles	11,841,378	32,442	32,442	1.8	10	14	--	--	--
	-------	-------	-------	-------	-------	-------			
Total: All Vehicles	**265,932,500**	**728,582**	**728,582**	**66.4**	**364**	**537**	--	--	--

	(4)	(4)	(4)	(4)	(4)	(4)	(3a)	(3)	(3)
Re-Entrained				---- **PM2.5 Emissions** ----			-- **PM2.5 Emission Factor** --		
Road Dust	--------------- **VMT** ---------------			Annual	TSD	WCD	Annual	TSD	WCD
	Annual	TSD	WCD	(tpy)	(lb/day)	(lb/day)	(lb/VMT)	(lb/VMT)	(lb/VMT)
Paved Roads	252,442,489	691,623	691,623	5.7	36	252	0.00005	0.00005	0.00036
Unpaved Roads	13,490,011	36,959	36,959	20.1	128	128	0.00298	0.00347	0.00347
	------	------	------	------	------	------			
Total: Re-Entrained Road Dust	**265,932,500**	**728,582**	**728,582**	**25.8**	**165**	**380**	--	--	--
				-----	-----	-----			
Total: On-Road				**92.2**	**529**	**917**			

Notes for Table 2.6.5:

TSD = Typical Season Day

WCD = Worst-Case Season Day

(1) Daily VMT provided by ODOT.

(a) Annual VMT = (Daily VMT) * (365 days/yr)

(2) PM2.5 Emissions = (VMT) * (MOVES output, emissions rate mode).

(a) Annual emissions = (TSD) * (365 days/ry)

(3) Emission Factor, lbs/VMT = (emissions, lbs) / (VMT)

(a) Annual Emission Factor, lbs/VMT = (emissions, tpy) * (2000 lbs/ton) / VMT

(4) Re-Entrained Road Dust emissions estimates and calculations are from Tables 2.6.6 and 2.6.7

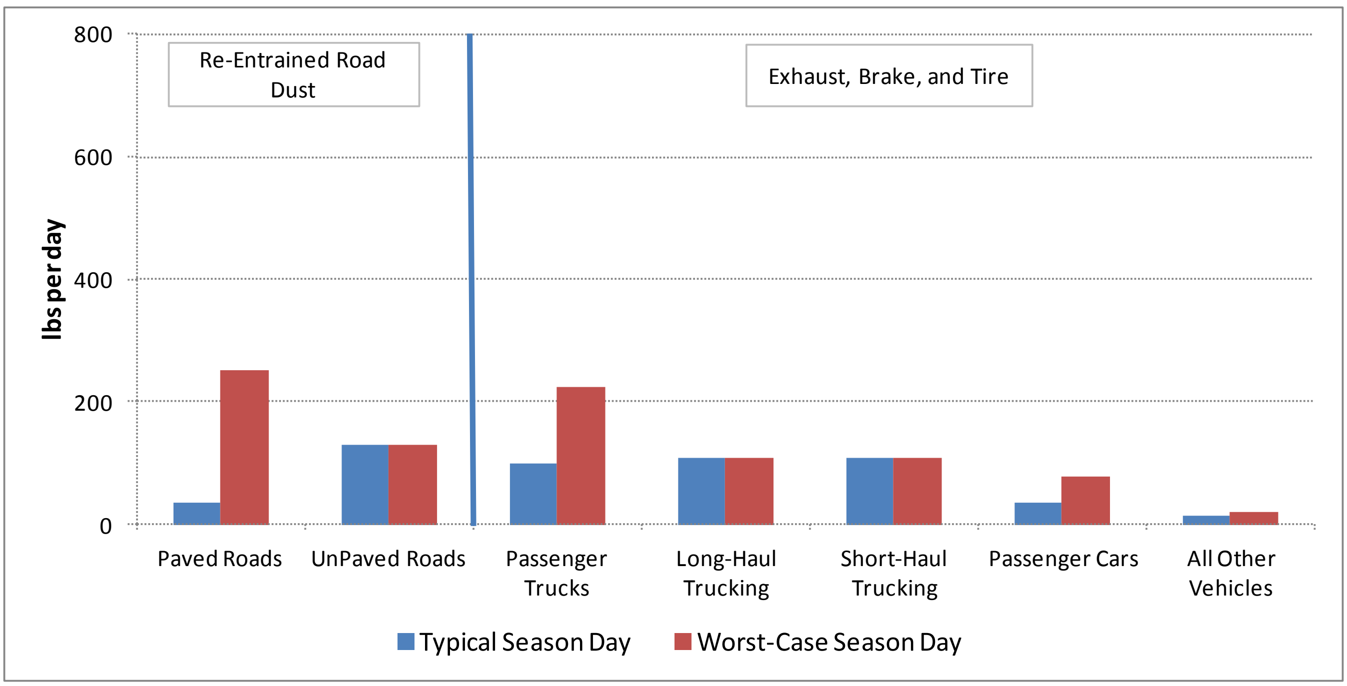

Figure 2.6-4. Klamath Falls 2008 NAA On-Road PM2.5 Emissions by Source

Table 2.6.6. 2008 Klamath Falls NAA On-Road Mobile Emissions by Roadway Type

PollutantName	*Rural Restricted Access*	*Rural Unrestricted Access*	*Urban Restricted Access*	*Urban Unrestricted Access*	*NAA Total*
Annual (1)					
NAA % Total VMT(2)	0.4%	15.1%	1.7%	82.8%	100.0%
Annual VMT (3)	1,160,619	40,176,703	4,492,382	220,102,796	265,932,500
	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
PM25-PRI Exhaust	0.3	8.6	1.2	53.8	63.9
PM25-PRI-Brakewear	3.E-03	0.2	4.E-02	1.9	2.1
PM25-PRI-Tirewear	2.E-03	0.1	9.E-03	0.4	0.5
PM25-PRI Re-Entrained Road Dust (4)	0.1	3.9	0.4	21.4	25.8
	--------	--------	--------	--------	--------
Total PM2.5	0.4	12.8	1.7	77.4	92.2
NH3	0.1	1.8	0.2	9.3	11.4
Oxides of Nitrogen	6.1	207.4	25.1	1,193.0	1,431.6
SO2	0.0	0.9	0.1	5.4	6.4
VOC	2.9	100.4	12.0	579.0	694.2
Typical Season Day (lbs/day)					
Daily VMT (3)	3,180	110,073	12,308	603,021	728,582
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	1	47	7	295	350
PM25-PRI-Brakewear	2.E-02	1	0.2	10	11
PM25-PRI-Tirewear	1.E-02	0.4	0.1	2	3
PM25-PRI Re-Entrained Road Dust (4)	7.E-01	25	3	136	165
	--------	--------	--------	--------	--------
Total PM2.5	2	73	10	443	529
NH3	0.3	10	1	51	62
Oxides of Nitrogen	34	1,137	138	6,537	7844
SO2	0.1	5	1	30	35
VOC	16	550	66	3,172	3804
Worst-Case Day (lbs/day)					
Daily VMT (3)	3,180	110,073	12,308	603,021	728,582
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	2	74	10	436	523
PM25-PRI-Brakewear	2.E-02	1	0.2	10	11
PM25-PRI-Tirewear	1.E-02	0.4	0.1	2	3
PM25-PRI Re-Entrained Road Dust (4)	2	57	6	315	380
	--------	--------	--------	--------	--------
Total PM2.5	4	133	17	764	917
NH3	0.3	10	1	51	62
Oxides of Nitrogen	34	1,158	140	6,657	7990
SO2	0.2	5	1	30	36
VOC	20	691	81	3,942	4734

Notes for Table 2.6.6:

(1) Annual emissions, tpy = (typical season day emissions, lbs/day) * (365 days/yr) / (2000 lbs/ton)

(2) % VMT by Roadway Type = default roadway type distribution for Klamath County, from MOVES supporting documentation and files

(3) VMT by Roadway Type = (Total VMT) * (% VMT by Roadway Type), where

Total Daily VMT =	728,582	(Provided by ODOT, DEQ Ref. 806)
Total Annual VMT =	265,932,500	= Daily VMT * 365

(4) PM2.5 from Re-Entrained Road Dust = (NAA 2008 Road Dust PM2.5 Emissions) * (% Total NAA VMT)

NAA 2008 Road Dust PM2.5 Emissions, from Tables 2.6.6 and 2.6.7

	Paved	Unpaved	Total
Annual (tpy)	5.7	20.1	25.8
Typical Season Day (lbs/day)	36	128	165
Worst-Case Day (lbs/day)	252	128	380

Table 2.6.7. 2008 Klamath Falls NAA On-Road Mobile Emissions by Vehicle Type

PollutantName	*Combination Long-Haul Truck*	*Combination Short-Haul Truck*	*Intercity Bus*	*Light Commercial Truck*	*Motor Home*	*Motorcycle*	*Passenger Car*	*Passenger Truck*	*Refuse Truck*	*School Bus*	*Single Unit Long-Haul Truck*	*Single Unit Short-haul Truck*	*Transit Bus*	*NAA Total*
Annual (1)														
NAA % Total VMT(2)	6.2%	6.2%	0%	3.9%	1.6%	2.6%	25.4%	41.4%	0.03%	0.2%	6.2%	6.2%	0.1%	
Annual VMT (3)	16,578,971	16,570,313	0	10,380,254	4,179,556	6,964,899	67,419,704	110,001,254	73,588	441,529	16,570,313	16,570,313	181,806	265,932,500
	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
PM25-PRI Exhaust	14.9	14.0	0	0.6	0.8	0.5	6.0	17.6	0.1	0.2	4.2	4.9	0.1	63.9
PM25-PRI-Brakewear	0.3	0.3	0	0.1	0.1	2.E-03	0.2	0.6	1.E-03	8.E-03	0.2	0.2	2.E-03	2.1
PM25-PRI-Tirewear	0.1	0.1	0	1.E-02	9.E-03	4.E-03	0.1	0.1	3.E-04	2.E-03	4.E-02	4.E-02	4.E-04	0.5
PM25-PRI Re-Entrained Road Dust (4)	1.6	1.6	0	1.0	0.4	0.7	6.5	10.7	7.E-03	4.E-02	1.6	1.6	2.E-02	25.8
	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total PM2.5	16.9	16.0	0	1.7	1.3	1.2	12.9	29.0	0.1	0.3	6.1	6.8	0.2	92.2
NH3	0.5	0.5	0	0.4	0.1	0.3	3.2	5.4	0.0	0.0	0.5	0.5	0.0	11.4
Oxides of Nitrogen	310.6	295.1	0	20.8	29.7	6.6	116.8	420.2	1.1	4.2	104.4	119.1	3.0	1,431.6
SO2	1.2	1.1	0	0.2	0.1	0.1	0.8	1.9	0.0	0.0	0.5	0.5	7.E-03	6.4
VOC	13.5	11.9	0	6.4	5.8	11.5	151.5	461.3	0.1	0.4	14.3	17.4	0.1	694.2
Typical Season Day (lbs/day)														
Daily VMT (3)	45,422	45,398	0	28,439	11,451	19,082	184,712	301,373	202	1,210	45,398	45,398	498	728,582
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	82	77	0	3	5	3	33	96	0.3	1	23	27	1	350
PM25-PRI-Brakewear	2	2	0	0.3	0.3	1.E-02	1	3	8.E-03	4.E-02	1	1	1.E-02	11
PM25-PRI-Tirewear	0.4	0.4	0	0.1	5.E-02	2.E-02	0.4	1	2.E-03	8.E-03	0.2	0.2	2.E-03	3
PM25-PRI Re-Entrained Road Dust (4)	10	10	0	6	3	4	42	68	5.E-02	3.E-01	10	10	1.E-01	165
	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total PM2.5	94	89	0	10	7	7	76	168	0	1	35	39	1	529
NH3	3	2	0	2	1	2	18	29	1.E-02	5.E-02	3	3	2.E-02	62
Oxides of Nitrogen	1,702	1,617	0	114	163	36	640	2,302	6	23	572	653	16	7844
SO2	7	6	0	1	1	0.4	4	11	2.E-02	7.E-02	3	3	4.E-02	35
VOC	74	65	0	35	32	63	830	2,528	0.3	2	78	95	1	3804
Worst-Case Day (lbs/day)														
Daily VMT (3)	45,422	45,398	0	28,439	11,451	19,082	184,712	301,373	202	1,210	45,398	45,398	498	728,582
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	82	77	0	5	6	5	75	219	0.3	1	24	29	1	523
PM25-PRI-Brakewear	2	2	0	0.3	0.3	1.E-02	1	3	8.E-03	4.E-02	1	1	1.E-02	11
PM25-PRI-Tirewear	0.4	0.4	0	0.1	5.E-02	2.E-02	0.4	1	2.E-03	8.E-03	0.2	0.2	2.E-03	3
PM25-PRI Re-Entrained Road Dust (4)	24	24	0	15	6	10	96	157	1.E-01	6.E-01	24	24	3.E-01	380
	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total PM2.5	108	103	0	20	12	15	173	381	0	2	49	54	1	917
NH3	3	2	0	2	1	2	18	29	1.E-02	5.E-02	3	3	2.E-02	62
Oxides of Nitrogen	1,721	1,637	0	116	165	36	661	2,364	6	23	580	663	16	7990
SO2	7	6	0	1	1	0.4	5	11	2.E-02	7.E-02	3	3	4.E-02	36
VOC	76	68	0	40	32	62	1,097	3,176	0.3	2	81	99	1	4734

Notes for Table 2.6.7:

(1) Annual emissions, tpy = (typical season day emissions, lbs/day) * (365 days/yr) / (2000 lbs/ton)

(2) % VMT by Vehicle Type = default roadway type distribution for Klamath County, from MOVES: Default database output.
Percentages used to allocate ODOT DVMT to DVMT by vehicle type. (DEQ Ref. 807)

(3) VMT by Vehicle Type = (Total VMT) * (% VMT by Vehicle Type), where

Total Daily VMT =	728,582	(Provided by ODOT, DEQ Ref. 806)
Total Annual VMT =	265,932,500	= Daily VMT * 365

(4) PM2.5 from Re-Entrained Road Dust = (NAA 2008 Road Dust PM2.5 Emissions) * (% Total NAA VMT)

NAA 2008 Road Dust PM2.5 Emissions, from Tables 2.6.6 and 2.6.7

	Paved	Unpaved	Total
Annual (tpy)	5.7	20.1	25.8
Typical Season Day (lbs/day)	36	128	165
Worst-Case Day (lbs/day)	252	128	380

Table 2.6.8. Klamath Falls NAA: Re-Entrained Road Dust, 2008 PM2.5 Emissions Estimates: Paved Roads

22-94-000-000: Paved Roads /All Paved Roads /Total: Fugitives (does not include brake or tire: These values are included in MOVES output)

(1)	(2)	(3)	(4)	(5)	(5)	(6)	(7)	(8)	(8)	(9)	(9)	(10)	(11)	(12)	(13)
------ Nonattainment Area ------			PM 2.5 Emission Factor Calculation Parameters											--- PM Season ---	
		Paved						PM2.5 Emission Factor				Seas.	2008	Typical	Worst
2008		Road		----- *sL* -----			Control	------------- *E* -------------				Adj.	Annual	Day	Case Day
Daily	% Paved	Daily	*k*	TSD	WCD	*W*	Efficiency	TSD	WCD	TSD	WCD	Factor	Emiss.	Emiss.	Emiss.
VMT	Roads	VMT	(g/VMT)	(g/m^2)	(g/m^2)	(tons)	(CE)	(g/VMT)	(g/VMT)	(lb/VMT)	(lb/VMT)	(SAF)	(tons/yr)	(lbs/day)	(lbs/day)
728,582	95%	691,623	0.25	0.37	3.1	3	0.90	0.03	0.22	7.1E-05	0.00049	0.74	**5.7**	**36**	**252**

Notes for Table 2.6.8

(1) E-mail from Richard Arnold, ODOT, to C. Swab. Klamath Falls 2008 VMT by TAZ and Link (downloaded from ODOT ftp site). 6/24/2011. (DEQ Ref. 747). Please see Appendix D, Figure D-1 for GIS allocation of ODOT Link data to NAA

(2) Total NAA road mileage = 396.04 (see note 1 for mileage data source and ArcGIS analysis project location)
Total NAA Paved Roadway mileage = 375.95 (DEQ Ref. 748)
% NAA Paved Roadway = 94.9%

(3) Paved road daily VMT = (NAA daily VMT) * (% Paved Roads within the NAA)

(4) k = Particle Size Multiplier = 0.25 g/VMT. AP-42, Table 13.2.1-1. (DEQ Ref. 8).

(5) sL = Paved Road Silt Loading Typical Season Day (TSD) = 0.37 g/m^2
Worst Case Day (WCD) = 3.1 g/m^2

Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)

(6) W = Average Vehicle Weight, tons = 3. This is a DEQ staff best estimate.

(7) Worst Case Day (WCD) Control Efficiency is due to the removal of road sand after sanding operations during ice and snow. Since the worst case day silt loading factor is due to the effects of road sanding, a control efficiency for sand removal can be applied to worst case day emissions estimates. The CE value for paved road sanding is based upon FHwA's estimates for high efficiency machines at 99.6% removal efficiency and 90% of the area covered CE is applied to the WCD PM2.5 EF calculations, see note (8) below.

(8) Typical Season Day (TSD) PM2.5 EF, E, g/VMT = k * (sL^0.91) * (W^1.02). AP-42, Chapter 13, Equation 1, p. 13.2.1-4. (DEQ Ref. 8)
Worst Case Day (WCD) PM2.5 EF, g/VMT = k * (sL^0.91) * (W^1.02) * (1-CE). AP-42, Chapter 13, Equation 1, p. 13.2.1-4, with CE added. (DEQ Ref. 8)

(9) PM2.5 EF, E, lb/VMT = (Particulate EF, g/VMT) * (0.0022046 lb/g)

(10) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)
SAF estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: Annual Days Without Precipitation: See Appendix D, Table D-2.

(11) 2008 NAA Annual Emissions, tpy = (Paved Road Daily VMT) * (233 days per year w/out precipitation) * (Particulate EF, lb/VMT, TSD) / (2000 lbs/ton)
Annual days without precipitation estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: See Appendix B9, Table B9i.

(12) 2008 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT, TSD) * (SAF)

(13) 2008 NAA Worst Case Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT, WCD) * (SAF)

Table 2.6.9. Klamath Falls NAA: Re-Entrained Road Dust, 2008 PM2.5 Emissions Estimates: Unpaved Roads

22-96-000-000: Unpaved Roads /All Unpaved Roads /Total: Fugitives (does not include brake or tire: These values are included in MOVES output)

(1)	(2)	(3)	(4)	(5)	(6)	(6)	(7)	(8)	(4)	(4)	(4)	(4)	(9)	(10)	(11)	(12)	(13)
																--- PM Season ---	
------ Nonattainment Area ------													PM2.5	Seasonal	2008	Typical	Worst
	%	Unpaved	---------- PM 2.5 Emission Factor Calculation Parameters. ----------										EF	Adjustment	Annual	Day	Case Day
2008	Unpaved	Road	*k*	*s*	*W*	*S*	*M*	*C*					*E*	Factor	Emissions	Emissions	Emissions
Daily VMT	Roads	Daily VMT	(lb/VMT)	(%)	(tons)	(mph)	(%)	(lb/VMT)	*a*	*b*	*c*	*d*	(lb/VMT)	(SAF)	(tons/yr)	(lbs/day)	(lbs/day)
Industrial Sites																	
728,582	2.5%	18,479	0.15	12%	25	--	12.5%	0.00036	0.9	0.45	--	--	0.0062	0.74	13.3	85	85
Publicly Accessible Roads																	
728,582	2.5%	18,479	0.18	8.7%	--	41.3	0.8%	0.00036	1	--	0.2	0.5	0.0032	0.74	6.8	43	43
															-------	-------	-------
Total															**20.1**	**128**	**128**

Notes for Table 2.6.9

(1) E-mail from Richard Arnold, ODOT, to C. Swab. Klamath Falls 2008 VMT by TAZ and Link (downloaded from ODOT ftp site). 6/24/2011. (DEQ Ref. 747).
Please see Appendix D, Figure D-1 for GIS allocation of ODOT Link data to NAA

(2) Total NAA road mileage =	396.04	(see note 1 for mileage data source and ArcGIS analysis project location)
Total NAA Unpaved Roadway mileage =	20.09	(DEQ Ref. 748)
% NAA Unpaved Roadway =	5.1%	
Industrial Sites =	2.5%	(50% of all unpaved NAA roadway, DEQ staff best estimate)
Publicly Accessible Roadways =	2.5%	(50% of all unpaved NAA roadway, DEQ staff best estimate)

(3) Unpaved road daily VMT = (NAA daily VMT) * (% Unpaved Roads within the NAA)

(4) Constants. AP-42, Table 13.2.2-2, p. 13.2.2-5. (DEQ Ref. 8)

(5) s = Surface Material Silt Content. Values taken from:
Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)

(6) W = Average Vehicle Weight in tons, S = Average Vehicle Speed. Values taken from:
Industrial W: Reference as in note (5), specifically, p. 41, Modoc Lumber Co. used as a surrogate.
Publicly Accessible Roads S: Speed estimated from ODOT data (see note 1). Speed is a VMT weight average, estimated as follows:

∑ (speed by link * daily VMT by link) =	30,081,747	VMT*mph
∑ daily VMT by link =	728,582	VMT

Avg Vehicle Speed =	41.3	mph

(7) M = Surface Material Moisture Content. Reference as in note (%). Table 2, p.12. Values are specific to Klamath Falls.

(8) C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear. From AP-42, Table 13.2.2-4, p. 13.2.2-6. (DEQ Ref. 8).

(9) Industrial PM2.5 EF, E = k * (s/12)^a * (W/3)^b. AP-42, Chapter 13.2.2, Equation 1a, p. 13.2.2-4. (DEQ Ref. 8)
Publicly Accessible Roads PM2.5 EF, E = ([k * (s/12)^a * (S/30)^d] \ [(M/0.5)^c]) - C. AP-42, Chapter 13.2.2, Equation 1b, p. 13.2.2-4. (DEQ Ref. 8)

(10) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)
SAF estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: <u>Annual Days Without Precipitation</u>: See Appendix D, Table D-2.

(11) 2008 NAA Annual Emissions, tpy = (Unpaved Road Daily VMT) * (233 annual days without precipitation) * (PM2.5 EF, lb/VMT) / (2000 lbs/ton)
Annual days without precipitation estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: See Appendix B9, Table B9i.

(12) 2008 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT) * (SAF)

(13) Worst Case Day assumed equal to Typical Season Day

3 FUTURE YEAR EMISSION INVENTORY (2014)

3.1 Future Year Emission Inventory

The maintenance demonstration must show that total emissions in the future will not exceed the National Ambient Air Quality Standard (NAAQS) based on a roll forward (or proportional) analysis. This simple analysis technique, called "roll forward," is used to predict future impacts on the Ambient Air Quality Standard, and is based on the premise that ambient $PM_{2.5}$ concentrations at Peterson School will change in proportion to changes in emissions calculated in the emissions inventory. In order to demonstrate continued attainment, future year anticipated ambient concentrations must be lower than the National Ambient Air Quality Standards (NAAQS) based on a proportional analysis of ambient concentrations compared to base year (2008) emissions. The Clean Air Act dictates the maintenance plan must be for a minimum of 10 years. The year 2014 is the future year dictated for this plan by the requirements of the Clean Air Act.

3.2 Emissions Projection Methodology

Since levels of growth are varied depending upon the type of $PM_{2.5}$ source category, a variety of applicable growth factors were developed for application to the 2014 emission inventory. The Department of Environmental Quality, and the Klamath Falls Air Quality Plan Advisory Committee assessed pertinent growth patterns within the Klamath Falls NAA. Based on recommendations by the Advisory Committee, DEQ calculated the appropriate population, household, employment, VMT, aircraft activity, and selected employment growth rates. DEQ provided growth assumption for wood use based on analysis of woodheating survey trends from 1985 through 2008.

The maintenance year has not been designated (12/5/11), but emissions were estimated for a10 year period out from the attainment year.

3.2.1 Permitted Point Sources

No growth was assumed for major permitted point sources between 2008 and 2014 because the sources have permitted limits. 80% of the permitted daily operating capacity was used to determine emissions through that period. However, there are three differences between the 2008 and 2014 permitted point source data:

1. The effects of the hardboard and particle board Maximum Achievable Control Technology (MACT DDDD) requirements on Collins Products (source number 18-0003) and Jeld Wen (source number 18-0006) were incorporated into the estimates.
2. Addition of emissions estimates for Klamath Falls Bioenergy, LLC (source number 18-9542). This facility has been permitted and is projected to be built by 2014.
3. Gasoline service station VOC emissions were grown using the formula

2008 Emission Inventory + ((2008 Emission Inventory) * (Average Annual Growth Rate, AAGR) * (# of years since 2008))

Where *2008 Emission Inventory was taken from Appendix A, Table A-1*
AAGR = *Oregon Office of Economic Development2008-2014 growth rate for population/housing units*[799]
# of years since 2008 *= 6*

2014 permitted point source emissions estimates for the Klamath Falls NAA are found in Appendix E, Table E-3.

3.2.2 Residential Wood Combustion

2014 residential wood combustion estimates were completed using a three part process:

1. Project device population growth, incorporating change-outs from the following:
    - EPA and city funded change-outs (2008 & 2009 only)
    - ARRA funded change-outs (2010 & 2011 only)
    - Change-outs mandated by Heat Smart: uncertified device removal/change-out upon existing home resale (2008-2014)
    - New device additions through new home construction (2008-2014)
    - Incorporate "natural attrition" change-outs: devices changed out by owners through their own accord, and not by any mandates or funding (2008-2014)
2. Estimate emissions from the projected device populations
3. Incorporate the impact from Advisory Day controls
    - The formula used to estimate advisory call effectiveness for the 2014 attainment year =

      $\boldsymbol{E_{AC} = E_{UC} * (1-(CE*RE*RP))}$

      Where

      $\mathbf{E_{AC}}$ = 2014 Advisory Controlled Emissions

      $\mathbf{E_{UC}}$ = 2014 Emissions with no advisory call controls applied: growth projection includes device change outs and new devices added

      CE = Control Efficiency: Advisory call effectiveness

      RE = Rule Effectiveness: Advisory call Enforcement effectiveness

      RP = Rule Penetration: impact from wood burning housing units exempted from the Advisory (approximately 100 burners)

The projected RWC emissions from steps 1 through 3 above are detailed in Appendix E, Tables E-19 through E-28.

3.2.3 Other Area Sources

For population and employment based area sources other than residential wood combustion, the 2008 base year emissions estimates were projected to the 2014 attainment year using Oregon Office of Economic Analysis forecast data[799]. Emissions were grown at a linear, non-compounding rate using the following formula:

*2008 Base Year Value + [(Growth Rate) * (Number of Years from 2008) * (2008 Base Year Value)]*

Growth rate data used was obtained from the Oregon Office of Economic Analysis (OEA)[799]. For example, for a selected sub-category for the year 2014, with a 2008 value of 10 tons per year, and a growth rate of 1% the emissions would be :

*10 tpy in 2008 + [(.01 growth) * (6 years) * (10 tpy in 2008)] = 10.6 tpy in 2014*

Emissions estimates for all other area sources, including wildfires, prescribed and agricultural burning, and windblown dust sources, were held constant for future year forecasts. Emissions forecasts for area sources are detailed in Appendix E, Tables E-2 through E-7.

3.2.4 Nonroad Sources

The EPA emissions model Nonroad2008a was used to model 2014 attainment year emissions for nonroad vehicles and equipment and recreational marine. Model inputs for the 2014 run are shown in Appendix C, Table C-1. 2009-2013 growth was estimated using linear extrapolation between 2008 and 2014.

Airport growth from 2008 to 2024, and Nonroad2008a output growth from 2014 to 2024 was estimated using a linear, non-compounding growth formula:

*Starting Year Value + [(Growth Rate) * (Number of Years from starting year) * (Starting Year Value)]*

Growth rate data used was obtained from the Oregon Office of Economic Analysis (OEA)[799]. For example, for a selected sub-category for the year 2024, with a 2014 value of 10 tons per year, and a growth rate of 1% the emissions would be :

*10 tpy in 2014 + [(.01 growth) * (10 years) * (10 tpy in 2014)] = 11.0 tpy in 2024*

Railroad emissions projections were estimated using projected industrial growth[799], and incorporating the impacts of both cleaner locomotives (Tier 1 through Tier 4 fleet penetration) and cleaner fuel. Emissions forecasts for area sources are detailed in Appendix E, Tables E-8 through E-13.

3.2.5 On-Road Mobile

3.2.5.1 ODOT Methodology: Estimating Daily VMT by Link

2014 daily VMT by link was provided to DEQ by ODOT; An ODOT Interoffice Memo[806] from Richard Arnold, Senior Transportation Analyst, detailing the Klamath Falls Travel Demand Model Update for Air Quality PM2.5 Non-Attainment Area Analysis may be found in Appendix D: Estimating Vehicle Activity Documentation. This memo discusses the generation of 2014 link-based DVMT in detail.

3.2.5.2 DVMT Adjustment: Clipping to NAA, Temporal Adjustment, Fleet Makeup

Methodology for formatting 2014 DVMT was the same as the methodology used for the 2008 DVMT formatting. Please see sections 2.6.2.1.2 – 2.6.2.1.4.

3.2.5.3 MOVES: Emission Factor Modeling, Exhaust, Brake, and Tire

3.2.5.3.1 2014 Inputs and Scenarios

Onroad mobile source emission rates were modeled using EPA's MOVES model. Three model runs were conducted for the NAA; typical season day, worst-case day, and annual. Temperature profiles were specific to each model run. The model was run at the county scale for Klamath County. The runs included all vehicle and road types and the pollutants PM2.5, SO2, NOx, VOC, NH3, and PM2.5 speciated pollutants. The model was run in emission rate mode to output emission factors for each road type, fuel type, day type, hour, speed bin, and process. The MOVES modeling Run Spec(s) are detailed in Tables 3.2.1 and 3.2.2 in the context of the Panel settings and County Data Manager datasets.

Table 3.2.1. MOVES Panel Settings, Attainment Year 2014

Panel Item	**Settings:** Typical Season Day (TSD) and Worst-Case Day (WCD)	**Settings:** Annual
Description	Typical Season Day, Worst-Case Day	Annual
Scale		
Scale	Klamath County (41035)	Klamath County (41035)
Calculation Type	Emission Rates	Emission Rates
Time Spans		
Aggregation	Hour	Hour
Year	2014	2014
Months	December	January, April, July, October
Days	Weekday	Weekend and Weekday
Hours	24	
Geographic Bounds	Klamath County	Klamath County
Vehicles/Equipment	All Gas and Diesel Vehicles/Equipment	All Gas and Diesel Vehicles/Equipment
Road Type	All	All
Pollutants and Processes		
Pollutants	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation
Processes	All	All
Manage Input Datasets	Customized MyLEV script, representing Oregon’s LEV program, model year 2009 and forward, per EPA guidance (EPA-420-B-10-003, Section 2. January, 2010)	Customized MyLEV script, representing Oregon’s LEV program, model year 2009 and forward, per EPA guidance (EPA-420-B-10-003, Section 2. January, 2010)
Strategies	None	None
Output		
General Output	Mass units = grams, Distance units = miles	Mass units = grams, Distance units = miles
Emissions Detail	Rates by pollutant, process, source type, roadtype, speedBin	Rates by pollutant, process, source type, roadtype, speedBin
Advanced Performance Features	N/A	N/A

Table 3.2.2. MOVES County Data Manager Data Inputs, Attainment Year 2014

Dataset(s)	**Information Sources**
Source Type Population	See Appendix D, Table D-1
Vehicle Type VMT	ODOT for K Falls NAA with vehicle split as detailed in Appendix D, Table D-1
Temporal Allocation	MOVES default
I/M Programs	N/A
Fuel	MOVES default with local regulations and ethanol amounts
Meteorology Data	*Temperature data*: specific to December (TSD) and December 23rd (WCD). WCD temperatures are consistent with residential wood combustion emissions estimate methodology where WCD estimates and temperatures are dependent upon 98th percentile monitoring data (see Appendix B, Table B-9 for monitoring data) *Humidity data*: MOVES default
Ramp Fraction	MOVES default
Road Type Distribution	ODOT with MOVES default vehicle split (see section 2.6.2.1.4)
Age Distribution	ODOT DMV vehicle Klamath County registration data (Ref. 814) was used to distribute source type 21 and 31 vehicle population data by age. All other source types = default data, National County Database
Average Speed Distribution	MOVES default

3.2.5.4 Final 2014 Emissions Inventory, Exhaust, Brake, and Tire

The same procedures used for the 2008 emissions estimates were used for 2014 estimates; please see section 2.6.3 of this document for a description of the methodology.

3.3 Emissions Summary

The 2014 emissions from stationary point, stationary area, non-road mobile, and on-road mobile are summarized below in Table 3.3.1. The emissions are further summarized in the figures that follow. The 2014 emissions are compared to the 2008 base year in the final two figures.

Table 3.3.1. Klamath Falls NAA: Summary of 2014 Emissions by Source Category

Source Category	Annual (tpy)	Percent Of Total	Worst-Case Day (lbs/day)	Percent Of Total
$PM_{2.5}$				
Point(1)	137.4	23%	1,378	32%
Area(2)	389.2	65%	2,066	48%
Nonroad	13.2	2%	123	3%
On-Road	60.7(3)	10%	699	16%
Total	**600.5**		**4,266**	
NO_X				
Point(1)	522.4	29%	4,517	34%
Area(2)	116.3	6%	1,354	10%
Nonroad	311.0	17%	2,586	19%
On-Road	860.6	48%	4,834	36%
Total	**1,810.4**		**13,291**	
VOC				
Point(1)	1,017.6	38%	10,430	51%
Area(2)	957.4	36%	5,944	29%
Nonroad	194.4	7%	793	4%
On-Road	475.3	18%	3,337	16%
Total	**2,644.7**		**20,504**	
NH_3				
Point(1)	73.2	30%	1,471	65%
Area(2)	163.5	66%	736	33%
Nonroad	--	--	--	--
On-Road	10.3	4%	56	2%
Total	**246.9**		**2,263**	
SO_X				
Point(1)	80.0	59%	568	46%
Area(2)	50.7	37%	556	45%
Nonroad	2.6	2%	89	7%
On-Road	2.9	2%	17	1%
Total	**136.3**		**1,230**	

(1) Worst-case day = 80% permitted daily operating capacity
(2) Area source residential wood combustion worst-case day = advisory controlled
(3) Re-entrained dust + (MOVES typical season day * 365 days): *11/18/11*

Updated, cls 2/17/12

Table 3.3.2. 2014 Estimated Typical Season Day and Worst-Case Day $PM_{2.5}$ Emissions, Grouped and Summed to Show Contribution by Major Source Group

	-- lbs/per day --		Percent of Total NAA Emissions	
	Typical Season Day	Worst-Case Day	Typical Season Day	Worst-Case Day
Permitted Point Sources[1]				
Columbia Forest Products	268	518	8%	12%
Collins Products	170	320	5%	8%
Klamath Cogeneration	3	62	0.1%	1%
JELD-WEN, Inc.	67	129	2%	3%
Klamath Falls Bioenergy, LLC	98	117	3%	3%
All Other Permitted Point Sources	145	233	4%	5%
Stationary Area Sources				
Residential Wood Combustion: Fireplace[2]	835	736	25%	17%
Residential Wood Combustion: Non-Certified Woodstove/Insert[2]	477	421	14%	10%
All Other Res Wood Combustion[2]	263	232	8%	5%
Wildfire/Prescribed Burning	459	459	14%	11%
All Other Stationary Area Sources	156	219	5%	5%
On-Road Sources				
On-Road: Exhaust, Brake, Tire	199	307	6%	7%
Re-Entrained Road Dust	156	392	5%	9%
Nonroad Sources				
All Nonroad Vehicles & Equipment	66	123	2%	3%
	------	------		
Total, All Sources, lbs/day	**3,361**	**4,266**		

(1) Worst-case day = 80% permitted daily operating capacity

Updated, CLS 2/17/12

(2) Worst-case day = Advisory controlled

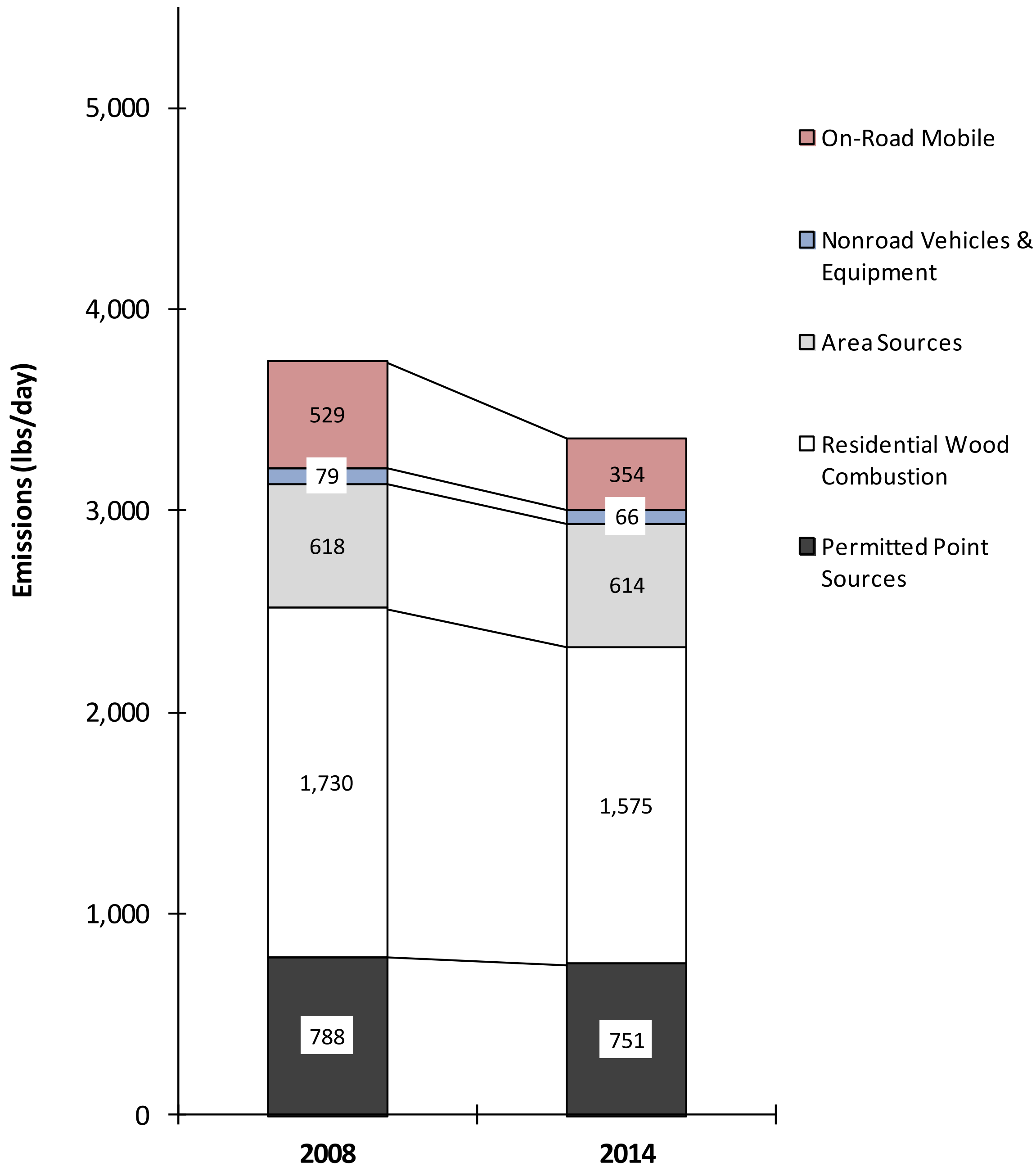

Figure 3.3-1. Comparison of 2008 Base Year and 2014 Forecast Year Typical Season Day $PM_{2.5}$ Emissions

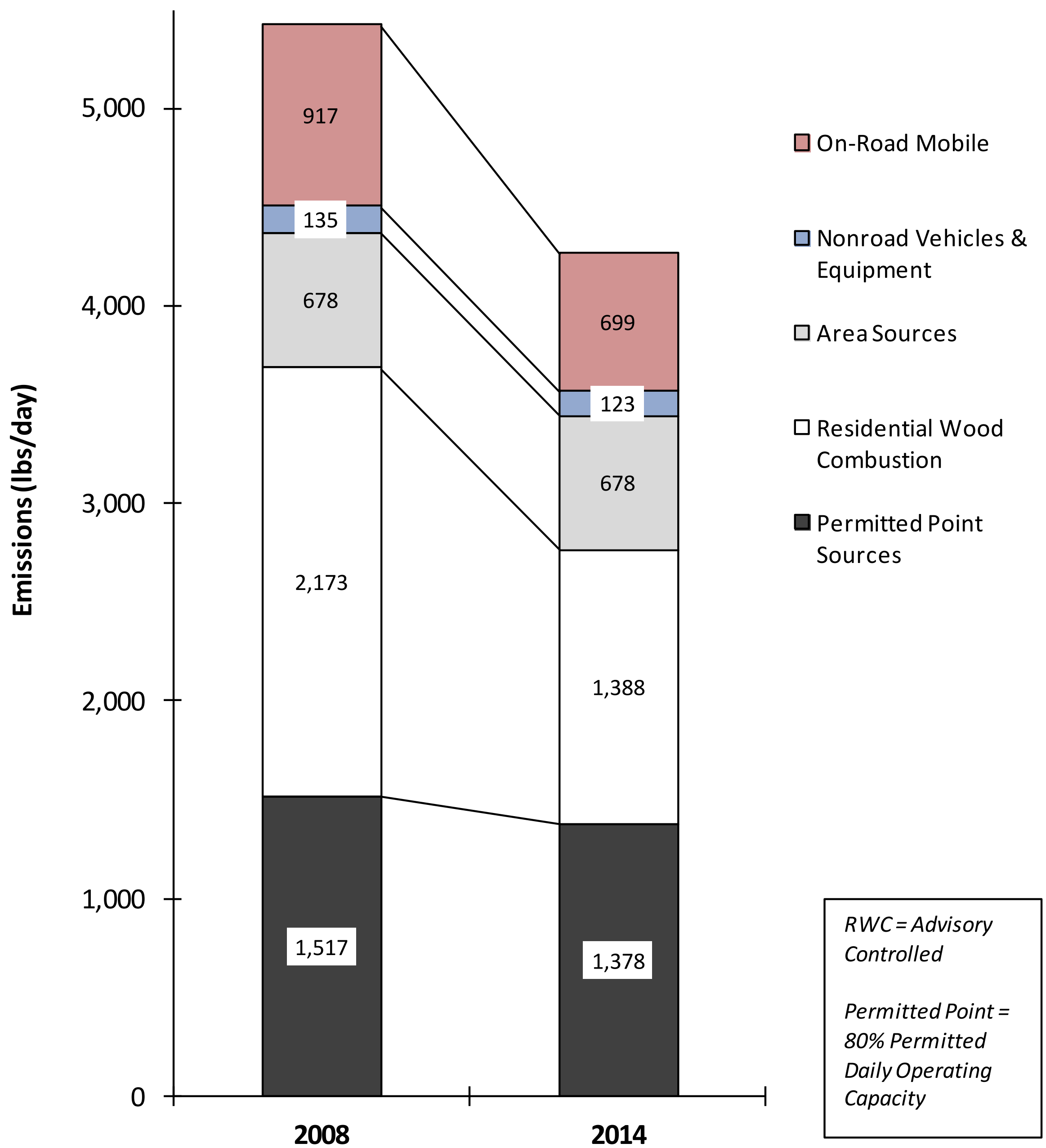

Figure 3.3-2. Comparison of 2008 Base Year and 2014 Forecast Year Worst-Case Season Day $PM_{2.5}$ Emissions

4 CONCENTRATION MODELING: DESIGN DAY EMISSION INVENTORY

The Klamath Falls PM2.5 Attainment Demonstration will use a so-called roll-back model to predict ambient concentrations for the 2014 future year. Roll-back models are based on the assumed correlation between emissions in a base period with concentrations measured at a reference monitor during the same period. Concentrations for a future year are predicted using the change in emissions from the base period, assuming that concentrations are correlated and will change in like manner. For the Klamath Falls demonstration, the base period from which the Design Value ambient concentration is estimated is 2006-2010. The base year for the emissions inventory is 2008, the center year of the Design Value period.

Emissions data for the 2008 base year can be estimated assuming a range of “operating” scenarios, including “actual” emissions, “typical season day” emissions, “worst case day” emissions, and other case-by-case emission estimates by source category. Please see section 1.2 of this document for a description of typical season and worst-case day emissions. For the purposes of the roll-back model, the goal is to develop an emissions inventory that matches as closely as possible the conditions under which the Design Value concentrations were measured. This emissions inventory is referred to as the Design Day inventory. As shown in the following Tables 4-1 through 4-4, the choice of which emissions to include in the Design Day inventory (worst-case or typical season day) varies by source category. For most categories, the emissions are typical season day emissions; for some, such as residential wood consumption, worst case day is a more representative choice. The permitted point source design day inventory includes emissions estimates for the following scenarios:

- Actual: Emissions estimated from source annual reports and adjusted to typical season day via EPA temporal profiles specific to process;
- 80% capacity: Potential emissions (PTE), estimated using 80% of the source permitted daily operating capacity as the activity level. Emissions represent worst-case day;
- 100% capacity: Potential emissions (PTE), estimated using 100% of the source permitted daily operating capacity as the activity level. Emissions represent worst-case day;
- Permitted Plant Site Emission Limits (PSEL): Potential emissions (PTE) estimated using the source’s PSEL emission limits.

The attainment year for Klamath Falls is 2014. For the attainment year, it is appropriate to develop multiple emission scenarios representing the range of possible future activity. For example, industrial source emissions could represent expected actual emissions, or emissions at higher levels such as 80% of production capacity, or at maximum permitted emission levels (PSELs). For other source categories, such as residential wood burning, a range of inventories could be developed to demonstrate the effect of different control strategies including uncertified stove change-outs, or more stringent no-burning calls.

Details about how the Design Day and Future Year emissions inventories used in the roll-back model are described in the roll-back modeling documentation for the Klamath Falls PM2.5 SIP.

Table 4- 1. Design Day Emission Inventory: 2014 Attainment Year, Permitted Sources.

Permit No.	Source Name	Actual 2014 **TSD** Emissions lbs/day	2014 **PSEL** lbs/day
18-9542	KBIOENGY	98	137
18-0003	KCOGEN	93	327
18-0006	JELDWEN	67	130
18-0014	COLUMB	268	361
18-0020	INDOIL	17	77
18-0026	KGEN	0	0
18-0032	KENERGY	3	92
18-0097	KINGSLEY	3	77
18-0013	COLLINS	170	532
	Total All	**717**	**1732**

Notes: TSD = Typical Season Day
PSEL = Plant Site Emission Limit

Table 4- 2. Design Day Emission Inventory: 2014 Attainment Year, Area Sources

TSD = Typical Season Day, WCD = Worst-Case Day Source Description	SCC	------------$PM_{2.5}$------------ TSD (lbs/day)	WCD (lbs/day)	Design Day (lbs/day)	Design Day EI Value Set Equal To:	Notes
WASTE DISPOSAL, TREATMENT, & RECOVERY						
Residential Open Burning: Total	21-04/26-10	38	38	38	typical season day	typical season day = worst-case day
Commercial / Institutional Open Burning	26-10-020-000	0	0	0		
Open Burning; Land Clearing Debris	26-10-000-500	5	5	5		
Category Subtotal		**43**	**43**	**43**		
SMALL STATIONARY FOSSIL FUEL COMBUSTION						
Industrial Distillate/Kerosene Fuel Oil	21-02-004-000	2.E-01	2.E-01	2.E-01	worst-case day	typical season day = worst-case day
Industrial Residual Fuel Oil	21-02-005-000	0.8	0.8	1		
Industrial Natural Gas Combustion	21-02-006-000	8	8	8		
Industrial Liquid Petroleum Gas Combustion	21-02-007-000	1.E-02	1.E-02	1.E-02		
Commercial/Institutional Distillate/Kerosene Fuel Oil	21-03-004-000	2	4	4		WCD estimated from HDD ratio
Commercial/Institutional Residual Fuel Oil	21-03-005-000	2.E-01	4.E-01	4.E-01		
Commercial/Institutional Natural Gas Combustion	21-03-006-000	13	23	23		
Commercial/Institutional Liquid Petroleum Gas Combustion	21-03-007-000	3.E-02	6.E-02	6.E-02		
Residential Distillate/Kerosene Fuel Oil	21-04-004-000	0.6	1.0	1.0		
Residential Natural Gas Combustion	21-04-006-000	0.3	0.5	0.5		
Residential Liquid Petroleum Gas Combustion	21-04-007-000	2.E-02	4.E-02	4.E-02		
Category Subtotal		**25**	**38**	**38**		
RESIDENTIAL WOOD COMBUSTION (1)						
Fireplace	21-04-008-100	835	736	736	worst-case day	*Emissions estimates incorporate changeouts and impacts from advisory day enforcement. Please see Appendix E, Tables E-19 through E-29 for detailed data on Residential Wood Combustion emissions Projections*
Insert Not Certified	21-04-008-210	239	210	210		
Insert Certified NonCatalytic	21-04-008-220	15	13	13		
Insert Certified Catalytic	21-04-008-230	83	73	73		
Woodstove Not Certified	21-04-008-310	239	210	210		
Woodstove Certified NonCatalytic	21-04-008-320	87	77	77		
Woodstove Certified Catalytic	21-04-008-330	42	37	37		
Certified Pellet Stove	21-04-008-400	24	21	21		
Central Furnace	21-04-008-510	12	11	11		
Category Subtotal		**1,575**	**1,388**	**1,388**		
MISCELLANEOUS AREA SOURCES						
Wildfire and Prescribed Burning	28-10	459	459	459	worst-case day	typical season day = worst-case day
Structure Fires	28-10-030-000	1	1	1		
Agricultural Burning	28-11-500-000	39	39	39		
Commercial Food Preparation (commercial cooking)	23-02	19	19	19		
Category Subtotal		**518**	**518**	**518**		
FUGITIVE DUST						
Aggregate Storage Piles	25-30-000-060	5	44	5	typical season day	seasonal estimates based on sanding logs
Road Sanding	22-94-000-002	21	33	21		
Construction	22-11-010-000	0	0	--	N/A	Based on soil disturbance: Seasonal emissions = 0
Agricultural Tilling	28-01-000-003	0	0	--	N/A	
Geogenic (fallow field) Wind Erosion	27-30-100-000	0	0	--	N/A	
Animal Husbandry	28-05	1	1	1.2	worst-case day	typical season day = worst-case day
Category Subtotal		**28**	**78**	**28**		
		-----	-----	-------		
AREA SOURCE $PM_{2.5}$ TOTAL		**2,190**	**2,066**	**2,016**		

Notes for Table 4-2:

(1) Reduction from advisory call applied to total WCD emissions: breakdown is as follows:

	WCD, no advisory	% Total	Less Advisory	Final Total
Fireplace	2,004	53%	1,268	736
Insert Not Certified	573	15%	363	210
Insert Certified NonCatalytic	36	1%	23	13
Insert Certified Catalytic	199	5%	126	73
Woodstove Not Certified	573	15%	362	210
Woodstove Certified NonCatalytic	209	6%	132	77
Woodstove Certified Catalytic	100	3%	64	37
Certified Pellet Stove	58	2%	37	21
Central Furnace	29	1%	18	11
	--------	--------	--------	--------
Total	3,781	100%	2,393	1,388
Less Advisory	2,393			
Final Total	1,388			

Table 4- 3. Design Day Emission Inventory, 2014 Attainment Year, Nonroad Sources

TSD = Typical Season Day, WCD = Worst-Case Day		------------PM$_{2.5}$------------			Design Day EI	
Source Description	SCC	TSD (lbs/day)	WCD (lbs/day)	Design Day (lbs/day)	Value Set Equal To:	Notes
NONROAD VEHICLES AND EQUIPMENT: *NONROAD2008a*						
Gasoline: 2-Cycle	22-60-000					
Recreational	22-60-001-000	1.6	1.6	2	typical season day	NONROAD2008a model run: input temps averaged over the season
Construction	22-60-002-000	0.3	0.3	3.E-01		
Industrial	22-60-003-000	1.E-03	1.E-03	1.E-03		
Lawn & Garden	22-60-004-000	1.1	1.1	1		
Agricultural	22-60-005-000	1.E-03	1.E-03	1.E-03		
Light Commercial	22-60-006-000	0.5	0.5	5.E-01		
Logging	22-60-007-000	5.E-02	5.E-02	5.E-02		
Subtotal 2- Cycle Gas		**4**	**4**	**4**		
Gasoline: 4-Cycle	22-65-000					
Recreational	22-65-001-000	2.E-01	2.E-01	2.E-01	typical season day	NONROAD2008a model run: input temps averaged over the season
Construction	22-65-002-000	2.E-02	2.E-02	2.E-02		
Industrial	22-65-003-000	2.E-02	2.E-02	2.E-02		
Lawn & Garden	22-65-004-000	0.1	0.1	9.E-02		
Agricultural	22-65-005-000	2.E-03	2.E-03	2.E-03		
Light Commercial	22-65-006-000	0.5	0.5	1		
Logging	22-65-007-000	9.E-04	9.E-04	9.E-04		
Subtotal 4- Cycle Gas		**1**	**1**	**1**		
CNG & LPG	22-67/68					
Recreational	22-67/68-001-000	3.E-05	3.E-05	3.E-05	typical season day	NONROAD2008a model run: input temps averaged over the season
Construction	22-67/68-002-000	3.E-03	3.E-03	3.E-03		
Industrial	22-67/68-003-000	6.E-01	6.E-01	6.E-01		
Lawn & Garden	22-67/68-004-000	1.E-04	1.E-04	1.E-04		
Agricultural	22-67/68-005-000	2.E-06	2.E-06	2.E-06		
Light Commercial	22-67/68-006-000	7.E-02	7.E-02	7.E-02		
Logging	22-67/68-007-000	--	--	--		
Subtotal CNG/LPG		**1**	**1**	**1**		
Diesel	22-70-000					
Recreational	22-70-001-000	7.E-03	7.E-03	7.E-03	typical season day	NONROAD2008a model run: input temps averaged over the season
Construction	22-70-002-000	5.9	5.9	6		
Industrial	22-70-003-000	2.1	2.1	2		
Lawn & Garden	22-70-004-000	3.E-02	3.E-02	3.E-02		
Agricultural	22-70-005-000	2.E-02	2.E-02	2.E-02		
Light Commercial	22-70-006-000	2.3	2.3	2		
Logging	22-70-007-000	--	--	--		
Subtotal Diesel		**10**	**10**	**10**		

Table 4-3, continued:

TSD = Typical Season Day, WCD = Worst-Case Day Source Description	SCC	PM$_{2.5}$ TSD (lbs/day)	PM$_{2.5}$ WCD (lbs/day)	PM$_{2.5}$ Design Day (lbs/day)	Design Day EI Value Set Equal To:	Notes
AIRPORT/RAIL/MARINE						
Kingsley Field Airport (1)						
Military Aircraft	22-75-001-000	1	4	1	typical season day	Growth based on OAE data. Typical day estimated from seasonal LTO data
Commercial Aircraft	22-75-020-000	13	45	13		
General Aviation	22-75-050-000	0	4	0.4		
Air Taxi	22-75-060-001	1	2	1		
Ground Support Equipment	22-XX-008-000	4	20	4		
Auxiliary Power Units (APU)	22-75-070-000	0	1	0.3		
Subtotal Airport		**19**	**77**	**19**		
Rail (2)						
Line Haul Locomotives: Class I	22-85-002-006	26	26	26	typical season day	Growth based on OEA data. Typical season day = worst-case day
Line Haul Locomotives: Class II & III	22-85-002-007	0	0	0		
Line Haul Locomotives: Passenger	22-85-002-008	1	1	1		
Yard Locomotives	22-85-002-010	2	2	2		
Maintenance Eqpmt: All Fuels	22-85-00X-015	8.E-05	8.E-05	8.E-05		NONROAD2008a
Subtotal Rail		**30**	**30**	**30**		
Recreational Marine Vessels: NONROAD2008a						
Gas, 2-Stroke: Outboard	22-82-005-010	0.5	0.5	0	typical season day	NONROAD2008a model run: input temps averaged over the season
Gas, 2-Stroke: Personal Water Craft	22-82-005-015	0.2	0.2	2.E-01		
Gas, 4-Stroke: Inboard/Sterndrive	22-82-010-005	0.1	0.1	6.E-02		
Diesel: Inboard/Sterndrive	22-82-020-005	0.1	0.1	6.E-02		
Diesel: Outboard	22-82-020-010	2.E-03	2.E-03	2.E-03		
Subtotal Recreational Marine		**1**	**1**	**1**		
		-----	-----	-------		
Nonroad Vehicles and Equipment Total PM2.5		**66**	**123**	**66**		

Notes for Table 4-3:

(1) Kingsley Field Breakdown (this needed to be done in order to estimate TSD, and also WCD & Annual by specific source type

	2008 Emissions			2008 Percentages		
	Annual	TSD	WCD	Annual	TSD	WCD
Military Aircraft	0.2	0.8	4	10%	4%	6%
Commercial Aircraft	1.1	12	44	51%	66%	59%
General Aviation	0.1	0.4	3	6%	2%	5%
Air Taxi	0.1	1	2	4%	3%	3%
Ground Support Equipment	0.6	4	19	27%	23%	26%
Auxiliary Power Units (APU)	4.E-02	0.3	1	2%	2%	2%
	-------	-------	-------	-------	-------	-------
Total	**2.2**	**19**	**74**	**100%**	**100%**	**100%**

		Emissions		
		Annual	WCD	TSD
AIRPORT: Aircraft + GSE + APU:	2008 =	2.2	74.4	18.7
Growth based on OEA data	2014 =	2.3	76.8	19.3
	2014/2008 =	1.032	1.032	1.032

(2) Locomotive Breakdown (this needed to be done in order to estimate TSD, and also WCD & Annual by specific source type

	2008 Emissions			2008 Percentages		
	Annual	TSD	WCD	Annual	TSD	WCD
Line Haul Locomotives: Class I	6.3	34	34	88%	88%	88%
Line Haul Locomotives: Class II & III	0	0	0	0%	0%	0%
Line Haul Locomotives: Passenger	0.3	2	2	4%	4%	4%
Yard Locomotives	0.6	3	3	8%	8%	8%
	-------	-------	-------	-------	-------	-------
	7.1	**39**	**39**	**100%**	**100%**	**100%**

		Emissions		
		Annual	WCD	TSD
Locomotives	2008 =	7.1	39.2	39.2
Growth based on OEA data: Incorporates fuel and engine changes	2014 =	5.5	30.2	30.2
	2014/2008 =	0.770	0.768	0.768

Table 4- 4. Design Day Emission Inventory, 2014 Attainment Year, On-Road Sources

TSD = Typical Season Day, WCD = Worst-Case Day Source Description	---- PM2.5 Emissions ---- TSD (lbs/day)	WCD (lbs/day)	Design Day (lbs/day)	Design Day Value Set Equal To:	Notes
Vehicle Emissions: Exhaust, Brake, and Tire					
Passenger Vehicles					
Passenger Car	23	50	23	typical season day	Model input temps averaged over the
Passenger Truck	62	137	62		
Total: Passenger Vehicles	86	188	86		
Trucking					
Single Unit Long-Haul Truck	12	12	12	typical season day	Model input temps averaged over the season
Single Unit Short-haul Truck	15	16	15		
Combination Long-Haul Truck	39	39	39		
Combination Short-Haul Truck	38	38	38		
Light Commercial Truck	2	4	2		
Total: Trucking	106	108	106		
Other Vehicles					
Intercity Bus	0	0	0	typical season day	Model input temps averaged over the season
Motor Home	3	4	3		
Motorcycle	3	6	3		
Refuse Truck	0	0	0.2		
School Bus	1	1	1		
Transit Bus	1	1	1		
Total: Other Vehicles	8	11	8		
	-------	-------	-------		
Total: All Vehicles	**199**	**307**	**199**		
Re-Entrained Road Dust *(ODOT VMT & AP-42 EF data)*					
Paved Roads	40	276	40	typical season day	Seasonal emissions dependent upon silt loading data from MRI study (Ref. 160)
Unpaved Roads	116	116	116		typical season day = worst-case day
	------	------			
Total: Re-Entrained Road Dust	**156**	**392**	**156**		
	-----	-----	-------		
Total: On-Road	**354**	**699**	**354**		

5 TRANSPORTATION CONFORMITY: 2037 ON-ROAD EMISSION INVENTORY

The 2037 transformation conformity emission inventory is the same as the 2014 attainment year inventory with one notable exception; On-road mobile emissions were estimated specifically for the 2037 conformity year.

5.1 On-Road Mobile: VMT and Emission Rate Methodology

The procedures for developing the 2037 On-road emissions inventory were the same as those discussed in Sections 2.6 and 3.2.5 of this document. Specifically, vehicle activity in the form of daily vehicle miles travelled (DVMT) was developed by ODOT, as detailed in Appendix D, ODOT Methodology - Estimating Daily VMT. DVMT was then clipped to the NAA, temporally allocated, and differentiated by MOVES source (vehicle) type by DEQ staff. MOVES inputs and modeling scenarios are detailed in Tables 5.1 and 5.2 below.

Table 5- 1. MOVES Panel Settings, Conformity Year 2037

Panel Item	**Settings:** Worst-Case Day (WCD)
Description	Worst-Case Day
Scale	
Scale	Klamath County (41035)
Calculation Type	Emission Rates
Time Spans	
Aggregation	Hour
Year	2037
Months	December
Days	Weekday
Hours	24
Geographic Bounds	Klamath County
Vehicles/Equipment	All Gas and Diesel Vehicles/Equipment. Electric vehicles. CNG transit buses.
Road Type	All
Pollutants and Processes	
Pollutants	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation
Processes	All
Manage Input Datasets	Customized MyLEV script, representing Oregon's LEV program, model year 2009 and forward, per EPA guidance (EPA-420-B-10-003, Section 2. January, 2010)
Strategies	None
Output	
General Output	Mass units = grams, Distance units = miles
Emissions Detail	Rates by pollutant, process, source type, roadtype, speedBin
Advanced Performance Features	N/A

Table 5- 2. MOVES County Data Manager Inputs, Conformity Year 2037

Dataset(s)	**Information Sources**
Source Type Population	See Appendix D, Table D-1
Vehicle Type VMT	ODOT for K Falls NAA with vehicle split as detailed in Appendix D, Table D-1
Temporal Allocation	MOVES default
I/M Programs	N/A
Fuel	MOVES default with local regulations, statewide ethanol requirement of 10%. 5% Biodiesel, in accordance with Oregon Renewable Fuel Standard (RFS). These are the only current, in-place requirements as of 2012.
Meteorology Data	*Temperature data*: specific to December 23rd. WCD temperatures are consistent with residential wood combustion emissions estimate methodology where WCD estimates and temperatures are dependent upon 98th percentile monitoring data (see Appendix B, Table B-9 for monitoring data) *Humidity data*: MOVES default
Ramp Fraction	MOVES default
Road Type Distribution	ODOT with MOVES default vehicle split (see section 2.6.2.1.4)
Age Distribution	ODOT DMV vehicle Klamath County registration data (Ref. 814) was used to distribute source type 21 and 31 vehicle population data by age. All other source types = default data, National County Database
Average Speed Distribution	MOVES default

5.2 2037 Emission Inventory Results

Figure 5.2-1 shows the ODOT DVMT values for 2008, 2014, and 2037, with linear extrapolation between data points. Also included in Figure 5.2-1 are the results of the DVMT estimated for the Klamath Falls NAA, calculated using ArcGIS. Additional information on how the 2037 DVMT was developed may be found in Appendix D, ODOT Methodology: Estimating Daily VMT: Memorandum from Richard Arnold, ODOT Senior Transportation Analysis/Modeler.

Tables 5.2.1 through 5.2.8 detail the 2037 On-road emissions estimates.

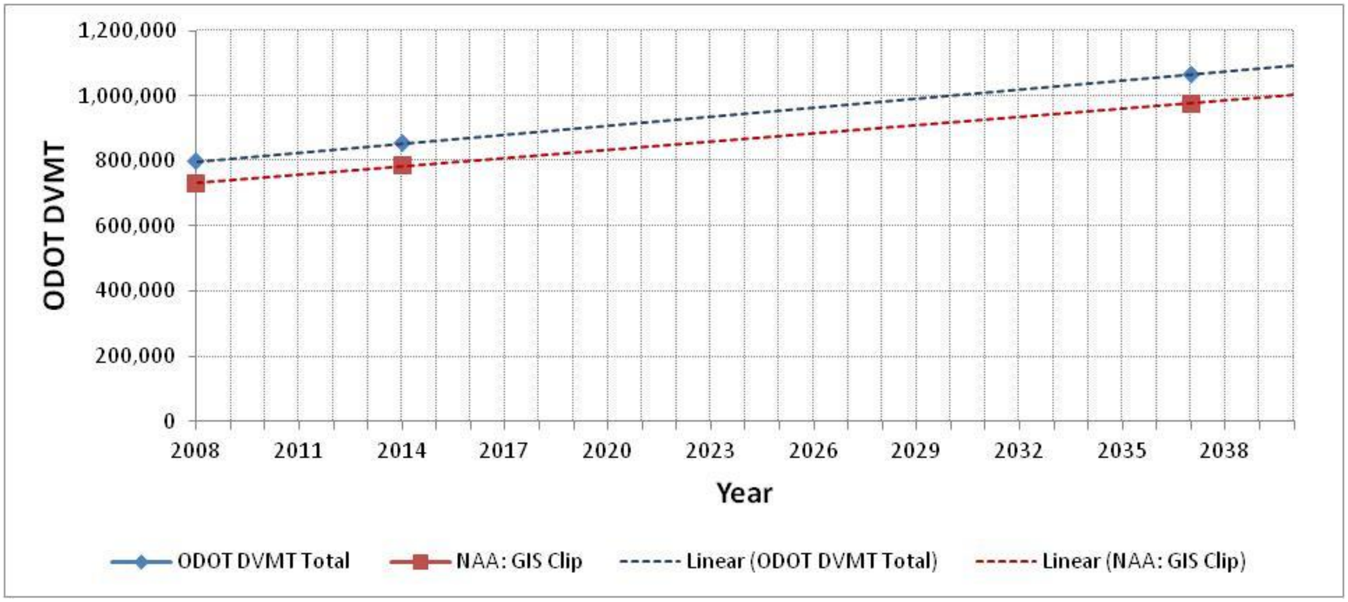

Figure 5.2-1. ODOT DVMT and NAA DVMT, 2008, 2014, 2037.

Table 5.2.1. 2037 Conformity Year Emission Inventory Results: Worst-Case Day, 2037 On-Road, All Other Sources = 2014 Attainment Year.

Source Category	2014 (lbs/day)	Percent Of Total	2037 (lbs/day)	Percent Of Total
$PM_{2.5}$				
Point(1)	1,378	32%	1,378	33%
Area(2)	2,066	48%	2,066	49%
Nonroad	123	3%	123	3%
On-Road	699	16%	642	15%
Total	**4,266**		**4,209**	
NO_X				
Point(1)	4,517	34%	4,517	44%
Area(2)	1,354	10%	1,354	13%
Nonroad	2,586	19%	2,586	25%
On-Road	4,834	36%	1,915	18%
Total	**13,921**		**10,372**	
VOC				
Point(1)	10,430	51%	10,430	57%
Area(2)	5,944	29%	5,944	33%
Nonroad	792	4%	793	4%
On-Road	3,337	16%	1,070	6%
Total	**20,504**		**18,237**	
NH_3				
Point(1)	1,471	65%	1,471	65%
Area(2)	736	33%	736	33%
Nonroad	--	--	--	--
On-Road	56	2%	49	2%
Total	**2,263**		**2,256**	
SO_X				
Point(1)	568	46%	568	46%
Area(2)	556	45%	556	45%
Nonroad	89	7%	89	7%
On-Road	17	1%	18	1%
Total	**1,230**		**1,232**	

(1) Worst-case day = 80% permitted daily operating capacity

(2) Area source residential wood combustion worst-case day = advisory controlled

Updated, CLS 3/16/12

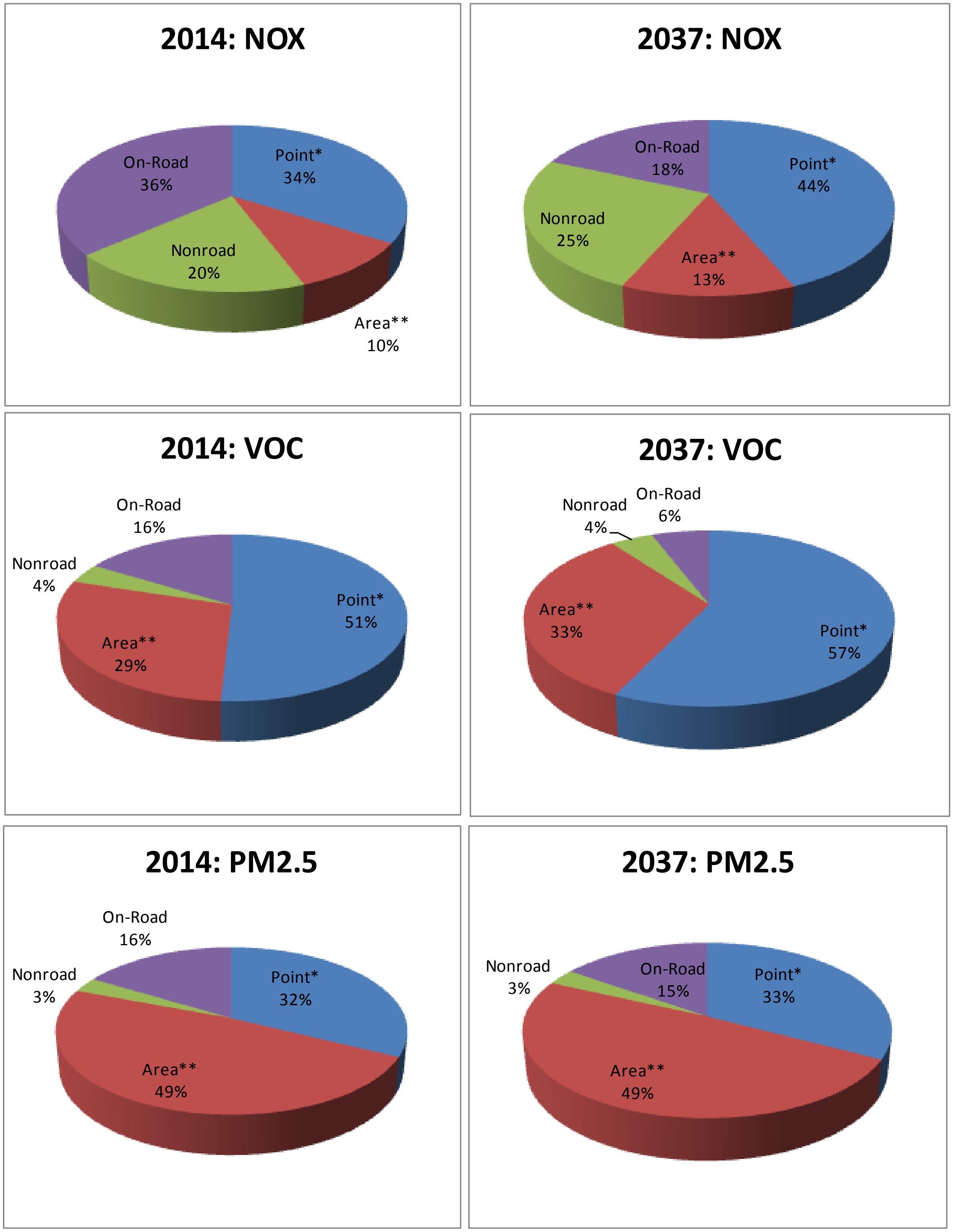

Figure 5.2-2. Attainment Year (2014) vs. Conformity Year (2037) Inventory Results

* Worst-case day = 80% permitted daily operating capacity

** Area source residential wood combustion worst-case day = advisory controlled

Table 5.2.2. 2037 NAA On-Road Mobile PM2.5 Emissions by Roadway Type

	Urban Unrestricted Access	Rural Unrestricted Access	Urban Restricted Access	Rural Restricted Access	**Total**	Units
Worst Case Season Day	529	98	11	3	642	lbs/day

Table 5.2.3. 2037 NAA On-Road Mobile PM2.5 Emissions by Process

	Exhaust	Re-Entrained Road Dust	Brake	Tire	**Total**	Units
Worst Case Season Day	138	486	15	3	642	lbs/day

Table 5.2.4. 2037 NAA On-Road PM2.5 Emissions and Emission Factors by Source

On-Road Vehicles	(1) **VMT** WCD	(2) WCD (lb/day)	(3) WCD (lb/VMT)
Passenger Vehicles			
Passenger Car	247,273	32	0.00013
Passenger Truck	403,447	90	0.00022
Total: Passenger Vehicles	650,720	122	--
Trucking			
Single Unit Long-Haul Truck	60,774	4	0.00007
Single Unit Short-haul Truck	60,774	4	0.00007
Combination Long-Haul Truck	60,806	7	0.00012
Combination Short-Haul Truck	60,774	6	0.00011
Light Commercial Truck	38,071	3	0.00008
Total: Trucking	281,200	26	--
Other Vehicles			
Intercity Bus	0	0	--
Motor Home	15,329	1	0.00007
Motorcycle	25,545	7	0.00029
Refuse Truck	270	0.03	0.00010
School Bus	1,619	0.12	0.00008
Transit Bus	667	0.05	0.00007
Total: Other Vehicles	43,430	9	--
	-------	-------	
Total: All Vehicles	**975,350**	**156**	--

Re-Entrained Road Dust	(4) **VMT** WCD	(4) WCD (lb/day)	(3) WCD (lb/VMT)
Paved Roads	939,763	342	0.00036
Unpaved Roads	35,587	143	0.00403
	------	------	
Total: Re-Entrained Road Dust	**975,350**	**486**	--

Total: On-Road		**642**	

Notes for Table 5.2-4:

WCD = Worst-Case Season Day

(1) Daily VMT provided by ODOT.

(2) PM2.5 Emissions = (VMT) * (MOVES output, emissions rate mode).

(3) Emission Factor, lbs/VMT = (emissions, lbs) / (VMT)

(4) Re-Entrained Road Dust emissions estimates and calculations

Table 5.2.5. 2037 Klamath Falls NAA On-Road Mobile Emissions by Roadway Type

PollutantName	*Rural Restricted Access*	*Rural Unrestricted Access*	*Urban Restricted Access*	*Urban Unrestricted Access*	*NAA Total*
Annual (1)					
NAA % Total VMT(2)	0.4%	15.1%	1.7%	82.8%	100.0%
Worst-Case Day (lbs/day)					
Daily VMT (3)	4,257	147,355	16,477	807,262	975,350
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	1.2	22.9	2.8	111.3	138
PM25-PRI-Brakewear	0.04	1.3	0.3	13.3	15
PM25-PRI-Tirewear	0.03	0.6	0.1	2.7	3
PM25-PRI Re-Entrained Road Dust (4)	2	73	8	402	486
	--------	--------	--------	--------	--------
Total PM2.5	3	98	11	529	642
NH3	0.4	8.8	0.9	39.4	49
Oxides of Nitrogen	13.9	317.7	34.9	1,548.1	1,915
SO2	0.1	2.8	0.3	14.4	18
VOC	7.4	172.0	19.4	871.2	1,070

Notes for Table 5.2.5

(1) Annual emissions, tpy = (typical season day emissions, lbs/day) * (365 days/yr) / (2000 lbs/ton)

(2) % VMT by Roadway Type = default roadway type distribution for Klamath County, from MOVES supporting documentation and files: Ref. 807.

(3) VMT by Roadway Type = (Total VMT) * (% VMT by Roadway Type), where

Total Daily VMT = 975,350 (Provided by ODOT, see Fig. 5.2-1)

(4) PM2.5 from Re-Entrained Road Dust = (NAA 2014 Road Dust PM2.5 Emissions) * (% Total NAA VMT)

NAA 2014 Road Dust PM2.5 Emissions, from Tables E-32 and E-33.

	Paved	Unpaved	Total
Worst-Case Day (lbs/day)	342	143	486

Table 5.2.6. 2037 Klamath Falls NAA On-Road Mobile Emissions by Vehicle Type

PollutantName	*Combination Long-Haul Truck*	*Combination Short-Haul Truck*	*Intercity Bus*	*Light Commercial Truck*	*Motor Home*	*Motorcycle*	*Passenger Car*	*Passenger Truck*	*Refuse Truck*	*School Bus*	*Single Unit Long-Haul Truck*	*Single Unit Short-haul Truck*	*Transit Bus*	*NAA Total*
Annual (1)														
NAA % Total VMT(2)	6.2%	6.2%	0%	3.9%	1.6%	2.6%	25.4%	41.4%	0.03%	0.2%	6.2%	6.2%	0.1%	
Worst-Case Day (lbs/day)														
Daily VMT (3)	60,806	60,774	0	38,071	15,329	25,545	247,273	403,447	270	1,619	60,774	60,774	667	975,350
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	4	4	0	3	1	7	30	85	0.01	0.05	2	2	0.03	138
PM25-PRI-Brakewear	2	2	0	0.4	0.4	1.E-02	2	4	1.E-02	6.E-02	2	2	1.E-02	15
PM25-PRI-Tirewear	0.5	0.5	0	0.1	6.E-02	3.E-02	0.6	1	2.E-03	1.E-02	0.3	0.3	3.E-03	3
PM25-PRI Re-Entrained Road Dust (4)	30	30	0	19	8	13	123	201	1.E-01	8.E-01	30	30	3.E-01	486
	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total PM2.5	38	37	0	22	9	20	156	291	0	1	34	35	0	642
NH3	4	3	0	2	1	3	10	19	1.E-02	6.E-02	4	4	2.E-02	49
Oxides of Nitrogen	334	232	0	36	75	41	165	572	1	3	218	237	2	1,915
SO2	2	2	0	1	0	0.4	3	7	7.E-03	2.E-02	1	1	1.E-02	18
VOC	17	10	0	9	12	65	267	632	0.0	0	27	31	0	1,070

Notes for Table 5.2.6

(1) Annual emissions, tpy = (typical season day emissions, lbs/day) * (365 days/yr) / (2000 lbs/ton)

(2) % VMT by Vehicle Type = default roadway type distribution for Klamath County, from
MOVES supporting documentation and files: Ref. 807.

(3) VMT by Vehicle Type = (Total VMT) * (% VMT by Vehicle Type), where
Total Daily VMT = 975,350 (Provided by ODOT, see Fig. 5.2-1)

(4) PM2.5 from Re-Entrained Road Dust = (NAA 2014 Road Dust PM2.5 Emissions) * (% Total NAA VMT)
NAA 2014 Road Dust PM2.5 Emissions, from Tables E-32 and E-33.

	Paved	Unpaved	Total
Worst-Case Day (lbs/day)	342	143	486

Table 5.2.7. Klamath Falls NAA 2037 Re-Entrained Road Dust, PM2.5 Emissions Estimates: Paved Roads

22-94-000-000: Paved Roads /All Paved Roads /Total: Fugitives (does not include brake or tire: These values are included in MOVES output)															
(1)	(2)	(3)	(4)	(5)	(5)	(6)	(7)	(8)	(8)	(9)	(9)	(10)	(11)	(12)	(13)
------ Nonattainment Area ------			PM 2.5 Emission Factor Calculation Parameters					PM2.5 Emission Factor						--- PM Season ---	
				----- *sL* -----				------------- *E* -------------							
2037 Daily VMT	% Paved Roads	Paved Road Daily VMT	*k* (g/VMT)	TSD (g/m^2)	WCD (g/m^2)	*W* (tons)	Control Efficiency (CE)	TSD (g/VMT)	WCD (g/VMT)	TSD (lb/VMT)	WCD (lb/VMT)	Seas. Adj. Factor (SAF)	2037 Annual Emiss. (tons/yr)	Typical Day Emiss. (lbs/day)	Worst Case Day Emiss. (lbs/day)
975,350	96%	939,763	0.25	0.37	3.1	3	0.90	0.03	0.22	7.1E-05	0.00049	0.74	**7.8**	**49**	**342**

Notes for Table 5.2.7:

(1) E-mail from Richard Arnold, ODOT, to C. Swab. Klamath Falls 2008 VMT by TAZ and Link (downloaded from ODOT ftp site). 6/24/2011. (DEQ Ref. 747).
Please see Fig. 5.2-1. The ArcGIS project for the final VMT (clipped to the NAA) is located here:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\MOVES\KFalls_MOVES_GIS\KFalls_MOVES.mxd

(2) Total NAA road mileage = 396.04 (see note 1 for mileage data source and ArcGIS analysis project location)
Total NAA Paved Roadway mileage = 381.59 (DEQ Ref. 748)
% NAA Paved Roadway = 96.4%

(3) Paved road daily VMT = (NAA daily VMT) * (% Paved Roads within the NAA)

(4) k = Particle Size Multiplier = 0.25 g/VMT. AP-42, Table 13.2.1-1. (DEQ Ref. 8).

(5) sL = Paved Road Silt Loading — Typical Season Day (TSD) = 0.37 g/m^2
Worst Case Day (WCD) = 3.1 g/m^2
Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)

(6) W = Average Vehicle Weight, tons = 3. This is a DEQ staff best estimate.

(7) Worst Case Day (WCD) Control Efficiency is due to the removal of road sand after sanding operations during ice and snow. Since the worst case day silt loading factor is due to the effects of road sanding, a control efficiency for sand removal can be applied to worst case day emissions estimates.
The CE value for paved road sanding is based upon FHwA's estimates for high efficiency machines at 99.6% removal efficiency and 90% of the area covered
CE is applied to the WCD PM2.5 EF calculations, see note (8) below.

(8) Typical Season Day (TSD) PM2.5 EF, E, g/VMT = k * (sL^0.91) * (W^1.02). AP-42, Chapter 13, Equation 1, p. 13.2.1-4. (DEQ Ref. 8)
Worst Case Day (WCD) PM2.5 EF, g/VMT = k * (sL^0.91) * (W^1.02) * (1-CE). AP-42, Chapter 13, Equation 1, p. 13.2.1-4, with CE added. (DEQ Ref. 8)

(9) PM2.5 EF, E, lb/VMT = (Particulate EF, g/VMT) * (0.0022046 lb/g)

(10) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)
SAF estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: Annual Days Without Precipitation: See Appendix D, Table D-2.

(11) 2008 NAA Annual Emissions, tpy = (Paved Road Daily VMT) * (233 days per year w/out precipitation) * (Particulate EF, lb/VMT, TSD) / (2000 lbs/ton)
Annual days without precipitation estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: See Appendix B9, Table B9i.

(12) 2008 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT, TSD) * (SAF)

(13) 2008 NAA Worst Case Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT, WCD) * (SAF)

Table 5.2.8. Klamath Falls NAA 20037 Re-Entrained Road Dust, PM2.5 Emissions Estimates: Unpaved Roads

22-96-000-000: Unpaved Roads /All Unpaved Roads /Total: Fugitives (does not include brake or tire: These values are included in MOVES output)

(1)	(2)	(3)	(4)	(5)	(6)	(6)	(7)	(8)	(4)	(4)	(4)	(4)	(9)	(10)	(11)	(12)	(13)
																--- PM Season ---	
------ Nonattainment Area ------													PM2.5	Seasonal	2037	Typical	Worst
	%	Unpaved	---------- PM 2.5 Emission Factor Calculation Parameters. ----------										EF	Adjustment	Annual	Day	Case Day
2037	Unpaved	Road	*k*	*s*	*W*	*S*	*M*	*C*					*E*	Factor	Emissions	Emissions	Emissions
Daily VMT	Roads	Daily VMT	(lb/VMT)	(%)	(tons)	(mph)	(%)	(lb/VMT)	*a*	*b*	*c*	*d*	(lb/VMT)	(SAF)	(tons/yr)	(lbs/day)	(lbs/day)
Industrial Sites																	
975,350	2.7%	26,690	0.15	12%	25	--	12.5%	0.00036	0.9	0.45	--	--	0.0062	0.74	19.2	122	122
Publicly Accessible Roads																	
975,350	0.9%	8,897	0.18	8.7%	--	41.3	0.8%	0.00036	1	--	0.2	0.5	0.0032	0.74	3.3	21	21
															-------	-------	-------
Total															**22.5**	**143**	**143**

Notes for Table 5.2.8:

(1) E-mail from Richard Arnold, ODOT, to C. Swab. Klamath Falls 2008 VMT by TAZ and Link (downloaded from ODOT ftp site). 6/24/2011. (DEQ Ref. 747).
Please see Fig. 5.2-1. The ArcGIS project for the final VMT (clipped to the NAA) is located here:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\MOVES\KFalls_MOVES_GIS\KFalls_MOVES.mxd

(2) Total NAA road mileage =	396.04	(see note 1 for mileage data source and ArcGIS analysis project location)
Total NAA Unpaved Roadway mileage =	14.45	(DEQ Ref. 748)
% NAA Unpaved Roadway =	3.6%	
Industrial Sites =	2.7%	(50% of all unpaved NAA roadway, DEQ staff best estimate)
Publicly Accessible Roadways =	0.9%	(50% of all unpaved NAA roadway, DEQ staff best estimate)

(3) Unpaved road daily VMT = (NAA daily VMT) * (% Unpaved Roads within the NAA)

(4) Constants. AP-42, Table 13.2.2-2, p. 13.2.2-5. (DEQ Ref. 8)

(5) s = Surface Material Silt Content. Values taken from:
Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)

(6) W = Average Vehicle Weight in tons, S = Average Vehicle Speed. Values taken from:
Industrial W: Reference as in note (5), specifically, p. 41, Modoc Lumber Co. used as a surrogate.
Publicly Accessible Roads S: Speed estimated from ODOT data (see note 1). Speed is a VMT weight average, estimated as follows:

∑ (speed by link * daily VMT by link) =	30,081,747	VMT*mph
∑ daily VMT by link =	728,582	VMT

Avg Vehicle Speed =	41.3	mph

(7) M = Surface Material Moisture Content. Reference as in note (%). Table 2, p.12. Values are specific to Klamath Falls.

(8) C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear. From AP-42, Table 13.2.2-4, p. 13.2.2-6. (DEQ Ref. 8).

(9) Industrial PM2.5 EF, E = k * (s/12)^a * (W/3)^b. AP-42, Chapter 13.2.2, Equation 1a, p. 13.2.2-4. (DEQ Ref. 8)
Publicly Accessible Roads PM2.5 EF, E = ([k * (s/12)^a * (S/30)^d] \ [(M/0.5)^c]) - C. AP-42, Chapter 13.2.2, Equation 1b, p. 13.2.2-4. (DEQ Ref. 8)

(10) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)
SAF estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: Annual Days Without Precipitation: See Appendix D, Table D-2.

(11) 2008 NAA Annual Emissions, tpy = (Unpaved Road Daily VMT) * (233 annual days without precipitation) * (PM2.5 EF, lb/VMT) / (2000 lbs/ton)
Annual days without precipitation estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: See Appendix B9, Table B9i.

(12) 2008 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT) * (SAF)

(13) Worst Case Day assumed equal to Typical Season Day

6 QUALITY ASSURANCE/QUALITY CONTROL

6.1 Introduction

The purpose of this section of the document is to describe the quality assurance (QA) and quality control (QC) procedures that were utilized in preparing the 2008 emission inventory for the Klamath Falls NAA. QA and QC were considered separate activities in this process where the QC is an internal system of routine technical activities implemented by inventory development personnel to measure and control the quality of the inventory as it is being developed, as well as actually checking the data generated. The QA is a planned system of review and audit procedures conducted by personnel not actively involved in the inventory development process. QA included establishing QC procedures, training QC personnel, and the actual auditing of QC activity.

6.2 Organization and Personnel

Anthony Barnack, who has experience with the emission inventory and air quality monitoring programs of the Department of Environmental Quality (DEQ), was appointed Quality Assurance Coordinator. Christopher Swab, Brandy Albertson, Miyoung Park, and Wes Risher performed the required source calculations at the DEQ Headquarters Office while Larry Calkins performed numerous source calculations from the Hermiston Office. The bulk of the QA/QC assignments were completed by Miyoung Park, Larry Calkins, Christopher Swab, and Wes Risher.

The abbreviated organizational hierarchy for carrying out the Quality Assurance Program is shown below.

Oregon Department of Environmental Quality: Air Quality Division
Andy Ginsburg, Division Administrator
Jeffrey Stocum, Technical Services Manager
Emission Inventory
Christopher Swab, Senior Emission Inventory Analyst
Brandy Albertson, Emission Inventory Analyst
Miyoung Park, Emission Inventory Specialist
Wesley Risher, Emission Inventory Analyst
Air Quality Information Systems
Brian Fields, Information Systems Specialist
LandGEM Modeling
Colin McConnaha, Greenhouse Gas Audit Specialist
Design Day Emission Inventory Consultation
Phil Allen, Senior Modeler
Quality Assurance
Anthony Barnack, Air Monitoring Coordinator
Mark Bailey, Air Quality Manager, DEQ Eastern Region (Bend Office)

Larry Calkins, Nonattainment Area Coordinator
David Collier, Air Quality Planning & Development Manager
Rachel Sakata, Air Quality Planner
Sue Langston, Air Quality Planner
Sarah Armitage, Air Quality Planner
Oregon State Department of Transportation
Transportation Development, Transportation Planning Analysis Unit (TPAU)
Richard D. Arnold, PE, Senior Transportation Analyst
Christina McDaniel-Wilson, Transportation Analyst
Highway Division, Technical Services, Air Quality Program
Marina Orlando, Air Quality Program Coordinator
US EPA Region 10
Robert Elleman, PhD. Meteorologist

The bulk of the source data is limited to single sources of information. Therefore, data evaluation relied heavily upon checking against previously compiled information, where available.

6.3 Data Collection and Analysis

To ensure the comprehensive nature of the emission inventory and proper QA/QC procedures, EPA Emission Inventory Improvement Program (EIIP) QA/QC guidance was used, specifically the guidance found in EIIP Volume VI, Chapter 3[321].

The inventoried sources are marked under the appropriate pollutant category. Only those sources that have been determined to operate in the inventoried areas were included. Source categories that were not included were summarized with an explanation for their omission.

As discussed in Section 1.3, the source categories were divided into stationary point source, stationary area source, non-road mobile, and on-road mobile. Stationary point source information is maintained by DEQ down to 5 tons per year, so a questionnaire/survey was not necessary to identify stationary area and point sources. Emissions from stationary point sources were calculated on the basis of 2008 production levels and the best available emission factors (from TV source tests or from the permits).

Area source emissions estimates were based on a variety of sources of activity and emission factors. Table 2.4.1 details the estimation approach by area source category. In many cases estimated emissions were obtained from EPA. For DEQ estimated data, activity and emission factor data sources were varied. However, in all cases, efforts were made to include the most up-to-date information available.

The residential wood combustion and open burning survey commissioned specifically for this inventory was conducted by the Oregon Institute of Technology (OIT)[695]. Analysis of the survey data was conducted by OIT, and occurred at the database level. Survey data were entered into a Microsoft Access database using a custom-built user interface. Upon completion of the data entry phase of the project a random sampling of 50 surveys were selected for use in a verification project. Data from these surveys were compared to the corresponding values as recorded in the database. This comparison indicated virtually no difference between the data as recorded in the database and the hard-copies of the surveys.

Nonroad vehicles and equipment (excluding aircraft and locomotive) and on-road mobile sources emissions were based on EPA emissions and emission rate models, ODOT's transportation demand model, and EMME/2. Locally available data at the county-wide level was used for VMT mix, and emissions by vehicle type. Customized data included fuel parameters and temperatures.

6.4 Data Handling

Data handling included: 1) coding formats and data recording, 2) data tracking, and 3) QA/QC (which included data checking, data correcting, and handling corrected data). Specific additional procedures included checking data after conversion to the inventory format, checking for missing data, and reviewing the estimates.

6.4.1 Data Tracking

Information obtained from source files, other divisions of the DEQ, other State, Federal, and local agencies, and private companies used in compiling the emission inventories were recorded in reference files, in appendices, and documented on the calculation spreadsheets. The appendices and calculation spreadsheets were also stored electronically. All emission factors, throughputs, seasonal adjustment factors, and activities were documented on the calculation spreadsheets in both hard copy and electronic copy. All of the above mentioned information is kept at DEQ Headquarters.

6.4.2 QA/QC

6.4.2.1 Primary Methods

Primary QA/QC methods used for the Klamath Falls inventories for this inventory included

- Reality checks;
- Peer review;
- Calculations review and checks;
- Reference data verification;

6.4.2.2 QA Procedures

6.4.2.2.1 Overview and Data Quality Objectives

In order to assess the effectiveness and appropriateness of the systems established to control data quality, lead quality assurance staff were provided with sample calculations of selected emissions. QA personnel generated QC forms and conducted any necessary training to ensure consistency and thoroughness by the QC personnel. QC procedures were reviewed, and verification made that all QC corrections were addressed. The final emissions summaries were checked for reasonableness. Additionally, training of all staff performing QC was conducted by the QC coordinator and other adequately trained staff.

As shown in Table 6.4.1 , data quality objectives were established to help ensure the accuracy, completeness, representativeness, and comparability of the inventory, in keeping with the EIIP's guidance for Level II inventories.

Table 6.4.1. Data Quality Objectives

Data Quality Objective	Procedure for Achieving Objective
Accuracy	For point sources, 100% of the calculations checked by the data generator, and 20% of the calculations checked by another equally qualified emissions inventory staff person. For area sources, 100% of the calculations checked by the data generator, and 10% of the calculations checked by another equally qualified emissions inventory staff person. For on-road mobile estimates, all model input and calculations reviewed by several members of the emissions inventory staff, and final estimates checked by IT staff. For nonroad sources, all model input checked by several members of the EI staff. In all cases, the data validator(s) develop a written summary of his or her activities, and conduct follow-up activities to ensure that data are corrected as needed. If more than 5% of the calculations checked by an equally qualified staff member need to be revised, then 100% of the calculations will be checked.
Completeness	Extensive planning conducted prior to data collection to identify all applicable emission sources. After identifying these sources, the goal was to determine 100% of the emissions from the largest emitting sources from each source category and as many of the minor sources as possible within the time frame allotted for the work. Those sources identified but not included in the inventory are identified in the data file and final report.
Representativeness	Primary source data reviewed and compared to previous emissions results and similar results from comparible regions by senior technical staff to determine the reasonableness of the emissions estimates and representativeness of the data.
Comparability	Standard procedures followed to ensure data comparability and results presented in the same units as previous inventories. Previous estimates recalculated or adjusted to ensure comparability if a new or improved emission estimation method used.

6.4.2.2.2 Peer Review

On December 1, 2011, DEQ emissions inventory, air quality modeling, and planning staff met with representatives from EPA Region 10 and the Lane Region Air Pollution Authority (LRAPA) in Chehalis, Washington for the purpose of reviewing the Klamath Falls NAA emission inventory methodology, including base year, future growth, and emissions reduction strategies. Attendees included:

- Rob Elleman, EPA Region 10
- Bob Kotchenruther, EPA Region 10
- Justin Spenillo, EPA Region 10
- Merlyn Hough, LRAPA
- Tim Sawyer, LRAPA
- Jeffrey Stocum, DEQ
- Phil Allen, DEQ
- Christopher Swab, DEQ
- Larry Calkins, DEQ
- Sue Langston, DEQ

Emission inventory base year methodology for all sources was presented by DEQ for EPA review. Questions and issues generated during the meeting were addressed by DEQ staff, and corrective action and revisions were incorporated into the EI[798]. Additionally, Bob Kotchenruther presented his findings on PM 2.5 receptor modeling (Positive Matrix Factorization, or PMF) for Klamath Falls. PMF results were supportive of the DEQ emissions inventory estimates in that the emission inventory was dominated by wood burning, either through open burning or residential wood combustion.

On February 1st, 2012 DEQ emissions inventory and air quality modeling staff met with representatives from EPA Region 10 to review and discuss the 2014 EI data, in particular permitted point source and residential wood combustion estimates. Additional questions were raised as to the sensitivity of changes to EI emission factors, with resultant changes to rollback modeling results, however EPA staff (Rob Elleman and Bob Kotchenruther) were supportive of the EI projection methodology in general.

6.4.2.3 QC Procedures

6.4.2.3.1 Method and Forms

The QC of all source category emissions included:

1. Checking input data for inventory completeness, missing data, incorrect calculations, incorrect information, and reasonableness, and
2. Correcting the calculation sheets, summary sheets, and Appendices.

The QA personnel generated QC forms and conducted any necessary training to ensure consistency and thoroughness by the QC personnel. The QC forms followed the forms outlined in the *Quality Assurance Implementation Instructions and Examples for SIP Inventory Development*[298]. Forms used included:

- Quality Control Review Worksheet: Error Report and Correction Sheet:
    - This form was used for review of all spreadsheets used for emissions calculations
- Data Table/Summary Table Audit - Stationary Area Sources
    - Tracking table for QC of area sources
- Data Table/Summary Table Audit - Nonroad and On-Road Mobile Sources
    - Tracking table for QC of nonroad and on-road mobile sources
- Audit Tracking Table: Non-Permitted Sources
    - Tracking table for emission inventory work and QC of all non-permitted sources (area, nonroad, and onroad)

6.4.2.3.2 Data Checking

6.4.2.3.2.1 Inventory Completeness

Completeness of the inventory was determined by checking against the EPA QA Plan guidance source listings. Double counting of sources was checked to ensure that source categories included in stationary point source categories were not also included in area or non-road mobile categories. This check was tracked via the Audit Tracking Table.

Extensive emission source category list checks were conducted prior to beginning any emissions inventory work. Permitted point source emissions sources were checked against data in the DEQ Tracking Reporting and Administration of Air Contaminant Sources (TRAACS) database, which is used for tracking compliance with plant site emission limits and for reporting compliance status to the EPA EIS system. The listing of area source emissions was taken from the EPA 2008 National Emissions Inventory (NEI), general purpose release v.1.5., and from the DEQ Area Mobile Emissions Estimates (AMEE) database. It was assumed that the universe of sources in EPA's NONROAD2008a was complete. It was assumed that the total VMT by link provided by ODOT encompassed all on-road source types.

6.4.2.3.2.2 Missing Data
Missing data for stationary area sources and non-road mobile sources can usually be identified by the inability to calculate emissions. If the appropriate data was missing, a reasonable effort was made to acquire it. If this was unsuccessful, estimates were made based on data of recent years or on information contained in EPA documents. Missing data were recorded on the QC area and non-road mobile correction forms

6.4.2.3.2.3 Incorrect Calculations
In order to ensure that all the calculations were done correctly, the calculations were first reviewed to ensure that they were used correctly; then the electronic equations were reviewed to make sure that they were entered correctly. Any improperly used or incorrect calculations were noted on the calculation sheet, in the Appendices, or on the correction form. All calculation corrections were documented on the QC Correction Forms

6.4.2.3.2.4 Incorrect Information
In order to ensure that the information in the summary tables, emissions calculations tables, and in the Appendices are correct, all the explanations, titles, and reference were checked for accuracy and clarity. Any changes were documented either directly on the sheet or on the QC correction forms.

6.4.2.3.2.5 Reasonableness
A reasonableness check was performed on the estimated emissions, activity levels, and emission factors using the 1996 Klamath Falls PM_{10} SIP[699] submittal as a background comparison. Additionally, on-road mobile lbs per VMT generated through MOVES was checked against WA ECY data[797] for reasonableness.

Stationary point source estimated emissions associated with the Air Contaminant Discharge Permit, Title V Permit, or Title V draft for each identified point source were reviewed in relation to similar sources. In addition, the stationary point source production levels, source tests, and permitted emission factors were rechecked. The source's current operational status was also reviewed using notices of construction, permit addendums, and DEQ source inspector information. The references from which the emission factors and activity levels were taken were confirmed for the appropriateness of their use. Any reasonableness errors were documented in the correction forms

6.4.2.3.2.6 Reference Data Verification
All references used in the emissions inventory calculations for all source categories were verified and the source data checked for accuracy. This process was completed by staff independent of those staff completing the initial calculations. Reference verification was considered to be one of the most important steps of the QC process. All reference data cited in this document is kept at DEQ headquarters, and is available upon request. Section 5 contains a complete list of references cited.

6.4.2.3.2.7 Data Correction

Receipt of information that necessitated a correction to the data used in the preparation of the emission inventories was documented on the Error Report and Correction sheet. For minor changes the corrections were noted on the actual spreadsheet with an explanation, a signature, and a date. The correction was made to the electronic copy and the corrected version was printed and placed in the final draft notebook. The correction information was placed in an audit trail notebook for QA examination.

6.4.3 Data Reporting

An electronic copy of this document was provided to EPA Region 10 March 22nd, 2012.

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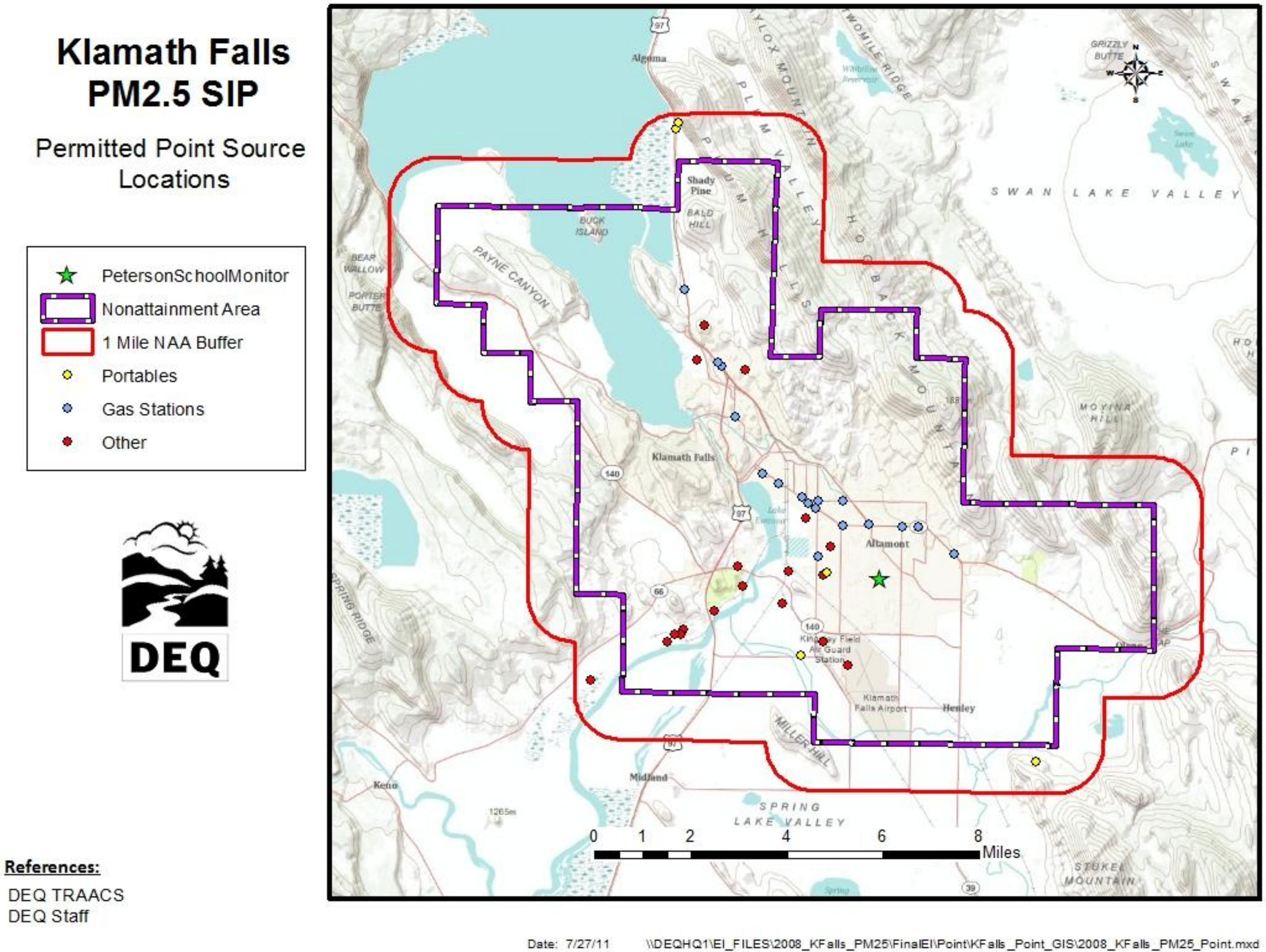
8 APPENDICES

APPENDIX A: STATIONARY POINT SOURCES
APPENDIX B: STATIONARY AREA SOURCES
APPENDIX C: NONROAD VEHICLES AND EQUIPMENT
APPENDIX D: ON-ROAD MOBILE
APPENDIX E: EMISSIONS FORECAST

APPENDIX A: STATIONARY POINT SOURCES

- Figure A-1: Permitted Point Source Locations
- Permitted Facility Emissions Estimates Reports (Excluding Gasoline Service Stations)
- Detailed Methodology Description: Gasoline Service Stations
- Table A-1: Emission Estimates for Gasoline Service Stations



Appendix A, Figure A- 1. Permitted Point Source Locations

APPENDIX A: PERMITTED POINT SOURCE EMISSIONS REPORTS
(excluding gasoline service stations)

Klamath Energy LLC Klamath Cogeneration Proj

18-0003

4940 HIGHWAY 97 S
KLAMATH FALLS 97603-9593

Permit Type: Title V

Location:
LAT DD: 42.1748
LONG DD: -121.8072

SIC/NAICS Codes:
SIC (Primary): 4911
SIC2:
SIC3:
SIC4:
NAICS (Primary): 221119

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
271	0	39	123

18-0003 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Auxiliary boiler-natural gas	1-02-006-01	76.79	mmcf/yr	3.20	0.99	0.1	1
Combustion turbine CT-1	2-01-002-01	10052136	mmbtu/yr	0.01	0.88	32.7	157
Combustion turbine CT-2	2-01-002-01	11104083	mmbtu/yr	0.01	0.88	36.1	173
				18-0003	**NH3 Totals:**	**68.9**	**331**
NOX							
Aggregate insignificant emissions	3-07-008-21	1	tons emitted/yr	2,000.00	1.00	1.0	5
Auxiliary boiler-natural gas	1-02-006-01	2.13	tons emitted/yr	2,000.00	0.99	2.1	12
Combustion turbine CT-1	2-01-002-01	81.04	tons emitted/yr	2,000.00	0.88	81.0	390

Combustion turbine CT-2	2-01-002-01	88	tons emitted/yr	2,000.00	0.88	88.0	423
			18-0003	**NOX**	**Totals:**	**172.2**	**830**

PM25

Auxiliary boiler-natural gas	1-02-006-01	80633	mmbtu/yr	0.01	0.99	0.2	1
Combustion turbine CT-1	2-01-002-01	10052136	mmbtu/yr	0.00	0.88	9.0	43
Combustion turbine CT-2	2-01-002-01	11104083	mmbtu/yr	0.00	0.88	10.0	48
			18-0003	**PM25**	**Totals:**	**19.3**	**93**

SO2

Aggregate insignificant emissions	3-07-008-21	1	tons emitted/yr	2,000.00	1.00	1.0	5
Auxiliary boiler-natural gas	1-02-006-01	80633	mmbtu/yr	0.00	0.99	0.1	0
Combustion turbine CT-1	2-01-002-01	10052136	mmbtu/yr	0.00	0.88	8.7	42
Combustion turbine CT-2	2-01-002-01	11104083	mmbtu/yr	0.00	0.88	9.7	46
			18-0003	**SO2**	**Totals:**	**19.5**	**94**

VOC

Aggregate insignificant emissions	3-07-008-21	1	tons emitted/yr	2,000.00	1.00	1.0	5

Auxiliary boiler-natural gas	1-02-006-01	80633	mmbtu/yr	0.01	0.99	0.2	1
Combustion turbine CT-1	2-01-002-01	10052136	mmbtu/yr	0.01	0.88	38.7	186
Combustion turbine CT-2	2-01-002-01	11104083	mmbtu/yr	0.01	0.88	42.7	205

18-0003 VOC Totals: 82.5 398

18-0003 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Auxiliary boiler- natural gas	1-02-006-01	7680	mmbtu/day	3.200	23
Combustion turbine CT-1	2-01-002-01	35404.8	mmbtu/day	0.007	673
Combustion turbine CT-2	2-01-002-01	35404.8	mmbtu/day	0.007	673

18-0003 NH3 Total (lbs/Worst-Case Day): 1,368

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NOX					
Aggregate insignificant emissions	3-07-008-21	5.48	lbs emitted/day	2,000.000	5
Auxiliary boiler- natural gas	1-02-006-01	7680	mmbtu/day	2,000.000	332
Combustion turbine CT-1	2-01-002-01	35404.8	mmbtu/day	2,000.000	584
Combustion turbine CT-2	2-01-002-01	35404.8	mmbtu/day	2,000.000	584

18-0003 NOX Total (lbs/Worst-Case Day): 1,506

PM25

Auxiliary boiler- natural gas	1-02-006-01	7680	mmbtu/day	0.005	40
Combustion turbine CT-1	2-01-002-01	35404.8	mmbtu/day	0.004	64
Combustion turbine CT-2	2-01-002-01	35404.8	mmbtu/day	0.004	64
	18-0003		**PM25 Total (lbs/Worst-Case Day):**		**168**
SO2					
Aggregate insignificant emissions	3-07-008-21	5.48	lbs emitted/day	2,000.000	5
Auxiliary boiler- natural gas	1-02-006-01	7680	mmbtu/day	0.002	16
Combustion turbine CT-1	2-01-002-01	35404.8	mmbtu/day	0.002	62
Combustion turbine CT-2	2-01-002-01	35404.8	mmbtu/day	0.002	62
	18-0003		**SO2 Total (lbs/Worst-Case Day):**		**145**
VOC					
Aggregate insignificant emissions	3-07-008-21	5.48	lbs emitted/day	2,000.000	5
Auxiliary boiler- natural gas	1-02-006-01	7680	mmbtu/day	0.005	38
Combustion turbine CT-1	2-01-002-01	35404.8	mmbtu/day	0.008	272
Combustion turbine CT-2	2-01-002-01	35404.8	mmbtu/day	0.008	272
	18-0003		**VOC Total (lbs/Worst-Case Day):**		**588**

JELD-WEN, Inc. dba JELD-WEN

18-0006

3303 LAKEPORT BLVD
KLAMATH FALLS 97601

Permit Type: Title V

Location:
LAT DD: 42.2515
LONG DD: -121.8027

SIC/NAICS Codes:
SIC (Primary): 2493
SIC2: 2431
SIC3: 3444
SIC4: 4961
NAICS (Primary): 321219

Operating Parameters:

Annual Days: 326
Annual Hours: 8256

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
73	0	39	427

18-0006 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
MM-T boiler G	1-02-009-05	247422	1000 lbs steam/yr	0.00	1.00	0.3	2
Natural gas combustion devices	1-03-006-02	94.56	mmcf/yr	0.49	1.12	0.0	0
				18-0006	**NH3 Totals:**	**0.3**	**2**
NOX							
MM-T boiler G	1-02-009-05	247422	1000 lbs steam/yr	0.25	1.00	30.9	190
MM-T rotary dryer	3-07-007-06	5153	tons chips/day	1.60	1.00	4.1	25
Natural gas combustion devices	1-03-006-02	94.56	mmcf/yr	53.70	1.12	2.5	17
				18-0006	**NOX Totals:**	**37.6**	**232**

PM25

MM-T boiler G	1-02-009-05	247422	1000 lbs steam/yr	0.02	1.00	2.4	14
MM-T fugitives	3-07-040-03	19172	mbf/yr	0.07	1.00	0.7	4
MM-T rotary dryer	3-07-007-06	5153	tons chips/day	0.86	1.00	2.2	14
MM-T supporting activities	3-07-008-96	19172	mbf/yr	0.25	1.00	2.4	15
Natural gas combustion devices	1-03-006-02	94.56	mmcf/yr	2.50	1.12	0.1	1
WFD-O fugitives	3-07-040-03	79110	msf/yr	0.00	1.00	0.0	0
WFD-O supporting activities	3-07-007-99	79110	msf/yr	0.24	1.00	9.5	58
			18-0006	**PM25**	**Totals:**	**17.3**	**106**

SO2

MM-T boiler G	1-02-009-05	247422	1000 lbs steam/yr	0.01	1.00	1.7	11
Natural gas combustion devices	1-03-006-02	94.56	mmcf/yr	2.60	1.12	0.1	1
			18-0006	**SO2**	**Totals:**	**1.9**	**11**

VOC

Facility wide VOC	3-07-040-03	157800	lbs/yr	1.00	1.00	78.9	484
MM-KF dehumidification kilns	3-07-008-96	19172	mbf/yr	0.73	1.00	7.0	43

MM-T boiler G	1-02-009-05	247422	1000 lbs steam/yr	0.13	1.00	16.1	99
MM-T fugitives	3-07-040-03	19172	mbf/yr	0.00	1.00	0.0	0
MM-T rotary dryer	3-07-007-06	5153	tons chips/day	9.00	1.00	23.2	142
MM-T supporting activities	3-07-008-96	19172	mbf/yr	2.30	1.00	22.0	135
Natural gas combustion devices	1-03-006-02	94.56	mmcf/yr	5.50	1.12	0.3	2
WFD-O supporting activities	3-07-007-99	79110	msf/yr	0.47	1.00	18.4	113

18-0006 VOC Totals: 165.9 1,018

18-0006 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
MM-T boiler G	1-02-009-05	960	1000 lbs steam/day	0.002	2
Natural gas combustion devices	1-03-006-02	1.07	mmcf/day	0.490	1

18-0006 NH3 Total (lbs/Worst-Case Day): 3

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NOX					
MM-T boiler G	1-02-009-05	960	1000 lbs steam/day	0.250	240
MM-T rotary dryer	3-07-007-06	48	tons chips/day	1.600	77

Natural gas combustion devices	1-03-006-02	0.99	mmcf/day	53.700	53

18-0006 NOX Total (lbs/Worst-Case Day): 370

PM25

MM-T boiler G	1-02-009-05	960	1000 lbs steam/day	0.019	17
MM-T fugitives	3-07-040-03	83	mbf/day	0.070	6
MM-T rotary dryer	3-07-007-06	48	tons chips/day	0.860	41
MM-T supporting activities	3-07-008-96	83	mbf/day	0.250	21
Natural gas combustion devices	1-03-006-02	0.99	mmcf/day	2.500	3
WFD-O fugitives	3-07-040-03	483	msf/day	0.001	0
WFD-O supporting activities	3-07-007-99	483	msf/day	0.240	116

18-0006 PM25 Total (lbs/Worst-Case Day): 204

SO2

MM-T boiler G	1-02-009-05	960	1000 lbs steam/day	0.014	13
Natural gas combustion devices	1-03-006-02	0.99	mmcf/day	2.600	3

18-0006 SO2 Total (lbs/Worst-Case Day): 16

VOC

Facility wide VOC	3-07-040-03	957.37	lbs/day	1.000	957
MM-KF dehumidification kilns	3-07-008-96	83	mbf/day	0.732	61
MM-T boiler G	1-02-009-05	960	1000 lbs steam/day	0.130	125

MM-T fugitives	3-07-040-03	83	mbf/day	0.000	0
MM-T rotary dryer	3-07-007-06	48	tons chips/day	9.000	432
MM-T supporting activities	3-07-008-96	83	mbf/day	2.300	191
Natural gas combustion devices	1-03-006-02	0.99	mmcf/day	5.500	5
WFD-O supporting activities	3-07-007-99	483	msf/day	0.466	225

18-0006 **VOC Total (lbs/Worst-Case Day): 1,996**

Collins Products LLC Weyerhaeuser

18-0013

6410 HIGHWAY 66
KLAMATH FALLS 97601

Permit Type: Title V

Location:

LAT DD: 42.1708
LONG DD: -121.8244

SIC/NAICS Codes:

SIC (Primary): 2493
SIC2:
SIC3:
SIC4:
NAICS (Primary): 321219

Operating Parameters:

Annual Days: 365
Annual Hours: 5354

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
54	0	50	1273

18-0013 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Natural gas combustion devices	3-99-900-03	21.632	mmcf/yr	3.20	1.00	0.0	0
				18-0013	**NH3 Totals:**	**0.0**	**0**
NOX							
Bake oven	3-07-007-09	233937	msf/yr	0.02	1.00	2.5	13
Core dryers-natural gas	3-07-007-03	456260	therms/yr	0.01	1.00	3.2	18
Existing defibrators-natural gas	3-07-007-05	26.68	mmcf/yr	200.00	1.00	2.7	15
Natural gas combustion devices	3-99-900-03	21.632	mmcf/yr	100.00	1.00	1.1	6
				18-0013	**NOX Totals:**	**9.4**	**52**

PM25

Hardboard Processes	3-07-014-99	233937	msf/yr	0.17	1.00	20.1	110
Particleboard Processes	3-07-007-99	82971	msf/yr	0.68	1.00	28.3	155
			18-0013	**PM25 Totals:**		**48.4**	**265**

SO2

Core dryers-natural gas	3-07-007-03	456260	therms/yr	0.00	1.00	0.1	0
Existing defibrators-natural gas	3-07-007-05	26.68	mmcf/yr	0.60	1.00	0.0	0
Natural gas combustion devices	3-99-900-03	45.427	mmcf/yr	0.60	1.00	0.0	0
			18-0013	**SO2 Totals:**		**0.1**	**0**

VOC

Bake oven	3-07-007-09	233937	msf/yr	0.17	1.00	20.1	110
Core dryers	3-07-007-03	75361	tons furnish/yr	0.60	1.00	22.4	123
Core dryers-natural gas	3-07-007-03	456260	therms/yr	0.00	1.00	0.0	0
Existing defibrators- 1 & 2-4	3-07-007-05	50851	tons emitted/yr	8.02	1.00	203.8	1,117
Existing defibrators- 1 & 2-4	3-07-007-05	116969	msf/yr	0.21	1.00	12.4	68
Existing defibrators-natural gas	3-07-007-05	26.68	mmcf/yr	3.00	1.00	0.0	0

Hardboard press vents	3-07-007-07	233937	msf/yr	1.13	1.00	132.2	724
Natural gas combustion devices	3-99-900-03	21.632	mmcf/yr	5.80	1.00	0.1	0
Particleboard press vents	3-07-007-99	82971	msf/yr	2.81	1.00	116.7	639
Particleboard vents	3-07-007-09	82971	msf/yr	0.25	1.00	10.5	57
Surface dryers	3-07-007-03	38426	tons furnish/yr	0.61	1.00	11.6	64

18-0013 VOC Totals: 529.8 2,903

18-0013 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Natural gas combustion devices	3-99-900-03	0.921	mmcf/day	3.200	3

18-0013 NH3 Total (lbs/Worst-Case Day): 3

NOX					
Bake oven	3-07-007-09	1186	msf/day	0.021	25
Core dryers- natural gas	3-07-007-03	2890	therms/day	0.014	40
Existing defibrators- natural gas	3-07-007-05	0.583	mmcf/day	200.000	117
Natural gas combustion devices	3-99-900-03	0.921	mmcf/day	100.000	92

18-0013 NOX Total (lbs/Worst-Case Day): 274

PM25

Hardboard Processes	3-07-014-99	1446	msf/day	0.172	249
Particleboard Processes	3-07-007-99	369	msf/day	0.682	252

18-0013 PM25 Total (lbs/Worst-Case Day): 500

SO2

Core dryers- natural gas	3-07-007-03	2890	therms/day	0.000	1
Existing defibrators- natural gas	3-07-007-05	0.583	mmcf/day	0.600	0
Natural gas combustion devices	3-99-900-03	0.921	mmcf/day	0.600	1

18-0013 SO2 Total (lbs/Worst-Case Day): 2

VOC

Bake oven	3-07-007-09	1186	msf/day	0.172	204
Core dryers	3-07-007-03	287	tons furnish/day	0.595	171
Core dryers- natural gas	3-07-007-03	2890	therms/day	0.000	0
Existing defibrators- 1 & 2-4	3-07-007-05	280.5	tons emitted/day	8.015	2,248
Existing defibrators- 1 & 2-4	3-07-007-05	1186	msf/day	0.212	251
Existing defibrators- natural gas	3-07-007-05	0.583	mmcf/day	3.000	2
Hardboard press vents	3-07-007-07	1186	msf/day	1.130	1,340
Natural gas combustion devices	3-99-900-03	0.921	mmcf/day	5.800	5

Particleboard press vents	3-07-007-99	335	msf/day	2.812	942
Particleboard vents	3-07-007-09	335	msf/day	0.252	84
Surface dryers	3-07-007-03	192	tons furnish/day	0.606	116

18-0013 **VOC Total (lbs/Worst-Case Day): 5,365**

Columbia Forest Products, Inc.

18-0014

SOUTH HIGHWAY 97
KLAMATH FALLS 97601

Permit Type: Title V

Location:
LAT DD: 42.1804
LONG DD: -121.8003

SIC/NAICS Codes:
SIC (Primary): 2435
SIC2: 4961
SIC3:
SIC4:
NAICS (Primary): 321211

Operating Parameters:

Annual Days: 365
Annual Hours: 5422

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
88	0	39	143

18-0014 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Natural gas boiler	1-03-006-02	20.1	mmcf/yr	0.49	1.12	0.0	0
North boiler (small)	1-02-009-05	33398	1000 lbs steam/yr	0.00	1.00	0.0	0
South boiler (large)	1-02-009-05	172026	1000 lbs steam/yr	0.00	1.00	0.2	1
				18-0014	**NH3 Totals:**	**0.3**	**1**
NOX							
Natural gas boiler	1-03-006-02	20.1	mmcf/yr	100.00	1.12	1.0	6
North boiler (small)	1-02-009-05	33398	1000 lbs steam/yr	0.31	1.00	5.2	28
South boiler (large)	1-02-009-05	172026	1000 lbs steam/yr	0.49	1.00	42.1	231

Veneer dryers- pine	3-07-007-50	28504	msf/yr	0.12	1.00	1.7	9
Veneer dryers- white fir	3-07-007-12	58539	msf/yr	0.12	0.99	3.5	19
			18-0014	**NOX**	**Totals:**	**53.5**	**294**

PM25

Material handling	3-07-008-08	97726	msf/yr	0.06	1.00	3.0	17
Natural gas boiler	1-03-006-02	20.1	mmcf/yr	2.50	1.12	0.0	0
North boiler (small)	1-02-009-05	33398	1000 lbs steam/yr	0.22	1.00	3.7	20
South boiler (large)	1-02-009-05	172026	1000 lbs steam/yr	0.30	1.00	25.8	141
Storage piles	3-07-008-21	97726	msf/yr	0.02	1.00	0.7	4
Veneer dryers- pine	3-07-007-50	28504	msf/yr	0.36	1.00	5.1	28
Veneer dryers- white fir	3-07-007-12	58539	msf/yr	0.36	0.99	10.5	57
			18-0014	**PM25**	**Totals:**	**48.9**	**268**

SO2

Natural gas boiler	1-03-006-02	20.1	mmcf/yr	0.04	1.12	0.0	0
North boiler (small)	1-02-009-05	33398	1000 lbs steam/yr	0.01	1.00	0.2	1

South boiler (large)	1-02-009-05	172026	1000 lbs steam/yr	0.01	1.00	1.2	7
				18-0014	**SO2 Totals:**	**1.4**	**8**
VOC							
Facility wide VOC	4-01-888-98	3.77	tons emitted/yr	2,000.00	1.00	3.8	21
Natural gas boiler	1-03-006-02	20.1	mmcf/yr	7.10	1.12	0.1	0
North boiler (small)	1-02-009-05	33398	1000 lbs steam/yr	0.01	1.00	0.2	1
South boiler (large)	1-02-009-05	172026	1000 lbs steam/yr	0.01	1.00	1.1	6
Veneer dryers- pine	3-07-007-50	28504	msf/yr	2.08	1.00	29.6	162
Veneer dryers- white fir	3-07-007-12	58539	msf/yr	0.22	0.99	6.4	35
				18-0014	**VOC Totals:**	**41.2**	**226**

18-0014 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Natural gas boiler	1-03-006-02	0.2	mmcf/day	0.490	0
North boiler (small)	1-02-009-05	240	1000 lbs steam/day	0.002	1
South boiler (large)	1-02-009-05	672	1000 lbs steam/day	0.002	2

		18-0014	**NH3 Total (lbs/Worst-Case Day):**		**2**
NOX					
Natural gas boiler	1-03-006-02	0.2	mmcf/day	100.000	20
North boiler (small)	1-02-009-05	240	1000 lbs steam/day	0.310	74
South boiler (large)	1-02-009-05	672	1000 lbs steam/day	0.490	329
Veneer dryers- pine	3-07-007-50	85	msf/day	0.119	10
Veneer dryers-white fir	3-07-007-12	499	msf/day	0.120	60
		18-0014	**NOX Total (lbs/Worst-Case Day):**		**494**
PM25					
Material handling	3-07-008-08	1080	msf/day	0.062	67
Natural gas boiler	1-03-006-02	0.2	mmcf/day	2.500	1
North boiler (small)	1-02-009-05	240	1000 lbs steam/day	0.220	53
South boiler (large)	1-02-009-05	672	1000 lbs steam/day	0.300	202
Storage piles	3-07-008-21	1080	msf/day	0.015	16
Veneer dryers	3-07-007-50	584	msf/day	0.360	180
	18-0014		**PM25Total (lbs/Worst-Case Day):**		**518**
SO2					
Natural gas boiler	1-03-006-02	0.2	mmcf/day	0.036	0

North boiler (small)	1-02-009-05	240	1000 lbs steam/day	0.014	3
South boiler (large)	1-02-009-05	672	1000 lbs steam/day	0.014	9

18-0014 **SO2 Total (lbs/Worst-Case Day): 13**

VOC

Facility wide VOC	4-01-888-98	327.67	lbs/day	2,000.000	328
Natural gas boiler	1-03-006-02	0.2	mmcf/day	7.100	1
North boiler (small)	1-02-009-05	240	1000 lbs steam/day	0.013	3
South boiler (large)	1-02-009-05	672	1000 lbs steam/day	0.013	9
Veneer dryers- pine	3-07-007-50	85	msf/day	2.080	177
Veneer dryers-white fir	3-07-007-12	499	msf/day	0.219	109

18-0014 **VOC Total (lbs/Worst-Case Day): 627**

Pyramid Cremations

18-0018

3539 AVALON ST
KLAMATH FALLS 97603

Permit Type: ACDP-General

Location:
LAT DD: 42.2029
LONG DD: -121.7504

SIC/NAICS Codes:
SIC (Primary): 4953
SIC2:
SIC3:
SIC4:
NAICS (Primary): 812220

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

18-0018 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NOX							
Crematory incinerator	3-05-021-01	0.01158	mmcf/yr	100.00	1.00	0.0	0
				18-0018	**NOX Totals:**	**0.0**	**0**
PM25							
Crematory incinerator	3-05-021-01	1522	hrs/yr	0.08	1.00	0.1	0
				18-0018	**PM25 Totals:**	**0.1**	**0**
SO2							
Crematory incinerator	3-05-021-01	0.01158	mmcf/yr	1.70	1.00	0.0	0
				18-0018	**SO2 Totals:**	**0.0**	**0**
VOC							
Crematory incinerator	3-05-021-01	0.01158	mmcf/yr	5.50	1.00	0.0	0

18-0018	VOC Totals:	0.0	0

18-0018 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NOX					
Crematory incinerator	3-05-021-01	171	lbs/day	100.000	0
	18-0018	**NOX Total (lbs/Worst-Case Day):**			**0**
PM25					
Crematory incinerator	3-05-021-01	41	hrs/day	0.075	0
	18-0018	**PM25 Total (lbs/Worst-Case Day):**			**0**
SO2					
Crematory incinerator	3-05-021-01	171	lbs/day	1.700	0
	18-0018	**SO2 Total (lbs/Worst-Case Day):**			**0**
VOC					
Crematory incinerator	3-05-021-01	171	lbs/day	5.500	0
	18-0018	**VOC Total (lbs/Worst-Case Day):**			**0**

Oil Re-Refining Company Industrial Oil

18-0020

1291 LAVERNE AVE
KLAMATH FALLS 97603-4563

Permit Type: ACDP-Simple

Location:
LAT DD: 42.1921
LONG DD: -121.7674

SIC/NAICS Codes:
SIC (Primary): 5093
SIC2:
SIC3:
SIC4:
NAICS (Primary): 423930

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

18-0020 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Auxiliary boiler	1-02-013-02	140	1000 gallons/yr	0.80	1.01	0.1	0
			18-0020		**NH3 Totals:**	**0.1**	**0**
NOX							
Auxiliary boiler	1-02-013-02	140	1000 gallons/yr	19.00	1.01	1.3	7
Energy recovery heater (non-oily solids)	3-06-001-99	432	tons solids/yr	3.00	1.00	0.6	4
Energy recovery heater (oil in solids)	3-06-001-01	287	1000 gallons/yr	19.00	1.00	2.7	15
Energy recovery heater (propane)	3-06-001-02	51	1000 gallons/yr	19.00	0.96	0.5	3
			18-0020		**NOX Totals:**	**5.2**	**28**
PM25							

Auxiliary boiler	1-02-013-02	140	1000 gallons/yr	32.54	1.01	2.3	13
Energy recovery heater (non-oily solids)	3-06-001-99	432	tons solids/yr	0.54	1.00	0.1	1
Energy recovery heater (oil in solids)	3-06-001-01	287	1000 gallons/yr	4.65	1.00	0.7	4
Energy recovery heater (propane)	3-06-001-02	51	1000 gallons/yr	0.34	0.96	0.0	0
			18-0020	**PM25**	**Totals:**	**3.1**	**17**

SO2

Auxiliary boiler	1-02-013-02	140	1000 gallons/yr	132.30	1.01	9.3	51
Energy recovery heater (non-oily solids)	3-06-001-99	432	tons solids/yr	2.50	1.00	0.5	3
Energy recovery heater (oil in solids)	3-06-001-01	86	1000 gallons/yr	257.25	1.00	11.1	61
Energy recovery heater (propane)	3-06-001-02	51	1000 gallons/yr	0.02	0.96	0.0	0
			18-0020	**SO2**	**Totals:**	**20.9**	**115**

VOC

Auxiliary boiler	1-02-013-02	140	1000 gallons/yr	1.00	1.01	0.1	0
Condenser vent, dehydrator	4-90-002-02	685	tons emitted/yr	0.77	1.00	0.3	1
Energy recovery heater (non-oily solids)	3-06-001-99	432	tons solids/yr	3.00	1.00	0.6	4

Energy recovery heater (oil in solids)	3-06-001-01	287	1000 gallons/yr	1.00	1.00	0.1	1
Energy recovery heater (propane)	3-06-001-02	51	1000 gallons/yr	0.50	0.96	0.0	0
Storage tanks	4-90-002-01	812	1000 gallons/yr	0.14	1.00	0.1	0
Water evaporation	4-90-999-98	399	1000 gallons/yr	0.83	1.00	0.2	1

18-0020 VOC Totals: 1.4 7

18-0020 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Auxiliary boiler	1-02-013-02	0.6	1000 gallons/day	0.800	0
	18-0020		**NH3 Total (lbs/Worst-Case Day):**		**0**
NOX					
Auxiliary boiler	1-02-013-02	0.6	1000 gallons/day	19.000	9
Energy recovery heater (non-oily solids)	3-06-001-99	1.3	tons solids/day	3.000	4
Energy recovery heater (oil in solids)	3-06-001-01	0.877	1000 gallons/day	19.000	18
Energy recovery heater (propane)	3-06-001-02	0.14	1000 gallons/day	19.000	3
	18-0020		**NOX Total (lbs/Worst-Case Day):**		**34**
PM25					

Auxiliary boiler	1-02-013-02	0.6	1000 gallons/day	32.543	15
Energy recovery heater (non-oily solids)	3-06-001-99	1.3	tons solids/day	0.535	1
Energy recovery heater (oil in solids)	3-06-001-01	0.877	1000 gallons/day	4.648	4
Energy recovery heater (propane)	3-06-001-02	0.14	1000 gallons/day	0.342	0

18-0020 **PM25 Total (lbs/Worst-Case Day): 20**

SO2

Auxiliary boiler	1-02-013-02	0.6	1000 gallons/day	132.300	61
Energy recovery heater (non-oily solids)	3-06-001-99	1.3	tons solids/day	2.500	4
Energy recovery heater (oil in solids)	3-06-001-01	0.877	1000 gallons/day	257.250	73
Energy recovery heater (propane)	3-06-001-02	0.14	1000 gallons/day	0.016	0

18-0020 **SO2 Total (lbs/Worst-Case Day): 138**

VOC

Auxiliary boiler	1-02-013-02	0.6	1000 gallons/day	1.000	0
Condenser vent, dehydrator	4-90-002-02	15.168	tons solids/day	0.770	2
Energy recovery heater (non-oily solids)	3-06-001-99	1.3	tons solids/day	3.000	4
Energy recovery heater (oil in solids)	3-06-001-01	0.877	1000 gallons/day	1.000	1
Energy recovery heater (propane)	3-06-001-02	0.14	1000 gallons/day	0.500	0
Storage tanks	4-90-002-01	0.00274	1000 gallons/day	0.143	0

Water evaporation	4-90-999-98	6.85	1000 gallons/day	0.830	1

18-0020 **VOC Total (lbs/Worst-Case Day): 9**

Electro Scientific Industries, Inc.

18-0022

4700 ESI WAY
KLAMATH FALLS 97601
Permit Type: ACDP-Simple

Location:
LAT DD: 42.2725
LONG DD: -121.7981

SIC/NAICS Codes:
SIC (Primary): 3699
SIC2:
SIC3:
SIC4:
NAICS (Primary): 335999

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	9	39	39

18-0022 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Natural gas combustion devices	1-02-006-03	8.2793	mmcf/yr	3.20	1.07	0.0	0
				18-0022	**NH3 Totals:**	**0.0**	**0**
NOX							
Natural gas combustion devices	1-02-006-03	8.2793	mmcf/yr	100.00	1.07	0.4	2
				18-0022	**NOX Totals:**	**0.4**	**2**
PM25							
Natural gas combustion devices	1-02-006-03	8.2793	mmcf/yr	2.50	1.07	0.0	0
				18-0022	**PM25 Totals:**	**0.0**	**0**
SO2							
Natural gas combustion devices	1-02-006-03	8.2793	mmcf/yr	2.60	1.07	0.0	0

			18-0022	**SO2 Totals:**		**0.0**	**0**

VOC

FW VOC emissions	4-02-025-01	3	tons emitted/yr	1.00	1.00	0.0	0
Natural gas combustion devices	1-02-006-03	8.2793	mmcf/yr	5.50	1.07	0.0	0
			18-0022	**VOC Totals:**		**0.0**	**0**

18-0022 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Natural gas combustion devices	1-02-006-03	0.06	mmcf/day	3.200	0
	18-0022	**NH3 Total (lbs/Worst-Case Day):**			**0**
NOX					
Natural gas combustion devices	1-02-006-03	0.06	mmcf/day	100.000	3
	18-0022	**NOX Total (lbs/Worst-Case Day):**			**3**
PM25					
Natural gas combustion devices	1-02-006-03	0.06	mmcf/day	2.500	0
	18-0022	**PM25 Total (lbs/Worst-Case Day):**			**0**
SO2					
Natural gas combustion devices	1-02-006-03	0.06	mmcf/day	2.600	0
	18-0022	**SO2 Total (lbs/Worst-Case Day):**			**0**

VOC

FW VOC emissions	4-02-025-01	30.32	tons emitted/day	1.000	0
Natural gas combustion devices	1-02-006-03	0.06	mmcf/day	5.500	0

18-0022 **VOC Total (lbs/Worst-Case Day): 0**

Reach, Inc.

18-0031

2350 MAYWOOD DR
KLAMATH FALLS 97603

Permit Type: ACDP-General

Location:
LAT DD: 42.2065
LONG DD: -121.7601

SIC/NAICS Codes:
SIC (Primary): 2431
SIC2:
SIC3:
SIC4:
NAICS (Primary): 321918

Operating Parameters:

Annual Days:	365
Annual Hours:	8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

18-0031 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Cyclone (baghouse)- sanderdust	3-07-008-08	1.503	bdt/yr	0.02	1.00	0.0	0
Cyclone (high efficiency)- chips, shavings, HF, bark, sawdust	3-07-008-08	2004.46	bdt/yr	0.08	1.00	0.1	0
Cyclone (med efficiency)- chips, shavings, HF, bark, sawdust	3-07-008-08	2099.23	bdt/yr	0.13	1.00	0.1	1
Kilns- Lodgepole Pine	3-07-007-60	526.704	mbf/yr	0.01	1.00	0.0	0
Kilns- Ponderosa Pine	3-07-007-60	584.158	mbf/yr	0.01	1.00	0.0	0
Kilns- Tan Oak	3-07-007-60	1.07	mbf/yr	0.01	1.00	0.0	0
			18-0031	**PM25 Totals:**		**0.2**	**1**

VOC

Kilns- Lodgepole Pine	3-07-007-60	526.704	mbf/yr	1.70	1.00	0.4	2
Kilns- Ponderosa Pine	3-07-007-60	584.158	mbf/yr	1.70	1.00	0.5	3
Kilns- Tan Oak	3-07-007-60	1.07	mbf/yr	0.60	1.00	0.0	0

18-0031 VOC Totals: 0.9 5

18-0031 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Cyclone (baghouse)- sanderdust	3-07-008-08	0.147	lbs/day	0.020	0
Cyclone (high efficiency)- chips, shavings, HF, bark, sawdust	3-07-008-08	23.89	lbs/day	0.080	1
Cyclone (med efficiency)- chips, shavings, HF, bark, sawdust	3-07-008-08	37.3	lbs/day	0.125	1
Kilns- Lodgepole Pine	3-07-007-60	3	mbf/day	0.015	0
Kilns- Ponderosa Pine	3-07-007-60	3	mbf/day	0.015	0
Kilns- Tan Oak	3-07-007-60	3	mbf/day	0.006	0

18-0031 PM25 Total (lbs/Worst-Case Day): 1

VOC					
Kilns- Lodgepole Pine	3-07-007-60	3	mbf/day	1.700	3
Kilns- Ponderosa Pine	3-07-007-60	3	mbf/day	1.700	3

Kilns- Tan Oak	3-07-007-60	3	mbf/day	0.600	0

18-0031 **VOC Total (lbs/Worst-Case Day): 6**

Klamath Energy, LLC Klamath Generation Peakers

18-0032

4940 HIGHWAY 97 SOUTH
KLAMATH FALLS 97603

Permit Type: Title V

Location:
LAT DD: 42.1808
LONG DD: -121.8011

SIC/NAICS Codes:
SIC (Primary): 4911
SIC2:
SIC3:
SIC4:
NAICS (Primary): 221112

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
40	0	23	11

18-0032 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
4 combustion turbines-natural gas	2-01-002-01	167.74	mmcf/yr	9.10	0.88	0.8	4
				18-0032	**NH3 Totals:**	**0.8**	**4**
NOX							
4 combustion turbines-natural gas	2-01-002-01	1.94	tons emitted/yr	2,000.00	0.88	1.9	9
				18-0032	**NOX Totals:**	**1.9**	**9**
PM25							
4 combustion turbines-natural gas	2-01-002-01	167.74	mmcf/yr	7.56	0.88	0.6	3
				18-0032	**PM25 Totals:**	**0.6**	**3**
SO2							
4 combustion turbines-natural gas	2-01-002-01	167.74	mmcf/yr	1.18	0.88	0.1	0

			18-0032	**SO2 Totals:**		**0.1**	**0**

VOC

4 combustion turbines-natural gas	2-01-002-01	167.74	mmcf/yr	5.88	0.88	0.5	2
			18-0032	**VOC Totals:**		**0.5**	**2**

18-0032 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
4 combustion turbines-natural gas	2-01-002-01	8602	mmbtu/day	9.100	75
	18-0032	**NH3 Total (lbs/Worst-Case Day):**			**75**
NOX					
4 combustion turbines-natural gas	2-01-002-01	8602	mmbtu/day	2,000.000	173
	18-0032	**NOX Total (lbs/Worst-Case Day):**			**173**
PM25					
4 combustion turbines-natural gas	2-01-002-01	8602	mmbtu/day	7.560	62
	18-0032	**PM25 Total (lbs/Worst-Case Day):**			**62**
SO2					
4 combustion turbines-natural gas	2-01-002-01	8602	mmbtu/day	1.180	10
	18-0032	**SO2 Total (lbs/Worst-Case Day):**			**10**
VOC					
4 combustion turbines-natural gas	2-01-002-01	8602	mmbtu/day	5.880	48

18-0032 **VOC Total (lbs/Worst-Case Day):** **48**

Sky Lakes Medical Center, Inc.

18-0056

2865 DAGGETT AVE
KLAMATH FALLS 97601-1106

Permit Type: ACDP-General

Location:
LAT DD: 42.2526
LONG DD: -121.7867

SIC/NAICS Codes:
SIC (Primary): 4961
SIC2:
SIC3:
SIC4:
NAICS (Primary): 221330

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

18-0056 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Boilers-natural gas	1-02-006-02	12	mmcf/yr	3.20	1.01	0.0	0
				18-0056	**NH3 Totals:**	**0.0**	**0**
NOX							
Boilers-natural gas	1-02-006-02	12	mmcf/yr	100.00	1.01	0.6	3
				18-0056	**NOX Totals:**	**0.6**	**3**
PM25							
Boilers-natural gas	1-02-006-02	12	mmcf/yr	2.50	1.01	0.0	0
				18-0056	**PM25 Totals:**	**0.0**	**0**
SO2							
Boilers-natural gas	1-02-006-02	12	mmcf/yr	1.70	1.01	0.0	0

18-0056 SO2 Totals: 0.0 0

VOC

Boilers-natural gas	1-02-006-02	12	mmcf/yr	5.50	1.01	0.0	0

18-0056 VOC Totals: 0.0 0

18-0056 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Boilers-natural gas	1-02-006-02	0.6	mmcf/day	3.200	0
	18-0056	**NH3 Total (lbs/Worst-Case Day):**			**0**
NOX					
Boilers-natural gas	1-02-006-02	0.6	mmcf/day	100.000	4
	18-0056	**NOX Total (lbs/Worst-Case Day):**			**4**
PM25					
Boilers-natural gas	1-02-006-02	0.6	mmcf/day	2.500	0
	18-0056	**PM25 Total (lbs/Worst-Case Day):**			**0**
SO2					
Boilers-natural gas	1-02-006-02	0.6	mmcf/day	1.700	0
	18-0056	**SO2 Total (lbs/Worst-Case Day):**			**0**
VOC					
Boilers-natural gas	1-02-006-02	0.6	mmcf/day	5.500	0

18-0056	**VOC Total (lbs/Worst-Case Day):**	**0**

Jefferson State Redi Mix, Inc.

18-0070

4815 TINGLEY LN
KLAMATH FALLS 97603

Permit Type: ACDP-General

Location:
LAT DD: 42.1842
LONG DD: -121.7722

SIC/NAICS Codes:
SIC (Primary): 3273
SIC2:
SIC3:
SIC4:
NAICS (Primary): 327320

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

18-0070 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Concrete production	3-05-011-01	41930	cubic yards/yr	0.01	0.96	0.1	1

18-0070 PM25 Totals: 0.1 1

18-0070 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Concrete production	3-05-011-01	1536	cubic yards/day	0.006	1

18-0070 PM25 Total (lbs/Worst-Case Day): 1

Down River LLC

18-0086

3033 MEMORIAL DRIVE
KLAMATH FALLS 97603

Permit Type: ACDP-General

Location:
LAT DD: 42.189
LONG DD: -121.7876

SIC/NAICS Codes:
SIC (Primary): 2431
SIC2:
SIC3:
SIC4:
NAICS (Primary): 321918

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

18-0086 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Cyclone (baghouse)- chips, shavings, HF, bark, sawdust	3-07-008-08	442	tons emitted/yr	0.00	1.00	0.0	0
				18-0086	**PM25 Totals:**	**0.0**	**0**
VOC							
FW VOC emissions	3-07-007-99	3	tons emitted/yr	2,000.00	1.00	3.0	24
				18-0086	**VOC Totals:**	**3.0**	**24**

18-0086 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Cyclone (baghouse)- chips, shavings, HF, bark, sawdust	3-07-008-08	60.032	tons emitted/day	0.001	0
		18-0086	**PM25 Total (lbs/Worst-Case Day):**		**0**

VOC

FW VOC emissions	3-07-007-99	249.6	tons emitted/day	2,000.000	29

18-0086 **VOC Total (lbs/Worst-Case Day): 29**

Eternal Hills Memorial Gardens & Funeral

18-0087

4711 HWY 39
KLAMATH FALLS 97603

Permit Type: ACDP-Basic

Location:

LAT DD: 42.1831
LONG DD: -121.6972

SIC/NAICS Codes:

SIC (Primary): 4953
SIC2:
SIC3:
SIC4:
NAICS (Primary): 812220

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
0	0	0	0

18-0087 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Crematory incinerator	3-15-021-01	14	tons material/yr	3.15	1.00	0.0	0

18-0087 PM25 Totals: 0.0 0

18-0087 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Crematory incinerator	3-15-021-01	0.04384	tons material/day	3.147	0

18-0087 PM25 Total (lbs/Worst-Case Day): 0

O'Hair & Riggs Funeral Chapel Klamath Cremation

18-0088

2680 MEMORIAL DR
KLAMATH FALLS 97601

Permit Type: ACDP-Basic

Location:
LAT DD: 42.1944
LONG DD: -121.7877

SIC/NAICS Codes:
SIC (Primary): 4953
SIC2:
SIC3:
SIC4:
NAICS (Primary): 812220

Operating Parameters:

Annual Days:	365
Annual Hours:	8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
0	0	0	0

18-0088 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Crematory incinerator	3-15-021-01	10	tons material/yr	3.15	1.00	0.0	0

18-0088 PM25 Totals: 0.0 0

18-0088 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Crematory incinerator	3-15-021-01	0.04384	tons material/day	3.147	0

18-0088 PM25 Total (lbs/Worst-Case Day): 0

Masco Bath Corporation Masco Bath

18-0093

5855 WASHBURN WAY
KLAMATH FALLS 97603-9634

Permit Type: Title V

Location:
LAT DD: 42.1734
LONG DD: -121.7573

SIC/NAICS Codes:
SIC (Primary): 3088
SIC2:
SIC3:
SIC4:
NAICS (Primary): 326191

Operating Parameters:

Annual Days: 176
Annual Hours: 1242

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	197

18-0093 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Air handling and boilers	1-03-006-02	1.48	mmcf/yr	0.49	1.12	0.0	0
				18-0093	**NH3 Totals:**	**0.0**	**0**
NOX							
Aggregate insignificant emissions	3-07-008-21	1	tons emitted/yr	2,000.00	1.00	1.0	11
Air handling and boilers	1-03-006-02	1.48	mmcf/yr	140.00	1.12	0.1	1
				18-0093	**NOX Totals:**	**1.1**	**13**
PM25							
Aggregate insignificant emissions	3-07-008-21	1	tons emitted/yr	2,000.00	1.00	1.0	11
Air handling and boilers	1-03-006-02	1.48	mmcf/yr	2.50	1.12	0.0	0

Fiber glass laminate manufacturing	3-08-007-20	35758	units/yr	0.00	1.00	0.1	1
				18-0093	**PM25 Totals:**	**1.1**	**12**

SO2

Aggregate insignificant emissions	3-07-008-21	1	tons emitted/yr	2,000.00	1.00	1.0	6
Air handling and boilers	1-03-006-02	1.48	mmcf/yr	2.60	1.12	0.0	0
				18-0093	**SO2 Totals:**	**1.0**	**6**

VOC

Aggregate insignificant emissions	3-07-008-21	1	tons emitted/yr	2,000.00	1.00	1.0	11
Air handling and boilers	1-03-006-02	1.48	mmcf/yr	5.30	1.12	0.0	0
Facility wide VOC	4-02-022-99	0.29	tons emitted/yr	1.00	1.00	0.0	0
Fiber glass laminate manufacturing	3-08-007-20	35758	units/yr	1.85	1.00	33.1	376
				18-0093	**VOC Totals:**	**34.1**	**387**

18-0093 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Air handling and boilers	1-03-006-02	0.3	mmcf/day	0.490	0

	18-0093	**NH3 Total (lbs/Worst-Case Day):**			**0**
NOX					
Aggregate insignificant emissions	3-07-008-21	11.36	tons emitted/day	2,000.000	11
Air handling and boilers	1-03-006-02	0.3	mmcf/day	140.000	42
	18-0093	**NOX Total (lbs/Worst-Case Day):**			**53**
PM25					
Aggregate insignificant emissions	3-07-008-21	11.36	tons emitted/day	2,000.000	6
Air handling and boilers	1-03-006-02	0.3	mmcf/day	2.500	1
Fiber glass laminate manufacturing	3-08-007-20	384	units/day	0.004	1
	18-0093	**PM25 Total (lbs/Worst-Case Day):**			**8**
SO2					
Aggregate insignificant emissions	3-07-008-21	11.36	tons emitted/day	2,000.000	11
Air handling and boilers	1-03-006-02	0.4472	mmcf/day	2.600	1
	18-0093	**SO2 Total (lbs/Worst-Case Day):**			**13**
VOC					
Aggregate insignificant emissions	3-07-008-21	11.36	tons emitted/day	2,000.000	11
Air handling and boilers	1-03-006-02	0.3	mmcf/day	5.300	2
Facility wide VOC	4-02-022-99	384	units/day	1.000	146
Fiber glass laminate manufacturing	3-08-007-20	384	units/day	1.850	710
	18-0093	**VOC Total (lbs/Worst-Case Day):**			**869**

Kingsley Field Air National Guard Base

18-0097

VANDENBURG DRIVE
KLAMATH FALLS 97603

Permit Type: ACDP-Simple

Location:

LAT DD: 42.1919
LONG DD: -121.7241

SIC/NAICS Codes:

SIC (Primary): 9711
SIC2:
SIC3:
SIC4:
NAICS (Primary): 928110

Operating Parameters: **Plant Site Emission Limits:**

		NOx	PM25	SO2	VOC
Annual Days:	365				
Annual Hours:	8760	39	0	39	39

18-0097 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NOX							
Engine testing-afterburner	2-04-001-99	5	hrs/yr	437.00	1.00	1.1	6
Engine testing- idle	2-04-001-99	65	hrs/yr	5.10	1.00	0.2	1
Engine testing-military power	2-04-001-99	23	hrs/yr	260.20	1.00	3.0	16
Engine testing-part power	2-04-001-99	20	hrs/yr	307.40	1.00	3.1	17
				18-0097	**NOX Totals:**	**7.3**	**40**
PM25							
Engine testing-afterburner	2-04-001-99	5	hrs/yr	53.00	1.00	0.1	1
Engine testing- idle	2-04-001-99	65	hrs/yr	4.07	1.00	0.1	1

Engine testing- military power	2-04-001-99	23	hrs/yr	6.75	1.00	0.1	0
Engine testing- part power	2-04-001-99	20	hrs/yr	14.84	1.00	0.1	1
				18-0097	**PM25 Totals:**	**0.5**	**3**

SO2

Engine testing- afterburner	2-04-001-99	5	hrs/yr	28.60	1.00	0.1	0
Engine testing- idle	2-04-001-99	65	hrs/yr	0.61	1.00	0.0	0
Engine testing- military power	2-04-001-99	23	hrs/yr	4.10	1.00	0.0	0
Engine testing- part power	2-04-001-99	20	hrs/yr	5.80	1.00	0.1	0
				18-0097	**SO2 Totals:**	**0.2**	**1**

VOC

Engine testing- afterburner	2-04-001-99	5	hrs/yr	79.60	1.00	0.2	1
Engine testing- idle	2-04-001-99	65	hrs/yr	8.70	1.00	0.3	2
Engine testing- military power	2-04-001-99	23	hrs/yr	2.10	1.00	0.0	0
Engine testing- part power	2-04-001-99	20	hrs/yr	19.00	1.00	0.2	1
				18-0097	**VOC Totals:**	**0.7**	**4**

18-0097 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NOX					
Engine testing- afterburner	2-04-001-99	0.1	hrs/day	437.000	7
Engine testing- idle	2-04-001-99	1.6	hrs/day	5.100	1
Engine testing- military power	2-04-001-99	0.7	hrs/day	260.200	20
Engine testing- part power	2-04-001-99	0.7	hrs/day	307.400	20
	18-0097	**NOX Total (lbs/Worst-Case Day):**			**48**
PM25					
Engine testing- afterburner	2-04-001-99	0.1	hrs/day	53.000	1
Engine testing- idle	2-04-001-99	1.6	hrs/day	4.070	1
Engine testing- military power	2-04-001-99	0.7	hrs/day	6.750	1
Engine testing- part power	2-04-001-99	0.7	hrs/day	14.840	1
	18-0097	**PM25 Total (lbs/Worst-Case Day):**			**3**
SO2					
Engine testing- afterburner	2-04-001-99	0.1	hrs/day	28.600	0
Engine testing- idle	2-04-001-99	1.6	hrs/day	0.610	0
Engine testing- military power	2-04-001-99	0.7	hrs/day	4.100	0

Engine testing- part power	2-04-001-99	0.7	hrs/day	5.800	0

18-0097 SO2 Total (lbs/Worst-Case Day): 1

VOC

Engine testing- afterburner	2-04-001-99	0.1	hrs/day	79.600	1
Engine testing- idle	2-04-001-99	1.6	hrs/day	8.700	2
Engine testing- military power	2-04-001-99	0.7	hrs/day	2.100	0
Engine testing- part power	2-04-001-99	0.7	hrs/day	19.000	1

18-0097 VOC Total (lbs/Worst-Case Day): 5

Klamath Pacific (CPM) asphalt plant

37-0209

Portable

KLAMATH FALLS n/a

Permit Type: ACDP-General

Location:

LAT DD: 42.3255

LONG DD: -121.8171

SIC/NAICS Codes:

SIC (Primary): 2951

SIC2:

SIC3:

SIC4:

NAICS (Primary): 324121

Operating Parameters:

Annual Days: 350

Annual Hours:

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

37-0209 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Generator -oil fired	2-02-001-01	116	1000 gallons/yr	1.40	0.95	0.1	0
			37-0209	**NH3 Totals:**		**0.1**	**0**
NOX							
Asphalt Drum Plant- oil fired	3-05-002-58	46310	tons asphalt/yr	0.06	1.00	1.3	7
Generator -oil fired	2-02-001-01	116	1000 gallons/yr	604.00	0.95	35.0	189
			37-0209	**NOX Totals:**		**36.3**	**197**
PM25							
Asphalt Drum Plant- oil fired	3-05-002-58	46310	tons asphalt/yr	0.02	1.00	0.5	3
Generator -oil fired	2-02-001-01	116	1000 gallons/yr	42.50	0.95	2.5	13

			37-0209	PM25 Totals:		3.0	16

SO2

Asphalt Drum Plant- oil fired	3-05-002-58	46310	tons asphalt/yr	0.01	1.00	0.3	1
Generator -oil fired	2-02-001-01	116	1000 gallons/yr	39.70	0.95	2.3	12
			37-0209	SO2 Totals:		2.6	14

VOC

Asphalt Drum Plant- oil fired	3-05-002-58	46310	tons asphalt/yr	0.03	1.00	0.7	4
Generator -oil fired	2-02-001-01	116	1000 gallons/yr	49.30	0.95	2.9	15
			37-0209	VOC Totals:		3.6	20

37-0209 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Generator -oil fired	2-02-001-01	0.624	1000 gallons/day	1.400	1
	37-0209	NH3 Total (lbs/Worst-Case Day):			1
NOX					
Asphalt Drum Plant- oil fired	3-05-002-58	1029	tons asphalt/day	0.055	9
Generator -oil fired	2-02-001-01	0.624	1000 gallons/day	604.000	227
	37-0209	NOX Total (lbs/Worst-Case Day):			236

PM25

Asphalt Drum Plant- oil fired	3-05-002-58	1029	tons asphalt/day	0.022	4
Generator -oil fired	2-02-001-01	0.624	1000 gallons/day	42.500	16

37-0209 PM25 Total (lbs/Worst-Case Day): 20

SO2

Asphalt Drum Plant- oil fired	3-05-002-58	1029	tons asphalt/day	0.011	2
Generator -oil fired	2-02-001-01	0.624	1000 gallons/day	39.700	15

37-0209 SO2 Total (lbs/Worst-Case Day): 17

VOC

Asphalt Drum Plant- oil fired	3-05-002-58	1029	tons asphalt/day	0.032	5
Generator -oil fired	2-02-001-01	0.624	1000 gallons/day	49.300	19

37-0209 VOC Total (lbs/Worst-Case Day): 24

Klamath Pacific (CPM) rock crusher

37-0438

Portable

KLAMATH FALLS n/a

Permit Type: ACDP-General

Location:

LAT DD: 42.3274

LONG DD: -121.8161

SIC/NAICS Codes:

SIC (Primary): 1442

SIC2:

SIC3:

SIC4:

NAICS (Primary): 212321

Operating Parameters:

Annual Days: 162

Annual Hours:

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

37-0438 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
NH3							
Generator -oil fired	2-02-001-01	12.405	1000 gallons/yr	1.40	0.95	0.0	0
				37-0438	**NH3 Totals:**	**0.0**	**0**
NOX							
Generator -oil fired	2-02-001-01	12.405	1000 gallons/yr	604.00	0.95	3.7	44
				37-0438	**NOX Totals:**	**3.7**	**44**
PM25							
Generator -oil fired	2-02-001-01	12.405	1000 gallons/yr	42.50	0.95	0.3	3
Rock Crusher	3-05-020-03	82939	tons rock/yr	0.01	0.94	0.4	4
				37-0438	**PM25 Totals:**	**0.6**	**7**
SO2							

Generator -oil fired	2-02-001-01	12.405	1000 gallons/yr	39.70	0.95	0.2	3

37-0438 SO2 Totals: 0.2 3

VOC

Generator -oil fired	2-02-001-01	12.405	1000 gallons/yr	49.30	0.95	0.3	4

37-0438 VOC Totals: 0.3 4

37-0438 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
NH3					
Generator -oil fired	2-02-001-01	0.3648	1000 gallons/day	1.400	0
	37-0438	**NH3 Total (lbs/Worst-Case Day):**			**0**
NOX					
Generator -oil fired	2-02-001-01	0.3648	1000 gallons/day	604.000	53
	37-0438	**NOX Total (lbs/Worst-Case Day):**			**53**
PM25					
Generator -oil fired	2-02-001-01	0.3648	1000 gallons/day	42.500	4
Rock Crusher	3-05-020-03	2000	tons rock/day	0.009	5
	37-0438	**PM25 Total (lbs/Worst-Case Day):**			**9**
SO2					
Generator -oil fired	2-02-001-01	0.3648	1000 gallons/day	39.700	3

		37-0438	**SO2**	**Total (lbs/Worst-Case Day):**	**3**

VOC

Generator -oil fired	2-02-001-01	0.3648	1000 gallons/day	49.300	4

37-0438	**VOC**	**Total (lbs/Worst-Case Day):**		**4**

Klamath Pacific (CPM) Redi-mix

37-0625

Portable
KLAMATH FALLS n/a

Permit Type: ACDP-General

Location:
LAT DD: 42.1668
LONG DD: -121.7631

SIC/NAICS Codes:
SIC (Primary): 3273
SIC2:
SIC3:
SIC4:
NAICS (Primary): 327320

Operating Parameters:

Annual Days: 365
Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

37-0625 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Concrete	3-05-011-01	13191	cubic yards/yr	0.01	0.96	0.0	0

37-0625 PM25 Totals: 0.0 0

37-0625 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Concrete	3-05-011-01	175	cubic yards/day	0.006	0

37-0625 PM25 Total (lbs/Worst-Case Day): 0

Rocky Mountain Construction

37-0667

Portable

KLAMATH FALLS n/a

Permit Type: ACDP-Basic

Location:

LAT DD: 42.136

LONG DD: -121.6667

SIC/NAICS Codes:

SIC (Primary): 1442

SIC2:

SIC3:

SIC4:

NAICS (Primary): 212321

Operating Parameters:

Annual Days: 365

Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
0	0	0	0

37-0667 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Rock Crusher	3-05-020-03	21745	tons rock/yr	0.01	0.94	0.1	1

37-0667 PM25 Totals: 0.1 1

37-0667 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Rock Crusher	3-05-020-03	59.6	tons rock/day	0.009	1

37-0667 PM25 Total (lbs/Worst-Case Day): 1

Rocky Mountain Construction

37-0675

Portable

KLAMATH FALLS n/a

Permit Type: ACDP-General

Location:

LAT DD: 42.1922

LONG DD: -121.7529

SIC/NAICS Codes:

SIC (Primary): 1442

SIC2:

SIC3:

SIC4:

NAICS (Primary): 212321

Operating Parameters:

Annual Days: 365

Annual Hours: 8760

Plant Site Emission Limits:

NOx	PM25	SO2	VOC
39	0	39	39

37-0675 2008 Annual and Typical Season Day Emissions:

ES Description	SCC	Annual Throughput	Activity Unit	Emission Factor	SAF	Annual Emissions (tpy)	TSD Emissions (lbs/day)
PM25							
Rock Crusher	3-05-020-03	15870	tons rock/yr	0.01	0.94	0.1	0

37-0675 PM25 Totals: 0.1 0

37-0675 2008 Worst Case Seasonal Day Emissions:

ES Description	SCC	Daily Capacity (@ 80%)	Daily Capacity Unit	Emission Factor	WCSD (lbs/day)
PM25					
Rock Crusher	3-05-020-03	55	tons rock/day	0.009	0

37-0675 PM25 Total (lbs/Worst-Case Day): 0

APPENDIX A: Detailed EI Methodology Description: Gasoline Service Stations

SOURCE CLASSIFICATION CODE (SCC):
25-01-060-000: Gasoline Service Stations /Total: All Gasoline/All Processes

DESCRIPTION OF SOURCE CATEGORY:
This category includes fugitive emissions at gasoline service stations from
25-01-060-051: Stage I, UST/AST controlled submerged filling
25-01-060-052: Stage I, UST/AST uncontrolled splash filling
25-01-060-053: Stage I, UST/AST controlled balanced/submerged filling
25-01-060-201: Stage I, UST/AST breathing & emptying
25-01-060-101: Stage II, uncontrolled vehicle refueling
25-01-060-102: Stage II, controlled vehicle refueling (ORVR/VRS compatible & incompatible)
25-01-060-103: Stage II, spillage during vehicle refueling
Emissions from these subcategories were summed to estimate the total emissions from each service station. Emissions for service stations were then summed to county-level.

GENERAL DESCRIPTION OF EMISSION ESTIMATE METHODOLOGY:
Emissions for each service station were calculated as follows:
*(station annual throughput in 1000 gallons gasoline) * (VOC emission factors in lbs/1000 gallons gasoline)*
VOC emissions were then multiplied by Hazardous Air Pollutant (HAP) speciation factors to estimate HAP emissions.

Control equipment and annual throughput data for gasoline service stations in Oregon, excluding Lane County, were taken from the DEQ TRAACS database[718]. To estimate VOC emissions, throughput data was multiplied by VOC emission factors from AP-42[8]. VOC speciation factors from EPA SPECIATE 4.2 were used to estimate hazardous air pollutant (HAP) emissions. The fleet penetration of vehicles with Onboard Refueling Vapor Recovery (ORVR) was estimated to account for the effect of ORVR incompatibility with gasoline pump Vapor Recovery Systems (VRS) during Stage II refueling.

THROUGHPUT/ACTIVITY DATA:
Information Source
Throughput activity data for gasoline stations in Oregon, in the form of annual throughput, were obtained from the DEQ "VAPORS" database[718]. This data was supplied to EI staff by Jerry Ebersole (AQ-Planning), and Johnny Baumgartner (DEQ-Northwest Region). The activity for gasoline services stations in Lane County was supplied by Sandra Lopez at LRAPA.

Adjustments/Modifications
For the DEQ data, if the 2008 data was missing, 2010 data was used as a surrogate. If neither data year was available, an average of throughput for all stations was applied (the averaged data equates to 0.5% of the total statewide throughput for DEQ data). The throughput was also divided into ORVR and non-ORVR percentages, based on county 2008 vehicle registration data obtained from DMV.

Assumptions
To determine ORVR/non-ORVR breakdown, only passenger vehicle data was used. It was assumed that any vehicle older than 1996 did not have ORVR. Regarding throughput, it was assumed that information representing all stations is in TRAACS (i.e. station coverage is good).

<u>EMISSION FACTORS:</u>
Information Source: VOC emission factors
VOC emission factors are temperature dependent, and were calculated for each county. The equation and efficiency references are as follows:
Stage I uncontrolled: AP-42, Section 5.2, p.5.2-4, Equation 1.
Stage I controlled: AP-42, p.5.2-6: *[VOC EF, uncontrolled filling] * [1-(eff/100)]*, where
Submerged filling efficiency is the difference between AP-42 emission factors for splash and balance/submerged filling[(720)]
Submerged/balanced efficiency was taken from the 1992 Portland SIP EI, p. 101, end note 7[(614)]
Stage II uncontrolled: The equation on page 9 of EPA420-P-02-003, Refueling Emissions For Nonroad Engine Modeling was used.
Stage II controlled: *[VOC EF, uncontrolled filling] * [1-(eff/100)]*, where
CE = 95%; taken from EPA documentation: "Onboard Refueling Vapor Recovery for Motor Vehicles Fact Sheet"[(722)]
RE = 98%; DEQ staff estimate
RP = 100% (gas stations treated as point sources)
Stage II ORVR/VRS compatibility = Stage II controlled EF
Stage II ORVR/VRS incompatibility = Stage II controlled EF, where
RE and RP = Stage II controlled RE and RP
CE revised to 90%, based on a CARB preliminary test report, June 1999. Specifically, Executive Summary, paragraph 5, ORVR incompatibility "…represents a 4.71% decrease in VRS efficiency."[(723)]
The Stage II spillage EF is from AP-42, Table 5.2-7. The Stage I UST/AST breathing & emptying EF is also from AP-42, Table 5.2-7.

Information Source: HAP speciation values
The HAP speciation off of VOC is from EPA Speciate 4.2: Profile 2455 (Composite Gasoline Vapor from Seattle (5 brands, 3 grades) - 1997).

Adjustments/Modifications
None

Assumptions
AST breathing & emptying emission factors may be significantly different from UST factors. Since the parameters for each AST (fixed-roof tank) are not known, it was assumed that using the UST EF would be acceptable. The AST throughput is approximately 3% of the state total.

TEMPORAL VARIATIONS:
EPA default temporal profiles indicate that activity is uniform throughout the year: (DEQ Ref. 760) (temporal profile, CAIR platform, Excel) For any temporal calculations, changes in RVP throughout the year should be taken into account when calculating Stage II EFs.

CONTROL EFFECTIVENESS:
Control effectiveness and CE/RE/RP references used in the emissions calculations are discussed under the EMISSION FACTOR section of this methodology.

COMMENTS AND RECOMMENDATIONS:
A cross-walk to the location coordinates for each station is feasible (via the UST ID). This would enable the mapping of each station, for spatial allocation of emissions for any future projects.

PREPARED BY:
C. Swab, 4/8/11.

Appendix A, Table A- 1. Klamath Falls NAA 2008 Annual & PM Season: VOC Emissions Estimates From Gasoline Service Stations

25-01-060-000: Gasoline Service Stations /Total: All Gasoline/All Processes			(1) --------- Stage I (tpy) ---------				(1) ------- Stage II (tpy) -------					(2) --- All Processes ---	(3)	(4)
			25-01-060-052	25-01-060-051	25-01-060-053	25-01-060-201	25-01-060-101	25-01-060-102 Controlled			25-01-060-103	Nonattainment Area		
Permit No.	Facility Name	Street Address	Uncontrolled Splash Fill	Controlled Submerged Fill	Controlled Submerged Fill + Vapor Balance	UST/AST Breathing & Emptying	Uncontrolled	Non-ORVR Vehicles	ORVR Vehicles: Compatible	ORVR Vehicles: Incompatible	Spillage	Annual Emissions [tons/yr]	Season Typical Day Emissions [lbs/day]	Season Worst Case Day Emissions [lbs/day]
18-9506 (a)	Ezell Suty Fuel Incorporated	2360 S 6TH ST										7.4	41	41
18-9509	AMA Mini Mart, Inc.	7255 S 6TH ST	0	1.1	0	0.4	3.6	N/A	N/A	N/A	0.3	5.4	30	30
18-9510	AMA Mini Mart, Inc.	5350 HWY 97	0	1.1	0	0.4	3.4	N/A	N/A	N/A	0.3	5.1	28	28
18-9511	AMA Mini Mart, Inc.	522 S. 6TH STREET	0	1.6	0	0.6	5.1	N/A	N/A	N/A	0.4	7.7	42	42
18-9512	Joey's Gas & Mini Mart	2566 S 6TH ST	0	0	0.1	0.8	6.5	N/A	N/A	N/A	0.5	7.9	43	43
18-9513	New Albertson's, Inc.	5400 SOUTH 6TH STREET	0	0	0.1	1.0	8.7	N/A	N/A	N/A	0.7	10.6	58	58
18-9519 (a)	Clough Oil Company	3303 WASHBURN WAY										7.4	41	41
18-9520	Clough Oil Company	3620 N HWY 97	0	0.3	0	0.1	0.9	N/A	N/A	N/A	0.1	1.4	8	8
18-9521	Clough Oil Company	3730 HWY 97N	0	1.0	0	0.4	3.3	N/A	N/A	N/A	0.3	5.0	27	27
18-9522	Clough Oil Company	5800 S 6TH ST	0	1.2	0	0.5	3.8	N/A	N/A	N/A	0.3	5.8	32	32
18-9523	Clough Oil Company	978 S SPRING ST	0	0.5	0	0.2	1.7	N/A	N/A	N/A	0.1	2.5	14	14
18-9527	Fred Meyer Stores, Inc.	2655 SHASTA WAY	0	0	0.3	2.4	20.0	N/A	N/A	N/A	1.7	24.4	134	134
18-9528 (a)	Klamath Falls Kampground Inc	3435 SHASTA WAY										7.4	41	41
18-9529	Truax Corporation	4315 S 6TH ST	0	0	0.2	1.3	10.6	N/A	N/A	N/A	0.9	12.9	71	71
18-9530	Colvin Oil Company	3434 S 6TH ST	0	0	0.1	0.5	3.8	N/A	N/A	N/A	0.3	4.6	25	25
18-9531	American Energy, Inc.	2104 S 6TH ST	0	0	0.0	0.4	2.9	N/A	N/A	N/A	0.2	3.6	20	20
18-9534	Oregon Avenue Food Mart	2075 OREGON AVE	0	1.3	0	0.5	4.3	N/A	N/A	N/A	0.4	6.5	35	35
18-9543 (a)	Ferrell's Fuel Network, Inc.	977 S SPRING ST										7.4	41	41
												----	----	----
Total												**133.2**	**730**	**730**

Notes for Appendix A, Table A-1

(1) Gasoline service station emissions estimated by DEQ staff for the 2008 NEI. Stations within the NAA mapped via ArcGIS
Emissions based on throughput and controls for each service station as reported to DEQ; estimates incorporate CE, RE, and RP (DEQ Ref. 761)
For gasoline service station locations, please see Appendix A, Figure A-1.

(2) Annual Emissions [tons/yr] = (Stage I emissions, tpy) + (Stage II emissions, tpy)
(a) At the time of the NEI calculations (see note 1), throughput and control data for these stations was not yet entered into DEQ databases, as such the tpy emissions for these stations is an average of the calculated emissions for stations within the NAA.

(3) Typical Day and Worst Case Day Emissions = ((Annual Emissions, tons/yr)* (2000 lbs/ton)) / 365 days/yr
Activity is considered uniform throughout the week and the year (EPA Temporal Allocation files, DEQ Ref. 759).

APPENDIX B: STATIONARY AREA SOURCES

- Appendix B Tables

Appendix B, Table B- 1. Klamath Falls Nonattainment Area 2008 Population Estimates

Census Tract	Block Group	Total population 1	Households: Total	Area	sq miles	clipped resid. zoning inside NA/total ratio of BG 2	Population BG inside NA	HH BG inside NA	Sq Mi BG inside NA	Census Tract	Population CT	HH CT	Area CT	Sq Mi CT	**Populati**on CT inside NA	HH CT inside NA	Sq Mi CT inside NA
8	2	910	596	9,020	14.1	1.0	910	596	14.1	8	910	596	9020	14.1	910	596	14
9	1	1402	559	38,069	59.5	1.0	1,388	554	58.9								
9	2	1279	552	6,862	10.7	0.4	512	221	4.3								
9	3	1193	458	1,834	2.9	1.0	1,193	458	2.9	9	3875	1569	46766	73.1	3093	1232	66
10	1	941	309	34,311	53.6	1.0	922	303	52.5								
10	2	1687	622	28,553	44.6	1.0	1,687	622	44.6	10	2629	931	62864	98.2	2610	925	97
11	1	903	307	484	0.8	1.0	903	307	0.8								
11	2	2235	945	8,169	12.8	1.0	2,235	945	12.8								
11	3	1184	425	156	0.2	1.0	1,184	425	0.2								
11	4	927	301	302	0.5	1.0	927	301	0.5	11	5249	1979	9111	14.2	5249	1979	14
12	1	1125	511	301	0.5	1.0	1,125	511	0.5								
12	2	825	295	134	0.2	1.0	825	295	0.2								
12	3	697	317	124	0.2	1.0	697	317	0.2	12	2647	1122	559	1.3	2647	1122	1
13	1	706	362	101	0.2	1.0	706	362	0.2								
13	2	822	331	199	0.3	1.0	822	331	0.3								
13	3	627	302	157	0.2	1.0	627	302	0.2								
13	4	688	253	104	0.2	1.0	688	253	0.2								
13	5	1593	624	393	0.6	1.0	1,593	624	0.6								
13	6	738	286	359	0.6	1.0	738	286	0.6	13	5173	2158	1314	2.1	5173	2158	2
14	1	897	300	171	0.3	1.0	897	300	0.3								
14	2	1180	491	162	0.3	1.0	1,180	491	0.3								
14	3	873	252	113	0.2	1.0	873	252	0.2								
14	4	1151	464	286	0.4	1.0	1,151	464	0.4								
14	5	1122	444	540	0.8	1.0	1,122	444	0.8	14	5222	1951	1272	2.0	5222	1951	2
15	1	743	314	3,146	4.9	1.0	743	314	4.9								
15	2	1013	394	373	0.6	1.0	1,013	394	0.6								
15	3	696	275	303	0.5	1.0	696	275	0.5								
15	4	728	309	152	0.2	1.0	728	309	0.2								
15	5	1309	486	355	0.6	1.0	1,309	486	0.6	15	4489	1779	4329	6.8	4489	1779	7
16	1	608	254	54	0.1	1.0	608	254	0.1								
16	2	860	333	165	0.3	1.0	860	333	0.3								
16	3	1001	498	183	0.3	1.0	1,001	498	0.3								
16	4	929	308	188	0.3	1.0	929	308	0.3	16	3399	1394	589	0.9	3399	1394	1
17	1	782	361	96	0.2	1.0	782	361	0.2								
17	2	850	362	431	0.7	1.0	850	362	0.7								
17	3	792	291	86	0.1	1.0	792	291	0.1								
17	4	645	271	126	0.2	1.0	645	271	0.2	17	3070	1285	739	1.2	3070	1285	1
18	1	1201	476	337	0.5	1.0	1,201	476	0.5								
18	2	718	311	70	0.1	1.0	718	311	0.1								
18	3	797	485	628	1.0	1.0	797	485	1.0	18	2716	1272	1035	2	2716	1272	2
19	1	802	335	138	0.2	1.0	802	335	0.2								
19	2	771	328	178	0.3	1.0	771	328	0.3								
19	3	628	236	63	0.1	1.0	628	236	0.1								
19	4	792	326	147	0.2	1.0	792	326	0.2								
19	5	693	240	53	0.1	1.0	693	240	0.1	19	3686	1464	580	0.9	3686	1464	1
20	1	793	307	263	0.4	1.0	793	307	0.4								
20	2	827	332	1,873	2.9	1.0	827	332	2.9								
20	3	1733	551	3,069	4.8	1.0	1,733	551	4.8								
20	4	972	421	190	0.3	1.0	972	421	0.3	20	4325	1612	5396	8.4	4325	1612	8
Total		47,388	19,110		224		46,588	18,767	216		47,388	19,110		225	46,588	18,767	216

Notes for Appendix B, Table B-1.

1 Population from PSU Population Center estimates of Persons in Klamath Falls and Klamath County.
Broken Down by Census Block Group based upon 2000 census block group information with growth factors by county developed by PSU.

2 Clipped Ratio based on residential zoning within each block group in the nonattainment area as a ratio of total population in the block group.
Ratios are 100% inside the nonattainment area unless identified below based on work GIS estimates by DEQ Staff:

STFID	%IN	%OUT
410359709002	40%	60%
410359709001	99%	1%
410359710001	98%	2%
410359710002	100%	0%
410359710002	100%	0%
410359708002	100%	0%
410359708001	0%	100%

Appendix B, Table B- 2. Oregon and Klamath County 2008 Population Estimates and Population Change

	% annual increase	July 1, 2008 Population Estimate	April 1, 2000 Census Population	Population Change 2000-08	Percent Change 2000-08	Births 2000-08	Deaths 2000-08	Natural Increase 2000-08	Net Migration 2000-08
OREGON: Total	1.4	3,791,075	3,421,399	369,676	10.8%	384,725	252,545	132,180	237,496
KLAMATH	0.5	66,180	63,775	2,405	3.8%	6,710	5,713	997	1,408

Appendix B, Table B- 3. 2008 Oregon Housing Unit (HU) Estimates

			(1)	(1)	(2)	(3)	(4)
			-------------- 2000	-----------------		---------- 2008 ----------	
STATE	FIPS	County Name	pop	HU	Person/HU	pop	HU (est)
OR	035	KLAMATH	63,775	28,883	2.2	66,180	29,972

Notes
(1) 2000 data is from US census data: http://www.census.gov/census2000/states/or.html
(2) 2000 Person/HU = (2000 pop) / (2000 HU)
(3) 2008 Oregon pop data is from the Population Research Center at Portland State University:
http://www.pdx.edu/prc/
(4) Estimated 2008 HU = (2008 pop) / (2000 person/HU)

Appendix B, Table B- 4. Klamath Falls NAA 2008 Residential Wood Heating Survey Results

	Survey Year = 2008	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	NAA Census Tract	CT 09	CT 11	CT 12	CT 13	CT 14	CT 15	CT 16	CT 17	CT 18	CT 19	CT 20	CT 8&10	NA Total
	Survey results CT Housing Units (HU) Burning Wood count (2)	61	73	16	57	60	28	18	33	15	31	64		456
Woodburnning HU	with Fireplace (No Insert) count(3)	6	13	3	10	10	0	3	7	3	4	15		74
	with Wood Stove (Certified no-cat) count(3)	4	3	0	2	4	3	0	1	1	0	1		19
	with Wood Stove (Certified Catalyst) count(3)	3	1	1	1	1	0	0	0	0	0	0		8
	with Wood Stove (Non-certified) count (3,4,5)	4	1	2	4	5	3	0	2	3	2	4		30
	with Fireplace Insert (certified no-cat) count (3)	1	0	2	3	2	1	0	1	0	0	2		12
	with Fireplace Insert (certified catalyst) count (3)	1	2	0	1	1	0	0	0	0	0	0		6
	with Fireplace Insert (Non-certified) count (3,5)	1	9	1	4	7	3	2	0	0	0	8		35
	with Pellet Stove count(3)	2	2	0	1	2	1	0	2	1	1	0		12
	with Central Furnace count(3)	0	0	1	2	4	1	1	0	1	0	2		12
	Total	22	31	10	28	36	12	7	13	9	8	32		209
Woodburnning HU	with Fireplace (No Insert) % of total (3)	9.8%	17.8%	18.8%	17.5%	16.7%	0.4%	16.7%	21.2%	20.0%	12.9%	23.4%		16.3%
	with Wood Stove (Certified no-cat) % of total (3)	6.6%	4.1%	0.6%	3.5%	6.7%	10.7%	0.6%	3.0%	6.7%	0.3%	1.6%		4.2%
	with Wood Stove (Certified catalyst) % of total (3)	4.9%	1.4%	6.3%	1.8%	1.7%	0.4%	0.6%	0.3%	0.7%	0.3%	0.2%		1.7%
	with Wood Stove (Non-certified) % of total (3,4,5)	6.6%	1.4%	12.5%	7.0%	8.3%	10.7%	0.6%	6.1%	20.0%	6.5%	6.3%		6.6%
	with Fireplace Insert (certified no cat) % of Total (3)	1.6%	0.1%	12.5%	5.3%	3.3%	3.6%	0.6%	3.0%	0.7%	0.3%	3.1%		2.7%
	with Fireplace Insert (certified catalyst) % of Total (3)	1.6%	2.7%	0.6%	1.8%	1.7%	0.4%	0.6%	0.3%	0.7%	0.3%	0.2%		1.3%
	with Fireplace Insert (Non-certified)% of total (3,5)	1.6%	12.3%	6.3%	7.0%	11.7%	10.7%	11.1%	0.3%	0.7%	0.3%	12.5%		7.7%
	with Pellet Stove % of total (3)	3.3%	2.7%	0.6%	1.8%	3.3%	3.6%	0.6%	6.1%	6.7%	3.2%	0.2%		2.7%
	with Central Furnace % of total(3)	0.2%	0.1%	6.3%	3.5%	6.7%	3.6%	5.6%	0.3%	6.7%	0.3%	3.1%		2.7%
	Total	36.1%	42.6%	64.4%	49.1%	60.0%	43.9%	36.7%	40.6%	62.7%	24.5%	50.5%		45.9%
	Estimated Housing Units Within NAA	1,232	1,979	1,122	2,158	1,951	1,779	1,394	1,285	1,272	1,464	1,612	1,520	18,767
	Distribution to all NAA Housing Estimated													
Number of Woodburning Devices	NA HU (Fireplace no insert) (3)	121	352	210	379	325	6	232	273	254	189	378	247	2,967
	NA HU (Certified Wood Stove catalyst) (3)	81	81	7	76	130	191	8	39	85	5	25	64	791
	NA HU (Certified Wood Stove no-cat) (3)	61	27	70	38	33	6	8	4	8	5	3	25	287
	NA HU (Noncertified Wood Stove) (3)	81	27	140	151	163	191	8	78	254	94	101	100	1,388
	NA HU (Fireplace Insert Certified no-cat) (3)	20	3	140	114	65	64	8	39	8	5	50	41	557
	NA HU (Fireplace Insert Certified Catalyst) (3)	20	54	7	38	33	6	8	4	8	5	3	19	205
	NA HU (Fireplace Insert non-certified) (3)	20	244	70	151	228	191	155	4	8	5	201	118	1,395
	NA HU (Pellet Stove) (3)	40	54	7	38	65	64	8	78	85	47	3	41	529
	NA HU (Central Furnace) (3)	2	3	70	76	130	64	77	4	85	5	50	41	607
	Total	444	843	652	985	1040	718	434	518	712	354	763	656	8,726

Appendix B, Table B-4, Continued

	NAA Census Tract	CT 09	CT 11	CT 12	CT 13	CT 14	CT 15	CT 16	CT 17	CT 18	CT 19	CT 20	CT 8&10	NA Total
Avg. Equivalents Burned Per HU	Cord (Fireplace no insert) (3)	2.4	1.3	1.1	0.7	2.1	0.1	1.5	0.4	3.0	4.0	0.8	1.6	1.6
	Cord (Certified Wood Stove no-cat) (3)	1.0	1.5	0.0	0.0	1.0	1.4	0.0	1.0	0.8	0.0	0.5	0.8	0.8
	Cord (Certified Wood Stove catalyst) (6)	1.1	1.0	2.5	1.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
	Cord (Noncertified Wood Stove) (6)	0.3	0.8	0.8	1.3	1.6	4.5	0.0	1.2	0.8	3.0	0.5	1.2	1.2
	Cord (Fireplace Insert Certified no-cat) (6)	0.1	0.0	2.5	1.0	0.3	1.7	0.0	1.0	0.0	0.0	0.4	0.7	0.7
	Cord (Fireplace Insert Certified Catalyst) (6)	0.5	0.9	0.0	1.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4
	Cord (Fireplace Insert non-certified) (6)	0.0	2.9	0.0	0.4	1.6	2.7	0.8	0.0	0.0	0.0	0.5	0.7	0.7
	Ton (Pellet Stove) (6)	2.9	3.9	0.2	2.9	2.5	8.1	0.2	2.5	0.5	2.1	0.2	2.4	2.4
	Cord (Central Furnace) (6)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	average / HU	1.0	1.5	0.9	1.1	1.3	2.3	0.3	0.8	0.6	1.2	0.4	1.0	1.0
	HDD - 2008 Inventory Year (10)	6,798												
	HDD - 2005 inventory Year (10)	6,795												
	HDD - 2009 Survey Year (10)	3,908												
	NAA Housing Units (HU) (11)	1,232	1,979	1,122	2,158	1,951	1,779	1,394	1,285	1,272	1,464	1,612	1,520	18,767
NAA Tons Burned	from Fireplace (7,8)	362	553	268	285	786	1	390	122	965	859	345	459	**5,395**
	from Cert. No Catalytic. W/S (7,8)	98	144	0	0	152	317	0	44	80	0	14	57	**906**
	from Cert. Catalytic. W/S (7,8)	84	32	213	51	20	0	0	0	0	0	0	18	**418**
	from Conventional W/S (7,8)	28	24	128	217	303	1,036	0	105	239	322	56	144	**2,603**
	from F/P Insert Cert. Cat. (7,8)	3	0	426	134	22	128	0	44	0	0	22	32	**812**
	from F/P Insert Cert No Cat (7,8)	13	55	0	54	22	0	0	0	0	0	0	9	**153**
	from Conventional F/P Insert (7,8)	0	819	0	63	418	614	130	0	0	0	117	96	**2,257**
	from Pellet Stove (7,9)	119	213	1	112	163	515	2	192	42	99	1	97	**1,556**
	from Central Furnace (7,8)	0	1	14	15	26	13	16	1	17	1	10	8	**123**
	Total NAA Tons Wood Burned	707	1,840	1,050	931	1,913	2,622	539	508	1,345	1,282	566	921	14,223

Notes for Appendix B, Table B-4.

1) Data from the "Oregon DEQ, Klamath Falls Wood Heating Survey, 2008" (Ref. 695).
2) Data from Question # 4, "Klamath Falls Wood Heating Survey, 2008" (Ref. 695)
3) Data based upon from Question #3, "Klamath Falls Wood Heating Survey 2008" (Ref. 695). Categories where 0 respondents - used 0.1 respondents, because 0 times a number is 0. It is unknown how many are really represented by 0 respondents
4) Total Wood Stoves include woodburning furnaces, cookstoves, and other woodburning devices not used for home heating. It also includes unknown stoves.
5) Data from Question #6, "Klamath Falls Wood Heating Survey, 2008" (Ref. 695) that addresses certified and uncertified stoves. Assumes don't know is uncertified unless clear it is based oı manufacturer year or other information.
6) Equivalent Cords burned per heating device is a weighted average for each device (see Appendix B Table B-7).
7) HU tons burned [for each device type] = (% HU burn wood)*(Av Cord Eq Burned per HU [device type]) * (Av Spec Mix lb/cd)*(Housing Units)
The cords burned are from question #10 in the "Klamath Falls Wood heating Survey, 2008" (Ref. 695).
8) 2008 fuel loading based upon DEQ estimate for typical cord wood mixture from "Klamath Falls Wood Heating Survey, 2008" (Ref. 695) question #11. See Appendix B Table B-5 through B-7.

Cord Equivalents	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)	(1g)	(1h)	(1i)	(1j)	(1k)	(1l)	(1m)
NAA Census Tract	CT 09	CT 11	CT 12	CT 13	CT 14	CT 15	CT 16	CT 17	CT 18	CT 19	CT 20	CT 8&10	NA Total
Survey Year =	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)		(2008)
Juniper Cord Equivalents	35%	34%	29%	22%	18%	17%	0%	6%	0%	14%	6%	23%	23%
Lodgepole Pine Cord Equivalents	33%	41%	53%	72%	66%	32%	86%	33%	33%	86%	46%	50%	50%
Pine Cords	6%	13%	9%	2%	14%	23%	14%	12%	41%	0%	43%	14%	14%
Fir cords	3%	2%	0%	0%	2%	28%	0%	0%	0%	0%	0%	5%	5%
Don't Know cords	13%	9%	1%	3%	0%	0%	0%	48%	9%	0%	0%	6%	6%
Other cords - elm and various	10%	0%	7%	0%	0%	0%	0%	0%	17%	0%	6%	2%	2%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

weighted pounds per cord	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)	(1g)	(1h)	(1i)	(1j)	(1k)	(1l)	(1m)
NAA Census Tract	CT 09	CT 11	CT 12	CT 13	CT 14	CT 15	CT 16	CT 17	CT 18	CT 19	CT 20	CT 8&10	NA Total
Survey Year =	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)		(2008)
Juniper Cord Equivalents	867	846	729	556	451	419	0	150	0	354	155	564	564
Lodgepole Pine Cord Equivalents	728	924	1194	1617	1470	726	1920	747	743	1920	1021	1128	1128
Pine Cords	142	297	206	44	317	505	320	272	929	0	954	304	304
Fir cords	86	52	0	0	55	766	0	0	0	0	0	141	141
Don't Know cords - used Pine	302	212	16	76	0	0	0	1086	196	0	0	132	132
Other cords - elm and various - used madrone/Tamarak	365	0	282	0	0	0	0	0	637	0	214	85	85
Average Species Mix	2491	2331	2428	2294	2293	2416	2240	2255	2505	2274	2344	2355	2355

Notes for Appendix B, Table B-4, continued

Wood Type	(a) Factors to Convert Wood Density (lbs/ft^3)	(b) Lbs/cord ($80\ ft^3/cord$)	(c) Factors to Convert Wood Density 12% MC (lbs/ft^3)	(d) Factors to Convert Wood Density 12% mc (lbs/ft^3)	
Juniper	31	2,480	31		
Lodgepole Pine	28	2,240		28	
Pine	28	2,240	28		
Douglas Fir	34	2,720	34	34	coastal
Oak	44	3,520	44		
Cedar	25	2,000	25	25	Cedar
White Fir	27	2,160		27	
Madrone/Tamarack	48	3,840			
Average		2,747			

(a) Used Juniper and P.Pine from factors in (c) and used Lodgepole pine, Douglas-fir, Oak and Cedar and White Fir from (d)

Wood density is from AP-42, Fourth Edition (Ref. 8), Pg. A-5 . Madrone/Tamarack density is assumed to be the same as Hickory.

(b) A cord of wood has a volume of 128 ft3 however, it is estimated that 80 ft3 of the volume is occupied by wood mass (Ref. 278).

lbs/cord = (air dried wood density [lbs/cord]) * (80 [ft^3/cord])

Klamath Falls NAestimated lbs/cord = (lbs/cord) * (typical cord %)

Values for western juniper from Dr. Ed Burke, School of Forestry, University of Montana.

Other values are from the Wood Handbook: Wood as an Engineering ; Material, USDA Forest Service, http://juniper.oregonstate.edu/primary.htm/

Forest Products Laboratory, Ag. Handbook #72, 1987.

the engineering tool box http://www.engineeringtoolbox.com/wood-density-d_40.html

(c) http://juniper.oregonstate.edu/primary.htm used for Juniper Wood Density Factor Conversion

(d) Ray Potts - Conversion Factors for Pac NW Forest Porducts - Ref 260 used for Lodgepole Pine and Pine.

9) Wood pellets for pellet stoves used for home heating are sold by the ton in plastic bags. One ton of pellets = 2000 pounds. From Appendix B Tbl B-5.

10) HDD used only in comparing year to year and to determine worst case day. Not used in this Table.

Data for Heating Degree Days (HDD) is from :

"Climatological Data Annual Summary, Oregon" (Ref. 93).

HDD	2008 Kingsley Field	2008 Peterson School
Oct	534	535
Nov	751	774
Dec	1182	1,146
Total	2467	2454
Ratio	1.01	

Note: The raw HDD data from Ref. 93 is found here: \\DEQHQ1\AQCOMMON\Klamath Falls Attain Plan\2008 Klamath Falls EI\Final_EI_Data\HDD_Data.xlsx

11) (Appendix B, Table B-1. Klamath Falls Population & Housing Unit Data) UGB Housing Unit data for 2008 Klamath Falls Nonattainment Area based upon Household information from Number of Housing Units is total estimated population by Block Group and aggregated to Census Tract (GIS Analysis clipping block groups)

Appendix B, Table B- 5. Woodheating Survey Bundles, Artificial Logs, Pellet Usage Evaluation. Survey Results (Applied to 2008) Cord Equivalency and Tons Pellets Burned

	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)	(1g)	(1h)	(1i)	(1j)	(1k)	(1l)	(1m)
NAA Census Tract	CT 09	CT 11	CT 12	CT 13	CT 14	CT 15	CT 16	CT 17	CT 18	CT 19	CT 20	CT 8&10	NA average
Survey Year =	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)		(2008)
Bundles (= 0.007 cord)													
Cord Equivalents Burned Per HU													
Fireplace (2)	2.4	1.3	1.1	0.7	2.1	0.1	1.5	0.4	3.0	4.0	0.8	1.6	1.6
Wood Stove (2)	2.4	3.3	3.3	2.4	3.2	5.9	0.1	2.2	1.5	3.0	1.0	2.6	2.6
Fireplace Insert (2)	0.6	3.8	2.5	2.6	2.5	4.3	0.8	1.0	0.1	0.1	0.9	1.7	1.7
Pellet Stove (2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.5	0.1	0.1	0.1	0.2	0.2
Central Furnace (3)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Artificial Logs (= 0.0003 cord)													
Cord Equivalents Burned Per HU													
Fireplace (2)	0.00021	0.02520	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00248	0.00248
Wood Stove (2)	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.04200	0.00021	0.00021	0.00021	0.00401	0.00401
Fireplace Insert (2)	0.00021	0.00420	0.00021	0.00210	0.00210	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00092	0.00092
Pellet Stove (2)	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021
Central Furnace (3)	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021
Pellets, Tons (1 bag = 0.02 ton)													
Tons Burned Per HU													
Fireplace (2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Wood Stove (2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fireplace Insert (2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Pellet Stove (2)	2.8	3.8	0.1	2.8	2.4	8.0	0.1	1.0	0.4	2.0	0.1	2.1	2.1
Central Furnace (3)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Notes:

(1 a-m) Cordwood usage split taken from crosstabulation of certified and noncertified stoves and inserts, by census tract.
If 0 used 0.1 respondents - can't be certain of 0 respondents per census tract and 0 X a number is still 0
Census Tracts # 09 and 11 through 20 use actual breakdowns from the crosstabulations, Census tracts 8 and 10 are averages from the other census tracts
The crosstabulations are used only for distribution of the data and are in percentage form of the type of certification divided by the total number of wood stoves or total number of inserts. Some categories in some census tracts may indicate 0% because of the small sample size when cross tabulated and may not reflect actual emissions from that census tract.

(2) Data from OIT Woodheating survey by total woodstove wood burned question 10 (Reference #695)

(3) Central Furnace - no cords or wood associated with answers to central furnace. In CT 13, 3.5 cords of wood burned in wood stove indicated.
In census tract 14, 6 cords of wood burned in woodstove indicated

Appendix B, Table B- 6. Klamath Falls NA 2008 Residential Wood Heating - Survey Results (Applied to 2008) - species mix

Klamath Falls NAA	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)	(1g)	(1h)	(1i)	(1j)	(1k)	(1l)	(1m)
Census Tract	CT 09	CT 11	CT 12	CT 13	CT 14	CT 15	CT 16	CT 17	CT 18	CT 19	CT 20	CT 8&10	NA Total
Survey Year =	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)		(2008)
Juniper Cords	11.0	18.0	4.0	5.8	9.0	6.0	0.0	0.5	0.0	2.0	0.6	5.2	56.9
Juniper Cord Equivalents (original in bundles)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lodgepole Pine Cords	10.3	21.8	7.3	18.5	32.5	11.5	3.0	2.8	2.0	12.0	4.5	11.5	126.0
Lodgepole Pine Cord Equivalents (original in bundles)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pine Cords	2.0	7.0	1.3	0.5	7.0	8.0	0.5	1.0	2.5	0.0	4.3	3.1	34.0
Pine Cord Equivalents (original in bundles)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fir cords	1.0	1.0	0.0	0.0	1.0	10.0	0.0	0.0	0.0	0.0	0.0	1.2	13.0
Fir cord Equivalents (original in bundles)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Don't Know cords	4.3	5.0	0.1	0.9	0.0	0.0	0.0	4.0	0.5	0.0	0.0	1.3	14.7
Don't Know cord Equivalents (original in bundles)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(2) Other cords	3.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.5	0.5	5.5
(2) Other cord Equivalents (original in bundles)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Total	31.5	52.8	13.6	25.6	49.5	35.5	3.5	8.3	6.0	14.0	10.0	22.8	250.3

(1 a-m) Cordwood usage split taken from crosstabulation Data from OIT Woodheating survey of question 11 crossreferenced by census tract (reference #695).
Census Tracts # 09 and 11 through 20 use actual breakdowns from the crosstabulations, Census tracts 8 and 10 are averages from the other census tracts
The crosstabulations are used only for distribution of the data and are in percentage form of the type of certification divided by the total number of wood stoves or total number of inserts.
Some categories in some census tracts may indicate 0 because of the small sample size when cross tabulated and may not reflect actual emissions from that census tract.

(2) Other is a mix of chinese elm, scrap wood, elm, assorted hardwoods, cherry, cedar and various undetermined species

Appendix B, Table B- 7. Woodheating Survey Cordwood Usage split for certified and catalytic percentages. Survey Results (Applied to 2008) - Cord Equivalency

Equivalent Cord (bundle = .007 cord)	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)	(1g)	(1h)	(1i)	(1j)	(1k)	(1l)	(1m)
Census Tract	CT 09	CT 11	CT 12	CT 13	CT 14	CT 15	CT 16	CT 17	CT 18	CT 19	CT 20	CT 8&10	NA average
Survey Year =	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)	(2008)		(2008)
Cord Equivalents Burned per HU													
Wood Stove cerrtified no cat (2)	41%	46%	0%	0%	32%	23%	33%	46%	50%	0%	51%	29%	29%
Wood Stove certified cat (2)	47%	31%	77%	48%	17%	0%	33%	0%	0%	0%	0%	23%	23%
Wood Stove noncert (2)	12%	23%	23%	52%	51%	77%	33%	54%	50%	100%	49%	48%	48%
Fireplace Insert cert no-cat (3)	20%	0%	100%	39%	12%	38%	0%	100%	33%	33%	43%	38%	38%
Fireplace Insert cert cat (3)	80%	23%	0%	47%	24%	0%	0%	0%	33%	33%	0%	22%	22%
Fireplace Insert not certified (3)	0%	77%	0%	14%	64%	62%	100%	0%	33%	33%	57%	40%	40%

Notes:

(1 a-m) Cordwood usage split taken from crosstabulation of certified and noncertified stoves and inserts, by census tract. (ref 695)

Census Tracts # 09 and 11 through 20 use actual breakdowns from the crosstabulations, Census tracts 8 and 10 are averages from the other census tracts

The crosstabulations are used only for distribution of the data and are in percentage form of the type of certification divided by the total number of wood stoves or total number of inserts.

Some categories in some census tracts may indicate 0% and used 0.1 because of the small sample size when cross tabulated and may not reflect actual emissions from that census tract.

(2) Data from OIT Woodheating survey by total woodstove wood burned question 10 crossreferenced to questin #6 and #9 (Reference #695)

(3) Data from OIT Woodheating survey by total Fireplace inserts wood burned question 10 crossreferenced to questin #6 and #9 (Reference #695)

Appendix B, Table B- 8. Klamath Falls NA 2008 Residential Wood Heating Survey Results, RWC SAF Calculations, Using Klamath Falls 2008/2009 RWC Survey Data (with profile graph)

Raw Survey Results: Respondents Burning

Device	Apr	Dec	Feb	Jan	Mar	Nov	Oct	Other
Central Furnace	25	30	29	31	37	25	27	8
Fireplace	2	16	18	20	11	12	9	0
Insert	25	61	57	60	51	55	44	14
Pellet Stove	8	23	23	21	21	16	13	2
Wood Stove	39	81	75	82	55	69	47	17

Survey Results by Month: Respondents Burning

Device	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Central Furnace	31	29	37	25	8	8	8	8	8	27	25	30	244
Fireplace	20	18	11	2	0	0	0	0	0	9	12	16	88
Insert	60	57	51	25	14	14	14	14	14	44	55	61	423
Pellet Stove	21	23	21	8	2	2	2	2	2	13	16	23	135
Wood Stove	82	75	55	39	17	17	17	17	17	47	69	81	533

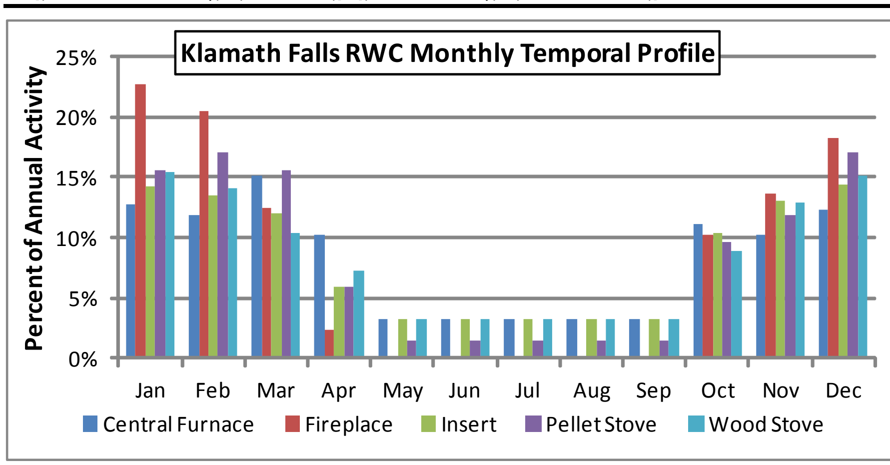
Survey Results Normalized by Month:

	PM Season										PM Season		
Device	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Central Furnace	13%	12%	15%	10%	3%	3%	3%	3%	3%	11%	10%	12%	100%
Fireplace	23%	20%	13%	2%	0%	0%	0%	0%	0%	10%	14%	18%	100%
Insert	14%	13%	12%	6%	3%	3%	3%	3%	3%	10%	13%	14%	100%
Pellet Stove	16%	17%	16%	6%	1%	1%	1%	1%	1%	10%	12%	17%	100%
Wood Stove	15%	14%	10%	7%	3%	3%	3%	3%	3%	9%	13%	15%	100%

PM2.5 SAF Calculations

Device	SAF#
Central Furnace	**1.4**
Fireplace	**2.3**
Insert	**1.7**
Pellet Stove	**1.8**
Wood Stove	**1.7**

= [(Peak Season Activity) * (12 months)] / [(Annual Activity) * (Season Months)]



Appendix B, Table B- 9. RWC Worst Case Day Multiplier Calculations

RWC Worst Case Day Emissions [lbs/day] based on Worst-Case Day Multiplier, Estimated From Monitoring Results: *98%ile of PM2.5 on the Peterson School Monitor Teflon filter.*

Station: Klamath Falls: Peterson School

Sorted Ascending By Sampling Date

Sample Date	$PM_{2.5}$ Teflon (µg/m³ (LTP))	Sample Date	$PM_{2.5}$ Teflon (µg/m³ (LTP))	Sample Date	$PM_{2.5}$ Teflon (µg/m³ (LTP))
1/1/2008	11.1	5/24/2008	1.4	10/9/2008	4.6
1/4/2008	2.6	5/27/2008	3.1	10/12/2008	11.5
1/7/2008	8	5/30/2008	3.3	10/15/2008	19.3
1/10/2008	9.2	6/2/2008	3.6	10/18/2008	12.3
1/13/2008	12.5	6/5/2008	3	10/21/2008	12.9
1/19/2008	57.3	6/8/2008	2.7	10/24/2008	20
1/22/2008	19.6	6/11/2008	2.7	10/27/2008	23.1
1/25/2008	20.3	6/14/2008	4.3	10/30/2008	20.4
1/28/2008	6.6	6/17/2008	4.4	11/2/2008	13.5
1/31/2008	3.9	6/20/2008	3.7	11/5/2008	20.4
2/3/2008	9.7	6/23/2008	5.2	11/8/2008	10.4
2/6/2008	6	6/26/2008	3.2	11/11/2008	7.5
2/9/2008	39.4	6/29/2008	23.1	11/14/2008	30.8
2/12/2008	37	7/2/2008	32.5	11/17/2008	25.8
2/18/2008	28.4	7/5/2008	7.2	11/20/2008	21.2
2/21/2008	15	7/8/2008	5.7	11/23/2008	31
2/24/2008	2.3	7/11/2008	3.4	11/26/2008	14.2
2/27/2008	29.1	7/14/2008	6	11/29/2008	36.9
3/1/2008	3.4	7/17/2008	12.4	12/2/2008	22.5
3/4/2008	15.2	7/20/2008	13.3	12/5/2008	34
3/10/2008	20.6	7/23/2008	2.9	12/8/2008	25.5
3/13/2008	3.8	7/26/2008	10.1	12/11/2008	32.6
3/16/2008	12.5	7/29/2008	16.5	12/14/2008	8.9
3/19/2008	7.2	8/1/2008	6.5	12/17/2008	74.1
3/22/2008	9.5	8/4/2008	8.1	12/20/2008	11
3/25/2008	6.2	8/7/2008	26.3	12/23/2008	52.2
3/28/2008	7.8	8/13/2008	7	12/26/2008	25.9
3/31/2008	16.8	8/16/2008	7.7	12/29/2008	2.9
4/3/2008	12.3	8/19/2008	12.7		
4/6/2008	6	8/22/2008	3.9		
4/9/2008	3.9	8/25/2008	4.5		
4/12/2008	10.9	8/28/2008	3.7		
4/15/2008	4	8/31/2008	3.2		
4/18/2008	10.7	9/3/2008	5.7		
4/21/2008	4	9/6/2008	8.2		
4/24/2008	3.8	9/9/2008	16.3		
4/27/2008	6.5	9/12/2008	18.3		
4/30/2008	2.8	9/15/2008	9.8		
5/3/2008	9.5	9/18/2008	5.5		
5/6/2008	6	9/21/2008	13.4		
5/9/2008	9	9/24/2008	11.5		
5/12/2008	5.1	9/27/2008	14.8		
5/15/2008	3.4	9/30/2008	5.2		
5/18/2008	6.1	10/3/2008	2.8		
5/21/2008	1.8	10/6/2008	8		

Total Count	**118**
PM Season Avg.	**21.7**

Wildfire Day =	

Appendix B, Table B-9, Continued.

Sorted Descending By $PM_{2.5}$ on Peterson School Station Teflon Filter

Sample Date	$PM_{2.5}$ Teflon (µg/m³ (LTP))	Sample Date	$PM_{2.5}$ Teflon (µg/m³ (LTP))	Sample Date	$PM_{2.5}$ Teflon (µg/m³ (LTP))
12/17/2008	74.1	10/18/2008	12.3	4/15/2008	4
1/19/2008	57.3	9/24/2008	11.5	4/21/2008	4
12/23/2008*	52.2	10/12/2008	11.5	1/31/2008	3.9
2/9/2008	39.4	1/1/2008	11.1	4/9/2008	3.9
2/12/2008	37	12/20/2008	11	8/22/2008	3.9
11/29/2008	36.9	4/12/2008	10.9	3/13/2008	3.8
12/5/2008	34	4/18/2008	10.7	4/24/2008	3.8
12/11/2008	32.6	11/8/2008	10.4	6/20/2008	3.7
7/2/2008	32.5	7/26/2008	10.1	8/28/2008	3.7
11/23/2008	31	9/15/2008	9.8	6/2/2008	3.6
11/14/2008	30.8	2/3/2008	9.7	3/1/2008	3.4
2/27/2008	29.1	3/22/2008	9.5	5/15/2008	3.4
2/18/2008	28.4	5/3/2008	9.5	7/11/2008	3.4
8/7/2008	26.3	1/10/2008	9.2	5/30/2008	3.3
12/26/2008	25.9	5/9/2008	9	6/26/2008	3.2
11/17/2008	25.8	12/14/2008	8.9	8/31/2008	3.2
12/8/2008	25.5	9/6/2008	8.2	5/27/2008	3.1
6/29/2008	23.1	8/4/2008	8.1	6/5/2008	3
10/27/2008	23.1	1/7/2008	8	7/23/2008	2.9
12/2/2008	22.5	10/6/2008	8	12/29/2008	2.9
11/20/2008	21.2	3/28/2008	7.8	4/30/2008	2.8
3/10/2008	20.6	8/16/2008	7.7	10/3/2008	2.8
10/30/2008	20.4	11/11/2008	7.5	6/8/2008	2.7
11/5/2008	20.4	3/19/2008	7.2	6/11/2008	2.7
1/25/2008	20.3	7/5/2008	7.2	1/4/2008	2.6
10/24/2008	20	8/13/2008	7	2/24/2008	2.3
1/22/2008	19.6	1/28/2008	6.6	5/21/2008	1.8
10/15/2008	19.3	4/27/2008	6.5	5/24/2008	1.4
9/12/2008	18.3	8/1/2008	6.5		
3/31/2008	16.8	3/25/2008	6.2		
7/29/2008	16.5	5/18/2008	6.1		
9/9/2008	16.3	2/6/2008	6		
3/4/2008	15.2	4/6/2008	6		
2/21/2008	15	5/6/2008	6		
9/27/2008	14.8	7/14/2008	6		
11/26/2008	14.2	7/8/2008	5.7		
11/2/2008	13.5	9/3/2008	5.7		
9/21/2008	13.4	9/18/2008	5.5		
7/20/2008	13.3	6/23/2008	5.2		
10/21/2008	12.9	9/30/2008	5.2		
8/19/2008	12.7	5/12/2008	5.1		
1/13/2008	12.5	10/9/2008	4.6		
3/16/2008	12.5	8/25/2008	4.5		
7/17/2008	12.4	6/17/2008	4.4		
4/3/2008	12.3	6/14/2008	4.3		

* = 98%tile day

Total Count	**117**
98%ile count	**115**
98%ile actual	**52.2**
Multiplier	**2.40**

Note: Worst-Case Day Multiplier = (98%tile actual) / (PM Season Average)

Appendix B, Table B- 10. Small Non-Permitted Point Sources: Monthly Temporal Profile by Area Source SCC

SCC	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	End Note	(3) PM Season SAF
2401005000	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	(1)	1.00
2401015000	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	(1)	1.00
2401025000	84	84	79	79	79	84	84	84	86	86	86	84	(2)	1.02
2401035000	82	82	81	81	81	86	86	86	85	85	85	82	(2)	0.99
2401055000	83	83	81	81	81	84	84	84	85	85	85	83	(2)	1.00
2401070000	80	80	79	79	79	87	87	87	87	87	87	80	(2)	0.98
2401080000	83	83	83	83	83	84	84	84	83	83	83	83	(2)	1.00
2401090000	83	83	82	82	82	85	85	85	85	85	85	83	(2)	1.00
2415000000	83	83	81	81	81	84	84	84	85	85	85	83	(2)	1.00
2425000000	83	83	82	82	82	84	84	84	84	84	84	83	(2)	1.00

Notes:

shaded cells indicated PM season

(1) Temporal profile from DEQ ref. 634: 2002 PDX Ozone SIP, Table 2.4.17.

SMOKE temporal allocation files located here:

\\DEQHQ1\EI_FILES\Temporal Files\SMOKE\SMOKEfiles.mdb

(2) EPA Temporal Profile Data. (DEQ Ref. 760)

EPA Temporal Allocation website:

http://www.epa.gov/ttnchie1/emch/temporal/

DEQ database with EPA data found here:

\\DEQHQ1\EI_FILES\Temporal Files\EPA\EPAtemporalFiles.mdb

(3) SAF = (Seasonal Activity) * (12 months) / (annual activity) * (# of season months). DEQ Ref. 2

Appendix B, Table B- 11. Small Non-Permitted Point Sources: Weekly Temporal Profile by Area Source SCC

SCC	--- Weekly Temporal Profile ---							End	(2) Days
	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Note	Per Week
2401005000									7
2401015000									7
2401025000	143	143	143	143	143	143	143	(1)	7
2401035000	143	143	143	143	143	143	143	(1)	7
2401055000	143	143	143	143	143	143	143	(1)	7
2401070000	143	143	143	143	143	143	143	(1)	7
2401080000	143	143	143	143	143	143	143	(1)	7
2401090000	143	143	143	143	143	143	143	(1)	7
2415000000	143	143	143	143	143	143	143	(1)	7
2425000000	170	170	170	170	160	160	0	(1)	6

Notes:

(1) EPA temporal profile data:

EPA Temporal Allocation website: (DEQ Ref. 760)

http://www.epa.gov/ttnchie1/emch/temporal/

DEQ database with EPA data found here:

\\DEQHQ1\EI_FILES\Temporal Files\EPA\EPAtemporalFiles.mdb

(2) 24-01-005 (Autobody shops) and 24-01-015 (factory finished wood) are DEQ staff best estimate.

Appendix B, Table B- 12. Non-Permitted Source Fossil Fuel Consumption Estimates: Klamath Falls NAA, 2008

		(1)	(1)	(1)	(1)	(2)	(1)	(3)
		State-Wide						
		---------- (10^3 gallons) ----------					(10^6 ft^3)	
		Fuel Oil			---------- LPG ----------		Natural	
Source Type		Distillate	Residual	Kerosene	(10^3 Barrels)	(10^3 gallons)	Gas	Population (2008)
								3,791,075
Residential	21-04-004-000	22,396	0	485	775	32,550	45,053	
Commercial	21-03-004-000	45,499	1,789	472	360	15,120	30,444	
Industrial	21-02-004-000	49,726	9,679	53	499	20,958	68,785	
		Nonattainment Area						
RESIDENTIAL USE (4)								
Klamath Falls NAA (2008)		275	0	6		400	554	46,588
Non-Permitted								(NAICS 42-56, 72, 81: 2007)
COMMERCIAL/INSTITUTIONAL USE (5)								881,442
Klamath Falls NAA (2008)		509	20	5.3		169	340	9,857
Non-Permitted								(NAICS 31-33: 2007)
INDUSTRIAL USE (6)								183,953
Klamath Falls NAA (2008)		254	49	0.3		107	352	940

Notes:

1) U.S. Energy Information Administration 2008 Oregon data. DEQ Ref. 741.
2) LPG, gallons = LPG barrels * 42 gallons/barrel
3) Oregon Statewide Population from Appendix B, Table B2
4) NAA Residential Use =
   State Residential Use * (2008 Klamth Falls NA Residential Population / 2008 State Residential Population).
   2008 Klamath Falls NA population is from Appendix B, Table B1.
5) NA Commercial/Institutional Use =
   State Commercial Use * (Klamath Falls NA NAICS Commercial employment / State NAICS Commercial employment)
   Top figure is State-wide NAICS 42-56, 72, & 81. Commercial employees from US Economic Census Data, Oregon (Ref. 742).
   Bottom figure is the 2008 Klamath Falls NA NAICS Commercial population estimate from ODOT. DEQ Ref. 733.
   <u>ODOT facility name/location checked against DEQ permitting data: All fuel use is for non-permitted facilities</u>.
   Please note that the ODOT data is proprietary.
6) NA Industrial Use = State Industrial Use * (Klamath Falls NA NAICS Industrial population / State NAICS Industrial population)
   Top figure is State-wide NAICS 31-33 Industrial employees from County Business Patterns, 2007 Oregon (Ref. 742).
   Bottom figure is the 2008 Klamath Falls NA NAICS non-permitted Industrial population estimate from ODOT. DEQ Ref. 733
   <u>ODOT facility name/location checked against DEQ permitting data: All fuel use is for non-permitted facilities</u>.
   Please note that the ODOT data is proprietary.

Appendix B, Table B- 13. 2008 Klamath Falls NAA Road Sanding: Monthly Estimates, SAF Calculation, and Days per Week Activity

	(1a)	(1a)	(1b)	(1d)	(2a)	(2b)	(2c)	(3)	(4)	(5)
	----- 1996 ODOT Daily Sanding Log -----				--- 2008 **ODOT** Sanding (est) ---			**Klamath County**	Seasonal	
	Days	----- Crushed Rock Applied -----			Days	Crushed Rock Applied		2008 Cinders Applied (est)	Adjustment	
	Applied			(avg/day)	Applied		(avg/day)	(avg/day)	Factor	Activity
Month	(total)	(cu yd)	(% annual)	(cu yd)	(total)	(cu yd)	(cu yd)	(cu yd)	(SAF)	(days/week)
January	21	711.5	49.4%	33.9	21	813.1	38.7	420		
February	13	189.5	13.2%	14.6	13	216.9	16.7	260		
March	5	73	5.1%	14.6	5	83.6	16.7	35		
April	1	1	0.1%	1.0	1	1.1	1.1	7		
May	0	0	0%	0	0	0	0	0		
June	0	0	0%	0	0	0	0	0		
July	0	0	0%	0	0	0	0	0		
August	0	0	0%	0	0	0	0	0		
September	0	0	0%	0	0	0	0	0		
October	3	20	1.4%	6.7	3	22.9	7.6	48		
November	5	39	2.7%	7.8	5	44.6	8.9	80		
December	18	405	28.2%	22.5	18	463.6	25.8	360		
	-------	-------	-------		-------	-------		-------		
Annual	66	**1,439**	100%		66	**1,646**		**1,210**	**2.59**	**1.3**

Notes: shaded cells indicate PM season

(1a) Klamath Falls SIP Appendices. Appendix D6: Klamath Falls UGB PM10, Appendix D6-4:
Emission Inventory and Forecast. Oregon DEQ. October 2002. Appendix Table B-6a. (DEQ Ref. 699).

(1b) (% annual material applied) = (monthly cu yd material applied) / (annual total)

(1c) (average material applied per day) = (cu yd material applied) / (Days Applied)

(2a) 2008 Days Applied assumed equal to 1996 Days Applied

(2b) (2008 % annual material applied) = (1996 % annual material applied) * (2008 annual total), where
2008 annual total is from DEQ Ref. 775a = 1,646 cu yd crushed rock

(2c) (average material applied per day) = (cu yd material applied) / (Days Applied)
2008 cu yd cinders applied, typical season day = Season cu yd applied / Season days applied = 1,646 cu yd / 57 days applied = **28.9**

(3) 2008 Klamath County estimated cinders applied, per day average by season (DEQ Ref. 775b)

	Fall (cu yd)	Winter (cu yd)	Spring (cu yd)
Per day average applied	16	20	7

2008 cu yd cinders applied, typical season day = Season cu yd applied / Season days applied = 1,120 cu yd / 57 days applied = **19.6**

(4) Seasonal Adjustment Factor = (Seasonal Activity * 12 months) / (Annual Activity * Season Months) =
(Seasonal Days Applied * 12 months) / (Annual Days Applied * Season Months) = (57 days* 12 months) / (66 days * 4 Months) = **2.59**

(5) Activity, days per week = Annual Days Applied / 52 Weeks per year = 66/52 = **1.3**

Appendix B, Table B- 14. Peterson School Average Wind Speed Measurements, mph

2005

Day \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1	8.8	2.3	9.5	8.6	6.8	9.1	7.0	6.4	5.8	8.9	5.9	11.6
2	6.9	2.0	1.8	4.9	5.1	6.5	5.6	5.4	5.5	4.7	4.9	9.9
3	8.3	2.1	4.9	12.1	5.8	5.9	5.2	4.8	4.9	4.5	12.7	8.2
4	6.2	5.0	3.4	7.7	8.7	7.0	3.7	4.1	4.8	2.2	9.7	2.4
5	3.2	3.4	4.9	6.5	7.6	12.3	4.9	3.5	3.9	3.0	5.9	0.6
6	5.6	3.5	3.4	14.2	10.5	8.7	6.3	5.1	4.1	3.3	7.5	0.7
7	16.3	4.4	3.3	15.0	6.0	6.1	5.4	3.3	4.7	3.4	3.0	4.8
8	16.0	5.8	1.6	11.7	11.0	5.3	7.7	4.5	6.7	7.4	2.8	7.2
9	5.6	4.6	4.8	9.8	10.9	6.6	6.1	5.6	9.7	3.2	4.3	5.7
10	3.7	6.0	5.6	3.6	10.6	6.0	5.3	5.1	6.9	1.3	2.6	1.2
11	4.8	2.7	3.6	10.6	5.9	7.8	4.3	5.4	3.5	3.8	7.5	2.6
12	2.4	4.8	6.4	11.0	2.3	6.4	5.6	5.2	4.1	1.8	6.1	1.6
13	0.7	4.6	9.7	7.7	4.2	5.7	7.2	6.6	3.1	3.1	9.0	4.8
14	0.4	4.9	4.9	2.8	1.5	8.8	3.7	3.8	4.5	16.6	9.2	5.9
15	3.8	6.8	5.9	3.1	5.6	3.8	4.3	5.9	4.7	6.7	3.6	5.0
16	1.1	9.2	10.9	4.6	12.7	14.7	6.6	6.4	8.1	2.4	1.3	2.3
17	1.5	6.1	7.7	12.5	8.5	16.0	7.0	6.5	4.2	2.2	2.6	5.6
18	3.1	6.5	7.8	9.6	14.6	10.7	5.8	5.5	4.3	3.8	2.6	9.9
19	1.0	6.9	14.1	10.2	6.7	5.2	5.1	3.0	1.4	8.1	1.5	12.1
20	1.9	9.2	15.0	5.8	8.3	4.2	3.4	3.5	5.3	1.8	2.3	11.1
21	1.0	8.0	8.0	4.6	6.4	8.5	3.7	5.1	3.9	1.0	2.9	13.2
22	2.5	9.9	9.2	7.9	9.9	5.5	8.6	5.1	4.6	1.2	2.4	7.3
23	2.1	4.9	10.5	13.1	6.9	5.6	4.8	5.6	9.0	1.0	1.5	1.9
24	3.3	3.2	6.1	5.1	8.2	6.5	6.3	5.3	2.8	1.7	3.3	6.6
25	6.8	2.4	4.1	2.5	7.1	8.4	5.2	4.4	8.9	11.4	14.3	11.0
26	9.0	6.1	10.5	2.7	5.7	6.1	4.4	3.6	2.4	4.3	7.4	11.4
27	6.3	12.8	19.9	8.5	7.1	6.9	5.4	3.4	4.6	8.7	3.2	18.4
28	12.6	10.7	13.2	5.2	10.9	5.7	5.6	4.9	2.0	7.5	9.6	12.8
29	2.5		13.9	6.9	9.4	4.8	4.6	11.0	3.2	4.7	9.3	7.2
30	1.6		8.5	6.5	5.3	5.8	4.0	4.9	5.1	0.8	5.8	16.1
31	3.7		5.5		9.2		3.4	6.4		4.6		11.8

2008

Day \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1	4.6	8.8	9.7	3.7	1.9	9.1	2.8	5.7	6.4	8.9	16.1	1.8
2	7.7	16.7	2.8	2.2	4.9	4.8	3.5	4.8	11.5	9.2	6.9	5.5
3	25.9	7.9	4.9	3.4	6.9	12.9	6.8	3.8	4.5	10.1	14.1	0.6
4	18.9	2.5	3.6	11.5	7.9	10.8	6.2	2.4	2.2	10.5	12.7	5.3
5	12.1	4.2	2.5	5.9	6.5	8.7	3.6	3.7	6.4	4.3	4.5	1.3
6	10.2	8.9	0.9	10.4	10.3	10.6	5.9	2.3	7.8	0.8	2.2	0.7
7	7.0	17.4	3.1	5.9	10.8	5.1	6.4	3.6	3.9	6.0	2.7	3.9
8	12.2	4.6	3.6	7.6	8.2	2.8	6.6	8.0	2.7	6.1	5.8	3.2
9	9.0	1.0	1.8	10.3	4.7	12.7	6.4	6.1	3.4	10.9	4.0	2.0
10	9.1	0.3	4.2	8.1	7.2	12.8	7.9	4.8	0.8	10.5	2.3	0.4
11	6.3	1.4	2.7	2.6	9.5	6.9	7.4	2.9	2.3	13.2	5.8	4.5
12	2.5	2.5	4.8	2.7	3.9	2.6	6.1	6.1	4.0	4.1	9.6	9.2
13	3.1	13.4	10.4	4.9	6.6	4.0	7.1	5.2	7.5	0.9	7.6	12.2
14	3.5	5.2	9.0	12.4	7.4	6.3	5.6	6.5	4.3	4.4	1.3	8.2
15	5.8	0.8	7.3	8.2	8.1	4.6	4.4	4.5	1.2	2.3	1.8	12.7
16	1.4	0.1	6.2	1.9	3.4	5.4	4.7	4.6	5.4	0.5	1.6	4.6
17	0.7	0.8	4.6	5.0	5.1	7.2	4.4	5.1	2.8	1.9	1.3	1.4
18	0.6	1.7	8.8	9.3	5.1	5.6	4.6	9.2	3.3	3.6	0.8	12.7
19	1.8	2.2	6.6	12.6	4.3	2.1	3.9	5.8	7.8	1.6	2.9	14.0
20	4.3	2.2	6.9	11.9	11.5	3.2	4.3	10.0	5.4	7.6	8.2	5.0
21	8.6	7.3	5.8	8.1	14.9	9.3	3.7	6.6	4.0	4.1	0.7	7.2
22	6.1	4.4	5.4	14.2	16.9	4.2	7.8	3.5	1.7		2.1	8.0
23	7.0	10.8	7.9	10.4	6.9	5.5	3.7	4.1	2.8		2.1	1.5
24	4.6	12.1	7.6	6.0	6.8	5.6	4.0	4.5	2.2		2.1	6.9
25	2.3	4.2	7.8	5.1	4.9	6.6	5.8	8.6	2.1		3.1	9.1
26	17.7	2.1	14.7	1.7	6.4	6.0	3.9	3.8	2.7		8.8	5.5
27	15.3	1.8	3.0	3.6	4.0	4.7	5.3	6.3	2.2		1.8	7.4
28	9.4	2.3	9.9	7.5	8.5	6.8	4.3	4.5	6.1		1.4	8.7
29	10.0	5.9	5.0	11.6	4.4	4.7	7.5	6.1	11.7		0.5	13.6
30	10.1		8.8	9.7	3.0	3.5	3.3	9.8	6.5		1.8	0.6
31	16.0		1.9		4.7		4.4	10.6				3.6

2009

Day \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1	9.7	1.5	16.8	2.8	7.9	6.0	4.2	5.3	6.4	2.7	2.8	2.4
2	12.6	1.8	16.2	11.3	9.7	6.3	4.6	7.2	11.5	7.0	1.6	8.0
3	3.0	2.9	10.9	9.2	8.6	4.5	4.7	3.8	4.5	9.9	2.3	1.6
4	1.6	3.8	4.7	1.8	12.3	5.5	5.3	5.6	2.2	12.9	6.0	3.7
5	9.2	8.4	7.6	5.6	9.4	6.2	6.2	7.0	6.4	8.2	18.8	7.2
6	8.2	7.3	8.1	4.2	10.4	9.8	6.9	8.5	7.8	6.1	10.2	4.3
7	6.0	7.8	6.7	6.3	7.2	8.2	6.6	9.8	3.9	2.6	5.8	6.8
8	7.5	5.1	11.9	4.0	2.3	4.9	5.6	2.2	2.7	3.5	1.1	0.4
9	1.4	6.4	9.3	5.7	5.1	3.5	3.1	3.6	3.4	4.5	5.5	1.4
10	1.6	8.9	4.2	3.2	5.0	3.8	5.6	2.4	0.8	3.9	3.1	0.3
11	1.6	8.0	6.4	4.3	6.9	3.8	5.6	4.2	2.3	4.6	5.2	0.6
12	1.2	8.0	4.6	4.7	11.8	5.5	8.6	6.9	4.0	8.5	4.9	2.6
13	0.8	12.1	3.0	8.8	6.3	5.5	5.1	8.3	7.5	16.4	3.1	4.9
14	0.0	11.3	7.1	13.2	10.5	4.3	3.0	6.9	4.3	10.4	1.4	4.9
15	0.3	15.3	13.6	11.1	3.8	6.1	3.0	4.4	1.2	4.7	2.0	16.8
16	1.6	12.2	12.6	2.0	3.7	4.8	4.3	4.7	5.4	1.1	11.8	7.0
17	2.3	7.1	3.9	3.3	4.4	7.0	3.5	8.5	2.8	3.9	11.9	2.3
18	7.1	4.7	1.7	1.6	7.6	4.3	4.9	3.5	3.3	3.2	2.9	2.1
19	7.7	4.4	2.5	2.3	11.3	9.7	4.8	1.4	7.8	2.4	7.7	2.1
20	3.5	1.7	4.0	2.0	5.2	9.0	4.5	3.9	5.4	1.2	18.3	10.0
21	1.8	7.7	6.0	5.1	7.2	8.4	4.0	5.7	4.0	4.9	7.7	13.7
22	3.2	10.2	14.4	7.0	6.2	2.4	4.8	5.7	1.7	2.9	12.5	8.4
23	2.8	14.3	4.2	9.6	7.5	4.6	5.2	6.1	2.8	6.5	1.7	0.5
24	5.8	8.4	4.6	4.7	6.2	6.6	4.3	2.2	2.2	2.3	1.7	1.2
25	6.6	9.2	12.1	10.1	5.3	5.4	5.3	2.9	2.1	1.2	2.3	2.1
26	7.3	13.2	7.4	2.7	6.7	5.6	3.8	4.6	2.7	8.9	2.2	5.0
27	6.5	5.1	5.3	8.4	5.7	5.4	4.6	1.3	2.2	13.0	10.4	3.7
28	4.9		11.2	8.5	4.3	4.9	4.4	1.6	6.1	4.7	5.9	1.4
29	1.0		16.3	5.0	5.3	6.0	5.3	5.2	11.7	3.3	2.0	5.1
30	1.5		3.9	2.4	4.6	6.0	3.5	4.7	6.5	1.7	1.5	3.9
31	3.0		10.5		5.4		2.8	5.3		4.4		7.2

Notes: Shaded cells = pm season.

Average Annual = 5.9 **mph** **Average Seasonal =** 5.8 **mph** **Max Seasonal =** **05 = 18.4** **08 = 25.9** **09 = 18.8** **Avg. Max Seasonal =** 21.0

Appendix B, Table B- 15. Residential Open Burning: 2008 tpy Split Wood Burned Within the Klamath Falls NAA

Census Tract	(1) HouseHolds Inside the NA	(2) Degree of Outdoor Burning	(3) Percent Device Usage: Burn Barrel	Chimnea	Firepit	Other	(4) Percent Respondents Burning Wood: Burn Barrel	Chimnea	Firepit	Other	(5) Avg. tpy Wood Burned per Respondent: Burn Barrel	Chimnea	Firepit	Other	(6) 2008 tpy Wood Burned: Burn Barrel	Chimnea	Firepit	Other	(7) Total
8	596	2.84%	21%	13%	58%	7%	5%	34%	5%	27%	0.019	0.048	0.276	0.034	0.00	0.04	0.14	0.011	0.19
9	1,232	6.25%	17%	3%	72%	7%	--	--	5%	--	--	--	0.108	--	--	--	0.29	--	0.29
10	925	2.84%	21%	13%	58%	7%	5%	34%	5%	27%	0.019	0.048	0.276	0.034	0.01	0.06	0.21	0.017	0.29
11	1,979	6.49%	26%	10%	65%	0%	13%	100%	5%	--	0.009	0.371	0.009	--	0.04	4.62	0.04	--	4.69
12	1,122	1.20%	0%	0%	80%	20%	--	--	--	100%	--	--	--	0.277	--	--	--	0.75	0.75
13	2,158	2.16%	8%	8%	67%	17%	--	--	38%	--	--	--	0.709	--	--	--	8.28	--	8.28
14	1,951	3.13%	31%	25%	44%	0%	20%	25%	--	100%	0.081	0.018	--	0.072	0.31	0.07	--	0.072	0.45
15	1,779	3.37%	38%	0%	57%	5%	--	--	--	--	--	--	--	--	--	--	--	--	0
16	1,394	1.20%	67%	0%	33%	0%	25%	--	--	--	0.117	--	--	--	0.33	--	--	--	0.33
17	1,285	1.92%	25%	13%	50%	13%	--	100%	--	100%	--	0.070	--	0.027	--	0.22	--	0.08	0.30
18	1,272	0.96%	17%	17%	50%	17%	--	100%	--	--	--	0.036	--	--	--	0.07	--	--	0.07
19	1,464	0.96%	0%	50%	50%	0%	--	50%	--	--	--	0.036	--	--	--	0.13	--	--	0.13
20	1,612	3.61%	6%	19%	75%	0%	--	--	8%	--	--	--	2.215	--	--	--	8.04	--	8.04
	--------																		--------
Total	18,767																		**23.8**

(1) From Table B1

(2) From Table B-16

(3) From Table B-16: Normalized Values

(4) From Table B-17

(5) From Table B-19

(6) 2008 tpy wood burned =

(Households inside NAA) * (Percent Device Usage) * (Percent Respondents Burning Wood) * (Avg tpy Wood Burned Per Respondent)

(7) 2008 tpy wood burned = (2008 tpy Burn Barrel) + (2008 tpy Chimnea) + (2008 tpy Firepit) + (2008 tpy "Other")

Appendix B, Table B- 16. Residential Open Burning, Degree of Outdoor Burning and Percent Device Usage, by Census Tract(1)

Surveyed	(1a) Degree of Outdoor Burning		(1b) Percent Device Usage													
		n = 416	Total Respondents Using Device					Percentage, n = 154				Normalized				
Census Tract	Yes Resp.	%	Hydronic Heater	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Total
9	26	6.3%	0	5	1	21	2	3.2%	0.6%	13.6%	1.3%	17%	3%	72%	7%	100%
11	27	6.5%	0	8	3	20	0	5.2%	1.9%	13.0%	0%	26%	10%	65%	0%	100%
12	5	1.2%	0	0	0	4	1	0%	0%	2.6%	0.6%	0%	0%	80%	20%	100%
13	9	2.2%	0	1	1	8	2	0.6%	0.6%	5.2%	1.3%	8%	8%	67%	17%	100%
14	13	3.1%	0	5	4	7	0	3.2%	2.6%	4.5%	0.0%	31%	25%	44%	0%	100%
15	14	3.4%	0	8	0	12	1	5.2%	0%	7.8%	0.6%	38%	0%	57%	5%	100%
16	5	1.2%	0	4	0	2	0	2.6%	0%	1.3%	0%	67%	0%	33%	0%	100%
17	8	1.9%	0	2	1	4	1	1.3%	0.6%	2.6%	0.6%	25%	13%	50%	13%	100%
18	4	1.0%	0	1	1	3	1	0.6%	0.6%	1.9%	0.6%	17%	17%	50%	17%	100%
19	4	1.0%	0	0	2	2	0	0%	1.3%	1.3%	0%	0%	50%	50%	0%	100%
20	15	3.6%	0	1	3	12	0	0.6%	1.9%	7.8%	0%	6%	19%	75%	0%	100%
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------					
Total	**130**	**31.3%**	**0**	**35**	**16**	**95**	**8**	**22.7%**	**10.4%**	**61.7%**	**5.2%**					
8(2)	--	2.8%										21.4%	13.1%	58.4%	7.0%	100%
10(2)	--	2.8%										21.4%	13.1%	58.4%	7.0%	100%

Notes:

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

(a) *Q 18: Outdoor burning occurring at the home*

(b) *Q 20: What type of woodburning device do you use outdoors*

(2) Data for census tracts 8 and 10 are the average of the results of the surveyed census tracts.

Appendix B, Table B- 17. Residential Open Burning: Percent Respondents Burning Wood, by Census Tract and Device

Surveyed Census Tract	Total Respondents Using Device (1a)				Respondents Burning Wood (1b)				% Respondents Burning Wood (2)			
	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other
9	5	1	21	2	0	0	1	0	--	--	5%	--
11	8	3	20	0	1	3	1	0	13%	100%	5%	--
12	0	0	4	1	0	0	0	1	--	--	--	100%
13	1	1	8	2	0	0	3	0	--	--	38%	--
14	5	4	7	0	1	1	0	1	20%	25%	--	100%
15	8	0	12	1	0	0	0	0	--	--	--	--
16	4	0	2	0	1	0	0	0	25%	--	--	--
17	2	1	4	1	0	1	0	1	--	100%	--	100%
18	1	1	3	1	0	1	0	0	--	100%	--	--
19	0	2	2	0	0	1	0	0	--	50%	--	--
20	1	3	12	0	0	0	1	0	--	--	8%	--
	-------	-------	-------	-------								
Total	**35**	**16**	**95**	**8**	Total Respondents =			**19**				
8 (3)									5%	34%	5%	27%
10 (3)									5%	34%	5%	27%

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

(a) *Q 20: What type of woodburning device do you use outdoors*

(b) *Q 21: How much split wood is burned outdoors per year (if you do not burn split wood - skip to Q 22)*

(2) % Respondents Burning Wood = (Respondents Burning Wood) / (Total Respondents Using Device)

(3) Data for census tracts 8 and 10 are the average of the results of the surveyed census tracts.

Appendix B, Table B- 18. Residential Open Burning, Avg Volume Split Wood Burned Per Respondent and Device, by Census Tract(1)

Surveyed Census Tract	Burn Barrels			Chimnea						On Ground: Open or Firepit						Other					
	Resp.	Bundles	Bundles / Resp.	Resp.	Cords	Cords / Resp.	Resp.	Bundles	Bundles / Resp.	Resp.	Cords	Cords / Resp.	Resp.	Bundles	Bundles / Resp.	Resp.	Cords	Cords / Resp.	Resp.	Bundles	Bundles / Resp.
9	0	--	--	0	--	--	0	--	--	0	--	--	1	12	12	0	--	--	0	--	--
11	1	1	1	1	0.25	0.250	2	21	10.5	0	--	--	1	1	1	0	--	--	0	--	--
12	0	--	--	0	--	--	0	--	--	0	--	--	0	--	--	1	0.25	0.25	0	--	--
13	0	--	--	0	--	--	0	--	--	1	0.6	0.6	2	10	5	0	--	--	0	--	--
14	1	9	9	0	--	--	1	2	2	0	--	--	0	--	--	0	--	--	1	8	8
15	0	--	--	0	--	--	0	--	--	0	--	--	0	--	--	0	--	--	0	--	--
16	1	13	13	0	--	--	0	--	--	0	--	--	0	--	--	0	--	--	0	--	--
17	0	--	--	1	0.063	0.063	0	--	--	0	--	--	0	--	--	0	--	--	1	3	3
18	0	--	--	0	--	--	1	4	4	0	--	--	0	--	--	0	--	--	0	--	--
19	0	--	--	0	--	--	1	4	4	0	--	--	0	--	--	0	--	--	0	--	--
20	0	--	--	0	--	--	0	--	--	1	2	2	0	--	--	0	--	--	0	--	--
Total Cords =			3.2																		
Total Bundles =			88																		

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

Q 21: How much split wood is burned outdoors per year.

Appendix B, Table B- 19. Residential Open Burning, Avg Mass (tpy) Split Wood Burned Per Respondent and Device, by Census Tract

	(1)	(2)	(1)	(3)	(2)	(1)	(3)	(2)	(1)	(3)
	Burn Barrels	Chimnea			On Ground			Other		
Census Tract	Total	Cords	Bundles	Total	Cords	Bundles	Total	Cords	Bundles	Total
9	--	--	--	--	--	0.108	0.108	--	--	--
11	0.009	0.277	0.095	0.371	--	0.009	0.009	--	--	--
12	--	--	--	--	--	--	--	0.277	--	0.277
13	--	--	--	--	0.664	0.045	0.709	--	--	--
14	0.081	--	0.018	0.018	--	--	--	--	0.072	0.072
15	--	--	--	--	--	--	--	--	--	--
16	0.117	--	--	--	--	--	--	--	--	--
17	--	0.07	--	0.070	--	--	--	--	0.027	0.027
18	--	--	0.036	0.036	--	--	--	--	--	--
19	--	--	0.036	0.036	--	--	--	--	--	--
20	--	--	--	--	2.215	--	2.215	--	--	--
8(4)	0.019			0.048			0.276			0.034
10(4)	0.019			0.048			0.276			0.034

Notes:

(1) bundle avg. mass, tpy = (avg. volume, Table B-18) * (18 lb/bundle) / (2000 lb/ton)

(2) cord wood avg. mass, tpy = (avg. volume, Table B-18) * (2,215 lb/cord, Table B-20) / (2000 lb/ton)

(3) total = (avg. mass bundle) + (avg. mass cord wood)

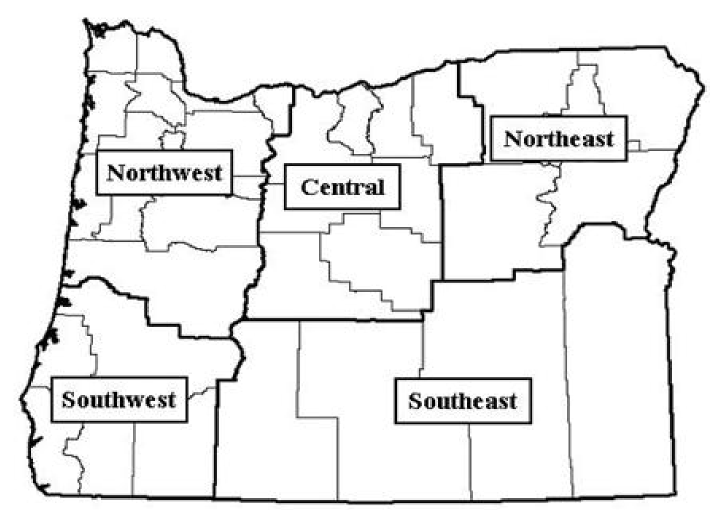
(4) Data for census tracts 8 and 10 are the average of the results of the surveyed census tracts.

Appendix B, Table B- 20. Typical Cord Density, Southeast Region of Oregon

	Fir	Lodgepole Pine	Ponderosa or Yellow Pine	Oak	Maple	Cedar	Madrone or Tamarack	Alder	Other Varieties	Total
Type of Wood Burned[2]										
	11.3%	54.9%	15.5%	5.6%	0%	5.6%	4.2%	1.4%	10.3%	108.8%
Type of Wood Burned: Normalized[3]										
	10%	50%	14%	5%	0%	5%	4%	1%	9%	100%
"Typical" Cord of Wood: Cubic Feet per Species[4]										
	8	40	11	4	0	4	3	1	8	80
"Typical" Cord Weight Estimates in lbs[5]										
	249	1033	285	175	0	82	102	26	262	**2,215**

Notes:

(1) OR State regions defined in the 2008/2009 Statewide Residential Wood Combustion Survey, DEQ ref. 682.



(2) Source: 2008 statewide RWC survey results report: DEQ ref. 682, Table 15a.

(3) (% tpye of wood burned) / (108.8%)

(4) Cubic feet by species = (80 cubic feet per cord) * (normalized percentages)

80 cubic feet per cord is from DEQ ref. 278. 80 cubic feet is the result of the elimination of air pockets in the cord.

Notes for Appendix B, Table B-20 Cont'd

(5) Species lbs per cord = (Species Density, lb/cu ft) * (species cubic feet, from Table 6), where species density =

Species	Fir	Lodgepole Pine	Ponderosa Pine	Oak	Maple	Cedar	Madrone / Tamarack	Alder	Other
lb/cu ft	*30*	*26*	*25*	*42*	*34*	*20*	*33*	*26*	*varies*
DEQ Reference	*278*	*278*	*278*	*278*	*278*	*278*	*278*	*278*	*(a)*

note: species densities from Ref. 278 are for wood containing 12% moisture content

(a) "Other" Types and Frequency of Wood Burned in SE Region

Southeast	Count	Density, lb/cu ft	(Count) * (Density)
Apple	1	50	50
Aspen	2	24	47
Box Elder	1	29	29
Cottonwood	2	24	48
Elm	4	35	140
Hybrid Poplar	1	26	26
Jack Pine	1	27	27
Juniper	27	35	938
Locust	1	41	41
Pine	1	26	26
Russian Olive	2	58	116
Average Density			**35**

Notes for (5a)

Species	Density, lb/cu ft	Reference
Apple	50	(i)
Aspen	24	(iii)
Box Elder	29	(iv)
Cottonwood	24	(ii)
Elm	35	(v)
Hybrid Poplar	26	(i) Midrange of poplar values
Jack Pine	27	(iii)
Juniper	35	(i)
Locust	41	(iii)
Pine	26	(iii)
Russian Olive	58	(i) Olive

References

(i) Tredgold, Thomas. Elementary Principles of Carpentry. Porter Press. February 2008. DEQ ref. 683b.

(ii) "Conversion Factors for Pacific Northwest Forest Products". Institute of Forest Products, Seattle Washington, DEQ ref. 260. All densities for air dried wood, moisture content = 12%

(iii) Shelton, Jay. The Woodburners Encyclopedia Section One. Vermont Crossroads Press. 1976. 12% moisture content. DEQ ref. 278.

(iv) Allely, Steve et. al. The Traditional Bowyer's Bible Volume Four. Lyons Press, 2008. DEQ ref. 683a.

(v) AP-42, Appendix A. DEQ ref. 8.

Appendix B, Table B- 21. Residential Open Burning, Cordwood and Bundles Burned by Season, Device, and Census Tract, Raw Survey Data

Census Tract	Burn Barrel				Chimnea					Ground: open or firepit						Other		
	Bundles				Cords	Bundles				Cords		Bundles				Cords	Bundles	
	Spring	Summer	Fall	Winter	Summer	Spring	Summer	Fall	Winter	Spring	Fall	Spring	Summer	Fall	Winter	Spring	Spring	Fall
9	0	0	0	0	0	0	0	0	0	0	0	4	4	4	0	0	0	0
11	0	0	1	0	0.25	5	1	5	10	0	0	0	0	1	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0
13	0	0	0	0	0	0	0	0	0	0.2	0.4	3	0	5	2	0	0	0
14	2	1	3	3	0	0	2	0	0	0	0	0	0	0	0	0	4	4
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	3	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0.0625	0	0	0	0	0	0	0	0	0	0	0	1	2
18	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Totals	5	7	8	3	0.3125	5	7	9	10	2.2	0.4	7	4	10	2	0.25	5	6
tpy totals(2)	0.05	0.06	0.07	0.03	0.35	0.05	0.06	0.08	0.09	2.44	0.44	0.06	0.04	0.09	0.02	0.28	0.05	0.05

Notes:

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

Q 21: How much split wood is burned outdoors per year.

(2) Bundles: (total) * (18 lbs/bundle) / (2000 lbs/ton)

Cords: (total) * ("typical" cord density in lbs/cord, from Table B-8e) / (2000 lbs/ton)

Appendix B, Table B- 22. Residential Open Burning, Split Wood: Seasonal Adjustment Factor Calculations (with profile graph)

Season	Spring			Summer			Fall			Winter			**Total**
Season tpy(1)	2.91			0.51			0.74			0.14			**4.29**
Month(2)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Monthly tpy(3)	0.97	0.97	0.97	0.17	0.17	0.17	0.25	0.25	0.25	0.05	0.05	0.05	**4.29**
% Annual Activity	23%	23%	23%	4%	4%	4%	6%	6%	6%	1%	1%	1%	**100%**
SAF(4)	**0.27**												

Notes:

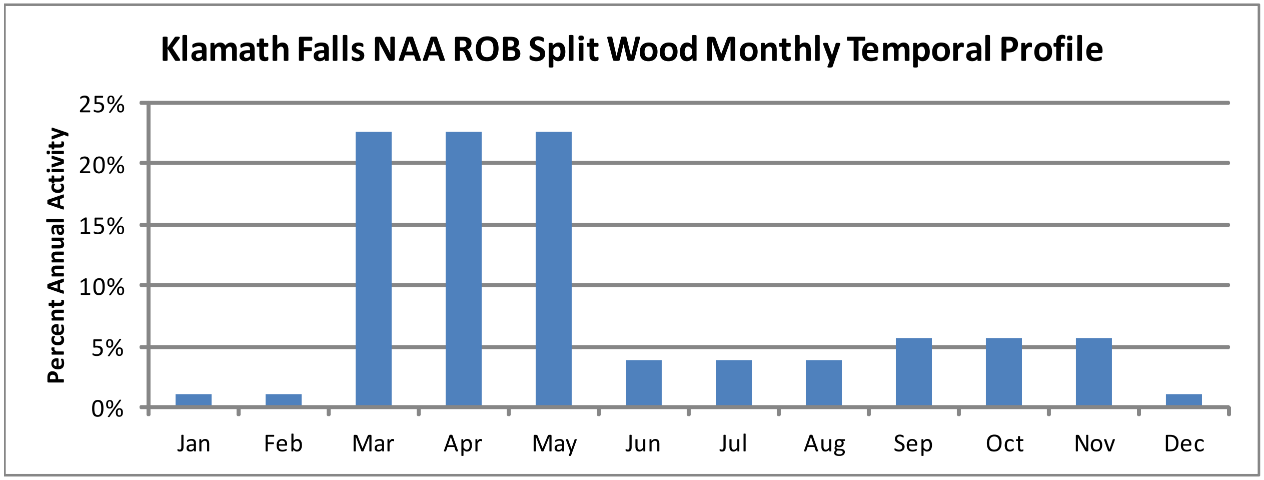
(1) From Table B-21

(2) Shaded cells indicate PM season

(3) Monthly tpy = (seasonal tpy) / (3)

(4) SAF = [(Peak Season Activity) * (12 months)] / [(Annual Activity) * (Season Months)] =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% Annual Activity	1%	1%	23%	23%	23%	4%	4%	4%	6%	6%	6%	1%



Appendix B, Table B- 23. Residential Open Burning: 2008 tpy Leaves & Grass Burned Within the Klamath Falls NAA

	(1)	(2)	(3)				(4)				(5)				---------- (6) ----------				(7)
			Percent Device Usage				% Respondents Burning Leaves & Grass				Avg. tpy Leaves & Grass Burned per Respondent				2008 tpy Leaves & Grass Burned				
Census Tract	HouseHolds Inside the NA	Degree of Outdoor Burning	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Total
8	596	2.84%	21%	13%	58%	7%	40%	--	65%	5%	0.08	--	1.29	0.69	0.1	--	8.3	0.0	8.4
9	1,232	6.25%	17%	3%	72%	7%	40%	--	57%	50%	0.08	--	1.29	0.69	0.4	--	41.1	1.8	43.4
10	925	2.84%	21%	13%	58%	7%	40%	--	65%	5%	0.08	--	1.29	0.69	0.2	--	12.8	0.1	13.1
11	1,979	6.49%	26%	10%	65%	0%	75%	--	60%	--	0.08	--	1.29	--	2.0	--	64.2	--	66.2
12	1,122	1.20%	0%	0%	80%	20%	--	--	75%	--	--	--	1.29	--	--	--	10.4	--	10.4
13	2,158	2.16%	8%	8%	67%	17%	100%	--	13%	--	0.08	--	1.29	--	0.3	--	5.0	--	5.3
14	1,951	3.13%	31%	25%	44%	0%	40%	--	57%	--	0.08	--	1.29	--	0.6	--	19.7	--	20.3
15	1,779	3.37%	38%	0%	57%	5%	38%	--	83%	--	0.08	--	1.29	--	0.7	--	36.8	--	37.5
16	1,394	1.20%	67%	0%	33%	0%	--	--	50%	--	--	--	1.29	--	--	--	3.6	--	3.6
17	1,285	1.92%	25%	13%	50%	13%	50%	--	100%	--	0.08	--	1.29	--	0.2	--	15.9	--	16.2
18	1,272	0.96%	17%	17%	50%	17%	--	--	67%	--	--	--	1.29	--	--	--	5.3	--	5.3
19	1,464	0.96%	0%	50%	50%	0%	100%	--	100%	--	0.08	--	1.29	--	0.0	--	9.1	--	9.1
20	1,612	3.61%	6%	19%	75%	0%	--	--	50%	--	--	--	1.29	--	--	--	28.1	--	28.1
	--------																		------
Total	18,767																		**266.8**

Notes for Table B-23:

(1) From Table B15

(2) From Table B-16

(3) From Table B-16: Normalized Values

(4) From Table B-24

(5) Results are from the 2008/2009 Oregon Statewide Residential Wood Combustion Survey (DEQ ref. 682).

Final Report, Q11: How do you burn outdoors?

Q13A1: How many piles or pounds of leaves did you burn?

Q13C1: How many piles or pounds of grass clippings did you burn?

For the Southeast Region of the state, the results are as follows:

	Leaves (tpy)	Grass (tpy)	Avg (tpy)	Avg (lbs/yr)
Burn Barrel	0.13	0.029	0.08	162
On-Ground	0.97	1.61	1.29	2,581

note: The calculations for the avg tpy leaves & grass burned (SE region of the state) may be found here:

\\DEQHQ1\EI_FILES\2008_NEI\AREA\OpenBurning\ROB_Yard_Debris\ROB_Yard_Debris.xlsx

Specifically, Tables 5a and 5b

(6) 2008 tpy wood burned =

(Households inside NA) * (Percent Device Usage) * (Percent Respondents Burning Leaves & Grass) * (Avg tpy Leaves & Grass Burned Per Respondent)

(7) 2008 tpy leaves & grass burned = (2008 tpy Burn Barrel) + (2008 tpy Chimnea) + (2008 tpy Firepit) + (2008 tpy "Other")

Appendix B, Table B- 24. Residential Open Burning: Percent Respondents Burning Grass Clippings & Leaves, by Census Tract and Device

Surveyed Census Tract	Total Respondents Using Device (1a)				Respondents Burning Leaves & Grass (1b)				% Respondents Burning Leaves & Grass(2)			
	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other
9	5	1	21	2	2	0	12	1	40%	--	57%	50%
11	8	3	20	0	6	0	12	--	75%	--	60%	--
12	0	0	4	1	--	--	3	0	--	--	75%	--
13	1	1	8	2	1	0	1	0	100%	--	13%	--
14	5	4	7	0	2	0	4	--	40%	--	57%	--
15	8	0	12	1	3	--	10	0	38%	--	83%	--
16	4	0	2	0	0	--	1	0	--	--	50%	--
17	2	1	4	1	1	0	4	0	50%	--	100%	--
18	1	1	3	1	0	0	2	0	--	--	67%	--
19	0	2	2	0	1	0	2	--	100%	--	100%	--
20	1	3	12	0	0	0	6	--	--	--	50%	--
	-------	-------	-------	-------								
Total	**35**	**16**	**95**	**8**	Total Respondents =			74				
8(3)									40%	--	65%	5%
10(3)									40%	--	65%	5%

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

(a) *Q 20: What type of woodburning device do you use outdoors*

(b) *Q 22: Do you burn any other material besides cord wood outdoors?*

(2) % Respondents Burning Wood = (Respondents Burning Wood) / (Total Respondents Using Device)

(3) Data for census tracts 8 and 10 are the average of the results of the surveyed census tracts.

Appendix B, Table B- 25. Residential Open Burning, Leaves and Grass, Respondents Burning by Season, Device, and Census Tract, Raw Survey Data

	Sep WD		Sep WE		Oct WD		Oct WE			Nov WD		Nov WE			Dec WD		Dec WE			Jan WD		Jan WE		Feb WD		Feb WE		Spr WD		Spr WE			Sum WD		Sum WE	
Census Tract	Burn Barrel	Firepit	Burn Barrel	Firepit	Burn Barrel	Firepit	Burn Barrel	Firepit	Other	Burn Barrel	Firepit	Burn Barrel	Firepit	Other	Burn Barrel	Firepit	Burn Barrel	Firepit	Other	Burn Barrel	Firepit	Burn Barrel	Firepit	Burn Barrel	Firepit	Burn Barrel	Firepit	Burn Barrel	Firepit	Burn Barrel	Firepit	Other	Burn Barrel	Firepit	Burn Barrel	Firepit
9	1	1	1	1	1	5	2	6	1		1	1	1	1				1	1				1				1		5	1	6	1				
11			2	1			3	3			1	2	1				2	1				2	1			2	1	1	2	2	4			1	1	1
12								1																					1		2					
13					1			1					1																							
14	1	1	1	1	1		1	2		1		1	2															1		1	3		1	1	1	1
15				1		2		2							1									1					2		4					
16								1					1																							
17	1	1		1	1	1		1		1			1					1					1	1				1	1		3		1			
18																													1		1					
19			1				1					1					1					1				1			1	1	2				1	
20				2		1		2			1		1			1					1				1				2		3					
Totals																																				
	6		12		13		27			5		14			2		7			1		6		3		5		18		34			4		5	

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

Q 22: Do you burn any other material besides cord wood outdoors?

Q 23: About when do you burn the material in question 22 outdoors?

Appendix B, Table B- 26. Residential Open Burning, Leaves & Grass: Seasonal Adjustment Factor Calculations (with profile graph)

Season	Spring			Summer			Fall			Winter			Total
Season respondents[1]	52			9			77			24			**162**
Month[2]	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Monthly respondents[3]	17	17	17	3	3	3	18	40	19	9	7	8	**162**
% Annual Activity	11%	11%	11%	2%	2%	2%	11%	25%	12%	6%	4%	5%	**100%**
SAF[4]	**0.80**												

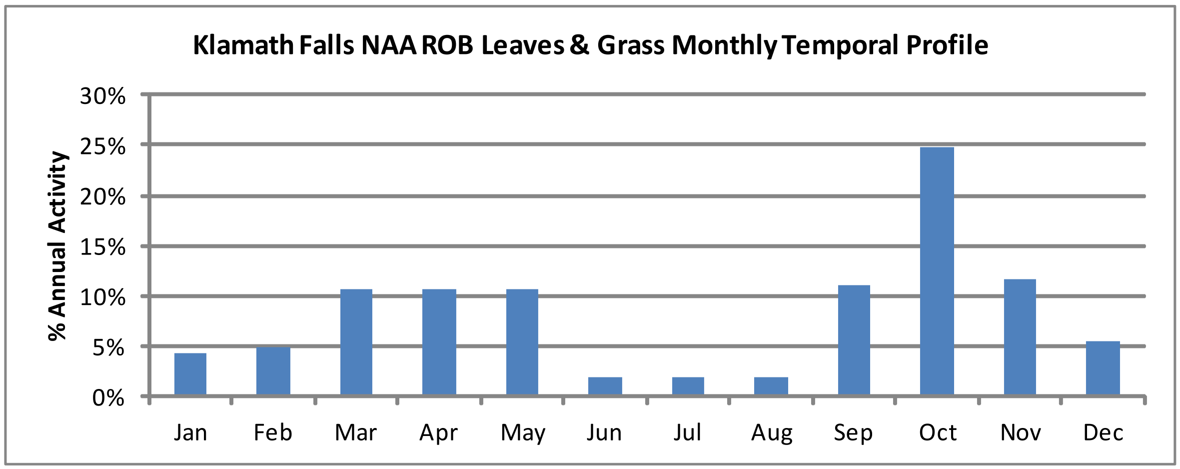
(1) From Table B-25

(2) Shaded cells indicate PM season

(3) Monthly tpy, spring & summer = (seasonal tpy) / (3). All other months are from Table B-25

(4) SAF = [(Peak Season Activity) * (12 months)] / [(Annual Activity) * (Season Months)]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% Annual Activity	4%	5%	11%	11%	11%	2%	2%	2%	11%	25%	12%	6%



Appendix B, Table B- 27. Residential Open Burning: 2008 tpy Brush Burned Within the Klamath Falls NAA

	(1)	(2)	(3) Percent Device Usage				(4) % Respondents Burning Brush				(5) Avg. tpy Brush Burned per Respondent				---------- (6) ---------- 2008 tpy Brush Burned				(7)
Census Tract	HouseHolds Inside the NAA	Degree of Outdoor Burning	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Total
8	596	2.84%	21%	13%	58%	7%	48%	16%	94%	5%	0.26	0.26	1.74	0.06	0.4	0.1	16.1	0.003	16.6
9	1,232	6.25%	17%	3%	72%	7%	40%	--	100%	50%	0.26	--	1.74	0.06	1.4	--	96.8	0.2	98.3
10	925	2.84%	21%	13%	58%	7%	48%	16%	94%	5%	0.26	0.26	1.74	0.06	0.7	0.1	25.0	0.01	25.8
11	1,979	6.49%	26%	10%	65%	0%	75%	--	95%	--	0.26	--	1.74	--	6.4	--	136.7	--	143.0
12	1,122	1.20%	0%	0%	80%	20%	--	--	75%	--	--	--	1.74	--	--	--	14.0	--	14.0
13	2,158	2.16%	8%	8%	67%	17%	100%	--	75%	--	0.26	--	1.74	--	1.0	--	40.5	--	41.5
14	1,951	3.13%	31%	25%	44%	0%	80%	75%	86%	--	0.26	0.06	1.74	--	3.9	0.7	39.7	--	44.3
15	1,779	3.37%	38%	0%	57%	5%	38%	--	100%	--	0.26	--	1.74	--	2.2	--	59.4	--	61.6
16	1,394	1.20%	67%	0%	33%	0%	50%	--	100%	--	0.26	--	1.74	--	1.4	--	9.7	--	11.1
17	1,285	1.92%	25%	13%	50%	13%	50%	--	100%	--	0.26	--	1.74	--	0.8	--	21.4	--	22.2
18	1,272	0.96%	17%	17%	50%	17%	--	--	100%	--	--	--	1.74	--	--	--	10.6	--	10.6
19	1,464	0.96%	0%	50%	50%	0%	100%	--	100%	--	0.26	--	1.74	--	3.6	--	12.2	--	15.8
20	1,612	3.61%	6%	19%	75%	0%	--	100%	100%	--	--	0.06	1.74	--	--	0.7	75.7	--	76.4
Total	-------- 18,767																		-------- **581.4**

Notes for Table B-27

(1) From Table B15

(2) From Table B-16

(3) From Table B-16: Normalized Values

(4) From Table B-28

(5) Burn Barrel and Firepit results are from the 2008/2009 Oregon Statewide Residential Wood Combustion Survey (DEQ ref. 682).

Final Report, Q11: How do you burn outdoors?

Q131: How many piles or pounds of brush did you burn?

For the Southeast Region of the state, the results are as follows:

	Brush (tpy)	Brush (lbs/yr)
Burn Barrel	0.26	511
On-Ground	1.74	3,472

note: The calculations for avg tpy burned may be found here:

\\DEQHQ1\EI_FILES\2008_NEI\AREA\OpenBurning\ROB_Yard_Debris\ROB_Yard_Debris.xlsx

Specifically, Tables 5a and 5b

Chimnea and Other assumed equal to 1/4 Burn Barrel

(6) 2008 tpy wood burned =

(Households inside NA) * (Percent Device Usage) * (Percent Respondents Burning Brush) * (Avg tpy Brush Burned Per Respondent)

(7) 2008 tpy brush burned = (2008 tpy Burn Barrel) + (2008 tpy Chimnea) + (2008 tpy Firepit) + (2008 tpy "Other")

Appendix B, Table B- 28. Residential Open Burning: Percent Respondents Burning Brush, by Census Tract and Device

Surveyed Census Tract	Total Respondents Using Device (1a)				Respondents Burning Brush (1b)				% Respondents Burning Brush (2)			
	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other
9	5	1	21	2	2	0	21	1	40%	--	100%	50%
11	8	3	20	0	6	0	19	0	75%	--	95%	--
12	0	0	4	1	0	0	3	0	--	--	75%	--
13	1	1	8	2	1	0	6	0	100%	--	75%	--
14	5	4	7	0	4	3	6	0	80%	75%	86%	--
15	8	0	12	1	3	0	12	0	38%	--	100%	--
16	4	0	2	0	2	0	2	0	50%	--	100%	--
17	2	1	4	1	1	0	5	0	50%	--	100%	--
18	1	1	3	1	0	0	3	0	--	--	100%	--
19	0	2	2	0	2	0	2	0	100%	--	100%	--
20	1	3	12	0	0	3	12	0	--	100%	100%	--
	-------	-------	-------	-------								
Total	**35**	**16**	**95**	**8**	Total Respondents =			119				
8(3)									48%	16%	94%	5%
10(3)									48%	16%	94%	5%

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

(a) *Q 20: What type of woodburning device do you use outdoors*

(b) *Q 22: Do you burn any other material besides cord wood outdoors?*

(2) % Respondents Burning Wood = (Respondents Burning Wood) / (Total Respondents Using Device)

(3) Data for census tracts 8 and 10 are the average of the results of the surveyed census tracts.

Appendix B, Table B- 29. Residential Open Burning, Brush, Respondents Burning by Season, Device, and Census Tract, Raw Survey Data

CensusTr	SEP WD	SEP WE	OCT WD	OCT WE	NOV WD	NOV WE	DEC WD	DEC WE	JAN WD	JAN WE	FEB WD	FEB WE	SPR WD	SPR WE	SUM WD	SUM WE
Burn Barrel Branches																
9				1	1	1								1		
11		3		4		3		3		3		3		3		1
13			1													
14	1	1	1	2	2	3							2	3	2	2
15			1	1												
16			1	1	1	1	1	1	1	1	1	1	1	1		
17	1		1		1						1		1		1	
19	1	1		1		1	1	1	1	1		1		1		1
Burn Barrel Brush																
9				1		1								1		
11		1		2		2		2		2		2		2		1
13			1													
17	1		1		1						1		1		1	
Burn Barrel Shrub																
9				1		1								1		
11		1		2		2		2		2		2		2		1
Burn Barrel Stump																
11						1		1		1		1				
Chimnea Branches																
14		1		2		1								1	1	1
Chimnea Brush																
14		1		1												
Ground/Firepit Branches																
9	1	1	6	8	2	2	1	2	1	2	1	2	9	8		1
11		1		5	2	2		1		1		1	5	8	1	1
12				1									1	2		
13		1		1		3		1		1		1	1	2		1
14	1	1		3		2								3	2	2
15		1	2	2			1				1		2	4	1	
16				1		1								1	1	1
17	1	2	1	1		1		1		1			1	4		1
18													1	2		
19													1	2		

CensusTr	SEP WD	SEP WE	OCT WD	OCT WE	NOV WD	NOV WE	DEC WD	DEC WE	JAN WD	JAN WE	FEB WD	FEB WE	SPR WD	SPR WE	SUM WD	SUM WE
Ground/Firepit Brush																
9	1	1	5	8	2	2	1	2	1	2	1	2	8	8		1
11		1		4	1	2		1		1		1	2	6		1
12				1										1		
13		1											1	1		1
14	1	1		1		1								1	1	1
15		1	2	2									2	3	1	
16				1		1								1	1	1
17	1	2	1	1									1	3		1
18													1	2		
19														1		
Ground/Firepit Shrub																
9	1	1	5	7	1	2	1	2	1	2	1	2	5	6		
11				1	1								1	2		
12				1									1	1		
13																
14	1	1				1								1		
15		1	1	1									1	2		
16														1	1	1
17	1	2	1	1									1	3		1
18													1	2		
19														1		
Ground/Firepit Stump																
9			1	2	2	1							3	2		
11				1		1							2	2		
13		1														1
15		1		1										1		
16														1	1	1
17														1		
Other Branches																
9				1		1		1						1		
Other Brush																
9				1		1		1						1		

Total Positive Responses = 490

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

Q 22: Do you burn any other material besides cord wood outdoors?

Q 23: About when do you burn the material in question 22 outdoors?

Appendix B, Table B- 30. Residential Open Burning, Brush: Seasonal Adjustment Factor Calculations (with profile graph)

Season	Spring			Summer			Fall			Winter			**Total**
Season respondents[1]	163			39			209			79			**490**
Month[2]	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Monthly respondents[3]	54	54	54	13	13	13	43	108	58	28	25	26	**490**
% Annual Activity	11%	11%	11%	3%	3%	3%	9%	22%	12%	6%	5%	5%	**100%**
SAF[4]	**0.84**												

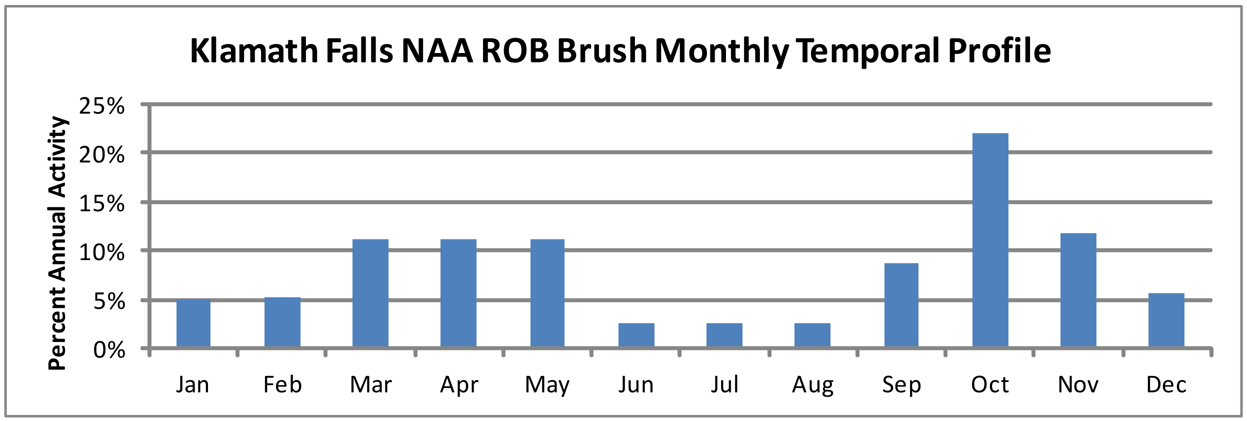
(1) From Table B-29

(2) Shaded cells indicate PM season

(3) Monthly tpy, spring & summer = (seasonal tpy) / (3). All other months are from Table B-29.

(4) SAF = [(Peak Season Activity) * (12 months)] / [(Annual Activity) * (Season Months)]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% Annual Activity	5%	5%	11%	11%	11%	3%	3%	3%	9%	22%	12%	6%



Appendix B, Table B- 31. Residential Open Burning: 2008 tpy Municipal Waste Burned Within the Klamath Falls NAA

	(1)	(2)	(3) Percent Device Usage				(4) % Respondents Burning Municipal Waste				(5) Avg. tpy Waste Burned per Respondent				---------- (6) ---------- 2008 tpy Municipal Waste Burned				(7)
Census Tract	HouseHolds Inside the NAA	Degree of Outdoor Burning	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Total
8	596	2.84%	21%	13%	58%	7%	44%	17%	20%	--	0.87	0.22	0.40	--	1.4	0.1	0.8	--	2.3
9	1,232	6.25%	17%	3%	72%	7%	60%	100%	33%	--	0.87	0.22	0.40	--	6.9	0.6	7.4	--	14.9
10	925	2.84%	21%	13%	58%	7%	44%	8%	20%	--	0.87	0.22	0.40	--	2.2	0.1	1.2	--	3.5
11	1,979	6.49%	26%	10%	65%	0%	63%	--	15%	--	0.87	--	0.40	--	18.0	--	5.0	--	23.0
12	1,122	1.20%	0%	0%	80%	20%	--	--	--	--	--	--	--	--	--	--	--	--	0.0
13	2,158	2.16%	8%	8%	67%	17%	--	--	--	--	--	--	--	--	--	--	--	--	0.0
14	1,951	3.13%	31%	25%	44%	0%	--	25%	--	--	--	0.22	--	--	--	0.8	--	--	0.8
15	1,779	3.37%	38%	0%	57%	5%	38%	--	8%	--	0.87	--	0.40	--	7.4	--	1.1	--	8.6
16	1,394	1.20%	67%	0%	33%	0%	75%	--	50%	--	0.87	--	0.40	--	7.3	--	1.1	--	8.4
17	1,285	1.92%	25%	13%	50%	13%	50%	--	50%	--	0.87	--	0.40	--	2.7	--	2.5	--	5.2
18	1,272	0.96%	17%	17%	50%	17%	100%	--	--	--	0.87	--	--	--	1.8	--	--	--	1.8
19	1,464	0.96%	0%	50%	50%	0%	--	--	50%	--	--	--	0.40	--	--	--	1.4	--	1.4
20	1,612	3.61%	6%	19%	75%	0%	100%	67%	17%	--	0.87	0.22	0.40	--	3.2	1.6	2.9	--	7.6
	--------																		--------
Total	18,767																		**77.5**

Notes for Table B-31

(1) From Table B1

(2) From Table B-16

(3) From Table B-16: Normalized Values

(4) From Table B-32

(5) Burn Barrel and Firepit results are from the 2008/2009 Oregon Statewide Residential Wood Combustion Survey (DEQ ref. 682).

Final Report, Q11: How do you burn outdoors?

Q131: How many piles or pounds of brush did you burn?

For the Southeast Region of the state, the results are as follows:

	Paper/CB (tpy)	Plastics (tpy)	Avg (tpy)	Avg (lbs/yr)
Burn Barrel	1.70	0.04	0.87	1,742
On-Ground	0.79	0.005	0.40	798

note: The calculations for the avg tpy municipal waste burned (SE region of the state) may be found here:

\\DEQHQ1\EI_FILES\2008_NEI\AREA\OpenBurning\ROB_Municipal_Waste\ROB_MunicipalWaste_Tables.xlsx

Specifically, Tables 5a and 5b

Chimnea assumed equal to 1/4 Burn Barrel

(6) 2008 tpy wood burned =

(Households inside NA) * (Percent Device Usage) * (Percent Respondents Burning Waste) * (Avg tpy Waste Burned Per Respondent)

(7) 2008 tpy municiap waste burned = (2008 tpy Burn Barrel) + (2008 tpy Chimnea) + (2008 tpy Firepit) + (2008 tpy "Other")

Appendix B, Table B- 32. Residential Open Burning: Percent Respondents Burning Municipal Waste, by Census Tract and Device

Surveyed Census Tract	Total Respondents Using Device (1a)				Respondents Burning Municipal Waste (1b)				% Respondents Burning Municipal Waste (2)			
	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other	Burn Barrel	Chimnea	Firepit	Other
9	5	1	21	2	3	1	7	0	60%	100%	33%	--
11	8	3	20	0	5	0	3	0	63%	--	15%	--
12	0	0	4	1	0	0	0	0	--	--	--	--
13	1	1	8	2	0	0	0	0	--	--	--	--
14	5	4	7	0	0	1	0	0	--	25%	--	--
15	8	0	12	1	3	0	1	0	38%	--	8%	--
16	4	0	2	0	3	0	1	0	75%	--	50%	--
17	2	1	4	1	1	0	2	0	50%	--	50%	--
18	1	1	3	1	1	0	0	0	100%	--	--	--
19	0	2	2	0	0	0	1	0	--	--	50%	--
20	1	3	12	0	1	2	2	0	100%	67%	17%	--
	-------	-------	-------	-------								
Total	**35**	**16**	**95**	**8**	Total Respondents =			**38**				
8(3)									44%	17%	20%	--
10(3)									44%	8%	20%	--

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

(a) *Q 20: What type of woodburning device do you use outdoors*

(b) *Q 22: Do you burn any other material besides cord wood outdoors?*

note: survey questions limited to paper, plastics, and cardboard.

Other materials listed by respondents as burned included yard debris and wooden pallets.

(2) % Respondents Burning Wood = (Respondents Burning Wood) / (Total Respondents Using Device)

(3) Data for census tracts 8 and 10 are the average of the results of the surveyed census tracts.

Appendix B, Table B- 33. Residential Open Burning, Municipal Waste, Respondents Burning by Season, Device, and Census Tract, Raw Surve Data

CensusTr	SEP WD	SEP WE	OCT WD	OCT WE	NOV WD	NOV WE	DEC WD	DEC WE	JAN WD	JAN WE	FEB WD	FEB WE	SPR WD	SPR WE	SUM WD	SUM WE
Burn Barrel Cardboard																
9				1		1								1		
11													1			
15																
16		1		1										2	1	2
17	1		1		1						1		1		1	
20					1		1		1						1	
Burn Barrel Paper																
9	1	1	1	3		1								2		
11		2		3	1	3		3		3		3	1	3		1
15			1										2			
16		1		1										2	1	2
17	1		1		1						1		1		1	
18																
20					1		1		1						1	
Burn Barrel Plastic																
11		1		1		1		1		1		1		1		
Chimnea Cardboard																
20	1		1		1										2	1
Chimnea Paper																
9																
14				1		1								1	1	1
20	1		1		1										2	1

CensusTr	SEP WD	SEP WE	OCT WD	OCT WE	NOV WD	NOV WE	DEC WD	DEC WE	JAN WD	JAN WE	FEB WD	FEB WE	SPR WD	SPR WE	SUM WD	SUM WE
Ground/Firepit Cardboard																
9	1	1	3	3	1	1							3	1		
11		1		1		1		1		1		1	1	2		1
15		1		1										1		
16														1	1	1
17						1		1		1				1		
19													1	1		
20			1		1		1		1		1		1			
Ground/Firepit Paper																
9	1	1	2	2		1							1	1		1
11		1		1		1		1		1		1	1	2		1
15		1		1										1		
17						1		1		1				1		
20			1		1		1		1		1		1			

Total Positive Responses = 172

(1) Klamath Falls 2008 Oregon Woodheating Survey Overview Report. Draft – January 22, 2009. (DEQ ref. 695)

Q 22: Do you burn any other material besides cord wood outdoors?

Q 23: About when do you burn the material in question 22 outdoors?

Appendix B, Table B- 34. Residential Open Burning, Municipal Waste: Seasonal Adjustment Factor Calculations (with profile graph)

Season	Spring			Summer			Fall			Winter			Total
Season respondents [1]	39			24			75			34			**172**
Month [2]	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Monthly respondents [3]	13	13	13	8	8	8	19	33	23	12	12	10	**172**
% Annual Activity	8%	8%	8%	5%	5%	5%	11%	19%	13%	7%	7%	6%	**100%**
SAF [4]	**0.99**												

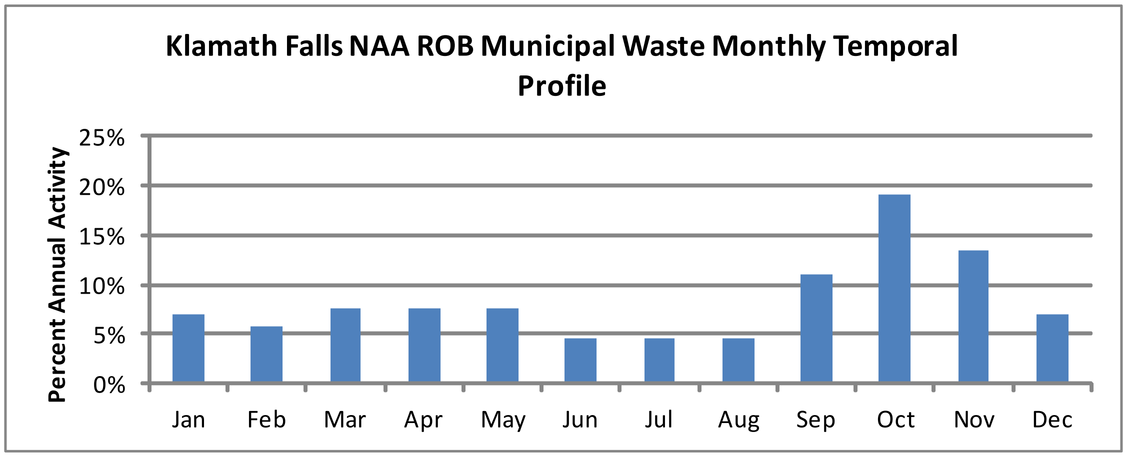
(1) From Table B-33

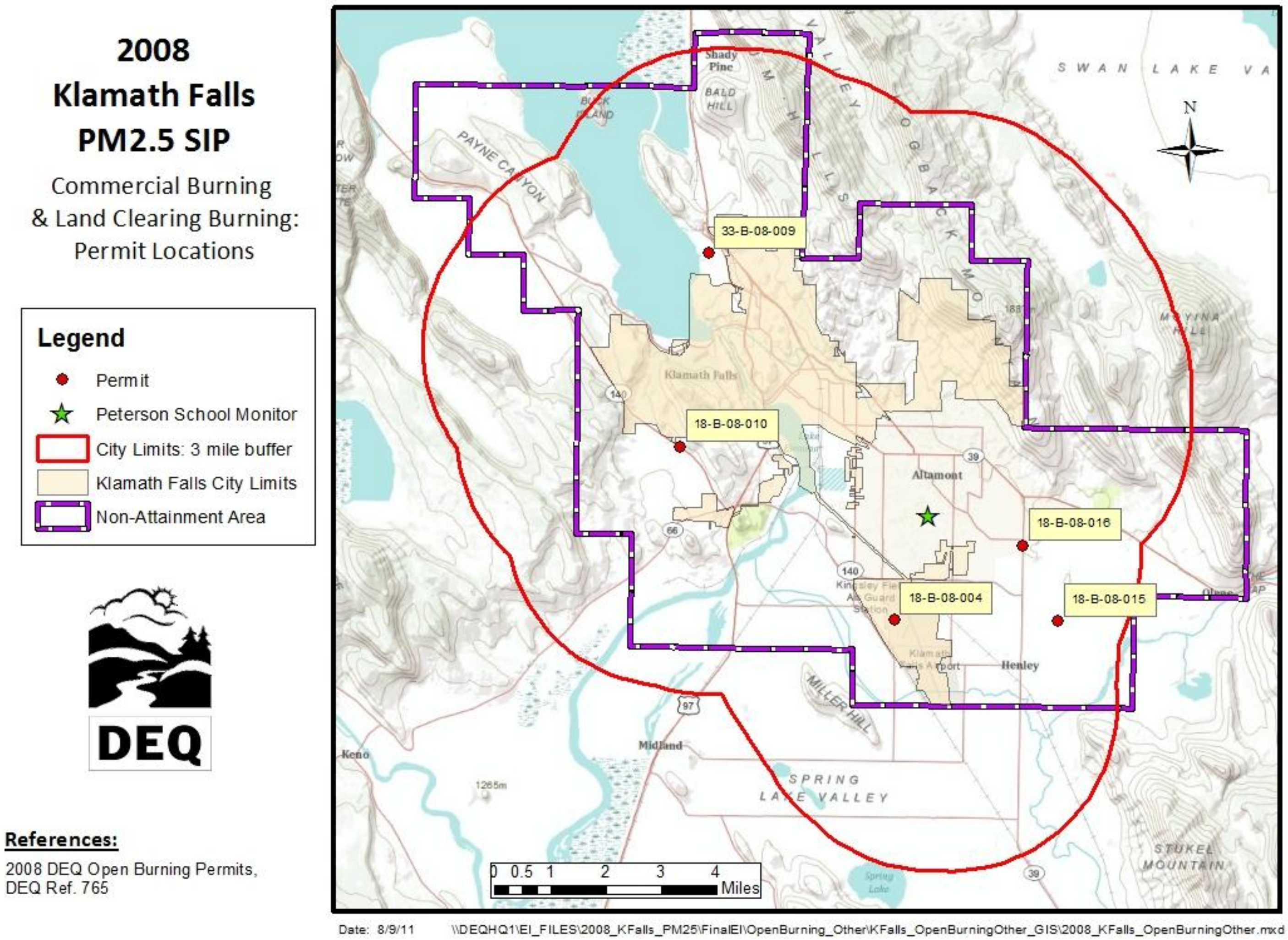
(2) Shaded cells indicate PM season

(3) Monthly tpy, spring & summer = (seasonal tpy) / (3). All other months are from Table B-8I.1

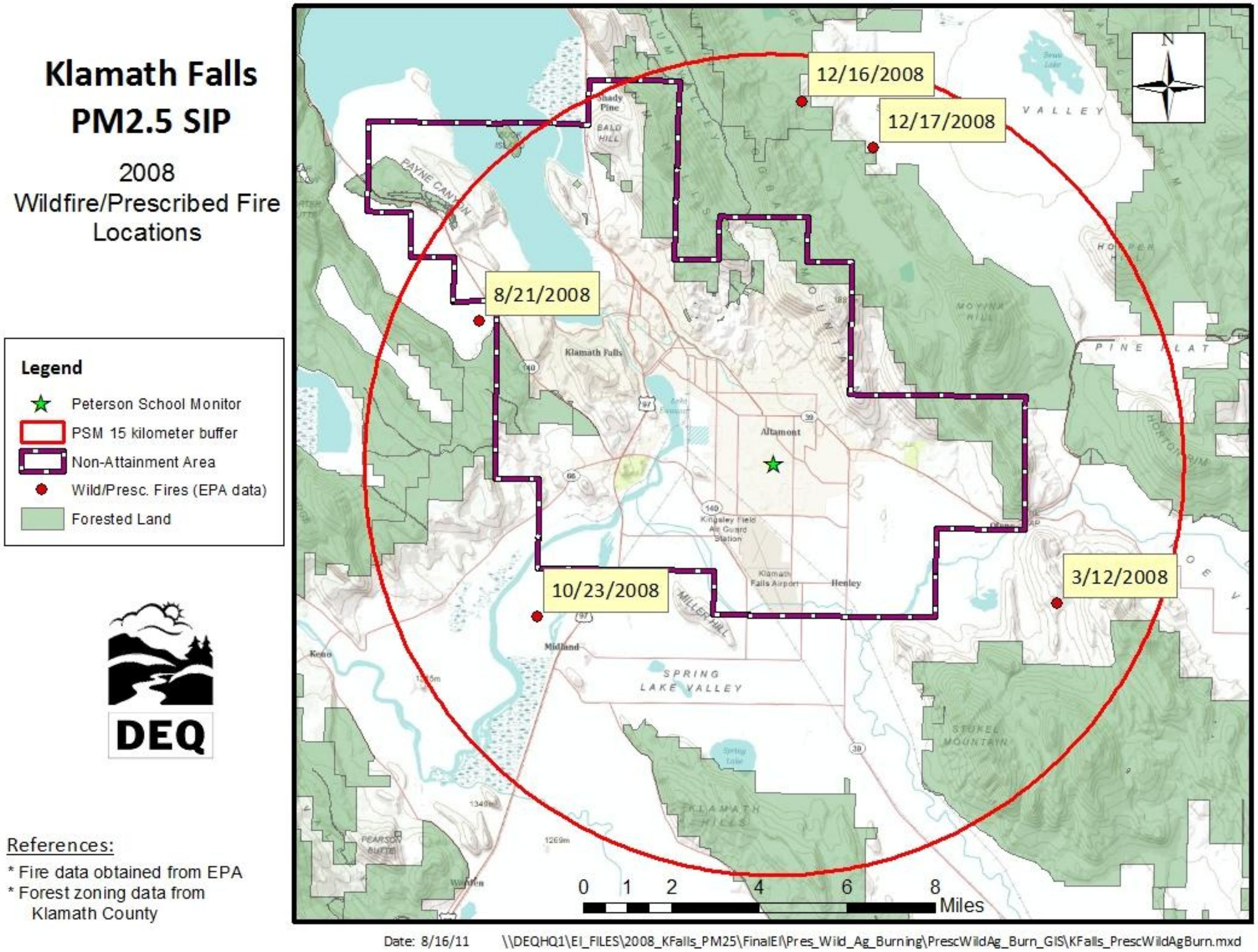
(4) SAF = [(Peak Season Activity) * (12 months)] / [(Annual Activity) * (Season Months)]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% Annual Activity	7%	6%	8%	8%	8%	5%	5%	5%	11%	19%	13%	7%

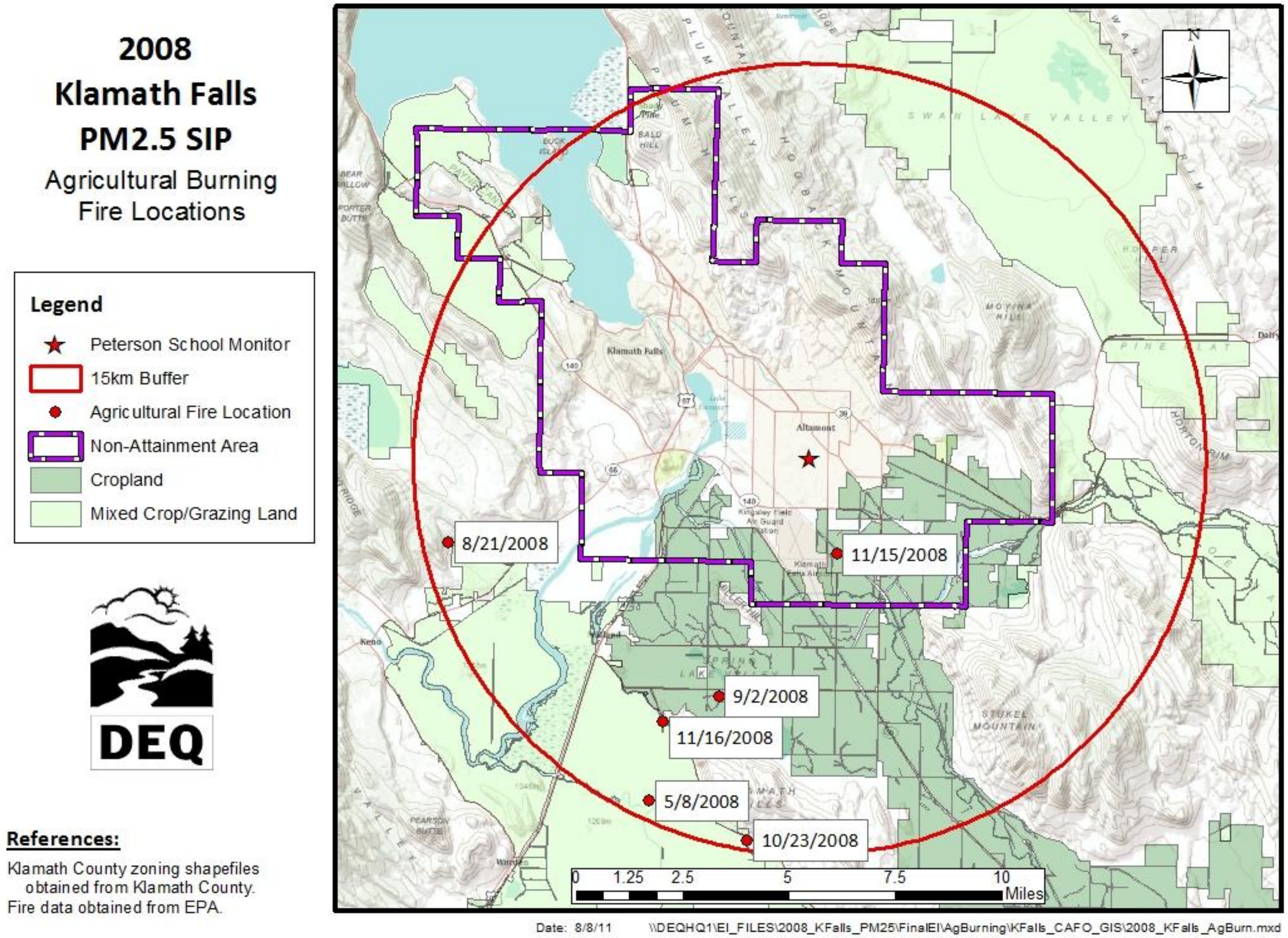




Appendix B, Figure B- 1. 2008 Open Burning Permit Locations



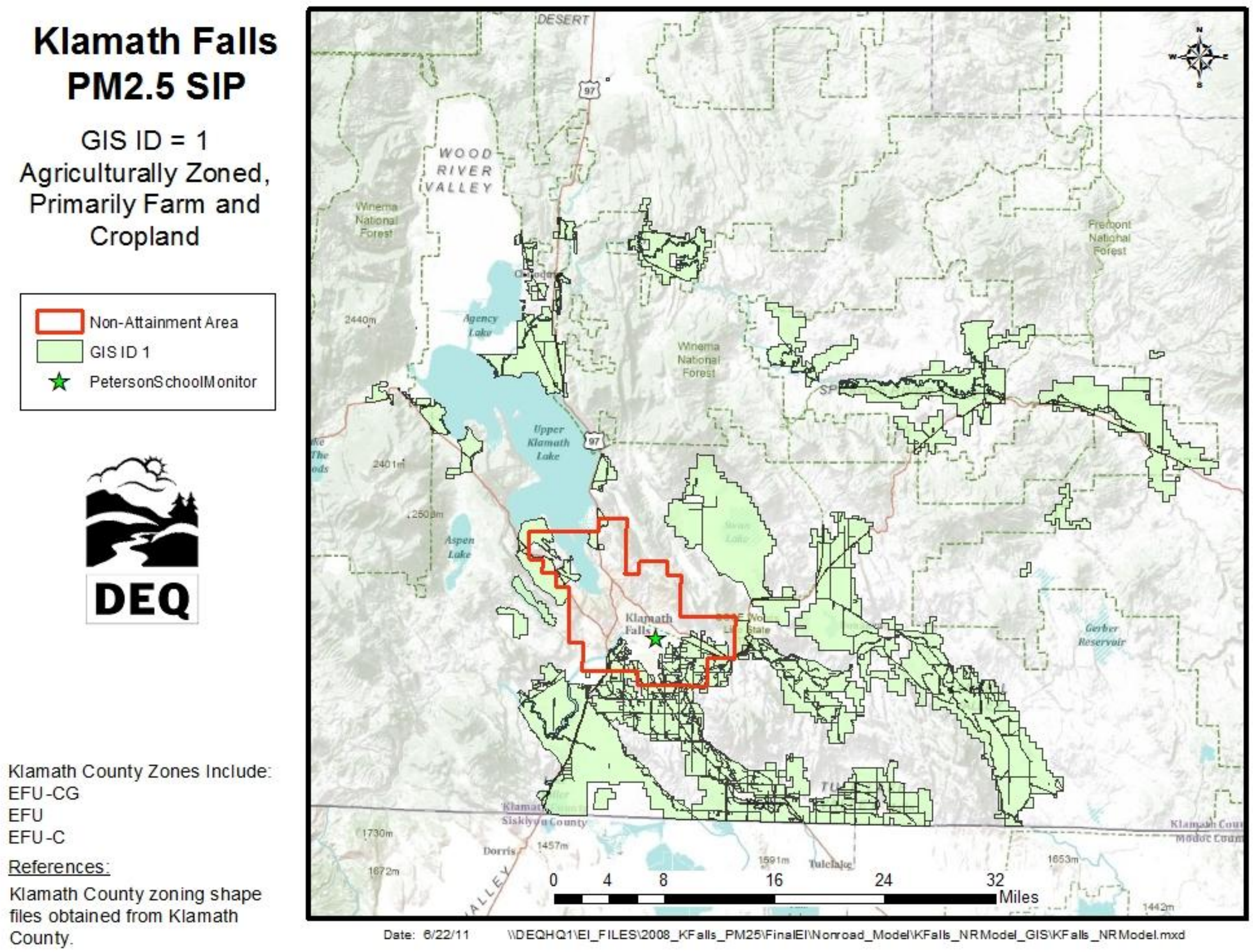
Appendix B, Figure B- 2. 2008 Wildfire/Prescribed Fire Locations and Dates



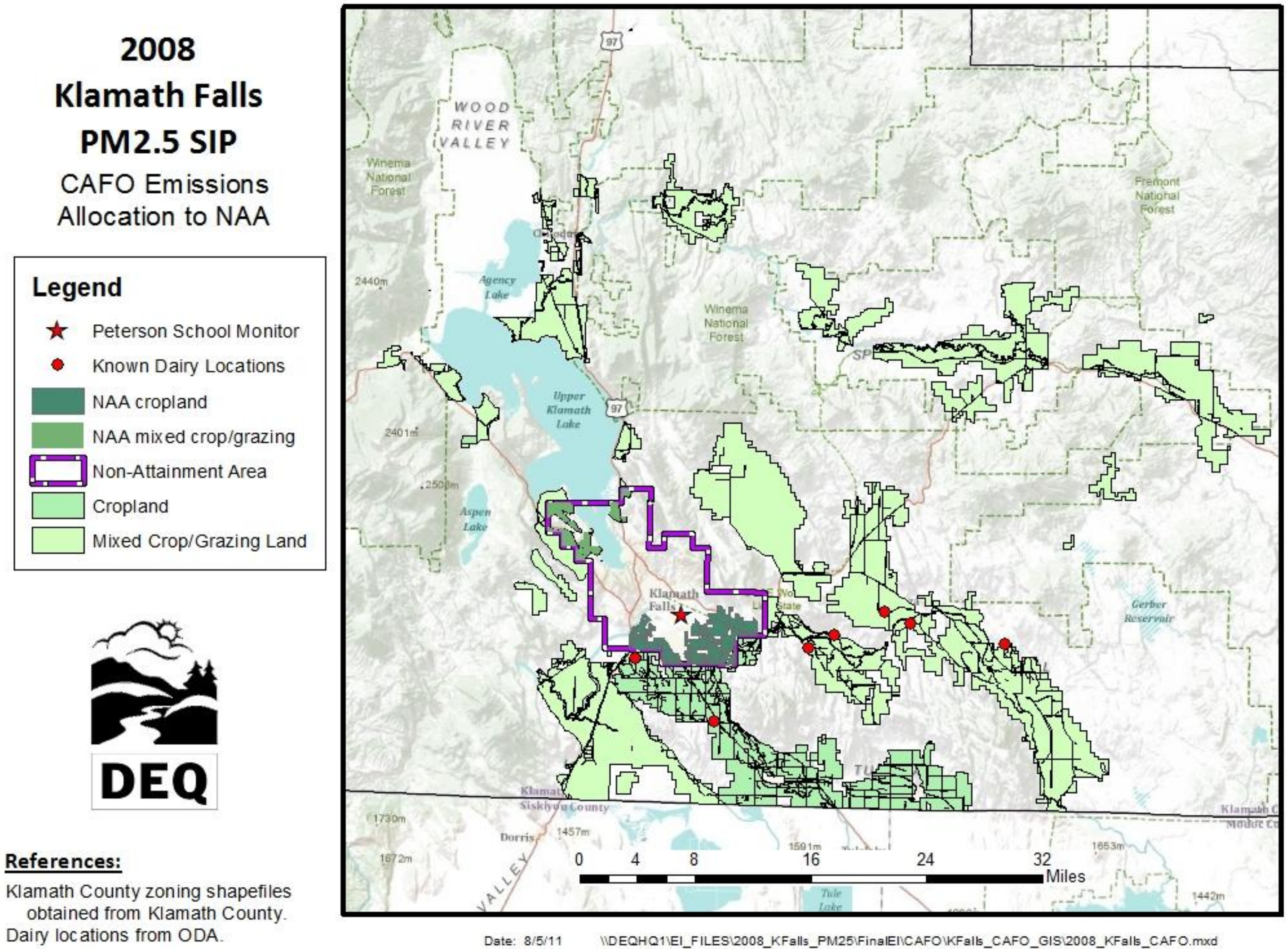
Appendix B, Figure B- 3. 2008 Agricultural Fire Locations and Dates

Klamath Falls PM2.5 SIP

GIS ID = 1
Agriculturally Zoned, Primarily Farm and Cropland



Appendix B, Figure B- 4. Agricultural Zoning, Primarily Farm and Cropland



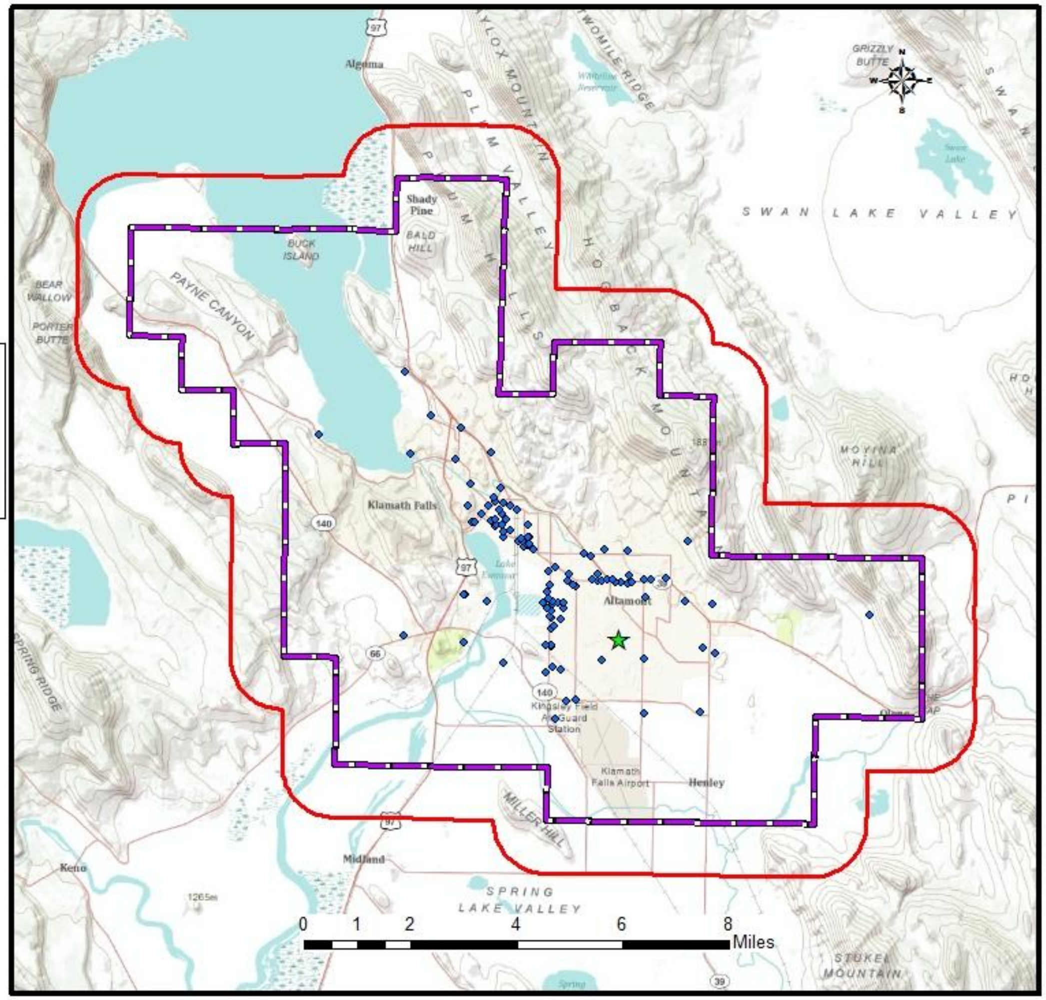
Appendix B, Figure B- 5. Concentrated Animal Feeding Operations (CAFO) and Agricultural Zoning, Cropland, and Mixed Crop and Grazing

Klamath Falls PM2.5 SIP

Non-Permitted Point Source Locations

PetersonSchoolMonitor
Nonattainment Area
1 Mile NAA Buffer
Non-Permitted Point Sources

DEQ



References:
ODOT

Date: 7/27/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Point\KFalls_Point_GIS\2008_KFalls_PM25_Point.mxd

Appendix B, Figure B- 6. Small, Non-Permitted Point Source Locations

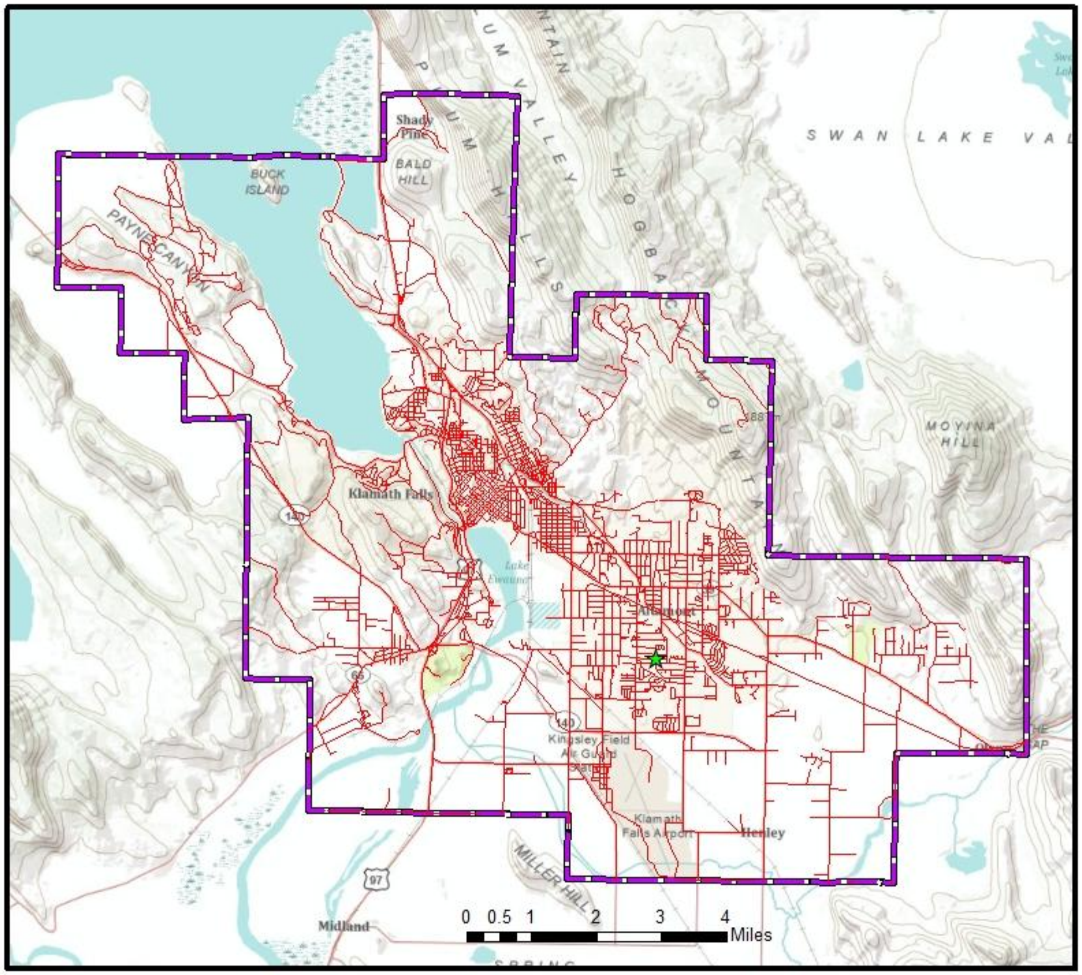
Klamath Falls PM2.5 SIP

Paving Asphalt
GIS Allocation

Legend

- Peterson School Monitor
- DEQ Roads Data: NAA
- Non-Attainment Area

DEQ

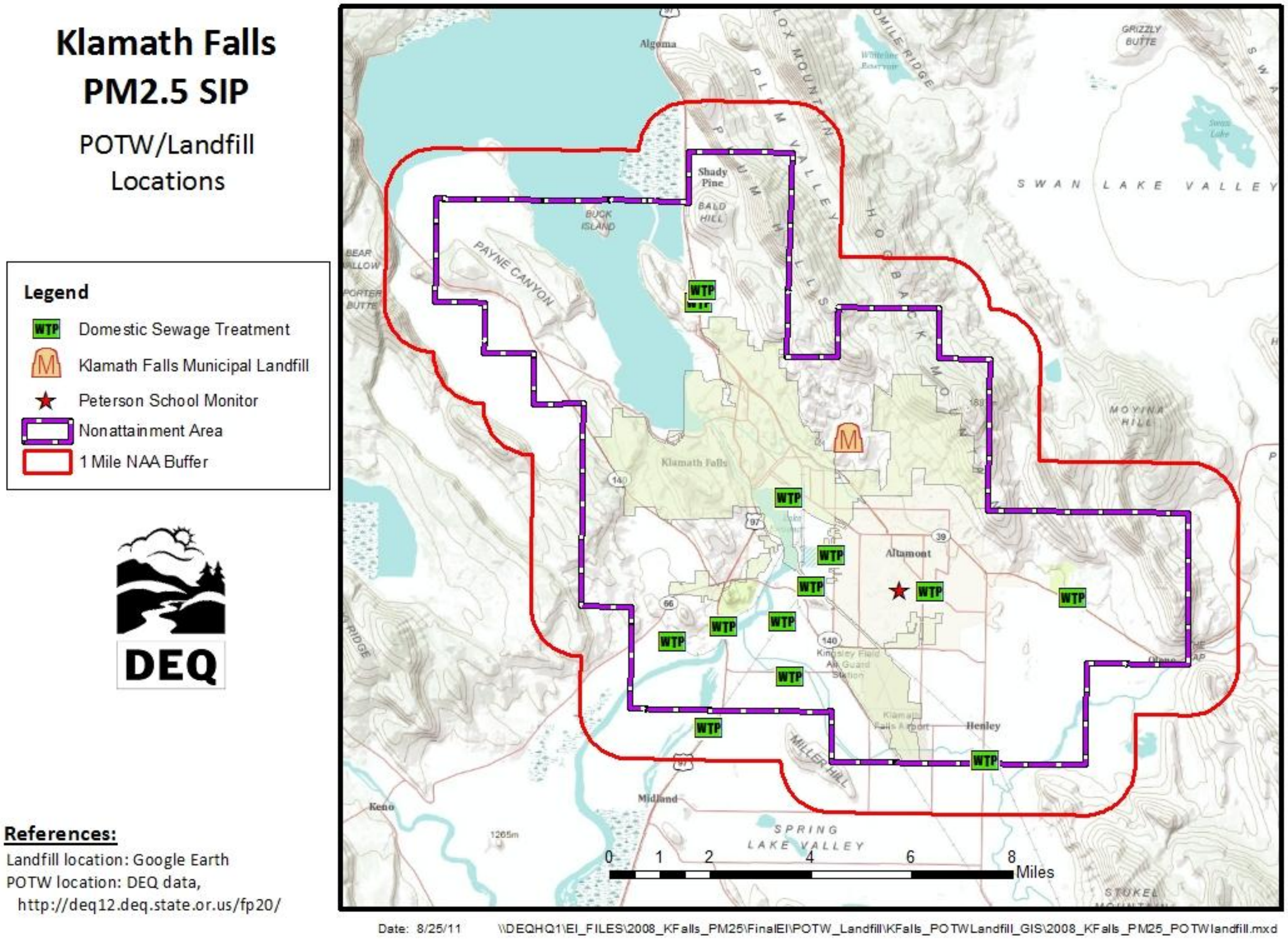


References:

Roadway shape files obtained from DEQ GISLibrary.

Date: 8/1/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Asphalt\KFalls_Asphalt_GIS\KFalls_Asphalt.mxd

Appendix B, Figure B- 7. Roadway (paving asphalt/traffic markings) Allocation



Appendix B, Figure B- 8. Domestic Sewage Treatment and Klamatrh Falls Municipal Landfill Locations

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: CONCENTRATED ANIMAL FEEDING OPERATIONS

DESCRIPTION OF SOURCE CATEGORY:

Concentrated animal feeding operations (CAFOs), including swine and poultry operations, and sheep, horse, and cattle feedlots, emit ammonia, H_2S, VOCs, “greenhouse” gases (CO_2 and CH_4), nitrous oxide , and PM.
Nitrous oxide is not a precursor for the formation of tropospheric ozone, but it is a greenhouse gas.
Volatile organic compounds (VOCs), sometimes referred to as reactive organic gases (ROGs), contribute to the formation of ozone, which is a criteria pollutant. Hydrogen sulfide is not listed as a criteria pollutant or HAP. However, it is a regulated pollutant because it is listed as having a New Source Performance Standard (NSPS).
It is likely to be added to the HAP list in the near future.

GENERAL DESCRIPTION OF EMISSION ESTIMATE METHODOLOGY –

DEQ noticed when comparing the permitted CAFO facilities with the county level animal population data from OSU that not all the animals are on a permitted facility. The numbers of animals at permitted facilities (ODA data) were summed by county and this number was subtracted from the OSU data. If the subtraction resulted in a negative number then the area source value was set to “0” and all the animals were assumed to be on a permitted facility. The OSU data covered more than the dairy, hog, poultry, and beef animal types and those animals were not affected by the point source calculation.

THROUGHPUT/ACTIVITY DATA:

Information Source –
County-level animal populations were obtained from OSU extension downloaded data for 2008.
Other data were obtained from the United States Department of Agriculture (USDA).

Web site:
Oregon Agricultural Information Network (OAIN):
http://oregonstate.edu/oain/

United States Department of Agriculture (USDA): http://www.nass.usda.gov/QuickStats/PullData_US_CNTY.jsp

EMISSION FACTOR:

There is no “Official” EPA emission factor or estimation method for calculating dairy emissions.
EPA encourages users to evaluate their own situation and determine the most appropriate method of estimating emissions. DEQ conducted a literature search and selected the best available emission factors from university published reports and the U.S. EPA. Emissions were calculated using the following formula:

Emissions= Number of animal * pollutant EF

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: CONCENTRATED ANIMAL FEEDING OPERATIONS, continued

Beef Emission Factors

SCC		2805001000	2805001100	2805001200	2805001300
		Beef Cattle Feedlots-Total	Beef cattle - finishing operations on feedlots (drylots) - Confinement [1]	Beef cattle - finishing operations on feedlots (drylots) - Manure handling and storage [1]	Beef cattle - finishing operations on feedlots (drylots) - Land application of manure [1]
Pollutant	Code	Emission Factor (Kg/hd-yr)			
NH_3 [1]	7664-41-7	20.91	11.36	0.00455	9.55
CH_4 [a]	74-82-8	85.34	—	—	—
PM10 [2]	PM10-PRI	1.09	—	—	—
H_2S [3].	7783-06-4	0.11	—	—	—
N_2O [4].	10024-97-2	3.65	—	—	—
VOC [5].	VOC	3.95	—	—	—
TOC [6].	TOC	72.73	—	—	—
ROC [6].	ROC	5.82	—	—	—

Note:

(1). Taken from the EPA AP-42. 9.4 Livestock & Poultry Feed Operations.
http://www.epa.gov/ttn/chief/ap42/ch09/index.html

(a). http://www.eqb.state.mn.us/geis/TWP_AirQuality.pdf (TABLE 5.9)

(2). USDA Report – UC Davis:
http://www.valleyair.org/busind/pto/dpag/FYI_%20Dairy_Feedlot_PM10_Emission_Factor.pdf
Livestock emission factors for PM10 re only available for cattle feedlots and dairies. This is from a study published by the University of California, Davis, during August 2001.
SAN JOAQUIN VALLEY and Texas A&M Univ.

(4). USDA, 2000; Grelinger, 1997. http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

(5). http://www.valleyair.org/farmpermits/applications/appendix/manual_emissions_calculator.pdf
San Joaquin Valley Air Pollution Control District. Emissions Calculations Sheets for CAFOs.

(6). TOC= total organic compounds: http://www.arb.ca.gov/ei/areasrc/districtmeth/Ventura/ventlivehus.pdf
ROC=Reative Oranic Compound

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: CONCENTRATED ANIMAL FEEDING OPERATIONS, continued

Swine Emission Factors

SCC		2805025000
		Swine production composite; Total
Pollutants	Pollutant Code	**Emission Factor (Kg/hd-yr)**
NH3 [(1)]	7664-41-7	5.757
VOC [(2)]	VOC	0.436
PM [(3)]	PM-PRI	1.600
CH4 [(4)]	74-82-8	1.500
H2S [(5)]	7783-06-4	2.382
N2O [(6)]	10024-97-2	0.031
TOC [(7)]	TOC	26.364
ROC [(7)]	ROC	2.091
CO2 [(8)]	124-38-9	3467

Note:

(1).Taken from the EAP AP-42. 9.4 Livestock & Poultry Feed Operations
http://www.epa.gov/ttn/chief/ap42/ch09/index.html

(2) Calculated using a volatile solids in manure to VOC conversion factor.

(3). http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

(4). http://www.ec.gc.ca/pdb/ghg/inventory_report/2004_report/ann13_e.cfm#sa13_5, And GHG\EPA_Guid_Tools\State Inventory Tools

(5). Jacobson, et al., 1999; Ni, et al., 2000;Pedersen, et al., 2000;USDA, 2000;Zhu et al., 2000.

(6). Calculated using nitrogen in manure to nitrous oxide conversion factor.
http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

(7). http://www.arb.ca.gov/ei/areasrc/districtmeth/Ventura/ventlivehus.pdf

(8). Lim et al. (1998) reported CO2 concentrations in fan exhaust from an 880 hd grow/finish swine building with total slotted floors and tunnel ventilation with curtain side walls.
http://www.airquality.nrcs.usda.gov/AAQTF/Archives/Old_Archives/2000/Policy/CAFO.htm

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: CONCENTRATED ANIMAL FEEDING OPERATIONS, continued

Poultry Emission Factors

SCC		Descripiton	NH3 (1) 7664-41-7	VOC (2) VOC	PM (3) PM-PRI	CH4 (4) 74-82-8	H2S (5) 7783-06-4	N2O (6) 10024-97-2	TOC (7) TOC	ROC ROC
			Emission Factor (Kg/hd-yr)							
Layers	2805030003	Poultry (Layers) Waste Emissions;Total	0.4227	0.0873	0.0373	0.3000	0.0002	0.0173	1.0909	0.0864
Layers	2805007100	Poultry production - layers with dry manure management system, Confinement	0.4045	—	—	—	—	—	—	—
Layers	2805007300	Poultry production - layers with dry manure management systems - Land application of manure	0.0182	—	—	—	—	—	—	—
Broilers	2805030004	Poultry (Broilers) Waste Emissions;Total	0.2000	0.0873	0.0373	0.0900	0.0002	0.0327	1.0909	0.0864
Broilers	2805009100	Poultry production - broilers - Confinement	0.1000	—	—	—	—	—	—	—
Broilers	2805009200	Poultry production - broilers - Manure handling and storage	0.0182	—	—	—	—	—	—	—
Broilers	2805009300	Poultry production - broilers - Land application of manure	0.0818	—	—	—	—	—	—	—

Note:

(1). Taken from the EPA AP-42. 9.4 Livestock & Poultry Feed Operations.
http://www.epa.gov/ttn/chief/ap42/ch09/index.html

(Ref.669) - ODA- William Matthews
Oregon is that all of our layer chicken facilities are a dry systems. The manure is deposited directly from the chickens, through the grates in the cage bottoms, into deep pit manure storage located below the building. There is not liquid or free water in this manure and it remains dry, 15 to 25 % moisture. Additional good news is that all of the broiler chicken systems in Oregon are also dry (litter) systems.
Broiler chickens live a a large free floor house and deposit their manure directly on a bed of sawdust, shavings or rice hulls. The manure cake is removed from the houses periodically and about once a year, all the manure and sawdust is removed. All manure and sawdust is dry.

2). San Joaquin Valley APCD, US EPA :
http://www.aqmd.gov/titlev/spreadsheets/AgScreeningCalculatorRev1Area2.xls and CAFO Document - CARBAnimalHusbandrySec7-6.pdf (Discussed with Jeffrey STOCUM.)

(3). EMISSION FROM ANIMAL FEEDING OPERATION :
http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf (Grub, et al, 1965, Takai et al., 1998.)

(4). http://www.factoryfarm.org/docs/dairy_paper_sectI_III_IV.doc . Source: Jacobson, Larry D., et al., Generic Environmental Impact Statement on Animal Agriculture, University of Minnesota, College of Agriculture,

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: CONCENTRATED ANIMAL FEEDING OPERATIONS, continued

Food, and Environmental Sciences, http://www.mnplan.state.mn.us/eqb/scoping.html, September, 1999, p. H-41.

(5). http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf , http://www.iowadnr.com/air/afo/files/section3.pdf

(6). Calculated using a nitrogen in manure to nitrous oxide conversion factor. See Section 8.2.2. http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

(7). 2002 Livestock husbandry process rates, Emission factors, and Emissions.
TOC= total organic compounds. ROC=reactive organic compound

Sheep-Horses-Goats Emission Factors

Pollutants	SCC	**2805040000** Sheep and lamb production composite; Total
	Pollutant Code	Emission Factor (Kg/hd-yr)
NH_3 (1)	7664-41-7	3.38
ROC (2)	ROC	0.44
CH_4 (3)	74-82-8	8.00
TOC (4)	TOC	5.45
ROC (4)	ROC	0.44
H_2S	7783-06-4	—
N_2O	10024-97-2	—
PM10	PM10-PRI	—

Note:

(1).Taken from the EAP AP-42. 9.4 Livestock & Poultry Feed Operations http://www.epa.gov/ttn/chief/ap42/ch09/index.html

(2). ROC= ROC=REACTIVE ORGANIC COMPOUND.

(3). State GreenHouse Inventory Tool - Methan: H:\GHG\EPA_Guid_Tools\State Inventory Tools and Crutzen et al. (1986)

(4). http://www.arb.ca.gov/ei/areasrc/districtmeth/Ventura/ventlivehus.pdf
TOC= total organic compounds. ROC=reactive organic compound

PREPARED BY: MYP

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: COMMERCIAL PESTICIDE APPLICATION

DESCRIPTION OF SOURCE CATEGORY:
VOCs are the emissions of concern from Agricultural Pesticide Application, which include application of insecticides, herbicides, fungicides and other chemicals. These chemicals are applied to protect crops from insect pests, limit competition from other growing plants, and prevent reduction in quality from fungus growth. Formulations of pesticides are made through the combination of pest-killing material, referred to as the active ingredient, and various solvents acting as carriers for the pest-killing material, referred to as the inert ingredient. Both types of ingredients contain volatile organic compounds (VOCs) that can potentially be emitted to the air either during application or as a result of evaporation. Agricultural applications of pesticides can be from the ground or from the air, and can be applied as sprays, dusts, pellets, fogs, or through other dispersion techniques.

GENERAL DESCRIPTION OF EMISSION ESTIMATE METHODOLOGY:
Activity, in the form of pesticide applied (pounds of active ingredient) was obtained from ODA for each water basin. The water basin data was then spatially allocated to the county-level via GIS by DEQ. The GIS data was obtained from Steven Aalbers (DEQ-HQ, Information Coordinator\GIS, Drinking Water Protection Program). The VOC emissions are based on the amount of active ingredient applied. The ODA active ingredient chemical list for pesticides are considered to be representative of the chemicals applied on that water basin in Oregon. The VOC emissions are calculated by combining the application rate from ODA, and emission factors for the active and inert ingredients based on information from the EPA (EIIP)[(321)] and other information.

THROUGHPUT/ACTIVITY DATA:
Information Source
Data for pounds of active ingredient applied, by chemical name, is from the Oregon Department of Agriculture (ODA)[(725)].
The ODA files are found here: H:\2008_NEI\AREA\Pesticides\Draft_Work\Supporting_Data\ODA_Original-aibywaterbasin2008.xlsx
Data was supplied by water basin and was then spatially allocated to county-level.
The allocation files are found here.
H:\2008_NEI\AREA\Pesticides\Draft_Work\Supporting_Data\Steven Albers-WaterBasin-data.xlsx

Adjustments/Modifications

Inert ingredients
The EIIP formula described below in the emission factor section requires the volatile percentage of the inert ingredients. The amount of inert ingredient had to be estimated because data provided by ODA only included the amount of active ingredient applied. Washington State University maintains a database (PICOL) that contains information taken from the chemical manufacturers' product labels. It can be found at the following website: http://cru66.cahe.wsu.edu/labels/Labels.php?SrchType=A
In addition, information was obtained from the Wisconsin Department of Agriculture, Trade and Consumer Protection: http://www.kellysolutions.com/WI/searchbychem.asp
This database can be searched by chemical name to show percentages of active ingredients, and was used to calculate percentages of inert ingredients.

Active Ingredients

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: COMMERCIAL PESTICIDE APPLICATION, continued

The percentages of active ingredient taken from the PICOL database and the Wisconsin Department of Agriculture are assumed to be acceptable approximations. And EPA website.
Web sites:
WSU PICOL: http://wsprs.wsu.edu/Pesticides.html
Wisconsin Department of Agriculture: http://www.kellysolutions.com,
EPA: (http://www.epa.gov/opprd001/factsheets/ . This page contains fact sheets on new active ingredients registered by the Office of Pesticide Programs under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). They are currently updating this web site to include risk assessments for new chemicals registered from Fiscal Year 2005 to the present.

Assumptions

The ODA chemical list for active ingredients are considered to be representative of the chemicals used on that water basin in Oregon.

EMISSION FACTOR:

Information Source

Emission Inventory Improvement Program, Volume III, chapter 9. Ref.321

Adjustments/Modifications

Active ingredient of the pesticide applied.

$\underline{E_a = R_a \times EF}$

Where:

E_a = Emission from the active ingredient (lbs)
R_a = Active ingredient applied per year per county (lbs)
EF_a= Emission factor (lbs/ton) from Table 9.4-4 base on vapor pressure of active ingredient. (Ref.321)

Inert ingredient of the pesticide applied.

$\underline{E_i = (R_a/P_a) \times P_i \times EF_i}$

Where:

E_i = Emissions from the inert ingredient (lbs)
R_a = Active ingredient applied per year per county (lbs)
P_a = Percentage Active Ingredient
P_i = Percentage of Inert ingredient

EF_i = Emission factor (%) from Table 9.4-3 based on formulation type (Ref.321)

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: COMMERCIAL PESTICIDE APPLICATION, continued

Table 9.4-3. Average VOC Content of Pesticide Inert Ingredient Portion, By Formulation Type

Formulation Type	Average VOC Content Of Inert Portion (wt. %)
Oils	66
Solution/liquid (ready to use)	20
Emulsifiable concentrate	56
Aqueous concentrate	21
Gel, paste, cream	40
Pressurized gas	29
Flow able (aqueous) concentrate	21
Microencapsulated	23
Pressurized liquid/sprays/foggers	39
Soluble pow der	12
Impregnated material	38
Pellet/tablet/cake/briquette	27
Wettable pow der	25
Dust/pow der	21
Dry flow able	28
Granule/flake	25
Suspension	15
Paint/coatings	64

http://www.epa.gov/ttn/chief/eiip/techreport/volume03/iii09_jun2001.pdf

Table 9.4-4. Uncontrolled emission factors for pesticide active ingredients

Vapor Pressure Range (mm Hg at 20 to 25 C)b	Emission Factorc (a) lb/ton
Surface application:(SCC 24-61-800-001)	
1 x 10-4 to 1 x 10-6	700
>1 x 10-4	1,160
Soil incorporation: (SCC 24-61-800-002)	
<1 x 10-6	5.4
1 x 10-4 to 1 x 10-6	42
>1 x 10-4	104

Note: Taken from EIIP Volume III. Table 9.4-4. (page9.4-22). Ref.321.
Emission factor based on vapor pressure of active ingredient.
http://www.epa.gov/ttn/chief/eiip/techreport/volume03/iii09_jun2001.pdf

The initial data obtained from the Wisconsin Department of Agriculture, PICOL, and National Agricultural Statistics Service (NASS) was in pounds of active ingredient. The amount of total pesticide applied can be calculated by dividing the amount of active ingredient by the % of active ingredient in total pesticide. This number can then be multiplied by the % of inactive ingredient to estimate the amount of inactive ingredient applied. The amount of inactive ingredient multiplied by the fraction of VOC in the product formulation from EIIP.Table 9.4-3 then gives the emissions from the inactive ingredient. The VOCs from the active and inactive portions are then added together to estimate total VOC emissions.

Assumptions

The percentages of inert ingredient taken from the PICOL database and the Wisconsin Department of Agriculture are assumed to be acceptable approximations.

APPENDIX B, DETAILED METHODOLOGY DESCRIPTIONS: COMMERCIAL PESTICIDE APPLICATION, continued

Web sites:
WSU PICOL: http://wsprs.wsu.edu/Pesticides.html
Wisconsin Department of Agriculture: http://www.kellysolutions.com,

COMMENTS AND RECOMMENDATIONS:
This was a very intensive process that results in only an approximation. If we get more detailed information for the fractions of the active ingredients in pesticides, there may be more accurate methods to calculate these emissions. Also, because ODA only provides the amount of each chemical state wide, it was difficult to determine the type of application (insecticide, herbicide, fungicide, pesticide) and formulation. In this inventory, an average type of pesticide was used.

REFERENCES:
http://www.kellysolutions.com/WI/
http://www.epa.gov/oppsrrd1/REDs/formetanatehcl_ired.pdf

PREPARED BY:
Initials: MYP
Date: February/2/2011

APPENDIX C: NONROAD VEHICLES AND EQUIPMENT

- Appendix C Tables

- Appendix C Figures

Appendix C, Table C- 1. NONROAD2008a Klamath County Fuel and Temperature Parameter Inputs

	(1)	(2)	(1)	(3)	(4)	(5)	(6)	(6)	(6)	(7)	(8)	(1)
	Gasoline	Oxygen	------------ Fuel Sulfur ------------				------- Temperature -------			Stage II		
			Gas	Diesel	Marine Diesel	CNG / LPG	Avg Max T	Avg Min T	Avg T	Control	------- EtOH -------	
2008	RVP	(wt%)	(wt%)	(wt%)	(wt%)	(wt%)	(F)	(F)	(F)	(%)	(blend mkt %)	(vol %)
Annual	10.81	2.14	0.00425	0.0355	0.0435	0.0123	59.7	32.2	46.2	0	61	10
Typical Season Day	12.90	2.24	0.00425	0.0355	0.0435	0.0123	41.7	21.5	31.9	0	64	10
Worst Case Season Day	13.95	3.43	0.00425	0.0355	0.0435	0.0123	37.1	18.6	28.1	0	98	10

	(1)	(2)	(1)	(3)	(4)	(5)	(6)	(6)	(6)	(7)	(8)	(1)
	Gasoline	Oxygen	------------ Fuel Sulfur ------------				---------- Temperature ----------			Stage II		
			Gas	Diesel	Marine Diesel	CNG / LPG	Avg Max T	Avg Min T	Avg T	Control	------- EtOH -------	
2014	RVP	(wt%)	(wt%)	(wt%)	(wt%)	(wt%)	(F)	(F)	(F)	(%)	(blend mkt %)	(vol %)
Annual	11.70	3.43	0.00270	0.0011	0.0052	0.0123	59.7	32.2	46.2	0	98	10
Typical Season Day	14.10	3.43	0.00277	0.0011	0.0052	0.0123	41.7	21.5	31.9	0	98	10
Worst Case Season Day	15.30	3.43	0.00280	0.0011	0.0052	0.0123	37.1	18.6	28.1	0	98	10

Notes for Table C-1

(1) Gasoline parameters are from the EPA National County Database (NCD), and are specific to Klamath County, Oregon (DEQ Ref. 791)

Shaded cells are those months of the PM season (Nov-Feb).

	---------- 2008 ----------			---------- 2014 ----------				---------- 2008 ----------			---------- 2014 ----------		
Month	Gas Sulfur	RVP	ETOH Volume	Gas Sulfur	RVP	ETOH Volume	Month	Gas Sulfur	RVP	ETOH Volume	Gas Sulfur	RVP	ETOH Volume
1	42.493	13.951	10	28	15.3	10	7	42.493	9.06	10	26.5003	9.7	10
2	42.493	11.855	10	27.357	12.9	10	8	42.493	9.06	10	26.5003	9.7	10
3	42.493	11.855	10	27.357	12.9	10	9	42.493	9.06	10	26.5003	9.7	10
4	42.493	11.855	10	27.357	12.9	10	10	42.493	9.06	10	26.5003	9.7	10
5	42.493	9.06	10	26.5	9.7	10	11	42.493	11.86	10	27.3573	12.9	10
6	42.493	9.06	10	26.5	9.7	10	*12*	*42.493*	*13.95*	*10*	*28*	*15.3*	*10*

(a) *Italics* indicate month of 2008 worst case day, Dec 17, based on Heating Degree Day (HDD) data. See Appendix C, Table C-3.

(2) Gasoline Oxygen wt% = (EtOH blend market %) * (EtOH volume %) * 0.35 * 0.01

This formula is provided in EPA NONROAD2008a. See note (1) for EtOH volume % and note (*) for EtOH blend market %

(3) Land diesel fuel parameters are from the EPA National County Database (NCD), and are specific to Klamath County, Oregon (DEQ Ref. 791)

(4) Marine diesel sulfur content is from EPA-420-B-09-018 (DEQ Ref. 738)

(5) CNG/LPG sulfur content is a conservative high estimate (maximum amount allowable) of 123 ppm for HD5 propane (LPG) rated for engine use. (DEQ Ref. 512e)

(6) Average Max, Average Min, and Average Temperatures are from Appendix C, Tabel C-2.

(7) Stage II controls not implemented in Klamath Falls

(8) EtOH market share is estimated as follows

Shaded cells are those months of the PM season (Nov-Feb). *Italics indicate month of 2008 worst case day (Dec 17, see endnote 1a).*

Month	(a) **2008**	(a) **2014**	**Month**	(a) **2008**	(a) **2014**
1	30%	98%	7	64%	98%
2	30%	98%	8	98%	98%
3	30%	98%	9	98%	98%
4	30%	98%	10	98%	98%
5	30%	98%	11	98%	98%
6	30%	98%	*12*	*98%*	*98%*

(a) As of July 15, 2008, all retail, nonretail, or wholesale dealers within Klamath County may only sell or offer for sale gasoline that contains 10% EtOH by volume (DEQ Ref. 739). 2% estimated to represent exempt marina dealers. Previous to July 15, 2008, a market share of 30% has been estimated by DEQ (DEQ Ref. 580a).

Appendix C, Table C- 2. Average Maximum, Average Minimum, and Average Temperature Data: Kingsley Field

	----- Avg Max Temp (F) -----				----- Avg Min Temp (F) -----				------- Avg Temp (F) -------			
Month	**2005**	**2008**	**2009**	**Avg**	**2005**	**2008**	**2009**	**Avg**	**2005**	**2008**	**2009**	**Avg**
Jan	38.3	32.5	42.3	37.7	19.4	16.0	22.5	19.3	29.1	24.5	32.6	28.7
Feb	48.4	38.4	45.3	44.1	24.5	16.5	25.8	22.3	36.6	27.7	35.8	33.4
Mar	55.3	46.2	47.5	49.7	26.2	23.5	25.5	25.1	41.0	35.1	36.7	37.6
Apr	55.1	53.9	58.3	55.8	28.7	25.4	26.8	26.9	42.1	39.8	42.9	41.6
May	63.2	65.7	69.3	66.1	39.5	37.2	39.0	38.5	51.6	51.7	54.4	52.6
Jun	68.4	74.2	72.5	71.7	39.5	40.2	44.6	41.4	54.2	57.4	58.7	56.8
Jul	85.9	83.9	86.5	85.4	50.1	49.4	50.2	49.9	68.2	66.9	68.6	67.9
Aug	84.3	82.5	82.0	82.9	47.9	48.2	46.5	47.5	66.4	65.6	64.5	65.5
Sep	71.4	79.6	79.6	76.9	37.2	41.0	41.0	39.7	54.5	60.5	60.5	58.5
Oct	61.8	61.6	59.3	60.9	30.3	32.2	31.4	31.3	46.4	47.1	45.5	46.3
Nov	45.4	51.0	47.8	48.0	25.7	28.4	23.9	26.0	35.8	40.0	36.1	37.3
Dec	38.5	36.7	36.0	*37.1*	23.4	16.4	16.0	*18.6*	31.2	26.9	26.3	*28.1*
				-------				-------				-------
Annual Average			Max	59.7			Min	32.2			Avg	46.2
Typical Season Day Average			Max	41.7			Min	21.5			Avg	31.9
Worst Case Season Day Average			Max	37.1			Min	18.6			Avg	28.1

Source: National Climactic Data Center, NOAA. http://www.ncdc.noaa.gov

Shaded cells indicate PM season (Nov - Feb)

Italicised numbers indicate worst case day temperature used, Dec. 17th. See Appendix C, Table C-3.

Temperature data calculations are in Reference 792.

Appendix C, Table C- 3. Maximum and Average Heating Degree Day Estimates

Seasonal

	Klamath Falls Airport (1)			Peterson School Calcuated HDD			Avg.
Month	2005	2008 (2)	2009	2005 (3)	2008 (3)	2009 (3)	
Jan	1,113	1,256	1,003	1,097	1,187	1036	
Feb	794	1,083	789	840	994	842	
Mar	744	926	876	754	922	875	
Apr	686	755	664	679	727	629	
May	419	426	332	425	372	291	
Jun	325	255	198	311	177	172	
Jul	15	13	46	(128)	(117)	-159	
Aug	31	67	75	(73)	(50)	-1	
Sept	316	170	144	309	132	136	
Oct	578	534	603	603	535	608	
Nov	877	751	867	904	774	876	
Dec	1,047	1182	1,200	1,072	1,146	1165	
Average:	-----	-----	-----	-----	-----	-----	
Annual	6,945	7,418	6,797	6,795	6,798	6,470	6,871
Season	3,831	4,272	3,859	3,913	4,101	3,920	3,983
Season Day	32	36	32	33	34	33	33

(1) Source of data is "Climatological Data Annual Summary, Oregon" (Ref. 93)
Data Generated from NWS at this website
http://www.weather.gov/climate/index.php?wfo=mfr
Preliminary Climatology Data (CF6)
(2) Oct 1 through 21 only - Oct 22-31 estimated based on annual polynomial regression to 2005 and 2008
Peterson School - average of y = -0.0023x^2 + 1.2183x - 5.7252 &
y = -0.0022x^2 + 1.1753x - 2.871
(3) Taken from DEQ's LASAR Data Base in degrees C - used 9/5C+32 to calc F; calc 65F-Daily Av F = HDD
Jan 15-17, 2008 missing and Sept 9 missing - estimated based on annual polynomial regression of 2008 &
2008 to airport - average of y 0.0026*x^2 + 0.7532*x + 6.3716 &
y = 0.003*x^2 + 0.7397*x + 5.0425

Maximum

	December 17, 2008 Peterson Elementary/4856 Clinton St.		December 17, 2008 Klamath Falls Airport		Avg.
	Mean Temperature (1)	Max. Daily HDD for 2008 (2)	Mean Temperature (2)	Max. Daily HDD for 2008 (2)	
	5	60	5	60	60

Notes:
1) Data from EPA AIRS Raw Data Report 1-hour listing (Ref. 475)
2) Data from Climatological Data Annual Summary, Oregon (Ref. 93)
Data Generated from NWS at this website
http://www.weather.gov/climate/index.php?wfo=mfr
Preliminary Climatology Data (CF6)
and DEQ LASAR data base
http://www.deq.state.or.us/news/databases.htm

Appendix C, Table C- 4. NONROAD2008a Output, Klamath County, 2008. Gasoline 2-Stroke Annual

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2260001010	Recreational Equipment	Motorcycles: Off-road	3.6E+00	1.1E+02	4.7E-01	1.0E-02
2260001020	Recreational Equipment	Snowmobiles	1.5E+00	6.6E+01	9.5E-01	3.0E-02
2260001030	Recreational Equipment	All Terrain Vehicles	4.6E+00	1.4E+02	6.4E-01	9.3E-03
2260001060	Recreational Equipment	Specialty Vehicles/Carts	6.7E-03	9.0E-01	2.1E-01	1.4E-03
2260002006	Construction and Mining Equipment	Tampers/Rammers	7.1E-02	6.0E-01	1.2E-02	1.5E-04
2260002009	Construction and Mining Equipment	Plate Compactors	2.5E-03	1.9E-02	7.1E-04	9.7E-06
2260002021	Construction and Mining Equipment	Paving Equipment	3.0E-03	2.3E-02	8.5E-04	1.2E-05
2260002027	Construction and Mining Equipment	Signal Boards/Light Plants	2.3E-05	1.9E-04	6.1E-06	8.2E-08
2260002039	Construction and Mining Equipment	Concrete/Industrial Saws	1.9E-01	1.3E+00	2.8E-02	3.8E-04
2260002054	Construction and Mining Equipment	Crushing/Processing Equipment	6.2E-04	4.6E-03	1.7E-04	2.3E-06
2260003030	Industrial Equipment	Sweepers/Scrubbers	1.2E-03	9.6E-03	3.3E-04	4.4E-06
2260003040	Industrial Equipment	Other General Industrial Equipment	9.8E-05	7.5E-04	2.6E-05	3.6E-07
2260004015	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Residential)	1.8E-02	2.5E-01	4.3E-03	6.7E-05
2260004016	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Commercial)	1.3E-02	1.4E-01	3.5E-03	5.1E-05
2260004020	Lawn and Garden Equipment	Chain Saws < 6 HP (Residential)	2.4E-01	3.2E+00	6.4E-02	9.3E-04
2260004021	Lawn and Garden Equipment	Chain Saws < 6 HP (Commercial)	2.7E-01	2.3E+00	4.2E-02	5.7E-04
2260004025	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Residential)	3.4E-01	4.1E+00	9.0E-02	1.3E-03
2260004026	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Commercial)	1.4E-01	1.2E+00	3.7E-02	5.0E-04
2260004030	Lawn and Garden Equipment	Leafblowers/Vacuums (Residential)	2.1E-01	2.6E+00	5.7E-02	8.3E-04
2260004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	1.6E-01	1.3E+00	3.5E-02	4.7E-04
2260004035	Lawn and Garden Equipment	Snowblowers (Residential)	8.0E-02	3.3E+00	2.2E-02	4.0E-04
2260004036	Lawn and Garden Equipment	Snowblowers (Commercial)	2.9E-02	1.1E+00	8.0E-03	1.5E-04
2260004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	5.6E-05	3.9E-04	1.6E-05	2.2E-07
2260005035	Agricultural Equipment	Sprayers	1.8E-02	1.3E-01	5.0E-03	6.8E-05
2260006005	Commercial Equipment	Generator Sets	2.1E-02	1.9E-01	5.9E-03	8.1E-05
2260006010	Commercial Equipment	Pumps	1.5E-01	1.4E+00	4.0E-02	5.4E-04
2260006015	Commercial Equipment	Air Compressors	5.9E-05	5.3E-04	1.6E-05	2.2E-07
2260006035	Commercial Equipment	Hydro-power Units	9.0E-04	8.4E-03	2.4E-04	3.3E-06
2260007005	Logging Equipment	Chain Saws : 6 HP	2.3E+00	1.8E+01	3.3E-01	4.6E-03
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2008 Total Tons Per Year			**13.9**	**351.5**	**3.1**	**0.1**

Appendix C, Table C- 5. NONROAD2008a Output, Klamath County, 2008. Gasoline 2-Stroke Typical Season Day

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2260001010	Recreational Equipment	Motorcycles: Off-road	8.1E+00	2.4E+02	1.1E+00	2.3E-02
2260001020	Recreational Equipment	Snowmobiles	2.6E+01	1.1E+03	1.7E+01	5.1E-01
2260001030	Recreational Equipment	All Terrain Vehicles	1.0E+01	3.1E+02	1.5E+00	2.1E-02
2260001060	Recreational Equipment	Specialty Vehicles/Carts	1.5E-02	1.9E+00	4.8E-01	3.2E-03
2260002006	Construction and Mining Equipment	Tampers/Rammers	3.8E-01	3.2E+00	6.4E-02	8.1E-04
2260002009	Construction and Mining Equipment	Plate Compactors	1.4E-02	9.9E-02	3.9E-03	5.2E-05
2260002021	Construction and Mining Equipment	Paving Equipment	1.6E-02	1.2E-01	4.6E-03	6.2E-05
2260002027	Construction and Mining Equipment	Signal Boards/Light Plants	1.2E-04	1.0E-03	3.3E-05	4.4E-07
2260002039	Construction and Mining Equipment	Concrete/Industrial Saws	1.0E+00	7.1E+00	1.5E-01	2.1E-03
2260002054	Construction and Mining Equipment	Crushing/Processing Equipment	3.3E-03	2.4E-02	9.1E-04	1.2E-05
2260003030	Industrial Equipment	Sweepers/Scrubbers	6.3E-03	5.0E-02	1.7E-03	2.3E-05
2260003040	Industrial Equipment	Other General Industrial Equipment	5.1E-04	3.9E-03	1.4E-04	1.9E-06
2260004015	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Residential)	1.8E-02	2.9E-01	4.5E-03	7.0E-05
2260004016	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Commercial)	2.0E-02	2.0E-01	5.3E-03	7.7E-05
2260004020	Lawn and Garden Equipment	Chain Saws < 6 HP (Residential)	1.0E+00	1.4E+01	2.8E-01	4.0E-03
2260004021	Lawn and Garden Equipment	Chain Saws < 6 HP (Commercial)	1.7E+00	1.4E+01	2.6E-01	3.6E-03
2260004025	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Residential)	3.5E-01	4.8E+00	9.4E-02	1.3E-03
2260004026	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Commercial)	2.1E-01	1.8E+00	5.6E-02	7.5E-04
2260004030	Lawn and Garden Equipment	Leafblowers/Vacuums (Residential)	2.2E-01	3.4E+00	6.0E-02	8.6E-04
2260004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	2.4E-01	1.9E+00	5.3E-02	7.0E-04
2260004035	Lawn and Garden Equipment	Snowblowers (Residential)	1.4E+00	5.3E+01	3.8E-01	6.9E-03
2260004036	Lawn and Garden Equipment	Snowblowers (Commercial)	7.3E-01	2.7E+01	2.0E-01	3.6E-03
2260004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	8.4E-05	5.9E-04	2.4E-05	3.3E-07
2260005035	Agricultural Equipment	Sprayers	2.8E-02	2.1E-01	7.9E-03	1.1E-04
2260006005	Commercial Equipment	Generator Sets	1.4E-01	1.2E+00	3.9E-02	5.2E-04
2260006010	Commercial Equipment	Pumps	1.0E+00	8.9E+00	2.6E-01	3.5E-03
2260006015	Commercial Equipment	Air Compressors	3.8E-04	3.4E-03	1.0E-04	1.4E-06
2260006035	Commercial Equipment	Hydro-power Units	5.8E-03	5.5E-02	1.6E-03	2.1E-05
2260007005	Logging Equipment	Chain Saws : 6 HP	1.5E+01	1.2E+02	2.2E+00	3.0E-02
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2008 Total lbs per day			**67**	**1,907**	**24**	**1**

Appendix C, Table C- 6. NONROAD2008a Output, Klamath County, 2008. Gasoline 2-Stroke Worst-Case Season Day

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2260001010	Recreational Equipment	Motorcycles: Off-road	8.1E+00	2.4E+02	1.2E+00	2.3E-02
2260001020	Recreational Equipment	Snowmobiles	2.6E+01	1.1E+03	1.9E+01	5.1E-01
2260001030	Recreational Equipment	All Terrain Vehicles	1.0E+01	3.0E+02	1.7E+00	2.1E-02
2260001060	Recreational Equipment	Specialty Vehicles/Carts	1.5E-02	1.8E+00	5.6E-01	3.2E-03
2260002006	Construction and Mining Equipment	Tampers/Rammers	3.8E-01	3.2E+00	7.4E-02	8.1E-04
2260002009	Construction and Mining Equipment	Plate Compactors	1.4E-02	9.9E-02	4.5E-03	5.2E-05
2260002021	Construction and Mining Equipment	Paving Equipment	1.6E-02	1.2E-01	5.4E-03	6.2E-05
2260002027	Construction and Mining Equipment	Signal Boards/Light Plants	1.2E-04	1.0E-03	3.8E-05	4.4E-07
2260002039	Construction and Mining Equipment	Concrete/Industrial Saws	1.0E+00	7.0E+00	1.8E-01	2.1E-03
2260002054	Construction and Mining Equipment	Crushing/Processing Equipment	3.3E-03	2.4E-02	1.1E-03	1.2E-05
2260003030	Industrial Equipment	Sweepers/Scrubbers	6.3E-03	4.9E-02	2.0E-03	2.3E-05
2260003040	Industrial Equipment	Other General Industrial Equipment	5.1E-04	3.8E-03	1.6E-04	1.9E-06
2260004015	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Residential)	1.8E-02	2.8E-01	5.3E-03	7.0E-05
2260004016	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Commercial)	2.0E-02	2.0E-01	6.2E-03	7.7E-05
2260004020	Lawn and Garden Equipment	Chain Saws < 6 HP (Residential)	1.0E+00	1.4E+01	3.2E-01	4.0E-03
2260004021	Lawn and Garden Equipment	Chain Saws < 6 HP (Commercial)	1.7E+00	1.4E+01	3.0E-01	3.6E-03
2260004025	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Residential)	3.5E-01	4.7E+00	1.1E-01	1.3E-03
2260004026	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Commercial)	2.1E-01	1.8E+00	6.4E-02	7.5E-04
2260004030	Lawn and Garden Equipment	Leafblowers/Vacuums (Residential)	2.2E-01	3.1E+00	7.0E-02	8.6E-04
2260004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	2.4E-01	1.9E+00	6.1E-02	7.0E-04
2260004035	Lawn and Garden Equipment	Snowblowers (Residential)	1.4E+00	5.2E+01	4.4E-01	6.9E-03
2260004036	Lawn and Garden Equipment	Snowblowers (Commercial)	7.3E-01	2.7E+01	2.3E-01	3.6E-03
2260004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	8.4E-05	5.8E-04	2.8E-05	3.3E-07
2260005035	Agricultural Equipment	Sprayers	2.8E-02	2.1E-01	9.1E-03	1.1E-04
2260006005	Commercial Equipment	Generator Sets	1.4E-01	1.2E+00	4.5E-02	5.2E-04
2260006010	Commercial Equipment	Pumps	1.0E+00	8.9E+00	3.1E-01	3.5E-03
2260006015	Commercial Equipment	Air Compressors	3.8E-04	3.4E-03	1.2E-04	1.4E-06
2260006035	Commercial Equipment	Hydro-power Units	5.8E-03	5.4E-02	1.8E-03	2.1E-05
2260007005	Logging Equipment	Chain Saws : 6 HP	1.5E+01	1.1E+02	2.5E+00	3.0E-02
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2008 Total lbs per day			**67**	**1,892**	**27**	**1**

Appendix C, Table C- 7. NONROAD2008a Output, Klamath County, 2008. Gasoline 4-Stroke Annual

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2265001010	Recreational Equipment	Motorcycles: Off-road	5.7E-02	3.9E+00	6.0E-01	5.4E-03
2265001030	Recreational Equipment	All Terrain Vehicles	5.6E-01	4.4E+01	5.5E+00	5.6E-02
2265001050	Recreational Equipment	Golf Carts	4.0E-02	3.8E+00	1.4E+00	8.5E-03
2265001060	Recreational Equipment	Specialty Vehicles/Carts	5.8E-03	8.9E-01	2.7E-01	1.4E-03
2265002003	Construction and Mining Equipment	Pavers	5.9E-04	4.7E-02	2.9E-02	1.4E-04
2265002006	Construction and Mining Equipment	Tampers/Rammers	3.9E-06	3.9E-04	1.7E-04	9.9E-07
2265002009	Construction and Mining Equipment	Plate Compactors	2.1E-03	2.1E-01	4.0E-02	2.4E-04
2265002015	Construction and Mining Equipment	Rollers	1.0E-03	7.9E-02	4.6E-02	2.4E-04
2265002021	Construction and Mining Equipment	Paving Equipment	2.7E-03	2.6E-01	8.1E-02	4.7E-04
2265002024	Construction and Mining Equipment	Surfacing Equipment	1.2E-03	9.1E-02	3.3E-02	2.0E-04
2265002027	Construction and Mining Equipment	Signal Boards/Light Plants	8.4E-05	5.5E-03	1.6E-03	1.0E-05
2265002030	Construction and Mining Equipment	Trenchers	2.5E-03	1.7E-01	8.8E-02	4.2E-04
2265002033	Construction and Mining Equipment	Bore/Drill Rigs	1.2E-03	1.3E-01	3.4E-02	1.4E-04
2265002039	Construction and Mining Equipment	Concrete/Industrial Saws	3.9E-03	3.0E-01	1.5E-01	8.6E-04
2265002042	Construction and Mining Equipment	Cement and Mortar Mixers	2.4E-03	3.0E-01	7.5E-02	4.2E-04
2265002045	Construction and Mining Equipment	Cranes	1.1E-04	1.0E-02	1.6E-02	3.5E-05
2265002054	Construction and Mining Equipment	Crushing/Processing Equipment	3.2E-04	2.4E-02	1.1E-02	5.6E-05
2265002057	Construction and Mining Equipment	Rough Terrain Forklifts	1.7E-04	1.4E-02	2.4E-02	5.5E-05
2265002060	Construction and Mining Equipment	Rubber Tire Loaders	4.2E-04	2.9E-02	5.0E-02	1.3E-04
2265002066	Construction and Mining Equipment	Tractors/Loaders/Backhoes	1.2E-03	9.6E-02	4.9E-02	2.8E-04
2265002072	Construction and Mining Equipment	Skid Steer Loaders	7.1E-04	6.4E-02	6.8E-02	2.0E-04
2265002078	Construction and Mining Equipment	Dumpers/Tenders	3.1E-04	4.0E-02	1.2E-02	6.6E-05
2265002081	Construction and Mining Equipment	Other Construction Equipment	1.4E-04	1.4E-02	2.4E-02	4.8E-05
2265003010	Industrial Equipment	Aerial Lifts	1.8E-03	1.9E-01	2.4E-01	5.4E-04
2265003020	Industrial Equipment	Forklifts	5.6E-03	4.4E-01	7.8E-01	1.7E-03
2265003030	Industrial Equipment	Sweepers/Scrubbers	1.9E-03	1.2E-01	1.1E-01	4.1E-04
2265003040	Industrial Equipment	Other General Industrial Equipment	7.8E-03	4.4E-01	1.3E-01	7.4E-04
2265003050	Industrial Equipment	Other Material Handling Equipment	1.3E-04	1.3E-02	1.6E-02	3.8E-05
2265003060	Industrial Equipment	AC\Refrigeration	8.6E-05	8.2E-03	3.5E-03	2.1E-05
2265003070	Industrial Equipment	Terminal Tractors	5.8E-04	2.1E-02	4.0E-02	1.7E-04
2265004010	Lawn and Garden Equipment	Lawn Mowers (Residential)	1.1E-01	1.8E+01	2.0E+00	1.1E-02
2265004011	Lawn and Garden Equipment	Lawn Mowers (Commercial)	1.7E-02	1.8E+00	2.2E-01	1.4E-03
2265004015	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Residential)	9.4E-03	1.6E+00	1.7E-01	9.6E-04
2265004016	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Commercial)	7.0E-03	1.0E+00	1.2E-01	7.2E-04
2265004025	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Residential)	6.4E-04	1.1E-01	1.1E-02	6.3E-05
2265004026	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Commercial)	2.8E-04	3.4E-02	5.4E-03	3.3E-05
2265004030	Lawn and Garden Equipment	Leafblowers/Vacuums (Residential)	1.2E-03	1.9E-01	2.1E-02	1.2E-04
2265004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	5.9E-03	6.1E-01	3.1E-01	1.4E-03
2265004035	Lawn and Garden Equipment	Snowblowers (Residential)	4.1E-03	1.4E+00	1.5E-01	1.3E-03
2265004036	Lawn and Garden Equipment	Snowblowers (Commercial)	1.5E-03	3.0E-01	5.4E-02	4.8E-04
2265004040	Lawn and Garden Equipment	Rear Engine Riding Mowers (Residential)	9.4E-03	1.5E+00	4.1E-01	2.4E-03
2265004041	Lawn and Garden Equipment	Rear Engine Riding Mowers (Commercial)	6.5E-04	5.9E-02	2.7E-02	1.6E-04
2265004046	Lawn and Garden Equipment	Front Mowers (Commercial)	7.7E-04	8.6E-02	3.5E-02	1.9E-04
2265004051	Lawn and Garden Equipment	Shredders < 6 HP (Commercial)	7.9E-04	1.2E-01	1.4E-02	8.3E-05
2265004055	Lawn and Garden Equipment	Lawn and Garden Tractors (Residential)	1.3E-01	1.6E+01	5.6E+00	3.2E-02
2265004056	Lawn and Garden Equipment	Lawn and Garden Tractors (Commercial)	8.8E-03	7.6E-01	3.7E-01	2.2E-03
2265004066	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	1.5E-03	1.1E-01	9.4E-02	3.8E-04
2265004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	3.6E-02	3.0E+00	1.2E+00	7.0E-03
2265004075	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Residential)	7.6E-03	1.1E+00	2.0E-01	1.1E-03
2265004076	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Commercial)	1.5E-03	2.1E-01	3.9E-02	2.2E-04
2265005010	Agricultural Equipment	2-Wheel Tractors	6.8E-04	5.8E-02	2.7E-02	1.7E-04
2265005015	Agricultural Equipment	Agricultural Tractors	2.4E-03	1.6E-01	2.4E-01	7.0E-04
2265005020	Agricultural Equipment	Combines	1.4E-05	1.7E-03	2.5E-03	4.6E-06
2265005025	Agricultural Equipment	Balers	1.4E-03	1.9E-01	2.4E-01	4.6E-04
2265005030	Agricultural Equipment	Agricultural Mowers	5.7E-04	5.6E-02	2.5E-02	1.4E-04
2265005035	Agricultural Equipment	Sprayers	7.9E-03	9.8E-01	4.2E-01	1.5E-03
2265005040	Agricultural Equipment	Tillers : 6 HP	1.1E-02	2.0E+00	4.9E-01	3.4E-03
2265005045	Agricultural Equipment	Swathers	2.2E-03	2.7E-01	3.9E-01	7.3E-04
2265005055	Agricultural Equipment	Other Agricultural Equipment	3.5E-03	3.8E-01	4.6E-01	1.1E-03
2265005060	Agricultural Equipment	Irrigation Sets	4.4E-03	2.5E-01	3.9E-01	1.2E-03
2265006005	Commercial Equipment	Generator Sets	8.0E-02	9.4E+00	3.0E+00	1.7E-02
2265006010	Commercial Equipment	Pumps	3.1E-02	2.8E+00	8.0E-01	4.1E-03
2265006015	Commercial Equipment	Air Compressors	1.5E-02	1.1E+00	5.1E-01	2.2E-03
2265006025	Commercial Equipment	Welders	2.1E-02	1.9E+00	9.8E-01	4.8E-03
2265006030	Commercial Equipment	Pressure Washers	5.1E-02	5.4E+00	1.2E+00	7.4E-03
2265006035	Commercial Equipment	Hydro-power Units	2.0E-03	1.6E-01	5.9E-02	3.5E-04
2265007010	Logging Equipment	Shredders : 6 HP	4.4E-02	5.4E+00	2.0E+00	1.1E-02
2265007015	Logging Equipment	Forest Eqp - Feller/Bunch/Skidder	1.3E-03	7.9E-02	1.8E-02	1.2E-04
2265010010	Industrial Equipment	Other Oil Field Equipment	3.1E-03	2.3E-01	1.0E-01	6.1E-04
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2008 Total Tons Per Year			**1.3**	**134.7**	**32.3**	**0.2**

Appendix C, Table C- 8. NONROAD2008a Output, Klamath County, 2008. Gasoline 4-Stroke Typical Season Day

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2265001010	Recreational Equipment	Motorcycles: Off-road	1.1E-01	7.7E+00	1.3E+00	1.0E-02
2265001030	Recreational Equipment	All Terrain Vehicles	1.1E+00	8.4E+01	1.2E+01	1.1E-01
2265001050	Recreational Equipment	Golf Carts	7.6E-02	7.4E+00	3.1E+00	1.6E-02
2265001060	Recreational Equipment	Specialty Vehicles/Carts	1.1E-02	1.8E+00	6.0E-01	2.7E-03
2265002003	Construction and Mining Equipment	Pavers	3.2E-03	2.5E-01	1.8E-01	7.3E-04
2265002006	Construction and Mining Equipment	Tampers/Rammers	2.1E-05	2.1E-03	1.0E-03	5.3E-06
2265002009	Construction and Mining Equipment	Plate Compactors	1.1E-02	1.1E+00	2.5E-01	1.3E-03
2265002015	Construction and Mining Equipment	Rollers	5.4E-03	4.2E-01	2.8E-01	1.3E-03
2265002021	Construction and Mining Equipment	Paving Equipment	1.5E-02	1.3E+00	5.0E-01	2.5E-03
2265002024	Construction and Mining Equipment	Surfacing Equipment	6.6E-03	4.9E-01	2.0E-01	1.1E-03
2265002027	Construction and Mining Equipment	Signal Boards/Light Plants	4.6E-04	3.0E-02	9.6E-03	5.4E-05
2265002030	Construction and Mining Equipment	Trenchers	1.3E-02	9.3E-01	5.5E-01	2.2E-03
2265002033	Construction and Mining Equipment	Bore/Drill Rigs	6.5E-03	6.6E-01	2.1E-01	7.5E-04
2265002039	Construction and Mining Equipment	Concrete/Industrial Saws	2.1E-02	1.6E+00	9.2E-01	4.7E-03
2265002042	Construction and Mining Equipment	Cement and Mortar Mixers	1.3E-02	1.5E+00	4.6E-01	2.3E-03
2265002045	Construction and Mining Equipment	Cranes	5.9E-04	5.3E-02	9.6E-02	1.9E-04
2265002054	Construction and Mining Equipment	Crushing/Processing Equipment	1.7E-03	1.3E-01	6.5E-02	3.0E-04
2265002057	Construction and Mining Equipment	Rough Terrain Forklifts	9.2E-04	7.3E-02	1.5E-01	2.9E-04
2265002060	Construction and Mining Equipment	Rubber Tire Loaders	2.2E-03	1.5E-01	3.1E-01	7.0E-04
2265002066	Construction and Mining Equipment	Tractors/Loaders/Backhoes	6.4E-03	5.1E-01	3.1E-01	1.5E-03
2265002072	Construction and Mining Equipment	Skid Steer Loaders	3.8E-03	3.3E-01	4.2E-01	1.1E-03
2265002078	Construction and Mining Equipment	Dumpers/Tenders	1.7E-03	1.9E-01	7.6E-02	3.6E-04
2265002081	Construction and Mining Equipment	Other Construction Equipment	7.8E-04	7.2E-02	1.5E-01	2.6E-04
2265003010	Industrial Equipment	Aerial Lifts	9.4E-03	9.3E-01	1.4E+00	2.8E-03
2265003020	Industrial Equipment	Forklifts	2.9E-02	2.3E+00	4.7E+00	9.1E-03
2265003030	Industrial Equipment	Sweepers/Scrubbers	9.7E-03	6.1E-01	6.5E-01	2.2E-03
2265003040	Industrial Equipment	Other General Industrial Equipment	4.1E-02	2.3E+00	7.9E-01	3.8E-03
2265003050	Industrial Equipment	Other Material Handling Equipment	6.7E-04	6.4E-02	9.4E-02	2.0E-04
2265003060	Industrial Equipment	AC\Refrigeration	3.8E-04	3.6E-02	1.8E-02	9.4E-05
2265003070	Industrial Equipment	Terminal Tractors	3.0E-03	1.1E-01	2.4E-01	8.7E-04
2265004010	Lawn and Garden Equipment	Lawn Mowers (Residential)	1.1E-01	2.2E+01	2.4E+00	1.2E-02
2265004011	Lawn and Garden Equipment	Lawn Mowers (Commercial)	2.5E-02	2.8E+00	3.8E-01	2.1E-03
2265004015	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Residential)	9.7E-03	1.9E+00	2.0E-01	1.0E-03
2265004016	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Commercial)	1.1E-02	1.5E+00	2.1E-01	1.1E-03
2265004025	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Residential)	6.6E-04	1.3E-01	1.3E-02	6.6E-05
2265004026	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Commercial)	4.1E-04	5.2E-02	9.2E-03	4.9E-05
2265004030	Lawn and Garden Equipment	Leafblowers/Vacuums (Residential)	1.3E-03	2.3E-01	2.4E-02	1.3E-04
2265004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	8.8E-03	9.3E-01	5.4E-01	2.1E-03
2265004035	Lawn and Garden Equipment	Snowblowers (Residential)	7.0E-02	1.5E+01	2.9E+00	2.3E-02
2265004036	Lawn and Garden Equipment	Snowblowers (Commercial)	3.7E-02	7.4E+00	1.5E+00	1.2E-02
2265004040	Lawn and Garden Equipment	Rear Engine Riding Mowers (Residential)	9.8E-03	1.9E+00	4.9E-01	2.5E-03
2265004041	Lawn and Garden Equipment	Rear Engine Riding Mowers (Commercial)	9.7E-04	9.1E-02	4.6E-02	2.4E-04
2265004046	Lawn and Garden Equipment	Front Mowers (Commercial)	1.2E-03	1.4E-01	5.9E-02	2.9E-04
2265004051	Lawn and Garden Equipment	Shredders < 6 HP (Commercial)	1.2E-03	1.8E-01	2.4E-02	1.2E-04
2265004055	Lawn and Garden Equipment	Lawn and Garden Tractors (Residential)	1.3E-01	2.1E+01	6.7E+00	3.3E-02
2265004056	Lawn and Garden Equipment	Lawn and Garden Tractors (Commercial)	1.3E-02	1.2E+00	6.3E-01	3.3E-03
2265004066	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	2.2E-03	1.6E-01	1.6E-01	5.7E-04
2265004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	5.4E-02	4.7E+00	2.0E+00	1.1E-02
2265004075	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Residential)	7.9E-03	1.2E+00	2.4E-01	1.2E-03
2265004076	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Commercial)	2.2E-03	3.2E-01	6.8E-02	3.3E-04
2265005010	Agricultural Equipment	2-Wheel Tractors	1.1E-03	9.3E-02	4.9E-02	2.6E-04
2265005015	Agricultural Equipment	Agricultural Tractors	3.7E-03	2.6E-01	4.3E-01	1.1E-03
2265005020	Agricultural Equipment	Combines	2.1E-05	2.3E-03	4.4E-03	7.2E-06
2265005025	Agricultural Equipment	Balers	2.1E-03	2.4E-01	4.4E-01	7.2E-04
2265005030	Agricultural Equipment	Agricultural Mowers	8.8E-04	9.2E-02	4.4E-02	2.2E-04
2265005035	Agricultural Equipment	Sprayers	1.2E-02	1.5E+00	7.5E-01	2.4E-03
2265005040	Agricultural Equipment	Tillers : 6 HP	1.7E-02	3.4E+00	8.8E-01	5.2E-03
2265005045	Agricultural Equipment	Swathers	3.4E-03	3.6E-01	6.9E-01	1.1E-03
2265005055	Agricultural Equipment	Other Agricultural Equipment	5.4E-03	5.7E-01	8.3E-01	1.6E-03
2265005060	Agricultural Equipment	Irrigation Sets	6.8E-03	3.9E-01	7.0E-01	1.9E-03
2265006005	Commercial Equipment	Generator Sets	5.2E-01	5.6E+01	2.2E+01	1.1E-01
2265006010	Commercial Equipment	Pumps	2.0E-01	1.8E+01	6.0E+00	2.7E-02
2265006015	Commercial Equipment	Air Compressors	9.5E-02	7.0E+00	3.8E+00	1.5E-02
2265006025	Commercial Equipment	Welders	1.3E-01	1.2E+01	7.3E+00	3.1E-02
2265006030	Commercial Equipment	Pressure Washers	3.3E-01	3.4E+01	9.1E+00	4.8E-02
2265006035	Commercial Equipment	Hydro-power Units	1.3E-02	1.1E+00	4.4E-01	2.3E-03
2265007010	Logging Equipment	Shredders : 6 HP	2.8E-01	3.3E+01	1.5E+01	7.0E-02
2265007015	Logging Equipment	Forest Eqp - Feller/Bunch/Skidder	8.5E-03	5.2E-01	1.3E-01	7.6E-04
2265010010	Industrial Equipment	Other Oil Field Equipment	1.6E-02	1.2E+00	6.0E-01	3.2E-03
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2008 Total lbs per day			**4**	**370**	**118**	**1**

Appendix C, Table C- 9. NONROAD2008a Output, Klamath County, 2008. Gasoline 4-Stroke Worst-Case Season Day

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2265001010	Recreational Equipment	Motorcycles: Off-road	1.1E-01	7.2E+00	1.5E+00	1.0E-02
2265001030	Recreational Equipment	All Terrain Vehicles	1.1E+00	7.9E+01	1.4E+01	1.1E-01
2265001050	Recreational Equipment	Golf Carts	7.6E-02	7.1E+00	3.6E+00	1.6E-02
2265001060	Recreational Equipment	Specialty Vehicles/Carts	1.1E-02	1.7E+00	6.8E-01	2.7E-03
2265002003	Construction and Mining Equipment	Pavers	3.2E-03	2.4E-01	2.0E-01	7.3E-04
2265002006	Construction and Mining Equipment	Tampers/Rammers	2.1E-05	2.0E-03	1.2E-03	5.3E-06
2265002009	Construction and Mining Equipment	Plate Compactors	1.1E-02	1.1E+00	2.8E-01	1.3E-03
2265002015	Construction and Mining Equipment	Rollers	5.4E-03	4.0E-01	3.2E-01	1.3E-03
2265002021	Construction and Mining Equipment	Paving Equipment	1.5E-02	1.3E+00	5.7E-01	2.5E-03
2265002024	Construction and Mining Equipment	Surfacing Equipment	6.6E-03	4.7E-01	2.3E-01	1.1E-03
2265002027	Construction and Mining Equipment	Signal Boards/Light Plants	4.6E-04	2.8E-02	1.1E-02	5.4E-05
2265002030	Construction and Mining Equipment	Trenchers	1.3E-02	8.9E-01	6.3E-01	2.2E-03
2265002033	Construction and Mining Equipment	Bore/Drill Rigs	6.5E-03	6.3E-01	2.4E-01	7.5E-04
2265002039	Construction and Mining Equipment	Concrete/Industrial Saws	2.1E-02	1.6E+00	1.1E+00	4.7E-03
2265002042	Construction and Mining Equipment	Cement and Mortar Mixers	1.3E-02	1.4E+00	5.3E-01	2.3E-03
2265002045	Construction and Mining Equipment	Cranes	5.9E-04	5.1E-02	1.1E-01	1.9E-04
2265002054	Construction and Mining Equipment	Crushing/Processing Equipment	1.7E-03	1.2E-01	7.5E-02	3.0E-04
2265002057	Construction and Mining Equipment	Rough Terrain Forklifts	9.2E-04	7.1E-02	1.7E-01	2.9E-04
2265002060	Construction and Mining Equipment	Rubber Tire Loaders	2.2E-03	1.5E-01	3.6E-01	7.0E-04
2265002066	Construction and Mining Equipment	Tractors/Loaders/Backhoes	6.4E-03	4.9E-01	3.5E-01	1.5E-03
2265002072	Construction and Mining Equipment	Skid Steer Loaders	3.8E-03	3.1E-01	4.8E-01	1.1E-03
2265002078	Construction and Mining Equipment	Dumpers/Tenders	1.7E-03	1.8E-01	8.7E-02	3.6E-04
2265002081	Construction and Mining Equipment	Other Construction Equipment	7.8E-04	6.9E-02	1.7E-01	2.6E-04
2265003010	Industrial Equipment	Aerial Lifts	9.4E-03	8.9E-01	1.7E+00	2.8E-03
2265003020	Industrial Equipment	Forklifts	2.9E-02	2.2E+00	5.4E+00	9.1E-03
2265003030	Industrial Equipment	Sweepers/Scrubbers	9.7E-03	5.8E-01	7.4E-01	2.2E-03
2265003040	Industrial Equipment	Other General Industrial Equipment	4.1E-02	2.2E+00	9.1E-01	3.8E-03
2265003050	Industrial Equipment	Other Material Handling Equipment	6.7E-04	6.2E-02	1.1E-01	2.0E-04
2265003060	Industrial Equipment	AC\Refrigeration	3.8E-04	3.5E-02	2.0E-02	9.4E-05
2265003070	Industrial Equipment	Terminal Tractors	3.0E-03	1.1E-01	2.8E-01	8.7E-04
2265004010	Lawn and Garden Equipment	Lawn Mowers (Residential)	1.1E-01	2.1E+01	2.7E+00	1.2E-02
2265004011	Lawn and Garden Equipment	Lawn Mowers (Commercial)	2.5E-02	2.7E+00	4.3E-01	2.1E-03
2265004015	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Residential)	9.7E-03	1.8E+00	2.3E-01	1.0E-03
2265004016	Lawn and Garden Equipment	Rotary Tillers < 6 HP (Commercial)	1.1E-02	1.5E+00	2.4E-01	1.1E-03
2265004025	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Residential)	6.6E-04	1.2E-01	1.5E-02	6.6E-05
2265004026	Lawn and Garden Equipment	Trimmers/Edgers/Brush Cutters (Commercial)	4.1E-04	5.0E-02	1.1E-02	4.9E-05
2265004030	Lawn and Garden Equipment	Leafblowers/Vacuums (Residential)	1.3E-03	2.1E-01	2.8E-02	1.3E-04
2265004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	8.8E-03	9.0E-01	6.1E-01	2.1E-03
2265004035	Lawn and Garden Equipment	Snowblowers (Residential)	7.0E-02	1.5E+01	3.3E+00	2.3E-02
2265004036	Lawn and Garden Equipment	Snowblowers (Commercial)	3.7E-02	7.1E+00	1.8E+00	1.2E-02
2265004040	Lawn and Garden Equipment	Rear Engine Riding Mowers (Residential)	9.8E-03	1.7E+00	5.7E-01	2.5E-03
2265004041	Lawn and Garden Equipment	Rear Engine Riding Mowers (Commercial)	9.7E-04	8.7E-02	5.3E-02	2.4E-04
2265004046	Lawn and Garden Equipment	Front Mowers (Commercial)	1.2E-03	1.3E-01	6.8E-02	2.9E-04
2265004051	Lawn and Garden Equipment	Shredders < 6 HP (Commercial)	1.2E-03	1.7E-01	2.8E-02	1.2E-04
2265004055	Lawn and Garden Equipment	Lawn and Garden Tractors (Residential)	1.3E-01	1.9E+01	7.6E+00	3.3E-02
2265004056	Lawn and Garden Equipment	Lawn and Garden Tractors (Commercial)	1.3E-02	1.1E+00	7.2E-01	3.3E-03
2265004066	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	2.2E-03	1.5E-01	1.8E-01	5.7E-04
2265004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	5.4E-02	4.5E+00	2.3E+00	1.1E-02
2265004075	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Residential)	7.9E-03	1.1E+00	2.7E-01	1.2E-03
2265004076	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Commercial)	2.2E-03	2.9E-01	7.7E-02	3.3E-04
2265005010	Agricultural Equipment	2-Wheel Tractors	1.1E-03	8.9E-02	5.6E-02	2.6E-04
2265005015	Agricultural Equipment	Agricultural Tractors	3.7E-03	2.5E-01	4.9E-01	1.1E-03
2265005020	Agricultural Equipment	Combines	2.1E-05	2.0E-03	5.0E-03	7.2E-06
2265005025	Agricultural Equipment	Balers	2.1E-03	2.0E-01	5.0E-01	7.2E-04
2265005030	Agricultural Equipment	Agricultural Mowers	8.8E-04	8.7E-02	5.0E-02	2.2E-04
2265005035	Agricultural Equipment	Sprayers	1.2E-02	1.4E+00	8.6E-01	2.4E-03
2265005040	Agricultural Equipment	Tillers : 6 HP	1.7E-02	3.2E+00	1.0E+00	5.2E-03
2265005045	Agricultural Equipment	Swathers	3.4E-03	3.2E-01	7.9E-01	1.1E-03
2265005055	Agricultural Equipment	Other Agricultural Equipment	5.4E-03	5.3E-01	9.5E-01	1.6E-03
2265005060	Agricultural Equipment	Irrigation Sets	6.8E-03	3.7E-01	8.1E-01	1.9E-03
2265006005	Commercial Equipment	Generator Sets	5.2E-01	5.3E+01	2.5E+01	1.1E-01
2265006010	Commercial Equipment	Pumps	2.0E-01	1.7E+01	6.8E+00	2.7E-02
2265006015	Commercial Equipment	Air Compressors	9.5E-02	6.7E+00	4.3E+00	1.5E-02
2265006025	Commercial Equipment	Welders	1.3E-01	1.2E+01	8.3E+00	3.1E-02
2265006030	Commercial Equipment	Pressure Washers	3.3E-01	3.3E+01	1.0E+01	4.8E-02
2265006035	Commercial Equipment	Hydro-power Units	1.3E-02	1.0E+00	5.0E-01	2.3E-03
2265007010	Logging Equipment	Shredders : 6 HP	2.8E-01	3.2E+01	1.7E+01	7.0E-02
2265007015	Logging Equipment	Forest Eqp - Feller/Bunch/Skidder	8.5E-03	5.0E-01	1.5E-01	7.6E-04
2265010010	Industrial Equipment	Other Oil Field Equipment	1.6E-02	1.2E+00	6.9E-01	3.2E-03
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2008 Total lbs per day			**4**	**351**	**135**	**1**

Appendix C, Table C- 10. NONROAD2008a Output, Klamath County, 2008. CNG & LPG Annual

SCC	Fuel	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2267001060	LPG	Recreational Equipment	Specialty Vehicles/Carts	3.3E-04	1.6E-02	5.9E-02	3.0E-04
2267002003	LPG	Construction and Mining Equipment	Pavers	9.3E-05	3.1E-03	1.1E-02	7.8E-05
2267002015	LPG	Construction and Mining Equipment	Rollers	1.6E-04	4.0E-03	1.4E-02	1.3E-04
2267002021	LPG	Construction and Mining Equipment	Paving Equipment	2.4E-05	1.0E-03	3.7E-03	2.1E-05
2267002024	LPG	Construction and Mining Equipment	Surfacing Equipment	1.6E-05	5.0E-04	1.8E-03	1.3E-05
2267002030	LPG	Construction and Mining Equipment	Trenchers	2.8E-04	1.0E-02	3.6E-02	2.4E-04
2267002033	LPG	Construction and Mining Equipment	Bore/Drill Rigs	9.2E-05	4.3E-03	1.6E-02	8.4E-05
2267002039	LPG	Construction and Mining Equipment	Concrete/Industrial Saws	2.8E-04	5.2E-03	1.8E-02	2.1E-04
2267002045	LPG	Construction and Mining Equipment	Cranes	9.8E-05	4.2E-03	1.5E-02	8.7E-05
2267002054	LPG	Construction and Mining Equipment	Crushing/Processing Equipment	1.6E-05	6.7E-04	2.4E-03	1.4E-05
2267002057	LPG	Construction and Mining Equipment	Rough Terrain Forklifts	1.8E-04	6.9E-03	2.5E-02	1.6E-04
2267002060	LPG	Construction and Mining Equipment	Rubber Tire Loaders	4.5E-04	1.5E-02	5.2E-02	3.8E-04
2267002066	LPG	Construction and Mining Equipment	Tractors/Loaders/Backhoes	4.9E-05	1.4E-03	4.8E-03	4.0E-05
2267002072	LPG	Construction and Mining Equipment	Skid Steer Loaders	3.7E-04	1.5E-02	5.4E-02	3.2E-04
2267002081	LPG	Construction and Mining Equipment	Other Construction Equipment	1.5E-04	6.5E-03	2.4E-02	1.3E-04
2267003010	LPG	Industrial Equipment	Aerial Lifts	2.4E-03	1.0E-01	3.6E-01	2.1E-03
2267003020	LPG	Industrial Equipment	Forklifts	2.3E-01	7.3E+00	2.6E+01	1.9E-01
2267003030	LPG	Industrial Equipment	Sweepers/Scrubbers	1.7E-03	4.0E-02	1.4E-01	1.4E-03
2267003040	LPG	Industrial Equipment	Other General Industrial Equipment	5.3E-04	1.5E-02	5.3E-02	4.4E-04
2267003050	LPG	Industrial Equipment	Other Material Handling Equipment	1.3E-04	5.4E-03	1.9E-02	1.1E-04
2267003070	LPG	Industrial Equipment	Terminal Tractors	1.1E-03	1.8E-02	6.4E-02	8.3E-04
2267004066	LPG	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	4.9E-04	1.5E-02	5.2E-02	4.1E-04
2267005055	LPG	Agricultural Equipment	Other Agricultural Equipment	2.6E-05	1.3E-03	4.7E-03	2.4E-05
2267005060	LPG	Agricultural Equipment	Irrigation Sets	1.5E-05	4.5E-04	1.6E-03	1.2E-05
2267006005	LPG	Commercial Equipment	Generator Sets	7.3E-03	2.4E-01	1.2E+00	6.7E-03
2267006010	LPG	Commercial Equipment	Pumps	1.7E-03	4.8E-02	2.3E-01	1.5E-03
2267006015	LPG	Commercial Equipment	Air Compressors	2.1E-03	5.2E-02	2.5E-01	1.8E-03
2267006025	LPG	Commercial Equipment	Welders	2.6E-03	9.2E-02	3.3E-01	2.2E-03
2267006030	LPG	Commercial Equipment	Pressure Washers	3.4E-05	1.4E-03	5.0E-03	3.0E-05
2267006035	LPG	Commercial Equipment	Hydro-power Units	3.4E-05	7.2E-04	3.5E-03	2.9E-05
2268002081	CNG	Construction and Mining Equipment	Other Construction Equipment	6.2E-06	1.6E-05	9.9E-04	4.8E-06
2268003020	CNG	Industrial Equipment	Forklifts	1.6E-02	3.1E-02	1.9E+00	1.2E-02
2268003030	CNG	Industrial Equipment	Sweepers/Scrubbers	2.3E-05	4.3E-05	2.6E-03	1.7E-05
2268003040	CNG	Industrial Equipment	Other General Industrial Equipment	1.2E-05	2.3E-05	1.3E-03	9.2E-06
2268003060	CNG	Industrial Equipment	AC\Refrigeration	4.5E-05	7.1E-05	4.3E-03	3.3E-05
2268003070	CNG	Industrial Equipment	Terminal Tractors	7.3E-05	7.4E-05	4.4E-03	5.2E-05
2268005055	CNG	Agricultural Equipment	Other Agricultural Equipment	1.9E-05	6.4E-05	3.7E-03	1.3E-05
2268005060	CNG	Agricultural Equipment	Irrigation Sets	3.0E-04	1.0E-03	5.9E-02	2.2E-04
2268006005	CNG	Commercial Equipment	Generator Sets	2.1E-03	4.4E-03	3.6E-01	1.8E-03
2268006010	CNG	Commercial Equipment	Pumps	1.1E-04	2.0E-04	1.6E-02	8.7E-05
2268006015	CNG	Commercial Equipment	Air Compressors	1.5E-04	2.5E-04	2.0E-02	1.2E-04
2268006020	CNG	Commercial Equipment	Gas Compressors	6.3E-03	1.0E-03	1.0E-01	4.3E-03
2268010010	CNG	Industrial Equipment	Other Oil Field Equipment	1.9E-03	8.2E-04	5.5E-02	1.4E-03
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2008 Total Tons Per Year				**0.3**	**8.1**	**31.5**	**0.2**

Appendix C, Table C- 11. NONROAD2008a Output, Klamath County, 2008. CNG & LPG Typical Season Day

SCC	Fuel	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2267001060	LPG	Recreational Equipment	Specialty Vehicles/Carts	6.3E-04	3.1E-02	1.1E-01	5.8E-04
2267002003	LPG	Construction and Mining Equipment	Pavers	5.0E-04	1.7E-02	6.0E-02	4.2E-04
2267002015	LPG	Construction and Mining Equipment	Rollers	8.4E-04	2.2E-02	7.6E-02	6.8E-04
2267002021	LPG	Construction and Mining Equipment	Paving Equipment	1.3E-04	5.6E-03	2.0E-02	1.2E-04
2267002024	LPG	Construction and Mining Equipment	Surfacing Equipment	8.5E-05	2.7E-03	9.7E-03	7.1E-05
2267002030	LPG	Construction and Mining Equipment	Trenchers	1.5E-03	5.4E-02	1.9E-01	1.3E-03
2267002033	LPG	Construction and Mining Equipment	Bore/Drill Rigs	5.0E-04	2.3E-02	8.6E-02	4.5E-04
2267002039	LPG	Construction and Mining Equipment	Concrete/Industrial Saws	1.5E-03	2.8E-02	9.9E-02	1.2E-03
2267002045	LPG	Construction and Mining Equipment	Cranes	5.3E-04	2.3E-02	8.2E-02	4.7E-04
2267002054	LPG	Construction and Mining Equipment	Crushing/Processing Equipment	8.6E-05	3.6E-03	1.3E-02	7.6E-05
2267002057	LPG	Construction and Mining Equipment	Rough Terrain Forklifts	9.8E-04	3.7E-02	1.3E-01	8.4E-04
2267002060	LPG	Construction and Mining Equipment	Rubber Tire Loaders	2.4E-03	7.9E-02	2.8E-01	2.0E-03
2267002066	LPG	Construction and Mining Equipment	Tractors/Loaders/Backhoes	2.6E-04	7.4E-03	2.6E-02	2.1E-04
2267002072	LPG	Construction and Mining Equipment	Skid Steer Loaders	2.0E-03	8.0E-02	2.9E-01	1.7E-03
2267002081	LPG	Construction and Mining Equipment	Other Construction Equipment	8.0E-04	3.5E-02	1.3E-01	7.2E-04
2267003010	LPG	Industrial Equipment	Aerial Lifts	1.2E-02	5.2E-01	1.9E+00	1.1E-02
2267003020	LPG	Industrial Equipment	Forklifts	1.2E+00	3.8E+01	1.4E+02	9.9E-01
2267003030	LPG	Industrial Equipment	Sweepers/Scrubbers	9.1E-03	2.1E-01	7.4E-01	7.3E-03
2267003040	LPG	Industrial Equipment	Other General Industrial Equipment	2.8E-03	7.8E-02	2.8E-01	2.3E-03
2267003050	LPG	Industrial Equipment	Other Material Handling Equipment	6.8E-04	2.8E-02	1.0E-01	6.0E-04
2267003070	LPG	Industrial Equipment	Terminal Tractors	5.6E-03	9.5E-02	3.3E-01	4.3E-03
2267004066	LPG	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	7.4E-04	2.2E-02	7.8E-02	6.1E-04
2267005055	LPG	Agricultural Equipment	Other Agricultural Equipment	4.0E-05	2.0E-03	7.3E-03	3.7E-05
2267005060	LPG	Agricultural Equipment	Irrigation Sets	2.4E-05	7.0E-04	2.4E-03	1.9E-05
2267006005	LPG	Commercial Equipment	Generator Sets	4.7E-02	1.5E+00	7.5E+00	4.3E-02
2267006010	LPG	Commercial Equipment	Pumps	1.1E-02	3.1E-01	1.5E+00	9.8E-03
2267006015	LPG	Commercial Equipment	Air Compressors	1.4E-02	3.4E-01	1.6E+00	1.2E-02
2267006025	LPG	Commercial Equipment	Welders	1.7E-02	6.0E-01	2.1E+00	1.4E-02
2267006030	LPG	Commercial Equipment	Pressure Washers	2.2E-04	8.8E-03	3.2E-02	1.9E-04
2267006035	LPG	Commercial Equipment	Hydro-power Units	2.2E-04	4.7E-03	2.3E-02	1.9E-04
2268002081	CNG	Construction and Mining Equipment	Other Construction Equipment	3.3E-05	8.6E-05	5.3E-03	2.6E-05
2268003020	CNG	Industrial Equipment	Forklifts	8.4E-02	1.6E-01	9.7E+00	6.3E-02
2268003030	CNG	Industrial Equipment	Sweepers/Scrubbers	1.2E-04	2.3E-04	1.4E-02	8.8E-05
2268003040	CNG	Industrial Equipment	Other General Industrial Equipment	6.4E-05	1.2E-04	7.0E-03	4.8E-05
2268003060	CNG	Industrial Equipment	AC\Refrigeration	2.0E-04	3.2E-04	1.9E-02	1.5E-04
2268003070	CNG	Industrial Equipment	Terminal Tractors	3.8E-04	3.9E-04	2.3E-02	2.7E-04
2268005055	CNG	Agricultural Equipment	Other Agricultural Equipment	2.9E-05	9.9E-05	5.7E-03	2.1E-05
2268005060	CNG	Agricultural Equipment	Irrigation Sets	4.7E-04	1.6E-03	9.1E-02	3.4E-04
2268006005	CNG	Commercial Equipment	Generator Sets	1.4E-02	2.8E-02	2.3E+00	1.1E-02
2268006010	CNG	Commercial Equipment	Pumps	6.9E-04	1.3E-03	1.0E-01	5.6E-04
2268006015	CNG	Commercial Equipment	Air Compressors	1.0E-03	1.6E-03	1.3E-01	7.9E-04
2268006020	CNG	Commercial Equipment	Gas Compressors	4.1E-02	6.6E-03	6.6E-01	2.8E-02
2268010010	CNG	Industrial Equipment	Other Oil Field Equipment	1.0E-02	4.2E-03	2.8E-01	7.1E-03
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2008 Total lbs per day				**1**	**43**	**167**	**1**

Appendix C, Table C- 12. NONROAD2008a Output, Klamath County, 2008. CNG & LPG Worst-Case Season Day

SCC	Fuel	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2267001060	LPG	Recreational Equipment	Specialty Vehicles/Carts	6.3E-04	3.1E-02	1.1E-01	5.8E-04
2267002003	LPG	Construction and Mining Equipment	Pavers	5.0E-04	1.7E-02	6.0E-02	4.2E-04
2267002015	LPG	Construction and Mining Equipment	Rollers	8.4E-04	2.2E-02	7.6E-02	6.8E-04
2267002021	LPG	Construction and Mining Equipment	Paving Equipment	1.3E-04	5.6E-03	2.0E-02	1.2E-04
2267002024	LPG	Construction and Mining Equipment	Surfacing Equipment	8.5E-05	2.7E-03	9.7E-03	7.1E-05
2267002030	LPG	Construction and Mining Equipment	Trenchers	1.5E-03	5.4E-02	1.9E-01	1.3E-03
2267002033	LPG	Construction and Mining Equipment	Bore/Drill Rigs	5.0E-04	2.3E-02	8.6E-02	4.5E-04
2267002039	LPG	Construction and Mining Equipment	Concrete/Industrial Saws	1.5E-03	2.8E-02	9.9E-02	1.2E-03
2267002045	LPG	Construction and Mining Equipment	Cranes	5.3E-04	2.3E-02	8.2E-02	4.7E-04
2267002054	LPG	Construction and Mining Equipment	Crushing/Processing Equipment	8.6E-05	3.6E-03	1.3E-02	7.6E-05
2267002057	LPG	Construction and Mining Equipment	Rough Terrain Forklifts	9.8E-04	3.7E-02	1.3E-01	8.4E-04
2267002060	LPG	Construction and Mining Equipment	Rubber Tire Loaders	2.4E-03	7.9E-02	2.8E-01	2.0E-03
2267002066	LPG	Construction and Mining Equipment	Tractors/Loaders/Backhoes	2.6E-04	7.4E-03	2.6E-02	2.1E-04
2267002072	LPG	Construction and Mining Equipment	Skid Steer Loaders	2.0E-03	8.0E-02	2.9E-01	1.7E-03
2267002081	LPG	Construction and Mining Equipment	Other Construction Equipment	8.0E-04	3.5E-02	1.3E-01	7.2E-04
2267003010	LPG	Industrial Equipment	Aerial Lifts	1.2E-02	5.2E-01	1.9E+00	1.1E-02
2267003020	LPG	Industrial Equipment	Forklifts	1.2E+00	3.8E+01	1.4E+02	9.9E-01
2267003030	LPG	Industrial Equipment	Sweepers/Scrubbers	9.1E-03	2.1E-01	7.4E-01	7.3E-03
2267003040	LPG	Industrial Equipment	Other General Industrial Equipment	2.8E-03	7.8E-02	2.8E-01	2.3E-03
2267003050	LPG	Industrial Equipment	Other Material Handling Equipment	6.8E-04	2.8E-02	1.0E-01	6.0E-04
2267003070	LPG	Industrial Equipment	Terminal Tractors	5.6E-03	9.5E-02	3.3E-01	4.3E-03
2267004066	LPG	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	7.4E-04	2.2E-02	7.8E-02	6.1E-04
2267005055	LPG	Agricultural Equipment	Other Agricultural Equipment	4.0E-05	2.0E-03	7.3E-03	3.7E-05
2267005060	LPG	Agricultural Equipment	Irrigation Sets	2.4E-05	7.0E-04	2.4E-03	1.9E-05
2267006005	LPG	Commercial Equipment	Generator Sets	4.7E-02	1.5E+00	7.5E+00	4.3E-02
2267006010	LPG	Commercial Equipment	Pumps	1.1E-02	3.1E-01	1.5E+00	9.8E-03
2267006015	LPG	Commercial Equipment	Air Compressors	1.4E-02	3.4E-01	1.6E+00	1.2E-02
2267006025	LPG	Commercial Equipment	Welders	1.7E-02	6.0E-01	2.1E+00	1.4E-02
2267006030	LPG	Commercial Equipment	Pressure Washers	2.2E-04	8.8E-03	3.2E-02	1.9E-04
2267006035	LPG	Commercial Equipment	Hydro-power Units	2.2E-04	4.7E-03	2.3E-02	1.9E-04
2268002081	CNG	Construction and Mining Equipment	Other Construction Equipment	3.3E-05	8.6E-05	5.3E-03	2.6E-05
2268003020	CNG	Industrial Equipment	Forklifts	8.4E-02	1.6E-01	9.7E+00	6.3E-02
2268003030	CNG	Industrial Equipment	Sweepers/Scrubbers	1.2E-04	2.3E-04	1.4E-02	8.8E-05
2268003040	CNG	Industrial Equipment	Other General Industrial Equipment	6.4E-05	1.2E-04	7.0E-03	4.8E-05
2268003060	CNG	Industrial Equipment	AC\Refrigeration	2.0E-04	3.2E-04	1.9E-02	1.5E-04
2268003070	CNG	Industrial Equipment	Terminal Tractors	3.8E-04	3.9E-04	2.3E-02	2.7E-04
2268005055	CNG	Agricultural Equipment	Other Agricultural Equipment	2.9E-05	9.9E-05	5.7E-03	2.1E-05
2268005060	CNG	Agricultural Equipment	Irrigation Sets	4.7E-04	1.6E-03	9.1E-02	3.4E-04
2268006005	CNG	Commercial Equipment	Generator Sets	1.4E-02	2.8E-02	2.3E+00	1.1E-02
2268006010	CNG	Commercial Equipment	Pumps	6.9E-04	1.3E-03	1.0E-01	5.6E-04
2268006015	CNG	Commercial Equipment	Air Compressors	1.0E-03	1.6E-03	1.3E-01	7.9E-04
2268006020	CNG	Commercial Equipment	Gas Compressors	4.1E-02	6.6E-03	6.6E-01	2.8E-02
2268010010	CNG	Industrial Equipment	Other Oil Field Equipment	1.0E-02	4.2E-03	2.8E-01	7.1E-03
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2008 Total lbs per day				**1.5**	**43**	**167**	**1**

Appendix C, Table C- 13. NONROAD2008a Output, Klamath County, 2008. Diesel Annual

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2270001060	Recreational Equipment	Specialty Vehicles/Carts	1.1E-01	2.0E-01	7.1E-01	1.4E-02
2270002003	Construction and Mining Equipment	Pavers	9.4E-02	1.0E-01	1.2E+00	3.1E-02
2270002006	Construction and Mining Equipment	Tampers/Rammers	3.1E-04	4.2E-04	2.7E-03	5.1E-05
2270002009	Construction and Mining Equipment	Plate Compactors	4.6E-03	6.7E-03	4.2E-02	8.4E-04
2270002015	Construction and Mining Equipment	Rollers	2.6E-01	2.7E-01	3.1E+00	7.8E-02
2270002018	Construction and Mining Equipment	Scrapers	2.0E-01	2.0E-01	3.4E+00	8.5E-02
2270002021	Construction and Mining Equipment	Paving Equipment	1.7E-02	1.8E-02	1.9E-01	4.7E-03
2270002024	Construction and Mining Equipment	Surfacing Equipment	1.2E-02	1.2E-02	1.4E-01	2.9E-03
2270002027	Construction and Mining Equipment	Signal Boards/Light Plants	3.6E-02	5.6E-02	3.8E-01	8.6E-03
2270002030	Construction and Mining Equipment	Trenchers	1.6E-01	1.6E-01	1.5E+00	3.7E-02
2270002033	Construction and Mining Equipment	Bore/Drill Rigs	1.2E-01	1.5E-01	1.8E+00	3.2E-02
2270002036	Construction and Mining Equipment	Excavators	8.0E-01	8.6E-01	1.1E+01	3.2E-01
2270002039	Construction and Mining Equipment	Concrete/Industrial Saws	1.2E-02	1.2E-02	1.0E-01	2.6E-03
2270002042	Construction and Mining Equipment	Cement and Mortar Mixers	5.6E-03	8.0E-03	7.0E-02	1.2E-03
2270002045	Construction and Mining Equipment	Cranes	1.6E-01	2.2E-01	3.2E+00	7.2E-02
2270002048	Construction and Mining Equipment	Graders	1.9E-01	2.1E-01	2.9E+00	7.9E-02
2270002051	Construction and Mining Equipment	Off-highway Trucks	5.5E-01	6.3E-01	1.1E+01	2.7E-01
2270002054	Construction and Mining Equipment	Crushing/Processing Equipment	3.4E-02	4.4E-02	5.8E-01	1.3E-02
2270002057	Construction and Mining Equipment	Rough Terrain Forklifts	4.1E-01	4.1E-01	4.1E+00	1.0E-01
2270002060	Construction and Mining Equipment	Rubber Tire Loaders	9.7E-01	1.1E+00	1.5E+01	3.4E-01
2270002066	Construction and Mining Equipment	Tractors/Loaders/Backhoes	1.4E+00	2.1E+00	9.8E+00	2.1E-01
2270002069	Construction and Mining Equipment	Crawler Tractor/Dozers	8.0E-01	8.8E-01	1.3E+01	3.2E-01
2270002072	Construction and Mining Equipment	Skid Steer Loaders	1.2E+00	2.0E+00	6.7E+00	1.4E-01
2270002075	Construction and Mining Equipment	Off-highway Tractors	9.6E-02	1.1E-01	1.6E+00	3.4E-02
2270002078	Construction and Mining Equipment	Dumpers/Tenders	3.8E-03	6.4E-03	2.2E-02	4.4E-04
2270002081	Construction and Mining Equipment	Other Construction Equipment	1.1E-01	1.2E-01	1.6E+00	3.2E-02
2270003010	Industrial Equipment	Aerial Lifts	7.2E-02	1.2E-01	4.4E-01	8.7E-03
2270003020	Industrial Equipment	Forklifts	3.9E-01	3.7E-01	4.2E+00	1.3E-01
2270003030	Industrial Equipment	Sweepers/Scrubbers	1.4E-01	1.8E-01	2.2E+00	5.5E-02
2270003040	Industrial Equipment	Other General Industrial Equipment	1.5E-01	2.1E-01	2.5E+00	5.6E-02
2270003050	Industrial Equipment	Other Material Handling Equipment	1.4E-02	2.2E-02	1.2E-01	2.2E-03
2270003060	Industrial Equipment	AC\Refrigeration	7.4E-01	8.3E-01	8.9E+00	2.3E-01
2270003070	Industrial Equipment	Terminal Tractors	2.0E-01	2.2E-01	2.7E+00	8.0E-02
2270004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	7.4E-06	1.3E-05	7.6E-05	1.4E-06
2270004036	Lawn and Garden Equipment	Snowblowers (Commercial)	1.1E-03	1.6E-03	2.0E-02	3.8E-04
2270004046	Lawn and Garden Equipment	Front Mowers (Commercial)	4.4E-02	6.5E-02	4.5E-01	1.0E-02
2270004056	Lawn and Garden Equipment	Lawn and Garden Tractors (Commercial)	8.4E-03	1.4E-02	9.1E-02	2.1E-03
2270004066	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	5.1E-02	6.8E-02	6.9E-01	1.4E-02
2270004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	4.8E-03	5.6E-03	6.4E-02	1.6E-03
2270004076	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Commercial)	1.8E-04	2.5E-04	1.8E-03	3.8E-05
2270005010	Agricultural Equipment	2-Wheel Tractors	5.6E-04	6.5E-04	3.9E-03	9.5E-05
2270005015	Agricultural Equipment	Agricultural Tractors	1.9E+01	2.1E+01	2.0E+02	4.2E+00
2270005020	Agricultural Equipment	Combines	2.1E+00	1.8E+00	2.1E+01	3.8E-01
2270005025	Agricultural Equipment	Balers	1.3E-02	1.7E-02	9.9E-02	2.1E-03
2270005030	Agricultural Equipment	Agricultural Mowers	2.8E-03	2.8E-03	2.0E-02	4.2E-04
2270005035	Agricultural Equipment	Sprayers	1.7E-01	2.3E-01	1.6E+00	3.2E-02
2270005040	Agricultural Equipment	Tillers : 6 HP	1.4E-04	1.7E-04	1.7E-03	3.4E-05
2270005045	Agricultural Equipment	Swathers	1.9E-01	1.8E-01	1.5E+00	3.0E-02
2270005055	Agricultural Equipment	Other Agricultural Equipment	4.3E-01	4.6E-01	4.3E+00	8.2E-02
2270005060	Agricultural Equipment	Irrigation Sets	2.2E-01	2.8E-01	2.8E+00	6.1E-02
2270006005	Commercial Equipment	Generator Sets	4.7E-01	6.9E-01	5.3E+00	1.1E-01
2270006010	Commercial Equipment	Pumps	1.2E-01	1.5E-01	1.3E+00	2.5E-02
2270006015	Commercial Equipment	Air Compressors	2.5E-01	3.1E-01	3.0E+00	7.0E-02
2270006025	Commercial Equipment	Welders	3.0E-01	5.1E-01	1.6E+00	3.5E-02
2270006030	Commercial Equipment	Pressure Washers	1.3E-02	2.2E-02	1.8E-01	3.4E-03
2270006035	Commercial Equipment	Hydro-power Units	1.1E-02	1.4E-02	1.3E-01	3.0E-03
2270007015	Logging Equipment	Forest Eqp - Feller/Bunch/Skidder	3.4E+00	3.7E+00	5.0E+01	1.4E+00
2270010010	Industrial Equipment	Other Oil Field Equipment	4.0E-02	5.6E-02	8.5E-01	1.8E-02
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2008 Total Tons Per Year			**36.3**	**40.9**	**412.0**	**9.3**

Appendix C, Table C- 14. NONROAD2008a Output, Klamath County, 2008. Diesel Typical Season Day

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2270001060	Recreational Equipment	Specialty Vehicles/Carts	2.0E-01	3.8E-01	1.4E+00	2.7E-02
2270002003	Construction and Mining Equipment	Pavers	5.1E-01	5.4E-01	6.4E+00	1.7E-01
2270002006	Construction and Mining Equipment	Tampers/Rammers	1.6E-03	2.3E-03	1.5E-02	2.7E-04
2270002009	Construction and Mining Equipment	Plate Compactors	2.5E-02	3.6E-02	2.3E-01	4.5E-03
2270002015	Construction and Mining Equipment	Rollers	1.4E+00	1.5E+00	1.7E+01	4.2E-01
2270002018	Construction and Mining Equipment	Scrapers	1.1E+00	1.1E+00	1.8E+01	4.6E-01
2270002021	Construction and Mining Equipment	Paving Equipment	9.1E-02	9.9E-02	1.0E+00	2.5E-02
2270002024	Construction and Mining Equipment	Surfacing Equipment	6.2E-02	6.7E-02	7.4E-01	1.6E-02
2270002027	Construction and Mining Equipment	Signal Boards/Light Plants	1.9E-01	3.0E-01	2.1E+00	4.6E-02
2270002030	Construction and Mining Equipment	Trenchers	8.6E-01	8.6E-01	8.2E+00	2.0E-01
2270002033	Construction and Mining Equipment	Bore/Drill Rigs	6.2E-01	8.3E-01	9.8E+00	1.7E-01
2270002036	Construction and Mining Equipment	Excavators	4.3E+00	4.6E+00	6.2E+01	1.7E+00
2270002039	Construction and Mining Equipment	Concrete/Industrial Saws	6.5E-02	6.4E-02	5.6E-01	1.4E-02
2270002042	Construction and Mining Equipment	Cement and Mortar Mixers	3.0E-02	4.3E-02	3.8E-01	6.7E-03
2270002045	Construction and Mining Equipment	Cranes	8.5E-01	1.2E+00	1.7E+01	3.9E-01
2270002048	Construction and Mining Equipment	Graders	1.0E+00	1.2E+00	1.5E+01	4.2E-01
2270002051	Construction and Mining Equipment	Off-highway Trucks	2.9E+00	3.4E+00	6.0E+01	1.5E+00
2270002054	Construction and Mining Equipment	Crushing/Processing Equipment	1.8E-01	2.4E-01	3.1E+00	6.9E-02
2270002057	Construction and Mining Equipment	Rough Terrain Forklifts	2.2E+00	2.2E+00	2.2E+01	5.5E-01
2270002060	Construction and Mining Equipment	Rubber Tire Loaders	5.2E+00	5.8E+00	8.0E+01	1.9E+00
2270002066	Construction and Mining Equipment	Tractors/Loaders/Backhoes	7.7E+00	1.1E+01	5.3E+01	1.1E+00
2270002069	Construction and Mining Equipment	Crawler Tractor/Dozers	4.3E+00	4.7E+00	6.8E+01	1.7E+00
2270002072	Construction and Mining Equipment	Skid Steer Loaders	6.6E+00	1.1E+01	3.6E+01	7.7E-01
2270002075	Construction and Mining Equipment	Off-highway Tractors	5.2E-01	6.0E-01	8.7E+00	1.8E-01
2270002078	Construction and Mining Equipment	Dumpers/Tenders	2.1E-02	3.4E-02	1.2E-01	2.4E-03
2270002081	Construction and Mining Equipment	Other Construction Equipment	5.7E-01	6.3E-01	8.4E+00	1.7E-01
2270003010	Industrial Equipment	Aerial Lifts	3.7E-01	6.4E-01	2.3E+00	4.6E-02
2270003020	Industrial Equipment	Forklifts	2.0E+00	1.9E+00	2.2E+01	6.6E-01
2270003030	Industrial Equipment	Sweepers/Scrubbers	7.4E-01	9.3E-01	1.1E+01	2.9E-01
2270003040	Industrial Equipment	Other General Industrial Equipment	8.0E-01	1.1E+00	1.3E+01	2.9E-01
2270003050	Industrial Equipment	Other Material Handling Equipment	7.3E-02	1.2E-01	6.4E-01	1.1E-02
2270003060	Industrial Equipment	AC\Refrigeration	3.3E+00	3.7E+00	4.0E+01	1.0E+00
2270003070	Industrial Equipment	Terminal Tractors	1.0E+00	1.1E+00	1.4E+01	4.2E-01
2270004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	1.1E-05	2.0E-05	1.1E-04	2.1E-06
2270004036	Lawn and Garden Equipment	Snowblowers (Commercial)	2.8E-02	4.1E-02	4.9E-01	9.5E-03
2270004046	Lawn and Garden Equipment	Front Mowers (Commercial)	6.5E-02	9.8E-02	6.7E-01	1.5E-02
2270004056	Lawn and Garden Equipment	Lawn and Garden Tractors (Commercial)	1.2E-02	2.0E-02	1.4E-01	3.1E-03
2270004066	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	7.6E-02	1.0E-01	1.0E+00	2.1E-02
2270004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	7.2E-03	8.3E-03	9.6E-02	2.4E-03
2270004076	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Commercial)	2.7E-04	3.7E-04	2.7E-03	5.7E-05
2270005010	Agricultural Equipment	2-Wheel Tractors	8.7E-04	1.0E-03	6.1E-03	1.5E-04
2270005015	Agricultural Equipment	Agricultural Tractors	3.0E+01	3.2E+01	3.2E+02	6.6E+00
2270005020	Agricultural Equipment	Combines	3.2E+00	2.9E+00	3.3E+01	5.9E-01
2270005025	Agricultural Equipment	Balers	2.0E-02	2.6E-02	1.5E-01	3.3E-03
2270005030	Agricultural Equipment	Agricultural Mowers	4.4E-03	4.4E-03	3.1E-02	6.6E-04
2270005035	Agricultural Equipment	Sprayers	2.6E-01	3.6E-01	2.5E+00	5.0E-02
2270005040	Agricultural Equipment	Tillers : 6 HP	2.2E-04	2.7E-04	2.7E-03	5.3E-05
2270005045	Agricultural Equipment	Swathers	2.9E-01	2.7E-01	2.4E+00	4.6E-02
2270005055	Agricultural Equipment	Other Agricultural Equipment	6.7E-01	7.2E-01	6.7E+00	1.3E-01
2270005060	Agricultural Equipment	Irrigation Sets	3.4E-01	4.4E-01	4.3E+00	9.4E-02
2270006005	Commercial Equipment	Generator Sets	3.1E+00	4.5E+00	3.4E+01	6.9E-01
2270006010	Commercial Equipment	Pumps	7.5E-01	1.0E+00	8.2E+00	1.6E-01
2270006015	Commercial Equipment	Air Compressors	1.6E+00	2.0E+00	2.0E+01	4.5E-01
2270006025	Commercial Equipment	Welders	1.9E+00	3.3E+00	1.0E+01	2.3E-01
2270006030	Commercial Equipment	Pressure Washers	8.4E-02	1.4E-01	1.1E+00	2.2E-02
2270006035	Commercial Equipment	Hydro-power Units	7.1E-02	8.8E-02	8.5E-01	2.0E-02
2270007015	Logging Equipment	Forest Eqp - Feller/Bunch/Skidder	2.2E+01	2.4E+01	3.2E+02	9.4E+00
2270010010	Industrial Equipment	Other Oil Field Equipment	2.0E-01	2.9E-01	4.4E+00	9.1E-02
			------	------	------	------
2008 Total lbs per day			**114**	**134**	**1,371**	**33**

Appendix C, Table C- 15. NONROAD2008a Output, Klamath County, 2008. Diesel Worst-Case Season Day

SCC	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2270001060	Recreational Equipment	Specialty Vehicles/Carts	2.0E-01	3.8E-01	1.4E+00	2.7E-02
2270002003	Construction and Mining Equipment	Pavers	5.1E-01	5.4E-01	6.4E+00	1.7E-01
2270002006	Construction and Mining Equipment	Tampers/Rammers	1.6E-03	2.3E-03	1.5E-02	2.7E-04
2270002009	Construction and Mining Equipment	Plate Compactors	2.5E-02	3.6E-02	2.3E-01	4.5E-03
2270002015	Construction and Mining Equipment	Rollers	1.4E+00	1.5E+00	1.7E+01	4.2E-01
2270002018	Construction and Mining Equipment	Scrapers	1.1E+00	1.1E+00	1.8E+01	4.6E-01
2270002021	Construction and Mining Equipment	Paving Equipment	9.1E-02	9.9E-02	1.0E+00	2.5E-02
2270002024	Construction and Mining Equipment	Surfacing Equipment	6.2E-02	6.7E-02	7.4E-01	1.6E-02
2270002027	Construction and Mining Equipment	Signal Boards/Light Plants	1.9E-01	3.0E-01	2.1E+00	4.6E-02
2270002030	Construction and Mining Equipment	Trenchers	8.6E-01	8.6E-01	8.2E+00	2.0E-01
2270002033	Construction and Mining Equipment	Bore/Drill Rigs	6.2E-01	8.3E-01	9.8E+00	1.7E-01
2270002036	Construction and Mining Equipment	Excavators	4.3E+00	4.6E+00	6.2E+01	1.7E+00
2270002039	Construction and Mining Equipment	Concrete/Industrial Saws	6.5E-02	6.4E-02	5.6E-01	1.4E-02
2270002042	Construction and Mining Equipment	Cement and Mortar Mixers	3.0E-02	4.3E-02	3.8E-01	6.7E-03
2270002045	Construction and Mining Equipment	Cranes	8.5E-01	1.2E+00	1.7E+01	3.9E-01
2270002048	Construction and Mining Equipment	Graders	1.0E+00	1.2E+00	1.5E+01	4.2E-01
2270002051	Construction and Mining Equipment	Off-highway Trucks	2.9E+00	3.4E+00	6.0E+01	1.5E+00
2270002054	Construction and Mining Equipment	Crushing/Processing Equipment	1.8E-01	2.4E-01	3.1E+00	6.9E-02
2270002057	Construction and Mining Equipment	Rough Terrain Forklifts	2.2E+00	2.2E+00	2.2E+01	5.5E-01
2270002060	Construction and Mining Equipment	Rubber Tire Loaders	5.2E+00	5.8E+00	8.0E+01	1.9E+00
2270002066	Construction and Mining Equipment	Tractors/Loaders/Backhoes	7.7E+00	1.1E+01	5.3E+01	1.1E+00
2270002069	Construction and Mining Equipment	Crawler Tractor/Dozers	4.3E+00	4.7E+00	6.8E+01	1.7E+00
2270002072	Construction and Mining Equipment	Skid Steer Loaders	6.6E+00	1.1E+01	3.6E+01	7.7E-01
2270002075	Construction and Mining Equipment	Off-highway Tractors	5.2E-01	6.0E-01	8.7E+00	1.8E-01
2270002078	Construction and Mining Equipment	Dumpers/Tenders	2.1E-02	3.4E-02	1.2E-01	2.4E-03
2270002081	Construction and Mining Equipment	Other Construction Equipment	5.7E-01	6.3E-01	8.4E+00	1.7E-01
2270003010	Industrial Equipment	Aerial Lifts	3.7E-01	6.4E-01	2.3E+00	4.6E-02
2270003020	Industrial Equipment	Forklifts	2.0E+00	1.9E+00	2.2E+01	6.6E-01
2270003030	Industrial Equipment	Sweepers/Scrubbers	7.4E-01	9.3E-01	1.1E+01	2.9E-01
2270003040	Industrial Equipment	Other General Industrial Equipment	8.0E-01	1.1E+00	1.3E+01	2.9E-01
2270003050	Industrial Equipment	Other Material Handling Equipment	7.3E-02	1.2E-01	6.4E-01	1.1E-02
2270003060	Industrial Equipment	AC\Refrigeration	3.3E+00	3.7E+00	4.0E+01	1.0E+00
2270003070	Industrial Equipment	Terminal Tractors	1.0E+00	1.1E+00	1.4E+01	4.2E-01
2270004031	Lawn and Garden Equipment	Leafblowers/Vacuums (Commercial)	1.1E-05	2.0E-05	1.1E-04	2.1E-06
2270004036	Lawn and Garden Equipment	Snowblowers (Commercial)	2.8E-02	4.1E-02	4.9E-01	9.5E-03
2270004046	Lawn and Garden Equipment	Front Mowers (Commercial)	6.5E-02	9.8E-02	6.7E-01	1.5E-02
2270004056	Lawn and Garden Equipment	Lawn and Garden Tractors (Commercial)	1.2E-02	2.0E-02	1.4E-01	3.1E-03
2270004066	Lawn and Garden Equipment	Chippers/Stump Grinders (Commercial)	7.6E-02	1.0E-01	1.0E+00	2.1E-02
2270004071	Lawn and Garden Equipment	Turf Equipment (Commercial)	7.2E-03	8.3E-03	9.6E-02	2.4E-03
2270004076	Lawn and Garden Equipment	Other Lawn and Garden Equipment (Commercial)	2.7E-04	3.7E-04	2.7E-03	5.7E-05
2270005010	Agricultural Equipment	2-Wheel Tractors	8.7E-04	1.0E-03	6.1E-03	1.5E-04
2270005015	Agricultural Equipment	Agricultural Tractors	3.0E+01	3.2E+01	3.2E+02	6.6E+00
2270005020	Agricultural Equipment	Combines	3.2E+00	2.9E+00	3.3E+01	5.9E-01
2270005025	Agricultural Equipment	Balers	2.0E-02	2.6E-02	1.5E-01	3.3E-03
2270005030	Agricultural Equipment	Agricultural Mowers	4.4E-03	4.4E-03	3.1E-02	6.6E-04
2270005035	Agricultural Equipment	Sprayers	2.6E-01	3.6E-01	2.5E+00	5.0E-02
2270005040	Agricultural Equipment	Tillers : 6 HP	2.2E-04	2.7E-04	2.7E-03	5.3E-05
2270005045	Agricultural Equipment	Swathers	2.9E-01	2.7E-01	2.4E+00	4.6E-02
2270005055	Agricultural Equipment	Other Agricultural Equipment	6.7E-01	7.2E-01	6.7E+00	1.3E-01
2270005060	Agricultural Equipment	Irrigation Sets	3.4E-01	4.4E-01	4.3E+00	9.4E-02
2270006005	Commercial Equipment	Generator Sets	3.1E+00	4.5E+00	3.4E+01	6.9E-01
2270006010	Commercial Equipment	Pumps	7.5E-01	1.0E+00	8.2E+00	1.6E-01
2270006015	Commercial Equipment	Air Compressors	1.6E+00	2.0E+00	2.0E+01	4.5E-01
2270006025	Commercial Equipment	Welders	1.9E+00	3.3E+00	1.0E+01	2.3E-01
2270006030	Commercial Equipment	Pressure Washers	8.4E-02	1.4E-01	1.1E+00	2.2E-02
2270006035	Commercial Equipment	Hydro-power Units	7.1E-02	8.8E-02	8.5E-01	2.0E-02
2270007015	Logging Equipment	Forest Eqp - Feller/Bunch/Skidder	2.2E+01	2.4E+01	3.2E+02	9.4E+00
2270010010	Industrial Equipment	Other Oil Field Equipment	2.0E-01	2.9E-01	4.4E+00	9.1E-02
			------	------	------	------
2008 Total lbs per day			**114**	**134**	**1,371**	**33**

Appendix C, Table C- 16. NONROAD2008a Output, Klamath County, 2008. Recreational Marine and Railway Maintenance Equipment, Annual

SCC	Fuel	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2282005010	2-Stroke	Recreational Marine/Outboard	Outboard	18.2	1,151.2	56.9	0.4
2282005015	2-Stroke	Recreational Marine/Personal Water Craft	Personal Water Craft	6.5	371.0	20.9	0.2
2282010005	4-Stroke	Recreational Marine/Inboard/Sterndrive	Inboard/Sterndrive	0.5	65.2	81.1	0.2
2282020005	Diesel	Recreational Marine/Inboard/Sterndrive	Inboard/Sterndrive	1.3	2.6	64.0	1.4
2282020010	Diesel	Recreational Marine/Outboard	Outboard	0.03	0.1	0.3	0.01
				-------	-------	-------	-------
Total: Recreational Marine Tons Per Year				**26.5**	**1,590.0**	**223.1**	**2.1**
2285002015	Diesel	Railway Maintenance	Railway Maintenance	4.8E-01	7.1E-01	3.9E+00	7.5E-02
2285004015	4-Stroke	Railway Maintenance	Railway Maintenance	2.0E-03	1.9E-01	7.5E-02	4.2E-04
2285006015	LPG	Railway Maintenance	Railway Maintenance	5.1E-05	2.1E-03	7.5E-03	4.5E-05
				-------	-------	-------	-------
Total: Railway Maintenance Tons Per Year				**0.5**	**0.9**	**4.0**	**0.1**

Appendix C, Table C- 17. NONROAD2008a Output, Klamath County, 2008. Recreational Marine and Railway Maintenance Equipment, Typical Season Day

SCC	Fuel	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2282005010	2-Stroke	Recreational Marine/Outboard	Outboard	8	708	26	0.2
2282005015	2-Stroke	Recreational Marine/Personal Water Craft	Personal Water Craft	3	182	10	0.1
2282010005	4-Stroke	Recreational Marine/Inboard/Sterndrive	Inboard/Sterndrive	0.2	58	42	0.1
2282020005	Diesel	Recreational Marine/Inboard/Sterndrive	Inboard/Sterndrive	0.6	1	29	0.6
2282020010	Diesel	Recreational Marine/Outboard	Outboard	0.01	0.03	0.1	0.004
				-------	-------	-------	-------
Total: Recreational Marine lbs Per Day				**12**	**949**	**106**	**1**
2285002015	Diesel	Railway Maintenance	Railway Maintenance	3.4E+00	4.9E+00	2.7E+01	5.3E-01
2285004015	4-Stroke	Railway Maintenance	Railway Maintenance	1.4E-02	1.3E+00	6.0E-01	2.9E-03
2285006015	LPG	Railway Maintenance	Railway Maintenance	3.6E-04	1.5E-02	5.3E-02	3.2E-04
				-------	-------	-------	-------
Total: Railway Maintenance lbs Per Day				**3**	**6**	**28**	**1**

Appendix C, Table C- 18. NONROAD2008a Output, Klamath County, 2008. Recreational Marine and Railway Maintenance Equipment, Worst-Case Season Day

SCC	Fuel	Group	Vehicles/Equipment	PM25	VOC	NOX	SO2
2282005010	2-Stroke	Recreational Marine/Outboard	Outboard	8	675	30	0.2
2282005015	2-Stroke	Recreational Marine/Personal Water Craft	Personal Water Craft	3	180	11	0.1
2282010005	4-Stroke	Recreational Marine/Inboard/Sterndrive	Inboard/Sterndrive	0.2	48	48	0.1
2282020005	Diesel	Recreational Marine/Inboard/Sterndrive	Inboard/Sterndrive	0.6	1	29	0.6
2282020010	Diesel	Recreational Marine/Outboard	Outboard	0.01	0.03	0.1	0.004
				-------	-------	-------	-------
Total: Recreational Marine lbs Per Day				**12**	**903**	**118**	**1**
2285002015	Diesel	Railway Maintenance	Railway Maintenance	3.4E+00	4.9E+00	2.7E+01	5.3E-01
2285004015	4-Stroke	Railway Maintenance	Railway Maintenance	1.4E-02	1.2E+00	6.9E-01	2.9E-03
2285006015	LPG	Railway Maintenance	Railway Maintenance	3.6E-04	1.5E-02	5.3E-02	3.2E-04
				-------	-------	-------	-------
Total: Railway Maintenance lbs Per Day				**3**	**6**	**28**	**1**

Appendix C, Table C- 19. GIS Allocation Results: Klamath County Zones, County-Wide and by Nonattainment Area

Area	ID 1 -- Agriculture -- (acres)	ID 2 (acres)	ID 3 Commercial (acres)	ID 4 Construction (acres)	ID 5 Industrial (acres)	ID 6 Forest (acres)	ID 7 Recreational (acres)	ID 8 Golf Carts (acres)	ID 9 -- Lawn & Garden -- Commercial (acres)	ID 10 Residential (acres)
County	310,657	454,135	2,058	126,126	6,320	2,869,475	555,633		73,941	70,499
NAA	13,329	13,329	1,339	30,648	3,845	8,396	24,436		15,384	13,534
	----------	----------	----------	----------	----------	----------	----------		----------	----------
NAA % of County	4.1%	2.9%	39.4%	19.5%	37.8%	0.3%	4.2%	100%	17.2%	16.1%

Notes:

ID 1 = Agriculturally Zoned: Primarily Farm and Cropland

ID 2 = Agriculturally Zoned: Farm, Cropland, and Grazing

ID 3 = Commercially Zoned

ID 4 = Construction: Commercial/Residential/Industrial Zoning Mix

ID 5 = Industrially Zoned

ID 6 = Forest Land

ID 8 = all county golf courses located within K Falls NA: http://golf-courses.local-data.com/county/oregon-or/klamath/3143/

ID 7 = Recreational Vehicles & Equipment: Farm/Rural and Low-Density Residential Zoning Mix

ID 9 = Commercial Lawn & Garden: Residential and Commercial Zones

ID 10 = Residential Lawn & Garden: Residential Zoning

Appendix C, Table C- 20. Recreational Boating Use and Activity by Waterbody and Launch: Klamath County, 2008

Waterbody (Destination)	Ramp, Launch Site, Marina (origin)	Use Days
Agency Lake	Henzel Park	6,583
	Unknown	703
	Petric Park	88
Crescent Lake	Unknown	5,384
	Spring Campground	3,037
	Crescent Lake Campground	643
	Tranquil Cove Day Use Area	641
Fourmile Lake	Unknown	176
Gerber Reservoir	North Gerber Day Use	25
	Unknown	424
Klamath River	Unknown	823
Lake of the Woods	Lake of the Woods Resort	11,359
	Unknown	9,975
	Sunset Beach	7,254
	Aspen	4,037
Miller Lake	Digit Point	416
Odell Lake	Unknown	8,188
	Sunset Cove Campground	7,775
	Trapper Creek	4,962
	Shelter Cove Resort	4,388
	Princess Creek	2,848
	Odell Lake Resort	1,476
Upper Klamath Lake	Unknown	7,132
	Pelican Marina	3,796
	Private Site	3,208
	Rocky Point	2,086
	Klamath Yacht Club	1,728
	Eagle Ridge	823
	Moore Park Marina II	165
Williamson River	Unknown	351
Willow Valley Reservoir	Willow Valley	329
Wood River	Petric Park	88
	Wood River Day Use Area	264

	Total	**101,175**
	Within Klamath Falls NA(1)	**10,859**
	% Within Klamath Falls NA(2)	**10.7%**

Notes:

Use day data for Klamath County supplied to DEQ by Randy Henry, OSMB.

(1) DEQ Reference 346e.

Includes Pelican Marina, Klamath Yacht Club, and Moore Park Marina II. For a conservative estimate, the total also includes 50% of the use days from the "Unknown" and "Private Site" locations on the Upper Klamath Lake waterbody.

(2) % Within Klamath Falls NA = (Within Klamath Falls NA) / (Total)

Appendix C, Table C- 21. Klamath Falls International Airport 2008 PM Season Landings & Takeoffs (LTOs) by Aircraft Category

Season Summary LTO data

Aircraft Category	LTOs (1)						
	(1) 2008 LTO Annual Activity	(2) 2008 ATADS Season LTOs	(3) Adjusted 2008 Season Total LTOs	(4) 2008 Season Daily Average LTOs	(5) 2008 Season Maximum Daily LTOs	(6) 2008 Season Maximum Date	(7) 2008 Maximum Daily to Daily Average LTO Ratio
Military	5,646	2,487	1,244	10.28	55.5	10-Dec	5.4
Commercial Air	2,142 **(8)**	Not Available	1,424	11.8	41.88	Date is unknown.	3.6
General Aviation	9,304	3,338	1,669	13.79	114	Novr/23	8.3
Air Taxi	2,455	1,632	816	6.7	24.00	Jan/16, Nov/10, Dec/12	3.6
All Aircraft		7,457	3,729	30.81	181	Dec/10/200	5.87

Notes:

1) Landings and Take-Offs from Appendex C, Table C-23.

Federal Aviation Administration (FAA) Air Traffic Activity Data System (ATADS) tables do not include Commercial Air LTOs on a monthly basis and therefore seasonal LTO data was not available.

Data is provided in this column only for Commercial Air and Air Taxi aircraft category and is used in estimating Commercial Air PM season maximum daily LTO activity. 2008 LTO Annual Activity for the Air Taxi category is from the Air Traffic Activity Data System (ATADS) web site.

Aircraft Category	(a) ATADS 2008 Annual LTOs	(b) ATADS to "EPA" LTO cycle adjustment	(c) "EPA-type" ATADS LTOs
Air Taxi (AT)	4,910	2	2,455

a) Annual Landings and Take-Offs from Appendex C, Table C-23.

Air Traffic Data System (ATADS) include both Landings & Takeoffs, each of which are counted as one(1) LTO.

b) ATADS data counts both landings and takeoffs as an individual activity, however, EPA defines an LTO as both a landing and a takeoff and the emission factors r
To obtain the "EPA" LTOs, activity levels reported in ATADS (Ref. 740) are divided by two to reflect this difference. ATADS to "EPA" LTO cycle adjustment = 2

c) 2008 EPA LTO Adjustment =
(ATADS 2008 Annual LTOs / ATADS to "EPA" LTO cycle adjustment) (See Note 2.)

2) 2008 ATADS Season LTO data is from the Federal Aviation Administration (FAA) Air Traffic Activity Data System (ATADS) web site (Ref. 479) and tables below).

These values are from the monthly LTO data in the tables below and are the sum of the four months (Jan., Feb., Nov., & Dec.) in the PM season. ATADS LTO data counts each Landing and Takeoff as one(1) LTO activity. EPA emission factors utilize an LTO cycle consisting of 1 landing & 1 takeoff. The ATADS LTOs are adjusted to EPA LTOs in the next column.

Notes for Table C-21, continued

3) For all aircraft categories except Commercial Air:
Adjusted 2008 Season Total LTOs = 2008 ATADS Season LTOs / 2 [LTOs/cycle] For Commercial Air no season data was available. Because commercial air activity is very similar to air taxi activity. the season data is estimated based upon the ratio of Air Taxi season LTOs to annual LTOs.

Adjusted 2008 Season Total LTOs (for Commercial Air) =
(2008 LTO Annual Activity for Commercial Air) X
(Adjusted 2008 Season Total for Air Taxi / 2008 LTO Annual Activity for Air Taxi)

4) For all aircraft categories:
2008 Season Daily Average LTOs = (Adjusted 2008 PM10 Season Total LTOs / 121 [days in PM10 season])

5) For all aircraft categories except Commercial Air:
2008 PM Season Maximum Daily LTOs data is from the tables below and is the maximum for the 4 months comprising the PM season Each maximum is highlighted in the tables below and the data when the maximum occurred is indicated in the next column.
Because this is ATADS data the LTO cycle is incorrect for the EPA LTO cycle and emission factors each maximum daily LTO is divided by two(2) (see Note 2 above).

2008 PM Season Maximum Daily LTOs =
Aircraft Category 2008 PM Season Maximum Daily LTOs / 2 [EPA LTOs per ATADS LTO)

For Commercial Air no PM Season data was available. Because Commercial Air activity is

very similar to Air Taxi activity the 2008 PM Season Maximum Daily LTO data for the Commercial Air Aircraft Category is estimated based upon the ratio of Air Tax 2008 PM Season Maximum Daily LTOs to the Air Taxi 2008 PM Season Daily Average.

2008 PM Season Maximum Daily LTOs for Commercial Air =
(Air Tax 2008 PM Season Maximum Daily LTOs * Air Taxi 2008 Maximum Daily to Daily Average LTO Ratio)

6) Date of the 2008 PM Season Maximum Daily LTOs for each aircraft category is indicated here and is found in the table below. No data was available for the Commercial Air category (see Note 5 above).

7) The ATADS data does not include LTO activity for Commercial Air and therefore there is no 2008 PM season Maximum Daily LTO which can be used. Because Commercial Air activity is very similar to Air Taxi activity the PMseason Maximum Daily LTOs for Commercial Air are estimated based upon the 2008 Maximum Daily to Daily Average LTO Ratio category for the Air Taxi.
The value found in this column is only used for Commercial Air
2008 PM10 Season Maximum Daily LTOs estimation.

2008 Maximum Daily to Daily Average LTO Ratio for Air Taxi =
(2008 PM Season Maximum Daily LTOs for Air Taxi /2008 PM Season Daily Average LTOs)

(8) LTOs for Klamath Falls (Kingsley field) (Ref. 749.)

Type of Aircraft	LTOs
Boeing 737-800	2
Boeing 737-900	1
CESSNA 208	798
EMB-120 BRASILIA	1,341
----------------------	---------------
Total:	***2,142***

Ref. 749. - Jennifer Fabrizi , (RITA, U.S. Department of Transportation's research and Innovative Technology Administration T100 Data Administrator), jennifer.fabrizi@dot.gov

Address: RITA, BTS, 1200 New Jersey Avenue, SE., Washington, DC 20590-0001,
Telephone Number (202) 366-8513, Fax Number (202) 366-3383

Appendix C, Table C- 22. Klamath Falls International Airport 2008 PM Season Landings & Takeoffs (LTOs) by Aircraft Category

Daily - LTOs	Itinerant				Local		TOTAL (Itinerant+Local)				TOTAL
Date (2008 year)	AC Air Carrier (Commercial Air)	AT Air Taxi	GA General Aviation	MIL Military	Civil (General Aviation)	Military	AC Air Carrier	AT Air Taxi	GA General Aviation	MIL Military	
Jan/01	--	5	3	0	30	0	--	5	33	0	38
Jan/02	--	18	5	0	15	0	--	18	20	0	38
Jan/03	--	14	1	0	0	0	--	14	1	0	15
Jan/04	--	17	1	0	0	0	--	17	1	0	18
Jan/05	--	8	1	0	0	0	--	8	1	0	9
Jan/06	--	6	2	0	19	0	--	6	21	0	27
Jan/07	--	18	4	0	12	0	--	18	16	0	34
Jan/08	--	12	1	0	0	0	--	12	1	0	13
Jan/09	--	20	5	4	7	13	--	20	12	17	49
Jan/10	--	14	7	4	4	46	--	14	11	50	75
Jan/11	--	15	11	12	9	26	--	15	20	38	73
Jan/12	--	9	0	13	8	20	--	9	8	33	50
Jan/13	--	9	2	8	7	0	--	9	9	8	26
Jan/14	--	16	5	0	10	0	--	16	15	0	31
Jan/15	--	14	3	5	43	27	--	14	46	32	92
Jan/16	--	24	11	14	60	12	--	***24***	71	26	121
Jan/17	--	18	5	8	42	16	--	18	47	24	89
Jan/18	--	14	6	6	47	10	--	14	53	16	83
Jan/19	--	14	4	0	48	2	--	14	52	2	68
Jan/20	--	5	0	0	31	0	--	5	31	0	36
Jan/21	--	11	7	0	2	2	--	11	9	2	22
Jan/22	--	14	7	7	23	11	--	14	30	18	62
Jan/23	--	21	6	3	14	16	--	21	20	19	60
Jan/24	--	18	2	0	0	0	--	18	2	0	20
Jan/25	--	19	4	3	5	15	--	19	9	18	46
Jan/26	--	10	3	0	3	0	--	10	6	0	16
Jan/27	--	4	3	0	0	0	--	4	3	0	7
Jan/28	--	19	4	0	0	0	--	19	4	0	23
Jan/29	--	12	3	0	0	0	--	12	3	0	15
Jan/30	--	15	4	8	0	0	--	15	4	8	27
Jan/31	--	1	2	0	0	0	--	1	2	0	3
Jan Total:	**--**	**414**	**122**	**95**	**439**	**216**	**0**	**414**	**561**	**311**	**1,286**

Table C-22, continued:

Feb/01	--	14	5	0	0	0	--	14	5	0	19
Feb/02	--	5	0	0	0	0	--	5	0	0	5
Feb/03	--	7	4	0	3	0	--	7	7	0	14
Feb/04	--	13	2	4	11	25	--	13	13	29	55
Feb/05	--	19	4	8	10	39	--	19	14	47	80
Feb/06	--	16	5	16	14	10	--	16	19	26	61
Feb/07	--	10	4	9	2	16	--	10	6	25	41
Feb/08	--	16	2	22	5	24	--	16	7	46	69
Feb/09	--	6	4	10	39	18	--	6	43	28	77
Feb/10	--	4	2	6	21	6	--	4	23	12	39
Feb/11	--	15	7	0	72	0	--	15	79	0	94
Feb/12	--	8	19	4	65	24	--	8	84	28	120
Feb/13	--	22	3	16	29	6	--	22	32	22	76
Feb/14	--	13	0	6	27	48	--	13	27	54	94
Feb/15	--	16	11	6	55	22	--	16	66	28	110
Feb/16	--	8	2	0	76	0	--	8	78	0	86
Feb/17	--	9	3	0	89	0	--	9	92	0	101
Feb/18	--	11	6	0	104	0	--	11	110	0	121
Feb/19	--	18	3	15	24	23	--	18	27	38	83
Feb/20	--	20	7	25	12	44	--	20	19	69	108
Feb/21	--	20	6	17	4	10	--	20	10	27	57
Feb/22	--	19	5	11	0	0	--	19	5	11	35
Feb/23	--	9	5	0	8	0	--	9	13	0	22
Feb/24	--	8	6	0	1	0	--	8	7	0	15
Feb/25	--	10	21	1	44	1	--	10	65	2	77
Feb/26	--	10	8	24	20	55	--	10	28	79	117
Feb/27	--	17	4	14	54	59	--	17	58	73	148
Feb/28	--	15	9	16	30	41	--	15	39	57	111
Feb/29	--	15	7	11	74	35	--	15	81	46	142
Feb Total:	**--**	**373**	**164**	**241**	**893**	**506**	**0**	**373**	**1057**	**747**	**2,177**

Table C-22, Continued:

Nov/01	--	10	10	0	2	0	--	10	12	0	22
Nov/02	--	7	7	0	0	0	--	7	7	0	14
Nov/03	--	17	5	0	0	0	--	17	5	0	22
Nov/04	--	15	17	25	0	0	--	15	17	25	57
Nov/05	--	18	6	12	0	2	--	18	6	14	38
Nov/06	--	15	4	37	1	1	--	15	5	38	58
Nov/07	--	13	13	0	0	0	--	13	13	0	26
Nov/08	--	10	5	0	6	0	--	10	11	0	21
Nov/09	--	8	20	4	36	20	--	8	56	24	88
Nov/10	--	24	12	28	22	18	--	**24**	34	46	104
Nov/11	--	16	6	0	0	0	--	16	6	0	22
Nov/12	--	21	6	37	8	16	--	21	14	53	88
Nov/13	--	16	5	30	2	10	--	16	7	40	63
Nov/14	--	11	15	21	37	14	--	11	52	35	98
Nov/15	--	11	24	22	28	36	--	11	52	58	121
Nov/16	--	8	52	10	22	31	--	8	74	41	123
Nov/17	--	16	10	0	98	0	--	16	108	0	124
Nov/18	--	12	16	32	29	9	--	12	45	41	98
Nov/19	--	17	17	30	17	12	--	17	34	42	93
Nov/20	--	18	8	33	5	12	--	18	13	45	76
Nov/21	--	11	14	20	22	10	--	11	36	30	77
Nov/22	--	9	6	0	16	0	--	9	22	0	31
Nov/23	--	9	57	0	57	0	--	9	***114***	0	123
Nov/24	--	20	13	27	14	19	--	20	27	46	93
Nov/25	--	12	24	30	25	34	--	12	49	64	125
Nov/26	--	16	12	13	43	9	--	16	55	22	93
Nov/27	--	20	6	0	4	0	--	20	10	0	30
Nov/28	--	10	8	0	20	0	--	10	28	0	38
Nov/29	--	12	9	0	22	0	--	12	31	0	43
Nov/30	--	9	14	0	30	0	--	9	44	0	53
Nov Total	**--**	411	421	411	566	253	0	411	987	664	**2,062**

Table C-22, Continued:

Dec/01	--	18	7	1	20	0	--	18	27	1	46
Dec/02	--	14	19	34	10	14	--	14	29	48	91
Dec/03	--	2	6	2	0	0	--	2	6	2	10
Dec/04	--	10	15	40	23	16	--	10	38	56	104
Dec/05	--	17	16	18	57	22	--	17	73	40	130
Dec/06	--	13	16	2	40	2	--	13	56	4	73
Dec/07	--	6	20	12	54	0	--	6	74	12	92
Dec/08	--	21	13	38	13	13	--	21	26	51	98
Dec/09	--	13	25	38	42	46	--	13	67	84	164
Dec/10	--	14	22	45	34	66	--	14	56	***111***	181
Dec/11	--	19	17	38	13	16	--	19	30	54	103
Dec/12	--	24	5	15	16	22	--	***24***	21	37	82
Dec/13	--	9	3	7	0	0	--	9	3	7	19
Dec/14	--	8	8	3	0	0	--	8	8	3	19
Dec/15	--	15	4	1	0	0	--	15	4	1	20
Dec/16	--	11	16	27	40	16	--	11	56	43	110
Dec/17	--	17	9	39	16	36	--	17	25	75	117
Dec/18	--	16	4	22	14	14	--	16	18	36	70
Dec/19	--	18	10	1	0	0	--	18	10	1	29
Dec/20	--	9	2	0	0	0	--	9	2	0	11
Dec/21	--	5	0	0	0	0	--	5	0	0	5
Dec/22	--	7	1	0	0	0	--	7	1	0	8
Dec/23	--	17	5	0	10	0	--	17	15	0	32
Dec/24	--	17	1	0	6	0	--	17	7	0	24
Dec/25	--	19	6	0	8	0	--	19	14	0	33
Dec/26	--	13	4	0	0	0	--	13	4	0	17
Dec/27	--	17	1	0	8	0	--	17	9	0	26
Dec/28	--	10	1	0	0	0	--	10	1	0	11
Dec/29	--	18	0	0	8	0	--	18	8	0	26
Dec/30	--	19	5	29	6	39	--	19	11	68	98
Dec/31	--	18	8	13	26	18	--	18	34	31	83
December	**--**	***434***	***269***	***425***	***464***	***340***	**--**	***434***	***733***	***765***	***1,932***
Total:							**--**	**816**	**1,669**	**1,244**	**3,729**
Max (Worst Case Day)								**24**	**114**	**111**	**181**

Note: These numbers from the Federal Aviation Administration (FAA) Air Traffic Data System (ATADS) include both Landings & Takeoffs From 1/1/2008 To 12/31/2008 | Facility: LMT- Klamath Falls Int'l. State: Oregon this tables do not include Commercial Air LTOs .
Report created on Thu Jun 2 17:18:09 EDT 2011
Sources: Air Traffic Activity System (ATADS)

FAA Total % of total annual LTO

Annual	Air Carrier	Air Taxi	General Aviation	Military
	--	4,910	18,608	11,292
Monthly % of total annual LTO				
January	--	8.43%	3.01%	2.75%
February	--	7.60%	5.68%	6.62%
November	--	8.37%	5.30%	5.88%
December	--	8.84%	3.94%	6.77%

Annual Landings and Take-Offs from Appendex C, Table C-23.

Appendix C, Table C- 23. Klamath Falls International Airport 2008 PM2.5 Daily Landings & Takeoffs (LTOs) by Aircraft Category

Daily - LTOs

Date	Itinerant				Local		Total			
	AC	AT	GA	MIL						
	Air Carrier	Air Taxi	General Aviation	Military	General Aviation	Military	Air Carrier	Air Taxi	General Aviation	Military
January/01/2008	---	5	3	0	30	0	---	5	33	0
January/02/2008	---	18	5	0	15	0	---	18	20	0
January/03/2008	---	14	1	0	0	0	---	14	1	0
January/04/2008	---	17	1	0	0	0	---	17	1	0
January/05/2008	---	8	1	0	0	0	---	8	1	0
January/06/2008	---	6	2	0	19	0	---	6	21	0
January/07/2008	---	18	4	0	12	0	---	18	16	0
January/08/2008	---	12	1	0	0	0	---	12	1	0
January/09/2008	---	20	5	4	7	13	---	20	12	17
January/10/2008	---	14	7	4	4	46	---	14	11	50
January/11/2008	---	15	11	12	9	26	---	15	20	38
January/12/2008	---	9	0	13	8	20	---	9	8	33
January/13/2008	---	9	2	8	7	0	---	9	9	8
January/14/2008	---	16	5	0	10	0	---	16	15	0
January/15/2008	---	14	3	5	43	27	---	14	46	32
January/16/2008	---	24	11	14	60	12	---	24	71	26
January/17/2008	---	18	5	8	42	16	---	18	47	24
January/18/2008	---	14	6	6	47	10	---	14	53	16
January/19/2008	---	14	4	0	48	2	---	14	52	2
January/20/2008	---	5	0	0	31	0	---	5	31	0
January/21/2008	---	11	7	0	2	2	---	11	9	2
January/22/2008	---	14	7	7	23	11	---	14	30	18
January/23/2008	---	21	6	3	14	16	---	21	20	19
January/24/2008	---	18	2	0	0	0	---	18	2	0
January/25/2008	---	19	4	3	5	15	---	19	9	18
January/26/2008	---	10	3	0	3	0	---	10	6	0
January/27/2008	---	4	3	0	0	0	---	4	3	0
January/28/2008	---	19	4	0	0	0	---	19	4	0
January/29/2008	---	12	3	0	0	0	---	12	3	0
January/30/2008	---	15	4	8	0	0	---	15	4	8
January/31/2008	---	1	2	0	0	0	---	1	2	0
January	**---**	**414**	**122**	**95**	**439**	**216**	**---**	**414**	**561**	**311**

Table C-23, Continued:

February/01/2008	---	14	5	0	0	0	---	14	5	0
February/02/2008	---	5	0	0	0	0	---	5	0	0
February/03/2008	---	7	4	0	3	0	---	7	7	0
February/04/2008	---	13	2	4	11	25	---	13	13	29
February/05/2008	---	19	4	8	10	39	---	19	14	47
February/06/2008	---	16	5	16	14	10	---	16	19	26
February/07/2008	---	10	4	9	2	16	---	10	6	25
February/08/2008	---	16	2	22	5	24	---	16	7	46
February/09/2008	---	6	4	10	39	18	---	6	43	28
February/10/2008	---	4	2	6	21	6	---	4	23	12
February/11/2008	---	15	7	0	72	0	---	15	79	0
February/12/2008	---	8	19	4	65	24	---	8	84	28
February/13/2008	---	22	3	16	29	6	---	22	32	22
February/14/2008	---	13	0	6	27	48	---	13	27	54
February/15/2008	---	16	11	6	55	22	---	16	66	28
February/16/2008	---	8	2	0	76	0	---	8	78	0
February/17/2008	---	9	3	0	89	0	---	9	92	0
February/18/2008	---	11	6	0	104	0	---	11	110	0
February/19/2008	---	18	3	15	24	23	---	18	27	38
February/20/2008	---	20	7	25	12	44	---	20	19	69
February/21/2008	---	20	6	17	4	10	---	20	10	27
February/22/2008	---	19	5	11	0	0	---	19	5	11
February/23/2008	---	9	5	0	8	0	---	9	13	0
February/24/2008	---	8	6	0	1	0	---	8	7	0
February/25/2008	---	10	21	1	44	1	---	10	65	2
February/26/2008	---	10	8	24	20	55	---	10	28	79
February/27/2008	---	17	4	14	54	59	---	17	58	73
February/28/2008	---	15	9	16	30	41	---	15	39	57
February/29/2008	---	15	7	11	74	35	---	15	81	46
February	**---**	**373**	**164**	**241**	**893**	**506**	**---**	**373**	**1,057**	**747**

Table C-23, Continued:

March/01/2008	---	10	6	0	8	0	---	10	14	0
March/02/2008	---	7	9	0	75	0	---	7	84	0
March/03/2008	---	11	12	14	20	18	---	11	32	32
March/04/2008	---	16	10	15	35	24	---	16	45	39
March/05/2008	---	20	5	22	52	30	---	20	57	52
March/06/2008	---	12	11	15	39	34	---	12	50	49
March/07/2008	---	23	4	10	38	16	---	23	42	26
March/08/2008	---	6	2	15	67	32	---	6	69	47
March/09/2008	---	5	0	8	29	12	---	5	29	20
March/10/2008	---	17	8	2	21	0	---	17	29	2
March/11/2008	---	16	5	26	47	28	---	16	52	54
March/12/2008	---	25	2	30	24	0	---	25	26	30
March/13/2008	---	17	6	27	8	47	---	17	14	74
March/14/2008	---	15	5	19	22	31	---	15	27	50
March/15/2008	---	9	0	0	0	0	---	9	0	0
March/16/2008	---	7	8	6	58	7	---	7	66	13
March/17/2008	---	18	2	37	48	30	---	18	50	67
March/18/2008	---	12	6	36	4	34	---	12	10	70
March/19/2008	---	24	7	54	10	23	---	24	17	77
March/20/2008	---	16	6	49	48	16	---	16	54	65
March/21/2008	---	19	5	7	31	33	---	19	36	40
March/22/2008	---	9	3	0	84	0	---	9	87	0
March/23/2008	---	6	0	0	37	0	---	6	37	0
March/24/2008	---	16	5	0	0	0	---	16	5	0
March/25/2008	---	22	9	26	10	12	---	22	19	38
March/26/2008	---	21	6	12	0	4	---	21	6	16
March/27/2008	---	13	2	14	31	16	---	13	33	30
March/28/2008	---	18	4	16	0	6	---	18	4	22
March/29/2008	---	8	1	0	103	0	---	8	104	0
March/30/2008	---	6	7	0	43	0	---	6	50	0
March/31/2008	---	9	4	20	73	80	---	9	77	100
March	**---**	**433**	**160**	**480**	**1065**	**533**	**---**	**433**	**1,225**	**1,013**

Table C-23, Continued:

April/01/2008	---	14	5	23	47	56	---	14	52	79
April/02/2008	---	14	7	35	91	35	---	14	98	70
April/03/2008	---	7	9	40	74	64	---	7	83	104
April/04/2008	---	19	1	15	91	36	---	19	92	51
April/05/2008	---	10	4	27	22	26	---	10	26	53
April/06/2008	---	5	8	11	37	48	---	5	45	59
April/07/2008	---	11	1	0	55	0	---	11	56	0
April/08/2008	---	15	1	26	7	53	---	15	8	79
April/09/2008	---	18	2	24	19	32	---	18	21	56
April/10/2008	---	15	9	23	53	42	---	15	62	65
April/11/2008	---	11	7	11	61	0	---	11	68	11
April/12/2008	---	6	1	0	51	0	---	6	52	0
April/13/2008	---	4	7	0	79	0	---	4	86	0
April/14/2008	---	25	8	34	14	47	---	25	22	81
April/15/2008	---	13	6	37	24	45	---	13	30	82
April/16/2008	---	8	13	25	42	36	---	8	55	61
April/17/2008	---	12	8	25	75	48	---	12	83	73
April/18/2008	---	19	4	10	19	34	---	19	23	44
April/19/2008	---	10	6	0	8	0	---	10	14	0
April/20/2008	---	5	5	0	0	0	---	5	5	0
April/21/2008	---	14	0	0	22	0	---	14	22	0
April/22/2008	---	15	7	33	5	11	---	15	12	44
April/23/2008	---	15	6	22	8	44	---	15	14	66
April/24/2008	---	11	6	18	35	41	---	11	41	59
April/25/2008	---	15	7	18	38	34	---	15	45	52
April/26/2008	---	4	3	0	74	0	---	4	77	0
April/27/2008	---	4	6	0	81	0	---	4	87	0
April/28/2008	---	16	6	18	15	34	---	16	21	52
April/29/2008	---	19	6	39	0	1	---	19	6	40
April/30/2008	---	12	7	30	20	33	---	12	27	63
April	**---**	**366**	**166**	**544**	**1167**	**800**	**---**	**366**	**1,333**	**1,344**

Table C-23, Continued:

May/01/2008	---	13	15	18	41	37	---	13	56	55
May/02/2008	---	20	7	13	89	16	---	20	96	29
May/03/2008	---	6	0	0	46	0	---	6	46	0
May/04/2008	---	4	2	0	36	0	---	4	38	0
May/05/2008	---	16	4	0	62	0	---	16	66	0
May/06/2008	---	22	22	0	42	0	---	22	64	0
May/07/2008	---	13	4	12	30	22	---	13	34	34
May/08/2008	---	11	0	6	21	21	---	11	21	27
May/09/2008	---	14	7	4	56	24	---	14	63	28
May/10/2008	---	5	2	4	54	0	---	5	56	4
May/11/2008	---	6	4	0	32	0	---	6	36	0
May/12/2008	---	19	6	18	21	16	---	19	27	34
May/13/2008	---	17	5	33	29	59	---	17	34	92
May/14/2008	---	14	3	39	54	42	---	14	57	81
May/15/2008	---	8	8	30	42	24	---	8	50	54
May/16/2008	---	15	3	9	41	27	---	15	44	36
May/17/2008	---	8	3	15	68	27	---	8	71	42
May/18/2008	---	5	10	12	40	32	---	5	50	44
May/19/2008	---	13	2	0	43	0	---	13	45	0
May/20/2008	---	17	10	30	30	20	---	17	40	50
May/21/2008	---	14	1	12	13	20	---	14	14	32
May/22/2008	---	12	2	17	17	48	---	12	19	65
May/23/2008	---	18	16	41	25	0	---	18	41	41
May/24/2008	---	7	5	0	41	0	---	7	46	0
May/25/2008	---	3	1	0	13	2	---	3	14	2
May/26/2008	---	6	8	5	17	20	---	6	25	25
May/27/2008	---	15	8	34	6	3	---	15	14	37
May/28/2008	---	20	7	29	0	0	---	20	7	29
May/29/2008	---	13	6	26	2	2	---	13	8	28
May/30/2008	---	15	14	7	14	15	---	15	28	22
May/31/2008	---	7	0	2	67	4	---	7	67	6
May	**---**	**376**	**185**	**416**	**1092**	**481**	**---**	**376**	**1,277**	**897**

Table C-23, Continued:

June/01/2008	---	5	6	0	22	0	---	5	28	0
June/02/2008	---	12	4	0	52	0	---	12	56	0
June/03/2008	---	18	8	30	4	8	---	18	12	38
June/04/2008	---	18	3	30	12	44	---	18	15	74
June/05/2008	---	17	3	18	26	26	---	17	29	44
June/06/2008	---	18	5	24	43	46	---	18	48	70
June/07/2008	---	6	5	0	61	0	---	6	66	0
June/08/2008	---	5	3	0	56	0	---	5	59	0
June/09/2008	---	11	4	29	27	29	---	11	31	58
June/10/2008	---	12	13	22	39	47	---	12	52	69
June/11/2008	---	12	15	29	116	23	---	12	131	52
June/12/2008	---	12	9	26	94	56	---	12	103	82
June/13/2008	---	15	3	22	69	17	---	15	72	39
June/14/2008	---	3	1	0	43	0	---	3	44	0
June/15/2008	---	4	0	0	45	0	---	4	45	0
June/16/2008	---	8	1	0	80	0	---	8	81	0
June/17/2008	---	7	9	18	102	45	---	7	111	63
June/18/2008	---	7	11	20	143	50	---	7	154	70
June/19/2008	---	6	11	21	71	62	---	6	82	83
June/20/2008	---	8	7	5	98	16	---	8	105	21
June/21/2008	---	2	7	1	113	3	---	2	120	4
June/22/2008	---	7	8	13	48	15	---	7	56	28
June/23/2008	---	12	2	10	129	20	---	12	131	30
June/24/2008	---	17	11	16	99	46	---	17	110	62
June/25/2008	---	9	7	3	72	78	---	9	79	81
June/26/2008	---	13	2	9	56	45	---	13	58	54
June/27/2008	---	13	3	10	61	31	---	13	64	41
June/28/2008	---	3	23	0	56	1	---	3	79	1
June/29/2008	---	4	15	1	35	0	---	4	50	1
June/30/2008	---	11	11	4	46	0	---	11	57	4
June	**---**	**295**	**210**	**361**	**1918**	**708**	**---**	**295**	**2,128**	**1,069**

Table C-23, Continued:

July/01/2008	---	12	41	69	35	51	---	12	76	120
July/02/2008	---	18	69	47	61	26	---	18	130	73
July/03/2008	---	15	73	26	71	17	---	15	144	43
July/04/2008	---	3	90	16	89	12	---	3	179	28
July/05/2008	---	6	56	0	51	0	---	6	107	0
July/06/2008	---	3	41	0	37	0	---	3	78	0
July/07/2008	---	19	39	49	37	29	---	19	76	78
July/08/2008	---	21	40	52	60	35	---	21	100	87
July/09/2008	---	26	68	76	65	52	---	26	133	128
July/10/2008	---	14	49	59	47	37	---	14	96	96
July/11/2008	---	10	47	27	47	19	---	10	94	46
July/12/2008	---	5	86	0	84	4	---	5	170	4
July/13/2008	---	13	85	0	82	0	---	13	167	0
July/14/2008	---	24	72	2	63	0	---	24	135	2
July/15/2008	---	25	44	63	37	43	---	25	81	106
July/16/2008	---	19	92	36	84	20	---	19	176	56
July/17/2008	---	11	92	50	44	32	---	11	136	82
July/18/2008	---	15	75	15	65	4	---	15	140	19
July/19/2008	---	7	100	0	93	0	---	7	193	0
July/20/2008	---	9	72	0	67	0	---	9	139	0
July/21/2008	---	11	79	48	69	30	---	11	148	78
July/22/2008	---	17	83	62	78	41	---	17	161	103
July/23/2008	---	13	79	44	76	18	---	13	155	62
July/24/2008	---	14	91	41	81	25	---	14	172	66
July/25/2008	---	8	86	28	85	12	---	8	171	40
July/26/2008	---	7	31	30	30	14	---	7	61	44
July/27/2008	---	8	48	32	47	19	---	8	95	51
July/28/2008	---	13	56	0	56	0	---	13	112	0
July/29/2008	---	13	83	41	71	25	---	13	154	66
July/30/2008	---	16	92	44	82	24	---	16	174	68
July/31/2008	---	12	76	2	65	0	---	12	141	2
July	**---**	**407**	**2135**	**959**	**1959**	**589**	**---**	**407**	**4,094**	**1,548**

Table C-23, Continued:

August/01/2008	---	16	17	19	60	16	---	16	77	35
August/02/2008	---	9	20	0	39	0	---	9	59	0
August/03/2008	---	11	22	6	35	0	---	11	57	6
August/04/2008	---	17	17	38	57	33	---	17	74	71
August/05/2008	---	18	43	38	59	27	---	18	102	65
August/06/2008	---	21	27	39	30	42	---	21	57	81
August/07/2008	---	16	8	29	26	25	---	16	34	54
August/08/2008	---	18	11	23	40	34	---	18	51	57
August/09/2008	---	10	9	3	32	21	---	10	41	24
August/10/2008	---	9	13	0	42	0	---	9	55	0
August/11/2008	---	15	13	0	51	0	---	15	64	0
August/12/2008	---	21	20	37	77	41	---	21	97	78
August/13/2008	---	22	9	39	48	27	---	22	57	66
August/14/2008	---	21	26	43	70	28	---	21	96	71
August/15/2008	---	10	20	1	68	0	---	10	88	1
August/16/2008	---	10	30	0	0	0	---	10	30	0
August/17/2008	---	5	30	0	0	0	---	5	30	0
August/18/2008	---	21	66	17	3	10	---	21	69	27
August/19/2008	---	23	7	15	16	8	---	23	23	23
August/20/2008	---	22	26	23	36	5	---	22	62	28
August/21/2008	---	7	16	17	39	11	---	7	55	28
August/22/2008	---	12	24	4	53	2	---	12	77	6
August/23/2008	---	8	19	30	28	35	---	8	47	65
August/24/2008	---	12	17	14	34	24	---	12	51	38
August/25/2008	---	20	7	0	28	0	---	20	35	0
August/26/2008	---	20	38	16	55	31	---	20	93	47
August/27/2008	---	19	14	30	44	40	---	19	58	70
August/28/2008	---	15	23	18	56	17	---	15	79	35
August/29/2008	---	23	29	12	10	0	---	23	39	12
August/30/2008	---	12	30	0	22	0	---	12	52	0
August/31/2008	---	10	19	0	50	0	---	10	69	0
August	**---**	**473**	**670**	**511**	**1208**	**477**	**---**	**473**	**1,878**	**988**

Table C-23, Continued:

September/01/2008	---	8	6	0	14	0	---	8	20	0
September/02/2008	---	21	12	31	15	25	---	21	27	56
September/03/2008	---	16	17	22	31	14	---	16	48	36
September/04/2008	---	20	44	15	14	32	---	20	58	47
September/05/2008	---	10	23	16	92	16	---	10	115	32
September/06/2008	---	9	44	0	117	0	---	9	161	0
September/07/2008	---	10	43	1	78	0	---	10	121	1
September/08/2008	---	25	16	6	53	4	---	25	69	10
September/09/2008	---	15	35	22	22	38	---	15	57	60
September/10/2008	---	17	73	63	14	20	---	17	87	83
September/11/2008	---	15	63	45	14	12	---	15	77	57
September/12/2008	---	21	33	24	24	13	---	21	57	37
September/13/2008	---	8	20	0	49	0	---	8	69	0
September/14/2008	---	10	12	0	42	4	---	10	54	4
September/15/2008	---	11	12	23	46	57	---	11	58	80
September/16/2008	---	21	21	30	11	43	---	21	32	73
September/17/2008	---	18	14	33	44	10	---	18	58	43
September/18/2008	---	20	54	13	17	15	---	20	71	28
September/19/2008	---	19	36	23	22	16	---	19	58	39
September/20/2008	---	10	8	23	25	87	---	10	33	110
September/21/2008	---	10	12	10	19	21	---	10	31	31
September/22/2008	---	18	80	0	73	0	---	18	153	0
September/23/2008	---	18	18	36	29	35	---	18	47	71
September/24/2008	---	23	20	31	45	25	---	23	65	56
September/25/2008	---	19	18	27	19	14	---	19	37	41
September/26/2008	---	19	11	11	55	0	---	19	66	11
September/27/2008	---	11	14	4	28	0	---	11	42	4
September/28/2008	---	11	75	0	20	0	---	11	95	0
September/29/2008	---	21	36	26	0	14	---	21	36	40
September/30/2008	---	21	26	2	27	1	---	21	53	3
September	**---**	**475**	**896**	**537**	**1059**	**516**	**---**	**475**	**1,955**	**1,053**

Table C-23, Continued:

October/01/2008	---	17	19	17	24	22	---	17	43	39
October/02/2008	---	16	18	28	29	16	---	16	47	44
October/03/2008	---	16	19	9	0	6	---	16	19	15
October/04/2008	---	10	6	0	1	0	---	10	7	0
October/05/2008	---	9	51	1	14	0	---	9	65	1
October/06/2008	---	20	18	0	66	0	---	20	84	0
October/07/2008	---	21	26	24	15	32	---	21	41	56
October/08/2008	---	14	32	14	43	23	---	14	75	37
October/09/2008	---	15	17	20	17	24	---	15	34	44
October/10/2008	---	17	43	27	14	12	---	17	57	39
October/11/2008	---	12	25	0	10	0	---	12	35	0
October/12/2008	---	7	14	0	40	0	---	7	54	0
October/13/2008	---	17	32	0	60	0	---	17	92	0
October/14/2008	---	14	28	33	13	20	---	14	41	53
October/15/2008	---	15	11	28	17	15	---	15	28	43
October/16/2008	---	16	25	28	6	24	---	16	31	52
October/17/2008	---	12	22	26	26	18	---	12	48	44
October/18/2008	---	14	32	30	26	10	---	14	58	40
October/19/2008	---	8	19	2	34	0	---	8	53	2
October/20/2008	---	15	19	0	30	0	---	15	49	0
October/21/2008	---	13	20	24	13	3	---	13	33	27
October/22/2008	---	17	15	40	20	20	---	17	35	60
October/23/2008	---	17	12	22	39	18	---	17	51	40
October/24/2008	---	18	12	20	15	13	---	18	27	33
October/25/2008	---	10	23	6	50	6	---	10	73	12
October/26/2008	---	6	4	0	37	0	---	6	41	0
October/27/2008	---	14	20	31	25	21	---	14	45	52
October/28/2008	---	20	25	30	14	12	---	20	39	42
October/29/2008	---	17	18	29	2	4	---	17	20	33
October/30/2008	---	17	22	40	13	8	---	17	35	48
October/31/2008	---	19	12	20	8	17	---	19	20	37
October	**---**	**453**	**659**	**549**	**721**	**344**	**---**	**453**	**1,380**	**893**

Table C-23, Continued:

November/01/2008	---	10	10	0	2	0	---	10	12	0
November/02/2008	---	7	7	0	0	0	---	7	7	0
November/03/2008	---	17	5	0	0	0	---	17	5	0
November/04/2008	---	15	17	25	0	0	---	15	17	25
November/05/2008	---	18	6	12	0	2	---	18	6	14
November/06/2008	---	15	4	37	1	1	---	15	5	38
November/07/2008	---	13	13	0	0	0	---	13	13	0
November/08/2008	---	10	5	0	6	0	---	10	11	0
November/09/2008	---	8	20	4	36	20	---	8	56	24
November/10/2008	---	24	12	28	22	18	---	24	34	46
November/11/2008	---	16	6	0	0	0	---	16	6	0
November/12/2008	---	21	6	37	8	16	---	21	14	53
November/13/2008	---	16	5	30	2	10	---	16	7	40
November/14/2008	---	11	15	21	37	14	---	11	52	35
November/15/2008	---	11	24	22	28	36	---	11	52	58
November/16/2008	---	8	52	10	22	31	---	8	74	41
November/17/2008	---	16	10	0	98	0	---	16	108	0
November/18/2008	---	12	16	32	29	9	---	12	45	41
November/19/2008	---	17	17	30	17	12	---	17	34	42
November/20/2008	---	18	8	33	5	12	---	18	13	45
November/21/2008	---	11	14	20	22	10	---	11	36	30
November/22/2008	---	9	6	0	16	0	---	9	22	0
November/23/2008	---	9	57	0	57	0	---	9	114	0
November/24/2008	---	20	13	27	14	19	---	20	27	46
November/25/2008	---	12	24	30	25	34	---	12	49	64
November/26/2008	---	16	12	13	43	9	---	16	55	22
November/27/2008	---	20	6	0	4	0	---	20	10	0
November/28/2008	---	10	8	0	20	0	---	10	28	0
November/29/2008	---	12	9	0	22	0	---	12	31	0
November/30/2008	---	9	14	0	30	0	---	9	44	0
November	**---**	**411**	**421**	**411**	**566**	**253**	**---**	**411**	**987**	**664**

Table C-23, Continued:

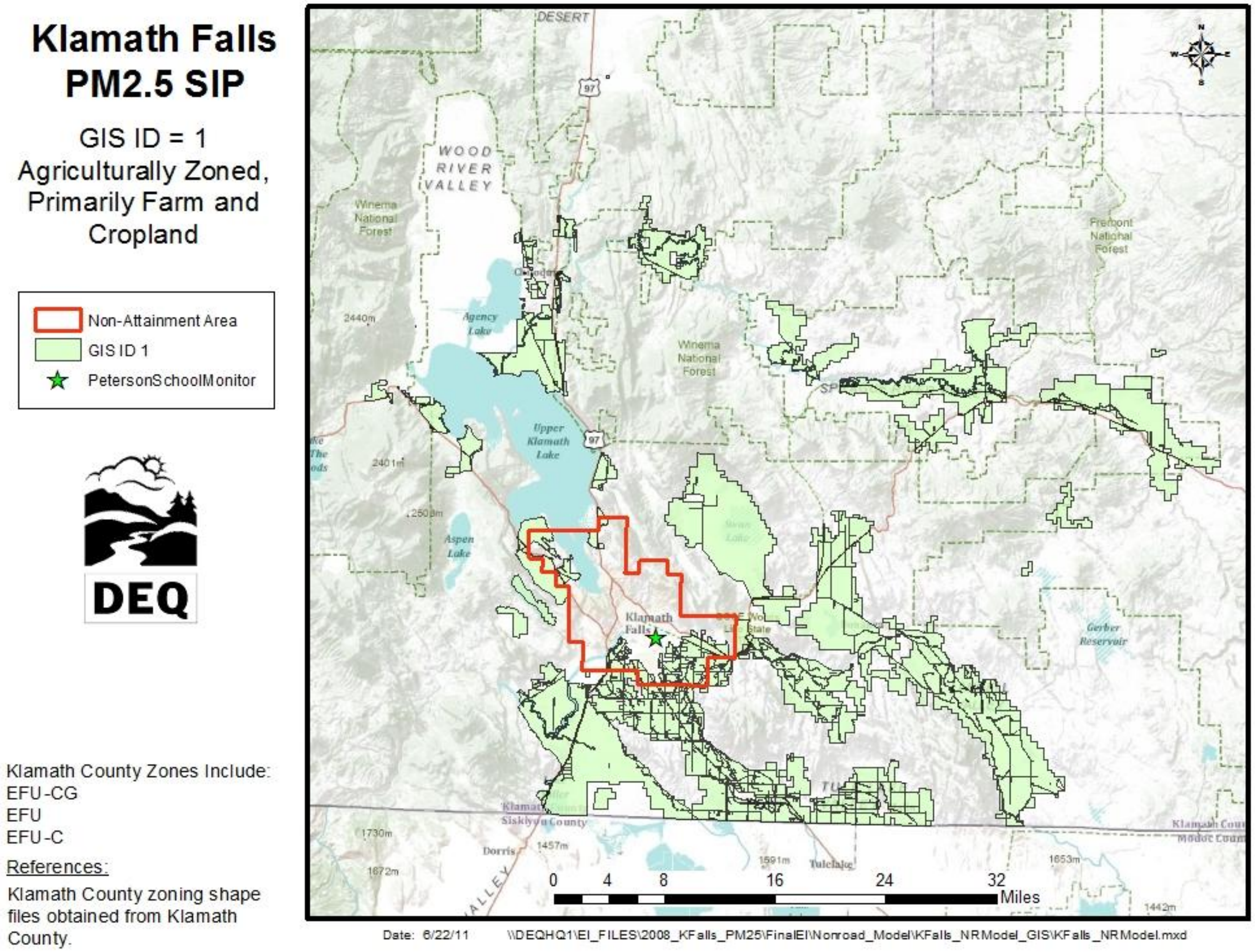
December/01/2008	---	18	7	1	20	0	---	18	27	1
December/02/2008	---	14	19	34	10	14	---	14	29	48
December/03/2008	---	2	6	2	0	0	---	2	6	2
December/04/2008	---	10	15	40	23	16	---	10	38	56
December/05/2008	---	17	16	18	57	22	---	17	73	40
December/06/2008	---	13	16	2	40	2	---	13	56	4
December/07/2008	---	6	20	12	54	0	---	6	74	12
December/08/2008	---	21	13	38	13	13	---	21	26	51
December/09/2008	---	13	25	38	42	46	---	13	67	84
December/10/2008	---	14	22	45	34	66	---	14	56	111
December/11/2008	---	19	17	38	13	16	---	19	30	54
December/12/2008	---	24	5	15	16	22	---	24	21	37
December/13/2008	---	9	3	7	0	0	---	9	3	7
December/14/2008	---	8	8	3	0	0	---	8	8	3
December/15/2008	---	15	4	1	0	0	---	15	4	1
December/16/2008	---	11	16	27	40	16	---	11	56	43
December/17/2008	---	17	9	39	16	36	---	17	25	75
December/18/2008	---	16	4	22	14	14	---	16	18	36
December/19/2008	---	18	10	1	0	0	---	18	10	1
December/20/2008	---	9	2	0	0	0	---	9	2	0
December/21/2008	---	5	0	0	0	0	---	5	0	0
December/22/2008	---	7	1	0	0	0	---	7	1	0
December/23/2008	---	17	5	0	10	0	---	17	15	0
December/24/2008	---	17	1	0	6	0	---	17	7	0
December/25/2008	---	19	6	0	8	0	---	19	14	0
December/26/2008	---	13	4	0	0	0	---	13	4	0
December/27/2008	---	17	1	0	8	0	---	17	9	0
December/28/2008	---	10	1	0	0	0	---	10	1	0
December/29/2008	---	18	0	0	8	0	---	18	8	0
December/30/2008	---	19	5	29	6	39	---	19	11	68
December/31/2008	---	18	8	13	26	18	---	18	34	31
December	---	**434**	**269**	**425**	**464**	**340**	---	**434**	**733**	**765**
Total:	**---**	**4,910**	**6,057**	**5,529**	**12,551**	**5,763**		**4,910**	**18,608**	**11,292**
LTOs	---	***2,455***	***3,029***	***2,765***	***6,276***	***2,882***		***2,455***	***9,304***	***5,646***

Report created on Thu Jun 2 17:18:09 EDT 2011

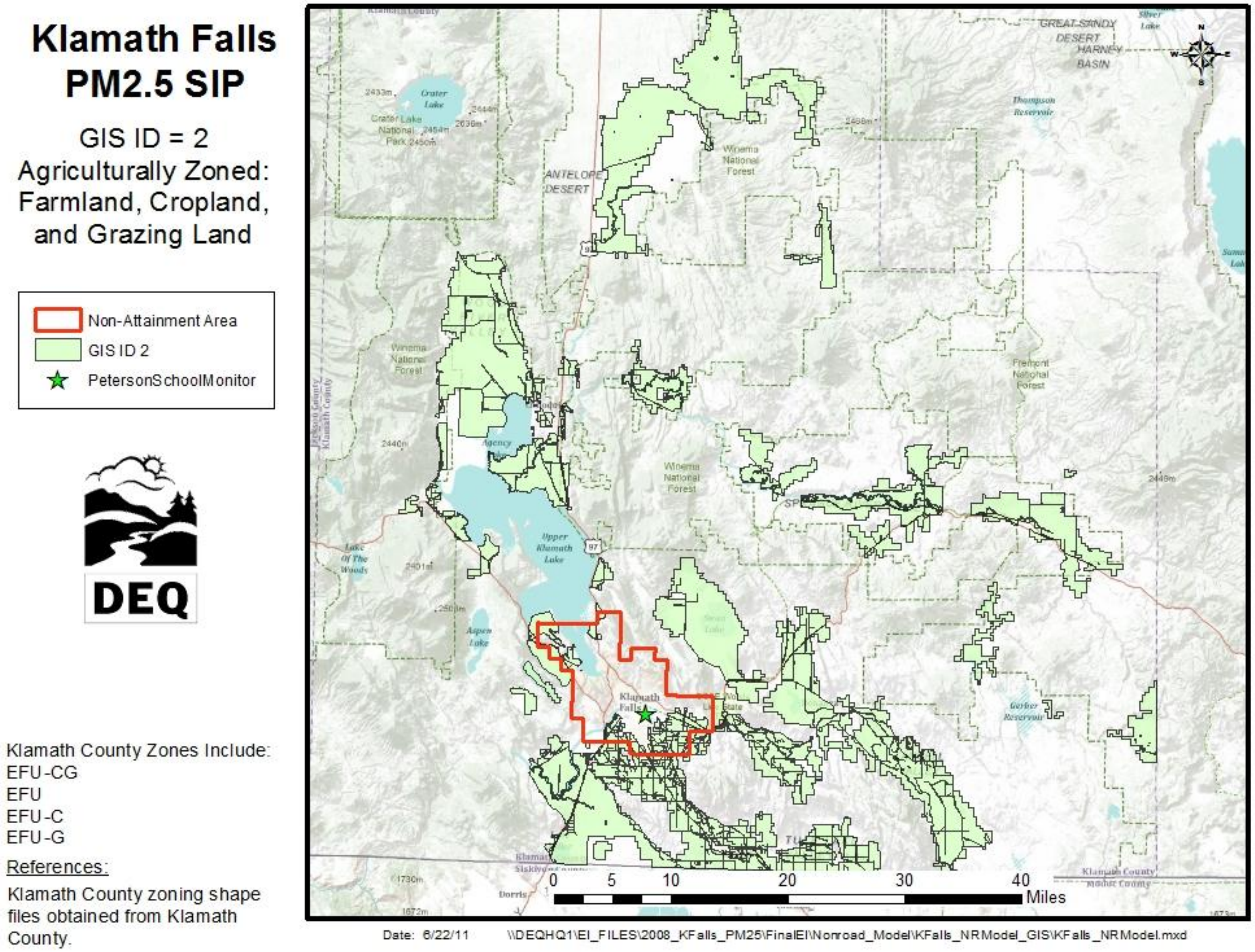
Sources: Air Traffic Activity System (ATADS)

Note: These numbers from the Federal Aviation Administration (FAA) Air Traffic Data System (ATADS) include both Landings & Takeoffs. do not include Commercial Air LTOs .

From 1/1/2008 To 12/31/2008 | Facility: LMT- Klamath Falls Int'l. State: Oregon



Appendix C, Figure C- 1. GIS ID 1



Appendix C, Figure C- 2. GIS ID 2

Klamath Falls PM2.5 SIP

GIS ID = 3
Commercially Zoned

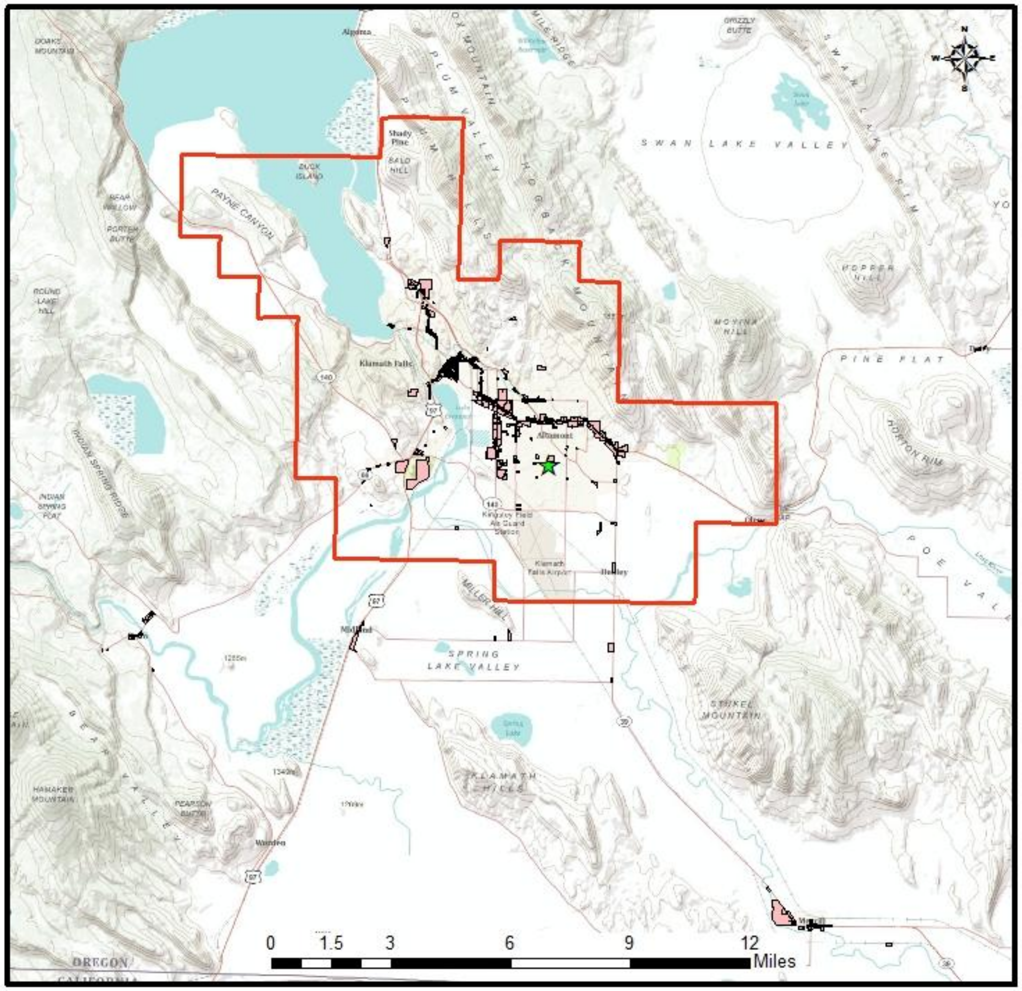
	Non-Attainment Area
	GIS ID 3
★	PetersonSchoolMonitor

DEQ

Klamath County Zones Include:
C, CG, CN, CRC,
GC, GC & MD, NC,
RCR-C, RSC-C,
RUC-C

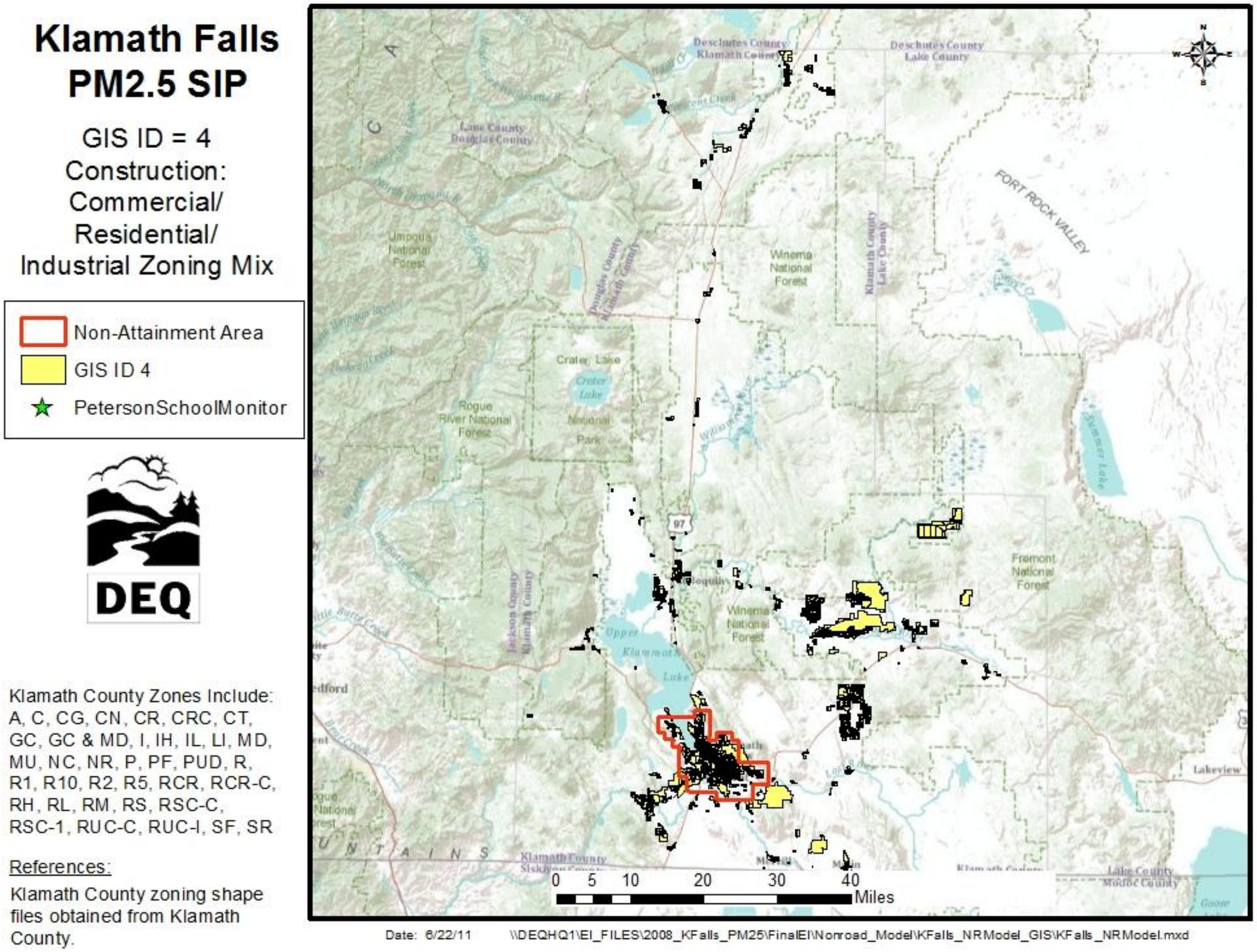
References:

Klamath County zoning shape files obtained from Klamath County.



Date: 6/22/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Nonroad_Model\KFalls_NRModel_GIS\KFalls_NRModel.mxd

Appendix C, Figure C- 3. GIS ID 3



Appendix C, Figure C- 4. GIS ID 4

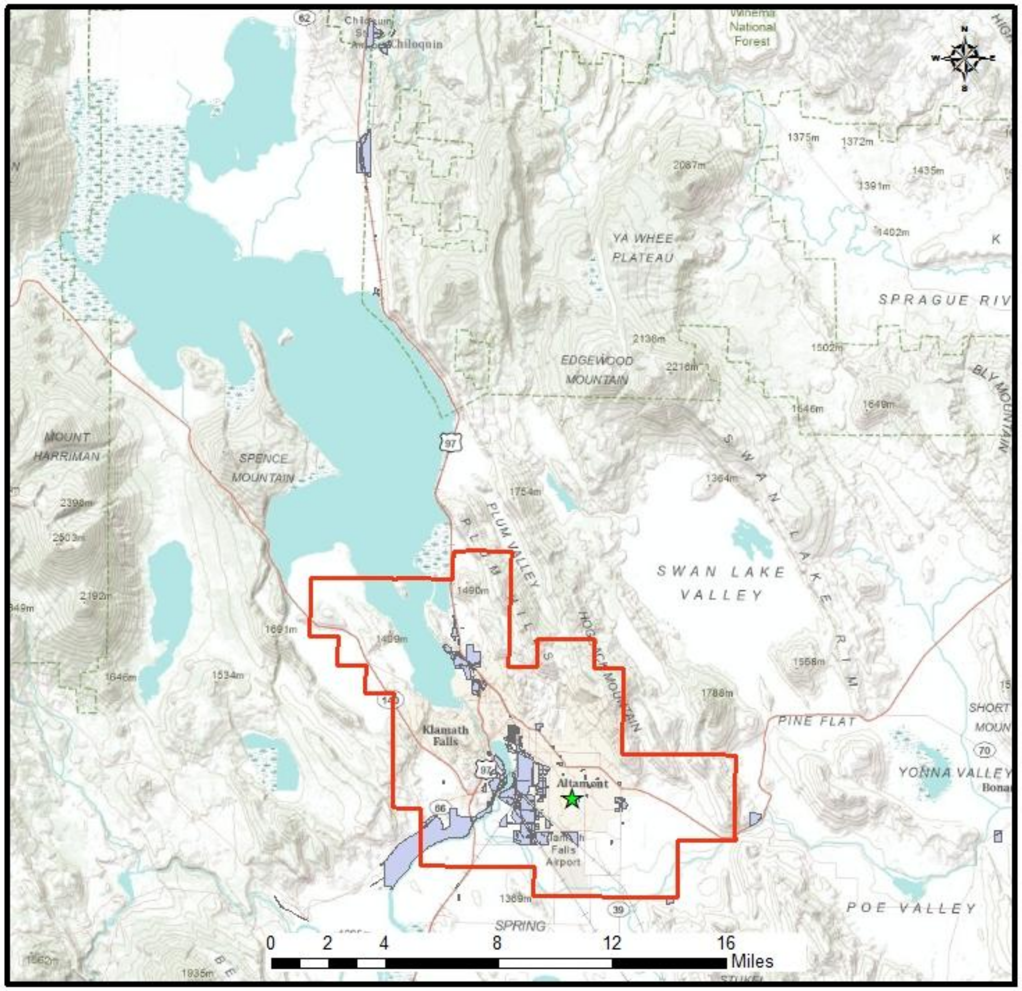
Klamath Falls PM2.5 SIP

GIS ID = 5
Industrial Zoning

Non-Attainment Area
GIS ID 5
PetersonSchoolMonitor

Klamath County Zones Include:
I, IH, IL, LI

References:
Klamath County zoning shape files obtained from Klamath County.



Date: 6/22/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Nonroad_Model\KFalls_NRModel_GIS\KFalls_NRModel.mxd

Appendix C, Figure C- 5. GIS ID 5

Klamath Falls PM2.5 SIP

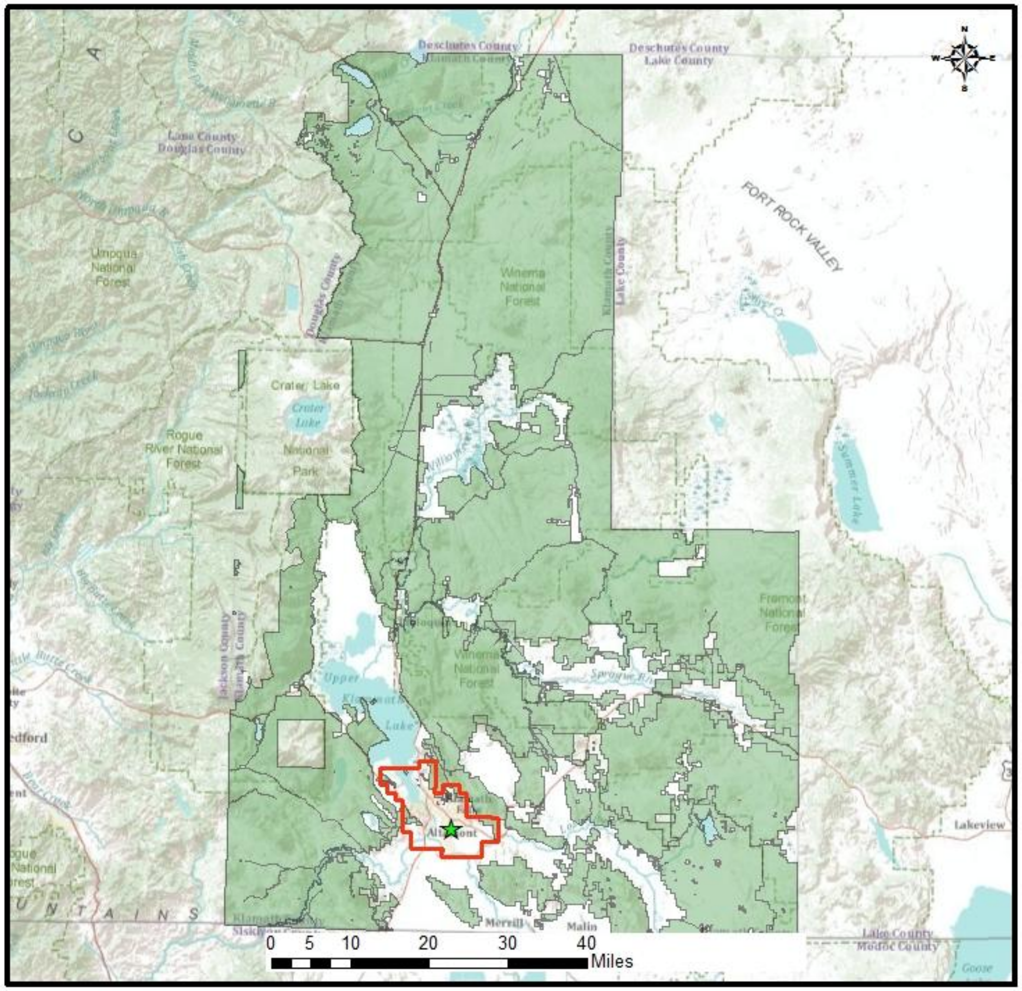
GIS ID = 6
Forest

- Non-Attainment Area
- GIS ID 6
- PetersonSchoolMonitor

DEQ

Klamath County Zones Include:
F, FR

References:
Klamath County zoning shape files obtained from Klamath County.



Date: 6/22/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Nonroad_Model\KFalls_NRModel_GIS\KFalls_NRModel.mxd

Appendix C, Figure C- 6. GIS ID 6

Klamath Falls PM2.5 SIP

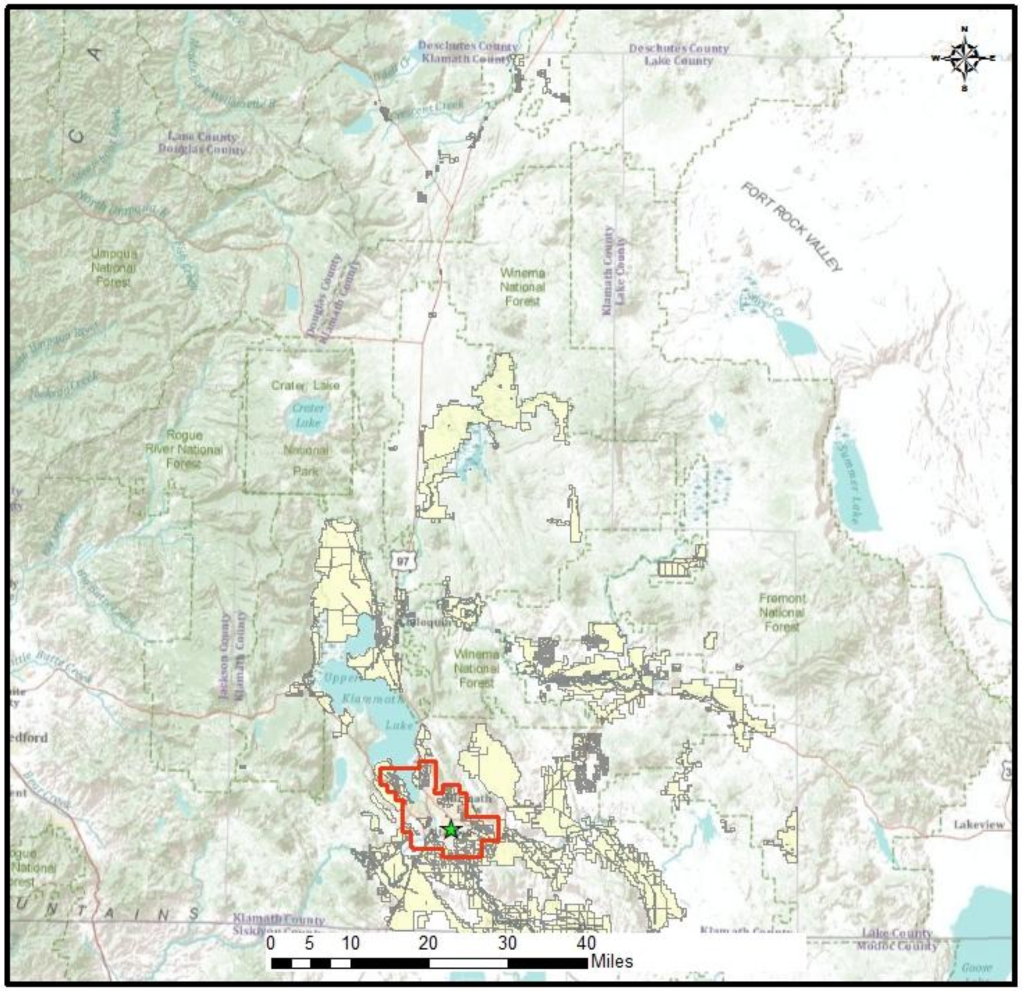
GIS ID = 7
Recreational:
Mix of Residential and Farm Zoning

Non-Attainment Area
GIS ID 7
PetersonSchoolMonitor

DEQ

Klamath County Zones Include: EFU, EFU-C, EFU-CG, EFU-G, NR, R1, R10, R2, R5, RCR, RL

References:
Klamath County zoning shape files obtained from Klamath County.



Date: 6/22/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Nonroad_Model\KFalls_NRModel_GIS\KFalls_NRModel.mxd

Appendix C, Figure C- 7. GIS ID 7

Klamath Falls PM2.5 SIP

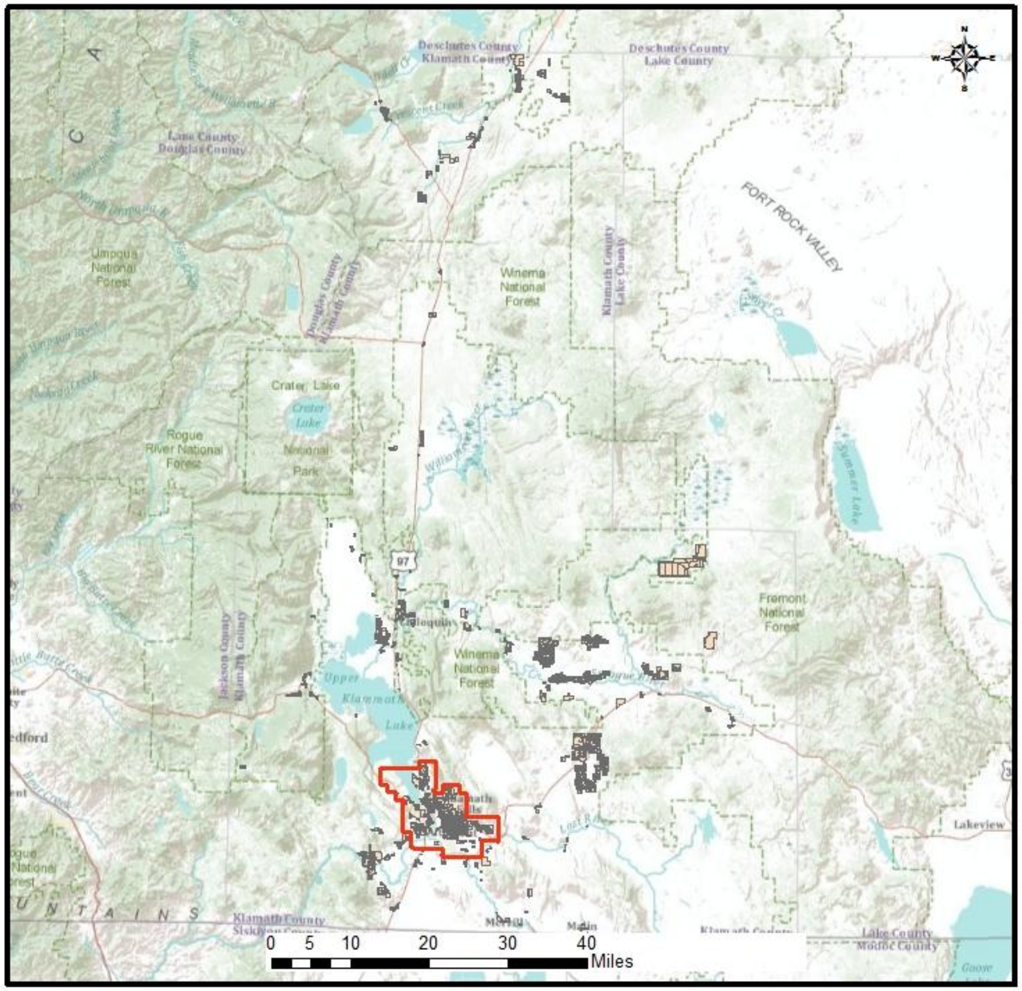
GIS ID = 9
Commercial
Lawn & Garden:
Mix of Residential and Commercial Zoning

Non-Attainment Area
GIS ID 9
PetersonSchoolMonitor

Klamath County Zones Include: A, C, CG, CN, CR, CRC, CT, GC, GC & MD, NC, R1, R10, R2, R5, RCR, RCR-C, RH, RL, RM, RS, RSC-C, RUC-C, SF, SR

References:

Klamath County zoning shape files obtained from Klamath County.



Date: 6/22/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Nonroad_Model\KFalls_NRModel_GIS\KFalls_NRModel.mxd

Appendix C, Figure C- 8. GIS ID 9

Klamath Falls PM2.5 SIP

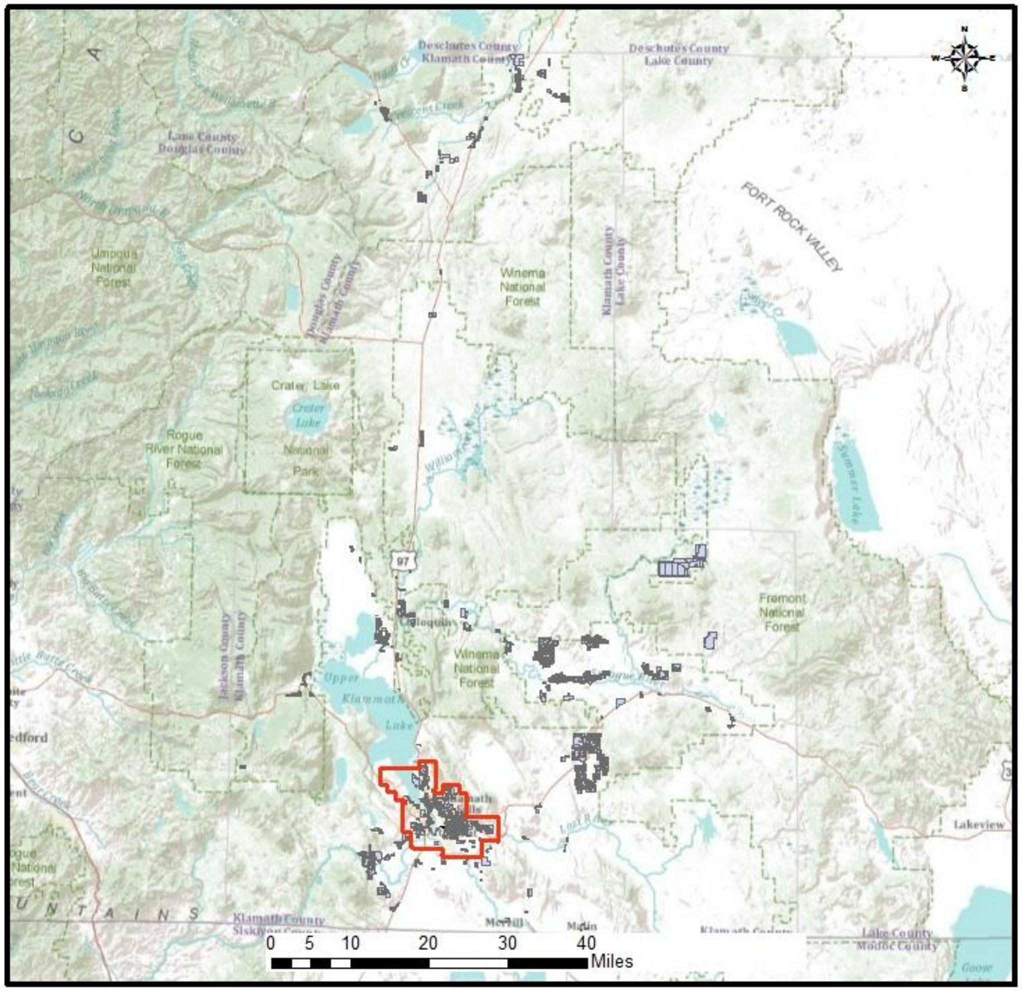
GIS ID = 10
Residential
Lawn & Garden:
Residential Zoning

Non-Attainment Area
GIS ID 10
PetersonSchoolMonitor

DEQ

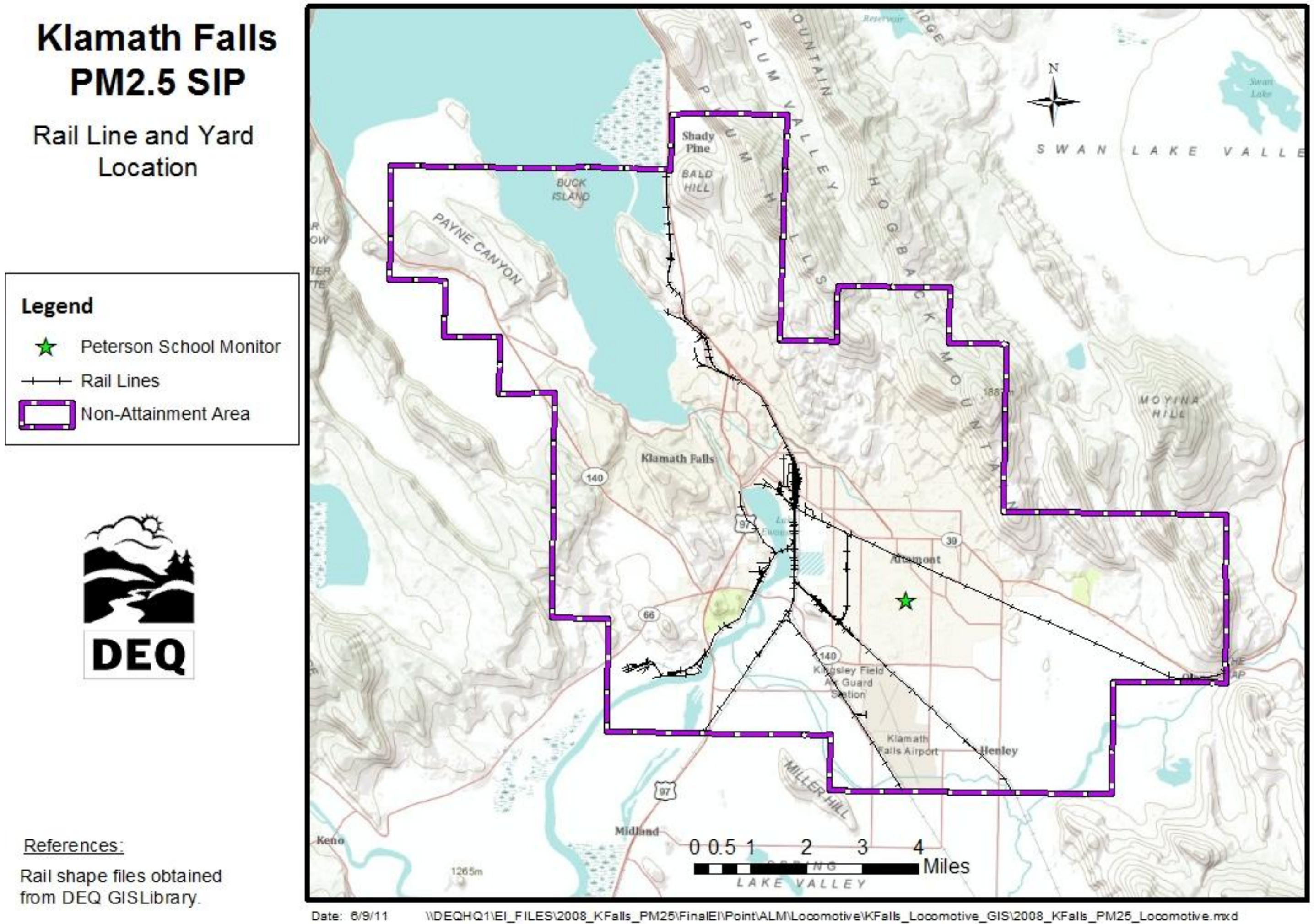
Klamath County Zones Include:
A, MD, R1, R10, R2, R5, RCR, RL, RH, RM, RS, SF

References:
Klamath County zoning shape files obtained from Klamath County.



Date: 6/22/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\Nonroad_Model\KFalls_NRModel_GIS\KFalls_NRModel.mxd

Appendix C, Figure C- 9. GIS ID 10



Appendix C, Figure C- 10. Rail Line Within the Klamath Falls NAA

APPENDIX D: ON-ROAD MOBILE

- Table D-1. Link DVMT % by MOVES Source Type
- Table D-2. Daily Precipitation, 2005, 2008, 2009: Kingsley Field, with Monthly Profile and SAF Calculations
- Figure D-1. Klamath Falls NAA Links
- ODOT Methodology: Estimating Daily VMT: Memorandum from Richard Arnold, ODOT Senior Transportation Analysis/Modeler

Appendix D, Table D- 1. Link DVMT % by MOVES Source Type.

(1) yearID	(1) source Type ID (MOVES Vehicle Type ID)	County-Wide source Type Population		(10) County-to-NAA source type apportionment method	(11) NAA Source Type Population	(12) NAA % Link VMT	(13) MOVES Vehicle Type ID Description	(14) HPMS Vehicle Class
2008	11	2,570	(2)	HU based	1,609	2.62%	Motorcycle	Motorcycles
2008	42	42	(2)	Set equal to county	42	0.07%	Transit Bus	Buses
2008	54	1,542	(2)	HU based	966	1.57%	Motor Home	Single Unit Trucks
2008	21	24,873	(3)	HU based	15,575	25.35%	Passenger Car	Passenger Car
2008	31	40,583	(3)	HU based	25,412	41.36%	Passenger Truck	Other 2 axle-4 tire vehicles
2008	41	0	(4)	Set equal to county	0	0%	Intercity Bus	Buses
2008	51	17	(5)	Set equal to county	17	0.03%	Refuse Truck	Single Unit Trucks
		-------						
Vehicle Subtotal		69,627	(6)					
Balance not accounted for		19,143	(7)					
2008	32	3,829	(8)	HU based	2,397	3.90%	Light Commercial Truck	Other 2 axle-4 tire vehicles
2008	52	3,829	(8)	Set equal to county	3,829	6.23%	Single Unit Short-Haul Truck	Single Unit Trucks
2008	53	3,829	(8)	Set equal to county	3,829	6.23%	Single Unit Long-Haul Truck	Single Unit Trucks
2008	61	3,829	(8)	Set equal to county	3,829	6.23%	Combination Short-haul Truck	Combination Trucks
2008	62	3,829	(8)	Set equal to county	3,829	6.23%	Combination Long-haul Truck	Combination Trucks
2008	43	102	(9)	Set equal to county	102	0.17%	School Bus	Buses
		-------			-------	-------		
Totals		**88,872**			**61,434**	**100%**		

Notes for Table D-1:

(1) MOVES default database data.

(2) ODOT Driver and Motor Vehicle Services Division, Oregon Motor Vehicle Registrations by County, 12/31/2008. DEQ AQ Ref. 810.

(3) Passenger vehicle breakdown is from Oregon DMV data (DEQ Ref. 812).

(4) No intercity buses in Klamath Falls

(5) Refuse truck population is an informal estimate by DEQ staff, based on DEQ Diesel Program data.

(6) Vehicle types 11, 42, 54, 21, 31, 41, 51 totaled.

(7) Balance not accounted for = (Total registration by county, minus school buses) - (Vehicle types 11, 42, 54, 21, 31, 41, 51 totaled)

Balance not accounted for is assumed to represent non-passenger vehicle trucking.

Total registration by county, minus school buses =	88,770	(DEQ Ref. 810: Total vehicle registration by county column)
Vehicle types 11, 42, 54, 21, 31, 41, 51 totaled =	69,627	

Balance not accounted for =	19,143	

(8) Balance not accounted for divided equally among the five non-passenger truck vehicle types:

The population for Vehicle types 32, 52, 53, 61, 62 = (Balance not accounted for, note 7) / 5

(9) School bus population data provided by L. Calkins, DEQ-ER (DEQ Ref. 813).

(10) Indicates apportionment methodology.

(11) For those source type NAA populations not set equal to county total population:

NAA Source Type Population = (Source Type Population) * (NAA HU/County HU) where

2008 County Total HU	29,972	(Appendix B, Table B-3)
2008 NAA Total HU	18,767	(Appendix B, Table B-1)
2008 NAA/County HU ratio	63%	

NOTE: THIS DATA WAS ENTERED INTO THE MOVES "sourceTypeYear" EXCEL FILE DATABASE INPUT.

(12) NAA Source Type Population / Total NAA Source Type Population. THIS IS THE DATA USED TO DISTRIBUTE ODOT DVMT BY VEHICLE TYPE.

(13) Default MOVES vehicle type = Vehicle Source Type ID description

(14) ODOT Traffic Recorder Highway Performance Monitoring System (HPMS) Vehicle Types: MOVES requires this vehicle class matched to Vehicle Type ID to generate output.

Appendix D, Table D- 2. Daily Precipitation, 2005, 2008, 2009: Kingsley Field, with Monthly Profile and SAF Calculations

Day	2005	2008	2009	2005	2008	2009	2005	2008	2009	2005	2008	2009	2005	2008	2009	2005	2008	2009	2005	2008	2009	2005	2008	2009
		JAN			FEB			MAR			APR			MAY			JUN			JUL			AUG	
1	0.04	0	0.03	0	0.04	0	0.05	T	T	0	0	0	0.04	0	0.22	0	0	0	0	0	0	0	0	0.07
2	0.16	0	0.24	0	0.14	0	0.05	0	0.82	0.02	0	0.09	0.01	0	0.33	0	T	0.22	0	0	0	0	0	0.08
3	0	T	T	0	0.01	0	0	0	0.1	0.1	0	T	0.05	0	0.18	0	0.06	0.06	0	0	0.03	0	0	0
4	0	0.59	0.03	0	T	0	0	0	0.03	0	0	0	0.16	0	0.17	T	0	0.05	0	0	0	0	0	T
5	0	0.01	0.09	0	T	0.02	0	0	0.01	0	T	0	0.11	0	T	T	0	0.49	0	0	0	0	0	0
6	0	0.01	0.01	0.06	T	T	0	0	T	0	T	0	0.06	0	0.1	0.02	T	0	0	0	0	0	0.23	0.17
7	0	0.14	T	0.12	0.09	0	0	0.01	0	0.05	0.01	0.18	0.1	T	0	0.07	0	0	0	0	0	0	0.02	0.02
8	0.04	0.08	0.06	0	0	0.06	0	T	0.01	0.04	0.08	0.54	0.79	0	0	0	0	0	0	0	0	0	0	0
9	T	0.38	0	0	0	T	0	0	T	T	0.01	0.2	0.25	0	0	0	0	0.02	0.01	0	T	0	0	T
10	0	T	0	0	T	0.04	0	0	0	T	0	0.18	0.02	0	0	0	0	0.08	0.01	0	0	0	0	0
11	0.17	0	0	0	T	T	0	0	0	T	0	0	0	0	0	0	0	0.21	0	0	0	0	0	0
12	0	0.09	0	T	0	0	0	0.22	0	T	0	0	0	0	0	0	0	0.16	0	0	0	0	0	0
13	0	0	0	0.18	T	0.06	0	0.02	0	0.04	0	0	0.08	0	0.01	0	0	0	0	0	0	0	0	0
14	0.07	0	0	T	0	0.02	0	0.01	T	0	T	T	0.01	0	0.02	0	0	0.09	0	0	0	0	0	0
15	T	0	T	0	0	T	0	0.01	0.14	0	T	0	0.32	0	0	0	0	0.22	0	0	0	0	0	0
16	0	0	0	0	0	T	0	0	0.02	0.2	0	0	0.02	0	0	0.07	0	T	0	0	0	0	0.04	0
17	0	0	0	0	0	T	0	0	0	0.03	0	0	0.16	0	0	T	0	T	0	0	0	0	T	0
18	0	0	0	0.02	0	0	0	0.03	0	0.03	0	0	0.17	0	0	0.14	0	0	0	0	0	0	T	0
19	0	0	0	0.06	T	0	0.06	0.07	0	T	T	0	T	0	0	0	0	T	0	0	0	0	0	0
20	0	0.01	0	0.12	T	0	T	0	0	0	T	0	0.06	0.03	0	0	0	0.02	0	0	0	0	0	0
21	0	T	0.06	0	T	T	0.16	T	0.16	0	T	0	0	0	0	0	T	0.06	T	T	0	0	0	0
22	0	0	0.08	0	0.03	0.37	0.08	0	0.02	T	T	0	0	0	0	0	0	0	0	0.05	0	T	0	0
23	0	0	T	0	0.01	0.27	0.06	T	0	0.16	0.02	0.05	0	0.09	0	0	0	0	0	0	0	0	0	0
24	0	0.09	T	0	0.13	0	0	0.04	0	0.09	T	0.24	0	T	0	0	0	0	0	0	0	0	0	0
25	T	T	0.01	0	0.01	T	T	T	T	0	0	0	0	0.19	0	0	0	0	0	0	0	0	0	0
26	0.03	0	T	0	0	T	T	0.06	0	0	0	0	0	T	0	0.04	0	0	0	0	0	0	0	0
27	0	0.16	0	0.03	0	0	0.07	T	0	0.56	0	0.03	0	0.67	0.12	0.01	0	0	0	0	0	0	0	0
28	0.02	0.06	0	0.01	0		T	T	0.03	0.35	0	0.09	T	0.44	0.05	0	T	0	0	0	0	0	0	T
29	T	0.17	0		T		0.12	0	T	T	0.03	0.01	0.05	0.52	0.09	0	0	0	0	0	0	0	0	0
30	0	0.03	0				0	0	0	0.19	0.01	0.16	0	0.01	0.01	0	0	0	0	0	0	0	0	0
31	0	0.31	0				0	0	0				0	0.02	0.01				T	0	0	0	0	0
Days PCPN	11	18	15	10	18	16	11	16	16	20	15	13	20	11	13	9	5	15	4	2	2	1	5	7
Days PCPN: 3 YR AVG		15			15			14			16			15			10			3			4	
Precip. Profile		0.111			0.111			0.108			0.121			0.111			0.073			0.020			0.033	
Non-PCPN: 3 YR AVG.		16			13			17			14			16			20			28			27	
Non-Precip. Profile		0.070			0.057			0.072			0.060			0.070			0.087			0.122			0.115	

Appendix D, Table D-1, Continued:

2005	2008	2009	2005	2008	2009	2005	2008	2009	2005	2008	2009
SEP			OCT			NOV			DEC		
0	0	0	0.04	0	0	0.16	0.17	0	0.4	0	0
0	0	0	0.09	0.04	0	0.09	0.22	0	0.08	0	0
0	0	0	0.02	0.27	0	0.35	0.09	0	T	0	0
0	0	0	T	0.1	T	0.04	0.06	0	0	0	0
0	0	0	0	T	0	0.26	0.41	0.04	0	0	0
0	0	0	0	0	0	1.43	0.02	0.07	0	0	0.02
0	0	0	0	0	0	0.91	T	T	0.14	0	0
0	0	0	T	0	0	0.02	0.05	0	T	T	0
0	0	0	0	0	0	T	0	0.04	0	0	0
T	0	0	0	T	0	T	0	0	0	0	0
0	0	0	T	0	0	0.01	0.09	0.07	0	0	0.1
0	T	T	0	0	0	T	0.02	0.01	0	0.09	0.2
0	0	0	0	0	0.12	0.13	0.03	0.02	0	T	0.02
0	0	0	0.03	0	0.13	0	0	0	0	0.04	0.01
0	0	0	0.04	0	0	0	0	0	0	0.05	0.11
0	0	0	0	0	0	0	0	0	0	T	T
0.03	0	0	0	0	0	0	0	0.26	0	0	0
0	0	0	0	0	0	0	0	0	0.32	0.09	0.01
0	0	0	0	0	0.06	0	0	0	0.1	0.01	0
0	0	0	0	0	0	T	0.02	T	0.22	0.09	0.02
0	0	0	0	0	0	T	0	T	0.03	0.07	T
0	0	0	0		0	T	T	0.06	0.26	0.02	0.04
0.21	0	0	0		0	T	0	0	0	T	0
0	0	0	0		0	0.15	0	0	0	0.27	0
0	0	0	T		0	0.17	T	0	0.13	0.02	0
0	0	0	0.14		0.01	T	0	0	0.24	0.01	0.01
T	0	0	T		0	T	0	0.3	0.16	0.11	T
0	0	0	0.04		0	0.46	0	0	0.38	0.15	0
0	0	0	T		0	T	0	0	0.04	T	0.08
0	0	0	0		0	0.49	0	0	1.37	0	0.01
			0		0				0.19	T	0.15
3	1	1	8	--	5	21	14	12	17	19	16
2			7			16			17		
0.013			0.049			0.119			0.131		
28			25			14			14		
0.122			0.105			0.062			0.059		

Precipitation

Seasonal Adjustment Factor (SAF)=

*(peak season activity * 12 months)/(annual activity * 4 months)*

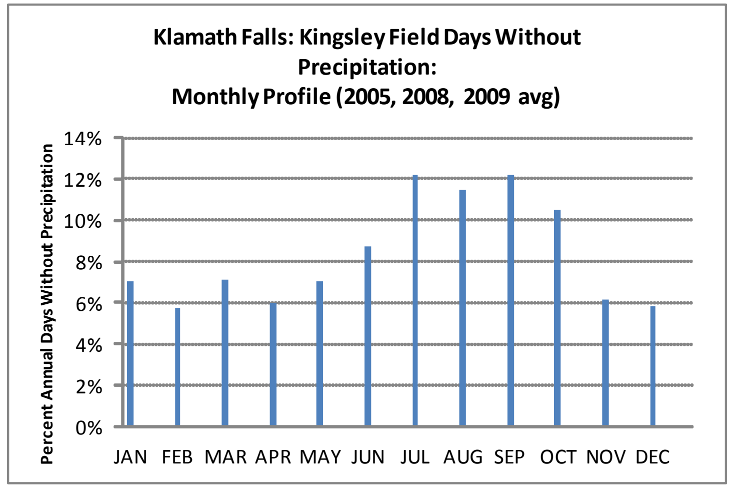
Peak season activity =	0.47	62	days
Annual Activity =	1.00	132	days
SAF =	**1.41**		

Non-Precipitation

Seasonal Adjustment Factor (SAF)=

*(peak season activity * 12 months)/(annual activity * 4 months)*

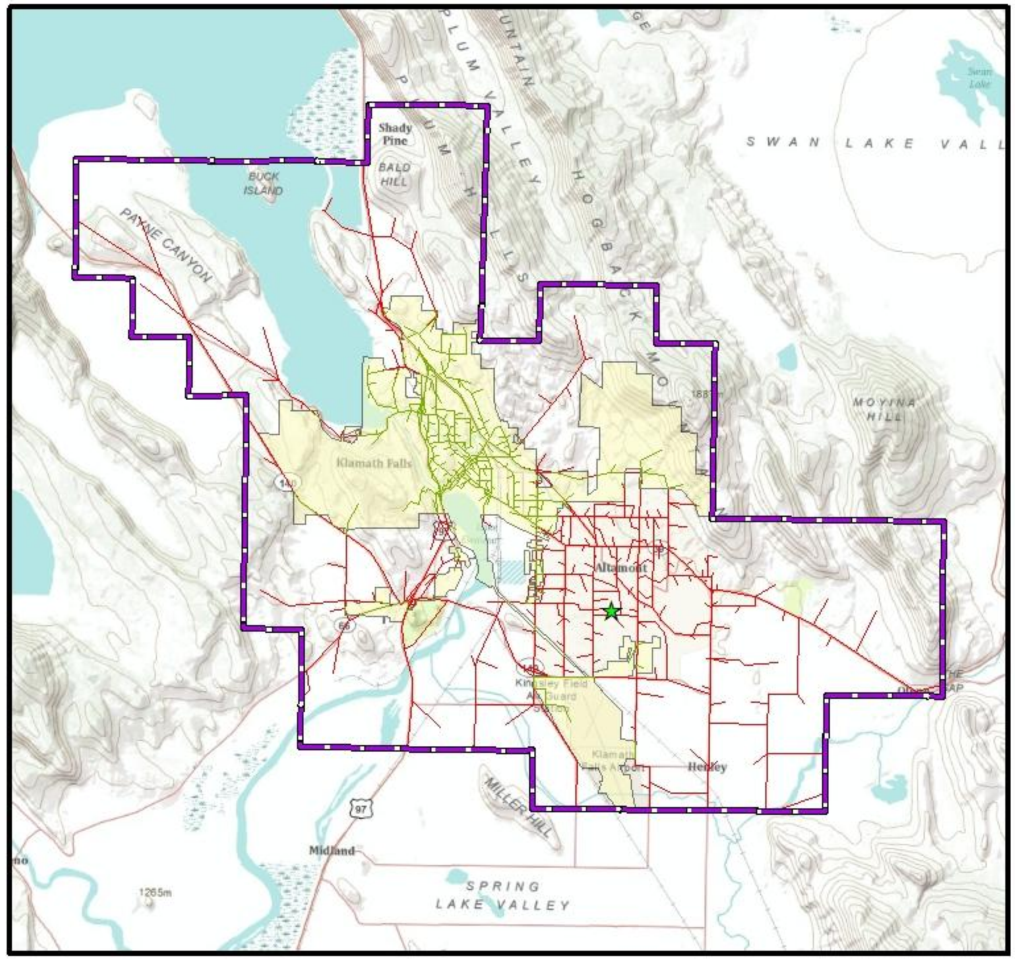
Peak season activity =	0.25	58	days
Annual Activity =	1.00	233	days
SAF =	**0.74**		



2008 Klamath Falls PM2.5 SIP

Legend

- ★ Peterson School Monitor
- ODOT links Within City Limits
- Non-Attainment Area
- ODOT Links Within NAA
- Klamath Falls City Limits



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DEQ

References:

Link and node shape files from ODOT. Emissions estimates generated by MOVES2010a run.

Appendix D, Figure D- 1. Klamath Falls NAA Links

Appendix D:

Interoffice Memo: Klamath Falls Travel Demand Model Update for Air Quality PM2.5 Non-Attainment Area Analysis. (DEQ Ref. 806)

STATE OF OREGON INTEROFFICE MEMO

Department of Transportation
Transportation Development Division
Mill Creek Office Park
555 13th Street NE Suite 2
Salem, Oregon 97301-4178
(503) 986-4110 FAX (503) 986-4174

File Code:

Date: January 23, 2012

TO: **Christopher Swab,**
Air Quality Division – Technical Services
Oregon Department of Environmental Quality

FROM: **Richard Arnold, P.E., Sr. Transportation Analyst/Modeler**
Transportation Planning Analysis Unit

SUBJECT: **Klamath Falls Travel Demand Model Update for Air Quality PM2.5 Non-Attainment Area Analysis**

This memo provides background information and summarizes the methodology used by the Oregon Department of Transportation (ODOT), Transportation Planning Analysis Unit (TPAU) to generate the land use data and roadway network updates required to develop the 2008 base year, 2014 interim year, and the 2037 future year scenarios for the Klamath Falls Transportation Demand Model. The updated model runs will be used for estimating transportation sector emissions for the Klamath Falls PM 2.5 non-attainment area.

Brief History

The Klamath Falls Travel Demand Model ("v1.0") was originally built in 2003, to support the development of the local Transportation System Plan (TSP), as well as to support Air Quality Analysis for the Klamath Falls Urban Growth Boundary Maintenance Area[1]. The model had the year 2000 as its base year, and 2025 as the horizon year. The base year reflected the observed urban characteristics associated with the supply and demand elements of the existing transport system, and horizon year reflecting projected condition for the 2025 future year.

The Model

The Klamath Falls Travel Demand Model utilized the Oregon Small Urban Model (OSUM) structure, as developed for Oregon State's non-MPO areas. The OSUM model

[1] Oregon Department of Environmental Quality, Klamath Falls Air Quality Maintenance Plan, http://www.deq.state.or.us/aq/planning/kfalls.htm

structure was estimated through a statistical analysis process that combined survey data collected from two compatible household surveys; the 1994-95 Oregon Household Activity Survey data covered a two-day survey of 1,000 households throughout three rural Oregon Counties (Marion, Polk and Yamhill), and the 1996-97 Oregon Household Activity Survey data surveyed 3,200 households throughout eight rural Oregon Counties (Clatsop, Coos, Deschutes, Josephine, Klamath, Lincoln, Malheur, and Umatilla). The survey data was combined in order to provide a good geographic cross-section of household trips within Oregon's smaller urban areas[2].

> *It would be expected that a person living in a small urban area, such as Klamath Falls or Grants Pass, would exhibit different trip characteristics and travel patterns than a similar person living within the Portland Metropolitan area. Differences in travel would be associated with such things as trip rates, trip purposes and time of day travel.*

The OSUM model follows the standard three step model structure comprised of Trip Generation, Trip Distribution, and Trip Assignment. The easiest way to think of it is to consider one's self sitting at home when overcome with a craving for ice cream, but with none in the house a trip needs to be made to get the ice cream (Trip Generation). Once it is decided to go out for ice cream, the decision needs to be made on where to go for the ice cream; should one go to Safeway, Dairy Queen, Baskin Robbins, etc (Trip Distribution)? The final step is to decide which route to take to get the ice cream; should one go down Main Street, turn left on 3rd Street, or rather travel across Maple Street and right on Allen Blvd (Trip Assignment). The travel demand model imitates decisions that we all make on a daily basis.

> *Note: Destination patterns (Trip Distribution) and route choice (Trip Assignment) might vary due level of service conditions, such as congestion, experienced by the trip maker at different the times of day.*

There are two distinct elements of the model that should be noted here: land-use characteristics and roadway network structure. The land-use (LU) data represents the Household (HH), Population (POP) and Employment (EMP) elements for the respective model years, while the roadway network reflects the state of the transport system.

Update

The transportation planning process is a crucial element in the development of a community's vision for its future. The Transportation Planning Rule (TPR)[3], under OAR-660-012-0060, requires local jurisdictions to develop and adopt local transportation

[2] Oregon Department of Transportation, Oregon Travel Behavior Survey, Summary of Findings, (2000), http://www.oregon.gov/ODOT/TD/TP/docs/TMR/96TBS/Final8Counties.pdf
[3] Oregon Department of Transportation ,Transportation Planning Rule(TPR) Review, Guidelines for implementing Section 660-012-0060, ODOT, 2006, http://www.oregon.gov/ODOT/TD/TP/docs/TPR/tprGuidelines.pdf

system plans (TSP)[4], associated with their comprehensive land use plans, that will maintain adopted performance standards for the transport systems throughout a 15-20 year planning period. The regional travel demand model plays a key role in the development and update of the TSP because future improvements can be tested, reviewed and evaluated under various scenario conditions.

During the process of updating the City of Klamath Falls' TSP, it was determined that the 2025 future planning scenario for the Klamath Falls Modelv1.0 was inadequate to satisfy the 15-20 planning horizon requirement for the TPR. TPAU was requested to update the model to meet the TSP requirements.

About the same time, The Oregon Department of Environmental Quality (DEQ) approached TPAU to obtain travel demand model output to support the air quality (AQ) analysis of fine particulate matter ($PM_{2.5}$) for the Klamath Falls PM2.5 Nonattainment Area[5]. The future year planning horizon for DEQ was 2037, with a 2014 Interim Year window. Again, the 2025 future year was deemed unacceptable for supporting the AQ analysis.

In order to satisfy both modeling needs, TPAU worked with the local jurisdictions to update the model. A discussion of the update process is covered under a separate documentation process.

The model update, known here on as "v1.1", includes land-use updates for HH, POP and EMP, based on planning assumptions defined in the current comprehensive plans for both the City of Klamath Falls and surrounding Klamath County area. Corrections and updates for the roadway network were reviewed by all jurisdictions and applied.

<u>TAZ</u>

Traffic Analysis Zones (TAZ, also called Transportation Analysis Zone) are the models principal geographic analysis units. They tend to be homogenous areas, defined to minimize land-use and demographic mixing. Centroids reflect the center of activity for the TAZ area, which may or may not be the physical center of the TAZ. The Centroid Connectors connect to the roadway system at reasonable locations, and serve to facilitate movement of trips between TAZs and the roadway network. Centroid Connectors are the points through which trips are loaded onto the network; they represent the aggregation of traffic volume from the local roads loading onto the model network. They do not account for localized intra-zonal trips that remain (i.e., begin and end) within a TAZ. The total numbers of trips in and out of TAZs are directly linked with the types of activity associated with each TAZ, as defined by the zonal land-use and demographic data, such as number of employees, types of employment, number of households, and age and size of households. The Klamath Falls Model area is divided into 293 TAZs.

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[4] Oregon Department of Transportation, Transportation System Planning Guidelines, 2008, http://www.oregon.gov/ODOT/TD/TP/docs/publications/TSP/guidelines.pdf

[5] Oregon Department of Environmental Quality, Klamath Falls PM2.5 Nonattainment Area, http://www.deq.state.or.us/aq/planning/kfallsCommittee.htm

Note: Centroid Connectors do not represent all the local roads and driveways located within a TAZ. Total traffic volume flows on Centroid Connectors are not meant to represent the total volume flows on all the local roads within the same TAZ.

No TAZ boundary changes were made to the model structure during this update process. Only the Land-Use, Network and External Model were updated through this task.

Land-Use

Household data for the model's base year zones came from US Census 2000 for the Klamath County area, while EMP data originated from the local jurisdictions. During the model updating efforts TPAU developed the initial 2008 and 2037 LU datasets and worked with personnel from the City of Klamath Falls and Klamath County to ensure that the final data properly represented their jurisdiction, as well as their comprehensive plan projections for the future. For the purpose of this report, the updated land-use data is defined as the final HH, POP and EMP data that was approved by the local jurisdictions. The updated land-use development process and results are documented under a separate report.

As part of the model update a 2008 reference year was defined for the model and the future year was extended out to 2037; these years were selected to correspond with the AQ analysis requirements.

The Oregon State Department of Administrative Service's Office of Economic Analysis (OEA) is tasked with the responsibility for developing the "official" population forecast for the 36 counties located within the State of Oregon; the forecasts are provided in five year increments[6]. It is then the responsibility of the individual counties to coordinate allocation of the forecasted population proportions to appropriate local jurisdictions located within the county jurisdiction.

Executive Order 97-22 directs TPAU to use the official OEA forecasts for planning analysis[7]. Since the Klamath Falls Model area covers more than the City of Klamath Falls but less than the entire Klamath County area, an evaluation was conducted to determine reasonable population shares accounted for in "v1.0".

Table 1
Klamath Falls Model v1.0
Population Comparison

Year	Official County Forecast	Model Area Population	Model Percent of County
2000	63.900	46,798	73.2%
2025	49,472	52,920	72.9%

[6] Oregon State Office of Economic Analysis, http://www.oregon.gov/DAS/OEA/demographic.shtml
[7] Kitzhaber, John A., M.D., Executive Order #EO 97-22, December 1997

As shown in Table 1, "v1.0" accounts for 73% of both the existing and forecast populations for Klamath County for years 2000 and 2025, respectively. The "v1.0" model share of county population, shown in Table 1, was maintained during the LU update for "v1.1", to ensure reasonability with the model update.. As shown in Table 2, a quick summation of the population for "v1.1" indicates 71% and 73% shares of the county population are accounted for in the 2008 and 2037 data, respectively. In this case, the "Annual Estimated County Forecast" for the Klamath County control numbers was developed by interpolation between the "official" 5-year OEA forecasts while the model population comes from the collaborative work with the local jurisdictions. Based on the percentage splits of model data to OEA (adjusted) projections, the total population developed for 2008 and 2037 model years appears to be consistent with previous model development.

Table 2
Klamath Falls Model v1.1
Population Comparison

Year	Annual Estimated County Forecast*	Model Area Population	Model Percent of County
2008	66,313	47,279	71.3%
2037	78,483	57,293	73.0%

*Linear interpolation between OEA 5-Year Forecasts

In order to ensure consistency between the two updated model years, and OEA's future projections, a comparison was made between a summation of the total "official" county employment forecast for the respective model years, and the total model employment projections developed for the model. As shown in Table 3, 84% of the Klamath County employment is included in the 2008 employment data developed for "v1.1", while 80% of the counties forecasted employment is included in the 2037 employment data. This indicates that between 80 and 84% of the county's employment is included within the updated model structure, and since the range is less than a 5% difference, it seems reasonably consistent.

Table 3
Klamath Falls Model v1.1
Employment Comparison

Year	Official County Forecast	Model Area Population	Model Percent of County
2008[8]	23,700	19,951	84.2%
2037*	30,173	24,024	79.6%

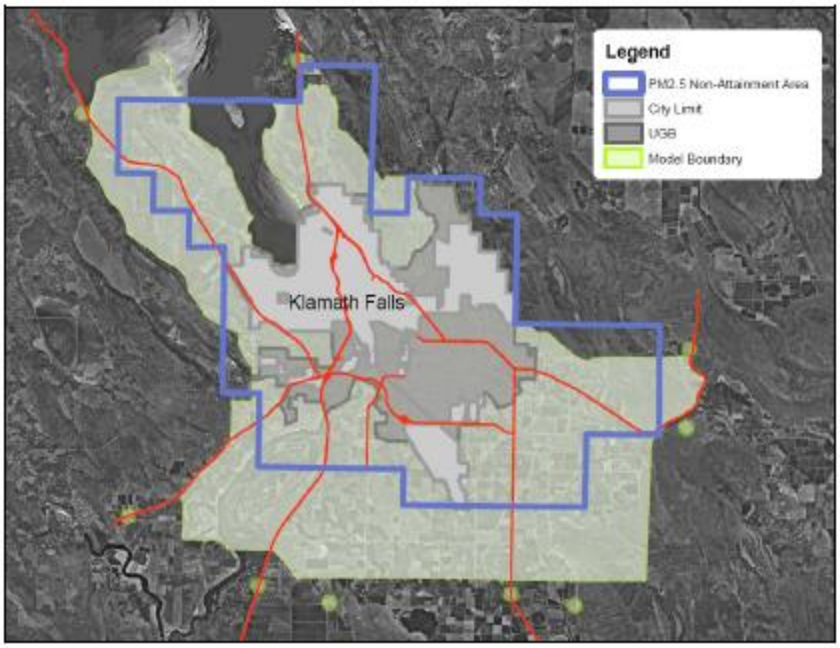
*OEA Long Term Employment Forecast

It should be carefully noted that though the DEQ's air quality analysis area, the actual land area defined within the non-attainment area, is considerably larger than the actual

[8] Oregon Labor Market Information System, Current Employment Statistics, http://www.qualityinfo.org/olmisj/CES?areacode=41040000350&action=summary&submit=Continue

Urban Growth Boundary (UGB) (see Graph 1). The area within the Klamath Falls Travel Demand Model covers considerably more surface than what is defined for the non-attainment area. Except for a few areas on the eastside and a small section on the west, the travel demand model area nearly encompasses the entire non-attainment area.

Graph 1
Klamath Falls PM2.5
Non-attainment Area



It is difficult to say how much vehicular travel is missed from the Air Quality Analysis due to the exclusion of the few non-attainment sections that are located outside the travel demand model area. It is assumed that since the omitted areas are located on the outskirts of the model, the LU activities for said areas are probably minor. It could be assumed that EMP opportunities are minimal for those areas because of their remote location, which would reduce the interaction of commerce with the town center. In a similar manner, the omitted areas are generally associated with steeper terrain, which would result in a reduction of buildable land, and subsequently fewer HH and POP allocation.

As mentioned above, the model accounts for 73% and 80% of the population and employment. This is probably an over estimation of POP and EMP for the non-attainment area, still the model deals with the majority of the activity for the non-attainment area.

<u>Interim Year</u>

A 2014 Interim Year land-use was required for Air Quality Analysis, but since it was not part of the model update efforts employed for the TSP, the data had to be developed through an alternative approach. TPAU developed the 2014 Interim Year data from a straight-line interpolation process between the 2008 Reference Year and the 2037 Future Year. The resulting 2014 Interim Year data was then checked to ensure consistency with the Klamath County population forecasts.

Note: The 2014 Interim Year LU was developed specifically for the Air Quality Analysis, and should not be used for any other purpose.

The updated total HH, POP and EMP data is presented in Table 4. The model data's compound average growth rate (CAGR) year, between the two model years (2008-2037) is consistent with the Klamath County Comprehensive Plan.

Table 4
Klamath Falls Model v1.1
Land-Use Summary

Year	Population	Housing	Employment
2008	47,276	18,818	19,951
2014	49,472	19,665	20,794
2037	57,293	22,911	24,024

The 2008 and 2037 LU data was developed through a coordinated effort with personnel from the local jurisdiction; this work was documented in a separate report.

<u>Network</u>

The model roadway network includes all roads within the model area that have a functional classification of collector or higher, where the collector classification includes both Major and Minor Collectors. The inclusion of local roads are required when Centroid Connectors are not able to connect zones to the roadway system; the general practice in model development is to exclude local roads unless absolutely necessary.

Centroid Connectors are not considered local roads; the Centroid location and Centroid Connectors can be subject to change in the future year network, depending on how future land-use growth is anticipated within any given TAZ. This means that as the LU changes within a TAZ, the center of activity can likely change as well, depending on where the future growth takes place; as a result, future accessibility to the TAZ is also subject to change.

Note: The Klamath Falls model does not include "off-network" roads such as dirt and gravel roads. TPAU will not provide the additional analysis necessary to produce estimates for vehicle travel on off-network roads.

The 2008 Reference Network was updated to reflect network improvements made to the system since the original model was developed. These improvements were most likely Statewide Transportation Improvement Program (STIP) projects constructed between the base and reference year periods. STIP improvement projects are associated with committed funding sources and should always be included in future model networks. Though the STIP improvement year may, on occasion, be adjusted, there is a high degree of expectation that these improvement projects will be constructed. It is TPAU's general practice, when developing standard future year model networks, to exclude TSP project improvements because the funding sources for these types of projects are usually not defined or identified. And, without a funding source attached to a project there is no guarantee that said projects will be constructed. Based on the State of Oregon's trend of continual funding reduction for modernization type improvements, this assumption seems fairly reasonable.

Note: TSP Project Improvements can be added to the network as a defined TSP Scenario, but should not be included in an "official" model.

External Model

All trips into and out of the Klamath Falls model area must pass through any one of nine External Stations. These points reside on the major roadway facilities and serve as gates to control flows between the model area and points beyond. The External Model accounts for trips into and out of the model area. The External-Internal (E-I) trips are trips that begin outside the model area and end inside the model area. The Internal-External (I-E) trips are those that begin inside the model area and end outside the model area. The External-External (E-E) trips are simply pass through trips that begin outside the model area, enter the model at one point, exit the model at another point, ending the trip outside the model area. The inputs to the external model are total volumes and percent split of volumes for the internal and external directions, for both base and future years.

The external model volumes were updated for the respective model years, 2008, 2014 and 2037. However, the internal and external percent splits were not changed during this model update.

Results

Model volumes are one of the primary model data outputs used for traffic and air quality analysis. The daily volume is the average daily auto volume that is assigned to the network link; the total daily and peak period volumes are the primary model outputs used for traffic analysis. Other data elements associated with analysis are the Length, Lanes, Capacity and Functional Classification: Length is the link length in miles; Lanes are the number of lanes defined by direction for a link; Capacity is the number of vehicles per hour per lane; Functional Classification is a unique number used within the model to identify roadway classes. The road type and associated functional classification is provided in Table 5.

It should be noted that each link represents a directional flow, such as a one-way roadway will be represented by one link and a two-way roadway system will be represented by two links. A summation of link lengths is not the same as a summation of centerline miles. As an example, there are 352 links categorized as Principal Arterials. All the link lengths sum up to 98.05 directional miles (i.e., where mileage on two-way roads are doubled), but these links only represent 68.37 centerline miles.

Table 5
Klamath Falls Model v1.1
Link and Mileage Summary, by Roadway Type

Roadway Type	Functional Classification	Number of Links	Directional Miles**	Centerline Miles
2	Principal Arterial	352	98.05	68.37
3	Minor Arterial	355	64.05	40.74
4	Collector	494	126.29	82.33
5*	Local	213	55.90	28.80
30	Ramps	70	6.12	5.79
99*	Centroid Connectors	670	129.68	65.26

*Not a true representation of the mileage on the ground
**Mileage represents directional miles, Two-way roads are double mileage

Note: Trip rates, as estimated from the HH survey data, vary depending on the trip purposes, such as work trips, shopping trips, recreational trips, etc. Trip purposes vary within any given TAZ based on the associated land-use and demographic data for said TAZ. Total trips assigned to the network vary by trip purpose and by trip rates. Trips are distributed throughout the roadway system based on trip origins (where the trip begins) and trip destinations (where the trip ends).

Daily Vehicle Miles Traveled (DVMT)

The Daily Vehicle Miles Traveled (DVMT) is an important performance measure used for the Air Quality Analysis. The model estimates volumes on each links, but does not output DVMT. Instead DVMT is a calculated element from the model output. DVMT is defined as the Model Volume times the Link Section Length (see Eq.1).

(Daily) DVMT = (Daily Link Volume) * (Link Length) Eq. 1

(Annual) VMT = (Daily Link Volume) * (Link Length) * 365 Eq. 2

It should be noted that DVMT represents a DAILY value. Occasionally, the term VMT is also used interchangeably as a daily measure, but VMT is most often defined as an ANNUAL value. Conversion of DVMT to VMT is simply a factor of 365 days (see Eq. 2).

It should be noted that the summation of the model DMVT can be a little deceiving, since it does not reflect the "official" daily VMT observed on the entire roadway systems within the model. This is simply because the model network includes functional classified roads from collector and above, along with a few local roads that are added to enhance the model. The local roads that are included do not statistically represent the roadway system that is actually on the ground. The Centroid Connectors are not representative of the local roadway system.

A summary of DVMT, by roadway classification, for the model years 2008, 2014 and 2037 are provided in Tables 6-8, respectively. The Percentage of DVMT ranges are consistent between all three model years: 56-57% of the model DVMT is associated with the Principal Arterial system and 20-21% and 12-13% of the DMVT is on the Minor Arterial and Collector systems, respectively.

Table 6
Klamath Falls Model v1.1
DVMT Summary, by Roadway Type
For 2008 Reference Year

Roadway Type	Functional Classification	DVMT	% DVMT
2	Principal Arterial	449,321	56%
3	Minor Arterial	168,021	21%
4	Collector	102,483	13%
5*	Local	12,445	2%
30	Ramps	12,444	2%
99*	Centroid Connectors	53,304	7%

*Not a true representation of the mileage or volumes on the ground
**Mileage represents directional miles, Two-way roads are double mileage

The total DVMT for the 2008 Reference Year is 798,019 vehicle miles traveled.

Table 7
Klamath Falls Model v1.1
DVMT Summary, by Roadway Type
For 2014 Interim Year

Roadway Type	Functional Classification	DVMT	% DVMT
2	Principal Arterial	482,720	57%
3	Minor Arterial	178,472	21%
4	Collector	108,478	13%
5*	Local	13,732	2%
30	Ramps	13,902	2%
99*	Centroid Connectors	56,971	7%

*Not a true representation of the mileage or volumes on the ground
**Mileage represents directional miles, Two-way roads are double mileage

The total DVMT for the 2014 Interim Year is 854,275 vehicle miles traveled. The DVMT average annual growth rate (AAGR), often referred to as CAGR, is 1.14% per year for the period 2008-2014.

Table 8
Klamath Falls v1.1 Model
DVMT Summary, by Roadway Type
For 2037 Future Year

Roadway Type	Functional Classification	DVMT	% DVMT
2	Principal Arterial	609,275	57%
3	Minor Arterial	214,877	20%
4	Collector	130,070	12%
5*	Local	18,580	2%
30	Ramps	19,172	2%
99*	Centroid Connectors	71,784	7%

*Not a true representation of the mileage or volumes on the ground
**Mileage represents directional miles, Two-day roads are double mileage

The total DVMT for the 2037 Future Year is 1,063,758 vehicle miles traveled. The AAGR over the entire project period (2008-2037) is 1.00% per year.

The technical memo discussing previous air quality model runs, dated July 2001, points out that "non-modeled streets are often referred to as 'off system' streets". The memo goes on to suggest that the 2001 model analysis included an assumption that an additional 10 percent[9] increase in estimated DVMT should be considered to account for vehicular travel on these types of streets. Looking at Tables 6-8, it can be observed that the DVMT for the roadway system classified as "Local" and "Centroid Connectors" represents approximately 10% DVMT. Even though the model does not adequately represent "off system roads, the summed total DMVT, associated with all model links, seems to be a reasonable approximation of the total vehicular activity within the model area, based on the previously accepted assumption.

Commercial Truck Travel

The Klamath Falls Travel Demand Model does not include a Freight or Commercial Truck Model. The following is strictly generalized information sharing.

Several reports have indicated that approximately 10-15%[10] [11] of the vehicle miles traveled on the system is associated with commercial delivery, passenger, freight and service vehicle movement not captured through the household survey analysis. These additional trips on the system, such as the Sears Repairman, the UPS delivery, the local bus service or the Fritos "chip man", are not generally accounted for in the Trip Generation step (as mentioned above). During the travel demand calibration efforts, non-

[9] Gillett, Mike (ODOT), Klamath Falls PM10 Analysis, memo (July 2001)
[10] Cambridge Systematics, Inc., *Accounting for Commercial Vehicles in Urban Transportation Models: Summary Report*, prepared for FHWA, March 2004.
[11] Hunt JD, Stefan KJ, Brownlee AT, McMillan JDP, Farhan A, Tsand K, Atkins D, and Ishani M, *A Commercial Movement Modelling Strategy for Alberta's Major Cities*, Proceedings of the 2004 Annual Conference of the Transportation Association of Canada, Quebec City, Quebec, Canada, 2004. (http://www.tac-atc.ca/english/pdf/conf2004/hunt.pdf)

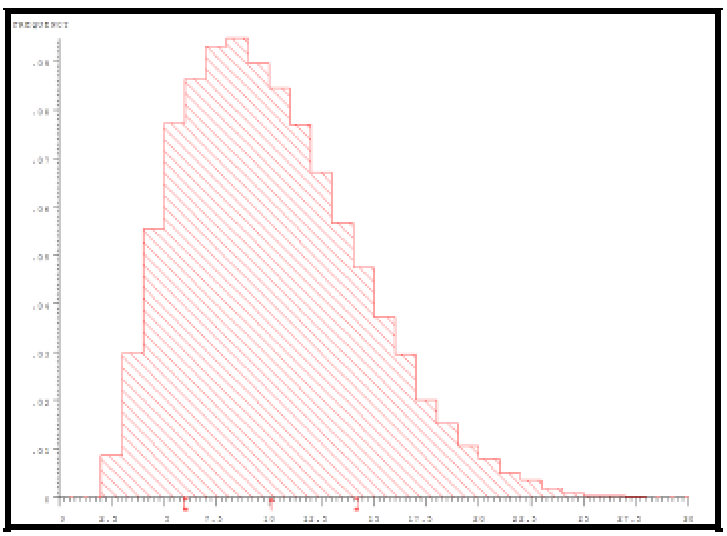
home based trip generation rates will be reviewed, and adjusted as needed to ensure that a reasonable number of trips were being generated by the model.

Model Travel Time

The travel time element is a significant measure of the model. The daily mean travel time and the Standard of Deviation values are almost identical for all analysis year scenarios (2008, 2014 and 2037), suggesting that the overall changes or estimated growth in the land-use within the model area has little impact on the trip patterns on the roadway system.

The Mean travel time for the Klamath Falls model is 6 minutes and the Standard of Deviation is about 4.2 minutes. The standard Histogram, as seen in Graph 3, indicates that approximately 68% of all trips fall between 2 and 10¼ minutes for the Klamath Falls regional travel demand model area and 95% of all trips are less than 15 minutes in length.

Graph 3
Klamath Falls Model v1.1
DVMT Summary, by Roadway Type
For 2037 Future Year



Conclusion

The Klamath Fall Model Update included a 2008 Reference Year and 2037 Future Year land-use updates, developed in a coordinated effort with the local jurisdictions. The 2014 Interim Year data was developed specifically as a scenario for the Air Quality Analysis, by linear interpolation between the updated 2008 and 2037 year data. Approximately 71-73% and 80-84% of the OEA projected population and employment, respectively, are accounted for in "v1.1", which is consistent with "v1.0". The updated POP and EMP data appears to be consistent with OEA projects.

The roadway network defined in the travel demand model accounts for all functional classified roads that are collector and above, but only includes local roads as needed to facilitate travel between TAZs. The model does not include all local roads, and those included are not a statistical representation of the entire system. For the purpose of this discussion, the non-modeled roads are defined as "off system" roads.

The model provides Peak and Daily volumes, which are estimations of auto travel on the major roadway system within the model area, based on the LU and demographic configurations associated with each specific TAZ. Volumes can only be estimated for the "off system" roads.

The DVMT is calculated from the Daily Volumes and Link lengths. Caution needs to be exercised when using DVMT because the model does not include all local roads; DVMT can only be estimated for the "off system" roads. Assumptions used in previous air quality analysis estimate an additional 10% DVMT be applied to the total DVMT to account for "off system" travel. This assumption is approximately the same as the inclusion of the DVMT for Local and Centroid Connector within the model. This suggests that tough the model does not adequately represent "off system" roads, the summed total DMVT, associated with all model links, seems to be a reasonable approximation of the total vehicular activity within the model area.

There is no noticeable difference in the travel time, between the 2008 Reference Year and the 2037 Future Year conditions. This would indicate that the projected growth in population and employment will have no impact on the travel patterns within the model area.

If you have any questions please feel free to contact Rich Arnold at 503-986-4218 or Brian Dunn at 503-986-4103.

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APPENDIX E: EMISSION INVENTORY FORECAST

- Table E-32. Nonroad Model (2008a) Output: Klamath County Growth to 2014. Nonroad Emissions Modeled SO2 Growth Factors: Averaged by Major SCC Category
- Table E-33. Re-Entrained Road Dust, PM2.5 Emissions Forecast: Paved Roads
- Table E-34. Re-Entrained Road Dust, PM2.5 Emissions Forecast: Unpaved Roads

Appendix E, Table E- 1. 2014 Permitted Point Source Emissions Estimates

Source Number	Source Name	------- $PM_{2.5}$ ------- Annual (tpy)	--- Season Day --- Typical (lbs/day)	Worst Case (1) (lbs/day)	------- NO_X ------- Annual (tpy)	--- Season Day --- Typical (lbs/day)	Worst Case (lbs/day)	----- SO_2 ----- Annual (tpy)	--- Season Day --- Typical (lbs/day)	Worst Case (lbs/day)	----- VOC ----- Annual (tpy)	--- Season Day --- Typical (lbs/day)	Worst Case (lbs/day)	----- NH_3 ----- Annual (tpy)	--- Season Day --- Typical (lbs/day)	Worst Case (lbs/day)
Stationary																
18-0003	Klamath Energy LLC Klamath Cogeneration Proj	19.3	93	168	172.2	830	1,506	19.5	94	145	82.5	398	588	68.9	331	1,368
18-0006	JELD-WEN, Inc. dba JELD-WEN	10.9	67	129	37.6	232	370	1.9	11	16	165.9	1,018	1,996	0.3	2	3
18-0013	Collins Products LLC Weyerhaeuser	31.0	170	320	9.4	52	274	0.1	0	2	529.8	2,903	5,365	0.0	0	3
18-0014	Columbia Forest Products, Inc.	48.9	268	518	53.5	294	494	1.4	8	13	41.2	226	627	0.3	1	2
18-0018	Pyramid Cremations	6.E-02	3.E-01	4.E-01	6.E-04	3.E-03	4.E-03	1.E-05	5.E-05	6.E-05	3.E-05	2.E-04	2.E-04	---	---	---
18-0020	Oil Re-Refining Company Industrial Oil	3.1	17	20	5.2	28	34	20.9	115	138	1.4	7	9	0.1	0	0
18-0022	Electro Scientific Industries, Inc.	0.01	0.06	0.07	0.41	2.44	2.93	0.01	0.06	0.08	0.02	0.14	0.17	0.01	0.08	0.09
18-0031	Reach, Inc.	0.2	1	1	---	---	---	---	---	---	0.9	5	6	---	---	---
18-0032	Klamath Energy, LLC Klamath Generation Peakers	0.6	3	62	1.9	9	173	0.1	5.E-01	10	0.5	2.E+00	48	0.8	4.E+00	75
18-0056	Sky Lakes Medical Center, Inc.	0.02	0.08	0.10	0.60	3.32	3.98	0.01	0.06	0.07	0.03	0.18	0.22	0.02	0.11	0.13
18-0070	Jefferson State Redi Mix, Inc.	0.1	1	1	---	---	---	---	---	---	---	---	---	---	---	---
18-0086	Down River LLC	1.E-04	1.E-03	1.E-03	---	---	---	---	---	---	3.00	24	29	---	---	---
18-0087	Eternal Hills Memorial Gardens & Funeral	0.02	0.12	0.14	---	---	---	---	---	---	---	---	---	---	---	---
18-0088	O'Hair & Riggs Funeral Chapel Klamath Cremation	0.02	0.09	0.10	---	---	---	---	---	---	---	---	---	---	---	---
18-0093	Masco Bath Corporation Masco Bath	1.1	6	8	1.1	13	53	1.0	11	13	34.1	387	869	0.0	0	0
18-0097	Kingsley Field Air National Guard Base	0.5	3	3	7.3	40	48	0.2	1	1	0.7	4	5	---	---	---
18-9542	Klamath Falls Bioenergy, LLC	17.8	98	117	193.1	1,058	1,270	32.2	176	212	16.1	88	106	2.7	15	18
Portable																
37-0209	CPM Development Corporation dba Klamath Pacific Company	3.0	16	20	36.3	197	236	2.6	14	17	3.6	20	24	0.1	4.E-01	1
37-0438	CPM Development Corporation dba Klamath Pacific Company	0.6	7	9	3.7	44	53	0.2	3	3	0.3	4	4	0.0	1.E-01	1.E-01
37-0625	CPM Development Corporation dba Klamath Pacific Company	0.04	0.2	0.2	---	---	---	---	---	---	---	---	---	---	---	---
37-0667	Rocky Mountain Construction, LLC	0.1	0.5	0.6	---	---	---	---	---	---	---	---	---	---	---	---
37-0675	Rocky Mountain Construction, LLC	0.1	0.4	0.4	---	---	---	---	---	---	---	---	---	---	---	---

Table E-1, Continued

Source Number	Source Name	PM2.5 Annual (tpy)	PM2.5 Season Day Typical (lbs/day)	PM2.5 Season Day Worst Case (lbs/day)	NOx Annual (tpy)	NOx Season Day Typical (lbs/day)	NOx Season Day Worst Case (lbs/day)	SO2 Annual (tpy)	SO2 Season Day Typical (lbs/day)	SO2 Season Day Worst Case (lbs/day)	VOC Annual (tpy)	VOC Season Day Typical (lbs/day)	VOC Season Day Worst Case (lbs/day)	NH3 Annual (tpy)	NH3 Season Day Typical (lbs/day)	NH3 Season Day Worst Case (lbs/day)
Gasoline Service Stations (2)																
18-9506	Ezell Suty Fuel Incorporated	---	---	---	---	---	---	---	---	---	7.6	42	42	---	---	---
18-9509	AMA Mini Mart, Inc.	---	---	---	---	---	---	---	---	---	5.6	31	31	---	---	---
18-9510	AMA Mini Mart, Inc.	---	---	---	---	---	---	---	---	---	5.3	29	29	---	---	---
18-9511	AMA Mini Mart, Inc.	---	---	---	---	---	---	---	---	---	8.0	44	44	---	---	---
18-9512	Joey's Gas & Mini Mart	---	---	---	---	---	---	---	---	---	8.2	45	45	---	---	---
18-9513	New Albertson's, Inc.	---	---	---	---	---	---	---	---	---	10.9	60	60	---	---	---
18-9519	Clough Oil Company	---	---	---	---	---	---	---	---	---	7.6	42	42	---	---	---
18-9520	Clough Oil Company	---	---	---	---	---	---	---	---	---	1.5	8	8	---	---	---
18-9521	Clough Oil Company	---	---	---	---	---	---	---	---	---	5.2	28	28	---	---	---
18-9522	Clough Oil Company	---	---	---	---	---	---	---	---	---	6.0	33	33	---	---	---
18-9523	Clough Oil Company	---	---	---	---	---	---	---	---	---	2.6	14	14	---	---	---
18-9527	Fred Meyer Stores, Inc.	---	---	---	---	---	---	---	---	---	25.2	138	138	---	---	---
18-9528	Klamath Falls Kampground Inc	---	---	---	---	---	---	---	---	---	7.6	42	42	---	---	---
18-9529	Truax Corporation	---	---	---	---	---	---	---	---	---	13.4	73	73	---	---	---
18-9530	Colvin Oil Company	---	---	---	---	---	---	---	---	---	4.8	26	26	---	---	---
18-9531	American Energy, Inc.	---	---	---	---	---	---	---	---	---	3.7	20	20	---	---	---
18-9534	Oregon Avenue Food Mart	---	---	---	---	---	---	---	---	---	6.7	37	37	---	---	---
18-9543	Ferrell's Fuel Network, Inc.	---	---	---	---	---	---	---	---	---	7.6	42	42	---	---	---
		-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Totals		**137.4**	**751**	**1,378**	**522.4**	**2,802**	**4,517**	**80.0**	**435**	**568**	**1,017.6**	**5,840**	**10,430**	**73.2**	**355**	**1,471**

Notes:

(1) Worst-Case day emissions are based on facility operating at 80% permitted daily capacity.

(2) Gasoline service station 2014 emissions estimates are based on a linear, non-compounding growth formula:

2008 Emission Inventory + ((2008 Emission Inventory) * (Average Annual Growth Rate, AAGR) * (# of years since 2008)): Where

2008 EI data taken from Appendix A, Table A-1		
AAGR =	0.54%	= Population & Household Growth Rate: DEQ Ref. 799
# of years since 2008 =	6	

Appendix E, Table E- 2. Area Source Annual & Worst Case PM2.5 Emission Growth for 2008, 2010, 2012, 2014 & 2024

AREA SOURCE	2008		2010		2012		2014		2024	
Category	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day
WASTE DISPOSAL, TREATMENT, & RECOVERY										
Commercial / Institutional Open Burning	2.5	0.0	2.6	0.0	2.6	0.0	2.6	0.0	2.9	0.0
Land Clearing Open Burning	0.3	5.0	0.3	5.1	0.3	5.2	0.3	5.2	0.3	5.7
Residential Open Burning	10.0	45.4	8.3	37.0	8.4	37.5	8.5	38.0	9.0	40.5
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Subtotal	12.8	50.4	11.1	42.1	11.3	42.7	11.4	43.3	12.2	46.1
SMALL STATIONARY FOSSIL FUEL USE										
Industrial										
Distillate/Kerosene	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2
Residual	0.1	0.8	0.1	0.8	0.1	0.8	0.1	0.8	0.2	0.9
Natural Gas Combustion	1.3	0.0	1.4	0.0	1.4	0.0	1.4	0.0	1.5	25.4
Liquid Petroleum Gas Combustion	0.0	1.2E-02	0.0	1.2E-02	0.0	1.2E-02	0.0	1.3E-02	0.0	1.4E-02
Commercial / Institutional										
Distillate/Kerosene	0.2	3.7	0.2	3.7	0.2	3.8	0.2	3.9	0.2	4.2
Residual	0.0	0.4	0.0	0.4	0.0	0.4	0.0	0.4	0.0	0.5
Natural Gas Combustion	1.3	22.3	1.3	22.7	1.3	23.1	1.4	23.5	1.5	25.4
Liquid Petroleum Gas Combustion	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
Residential										
Distillate/Kerosene	0.1	1.0	0.1	1.0	0.1	1.0	0.1	1.0	0.1	1.1
Natural Gas Combustion	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6
Liquid Petroleum Gas Combustion	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Subtotal	3.1	29	3.2	29	3.2	30	3.3	30	3.6	58
RESIDENTIAL WOOD COMBUSTION										
Fireplaces	63.7	1,889.1	65.0	1,927.3	66.2	1,965.5	67.5	2,003.7	74.0	2,194.7
Certified Catalytic Devices	12.5	276.9	13.2	291.3	13.4	295.0	13.6	299.4	13.2	290.1
Certified Non-Catalytic Devices	10.4	234.4	10.7	242.3	10.8	243.7	10.9	245.3	10.4	233.6
Non-Certified Devices	74.4	1,661.9	65.4	1,461.2	55.0	1,227.2	51.4	1,145.5	39.7	882.5
Central Furnace + Pellet Stove	4.1	89.3	4.1	89.1	3.9	87.0	4.0	87.5	4.0	89.1
Less advisory	--	1,978.8	--	2,880.3	--	2,416.6	--	2,393.2	--	2,335.4
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Subtotal	165.0	2,173	158.4	1,131	149.3	1,402	147.3	1,388	141.2	1,355
MISCELLANEOUS AREA SOURCES										
Wildfire/Prescribed Burning	107.0	458.9	107.0	458.9	107.0	458.9	107.0	458.9	107.0	458.9
Structural Fires	0.3	1.1	0.3	1.1	0.3	1.1	0.3	1.1	0.3	1.2
Agricultural Field Burning	7.2	39.5	7.2	39.5	7.2	39.5	7.2	39.5	7.2	39.5
Commercial Food Preparation	9.9	18.1	10.1	18.4	10.2	18.7	10.4	19.0	11.2	20.6
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Subtotal	124.4	518	124.5	518	124.7	518	124.9	518	125.7	520
FUGITIVE DUST										
Aggregate Storage Piles	0.3	41.5	0.3	42.2	0.3	42.9	0.3	43.6	0.3	47.1
Road Sanding	0.3	31.4	0.3	31.9	0.3	32.4	0.3	33.0	0.3	35.7
Heavy New Construction	89.3	0.0	90.8	0.0	92.3	0.0	93.8	0.0	101.4	0.0
Agricultural Wind Erosion	5.5	0.0	5.5	0.0	5.5	0.0	5.5	0.0	5.5	0.0
Agricultural Tillage	2.0	0.0	2.0	0.0	2.0	0.0	2.0	0.0	2.0	0.0
Animal Husbandry	0.4	1.2	0.4	1.2	0.4	1.2	0.4	1.2	0.4	1.2
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Subtotal	97.7	74	99.2	75	100.7	77	102.3	78	109.9	84
TOTAL EMISSIONS FROM AREA SOURCES	**403.0**	**2,851**	**396.4**	**1,803**	**389.3**	**2,077**	**389.2**	**2,066**	**392.7**	**2,046**

Notes:
This table summarizes data found in Tables E-4 and E-6.

Appendix E, Table E- 3. Area Source Annual & Worst Case NOX, SOX, VOC, NH3 Emission Growth for 2008, 2010, 2012, 2014 & 2024

Category	2008		2010		2012		2014		2024	
	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day
WASTE DISPOSAL, TREATMENT, & RECOVERY										
NOX	3.6	14	3.5	14	3.3	13	3.3	12	3.5	13
SOX	0.6	3	0.6	3	0.6	2	0.5	2	0.6	3
VOC	10.6	42	10.2	40	9.7	38	9.5	36	10.1	39
NH3	0.6	2	0.5	2	0.5	2	0.5	2	0.5	2
SMALL STATIONARY FOSSIL FUEL USE										
NOX	75.2	1,049	76.8	1,070	78.3	1,091	79.0	1,102	85.4	1,190
SOX	36.8	467	37.5	476	38.2	486	38.6	491	41.7	530
VOC	3.8	54	3.9	55	4.0	56	4.0	57	4.3	61
NH3	12.9	181	13.2	184	13.5	188	13.6	190	14.7	205
RESIDENTIAL WOOD COMBUSTION										
NOX	19.3	256	18.8	134	18.0	169	17.8	168	17.4	167
SO2	2.9	38	2.8	20	2.7	25	2.7	25	2.6	25
VOC	196.1	2,486	182.4	1,254	165.4	1,497	160.4	1,458	144.8	1,342
NH3	10.4	140	10.0	73	9.5	92	9.4	91	9.2	91
MISCELLANEOUS AREA SOURCES										
NOX	16.1	72	16.2	72	16.2	72	16.2	72	16.3	72
SOX	8.8	38	8.8	38	8.8	38	8.8	38	8.9	38
VOC	306.6	1,318	307.1	1,319	307.6	1,319	307.8	1,320	310.0	1,324
NH3	20.8	89	20.9	89	20.9	89	20.9	89	21.1	90
FUGITIVE DUST										
VOC	11.8	41	11.8	41	11.8	41	11.8	41	11.8	41
NH3	76.2	264	76.2	264	76.2	264	76.2	264	76.2	264
EVAPORATIVE/OFF-GASSING EMISSION SOURCES										
VOC	444.1	2,902	450.7	2,946	457.3	2,989	464.0	3,032	497.1	3,249
NH3	41.1	95	41.7	96	42.3	98	42.9	99	46.0	106
TOTAL										
NOX	114.3	1,391	115.2	1,290	115.8	1,345	116.3	1,354	122.6	1,442
SOX	49.1	546	49.7	537	50.3	552	50.7	556	53.8	596
VOC	972.9	6,843	966.0	5,654	955.8	5,940	957.4	5,944	978.1	6,056
NH3	161.9	772	162.4	710	162.8	734	163.5	736	167.7	759

Notes:
This table summarizes data found in Tables E-5 and E-7.

Appendix E, Table E- 4. Area Source Annual PM2.5 Emission Growth

(1)		(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Type Of	Year	**2008**	2009	2010	2011	2012	2013	**2014**	2024
Growth	Years of Growth	**0**	1	2	3	4	5	**6**	16
		------------------------------ **Tons per year** ------------------------------							
	WASTE DISPOSAL, TREATMENT, & RECOVERY								
3	Commercial / Institutional Open Burning	**2.5**	2.5	2.6	2.6	2.6	2.6	**2.6**	2.9
4	Land Clearing Open Burning	**0.3**	0.3	0.3	0.3	0.3	0.3	**0.3**	0.3
2	Residential Open Burning (4b)	**10.0**	8.2	8.3	8.3	8.4	8.5	**8.5**	9.0
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	**12.8**	11.1	11.1	11.2	11.3	11.4	**11.4**	12.2
	SMALL STATIONARY FOSSIL FUEL USE								
	Industrial								
4	Distillate/Kerosene	**3.E-02**	3.E-02	3.E-02	3.E-02	3.E-02	3.E-02	**3.E-02**	4.E-02
4	Residual	**0.1**	0.1	0.1	0.1	0.1	0.1	**0.1**	0.2
4	Natural Gas Combustion	**1.3**	1.3	1.4	1.4	1.4	1.4	**1.4**	1.5
4	Liquid Petroleum Gas Combustion	**2.E-03**	2.E-03	2.E-03	2.E-03	2.E-03	2.E-03	**2.E-03**	2.E-03
	Commercial / Institutional								
3	Distillate/Kerosene	**0.2**	0.2	0.2	0.2	0.2	0.2	**0.2**	0.2
3	Residual	**2.E-02**	2.E-02	2.E-02	2.E-02	2.E-02	2.E-02	**2.E-02**	3.E-02
3	Natural Gas Combustion	**1.3**	1.3	1.3	1.3	1.3	1.3	**1.4**	1.5
3	Liquid Petroleum Gas Combustion	**3.E-03**	3.E-03	4.E-03	4.E-03	4.E-03	4.E-03	**4.E-03**	4.E-03
	Residential								
2	Distillate/Kerosene	**0.1**	0.1	0.1	0.1	0.1	0.1	**0.1**	0.1
2	Natural Gas Combustion	**3.E-02**	3.E-02	3.E-02	3.E-02	3.E-02	3.E-02	**3.E-02**	3.E-02
2	Liquid Petroleum Gas Combustion	**2.E-03**	2.E-03	2.E-03	2.E-03	2.E-03	2.E-03	**2.E-03**	2.E-03
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	**3.1**	3.2	3.2	3.2	3.2	3.3	**3.3**	3.6
(EndNote)	RESIDENTIAL WOOD COMBUSTION								
(4a)	Fireplaces	**63.7**	64.3	65.0	65.6	66.2	66.9	**67.5**	74.0
(4a)	Certified Catalytic Devices	**12.5**	13.0	13.2	13.3	13.4	13.5	**13.6**	13.2
(4a)	Certified Non-Catalytic Devices	**10.4**	10.7	10.7	10.8	10.8	10.9	**10.9**	10.4
(4a)	Non-Certified Devices	**74.4**	69.3	65.4	60.2	55.0	53.0	**51.4**	39.7
(4a)	Central Furnace + Pellet Stove	**4.1**	4.1	4.1	4.0	3.9	4.0	**4.0**	4.0
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	**165.0**	161.4	158.4	153.8	149.3	148.2	**147.3**	141.2
	MISCELLANEOUS AREA SOURCES								
	Other Combustion								
5	Wildfire/Prescribed Burning	**107.0**	107.0	107.0	107.0	107.0	107.0	**107.0**	107.0
2	Structural Fires	**0.3**	0.3	0.3	0.3	0.3	0.3	**0.3**	0.3
5	Agricultural Field Burning	**7.2**	7.2	7.2	7.2	7.2	7.2	**7.2**	7.2
3	Commercial Food Preparation	**9.9**	10.0	10.1	10.1	10.2	10.3	**10.4**	11.2
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	**124.4**	124.5	124.5	124.6	124.7	124.8	**124.9**	125.7
	FUGITIVE DUST								
4	Aggregate Storage Piles	**0.3**	0.3	0.3	0.3	0.3	0.3	**0.3**	0.3
4	Road Sanding	**0.3**	0.3	0.3	0.3	0.3	0.3	**0.3**	0.3
4	Heavy New Construction	**89.3**	90.0	90.8	91.5	92.3	93.1	**93.8**	101.4
5	Agricultural Wind Erosion	**5.5**	5.5	5.5	5.5	5.5	5.5	**5.5**	5.5
5	Agricultural Tillage	**2.0**	2.0	2.0	2.0	2.0	2.0	**2.0**	2.0
5	Animal Husbandry	**0.4**	0.4	0.4	0.4	0.4	0.4	**0.4**	0.4
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	**97.7**	98.4	99.2	100.0	100.7	101.5	**102.3**	109.9
		-----	-----	-----	-----	-----	-----	-----	-----
	TOTAL EMISSIONS FROM AREA SOURCES	**403.0**	398.5	396.4	392.9	389.3	389.2	**389.2**	392.7

Notes for Table E-4:

Notes for Table E-4:

(1) Type of growth is as follows:

Type	Klamath Falls NAA Growth Factors	%	Growth Parameter Data	Reference
2	Population (Zoning & Land Use Based)	0.54%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
3	Commercial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
4	Industrial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
See note 4 below	Residential wood combustion, Residential Open Burning		Housing, Wood Usage, Fraction of Existing & New Housing Equipped with Wood Burning Un (Linear, Non-Compounding)	See note (4) below
5	Wildfires, Prescribed Burning, Ag Wind Erosion, Animal Husbandry	0%		DEQ Ref. 333

(2) 2008 Emissions from Table 2.4.2.

(3) Growth formula applied to years 2008 to 2024 = (2008 tons/yr) + ((type of growth) * (years of growth) * (2008 tons/yr))

(4) (a) Annual Residential Wood Combustion growth is detailed in Table E-18. No reductions assumed for annual emissions estimates.

(b) Residential Open Burning incorporates Burn Barrel Prohibition and 15-Day Window strategy reductions as show below:

	Emissions	------------------------------ Reductions ------------------------------						
Open Burn. Strategy Reductions, tpy	2008	2009	2010	2011	2012	2013	2014	2024
Advisory Open Burn (i)	--	--	--	--	--	--	--	--
Burn Barrel Prohibition (ii)	10.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Open Burn 15 day window (ii)	12.8	1.3	1.3	1.3	1.3	1.3	1.3	1.3

(i) No reductions assumed for annual emissions estimates from advisory

(ii) (2008 residential open burn total) * 5%. It is estimated that burn barrels contribute 5% of the open burn total

(iii) (2008 open burning total) * (10% reduction)

Appendix E, Table E- 5. Area Source Annual NOX, SOX, VOC, NH3 Emission Growth

(1) 2008-2015 GF	(1) 2008-2024 GF	Year / Years of Growth	(2) **2008** / **0**	(4) 2009 / 1	(4) 2010 / 2	(4) 2011 / 3	(4) 2012 / 4	(4) 2013 / 5	(3) **2014** / **6**	(3) 2024 / 16
			---------------------------------- **Tons per year** ----------------------------------							
		WASTE DISPOSAL, TREATMENT, & RECOVERY								
		NOX	**3.6**	3.6	3.5	3.4	3.3	3.3	**3.3**	3.5
0.8971	0.9576	SOX	**0.6**	0.6	0.6	0.6	0.6	0.5	**0.5**	0.6
		VOC	**10.6**	10.4	10.2	9.9	9.7	9.5	**9.5**	10.1
		NH3	0.6	0.5	0.5	0.5	0.5	0.5	**0.5**	0.5
		SMALL STATIONARY FOSSIL FUEL USE								
		NOX	**75.2**	76.0	76.8	77.5	78.3	79.0	**79.0**	85.4
1.0506	1.1349	SOX	**36.8**	37.1	37.5	37.9	38.2	38.6	**38.6**	41.7
		VOC	**3.8**	3.9	3.9	3.9	4.0	4.0	**4.0**	4.3
		NH3	**12.9**	13.1	13.2	13.3	13.5	13.6	**13.6**	14.7
		RESIDENTIAL WOOD COMBUSTION (5)								
		NOX	**19.3**	19.0	18.8	18.4	18.0	17.9	**17.8**	17.4
--	--	SO2	**2.9**	2.8	2.8	2.7	2.7	2.7	**2.7**	2.6
		VOC	**196.1**	188.4	182.4	173.9	165.4	162.7	**160.4**	144.8
		NH3	**10.4**	10.2	10.0	9.8	9.5	9.5	**9.4**	9.2
		MISCELLANEOUS AREA SOURCES								
		NOX	**16.1**	16.1	16.2	16.2	16.2	16.2	**16.2**	16.3
1.0041	1.0111	SOX	**8.8**	8.8	8.8	8.8	8.8	8.8	**8.8**	8.9
		VOC	**306.6**	306.8	307.1	307.3	307.6	307.8	**307.8**	310.0
		NH3	**20.8**	20.8	20.9	20.9	20.9	20.9	**20.9**	21.1
		FUGITIVE DUST (6)								
--	--	VOC	**11.8**	11.8	11.8	11.8	11.8	11.8	**11.8**	11.8
		NH3	**76.2**	76.2	76.2	76.2	76.2	76.2	**76.2**	76.2
		EVAPORATIVE/OFF-GASSING EMISSION SOURCES (7)								
--	--	VOC	**444.1**	447.4	450.7	454.0	457.3	460.6	**464.0**	497.1
		NH3	**41.1**	41.4	41.7	42.0	42.3	42.6	**42.9**	46.0
		TOTAL								
		NOX	**114.3**	114.7	115.2	115.5	115.8	116.4	**116.3**	122.6
		SOX	**49.1**	49.4	49.7	50.0	50.3	50.7	**50.7**	53.8
		VOC	**972.9**	968.7	966.0	960.8	955.8	956.4	**957.4**	978.1
		NH3	**161.9**	162.2	162.4	162.6	162.8	163.2	**163.5**	167.7

Notes:
(1) GF = Growth Factors, estimated from Table E-4
(2) 2008 data from Tables 2.4.3 through 2.4.6.
(3) 2014 and 2024 estimates = (2008 emissions) * (GF)
(4) Intermediate year estimates are a linear extapolation between 2008 and 2014 estimates.
(5) Residential Wood Combustion Emissions are from Appendix E, Tables E-20 through E-23. *No credit taken for advisory day reductions*.
(6) The only source of VOC and NH3 in the fugitive dust category are CAFOs: DEQ assumes 0% growth for animal husbandry (DEQ Ref. 333)
(7) Emissions sources include:
- Commercial Fertilizer Application
- Small, Non-Permitted Point Sources: Solvent Use
- Commercial Pesticide Application
- Non-Industrial Asphalt Application
- Consumer Solvent Use
- Architectural Surface Coating
- Traffic Markings
- Portable Fuel Containers
- Truck Transport of Gasoline
- Domestic Sewage and Wastewater Treatment
- Municipal Landfills

Non-compounding annual growth is an average of population and commercial/industrial employment

Klamath Falls NAA Growth Factors	%	Growth Parameter Data	Reference
Population (Zoning & Land Use Based)	0.54%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
Commercial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
Industrial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
	-------		
Average:	0.75%		

Appendix E, Table E- 6. Area Source Worst Case Day PM2.5 Emission Growth

(1) Type of Growth	Category	(2) 2008	(3) 2009	(3) 2010	(3) 2011	(3) 2012	(3) 2013	(3) 2014	(3) 2024
	Years of Growth:	0	1	2	3	4	5	6	16
		------------------------------- lbs per day -------------------------------							
	WASTE DISPOSAL, TREATMENT, & RECOVERY								
3	Commercial / Institutional Open Burning	0	0	0	0	0	0	0	0
4	Land Clearing Open Burning	5	5	5	5	5	5	5	6
2	Residential Open Burning (4b)	45	37	37	37	38	38	38	40
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	50	42	42	42	43	43	43	46
	SMALL STATIONARY FOSSIL FUEL USE								
	Industrial								
4	Distillate/Kerosene	2.E-01	2.E-01	2.E-01	2.E-01	2.E-01	2.E-01	2.E-01	2.E-01
4	Residual	1	8.E-01	8.E-01	8.E-01	8.E-01	8.E-01	8.E-01	9.E-01
4	Natural Gas Combustion	7	7	7	8	8	8	8	8
4	Liquid Petroleum Gas Combustion	1.E-02	1.E-02	1.E-02	1.E-02	1.E-02	1.E-02	1.E-02	1.E-02
	Commercial / Institutional								
3	Distillate/Kerosene	4	4	4	4	4	4	4	4
3	Residual	4.E-01	4.E-01	4.E-01	4.E-01	4.E-01	4.E-01	4.E-01	5.E-01
3	Natural Gas Combustion	22	23	23	23	23	23	23	25
3	Liquid Petroleum Gas Combustion	6.E-02	6.E-02	6.E-02	6.E-02	6.E-02	6.E-02	6.E-02	7.E-02
	Residential								
2	Distillate/Kerosene	1	1	1	1	1	1	1	1
2	Natural Gas Combustion	1	1	1	1	1	1	1	1
2	Liquid Petroleum Gas Combustion	4.E-02	4.E-02	4.E-02	4.E-02	4.E-02	4.E-02	4.E-02	4.E-02
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	36	37	37	37	38	38	38	41
(EndNote)	RESIDENTIAL WOOD COMBUSTION								
(4a)	Fireplaces	1889	1908	1927	1946	1965	1985	2004	2195
(4a)	Certified Catalytic Devices	277	288	291	293	295	298	299	290
(4a)	Certified Non-Catalytic Devices	234	241	242	243	244	245	245	234
(4a)	Non-Certified Devices	1662	1549	1461	1344	1227	1183	1145	882
(4a)	Central Furnace + Pellet Stoves	89	89	89	88	87	87	88	89
(5)	Less Advisory	1,979	2,510	2,880	2,789	2,417	2,404	2,393	2,335
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	2,173	1,565	1,131	1,125	1,402	1,394	1,388	1,355
	MISCELLANEOUS AREA SOURCES								
	Other Combustion								
5	Forest Wild Fires and Prescribed Burning	459	459	459	459	459	459	459	459
2	Structural Fires	1	1	1	1	1	1	1	1
5	Agricultural Field Burning	39	39	39	39	39	39	39	39
3	Commercial Food Preparation	18	18	18	19	19	19	19	21
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	518	518	518	518	518	518	518	520
	FUGITIVE DUST								
3	Aggregate Storage Piles	41	42	42	43	43	43	44	47
3	Road Sanding	31	32	32	32	32	33	33	36
3	Heavy New Construction	0	0	0	0	0	0	0	0
5	Agricultural Wind Erosion	0	0	0	0	0	0	0	0
5	Agricultural Tillage	0	0	0	0	0	0	0	0
5	Animal Husbandry	1	1	1	1	1	1	1	1
		-----	-----	-----	-----	-----	-----	-----	-----
	Subtotal	74	75	75	76	77	77	78	84
	TOTAL EMISSIONS FROM AREA SOURCES	2,851	2,236	1,803	1,799	2,077	2,071	2,066	2,046

Notes for Table E-6:

(1) Type of growth is as follows:

Type	Klamath Falls NAA Growth Factors	%	Growth Parameter Data	Reference
1	Population (Zoning & Land Use Based)	0.54%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
2	Population (Zoning & Land Use Based)	0.54%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
3	Commercial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
4	Industrial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
See note 4 below	Residential wood combustion, Residential Open Burning		Housing, Wood Usage, Fraction of Existing & New Housing Equipped with Wood Burning Units (Linear, Non-Compounding)	See note (4) below
5	Wildfires, Slashburning, Ag Wind Erosion, Animal Husbandry	0%	No Growth	DEQ Ref. 333

(2) 2008 Emissions from Table 2.4.2.

(3) Growth formula applied, years 2008 to 2024 = (2008 lbs/day) + [(type of growth) * (years of growth) * (2008 lbs/day)]

(4) (a) Worst-Case Day Residential Wood Combustion growth is detailed in Table E-19.

(b) Open Burning incorporates Burn Barrel Prohibition and 15-Day Window strategy reductions as show below:

	Emissions	----------------------------- Reductions -----------------------------						
Open Burn. Strategy Reductions, lbs/day	2008	2009	2010	2011	2012	2013	2014	2024
Advisory Open Burn (i)	50	2	2	2	2	2	2	2
Burn Barrel Prohibition (ii)	45	2	2	2	2	2	2	2
Open Burn 15 day window (ii)	50	5	5	5	5	5	5	5

(i) (Avg. Advisory call effectiveness - Avg. Advisory Call effectiveness, 2008) * 2008 open burning total, lbs
Please see Table E-28 end note 2 for avg. advisory call effectiveness, also known as control efficiency.

(ii) (2008 residential open burn total) * 5%. It is estimated that burn barrels contribute 5% of the open burn total

(iii) (2008 open burning total) * (10% reduction)

(5) Residential Wood Combustion advisory call and enforcement reductions estimates are detailed in Table E-28.

Year	2008	2009	2010	2011	2012	2013	2014	2024
Reductions from advisory calls and enforcement	1,979	2,510	2,880	2,789	2,417	2,404	2,393	2,335

Appendix E, Table E- 7. Area Source Worst Case Day NOX, SOX, VOC, NH3 Emission Growth

(1) 2008-2015 GF	(1) 2008-2024 GF	Year / Years of Growth		(2) **2008** **0**	(4) 2009 1	(4) 2010 2	(4) 2011 3	(4) 2012 4	(4) 2013 5	(3) **2014** **6**	(3) 2024 16
				---------- lbs per day ----------							
		WASTE DISPOSAL, TREATMENT, & RECOVERY									
			NOX	**14**	14	14	13	13	12	**12**	13
0.8586	0.9154		SOX	**3**	3	3	3	2	2	**2**	3
			VOC	**42.4**	41	40	39	38	36	**36**	39
			NH3	**2**	2	2	2	2	2	**2**	2
		SMALL STATIONARY FOSSIL FUEL USE									
			NOX	**1,049**	1,059	1,070	1,081	1,091	1,102	**1,102**	1,190
1.0503	1.1342		SOX	**467**	472	476	481	486	491	**491**	530
			VOC	**54.1**	55	55	56	56	57	**57**	61
			NH3	**181**	183	184	186	188	190	**190**	205
		RESIDENTIAL WOOD COMBUSTION (5)									
			NOX	**256**	185	134	135	169	169	**168**	167
--	--		SO2	**38**	27	20	20	25	25	**25**	25
			VOC	**2,486**	1,760	1,254	1,225	1,497	1,475	**1,458**	1,342
			NH3	**140**	101	73	73	92	91	**91**	91
		MISCELLANEOUS AREA SOURCES									
			NOX	**72**	72	72	72	72	72	**72**	72
1.0019	1.0049		SOX	**38**	38	38	38	38	38	**38**	38
			VOC	**1,317.5**	1,318	1,319	1,319	1,319	1,320	**1,320**	1,324
			NH3	**89**	89	89	89	89	89	**89**	90
		FUGITIVE DUST (6)									
--	--		VOC	**41**	41	41	41	41	41	**41**	41
			NH3	**264**	264	264	264	264	264	**264**	264
		EVAPORATIVE/OFF-GASSING EMISSION SOURCES (7)									
--	--		VOC	**2,902**	2,924	2,946	2,967	2,989	3,011	**3,032**	3,249
			NH3	**95**	96	96	97	98	99	**99**	106
		TOTAL									
			NOX	**1,391**	1,331	1,290	1,301	1,345	1,355	**1,354**	1,442
			SOX	**546**	540	537	542	552	556	**556**	596
			VOC	**6,843**	6,138	5,654	5,647	5,940	5,940	**5,944**	6,056
			NH3	**772**	735	710	713	734	736	**736**	759

Notes:
(1) GF = Growth Factors, estimated from Table E-6
(2) 2008 data from Tables 2.4.3 through 2.4.6.
(3) 2014 and 2024 estimates = (2008 emissions) * (GF)
(4) Intermediate year estimates are a linear extapolation between 2008 and 2014 estimates.
(5) Advisory Controlled Residential Wood Combustion Emissions are from Appendix E, Table E-28.
(6) The only source of VOC and NH3 in the fugitive dust category are CAFOs: DEQ assumes 0% growth for animal husbandry (DEQ Ref. 333)
(7) Emissions sources include:

- Commercial Fertilizer Application
- Small, Non-Permitted Point Sources: Solvent Use
- Commercial Pesticide Application
- Non-Industrial Asphalt Application
- Consumer Solvent Use
- Architectural Surface Coating
- Traffic Markings
- Portable Fuel Containers
- Truck Transport of Gasoline
- Domestic Sewage and Wastewater Treatment
- Municipal Landfills

Non-compounding annual growth is an average of population and commercial/industrial employment

Klamath Falls NAA Growth Factors	**%**	**Growth Parameter Data**	**Reference**
Population (Zoning & Land Use Based)	0.54%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
Commercial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
Industrial Employment	0.85%	Linear, Non-Compounding	DEQ Ref. 799: OEA data
	-------		
Average:	0.75%		

Appendix E, Table E- 8. Nonroad Annual & Worst Case Day PM2.5 Emission Growth for 2008, 2010, 2012, 2014 & 2024

Nonroad Source Category	2008		2010		2012		2014		2024	
	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day
NONROAD VEHICLES & EQUIPMENT										
Gasoline: 2-Stroke	0.8	4	0.8	4	0.8	4	0.8	4	0.8	4
Gasoline: 4-Stroke	0.2	1	0.2	1	0.2	1	0.2	1	0.2	1
CNG/LPG	0.1	1	0.1	1	0.1	1	0.1	1	0.1	1
Diesel	2.7	14	2.4	13	2.1	12	1.9	10	2.0	11
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Subtotal	*3.8*	*19*	*3.5*	*18*	*3.2*	*17*	*3.0*	*15*	*3.1*	*16*
RECREATIONAL MARINE VESSELS	2.8	1	2.7	1	2.6	1	2.4	1	2.6	1
AIRPORT: AIRCRAFT, GSE, APU	2.2	74	2.2	75	2.3	76	2.3	77	2.4	81
RAILROADS	7.2	40	6.8	37	6.1	34	5.5	30	5.5	16
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
TOTAL: NONROAD	**16.1**	**135**	**15.3**	**132**	**14.2**	**127**	**13.2**	**123**	**13.6**	**114**

Note: Emissions summed from Tables E-10 and E-12.

Appendix E, Table E- 9. Nonroad Annual & Worst Case Day NOX, SOX, VOC, NH3 Emission Growth for 2008, 2010, 2012, 2014 & 2024

Nonroad Source Category		2008		2010		2012		2014		2024	
		Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day	Annual Ton/yr	Worst Case Lbs/Day
NONROAD VEHICLES & EQUIPMENT											
Gasoline: 2-Stroke											
	NOX	0.2	1	0.2	2	0.2	2	0.2	2	0.3	2
	SO2	0.003	0.03	0.003	0.03	0.003	0.02	0.0	0.02	0.0	0.005
	VOC	17.4	95	17.0	94	16.6	92	16.3	91	14.5	84
Gasoline: 4-Stroke											
	NOX	6.9	35	6.3	31	5.7	27	5.1	24	2.3	5
	SO2	0.04	0.1	0.03	0.1	0.03	0.1	0.0	0.1	0.0	0.0
	VOC	23.0	77	20.5	69	18.1	61	15.6	53	3.2	14
CNG/LPG											
	NOX	11.9	63	9.7	51	7.4	40	5.2	28	<0.1	<0.1
	SO2	0.1	0.5	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
	VOC	3.0	16	2.5	13	2.0	10	1.4	7	<0.1	<0.1
Diesel											
	NOX	31.3	168	29.1	156	26.9	144	24.7	132	13.5	72
	SO2	0.8	4	0.5	3	0.3	1	0.0	0	<0.1	<0.1
	VOC	3.4	18	3.0	17	2.7	15	2.4	13	0.8	4
RECREATIONAL MARINE VESSELS											
	NOX	24.0	13	25.4	13	26.8	13	28.2	14	35.3	15
	SO2	0.2	0	0.2	0.1	0.1	0.1	0.1	0.0	<0.1	<0.1
	VOC	170.7	97	158.2	90	145.8	83	133.4	76	71.4	42
AIRPORT: AIRCRAFT, GSE, APU											
	NOX	32.5	1,177	32.9	1,190	33.2	1,202	33.6	1,215	35.3	1,278
	SO2	2.3	85	2.3	86	2.3	87	2.4	88	2.5	93
	VOC	14.3	479	14.4	484	14.6	489	14.7	494	15.5	520
RAILROADS											
	NOX	254.2	1,398	240.3	1,317	224.7	1,231	214.0	1,173	139.3	763
	SO2	3.2	18	0.3	2	0.1	1	0.1	1	0.1	1
	VOC	14.3	95	13.5	74	11.9	65	10.6	58	5.6	31
TOTAL											
	NOX	360.9	2,855	343.8	2,760	324.9	2,659	311.0	2,586	226.0	2,135
	SO2	6.6	108	3.4	91	2.9	90	2.6	89	2.6	94
	VOC	246.0	876	229.3	840	211.7	816	194.4	793	110.9	694

Note: Emissions summed from Tables E-11 and E-13.

Appendix E, Table E- 10. Nonroad Annual PM2.5 Emission Growth

	(1) 2014 Growth Factor	(2)	(4)	(4)	(4)	(4)	(4)	(3)	(4)
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
		tpy	*tpy*	*tpy*	*tpy*	*tpy*	*tpy*	*tpy*	*tpy*
Nonroad2008a: MODELED EMISSIONS FROM NONROAD VEHICLES AND EQUIPMENT (3)									
Gasoline: 2-Stroke	0.9892	**0.8**	0.8	0.8	0.8	0.8	0.8	**0.8**	0.8
Gasoline: 4-Stroke	1.0143	**0.2**	0.2	0.2	0.2	0.2	0.2	**0.2**	0.2
CNG/LPG	0.9659	**0.1**	0.1	0.1	0.1	0.1	0.1	**0.1**	0.1
Diesel	0.7092	**2.7**	2.5	2.4	2.3	2.1	2.0	**1.9**	2.0
Recreational Marine Vessels	0.8619	**2.8**	2.8	2.7	2.6	2.6	2.5	**2.4**	2.6
		-----	-----	-----	-----	-----	-----	**-----**	-----
Nonroad2008a Output: Subtotal		**6.6**	6.4	6.2	6.0	5.8	5.6	**5.4**	5.7
	(5) Type of Growth								
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
AIRPORT: Aircraft + GSE + APU (6)		**2.2**	2.2	2.2	2.3	2.3	2.3	**2.3**	2.4
RAILROADS (7)		**7.2**	7.0	6.8	6.5	6.1	5.8	**5.5**	2.9
		-----	-----	-----	-----	-----	-----	-----	-----
TOTAL NON-ROAD		**16.1**	15.7	15.3	14.8	14.2	13.7	**13.2**	11.0

Notes for Table E-10:

(1) 2014 Growth factors estimated from 2014 model run results: see Table E-29.
(2) 2008 Emissions from Tables 2.5.1
(3) 2014 totaled emissions = (2008 emissions) * (2014 growth factor)
(4) Emissions are a linear extrapolation of 2008 and 2014 model results.
(5) Type of growth is as follows:

Type	Klamath Falls NAA Growth Factors	%	Growth Parameter Data	Reference
1	Population	0.54%	Linear, Non-Compounding, 2008-2024	DEQ Ref. 799: OEA data
2	Industrial Employment (Railroads)	0.85%	Linear, Non-Compounding, 2008-2024	DEQ Ref. 799: OEA data

(6) Growth formula applied to years 2008 to 2024 = (2008 tons/yr) + ((type of growth) * (years of growth) * (2008 tons/yr))
(7) Rail growth estimated from 2008 fuel consumed (Table 2.5.25) multiplied by growth factor 2. Impact of fleet penetration by Tier 1-Tier 4 locomotives is shown below.

Growth	Category	**2008**	2009	2010	2011	2012	2013	**2014**	2015
	Years of Growth	**0**	1	2	3	4	5	**6**	7
	Locomotive Fuel Use	(gal)	(gal)	(gal)	(gal)	(gal)	(gal)	(gal)	(gal)
2	Line-Haul, Freight	1,148,293	1,158,075	1,167,857	1,177,638	1,187,420	1,197,202	1,206,983	1,216,765
2	Line-Haul, Passenger	53,573	54,030	54,486	54,942	55,399	55,855	56,312	56,768
2	Yard	100,000	100,852	101,704	102,556	103,407	104,259	105,111	105,963
	Locomotive PM10 Emission Factor (a)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)
	Line-Haul, Freight	5.1	4.9	4.7	4.4	4.1	3.8	3.6	3.4
	Line-Haul, Passenger	5.1	5.0	4.8	4.5	4.2	3.9	3.6	3.4
	Yard	5.5	5.5	5.4	5.3	5.1	5.0	4.8	4.8
	Locomotive PM2.5 Emission Factor (b)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)
	Line-Haul, Freight	4.9	4.8	4.6	4.3	4.0	3.7	3.5	3.3
	Line-Haul, Passenger	4.9	4.9	4.7	4.4	4.1	3.8	3.5	3.3
	Yard	5.3	5.3	5.2	5.1	4.9	4.9	4.7	4.7
	Emissions: Locomotives, grams per year (c)	(g/yr)	(g/yr)	(g/yr)	(g/yr)	(g/yr)	(g/yr)	(g/yr)	(g/yr)
	Line-Haul, Freight	5,680,608	5,504,331	5,324,259	5,026,161	4,722,370	4,412,886	4,214,786	4,012,891
	Line-Haul, Passenger	265,027	262,044	253,687	239,824	225,695	211,300	196,640	187,221
	Yard	533,500	538,045	532,724	527,238	511,556	505,657	489,397	493,363
	Emissions: Locomotives, tpy (d)	tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
	Line-Haul, Freight	6.3	6.1	5.9	5.5	5.2	4.9	4.6	4.4
	Line-Haul, Passenger	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2
	Yard	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5
		----------	----------	----------	----------	----------	----------	----------	----------
	Subtotal: Locomotives, tpy (e)	7.1	7.0	6.7	6.4	6.0	5.7	5.4	5.2
2	Railway Maintenance Equipment, tpy (f)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		----------	----------	----------	----------	----------	----------	----------	----------
	Rail Total, tpy (g)	7.2	7.0	6.8	6.5	6.1	5.8	**5.5**	5.3

(a) From EPA-420-F-09-025, Table 6. DEQ ref. 715, Table 6.
(b) PM25 = (PM10)*0.97 : From the EPA420-P-04-009,April 2009.(page.23):
(c) Emissions: Locomotives, g = (gal) * (PM2.5 EF, g/gal)
(d) Emissions: Locomotives, tpy = (Emissions: Locomotives, g) * (0.002205 lb/gram) / (2000 lb/ton)
(e) Locomotive emissions = Line haul, freight + line haul, passenger + yard
(f) Emissions grown as in note (6)
(g) Rail Total, tpy = Locomotive tpy + Railway maintenance tpy

Appendix E, Table E- 11. Nonroad Annual NOX, SO2, VOC, NH3 Growth

	(1) 2014 Growth Factor	(2)	(4)	(4)	(4)	(4)	(4)	(3)	(4)
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
		tpy	*tpy*	*tpy*	*tpy*	*tpy*	*tpy*	*tpy*	*tpy*
Nonroad2008a: MODELED EMISSIONS FROM NONROAD VEHICLES AND EQUIPMENT									
Gasoline: 2-Stroke									
NOX	1.3147	**0.18**	0.19	0.20	0.21	0.22	0.23	**0.24**	0.34
SO2	0.6717	**0.003**	0.003	0.003	0.003	0.003	0.002	**0.002**	0.0004
VOC	0.9379	**17.4**	17.2	17.0	16.8	16.6	16.5	**16.3**	14.5
Gasoline: 4-Stroke									
NOX	0.7486	**6.9**	6.6	6.3	6.0	5.7	5.4	**5.1**	2.3
SO2	0.6585	**0.04**	0.04	0.03	0.03	0.03	0.03	**0.03**	0.003
VOC	0.6766	**23.0**	21.8	20.5	19.3	18.1	16.8	**15.6**	3.2
CNG/LPG									
NOX	0.4416	**11.9**	10.8	9.7	8.5	7.4	6.3	**5.2**	<0.1
SO2	0.9098	**0.09**	0.09	0.08	0.08	0.08	0.08	**0.08**	0.1
VOC	0.4599	**3.0**	2.8	2.5	2.2	2.0	1.7	**1.4**	<0.1
Diesel									
NOX	0.7870	**31.3**	30.2	29.1	28.0	26.9	25.8	**24.7**	13.5
SO2	0.0325	**0.8**	0.6	0.5	0.4	0.3	0.1	**0.02**	<0.1
VOC	0.7110	**3.4**	3.2	3.0	2.9	2.7	2.6	**2.4**	0.8
Recreational Marine Vessels									
NOX	1.1774	**24.0**	24.7	25.4	26.1	26.8	27.5	**28.2**	35.3
SO2	0.2549	**0.2**	0.2	0.2	0.1	0.1	0.1	**0.1**	<0.1
VOC	0.7818	**170.7**	164.5	158.2	152.0	145.8	139.6	**133.4**	71.4
	(5) Type of Growth								
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
AIRPORT: Aircraft + GSE + APU (6)									
NOX		**32.5**	32.7	32.9	33.0	33.2	33.4	**33.6**	35.3
SO2	1	**2.3**	2.3	2.3	2.3	2.3	2.3	**2.4**	2.5
VOC		**14.3**	14.3	14.4	14.5	14.6	14.7	**14.7**	15.5
RAILROADS (7)									
NOX		**254.2**	250.1	240.3	230.9	224.7	219.1	**214.0**	139.3
SO2	2	**3.2**	3.2	0.3	0.1	0.1	0.1	**0.1**	0.1
VOC		**14.3**	14.0	13.5	12.8	11.9	11.1	**10.6**	5.6

Notes for Table E-11:

(1) 2014 Growth factors estimated from 2014 model run results: see Tables E-30 through E-32
(2) 2008 Emissions from Tables 2.5.2-2.5.4
(3) 2014 totaled emissions = (2008 emissions) * (2014 growth factor)
(4) Emissions are a linear extrapolation of 2008 and 2014 model results.
(5) Type of growth is as follows:

Type	Klamath Falls NAA Growth Factors	%	Growth Parameter Data	Reference
1	Population	0.54%	Linear, Non-Compounding, 2008-2024	DEQ Ref. 799: OEA data
2	Industrial	0.85%	Linear, Non-Compounding, 2008-2024	DEQ Ref. 799: OEA data

(6) Growth formula applied to years 2008 to 2024 = (2008 tons/yr) + ((type of growth) * (years of growth) * (2008 tons/yr))
(7) Rail growth estimated from 2008 fuel consumed (Table 2.5.25) multiplied by growth factor 2 (see end note 5).
Impact of fleet penetration by Tier 1-Tier 4 locomotives is shown below.

Fuel Use Type of Growth = 2	Category	**2008**	2009	2010	2011	2012	2013	**2014**	2024
See Note (5) above	Years of Gr	**0**	1	2	3	4	5	**6**	16
Locomotive Fuel Use		(gal)	(gal)	(gal)	(gal)	(gal)	(gal)	(gal)	(gal)
Line-Haul, Freight		1,148,293	1,158,075	1,167,857	1,177,638	1,187,420	1,197,202	1,206,983	1,304,800
Line-Haul, Passenger		53,573	54,030	54,486	54,942	55,399	55,855	56,312	60,875
Yard		100,000	100,852	101,704	102,556	103,407	104,259	105,111	113,630
Land Diesel Sulfur Content: ppm (a)		355	355	31	11	11	11	11	11
Locomotive NOX Emission Factor (b)		(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)
Line-Haul, Freight		169	165	157	149	144	139	135	79
Line-Haul, Passenger		214	200.0	183	167	157	147	138	73
Yard		243	241	236	235	227	225	217	162
Rail NOX Emissions		tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
Line-Haul, Freight (c)		214.0	210.7	202.1	193.5	188.5	183.5	179.6	113.6
Line-Haul, Passenger (c)		12.6	11.9	11.0	10.1	9.6	9.1	8.6	4.9
Yard (c)		26.8	26.8	26.5	26.6	25.9	25.9	25.1	20.3
Maintenance Equipment (d)		0.78	0.76	0.74	0.72	0.70	0.68	0.66	0.47
Rail: Total NOX Emissions (e)		**254.2**	250.1	240.3	230.9	224.7	219.1	**214.0**	139.3
Locomotive SO2 EF, lb/gal (f)		4.90E-03	4.90E-03	4.28E-04	1.52E-04	1.52E-04	1.52E-04	1.52E-04	1.52E-04
Locomotive SO2 Emissions, tpy (g)		3.2	3.2	0.3	0.1	0.1	0.1	0.1	0.1
Maintenance Equipment SO2, tpy (h)		1.5E-02	1.2E-02	1.0E-02	7.6E-03	5.3E-03	2.9E-03	6.E-04	5.7E-04
Rail: Total SO2 Emissions (i)		**3.2**	3.2	0.3	0.1	0.1	0.1	**0.1**	0.1
Locomotive HC Emission Factor (j)		(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)	(g/gal)
Line-Haul, Freight		9.0	8.7	8.3	7.7	7.1	6.5	6.1	2.8
Line-Haul, Passenger		9.3	9.1	8.6	8.1	7.5	6.9	6.3	2.2
Yard		14.5	14.5	14.1	14.0	13.3	13.3	12.7	8.9
Rail VOC Emissions		tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
Line-Haul, Freight (k)		12.0	11.7	11.3	10.5	9.8	9.0	8.5	4.2
Line-Haul, Passenger (k)		0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.2
Yard (k)		1.7	1.7	1.7	1.7	1.6	1.6	1.5	1.2
Maintenance Equipment (l)		0.07	0.07	0.06	0.06	0.06	0.06	0.05	0.02
Rail: Total VOC Emissions (m)		**14.3**	14.0	13.5	12.8	11.9	11.1	**10.6**	5.6

(a) Land diesel sulfer ppm obtained from the EPA 2008 National County Database (DEQ Ref. 791)
(b) From EPA-420-F-09-025, Table 6. DEQ ref. 715, Table 5.
(c) NOX Emissions: Locomotives, tpy = (gal) * (NOX EF, g/gal) * (0.002205 lb/gram) / (2000 lb/ton). Railway maintenance equipment =
(d) Railway Maintenance Equipment 2008-2014 growth factor = 0.853 See Table E-30. All other railway maintenance growth
emissions are linear extrapolation from 2008 & 2014 data.
(e) Rail total NOX emissions = total locomotive emissions + railway maintenance
(b) From EPA-420-F-09-025, Equations on page 5. DEQ ref. 715:
SO_2 (g/gal) = (diesel fuel density, g/gal) * (Fractionof Fuel Sulfur Converted to SO2) * (64 g SO2/32 g S)) *
(Fuel Sulfur Content, ppm* (10^-6)) * (0.002205 lb/gram)
where fraction of fuel sulfur converted to SO2 = 0.978
and diesel fuel density = 3200 g/gal
(g) SO2 emissions, tpy = (? Locomotive Fuel Consumption, gal) * (Locomotive SO2 EF, lb/gal) / (2000 lb/gal)
(h) Railway Maintenance Equipment 2008-2014 growth factor = 0.039 See Table E-32. All other railway maintenance growth
emissions are linear extrapolation from 2008 & 2014 data.
(i) Rail total SO2 emissions = total locomotive emissions + railway maintenance
(j) From EPA-420-F-09-025, Table 6. DEQ ref. 715, Table 7.
(k) VOC Emissions = (fuel consumption, gal) * (HC EF, g/gal) * (0.002205 lb/gram) / (2000 lb/ton) * (HC to VOC conversion factor)
where the HC/VOC conversion factor = 1.053 from EPA-420-F-09-025, p. 4. DEQ ref. 715
(l) Railway Maintenance Equipment 2008-2014 growth factor = 0.748 See Table E-31. All other railway maintenance growth
emissions are linear extrapolation from 2008 & 2014 data.
(m) Rail total VOC emissions = total locomotive emissions + railway maintenance

Appendix E, Table E- 12. NonRoad PM2.5 Worst-Case Day Emission Growth

	(1) 2014 Growth Factor	(2)	(4)	(4)	(4)	(4)	(4)	(3)	(4)
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
		lbs/day	*lbs/day*	*lbs/day*	*lbs/day*	*lbs/day*	*lbs/day*	*lbs/day*	*lbs/day*
Nonroad2008a: MODELED EMISSIONS FROM NONROAD VEHICLES AND EQUIPMENT (3)									
Gasoline: 2-Stroke	0.9987	**4**	4	4	4	4	4	**4**	4
Gasoline: 4-Stroke	1.0130	**1**	1	1	1	1	1	**1**	1
CNG/LPG	0.9659	**1**	1	1	1	1	1	**1**	1
Diesel	0.7078	**14**	14	13	12	12	11	**10**	11
Recreational Marine Vessels	0.8619	**1**	1	1	1	1	1	**1**	1
		-----	-----	-----	-----	-----	-----	**-----**	-----
Nonroad2008a Output: Subtotal		**21**	20	19	18	18	17	**16**	17
	(5) Type of Growth								
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
AIRPORT: Aircraft + GSE + APU (6)	1	**74**	75	75	76	76	76	**77**	81
RAILROADS (7)	--	**40**	39	37	36	34	32	**30**	16
		-----	-----	-----	-----	-----	-----	-----	-----
TOTAL NON-ROAD		**135**	133	132	130	127	125	**123**	114

Notes:

(1) 2014 Growth factors estimated from 2014 model run results: see Table E-29.

(2) 2008 Emissions from Tables 2.5.1

(3) 2014 totaled emissions = (2008 emissions) * (2014 growth factor)

(4) Emissions are a linear extrapolation of 2008 and 2014 model results.

(5) Type of growth is as follows:

Type	Klamath Falls NAA Growth Factors	%	Growth Parameter Data	Reference
1	Population	0.54%	Linear, Non-Compounding, 2008-2024	DEQ Ref. 799: OEA data

(6) Growth formula applied to years 2008 to 2024 = (2008 tons/yr) + ((type of growth) * (years of growth) * (2008 tons/yr))

(7) Rail activity is considered uniform through the year: Rail growth = (Annual emissions, tpy, from Appendix E, Table E-10) * (2000 lb/ton) / (365 days/yr).

Appendix E, Table E- 13. Nonroad NOX, SO2, VOC, NH3 Worst-Case Day Emission Growth

	(1) 2014 Growth Factor	(2)	(4)	(4)	(4)	(4)	(4)	(3)	(4)
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
		lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Nonroad2008a: MODELED EMISSIONS FROM NONROAD VEHICLES AND EQUIPMENT									
Gasoline: 2-Stroke									
NOX	1.1625	**1**	1	2	2	2	2	**2**	2.0
SO2	0.6872	**0.03**	0.03	0.03	0.02	0.02	0.02	**0.02**	0.005
VOC	0.9548	**95**	94	94	93	92	91	**91**	84
Gasoline: 4-Stroke									
NOX	0.6816	**35**	33	31	29	27	26	**24**	5
SO2	0.6830	**0.14**	0.14	0.13	0.12	0.11	0.11	**0.10**	0.02
VOC	0.6930	**77**	73	69	65	61	57	**53**	14
CNG/LPG									
NOX	0.4416	**63**	57	51	45	40	34	**28**	<0.1
SO2	0.9098	**0.5**	0.5	0.4	0.4	0.4	0.4	**0.4**	0.4
VOC	0.4599	**16**	15	13	12	10	9	**7**	<0.1
Diesel									
NOX	0.7845	**168**	162	156	150	144	138	**132**	72
SO2	0.0325	**4**	3	3	2	1	1	**0.1**	<0.1
VOC	0.7121	**18**	17	17	16	15	14	**13**	4
Recreational Marine Vessels									
NOX	1.0672	**13**	13	13	13	13	13	**14**	15
SOX	0.2629	**0.1**	0.1	0.1	0.1	0.1	0.0	**0.0**	<0.1
VOC	0.7879	**97**	94	90	87	83	80	**76**	42
	(5) Type of Growth								
Year		**2008**	2009	2010	2011	2012	2013	**2014**	2024
Years of Growth			1	2	3	4	5	**6**	16
AIRPORT: Aircraft + GSE + APU (6)									
NOX		**1,177**	1,183	1,190	1,196	1,202	1,209	**1,215**	1,278
SO2	1	**85**	86	86	87	87	88	**88**	93
VOC		**479**	481	484	486	489	491	**494**	520
RAILROADS (7)									
NOX		**1,398**	1,371	1,317	1,265	1,231	1,200	**1,173**	763
SO2	--	**18**	18	2	1	1	1	**1**	1
VOC		**95**	77	74	70	65	61	**58**	31

Notes:
(1) 2014 Growth factors estimated from 2014 model run results: see Tables E-30 through E-32
(2) 2008 Emissions from Tables 2.5.2-2.5.4
(3) 2014 totaled emissions = (2008 emissions) * (2014 growth factor)
(4) Emissions are a linear extrapolation of 2008 and 2014 model results.
(5) Type of growth is as follows:

Type	**Klamath Falls NAA Growth Factors**	**%**	**Growth Parameter Data**	**Reference**
1	Population	0.54%	Linear, Non-Compounding, 2008-2024	DEQ Ref. 799: OEA data

(6) Growth formula applied to years 2008 to 2024 = (2008 tons/yr) + ((type of growth) * (years of growth) * (2008 tons/yr))
(7) Rail activity is considered uniform through the year: Rail growth = (Annual emissions, tpy, from Appendix E, Table E-11) * (2000 lb/ton) / (365 days/yr).

Appendix E, Table E- 14. 2014 NAA On-Road Mobile PM2.5 Emissions by Roadway Type

	Urban Unrestricted Access	Rural Unrestricted Access	Urban Restricted Access	Rural Restricted Access	**Total**	Units
Annual	50.2	9.0	1.1	0.4	60.7	tpy
Typical Season Day	293	53	7	2	354	lbs/day
Worst Case Season Day	576	107	13	4	699	lbs/day

Appendix E, Table E- 15. 2014 NAA On-Road Mobile PM2.5 Emissions by Process

	Exhaust	Re-Entrained Road Dust	Brake	Tire	**Total**	Units
Annual	33.6	24.4	2.2	0.5	60.7	tpy
Typical Season Day	184	156	12	3	354	lbs/day
Worst Case Season Day	293	392	12	3	699	lbs/day

Appendix E, Table E- 16. 2014 NAA On-Road PM2.5 Emissions and Emission Factors by Source Type

On-Road Vehicles	(1a) VMT Annual	(1) VMT TSD	(1) VMT WCD	(2a) PM2.5 Emissions Annual (tpy)	(2) PM2.5 Emissions TSD (lb/day)	(2) PM2.5 Emissions WCD (lb/day)	(3a) PM2.5 Emission Factor Annual (lb/VMT)	(3) PM2.5 Emission Factor TSD (lb/VMT)	(3) PM2.5 Emission Factor WCD (lb/VMT)
Passenger Vehicles									
Passenger Car	67,419,704	184,712	184,712	4.2	23	50	0.00013	0.00013	0.00027
Passenger Truck	110,001,254	301,373	301,373	11.4	62	137	0.00021	0.00021	0.00046
Total: Passenger Vehicles	177,420,958	486,085	486,085	15.6	86	188	--	--	--
Trucking									
Single Unit Long-Haul Truck	16,570,313	45,398	45,398	2.1	12	12	0.0003	0.0003	0.0003
Single Unit Short-haul Truck	16,570,313	45,398	45,398	2.7	15	16	0.0003	0.0003	0.0003
Combination Long-Haul Truck	16,578,971	45,422	45,422	7.1	39	39	0.0009	0.0009	0.0009
Combination Short-Haul Truck	16,570,313	45,398	45,398	6.9	38	38	0.0008	0.0008	0.0008
Light Commercial Truck	10,380,254	28,439	28,439	0.4	2	4	0.0001	0.0001	0.0001
Total: Trucking	76,670,164	210,055	210,055	19.3	106	108	--	--	--
Other Vehicles									
Intercity Bus	0	0	0	0	0	0	--	--	--
Motor Home	4,179,556	11,451	11,451	0.6	3	4	0.0003	0.0003	0.0003
Motorcycle	6,964,899	19,082	19,082	0.6	3	6	0.0002	0.0002	0.0003
Refuse Truck	73,588	202	202	0.0	0.2	0.2	0.0008	0.0008	0.0008
School Bus	441,529	1,210	1,210	0.2	1	1	0.0007	0.0007	0.0007
Transit Bus	181,806	498	498	0.1	1	1	0.0010	0.0010	0.0010
Total: Other Vehicles	11,841,378	32,442	32,442	1.4	8	11	--	--	--
	-------	-------	-------	-------	-------	-------			
Total: All Vehicles	**265,932,500**	**728,582**	**728,582**	**36.3**	**199**	**307**	--	--	--

Re-Entrained Road Dust	(4) VMT Annual	(4) VMT TSD	(4) VMT WCD	(4) PM2.5 Emissions Annual (tpy)	(4) PM2.5 Emissions TSD (lb/day)	(4) PM2.5 Emissions WCD (lb/day)	(3a) PM2.5 Emission Factor Annual (lb/VMT)	(3) PM2.5 Emission Factor TSD (lb/VMT)	(3) PM2.5 Emission Factor WCD (lb/VMT)
Paved Roads	276,637,348	757,911	757,911	6.3	39.9	276.1	0.00005	0.00005	0.00036
Unpaved Roads	10,475,667	28,700	28,700	18.1	115.6	115.6	0.00346	0.00403	0.00403
	------	------	------	------	------	------			
Total: Re-Entrained Road Dust	**287,113,015**	**786,611**	**786,611**	**24.4**	**156**	**392**	--	--	--
				-----	-----	-----			
Total: On-Road				**60.7**	**354**	**699**			

Notes for Table E-16:

TSD = Typical Season Day

WCD = Worst-Case Season Day

(1) Daily VMT provided by ODOT.

(a) Annual VMT = (Daily VMT) * (365 days/yr)

(2) PM2.5 Emissions = (VMT) * (MOVES output, emissions rate mode).

(a) Annual emissions = (TSD) * (365 days/ry)

(3) Emission Factor, lbs/VMT = (emissions, lbs) / (VMT)

(a) Annual Emission Factor, lbs/VMT = (emissions, tpy) * (2000 lbs/ton) / VMT

(4) Re-Entrained Road Dust emissions estimates and calculations are from Tables E-33 and E-34.

Appendix E, Table E- 17. 2014 NAA On-Road Mobile Emissions by Roadway Type

PollutantName	*Rural Restricted Access*	*Rural Unrestricted Access*	*Urban Restricted Access*	*Urban Unrestricted Access*	*NAA Total*
Annual (1)					
NAA % Total VMT(2)	0.4%	15.1%	1.7%	82.8%	100.0%
Annual VMT (3)	1,253,058	43,376,625	4,850,184	237,633,149	287,113,015
	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
PM25-PRI Exhaust	0.2	5.1	0.7	27.6	33.6
PM25-PRI-Brakewear	6.E-03	0.2	4.E-02	2.0	2.2
PM25-PRI-Tirewear	4.E-03	0.1	1.E-02	0.4	0.5
PM25-PRI Re-Entrained Road Dust (4)	0.1	3.7	0.4	20.2	24.4
	--------	--------	--------	--------	--------
Total PM2.5	0.4	9.0	1.1	50.2	60.7
NH3	0.1	1.8	0.2	8.2	10.3
Oxides of Nitrogen	6.1	140.7	15.6	698.2	860.6
SO2	0.0	0.5	0.1	2.4	2.9
VOC	3.2	76.8	8.5	386.7	475.3
Typical Season Day (lbs/day)					
Daily VMT (3)	3,433	118,840	13,288	651,050	786,611
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	1.3	27.7	3.6	151.5	184
PM25-PRI-Brakewear	0.0	1.0	0.2	10.7	12
PM25-PRI-Tirewear	0.0	0.5	0.1	2.2	3
PM25-PRI Re-Entrained Road Dust (4)	7.E-01	23	3	129	156
	--------	--------	--------	--------	--------
Total PM2.5	2	53	7	293	354
NH3	0.4	10.0	1.0	44.8	56
Oxides of Nitrogen	33.3	771.2	85.5	3,825.7	4716
SO2	0.1	2.6	0.3	13.1	16
VOC	17.8	421.0	46.6	2,119.0	2604
Worst-Case Day (lbs/day)					
Daily VMT (3)	3,433	118,840	13,288	651,050	786,611
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	2.3	46.0	5.8	238.5	293
PM25-PRI-Brakewear	0.0	1.0	0.2	10.7	12
PM25-PRI-Tirewear	0.0	0.5	0.1	2.2	3
PM25-PRI Re-Entrained Road Dust (4)	2	59	7	324	392
	--------	--------	--------	--------	--------
Total PM2.5	4	107	13	576	699
NH3	0.4	10.0	1.0	44.8	56
Oxides of Nitrogen	34.1	791.1	87.6	3,921.1	4834
SO2	0.1	2.7	0.3	13.6	17
VOC	23.0	544.3	59.4	2,710.4	3337

Notes for Table E-17:

Notes for Table E-17

(1) Annual emissions, tpy = (typical season day emissions, lbs/day) * (365 days/yr) / (2000 lbs/ton)

(2) % VMT by Roadway Type = default roadway type distribution for Klamath County, from
MOVES supporting documentation and files: Ref. 807.

(3) VMT by Roadway Type = (Total VMT) * (% VMT by Roadway Type), where

Total Daily VMT =	786,611	(Provided by ODOT)
Total Annual VMT =	287,113,015	= Daily VMT * 365

(4) PM2.5 from Re-Entrained Road Dust = (NAA 2014 Road Dust PM2.5 Emissions) * (% Total NAA VMT)
NAA 2014 Road Dust PM2.5 Emissions, from Tables E-33 and E-34.

	Paved	Unpaved	Total
Annual (tpy)	6.3	18.1	24.4
Typical Season Day (lbs/day)	40	116	156
Worst-Case Day (lbs/day)	276	116	392

Appendix E, Table E- 18. 2014 NAA On-Road Mobile Emissions by Vehicle Type

PollutantName	*Combination Long-Haul Truck*	*Combination Short-Haul Truck*	*Intercity Bus*	*Light Commercial Truck*	*Motor Home*	*Motorcycle*	*Passenger Car*	*Passenger Truck*	*Refuse Truck*	*School Bus*	*Single Unit Long-Haul Truck*	*Single Unit Short-haul Truck*
Annual (1)												
NAA % Total VMT(2)	6.2%	6.2%	0%	3.9%	1.6%	2.6%	25.4%	41.4%	0.03%	0.2%	6.2%	6.2%
Annual VMT (3)	16,578,971	16,570,313	0	10,380,254	4,179,556	6,964,899	67,419,704	110,001,254	73,588	441,529	16,570,313	16,570,313
	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
PM25-PRI Exhaust	6.6	6.5	0	0.4	0.5	0.5	3.9	10.6	0.0	0.1	1.8	2.4
PM25-PRI-Brakewear	0.4	0.3	0	0.1	0.1	2.E-03	0.2	0.6	2.E-03	9.E-03	0.3	0.3
PM25-PRI-Tirewear	0.1	0.1	0	1.E-02	9.E-03	4.E-03	0.1	0.1	3.E-04	2.E-03	5.E-02	5.E-02
PM25-PRI Re-Entrained Road Dust (4)	1.5	1.5	0	1.0	0.4	0.6	6.2	10.1	7.E-03	4.E-02	1.5	1.5
	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total PM2.5	8.6	8.5	0	1.4	1.0	1.2	10.4	21.5	0.0	0.2	3.7	4.2
NH3	0.5	0.5	0	0.3	0.2	0.4	2.7	4.6	0.0	0.0	0.5	0.5
Oxides of Nitrogen	142.0	140.4	0	12.3	23.0	5.9	88.0	312.8	0.6	2.9	59.1	71.9
SO2	0.3	0.3	0	0.1	0.1	0.1	0.5	1.2	0.0	0.0	0.2	0.2
VOC	7.6	6.7	0	3.4	4.2	9.9	98.6	324.6	0.0	0.3	8.5	11.3
Typical Season Day (lbs/day)												
Daily VMT (3)	45,422	45,398	0	28,439	11,451	19,082	184,712	301,373	202	1,210	45,398	45,398
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	36	36	0	2	3	3	22	58	0.1	1	10	13
PM25-PRI-Brakewear	2	2	0	0.3	0.3	1.E-02	1	3	9.E-03	5.E-02	1	1
PM25-PRI-Tirewear	0.4	0.4	0	0.1	5.E-02	2.E-02	0.5	1	2.E-03	9.E-03	0.3	0.2
PM25-PRI Re-Entrained Road Dust (4)	10	10	0	6	2	4	39	64	4.E-02	3.E-01	10	10
	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total PM2.5	48	48	0	9	6	7	63	127	0.2	1	21	24
NH3	3	3	0	2	1	2	15	25	1.E-02	5.E-02	3	3
Oxides of Nitrogen	778	770	0	68	126	32	482	1,714	3	16	324	394
SO2	2	2	0	1	0	0.3	3	7	6.E-03	2.E-02	1	1
VOC	42	37	0	19	23	54	540	1,778	0.2	1	47	62
Worst-Case Day (lbs/day)												
Daily VMT (3)	45,422	45,398	0	28,439	11,451	19,082	184,712	301,373	202	1,210	45,398	45,398
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
PM25-PRI Exhaust	36	36	0	3	3	6	49	133	0.1	1	10	14
PM25-PRI-Brakewear	2	2	0	0.3	0.3	1.E-02	1	3	9.E-03	5.E-02	1	1
PM25-PRI-Tirewear	0.4	0.4	0	0.1	5.E-02	2.E-02	0.5	1	2.E-03	9.E-03	0.3	0.2
PM25-PRI Re-Entrained Road Dust (4)	24	24	0	15	6	10	99	162	1.E-01	7.E-01	24	24
	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total PM2.5	63	62	0	19	10	16	150	299	0	2	37	40
NH3	3	3	0	2	1	2	15	25	1.E-02	5.E-02	3	3
Oxides of Nitrogen	790	783	0	69	127	33	501	1,770	3	16	330	403
SO2	2	2	0	1	0	0	3	7	6.E-03	2.E-02	1	1
VOC	43	39	0	23	23	53	754	2,286	0	1	49	65

Notes for Table E-18:

(1) Annual emissions, tpy = (typical season day emissions, lbs/day) * (365 days/yr) / (2000 lbs/ton)

(2) % VMT by Vehicle Type = default roadway type distribution for Klamath County, from MOVES supporting documentation and files: Ref. 807.

(3) VMT by Vehicle Type = (Total VMT) * (% VMT by Vehicle Type), where

Total Daily VMT =	786,611	(Provided by ODOT)
Total Annual VMT =	287,113,015	= Daily VMT * 365

(4) PM2.5 from Re-Entrained Road Dust = (NAA 2014 Road Dust PM2.5 Emissions) * (% Total NAA VMT)

NAA 2014 Road Dust PM2.5 Emissions, from Tables E-32 and E-33.

	Paved	Unpaved	Total
Annual (tpy)	6.3	18.1	24.4
Typical Season Day (lbs/day)	40	116	156
Worst-Case Day (lbs/day)	276	116	392

Appendix E, Table E- 19. Residential Wood Burning HU Population and PM2.5 Emissions Forecast

Forecasted HU Population (1)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	2,967	2,997	3,027	3,057	3,087	3,117	3,147	3,447
Woodstove: Certified Non-Catalytic	287	294	296	296	297	298	298	282
Woodstove: Certified Catalytic	791	810	814	816	817	821	820	778
Woodstove: Non-Certified	1,388	1,273	1,177	1,072	969	919	875	545
Insert: Certified Non-Catalytic	557	583	593	598	603	612	615	603
Insert: Certified Catalytic	205	214	218	220	221	225	226	221
Insert: Non-Certified	1,395	1,326	1,280	1,189	1,098	1,076	1,060	974
Pellet Stove (certified)	529	530	531	532	533	534	535	545
Central Furnace	607	602	598	576	554	559	560	570
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*8,726*	*8,629*	*8,532*	*8,356*	*8,179*	*8,160*	*8,137*	*7,964*
Appendix B, Table B-4 QC Check:	8,726							

Annual Emissions: tpy (2)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	63.7	64.3	65.0	65.6	66.2	66.9	67.5	74.0
Woodstove: Certified Non-Catalytic	8.9	9.1	9.1	9.2	9.2	9.2	9.2	8.7
Woodstove: Certified Catalytic	4.3	4.4	4.4	4.4	4.4	4.4	4.4	4.2
Woodstove: Non-Certified	39.8	36.5	33.8	30.8	27.8	26.4	25.1	15.6
Insert: Certified Non-Catalytic	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.6
Insert: Certified Catalytic	8.3	8.7	8.8	8.9	9.0	9.1	9.2	9.0
Insert: Non-Certified	34.5	32.8	31.7	29.4	27.2	26.6	26.3	24.1
Pellet Stove (certified)	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5
Central Furnace	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*165.0*	*161.4*	*158.4*	*153.8*	*149.3*	*148.2*	*147.3*	*141.2*
Table 2.4.30 QC Check:	165.0							

Typical Season Day Emissions: lbs/day (3)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	787	795	803	811	819	827	835	914
Woodstove: Certified Non-Catalytic	84	86	86	87	87	87	87	83
Woodstove: Certified Catalytic	40	41	41	42	42	42	42	40
Woodstove: Non-Certified	378	347	321	292	264	251	239	149
Insert: Certified Non-Catalytic	14	14	14	15	15	15	15	15
Insert: Certified Catalytic	75	79	80	81	81	82	83	81
Insert: Non-Certified	314	298	288	268	247	242	239	219
Pellet Stove (certified)	24	24	24	24	24	24	24	25
Central Furnace	13	13	13	12	12	12	12	12
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*1,730*	*1,698*	*1,671*	*1,631*	*1,591*	*1,582*	*1,575*	*1,537*
Table 2.4.30 QC Check:	1,730							

Worst-Case Day Emissions: lbs/day (4)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	1,889	1,908	1,927	1,946	1,965	1,985	2,004	2,195
Woodstove: Certified Non-Catalytic	202	207	208	208	208	209	209	198
Woodstove: Certified Catalytic	97	99	100	100	100	100	100	95
Woodstove: Non-Certified	908	833	770	701	634	601	573	356
Insert: Certified Non-Catalytic	33	34	35	35	35	36	36	35
Insert: Certified Catalytic	180	189	192	193	195	198	199	195
Insert: Non-Certified	754	716	691	642	593	581	573	526
Pellet Stove (certified)	58	58	58	58	58	58	58	59
Central Furnace	32	31	31	30	29	29	29	30
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*4,152*	*4,075*	*4,011*	*3,914*	*3,818*	*3,798*	*3,781*	*3,690*
Table 2.4.30 QC Check:	4,152							

Notes for Table E-19:

(1) From Table E-24

(2) Annual Emissions = (Forecasted Woodburning HU population) * (Annual Wood Burned, ton/HU) * (PM2.5 EF, lb/ton) / (2000 lb/ton)

PM2.5 EF data and Wood Burned per HU calculations:

	(i) PM2.5 EF (lb/ton)	(ii) 2008 Woodburning HU	(i) 2008 Wood Burned (ton)	(iii) Annual Wood Burned (ton/HU)	(iv) Seasonal Adj. Factor (SAF)	(v) TSD Wood Burned (ton/HU)	(vi) TSD Wood Burned (lbs/HU)
Fireplace	23.6	2,967	5,395.2	1.82	2.25	0.0112	22
Woodstove: Certified Non-Catalytic	19.6	287	906.1	3.15	1.73	0.0149	30
Woodstove: Certified Catalytic	20.4	791	417.6	0.53	1.73	0.0025	5
Woodstove: Non-Certified	30.6	1,388	2,602.9	1.87	1.73	0.0089	18
Insert: Certified Non-Catalytic	19.6	557	153.1	0.27	1.65	0.0012	2
Insert: Certified Catalytic	20.4	205	812.4	3.97	1.65	0.0180	36
Insert: Non-Certified	30.6	1,395	2,257.4	1.62	1.65	0.0074	15
Pellet Stove (certified)	3.06	529	1,555.5	2.94	1.84	0.0149	30
Central Furnace	27.6	607	123.1	0.20	1.41	0.0008	2
		-------	-------				
Total		*8,726*	*14,223.2*				

(i) From Table 2.4.30.

(ii) From Appendix B, Table B-4. Number of woodburning devices: Distribution to all NAA housing

(iii) Annual Wood Burned, ton/HU = (2008 Wood Burned, ton) / (2008 Woodburning HU)

(iv) From Appendix B, Table B-8

(v) TSD = Typical Season Day: Wood burned, ton/HU = (Annual Wood Burned, tons) * (SAF) / 365 day/yr

(vi) TSD, lbs/HU = (TSD, ton/hu) * (2000 lb/ton). Data shown here is for comparison and QC purposes only.

(3) Typical Season Day Emissions = (Forecasted Woodburning HU population) * (TSD Wood Burned, ton/HU) * (PM2.5 EF, lb/ton)

See Note (2) for wood burned per HU calculations and PM2.5 EF data.

(4) WCD = Worst Case Day: Wood Burned, ton/HU = (TSD Wood Burned, ton/HU) * (WCD Multiplier).

WCD Multiplier = 2.40 = from Appendix B, Table B-9

Appendix E, Table E- 20. Residential Wood Burning HU Population and NOX Emissions Forecast

Forecasted HU Population (1)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	2,967	2,997	3,027	3,057	3,087	3,117	3,147	3,447
Woodstove: Certified Non-Catalytic	287	294	296	296	297	298	298	282
Woodstove: Certified Catalytic	791	810	814	816	817	821	820	778
Woodstove: Non-Certified	1,388	1,273	1,177	1,072	969	919	875	545
Insert: Certified Non-Catalytic	557	583	593	598	603	612	615	603
Insert: Certified Catalytic	205	214	218	220	221	225	226	221
Insert: Non-Certified	1,395	1,326	1,280	1,189	1,098	1,076	1,060	974
Pellet Stove (certified)	529	530	531	532	533	534	535	545
Central Furnace	607	602	598	576	554	559	560	570
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*8,726*	*8,629*	*8,532*	*8,356*	*8,179*	*8,160*	*8,137*	*7,964*
Appendix B, Table B-4 QC Check:	8,726							

Annual Emissions: tpy (2)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	7.0	7.1	7.2	7.2	7.3	7.4	7.4	8.1
Woodstove: Certified Non-Catalytic	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.0
Woodstove: Certified Catalytic	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Woodstove: Non-Certified	3.6	3.3	3.1	2.8	2.5	2.4	2.3	1.4
Insert: Certified Non-Catalytic	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Insert: Certified Catalytic	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Insert: Non-Certified	3.2	3.0	2.9	2.7	2.5	2.4	2.4	2.2
Pellet Stove (certified)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Central Furnace	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*19.3*	*19.0*	*18.8*	*18.4*	*18.0*	*17.9*	*17.8*	*17.4*
Table 2.4.31 QC Check:	19.3							

Typical Season Day Emissions: lbs/day (3)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	87	88	88	89	90	91	92	101
Woodstove: Certified Non-Catalytic	10	10	10	10	10	10	10	10
Woodstove: Certified Catalytic	4	4	4	4	4	4	4	4
Woodstove: Non-Certified	35	32	29	27	24	23	22	14
Insert: Certified Non-Catalytic	2	2	2	2	2	2	2	2
Insert: Certified Catalytic	7	8	8	8	8	8	8	8
Insert: Non-Certified	29	27	26	25	23	22	22	20
Pellet Stove (certified)	30	30	30	30	30	30	30	31
Central Furnace	1	1	1	1	1	1	1	1
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*204*	*201*	*199*	*195*	*192*	*191*	*191*	*189*
Table 2.4.31 QC Check:	204							

Worst-Case Day Emissions: lbs/day (4)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	208	210	212	214	217	219	221	242
Woodstove: Certified Non-Catalytic	23	24	24	24	24	24	24	23
Woodstove: Certified Catalytic	9	10	10	10	10	10	10	9
Woodstove: Non-Certified	83	76	71	64	58	55	53	33
Insert: Certified Non-Catalytic	4	4	4	4	4	4	4	4
Insert: Certified Catalytic	18	18	19	19	19	19	20	19
Insert: Non-Certified	69	66	63	59	54	53	52	48
Pellet Stove (certified)	72	72	72	72	72	72	73	74
Central Furnace	2	2	2	2	2	2	2	2
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*489*	*482*	*477*	*469*	*460*	*459*	*458*	*454*
Table 2.4.31 QC Check:	489							

Notes for Table E-20:

(1) From Table E-24

(2) Annual Emissions = (Forecasted Woodburning HU population) * (Annual Wood Burned, ton/HU) * (PM2.5 EF, lb/ton) / (2000 lb/ton)

PM2.5 EF data and Wood Burned per HU calculations:

	(i) NOX EF (lb/ton)	(ii) 2008 Woodburning HU	(i) 2008 Wood Burned (ton)	(iii) Annual Wood Burned (ton/HU)	(iv) Seasonal Adj. Factor (SAF)	(v) TSD Wood Burned (ton/HU)	(vi) TSD Wood Burned (lbs/HU)
Fireplace	2.6	2,967	5,395.2	1.82	2.25	0.0112	22
Woodstove: Certified Non-Catalytic	2.28	287	906.1	3.15	1.73	0.0149	30
Woodstove: Certified Catalytic	2	791	417.6	0.53	1.73	0.0025	5
Woodstove: Non-Certified	2.8	1,388	2,602.9	1.87	1.73	0.0089	18
Insert: Certified Non-Catalytic	2.28	557	153.1	0.27	1.65	0.0012	2
Insert: Certified Catalytic	2	205	812.4	3.97	1.65	0.0180	36
Insert: Non-Certified	2.8	1,395	2,257.4	1.62	1.65	0.0074	15
Pellet Stove (certified)	3.8	529	1,555.5	2.94	1.84	0.0149	30
Central Furnace	1.8	607	123.1	0.20	1.41	0.0008	2
		-------	-------				
Total		*8,726*	*14,223.2*				

(i) From Table 2.4.31.

(ii) From Appendix B, Table B-4. Number of woodburning devices: Distribution to all NAA housing

(iii) Annual Wood Burned, ton/HU = (2008 Wood Burned, ton) / (2008 Woodburning HU)

(iv) From Appendix B, Table B-8

(v) TSD = Typical Season Day: Wood burned, ton/HU = (Annual Wood Burned, tons) * (SAF) / 365 day/yr

(vi) TSD, lbs/HU = (TSD, ton/hu) * (2000 lb/ton). Data shown here is for comparison and QC purposes only.

(3) Typical Season Day Emissions = (Forecasted Woodburning HU population) * (TSD Wood Burned, ton/HU) * (PM2.5 EF, lb/ton)

See Note (2) for wood burned per HU calculations and PM2.5 EF data.

(4) WCD = Worst Case Day: Wood Burned, ton/HU = (TSD Wood Burned, ton/HU) * (WCD Multiplier).

WCD Multiplier = 2.40 = from Appendix B, Table B-9

Appendix E, Table E- 21. Residential Wood Burning HU Population and SO2 Emissions Forecast

Forecasted HU Population (1)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	2,967	2,997	3,027	3,057	3,087	3,117	3,147	3,447
Woodstove: Certified Non-Catalytic	287	294	296	296	297	298	298	282
Woodstove: Certified Catalytic	791	810	814	816	817	821	820	778
Woodstove: Non-Certified	1,388	1,273	1,177	1,072	969	919	875	545
Insert: Certified Non-Catalytic	557	583	593	598	603	612	615	603
Insert: Certified Catalytic	205	214	218	220	221	225	226	221
Insert: Non-Certified	1,395	1,326	1,280	1,189	1,098	1,076	1,060	974
Pellet Stove (certified)	529	530	531	532	533	534	535	545
Central Furnace	607	602	598	576	554	559	560	570
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*8,726*	*8,629*	*8,532*	*8,356*	*8,179*	*8,160*	*8,137*	*7,964*
Appendix B, Table B-4 QC Check:	8,726							

Annual Emissions: tpy (2)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.3
Woodstove: Certified Non-Catalytic	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Woodstove: Certified Catalytic	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Woodstove: Non-Certified	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.2
Insert: Certified Non-Catalytic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Insert: Certified Catalytic	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Insert: Non-Certified	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3
Pellet Stove (certified)	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Central Furnace	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*2.9*	*2.8*	*2.8*	*2.7*	*2.7*	*2.7*	*2.7*	*2.6*
Table 2.4.32 QC Check:	2.9							

Typical Season Day Emissions: lbs/day (3)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	13	13	14	14	14	14	14	15
Woodstove: Certified Non-Catalytic	2	2	2	2	2	2	2	2
Woodstove: Certified Catalytic	1	1	1	1	1	1	1	1
Woodstove: Non-Certified	5	5	4	4	3	3	3	2
Insert: Certified Non-Catalytic	0	0	0	0	0	0	0	0
Insert: Certified Catalytic	1	2	2	2	2	2	2	2
Insert: Non-Certified	4	4	4	3	3	3	3	3
Pellet Stove (certified)	3	3	3	3	3	3	3	3
Central Furnace	1	1	1	1	1	1	1	1
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*30*	*30*	*29*	*29*	*28*	*28*	*28*	*28*
Table 2.4.32 QC Check:	30							

Worst-Case Day Emissions: lbs/day (4)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	32	32	33	33	33	34	34	37
Woodstove: Certified Non-Catalytic	4	4	4	4	4	4	4	4
Woodstove: Certified Catalytic	2	2	2	2	2	2	2	2
Woodstove: Non-Certified	12	11	10	9	8	8	7	5
Insert: Certified Non-Catalytic	1	1	1	1	1	1	1	1
Insert: Certified Catalytic	4	4	4	4	4	4	4	4
Insert: Non-Certified	10	9	9	8	8	8	7	7
Pellet Stove (certified)	6	6	6	6	6	6	6	6
Central Furnace	2	2	2	2	2	2	2	2
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*72*	*71*	*71*	*70*	*68*	*68*	*68*	*68*
Table 2.4.32 QC Check:	72							

Notes for Table E-21:

(1) From Table E-24

(2) Annual Emissions = (Forecasted Woodburning HU population) * (Annual Wood Burned, ton/HU) * (PM2.5 EF, lb/ton) / (2000 lb/ton)

PM2.5 EF data and Wood Burned per HU calculations:

	(i) PM2.5 EF (lb/ton)	(ii) 2008 Woodburning HU	(i) 2008 Wood Burned (ton)	(iii) Annual Wood Burned (ton/HU)	(iv) Seasonal Adj. Factor (SAF)	(v) TSD Wood Burned (ton/HU)	(vi) TSD Wood Burned (lbs/HU)
Fireplace	0.4	2,967	5,395.2	1.82	2.25	0.0112	22
Woodstove: Certified Non-Catalytic	0.4	287	906.1	3.15	1.73	0.0149	30
Woodstove: Certified Catalytic	0.4	791	417.6	0.53	1.73	0.0025	5
Woodstove: Non-Certified	0.4	1,388	2,602.9	1.87	1.73	0.0089	18
Insert: Certified Non-Catalytic	0.4	557	153.1	0.27	1.65	0.0012	2
Insert: Certified Catalytic	0.4	205	812.4	3.97	1.65	0.0180	36
Insert: Non-Certified	0.4	1,395	2,257.4	1.62	1.65	0.0074	15
Pellet Stove (certified)	0.32	529	1,555.5	2.94	1.84	0.0149	30
Central Furnace	2.03	607	123.1	0.20	1.41	0.0008	2
		-------	-------				
Total		*8,726*	*14,223.2*				

(i) From Table 2.4.32.

(ii) From Appendix B, Table B-4. Number of woodburning devices: Distribution to all NAA housing

(iii) Annual Wood Burned, ton/HU = (2008 Wood Burned, ton) / (2008 Woodburning HU)

(iv) From Appendix B, Table B-8

(v) TSD = Typical Season Day: Wood burned, ton/HU = (Annual Wood Burned, tons) * (SAF) / 365 day/yr

(vi) TSD, lbs/HU = (TSD, ton/hu) * (2000 lb/ton). Data shown here is for comparison and QC purposes only.

(3) Typical Season Day Emissions = (Forecasted Woodburning HU population) * (TSD Wood Burned, ton/HU) * (PM2.5 EF, lb/ton)

See Note (2) for wood burned per HU calculations and PM2.5 EF data.

(4) WCD = Worst Case Day: Wood Burned, ton/HU = (TSD Wood Burned, ton/HU) * (WCD Multiplier).

WCD Multiplier = 2.40 = from Appendix B, Table B-9

Appendix E, Table E- 22. Residential Wood Burning HU Population and VOC Emissions Forecast

Forecasted HU Population (1)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	2,967	2,997	3,027	3,057	3,087	3,117	3,147	3,447
Woodstove: Certified Non-Catalytic	287	294	296	296	297	298	298	282
Woodstove: Certified Catalytic	791	810	814	816	817	821	820	778
Woodstove: Non-Certified	1,388	1,273	1,177	1,072	969	919	875	545
Insert: Certified Non-Catalytic	557	583	593	598	603	612	615	603
Insert: Certified Catalytic	205	214	218	220	221	225	226	221
Insert: Non-Certified	1,395	1,326	1,280	1,189	1,098	1,076	1,060	974
Pellet Stove (certified)	529	530	531	532	533	534	535	545
Central Furnace	607	602	598	576	554	559	560	570
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*8,726*	*8,629*	*8,532*	*8,356*	*8,179*	*8,160*	*8,137*	*7,964*
Appendix B, Table B-4 QC Check:	8,726							

Annual Emissions: tpy (2)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	51.0	51.5	52.0	52.5	53.0	53.6	54.1	59.2
Woodstove: Certified Non-Catalytic	5.4	5.6	5.6	5.6	5.6	5.6	5.6	5.3
Woodstove: Certified Catalytic	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.1
Woodstove: Non-Certified	69.0	63.2	58.5	53.3	48.1	45.7	43.5	27.1
Insert: Certified Non-Catalytic	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Insert: Certified Catalytic	6.1	6.4	6.5	6.5	6.6	6.7	6.7	6.6
Insert: Non-Certified	59.8	56.8	54.9	51.0	47.1	46.1	45.5	41.7
Pellet Stove (certified)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Central Furnace	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*196.1*	*188.4*	*182.4*	*173.9*	*165.4*	*162.7*	*160.4*	*144.8*
Table 2.4.33 QC Check:	196.1							

Typical Season Day Emissions: lbs/day (3)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	630	637	643	649	656	662	668	732
Woodstove: Certified Non-Catalytic	51	53	53	53	53	53	53	51
Woodstove: Certified Catalytic	30	30	31	31	31	31	31	29
Woodstove: Non-Certified	655	600	555	505	457	433	413	257
Insert: Certified Non-Catalytic	8	9	9	9	9	9	9	9
Insert: Certified Catalytic	55	58	59	59	60	61	61	60
Insert: Non-Certified	544	517	499	464	428	419	413	380
Pellet Stove (certified)	0	0	0	0	0	0	0	0
Central Furnace	6	6	5	5	5	5	5	5
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*1,979*	*1,909*	*1,854*	*1,776*	*1,699*	*1,674*	*1,654*	*1,523*
Table 2.4.33 QC Check:	1,979							

Worst-Case Day Emissions: lbs/day (4)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	1,513	1,528	1,543	1,559	1,574	1,589	1,605	1,758
Woodstove: Certified Non-Catalytic	124	126	127	127	128	128	128	121
Woodstove: Certified Catalytic	71	73	73	73	74	74	74	70
Woodstove: Non-Certified	1,571	1,441	1,332	1,213	1,097	1,040	991	617
Insert: Certified Non-Catalytic	20	21	21	21	22	22	22	22
Insert: Certified Catalytic	132	139	141	142	143	146	146	143
Insert: Non-Certified	1,306	1,241	1,198	1,113	1,028	1,007	992	911
Pellet Stove (certified)	1	1	1	1	1	1	1	1
Central Furnace	13	13	13	13	12	12	12	13
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*4,751*	*4,582*	*4,449*	*4,263*	*4,077*	*4,019*	*3,971*	*3,655*
Table 2.4.33 QC Check:	4,751							

Notes for Table E-22:

(1) From Table E-24

(2) Annual Emissions = (Forecasted Woodburning HU population) * (Annual Wood Burned, ton/HU) * (PM2.5 EF, lb/ton) / (2000 lb/ton)

PM2.5 EF data and Wood Burned per HU calculations:

	(i) PM2.5 EF (lb/ton)	(ii) 2008 Woodburning HU	(i) 2008 Wood Burned (ton)	(iii) Annual Wood Burned (ton/HU)	(iv) Seasonal Adj. Factor (SAF)	(v) TSD Wood Burned (ton/HU)	(vi) TSD Wood Burned (lbs/HU)
Fireplace	18.9	2,967	5,395.2	1.82	2.25	0.0112	22
Woodstove: Certified Non-Catalytic	12	287	906.1	3.15	1.73	0.0149	30
Woodstove: Certified Catalytic	15	791	417.6	0.53	1.73	0.0025	5
Woodstove: Non-Certified	53	1,388	2,602.9	1.87	1.73	0.0089	18
Insert: Certified Non-Catalytic	12	557	153.1	0.27	1.65	0.0012	2
Insert: Certified Catalytic	15	205	812.4	3.97	1.65	0.0180	36
Insert: Non-Certified	53	1,395	2,257.4	1.62	1.65	0.0074	15
Pellet Stove (certified)	0.041	529	1,555.5	2.94	1.84	0.0149	30
Central Furnace	11.7	607	123.1	0.20	1.41	0.0008	2
		-------	-------				
Total		*8,726*	*14,223.2*				

(i) From Table 2.4.33.

(ii) From Appendix B, Table B-4. Number of woodburning devices: Distribution to all NAA housing

(iii) Annual Wood Burned, ton/HU = (2008 Wood Burned, ton) / (2008 Woodburning HU)

(iv) From Appendix B, Table B-8

(v) TSD = Typical Season Day: Wood burned, ton/HU = (Annual Wood Burned, tons) * (SAF) / 365 day/yr

(vi) TSD, lbs/HU = (TSD, ton/hu) * (2000 lb/ton). Data shown here is for comparison and QC purposes only.

(3) Typical Season Day Emissions = (Forecasted Woodburning HU population) * (TSD Wood Burned, ton/HU) * (PM2.5 EF, lb/ton)

See Note (2) for wood burned per HU calculations and PM2.5 EF data.

(4) WCD = Worst Case Day: Wood Burned, ton/HU = (TSD Wood Burned, ton/HU) * (WCD Multiplier).

WCD Multiplier = 2.40 = from Appendix B, Table B-9

Appendix E, Table E- 23. Residential Wood Burning HU Population and NH3 Emissions Forecast

Forecasted HU Population (1)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	2,967	2,997	3,027	3,057	3,087	3,117	3,147	3,447
Woodstove: Certified Non-Catalytic	287	294	296	296	297	298	298	282
Woodstove: Certified Catalytic	791	810	814	816	817	821	820	778
Woodstove: Non-Certified	1,388	1,273	1,177	1,072	969	919	875	545
Insert: Certified Non-Catalytic	557	583	593	598	603	612	615	603
Insert: Certified Catalytic	205	214	218	220	221	225	226	221
Insert: Non-Certified	1,395	1,326	1,280	1,189	1,098	1,076	1,060	974
Pellet Stove (certified)	529	530	531	532	533	534	535	545
Central Furnace	607	602	598	576	554	559	560	570
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*8,726*	*8,629*	*8,532*	*8,356*	*8,179*	*8,160*	*8,137*	*7,964*
Appendix B, Table B-4 QC Check:	8,726							

Annual Emissions: tpy (2)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	4.9	4.9	5.0	5.0	5.1	5.1	5.2	5.6
Woodstove: Certified Non-Catalytic	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Woodstove: Certified Catalytic	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Woodstove: Non-Certified	2.2	2.0	1.9	1.7	1.5	1.5	1.4	0.9
Insert: Certified Non-Catalytic	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Insert: Certified Catalytic	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Insert: Non-Certified	1.9	1.8	1.8	1.6	1.5	1.5	1.5	1.3
Pellet Stove (certified)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Central Furnace	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*10.4*	*10.2*	*10.0*	*9.8*	*9.5*	*9.5*	*9.4*	*9.2*
Table 2.4.34 QC Check:	10.4							

Typical Season Day Emissions: lbs/day (3)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	60	61	61	62	62	63	64	70
Woodstove: Certified Non-Catalytic	4	4	4	4	4	4	4	4
Woodstove: Certified Catalytic	2	2	2	2	2	2	2	2
Woodstove: Non-Certified	21	19	18	16	15	14	13	8
Insert: Certified Non-Catalytic	1	1	1	1	1	1	1	1
Insert: Certified Catalytic	3	3	4	4	4	4	4	4
Insert: Non-Certified	17	17	16	15	14	13	13	12
Pellet Stove (certified)	2	2	2	2	2	2	2	2
Central Furnace	1	1	1	1	1	1	1	1
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*111*	*110*	*108*	*106*	*104*	*104*	*104*	*103*
Table 2.4.34 QC Check:	111							

Worst-Case Day Emissions: lbs/day (4)

	2008	2009	2010	2011	2012	2013	2014	2024
Fireplace	144	146	147	148	150	151	153	167
Woodstove: Certified Non-Catalytic	9	9	10	10	10	10	10	9
Woodstove: Certified Catalytic	4	4	4	4	4	4	4	4
Woodstove: Non-Certified	50	46	43	39	35	33	32	20
Insert: Certified Non-Catalytic	1	2	2	2	2	2	2	2
Insert: Certified Catalytic	8	8	8	9	9	9	9	9
Insert: Non-Certified	42	40	38	36	33	32	32	29
Pellet Stove (certified)	6	6	6	6	6	6	6	6
Central Furnace	2	2	2	2	2	2	2	2
	-------	-------	-------	-------	-------	-------	-------	-------
Total	*267*	*263*	*260*	*255*	*250*	*249*	*249*	*248*
Table 2.4.34 QC Check:	267							

Notes for Table E-23:

(1) From Table E-24

(2) Annual Emissions = (Forecasted Woodburning HU population) * (Annual Wood Burned, ton/HU) * (PM2.5 EF, lb/ton) / (2000 lb/ton)
PM2.5 EF data and Wood Burned per HU calculations:

	(i) PM2.5 EF (lb/ton)	(ii) 2008 Woodburning HU	(i) 2008 Wood Burned (ton)	(iii) Annual Wood Burned (ton/HU)	(iv) Seasonal Adj. Factor (SAF)	(v) TSD Wood Burned (ton/HU)	(vi) TSD Wood Burned (lbs/HU)
Fireplace	1.8	2,967	5,395.2	1.82	2.25	0.0112	22
Woodstove: Certified Non-Catalytic	0.9	287	906.1	3.15	1.73	0.0149	30
Woodstove: Certified Catalytic	0.9	791	417.6	0.53	1.73	0.0025	5
Woodstove: Non-Certified	1.7	1,388	2,602.9	1.87	1.73	0.0089	18
Insert: Certified Non-Catalytic	0.9	557	153.1	0.27	1.65	0.0012	2
Insert: Certified Catalytic	0.9	205	812.4	3.97	1.65	0.0180	36
Insert: Non-Certified	1.7	1,395	2,257.4	1.62	1.65	0.0074	15
Pellet Stove (certified)	0.3	529	1,555.5	2.94	1.84	0.0149	30
Central Furnace	1.8	607	123.1	0.20	1.41	0.0008	2
		-------	-------				
Total		*8,726*	*14,223.2*				

(i) From Table 2.4.30.
(ii) From Appendix B, Table B-4. Number of woodburning devices: Distribution to all NAA housing
(iii) Annual Wood Burned, ton/HU = (2008 Wood Burned, ton) / (2008 Woodburning HU)
(iv) From Appendix B, Table B-8
(v) TSD = Typical Season Day: Wood burned, ton/HU = (Annual Wood Burned, tons) * (SAF) / 365 day/yr
(vi) TSD, lbs/HU = (TSD, ton/hu) * (2000 lb/ton). Data shown here is for comparison and QC purposes only.

(3) Typical Season Day Emissions = (Forecasted Woodburning HU population) * (TSD Wood Burned, ton/HU) * (PM2.5 EF, lb/ton)
See Note (2) for wood burned per HU calculations and PM2.5 EF data.

(4) WCD = Worst Case Day: Wood Burned, ton/HU = (TSD Wood Burned, ton/HU) * (WCD Multiplier).
WCD Multiplier = 2.40 = from Appendix B, Table B-9

Appendix E, Table E- 24. Residential Wood Burning Device Population Forecast

Device Type	---------- Total Woodburning HU in NAA ----------																
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fireplace																	
Base (1)	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967	2,967
Construction, compounding (2)	0	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480
Total	**2,967**	**2,997**	**3,027**	**3,057**	**3,087**	**3,117**	**3,147**	**3,177**	**3,207**	**3,237**	**3,267**	**3,297**	**3,327**	**3,357**	**3,387**	**3,417**	**3,447**
Woodstoves																	
Non-Certified																	
Final Population, Compounding (1a)	**1,388**	**1,273**	**1,177**	**1,072**	**969**	**919**	**875**	**834**	**794**	**757**	**721**	**688**	**656**	**626**	**597**	**571**	**545**
Certified Non-Catalytic																	
Base (1)	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287
Construction & Changeover, compounding (2)	0	-3	-6	-8	-11	-14	-17	-20	-22	-25	-28	-31	-34	-37	-39	-42	-45
Heat Smart Additions, compounding (3)	0	10	14	17	21	25	27	30	32	34	35	36	38	38	39	40	40
Total	**287**	**294**	**296**	**296**	**297**	**298**	**298**	**297**	**297**	**296**	**294**	**293**	**291**	**289**	**287**	**285**	**282**
Certified Catalytic																	
Base (1)	791	791	791	791	791	791	791	791	791	791	791	791	791	791	791	791	791
Construction & Changeover, compounding (2)	0	-8	-15	-23	-31	-39	-46	-54	-62	-70	-77	-85	-93	-101	-108	-116	-124
Heat Smart Additions, compounding (3)	0	26	38	48	57	68	76	82	88	93	97	100	103	106	108	109	110
Total	**791**	**810**	**814**	**816**	**817**	**821**	**820**	**819**	**817**	**814**	**811**	**807**	**802**	**796**	**791**	**784**	**778**
Inserts																	
Non-Certified																	
Final Population, Compounding (1a)	**1,395**	**1,326**	**1,280**	**1,189**	**1,098**	**1,076**	**1,060**	**1,047**	**1,034**	**1,023**	**1,013**	**1,004**	**997**	**990**	**983**	**978**	**974**
Certified Non-Catalytic																	
Base (1)	557	557	557	557	557	557	557	557	557	557	557	557	557	557	557	557	557
Construction & Changeover, compounding (2)	0	-5	-11	-16	-22	-27	-33	-38	-44	-49	-54	-60	-65	-71	-76	-82	-87
Heat Smart Additions, compounding (3)	0	32	47	57	68	82	91	99	106	112	117	121	125	128	130	132	133
Total	**557**	**583**	**593**	**598**	**603**	**612**	**615**	**618**	**619**	**620**	**619**	**618**	**616**	**614**	**611**	**607**	**603**
Certified Catalytic																	
Base (1)	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205
Construction & Changeover, compounding (2)	0	-2	-4	-6	-8	-10	-12	-14	-16	-18	-20	-22	-24	-26	-28	-30	-32
Heat Smart Additions, compounding (3)	0	12	17	21	25	30	33	36	39	41	43	45	46	47	48	48	49
Total	**205**	**214**	**218**	**220**	**221**	**225**	**226**	**227**	**227**	**228**	**227**	**227**	**226**	**225**	**224**	**223**	**221**
Pellet Stove																	
Base (1)	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529
Construction & Changeover, compounding (2)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Total	**529**	**530**	**531**	**532**	**533**	**534**	**535**	**536**	**537**	**538**	**539**	**540**	**541**	**542**	**543**	**544**	**545**
Central Furnace																	
Base (1)	607	607	607	607	607	554	554	554	554	554	554	554	554	554	554	554	554
Construction & Changeover, compounding (2)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Changeouts, 2009-2012: EPA, City, and ARRA (4)	0	-6	-11	-34	-57												
Total	**607**	**602**	**598**	**576**	**554**	**559**	**560**	**561**	**562**	**563**	**564**	**565**	**566**	**567**	**568**	**569**	**570**
Total # of Woodburning HUs	**8,726**	**8,629**	**8,532**	**8,356**	**8,179**	**8,160**	**8,137**	**8,115**	**8,095**	**8,075**	**8,056**	**8,039**	**8,022**	**8,006**	**7,992**	**7,978**	**7,964**
QC check: Appendix B-4	8,726																

Notes for Table E-24:

(1) From Appendix B, Table B-4. Number of woodburning devices: Distribution to all NAA housing

(a) Compounding Non-certified device population estimates are taken from Table E-25.

(2) Woodburning HU growth, by device, is dependent upon new construction growth rates, and changeover in existing housing.

The projection is considered to be linear, non-compounding as follows:

New construction growth rates and Changeover in existing housing are as follows:

			Units per Year: By device type (v)			
			Woodstoves		Inserts	
New Construction Growth Rates	**Units/yr**	**Notes**	*Cat*	*Non-Cat*	*Cat*	*Non-Cat*
Fireplaces	30	i	*N/A*	*N/A*	*N/A*	*N/A*
Certified Stoves/Inserts	4	ii	1.7	0.6	0.4	1.2
			Pellet	Central Furnace		
Pellet Stoves/ Central Furnace	1	ii	0.5	0.5		

			Units per Year: By device type (v)			
			Woodstoves		Inserts	
Device Change over in existing housing	**Units/yr**	**Notes**	*Cat*	*Non-Cat*	*Cat*	*Non-Cat*
Fireplaces	0	iii	*N/A*	*N/A*	*N/A*	*N/A*
Certified Stoves/Inserts	22	iv	9.5	3.4	2.4	6.7
Pellet Stoves/ Central Furnace	0	iii	*N/A*	*N/A*	*N/A*	*N/A*

(i) Alan Barnes (@ 1-800-387-1304, County Building) says there would probably be about 30-40 wood burning fireplaces per year in new construction.

(ii) According to David Collier's conversation with Allan Barnes, the Klamath County Building Department issues about 4-5 stove permits/year. Klamath County handles permitting for the City.

(iii) DEQ staff assume that there is no growth in fireplaces and pellet stoves in existing HUs.

(iv) According to Carolyn Noller with Orley Stove & Spa who was contacted by David Collier, they typically sell 20--30 woodstoves/yr in the K. Falls urban area (combination new stoves & old stove replacements). Big R Stores sells 40-50 stoves/year, approximately 5% of which go to K. Falls UGB area (Ref. 353).

(v) Units per Year by Device Type ratio'd from Units/Yr using 2008 device populations.

(3) Heat Smart "additions" takes into account certified devices replacing uncertified devices changed out through Heat Smart

NOTE: No credit for Heat Smart changes taken in 2008: DEQ K Falls RWC Survey results assumed to incorporate any Heat Smart impact.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Units/Yr: Linear, Compounding																
Uncertified Stoves Changed Out on HU re-sale: From Table E-21	0	36	52	65	77	93	103	112	120	126	132	137	141	144	147	149	150
Cert. Cat. Stoves Changed In on HU re-sale (i)	0	26	38	48	57	68	76	82	88	93	97	100	103	106	108	109	110
Cert. Non-Cat. Stoves Changed In on HU re-sale (i)	0	10	14	17	21	25	27	30	32	34	35	36	38	38	39	40	40
Uncertified Inserts Changed Out on HU re-sale: From Table E-21	0	44	64	78	93	112	125	135	145	153	160	166	171	175	178	180	182
Cert. Cat. Inserts Changed In on HU re-sale (i)	0	12	17	21	25	30	33	36	39	41	43	45	46	47	48	48	49
Cert. Non-Cat. Inserts Changed In on HU re-sale (i)	0	32	47	57	68	82	91	99	106	112	117	121	125	128	130	132	133

(i) Certified device change-in breakdown to cat/non-cat device type estimated using 2008 population ratios:

	Cat	Non-Cat
Stove Ratio	73%	27%
Insert Ratio	27%	73%

(4) Central Furnace changeouts from non-Heat Smart funding are from Tables E-26 and E-27.

	Units	
E-19: 2008-2009	6	*changed out per year*
E-20: 2010-2011	23	*changed out per year*

Appendix E, Table E- 25. Residential Wood Burning Non-Certified Device Population Forecast

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Impact of Non-Heat Smart Changeouts: *Non-Compounding*																	
Non-Certified Woodstoves																	
Device Population, 1 per HU: Base (1)	1,388	1,388	1,309	1,229	1,138	1,046	1,012	978	945	914	883	853	825	797	770	744	719
Changeouts, 2008-2011: EPA, City, and ARRA funded (2)		46	46	57	57												
Changeouts, Changeover in Existing Housing (3)		34	34	34	34	34	34	33	32	31	30	29	28	27	26	25	24
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Non-Certified Woodstove Population (4)	1,388	1,309	1,229	1,138	1,046	1,012	978	945	914	883	853	825	797	770	744	719	695
Non-Certified Inserts																	
Device Population, 1 per HU: Base (1)	1,395	1,395	1,369	1,344	1,267	1,191	1,188	1,185	1,182	1,179	1,176	1,173	1,170	1,167	1,164	1,161	1,158
Changeouts, 2008-2011: EPA, City, and ARRA funded (2)		23	23	73	73												
Changeouts, Changeover in Existing Housing (3)		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Non-Certified Insert Population (4)	1,395	1,369	1,344	1,267	1,191	1,188	1,185	1,182	1,179	1,176	1,173	1,170	1,167	1,164	1,161	1,158	1,155
Heat Smart Affected Hus: HU Resale: HU Sold With Uncertified Devices. *Compounding*																	
County-Wide number homes sold, HU/Yr (5)	633	572	654	636	630	630	630	630	630	630	630	630	630	630	630	630	630
County-Wide number homes sold: compounding	633	1,205	1,859	2,495	3,125	3,755	4,385	5,015	5,645	6,275	6,905	7,535	8,165	8,795	9,425	10,055	10,685
Percent HU inside NAA (6)	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%
Estimated HU sold in NAA, compounding (7)	396	755	1,164	1,562	1,957	2,351	2,746	3,140	3,535	3,929	4,324	4,718	5,113	5,507	5,902	6,296	6,691
% Homes containing non-certified stove (8)	6.6%	6.3%	6.0%	5.7%	5.4%	5.1%	4.9%	4.6%	4.4%	4.2%	4.0%	3.8%	3.6%	3.4%	3.2%	3.1%	2.9%
HU Sold with Uncertified Stoves: Unadjusted (9)	26	47	69	88	105	120	133	145	155	163	171	177	182	187	190	193	194
% Homes containing non-certified insert (8)	7.7%	7.4%	7.0%	6.6%	6.3%	6.0%	5.7%	5.4%	5.1%	4.9%	4.6%	4.4%	4.2%	4.0%	3.8%	3.6%	3.4%
HU Sold with Uncertified Inserts: Unadjusted (9)	31	55	81	104	123	141	156	170	182	192	200	208	214	219	223	226	228
HU Sold with Uncertified Stoves: Adjusted (10)	26	45	65	82	97	116	129	140	150	158	165	171	176	180	184	186	188
HU Sold with Uncertified Inserts: Adjusted (10)	31	54	80	98	116	140	156	169	181	191	200	207	213	218	222	225	227
Impact of Heat Smart *(in effect by 2008) Units/Yr, Compounding*																	
Estimated Heat Smart Rule Effectiveness, RE (11)	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Uncertified Stoves Changed Out on HU re-sale (12)	0	36	52	65	77	93	103	112	120	126	132	137	141	144	147	149	150
Uncertified Inserts Changed Out on HU re-sale (12)	0	44	64	78	93	112	125	135	145	153	160	166	171	175	178	180	182
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Total Uncertified Devices Changed Out on HU resale	0	79	116	144	170	205	228	247	265	279	292	303	312	319	325	329	332
Final Device Populations: All Changeouts																	
Uncertified Stoves (13)	1,388	1,273	1,177	1,072	969	919	875	834	794	757	721	688	656	626	597	571	545
Uncertified Inserts (13)	1,395	1,326	1,280	1,189	1,098	1,076	1,060	1,047	1,034	1,023	1,013	1,004	997	990	983	978	974
	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
QC: Total Uncertified Device Populations, All Changeouts	2,783	2,599	2,456	2,261	2,067	1,995	1,936	1,880	1,828	1,780	1,734	1,692	1,653	1,616	1,581	1,549	1,518

Notes for Table E-25:

(1) 2008 population from Appendix B, Table B-4. All other populations are from previous year (see note 4).

(2) Changeouts from non-Heat Smart funding are from Tables E-26 and E-27.

	Stove	Insert	
E-26: 2008-2009	46	23	*changed out per year*
E-27: 2010-2011	57	73	*changed out per year*

(3) "Natural Attrition" = changeouts for existing housing, unsold, in which the occupants change out an uncertified device for a newer, certified device, or remove the uncertified device on their own accord:

	Units/yr	
Noncertified Stoves	34	Removed
Noncertified Inserts	3	Removed

Beginning 2014, natural attrition reduced by the year-by-year reduction in number of houses being sold with uncertified devices

(4) Non-certified device population = (Device population, base) - (changeouts from non-Heat Smart funding) - (changeouts from changeover in existing housing)

(5) estimates from http://www.klamathcountyrealtors.com/market.htm for 2009 2010 and 2011
2008 estimated by Klamath County Realtors; 2012, 2013 and 2014 estimated based on discussion with Diane from Klamath County Realtors - She said "Market appears to be leveling out".

(6) Percent HU inside NAA = NAA HU / County HU, where NAA HU =

NAA HU =	18,767	from Appendix B, Table B-1
County HU =	29,972	from Appendix B, Table B-3.
Percentage HU within NAA =	63%	

(7) Estimated homes sold in NAA = (County-wide # of homes sold) * (Percent HU inside NAA)

(8) % Homes within the NAA containing non-certified devices =

non-certified woodstove	6.6%	from Appendix B, Table B-4:
non-certified insert	7.7%	from Appendix B, Table B-4:
Total	14.3%	

Annual Reduction of 5% due to the year-by-year reduction in number of houses being sold with uncertified devices

(9) HU Sold with Uncertified Devices: Unadjusted = (Estimated HU sold in NAA) * (Percent HU inside NAA containing uncertified devices)

(10) HU Sold with Uncertified Devices: Adjusted =
(HU Sold with Uncertified Devices: Unadjusted) * [(Population impacted by non-Heat Smart changeouts, note 4) / (Base population, note 1)]

(11) Heat Smart Rule Effectiveness (RE) for the Klamath Falls NAA is a DEQ staff best estimate

(12) Uncertified devices changed out on resale = (HU sold with uncertified devices, adjusted) * (RE). *Note: RE applied to changeouts here, not emissions estimates.*

(13) Final uncertified device population = (non-certified device population, impact of non-Heat Smart changeouts, note 4) - (Heat Smart Changeouts, note 11)
NOTE: No credit for Heat Smart changes taken in 2008: Survey results assumed to incorporate any Heat Smart impact.

Appendix E, Table E- 26. EPA and City Funded Device Changeouts Impacting 2008-2009 RWC Emissions

(1) New Device **Make/Model**	(1) # **Changed Out**	(2) New Device Code	(3) Replaced Device Type
Unknown	2	U-U	Conv. WS/INS
Avalon Arbor	4	WS-N	Conv.WS
Avalon Astoria Pellet	1	PS-NA	Conv.WS
Avalon Gas	1	G-NA	Central Furnace
Avalon Olympic	8	WS-N	Conv.WS
Avalon Pellet	1	PS-NA	Conv.WS
Avalon Pendleton	7	WS/INS-N	Conv. WS/INS
Avalon Perfect Fit	2	INS-N	Conv.INS
Avalon Rainier	19	WS/INS-N	Conv. WS/INS
Avalon Spokane	6	WS-N	Conv.WS
Big E	1	PS-NA	Conv.WS
BlazeKing 1107	1	WS-Y	Conv.WS
BlazeKing Classic	1	WS-Y	Conv.WS
BlazeKing Princess	23	WS/INS-Y	Conv. WS/INS
Breckwell Pellet	3	PS-NA	Conv.WS
Buck stove 21	1	WS/INS-N	Conv. WS/INS
Bucksove #21	3	WS/INS-N	Conv. WS/INS
Buckstove #18	1	WS-N	Conv.WS
Buckstove #21	5	WS/INS-N	Conv. WS/INS
Buckstove #24	2	G-NA	Central Furnace
Buckstove #74	15	WS/INS-N	Conv. WS/INS
Buckstove #81	3	WS/INS-N	Conv. WS/INS
Buckstove 18	1	WS-N	Conv.WS
Buckstove 74	1	WS/INS-N	Conv. WS/INS
Century	1	WS/INS-N	Conv. WS/INS
Gas	8	G-NA	Central Furnace
Hearthstone Shelborne	1	WS-N	Conv.WS
Heritage 8021	1	WS-N	Conv.WS
Jotul F3 CB	2	WS-N	Conv.WS
Majolica Brown	1	WS/INS-U	Conv. WS/INS
Pellet	5	PS-NA	Conv.WS
Quadrafire 3100m	4	WS-N	Conv.WS
Quadrafire 5100	3	INS-N	Conv.INS
Whitfield Pellet	10	PS-NA	Conv.WS

Total Changeouts	148		

Uncertified Devices Changed Out: 2008-2009

Stoves	**92**	(this value, a count of all the replaced devices by type, is used in Table E-25)
Inserts	**46**	(this value, a count of all the replaced devices by type, is used in Table E-25)
Central Furnaces	**11**	(this value, a count of all the replaced devices by type, is used in Table E-25)

Notes: ANN = Annual, TSD = Typical Season Day, WCD = Worst-Case Day
(1) ODOE DEQ Woodstove Change-out Tracking Data, 2008-2009
(2) ODOE DEQ Woodstove Change-out Tracking Data, 2008-2009. Data gap-filled using EPA RWC device data
http://www.epa.gov/compliance/resources/publications/monitoring/caa/woodstoves/certifiedwood.pdf

Appendix E, Table E- 27. ARRA Device Changeouts Impacting 2010-2011 RWC Emissions

(1) New Device Make/Model	(1) # Changed Out	(2) Catalyst/ Non-Catalyst/ Fuel	(3) New Device Code	(3) Replaced Device Type
Astoria Bay Insert	1	nc	INS-N	Conv.INS
Avalon 1750 F/S	1	nc	WS-N	Conv.WS
Avalon Arbor	2	pellet	PS-NA	Conv.WS
Avalon Astoria Pellet	1	pellet	PS-NA	Conv.WS
Avalon Newport Bay	1	nc	PS-NA	Conv.WS
Avalon Newport Pellet	1	pellet	PS-NA	Conv.WS
Avalon Olympic	8	nc	INS-N	Conv.INS
Avalon Olympic Insert	2	nc	INS-N	Conv.INS
Avalon Pendleton	8	nc	WS/INS-N	Conv. WS/INS
Avalon Rainier	2	nc	INS-N	Conv.INS
Avalon Rainier	21	nc	INS-N	Conv.INS
Avalon Rainier Insert	5	nc	INS-N	Conv.INS
Avalon Spokane 1750	7	nc	WS-N	Conv.WS
Blaze King Classic	1	cat	WS-Y	Conv.WS
Blaze King Classic	7	cat	WS-Y	Conv.WS
Blaze King Classic	2	nc	WS-Y	Conv.WS
Blaze King Insert	1	cat	INS-Y	Conv.INS
Blaze King KEJ1107	2	cat	WS-Y	Conv.WS
Blaze King Parlor	1	cat	WS-Y	Conv.WS
Blaze King Parlour	1	nc	WS-Y	Conv.WS
Blaze King Princess Insert	7	cat	INS-Y	Conv.INS
Bosca Pellet Stove	3	pellet	PS-NA	Conv.WS
Breckwell 0	1	pellet	PS-NA	Conv.WS
Breckwell 2000	1	nc	PS-NA	Conv.WS
Breckwell Big E	2	nc	PS-NA	Conv.WS
Breckwell Big E	1	pellet	PS-NA	Conv.WS
Breckwell Mahogany	1	nc	PS-NA	Conv.WS
Breckwell P2000	1	nc	PS-NA	Conv.WS
Breckwell P2000i	1	n	INS-N	Conv.INS
Breckwell P22 Pellett	1	pellet	PS-NA	Conv.WS
Breckwell p22i	3	nc	INS-N	Conv.INS
Breckwell Sonora	1	nc insert	INS-N	Conv.INS
Breckwell W3100	1	nc insert	INS-N	Conv.INS
Brickwell Mahogany	1	pellet	PS-NA	Conv.WS
Buck 91 Insert	1	cat	INS-Y	Conv.INS
Buck Stoves 261NC	1	nc	WS-N	Conv.WS
Carrier 25HCC524A003	1	gas	G-NA	Central Furnace
Carrier 58 HDV080-20	1	gas	G-NA	Central Furnace
Craftsbury Wood	1	nc	WS-N	Conv.WS
Dutchwest 2478	1	nc	WS-N	Conv.WS
Dutchwest Vermont Castings	1	nc	WS-N	Conv.WS
Englander 2200	1	cat	WS-Y	Conv.WS
Englander 50-30NC	1	nc	WS-N	Conv.WS
Englander 50NFC	1	nc	WS/INS-N	Conv. WS/INS
Englander 50-SNC13	1	nc	WS-N	Conv.WS
Englander 50-SNC-30	1	nc	WS/INS-N	Conv. WS/INS
England's Stove Works 50 SNC 30	1	nc	WS/INS-N	Conv. WS/INS
England's Stove Works Englander 30-NC	1	nc	WS-N	Conv.WS
Enviro Mini	1	pellet	PS-NA	Conv.WS
Enviro Mini	2	pellet	PS-NA	Conv.WS
Frigidaire FG7TE	2	gas	G-NA	Central Furnace
Harman TL300	1	nc	WS-N	Conv.WS
Hearthstone Clydesdale I	1	nc	INS-N	Conv.INS
Hearthstone Homestead	2	nc	WS-N	Conv.WS
Hearthstone Mansfield	1	nc	WS-N	Conv.WS
Hearthstone Mansfield	1	pellet	PS-NA	Conv.WS
Hearthstone Tribute	1	nc	WS-N	Conv.WS
Heatilator ECO ADV WS18	1	nc	WS-N	Conv.WS
Lennox GB1MPB-36B-071	1	gas	G-NA	Central Furnace
Lennox P140	1	pellet	PS-NA	Conv.WS
Lennox SLP98DF070V36B	2	gas	G-NA	Central Furnace
Lennox Winslow P140 Insert	3	pellet	PS-NA	Conv.WS
Lopi 1750	1	nc	INS-N	Conv.INS
Lopi 1750 I	1	nc	INS-N	Conv.INS
Lopi 1750 I Insert	2	nc	INS-N	Conv.INS
Lopi 1750 Republic	1	nc	INS-N	Conv.INS
Lopi 1750i	5	nc	INS-N	Conv.INS
Lopi 1750i	2	nc insert	INS-N	Conv.INS
Lopi 1750i Insert	1	nc insert	INS-N	Conv.INS
Lopi Endeavor	12	nc	WS/INS-N	Conv. WS/INS
Lopi Freedom Bay	6	nc	INS-N	Conv.INS
Lopi Liberty	4	nc	WS-N	Conv.WS
Lopi Pioneer	2	nc	PS-NA	Conv.WS
Lopi Pioneer Bay	3	nc	PS-NA	Conv.WS
Lopi Repbulic 1750	1	nc	INS-N	Conv.INS
Lopi Republic 1750	13	nc	INS-N	Conv.INS
Lopi Republic 1750i	6	nc	INS-N	Conv.INS
Lopi Republic 1750i	1	nc insert	INS-N	Conv.INS
Lopi Revere Insert	1	nc	INS-N	Conv.INS
Lopi Revere Insert	1	nc insert	INS-N	Conv.INS
Lopi Yankee Bay Insert	2	pellet	PS-NA	Conv.WS
Lopi Republic 1750	1	nc	INS-N	Conv.INS
Lopi Republic 1750I	2	nc	INS-N	Conv.INS
Luxaire TG9S060A10MP1	1	gas	G-NA	Central Furnace
Mitsubishi FE12	5	hp	HP-NA	Central Furnace
Mitsubishi FE18	1	hp	HP-NA	Central Furnace
Mitsubishi FE18HP	2	hp	HP-NA	Central Furnace
Mitsubishi MUZFE12NA	3	hp	HP-NA	Central Furnace
Mitsubishi MUZFE12NA	1	pellet	PS-NA	Conv.WS
Napolean 1400	1	nc	WS-N	Conv.WS
Napolean 1402	1	nc	INS-N	Conv.INS
Napolean 1402 Insert	2	nc	INS-N	Conv.INS
Napolean 1450	1	nc	WS-N	Conv.WS
Napolean 1450 EPA Independence	8	nc	WS-N	Conv.WS
Napoleon 1400	1	nc	WS-N	Conv.WS
Napoleon 1402	6	nc	INS-N	Conv.INS
Napoleon 1402	3	nc insert	INS-N	Conv.INS
Napoleon 1402i	1	nc	INS-N	Conv.INS
Napoleon 1402P	3	nc	INS-N	Conv.INS
Napoleon 1450	9	nc	INS-N	Conv.INS
Napoleon 1450	1	nc insert	INS-N	Conv.INS
Napoleon 1450 EPA Independence	1	nc	INS-N	Conv.INS
Napoleon 1450EPA	2	nc	INS-N	Conv.INS
Pioneer Bay	1	pellet	PS-NA	Conv.WS
Quadra Fire 1200	1	pellet	PS-NA	Conv.WS
Quadra Fire 3100 I	1	nc	INS-N	Conv.INS
Quadra Fire 4300 E/S	1	nc	WS-N	Conv.WS
Quadra Fire Millennium 3100	1	nc	WS-N	Conv.WS
Quadrafire 2700I	1	nc insert	INS-N	Conv.INS
Quadrafire 3100	1	nc	WS-N	Conv.WS
Quadrafire 3100I	1	nc	INS-N	Conv.INS
Quadrafire 4100	2	nc	WS-N	Conv.WS
Quadrafire 4100I	3	nc	INS-N	Conv.INS
Quadrafire 4300	1	nc	WS-N	Conv.WS
Quadrafire 4300 Millennium	1	nc	PS-NA	Conv.WS
Quadrafire 4300 Millennium	1	pellet	PS-NA	Conv.WS
Quadrafire 5100i	2	nc	INS-N	Conv.INS
Quadrafire Castile	1	pellet	PS-NA	Conv.WS
Quadrafire CB1200	3	pellet	PS-NA	Conv.WS
Quadrafire CB1200I	4	pellet	PS-NA	Conv.WS
Quadrafire CB1200Insert	1	pellet	PS-NA	Conv.WS
Quadra-Fire 5100I	1	nc	INS-N	Conv.INS
Republic 1750i	1	nc	INS-N	Conv.INS
Rheem 13PJK42A01RHLLMM4821JA	1	hp	HP-NA	Central Furnace
Rheem RBTC06EMAES	1	gas	G-NA	Central Furnace
Rheem RBTC07ERBGS	1	gas	G-NA	Central Furnace
Rheem RGT06EMAES	1	gas	G-NA	Central Furnace
Rheem RGTC06EMAES	2	gas	G-NA	Central Furnace
Rheem RGTC-06-EMAES	1	hp	HP-NA	Central Furnace
Rheem RGTC06EMAGS	1	hp	HP-NA	Central Furnace
Rheem RGTC07ERBGS	2	gas	G-NA	Central Furnace
Rheem RGTC07ERBGS	1	hp	HP-NA	Central Furnace
Rheem RGTC-09-ERBGS	1	hp	HP-NA	Central Furnace
Rheem RGTC09EZAJS	1	hp	HP-NA	Central Furnace
Rheem RGTC-09-EZ-AJS	1	hp	HP-NA	Central Furnace
Rheem RGTG06EMAES	1	gas	G-NA	Central Furnace
Rheem RHLL03617	1	gas	G-NA	Central Furnace
Rheem RHLLHM1817JA	1	gas	G-NA	Central Furnace
Trane TDH2B080A9V3VAC	1	gas	G-NA	Central Furnace
Trane XR 95	1	gas	G-NA	Central Furnace
Voyager Fireplace Insert	1	nc	INS-N	Conv.INS
Wolf Steel USA Napoleon 1450	2	nc	INS-N	Conv.INS
Wolf Steel USA Napoleon Insert	1	nc	INS-N	Conv.INS

Total Changeouts	307			

Uncertified Devices Changed Out: 2010-2011		
Stoves	115	(this value, a count of all the replaced devices by type, is used in Table E-25)
Inserts	147	(this value, a count of all the replaced devices by type, is used in Table E-25)
Central Furnaces	46	(this value, a count of all the replaced devices by type, is used in Table E-25)

Notes:
(1) ODOE DEQ Woodstove Change-out Tracking Data, 2011-2012: DEQ Ref. 805.
(2) Certified device listing from EPA website: http://www.epa.gov/compliance/resources/publications/monitoring/caa/woodstoves/certifiedwood.pdf

Appendix E, Table E- 28. Worst-Case Day Forecasted RWC Emissions: Overall Reduction from Advisory Calls and Enforcement

	(7) 2004 (lbs/day)	(7) 2005 (lbs/day)	(7) 2006 (lbs/day)	(7) 2007 (lbs/day)	2008 (lbs/day)	2009 (lbs/day)	2010 (lbs/day)	2011 (lbs/day)	2012 (lbs/day)	2013 (lbs/day)	2014 (lbs/day)	2024 (lbs/day)
Emissions: Device Population Growth Only (1)												
PM2.5	4,152	4,152	4,152	4,152	4,152	4,075	4,011	3,914	3,818	3,798	3,781	3,690
NOX	489	489	489	489	489	482	477	469	460	459	458	454
SO2	72	72	72	72	72	71	71	70	68	68	68	68
VOC	4,751	4,751	4,751	4,751	4,751	4,582	4,449	4,263	4,077	4,019	3,971	3,655
NH3	267	267	267	267	267	263	260	255	250	249	249	248
Advisory Controls												
Control Efficiency (CE): Advisory Call Effectiveness (2)	88%	67%	78%	84%	90%	98%	100%	85%	93%	93%	93%	93%
Rule Effectiveness (RE): Enforcement Effectiveness (3)	58%	58%	58%	58%	58%	69%	78%	92%	74%	74%	74%	74%
Rule Penetration (RP): exempted burners (4)	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%
Advisory-Controlled Emissions (5)	------	------	------	------	------	------	------	------	------	------	------	------
PM2.5	2,233	2,690	2,431	2,302	2,173	1,565	1,131	1,125	1,402	1,394	1,388	1,355
NOX	263	317	286	271	256	185	134	135	169	169	168	167
SO2	39	47	42	40	38	27	20	20	25	25	25	25
VOC	2,556	3,078	2,782	2,634	2,486	1,760	1,254	1,225	1,497	1,475	1,458	1,342
NH3	144	173	156	148	140	101	73	73	92	91	91	91
Reductions from Advisory Controls (6)	------	------	------	------	------	------	------	------	------	------	------	------
PM2.5	1,918	1,462	1,720	1,849	1,979	2,510	2,880	2,789	2,417	2,404	2,393	2,335
NOX	226	172	202	218	233	297	343	334	291	291	290	287
SO2	33	25	30	32	34	44	51	50	43	43	43	43
VOC	2,195	1,673	1,968	2,116	2,264	2,823	3,195	3,037	2,581	2,544	2,513	2,313
NH3	123	94	111	119	127	162	187	182	158	158	157	157

Notes for Table E-28:

(1) 2009-2024 emissions, emissions from device population growth only, are from Tables E-17 through E-21.

(2) Control Efficiency = Average Advisory Call effectiveness,

where Average Call Effectiveness is estimated from Klamath County Forecasted Advisory records:

	Jan	Feb	Mar	Oct	Nov	Dec	Avg
2008							
Total	4	13	1	3	11	12	
Missed	0	1	0	0	1	5	
% Effective (a)	100%	92%	100%	100%	91%	58%	90%
2009							
Total	12	1	0	0	8	10	
Missed	0	0	0	0	1	0	
% Effective (a)	100%	100%	100%	100%	88%	100%	98%
2010							
Total	4	8	1	2	6	5	
Missed	0	0	0	0	0	0	
% Effective (a)	100%	100%	100%	100%	100%	100%	100%
2011							
Total	20		--	--	--	--	
Missed	3		--	--	--	--	
% Effective (a)	85%						85%
2012-2024 Effectiveness (b)							93%

(a) % Effectiveness = 1 - (Missed/Total)

(b) 2012-2024 Avg. % Effectiveness = Average of 2008 through 2011

Notes for Table E-28, continued:

(3) Rule Effectiveness = Average Enforcement Effectiveness,

Enforcement Effectiveness Estimate on Red days: Need reference here.....

	Jan	Feb	Mar	Oct	Nov	Dec	Avg
2008							
# R Calls	4	12	1	3	10	7	
volations	4	31	1	9	78	24	
red days	1	7	1	3	10	9	
Violations/day (a)	4	4	1	3	8	3	
Violations Total (b)	2,128	7,068	133	1,197	10,374	2,483	
% Effective (c)	65%	57%	88%	53%	9%	74%	58%
2009							
# R Calls	12	1	0	0	7	10	
volations	50	6	0	0	36	33	
red days	6	4	0	0	7	8	
Violations/day (a)	8	2	0	0	5	4	
Violations Total (b)	13,300	200	0	0	4,788	5,486	
% Effective (c)	27%	86%	100%	100%	40%	60%	69%
2010							
# R Calls	4	8	1	2	6	5	
volations	10	18	1	0	28	3	
red days	3	6	1	0	6	7	
Violations/day (a)	3	3	1	0	5	0	
Violations Total (b)	1,773	3,192	133	0	3,724	285	
% Effective (c)	71%	71%	88%	100%	46%	96%	78%
2011							
# R Calls	17	6	0	--	--	--	
volations	22	9	0	--	--	--	
red days	18	6	0	--	--	--	
Violations/day (a)	1	2	0	--	--	--	
Violations Total (b)	2,763	1,197	0	--	--	--	
% Effective (c)	89%	86%	100%	--	--	--	92%
2012-2024 Effectiveness (d)							74%

(a) Violations per day = (Violations) / (Red Days)

(b) Violations Total = (Violations/day* # R calls *7*19):
For every violation in one of the 7 surveyed areas, there are an estimated 19 burners not identified. This is based on 2000/2001 enforcement data.

(c) % effectiveness = (total burners - (Violations Total / # R Calls)) / total burners).
Total Burners estimated below:

2008 Survey data: percent of burners by device (DEQ Ref. 695)							
Device	Jan	Feb	Mar	Oct	Nov	Dec	Total
Central Furnace	13%	12%	15%	11%	10%	12%	100%
Fireplace	23%	20%	13%	10%	14%	18%	100%
Insert	14%	13%	12%	10%	13%	14%	100%
Pellet Stove	16%	17%	16%	10%	12%	17%	100%
Wood Stove	15%	14%	10%	9%	13%	15%	100%
Estimated total # of wood burners based on a monthly adjustment factor 2008 survey							
Central Furnace	79	73	91	67	61	73	607
Fireplace	682	593	386	297	415	534	2,967
Insert	302	280	259	216	280	302	2,157
Pellet Stove	85	90	85	53	63	90	529
Wood Stove	370	345	247	222	321	370	2,466
Total Burners	1,518	1,382	1,067	854	1,141	1,369	8,726

(d) 2012-2024 Avg. % Effectiveness = Average of 2008 through 2011

Notes for Table E-28, continued:

(4) Exemptions = approximately 100 burners (reference needed here?)

Rule Penetration = (Exempt Burners/ Total Burners)

	Jan	Feb	Mar	Oct	Nov	Dec	Avg
Total Burners	1,518	1,382	1,067	854	1,141	1,369	
Exempt Burners	100	100	100	100	100	100	
Rule Penetration	93%	93%	91%	88%	91%	93%	92%

(5) Controlled emissions = Uncontrolled Emissions * (1-(CE*RE*RP)). EPA-450/4-91-016, p. 3-22. (DEQ Ref. 2)

(6) Reductions from Advisory & Enforcement =

(Emissions from Device Growth only) - (Advisory & Enforcement Controlled Emissions)

(7) *Emissions from device growth only = 2008 estimates*

CE for "shoulder year" EI data for Rollback Modeling:

	Jan	Feb	Mar	Oct	Nov	Dec	Total	
2003								
Red Days	--	--	--	--	1	0	1	
Missed	--	--	--	--	1	0	1	
% Effective (a)							100%	
2004								
Red Days	2	0	--	--	4	2	8	
Missed	1	0	--	--	4	2	7	
% Effective (a)							88%	
2005								
Red Days	4	2	--	1	3	2	12	
Missed	2	1	--	1	2	2	8	2004/2005 avg
% Effective (a)							67%	77%
Grand Total Red Day							21	
Grand Total Missed							16	
% Effective (a)							24%	

(a) % Effectiveness = 1 - (grand total Missed/grand total red day)

RE = 2008 values, RP held constant at 92% (100 exemptions)

Appendix E, Table E- 29. Nonroad Model (2008a) Output: Klamath County Growth to 2014. Nonroad Emissions Modeled PM2.5 Growth Factors: Averaged by Major SCC Category

	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	------- Annual -------			------- TSD -------			------- WCD -------		
	tpy	tpy	**Growth**	lbs/day	lbs/day	**Growth**	lbs/day	lbs/day	**Growth**
	2008	2014	**Factor**	2008	2014	**Factor**	2008	2014	**Factor**
2-Stroke									
22-60-001-000: Recreational	9.7E+00	8.0E+00	0.831	4.4E+01	3.9E+01	0.892	4.4E+01	3.9E+01	0.892
22-60-002-000: Construction	2.6E-01	2.7E-01	1.016	1.4E+00	1.4E+00	1.016	1.4E+00	1.4E+00	1.016
22-60-003-000: Industrial	1.3E-03	7.1E-04	0.544	6.8E-03	3.7E-03	0.544	6.8E-03	3.7E-03	0.544
22-60-004-000: Lawn & Garden	1.5E+00	1.6E+00	1.098	5.9E+00	6.5E+00	1.105	5.9E+00	6.5E+00	1.105
22-60-005-000: Agricultural	1.8E-02	2.0E-02	1.086	2.8E-02	3.1E-02	1.086	2.8E-02	3.1E-02	1.086
22-60-006-000: Light Commercial	1.8E-01	2.1E-01	1.165	1.1E+00	1.3E+00	1.165	1.1E+00	1.3E+00	1.165
22-60-007-000: Logging	2.3E+00	2.8E+00	1.183	1.5E+01	1.8E+01	1.183	1.5E+01	1.8E+01	1.183
AVG			**0.989**			**0.999**			**0.999**
4-Stroke									
22-65-001-000: Recreational	6.6E-01	8.2E-01	1.241	1.3E+00	1.6E+00	1.241	1.3E+00	1.6E+00	1.241
22-65-002-000: Construction	2.1E-02	2.0E-02	0.961	1.1E-01	1.1E-01	0.961	1.1E-01	1.1E-01	0.961
22-65-003-000: Industrial	2.1E-02	1.2E-02	0.567	1.1E-01	6.2E-02	0.567	1.1E-01	6.2E-02	0.567
22-65-004-000: Lawn & Garden	3.5E-01	4.0E-01	1.132	5.0E-01	5.6E-01	1.125	5.0E-01	5.6E-01	1.125
22-65-005-000: Agricultural	3.4E-02	3.7E-02	1.082	5.3E-02	5.7E-02	1.082	5.3E-02	5.7E-02	1.082
22-65-006-000: Light Commercial	2.0E-01	2.1E-01	1.061	1.3E+00	1.4E+00	1.061	1.3E+00	1.4E+00	1.061
22-65-007-000: Logging	4.5E-02	4.7E-02	1.055	2.9E-01	3.1E-01	1.055	2.9E-01	3.1E-01	1.055
AVG			**1.014**			**1.013**			**1.013**
LPG/CNG									
22-67/68-001-000: Recreational	3.3E-04	3.5E-04	1.046	6.3E-04	6.6E-04	1.046	6.3E-04	6.6E-04	1.046
22-67/68-002-000: Construction	2.3E-03	2.5E-03	1.112	1.2E-02	1.4E-02	1.112	1.2E-02	1.4E-02	1.112
22-67/68-003-000: Industrial	2.5E-01	2.9E-01	1.150	1.3E+00	1.5E+00	1.150	1.3E+00	1.5E+00	1.150
22-67/68-004-000: Lawn & Garden	4.9E-04	5.5E-04	1.113	7.4E-04	8.2E-04	1.113	7.4E-04	8.2E-04	1.113
22-67/68-005-000: Agricultural	3.6E-04	5.2E-05	0.144	5.6E-04	8.1E-05	0.144	5.6E-04	8.1E-05	0.144
22-67/68-006-000: Light Commercial	2.2E-02	2.8E-02	1.231	1.5E-01	1.8E-01	1.231	1.5E-01	1.8E-01	1.231
22-67/68-007-000: Logging	--	--		--	--		--	--	
AVG			**0.966**			**0.966**			**0.966**
Diesel									
22-70-001-000: Recreational	1.1E-01	8.4E-02	0.794	2.0E-01	1.6E-01	0.794	2.0E-01	1.6E-01	0.794
22-70-002-000: Construction	7.7E+00	5.6E+00	0.731	4.1E+01	3.0E+01	0.731	4.1E+01	3.0E+01	0.731
22-70-003-000: Industrial	1.7E+00	1.1E+00	0.635	8.6E+00	5.4E+00	0.635	8.6E+00	5.4E+00	0.635
22-70-004-000: Lawn & Garden	1.1E-01	8.8E-02	0.810	1.9E-01	1.5E-01	0.800	1.9E-01	1.5E-01	0.800
22-70-005-000: Agricultural	2.2E+01	1.5E+01	0.674	3.4E+01	2.3E+01	0.674	3.4E+01	2.3E+01	0.674
22-70-006-000: Light Commercial	1.2E+00	9.1E-01	0.783	7.5E+00	5.9E+00	0.783	7.5E+00	5.9E+00	0.783
22-70-007-000: Logging	3.4E+00	1.8E+00	0.538	2.2E+01	1.2E+01	0.538	2.2E+01	1.2E+01	0.538
AVG			**0.709**			**0.708**			**0.708**
Recreational Marine									
22-82-005-000: Gasoline, 2-Stroke	2.5E+01	1.3E+01	0.513	1.1E+01	5.7E+00	0.513	1.1E+01	5.7E+00	0.513
22-82-010-000: Gasoline, 4-Stroke	4.8E-01	5.0E-01	1.044	2.2E-01	2.3E-01	1.044	2.2E-01	2.3E-01	1.044
22-82-020-000: Diesel	1.3E+00	1.3E+00	1.028	5.8E-01	6.0E-01	1.028	5.8E-01	6.0E-01	1.028
AVG			**0.862**			**0.862**			**0.862**
Railway Maintenance									
22-85-000-000: All Fuel Types	4.9E-01	3.9E-01	**0.792**	3.4E+00	2.7E+00	**0.792**	3.4E+00	2.7E+00	**0.792**

Appendix E, Table E- 30. Nonroad Model (2008a) Output: Klamath County Growth to 2014. Nonroad Emissions Modeled NOX Growth Factors: Averaged by Major SCC Category

	NOX	NOX	NOX	NOX	NOX	NOX	NOX	NOX	NOX
	------- Annual -------			------- TSD -------			------- WCD -------		
	tpy	tpy	**Growth**	lbs/day	lbs/day	**Growth**	lbs/day	lbs/day	**Growth**
	2008	2014	**Factor**	2008	2014	**Factor**	2008	2014	**Factor**
2-Stroke									
22-60-001-000: Recreational	2.3E+00	4.6E+00	2.017	2.0E+01	4.6E+01	2.338	2.3E+01	4.6E+01	2.022
22-60-002-000: Construction	4.1E-02	4.8E-02	1.159	2.3E-01	2.6E-01	1.144	2.6E-01	2.6E-01	0.989
22-60-003-000: Industrial	3.5E-04	2.2E-04	0.637	1.9E-03	1.2E-03	0.629	2.2E-03	1.2E-03	0.544
22-60-004-000: Lawn & Garden	3.6E-01	4.9E-01	1.349	1.4E+00	1.8E+00	1.310	1.6E+00	1.8E+00	1.133
22-60-005-000: Agricultural	5.0E-03	6.4E-03	1.290	7.9E-03	1.0E-02	1.273	9.1E-03	1.0E-02	1.101
22-60-006-000: Light Commercial	4.6E-02	6.3E-02	1.365	3.1E-01	4.1E-01	1.347	3.5E-01	4.1E-01	1.165
22-60-007-000: Logging	3.3E-01	4.6E-01	1.386	2.2E+00	3.0E+00	1.368	2.5E+00	3.0E+00	1.183
AVG			**1.315**			**1.344**			**1.162**
4-Stroke									
22-65-001-000: Recreational	7.8E+00	8.4E+00	1.077	1.7E+01	1.8E+01	1.067	2.0E+01	1.9E+01	0.963
22-65-002-000: Construction	8.3E-01	5.0E-01	0.598	5.1E+00	3.0E+00	0.592	5.9E+00	3.1E+00	0.534
22-65-003-000: Industrial	1.4E+00	4.4E-01	0.309	8.5E+00	2.6E+00	0.306	9.8E+00	2.7E+00	0.276
22-65-004-000: Lawn & Garden	1.1E+01	8.5E+00	0.770	1.9E+01	1.6E+01	0.861	2.1E+01	1.7E+01	0.777
22-65-005-000: Agricultural	2.7E+00	2.2E+00	0.799	4.8E+00	3.8E+00	0.792	5.5E+00	3.9E+00	0.714
22-65-006-000: Light Commercial	6.5E+00	4.9E+00	0.754	4.8E+01	3.6E+01	0.747	5.6E+01	3.7E+01	0.674
22-65-007-000: Logging	2.0E+00	1.9E+00	0.933	1.5E+01	1.4E+01	0.924	1.7E+01	1.4E+01	0.834
AVG			**0.749**			**0.756**			**0.682**
LPG/CNG									
22-67/68-001-000: Recreational	5.9E-02	4.5E-02	0.772	1.1E-01	8.7E-02	0.772	0.11	0.09	0.772
22-67/68-002-000: Construction	2.8E-01	1.3E-01	0.466	1.5E+00	7.0E-01	0.466	1.50	0.70	0.466
22-67/68-003-000: Industrial	2.9E+01	8.9E+00	0.312	1.5E+02	4.7E+01	0.312	149.16	46.53	0.312
22-67/68-004-000: Lawn & Garden	5.2E-02	1.5E-02	0.281	7.8E-02	2.2E-02	0.281	0.08	0.02	0.281
22-67/68-005-000: Agricultural	6.8E-02	6.0E-03	0.088	1.1E-01	9.4E-03	0.088	0.11	0.01	0.088
22-67/68-006-000: Light Commercial	2.5E+00	1.8E+00	0.730	1.6E+01	1.2E+01	0.730	16.03	11.70	0.730
22-67/68-007-000: Logging	--	--		--	--		--	--	
AVG			**0.442**			**0.442**			**0.442**
Diesel									
22-70-001-000: Recreational	7.1E-01	6.5E-01	0.915	1.4E+00	1.2E+00	0.915	1.4E+00	1.2E+00	0.915
22-70-002-000: Construction	9.2E+01	6.7E+01	0.720	5.0E+02	3.6E+02	0.720	5.0E+02	3.6E+02	0.720
22-70-003-000: Industrial	2.2E+01	1.6E+01	0.734	1.1E+02	7.8E+01	0.726	1.1E+02	7.8E+01	0.726
22-70-004-000: Lawn & Garden	1.3E+00	1.3E+00	0.958	2.4E+00	2.3E+00	0.948	2.4E+00	2.3E+00	0.948
22-70-005-000: Agricultural	2.3E+02	1.9E+02	0.796	3.6E+02	2.9E+02	0.796	3.6E+02	2.9E+02	0.796
22-70-006-000: Light Commercial	1.2E+01	1.0E+01	0.902	7.5E+01	6.7E+01	0.902	7.5E+01	6.7E+01	0.902
22-70-007-000: Logging	5.0E+01	2.4E+01	0.484	3.2E+02	1.6E+02	0.484	3.2E+02	1.6E+02	0.484
AVG			**0.787**			**0.785**			**0.785**
Recreational Marine									
22-82-005-000: Gasoline, 2-Stroke	7.8E+01	1.2E+02	1.534	3.5E+01	5.4E+01	1.514	4.1E+01	5.4E+01	1.310
22-82-010-000: Gasoline, 4-Stroke	8.1E+01	8.1E+01	0.993	4.2E+01	4.1E+01	0.984	4.8E+01	4.3E+01	0.888
22-82-020-000: Diesel	6.4E+01	6.5E+01	1.005	2.9E+01	2.9E+01	1.005	2.9E+01	2.9E+01	1.005
AVG			**1.177**			**1.168**			**1.067**
Railway Maintenance									
22-85-000-000: All Fuel Types	4.0E+00	3.4E+00	0.853	2.8E+01	2.4E+01	0.852	2.8E+01	2.4E+01	0.850

Appendix E, Table E- 31. Nonroad Model (2008a) Output: Klamath County Growth to 2014.
Nonroad Emissions Modeled VOC Growth Factors: Averaged by Major SCC Category

	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC
	------- Annual -------			------- TSD -------			------- WCD -------		
	tpy	tpy	**Growth**	lbs/day	lbs/day	**Growth**	lbs/day	lbs/day	**Growth**
	2008	2014	**Factor**	2008	2014	**Factor**	2008	2014	**Factor**
2-Stroke									
22-60-001-000: Recreational	3.1E+02	2.6E+02	0.830	1.7E+03	1.4E+03	0.842	1.6E+03	1.4E+03	0.849
22-60-002-000: Construction	2.0E+00	1.9E+00	0.965	1.1E+01	1.0E+01	0.966	1.0E+01	1.0E+01	0.973
22-60-003-000: Industrial	1.0E-02	5.6E-03	0.539	5.3E-02	2.9E-02	0.540	5.3E-02	2.9E-02	0.543
22-60-004-000: Lawn & Garden	1.9E+01	1.8E+01	0.940	1.2E+02	1.3E+02	1.044	1.2E+02	1.2E+02	1.050
22-60-005-000: Agricultural	1.3E-01	1.3E-01	0.986	2.1E-01	2.0E-01	0.937	2.1E-01	1.9E-01	0.944
22-60-006-000: Light Commercial	1.6E+00	1.8E+00	1.129	1.0E+01	1.2E+01	1.133	1.0E+01	1.2E+01	1.140
22-60-007-000: Logging	1.8E+01	2.1E+01	1.176	1.2E+02	1.4E+02	1.176	1.1E+02	1.4E+02	1.184
AVG			**0.938**			**0.948**			**0.955**
4-Stroke									
22-65-001-000: Recreational	5.2E+01	5.4E+01	1.032	1.0E+02	1.0E+02	0.990	9.5E+01	9.7E+01	1.020
22-65-002-000: Construction	1.9E+00	1.0E+00	0.538	9.8E+00	5.2E+00	0.525	9.4E+00	5.2E+00	0.553
22-65-003-000: Industrial	1.5E+00	4.6E-01	0.316	7.6E+00	2.4E+00	0.316	7.3E+00	2.4E+00	0.333
22-65-004-000: Lawn & Garden	4.9E+01	3.2E+01	0.664	8.4E+01	5.9E+01	0.708	7.9E+01	5.7E+01	0.723
22-65-005-000: Agricultural	4.4E+00	3.3E+00	0.744	6.9E+00	5.0E+00	0.734	6.5E+00	4.9E+00	0.752
22-65-006-000: Light Commercial	2.1E+01	1.3E+01	0.608	1.3E+02	7.5E+01	0.586	1.2E+02	7.5E+01	0.613
22-65-007-000: Logging	5.5E+00	4.6E+00	0.834	3.4E+01	2.8E+01	0.823	3.2E+01	2.8E+01	0.857
AVG			**0.677**			**0.669**			**0.693**
LPG/CNG									
22-67/68-001-000: Recreational	1.6E-02	1.2E-02	0.779	3.1E-02	2.4E-02	0.779	3.1E-02	2.4E-02	0.779
22-67/68-002-000: Construction	7.7E-02	3.4E-02	0.433	4.2E-01	1.8E-01	0.433	4.2E-01	1.8E-01	0.433
22-67/68-003-000: Industrial	7.6E+00	2.0E+00	0.263	3.9E+01	1.0E+01	0.263	3.9E+01	1.0E+01	0.263
22-67/68-004-000: Lawn & Garden	1.5E-02	3.2E-03	0.221	2.2E-02	4.9E-03	0.221	2.2E-02	4.9E-03	0.221
22-67/68-005-000: Agricultural	2.8E-03	1.1E-03	0.389	4.4E-03	1.7E-03	0.389	4.4E-03	1.7E-03	0.389
22-67/68-006-000: Light Commercial	4.4E-01	2.9E-01	0.674	2.8E+00	1.9E+00	0.674	2.8E+00	1.9E+00	0.674
22-67/68-007-000: Logging	--	--		--	--		--	--	
AVG			**0.460**			**0.460**			**0.460**
Diesel									
22-70-001-000: Recreational	2.0E-01	1.5E-01	0.779	3.8E-01	3.0E-01	0.779	3.8E-01	3.0E-01	0.779
22-70-002-000: Construction	9.6E+00	7.1E+00	0.735	5.2E+01	3.8E+01	0.735	5.2E+01	3.8E+01	0.735
22-70-003-000: Industrial	2.0E+00	1.3E+00	0.654	9.8E+00	6.4E+00	0.654	9.8E+00	6.4E+00	0.654
22-70-004-000: Lawn & Garden	1.5E-01	1.2E-01	0.785	2.7E-01	2.1E-01	0.793	2.7E-01	2.1E-01	0.793
22-70-005-000: Agricultural	2.4E+01	1.6E+01	0.700	3.7E+01	2.6E+01	0.700	3.7E+01	2.6E+01	0.700
22-70-006-000: Light Commercial	1.7E+00	1.3E+00	0.751	1.1E+01	8.3E+00	0.751	1.1E+01	8.3E+00	0.751
22-70-007-000: Logging	3.7E+00	2.1E+00	0.573	2.4E+01	1.4E+01	0.573	2.4E+01	1.4E+01	0.573
AVG			**0.711**			**0.712**			**0.712**
Recreational Marine									
22-82-005-000: Gasoline, 2-Stroke	1.5E+03	8.9E+02	0.585	8.9E+02	5.9E+02	0.658	8.5E+02	5.3E+02	0.619
22-82-010-000: Gasoline, 4-Stroke	6.5E+01	5.7E+01	0.879	5.8E+01	5.3E+01	0.915	4.8E+01	4.2E+01	0.881
22-82-020-000: Diesel	2.7E+00	3.2E+00	1.192	1.2E+00	1.4E+00	1.192	1.2E+00	1.4E+00	1.192
AVG			**0.782**			**0.800**			**0.788**
Railway Maintenance									
22-85-000-000: All Fuel Types	9.0E-01	6.7E-01	0.748	6.2E+00	4.6E+00	0.747	6.2E+00	4.6E+00	0.755

Appendix E, Table E- 32. Nonroad Model (2008a) Output: Klamath County Growth to 2014. Nonroad Emissions Modeled SO2 Growth Factors: Averaged by Major SCC Category

	SO2	SO2	SO2	SO2	SO2	SO2	SO2	SO2	SO2
	------- Annual -------			------- TSD -------			------- WCD -------		
	tpy	tpy		lbs/day	lbs/day		lbs/day	lbs/day	
	2008	2014	**Factor**	2008	2014	**Factor**	2008	2014	**Factor**
2-Stroke									
22-60-001-000: Recreational	5.0E-02	4.1E-02	0.818	5.6E-01	4.3E-01	0.776	5.6E-01	4.4E-01	0.785
22-60-002-000: Construction	5.6E-04	3.6E-04	0.644	3.0E-03	2.0E-03	0.660	3.0E-03	2.0E-03	0.668
22-60-003-000: Industrial	4.8E-06	1.6E-06	0.346	2.5E-05	8.8E-06	0.355	2.5E-05	8.9E-06	0.358
22-60-004-000: Lawn & Garden	5.3E-03	3.7E-03	0.710	2.2E-02	1.6E-02	0.726	2.2E-02	1.6E-02	0.734
22-60-005-000: Agricultural	6.8E-05	4.7E-05	0.694	1.1E-04	7.5E-05	0.712	1.1E-04	7.6E-05	0.719
22-60-006-000: Light Commercial	6.2E-04	4.6E-04	0.739	4.0E-03	3.1E-03	0.758	4.0E-03	3.1E-03	0.767
22-60-007-000: Logging	4.6E-03	3.4E-03	0.752	3.0E-02	2.3E-02	0.771	3.0E-02	2.3E-02	0.780
AVG			**0.672**			**0.680**			**0.687**
4-Stroke									
22-65-001-000: Recreational	7.1E-02	5.5E-02	0.776	1.4E-01	1.1E-01	0.796	1.4E-01	1.1E-01	0.805
22-65-002-000: Construction	4.0E-03	2.6E-03	0.640	2.2E-02	1.4E-02	0.657	2.2E-02	1.4E-02	0.664
22-65-003-000: Industrial	4.3E-03	1.6E-03	0.375	2.2E-02	8.5E-03	0.384	2.2E-02	8.6E-03	0.388
22-65-004-000: Lawn & Garden	6.4E-02	4.5E-02	0.704	1.1E-01	7.6E-02	0.724	1.1E-01	7.7E-02	0.732
22-65-005-000: Agricultural	9.3E-03	6.2E-03	0.661	1.5E-02	9.9E-03	0.679	1.5E-02	1.0E-02	0.686
22-65-006-000: Light Commercial	3.6E-02	2.6E-02	0.736	2.3E-01	1.8E-01	0.755	2.3E-01	1.8E-01	0.763
22-65-007-000: Logging	1.1E-02	7.9E-03	0.717	7.1E-02	5.2E-02	0.735	7.1E-02	5.3E-02	0.743
AVG			**0.659**			**0.676**			**0.683**
LPG/CNG									
22-67/68-001-000: Recreational	3.0E-04	3.0E-04	0.998	5.8E-04	5.8E-04	0.998	5.8E-04	5.8E-04	0.998
22-67/68-002-000: Construction	1.9E-03	2.0E-03	1.035	1.0E-02	1.1E-02	1.035	1.0E-02	1.1E-02	1.035
22-67/68-003-000: Industrial	2.1E-01	2.2E-01	1.062	1.1E+00	1.2E+00	1.062	1.1E+00	1.2E+00	1.062
22-67/68-004-000: Lawn & Garden	4.1E-04	4.2E-04	1.031	6.1E-04	6.3E-04	1.031	6.1E-04	6.3E-04	1.031
22-67/68-005-000: Agricultural	2.7E-04	4.2E-05	0.158	4.1E-04	6.5E-05	0.158	4.1E-04	6.5E-05	0.158
22-67/68-006-000: Light Commercial	1.9E-02	2.2E-02	1.174	1.2E-01	1.4E-01	1.174	1.2E-01	1.4E-01	1.174
22-67/68-007-000: Logging	--	--		--	--		--	--	
AVG			**0.910**			**0.910**			**0.910**
Diesel									
22-70-001-000: Recreational	1.4E-02	4.9E-04	0.034	2.7E-02	9.4E-04	0.034	2.7E-02	9.4E-04	0.034
22-70-002-000: Construction	2.2E+00	7.1E-02	0.032	1.2E+01	3.8E-01	0.032	1.2E+01	3.8E-01	0.032
22-70-003-000: Industrial	5.7E-01	1.8E-02	0.032	2.8E+00	9.0E-02	0.032	2.8E+00	9.0E-02	0.032
22-70-004-000: Lawn & Garden	2.8E-02	1.0E-03	0.037	5.1E-02	1.9E-03	0.036	5.1E-02	1.9E-03	0.036
22-70-005-000: Agricultural	4.8E+00	1.6E-01	0.033	7.5E+00	2.5E-01	0.033	7.5E+00	2.5E-01	0.033
22-70-006-000: Light Commercial	2.4E-01	8.5E-03	0.035	1.6E+00	5.5E-02	0.035	1.6E+00	5.5E-02	0.035
22-70-007-000: Logging	1.4E+00	3.7E-02	0.025	9.4E+00	2.4E-01	0.025	9.4E+00	2.4E-01	0.025
AVG			**0.033**			**0.033**			**0.033**
Recreational Marine									
22-82-005-000: Gasoline, 2-Stroke	5.2E-01	3.4E-01	0.658	2.3E-01	1.6E-01	0.675	2.3E-01	1.6E-01	0.683
22-82-010-000: Gasoline, 4-Stroke	1.8E-01	1.1E-01	0.642	7.9E-02	5.2E-02	0.658	7.9E-02	5.3E-02	0.665
22-82-020-000: Diesel	1.4E+00	2.0E-01	0.137	6.4E-01	8.8E-02	0.137	6.4E-01	8.8E-02	0.137
AVG			**0.255**			**0.261**			**0.263**
Railway Maintenance									
22-85-000-000: All Fuel Types	7.6E-02	2.9E-03	0.039	5.3E-01	2.1E-02	0.039	5.3E-01	2.1E-02	0.039

Appendix E, Table E- 33. Re-Entrained Road Dust, PM2.5 Emissions Forecast: Paved Roads

22-94-000-000: Paved Roads /All Paved Roads /Total: Fugitives (does not include brake or tire: These values are included in MOVES output)

(1)	(2)	(3)	(4)	(5)	(5)	(6)	(7)	(8)	(8)	(9)	(9)	(10)	(11)	(12)	(13)
------ Nonattainment Area ------			PM 2.5 Emission Factor Calculation Parameters					PM2.5 Emission Factor						--- PM Season ---	
				----- *sL* -----				------------- *E* -------------							
2014 Daily VMT	% Paved Roads	Paved Road Daily VMT	*k* (g/VMT)	TSD (g/m^2)	WCD (g/m^2)	*W* (tons)	Control Efficiency (CE)	TSD (g/VMT)	WCD (g/VMT)	TSD (lb/VMT)	WCD (lb/VMT)	Seas. Adj. Factor (SAF)	2014 Annual Emiss. (tons/yr)	Typical Day Emiss. (lbs/day)	Worst Case Day Emiss. (lbs/day)
786,611	96%	757,911	0.25	0.37	3.1	3	0.90	0.03	0.22	7.1E-05	0.00049	0.74	**6.3**	**40**	**276**

Notes for Table E-33:

(1) E-mail from Richard Arnold, ODOT, to C. Swab. Klamath Falls 2008 VMT by TAZ and Link (downloaded from ODOT ftp site). 6/24/2011. (DEQ Ref. 747).
The ArcGIS project for the final VMT (clipped to the NAA) is located here:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\MOVES\KFalls_MOVES_GIS\KFalls_MOVES.mxd

(2) Total NAA road mileage = 396.04 (see note 1 for mileage data source and ArcGIS analysis project location)
Total NAA Paved Roadway mileage = 381.59 (DEQ Ref. 748)
% NAA Paved Roadway = 96.4%

(3) Paved road daily VMT = (NAA daily VMT) * (% Paved Roads within the NAA)

(4) k = Particle Size Multiplier = 0.25 g/VMT. AP-42, Table 13.2.1-1. (DEQ Ref. 8).

(5) sL = Paved Road Silt Loading Typical Season Day (TSD) = 0.37 g/m^2
Worst Case Day (WCD) = 3.1 g/m^2
Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)

(6) W = Average Vehicle Weight, tons = 3. This is a DEQ staff best estimate.

(7) Worst Case Day (WCD) Control Efficiency is due to the removal of road sand after sanding operations during ice and snow. Since the worst case day silt loading factor is due to the effects of road sanding, a control efficiency for sand removal can be applied to worst case day emissions estimates. The CE value for paved road sanding is based upon FHwA's estimates for high efficiency machines at 99.6% removal efficiency and 90% of the area covered CE is applied to the WCD PM2.5 EF calculations, see note (8) below.

(8) Typical Season Day (TSD) PM2.5 EF, E, g/VMT = k * (sL^0.91) * (W^1.02). AP-42, Chapter 13, Equation 1, p. 13.2.1-4. (DEQ Ref. 8)
Worst Case Day (WCD) PM2.5 EF, g/VMT = k * (sL^0.91) * (W^1.02) * (1-CE). AP-42, Chapter 13, Equation 1, p. 13.2.1-4, with CE added. (DEQ Ref. 8)

(9) PM2.5 EF, E, lb/VMT = (Particulate EF, g/VMT) * (0.0022046 lb/g)

(10) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)
SAF estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: Annual Days Without Precipitation: See Appendix D, Table D-2

(11) 2008 NAA Annual Emissions, tpy = (Paved Road Daily VMT) * (233 days per year w/out precipitation) * (Particulate EF, lb/VMT, TSD) / (2000 lbs/ton)
Annual days without precipitation estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: See Appendix B9, Table B9i.

(12) 2008 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT, TSD) * (SAF)

(13) 2008 NAA Worst Case Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT, WCD) * (SAF)

Appendix E, Table E- 34. Re-Entrained Road Dust, PM2.5 Emissions Forecast: Unpaved Roads

22-96-000-000: Unpaved Roads /All Unpaved Roads /Total: Fugitives (does not include brake or tire: These values are included in MOVES output)

(1)	(2)	(3)	(4)	(5)	(6)	(6)	(7)	(8)	(4)	(4)	(4)	(4)	(9)	(10)	(11)	(12)	(13)
																--- PM Season ---	
------ Nonattainment Area ------													PM2.5	Seasonal	2014	Typical	Worst
	%	Unpaved	---------- PM 2.5 Emission Factor Calculation Parameters. ----------										EF	Adjustment	Annual	Day	Case Day
2014	Unpaved	Road	*k*	*s*	*W*	*S*	*M*	*C*					*E*	Factor	Emissions	Emissions	Emissions
Daily VMT	Roads	Daily VMT	(lb/VMT)	(%)	(tons)	(mph)	(%)	(lb/VMT)	*a*	*b*	*c*	*d*	(lb/VMT)	(SAF)	(tons/yr)	(lbs/day)	(lbs/day)
Industrial Sites																	
786,611	2.7%	21,525	0.15	12%	25	--	12.5%	0.00036	0.9	0.45	--	--	0.0062	0.74	15.5	99	99
Publicly Accessible Roads																	
786,611	0.9%	7,175	0.18	8.7%	--	41.3	0.8%	0.00036	1	--	0.2	0.5	0.0032	0.74	2.6	17	17
															-------	-------	-------
Total															**18.1**	**116**	**116**

Notes for Table E-34:

(1) E-mail from Richard Arnold, ODOT, to C. Swab. Klamath Falls 2008 VMT by TAZ and Link (downloaded from ODOT ftp site). 6/24/2011. (DEQ Ref. 747).
The ArcGIS project for the final VMT (clipped to the NAA) is located here:
\\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\MOVES\KFalls_MOVES_GIS\KFalls_MOVES.mxd

(2) Total NAA road mileage =	396.04	(see note 1 for mileage data source and ArcGIS analysis project location)
Total NAA Unpaved Roadway mileage =	14.45	(DEQ Ref. 748)
% NAA Unpaved Roadway =	3.6%	
Industrial Sites =	2.7%	(50% of all unpaved NAA roadway, DEQ staff best estimate)
Publicly Accessible Roadways =	0.9%	(50% of all unpaved NAA roadway, DEQ staff best estimate)

(3) Unpaved road daily VMT = (NAA daily VMT) * (% Unpaved Roads within the NAA)
(4) Constants. AP-42, Table 13.2.2-2, p. 13.2.2-5. (DEQ Ref. 8)
(5) s = Surface Material Silt Content. Values taken from:
Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)
(6) W = Average Vehicle Weight in tons, S = Average Vehicle Speed. Values taken from:
Industrial W: Reference as in note (5), specifically, p. 41, Modoc Lumber Co. used as a surrogate.
Publicly Accessible Roads S: Speed estimated from ODOT data (see note 1). Speed is a VMT weight average, estimated as follows:

∑ (speed by link * daily VMT by link) =	30,081,747	VMT*mph
∑ daily VMT by link =	728,582	VMT

Avg Vehicle Speed =	41.3	mph

(7) M = Surface Material Moisture Content. Reference as in note (%). Table 2, p.12. Values are specific to Klamath Falls.
(8) C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear. From AP-42, Table 13.2.2-4, p. 13.2.2-6. (DEQ Ref. 8).
(9) Industrial PM2.5 EF, E = k * (s/12)^a * (W/3)^b. AP-42, Chapter 13.2.2, Equation 1a, p. 13.2.2-4. (DEQ Ref. 8)
Publicly Accessible Roads PM2.5 EF, E = ([k * (s/12)^a * (S/30)^d] \ [(M/0.5)^c]) - C. AP-42, Chapter 13.2.2, Equation 1b, p. 13.2.2-4. (DEQ Ref. 8)
(10) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)
SAF estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: Annual Days Without Precipitation: See Appendix D, Table D-2
(11) 2008 NAA Annual Emissions, tpy = (Unpaved Road Daily VMT) * (233 annual days without precipitation) * (PM2.5 EF, lb/VMT) / (2000 lbs/ton)
Annual days without precipitation estimated from 2005, 2008, 2009 precipitation data at Kingsley Field: See Appendix B9, Table B9i.
(12) 2008 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT) * (SAF)
(13) Worst Case Day assumed equal to Typical Season Day

APPENDIX A-12

Potential contribution of prescribed burning on Klamath Falls Design Value Days

Overview.

The level of impacts from prescribed burning on the Klamath Falls PM2.5 NAA during the winter season has been of concern in developing the Design Value (DV) for the Attainment Demonstration. Because of the episodic timing and location of burns, it has been difficult to quantify the contribution of prescribed fire to measured concentrations at the Peterson School, in particular as they may affect the DV.

In examining temperature data for the Klamath Falls DV days, EPA flagged four days with both high measured PM2.5 and higher than average winter time temperatures. Three of these days are in 2007 (11/5, 11/8, and 11/14) and one day in 2010 (11/13). It was considered that the high levels of PM2.5 on these days could be the result of smoke intrusion from prescribed burning events outside of the NAA based on the reasonable assumption that high temperatures would be inversely correlated with residential wood heating, the presumed major contributor to high ambient levels of PM2.5, and that less residential wood burning could have occurred.

In order to evaluate the significance that prescribed burning may have had on these days, burn information was obtained from the Oregon Dept of Forestry (ODF) for 2007, and NOAA MODIS imagery of fires was obtained from the WRAP - FETS (Fire Emissions Tracking System) for 2010. In addition, wind speed, wind direction, temperature, and nephelometer (b scat) data was acquired from the DEQ Peterson School Monitor for these days.

These data have been compiled and presented in a series of spreadsheets for each of the four days of concern, and include plots of temperature / PM2.5, windspeed / PM2.5, and wind direction / PM2.5. Information about the burns that could reasonably impact the monitor is also provided in the charts, including location, distance and direction to the fire from the monitor. In addition, forward trajectories were plotted for each of the burns using the NOAA-ARL program HYSPLIT.

The results of this brief analysis show that prescribed burning on these days did not significantly impact the Peterson School monitor, and that high PM2.5 measurements were the results of local emissions sources, most likely from residential wood heating.

Notes about maps and charts.

1) The PM2.5 / Temperature plots show the basis for identifying the four Design Value Days. The plots show a significant diurnal swing in temperature accompanied by swings in PM2.5 concentration.

2) The location map identifies all burns that were considered significant for the target days (11/5/07, 11/8/07, 11/14/07, and 11/13/10). Labels are color coded to identify fires by target day. Note that there were no fires in the record for the target day 11/5/07.

3) The HYSPLIT plots include forward trajectories for all fires shown on the location map. Start times are ignition times as given in the ODF reports. The times of the NOAA MODIS images represent overflight times. Fires are detected by MODIS above a certain intensity level, for example sufficiently bright to light up a single pixel. As a result fires are already burning by the time of overflight and as a default, ignition times are considered to have occurred two hours before overflight time. HYSPLIT was run for four consecutive hours after ignition, thus each burn has plume streamlines all of the same color, one for each hour. The different colors for the burns have no significance and were chosen only to distinguish fires one from another and to provide aesthetic relief. The estimated plume height was 300 meters, which is based on information from Idaho DEQ, WSU, and other sources for agricultural and prescribed forest burning. Initial modeling using a plume height of 50 meters did not show significant differences, so in these HYSPLIT runs, at least, forward trajectories did not appear to be sensitive to this parameter.

4) Each target day of interest has two plots: PM2.5 / wind direction, and PM2.5 / windspeed. Since the frequency of winds out of the north and south are significant, 135 degrees were added to wind directions less than 135 in order to keep northerly winds in the same area of the plot. Thus, a 1 degree wind direction is represented by 366 degrees on the plot. Following the “truthiness” convention as developed by a prominent TV philosopher, of sorts, winds are characterized by their northiness, southiness, etc., shortened to northy, southy, easty, and westy. For each target day, burns that may impact the Peterson School monitor are identified with their parameters in an insert table at the top of the plot.

Comments.

All target days show distinct PM2.5 diurnal patterns with low concentrations during mid day, and peak values in the evening and early morning hours. Windspeeds are in general low (less that 5 mph) for most hours with relatively higher winds during mid day, and very low winds in the evening. Wind directions show some favorability for the northwest, but some hours for some days show southerly winds. East-west winds are not as common for the target days. The HYSPLIT results show that the trajectories for all burns on both the target day and previous day did not approach or enter the Klamath Falls NAA.

The following is an overview of the data for each of the four target days:

1) 11/5/2007. Information from ODF indicates no burning activity. PM2.5 concentrations show a distinct diurnal variation with low concentrations during mid-day. Windspeeds are low (1-5 mph) and show no strong correlation with time of day and PM2.5 levels. Wind direction is northwesterly with a somewhat more northerly component in the evening and more westerly during the day.

2) 11/8/2007. Burning occurred on 11/7 and 11/8 at distances of 123 and 61 km, respectively. PM2.5 shows a distinct diurnal variation with low concentrations during mid-day. Windspeeds are less than 4 mph and show no strong correlation with time of day and PM2.5 levels for the day of concern. Wind direction shows some diurnal variation with more southerly flow during mid-day that is correlated lower PM2.5. The evening hours show winds out of the north and northeast, but at very low wind speeds.

3) 11/14/2007. ODF records show burning on 11/13 (9 fires to the north and west south west) and on 11/14 (2 fires to the north). Distances ranged from 32 to almost 150 km. PM2.5 shows a

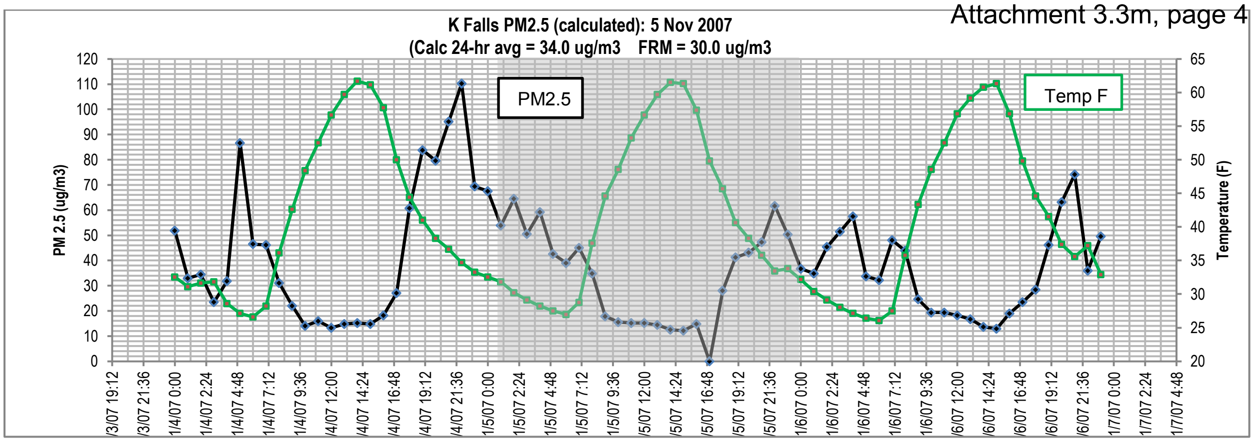
distinct diurnal variation with low concentrations during mid-day. Winds on the day of concern, peak at about 5.5 mph during mid day and are from the northwest. The lowest PM2.5 concentrations are observed during this time indicating the burning activity to the north is not contributing to PM2.5 concentrations. Winds drop in the evening hours to 1-2 mph at the time of highest PM2.5 concentrations. Wind direction in the evening is variable but with somewhat of a north westerly component. The highest concentrations in the evening hours with low wind speeds and shifting directions suggest local emission sources.

4) 11/13/2010. No burn information was readily available from ODF for fires in 2010. However, satellite NOAA MODIS imagery was obtained from WRAP – FETS. These images showed two fires, above a minimum threshold, at times of satellite overpass on 11/12 and 121/13. These burns were located about 64 and 81 km to the north and northwest, respectively. Although moderate winds (up to about 8.5 mph) out of the northwest were observed during mid day on 11/12, lower winds, between 2-3 mph were seen on the day of concern (11/13) throughout the day and evening hours. The daytime northwesterly daytime winds on 11/12 shifted to northeasterly in the evening hours of 11/12, to highly variable on 11/13. During hours of highest PM2.5 concentration on the evening of 11/13/2010, the winds were predominantly out of the east and northeast. As a result, the high concentrations on 11/13/2010 do not reflect the influence of prescribed burning outside of the NAA, but appear and to be from local emission sources such as RWC.

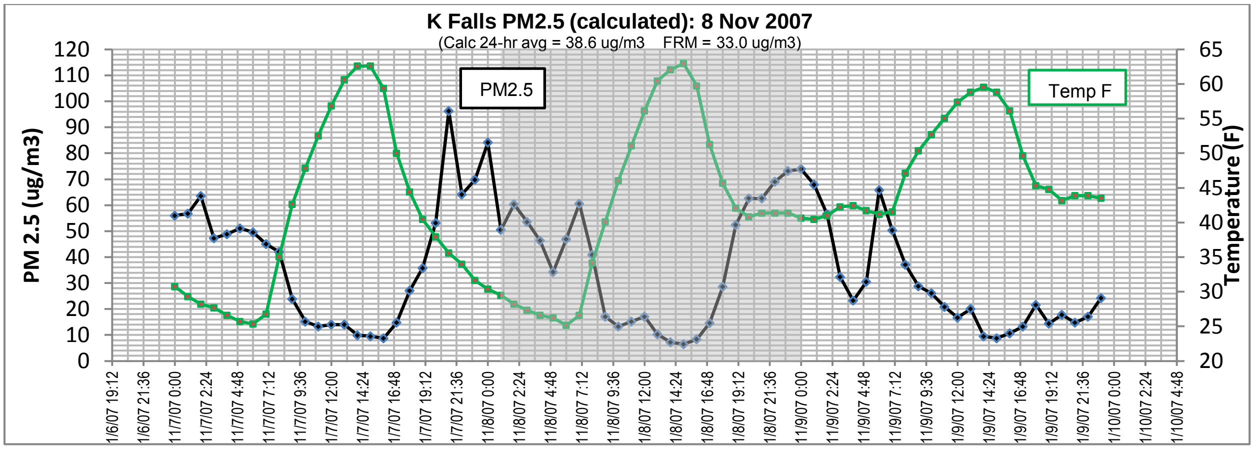
<u>Conclusions.</u>

HYSPLIT results show that plume trajectories do not impact the Klamath Falls NAA. In addition, an analysis of local winds and estimated PM2.5 concentrations measured at the Peterson School monitor do not show patterns that are consistent with smoke intrusion events. In particular, the diurnal variation of PM2.5 concentrations in the presence of overall low windspeeds, especially during evening hours, and generally shifty wind directions suggest the influence of local, temporally varying emission sources such as residential wood heating. As a result DEQ believes that prescribed burning contributions to the PM2.5 mass measured on the target days (DV days) are not significant and that these days should remain in the record of days used to construct the Design Value.

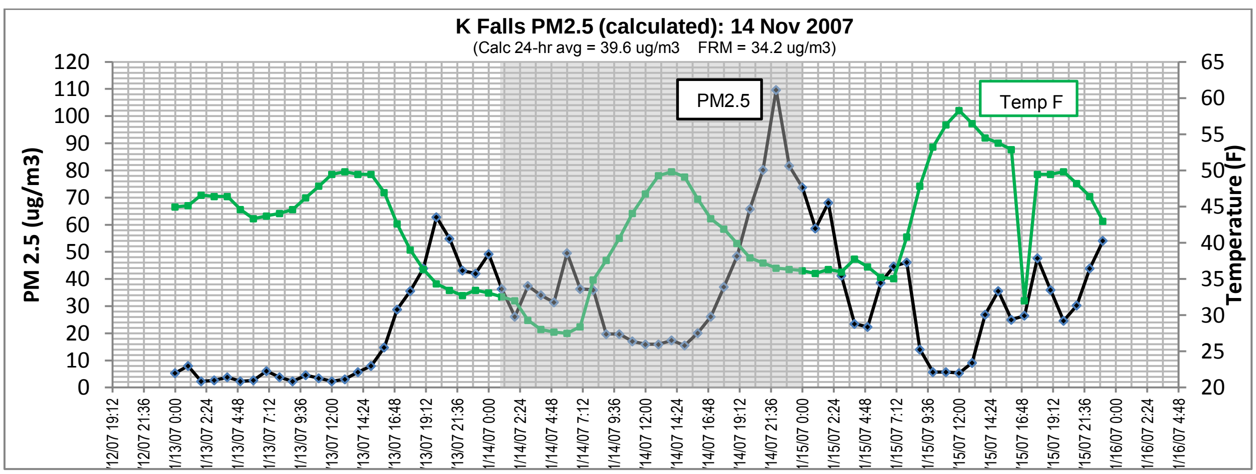
Oregon DEQ, 7 March 2012



K Falls PM2.5 (calculated): 5 Nov 2007
(Calc 24-hr avg = 34.0 ug/m3 FRM = 30.0 ug/m3)



K Falls PM2.5 (calculated): 8 Nov 2007
(Calc 24-hr avg = 38.6 ug/m3 FRM = 33.0 ug/m3)



K Falls PM2.5 (calculated): 14 Nov 2007
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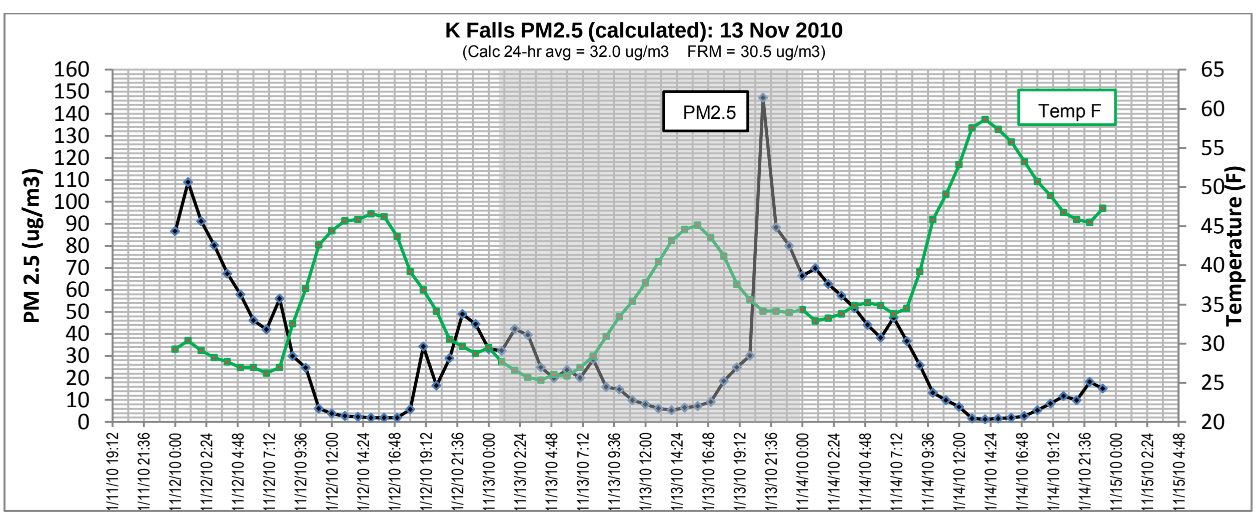

K Falls PM2.5 (calculated): 13 Nov 2010
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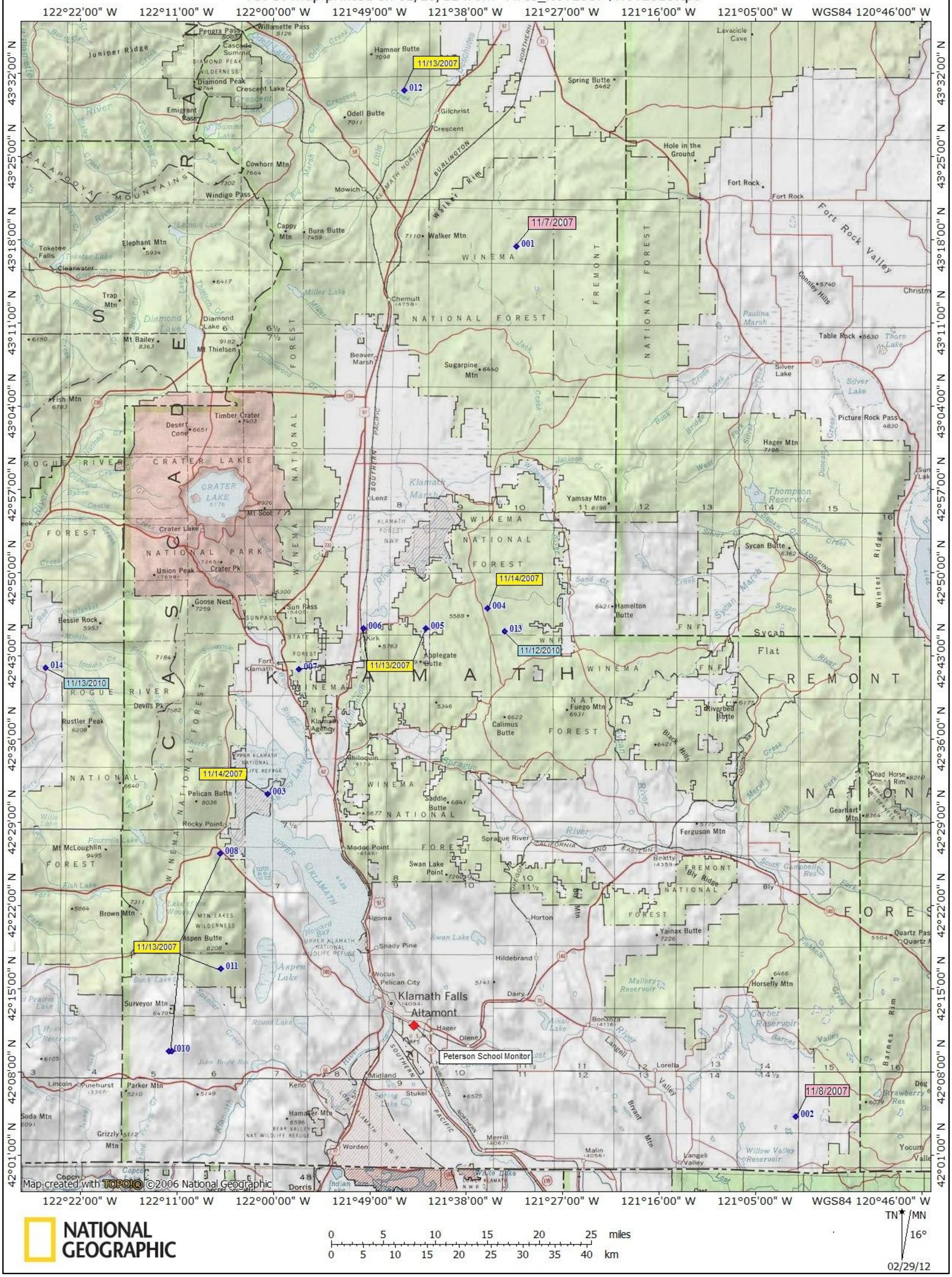
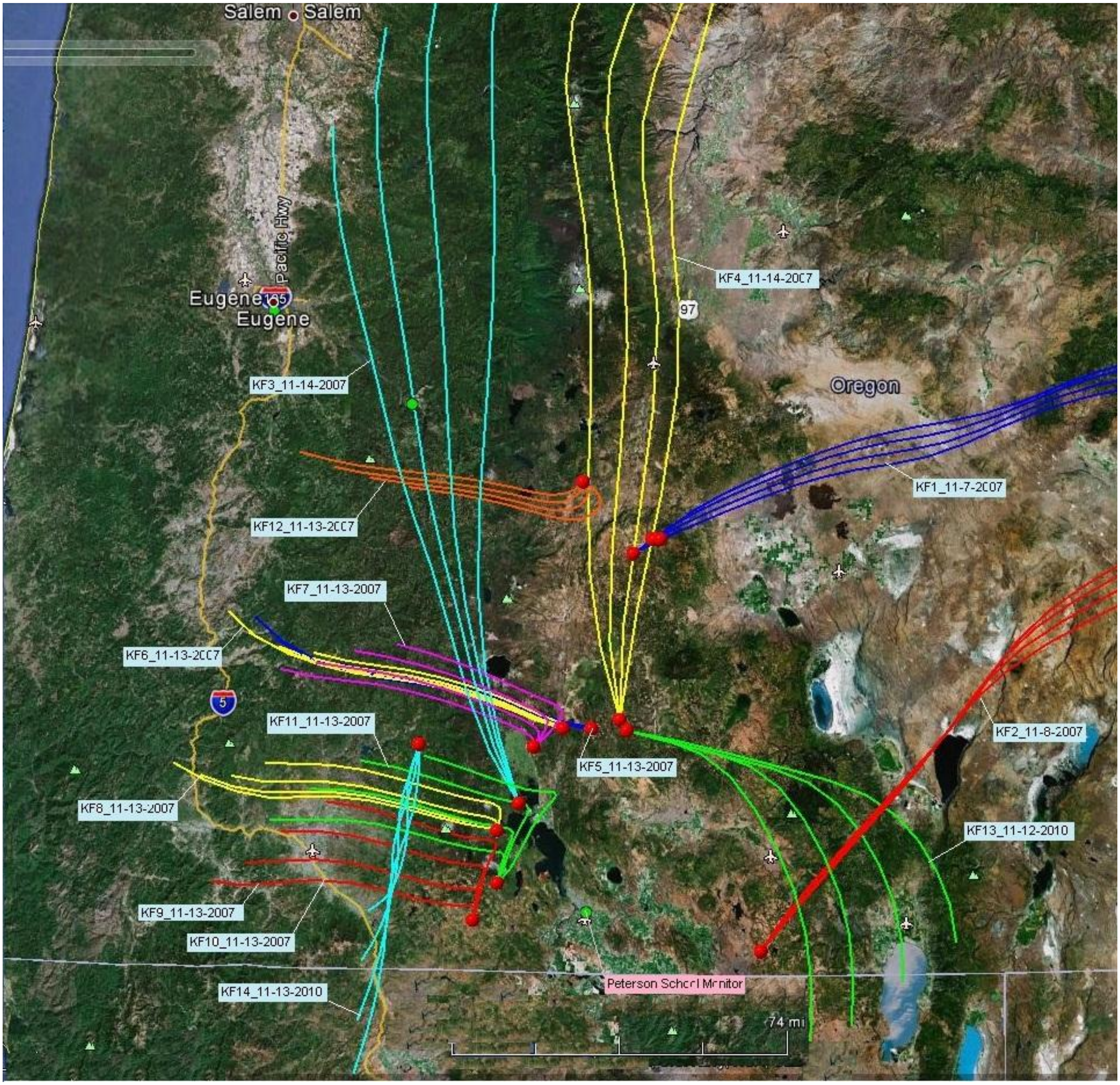
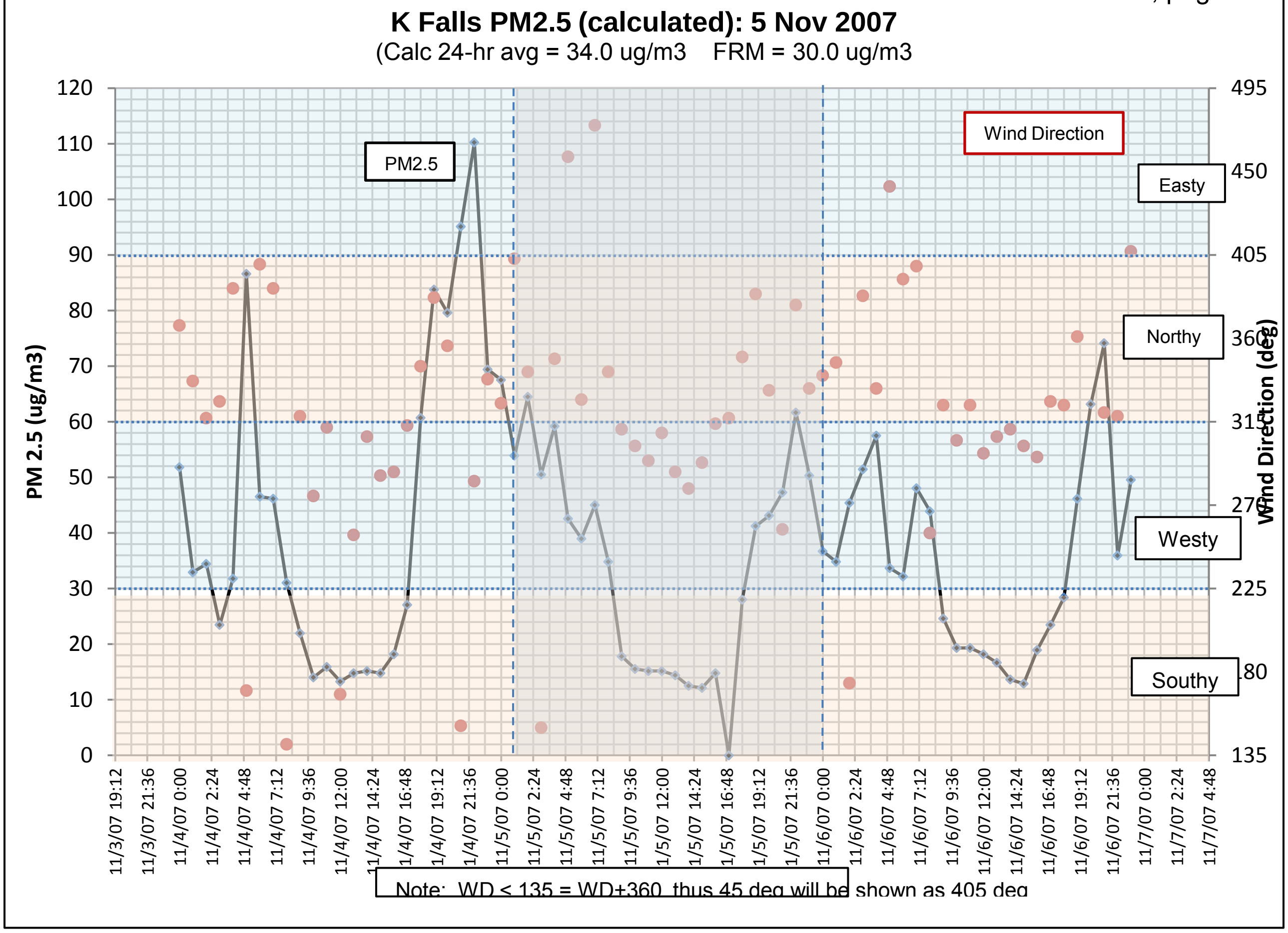
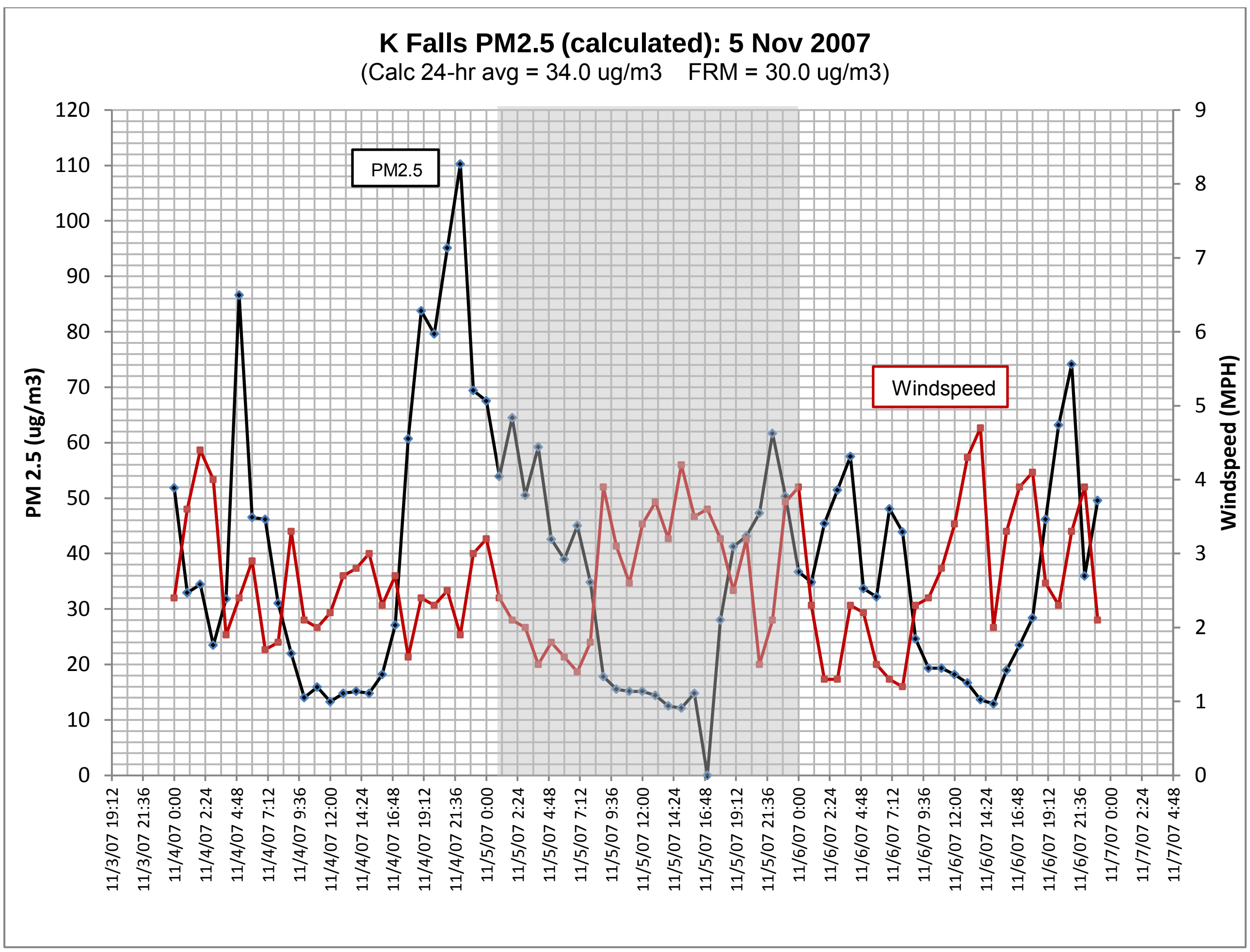
TOPO! map printed on 02/29/12 from "Fires_Nov2007+Nov2010.tpo"





HYSPLIT trajectories for burns affecting target days.

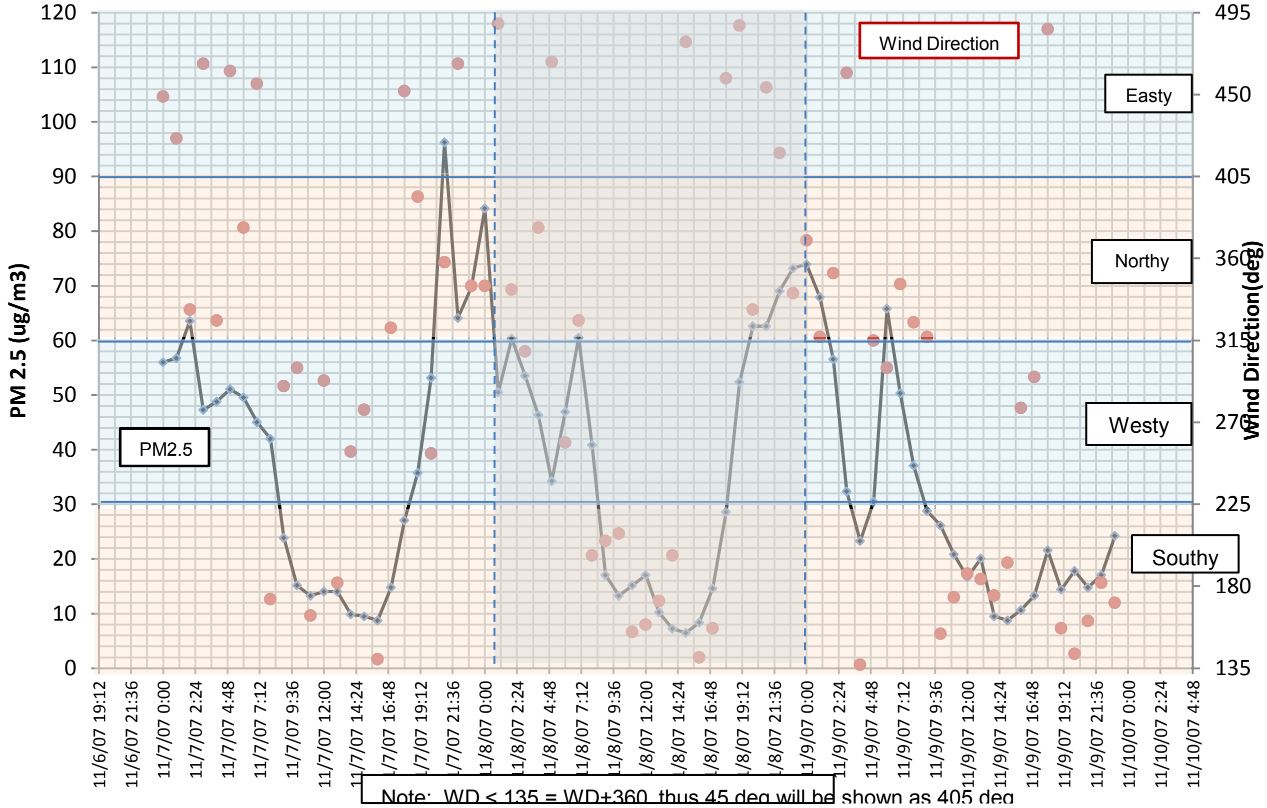

K Falls PM2.5 (calculated): 5 Nov 2007
(Calc 24-hr avg = 34.0 ug/m3 FRM = 30.0 ug/m3
PM2.5
Wind Direction
Easty
Northy
Westy
Southy
PM 2.5 (ug/m3)
Wind Direction (deg)
Note: WD < 135 = WD+360 thus 45 deg will be shown as 405 deg


K Falls PM2.5 (calculated): 5 Nov 2007
(Calc 24-hr avg = 34.0 ug/m3 FRM = 30.0 ug/m3)
PM2.5
Windspeed
PM 2.5 (ug/m3)
Windspeed (MPH)

Burn Date	PST	DEQ #	Utme	Utmn	Elev m	km	Direction	Fuel tons
11/7/2007	1130	1	618636	4794176	1684	123.5	N	60
11/8/2007	900	2	664875	4659595	1597	61.3	SE	2595

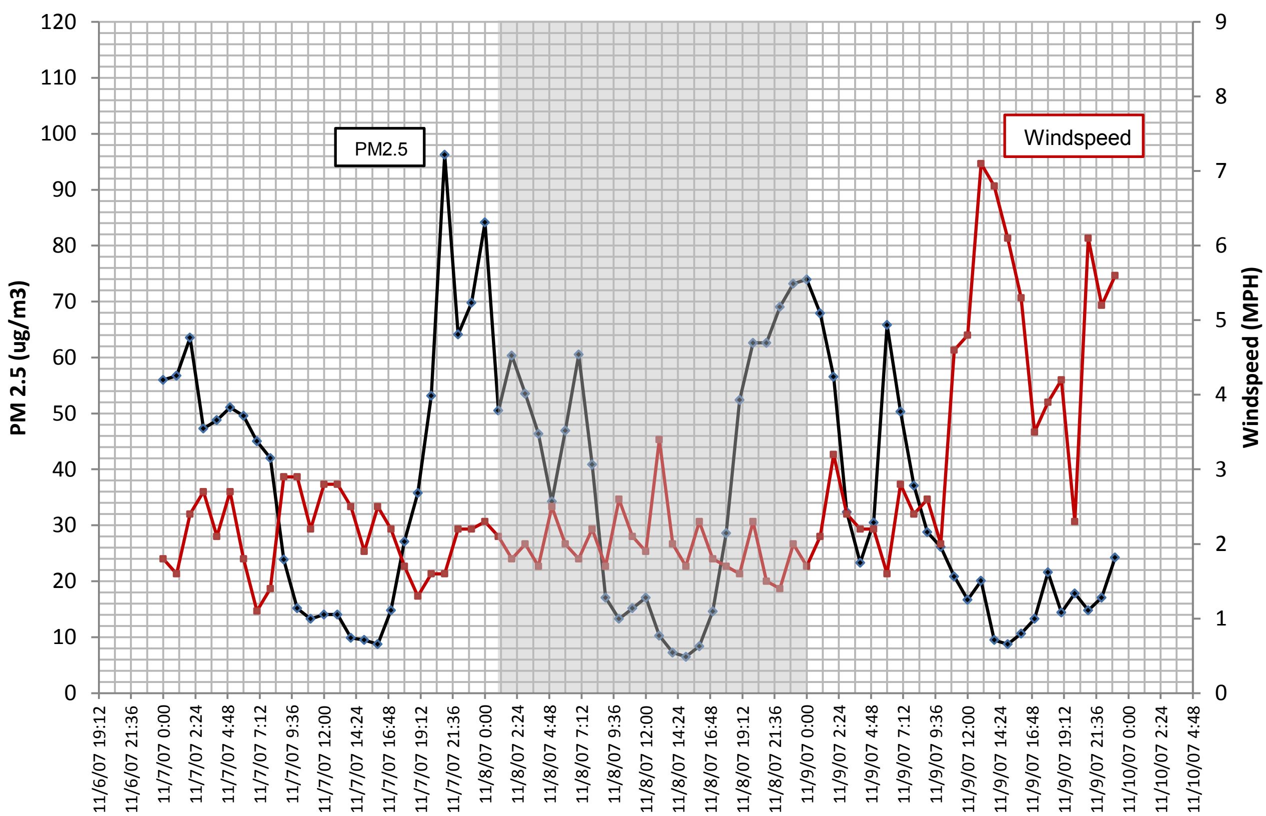
K Falls PM2.5 (calculated): 8 Nov 2007

(Calc 24-hr avg = 38.6 ug/m3 FRM = 33.0 ug/m3)

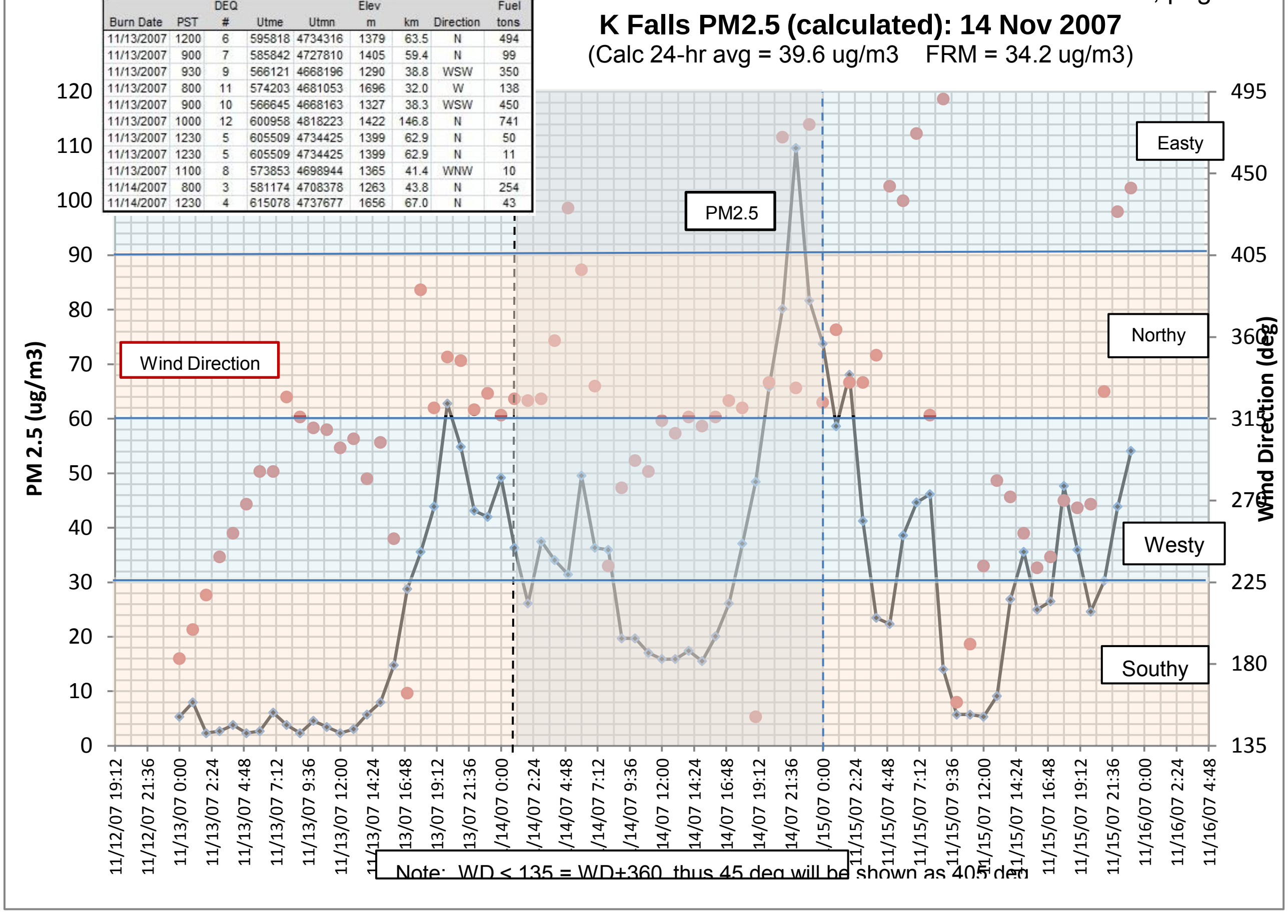


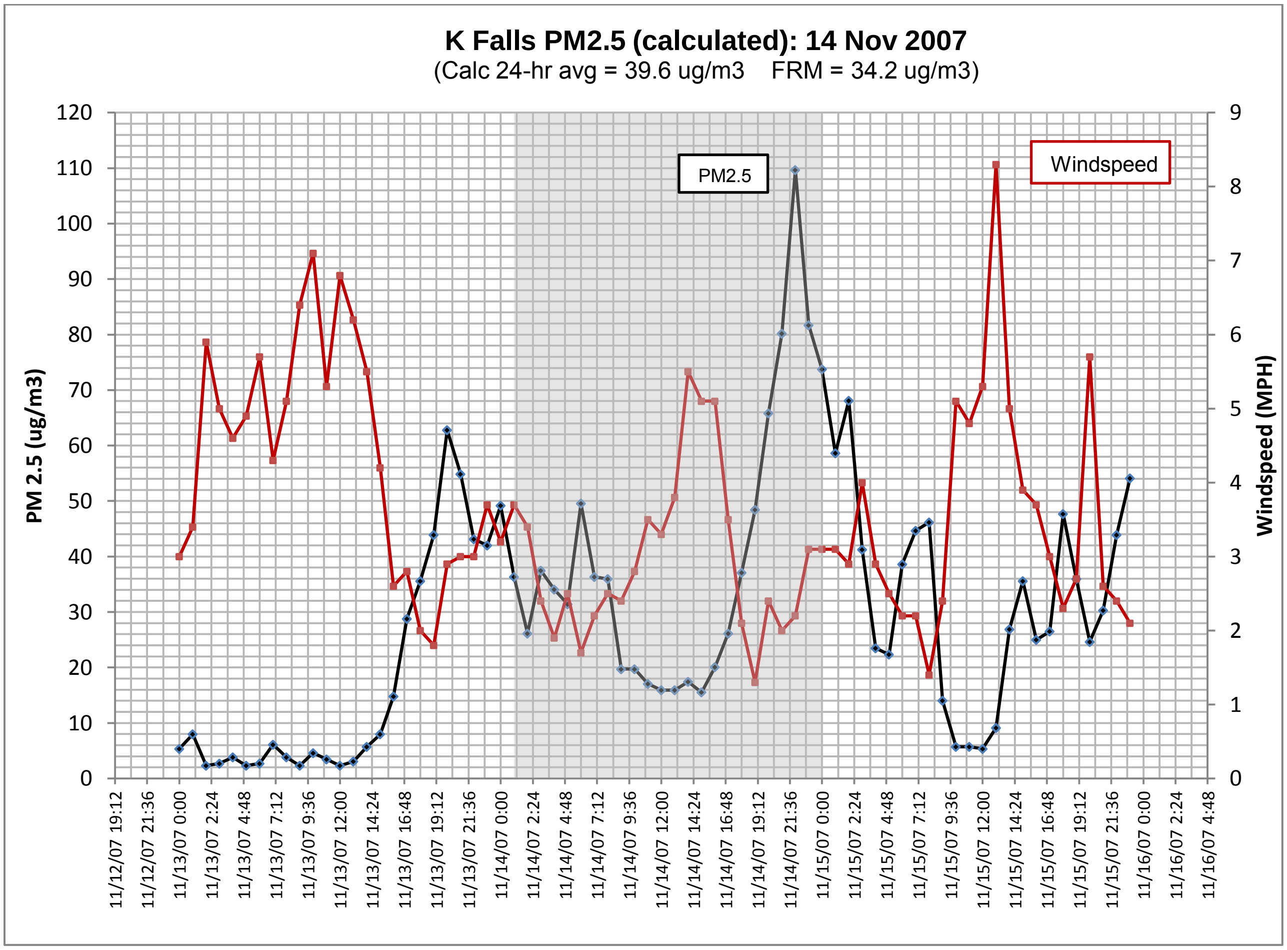
K Falls PM2.5 (calculated): 8 Nov 2007

(Calc 24-hr avg = 38.6 ug/m3 FRM = 33.0 ug/m3)

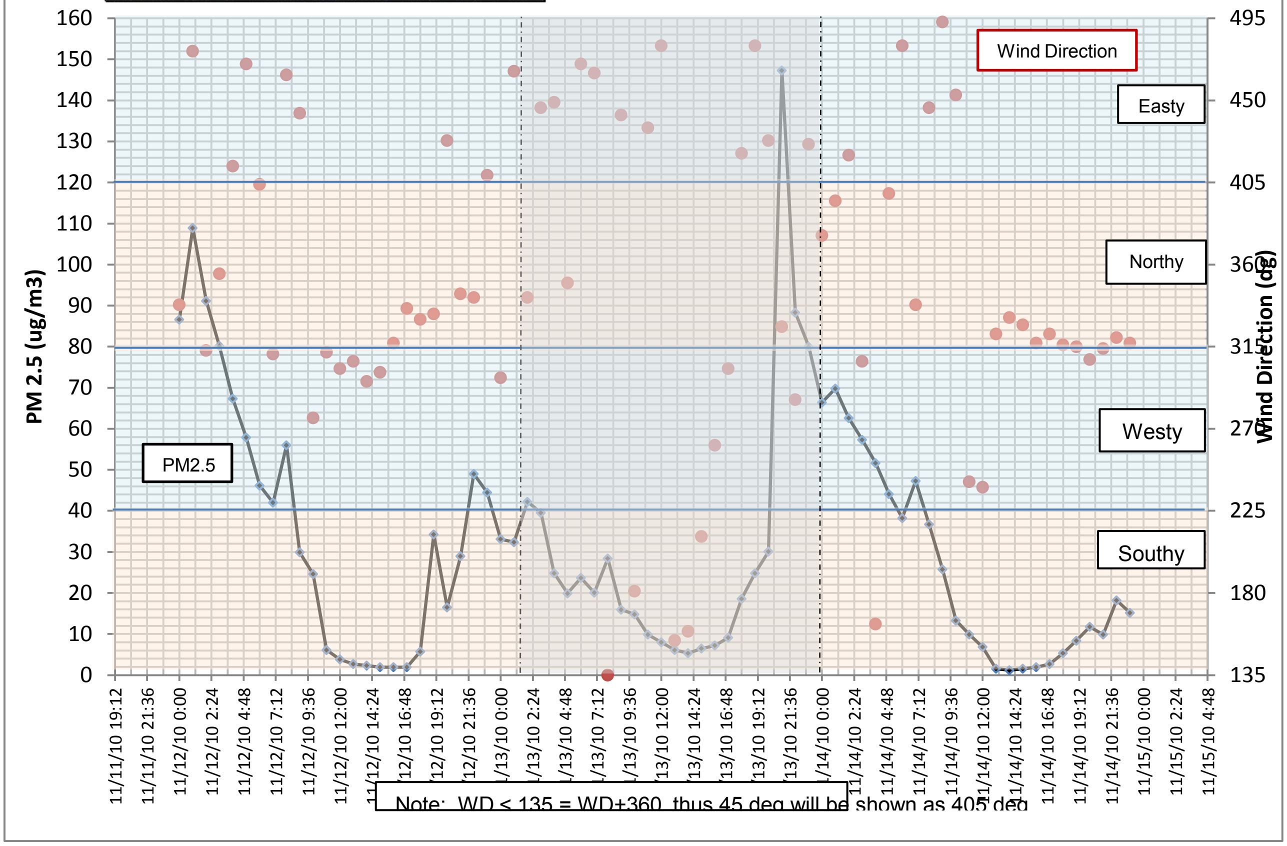


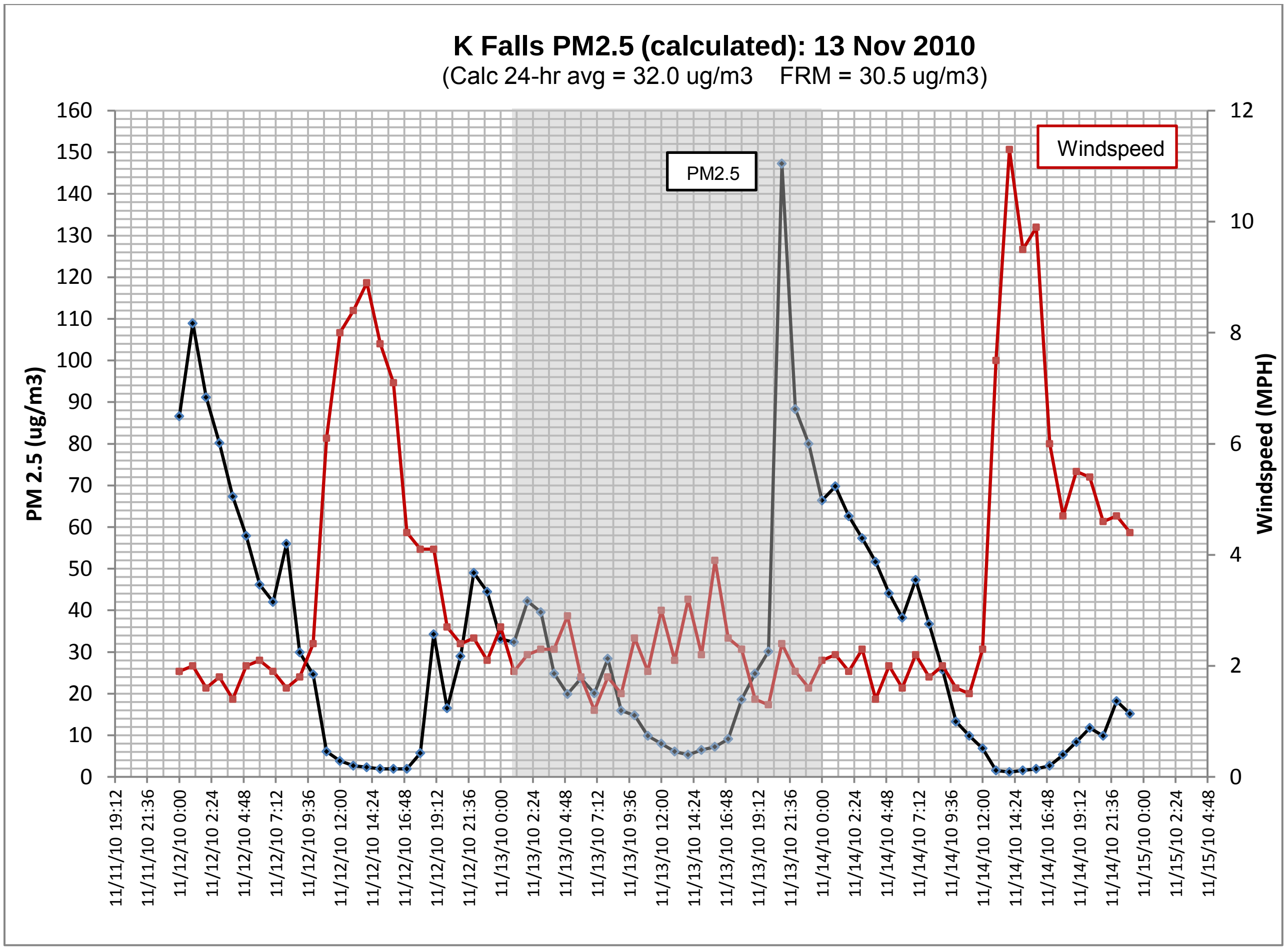
Burn Date	PST	DEQ #	Utme	Utmn	Elev m	km	Direction	Fuel tons
11/13/2007	1200	6	595818	4734316	1379	63.5	N	494
11/13/2007	900	7	585842	4727810	1405	59.4	N	99
11/13/2007	930	9	566121	4668196	1290	38.8	WSW	350
11/13/2007	800	11	574203	4681053	1696	32.0	W	138
11/13/2007	900	10	566645	4668163	1327	38.3	WSW	450
11/13/2007	1000	12	600958	4818223	1422	146.8	N	741
11/13/2007	1230	5	605509	4734425	1399	62.9	N	50
11/13/2007	1230	5	605509	4734425	1399	62.9	N	11
11/13/2007	1100	8	573853	4698944	1365	41.4	WNW	10
11/14/2007	800	3	581174	4708378	1263	43.8	N	254
11/14/2007	1230	4	615078	4737677	1656	67.0	N	43





Burn Date	PST	DEQ #	Utme	Utmn	Elev m	km	Direction	Fuel tons
11/12/2010	1324	13	617601	4733947	1543	63.8	N	na
11/13/2010	202	14	546662	4727894	921	81.0	NW	na





Appendix A-13

Effective Emissions

Introduction.

A rollback model is based on a correlation between emissions and ambient air concentrations, and assumes a relatively even distribution of emissions across a local air basin that results in relatively low concentration gradients. In Klamath Falls this assumption is considered generally representative with the exception of three emissions categories: industrial point sources, prescribed burning, and road dust. Two of these source categories are located at some distance from the FRM Peterson School monitor sited at the approximate center of the NAA: prescribed burning occurs outside of the NAA, and industrial sources are located near the western and northern edges of the NAA. Although these sources may have local high concentrations, their impact at the monitor is likely to be lower, with flat concentration gradients. Emissions from the third category, road and fugitive dust, appear high relative to the fugitive dust component of measured concentrations based on a Positive Matrix Factorization (PMF) analysis. The reasons for differences between emissions and concentrations for these three categories can be the result of plume dispersion, inaccurate emissions estimates, use of unrepresentative emission factors, or a combination of factors.

In order to better provide a correlation between emissions and their contribution to measured concentrations at the monitor from these three source types, PMF and an air dispersion model were used to develop what is termed “effective emissions.” Effective emissions are defined as those emission rates from a given source category that are considered to proportionately correlate with measured concentrations of that same source category at the monitor. For source categories whose emissions are evenly distributed across the domain, effective emissions are considered to be their actual emissions. For source category emissions that are not evenly distributed, or require other adjustments, effective emissions are estimated using other models.

PMF and Fugitive Dust Effective Emissions.

The PMF analysis was conducted by Bob Kotchenruther at EPA Region 10. Depending on which of two sample populations (and sample analysis methodologies) was used in the factor analysis, the PMF study estimated fugitive dust to be 2.6 % and 3.7 %, respectively. As used in the rollback model, the fugitive dust category includes dust from aggregate (piles) used for road sanding, dust from sanding operations, and paved road vehicle dust. Because the road sanding material, and its associated dust, is the same for each of the three phases of its use or presence, fugitive dust from these phases is considered similar in composition, these emissions are combined into a single source category and a representative source profile applied. For the rollback model, a conservative value of 3.5% was used to adjust fugitive dust emissions to an effective emission rate, as shown in Table 6-2.

Effective Emissions Calculations.

The following table illustrates how the effective emission rates were calculated for prescribed burning, fugitive dust, and industrial point sources. As described in Appendix A-22, the contribution of industrial point source and prescribed burning emissions were estimated using the AERMOD air dispersion model, at 1.0% and 1.75%, respectively. Fugitive dust emissions from aggregate storage piles, road sanding operations, and re-entrained road dust were estimated to be about 3.5% using the PMF study conducted by EPA Region 10 study of Bob Kotchenruther.

These values for prescribe burning (PB), fugitive dust (FD), and industrial point sources (IP) have been entered in the "Emissions as %" column in the table, and an effective emission rate has been calculated at a level that, together with the actual emission rates of the other source categories, will result in the percent contributions determined by dispersion and PMF modeling. For example, 1.75% of total emissions from all categories will give an effective emission rate of 56 lbs/day for prescribed burning.That is to say, 56 lbs/day of prescribed burning emissions in an area near the Peterson School monitor, where the rollback model assumes all emissions are occurring, will contribute 1.75% of total PM2.4 at the monitor which is what the dispersion modeling predicts. This calculation uses an equation to determine a Reconstructed Total Emissions, where:

Reconstructed Total = (Total emissions w/o PB, FD, IP) / (1- (PB%+FD%+IP%) / 100) or, from the table,

Reconstructed Total = (3026 lbs/day) / (1 – (0.0175 + 0.035 + 0.01))

Reconstructed Total = 3026 / 0.9375 = 3228

and for PB,

Effective Emissions = 1.75%/100 x 3228 = 56 lbs/day

The calculation of the effective emissions for fugitive dust and industrial point sources follows the same procedure.

Table 6.3. Source categories and their effective emissions in the rollback model.

	Effective Emissions Calculations				
	Baseline Year: 2008				
			Reconstructed Total[1] =	***3228***	
				Effective	Emissions
DEQ		PM2.5	PM2.5	**Emissions**	as
ID	Source Category (3)	lbs/day	lbs/day	lbs/day	%
1	Waste Disposal	50.4	50.4	50.4	1.6%

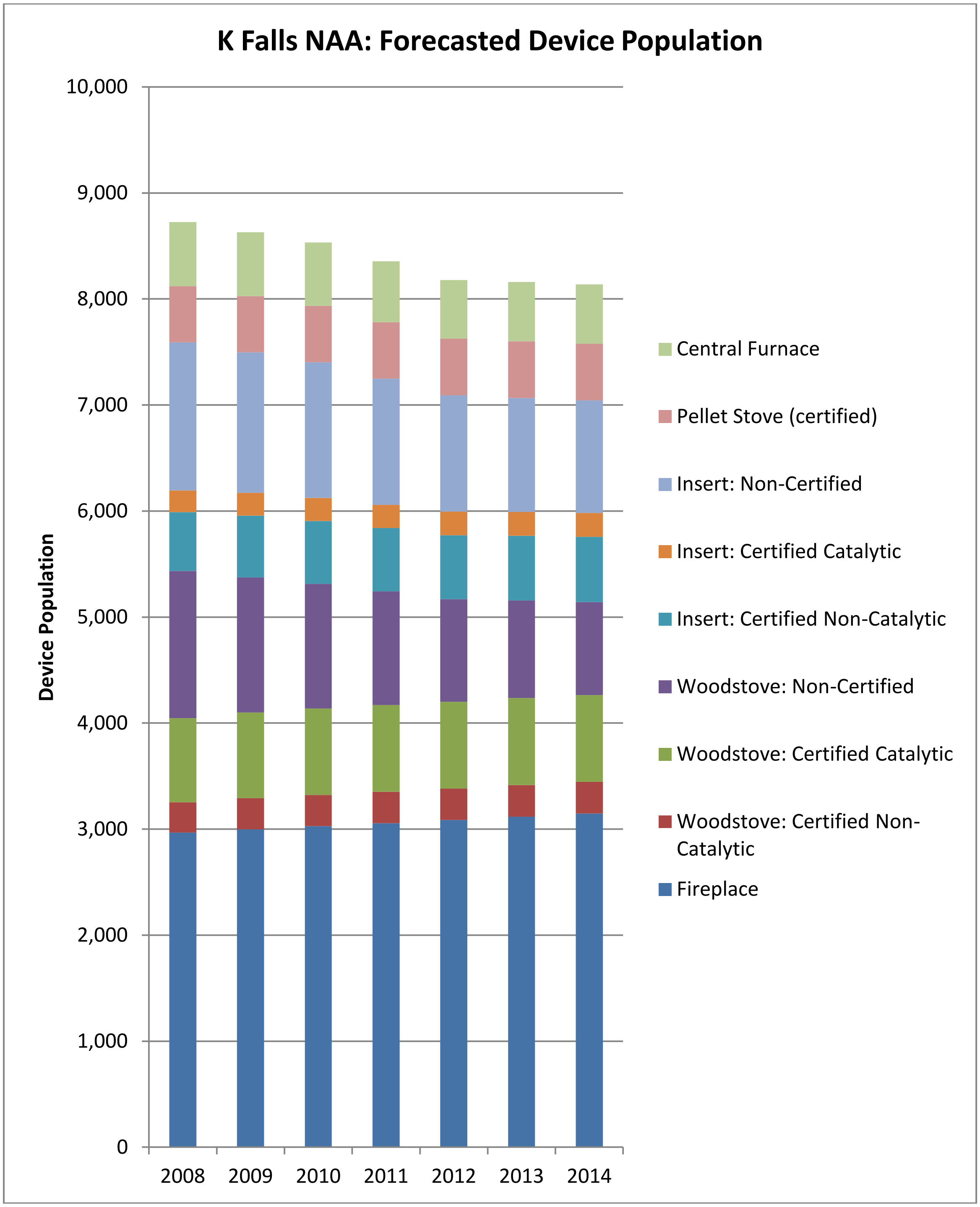
2	Small Non-Permitted Fossil Fuel Combustion	36.3	36.3	36.3	1.1%
3	Fireplace	1093.0	1093.0	1093.0	33.9%
4	Insert Non-Cert	435.9	435.9	435.9	13.5%
5	Insert Cert (Non-Cat)	18.8	18.8	18.8	0.6%
6	Insert Cert (Cat)	105.1	105.1	105.1	3.3%
7	Stove Non-Cert	525.5	525.5	525.5	16.3%
8	Stove Cert (Non-Cat)	117.3	117.3	117.3	3.6%
9	Stove Cert (Cat)	56.4	56.4	56.4	1.7%
10	Pellet /Stove Cert	33.2	33.2	33.2	1.0%
11	Central Furnace	18.8	18.8	18.8	0.6%
12	Prescribed Burns	458.9		**56**	**1.75%**
13	Other Burning/Cooking	59.0	59.0	59.0	1.8%
14	Fugitive Dust (road agg piles, sanding, dust)	191.0		**113**	**3.5%**
15	Non-Road + Marine	20.6	20.6	20.6	0.6%
16	Aircraft	18.7	18.7	18.7	0.6%
17	Rail (6)	39.9	39.9	39.9	1.2%
18	Passengr Vehicles (5)	134.8	134.8	134.8	4.2%
19	Trucks (4)	219.2	219.2	219.2	6.8%
20	Other On-road (7)	10.0	10.0	10.0	0.3%
21	Misc small point sources	33.1	33.1	33.1	1.0%
22	Points-Actual TSD	754.4		**32**	**1.0%**
	Total	4430	3026	**3228**	100.0%

In summary, effective emissions are defined as those emission rates from a given source category that are considered to correlate with measured concentrations of that same source category at the monitor. The calculations described above show the process by which the emissions for prescribed burning, fugitive dust, and industrial sources have been adjusted so that their emissions (effective emissions) correlate with their contribution to total PM2.5 mass at the monitor.

APPENDIX A-14
Woodstove Reductions & County Ordinance

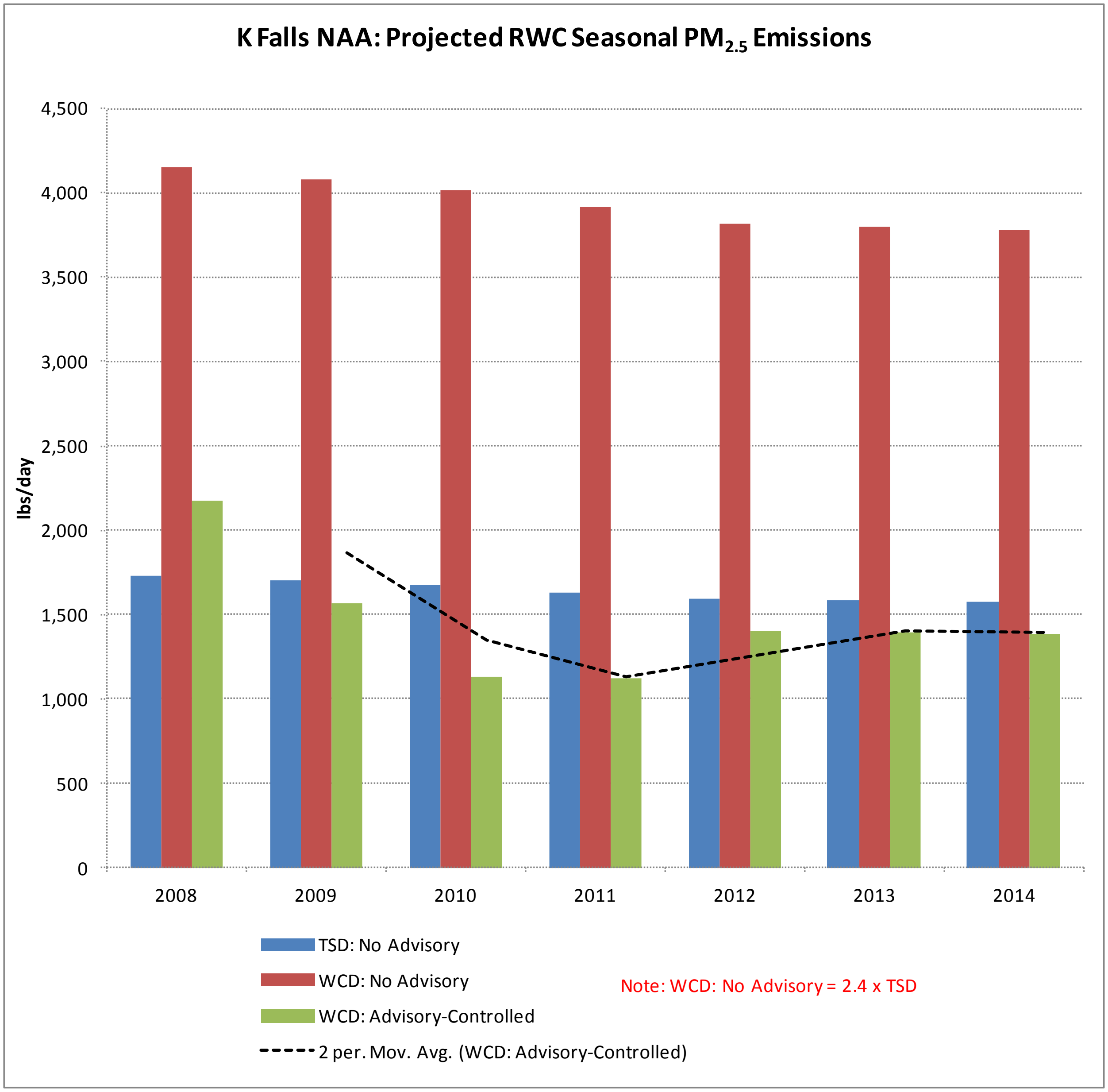
Figure 1 shows the emissions from residential wood combustion between 2008 and 2014 without any attainment strategies associated with the emissions. Uncertified wood stoves are decreasing in number as individuals replace these devices with new certified stove or a different heating system altogether. Fireplace emissions have a slight increase due to new construction.

Figure 1 – Residential Wood Combustion contribution between 2008 and 2014 on a worst case day without attainment strategies primarily through natural attrition of uncertified wood stoves and inserts



The largest reductions are from residential wood combustion and for the worst case day it becomes significant due to the mandatory advisory action call. Citizens are prohibited from burning by ordinance in either an uncertified stove or a certified stove unless they have an exemption from the county. Figure 2 shows emissions without an advisory and also with the advisory.

Figure 2 – Residential wood combustion emissions on a typical day (TSD) and a worst case day (WCD) with attainment plan advisory controls from the 2007 ordinance.



APPENDIX A-15-1

REASONABLE AVAILABLE CONTROL TECHNOLOGY and

REASONABLE AVAILABLE CONTROL MEASURES

This appendix provides and analysis of potential control measures for major point source categories in order to determine whether or not any of these measures could be considered a reasonably available control technology (RACT) for the fine particulate matter (PM2.5) National Ambient Air Quality Standard (NAAQS). It includes:

1. A discussion of the PM2.5 RACT requirements,
2. A discussion of Oregon's process in identifying RACT/RACM,
3. Oregon's PM2.5 RACT/RACM analysis and commitments

This RACT/RACM analysis focused on control measures that reduce direct PM2.5, and precursors for PM2.5 (SO2 , and NOx) emissions.

PM2.5 RACT/RACM Requirements

42 U.S.C. §7502(c)(1) (Section 172(c)(1) of the Clean Air Act) requires states with nonattainment areas to submit State Implementation Plans (SIPs) implementing emission controls that are economically and technologically feasible. Specifically, Section 172(c)(1) of the Clean Air Act states:

> "In general – such plan provisions shall provide for the implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology)"

Emissions control technologies that meet these criteria for major stationary sources are known as Reasonably Available Control Technology or "RACT". EPA considers RACM to be measures of any type that may be applicable to a wide range of sources.

DEQ often uses the term "strategies" interchangeably with the terms Reasonable Available Control Measures (RACM) and Reasonably Available Control Technology (RACT). For the Klamath Falls nonattainment area, DEQ is required to show it is implementing all RACM and RACT measures necessary to demonstrate attainment as expeditiously as practicable and before the clean air act deadline of December 2014. Since DEQ determined that the Klamath Falls nonattainment area can meet the standard by 2014, it conducted a limited RACT and RACM analysis (72 FR 20612) as described in this Appendix.

Process in Identifying RACT/RACM

Current Strategies – RACT/RACM Measures Already Implemented

There are a number of strategies and regulations recently implemented that will reduce $PM_{2.5}$ emissions and as described in Section 6, "Attainment Demonstration", show that the Klamath Falls area will reach attainment with the standard by 2014. These current strategies are a continuum of past strategies developed over the years that have been adjusted and updated to address the current $PM_{2.5}$ standard. Local efforts include revisions to the existing Klamath County clean air ordinance and woodstove changeouts. One of the most effective strategies has been the implementation of the revised Klamath County clean air ordinance, and in particular, the tighter levels and enhanced enforcement of the woodstove curtailment program. In addition, State and federal regulations recently implemented affect industrial sources, woodstoves, and transportation emissions. These strategies were not in place to affect the base year 2008 emission inventory but were accounted for in the 2014 emission inventory, as they are currently being implemented. All these current strategies provided emissions reductions for 2014, as noted in Section 5 of the attainment plan.

These strategies are permanent and enforceable; they are currently implemented and enacted by county ordinance, state, or federal rules. DEQ's rollback modeling indicates that under these existing strategies, Klamath Falls will attain the standard by 2014. Because the existing strategies are already implemented, they represent the fastest measures in place that achieve the RACT/RACM goals for attainment. Table 1 lists all the current strategies in place.

Table 1: Current Strategies Already Implemented

Strategies Already In Place and Implemented (not considered by Advisory Committee)				
RACT/RACM	**Source Category**	**Activity**	**RACT/RACM**	**Implemented**
MACT - particleboard and hardboard facilities	point	industrial	RACT	MACT reduction
Klamath County Clean Air Ordinance: Woodstove curtailment program	area	wood smoke	RACM	2007
Woodstove changeout program	area	wood smoke	RACM	2007-2012
Heat Smart program	area	wood smoke	RACM	2007
Klamath County Clean Air Ordinance: Reduce open burn window	area	open burning	RACM	2007
Transportation and fuel related emissions				
• Oregon low emission vehicle standards	mobile	motor vehicles	RACM/TCM	2008
• School bus diesel retrofit	non-road		RACM/TCM	2007
• Federal non-road vehicle emission standards	non-road		RACM	2007
Road paving	area	road dust	RACM/TCM	
Forestry burning agreement	area	forestry burning	RACM	

Reasonably Achievable Control Technology (RACT)

The Clean Air Act requires States with nonattainment areas to implement RACT on existing major sources. As mentioned in the attainment plan, DEQ conducted an analysis of the contribution of industrial sources. Industrial source emissions were determined to be a small part of the $PM_{2.5}$ pollution at the Peterson School monitor. Modeling results indicated that industrial point sources contribute only 1% of the baseline design value (45.1 $\mu g/m^3$), as opposed to the contribution from other sources, such as residential wood combustion (over 70%). Because industrial sources are such a small part of the contribution, DEQ focused primarily on residential wood combustion sources (as described in the RACM sections below).

However, RACT measures were identified for those industrial sources that contribute over 10 tons/year of $PM_{2.5}$ emissions (significant emission rate for PM2.5). There were four sources identified: Columbia Forest Products, Jeld-Wen, Collins Products, and Klamath Cogeneration. DEQ reviewed the source equipment, corresponding emissions from these facilities, and reviewed current state and federal requirements to determine whether existing controls at these facilities provide reductions of $PM_{2.5}$ and any precursors. Existing state regulations were deemed sufficient for Klamath Cogeneration, as their NOx and $PM_{2.5}$ emissions are managed through existing control equipment (state-of-the-art low NOx burners) and state rules (fugitive emissions regulations). Any additional controls for both NOx and $PM_{2.5}$ would be too expensive or unreasonable at this facility. Controls for Columbia Forest Products are addressed in the following section, under “New Strategies”.

Maximum Achievable Control Technology (MACT)
On July 30, 2004 EPA adopted MACT rules for Plywood and Composite Wood Products (hardboard and particleboard plants) (69 FR45943). The MACT rules required compliance by October 1, 2007 but allowed states to offer facilities a one year extension if needed. Jeld-Wen was offered an extension and complied by June 2008. Collins was also offered an extension for compliance but did not comply until February 2009 for their particleboard facility and June 2011 for their hardboard facility. Although MACT rules are designed for hazardous air pollutants, there is a significant reduction in $PM_{2.5}$ emissions from these facilities. Both Collins and Jeld-Wen are subject to the MACT requirements, installed biofilters, and will see a reduction of 36% and 37%, respectively in $PM_{2.5}$ emissions. Jeld-Wen’s actual emissions decrease by 7 tons per year and Collins’ actual emissions decrease by 17 tons per year.

Reasonably Available Control Measures (RACM)

Klamath County Ordinance (Woodstove Curtailment and Open Burning)

In 2007, DEQ in conjunction with Klamath County identified early emission reduction strategies or control strategies (referred to as “current strategies” in the attainment plan) just after the County became aware they were identified as a potential nonattainment area. The revision to the county ordinance included some key provisions: more restrictive levels for the woodstove curtailment program and a shortening of the open burning window. The county reduced the threshold for the woodstove curtailment program from 65 μg/m^3 to 30 μg/m^3 to accommodate the new $PM_{2.5}$ standard. It was a relatively inexpensive option and highly effective in reducing $PM_{2.5}$ emissions. The change resulted in more red and yellow days where citizens could not burn in their woodheating devices, however, many people were familiar with the program because it had been in place since 1987 to address PM10 emissions. DEQ estimated there were 62.4 tons of emissions per year reduced by this curtailment program resulting in 7.5 μg/m^3 reduction in the daily design value in 2014.

The County also decided to reduce the open burn window in the ordinance from 30 days to 15 days; one in the fall and one in the spring. The Commissioners had experience with reducing the open burn windows from all winter to a fall and spring burn window. It proved effective and offered this strategy as another RACM measure in the 2007 ordinance. DEQ estimated a reduction in emissions of 41.5 tons per year and included the reduction in design value into the plan.

Heat Smart program

Another RACM measure was implementation of a program called "Heat Smart". The Heat Smart program requires the removal of uncertified stoves upon sale of a home. The program was first adopted by county ordinance in 2007 and then adopted as a statewide program in 2010. The program has been effective in removing uncertified stoves from homes since the program's inception. DEQ estimated there will be 2.4 tons per year of $PM_{2.5}$ reduced each year from the Heat Smart program, resulting in a 3.3 μg/m^3 reduction in the daily design value.

Woodstove changeout program

Klamath Falls recently conducted multiple changeout programs with the assistance of approximately $1.5 million dollars in funds from EPA, the city of Klamath Falls, and federal American Recovery and Reinvestment Act (ARRA) stimulus money. Since 2008, 584 uncertified wood burning devices in Klamath Falls have been removed, destroyed, and replaced with cleaner burning heating units, such as certified woodstoves, pellet stoves, heat exchangers, or natural gas furnaces. The ARRA funding in particular, replaced 246 of the 305 uncertified stoves in low income homes. This effort in particular provided woodsmoke reductions because low income woodburning homeowners are more likely to use older, high emitting stoves, have higher fuel consumption because older stoves are less efficient, and can receive a hardship exemption from the county during woodstove advisories. DEQ estimated there will be 10.3 tons per year of $PM_{2.5}$ reduced, resulting in 1.5 μg/m^3 reduction in the daily design value.

Transportation and Fuel Related Emissions

On a statewide basis, there were several transportation and fuel related initiatives that DEQ considers RACM for Klamath Falls. This includes the Oregon Low Emission Vehicle (LEV) program, which is based on the successful California program to reduce pollution from vehicles. The Oregon LEV program has been in effect since 2008. In addition, federal nonroad standards promulgated in 2008, (diesel marine engines and spark-ignition engines, equipment, and vessels) for improved fuel economy also provided $PM_{2.5}$ emission reductions for Klamath Falls. Oregon has also undertaken efforts in Klamath Falls to reduce emissions from diesel engines; Klamath Falls' School Districts were targeted for retrofits on the school buses. DEQ estimated 15.7 tons per year reduction from low emission vehicles, diesel retrofits and other transportation related measures that resulted in a 0.3 $\mu g/m^3$ reduction in the daily design value.

Road Paving

Road paving was conducted by the City of Klamath Falls using Congestion Mitigation Air Quality (CMAQ) funds from the Federal Highway Administration. While dust is not a major contributor to $PM_{2.5}$ emissions, a significant effort was made by the city to conduct road paving which reduced the miles of unpaved road in the community. DEQ considers this effort to be RACM, as unpaved roads can provide a substantial amount of dust and reducing the length of unpaved roads reduces $PM_{2.5}$ emissions. DEQ estimates a reduction of 2.0 tons per year of $PM_{2.5}$ in road dust from paving roads.

New Strategies – RACT/RACM Control Measures

In 2011 and 2012, DEQ, in collaboration with Klamath County, convened the Klamath Air Quality Advisory Committee to help develop and recommend a comprehensive list of "new control strategies" or RACM to be implemented as soon as practicable but prior to January 1, 2013. These recommendations would then be provided to DEQ and Klamath County to determine which strategies or RACT/RACM would be selected, incorporated, and implemented as part of the Klamath Falls attainment plan. For over a year the committee met to consider data, community values, and pollution reduction strategies with the highest chance of success in meeting the $PM_{2.5}$ standard. The Advisory Committee was charged with investigating the contribution and need for emission reductions from all emission source categories, including residential wood heating, residential open burning, motor vehicles, major industry, and other sources. In identifying and recommending strategies, the committee evaluated the strategies based on specific criteria listed below:

Environmental
- Effect on $PM_{2.5}$ level

Health
- Likely effect on pollution related illness
- Effect on quality of life

Economic
- Likely effect on local jobs
- Cost to those affected
- Costs to state/taxpayers
- Level of financial incentive to comply

- Level of financial deterrent to violate

Social
- Level of public support
- Difficulty of explaining idea to those affected
- Relative impact on under-served communities

Technological Feasibility
- Degree of difficulty to implement

The Advisory Committee analyzed the strategies by ranking the importance of each criteria listed above and factored in their assessment of whether the strategy would have a positive, negative or no impact for each criteria. The Committee also discussed their rationale and decision for how they ranked each strategy based on the criteria. These scores were accumulated and ranked in order and are listed in Table 2.

Table 2: Full list of RACT/RACM strategies identified by Advisory Committee

RACT/RACM	Source Category	RACT/RACM
Woodstove changeouts	area	RACM
weatherization	area	RACM
survey woodburning appliances	area	RACM
use NSR offsets to changeout stoves - state	area	RACM
use enterprise zone to changeout stoves	area	RACM
use NSR offsets to changeout stoves - local	area	RACM
geothermal district	area	RACM
enlarge AQZ		RACM
mandate rental certified stoves	area	RACM
Woodstove education	area	RACM
Ag and forest agreement	area	RACM
eliminate fall open burn window	area	RACM
landfill yard waste	area	RACM
confirm heat smart - enforcement	area	RACM
ASTM standards for fireplaces	area	RACM
habitual offenders	area	RACM
ban sole source	area	RACM
DEQ Open burn boundary change to NAA	area	RACM
Mandatory alternative heat source new construction	area	RACM
increased air sampling	area	RACM
Prohibit use of uncertified stoves	area	RACM
minimum fine for second violation	area	RACM
inventory wood appliances - tax statements	area	RACM
remove roadblocks to alternatives energy	area	RACM

exempt stoves meeting criteria	area	RACM
2-tier advisory	area	RACM
eliminate exemptions	area	RACM
Ban woodstoves	area	RACM
ban fireplaces	area	RACM

For example, conducting another woodstove changeout program was ranked as the top recommended strategy. It provided a positive environmental benefit, health impact, social impact, was easy to implement, and was determined to not have much of a negative economic impact. Other top ranked strategies included lowering the levels for the woodburning curtailment calls, weatherizing homes, conducting a woodstove survey, and allowing woodstove offsets for new and expanding industry. For more information regarding the analysis of each strategy, please see Appendix A-15-2.

The advisory committee also reviewed and rejected a number of other potential strategies because they were not feasible or duplicative with existing strategies already in place. The committee also did not review any potential RACT measures because they decided DEQ should determine which measures would be appropriate. A list of the rejected strategies is available in Appendix A-15-3.

The full committee report is available in Appendix A-16:

RACT/RACM Analysis and Commitments

After evaluating all the strategies presented in Table 2, the Advisory Committee provided its recommendations to DEQ and Klamath County. As mentioned previously, the committee recommended strategies based on its evaluation of technical feasibility, economic feasibility, environmental benefits and implementation feasibility. Both DEQ and the Klamath County Commissioners selected certain strategies for implementation (new control measures), while considering those strategies that were already being implemented (current strategies implemented since 2007). A number of strategies recommended by the Advisory Committee were not selected by the county or DEQ for various reasons, such as the strategies not being feasible, were too costly, or did not provide an immediate benefit. Table 3 provides a list of the rejected strategies and reasons for not including them in the attainment plan.

Table 3: Rejected RACT/RACM strategies

RACT/RACM	**Reason**
Use enterprise zone to changeout stoves	County rejected – not economically feasible
Use NSR offsets to changeout stoves – local siting requirements	County rejected – not economically feasible and DEQ was adopting state rules
Enlarge AQZ to same boundaries as NAA	County rejected – not economically feasible
Mandate rental certified stoves	County rejected – not economically feasible and too costly
Decrease fall open burn window	County rejected – not economically feasible
Confirm heat smart - enforcement	County rejected – not economically feasible

Enforcement of woodstove curtailment habitual offenders	County rejected – not economically feasible and too costly
Increased air sampling	County rejected – not economically feasible and too costly
Minimum fine for second burning violation	County rejected – not economically feasible
Inventory wood appliances through a survey	County rejected – not economically feasible and too costly
Strategies committee didn't evaluate but DEQ did	
Require Significant Emission Rate - 5 tons	DEQ rejected - Economic burden and industrial sources are only a small portion of the nonattainment problem
Short term limits for industrial sources	DEQ rejected - Not practical for sources to measure, economic burden
Lower Significant Impact Level for industrial sources	DEQ rejected - Economic burden, industrial sources are only a small portion of the nonattainment problem
Require BACT for existing boilers	DEQ rejected - Economic burden, industrial sources are only a small portion of the nonattainment problem
Require boilers to have opacity of less than 20%	DEQ rejected - Economic burden, industrial sources are only a small portion of the nonattainment problem
Require better controls on NOx for gas turbines	DEQ rejected - Economic burden, industrial sources are only a small portion of the nonattainment problem
Require more limitations beyond MACT for hardboard facilities	DEQ rejected - Economic burden, industrial sources small impact and already MACT limitations for Title V
Require more limitations beyond MACT for particleboard facilities	DEQ rejected - Economic burden, industrial sources small impact and already MACT limitations for Title V
Added source testing for all industrial sources	DEQ rejected - Economic burden, industrial sources are only a small portion of the nonattainment problem

As mentioned previously, the current strategies (RACM/RACT implemented since 2007) are on-going and provide emissions reductions that will allow Klamath Falls to meet the standard by December 2014. However, DEQ and the County did select certain strategies recommended by the Advisory Committee to adopt and implement. The County Commissioners, who are responsible for adopting any local ordinances that could implement recommended reduction strategies added some committee recommended RACM as assurance to meet the standard. In addition, DEQ added some industrial RACT to provide a large enough margin to ensure Klamath Falls would be in compliance by 2014. DEQ determined that certain RACT measures were necessary for stationary industrial sources to further reduce emissions although the reductions are not as significant as the RACM measures. In addition, on a statewide and federal basis, DEQ is taking credit for transportation strategies, that could be considered transportation control measures (TCM) and nonpoint control strategies both of which could be considered RACM for on-road and non-road sources of $PM_{2.5}$ and associated precursors.

Table 4 shows the final strategies selected and identified as being RACT/RACM for the Klamath Falls plan. These strategies include those being implemented or those that will be implemented soon, providing emissions reductions for Klamath Falls to reach attainment by 2014. Table 4 also identifies which rule, ordinance or enforcement methodology was used to assure the requirements for each strategy is met and which source is impacted by the strategy.

Table 4: Final RACT/RACM Strategies

Current Strategies RACT/RACM (already implemented)	RACM/ RACT	Implementation by Rule	Effective Date	Sources affected	Pollutants Affected	Reduction ug/m3	Reduction tons/yr	Cost Effectiveness cost per ton emissions reduced per year
Klamath County Clean Air Ordinance: Woodstove Curtailment Advisory & Enforcement	RACM	County Ordinance	Nov-07	Residential Wood Combustion and Open Burning	$PM_{2.5}$	9.6	33.5	$1313 =44000/33.5
Klamath County Clean Air Ordinance: Open burning window	RACM	County Ordinance	Nov-07	Open Burning	$PM_{2.5}$		41.5	$241 =10000/41.5
Heat Smart - removal of stove upon sale of home	RACM	County Ordinance/ DEQ Rule	Nov-07	Residential Wood Combustion	$PM_{2.5}$	0.3	2.4	$379 =(32640/36/(141*1.26*26.93)/2000)
Woodstove changeouts	RACM	County and SCOEDD	2008, 2009, 2010 and 2011	Residential Wood Combustion	$PM_{2.5}$	1.0	10.3	$7959 =82300/10.34
Transportation emissions: Oregon low emission vehicle standards and diesel retrofits	RACM/ TCM	State Rule and Local Efforts	2006-2012	Transportation -related	$PM_{2.5}$	minimal	15.7	$40.0 =2523+0/31.5/2
Transportation emissions: Non-road vehicle emission standards	RACM	Federal Rule	2006-2012	Non-road	$PM_{2.5}$		15.8	$1.5 =100/31.5/2
MACT at Collins and Jeld Wen	RACT	MACT	2008 and 2010	Hardboard and Particleboard	$PM_{2.5}$	0.1	10	$172,500 34,500,000/20/10
Road Paving	RACM	City	2008	Road dust	$PM_{2.5}$	minimal	2	

New Strategies RACT/RACM (to be implemented)	**RACM/ RACT**	**Implementation by Rule**	**Effective Date**	**Sources affected**	**Pollutants Affected**	**Reduction ug/m3**	**Reduction tons/yr**	**Cost Effectiveness cost per ton emissions reduced per year**
Wood stove changeouts	RACM	Ongoing County	Jan-13	Residential Wood Combustion	$PM_{2.5}$	0	varies	Depending upon funding
DEQ offset requirements	RACM	DEQ Div 225 and 240	Jan-13	Residential Wood Combustion	$PM_{2.5}$	0	varies	$60,000 One time
New fireplace standards	RACM	County Ordinance	Jan-13	Fireplace	$PM_{2.5}$	0.2	3.9	$513 =2000/3.9
Public awareness and remove obstacles	RACM	County/DEQ activity	Jan-13	Residential Wood Combustion and Open Burning	$PM_{2.5}$	0.6	15.1	$662 =10000/15.1
RACT* - 20% opacity limitation using Method 9	RACT	State Rule	DEQ Div 240	Industrial Sources	$PM_{2.5}$	0.1	5.7	$17,895 =(2000+100000)[1]/5.7
RACT* - Operation and Maintenance Plan requirements	RACT	State Rule	DEQ Div 240	Industrial Sources	$PM_{2.5}$		0	$35,000 One time

[1] $2,000 is DEQ cost, $100,000 is industry cost

Appendix A-15-2

Strategy Evaluation - Examples

Rec. #: 04

Contingency?	Y	N
	☐	☑

Recommendation Description:

Wood Combustion Incentive Programs: Wood Stove change out program

Feasibility			
Is recommendation technologically possible?	☑ Yes	☐ No	☐ Need info
Does recommendation meet EPA/DEQ requirements?	☑ Yes	☑ No	☐ Need info
Does recommendation meet all other legal requirements?	Yes	No	Need info

Criteria	Wt.	Raw Score	Wtd. Score
Environmental			
Effect on PM2.5 level	3.8	2	7.6
Health			
Likely effect on pollution related illness	2.9	2	5.8
Effect on quality of life	3	2	6
Economic			
Likely effect on local jobs	3.4	1	3.4
Cost to those affected	3.2	2	6.4
Costs to state/taxpayers	2.7	-2	-5.4
Level of financial incentive to comply	2.2	1	2.2
Level of financial deterrent to violate	2.2	0	0
Social			
Level of public support	2.8	1	2.8
Difficulty of explaining idea to those affected	2.1	1	2.1
Relative impact on under-served communities	2.5	2	5
Technological Feasibility			
Degree of difficulty to implement	3.2	2	6.4
	Total Wtd. Score:		**42.3**

Raw Scoring Scale	
Good	2
	1
Neutral	0
Bad	-1
	-2

Is recommendation technologically possible?

Yes very simple to replace a stove

Does recommendation meet EPA/DEQ requirements?

I would think certified wood stoves would meet the EPA/DEQ requirements

Does recommendation meet all other legal requirements?

Yes

Environmental

Effect on PM2.5 level

Effectiveness is dependent on the number of stoves changed out, which in turn is dependent on the funding which can be raised for the incentive program. (1.4% per 100 stove). This will help reduce PM2.5. certified will should provide more heat, with lower emissions.

Health

Likely effect on pollution related illness

Again as above, effect is dependent on the number of stoves. Resulting in positive impact for those with breathing problems. Should help reduce pollution related illnesses.

Health

Effect on quality of life

Again as above, effect is dependent on the number of stoves. Less emissions should improve air quality, good air quality would improve quality of life.

Economic

Likely effect on local jobs

Some small positive effect associated with the actual change out work by local business. Would potentially provide some jobs for the removal of old and installation of the new.

Economic

Cost to those affected

If this is completely subsidized there would be no cost, then the ranking of 2 applies otherwise, the cost could lower the ranking to negative 2. There will be some adverse impact to the extent the cost of fuel is increased over that currently paid for wood.

Economic

Costs to state/taxpayers

This program entails a major cost to the state/taxpayers in order to fund the incentives unless alternative funding sources can be identified. Some one will be paying for it, likely from taxes or the state, hence the negative number.
Use County Enterprise Zone to obtain funds from new and/or expanding industry to support woodstove changeouts

Economic

Level of financial incentive to comply

The incentive has to cover all or substantially all of the cost of replacement in order to be effective. In addition, the program incentives need to be extended to residents who are not 'low income' to increase the program's impact on PM2.5. There maybe a feeling of financial gain here by those who receive the incentives.

Level of financial deterrent to violate

N/A. I am not sure what is the financial deterrent here to violate. Hence the 0 is there a financial deterrent?

Social

Level of public support

The public should continue to be supportive of such a voluntary incentive program. Public would be supportive if they benefit fro it. Others who do not may not want to se the tax $$ spent that way, Hence a rank of 1.

Difficulty of explaining idea to those affected

Since the program has been implemented over time in the community, it should be relatively easy to explain and market through SCOEDD. Maybe hard to explain to those who do not see themselves benefiting from it, hence a 1.

Social

Relative impact on under-served communities

Increased fuel costs balance out the free change-out. If the under served communities get a free replacement it would be a 2.

Technological Feasibility

Degree of difficulty to implement
The program has been successfully implemented though SCOEDD with no technological difficulty. Should be easy to change a stove out, not to technical it is done all the time.

Rec. #: 19

Contingency? Y ☑ N ☐

Recommendation Description:

Change advisory call setpoints and applianced allowed to be used

Feasibility			
Is recommendation technologically possible?	☑ Yes	☐ No	☐ Need info
Does recommendation meet EPA/DEQ requirements?	☑ Yes	☐ No	☐ Need info
Does recommendation meet all other legal requirements?	Yes	No	Need info

Criteria	**Wt.**	**Raw Score**	**Wtd. Score**
Environmental			
Effect on PM2.5 level	3.8	2	7.6
Health			
Likely effect on pollution related illness	2.9	2	5.8
Effect on quality of life	3	2	6
Economic			
Likely effect on local jobs	3.4	0	0
Cost to those affected	3.2	-1	-3.2
Costs to state/taxpayers	2.7	0	0
Level of financial incentive to comply	2.2	-1	-2.2
Level of financial deterrent to violate	2.2	1	2.2
Social			
Level of public support	2.8	-1	-2.8
Difficulty of explaining idea to those affected	2.1	0	0
Relative impact on under-served communities	2.5	0	0
Technological Feasibility			
Degree of difficulty to implement	3.2	2	6.4
	Total Wtd. Score:		**19.8**

Is recommendation technologically possible?

Yes

Does recommendation meet EPA/DEQ requirements?

Raw Scoring Scale	
Good	2
	1

Neutral	0
Bad	-1
	-2

Yes

Does recommendation meet all other legal requirements?

Yes

Environmental

Effect on PM2.5 level
Would lower it commensurate with the amount the threshold is lowered. The exact amount it is lowered would require input from DEQ experts.

Health

Likely effect on pollution related illness

Would have positive effect

Health

Effect on quality of life

Would have positive effect on health. Slight negative effect if it increases heating costs.

Economic

Likely effect on local jobs

Zero impact

Economic

Cost to those affected

Could increase heating costs

Economic

Costs to state/taxpayers

No cost

Economic

Level of financial incentive to comply

Slight negative

Economic

Level of financial deterrent to violate

Imposition of $750 fine would hurt

Social

Level of public support

Probably would be negative

Social

Difficulty of explaining idea to those affected

Relatively easy

Social

Relative impact on under-served communities

Technological Feasibility

Degree of difficulty to implement

Pretty simple

Appendix A-15-3

List of Rejected Strategies by the Advisory Committee

RACT/RACM
geothermal district
truck stop electrical plug-in
Wood burning permit
Public transit improvements
restrict roads or lanes
Employer-based mgt plans
trip-reduction ordinance
traffic flow improvement programs
parking facilities - multiple-occupancy
limit or restrict vehicle use downtown
high-occupancy - ride share
limit road surfaces to non-motorized vehicles
Bike storage facilities
control idling of vehicles
reduce extreme cold-starts
Employer-sponsored flex schedules
ordinance to facilitate auto travel etc
new and reconstructed paths non-motorized
removal of pre-1980 vehicles
Landuse planning - mixed use
Redevelopment - infill
Road design
Stricter Woodstove Certification Standards
Boiler MACT
shutdown forest sales of firewood
Share smoke violations with public
Prohibit outdoor woodheaters statewide
Create larger Smoke protection zone
Negotiate agreement with Modoc co
Stricter ODF enforcement in SPZ
Dept of AG issues instructions for ag burning
Rules for Fryer cookers
Barbeque rules
Create diesel free zones
create Idle free zones
Safe perimeter parking for parents & Kids
satellite service to reach outliying communities

idle reduction at schools
More neighborhood stores
Cost effectiveness of plowing or sanding
Improve trails
Subgroup to tap CMAQ Funding
"Think ahead" program plan trips

APPENDIX A-16

Klamath Air Quality Advisory Committee Report

Recommendations for the Klamath Falls $PM_{2.5}$ Attainment Plan

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Executive Summary

Klamath Falls has a lengthy history of identifying and successfully working to solve problems with particulate air pollution. In the late 1980s Klamath Falls had particulate pollution that violated federal standards by more than five times. By January 1991 the community's particulate reduction strategies achieved federal standards, and the area was designated as "in attainment" in 2003. With a greater understanding of the health effects of particulates, the federal U.S. Environmental Protection Agency (EPA) revised the standard to lower more protective levels. As a result, Klamath Falls area was again in violation of the federal 24-hour particulate standard (PM 2.5) in 2009. The Oregon Department of Environmental Quality (DEQ), along with representatives of the Klamath Falls community and local government must now develop a new plan to meet the more stringent air quality standard and further reduce emissions. The federal deadline to meet the PM 2.5 standard in Klamath Falls is December 31, 2014.

DEQ, in collaboration with Klamath County, convened the Klamath Air Quality Advisory Committee to help develop and recommend strategies to bring Klamath Falls back into attainment with the federal 24-hour daily $PM_{2.5}$ standard. For over a year the committee met to consider data, community values, and pollution reduction strategies with the highest chance of success in meeting the PM 2.5 standard. The result is a thoroughly considered group of primary emission reduction recommendations and a set of secondary contingency measures and minority opinions to be implemented in the event that the December 2014 deadline is not met. These recommendations form the groundwork for the Board of Klamath County Commissioners to include emission reduction measures in ordinances and DEQ to produce an attainment plan for EPA approval.

In addition to addressing concerns about public health, there are strong economic incentives for Klamath Falls to return to attainment with the federal particulate standard. While in violation of the PM 2.5 standard, the community is subject to more stringent industrial growth rules, the possibility of restrictions on federal transportation funding and impediments to local economic growth in some industrial sectors.

The largest source of particulate in Klamath Falls is residential wood burning, and this category is the primary focus of the committee recommendations. While it is difficult to manage multiple and dispersed emission sources from residences, both local government and DEQ have extensive experience reducing particulate through wood burning curtailment programs. The recommendations will enhance the existing woodstove curtailment and public awareness programs, increase open burning controls, and allow for new and expanded industrial emissions by allowing emission offsets from wood burning appliances. Previous community experience and DEQ's scientific analysis both support the expectation that Klamath Falls will meet the PM 2.5 standard by December 2014.

Chapter 1: Background

This chapter describes:
1. An overview of federal particulate standards
2. The purpose, scope and membership of the advisory committee
3. Next steps and timelines
4. The history of particulate standards and status of Klamath Falls

1.1 Overview

The federal U.S. Environmental Protection Agency establishes health standards for specific air pollutants - carbon monoxide, ozone, particulate matter, sulfur dioxide, nitrogen dioxide, and lead. EPA revised the National Ambient Air Quality Standards for fine particulate matter in 2006. Klamath Falls failed to meet the federal 2006 twenty-four hour fine particulate standard also known as the $PM_{2.5}$ standard. In response to this failure to meet the standard, in December 2009, the EPA designated Klamath Falls, Oregon as a nonattainment area for $PM_{2.5}$, also known as fine particulate air pollution. The Oregon Department of Environmental Quality must develop a plan specifying how, through particulate reductions, Klamath Falls will attain the federal standard by 2014. DEQ, in collaboration with Klamath County, convened the Klamath Air Quality Advisory Committee (KAQAC) to help develop and recommend strategies to bring Klamath Falls back into attainment with the federal 24-hour $PM_{2.5}$ standard. The committee has recommended strategies to the Board of Klamath County Commissioners for inclusion in their ordinances and to DEQ for incorporation in an attainment plan. Using these recommendations and its own technical analysis, DEQ will propose rules and develop an attainment plan for consideration by the Oregon Environmental Quality Commission[1] and subsequently, EPA.

The Klamath Air Quality Advisory Committee (KAQAC) met during 2011 and 2012 and deliberated on how to improve air quality in the Klamath Basin. The KAQAC identified air quality strategies to bring Klamath Falls into attainment with the $PM_{2.5}$ standard. This report outlines those strategies and categorizes them into recommendations for immediate implementation and contingency strategies that would be implemented in 2015 should Klamath Falls nonattainment area not meet the December 2014 federal deadline for attainment.

Failure to attain the standard by December 2014 will result in the continuation of strict regulations on new and expanding industrial sources attempting to locate within the Klamath Falls nonattainment area and could cause funding consequences for proposed federally funded transportation projects. In addition, the contingency measures would be automatically be instituted, leading to further restrictions on many sources of $PM_{2.5}$ emissions.

The purpose of this document is to recommend emission reduction strategies to DEQ and Klamath County for the $PM_{2.5}$ Attainment Plan.

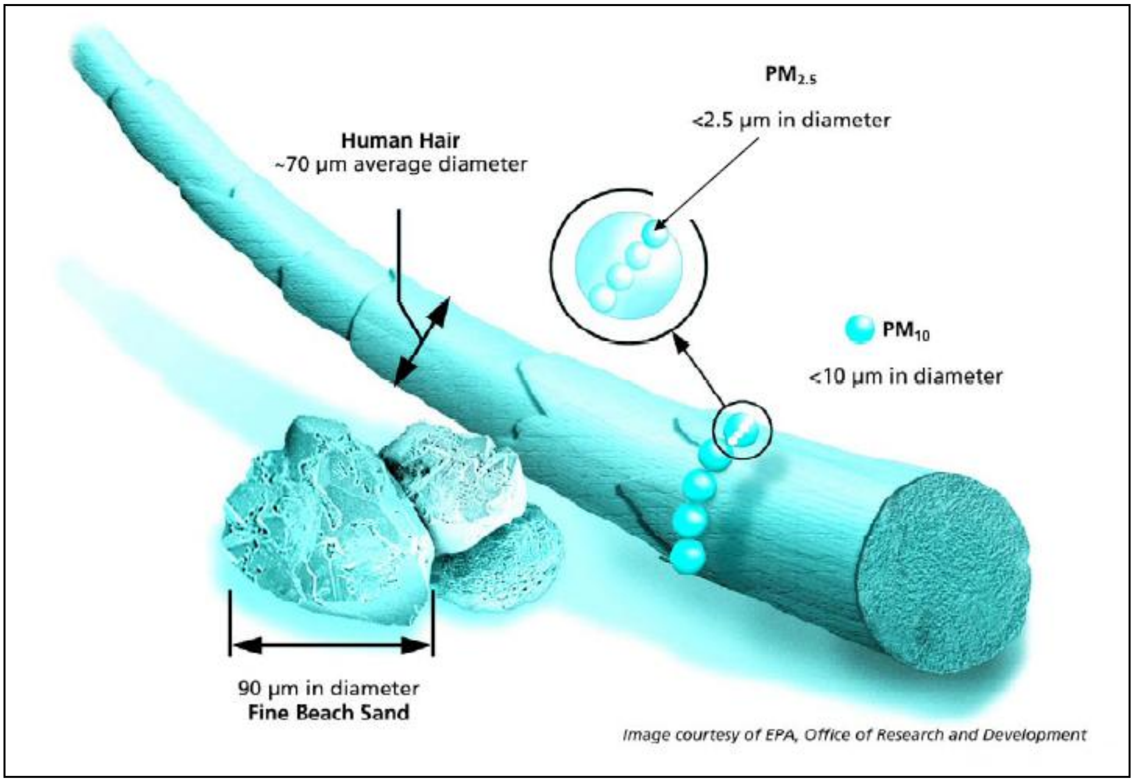
1.2 National Air Quality Standard for $PM_{2.5}$

Particulate matter is a mixture of very small droplets of smoke, soot, and dust. Particulates less than 2.5 micrometers (µm) in diameter are referred to as fine particulate, and when inhaled, can lodge deep in the human lungs and can cause heart or respiratory ailments especially in the young, the elderly and those with respiratory or circulatory problems. Sources of fine particulate matter include fuel burning equipment (including wood stoves), agricultural burning, automobiles and some dust related sources.

The particles in PM 2.5 pollution are extremely small. The average human hair is about 70 micrometers in diameter, making it 30 times larger than the largest fine particle. Figure 1 illustrates the size of a $PM_{2.5}$ particle compared to beach sand and a human hair.

[1] The Environmental Quality Commission is a five-member citizen panel appointed by the governor to four-year terms, serving as Department of Environmental Quality's (DEQ) policy and rulemaking board.

Figure 1: Comparative Size of $PM_{2.5}$ Particles



For $PM_{2.5}$, EPA sets two "forms of the standard". There is a 24-hour (daily) standard and an annual standard. The 24-hour daily standard addresses short-term events such as emissions from residential wood combustion. The annual standard addresses long-term events. Emissions associated with this are generally from residential wood combustion, and vehicle and industrial emissions, where sources of particulate matter are constantly contributing emissions into the atmosphere. Together, these two forms of the standard protect against all particulate health effects.

Monitoring data show that Klamath Falls meets the annual $PM_{2.5}$ standard, but fails to meet the 24-hour $PM_{2.5}$ standard.

According to EPA, effects associated with short-term exposure to higher levels of fine $PM_{2.5}$ include:

- Premature death in people with heart and lung disease
- Non-fatal heart attacks
- Increased hospital admissions, emergency room visits and doctor's visits for respiratory diseases
- Increased hospital admission and emergency room visits for cardiovascular diseases
- Increased respiratory symptoms such as coughing, wheezing and shortness of breath
- Lung function changes, especially in children and people with lung diseases such as asthma
- Changes in heart rate variability
- Irregular heartbeat
- Changes in subtle indicators of cardiovascular health

1.3 Klamath Falls Air Quality Advisory Committee

1.3.1 Purpose

DEQ and Klamath County convened an advisory committee that represents different perspectives in the Klamath Falls area. The Advisory Committee was charged with investigating the contribution and need for emission reductions from all emission source categories, including residential wood heating, residential open burning, motor vehicles, major industry, and other sources. The Committee met 13 times over the course of about a year, approximately once a month from March 2011 through February 2012. DEQ and the County provided technical information and assistance to the committee.

The purpose of the committee was to devise actions, strategies, ideas, rules, incentives and other mechanisms to reduce air pollution in Klamath Falls. Strategies were developed to reduce $PM_{2.5}$ emissions and bring Klamath Falls into attainment by the Clean Air Act deadline of 2014. The committee also recognized the County's 2007 revision of its Clean Air Ordinance in response to the more protective 2006 $PM_{2.5}$ standard. These revisions included a Heat Smart strategy to increase the numbers of clean burning woodstoves and a new 30 $\mu g/m^3$ threshold for the mandatory curtailment program. These strategies are designed to keep the Klamath Falls area in compliance beyond 2014, and were weighed by the committee to determine their effectiveness in pollution reduction. The group recommended additional strategies to DEQ for inclusion in the Klamath Falls $PM_{2.5}$ Attainment Plan. Additional, contingency measures were also identified that will automatically be undertaken if Klamath Falls does not reach attainment by December 2014, or if it violates the standard in the future. The strategies, when implemented, will improve air quality enough for Klamath Falls to meet the federal air quality standard for $PM_{2.5}$.

This report is presented to DEQ and the Klamath County Board of Commissioners providing recommended strategies to bring Klamath Falls into attainment.

1.3.2 Advisory Committee Members

Name	Affiliation
Jeff Ball – *Advisory Committee chair*	Retired, former Klamath Falls City Manager
Kenneth Paul, *vice chair*	Retired, former US Forest Service
John Elliott	Private citizen, former Klamath County Commissioner
Scott Rice	Deputy Fire Marshal, Klamath County Fire District #1
Edward Fenner	Private citizen
Charles Massie	Klamath County Chamber of Commerce
Kirk Oakes	Private citizen
Ann McGill	Private citizen
Dwayne Arino	Private citizen, environmental engineer
Jim Gillam	Editor, The Chimney Sweep News
Michael Broughton	US Fish and Wildlife, smoke management specialist
Wendy Warren	Physician
Delbert Bell (ex officio)	Environmental Health Manager, Klamath County Health

1.3.3 Scope

The advisory committee focused the scope of its discussion on particulate reduction strategies for sources affecting the air quality problem within the Klamath Falls attainment area. Discussions concerned strategy development, not technical applications. A separate local technical group, called the Klamath Air Quality Science and Technical Committee, was established to review the technical applications DEQ uses to measure emissions and establish its technical approach.

1.3.4 Public Involvement

On behalf of the committee, DEQ provided public notice to the media and acted as point of contact for the general public. All meetings were open to the public and had a limited time set aside each meeting for the public to speak. All meeting summaries, agendas, materials, meeting times and locations were posted on the DEQ web site for public access. The last four meetings were broadcast on public access television. Citizens were also encouraged to comment to the committee through the following channels:

- Website: www.deq.state.or.us/aq/planning/kfallsCommittee.htm
- Mail: Send letters to 811 SW Sixth Ave, Portland, OR 97204
- Phone: Call DEQ at 1-800-452-4011.

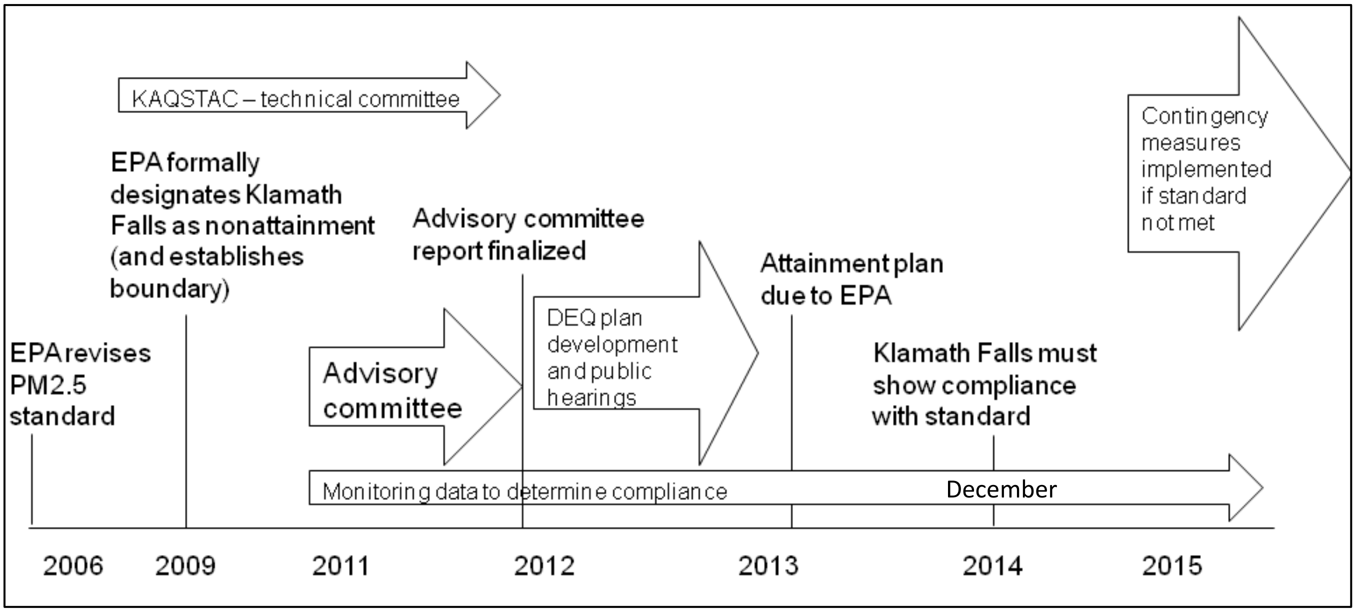
All public comments were compiled by DEQ and discussed with the committee. The comments are also compiled and included as Appendix A6 in the Advisory Committee's final report. The committee considered, but did not necessarily respond to input.

1.3.5 Timeline/Deadlines

After the advisory committee work concludes, DEQ will use committee recommendations and the County Ordinance to develop an attainment plan in collaboration with Klamath County and others as needed. The attainment plan must contain local and state rules which will bring Klamath Falls into attainment with the 24-hour daily PM2.5 standard by December 2014. DEQ will initiate rulemaking to implement emission reduction strategies, and as part of the rulemaking process, will hold public hearings in mid 2012. DEQ plans to bring the attainment plan to the Environmental Quality Commission in December 2012 for approval. The attainment plan is due to EPA on December 14, 2012, although DEQ plans to submit it to EPA in January 2013 because of current administrative rule adoption timelines. Figure 2 shows the attainment plan timeline.

If Klamath Falls does not meet the standard in December 2014, contingency measures will be implemented to bring the area into attainment. The advisory committee has recommended contingency measures in section 3.4 of this report.

Figure 2: Klamath Falls $PM_{2.5}$ Attainment Plan Timeline



1.4 History of Success Addressing PM in Klamath Falls

Citizens in Klamath Falls and Klamath County have had a history of addressing particulate matter, and have met the challenge of improving their air quality on several occasions. In the past, EPA has had two other standards related to particulate matter: total suspended particulate and PM_{10}. Originally, EPA regulated total suspended particulate matter which was a category of relatively large particulate matter. PM_{10}, a subset of total suspended particulate, is officially known as "coarse" particulate matter. The expansion of natural gas in Klamath Falls has provided an alternative source of heat to wood burning. For historical perspective, Figure 3 is a graph showing air quality in Klamath Falls since DEQ began monitoring particulate matter in the area.

Figure 3: History of Particulate Matter in Klamath Falls

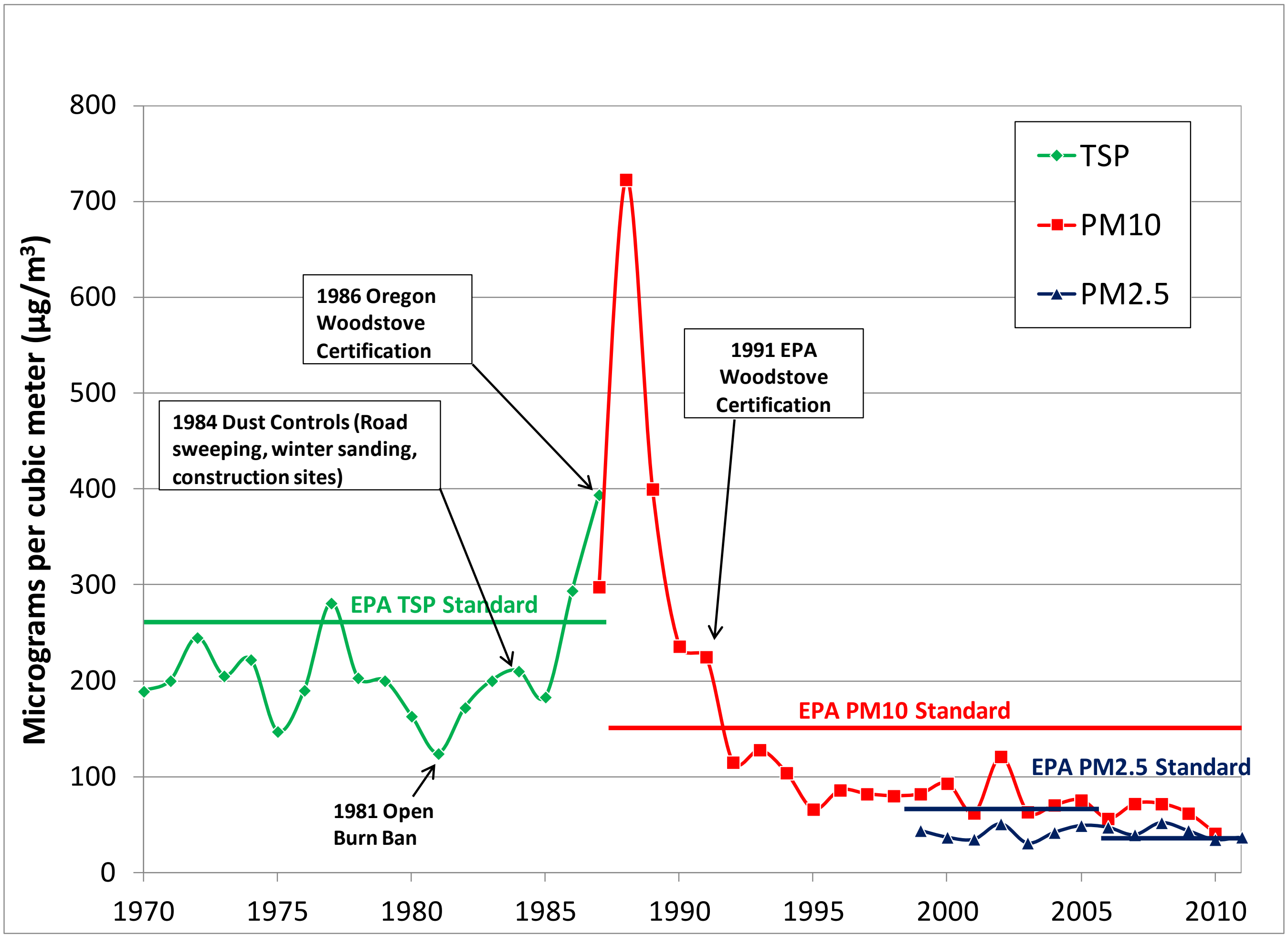


Figure Note: (µg/m3) = micrograms per cubic meter.

1.4.1 1987 PM_{10} Standard

The green lines in Figure 13 show monitoring results and the value for the first federal standard for total suspended particulate (TSP). As more information became available, EPA finalized PM_{10} standards in 1987, with a 24-hour daily standard of 150 micrograms per cubic meter (µg/m^3), and an annual standard of 50 µg/m^3. Klamath Falls was designated as nonattainment for PM_{10} in 1987. The red lines in Figure 3 show second highest day monitoring results as required for evaluation against the 1987 PM_{10} standard. The peak value in 1988 resulted from both the switch to a more protective standard and the relocation of the monitor from the downtown fire station to the Peterson School where values were much higher.

An advisory committee convened to develop strategies that included woodstove curtailment, uncertified stove replacement, new road dust controls, and fugitive dust controls. As a result, Klamath Falls met the PM_{10} standard by 1994, and has continued to meet the standard since then. DEQ convened another advisory committee to develop a maintenance plan and submitted this plan to EPA in 2002. EPA redesignated Klamath Falls as attainment in 2004.

1.4.2 1997 $PM_{2.5}$ Standard

In 1997, EPA tightened the standard by recognizing that the $PM_{2.5}$ particle size was of concern. The 24-hour daily standard was set at 65 μg/m^3, and the blue lines on Figure 3 show the monitoring results and standard for $PM_{2.5}$. Klamath Falls did not violate the 1997 $PM_{2.5}$ standards due to previous successful emission reduction efforts.

1.4.3 2006 Revised $PM_{2.5}$ Standard

In 2006, EPA reviewed hundreds of additional studies and recent health effects information, and determined the standard needed to be lowered to adequately protect public health. The 24-hour daily standard is now 35 μg/m^3. The blue line in Figure 3 shows 98^{th} percentile values, all of which are above the current standard.

Unhealthy accumulation of $PM_{2.5}$ continues to be a wintertime occurrence in the Klamath Falls basin due to cold air inversions trapping emissions near the ground. The predominant source of particulate in Klamath Falls in the winter still is residential wood heating. Other sources of $PM_{2.5}$ emissions include fuel oil use, large and small industry, vehicle tailpipe emissions and road dust, forest and agricultural fires, as well as open burning and other fuel combustion sources. Chapter 2 of this report contains detailed information on sources of $PM_{2.5}$ within the Klamath Falls nonattainment area.

Chapter 2: Description of Problem

This chapter describes:

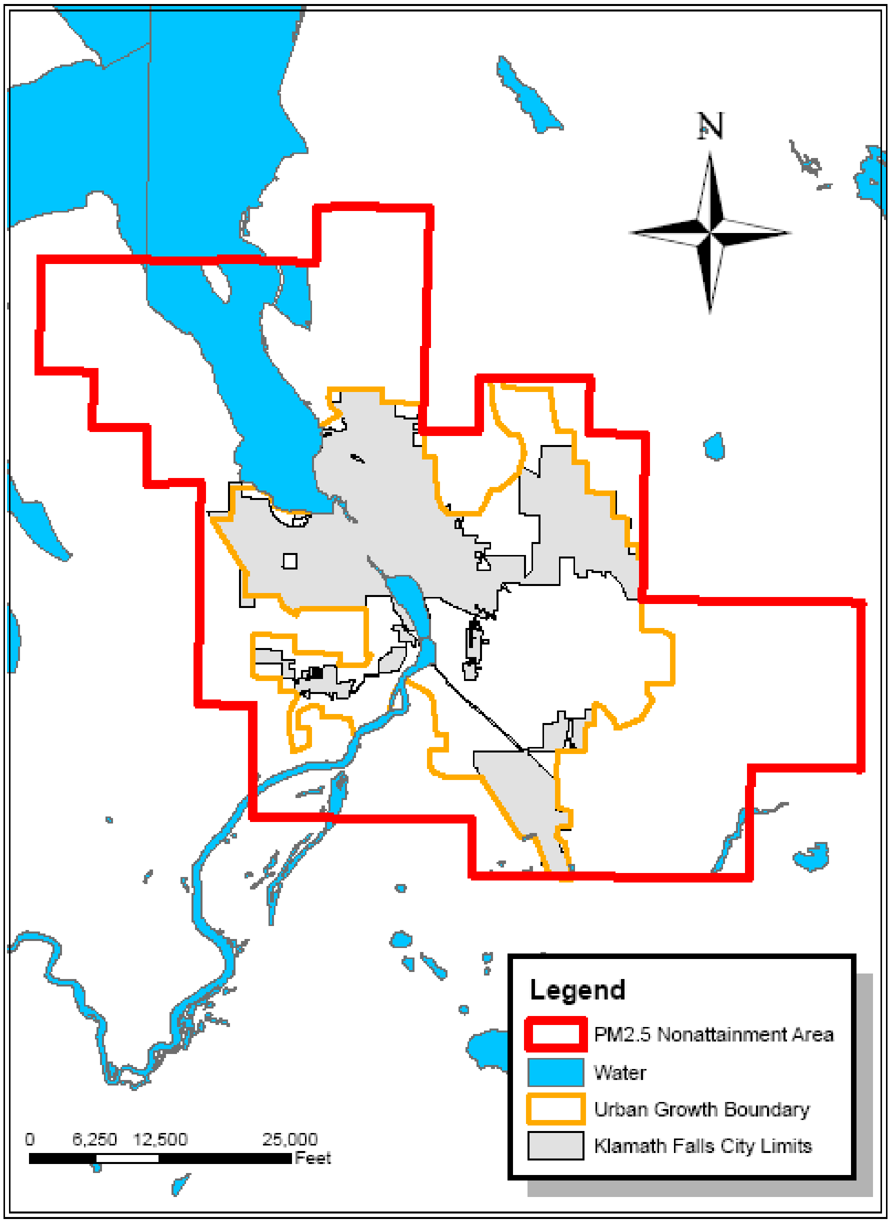
1. The Klamath Falls Nonattainment Area Boundary.
2. Monitoring data for $PM_{2.5}$ in the Klamath Falls area and how results are evaluated against the standards.
3. The emissions inventory that was conducted for Klamath Falls.
4. The sources of $PM_{2.5}$ in the 2008 base year for the worst case day.
5. Projected worst case day $PM_{2.5}$ emissions in 2014 (when Klamath Falls must meet the 24-hour daily $PM_{2.5}$ standard) based on increases in emissions due to growth and decreases in emissions due to local, state, and federal emission control measures.

2.1 Klamath Falls $PM_{2.5}$ Nonattainment Area Boundary

In setting the nonattainment area boundary, EPA considered emissions data, air quality monitoring data, meteorology data, Oregon's unique land-use laws, population density and growth estimates, traffic and commuting patterns, and the geography and topography of Klamath County. The nonattainment area boundary includes the sources that contribute to violations of the standard and potential sources that could contribute to violations at the monitor. Exceedances usually occur at night during winter cold air inversions with wind speeds below three miles per hour. A cold air inversion occurs when the sun goes down, the earth cools, and a layer of cooler air is trapped at the surface. During these inversions, there is little or no transport of wood combustion related smoke into or out of the area. Other potential outside sources, such as the small, southern communities of Keno and Merrill are located about 12 miles and 20 miles from Peterson School monitor respectively. They are separated by hills, topography or distance to prevent the buildup and transport of emissions. For this reason, these small communities are not included within the nonattainment area boundary.

Figure 4 illustrates the $PM_{2.5}$ nonattainment area boundary, which includes existing residential areas and industrial sources. It goes beyond the urban growth boundary to the east to include existing residential subdivisions. The boundary continues south to include the airport (Kingsley Field). Continuing southeast, the boundary includes four major industrial sources (Collins Forest Products, Columbia Plywood, the Peaker Facility and the Klamath Co-Generation facility). The delineation of the $PM_{2.5}$ nonattainment area boundary also considered potential future impacts to the Klamath Falls area, and extends north and east of the urban growth boundary to include a destination resort along Klamath Lake and proposed residential subdivisions and to account for future recreational and residential growth.

Figure 4: Klamath Falls $PM_{2.5}$ Nonattainment Area



Klamath Falls Nonattainment Area Boundary Set by EPA on December 18, 2008
Klamath Falls Urban Growth Boundary and City Limits based on Oregon's Land Use Planning Laws.

2.2 $PM_{2.5}$ Monitoring Data

Klamath Falls has one $PM_{2.5}$ monitor located at the Peterson School, which has the highest particulate levels in the area. DEQ has conducted several saturation surveys where PM2.5 monitors have been placed throughout the community to determine that the Peterson School is the most representative of high concentration locations suitable for monitoring violations of the particulate standard. Addressing violations of the standard at the Peterson School monitor will ensure compliance at other locations in the Klamath Falls area.

Exceedances occur when particulate levels are monitored above the standard. Violations consist of one or more exceedances of the standard. For PM_{10}, a violation occurs when there is more than one day above150 ug/m3 over a three year period. For the $PM_{2.5}$ 24 hour standard, a violation occurs when the three year average of the 98th percentile values exceeds 35 ug/m3. The Klamath Falls area has been in violation of the 2006 revised three year average of the 24 hour daily standard every year since 2006 and has exceeded the standard all but one year. Like Figure 3, Figure 5: Klamath Falls 24-hour Daily Particulate Matter Trend shows the daily particulate matter trends using levels specified by the standards (2nd highest day for PM_{10}, 98th percentile days for $PM_{2.5}$). The year 2008 is a baseline measurement year for the current $PM_{2.5}$ because it is a year when DEQ had gathered monitoring data sufficient for EPA to make the determination of nonattainment.

Figure 5: Klamath Falls 24-hour Daily Particulate Matter Trend

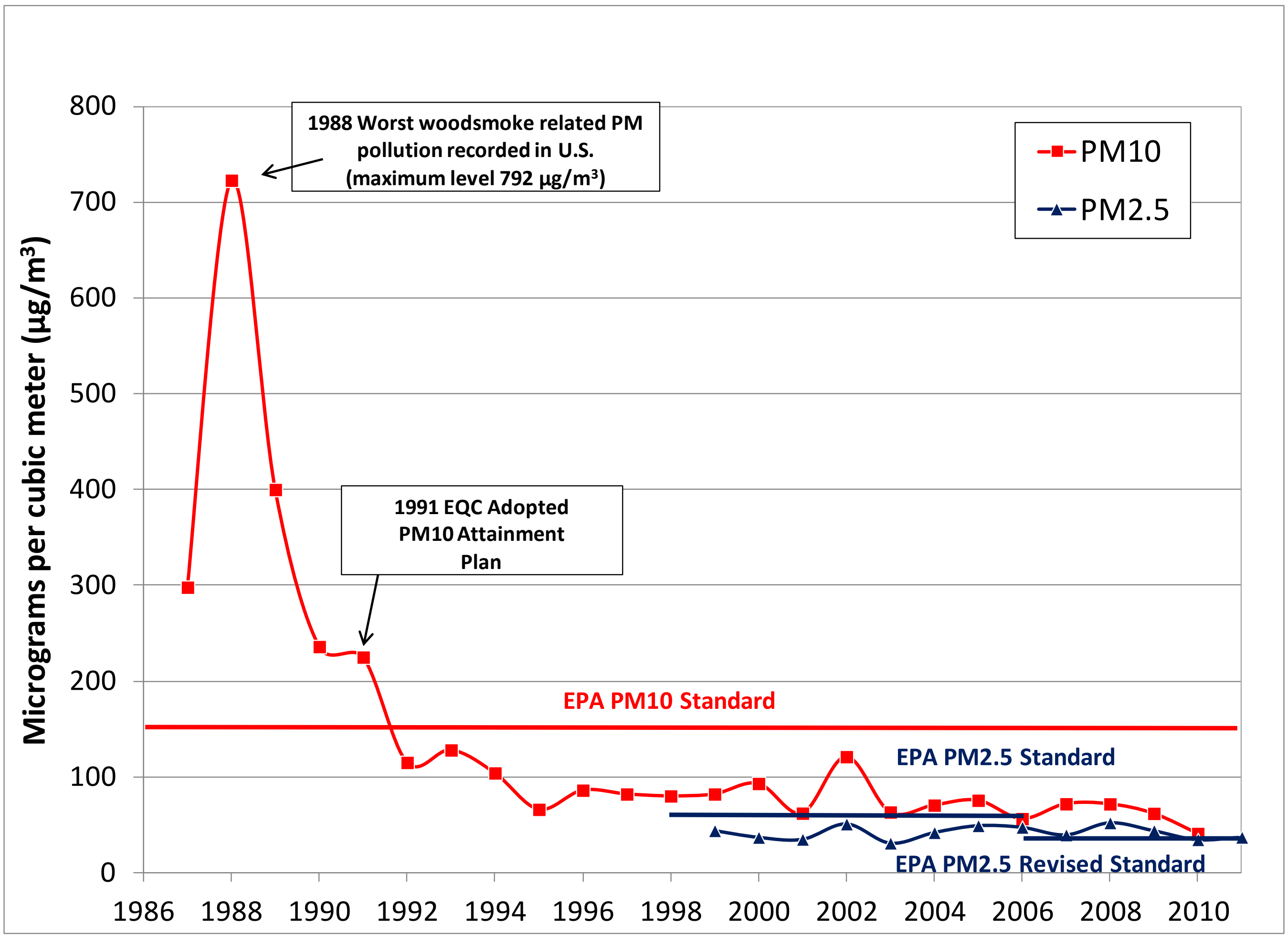
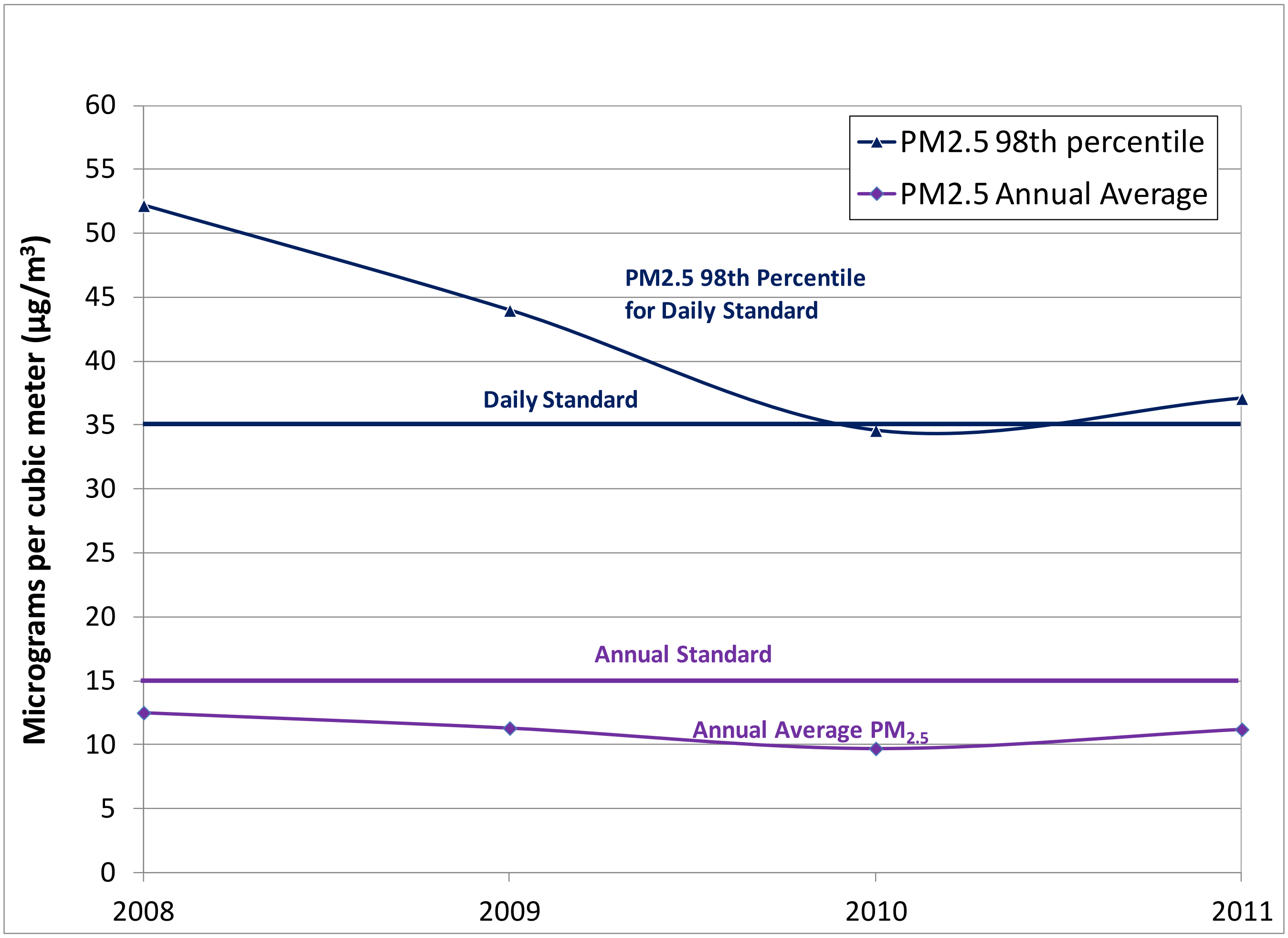


Figure 6 illustrates the most recent four years of 24-hour $PM_{2.5}$ monitoring data at the Peterson School as compared to the 24-hour daily standard. In 2010 there was no exceedance of the 24 hour pm 2.5 standard, but levels were again above the standard in 2011.

Figure 6: Klamath Falls Most Recent Four Years of $PM_{2.5}$ Data



As illustrated by Figure 7, the Klamath Falls area has not violated the $PM_{2.5}$ annual standard since 1990, even with the lower more protective standard of 15 μg/m^3.

Figure 7: Klamath Falls Particulate Matter Trend (Annual)

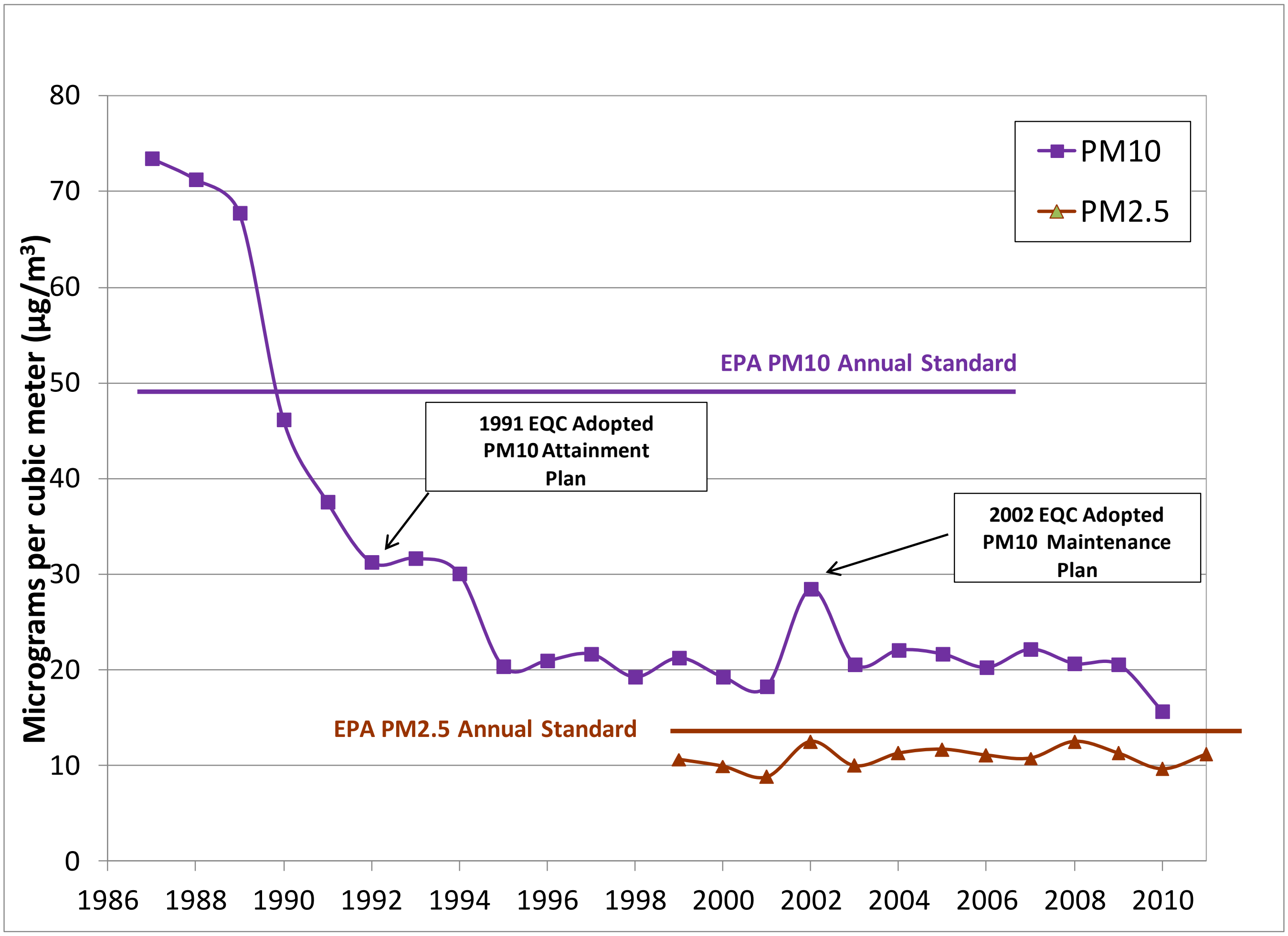


Table 1 illustrates the 24 hour and annual monitored $PM_{2.5}$ levels for the years 2005 through 2011. The table includes three-year rolling averages. These are the values that attainment or nonattainment determinations are based on. As the data show, the rolling averages of Klamath Falls monitored 24-hour $PM_{2.5}$ levels between 2007 and 2011 are all above the standard of 35 µg/m3. Table 1 also shows that rolling averages for monitored annual $PM_{2.5}$ levels during these years met the standard of 15 µg/m3.

Table 1: Klamath Falls Monitored $PM_{2.5}$ Levels

	Monitored 24 hour concentration (µg/m3)	Rolling average 24 hour concentrations (24 hr PM2.5 standard = 35 µg/m3)	Monitored annual average concentrations (µg/m3)	Rolling average annual concentrations (Annual PM2.5 standard = 15 µg/m3)
2005	49		11.7	
2006	48		11.1	
2007	40	45.7	10.8	11.2
2008	52	46.7	12.5	11.5
2009	44	45.3	11.3	11.5
2010	34.6	43.5	9.7	11.2
2011	37.2	38.6	11.2	10.7

Table Notes: (µg/m3) = micrograms per cubic meter. Wildfire Data Removed in 2008 and 2009

2.3 Emissions Inventory Description

2.3.1 Overview

Klamath Falls must show the EPA that they will meet the federal 24-hour daily $PM_{2.5}$ standard by December 2014 by implementing emission control strategies to reduce PM2.5 emissions. In order to determine the sources of PM2.5 emissions in Klamath Falls, EPA requires DEQ to develop an emissions inventory within the nonattainment area boundary (See Figure 4). An emissions inventory is a comprehensive estimation of air pollutant emissions by source in a geographic area during a specific time period. DEQ selected 2008 as the base year because it was the most recent data available. Using the 2008 emissions inventory, DEQ estimated the emissions for the future year of 2014 based on a growth rate and implementation of emission reduction measures at the local, state, and federal levels. The 2014 emission inventory is the basis for DEQ's attainment demonstration to EPA. Section 2.4 describes the result of the 2008 emissions inventory, and section 2.5 describes the results of the 2014 emissions inventory.

2.3.2 What Sources of Emissions are Included?

Emissions are described by source categories, and for each source category the emissions are calculated using specific methodologies. Most of the emissions are calculated using emission factors from the U.S. EPA. This information, in some cases, was further refined using information from surveys, information gathered from other government agencies (such as ODOT), and industrial permits.

There are four major emission source categories that EPA requires be addressed. Figure 8 illustrates the main emission source categories:

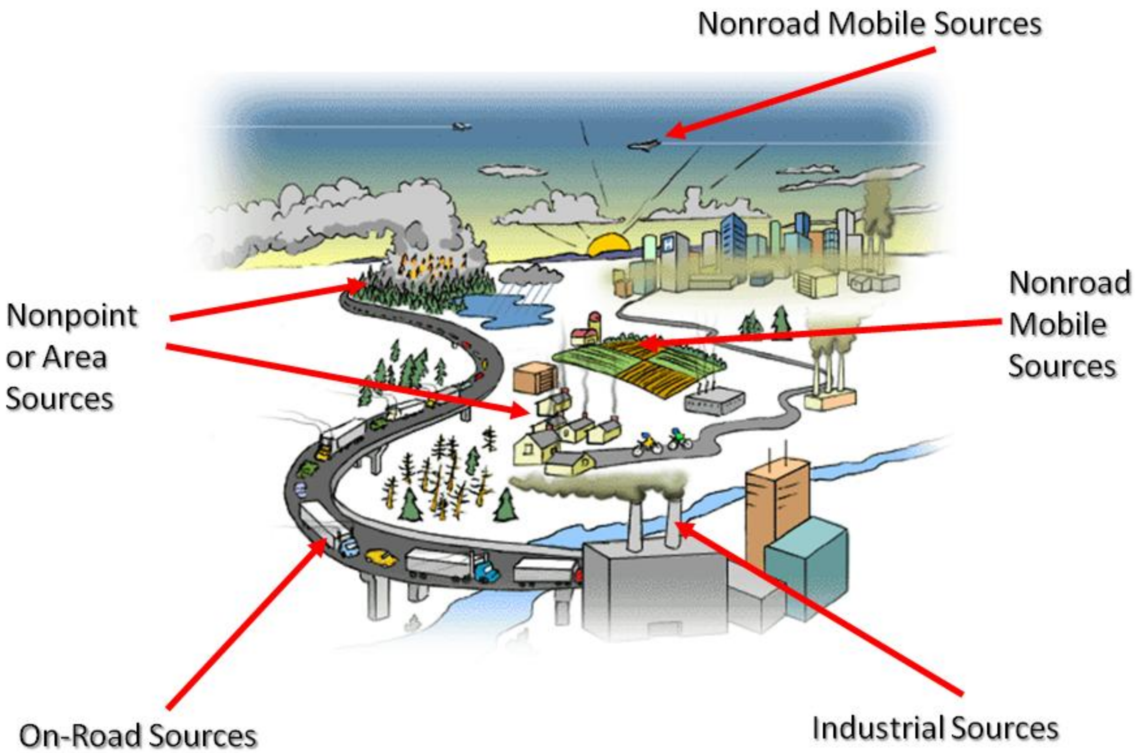
- **Nonpoint or Area** emission sources include woodstove emissions, open burning emissions, small business or industry emissions, fugitive dust from construction and agricultural operations, and agricultural and forest burning. EPA only expects DEQ to categorize emissions within the nonattainment area. Agreements on forest and agriculture activities outside the nonattainment area will be considered when developing agreements to prevent or limit intrusions into the nonattainment area.

- **Point** emission sources include major industrial complexes that are permitted by the DEQ and could contribute $PM_{2.5}$ emissions to the Klamath Falls Nonattainment Area.

- **On-road mobile** emission sources include cars, buses and trucks. The Oregon Department of Transportation (ODOT) used a model to determine the number and type of vehicles traveling along each segment of roadway. $PM_{2.5}$ from vehicles is predominately from re-entrained road dust and diesel engines. Roadway dust includes re-entrained dust produced from vehicles traveling over a roadway, and also fugitive dust produced from wind blowing across paved and unpaved roads. Gas powered vehicle tailpipe $PM_{2.5}$ emissions are rather low compared to re-entrained dust estimates.

- **Non-road mobile** emission sources include airplanes, railroads, lawn mowers and watercraft. This category does not constitute a major part of the total emission inventory, but is a requirement for analysis.

Figure 8: Types of $PM_{2.5}$ Estimated Emission Sources Included in Emissions Inventory



2.3.3 24-hour Daily Emissions versus Annual Emissions

Because Klamath Falls meets the annual standard for $PM_{2.5}$, sections 2.4 through 2.7 of this report focus on information used to identify emissions potentially contributing to the violation of the 24-hour daily standard. Worst-case day emissions are important because they correspond with the daily 24-hour National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$. The annual average emissions correspond to the annual NAAQS for $PM_{2.5}$ and are based on an average of all typical daily emissions. EPA also requires the annual emissions be included in the inventory. Information on annual $PM_{2.5}$ emissions can be found in Appendix A4.

2.3.4 What pollutants contribute to $PM_{2.5}$ concentrations?

Particulate matter is composed of fine particulate matter as well as particulate matter formed in the atmosphere from precursors. Sulfates, nitrates, volatile organic compounds, and ammonia all contribute to the formation of particulate matter. DEQ included sulfates, nitrates, volatile organic compounds, and ammonia in the inventory as well as $PM_{2.5}$.

2.3.5 How Are 2014 Emissions Estimated?

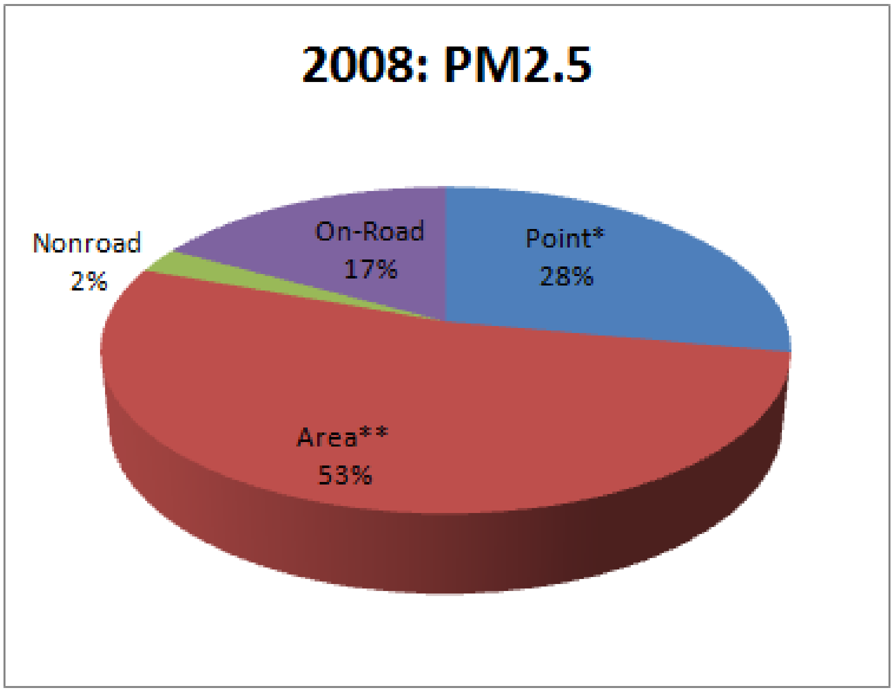
Future year emission inventories are affected by several factors including growth, which can increase emissions, and new regulations at the local, state, or federal level, which can decrease emissions. In addition, technology changes such as further expansion of natural gas, certified stoves and alternative energy sources can decrease emissions by allowing people to switch away from wood as a heat source. In Klamath Falls, emissions changes are based on estimated changes in indicators such as population, economic and industrial activity, and vehicle traffic. DEQ calculated e missions for 2014 using growth assumptions and other knowledge about emission sources in Klamath Falls. For most categories of emissions, DEQ used growth assumptions from the Oregon Office of Economic Analysis. Growth in woodstove emissions was based on construction and change out information. Projections for industrial emissions were based on a no growth scenario. Several local, state, and federal regulations will decrease emissions from some source categories between 2008 and 2014. The emissions inventory is a catalog of the best estimate of 2008 emissions, and an informed prediction of what is likely to happen by 2014. Both present and future year inventories are critical components of air quality planning. Section 2.5 describes growth factors and the 2014 emissions inventory.

2.4 Emissions Inventory 2008

Unhealthy accumulation of $PM_{2.5}$ is typically a wintertime problem in the Klamath Falls basin, due to cold air inversions that trap emissions near the ground. The predominant source of particulates in Klamath Falls in the winter is residential wood combustion, including wood combustion in fireplaces. Other sources of $PM_{2.5}$ emissions include industrial, transportation and forest and agricultural burning emissions. Figure 9 shows the contribution of each of these source categories in the Klamath Falls area based on the 2008 inventory.

Residential wood combustion makes up 76% percent of the area source category. Because residential wood emissions are released in neighborhoods near the Peterson School monitor, usually at low heights in evening hours with low wind speeds, and shallow, capping temperature inversions, these emissions have the highest impacts at the monitor. While industrial emissions make up 28% of total PM2.5 emissions, they only comprise about 2-3% of the measured concentration of PM2.5 at the monitor. This is in large part because of higher release heights, more buoyant plumes, greater distance from the monitor, and greater dispersion. Emission sources contributing the smallest proportion of $PM_{2.5}$ emission include non road and on road emissions. Non Road emission from sources such as airplanes, railroads, watercraft and lawnmowers represent only 2% of emissions. Other area emissions from sources such as residential heating other than wood (natural gas, for example), fugitive dust from agricultural and construction operations, small business and small industry emissions, and open burning represent 2% of all emissions.

Figure 9: Source Characterization of 24-hour $PM_{2.5}$ Worst Case Day Estimate in Lbs per Day (2008 Data)



* 80% permitted daily operating capacity
** Area source residential wood combustion emissions are advisory controlled

2.5 Projected 2014 Emissions

2.5.1 Overview

The 2014 emissions inventory is calculated using growth assumptions, based on estimated changes in indicators such as population, economic and industrial activity, and vehicle traffic. The 2014 forecast is produced by applying growth factors to 2008 emissions, and then subtracting any emissions controlled by local, state, or federal regulations. Examples of these regulatory controls include the Klamath County Air Quality Ordinance, Oregon's Heat Smart rules, new passenger car fuel economy requirements, and new lower sulfur requirements in fuel.

2.5.2 Growth

DEQ used growth factors from the Oregon Office of Economic Analysis (OEA) (http://www.oea.das.state.or.us/) in the Department of Administrative Services, as required by executive order of the governor's office. OEA predicted Klamath County's growth based on historic growth rates. Table 2 provides the growth factors DEQ used to project 2014 emissions.

Table 2: Growth Rates Used in Calculating 2014 Emissions

Growth	Average Annual Growth Rate	Based on
Population And Household	0.54%	Oregon Office of Economic Assessment County estimate
Employment	0.85%	Oregon Office of Economic Assessment County estimate for 2008-2024
Vehicle Miles Travelled	1.29%	Estimated by ODOT to 2014

OEA estimated an average annual growth rate from 2008 to 2014 of 0.03%, but because of the recession, this growth rate is likely to be too low for future years. DEQ used the average annual growth rate for employment from the time period 2008-2024 because it more realistic for the long term. The change in number of residential wood combustion devices from 2008 to 2014 is based on the household growth rate. However, other factors are also taken into account, such as the rule that no uncertified stove can be installed. To calculate emissions from on-road transportation, DEQ used ODOT's projections of vehicle miles travelled for 2014 and the MOVES model, as required by EPA.

2.5.3 Emission Reductions from Existing Strategies Implemented 2009 through 2014

Several emission reduction strategies will reduce emissions in 2014. These include local, state, and federal rules which are currently in effect, or will be in effect by 2014.

2.5.3.1 *Klamath County Clean Air Ordinance*

In November 2007, Klamath County revised several aspects of their Clean Air Ordinance. Changes fully implemented by 2009 included:

- Revised woodstove curtailment levels. Instead of issuing red advisories at 65 $\mu g/m^3$ for $PM_{2.5}$, they are issued at 30 $\mu g/m^3$. As a result, there are more red and yellow days.
- Required removal of an uncertified woodstove upon sale of a home.
- Open burn – 2 periods, 15-day windows within the air quality zone. This reduced the number of days in the open burn window from 30 to 15 days. The county now has the option to not open a fall window at all.
- Burn barrel prohibition.
- Tightened enforcement. This includes more patrols and active enforcement such as sending letters and knocking on doors of repeated violators. There is the potential for court citations.

2.5.3.2 ***Woodstove Changeout Program.***
Since 2008, DEQ's emission inventory and records of woodstove changeouts reflect a decrease of 769 uncertified wood burning units in the Klamath Falls area. This includes uncertified woodstoves that were replaced with certified stoves or inserts, pellet stoves, heat exchangers, or natural gas furnaces .Table 3 shows the number of uncertified stoves changed out since 2008 year and projected numbers for 2012 through 2014. The number of changeouts between 2008 and 2012 are related to EPA, the City of Klamath Falls and American Recovery and Reinvestment Act funding.

Table 3 Klamath Falls Woodstove Changeouts

Year	2008	2009	2010	2011	2012 Projected	2013 Projected	2014 Projected
Number of uncertified wood burning units	2,783	2,599	2,456	2,261	2,067	1,995	1,936
Changeouts		185	143	196	194	72	59

2.5.3.3 ***Road Paving.*** Six miles of road have been paved in the nonattainment area since 2008.

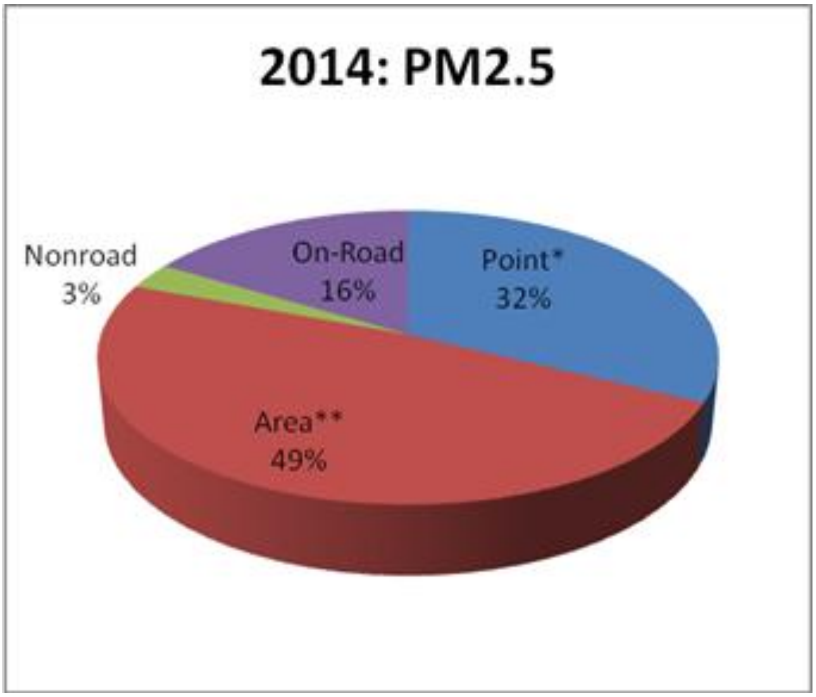
2.5.3.4 ***Transportation and Fuel-Related Emissions.*** Federal and state transportation emission reductions are calculated as part of the emissions inventory. These strategies include:

- Reduced sulfur content of gasoline and diesel due to federal regulations.
- Increased fuel economy due to federal regulations.
- Oregon's Low Emissions Vehicle fleet 2009 model years and newer.
- Oregon's renewable fuel standard for Bio-diesel, 5%.
- Diesel retrofits of City of Klamath Falls and Klamath County bus and school buses.

2.5.4 2014 Emissions Inventory Results

Figure 10 illustrates the worst case day projected 2014 PM2.5 emissions. This includes current strategies including recent woodstove changeouts and the current ordinance changes as of 2007. Between 2008 and 2014, residential wood combustion from sources other than fireplaces will have been reduced dramatically.

Figure 10: Source Characterization of 24-hour $PM_{2.5}$ Worst Case Day Estimate in Lbs per Day (2014 Data)



* 80% permitted daily operating capacity
** Area source residential wood combustion emissions are advisory controlled

2.6 Projected 2037 Transportation Emissions

Transportation conformity is a process required by the Clean Air Act (CAA) which establishes the framework for improving air quality to protect public health and the environment. The goal of transportation conformity is to ensure that Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funding and approvals are given to highway and transit activities that are consistent with air quality goals.

The CAA requires that metropolitan transportation plans, metropolitan transportation improvement programs and Federal projects will not cause or contribute to any new violations of the National Ambient Air Quality Standards (NAAQS); increase the frequency or severity of NAAQS violations; or delay timely attainment of the NAAQS or any required interim milestone.

DEQ is currently working to determine whether or not transportation emissions in Klamath Falls are insignificant. If EPA determines that transportation emissions are insignificant, then some of the conformity requirements will not apply in the Klamath Falls area.

Chapter 3: Recommended Strategies

3.1 Criteria for Selection of Strategies

In recommending strategies, the committee considered if the potential strategy is technologically possible, if the strategy meets EPA/DEQ requirements, and if the strategy is within legal authority. The committee also evaluated potential strategies based on the following criteria:

Environmental
- Effect on PM2.5 level

Health
- Likely effect on pollution related illness
- Effect on quality of life

Economic
- Likely effect on local jobs
- Cost to those affected
- Costs to state/taxpayers
- Level of financial incentive to comply
- Level of financial deterrent to violate

Social
- Level of public support
- Difficulty of explaining idea to those affected
- Relative impact on under-served communities

Technological Feasibility
- Degree of difficulty to implement

3.2 Recommended Strategies

The Klamath Air Quality Advisory Committee has developed recommendations for strategies to bring Klamath Falls nonattainment area into compliance with the federal $PM_{2.5}$ air quality standards by 2014. As described in the Committee Charter, where members did not reach consensus, minority opinions are included in the recommendations. The committee is recommending a two-step approach:
1. An initial package of strategies, of lesser impact on residents which modify and strengthen the current approach to keep us on track,
2. A second set of contingency strategies of greater impact, but only to be implemented in the event that the federal $PM_{2.5}$ is not met in 2014.

3.2.1 Initial Strategies for 2012 Implementation

3.2.1.1Boundaries

3.2.1.1.1 Air Quality Zone Change: enlarge the Air Quality Zone (AQZ) to the same boundaries as the EPA non-attainment area .

The advisory committee recommends that Klamath County change its rules to enlarge the AQZ to the same boundary as the EPA non-attainment area for consistency and to reduce confusion.

- **Reduction in $PM_{2.5}$ emissions**. This strategy will have a small reduction in $PM_{2.5}$.
- **Likely effect on local jobs and the economy.** The effect on local jobs and the economy is likely to be negligible.

3.2.1.1.2 Open Burning Setback Change: request that DEQ change their Open Burning Rules setback from city limits of Klamath Falls to the Nonattainment Area.

The advisory committee recommends that DEQ amend their regulations to enlarge their Open Burning Boundary to include the Nonattainment Area. This would require permits for the open burning of commercial and demolition debris.

- **Reduction in $PM_{2.5}$ emissions**. This strategy will have a small reduction in $PM_{2.5}$ caused by increased permitting requirements.
- **Likely effect on local jobs and the economy.** The effect on local jobs and the economy is likely to be negligible; there will be slightly higher permitting costs for businesses that previously disposed of waste by burning.

3.2.1.2Wood burning

3.2.1.2.1 Changeout Program: Continue the wood stove change out program.

The advisory committee recommends that the City of Klamath Falls, Klamath County, and DEQ pursue funds to continue offering woodstove change outs and fireplace conversions within the nonattainment area. This has been an effective strategy in the past, and continued implementation will provide substantial reductions in $PM_{2.5}$ in the future. The program has been successfully implemented though South Central Oregon Economic Development District (SCOEDD) and Klamath County Environmental Health program with no technological difficulty. Some funding considerations for future woodstove change out incentives include:

1. Incentives must cover all or substantially all of the cost of replacement for low income individuals in order to be effective; and
2. Funding sources should be identified to provide substantial (at least 50%) incentives to residents who are not “low income” (as defined in County ordinance) to increase the program's impact on $PM_{2.5}$.

- **Reduction in $PM_{2.5}$ emissions**. The effectiveness of this strategy is dependent on the number of stoves changed out, which in turn is dependent on the funding which can be raised for the incentive program. (Approximately a 1.4% reduction in $PM_{2.5}$ concentration per 100 stoves). Certified stoves will provide more heat, with lower emissions.

- **Likely effect on local jobs and the economy.** This strategy is likely to have some positive effect on the economy associated with the removal of old stoves and installation of the new. This program entails a major cost to the state/taxpayers in order to fund the incentives unless alternative funding sources can be identified.

3.2.1.2.2 State Industrial Offsets: DEQ to modify or clarify requirements to allow woodstove change outs as offsets for new or expanding industry.

The advisory committee recommends DEQ clarify or change state industrial offset rules so that new or expanding industry could contribute to a woodstove change out program for emission offsets in Klamath Falls.

A new or expanding industry in the Klamath Falls Non-attainment area is required to obtain “offsets” if their $PM_{2.5}$ emissions are above a significant level. In the past, this has meant buying “offsets” from an industry that is not using them, or paying for emission reductions at another industrial facility. The program should be modified so that industry seeking offsets has the additional option of contributing to a woodstove change out program as a one-time cost to purchase offsets. The program could use a formula along the lines of: Average daily $PM_{2.5}$ industrial emissions divided by 1.2kg (daily uncertified stove output) times $2,000 (cost of one woodstove change out). The Commissioners may wish to consider a cap (i.e. $500,000). This strategy is dependent on new industry locating in the community or expansion of existing industry.

- **Reduction in $PM_{2.5}$ emissions**. The effectiveness of this strategy is dependent on new or expanding industry. There is the potential for large reductions in $PM_{2.5}$ in areas where it has the most impact.
- **Likely effect on local jobs and the economy.** This strategy may benefit new or expanding industry by providing an additional source of offsets. The committee recommends that DEQ consider ways of structuring this recommendation to address the potentially unfair burden on industries expanding in the area first.
- **Minority opinion.** This strategy is not a reliable source of woodstove change outs, and it would be difficult to influence the number of change outs. Industry's use of technological improvements could allow for more control of potential reductions. Under this recommendation, consider whether residents rather than industry are unfairly bearing the burden of improving air quality. For example, residents choosing to participate in industry funded change outs could bear the burden of higher cost if they move away from wood as a source of heat. Depending on heating devices, residents rather than industry would be responsible for maintenance and upkeep.

3.2.1.2.3 Local Industrial Offsets: implement City and County siting requirements which allow new and expanding industry to contribute to a woodstove change out program as an offset to increased emissions.

If DEQ cannot allow woodstove change outs as offsets for new or expanding industry, or this provision is not effective the advisory committee recommends the City of Klamath Falls and Klamath County implement siting requirements which require new and expanding industry that emit $PM_{2.5}$ to contribute to a woodstove change out program as an offset to increased $PM_{2.5}$ emissions. This strategy is dependent on new industry locating in the community or expansion of existing industry.

- **Reduction in $PM_{2.5}$ emissions**. The effectiveness of this strategy is dependent on new or expanding industry. There is the potential for large reductions in $PM_{2.5}$.
- **Likely effect on local jobs and the economy.** This strategy may adversely impact new and expanding industry, but if there are caps imposed, industry in the past has demonstrated a willingness to make up front contributions to improving the air shed. The impact could be high to affected industry as a one-time cost. The program could use a formula along the lines of: average daily $PM_{2.5}$ industrial emissions divided by 1.2kg (daily uncertified stove output) times $2,000 (cost of one change out). The Commissioners may wish to consider a cap (i.e. $500,000).
- **Minority opinion**
  New industry should use technology that reduces emissions. This strategy would impose an additional cost for industry to develop business in Klamath Falls. Some industries may not want to bear the additional costs and choose not to do business in the area.

3.2.1.2.4 <u>County Enterprise Zone: Change County Enterprise Zone conditions to obtain funds from new and/or expanding industry to support woodstove change outs.</u>

The advisory committee recommends that Klamath County change the County Enterprise Zone to require new or expanding industry that has $PM_{2.5}$ emissions to contribute to a woodstove change out program. The Commissioners may wish to consider applying this requirement to new industry that is located beyond the nonattainment zone.

- **Reduction in $PM_{2.5}$ emissions**. The effectiveness of this strategy is dependent on new industry locating in the community or expansion of an existing industry. There is the potential for large reductions in $PM_{2.5}$.
- **Likely effect on local jobs and the economy.** This strategy may adversely impact new and expanding industry because industry would need to pay more money for startup or expansion, but if there are caps imposed, industry in the past has demonstrated a willingness to make up front contributions to improving the air shed. For example, Aqua Glass (currently Masco Bath), purchased a number of woodstoves in the 1990s as an act of good will to establish themselves in the community. The impact could be high to affected industry as a one-time cost. The program could use a formula along the lines of: average daily $PM_{2.5}$ industrial emissions divided by 1.2kg (daily uncertified stove output) times $2,000 (cost of one change out). The Commissioners may wish to consider a cap (i.e. $500,000).
- **Minority opinion**
  New industry should use technology that reduces emissions. This strategy would impose an additional cost for industry to develop business in Klamath Falls. Some industries may not want to bear the additional costs and choose not to do business in the area.

3.2.1.2.5 <u>Rental Unit Change Outs: Mandate that a rental must have a certified stove, if there is a stove in the residence (within 2 years from effective rule date).</u>

The advisory committee recommends that Klamath County change its rules to mandate that within the AQZ, any stoves , fireplace inserts and pellet stoves in rental units must be certified.. Replacement of uncertified woodstoves with certified models in rentals will reduce levels of $PM_{2.5}$ generated by those houses.

- **Reduction in $PM_{2.5}$ Emissions**. Replacement of uncertified woodstoves with certified models in rentals will reduce levels of $PM_{2.5}$ generated by those houses. The current Clean Air ordinance stipulates that that woodstoves cannot be the sole source of heat in rental properties. The recommendation could result in a large $PM_{2.5}$ reduction if landlords decide to remove the woodstove without replacing it, requiring tenants to use alternative heat sources such as gas or electric.
- **Likely effect on local jobs and the economy.** Replacement of uncertified woodstoves in rentals would generate some work, and would force landlords to incur some expenses. Tenants might need to pay more for heat from non-wood sources.
- **Minority opinion**
  Use the woodstove change out program to offset costs to landlords on a voluntary basis. Do not mandate this strategy.

3.2.1.2.6 Wood Combustion Enforcement, Heat Smart: Confirm Heat Smart change-outs.

The advisory committee recommends that Klamath County confirm the residences where owners removed or changed-out uncertified woodstoves upon home sale as required by the state Heat Smart law. Heat Smart is administered by DEQ which receives electronic or paper certifications of woodstove removal and destruction. Heat Smart records are available to Klamath County in the form of a database from DEQ, and can be used to estimate the level of compliance and need for additional education and compliance follow-up. Currently, DEQ has no budget for enforcement of Heat Smart. While the committee does not see the need for extensive County enforcement at this time, the County may consider improving compliance by amending ordinances to provide appropriate penalties.

In addition, the committee recommends that the county ordinance should be changed to specify that woodstoves need to be removed from outbuildings and shops to be consistent with the State Heat Smart law.

- **Reduction in $PM_{2.5}$ Emissions** The estimated effect on overall PM levels is small, although locally impacts could be more significant.
- **Likely effect on local jobs and the economy** There is no estimated effect on local jobs or the economy.

3.2.1.2.7 Wood Combustion Enforcement, Habitual Violators: Focus enforcement of woodstove curtailment on habitual violators.

The advisory committee recommends that Klamath County continue its existing focus of enforcement on habitual violators. Experience with this program shows that personal visits usually result in compliance; and that the existing enforcement for habitual violators structure is adequate. A summary of the enforcement program is included in Appendix A5 of this report.

- **Reduction in $PM_{2.5}$ Emissions** The estimated effect on overall PM levels is small, although the impacts to the local neighborhood could be more significant.
- **Likely effect on local jobs and the economy** There is no estimated effect on local jobs or the economy although the cost to violators can be significant.

3.2.1.2.8 Wood Combustion Enforcement, Minimum Fine: Amend the County ordinance to mandate a minimum fine for a second burning violation.

The advisory committee recommends that the County amend its ordinance to mandate a minimum fine for a second burning violation.

- **Reduction in $PM_{2.5}$ Emissions** The estimated effect on overall PM levels is small.
- **Likely effect on local jobs and the economy** There is no estimated effect on local jobs or the economy although the cost to violators could be significant.

3.2.1.2.9 Alternatives to Wood Energy: Identify and create incentives to develop and use non- wood energy sources. The City and County to review existing codes and ordinances to remove barriers to alternative energy sources.

The advisory committee recommends that the City and County review existing codes and ordinances to remove any obstacles and create incentives for the development and use of non-wood energy sources. Examples are ground source heat or solar.

- **Reduction in $PM_{2.5}$ Emissions** The estimated effect on overall PM levels is small.
- **Likely effect on local jobs and the economy** The effect on local jobs or the economy is unknown, although development of alternative energy sources could increase economic opportunities and jobs.

3.2.1.2.10 Wood Burning Survey: The County to inventory all wood burning devices through tax statements.

The advisory committee recommends that the County inventory all wood burning devices through a survey enclosed with tax statements received by all homeowners in the county. Coordinate with OIT surveys.

- **Reduction in $PM_{2.5}$ Emissions** There is no effect on overall PM levels.
- **Likely effect on local jobs and the economy** There is no effect on local jobs and the economy.

3.2.1.2.11 New Fireplace Standard: in new residential construction, only allow fireplaces that meet the most current ASTM international standard. Incorporate the ASTM international fireplace emission standards of 5.1 g/kg or less into the county building code.

The advisory committee recommends that Klamath County require that fireplaces in new homes are built using the most stringent ASTM international standards. ASTM standards were developed by EPA and the Hearth, Patio and Barbeque Association. Phase 2 ASTM standards of 5.1 gr/kg start in 2012. This would be a 2/3 reduction from current fireplace emissions.

- **Reduction in $PM_{2.5}$ Emissions** The estimated effect on overall PM levels is small, although impacts to the local neighborhood could be more significant. Over time, as new houses are built, neighborhoods with ASTM compliant fireplaces would experience less PM2.5 exposure compared to building with traditional fireplaces.

- **Likely effect on local jobs and the economy** There is no estimated effect on local jobs or the economy.

3.2.1.3 Education and Outreach

3.2.1.3.1 Education

The advisory committee recommends that the City of Klamath Falls and Klamath County continue and expand educational efforts regarding reducing $PM_{2.5}$ from wood smoke. Education has had an impact and reduced wood smoke in the past, and can be a relatively inexpensive strategy; newspaper articles, stuffers in city water bills, and the existing website are all inexpensive methods of reaching the public. However, some funding needs to be available at the city and county level to enhance educational strategies: including hands-on demonstration of stove use, wood smoke health effects, the economics of a new wood stove, videos on public access and government websites, television spots, and outreach to teach homeowners appropriate wood selection. This strategy could also include wood smoke education in the schools.

The advisory committee recommends that the education program encourage people to use local utility company weatherization rebate programs and state tax credits.

- **Reduction in $PM_{2.5}$ Emissions** This strategy is estimated to have a positive impact of 0.5 to 6% reduction in wood smoke emissions (depending on magnitude and effectiveness of effort).

- **Likely effect on local jobs and the economy** This will have very little impact on local jobs and the economy, but some funding would be necessary from local governments.

3.2.1.4 Open Burning

3.2.1.4.1 Fall open burning: Decrease the fall open burn window and provide free drop off during that time with unloading assistance on Saturdays.

The advisory committee recommends reducing the fall 15-day open burning window to 8 days including two Saturdays during which time the County would offer free disposal. This would decrease PM levels in the fall, while still allowing a limited opportunity for open burning in situations where people would have difficulty disposing of debris. Appropriate agencies should coordinate. In addition, it is more accurate to forecast optimal weather conditions for one week rather than two weeks of open burning.

- **Reduction in $PM_{2.5}$ Emissions** The estimated effect on overall PM levels is small, although locally impacts could be more significant.
- **Likely effect on local jobs and the economy** The existing free debris dumping day results in a $36,000 reduction in revenue. Increasing this opportunity over the period of a week would

increase the revenue reduction. Staff costs to unload debris are $1,500 per day. Adding an additional Saturday of unloading assistance would double that cost. The county may consider applying for a grant to cover the loss of revenue.

3.2.1.5Monitoring

3.2.1.5.1 Identify options for increased air sampling including feasibility, use of results and cost.

The advisory committee recommends that the County in partnership with DEQ identify options for increased monitoring in Klamath Falls. This investigation would include information on feasibility, cost and potential use of results. More monitoring would advance understanding of air quality, and it relates directly to the goals of lowering emissions. Additional data could lead to a better understanding of PM problems and solutions. However the data from the Peterson school is definitive. Data from different sites cannot be averaged.

- **Reduction in $PM_{2.5}$ Emissions** There is no effect on overall PM levels.
- **Likely effect on local jobs and the economy** There is no effect on local jobs and the economy.

3.3 Attainment Demonstration

EPA requires DEQ to develop emission reduction strategies and to demonstrate that these strategies will bring Klamath Falls into attainment by 2014 for $PM_{2.5}$ pollution within the nonattainment area boundary. The analysis to show that reduction strategies will reduce emissions enough so that Klamath Falls will meet the federal $PM_{2.5}$ standard is called the "attainment demonstration."

DEQ used a mathematical model to generate estimates that show future compliance with the PM2.5 standard in the Klamath Falls Nonattainment Area. This estimation method, called a "proportional rollback/rollforward analysis" or "rollback model" is based on the assumption that there is a direct correlation between emissions of a pollutant and measured concentrations of that pollutant in the same airshed, and that changes in emissions will result in corresponding changes in concentration. This correlation is used to predict future concentrations. In the rollback model DEQ applied expected emission changes in Klamath Falls PM2.5 concentrations to the 2008 base year worst case day emission data to predict concentrations in the future year 2014. For the purposes of this exercise the worst case day emissions are the 98th percentile ambient concentration.

There are four basic steps in the Klamath Falls rollback model: determining the relative impact of emissions on the reference location at the DEQ Peterson School monitor, determining emissions growth or change within the community, including planned emission reductions, getting results from the model, and characterizing strengths, limitations and uncertainties of the results.

To determine the extent to which various source emissions impacted the Peterson School monitor and prepare data for use in the rollback model, DEQ compared 2008 estimated emissions to monitored concentrations for the period of 2006-2010. These emissions were estimated for a range of source types, including industrial sources, on-road vehicles, commercial activities, and residential wood heating. DEQ also studied the impacts of prescribed forest burning and other burning activity outside of Klamath Falls area. To accurately estimate source impacts, DEQ used tools that account for emissions travel distance, release heights, pollutant movement in the atmosphere, meteorological effects and other factors. Air dispersion and source apportionment models were used to adjust emissions from prescribed burning, industrial sources, and road dust. These adjustments were made in the emission inventory to accurately reflect estimated impacts at the Peterson School reference monitor.

To estimate expected changes in emissions between 2008 and 2014, DEQ evaluated changes in the community including the local economy, population growth, expansion of commercial activity, heating trends, and increase in vehicle traffic on highways. The most significant changes evaluated for 2014 are those from reductions in residential wood heating as a result of control strategies. These strategies include designation of no-burn days during periods of potential high pollution, and wood stove change-out programs that are ongoing or will be implemented.

After completing the future year 2014 inventory DEQ compared to the 2008 emissions concentration correlation to predict a 2014 concentration. A sufficient decrease in emissions, for example from reductions in residential wood heating, will result in decreased future year concentrations for attainment of the 35 ug/m3 PM2.5 standard .For Klamath Falls, the measured concentration determined as representative of the 2006-2010 period is 45.1 ug/m3, and is called the 2008 Design Value. Based on the rollback model, using a predicted 2014 emissions inventory incorporating current reduction strategies for wood heating, the estimated 2014 ambient air concentration, or the 2014 Design Value, is 31.8 ug/m3 . This concentration is lower than 35 ug/m3, and shows attainment with the EPA standard.

There are several areas of uncertainty in the Klamath Falls rollback model but they do not affect its overall accuracy and utility. One area of uncertainty is the assumption that PM2.5 emissions are well-mixed in the airshed. DEQ believes that this is generally the case given the shape of the local airshed, and the typically low wind speeds and mixing heights during winter time periods when the highest concentrations are measured. In addition, emissions from distant sources have been adjusted to reflect that condition. Another uncertainty in the model is the emissions estimates themselves, primarily emissions from wood heating devices since they comprise the largest component. These emissions are based on a comprehensive wood heating survey, and have undergone extensive scrutiny and analysis. However, as noted in the advisory committee recommendations, wood heating emissions could be more accurately estimated with additional data gathered through surveys or other means. The rollback model has been constructed to allow further evaluation of data uncertainty if needed.

DEQ believes that the predicted 2014 Design Value of 31.8 ug/m3 is a robust value based on a comprehensive and detailed inventory including consideration of varying impacts due to distance and other factors. Adding to the accuracy of the rollback model is a speciation analysis, in which DEQ refined the Klamath Falls PM2.5 emission inventory by using source profiles to divide PM2.5 emissions into constituent chemical components. These components include organic carbon, an important product of wood burning; elemental carbon, an industrial and diesel engine combustion product; SO4 and NO3, both minor components; and other particulate matter, including earth crustal material from road dust. The chemical speciation data supports model assumptions about the importance of wood burning emissions. Finally, the roll back model has been designed to be flexible, and can be used to study different levels of residential wood heating and industrial activity to assess various control strategies and contingency measures in the attainment demonstration.

3.4 Recommended Contingency Measures

The committee anticipates that if all of the above recommended actions are taken, attainment will be achieved, however if it is not, the implementation of contingency measures will be necessary.

Contingency measures are additional controls needed to further reduce emissions in the event that monitoring shows that Klamath Falls fails to attain the 24-hour daily $PM_{2.5}$ standard by its attainment date of 2014. These contingency measures must be fully adopted rules or measures that are ready for implementation without further action by the state of Oregon or the EPA upon failure to reach attainment.

The advisory committee recommends the following contingency measures:

3.4.1 Boundaries

3.4.1.1 Expand the AQZ beyond the EPA Non Attainment Boundary (#41)
Emissions outside the current AQZ are a contributing factor to non attainment within the current AQZ. Under this recommendation, the AQZ would be expanded to include contributing areas.

3.4.2 Woodburning

3.4.2.1 Prohibit the use of all uncertified wood heating stoves and inserts inside the AQZ (#3)

Uncertified wood heating stoves and uncertified fireplace inserts would be prohibited from use at all times except during power failures.

3.4.2.2 Prohibit the use of open structurally integrated fireplaces within the AQZ (#1)

Large amounts of wood are burned in fireplaces and they are not efficient. Based on the survey and emission factors 40 to 50% of particulate pollution is coming from fireplaces. This strategy would allow use of ASTM International certified fireplaces and fireplaces with certified inserts in conformity with the existing ordinance.

- **Minority opinion**

Although the Klamath Falls community is considered a "non-attainment" area regarding federal air pollution standards for particulate matter, members of the community recognize that many days during the winter are not impacted by air pollution. The air pollution episodes coincide with wintertime temperature inversions. Banning the use of fireplaces when the Klamath Basin's air quality far exceeds federal standards would be perceived as overkill. To retain community support for the total air quality improvement package, it must be perceived as reasonable.

Fireplaces exist in a large percentage of homes in this area, and many people enjoy having fires in their fireplaces. Enforcement of a ban on the use of fireplaces would prove to be very difficult. Differentiating between fireplace users and woodstove users would add to this difficulty. It should be noted that the advisory committee is not recommending a similar ban on the use of woodstoves.

Furthermore, while the majority of fireplaces are not considered "clean burning", some are comparable to most EPA certified wood stoves. There are some models that achieve no visible emissions and very low measured emissions. It would be grossly unfair to those members of the community who have invested in a cleaner burning fireplace to ban them altogether.

3.4.3 Open Burning

3.4.3.1 Eliminate the fall open burning window as needed (#39)

Further reduction of the fall open burning window would be impractical.

See appendix A7 for a list of strategies that were considered by the advisory committee, but are not recommended at this time.

3.5 Likely Effect of Recommended Strategies on Local Jobs and Economy

Klamath County has been losing jobs since 2006, one year longer than the state and most other counties in the state. In 2011, jobs loss was small compared to the previous year's but still adds to the county's employment losses which now total over 2,500 jobs lost (over 10 percent of the county's 2006 employment). Klamath County is beginning to recover from their high unemployment rate. The strategies recommended in this report would likely have no negative effect on local jobs and the economy. The committee was careful to consider these criteria and avoided strategies that could hinder economic recovery.

Because the Klamath Falls area is currently designated as nonattainment, new and expanded industrial facilities are subject to the most stringent emission requirements called "Lowest Achievable Control Technology." The attainment plan does not in and of itself make it easier for the regulated community to do business, but it is the first step towards less restrictive requirements. Over time, the attainment plan will help the community meet PM standards and eventually achieve a maintenance designation under which new and expanded facilities will have more flexibility.

During the last two years, DEQ has consulted with stakeholders and local air quality committees, which include members from the chamber of commerce and business. DEQ is sensitive to the economic needs of this community and plans to revise its regulations to provide additional opportunities for new or expanding industry while ensuring public health protection. For example, new facilities may be able to change-out dirty woodstoves as a way to offset their emissions in the airshed.

Chapter 4: Next Steps

Klamath County will consider the recommendations from the advisory committee to help determine if refinements to the local air quality ordinance are needed. After County consideration , DEQ will use these recommendations to develop the Klamath Falls $PM_{2.5}$ Attainment Plan. The attainment plan could contain rules, permit conditions, agreements, and local rules. DEQ will hold public hearings on the attainment plan in June 2012, and present the attainment plan to the Environmental Quality Commission by December 2012.

DEQ and local partners will implement the plan and rules to reach attainment with the $PM_{2.5}$ standard. If Klamath Falls fails to come into compliance with the standard, transportation funds can be withheld. In addition, contingency strategies (see section 3.4) would automatically be implemented, should Klamath Falls not meet the standard by 2014. Most importantly, the attainment of the $PM_{2.5}$ standard will safeguard the health of citizens.

5. Signature of Chair

On behalf of the Klamath Falls Air Quality Advisory Committee, the Chair Jeff Ball agrees that this report accurately represents the work and recommendations of the Committee.

____ _______________

Jeff Ball Date

Chair, Klamath Falls Air Quality Advisory Committee

Klamath County Counsel

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November 7, 2007

Larry Calkins
Air Quality Specialist
Department of Environmental Quality
256 E. Hurlburt Ste. 101
Hermiston, OR 97838

RE: Air Quality Ordinance and County Code

Dear Mr. Calkins:

Enclosed is a copy of the Klamath County Air Quality Ordinance, which became effective November 7, 2007. Also enclosed is a copy of how the ordinance appears in the Klamath County Code.

Please feel free to contact me if you have any questions.

Sincerely yours,

Daneen M Dail

Daneen M. Dail
Paralegal

dd
Enclosures

c: Marilynn Sutherland, Public Health Director (w/out encl.)

BOARD OF COUNTY COMMISSIONERS

KLAMATH COUNTY, OREGON

IN THE MATTER OF REPEALING THE CURRENT CHAPTER 406 AND ADOPTING A NEW CHAPTER 406, KLAMATH COUNTY CLEAN AIR ORDINANCE, OF THE KLAMATH COUNTY CODE	)	ORDINANCE NO. 63.05

WHEREAS, Klamath County passed the Clean Air Ordinance on July 31, 1991, in order to meet the standards of the 1990 Federal Clean Air Act; and

WHEREAS, the United States Environmental Protection Agency adopted new standards for ambient air quality particulate matter (PM-2.5) in December 2006; and

WHEREAS, Klamath County desires to revise the Klamath County Clean Air Ordinance to require the removal of non-certified wood stoves from building at the time of sale, eliminate the use of burn barrels within the Air Quality Zone, reduce the length of the Open Burning Windows within the Air Quality Zone and establish a volunteer Air Quality Advisory Committee; and

NOW, THEREFORE, the Board of County Commissioners ordains that the current Chapter 406 is repealed in its entirety and a new Chapter 406, Klamath County Clean Air Ordinance, of the Klamath County Code is adopted and will read as follows:

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CHAPTER 406

KLAMATH COUNTY CLEAN AIR ORDINANCE

Exhibits:

Ordinance No. 63.00 - 07/31/91

Ordinance No. 63.01 - 06/25/97

Ordinance No. 63.02 - 12/23/97

Ordinance No. 63.03 – 08/23/2001

Ordinance No. 63.04 - 10/05/2004

Ordinance No. 63.05

CHAPTER 406

KLAMATH COUNTY CLEAN AIR ORDINANCE

406.001 Policy and Purpose

To control and address air quality problems and identify the Air Quality Zone, so that Klamath County will have clean air for the benefit of its citizens' health and welfare; to be in compliance with requirements of the Federal Clean Air Act of 1990 and applicable revisions or updates, and not exceed the National Ambient Air Quality Standard for particulate matter; and to improve economic development opportunities.

406.005 Definitions

Except where the context otherwise requires, the definitions given in this section govern the construction of this Chapter.

(1) AIR QUALITY ADVISORY - A means, declared and provided by the Klamath County Environmental Health Division based on the Air Quality Forecast, to inform area residents of what the air quality is or potentially will be. The advisories shall be:

(a) Red Advisory Period - A period of time when an Air Quality Forecast predicts that particulate matter concentrations have the potential to exceed or are exceeding an estimate of 150 µg/m3 of PM-10 or 30 µg/m3 for PM-2.5 for a 24-hour average. Such pollution concentrations have a high probability of being unhealthy.

(b) Yellow Advisory Period - A period of time when the Air Quality Forecast predicts that particulate matter concentrations are less than what would be considered for the Red Advisory Period, but would likely exceed estimates of 80 µg/m3 of PM-10 or 16 µg/m3 of PM-2.5 for a 24-hour average. Such pollution concentrations have a high probability of impacting public health.

(c) Green Advisory Period - A period of time when an Air Quality Forecast predicts daily particulate matter concentrations for a 24-hour average will not exceed 80 µg/m3 of PM-10; or 16 µg/m3 of PM-2.5.

(2) AIR QUALITY FORECAST - A method of using available data including, but not limited to, local weather conditions, current and anticipated particulate levels, and weather forecasts to determine the PM-10 and PM-2.5 particulate matter concentrations.

(3) AIR QUALITY INSPECTOR – Air Quality Inspectors may be staff of the Klamath County Environmental Health Division, the Klamath County Code Compliance Office, the Code Enforcement Office of the City of Klamath Falls, or the County Fire Districts who will act within their scope of authority. The primary role of an Air Quality Inspector is to observe and document violations of Chapter 406 and to educate the public with respect to this Chapter and the documented violation.

(4) AIR QUALITY ZONE An area within the County as depicted on the map and legal description in Exhibit A.

(5) AGRICULTURAL OPERATION - An activity including an irrigation operation on land currently used, or intended to be used primarily for the purpose of obtaining a profit by raising, harvesting and selling crops, or by raising and selling livestock and/or poultry, or the products thereof. Agricultural operation also means activities conducted by not-for-profit agricultural research organizations, which activities are necessary to serve that purpose. It does not include the

construction and use of dwellings customarily provided in conjunction with the agricultural operation.

(6) BUILDING - All residential or commercial structures including manufactured homes.

(7) BURN-DOWN TIME - A period of time allowed for fires in solid fuel-fired appliances and open/outdoor burning, to die down prior to the beginning of enforcement activities. Such burn-down time applies to Red or Yellow Advisory Period.

(8) CERTIFICATE OF EXEMPTION - A written approval issued by the Klamath County Environmental Health Division to use a solid fuel-fired appliance in a manner normally in violation of the requirements of this Chapter.

(9) CERTIFICATE OF VARIANCE - A written approval issued to a person by the Klamath County Environmental Health Division to open or outdoor burn in a manner normally in violation of the requirements of this Chapter.

(10) CERTIFICATE OF WAIVER - A written approval issued by the Klamath County Environmental Health Division to allow open/outdoor burning in a manner normally in violation of the requirements of this Chapter.

(11) CERTIFIED WOODSTOVE OR FIREPLACE INSERT - A solid fuel-fired space heating appliance that has been certified by the Oregon Department of Environmental Quality (DEQ) or bears an Environmental Protection Agency certification label indicating that the model is built in accordance with EPA emission certification.

(12) COOK STOVE - A wood burning stove installed in the kitchen, which is primarily designed for cooking and has a stovetop and an oven. It may also be equipped with gas burners or electric heat elements.

(13) EXEMPT SOLID-FUEL FIRED APPLIANCE - A solid fuel-fired appliance that is exempt from the Oregon Department of Environmental Quality (DEQ) or the United States Environmental Protection Agency (EPA) requirements for certification for its installation. Exempt stoves are pellet stoves, antique stoves (built before 1940 with ornate construction and a substantially higher current market value), open masonry fireplaces, cook stoves, or other stoves that have a valid letter of exemption from DEQ, or do not meet the definition of a "woodstove" or "wood heater" as defined in DEQ's Oregon Administrative Rules for Residential Wood Heating.

(14) FIRE DEPARTMENT - The unit of municipal government or county approved Local Fire District having the authority and responsibility to extinguish unintended fires and to promote fire safety.

(15) FIREPLACE – A framed opening made in a chimney to hold an open fire.

(16) KLAMATH COUNTY AIR QUALITY ADVISORY COMMITTEE - A volunteer committee appointed by the Klamath County Board of Commissioners. The purpose of the Air Quality Advisory Committee is to evaluate relevant air quality data, identify significant contributing emission sources, recommend appropriate emission reduction strategies and recommend action to the Board of County Commissioners.

(17) LOW INCOME PERSON - A person or family who demonstrates economic need by certifying through proof that their total household income is less than the very low-income guidelines established by the United States Department of Housing and Urban Development.

(18) NON-CERTIFIED WOOD STOVE OR FIREPLACE INSERT - A solid fuel-fired residential space heating device that has not been certified by either the Oregon Department of Environmental Quality or the Environmental Protection Agency (EPA) as complying with smoke

emission standards. "Non-certified wood stove or fireplace insert" does not include fireplaces, nor devices exempt from certification requirements as defined in Section 406.005(13).

(19) NOTICE OF NONCOMPLIANCE - A letter notifying a violator of this Chapter of the specific violation and the corrective action necessary.

(20) OPEN/OUTDOOR BURNING – This section refers to all open or outdoor fires intended for heating or the combustion of waste, and those included in the definition of "Open Burning" in Oregon Administrative Rule Chapter 340 Division 264. Outdoor cooking fires are not included.

(21) PARTICULATE MATTER TEN MICRONS AND LESS (PM-10) - Airborne particulate matter with an aerodynamic diameter of ten (10) microns in size or less. PM-10 is normally measured by weight per unit volume of air in micrograms per cubic meter (µg/m3). The National Ambient Air Quality Standard is 150 µg/m3 for a 24-hour period beginning at 12:01 AM.

(22) PARTICULATE MATTER TWO AND ONE-HALF MICRONS OR LESS (PM-2.5) - Airborne particulate matter with an aerodynamic diameter of two-point-five (2.5) microns in size or less. PM-2.5 is normally measured by weight per unit volume of air in micrograms per cubic meter (µg/m3). The National Ambient Air Quality Standards are 35 µg/m3 for a 24-hour period beginning at 12:01 AM, with a 15 µg/m3 annual average.

(23) PELLET STOVE – A wood burning heating appliance which uses wood pellets as its primary source of fuel.

(24) PERSON - Any individual, partnership, corporation, company or other association.

(25) PROHIBITED MATERIALS - Any combustible material as defined by the State's prohibited materials open burning rule which include wet garbage, plastic, wire insulation, automobile parts, asphalt, petroleum product, petroleum treated material, rubber products, or animal or vegetable matter resulting from the handling, preparation, cooking or service of food that normally results in dense or noxious smoke when burned. Also included are coal and any open burned materials that cause a public or private nuisance or a hazard to public safety.

(26) RESPONSIBLE PERSON – A person eighteen (18) years of age or older, authorized by the property owner to attend an open burning event and who is capable of and has the necessary equipment to extinguish the fire.

(27) SALE OF REAL PROPERTY - Any transaction whereby the ownership of a building as defined by the Klamath County Development Code, or the real property upon which a building is located, is transferred by an agreement for the sale and purchase of the building or the real property.

(28) SOLE SOURCE OF HEAT - One or more residential solid fuel-fired appliances that constitute the only source of space heat in a private residence. No residential solid fuel-fired appliance or devices shall be considered to be the sole source of heat if the private residence is equipped with a permanently installed working system such as: oil, natural gas, electric, geothermal, solar or propane heating system, whether connected or disconnected from its source.

(29) SOLID FUEL-FIRED APPLIANCE - A device designed for solid fuel combustion, including cordwood stoves (wood stoves and fireplace stove inserts), fireplaces, solid fuel-fired cook stoves and combination fuel furnaces or boilers, which burn solid fuels.

(30) URBAN GROWTH BOUNDARY (UGB) - An area of the county surrounding and including the City of Klamath Falls which has been designated by the Klamath County Board of Commissioners and the City of Klamath Falls as an area of potential growth which may impact both governmental bodies.

(31) WASTE

(a) Agricultural Waste - Any waste materials generated or used by an agricultural operation.

(b) Commercial Waste – Waste Materials from offices, warehouses, restaurants, mobile home parks, dwellings (apartments) containing more than four (4) family units, hotels, motels, schools, or wholesale or retail yards.

(c) Construction Waste - Any waste material produced by a building or construction project. Examples of construction waste are wood, lumber, paper, wood pallets, crating and packing materials used during construction, materials left after completion of construction and materials collected during cleanup of a construction site.

(d) Demolition Waste - Any material produced by the complete or partial destruction, or tearing down, of any man-made structure the clearing of any site for land improvement; or cleanup such as the removal of trees, brush or stumps, excluding agricultural waste, Section 406.005(31)(a), or domestic waste, Section 406.005(31)(e).

(e) Domestic Waste - Household materials including paper, cardboard, clothing, yard debris, Section 406.005(31)(h), or other material generated in or around a dwelling of four (4) or less family units, or on the real property adjacent to the dwelling. Once domestic waste is removed from the property of origin it becomes commercial waste.

(f) Forest Slash - Forest debris or woody vegetation related to the management of forestlands, used for the growing and harvesting of timber.

(g) Industrial Waste - Any materials (including process wastes) produced as a direct result of any manufacturing or industrial process.

(h) Yard Debris - Wood, needle or leaf material from trees, shrubs, or plants on real property adjacent to a dwelling of not more than four (4) family dwelling units. Once yard debris is removed from the property of origin, it becomes commercial waste, Section 406.005(31)(b) .

(32) WOODSTOVE/WOODHEATER – An enclosed, wood burning appliance capable of and intended for space heating or domestic water heating that meets all of the following:

(a) An air-to-fuel ratio in combustion chamber averaging less than 35-1 as determined by the test procedure prescribed in federal regulations, 40 CFR Part 60, Subpart AAA, Section 60.534 performed at an accredited laboratory;

(b) A usable firebox volume of less than 20 cubic feet;

(c) A minimum burn rate less than 5 kg/hr as determined by the test procedure prescribed in federal regulation, 40 CFR, Part 60, Subpart AAA, Section 60.534 performed at an accredited laboratory; and

(d) A maximum weight of 800 kg (1,760 lb). In determining the weight of an appliance for these purposes, fixtures and devices that are normally sold separately, such as flue pipe, chimney, heat distribution ducting, and masonry components that are not an integral part of the appliance or heat distribution ducting, shall not be included.

406.100 County Wide Air Quality Pollution Control Requirements

(1) AIR QUALITY ADVISORIES - The Klamath County Environmental Health Division shall determine and issue Air Quality Advisories at least daily during the winter heating season and at other times of the year as needed according to the definitions provided in Section 406.005(1). Air Quality Advisories will be provided to the public.

(2) PUBLIC RESPONSIBILITIES - Each person that burns outdoors or in a solid fuel-fired-appliance in Klamath County is required to comply with the requirements of this Chapter.

(3) SOLID FUEL-FIRED APPLIANCES

(a) Appliance Resale and Installation:

(i) The resale or installation of a non-certified solid fuel-fired appliance or any appliance not meeting the requirements of Section 406.005(31) is prohibited.

(ii) The resale, or installation of an exempt solid fuel-fired appliance, is allowed in accordance with state and local requirements.

(iii) A Klamath County Building Division permit is required for the installation of a solid fuel-fired appliance.

(b) Disclosure of Solid Fuel-Fired Appliances upon the Sale of Real Property - The presence of all solid fuel-fired appliances including wood stoves, fireplace inserts, fireplaces, and pellet stoves in the building shall be disclosed by the seller to the buyer as part of the sale and purchase of any building. The disclosure shall state whether any solid fuel-fired appliances are certified, non-certified, exempt or pellet.

(c) Removal of Non-Certified Woodstoves and Fireplace Inserts upon the Sale of Real Property - Non-certified wood stoves and fireplace inserts must be removed from building upon sale of any building containing them. The removal shall be accomplished prior to the closing of any real estate transaction involving the building containing the non-certified wood stove(s) or fireplace insert(s).

(d) Sole Heating Source - It shall be unlawful for a solid fuel-fired appliance to be the sole source of heat in any non-owner (tenant) occupied dwelling unit within Klamath County.

(e) Solid Fuel-fired Appliance Fuel - Only dry, seasoned cordwood, pressed sawdust logs, organic charcoal or pellets specifically manufactured for the appliance may be burned in a solid fuel-fired appliance.

(f) Prohibited Materials - Prohibited materials as defined in Section 406.005(25) and Oregon Administrative Rule 340-264-0060(3), shall not be burned in fireplaces, solid fuel-fired appliances, pellet stoves or cook stoves within Klamath County. An exception is the burning of re-refined used oil in an approved oil-burning device.

(4) OPEN/OUTDOOR BURNING REQUIREMENTS - This section pertains to burning as defined in Section 406.005(20).

(a) All open burning is prohibited during Red or Yellow Advisory Periods within Klamath County unless a Certificate of Variance has been issued by the Klamath County Environmental Health Division in accordance with Section 406.250.

(b) Open Burning Hours:

(i) Open burning fires are not to be started until one hour after sunrise and must be completely out one hour before sunset, unless otherwise directed by the local fire department.

(ii) Burning conducted for forest or ecosystem management, for example slash fires, are not required to be out by sunset.

(c) Local Fire Permit Required - Persons burning, shall adhere to all municipal, local Fire Department, State Fire Marshal or Oregon Department of Forestry or DEQ rules, ordinances, or restrictions.

(d) Responsible Person:

(i) A responsible person, as defined in Section 406.005(26), must constantly attend all open burning.

(ii) This person must also completely extinguish the fire before leaving it.

(e) Prohibited Materials – Burning of Prohibited materials as defined in Section 406.005(25) and Oregon Administrative Rule 340-264-0060(3), in outdoor or open fires is prohibited.

406.150 Air Quality Pollution Requirements Applying Within the Air Quality Zone.

In addition to the requirements in Section 406.100 the following requirements apply:

(1) SOLID FUEL-FIRED APPLIANCES - This section applies to the use of solid fuel-fired appliances for residential and commercial heating **within the Air Quality Zone.**

(a) During a Red Advisory Period, no person shall operate any solid fuel-fired appliance except a pellet stove.

(b) During a Yellow Advisory Period, no person shall operate an non-certified wood stove, non-certified wood stove insert, or fireplace. Only certified solid fuel-fired appliances and pellet stoves may be operated.

(c) During a Green Advisory Period, non-certified wood stoves, non-certified wood stove inserts, fireplaces, certified wood stoves, certified wood stove inserts and pellet stoves may be used for indoor heating.

(d) Visible Air Contaminant Emissions. No person operating a solid fuel-fired appliance within the Air Quality Zone shall allow smoke of an opacity of greater than 20%, or comparable to that described in the Ringelmann Smoke Chart (Exhibit B), to be vented to the atmosphere for more than three (3) minutes in any one (1) hour period. Emissions created during a ten (10) minute start-up period are exempt.

(e) Burn-down time. A Burn-down time, not to exceed three (3) hours, will be given on Red or Yellow Advisory Periods. No enforcement action described in Section 406.300 will take place for visible air contaminant emissions emitted during the burn-down time.

(f) Emergency Conditions. An exemption to Section 406.150 may be issued by the Klamath County Environmental Health Division to allow the use of normally prohibited solid fuel-burning appliances within the Air Quality Zone, during periods when:

(i) utility suppliers declare energy shortages;

(ii) electric power or outages occur;

(iii) interruptions occur of natural gas supplies; or

(iv) temporary failure occurs of a resident's heating system when there is an immediate need to operate a solid fuel space-heating device to protect family/individual health and welfare.

(2) OPEN BURNING - Except as specified in this section or allowed by Section 406.250, open burning is prohibited within the Air Quality Zone.

(a) Open Burning Window: The Klamath County Environmental Health Division Manager, in consultation with the Board of County Commissioners, the City of Klamath Falls Code Compliance Officer and Fire Districts No. 1 and No. 4 may declare two specific fifteen (15) day periods a year during which times the open burning of residential yard debris, as defined in Section 406.005(31)(h), will be allowed within the Air Quality Zone. Open Burning Windows within the Air Quality Zone will occur in Spring and Fall. Each window will include three (3) weekends.

(i) During the Open Burning Window, the Klamath County Environmental Health Division may temporarily prohibit open burning should poor ventilation episodes occur, or be forecast.

(ii) The Klamath County Environmental Health Division Manager in consultation with the Board of County Commissioners, the City of Klamath Falls Code Compliance Officer, and Fire Districts No. 1 and No. 4 may extend the Open Burning Window one day for every day in which open burning has been prohibited during the Open Burning Window due to poor ventilation or weather conditions.

(b) All agricultural open burning is prohibited at all times in the Air Quality Zone unless allowed by a Certificate of Variance.

(c) The use of burn barrels and other outdoor burning devices is prohibited.

(d) A Certificate of Variance, as defined in Section 406.250(1), to allow Open Burning outside the Spring or Fall Open Burning Windows, may be issued on a case by case basis within the Air Quality Zone when an emergency, or substantial need, is documented.

406.200 Certificates of Exemption

(1) ISSUANCE - The Klamath County Environmental Health Division Manager or designee may issue a Certificate of Exemption to allow the use of solid fuel-fired appliances within the Air Quality Zone for residential space heating purposes during Red or Yellow Advisory Periods.

(a) All applications for Certificates of Exemption shall be on forms provided by the Klamath County Environmental Health Division.

(b) Within five (5) working days of receiving a completed application, the Klamath County Environmental Health Division shall review and: 1) approve the application; 2)approve the application with conditions; or 3) deny the application.

(c) Klamath County Environmental Health Division shall not charge a fee for processing an application or issuing a Certificate of Exemption.

(d) All Certificates of Exemption expire on May 15 of each year.

(e) Applying for the renewal of all Certificates of Exemption is the responsibility of the registrant.

(2) LOW INCOME EXEMPTION - A low-income person, either tenant or owner, after submitting adequate documentation, may be granted a Certificate of Exemption to use a solid fuel-fired appliance, for residential heating, during Red and Yellow Advisory Periods.

406.250 Certificates of Variance and Certificates of Waiver

Certificates of Variance or Certificates of Waiver, issued by Klamath County Environmental Health Division, are required for all Open Burning not conforming to the requirements of Section 406.100(4) and Section 406.150(2).

(1) CERTIFICATE OF VARIANCE.

(a) All applications for Certificates of Variance shall be on forms provided by the Klamath County Environmental Health Division and submitted at least ten (10) working days prior to the proposed or desired starting date of the variance.

(b) Within ten (10) working days of receiving a completed application, the Klamath County Environmental Health Division shall review and: 1) approve the application; 2) approve the application with conditions; or 3) deny the application.

(c) Klamath County Environmental Health Division shall not charge a fee for processing an application or issuing a Certificate of Variance.

(d) Inside the Air Quality Zone, Klamath County Fire Districts No.1 and No.4, the City of Klamath Falls, and the Klamath County Environmental Health Division may develop an interagency agreement to expedite the processing of applications.

(2) CERTIFICATE OF WAIVER - The Klamath County Environmental Health Division Manager, or designate, may issue a Certificate of Waiver for an area of the county when the meteorological conditions are expected to be different from those forecast for other parts of the county.

406.300 Enforcement

(1) Klamath County Environmental Health Division Staff will monitor and enforce compliance with this Chapter countywide. Minor violations of this Chapter will result in a Notice of Noncompliance being sent to the violator. Repeated or major violations will result in the issuance of a Citation and Summons to the violator to appear in court.

(2) When a Klamath County Air Quality Inspector has observed a violation of this Chapter, he or she shall transmit this information, along with the documentation, to the Klamath County Environmental Health Division Manager. The Environmental Health Manager will review the submitted documentation and:

(a) If the documentation is complete, the Environmental Health Manager will issue a Notice of Noncompliance, a Citation and Summons to the violator to appear in court, or other legal action depending on the severity and frequency of the violation.

(b) If the documentation is not complete, the Environmental Health Manager will issue a Notice of Noncompliance to the alleged violator, and send a copy of the documents to the Air Quality Inspector who observed the violation.

(3) NOTICE OF NONCOMPLIANCE - A Notice of Noncompliance as defined in Section 406.005(19) may be issued to the violator as the sole enforcement action, or in addition to a citation.

(a) The notice shall contain the date, time and street name and number and the violation observed.

(b) The notice shall specify the corrective action that must be taken and the time in which it must be accomplished.

(c) The notice may require that within ten (10) days of correcting the violation, the violator shall in writing notify the Klamath County Air Quality Inspector that the corrective action has been taken.

(4) AIR QUALITY CITATIONS - An appropriate law enforcement officer or a Klamath County Environmental Health Division Manager may issue a Citation and Summons to appear in court for a violation of this Chapter.

406.400 Penalties

Failure to comply with the provisions of this Chapter shall be subject to fines of up to $720.00 for a one-time occurrence, and fines of not more than $1,000.00 for a continuing, or repeated offense. This provision will be enforced in accordance with Chapter 800, Uniform Civil Violation Procedure of the Klamath County Code.

406.450 Severability

If any section, subsection, sentence, clause, phrase or portion of this Chapter is for any reason held invalid or unconstitutional in a court of competent jurisdiction, such portion shall be deemed a separate, distinct and independent provision, and shall not affect the validity of the remaining portion thereof.

406.500 Contingency Strategies and Formation of an Air Quality Advisory Committee

Klamath County Board of Commissioners hereby establishes the Klamath County Air Quality Advisory Committee. The purpose of the Committee is to evaluate relevant air quality data; identify significant contributing emission sources; develop appropriate emission reduction strategies such as the expansion of the Air Quality Zone and will recommend action to the Board of County Commissioners. The committee will meet semi-annually, once in the spring and again in the fall, and at other times as deemed necessary. The Committee will be composed of interested persons representing industry, the general public and governmental agencies.

DONE and DATED this 7th day of August, 2007.

KLAMATH COUNTY BOARD OF COMMISSIONERS

Chairman	Commissioner	"NAY" William R. Brown Commissioner

APPROVED FOR LEGAL SUFFICIENCY:

Klamath County Counsel

RECORDING SECRETARY:

Pamela Novak

Administrative Assistant

Exhibit A – Air Quality Zone

WOOD SMOKE ORDINANCE
AIR QUALITY ZONE BOUNDARY DESCRIPTION
Exhibit A

Beginning at the Corner common to T.37S.,R.8E., T.37S.,R.9E., T.38S.,R.9E. and T.38S.,R.8E.W.M.; thence North along the West Line of Section 31, approximately 0.5 miles to the West 1/4 corner of Section 31; thence East along the East-West center Section line of Sections 31 and 32, approximately 1.5 miles to the N.E. Corner of the S.W. 1/4 Section of Section 32; thence South along the North-South center Section line of Section 32, T.37S.,R.9E. and Sections 5 and 8, T.38S.,R.9E.W.M., approximately 2.5 miles to the North 1/4 Corner of Section 17; thence East along the North Line of Section 17, approximately 0.5 miles to the N.E. Corner of Section 17; thence South along the East line of Section 17, approximately 1.0 mile to the N.W. Corner Section 21; thence East along the North line of Section 21, approximately 1.0 mile to the N.E Corner of Section 21; thence North along the West line of Section 15, approximately 1.0 mile to the N.W. Corner of Section 15; thence East along the North line of Sections 15 and 14, approximately 1.5 miles to the North 1/4 Corner of Section 14; thence South along the North-South center section line of Section 14, approximately 1.0 mile to the South 1/4 Corner of Section 14; thence East along the North line of Sections 23 and 24, approximately 1.5 miles to the N.E. Corner of Section 24; thence South along the East line of Sections 24, 25 and 36, approximately 3.0 miles to the N.W. Corner of Section 6, T.39S.,R.10E.W.M.; thence East along the North line of Section 6, approximately 0.5 miles to the North 1/4 Corner of Section 6; thence South along the North-South centerline of Section 6, approximately 1.0 miles to the South 1/4 Corner of Section 6; thence East along the North line of Sections 7, 8, 9 and 10, approximately 3.0 miles to the North 1/4 Corner of Section 10; thence South along the North-South center Section line of Section 10 and 15 to the intersection with the North Right-of-Way of the abandoned Oregon-California and Eastern (O.C.&E.) Railroad; thence Northwesterly along the North Right-of-Way line to the intersection with the North-South center Section line of Section 17; thence South along the North-South center Section line of Sections 17, 20 and 29 to the S.E. corner of the N.W. 1/4 of Section 29; thence West along the East-West center Section line of Sections 29 and 30, T.39S.,R.10E. and Section 25, T.39S.,R.9E.W.M., approximately 2.5 miles to the West 1/4 Corner of Section 25; thence South along the East line of Section 26, approximately 0.5 miles to the S.E. corner of Section 26; thence

West along the South line of Section 26, approximately 0.7 miles to the intersection with the East Right-of-Way of the Union Pacific Railroad; thence Northwesterly along the Easterly Right-of-Way line to the intersection with the East-West Center Section line of Section 22; thence West along the East-West center Section line of Sections 22,21,20 and 19, T.39S.,R.9E. and Sections 24 T.39S.,R.8E.W.M., approximately 4.3 miles to the West ¼ corner of said Section 24; thence North approximately 4040 feet to the northerly right-of-way line of State Highway 66 and the boundary of the Keno Rural Fire Protection District; thence Northeasterly along the northerly right-of-way line of said State Highway 66 and said boundary of the Keno Rural Fire Protection District to the intersection with the boundary of the Klamath County Fire District #4; thence Northeasterly along said District's boundaries to the C-E-W-W 1/256 corner of Section 13, T.39S.,R.8E. W.M.; thence North approximately 2640 feet to the E-W-W 1/256 corner of said Section 13; thence West approximately 3630 feet along the north line of said Section 13 and Section 14 T.39S.,R.8E. W.M., to the North 1/4 Corner of said Section 14; thence North along the North-South center Section Line of Sections 11 and 2 T.39S.,R.8E. and Section 35 T.38S.,R8E, approximately 2.75 miles to the South Right-of-way line of Highway 140; thence Northwesterly along the South Right-of-way of Highway 140, approximately 0.25 miles to the intersection of Highway 140 and South line of Section 26; thence West along the South Section line of Section 26, approximately 0.35 miles to the S.W. Corner of Section 26; thence North along the West line of Sections 26 and 23, approximately 1.5 miles to the South right-of-way line of Lakeshore Drive; thence Northwesterly along the South right-of-way line Lakeshore Drive, approximately 1.0 mile to the South right-of-way line of Highway 140; thence Northwesterly along the South Right-of-way line of Highway 140,approximately 2.2 miles to the intersection of Highway 140 and the West Line of Section 8; thence North along the West line of Section 8 and 5 approximately 1.5 miles to the N.W. Corner of Section 5; thence East along the North line of Section 5, 4, 3, and 2, across Klamath Lake, then along the North line of Section 1, approximately 5.0 miles to the point of beginning.

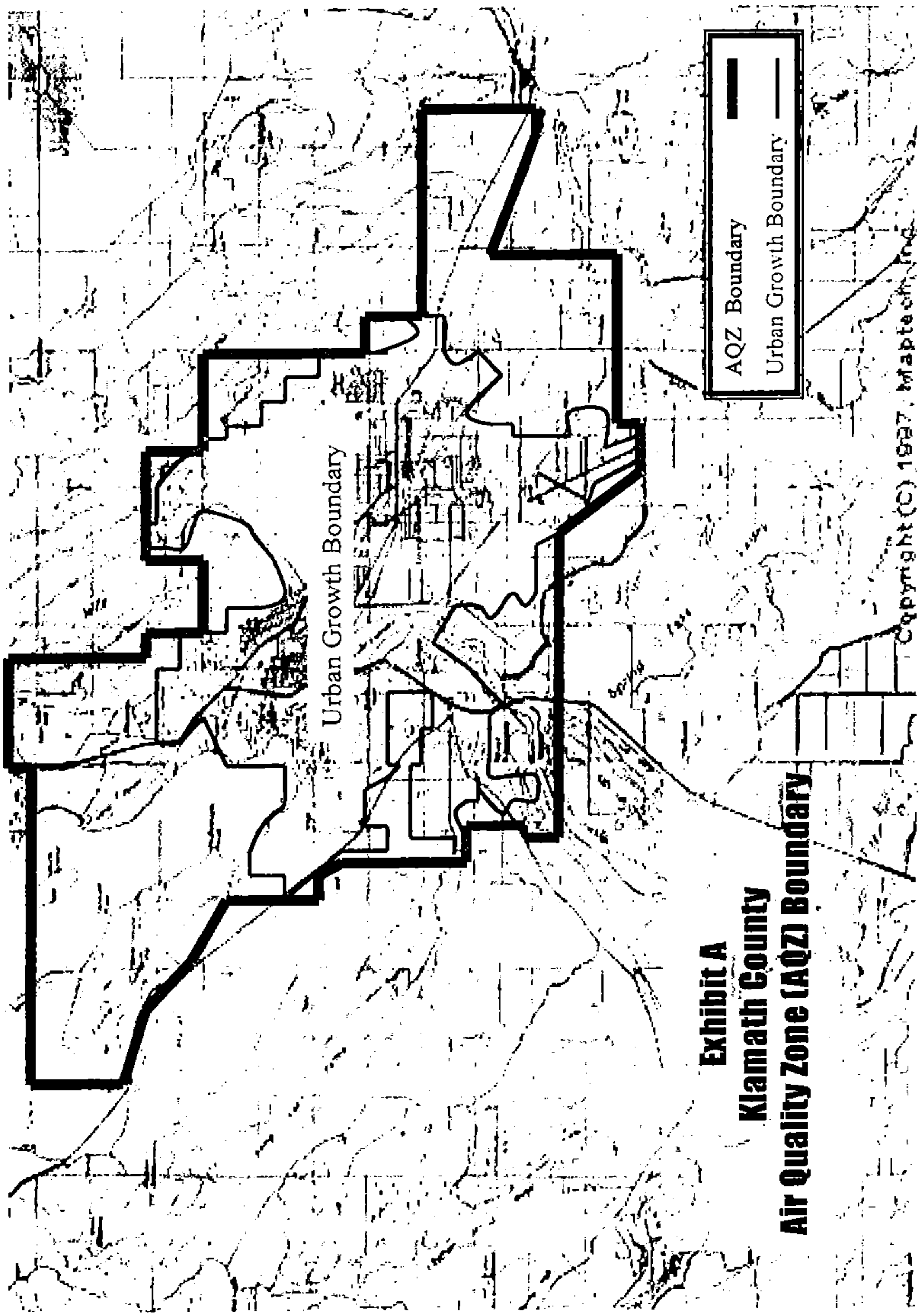
AQZ Boundary
Urban Growth Boundary
Urban Growth Boundary
Copyright (C) 1997, Maptech, Inc.
Exhibit A
Klamath County
Air Quality Zone (AQZ) Boundary

Exhibit B - Ringlemann Smoke Chart

(See http://www.cdc.gov/niosh/mining/pubs/pdfs/ic8333.pdf)

IC bureau of mines
information circular 8333

RINGELMANN SMOKE CHART

(Revision of IC 7718)

By Staff, Bureau of Mines

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF MINES

May 1967

RINGELMANN SMOKE CHART

(Revision of IC 7718)

By Staff, Bureau of Mines

* * * * * * * * * * * information circular 8333

UNITED STATES DEPARTMENT OF THE INTERIOR
Stewart L. Udall, Secretary

BUREAU OF MINES
Walter R. Hibbard, Jr., Director

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CONTENTS

RINGELMANN SMOKE CHART

(Revision of IC 7718)

by

Staff, Bureau of Mines[1]

ABSTRACT

The Ringelmann Smoke Chart fulfills an important need in smoke abatement work and in certain problems in the combustion of fuels. A knowledge of its history and method of preparation is, therefore, of interest to many. Since instructions on its use are not shown on the recent edition of the chart, those included in this revision of the previous Bureau of Mines publication now are a necessary complement to the chart. More detail regarding the use of the chart is included than was given in the earlier version.

INTRODUCTION

The Ringelmann Smoke Chart, giving shades of gray by which the density of columns of smoke rising from stacks may be compared, was developed by Professor Maximilian Ringelmann of Paris. Ringelmann, born in 1861, was professor of agricultural engineering at l'Institute National Agronomique and Director de la Station d'Essais de Machines in Paris in 1888, and held those positions for many years thereafter.

The chart apparently was introduced into the United States by William Kent in an article published in Engineering News of November 11, 1897, with a comment that he had learned of it in a private communication from a Bryan Donkin of London. It was said to have come into somewhat extensive use in Europe by that time. Kent proposed in 1899 that it be accepted as the standard measure of smoke density in the standard code for power-plant testing that was being formulated by the American Society of Mechanical Engineers.

The Ringelmann Chart was used by the engineers of the Technologic Branch of the U.S. Geological Survey (which later formed the nucleus of the present Bureau of Mines) in their studies of smokeless combustion beginning at St. Louis in 1904, and by 1910, it had been recognized officially in the smoke ordinance for Boston passed by the Massachusetts Legislature.

The chart is now used as a device for determining whether emissions of smoke are within limits or standards of permissibility (statutes and ordinances) established and expressed with reference to the chart. It is widely used by law-enforcement or compliance officers in jurisdictions that have adopted standards based upon the chart.

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[1]Office of the Director of Coal Research, Washington, D.C.

In 1908, copies of the chart were prepared by the Technologic Branch of the Geological Survey for use by its fuel engineers and for public distribution. Upon its organization in 1910, the Bureau of Mines assumed this service together with the other fuel-testing activities of the Technologic Branch.

DESCRIPTION AND METHOD OF PREPARING THE CHART

The Ringelmann system is virtually a scheme whereby graduated shades of gray, varying by five equal steps between white and black, may be accurately reproduced by means of a rectangular grill of black lines of definite width and spacing on a white background. The rule given by Professor Ringelmann by which the charts may be reproduced is as follows:

Card 0—All white.

Card 1—Black lines 1 mm thick, 10 mm apart, leaving white spaces 9 mm square.

Card 2—Lines 2.3 mm thick, spaces 7.7 mm square.

Card 3—Lines 3.7 mm thick, spaces 6.3 mm square.

Card 4—Lines 5.5 mm thick, spaces 4.5 mm square.

Card 5—All black.

The chart, as distributed by the Bureau of Mines, provides the shades of cards 1, 2, 3, and 4 on a single sheet, which are known as Ringelmann No. 1, 2, 3, and 4, respectively. A copy of the chart is included in this report.

USE OF CHART

Many municipal, state, and federal regulations prescribe smoke-density limits based on the Ringelmann Smoke Chart, as published by the Bureau of Mines. Although the chart was not originally designed for regulatory purposes, it is presently used for this purpose in many jurisdictions where the results obtained are accepted as legal evidence.

While the chart still serves a useful purpose, it should be remembered that the data obtained by its use is empirical in nature and has definite limitations. The apparent darkness or opacity of a stack plume depends upon the concentration of the particulate matter in the effluent, the size of the particulate, the depth of the smoke column being viewed, natural lighting conditions such as the direction of the sun relative to the observer, and the color of the particles. Since unburned carbon is a principal coloring material in a smoke column from a furnace using coal or oil, the relative shade is a function of the combustion efficiency.

While the Ringelmann Smoke Chart has many limitations, it gives good practical results in the hands of well-trained operators. However, it is questionable whether results should be expressed in fractional units because of variations in physical conditions and in the judgement of the observers.

To use the chart, it is supported on a level with the eye, at such a distance from the observer that the lines on the chart merge into shades of gray, and as nearly as possible in line with the stack. The observer glances from the smoke, as it issues from the stack, to the chart and notes the number of the chart most nearly corresponding with the shade of the smoke, then records this number with the time of observation. A clear stack is recorded as No. 0, and 100 percent black smoke as No. 5.

To determine average smoke emission over a relatively long period of time, such as an hour, observations are usually repeated at one-fourth or one-half minute intervals. The readings are then reduced to the total equivalent of No. 1 smoke as a standard. No. 1 smoke being considered as 20 percent dense, the percentage "density" of the smoke for the entire period of observation is obtained by the formula:

$$\frac{\text{Equivalent units of No. 1 smoke} \times 0.20 \times 100}{\text{Number of observations}} = \text{percentage smoke density.}$$

A convenient form for recording and computing the percentage of smoke density appears at the end of this report. This procedure is often used on acceptance tests of fuel-burning equipment.

The timing and extent of observations made for the purpose of determining compliance with a local smoke abatement ordinance depends upon the wording and smoke limitations of the ordinance.

RINGELMANN-CHART READING

Location . . . .

Hour. . . 9:00 - 10:00 a.m. . . . Date. . . . .

9	0	1/4	1/2	3/4		0	1/4	1/2	3/4
0	-	-	-	-	30	1	1	1	1
1	-	-	-	-	31	1	1	1	1
2	-	-	-	-	32	-	-	-	-
3	1	1	1	1	33	-	-	-	-
4	1	1	1	1	34	-	-	-	-
5	2	2	2	2	35	1	1	1	1
6	2	3	3	3	36	1	1	1	1
7	3	3	3	3	37	1	1	1	1
8	2	2	1	1	38	1	1	-	-
9	1	1	-	-	39	-	-	-	-
10	-	-	-	-	40	-	-	-	-
11	-	-	-	-	41	-	-	-	-
12	-	-	-	-	42	-	-	-	-
13	-	-	-	-	43	-	-	-	-
14	-	-	-	-	44	1	1	2	2
15	-	-	-	-	45	2	2	3	3
16	-	-	-	-	46	3	3	3	3
17	-	-	-	-	47	3	3	4	3
18	-	-	-	-	48	2	2	2	2
19	2	2	2	2	49	2	2	2	2
20	2	2	2	2	50	2	1	1	1
21	2	2	2	2	51	1	1	1	1
22	3	3	3	3	52	1	1	1	-
23	3	4	4	4	53	-	-	-	-
24	4	5	5	5	54	-	-	-	-
25	5	5	5	5	55	-	-	-	-
26	4	4	3	3	56	-	-	-	-
27	3	3	3	3	57	-	-	-	-
28	2	2	1	1	58	-	-	-	-
29	1	1	1	1	59	-	-	-	-

Point of observation

. . . .

Distance to stack . . . .

Direction of stack . . . .

Direction of wind . . . .

Velocity of wind . . . .

		Equiv. No. 1 Units
7	Units No. 5	35
7	Units No. 4	28
27	Units No. 3	81
34	Units No. 2	68
52	Units No. 1	52
113	Units No. 0	0
240	Units	264

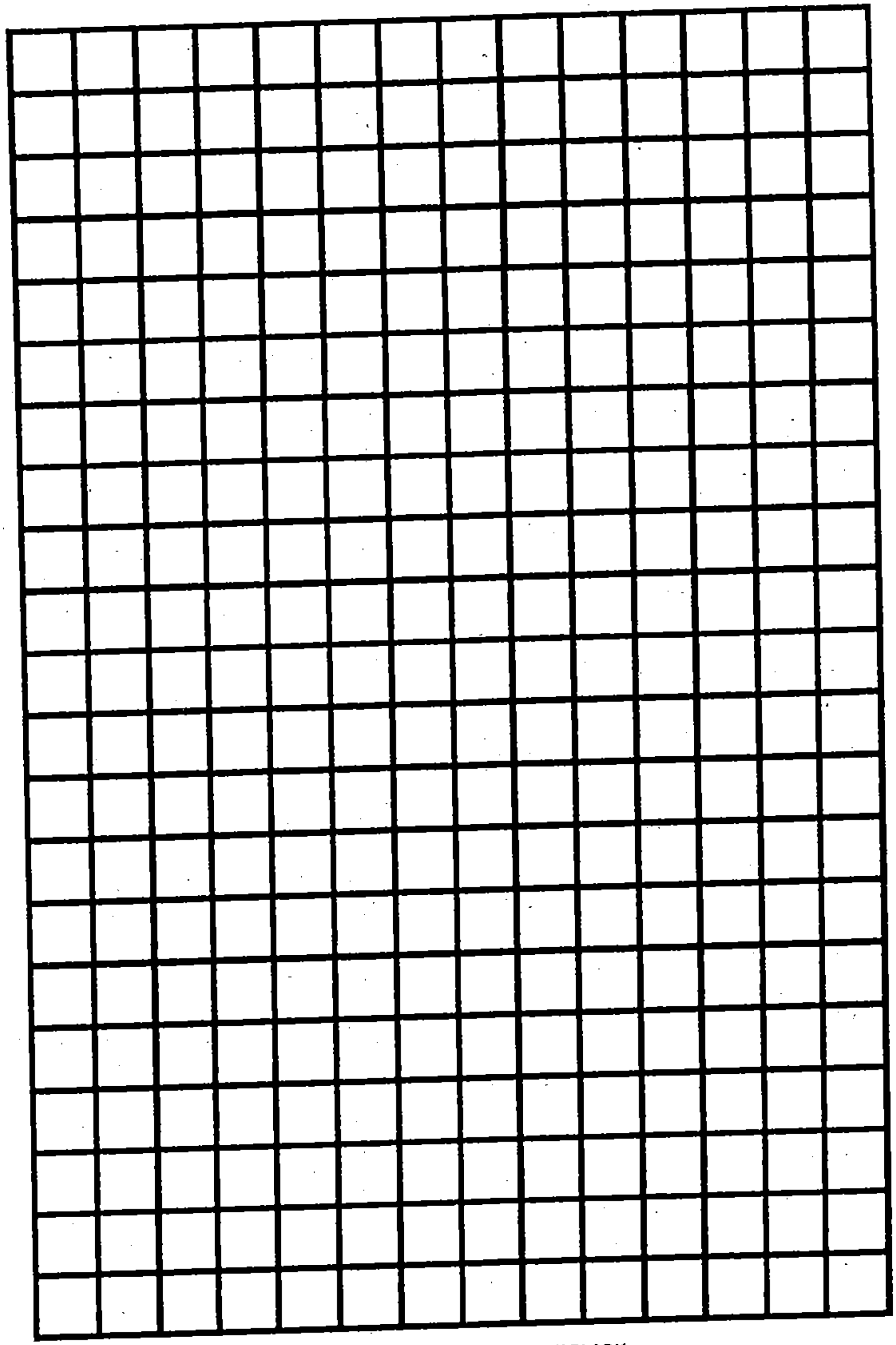
$\frac{264}{240} \times 20$ pct =

22 pct . . . . Smoke density

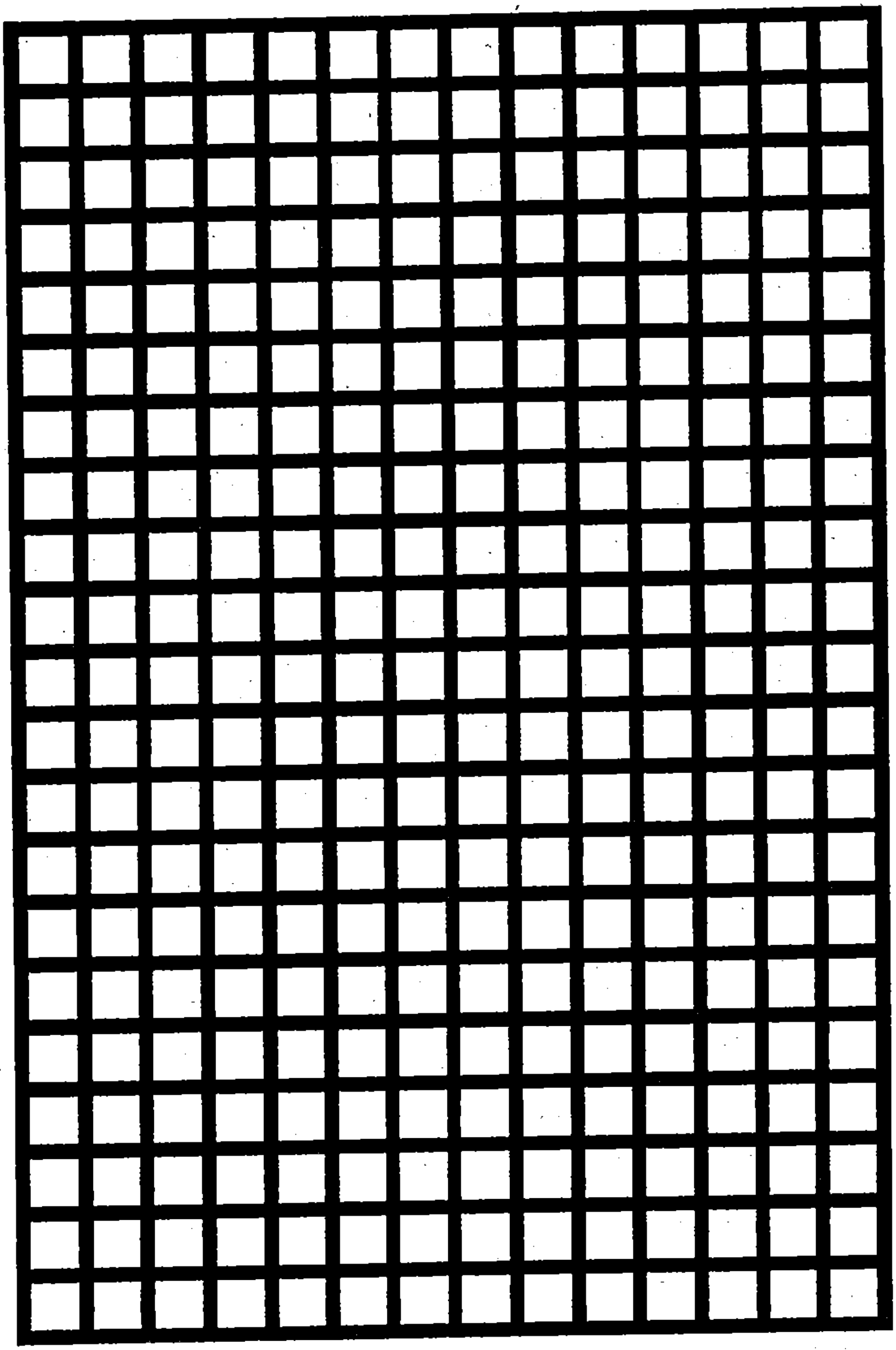
Observer. . . . .

Checked by. . . . .

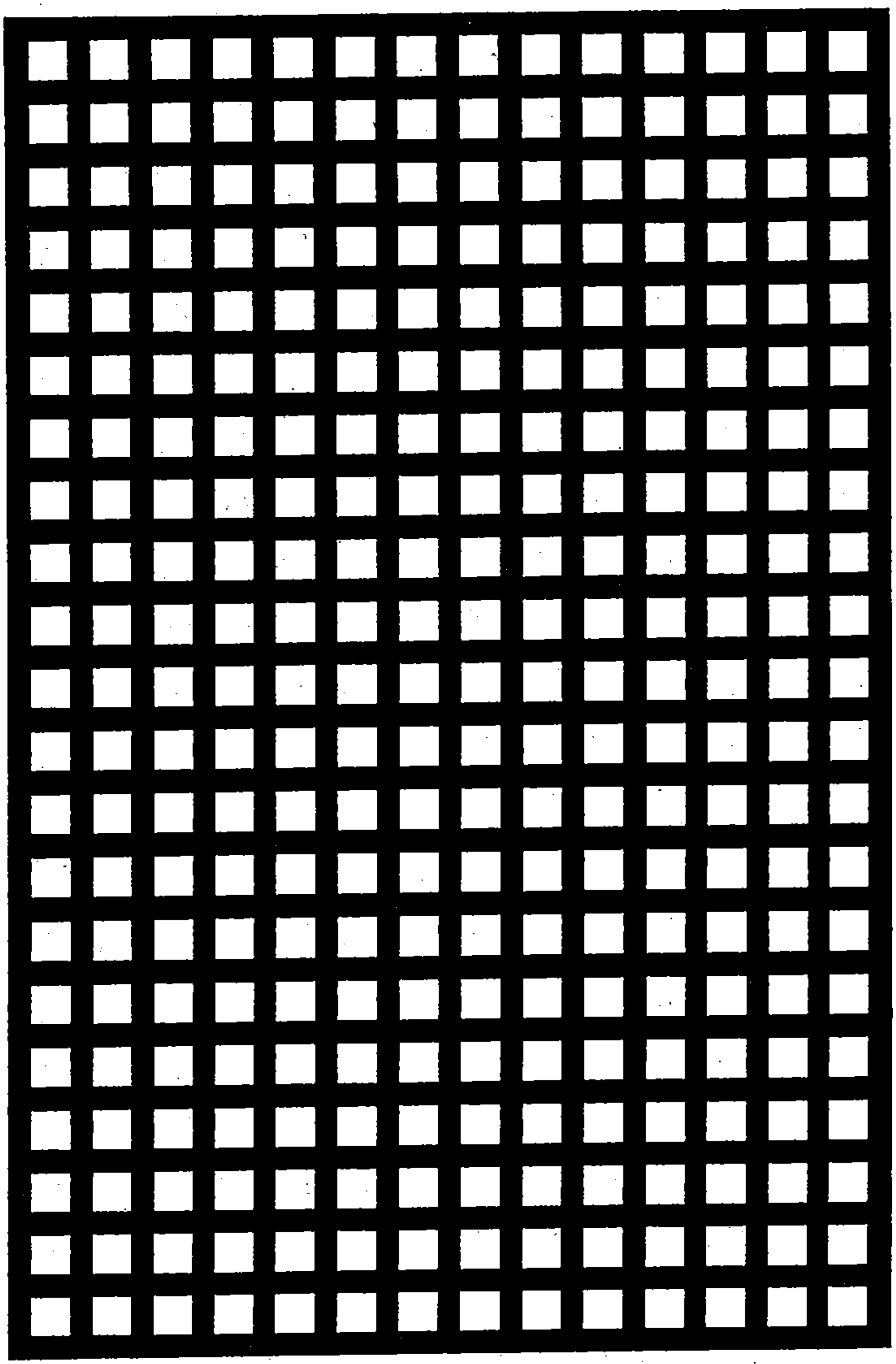
INT.-BU. OF MINES, PGH., PA. 10992



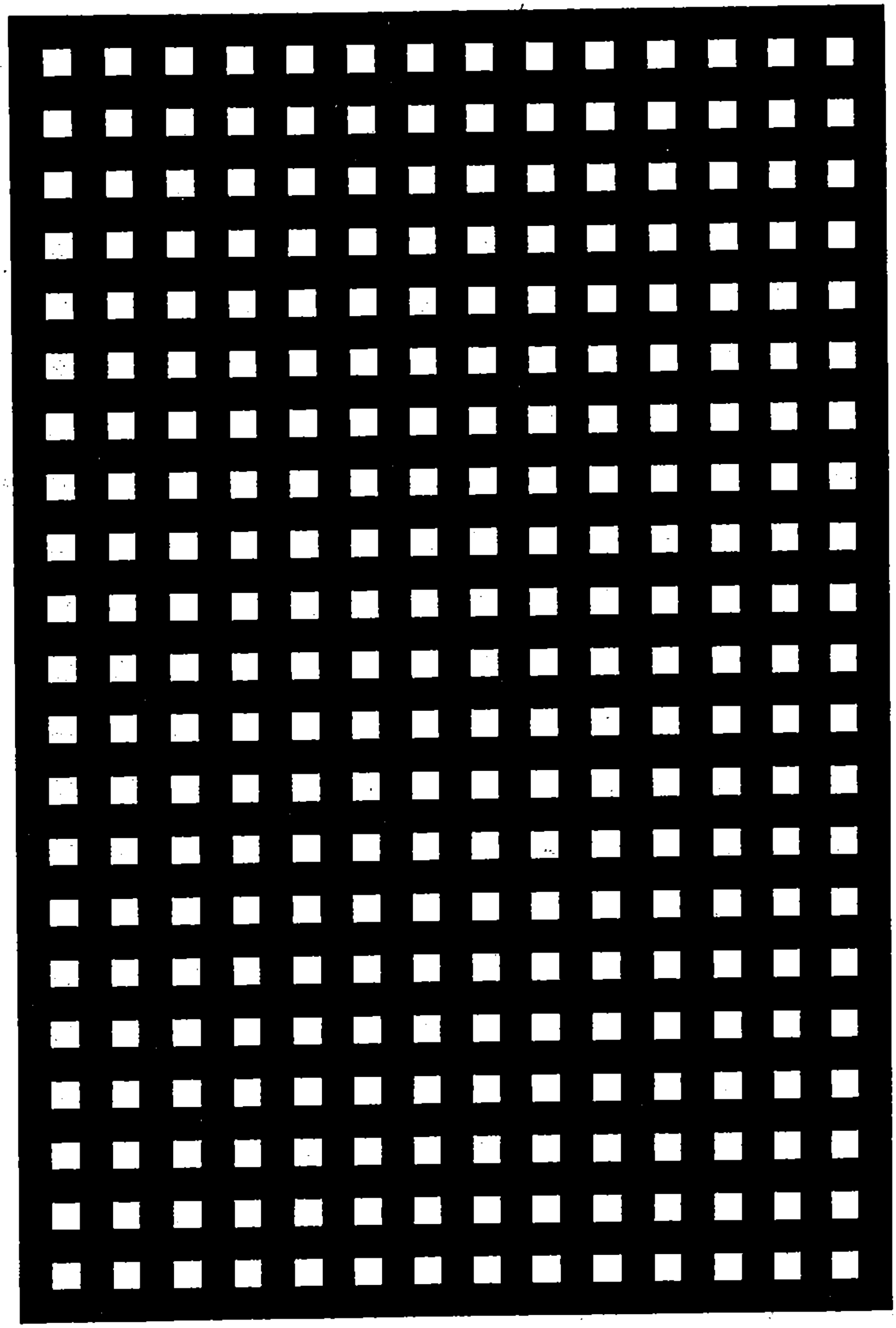
1. EQUIVALENT TO 20 PERCENT BLACK



2. EQUIVALENT TO 40 PERCENT BLACK



3. EQUIVALENT TO 60 PERCENT BLACK



4. EQUIVALENT TO 80 PERCENT BLACK

AGENDA REPORT
BOARD OF COUNTY COMMISSIONERS

Agenda Category: Public Hearing/Ordinance	Item No: F.2

Originating Department: Board of County Commissioners

Date Action Requested: October 2, 2012
9:45 a.m. Time Certain

Date Action Taken:

ISSUE: Final public hearing and approval of Ordinance No. 63.06 which will amend the Klamath County Code Chapter 406 – Klamath County Clean Air Ordinance.

BACKGROUND & CONCLUSIONS: The Board of County Commissioners held the first public hearing on proposed Ordinance No. 63.06 on September 18, 2012 @9:45 a.m. , the second and final public hearing is being held today for the taking of testimony and consideration of final action. Public notice of the hearing was posted in three public places and published in the *Herald and News* on September 11, 2012. The proposed ordinance will amend the County code to develop a plan for reductions in PM2.5 that will bring the Klamath Falls non-attainment area into compliance with the National Ambient Air Quality Standards by December 2014.

FISCAL IMPACT: **Unknown**

RECOMMENDED MOTION: That the Klamath County Board of Commissioners approves and signs the attached ordinance which will amend the Klamath County Code Chapter 406 – Klamath County Clean Air Ordinance. This ordinance will go into effect on the 90th day after adoption.

DEPARTMENT HEAD APPROVAL: ____________________

BUDGET OFFICER APPROVAL: ____________________

CONTRACT SPECIALIST APPROVAL: ____________________

COUNTY COUNSEL REVIEW: ____________________ 9/24/12

COMMISSIONER LIAISON APPROVAL: ____________________

APPROVED THIS _____ DAY OF	DISTRIBUTION:
	ORIGINAL – CLERK
____________________	ORIGINAL –
by the Klamath County Board of Commissioners	1 - COUNTY COUNSEL
	1 – Proceedings
(SEAL)	1 –
CERTIFIED by ____________________	1 –
Recording Secretary	1 -
	TOTAL - 3

Revised 5/11/11

BOARD OF COUNTY COMMISSIONERS

KLAMATH COUNTY, OREGON

IN THE MATTER OF REVISING THE CURRENT)
CHAPTER 406, KLAMATH COUNTY CLEAN AIR)
ORDINANCE OF THE KLAMATH COUNTY CODE) ORDINANCE NO. 63.06
) FINAL DRAFT

WHEREAS, Klamath County passed the Clean Air Ordinance on July 31, 1991, in order to meet the standards of the 1990 Federal Clean Air Act; and

WHEREAS, the United States Environmental Protection Agency (EPA) adopted new standards for ambient air quality particulate matter (PM-2.5) in December 2006; and

WHEREAS, the Board of County Commissioners revised the clean air ordinance on July 24, 2007 to comply with the new EPA standards and to establish a volunteer Air Quality Advisory Committee; and

WHEREAS, the Department of Environmental Quality (DEQ)has requested the Board of County Commissioners (BOCC) to provide a revised clean air ordinance with emission reduction strategies to bring air quality in Klamath Falls back into compliance with federal air quality standards for fine particulate (PM2.5); and

WHEREAS, Section 110 of the Clean Air Act, 42 U.S.C. §7410 requires DEQ to adopt a State Implementation Plan (SIP) showing sufficient reductions in PM2.5 that will bring the Klamath Falls non-attainment area in compliance with the National Ambient Air Quality Standards (NAAQS) by December 2014; and

WHEREAS, the Klamath Falls SIP must also show that the non-attainment area will continue to meet NAAQS in the future and provide contingency measures in case it fails.

NOW, THEREFORE, the Board of County Commissioners ordains that the current Chapter 406 is hereby revised to implement the applicable federal requirements for compliance with particulate standards and to establish contingency measures for use in the future if the Klamath County SIP fails. Chapter 406, Klamath County Clean Air Ordinance, of the Klamath County Code is hereby revised to read as follows:

CHAPTER 406 CONTENTS

CHAPTER 406
KLAMATH COUNTY CLEAN AIR ORDINANCE

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Ordinance No. 63.00 - 07/31/91
Ordinance No. 63.01 - 06/25/97
Ordinance No. 63.02 - 12/23/97
Ordinance No. 63.03 - 08/23/2001
Ordinance No. 63.04 - 10/05/2004
Ordinance No. 63.05 - 08/07/2007
Ordinance No. 63.06 -

CHAPTER 406
KLAMATH COUNTY CLEAN AIR ORDINANCE

406.001 Policy and Purpose. To control and address air quality problems and identify the Air Quality Zone, so that Klamath County will have clean air for the benefit of its citizens' health and welfare; to be in compliance with requirements of the Federal Clean Air Act of 1990 and applicable revisions or updates, and not exceed the National Ambient Air Quality Standard for particulate matter; and to improve economic development opportunities.

406.005 Definitions. Except where the context otherwise requires, the definitions given in this section govern the construction of this Chapter.

(1) AIR QUALITY ADVISORY - A means, declared and provided by the Klamath County Environmental Health Division based on the Air Quality Forecast, to inform area residents of what the air quality is or potentially will be. The advisories shall be:

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(a) Red Advisory Period - A period of time when an Air Quality Forecast predicts that particulate matter concentrations have the potential to exceed or are exceeding an estimate of 150 µg/m3 of PM-10 or 30 µg/m3 for PM-2.5 for a 24-hour average. Such pollution concentrations have a high probability of being unhealthy.

(b) Yellow Advisory Period - A period of time when the Air Quality Forecast predicts that particulate matter concentrations are less than what would be considered for the Red Advisory Period, but would likely exceed estimates of 80 µg/m3 of PM-10 or 16 µg/m3 of PM-2.5 for a 24-hour average. Such pollution concentrations have a high probability of impacting public health.

(c) Green Advisory Period - A period of time when an Air Quality Forecast predicts daily particulate matter concentrations for a 24-hour average will not exceed 80 µg/m3 of PM-10; or 16 µg/m3 of PM-2.5.

(2) AIR QUALITY FORECAST - A method of using available data including, but not limited to, local weather conditions, current and anticipated particulate levels, and weather

Formatted: Indent: Left: -0.5", Hanging: 1.06" forecasts to determine the PM-10 and PM-2.5 particulate matter concentrations.

(3) AIR QUALITY INSPECTOR - Air Quality Inspectors may be staff of the Klamath County Environmental Health Division, the Klamath County Code Compliance Office, the Code Enforcement Office of the City of Klamath Falls,or the County Fire Districts who will act within their scope of authority. The primary role of an Air Quality Inspector is to observe and document violations of Chapter 406 and to educate the public with respect to this Chapter and the documented violation.

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(4) AIR QUALITY ZONE - An area within the County as depicted on the map and legal description in Exhibit A.

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(5) AGRICULTURAL OPERATION - An activity including an irrigation operation on land currently used, or intended to be used primarily for the purpose of obtaining a profit by raising, harvesting and selling crops, or by raising and selling livestock and/or poultry, or the products thereof. Agricultural operation also means activities conducted by not-for-profit agricultural research organizations, which activities are necessary to serve that purpose. It does not include the construction and use of dwellings customarily provided in conjunction with the agricultural operation.

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(6) BUILDING - All residential or commercial structures including manufactured homes.

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(7) BURN-DOWN TIME - A period of time allowed for fires in solid fuel-fired appliances and open/outdoor burning, to die down prior to the beginning of enforcement activities. Such burn-down time applies to Red or Yellow Advisory Period.

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(8) CERTIFICATE OF EXEMPTION - A written approval issued by the Klamath County Environmental Health Division to use a solid fuel-fired appliance or open outdoor burning in a manner normally in violation of the requirements of this Chapter.

(9) CERTIFICATE OF VARIANCE - A written approval issued to a person by the Klamath County Environmental Health Division to open or outdoor burn in a manner normally in violation of the requirements of this Chapter.

~~(10) CERTIFICATE OF WAIVER - A written approval issued by the Klamath County Environmental Health Division to allow open/outdoor burning in a manner normally in violation of the requirements of this Chapter.~~

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(~~11~~10) CERTIFIED WOODSTOVE OR FIREPLACE INSERT - A solid fuel-fired space heating appliance that has been certified by the Oregon Department of Environmental Quality (DEQ) or bears an Environmental Protection Agency certification label indicating that the model is built in accordance with EPA emission certification.

(~~12~~11) COOK STOVE - A wood burning stove installed in the kitchen, which is primarily designed for cooking and has a stovetop and an oven. It may also be equipped with gas burners or electric heat elements.

(~~13~~12) EXEMPT SOLID-FUEL FIRED APPLIANCE - A solid fuel-fired appliance that is exempt from the Oregon Department of Environmental Quality (DEQ) or the United States Environmental Protection Agency (EPA) requirements for certification for its installation. Exempt stoves are pellet stoves, antique stoves (built before 1940 with ornate construction and a substantially higher current market value), open masonry fireplaces, cook stoves, or other stoves that have a valid letter of exemption from DEQ, or do not meet the definition of a "woodstove" or "wood heater" as defined in DEQ's Oregon Administrative Rules for Residential Wood Heating.

(~~14~~13) FIRE DEPARTMENT - The unit of municipal government or county approved Local Fire District having the authority and responsibility to extinguish unintended fires and to promote fire safety.

(~~15~~14) FIREPLACE - A framed opening made in a chimney to hold an open fire. Also known as an open fireplace or structurally integrated fireplace which could be made of metal or masonry construction.

(15) FIREPLACE ASTM STANDARDS - All fireplaces that meet the ASTM international standard test method E2558, and meet 5.1 grams per kilogram specifications, or current federal EPA NSPS standards for structurally integrated fireplaces, whichever is less.

(16) KLAMATH COUNTY AIR QUALITY ADVISORY COMMITTEE - A volunteer committee appointed by the Klamath County Board of Commissioners. The purpose of the Air Quality Advisory Committee is to evaluate relevant air quality data, identify significant contributing emission sources, recommend appropriate emission reduction strategies and recommend action to the Board of County Commissioners.

(17) LOW INCOME PERSON - A person or family who demonstrates economic need by certifying through proof that their total household income is less than the very low-income guidelines established by the United States Department of Housing and Urban Development.

(18) NON-CERTIFIED WOOD STOVE OR FIREPLACE INSERT - A solid fuel-fired residential space heating device that has not been certified by either the Oregon Department of Environmental Quality or the Environmental Protection Agency (EPA) as complying with smoke emission standards. "Non-certified wood stove or fireplace insert" does not include fireplaces, nor devices exempt from certification requirements as defined in Section 406.005(13).

(19) NOTICE OF NONCOMPLIANCE - A letter notifying a violator of this Chapter of the specific violation and the corrective action necessary.

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(20) NONATTAINMENT AREA - The federally designated area within the County that is depicted on the map and legal description in Exhibit A. Normally thought of as synonymous with the Air Quality Zone unless contingency measures are implemented.

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(~~20~~21) OPEN/OUTDOOR BURNING - This section refers to all open or outdoor fires intended for heating or the combustion of waste, and those included in the definition of "Open Burning" in Oregon Administrative Rule Chapter 340 Division 264. Outdoor cooking fires are not included.

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(~~21~~22) PARTICULATE MATTER TEN MICRONS AND LESS (PM-10) - Airborne particulate matter with an aerodynamic diameter of ten (10) microns in size or less. PM-10 is normally measured by weight per unit volume of air in micrograms per cubic meter (μg/m3). The National Ambient Air Quality Standard is 150 μg/m3 for a 24-hour period beginning at 12:01 AM.

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(~~22~~23) PARTICULATE MATTER TWO AND ONE-HALF MICRONS OR LESS (PM-2.5) - Airborne particulate matter with an aerodynamic diameter of two-point-five (2.5) microns in size or less. PM-2.5 is normally measured by weight per unit volume of air in micrograms per cubic meter (μg/m3). The National Ambient Air Quality Standards are 35 μg/m3 for a 24-hour period beginning at 12:01 AM, with a 15 μg/m3 annual average.

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(~~23~~24) PELLET STOVE - A wood burning heating appliance which uses wood pellets as its primary source of fuel.

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(~~24~~25) PERSON - Any individual, partnership, corporation, company or other association.

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(~~25~~26) PROHIBITED MATERIALS - Any combustible material as defined by the State's prohibited materials open burning rule which include wet garbage, plastic, wire insulation, automobile parts, asphalt, petroleum product, petroleum treated material, rubber products, or animal or vegetable matter resulting from the handling, preparation, cooking or service of food that normally results in dense or noxious smoke when burned. Also included are coal and any open burned materials that cause a public or private nuisance or a hazard to public safety.

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(~~26~~27) RESPONSIBLE PERSON - A person eighteen (18) years of age or older, authorized by the property owner to attend an open burning event and who is capable of and has the necessary equipment to extinguish the fire.

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(~~27~~28) SALE OF REAL PROPERTY - Any transaction whereby the ownership of a building as defined by the Klamath County Development Code, or the real property upon which a building is located, is transferred by an agreement for the sale and purchase of the building or the real property.

(~~28~~29) SOLE SOURCE OF HEAT - One or more residential solid fuel-fired appliances that constitute the only source of space heat in a private residence. No residential solid fuel-fired appliance or devices shall be considered to be the sole source of heat if the private residence is equipped with a permanently installed working system such as: oil, natural gas, electric, geothermal, solar or propane heating system, whether connected or disconnected from its source.

(~~29~~30) SOLID FUEL-FIRED APPLIANCE - A device designed for solid fuel combustion, including cordwood stoves (wood stoves and fireplace stove inserts), fireplaces, solid fuel-fired cook stoves and combination fuel furnaces or boilers, which burn solid fuels.

(~~30~~31) URBAN GROWTH BOUNDARY (UGB) - An area of the county surrounding and including the City of Klamath Falls which has been designated by the Klamath County Board of Commissioners and the City of Klamath Falls as an area of potential growth which may impact both governmental bodies.

~~(31)~~ (32) WASTE

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(a) Agricultural Waste - Any waste materials generated or used by an agricultural operation.

(b) Commercial Waste - Waste Materials from offices, warehouses, restaurants, mobile home parks, dwellings (apartments) containing more than four (4) family units, hotels, motels, schools, or wholesale or retail yards.

(c) Construction Waste - Any waste material produced by a building or construction project. Examples of construction waste are wood, lumber, paper, wood pallets, crating and packing materials used during construction, materials left after completion of construction and materials collected during cleanup of a construction site.

(d) Demolition Waste - Any material produced by the complete or partial destruction, or tearing down, of any man-made structure the clearing of any site for land improvement; or cleanup such as the removal of trees, brush or stumps, excluding agricultural waste, Section 406.005(31)(a), or domestic waste, Section 406.005(31)(e).

(e) Domestic Waste - Household materials including paper, cardboard, clothing, yard debris, Section 406.005(31)(h), or other material generated in or around a dwelling of four (4) or less family units, or on the real property adjacent to the dwelling. Once domestic waste is removed from the property of origin it becomes commercial waste.

(f) Forest Slash - Forest debris or woody vegetation related to the management of forestlands, used for the growing and harvesting of timber.

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(g) Industrial Waste - Any materials (including process wastes) produced as a direct result of any manufacturing or industrial process.

(h) Yard Debris - Wood, needle or leaf material from trees, shrubs, or plants on real property adjacent to a dwelling of not more than four (4) family dwelling units. Once yard debris is removed from the property of origin, it becomes commercial waste, Section 406.005(31)(b).

(~~32~~33) WOODSTOVE/WOODHEATER - An enclosed, wood burning appliance capable of and intended for space heating or domestic water heating that meets all of the following:

(a) An air-to-fuel ratio in combustion chamber averaging less than 35-1 as determined by the test procedure prescribed in federal regulations, 40 CFR Part 60, Subpart AAA, Section 60.534 performed at an accredited laboratory;

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(b) A usable firebox volume of less than 20 cubic feet;

(c) A minimum burn rate less than 5 kg/hr as determined by the test procedure prescribed in federal regulation, 40 CFR, Part 60, Subpart AAA, Section 60.534 performed at an accredited laboratory; and

(d) A maximum weight of 800 kg (1,760 lb). In determining the weight of an appliance for these purposes, fixtures and devices that are normally sold separately, such as flue pipe, chimney, heat distribution ducting, and masonry components that are not an integral part of the appliance or heat distribution ducting, shall not be included.

406.100 County Wide Air Quality Pollution Control Requirements.

(1) AIR QUALITY ADVISORIES - The Klamath County Environmental Health Division shall determine and issue Air Quality Advisories at least daily during the winter heating season and at other times of the year as needed according to

the definitions provided in Section 406.005(1). Air Quality Advisories will be provided to the public.

(2) PUBLIC RESPONSIBILITIES - Each person that burns outdoors or in a solid fuel-fired-appliance in Klamath County is required to comply with the requirements of this Chapter.

(3) SOLID FUEL-FIRED APPLIANCES

(a) Appliance Resale and Installation:

(i) The resale or installation of a non-certified solid fuel-fired appliance or any appliance not meeting the requirements of Section 406.005(31) is prohibited.

(ii) The resale, or installation of an exempt solid fuel-fired appliance, is allowed in accordance with state and local requirements.

(iii) A Klamath County Building Division permit is required for the installation of a solid fuel-fired appliance.

(b) Disclosure of Solid Fuel-Fired Appliances upon the Sale of Real Property - The presence of all solid fuel-fired appliances including wood stoves, fireplace inserts, fireplaces, and pellet stoves in the building shall be disclosed by the seller to the buyer as part of the sale and purchase of any building. The disclosure shall state whether any solid fuel-fired appliances are certified, non-certified, exempt or pellet.

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(c) Removal of Non-Certified Woodstoves and Fireplace Inserts upon the Sale of Real Property - Non-certified wood stoves and fireplace inserts must be removed from building upon sale of any building containing them. The removal shall be accomplished prior to the closing of any real estate transaction involving the building containing the non-certified wood stove(s) or fireplace insert(s).

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(d) Sole Heating Source - It shall be unlawful for a solid fuel-fired appliance to be the sole source of heat in any non-owner (tenant) occupied dwelling unit within Klamath County.

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(e) Solid Fuel-fired Appliance Fuel - Only dry, seasoned cordwood, pressed sawdust logs, organic charcoal or pellets specifically manufactured for the appliance may be burned in a solid fuel-fired appliance.

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(f) Any newly constructed fireplaces must comply with fireplaces ASTM standards. Any retrofitted fireplace must meet fireplace ASTM standards.

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(~~f~~g) Prohibited Materials - Prohibited materials as defined in Section 406.005(25) and Oregon Administrative Rule 340-264-0060(3), shall not be burned in fireplaces, solid fuel-fired appliances, pellet stoves or cook stoves within Klamath County. An exception is the burning of re-refined used oil in an approved oil-burning device.

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(4) OPEN/OUTDOOR BURNING REQUIREMENTS - This section pertains to burning as defined in Section 406.005(20).

(a) All open burning is prohibited during Red or Yellow Advisory Periods within Klamath County unless a Certificate of Variance has been issued by the Klamath County Environmental Health Division in accordance with Section 406.250.

(b) Open Burning Hours:

(i) Open burning fires are not to be started until one hour after sunrise and must be completely out one hour before sunset, unless otherwise directed by the local fire department.

(ii) Burning conducted for forest or ecosystem management, for example slash fires, are not required to be out by sunset.

(c) Local Fire Permit Required - Persons burning, shall adhere to all municipal, local Fire Department, State Fire Marshal or Oregon Department of Forestry or DEQ rules, ordinances, or restrictions.

(d) Responsible Person:

(i) A responsible person, as defined in Section 406.005(26), must constantly attend all open burning.

(ii) This person must also completely extinguish the fire before leaving it.

(e) Prohibited Materials - Burning of Prohibited materials as defined in Section 406.005(25) and Oregon Administrative Rule 340-264-0060(3), in outdoor or open fires is prohibited.

406.150 Air Quality Pollution Requirements Applying Within the Air Quality Zone. In addition to the requirements in Section 406.100 the following requirements apply:

(1) SOLID FUEL-FIRED APPLIANCES - This section applies to the use of solid fuel-fired appliances for residential and commercial heating **within the Air Quality Zone.**

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——(a) During a Red Advisory Period, no person shall operate any solid fuel-fired appliance except a pellet stove.

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——(b) During a Yellow Advisory Period, no person shall operate an non-certified wood stove, non-certified wood stove insert, or fireplace. Only certified solid fuel-fired appliances and pellet stoves may be operated.

——(c) During a Green Advisory Period, non-certified wood stoves, non-certified wood stove inserts, fireplaces, certified wood stoves, certified wood stove inserts and pellet stoves may be used for indoor heating.

——(d) Visible Air Contaminant Emissions. No person operating a solid fuel-fired appliance within the Air Quality Zone shall allow smoke of an opacity of greater than 20%, or comparable to that described in the Ringelmann Smoke Chart (Exhibit B), to be vented to the atmosphere for more than three (3) minutes in any one (1) hour period. Emissions created during a ten (10) minute start-up period are exempt.

——(e) Burn-down time. A Burn-down time, not to exceed three (3) hours, will be given on Red or Yellow Advisory Periods. No enforcement action described in Section 406.300 will take place for visible air contaminant emissions emitted during the burn-down time.

(f) Emergency Conditions. An exemption to Section 406.150 may be issued by the Klamath County Environmental Health Division to allow the use of normally prohibited solid fuel-burning appliances within the Air Quality Zone, during periods when:

(i) utility suppliers declare energy shortages;

(ii) electric power or outages occur;

(iii) interruptions occur of natural gas supplies; or

(iv) temporary failure occurs of a resident's heating system when there is an immediate need to operate a solid fuel space-heating device to protect family/individual health and welfare.

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(2) OPEN BURNING - Except as specified in this section or allowed by Section 406.250, open burning is prohibited within the Air Quality Zone.

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(a) Open Burning Window: The Klamath County Environmental Health Division Manager, in consultation with the Board of County Commissioners, the City of Klamath Falls Code Compliance Officer and Fire Districts No. 1 and No. 4 may declare two specific fifteen (15) day periods a year during which times the open burning of residential yard debris, as defined in Section 406.005(~~31~~32)(h), will be allowed within the Air Quality Zone. Open Burning Windows within the Air Quality Zone will occur in Spring and Fall. Each window will include three (3) weekends.

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(i) During the Open Burning Window, the Klamath County Environmental Health Division may temporarily prohibit open burning should poor ventilation episodes occur, or be forecast.

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(ii) The Klamath County Environmental Health Division Manager in consultation with the Board of County Commissioners, the City of Klamath Falls Code Compliance Officer,
and Fire Districts No. 1 and No. 4 may extend the Open Burning Window one day for every day in which open burning has been prohibited during the Open

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Burning Window due to poor ventilation or weather conditions.

(b) All agricultural open burning is prohibited at all times in the Air Quality Zone unless ~~allowed by a Certificate of Variance.~~ unless issued a variance in accordance with Section 406.250.

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(c) The use of burn barrels and other outdoor burning devices is prohibited.

(d) A Certificate of Variance, as defined in Section 406.250(1), to allow Open Burning outside the Spring or Fall Open Burning Windows, may be issued on a case by case basis within the Air Quality Zone when an emergency, or substantial need, is documented.

406.200 Certificates of Exemption.

(1) ISSUANCE - The Klamath County Environmental Health Division Manager or designee may issue a Certificate of Exemption to allow the use of solid fuel-fired appliances within the Air Quality Zone for residential space heating purposes during Red, ~~or~~ Yellow **or Green** Advisory Periods.

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(a) All applications for Certificates of Exemption shall be on forms provided by the Klamath County Environmental Health Division.

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(b) Within five (5) working days of receiving a completed application, the Klamath County Environmental Health Division shall review and: 1) approve the application; 2)approve the application with conditions; or 3) deny the application.

(c) Klamath County Environmental Health Division shall not charge a fee for processing an application or issuing a Certificate of Exemption.

(d) All Certificates of Exemption expire on May 15 of each year.

(e) Applying for the renewal of all Certificates of Exemption is the responsibility of the registrant.

(2) LOW INCOME EXEMPTION - A low-income person, either tenant or owner, after submitting adequate documentation, may be granted a Certificate of Exemption to use a solid

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fuel-fired appliance, for residential heating, during Red and Yellow Advisory Periods.

406.250 Certificates of Variance. ~~**and Certificates of Waiver.**~~ Certificates of Variance ~~or Certificates of Waiver,~~ issued by Klamath County Environmental Health Division, are required for all Open Burning not conforming to the requirements of Section 406.100(4) and Section 406.150(2).

(1) CERTIFICATE OF VARIANCE.

(a) All applications for Certificates of Variance shall be on forms provided by the Klamath County Environmental Health Division and submitted at least ~~ten~~ five (~~10~~5) working days prior to the proposed or desired starting date of the variance.

(b) Within ~~ten~~ five (~~10~~5) working days of receiving a completed application, the Klamath County Environmental Health Division shall review and: 1) approve the application; 2) approve the application with conditions; or 3) deny the application.

(c) Klamath County Environmental Health Division shall not charge a fee for processing an application or issuing a Certificate of Variance.

(d) Inside the Air Quality Zone, Klamath County Fire Districts No.1 and No.4, the City of Klamath Falls, and the Klamath County Environmental Health Division may develop an interagency agreement to expedite the processing of applications.

~~(2) CERTIFICATE OF WAIVER~~ (e) The Klamath County Environmental Health Division Manager, or designate, may issue a Certificate of ~~Waiver~~ Variance for an area of the county when the meteorological conditions are expected to be different from those forecast for other parts of the county.

406.300 Enforcement.

(1) Klamath County Environmental Health Division Staff will monitor and enforce compliance with this Chapter countywide. Minor violations of this Chapter will result in a Notice of Noncompliance being sent to the violator. Repeated or major violations will result in the issuance of a Citation and Summons to the violator to appear in court.

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(2) When a Klamath County Air Quality Inspector has observed a violation of this Chapter, he or she shall transmit this information, along with the documentation, to the Klamath County Environmental Health Division Manager. The Environmental Health Manager will review the submitted documentation and:

(a) If the documentation is complete, the Environmental Health Manager will issue a Notice of Noncompliance, a Citation and Summons to the violator to appear in court, or other legal action depending on the severity and frequency of the violation.

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(b) If the documentation is not complete, the Environmental Health Manager will issue a Notice of Noncompliance to the alleged violator, and send a copy of the documents to the Air Quality Inspector who observed the violation.

(3) NOTICE OF NONCOMPLIANCE - A Notice of Noncompliance as defined in Section 406.005(19) may be issued to the violator as the sole enforcement action, or in addition to a citation.

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(a) The notice shall contain the date, time and street name and number and the violation observed.

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(b) The notice shall specify the corrective action that must be taken and the time in which it must be accomplished.

(c) The notice may require that within ten (10) days of correcting the violation, the violator shall in writing notify the Klamath County Air Quality Inspector that the corrective action has been taken.

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(4) AIR QUALITY CITATIONS - An appropriate law enforcement officer or a Klamath County Environmental Health Division Manager may issue a Citation and Summons to appear in court for a violation of this Chapter.

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406.400 Penalties. Failure to comply with the provisions of this Chapter shall be subject to fines of up to $720.00 for a one-time occurrence, and fines of not more than $1,000.00 for a continuing, or repeated offense. This provision will be enforced in accordance with Chapter 800, Uniform Civil Violation Procedure of the Klamath County Code.

406.450 Severability. If any section, subsection, sentence, clause, phrase or portion of this Chapter is for any reason held invalid or unconstitutional in a court of competent jurisdiction, such portion shall be deemed a separate, distinct and independent provision, and shall not affect the validity of the remaining portion thereof.

406.500 ~~Contingency Strategies and Formation of an~~ Air Quality Advisory Committee and Contingency Strategies.

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(1) COMMITTEE. Klamath County Board of Commissioners hereby establishes the Klamath County Air Quality Advisory Committee. The purpose of the Committee is to evaluate relevant air quality data; identify significant contributing emission sources; develop appropriate emission reduction strategies such as the expansion of the Air Quality Zone and will recommend action to the Board of County Commissioners. The committee will meet semi-annually, once in the spring and again in the fall, and at other times as deemed necessary. The Committee will be composed of interested persons representing industry, the general public and governmental agencies.

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(2) CONTINGENCY MEASURES. If the Klamath Falls Nonattainment Area does not meet the federal deadline (December 2014) for compliance with PM2.5 (2006) standard by the Department of Environmental Quality, Klamath County automatically requires the following Best Available Control Measures to become additions to Sections 406.100 and 406.150:

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(a) Beginning March 1, 2015, within the air quality zone, the use of fireplaces, without certified inserts or not meeting fireplace ASTM standards, shall be prohibited between November 1 and February 28 of each winter heating season. On a case by case basis, the Environmental Health Program may grant a limited short term exemption for holidays or special occasions on green advisory days only in accordance with Section 406.200.

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The Exhibits can be obtained from the County Counsel Office, 305 Main Street, 2nd Floor, Klamath Falls, OR 97601; the Klamath County Library; or the Klamath County Law Library. They can also be accessed at the following links:

Exhibit A - Air Quality Zone:
http://www.co.klamath.or.us/EH/index.html

Exhibit B - Ringlemann Smoke Chart:
http://www.cdc.gov/niosh/mining/pubs/pdfs/ic8333.pdf

DONE and DATED this 2nd day of October, 2012.

KLAMATH COUNTY BOARD OF COMMISSIONERS

Out of Office Today	Cheryl Hukill	
Chair	Commissioner	Commissioner

APPROVED FOR LEGAL SUFFICIENCY:

Klamath County Counsel

APPENDIX A-18

DEQ - xxx-xx

INTERGOVERNMENTAL AGREEMENT
Particulate Matter (PM) Curtailment and Compliance Program

This Agreement is between the State of Oregon, acting by and through its Department of Environmental Quality (DEQ) and Klamath County.

KLAMATH COUNTY DATA	DEQ DATA
Agreement Administrator: Marilynn Sutherland Health Department Director Organization: Klamath County Address: 403 Pine Street Klamath Falls, OR 97601 541-883-1122 msutherland@co.klamath.or.us Federal Tax ID: 93-6002301	Agreement Administrator: Larry Calkins Dept. of Environmental Quality 700 SE Emigrant #330 Pendleton, OR 97801 541-278-4612 calkins.larry@deq.state.or.us

1. **Background** This Agreement provides Klamath County with funding to conduct an air quality program necessary to reduce particulate matter (PM) emissions to meet National Ambient Air Quality Standards.

2. **Authority.** DEQ has authority under Oregon Revised Statute (ORS) 468A.005 to 468A.085 to restore and maintain the quality of the air resources in a condition as free from air pollution as practicable, to provide for a coordinated statewide approach, and to facilitate cooperation among local units of government. DEQ has authority under ORS 190.110 to cooperate for any lawful purpose with a unit of local government.

3. **Effective Date and Duration** This Agreement is effective on the date that every party has signed this Agreement and, when required, approved by the Department of Justice. Unless earlier terminated or extended, this Agreement expires **June 30, 2013**.

4. **Agreement Documents.** This Agreement consists of this document and the attached Exhibit A (Statement of Work).

5. **Statement of Work** The statement of work (Work), including the delivery schedule is contained in attached Exhibit A including the delivery schedule is contained in attached Exhibit A. Klamath County agrees to perform the Work in accordance with the terms and conditions of this Agreement.

6. **Consideration** The maximum, not-to-exceed compensation payable to under this Agreement, which includes any allowable expenses, is **$52,000**. Interim payments to Klamath County will be made only in accordance with the schedule and requirements described in Exhibit A. Expenses authorized by this Agreement and occurring on or after October 15, 2011 are eligible for reimbursement.

7. **Invoicing/Payments**

   A. Klamath County will not submit invoices for, and DEQ will not pay, any amount in excess of the maximum not-to-exceed compensation amount identified in this Agreement. If this maximum compensation amount is increased by amendment of this Agreement, the amendment must be fully effective before Klamath County performs work subject to the amendment. Klamath County will notify DEQ's Agreement Administrator in writing sixty (60) calendar days before this Agreement expires of any proposed amendments to the Agreement. This agreement will not be amended after the expiration date.

   B. Klamath County will submit a single invoice for work performed at the completion and DEQ's acceptance of the work described in Exhibit A. The invoice will itemize and explain all expenses for which reimbursement is claimed. Invoices must be sent to **Contracts Office, Department of Environmental Quality, 811 SW Sixth Ave, Portland, OR 97204**. Invoices are subject to the review and approval of the DEQ Agreement Administrator. Invoice payments will be sent to Klamath County 403 Pine Street. c/o Marilyn Sutherland, Klamath Falls, OR 97601. Invoices and payments will be based on actual expenditures made by Klamath County.

8. **Travel and Travel Related Expenses** It is the policy of the State that all travel be allowed only when the travel is essential to the normal discharge of this Agreement. All travel will be conducted in the most efficient and cost-effective manner resulting in the best value to the State. Personal expenses will not be authorized at any time. All expenses are included in the total maximum Agreement amount. Klamath County understands and agrees that travel expenses will be reimbursed at rates not to exceed those rates approved by the Oregon Department of Administrative Services for State employees and in effect at the time the expense was incurred. **Receipts for lodging, car rental and airfare expenses must be provided to be eligible for reimbursement.** Klamath County understands and agrees that the rates are subject to change and, in such event, the changed rates will immediately become part of this Agreement and govern reimbursement of any travel expenses incurred after the date of the change.

9. **Amendments** The terms of this Agreement will not be waived, altered, modified, supplemented, or amended, in any manner whatsoever, except by written instrument signed by both parties.

10. **Termination** This Agreement may be terminated by mutual consent of both parties or by either party upon 30 days written notice. This notice may be transmitted in person, by mail, facsimile or by Email. If this Agreement is terminated under this Section 10, DEQ will pay for approved unpaid invoices and services performed within any limits set forth in this Agreement.

8. **Funds Available and Authorized** Klamath County shall not be compensated for Work performed under this Agreement by any other agency or department of the State of Oregon. DEQ certifies that it has sufficient funds currently authorized for expenditure to finance the costs of this Agreement within the DEQ's current biennial appropriation or limitation. Klamath County understands and agrees that DEQ's payment of amounts under this Agreement is contingent on DEQ receiving appropriations, limitations, allotments or other expenditure authority sufficient to allow DEQ, in the exercise of its reasonable administrative discretion, to continue to make payments under this Agreement.

11. **Captions** The captions or headings in this Agreement are for convenience only and in no way define, limit or describe the scope or intent of any provisions of this Agreement.

10. **Access to Records** Klamath County will maintain all financial records relating to this Agreement in accordance with generally accepted accounting principles. In addition, Klamath County will maintain any other records pertinent to this Agreement in such a manner as to clearly document Klamath County's performance. The Oregon Secretary of State's Office and the federal government and their duly authorized representatives will have access to such financial records and other books, documents, papers, plans, records of shipments and payments and writings of Klamath County that are pertinent to this Agreement, whether in paper, electronic or other form, to perform examinations and audits and make excerpts and transcripts. Klamath County will retain and keep accessible all such financial records, books, documents, papers, plans, records of shipments and payments and writings for a minimum of six (6) years, or such longer period as may be required by applicable law, following final payment and termination of this Agreement, or until the conclusion of any audit, controversy or litigation arising out of or related to this Agreement, whichever date is later.

11. **Compliance with Applicable Law** Klamath County will comply with all federal, state and local laws, regulations, executive orders and ordinances applicable to the work performed under this Agreement. Without limiting the generality of the foregoing, Klamath County expressly agrees to comply with the following laws, regulations and executive orders to the extent they are applicable to the Agreement: (i) Titles VI and VII of the Civil Rights Act of 1964, as amended; (ii) Sections 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Americans with Disabilities Act of 1990, as amended; (iv) Executive Order 11246, as amended; (v) the Health Insurance Portability and Accountability Act of 1996; (vi) the Age Discrimination in Employment Act of 1967, as amended, and the Age Discrimination Act of 1975, as amended; (vii) the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended; (viii) ORS Chapter 659, as amended; (ix) all regulations and administrative rules established pursuant to the foregoing laws; and (x) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations; and (xi) ORS 279A, ORS 279B, ORS 279C as applicable to Klamath County. These laws, regulations and executive orders are incorporated by reference herein to the extent that they are applicable to the Agreement and required by law to be so incorporated.

12. **Recycled Products** Klamath County shall, to the maximum extent economically feasible in the performance of this Agreement, use recycled paper (as defined in ORS 279A.010(1)(ee)), recycled PETE products (as defined in ORS 279A.010(1)(ff)), and other recycled products (as "recycled product" is defined in ORS 279A.010(1)(gg)).

13. **Contribution** If any third party makes any claim or brings any action, suit or proceeding alleging a tort as now or hereafter defined in ORS 30.260 ("Third Party Claim") against a party (the "Notified Party") with respect to which the other party ("Other Party") may have liability, the Notified Party must promptly notify the Other Party in writing of the Third Party Claim and deliver to the Other Party a copy of the claim, process, and all legal pleadings with respect to the Third Party Claim. Either party is entitled to participate in the defense of a Third Party Claim, and to defend a Third Party Claim with counsel of its own choosing. Receipt by the Other Party of the notice and copies required in this paragraph and meaningful opportunity for the Other Party to participate in the investigation, defense and settlement of the Third Party Claim with counsel of its own choosing are conditions precedent to the Other Party's liability with respect to the Third Party Claim.
With respect to a Third Party Claim for which the State is jointly liable with the Klamath County (or would be if joined in the Third Party Claim), the State shall contribute to the amount of expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred and paid or payable by Klamath County in such proportion as is appropriate to reflect the relative fault of the State on the one hand and of Klamath County on the other hand in connection with the events which resulted in such expenses, judgments, fines or settlement amounts, as well as any other relevant equitable considerations. The relative fault of the State on the one hand and of Klamath County on the other hand shall be determined by reference to, among other things, the parties' relative intent, knowledge, access to information and opportunity to correct or prevent the circumstances resulting in such expenses, judgments, fines or settlement amounts. The State's contribution amount in any instance is capped to the same extent it would have been capped under Oregon law if the State had sole liability in the proceeding.
With respect to a Third Party Claim for which Klamath County is jointly liable with the State (or would be if joined in the Third Party Claim), Klamath County shall contribute to the amount of expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred and paid or payable by the State in such proportion as is appropriate to reflect the relative fault of Klamath County on the one hand and of the State on the other hand in connection with the events which resulted in such expenses, judgments, fines or settlement amounts, as well as any other relevant equitable considerations. The relative fault

of Klamath County on the one hand and of the State on the other hand shall be determined by reference to, among other things, the parties' relative intent, knowledge, access to information and opportunity to correct or prevent the circumstances resulting in such expenses, judgments, fines or settlement amounts. Klamath County's contribution amount in any instance is capped to the same extent it would have been capped under Oregon law if it had sole liability in the proceeding.

14. Indemnification by Subcontractors Klamath County shall take all reasonable steps to cause its contractor(s) that are not units of local government as defined in ORS 190.003, if any, to indemnify, defend, save and hold harmless the State of Oregon and its officers, employees and agents ("Indemnitee") from and against any and all claims, actions, liabilities, damages, losses, or expenses (including attorneys' fees) arising from a tort (as now or hereafter defined in ORS 30.260) caused, or alleged to be caused, in whole or in part, by the negligent or willful acts or omissions of Klamath County's contractor or any of the officers, agents, employees or subcontractors of the contractor("Claims"). It is the specific intention of the parties that the Indemnitee shall, in all instances, except for Claims arising solely from the negligent or willful acts or omissions of the Indemnitee, be indemnified by the contractor from and against any and all Claims.

15. Federal Fund Requirements Any recipient of federal grant funds, pursuant to this agreement with the state, shall assume sole liability for that recipient's breach of the conditions of the Grant, and shall, upon recipient's breach of grant conditions that requires the state to return funds to the federal grantor, hold harmless and indemnify the state for an amount equal to the funds received under this agreement; or if legal limitations apply to the indemnification ability of the recipient of grant funds, the indemnification amount shall be the maximum amount of funds available for expenditure, including any available contingency funds or other available non-appropriated funds, up to the amount received under this Agreement.

16. Alternative Dispute Resolution The parties should attempt in good faith to resolve any dispute arising out of this Agreement. This may be done at any management level, including at a level higher than persons directly responsible for administration of the Agreement. In addition, the parties may agree to utilize a jointly selected mediator or arbitrator (for non-binding arbitration) to resolve the dispute short of litigation.

17. Merger Clause THIS AGREEMENT CONSTITUTES THE ENTIRE AGREEMENT BETWEEN THE PARTIES. NO WAIVER, CONSENT, MODIFICATION OR CHANGE OF TERMS OF THIS AGREEMENT SHALL BIND EITHER PARTY UNLESS IN WRITING AND SIGNED BY BOTH PARTIES. SUCH WAIVER, CONSENT, MODIFICATION OR CHANGE, IF MADE, SHALL BE EFFECTIVE ONLY IN THE SPECIFIC INSTANCE AND FOR THE SPECIFIC PURPOSE GIVEN. THERE ARE NO UNDERSTANDINGS, AGREEMENTS, OR REPRESENTATIONS, ORAL OR WRITTEN, NOT SPECIFIED HEREIN REGARDING THIS AGREEMENT. KLAMATH COUNTY, BY THE SIGNATURE BELOW OF ITS AUTHORIZED REPRESENTATIVE, HEREBY ACKNOWLEDGES THAT HE/SHE HAS READ THIS AGREEMENT, UNDERSTANDS IT AND AGREES TO BE BOUND BY ITS TERMS AND CONDITIONS.

18. THE PERSONS SIGNING THIS AGREEMENT REPRESENT AND WARRANT THAT THEY HAVE THE POWER AND AUTHORITY TO ENTER INTO THIS AGREEMENT.

Agreed by Klamath County:

Al Switzer, Chair, Board of County Commissioners Date

Cheryl Hukill, Commissioner Date

Dennis Linthicum, Commissioner Date

Agreed by DEQ:

Andrew Ginsburg, Air Quality Administrator Date

Index-PC-/Project Jim Roys, Financial Services Manager Date

EXHIBIT A

INTERGOVERNMENTAL AGREEMENT
Particulate Matter (PM) Curtailment and Compliance Program

GENERAL DESCRIPTION
This Agreement provides Klamath County with funding to conduct an air quality program necessary to reduce particulate matter (PM) emissions to meet the associated PM2.5 National Ambient Air Quality Standards. The Agreement requires Klamath County to conduct a mandatory wood burning curtailment program, a public education program, and a compliance survey and other activities.

STATEMENT OF WORK
1) **Mandatory Woodburning and Open Burning Curtailment Program**

a) Klamath County will operate a mandatory wood burning curtailment program from October 1, 2012 through March 31, 2013. The DEQ's Project Officer may extend the dates of curtailment program as warranted. Klamath County will review meteorological data and air quality data over a daily or multiple day period to issue wood burning curtailment advisories for each day of the week, starting October 1, 2012 if weather permits but by no later than November 1, 2012 through at least March 15, 2013. Klamath County will contact State Forestry's duty officer for smoke management during this period to coordinate the curtailment calls.

b) Klamath County will conduct a mandatory open burning curtailment program for the open burn periods specified in the Klamath County Clean Air Ordinance. The fall open burn window will end on or before November 11, 2012. The spring open burn window will not begin until March 1st. The County will issue a daily or multiple day burn or no burn advisory call during each day for the open burning period following the Klamath County Ordinance.

c) Klamath County will conduct a program of field surveillance, enforcement of visible emission restrictions, and maintain records of the curtailment program. Records of curtailment calls at a minimum shall include:

i) Date call is effective

ii) Curtailment call

iii) NWS wind forecast

iv) Other meteorological factors.

v) DEQ AQI for previous 24 hours

2) Compliance

Enforcement and compliance assurance of the county ordinance and state rules improves the effectiveness of the PM Curtailment program. Klamath County will conduct air quality zone patrols during the day or in the evening of homes and businesses suspected of violating the Klamath County maintenance plan, Klamath County Clean Air Ordinance or State air quality rules. Additionally, Klamath County will respond to complaints.

a) Klamath County will respond to complaints relating to inappropriate use of woodstoves or inappropriate open burning.

b) Patrols must be conducted on all "Red" day conditions between October 15, 2012 and March 15, 2013. Each patrol must choose a particular section of the nonattainment area that represents approximately 1/7 of the area.

c) Patrols must be conducted on an additional "Yellow" days up to a maximum of seven (7) "Yellow Day" Patrols between if there are 7 additional yellow days between October 15, 2011 and March 15, 2012.

d) Open burning patrols will be conducted periodically and could be combined in conjunction with patrols for 2)a) through 2)c) above.

Nothing precludes Klamath County from conducting additional patrols or responding to complaints during a patrol. Patrols will be conducted throughout the air quality zone for approximately three hours each day of patrol. Each patrol day may include day time and/or night time surveillance. Night surveillance may include the use of night vision equipment to help with the surveillance using a DEQ approved methodology. Patrols are to be conducted to primarily witness violations of the wood burning curtailment and open burning requirements in the ordinance, rules or plan, but may also be used to determine other compliance issues such as complaint response or other potential violation. Progressive enforcement should take place whereby repeat violators receive more attention than first time violators.

Staff must document the dates of patrol or dates of complaint visits, locations where observations occurred, any significant observations, and violations observed. Once a violation is documented, enforcement may be addressed in several ways:

a) Observe or document a violation;

b) Contact the violator by telephone or a personal visit;

c) Send a warning letter;

d) Send a notice of violation;

e) Submit documentation to the court for further follow-up and formal enforcement. Court appearances and formal enforcement actions are considered part of compliance.

Patrols will follow the guidance set forth in the xxxxxx document.

Staff will evaluate the effectiveness of the compliance program monthly considering 1/7th of the area is surveyed each red day. For red day compliance, the target is roughly 86% compliance of the total number of woodburners with the ordinance for residential wood combustion sources. The violation target roughly equals 1/7th of the area surveyed assuming that for every violation 10 go unseen. Klamath County will attempt to meet the following average violation targets (fewer violations than the target) by month:

	Oct	Nov	Dec	Jan	Feb	Mar	Avg
Average # of Observed Violations/red day	1.7	2.2	2.7	3.0	2.8	2.1	2.4

If there are more average violations per month than the target, staff will redouble their efforts in the patrols, and provide more public education to reduce the likelihood of exceeding the targets in the future. Staff will do this by:

a) Conduct more thorough patrols
b) Conduct public education through the media
c) Discuss with the public the failure to meet targets and what it means for the community in the media
d) Inform DEQ and the County Commissioners of the enforcement effectiveness results.
e) Recommend smarter enforcement methodologies, targeting the greater number of violators with fewer staff resources.

3) Public Awareness

Klamath County will conduct public awareness efforts including the daily advertising of the wood burning advisory. Media efforts may include, but not be limited to, the use of newspaper, radio, and television PSA's and advertisements providing air quality information and encouraging curtailment compliance. The curtailment advisory will be made available to the public daily or on a multiday basis for each day from October 15, 2012 through March 15, 2013. Other education efforts conducted by Klamath County may include the following:

a) The use of news articles and personal interviews to provide air quality information and encourage compliance.
b) Provide information to the public on the health effects of PM exposure and the related public health issues.
c) Distribute information as appropriate on woodsmoke curtailment program, woodsmoke advisories, and other related topics through brochures, flyers, and individual citizen contact.
d) Promote any existing uncertified woodstove removal and replacement heating system program.
e) Promote the daily curtailment advisory for each day from October 15, 2012 through March 15, 2013. Klamath County shall utilize a reader board located at the county fairgrounds to promote the wood burning curtailment advisory call. Other promotions could include; an announcement in the Herald and News, billboards or other types of ongoing curtailment promotions.

f) Educate children in the classroom by providing teachers resources for their students, speaking in classrooms, providing experiments or assignments or promote the red, yellow, green flag program in the schools.

4) Written Evaluation: Assessment of Program Effectiveness

Klamath County shall submit to DEQ an evaluation of the effectiveness of the PM Curtailment and Compliance Program (Evaluation) no later than June 30, 2013. The Evaluation is a seasonal report for the winter wood heating season and the open burning curtailment program. The Evaluation shall include a comprehensive discussion on:

a) Curtailment program, including a summary of each daily forecast call, participation of the Klamath County Citizens, preseason and post season activities, AQI, open burn windows, variances, exemptions and waivers and other data associated with the curtailment program;
b) Compliance Patrol activity, including dates of patrol, a summary of observations, a summary of letters written, a summary of enforcement actions, program difficulties and recommendations for improvement;
c) Prepare a discussion of compliance effectiveness as described in Condition 2 above.

d) Planning activities and meetings will be documented including a summary of any dates and purpose of travel, dates and purpose of meeting, and work accomplished.
e) Public Awareness Program, including a summary of news articles, interviews, informational bulletins on health effects of exposure, woodsmoke brochure/flyer distribution, and any promotions on uncertified woodstove removal program;
f) The overall effectiveness of each of the program's specific elements including recommendations for the future.
g) The evaluation will also include the total amount of all local funds expended on the curtailment and air quality programs in accordance with the budget below.

BUDGET:

	Work Schedule	not to exceed:

Curtailment	October 1, 2012 – March 31, 2013	$16,000
Compliance Program	October 15, 2012 – March 15, 2013 Or As Conditions Warrant	23,000
Public Awareness Program	Contract Duration	10,000
Assessment	No later than June 30, 2013	$3,000
Total		$52,000

Shifts between budget line items above may be allowed with prior written approval from DEQ Agreement Administrator. The invoice and payment will be based on the actual costs of performing work described in this Agreement. The invoice must reflect actual expenses in the Budget categories described in the Budget table above.

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 204

DESIGNATION OF AIR QUALITY AREAS

340-204-0010

Definitions

The definitions in OAR 340-200-0020 and this rule apply to this division. If the same term is defined in this rule and 340-200-0020, the definition in this rule applies to this division. Definitions of boundaries in this rule also apply to OAR 340 division 200 through 268 and throughout the State of Oregon Clean Air Act Implementation Plan adopted under 340-200-0040.

(1) “AQCR” means Air Quality Control Region.

(2) “AQMA” means Air Quality Maintenance Area.

(3) “CO” means Carbon Monoxide.

(4) “CBD” means Central Business District.

(5) “Criteria Pollutant” means any of the six pollutants set out by the Clean Air Act (sulfur oxides, particulate matter, ozone, carbon monoxide, nitrogen dioxide, and lead) for which the EPA has promulgated standards in 40 CFR 50.4 through 50.12 (July, 1993).

(6) “Eugene-Springfield UGB” means the area within the bounds beginning at the Willamette River at a point due east from the intersection of East Beacon Road and River Loop No.1; thence southerly along the Willamette River to the intersection with Belt Line Road; thence easterly along Belt Line Road approximately one-half mile to the intersection with Delta Highway; thence northwesterly and then northerly along Delta Highway and on a line north from the Delta Highway to the intersection with the McKenzie River; thence generally southerly and easterly along the McKenzie River approximately eleven miles to the intersection with Marcola Road; thence southwesterly along Marcola Road to the intersection with 42nd Street; thence southerly along 42nd Street to the intersection with the northern branch of US Highway 126; thence easterly along US Highway 126 to the intersection with 52nd Street; thence north along 52nd Street to the intersection with High Banks Road; thence easterly along High Banks Road to the intersection with 58th Street; thence south along 58th Street to the intersection with Thurston Road; thence easterly along Thurston Road to the intersection with the western boundary of Section 36, T17S, R2W; thence south to the southwest corner of Section 36, T17S, R2W; thence west to the Springfield City Limits; thence following the Springfield City Limits southwesterly to the intersection with the western boundary of Section 2, T18S, R2W; thence on a line southwest to the Private Logging Road approximately one-half mile away; thence southeasterly along the Private Logging Road to the intersection with Wallace Creek; thence southwesterly along Wallace Creek to the confluence with the Middle Fork of the Willamette River; thence generally northwesterly along the Middle Fork of the Willamette River approximately seven and one-half miles to the intersection with the northern boundary of Section 11, T18S, R3W; thence west to the northwest corner of Section 10, T18S, R3W; thence south to the intersection with 30th Avenue; thence westerly along 30th Avenue to the intersection with the Eugene City Limits; thence following the Eugene City Limits first southerly then westerly then northerly and finally westerly to the intersection with the northern boundary of Section 5, T18S, R4W; thence west to the intersection with Greenhill Road; thence north along Greenhill Road to the intersection with Barger Drive; thence east along Barger Drive to the intersection with the Eugene City Limits (Ohio Street); thence following the Eugene City Limits first north then east then north then east then south then east to the intersection with Jansen Drive; thence east along Jansen Drive to the intersection with Belt Line Road; thence northeasterly along Belt Line Road to the intersection with Highway 99; thence northwesterly along Highway 99 to the intersection with Clear Lake Road; thence west along Clear Lake Road to the intersection with the western boundary of Section 9, T17S, R4W; thence north to the intersection with Airport Road; thence east along Airport Road to the intersection with Highway 99; thence northwesterly along Highway 99 to the intersection East Enid Road; thence east

along East Enid Road to the intersection with Prairie Road; thence southerly along Prairie Road to the intersection with Irvington Road; thence east along Irvington Road to the intersection with the Southern Pacific Railroad Line; thence southeasterly along the Southern Pacific Railroad Line to the intersection with Irving Road; thence east along Irving Road to the intersection with Kalmia Road; thence northerly along Kalmia Road to the intersection with Hyacinth Road; thence northerly along Hyancinth Road to the intersection with Irvington Road; thence east along Irvington Road to the intersection with Spring Creek; thence northerly along Spring Creek to the intersection with River Road; thence northerly along River Road to the intersection with East Beacon Drive; thence following East Beacon Drive first east then south then east to the intersection with River Loop No.1; thence on a line due east to the Willamette River and the point of beginning.

(7) “Grants Pass CBD” means the area within the City of Grants Pass enclosed by “B” Street on the north, 8th Street to the east, “M” Street on the south, and 5th Street to the west.

(8) Grants Pass Control Area means the area of the state beginning at the northeast corner of Section 35, T35S, R5W; thence south to the southeast corner of Section 11, T37S, R5W; thence west to the southwest corner of Section 9, T37S, R6W; thence north to the northwest corner of Section 33, T35S, R6W; thence east to the point of beginning.

(9) “Grants Pass UGB” as shown on the Plan and Zoning maps for the City of Grants Pass as of Feb. 1, 1988 is the area within the bounds beginning at the NW corner of Sec. 7, T36S, R5W; thence south to the SW corner of Sec. 7; thence west along the southern boundary of Sec. 12, T36S, R5W approx. 2000 feet; thence south approx. 100 feet to the northern right of way of the Southern Pacific Railroad Line (SPRR Line); thence southeasterly along said right of way approx. 800 feet; thence south approx. 400 feet; thence west approx. 1100 feet; thence south approx. 700 feet to the intersection with the Hillside Canal; thence west approx. 100 feet; thence south approx. 550 feet to the intersection with Upper River Road; thence southeasterly along Upper River Road and continuing east along Old Upper River Road approx. 700 feet; thence south approx. 1550 feet; thence west approx. 350 feet; thence south approx. 250 feet; thence west approx. 1000 feet; thence south approx. 600 feet to the north end of Roguela Lane; thence east approx. 400 feet; thence south approx. 1400 feet to the intersection with Lower River Road; thence west along Lower River Road approx. 1400 feet; thence south approx. 1350 feet; thence west approx. 25 feet; thence south approx. 1200 feet to the south bank of the Rogue River; thence northwesterly along said bank approx. 2800 feet; thence on a line southwesterly and parallel to Parkhill Place approx. 600 feet; thence northwesterly at a 90 degree angle approximately 300 feet to the intersection with Parkhill Place; thence southwesterly along Parkhill Place approx. 250 feet; thence on a line southeasterly forming a 90 degree angle approximately 300 feet to a point even with Leonard Road; thence west approx. 1500 feet along Leonard Road; thence north approx. 200 feet; thence west to the west side of Schroeder Lane; thence north approx. 150 feet; thence west approx. 200 feet; thence south to the intersection with Leonard Road; thence west along Leonard Road approx. 450 feet; thence north approx. 300 feet; thence east approx. 150 feet; thence north approx. 400 feet; thence west approx. 500 feet; thence south approx. 300 feet; thence west to the intersection with Coutant Lane; thence south along Coutant Lane to the intersection with Leonard Road; thence west along Leonard Road to the intersection with Buena Vista Lane; thence north along the west side of Buena Vista Lane approx. 200 feet; thence west approx. 150 feet; thence north approx. 150 feet; thence west approx. 200 feet; thence north approx. 400 feet; thence west approx. 600 feet to the intersection with the western boundary of Sec. 23, T36S, R6W; thence south to the intersection with Leonard Road; thence west along Leonard Road approx. 300 feet; thence north approx. 600 feet to the intersection with Darneille Lane; thence northwesterly along Darneille Lane approx. 200 feet; thence west approx. 300 feet; thence south approx. 600 feet to the intersection with Leonard Road; thence west along Leonard Road approx. 700 feet; thence south approx. 1350 feet; thence east approx. 1400 feet to the intersection with Darneille Lane; thence south along Darneille Lane approx. 600 feet; thence west approx. 300 feet; thence south to the intersection with Redwood Avenue; thence east along Redwood Avenue to the intersection with Hubbard Lane and the western boundary of Sec. 23, T36S, R6W; thence south along Hubbard Lane approx. 1850 feet; thence west approx. 1350 feet ; thence south to the south side of U.S. Highway 199; thence westerly along U.S. 199 approx. 1600 feet to the intersection with the north-south midpoint of Sec. 27, T36S, R6W; thence south approx. 2200 feet; thence east approx. 1400 feet; thence north approx. 1000 feet; thence east approx. 300 feet; thence north approx. 250 feet to the intersection with the Highline Canal; thence northerly along the Highline Canal approx. 900 feet; thence east to the intersection with Hubbard Lane; thence north along Hubbard Lane approximately 600 feet; thence east approx. 200 feet; thence north approx. 400 feet to a point even with Canal Avenue; thence east approx. 550 feet; thence north to the south side of U.S. 199; thence easterly along the southern edge of U.S. 199 to the intersection with Willow Lane; thence south along Willow Lane to the intersection with Demaray Drive; thence easterly along Demaray Drive and continuing along the southern edge of U.S. 199 to the intersection with Dowell Road; thence south along Dowell Road approx. 550 feet; thence easterly approx. 750 feet; thence north to the intersection with the South Canal; thence easterly along the South Canal to the intersection with Schutzwohl Lane; thence south approx. 1300 feet to a point even with West Harbeck Road; thence east approx. 2000 feet to the intersection with Allen Creek; thence southerly along Allen Creek approx. 1400 feet to a

point even with Denton Trail to the west; thence west to the intersection with Highline Canal; thence southerly along Highline Canal to the intersection with the southern boundary of Sec. 25, T36S, R6W; thence east to the intersection with Allen Creek; thence southerly along Allen Creek to the intersection with the western boundary of Sec. 31, T36S, R5W; thence south to the SW corner of Sec. 31; thence east to the intersection with Williams Highway; thence southeasterly along Williams Highway approx. 1300 feet; thence east approx. 200 feet; thence north approx. 400 feet; thence east approx. 700 feet; thence north to the intersection with Espey Road; thence west along Espey Road approx. 150 feet; thence north approx. 600 feet; thence east approx. 300 feet; thence north approx. 2000 feet; thence west approx. 2100 feet; thence north approx. 1350 feet; thence east approx. 800 feet; thence north approx. 2800 feet to the east-west midline of Sec. 30, T36S, R5W; thence on a line due NE approx. 600 feet; thence north approx. 100 feet; thence east approx. 600 feet; thence north approx. 100 feet to the intersection with Highline Canal; thence easterly along Highline Canal approx. 1300 feet; thence south approx. 100 feet; thence east to the intersection with Harbeck Road; thence north along Harbeck Road to the intersection with Highline Canal; thence easterly along Highline Canal to a point approx. 250 feet beyond Skyway Road; thence south to the intersection with Skyway Road; thence east to the intersection with Highline Canal; thence southeasterly along Highline Canal approx. 1200 feet; thence on a line due SW to the intersection with Bluebell Lane; thence southerly along Bluebell Lane approx. 150 feet; thence east to the intersection with Sky Crest Drive; thence southerly along Sky Crest Drive to the intersection with Harper Loop; thence southeasterly along Harper Loop to the intersection with the east-west midline of Sec. 29, T36S, R5W; thence east approx. 400 feet; thence south approx. 1300 feet to a point even with Troll View Road to the east; thence east to the intersection with Hamilton Lane; thence north along Hamilton Lane to the intersection with the Highline Canal; thence northeasterly along the Highline Canal to the northern boundary of Sec. 28, T36S, R5W; thence east approx. 1350 feet to the transmission line; thence north to the intersection with Fruitdale Drive; thence southwesterly along Fruitdale Drive approx. 700 feet; thence north to the northern edge of U.S. 199; thence easterly along the northern edge of U.S. 199 approx. 50 feet; thence north to the north bank of the Rogue River; thence northeasterly along the north bank of the Rogue River approx. 2100 feet to a point even with Ament Road; thence north to Ament Road and following Ament Road to U.S. Interstate Highway 5 (U.S. I-5); thence continuing north to the 1200 foot contour line; thence following the 1200 foot contour line northwesterly approx. 7100 feet to the city limits and a point even with Savage Street to the west; thence north following the city limits approx. 400 feet; thence west to the intersection with Beacon Street; thence north along Beacon Street and the city limits approx. 250 feet; thence east along the city limits approx. 700 feet; thence north along the city limits approx. 2200 feet; thence southwesterly along the city limits approximately 800 feet to the intersection with the 1400 foot contour line; thence northerly and northwesterly along the 1400 foot contour line approx. 900 feet to the intersection with the northern boundary of Sec. 9, T36S, R5W; thence west along said boundary approx. 100 feet to the NW corner of Sec. 9; thence south along the western boundary of Sec. 9 approx. 700 feet; thence west approx. 1400 feet; thence north approx. 2400 feet; thence west approx. 1350 feet; thence north approx. 1100 feet to the city limits; thence following the city limits first west approx. 1550 feet, then south approx. 800 feet, then west approx. 200 feet, then south approx. 200 feet, then east approx. 200 feet, then south approx. 300 feet, and finally westerly approx. 1200 feet to the intersection with the western boundary of Sec. 5, T36S, R5W; thence south along said boundary to the northern side of Vine Avenue; thence northwesterly along the northern side of Vine Avenue approx. 3150 feet to the intersection with the west fork of Gilbert Creek; thence north to the intersection with the southern right of way of U.S. I-5; thence northwesterly along said right of way approx. 1600 feet; thence south to the intersection with Old Highland Avenue; thence northwesterly along Highland Avenue approx. 650 feet; thence west approx. 350 feet; thence south approx. 1400 feet; thence east approx. 700 feet; thence south approx. 1000 feet; thence on a line SW approx. 800 feet; thence south approx. 1400 feet to the intersection with the northern boundary of Sec. 7, T36S, R5W; thence west to the NW corner of Sec. 7, the point of beginning.

(10) Klamath Falls Control Area means the area of the state beginning at the northeast corner of Section 8, T38S, R10E, thence south to the southeast corner of Section 5, T40S, R10E; thence west to the southwest corner of Section 3, T40S, R8E; thence north to the northwest corner of Section 10, T38S, R8E; thence east to the point of beginning.

(11) “Klamath Falls Nonattainment Area” means the area of the state beginning at the northwest corner of Section 31, T37S, R9E; thence east approximately two miles to the northeast corner of Section 32; thence south approximately four miles to the southeast corner of Section 17, T38S, R9E; thence east approximately one mile to the southwest corner of Section 15,; thence north approximately one mile to the northwest corner of Section 15; thence east approximately 2 miles to the northeast corner of Section 14; thence south approximately one mile to the northwest corner of section 24; thence east approximately one mile to the northeast corner of Section 24; thence south approximately three miles to the southeast corner of Section 36; thence east approximately four miles to the northeast corner of Section 3, T39S, R10E; thence south approximately three miles to the southeast corner of Section 15; thence west approximately two miles to the southwest corner of Section16; thence south approximately two miles to the southeast corner of Section 29; thence west approximately five miles to the southwest corner of Section 27, T39S, R9E; thence north approximately one mile to the northeast corner of Section 27; thence west

approximately four miles to the southwest corner of Section 24, T39S R8E; thence north approximately two miles to the northeast corner of Section 13; thence west approximately one mile to the southwest corner of Section 11; thence north approximately four miles to the northwest corner of Section 26 T38S, R8E; thence west one mile to the southwest corner of Section 22; thence north approximately one mile to the northwest corner of Section 22; thence west approximately one mile to the southwest corner of Section 16; thence north approximately one mile to the northeast corner of Section 16; thence west approximately one mile to the southwest corner of Section 8; thence north approximately two miles to the northwest corner of Section 5; thence east to the northeast corner of Section 1; thence north approximately one mile to the point of beginning.

(12) “Klamath Falls UGB” means the area within the bounds beginning at the southeast corner of Section 36, Township 38 South, Range 9 East; thence northerly approximately 4500 feet; thence westerly approximately 1/4 mile; thence northerly approximately 3/4 mile into Section 25, T38S, R9E; thence westerly approximately 1/4 mile; thence northerly approximately 1/2 mile to the southern boundary of Section 24, T38S, R9E; thence westerly approximately 1/2 mile to the southeast corner of Section 23, T38S, R9E; thence northerly approximately 1/2 mile; thence westerly approximately 1/4 mile; thence northerly approximately 1/2 mile to the southern boundary of Section 14, T38S, R9E; thence generally northwesterly along the 5000 foot elevation contour line approximately 3/4 mile; thence westerly 1 mile; thence north to the intersection with the northern boundary of Section 15, T38S, R9E; thence west 1/4 mile along the northern boundary of Section 15, T38S, R9E; thence generally southeasterly following the 4800 foot elevation contour line around the old Oregon Institute of Technology Campus to meet with the westerly line of Old Fort Road in Section 22, T38S, R9E; thence southwesterly along the westerly line of Old Fort Road approximately 1 and 1/4 miles to Section 27, T38S, R9E; thence west approximately 1/4 mile; thence southwesterly approximately 1/2 mile to the intersection with Section 27, T38S, R9E; thence westerly approximately 1/2 mile to intersect with the Klamath Falls City Limits at the northerly line of Loma Linda Drive in Section 28, T38S, R9E; thence northwesterly along Loma Linda Drive approximately 1/4 mile; thence southwesterly approximately 1/8 mile to the Klamath Falls City Limits; thence northerly along the Klamath Falls City Limits approximately 1 mile into Section 21, T38S, R9E; thence westerly approximately 1/4 mile; thence northerly approximately 1 mile into Section 17, T38S, R9E; thence westerly approximately 3/4 mile into Section 17, T38S, R9E; thence northerly approximately 1/4 mile; thence westerly approximately 1 mile to the west boundary of Highway 97 in Section 18, T38S, R9E; thence southeasterly along the western boundary of Highway 97 approximately 1/2 mile; thence southwesterly away from Highway 97; thence southeasterly to the intersection with Klamath Falls City Limits at Front Street; thence westerly approximately 1/4 mile to the western boundary of Section 19, T38S, R9E; thence southerly approximately 1 and 1/4 miles along the western boundary of Section 19, T38S, R9E and the Klamath Falls City Limits to the south shore line of Klamath Lake; thence northwesterly along the south shore line of Klamath Lake approximately 1 and 1/4 miles across Section 25, T38S, R9E and Section 26, T38S, R9E; thence westerly approximately 1/2 mile along Section 26, T38S, R9E; thence southerly approximately 1/2 mile to Section 27, T38S, R9E to the intersection with eastern boundary of Orindale Draw, thence southerly along the eastern boundary of Orindale Draw approximately 1 and 1/4 miles into Section 35, T38S, R9E; thence southerly approximately 1/2 mile into Section 2, T39S, R8E; thence easterly approximately 1/4 mile; thence northerly approximately 1/4 mile to the southeast corner of Section 35, T38S, R8E and the Klamath Falls City Limits; thence easterly approximately 1/2 mile to the northern boundary of Section 1, T38S, R8E; thence southeasterly approximately 1/2 mile to Orindale Road; thence north 500 feet along the west side of an easement; thence easterly approximately 1 and 1/4 miles through Section 1, T38S, R8E to the western boundary of Section 6, T39S, R9E; thence southerly approximately 3/4 mile to the southwest corner of Section 6, T39S, R9E; thence easterly approximately 1/8 mile to the western boundary of Highway 97; thence southwesterly along the Highway 97 right-of-way approximately 1/4 mile; thence westerly approximately 1/2 mile to Agate Street in Section 7, T39S, R8E; thence northerly approximately 1/4 mile; thence westerly approximately 3/4 mile to Orindale Road in Section 12, T39S, R8E; thence northerly approximately 1/4 mile into Section 1, T39S, R8E; thence westerly approximately 3/4 mile to the Section 2, T39S, R8E boundary line; thence southerly approximately 3/4 mile along the Section 2, T39S, R8E boundary line to the northwest corner of Section 12, T39S, R8E; thence westerly approximately 1/8 mile into Section 11, T39S, R8E; thence southerly approximately 1/8 mile; thence northeasterly approximately 3/4 mile to the southern boundary of Section 12, T39S, R8E at Balsam Drive; thence southerly approximately 1/4 mile into Section 12, T39S, R8E; thence easterly approximately 1/4 mile to Orindale Road; thence southeasterly approximately 500 feet to Highway 66; thence southwesterly approximately 1/2 mile along the boundary of Highway 66 to Holiday Road; thence southerly approximately 1/2 mile into Section 13, T39S, R8E; thence northeasterly approximately 1/4 mile to the eastern boundary of Section 13, T39S, R8E; thence northerly approximately 1/4 mile along the eastern boundary of Section 13, T39S, R8E; thence westerly approximately 1/4 mile to Weyerhaeuser Road; thence northerly approximately 1/8 mile; thence easterly approximately 1/8 mile; thence northerly approximately 1/8 mile; thence westerly approximately 1/8 mile to Farrier Avenue; thence northerly approximately 1/4 mile; thence easterly approximately 1/4 mile to the eastern boundary of Section 13, T39S, R8E; thence northerly approximately 1/8 mile along the eastern boundary of Section 13, T39S, R8E; thence easterly approximately 1/4 mile along the northern section line of Section 18, T39S, R8E; thence southerly approximately 1/4 mile; thence easterly approximately 1/2 mile to the boundary of Highway 97; thence southerly approximately 1/3 mile to the Burlington Northern Right-of-Way; thence northeasterly approximately 1 and 1/3 miles along the high water line of the Klamath River to the Southside

Bypass in Section 8, T39S, R9E; thence southeasterly along the Southside Bypass to the Southern Pacific Right-of-Way in Section 9, T39S, R9E; thence southerly approximately 1/2 mile along the Southern Pacific Right-of-Way; thence southwesterly approximately 1/4 mile along the Midland Highway; thence southeasterly approximately 1/4 mile to the old railroad spur; thence easterly 1/4 mile along the old railroad spur; thence southerly approximately 1/4 mile in Section 16, T39S, R9E; thence westerly approximately 1/3 mile; thence southerly approximately 1/4 mile; thence easterly approximately 1/16 mile in Section 21, T39S, R9E; thence southerly approximately 1/8 mile to the Lost River Diversion Channel; thence southeasterly approximately 1/4 mile along the northern boundary of the Lost River Diversion Channel; thence easterly approximately 3/4 mile along Joe Wright Road into Section 22, T39S, R9E; thence southeasterly approximately 1/8 mile on the eastern boundary of the Southern Pacific Right-of-Way; thence southeasterly approximately 1 mile along the western boundary of the Southern Pacific Right-of-Way across Section 22, T39S, R9E and Section 27, T39S, R9E to a point 440 yards south of the northern boundary of Section 27, T39S, R9E; thence easterly to Kingsley Field; thence southeasterly approximately 3/4 mile to the southern boundary of Section 26, T39S, R9E; thence east approximately 1/2 mile along the southern boundary of Section 26, T39S, R9E to a pond; thence north-northwesterly for 1/2 mile following the Klamath Falls City Limits; thence north 840 feet; thence east 1155 feet to Homedale Road; thence north along Homedale Road to a point 1/4 mile north of the southern boundary of Section 23, T39S, R9E; thence west 1/4 mile; thence north 1 mile to the Southside Bypass in Section 14, T39S, R9E; thence east 1/2 mile along the Southside Bypass to the eastern boundary of Section 14, T39S, R9E; thence north 1/2 mile; thence east 900 feet into Section 13, T39S, R9E; thence north 1320 feet along the USBR 1-C 1-A to the southern boundary of Section 12, T39S, R9E; thence north 500 feet to the USBR A Canal; thence southeasterly 700 feet along the southern border of the USBR A Canal back into Section 13, T39S, R9E; thence southeast 1600 feet to the northwest parcel corner of an easement for the Enterprise Irrigation District; thence east-northeast 2200 feet to the eastern boundary of Section 13, T39S, R9E; thence north to the southeast corner of Section 12, T39S, R9E; thence along the Enterprise Irrigation Canal approximately 1/2 mile to Booth Road; thence east 1/2 mile to Vale Road; thence north 1 mile to a point in Section 6, T39S, R10E that is approximately 1700 feet north of the southern boundary of Section 6, T39S, R10E; thence west approximately 500 feet; thence south approximately 850 feet; thence west approximately 200 feet; thence north approximately 900 feet; thence west approximately1600 feet to the western boundary of Section 6, T39S, R10E; thence north approximately 1/2 mile to the southeast corner of Section 36, T38S, R9E, the point of beginning.

(13) “LaGrande UGB” means the area within the bounds beginning at the point where U.S. Interstate 84 (I-84) intersects Section 31, Township 2 South, Range 38 East; thence east along I-84 to the Union County Fairgrounds; thence north and then east on a line encompassing the Union County Fairgrounds to the intersection with Cedar Street; thence further east approximately 500 feet, encompassing two (2) residential properties; thence on a line south to the intersection with the northern bank of the Grande Ronde River; thence westerly along the northern bank of the Grande Ronde River to the intersection with the western edge of Mount Glenn Road and Riverside Park; thence north along the western edge of Mount Glenn Road and Riverside Park to the intersection with Fruitdale Road; thence east along Fruitdale Road and the northern boundary of Riverside Park to the eastern boundary of Riverside Park; thence south along the eastern boundary of Riverside Park to the north bank of the Grande Ronde River; thence on a line southeast to the intersection with the northern edge of I-84; thence easterly along the northern edge of I-84 to May Street; thence easterly along May Street to the intersection with State Highway 82; thence northeasterly along State Highway 82 to the a point approximately 1/4 mile from the eastern edge of Section 4, T3S, R38E; thence south to the intersection with Section 9, T3S, R38E, and the southern edge of Buchanan Avenue; thence west along the southern edge of Buchanan Avenue to the intersection with the northern edge of I-84; thence on a line south to the southern edge of I-84; thence southeasterly along the southern edge of I-84 approximately 2500 feet; thence on a line due west approximately 1400 feet; thence on a line due south to the intersection with the Union Pacific Railroad Line; thence southeasterly along the Union Pacific Railroad Line to the intersection with Gekeler Lane; thence west along Gekeler Lane to the intersection with U.S. Highway 30; thence southeast along U.S. Highway 30 to the intersection with the western boundary of Section 15, T3S, R38E; thence on a line west following existing property boundaries approximately 2900 feet; thence on a line north following existing property boundaries approximately 250 feet; thence on a line east following existing property boundaries approximately 650 feet; thence north on a line to the intersection with Gekeler Lane; thence west along Gekeler Lane to the intersection with 20th Avenue; thence south along 20th Avenue to the intersection with Foothill Road; thence southeasterly along Foothill Road approximately 2900 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line south following existing property boundaries approximately 1250 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line north following existing property boundaries approximately 450 feet to the intersection with the southernmost part of the La Grande City Limits; thence westerly and northwesterly along the southernmost part of the La Grande City Limits approximately 1100 feet to the intersection with the 3000 foot elevation contour line; thence westerly following the 3000 foot elevation contour line and existing property boundaries approximately 2200 feet; thence on a line north following existing property boundaries approximately 1900 feet; thence on a line west following existing property boundaries approximately 500 feet; thence on a line north to the La Grande City Limits; thence west along the La Grande City Limits and following existing property boundaries approximately 650 feet; thence on a line south following existing property boundaries

approximately 900 feet; thence on a line west following existing property boundaries approximately 1250 feet; thence on a line north to the intersection with the La Grande City Limits; thence west along the southern boundary of the La Grande City Limits to the intersection with the western boundary of the La Grande City Limits; thence north along the western boundary of the La Grande City Limits and following existing property lines approximately 500 feet; thence on a line west following existing property boundaries approximately 200 feet; thence on a line north following existing property boundaries approximately 700 feet; thence east to the first 3000 foot elevation contour line west of the La Grande City Limits; thence northerly following that 3000 foot elevation contour line to the intersection with Deal Canyon Road; thence easterly along Deal Canyon Road to the intersection with the western boundary of the La Grande City Limits; thence northerly along the western boundary of the La Grande City Limits to the intersection with U.S. Highway 30; thence northwesterly along U.S. Highway 30 and following existing property boundaries approximately 1400 feet; thence on a line west to the intersection with the western boundary of Section 6, T3S, R38E; thence north along the western boundaries of Section 6, T3S, R38E and Section 31, T2S, R38E to the point of beginning.

(14) “Lakeview UGB” means the area beginning at the corner common to sections 21, 22, 27, and 28, T39S, R20E; thence north on the section line between section 21 and 22 to the section corner common to section 15, 16, 21, and 22; thence west along the section line between section 21 and 16 to the section corner common to sections 16, 17, 20, and 21; thence north along the section line between section 16 and 17 approximately 3550 feet to the east branch of Thomas Creek; thence northwesterly along the east branch of Thomas Creek to the center line of Highway 140; thence east along the center line of Highway 140 to the section corner common to sections 8, 9, 16, and 17, T39S, R20E; thence north along the section line between sections 8 and 9 to the section corner common to sections 4, 5, 8, and 9, T39S, R20E; thence north along the section line between section 4 and 5 to the section corner common to section 4 and 5, T39S, R20E and sections 32 and 33, T38S, R20E; thence east along the section line between sections 4 and 33 to the section corner common to sections 3 and 4, T39S, R20E and sections 33 and 34, T38S, R20E; thence south along the eastern boundary of section 4 approximately 4,1318.6 feet; thence S 89 degrees, 11 minutes W 288.28 feet to the east right of way line of the old Paisley/Lakeview Highway; thence S 21 degrees, 53 minutes E along the eastern right of way of the old Paisley/Lakeview Highway 288.4 feet; thence S 78 degrees, 45 minutes W 1375 feet; thence S 3 degrees, 6 minutes, and 30 seconds W 200 feet; thence S 77 degrees, 45 minutes W 136 feet to the east right of way line of U.S. Highway 395; thence southeasterly along the east right of way line of U.S. Highway 395 53.5 feet; thence N 77 degrees, 45 minutes E 195.6 feet; thence S 38 degrees, 45 minutes E 56.8 feet; thence S 51 degrees, 15 minutes W 186.1 feet to the east right of way of U.S. Highway 395; thence southeast along the eastern right of way line of U.S. Highway 395 2310 feet; thence N 76 degrees, 19 minutes 544.7 feet; thence S 13 degrees, 23 minutes, 21 seconds E 400 feet; thence N 63 degrees, 13 minutes E 243.6 feet to the western line of the old American Forest Products Logging Road; thence southeast along the old American Forest Products Logging Road to the western line of the northeast quadrant of the northwest quadrant of section 10, T39S, R20E; thence southeast to a point on the south line of the northeast quadrant of the northwest quadrant of Section 10, T39S, R20E (this point also bears N 89 degrees, 33 minutes E 230 feet from the center line of U.S. Highway 395); thence south on a line parallel to the east right of way line of U.S. Highway 395 to the south line of the northwest quadrant of section 10, T39S, R20E; thence south 491 feet to the east right of way of U.S. Highway 395; thence southeasterly following the east right of way of U.S. Highway 395 255 feet to the south line of the northeast quadrant of the northeast quadrant of the southwest quadrant of section 10, T39S, R20E; thence east along that south line to the center line of section 10, T39S, R20E; thence continuing east along the same south line to the eastern boundary of section 10, T39S, R20E; thence south along the eastern boundary of section 10 to the section corner common to sections 10, 11, 14, and 15, T39S, R20E; thence south along the section line between section 14 and 15 to the section corner common to sections 14, 15, 22, and 23, T39S, R20E; thence west along the section line between sections 15 and 22 to the northwest corner of the northeast quadrant of the northeast quadrant of section 22, T39S, R20E; thence south along the eastern line of the western half of the eastern half of section 22 to the southern boundary of section 22, T39S, R20E; thence west along the southern boundary of section 22 to the point of beginning.

(15) “Maintenance Area” means any area that was formerly nonattainment for a criteria pollutant but has since met EPA promulgated standards and has had a maintenance plan to stay within the standards approved by the EPA pursuant to 40 CFR 51.110 (July, 1993).

(16) “Medford-Ashland Air Quality Maintenance Area” (AQMA) means the area defined as beginning at a point approximately two and quarter miles northeast of the town of Eagle Point, Jackson County, Oregon at the northeast corner of Section 36, Township 35 South, Range 1 West (T35S, R1W); thence South along the Willamette Meridian to the southeast corner of Section 25, T37S, R1W; thence southeast along a line to the southeast corner of Section 9, T39S, R2E; thence south-southeast along line to the southeast corner of Section 22, T39S, R2E; thence South to the southeast corner of Section 27, T39S, R2E; thence southwest along a line to the southeast corner of Section 33, T39S, R2E; thence West to the southwest corner of Section 31, T39S, R2E; thence northwest along a line to the

northwest corner of Section 36, T39S, R1E; thence West to the southwest corner of Section 26, T39S, R1E; thence northwest along a line to the southeast corner of Section 7, T39S, R1E; thence West to the southwest corner of Section 12, T39S, R1W, T39S, R1W; thence northwest along a line to southwest corner of Section 20, T38S, R1W; thence West to the southwest corner of Section 24, T38S, R2W; thence northwest along a line to the southwest corner of Section 4, T38S, R2W; thence West to the southwest corner of Section 6, T38S, R2W; thence northwest along a line to the southwest corner of Section 31, T37S, R2W; thence North and East along the Rogue River to the north boundary of Section 32, T35S, R1W; thence East along a line to the point of beginning.

(17) “Medford-Ashland CBD” means the area beginning at the intersection of Crater Lake Highway (Highway 62) south on Biddle Road to the intersection of Fourth Street, west on Fourth Street to the intersection with Riverside Avenue (Highway 99), south on Riverside Avenue to the intersection with Tenth Street, west on Tenth Street to the intersection with Oakdale Avenue, north on Oakdale Avenue to the intersection with Fourth Street, east on Fourth Street to the intersection with Central Avenue, north on Central Avenue to the intersection with Court Street, north on Court Street to the intersection with Crater Lake Highway (Highway 62) and east on Crater Lake Highway to the point of beginning, with extensions along McAndrews Road east from Biddle Road to Crater Lake Avenue, and along Jackson Street east from Biddle Road to Crater Lake Avenue.

NOTE: This definition also marks the area where indirect sources are required to have indirect source construction permits in the Medford area. See OAR 340-254-0040.

(18) “Medford UGB” means the area beginning at the line separating Range 1 West and Range 2 West at a point approximately 1/4 mile south of the northwest corner of Section 31, T36S, R1W; thence west approximately 1/2 mile; thence south to the north bank of Bear Creek; thence west to the south bank of Bear Creek; thence south to the intersection with the Medford Corporate Boundary; thence following the Medford Corporate Boundary west and southwesterly to the intersection with Merriman Road; thence northwesterly along Merriman Road to the intersection with the eastern boundary of Section 10, T36S, R2W; thence south along said boundary line approximately 3/4 mile; thence west approximately 1/3 mile; thence south to the intersection with the Hopkins Canal; thence east along the Hopkins Canal approximately 200 feet; thence south to Rossanely Drive; thence east along Rossanley Drive approximately 200 feet; thence south approximately 1200 feet; thence west approximately 700 feet; thence south approximately 1400 feet; thence east approximately 1400 feet; thence north approximately 100 feet; thence east approximately 700 feet; thence south to Finley Lane; thence west to the end of Finley Lane; thence approximately 1200 feet; thence west approximately 1300 feet; thence north approximately 150 feet; thence west approximately 500 feet; thence south to Highway 238; thence west along Highway 238 approximately 250 feet; thence south approximately 1250 feet to a point even with the end of Renault Avenue to the east; thence east approximately 2200 feet; thence south approximately 1100 feet to a point even with Sunset Court to the east; thence east to and along Sunset Court to the first (nameless) road to the south; thence approximately 850 feet; thence west approximately 600 feet; thence south to Stewart Avenue; thence west along Stewart Avenue approximately 750 feet; thence south approximately 1100 feet; thence west approximately 100 feet; thence south approximately 800 feet; thence east approximately 800 feet; thence south approximately 1000 feet; thence west approximately 350 feet to a point even with the north-south connector street between Sunset Drive and South Stage Road; thence south to and along said connecting road and continuing along South Stage Road to Fairlane Road; thence south to the end of Fairlane Road and extending beyond it approximately 250 feet; thence east approximately 250 feet; thence south approximately 250 feet to the intersection with Judy Way; thence east on Judy Way to Griffin Creek Road; thence north on Griffin Creek Road to South Stage Road; thence east on South Stage Road to Orchard Home Drive; thence north on Orchard Home Drive approximately 800 feet; thence east to Columbus Avenue; thence south along Columbus Avenue to South Stage Road; thence east along South Stage Road to the first road to the north after Sunnyview Lane; thence north approximately 300 feet; thence east approximately 300 feet; thence north approximately 700 feet; thence east to King’s Highway; thence north along King’s Highway to Experiment Station Road; thence east along Experiment Station Road to Marsh Lane; thence east along Marsh Lane to the northern boundary of Section 6, T38S, R1W; thence east along said boundary approximately 1100 feet; thence north approximately 1200 feet; thence east approximately 1/3 mile; thence north approximately 400 feet; thence east approximately 1000 feet to a drainage ditch; thence following the drainage ditch southeasterly approximately 500 feet; thence east to the eastern boundary of Section 31, T37S, R1W; thence south along said boundary approximately 1900 feet; thence east to and along the loop off of Rogue Valley Boulevard, following that loop to the Southern Pacific Railroad Line (SPRR); thence following SPRR approximately 500 feet; thence south to South Stage Road; thence east along South Stage Road to SPRR; thence southeasterly along SPRR to the intersection with the west fork of Bear Creek; thence northeasterly along the west fork of Bear Creek to the intersection with U.S. Highway 99; thence southeasterly along U.S. Highway 99 approximately 250 feet; thence east approximately 1600 feet; thence south to East Glenwood Road; thence east along East Glenwood Road approximately 1250 feet; thence north approximately 1/2 mile; thence west approximately 250 feet; thence north approximately 1/2 mile to the Medford City Limits; thence east along the city limits to Phoenix Road; thence south along Phoenix Road to Coal Mine Road; thence east along Coal Mine Road approximately 9/10

mile to the western boundary of Section 35, T37S, R1W; thence north to the midpoint of the western boundary of Section 35, T37S, R1W; thence west approximately 800 feet; thence north approximately 1700 feet to the intersection with Barnett Road; thence easterly along Barnett Road to the southeast corner of Section 27, T37S, R1W; thence north along the eastern boundary line of said section approximately 1/2 mile to the intersection with the 1800 foot contour line; thence east to the intersection with Cherry Lane; thence following Cherry Lane southeasterly and then northerly to the intersection with Hillcrest Road; thence east along Hillcrest Road to the southeast corner of Section 23, T37S, R1W; thence north to the northeast corner of Section 23, T37S, R1W; thence west to the midpoint of the northern boundary of Section 22; T37S, R1W; thence north to the midpoint of Section 15, T37S, R1W; thence west to the midpoint of the western boundary of Section 15, T37S, R1W; thence south along said boundary approximately 600 feet; thence west approximately 1200 feet; thence north approximately 600 feet; thence west to Foothill Road; thence north along Foothill Road to a point approximately 500 feet north of Butte Road; thence west approximately 300 feet; thence south approximately 250 feet; thence west on a line parallel to and approximately 250 feet north of Butte Road to the eastern boundary of Section 8, T37S, R1W; thence north approximately 2200 feet; thence west approximately 1800 feet; thence north approximately 2000 feet; thence west approximately 500 feet; thence north to Coker Butte Road; thence east along Coker Butte Road approximately 550 feet; thence north approximately 1250 feet; thence west to U.S. Highway 62; thence north approximately 3000 feet; thence east approximately 400 feet to the 1340 foot contour line; thence north approximately 800 feet; thence west approximately 200 feet; thence north approximately 250 feet to East Vilas Road; thence east along East Vilas Road approximately 450 feet; thence north approximately 2000 feet to a point approximately 150 feet north of Swanson Creek; thence east approximately 600 feet; thence north approximately 850 feet; thence west approximately 750 feet; thence north approximately 650 feet; thence west approximately 2100 feet; thence on a line southeast approximately 600 feet; thence east approximately 450 feet; thence south approximately 1600 feet; thence west approximately 2000 feet to the continuance of the private logging road north of East Vilas Road; thence south along said logging road approximately 850 feet; thence west approximately 750 feet; thence south approximately 150 feet; thence west approximately 550 feet to Peace Lane; thence north along Peace Lane approximately 100 feet; thence west approximately 350 feet; thence north approximately 950 feet; thence west approximately 1000 feet to the western boundary of Section 31, T36S, R1W; thence north approximately 1300 feet along said boundary to the point of beginning.

(19) “Nonattainment Area” means any area that has been designated as not meeting the standards established by the U.S. Environmental Protection Agency (EPA) pursuant to 40 CFR 51.52 (July, 1993) for any criteria pollutant.

(20) “O3” means Ozone.

(21) “Oakridge UGB” means the area enclosed by the following: Beginning at the northwest corner of Section 17, T21S, R3E and the city limits; thence south along the western boundary of Section 17, T21S, R3E along the city limits approximately 800 feet; thence southwesterly following the city limits approximately 750 feet; thence west along the city limits approximately 450 feet; thence northwesterly along the city limits approximately 450 feet; thence on a line south along the city limits approximately 250 feet; thence on a line east along the city limits approximately 100 feet; thence southwesterly along the city limits approximately 200 feet; thence on a line east along the city limits approximately 400 feet; thence on a line south along the city limits to the channel of the Willamette River Middle Fork; thence south-easterly up the Willamette River Middle Fork along the city limits approximately 7200 feet; thence exiting the Willamette River Middle Fork with the city limits in a northerly manner and forming a rough semicircle with a diameter of approximately one-half mile before rejoining the Willamette River Middle Fork; thence diverging from the city limits upon rejoining the Willamette River Middle Fork and moving southeasterly approximately 5600 feet up the Willamette River Middle Fork to a point on the river even with the point where Salmon Creek Road intersects with U.S. Highway 58; thence on a line east from the channel of the Willamette River Middle Fork across the intersection of Salmon Creek Road and U.S. Highway 58 to the intersection with the Southern Pacific Railroad Line; thence northerly along the Southern Pacific Railroad Line to the intersection with the northern boundary of Section 22, T21S, R3E; thence west along the northern boundary of Section 22, T21S, R3E to the intersection with Salmon Creek Road; thence on a line north to the intersection with the Southern Pacific Railroad Line; thence east along the Southern Pacific Railroad Line approximately 600 feet; thence on a line north to the intersection with High Prairie Road; thence on a line west approximately 400 feet; thence on a line north to the intersection with the northern boundary of Section 15, T21S, R3E; thence west along the northern boundary of Section 15, T21S, R3E to the intersection with the southeastern corner of Section 9, T21S, R3E; thence north along the eastern boundary of Section 9, T21S, R3E approximately 1300 feet; thence on a line west approximately 1100 feet; thence on a line south to the intersection with West Oak Road; thence northwesterly along West Oak Road approximately 2000 feet; thence on a line south to the intersection with the northern boundary line of the city limits; thence westerly and northwesterly approximately 8000 feet along the city limits to the point of beginning.

(22) “Particulate Matter” has the meaning given that term in OAR 340-200-0020(82).

(23) PM10: has the meaning given that term in OAR 340-200-0020(90).

(24) “PM2.5” has the meaning given that term in OAR 340-200-0020(91).

(25) “Portland AQMA” means the area within the bounds beginning at the point starting on the Oregon-Washington state line in the Columbia River at the confluence with the Willamette River, thence east up the Columbia River to the confluence with the Sandy River, thence southerly and easterly up the Sandy River to the point where the Sandy River intersects the Clackamas County-Multnomah County line, thence west along the Clackamas County-Multnomah County line to the point where the Clackamas County-Multnomah County line is intersected by H. Johnson Road (242nd), thence south along H. Johnson Road to the intersection with Kelso Road (Boring Highway), thence west along Kelso Road to the intersection with Deep Creek Road (232nd), thence south along Deep Creek Road to the point of intersection with Deep Creek, thence southeasterly along Deep Creek to the confluence with Clackamas River, thence easterly along the Clackamas River to the confluence with Clear Creek, thence southerly along Clear Creek to the point where Clear Creek intersects Springwater Road then to Forsythe Road, thence easterly along Forsythe Road to the intersection with Bradley Road, thence south along Bradley Road to the intersection with Redland Road, thence west along Redland Road to the intersection with Ferguson Road, thence south along Ferguson Road to the intersection with Thayler Road, thence west along Thayler Road to the intersection with Beaver Creek Road, thence southeast along Beaver Creek Road to the intersection with Henrici Road, thence west along Henrici Road to the intersection with State Highway 213 (Mollala Avenue), thence southeast along State Highway 213 to the point of intersection with Beaver Creek, thence westerly down Beaver Creek to the confluence with the Willamette River, thence southerly and westerly up the Willamette River to the point where the Willamette River intersects the Clackamas County-Yamhill County line, thence north along the Clackamas County-Yamhill County line to the point where it intersects the Washington County-Yamhill County line, thence west and north along the Washington County-Yamhill County line to the point where it is intersected by Mount Richmond Road, thence northeast along Mount Richmond Road to the intersection with Patton Valley Road, thence easterly and northerly along Patton Valley Road to the intersection with Tualatin Valley State Highway, thence northerly along Tualatin Valley State Highway to the intersection with State Highway 47, thence northerly along State Highway 47 to the intersection with Dilley Road, thence northwesterly and northerly along Dilley Road to the intersection with Stringtown Road, thence westerly and northwesterly along Stringtown Road to the intersection with Gales Creek Road, thence northwesterly along Gales Creek Road to the intersection with Tinmmerman Road, thence northerly along Tinmmerman Road to the intersection with Wilson River Highway, thence west and southwesterly along Wilson River Highway to the intersection with Narup Road, thence north along Narup Road to the intersection with Cedar Canyon Road, thence westerly and northerly along Cedar Canyon Road to the intersection with Banks Road, thence west along Banks Road to the intersection with Hahn Road, thence northerly and westerly along Hahn Road to the intersection with Mountaindale Road, thence southeasterly along Mountaindale Road to the intersection with Glencoe Road, thence east-southeasterly along Glencoe Road to the intersection with Jackson Quarry Road, thence north-northeasterly along Jackson Quarry Road to the intersection with Helvetia Road, thence easterly and southerly along Helvetia Road to the intersection with Bishop Road, thence southerly along Bishop Road to the intersection with Phillips Road, thence easterly along Phillips Road to the intersection with the Burlington Northern Railroad Track, thence northeasterly along the Burlington Northern Railroad Line to the intersection with Rock Creek Road, thence east-southeasterly along Rock Creek Road to the intersection with Old Cornelius Pass Road, thence northeasterly along Old Cornelius Pass Road to the intersection with Skyline Boulevard, thence easterly and southerly along Skyline Boulevard to the intersection with Newberry Road, thence northeasterly along Newberry Road to the intersection with State Highway 30 (St. Helens Road), thence northeast on a line over land across State Highway 30 to the Multnomah Channel, thence east-southeasterly up the Multnomah Channel to the diffluence with the Willamette River, thence north-northeasterly down the Willamette River to the confluence with the Columbia River and the Oregon-Washington state line (the point of beginning).

(26) “Portland Metropolitan Service District Boundary” or “Portland Metro” means the boundary surrounding the urban growth boundaries of the cities within the Greater Portland Metropolitan Area. It is defined in the Oregon Revised Statutes (ORS) 268.125 (1989).

(27) “Portland Vehicle Inspection Area” means the area of the state included within the following census tracts, block groups, and blocks as used in the 1990 Federal Census. In Multnomah County, the following tracts, block groups, and blocks are included: Tracts 1, 2, 3.01, 3.02, 4.01, 4.02, 5.01, 5.02, 6.01, 6.02, 7.01, 7.02, 8.01, 8.02, 9.01, 9.02, 10, 11.01, 11.02, 12.01, 12.02, 13.01, 13.02, 14, 15, 16.01, 16.02, 17.01, 17.02, 18.01, 18.02, 19, 20, 21, 22.01, 22.02, 23.01, 23.02, 24.01, 24.02, 25.01, 25.02, 26, 27.01, 27.02, 28.01, 28.02, 29.01, 29.02, 29.03, 30, 31, 32, 33.01, 33.02, 34.01, 34.02, 35.01, 35.02, 36.01, 36.02, 36.03, 37.01, 37.02, 38.01, 38.02, 38.03, 39.01, 39.02, 40.01, 40.02, 41.01, 41.02, 42, 43, 44, 45, 46.01, 46.02, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 57, 58, 59, 60.01. 60.02, 61, 62, 63, 64.01, 64.02, 65.01, 65.02, 66.01, 66.02, 67.01, 67.02, 68.01, 68.02, 69, 70, 71, 72.01, 72.02, 73, 74, 75, 76, 77, 78, 79, 80.01, 80.02, 81, 82.01, 82.02, 83.01, 83.02, 84, 85, 86, 87, 88, 89, 90, 91, 92.01, 92.02, 93, 94, 95,

96.01, 96.02, 97.01, 97.02, 98.01, 98.02, 99.01, 99.02, 99.03, 100, 101, 102, 103.01, 103.02, 104.02, 104.04, 104.05, 104.06, 104.07; Block Groups 1, 2 of Tract 105; Blocks 360, 361, 362 of Tract 105; that portion of Blocks 357, 399 of Tract 105 beginning at the intersection of the Oregon-Washington State Line ("State Line") and the northeast corner of Block Group 1 of Tract 105, thence east along the State Line to the intersection of the State Line and the eastern edge of Section 26, Township 1 North, Range 4 East, thence south along the section line to the centerline of State Highway 100 to the intersection of State Highway 100 and the western edge of Block Group 2 of Tract 105. In Clackamas County, the following tracts, block groups, and blocks are included: Tracts 201, 202, 203.01, 203.02, 204.01, 204.02, 205.01, 205.02, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216.01, 216.02, 217, 218, 219, 220, 221.01, 221.02, 222.02, 223, 224, 225, 226, 227.01, 227.02, 228, 229, 230, 231, 232, 233, 234.01, 234.02, , 235, 236, 237; Block Groups 1, 2 of Tract 241; Block Groups 1, 2, 3, 4 of Tract 242; Block Groups 1, 2 of Tract 243.02. In Yamhill County, the following tract is included: Tract 301, except those areas in Tract 301 that lie within the Newberg City Limits defined as of July 12, 1996, and the following blocks within Tract 301: 102B, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121D, 122B, 122C, 123, 126, and 127B. In Washington County the following tracts, block groups, and blocks are included: Tracts 301, 302, 303, 304.01, 304.02, 305.01, 305.02, 306, 307, 308.01, 308.02, 309, 310.03, 310.04, 310.05, 310.06, 311, 312, 313, 314.01, 314.02, 315.01, 315.04, 315.05, 315.06, 315.07, 315.08, 316.03, 316.04, 316.05, 316.06, 316.07, 317.02, 317.03, 317.04, 318.01, 318.02, 318.03, 319.01, 319.03, 319.04, 320, 321.01, 321.02, 322, 323, 324.02, 324.03, 324.04, 325, 326.01, 326.02, 328, 329, 330, 331, 332, 333; Block Groups 1, 2 of Tract 327; Block Group 1 of Tract 334; Block Group 2 of Tract 335; Block Group 1 of Tract 336. In Columbia County the following tracts, block groups, and blocks are included: Tract 9710.98; Block Groups 2, 3 of Tract 9709.98; Blocks 146B, 148, 152 of Tract 9709.98.

(28) "Rogue Basin" means the area bounded by the following line: Beginning at the NE corner of T32S, R2E, W.M., thence south along range line 2E to the SE corner of T39S; thence west along township line 39S to the NE corner of T40S, R7W; thence south to the SE corner of T40S, R7W; thence west to the SE corner of T40S, R9W; thence north on range line 9W to the NE corner of T39S, R9W; thence east to the NE corner of T39S, R8W; thence north on range line 8W to the SE corner of Section 1, T33S, R8W on the Josephine-Douglas County line; thence east on the Josephine-Douglas and Jackson-Douglas County lines to the NE corner of T32S, R1W; thence east along township line 32S to the NE corner of T32S, R2E to the point of beginning.

(29) "Salem-Keizer Area Transportation Study" or "SKATS" means the area within the bounds beginning at the intersection of U.S. Interstate Highway 5 (I-5) with Battle Creek Road SE and Wiltsey Road, south along I-5 to the intersection with the western boundary of Section 24, T8S, R3W; thence due south on a line to the intersection with Delaney Road; thence easterly along Delaney Road to the intersection with Sunnyside Road; thence north along Sunnyside Road to the intersection with Hylo Road SE; thence west along Hylo Road SE to the intersection with Liberty Road; thence north along Liberty Road to the intersection with Cole Road; thence west along Cole Road to the intersection with Bates Road; thence northerly and easterly along Bates Road to the intersection with Jory Hill Road; thence west along Jory Hill Road to the intersection with Stone Hill Avenue; thence north along Stone Hill Avenue to the intersection with Vita Springs Road; thence westerly along Vita Springs Road to the Willamette River; thence northeasterly downstream the Willamette River to a point adjacent to where the western boundary of Section 30, T7S, R3W intersects the Southern Pacific Railroad Line; thence westerly along the Southern Pacific Railroad Line to the intersection with State Highway 51; thence northeasterly along State Highway 51 to the intersection with Oak Grove Road; thence northerly along Oak Grove Road to the intersection with State Highway 22; thence west on State Highway 22 to the intersection with Oak Grove Road; thence north along Oak Grove Road to the intersection with Orchard Heights Road; thence east and north along Orchard Heights Road to the intersection with Eagle Crest Drive; thence northerly along Eagle Crest Drive to the intersection with Hunt Road; thence north along Hunt Road to the intersection with Fourth Road; thence east along Fourth Road to the intersection with Spring Valley Road; thence north along Spring Valley to the intersection with Oak Knoll Road; thence east along Oak Knoll Road to the intersection with Wallace Road; thence south along Wallace Road to the intersection with Lincoln Road; thence east along Lincoln Road on a line to the intersection with the Willamette River; thence northeasterly downstream the Willamette River to a point adjacent to where Simon Street starts on the East Bank; thence east and south along Simon Street to the intersection with Salmon; thence east along Salmon to the intersection with Ravena Drive; thence southerly and easterly along Ravena Drive to the intersection with Wheatland Road; thence northerly along Wheatland Road to the intersection with Brooklake Road; thence southeast along Brooklake Road to the intersection with 65th Avenue; thence south along 65th Avenue to the intersection with Labish Road; thence east along Labish Road to the intersection with the West Branch of the Little Pudding River; thence southerly along the West Branch of the Little Pudding River to the intersection with Sunnyview Road; thence east along Sunnyview Road to the intersection with 63rd Avenue; thence south along 63rd Avenue to the intersection with State Street; thence east along State Street to the intersection with 62nd Avenue; thence south along 62nd Avenue to the intersection with Deer Park Drive; thence southwest along Deer Park Drive to the intersection with Santiam Highway 22; thence southeast along Santiam Highway 22 to the point where it intersects the Salem Urban Growth Boundary (SUGB);

thence following the southeast boundary of the SUGB generally southerly and westerly to the intersection with Wiltsey Road; thence west along Wiltsey Road to the intersection with I-5 (the point of beginning).

(30) “UGB” means Urban Growth Boundary.

(31) “Umpqua Basin” means the area bounded by the following line: Beginning at the SW corner of Section 2, T19S, R9W, on the Douglas-Lane County lines and extending due south to the SW corner of Section 14, T32S, R9W, on the Douglas-Curry County lines, thence easterly on the Douglas-Curry and Douglas-Josephine County lines to the intersection of the Douglas, Josephine, and Jackson County lines; thence easterly on the Douglas-Jackson County line to the intersection of the Umpqua National Forest boundary on the NW corner of Section 32, T32S, R3W; thence northerly on the Umpqua National Forest boundary to the NE corner of Section 36, T25S, R2W; thence west to the NW corner of Section 36, T25S, R4W; thence north to the Douglas-Lane County line; thence westerly on the Douglas-Lane County line to the starting point.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468.020
Stats. Implemented: ORS 468A.025
Hist.: DEQ 14-1995, f. & cert. ef. 5-25-95; DEQ 18-1996, f. & cert. ef. 8-19-96; DEQ 1-1999, f. & cert. ef. 1-25-99; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-031-0500; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 5-2010, f. & cert. ef. 5-21-10; DEQ 18-2011, f. & cert. ef. 12-21-11

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 225

AIR QUALITY ANALYSIS REQUIREMENTS

340-225-0090

Requirements for Demonstrating a Net Air Quality Benefit

Demonstrations of net air quality benefit for offsets must include the following:

(1) Ozone areas (VOC and NOx emissions). For sources capable of impacting a designated ozone nonattainment or maintenance area;

(a) Offsets for VOC and NOx are required if the source will be located within the designated area or within the Ozone Precursor Distance.

(b) The amount and location of offsets must be determined in accordance with this subsection:

(A)For new or modified sources locating within a designated nonattainment area, the offset ratio is 1.1:1. These offsets must come from within either the same designated nonattainment area as the new or modified source or another ozone nonattainment area (with equal or higher nonattainment classification) that contributes to a violation of the NAAQS in the same designated nonattainment area as the new or modified source.

(B) For new or modified sources locating within a designated maintenance area, the offset ratio is 1.1:1. These offsets may come from within either the designated area or the ozone precursor distance.

(C) For new or modified sources locating outside the designated area, but within the ozone precursor distance, the offset ratio is 1:1. These offsets may come from within either the designated area or the ozone precursor distance.

(D) Offsets from outside the designated area but within the Ozone Precursor Distance must be from sources affecting the designated area in a comparable manner to the proposed emissions increase. Methods for determining offsets are described in the Ozone Precursor Offsets definition (OAR 340-225-0020(11)).

(c) In lieu of obtaining offsets, the owner or operator may obtain an allocation at the rate of 1:1 from a growth allowance, if available, in an applicable maintenance plan.

(d) Sources within or affecting the Medford Ozone Maintenance Area are exempt from the requirement for NOx offsets relating to ozone formation.

(e) Sources within or affecting the Salem Ozone Maintenance Area are exempt from the requirement for VOC and NOx offsets relating to ozone formation.

(2) Non-Ozone areas (PM2.5, PM10, SO2, CO, NOx, and Lead emissions):

(a) For a source locating within a designated nonattainment area, the owner or operator must comply with paragraphs (A) through (E) of this subsection:

(A) Obtain offsets from within the same designated nonattainment area for the nonattainment pollutant(s);

(B) Except as provided in paragraphs (C) of this subsection, provide a minimum of 1:1 offsets for each nonattainment pollutant and precursor with emission increases over the Netting Basis;

(C) For PM2.5; inter-pollutant offsets are allowed as follows:

(i) 1 ton of direct PM2.5 may be used to offset 40 tons of SO2;

(ii) 1 ton of direct PM2.5 may be used to offset 100 tons of NOx;

(iii) 40 tons of SO2 may be used to offset 1 ton of direct PM2.5;

(iv) 100 tons of NOx may be used to offset 1 ton of direct PM2.5.

(D) Except as provided in section (7) of this rule, provide a net air quality benefit within the designated nonattainment area. "Net Air Quality Benefit" means:

(i) Offsets obtained result in a reduction in concentration at a majority of the modeled receptors and the emission increases from the proposed source or modification will result in less than a significant impact level increase at all modeled receptors; or

(ii) For a small scale local energy project and any infrastructure related to that project located in the same area, a reduction of the nonattainment pollutant emissions equal to the ratio specified in this subsection, provided that the proposed major source or major modification would not cause or contribute to a violation of the national ambient air quality standard or otherwise pose a material threat to compliance with air quality standards in the nonattainment area.

(E) Provide offsets sufficient to demonstrate reasonable further progress toward achieving the NAAQS.

(b) For a source locating outside a designated nonattainment area but causing a significant air quality impact on the area, the owner or operator must provide offsets sufficient to reduce the modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the designated nonattainment area. These offsets may come from within or outside the designated nonattainment area. This requirement only applies to the emissions remaining after first deducting the offsets obtained in accordance with section (7) of this rule.

(c) For a source locating inside or causing a significant air quality impact on a designated maintenance area, the owner or operator must either provide offsets sufficient to reduce modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the designated maintenance area or obtain an allocation from an available growth allowance as allowed by an applicable maintenance plan. These offsets may come from within or outside the designated maintenance area. This requirement only applies to the emissions remaining after first deducting the offsets obtained in accordance with section (7) of this rule.

(A) Medford-Ashland AQMA: Proposed new major PM10 sources or major PM10 modifications locating within the AQMA that are required to provide emission offsets under OAR 340-224-0060(2)(a) must provide reductions in PM10 emissions equal to 1.2 times the emissions increase over the netting basis from the new or modified source, and must provide a net air quality benefit within the AQMA. "Net Air Quality Benefit" means:

(i) A reduction in concentration at a majority of the modeled receptors and less than a significant impact level increase at all modeled receptors; or

(ii) For a small scale local energy project and any infrastructure related to that project located in the same area, a reduction of the maintenance pollutant emissions equal to the ratio specified in this paragraph, provided that the proposed major source or major modification would not cause or contribute to a violation of the national ambient air quality standard or otherwise pose a material threat to compliance with air quality standards in the maintenance area.

(B) Medford-Ashland AQMA: Proposed new major PM10 sources or major PM10 modifications located outside the Medford-Ashland AQMA that cause a significant air quality impact on the AQMA must provide reductions in PM10

emissions sufficient to reduce modeled impacts below the significant air quality impact level (OAR 340-200-0020) at all receptors within the AQMA.

(3) Except as provided in paragraph (2)(a)(C) of this rule, the emission reductions used as offsets must be of the same type of pollutant as the emissions from the new source or modification. Sources of PM10 must be offset with particulate in the same size range.

(4) The emission reductions used as offsets must be contemporaneous, that is, the reductions must take effect before the time of startup but not more than two years before the submittal of a complete permit application for the new source or modification. This time limitation may be extended through banking, as provided for in OAR 340 division 268, Emission Reduction Credit Banking. In the case of replacement facilities, the DEQ may allow simultaneous operation of the old and new facilities during the startup period of the new facility, if net emissions are not increased during that time period. Any emission reductions must be federally enforceable at the time of the issuance of the permit.

(5) Offsets required under this rule must meet the requirements of Emissions Reduction Credits in OAR 340 division 268.

(6) Emission reductions used as offsets must be equivalent in terms of short term, seasonal, and yearly time periods to mitigate the effects of the proposed emissions.

(7) Offsets obtained in accordance with OAR 340-240-0550 and 340-240-0560 for sources locating within or causing significant air quality impact on the Klamath Falls PM2.5 nonattainment or PM10 maintenance areas are exempt from the requirements of paragraph (2)(a)(E) and sub-sections 2(b) and 2(c) of this rule provided that the proposed major source or major modification would not cause or contribute to a new violation of the national ambient air quality standard. This exemption only applies to the direct PM2.5 or PM10 offsets obtained from residential wood-fired devices in accordance with OAR 340-240-0550 and 340-240-0560. Any remaining emissions from the source that are offset by emission reductions from other sources are subject to the requirements of paragraph (2)(a)(E) or sub-sections (2)(b) or (2(c) of this rule, as applicable.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the EQC under OAR 340-200-0040.

Stat. Auth.: ORS 468.020
Stats. Implemented: ORS 468A.025
Hist.: DEQ 25-1981, f. & ef. 9-8-81; DEQ 5-1983, f. & ef. 4-18-83; DEQ 8-1988, f. & cert. ef. 5-19-88 (and corrected 5-31-88); DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 27-1992, f. & cert. ef. 11-12-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 12-1993, f. & cert. ef. 9-24-93, Renumbered from 340-020-0260; DEQ 19-1993, f. & cert. ef. 11-4-93; DEQ 4-1995, f. & cert. ef. 2-17-95; DEQ 26-1996, f. & cert. ef. 11-26-96; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-028-1970; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0111; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01, Renumbered from 340-224-0090 & 340-240-0260; DEQ 11-2002, f. & cert. ef. 10-8-02; DEQ 12-2002(Temp), f. & cert. ef. 10-8-02 thru 4-6-03; Administrative correction 11-10-03; DEQ 1-2004, f. & cert. ef. 4-14-04; DEQ 1-2005, f. & cert. ef. 1-4-05; DEQ 3-2007, f. & cert. ef. 4-12-07; DEQ 10-2010(Temp), f. 8-31-10, cert. ef. 9-1-10 thru 2-28-11; Administrative correction, 3-29-11; DEQ 5-2011, f. 4-29-11, cert. ef. 5-1-11

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 240

RULES FOR AREAS WITH UNIQUE AIR QUALITY NEEDS

340-240-0010

Purpose

The purpose of this division is to address the air quality control needs of the Medford-Ashland AQMA and Grants Pass UGB (OAR 340-240-0100 through 340-240-0270), the La Grande UGB (340-240-0300 through 340-240-0360, the Lakeview UGB (340-240-0400 through 340-240-0440), and the Klamath Falls Nonattainment Area (340-240-0500 through 340-240-0630).

[NOTE: These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025
Hist.: DEQ 4-1978, f. & ef. 4-7-78; DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0005

340-240-0030

Definitions

The definitions in OAR 340-200-0020, 340-204-0010 and this rule apply to this division. If the same term is defined in this rule and 340-200-0020 or 340-204-0010, the definition in this rule applies to this division.

(1) "Air contaminant" means a dust, fume, gas, mist, odor, smoke, vapor, pollen, soot, carbon, acid or particulate matter, or any combination thereof.

(2) "Air Conveying System" means an air moving device, such as a fan or blower, associated ductwork, and a cyclone or other collection device, the purpose of which is to move material from one point to another by entrainment in a moving airstream.

(3) "Average Operating Opacity" means the opacity of emissions determined using EPA Method 9 on any three days within a 12-month period which are separated from each other by at least 30 days; a violation of the average operating opacity limitation is judged to have occurred if the

opacity of emissions on each of the three days is greater than the specified average operating opacity limitation.

(4) "Charcoal Producing Plant" means an industrial operation which uses the destructive distillation of wood to obtain the fixed carbon in the wood.

(5) "Collection Efficiency" means the overall performance of the air cleaning device in terms of ratio of weight of material collected to total weight of input to the collector.

(6) "Department" means Department of Environmental Quality.

(7) "Design Criteria" means the numerical as well as verbal description of the basis of design, including but not necessarily limited to design flow rates, temperatures, humidities, contaminant descriptions in terms of types and chemical species, mass emission rates, concentrations, and specification of desired results in terms of final emission rates and concentrations, and scopes of vendor supplies and owner-supplied equipment and utilities, and a description of any operational controls.

(8) "Domestic Waste" means combustible household waste, other than wet garbage, such as paper, cardboard, leaves, yard clippings, wood, or similar materials generated in a dwelling housing four (4) families or less, or on the real property on which the dwelling is situated.

(9) "Dry Standard Cubic Foot" means the amount of gas that would occupy a volume of one cubic foot, if the gas were free of uncombined water at standard conditions.

(10) "Emission" means a release into the outdoor atmosphere of air contaminants.

(11) "EPA Method 9" means the method for Visual Determination of the Opacity of Emissions From Stationary Sources described as Method (average of 24 consecutive observations) in the Department Source Sampling Manual (January, 1992).

(12) "Facility" means an identifiable piece of process equipment. A stationary source may be comprised of one or more pollutant-emitting facilities.

(13) “Fireplace” is defined in OAR 340-262-0450

(14) "Fuel Burning Equipment" means a device that burns a solid, liquid, or gaseous fuel, the principal purpose of which is to produce heat or power by indirect heat transfer. All stationary gas turbines are considered Fuel Burning Equipment. Marine installations and internal combustion engines are not considered Fuel Burning Equipment.

(15) "Fuel Moisture Content By Weight Greater Than 20 Percent" means bark, hogged wood waste, or other wood with an average moisture content of more than 20 percent by weight on a wet basis as used for fuel in the normal operation of a wood-fired veneer dryer as measured by ASTM D4442-84 during compliance source testing.

(16) "Fuel Moisture Content By Weight Less Than 20 Percent" means pulverized ply trim, sanderdust, or other wood with an average moisture content of 20 percent or less by weight on a wet basis as used for fuel in the normal operation of a wood-fired veneer dryer as measured by ASTM D4442-84 during compliance source testing.

(17) "Fugitive Emissions" means dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof not easily given to measurement, collection and treatment by conventional pollution control methods.

(18) "Grants Pass Urban Growth Area" and "Grants Pass Area" means the area within the Grants Pass Urban Growth Boundary as shown on the Plan and Zoning Maps for the City of Grants Pass as of 1 February 1988.

(19) "Hardboard" means a flat panel made from wood that has been reduced to basic wood fibers and bonded by adhesive properties under pressure.

(20) “Klamath Falls Nonattainment Area” means the area as defined in OAR 340-204-0010.

(21) "La Grande Urban Growth Area" means the area within the La Grande Urban Growth Boundary as shown on the Plan and Zoning Maps for the City of La Grande as of 1 October 1991.

(22) "Lakeview Urban Growth Area" means the area within the Lakeview Urban Growth Boundary as shown on the Plan and Zoning Maps for the Town of Lakeview as of 25 October 1993.

(23) "Liquefied petroleum gas" has the meaning given by the American Society for Testing and Materials in ASTM D1835-82, "Standard Specification for Liquid Petroleum Gases."

(24) "Lowest Achievable Emission Rate" or "LAER" is defined in OAR 340-200-0020.

(25) "Maximum Opacity" means the opacity as determined by EPA Method 9 (average of 24 consecutive observations).

(26) "Medford-Ashland Air Quality Maintenance Area" (AQMA) means the area defined as beginning at a point approximately two and quarter miles northeast of the town of Eagle Point, Jackson County, Oregon at the northeast corner of Section 36, Township 35 South, Range 1 West (T35S, R1W); thence South along the Willamette Meridian to the southeast corner of Section 25, T37S, R1W; thence southeast along a line to the southeast corner of Section 9, T39S, R2E; thence south-southeast along line to the southeast corner of Section 22, T39S, R2E; thence South to the southeast corner of Section 27, T39S, R2E; thence southwest along a line to the southeast corner of Section 33, T39S, R2E; thence West to the southwest corner of Section 31, T39S, R2E; thence northwest along a line to the northwest corner of Section 36, T39S, R1E; thence West to the southwest corner of Section 26, T39S, R1E; thence northwest along a line to the southeast corner of Section 7, T39S, R1E; thence West to the southwest corner of Section 12, T39S, R1W, T39S, R1W; thence northwest along a line to southwest corner of Section 20, T38S,

R1W; thence West to the southwest corner of Section 24, T38S, R2W; thence northwest along a line to the southwest corner of Section 4, T38S, R2W; thence West to the southwest corner of Section 6, T38S, R2W; thence northwest along a line to the southwest corner of Section 31, T37S, R2W; thence North and East along the Rogue River to the north boundary of Section 32, T35S, R1W; thence East along a line to the point of beginning.

(27) "Modified Source" means any source with a major modification as defined in OAR 340-200-0020.

(28) "Natural gas" means a naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in geologic formations beneath the earth's surface, of which the principal component is methane.

(29) "New Source" means any source not in existence prior to April 7, 1978 or any source not having a Permit as of April 7, 1978.

(30) "Odor" means that property of an air contaminant that affects the sense of smell.

(31) "Offset" is defined in OAR 340-200-0020.

(32) "Opacity" means the degree to which an emission reduces transmission of light and obscures the view of an object in the background as measured in accordance with the Department's Source Sampling Manual (January, 1992). Unless otherwise specified by rule, opacity must be measured in accordance with EPA Method 9. For all standards, the minimum observation period must be six minutes, though longer periods may be required by a specific rule or permit condition. Aggregate times (e.g. 3 minutes in any one hour) consist of the total duration of all readings during the observation period that exceed the opacity percentage in the standard, whether or not the readings are consecutive. Alternatives to EPA Method 9, such as a continuous opacity monitoring system (COMS), alternate Method 1 (LIDAR), or EPA Methods 22, or 203, may be used if approved in advance by the DEQ, in accordance with the Source Sampling Manual.

(33) "Open Burning" means burning conducted in such a manner that combustion air and combustion products may not be effectively controlled including, but not limited to, burning conducted in open outdoor fires, burn barrels, and backyard incinerators.

(34) "Particleboard" means matformed flat panels consisting of wood particles bonded together with synthetic resin or other suitable binders.

(35) "Particulate Matter" means all solid or liquid material, other than uncombined water, emitted to the ambient air as measured in accordance with the Department Source Sampling Manual. Particulate matter emission determinations must consist of the average of three separate consecutive runs. For sources tested using DEQ Method 5 or DEQ Method 7, each run must have a minimum sampling time of one hour, a maximum sampling time of eight hours, and a minimum sampling volume of 31.8 dscf. For sources tested using DEQ Method 8, each run must have a minimum sampling time of 15 minutes and must collect a minimum particulate sample of

100 mg. Wood waste boilers and charcoal producing plants must be tested with DEQ Method 5; veneer dryers, wood particle dryers, fiber dryers and press/cooling vents must be tested with DEQ Method 7; and air conveying systems must be tested with DEQ Method 8 (January, 1992).

(36) "Person" includes individuals, corporations, associations, firms, partnerships, joint stock companies, public and municipal corporations, political subdivisions, the state and any agencies thereof, and the federal government and any agencies thereof.

(37) "Press/Cooling Vent" means any opening through which particulate and gaseous emissions from plywood, particleboard, or hardboard manufacturing are exhausted, either by natural draft or powered fan, from the building housing the process. Such openings are generally located immediately above the board press, board unloader, or board cooling area.

(38) "Rebuilt Boiler" means a physical change after April 29, 1988, to a wood-waste boiler or its air-contaminant emission control system which is not considered a "modified source" and for which the fixed, depreciable capital cost of added or replacement components equals or exceeds fifty percent of the fixed depreciable cost of a new component which has the same productive capacity

(39) "Refuse" means unwanted material.

(40) "Refuse burning equipment" means a device designed to reduce the volume of solid, liquid, or gaseous refuse by combustion.

(41) “Wood Fuel-Fired Device” means a device or appliance designed for wood fuel combustion, including cordwood stoves, wood stoves and fireplace stove inserts, fireplaces, wood fuel-fired cook stoves, pellet stoves and combination fuel furnaces or boilers, which burn wood fuels.

(42) "Source" means any structure, building, facility, equipment, installation or operation, or combination thereof, which is located on one or more contiguous or adjacent properties and which is owned or operated by the same person, or by persons under common control.

(43) "Standard Conditions" means a temperature of 68° Fahrenheit (20° Celsius) and a pressure of 14.7 pounds per square inch absolute (1.03 Kilograms per square centimeter).

(44) "Standard cubic foot" means the amount of gas that would occupy a volume of one cubic foot, if the gas were free of uncombined water at standard conditions. When applied to combustion flue gases from fuel or refuse burning, "standard cubic foot" also implies adjustment of gas volume to that which would result at a concentration of 12% carbon dioxide or 50% excess air.

(45) "Veneer" means a single flat panel of wood not exceeding 1/4 inch in thickness formed by slicing or peeling from a log.

(46) "Veneer Dryer" means equipment in which veneer is dried.

(47) "Wood-fired Veneer Dryer" means a veneer dryer which is directly heated by the products of combustion of wood fuel in addition to or exclusive of steam or natural gas or propane combustion.

(48) "Wigwam Fired Burner" means a burner which consists of a single combustion chamber, has the general features of a truncated cone, and is used for the incineration of wastes.

(49) "Wood Waste Boiler" means equipment which uses indirect heat transfer from the products of combustion of wood waste to provide heat or power.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025
Hist.: DEQ 4-1978, f. & ef. 4-7-78; DEQ 9-1979, f. & ef. 5-3-79; DEQ 3-1980, f. & ef. 1-28-80; DEQ 14-1981, f. & ef. 5-6-81; DEQ 22-1989, f. & cert. ef. 9-26-89; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 4-1995, f. & cert. ef. 2-17-95; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 3-1996, f. & cert. ef. 1-29-96; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-030-0010; DEQ 6-2001, f. 6-18-01, cert. ef. 7-1-01; DEQ 1-2005, f. & cert. ef. 1-4-05

Klamath Falls Nonattainment Area

340-240-0500

Applicability

OAR 340-240-0500 through 340-240-0630 apply in the Klamath Falls Nonattainment Area beginning January 1, 2013.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0510

Opacity Standard

(1) Except as provided in section (2) of this rule, no person conducting a commercial or industrial activity may cause or permit the emission of any air contaminant into the atmosphere from any stationary source including fuel or refuse burning equipment, that exhibits equal to or greater than 20% opacity for a period or periods aggregating more than three minutes in any one hour.

(2) Exceptions to section (1) of this rule:

(a) This rule does not apply to fugitive emissions.

(b) This rule does not apply where the presence of uncombined water is the only reason for failure of any source to meet the requirements of this rule.

(c) For wood-fired boilers that were constructed or installed prior to June 1, 1970 and not modified since that time, visible emissions during grate cleaning operations must not equal or exceed 40% opacity for a period or periods aggregating more than three minutes in any one hour.

(A) Beginning June 30, 2013, this exception will only apply if the owner or operator conducts the grate cleaning in accordance with a grate cleaning plan that has been approved by DEQ.

(B) The owner or operator must prepare a grate cleaning plan in consultation with DEQ and submit the plan to DEQ by June 1, 2013.

(3) Opacity is determined in accordance with EPA Method 9 of Appendix A to 40 CFR Part 60 or a continuous opacity monitoring system (COMS) installed and operated in accordance with Performance Specification 1 of Appendix B to 40 CFR Part 60.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468.020 & ORS 468A.025.

340-240-0520

Control of Fugitive Emissions

(1) All sawmills, plywood mills and veneer manufacturing plants, particleboard and hardboard plants, asphalt plants, rock crushers, animal feed manufacturers, and other major industrial facilities as identified by the DEQ, must prepare and implement site-specific plans for the control of fugitive emissions. The plan must be submitted to the DEQ for approval in accordance with paragraph (5) below.

(2) Fugitive emission-control plans must identify reasonable measures to prevent particulate matter from becoming airborne, and avoid the migration of material onto the public road system. Such reasonable measures may include, but are not limited to the following:

(a) Paving all roads and areas on which vehicular traffic occurs at the facility;

(b) Scheduled application of water, or other suitable chemicals on unpaved roads, log storage or sorting yards, materials stockpiles, and other surfaces which can create airborne dust. Dust suppressant material must not adversely affect water quality;

(c) Periodic sweeping or cleaning of paved roads and other areas as necessary to prevent migration of material onto the public road system;

(d) Full or partial enclosure of materials stockpiled or other best management practices in cases where application of oil, water, or chemicals are not sufficient to prevent particulate matter from becoming airborne;

(e) Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;

(f) Adequate containment during sandblasting or other similar operations;

(g) Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne; and

(h) Procedures for the prompt removal of earth or other material from paved streets.

(3) Reasonable measures may include landscaping and using vegetation to reduce the migration of material onto public and private roadways or from becoming airborne.

(4) The facility owner or operator must supervise and control fugitive emissions and material that may become airborne caused by the activity of outside contractors delivering or removing materials at the site.

(5) For existing sources, the site-specific fugitive emissions control plan must be submitted to the DEQ by July 1, 2013. For sources that obtain their initial permit after December 14, 2012, the site-specific fugitive emission control plan must be submitted within 60 days after permit issuance. For portable sources that move into the nonattainment area after December 14, 2012, the site-specific fugitive emission control plan must be submitted with the relocation notification. Unless otherwise notified by the DEQ, the fugitive emission control plan will be approved by default within 30 days after the plan is submitted to the DEQ. The DEQ may request revisions to the plan at any time if fugitive emissions are not adequately controlled as demonstrated by visible emissions.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0530

Requirement for Operation and Maintenance Plans

(1) With the exception of basic and general permit holders, a permit holder must prepare and implement Operation and Maintenance Plans for non-fugitive sources of particulate matter.

(2) The purposes of the operation and maintenance plans are to:

(a) Reduce the number of upsets and breakdowns in particulate control equipment;

(b) Reduce the duration of upsets and downtimes; and

(c) Improve the efficiency of control equipment during normal operations.

(3) The operation and maintenance plans should consider, but not be limited to, the following:

(a) Personnel training in operation and maintenance;

(b) Preventative maintenance procedures, schedule and records;

(c) Logging of the occurrence and duration of all upsets, breakdowns and malfunctions which result in excessive emissions;

(d) Routine follow-up evaluation of upsets to identify the cause of the problem and changes needed to prevent a recurrence;

(e) Periodic source testing of pollution control units as required by the permit;

(f) Inspection of internal wear points of pollution control equipment during scheduled shutdowns; and

(g) Inventory of key spare parts.

(4) Existing sources must submit an Operation and Maintenance Plan to the DEQ by July 1, 2013. Sources obtaining an initial permit after December 14, 2012 must submit the Operation and Maintenance Plan within 60 days of permit issuance. The DEQ will notify sources within 30 days of plan submittal only if the Operation and Maintenance Plan is not approved. The DEQ may request revisions to the plan at any time if plans are not sufficient.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

340-240-0540

Compliance Schedule for Existing Industrial Sources

(1) Except as provided in sections (2) and (3) of this rule, compliance with applicable requirements of OAR 340-240-0500 through 340-240-0540 for a source that is built and located in the Klamath Falls Nonattainment Area prior to December 14, 2012 must be demonstrated by the owner or operator of the source as expeditiously as possible, but in no case later than the following schedule:

(a) No later than June 15, 2013, the owner or operator must submit Design Criteria and a Notice of Intent to Construct for emission-control systems for complying with OAR 340-240-0510 through 340-240-0540 for DEQ review and approval; If the DEQ disapproves the Design Criteria, the owner or operator must revise the Design Criteria to meet the DEQ's objections and submit the revised Design Criteria to the DEQ no later than one month after receiving the DEQ's disapproval;

(b) No later than three months after receiving the DEQ's approval of the Design Criteria, the owner or operator must submit to the DEQ copies of purchase orders for any emission-control devices;

(c) No later than eight months after receiving the DEQ's approval of the Design Criteria, the owner or operator must submit to the DEQ vendor drawings as approved for construction of any emission-control devices and specifications of any other major equipment in the emission-control system in sufficient detail to demonstrate that the requirements of the Design Criteria will be satisfied;

(d) No later than nine months after receiving the DEQ's approval of the Design Criteria, the owner or operator must begin construction of any emission-control devices;

(e) No later than fourteen months after receiving the DEQ's approval of Design Criteria, the owner or operator must complete construction in accordance with the Design Criteria;

(f) No later than October 15, 2014, the owner or operator must demonstrate compliance with the applicable requirements identified in OAR 340-240-0500 through 0540. Compliance with 340-240-0510 must be demonstrated by conducting a source test. Compliance with 340-240-0520 and 0530 must be demonstrated by implementing the approved plans.

(2) Section (1) of this rule does not apply if the owner or operator of the source has demonstrated by September 15, 2014 that the source is capable of being operated and is operated in continuous compliance with applicable requirements of OAR 340-240-0500 through 340-240-0540 and the DEQ has agreed with the demonstration in writing. The DEQ may grant an extension until April

15, 2015 for a source to demonstrate compliance under this section. The applicable requirements will be incorporated in the Permit issued to the source.

(3) The DEQ may adjust the schedule specified in subsections (1)(a) through (e) of this rule if necessary to ensure timely compliance with subsection (1)(f) of this rule or if necessary to conform to an existing compliance schedule with an earlier compliance demonstration date.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

340-240-0550

Requirements for New Sources When Using Residential Wood Fuel-Fired Device Offsets

(1) All new or modified sources subject to OAR 340-224-0050 or 340-224-0060 may opt to use wood fuel-fired device emission reductions from within the nonattainment or maintenance area to satisfy the offset requirements of OAR 340-225-0090(2):

(a) Offsets for decommissioning fireplaces and non-certified woodstoves (including fireplace inserts) are obtained at a ratio of at least 1:1 (i.e., one ton of emission reductions from fireplaces and non-certified wood stoves offsets one ton of emissions from a proposed new or modified industrial point source proposed to be located inside or impacting the non-attainment area or maintenance area);

(b) Offsets must be obtained from within the Klamath Falls Nonattainment Area and Maintenance Area; and

(c) The emission reductions offsets must be approved by the DEQ and comply with OAR 340-240-0560.

(2) The net air quality benefit analysis specified in OAR 340-225-0090(2)(a)(E) is not applicable to offsets meeting the criteria in (a) through (c) of section (1) of this rule.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

Real and Permanent $PM_{2.5}$ and PM_{10} Offsets

340-240-0560

(1) Annual emissions reductions offsets ($PM_{2.5}$ and PM_{10}) are determined as follows:

(a) For **fireplaces**, the emission reductions offsets for decommissioning the fireplace and replacing it with a:

(A) certified fireplace insert is 0.02 tons for each replaced device;

(B) pellet stove insert is 0.03 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.04 tons for each replaced device.

Note: As used in this rule, "Certified" includes catalytic and non-catalytic designs, unless otherwise specified.

(b) For **non-certified fireplace inserts**, the emission reduction for replacing the heating device with a:

(A) certified fireplace insert is 0.02 tons for each replaced device;

(B) pellet stove is 0.04 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.04 tons for each replaced device

(c) For **conventional (non-certified) woodstoves**, the emission reduction for replacing the heating device with a:

(A) certified woodstove (including both catalytic and non-catalytic designs) or certified fireplace insert is 0.03 tons for each replaced device; or

(B) pellet stove is 0.05 tons for each replaced device; or

(C) alternative non-wood burning heating system is 0.06 tons for each replaced device

(d) For **certified woodstoves** (including both catalytic and non-catalytic designs), the emission reduction for replacing the heating device with a:

(A) pellet stove is 0.03 tons for each replaced device; or

(B) alternative non-wood burning heating system is 0.04 tons for each replaced device

(2) For the emission reductions identified in section (1) to be considered permanent, the person responsible for taking credit for the emission reductions must obtain and maintain the following records for at least 5 years from the date that the proposed industrial point source commences operation:

(a) the address of the residence where the emission reduction occurred;

(b) the date that the emission reduction was achieved;

(c) purchase and installation records for certified woodstoves, certified inserts, or alternative non-wood burning heating systems;

(d) records for permanently decommissioning fireplaces, if applicable; and

(e) disposal records for non-certified woodstoves or fireplace inserts removed.

(3) The records identified in section (2) may be provided by a third party authorized and monitored by the DEQ to procure the emission reductions identified in section (1).

(4) All emission reductions must be achieved prior to startup of the proposed source using the emission reductions as offsets in the permitting action specified in OAR 340-224-0050 or 340-224-0060.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

Klamath Falls Nonattainment Area Contingency Measures

340-240-0570

Applicability

OAR 340-240-0570 through 340-240-0630 apply to the Klamath Falls Nonattainment Area for $PM_{2.5}$ should the area not achieve attainment by the applicable attainment date established pursuant to 42 U.S.C. 7502(a)(2).

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.480

340-240-0580

Existing Industrial Sources Control Efficiency

The owner or operator of an Oregon Title V Operating Permit program source, as defined in OAR 340-200-0020 may not remove or modify existing control devices unless the new control device has the same or better $PM_{2.5}$ control efficiency as the old device.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.480

340-240-0610

Continuous Monitoring for Industrial Sources

(1) The owner or operator of an Oregon Title V Operating Permit program source, as defined in OAR 340-200-0020 must install and operate instrumentation for measuring and recording emissions or the parameters that affect the emission of particulate matter from wood-fired boilers by June 1, 2015, to ensure that the sources and the air pollution control equipment are operated at all times at their full efficiency and effectiveness so that the emission of particulate matter is kept at the lowest practicable level. Continuous monitoring equipment and operation must be in accordance with the Department's Continuous Monitoring Manual.

(2) At a minimum, the monitoring required under paragraph (1) of this section must include:

(a) Continuous monitoring of control device parameters for any wood- fired boiler.

(b) Continuous monitoring of opacity for any wood- fired boiler not controlled by a wet scrubber.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[Publications: Publications referenced are available from the agency.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468.020 & 468A.025

340-240-0620

Contingency Measures: New Industrial Sources

New industrial sources must comply with OAR 340-240-0570 through 340-240-0610 immediately upon receiving an Air Contaminant Discharge Permit or an Oregon Title V Operating Permit.

[**NOTE:** These rules are included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.025

340-240-0630

Contingency Enhanced Curtailment of Use of Solid Fuel Burning Devices and Fireplaces

(1) Beginning on November 1 of each year and continuing through and including February 28 of the following year, no fireplace, as defined by OAR 340-262-0450, may emit more than 5.1 grams per kilogram of particulate emissions. A fireplace shall be deemed in compliance with this emission standard if it has been certified either in accordance with ASTM international standard test method E2558 or by the DEQ pursuant to OAR 340-262-0500. A fireplace that is not certified as described in this rule shall be presumed not to comply with this rule.

(2) The DEQ may approve exemptions from compliance with section (1) of this rule on days when the DEQ or the Klamath County Health Department has issued a local Klamath Falls Advisory Call indicating that it is a good ventilation day (a "green day") that are also state holidays or days that the county has designated as a "special occasion day". Any person who wishes to receive such an exemption must file an exemption application with the DEQ and the DEQ must have approved the exemption request prior to the green day.

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.010 to 468A.025

DIVISION 262

HEAT SMART PROGRAM FOR RESIDENTIAL WOODSTOVES AND OTHER SOLID FUEL HEATING DEVICES

340-262-1000

Wood Burning Contingency Measures for PM2.5 Nonattainment Areas

(1) Applicability

This rule applies to any area classified as a nonattainment area for PM2.5 that does not achieve attainment by the applicable Clean Air Act deadline.

(2) No owner of a residential solid fuel burning device shall allow the appliance to burn creating opacity greater than 20% opacity for more than three minutes in any 60-minute period including startup time.

Stat. Auth.: ORS 468 & 468A
Stats. Implemented: ORS 468A.020, 468A.025 & 468A.460 - 468A.515

DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION 264

RULES FOR OPEN BURNING

340-264-0040

Exemptions, Statewide

Except for the provisions contained in OAR 340-264-0050 and 340-264-0060, this Division does not apply to:

(1) Recreational fires and ceremonial fires, for which a fire is appropriate.

(2) Barbecue equipment used in connection with any residence.

(3) Fires set or permitted by any public agency when such fire is set or permitted in the performance of its official duty for the purpose of weed abatement, prevention or elimination of a fire hazard, or a hazard to public health or safety, or for instruction of employees in the methods of fire fighting, which in the opinion of the public agency is necessary. Every effort will be made by the public agency to conduct this burning during good smoke dispersal conditions and specifically avoiding periods during Air Pollution Advisories. The agency will adjust its schedule for setting such fires for better smoke dispersal if necessary. Open burning fires otherwise exempt from the requirements of this division are still subject to the requirements and prohibitions of local jurisdictions and the State Fire Marshall.

(4) Agricultural open burning pursuant to ORS 468A.020. Agricultural open burning is still subject to the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(5) Open field burning, propane flaming, and stack and pile burning in the Willamette Valley between the crests of the Cascade and Coast Ranges pursuant to OAR chapter 340, division 266, Rules for Field Burning.

(6) Slash burning on forest land or within one-eighth mile of forest land permitted under the Oregon Smoke Management Program regulated by the Department of Forestry pursuant to ORS 477.515.

(7) Fires set pursuant to permit for the purpose of instruction of employees of private industrial concerns in methods of fire fighting, or for civil defense instruction.

(8) Fires set for the purpose of disposal of dry tumbleweed plants (typically Russian Thistle and Tumbleweed Mustard plants) that have been broken off, and rolled about, by the wind.

(9) Agricultural burning for disease or pest control when the fire is set or authorized in writing by the Department of Agriculture.

(10) When caused by an authorized representative of the Department of Agriculture, open burning of carcasses of animals that have died or been destroyed because of an animal disease emergency.

NOTE: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.

Stat. Auth.: ORS 468, 468A & 477
Stats. Implemented: ORS 468A.025
Hist.: DEQ 123, f. & ef. 10-20-76; DEQ 23-1979, f. & ef. 7-5-79; DEQ 27-1981, f. & ef. 9-8-81; DEQ 10-1984, f. 5-29-84, ef. 6-16-84; DEQ 6-1992, f. & cert. ef. 3-11-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0035; DEQ 21-2000, f. & cert. ef. 12-15-00; DEQ 12-2008, f. & cert. ef. 9-17-08

340-264-0078

Open Burning Control Areas

Generally, areas around the more densely populated locations in the state and valleys or basins that restrict atmospheric ventilation are designated "Open Burning Control Areas". The practice of open burning may be more restrictive in open burning control areas than in other areas of the state. The specific open burning restrictions associated with these open burning control areas are listed in OAR 340-264-0100 through 340-264-0170 by county. The general locations of open burning control areas are depicted in **Figures 2** through **5**. The open burning control areas of the state are defined as follows:

(1) All areas in or within three miles of the incorporated city limit of all cities with a population of 4,000 or more.

(2) The Coos Bay Open Burning Control Area is located in Coos County with boundaries as generally depicted in **Figure 3** of this rule. The area is enclosed by a line beginning at a point approximately 4-1/2 miles WNW of the City of North Bend, at the intersection of the north boundary of T25S, R13W, and the coastline of the Pacific Ocean; thence east to the NE corner of T25S, R12W; thence south to the SE corner of T26S, R12W; thence west to the intersection of the south boundary of T26S, R14W and the coastline of the Pacific Ocean, thence northerly and easterly along the coastline of the Pacific Ocean to its intersection with the north boundary of T25S, R13W, the point of beginning.

(3) The Rogue Basin Open Burning Control Area is located in Jackson and Josephine Counties with boundaries as generally depicted in Figure 4. The area is enclosed by a line beginning at a point approximately 4-1/2 miles NE of the City of Shady Cove at the NE corner of T34S, R1W, Willamette Meridian, thence south along the Willamette Meridian to the SW corner of T37S, R1W; thence east to the NE corner of T38S, R1E; thence south to the SE corner of T38S, R1E; thence east to the NE corner of T39S, R2E; thence south to the SE corner of T39S, R2E; thence west to the SW corner of T39S, R1E; thence NW along a line to the NW corner of T39S, R1W; thence west to the SW corner of T38S, R2W; thence north to the SW corner of T36S, R2W; thence west to the SW corner of T36S, R4W; thence south to the SE corner of T37S, R5W; thence west to the SW corner of T37S, R6W; thence north to the NW corner of T36S, R6W; thence east to the SW corner of T35S, R1W; thence north to the NW corner of T34S, R1W; thence east to the point of beginning.

(4) The Umpqua Basin Open Burning Control Area is located in Douglas County with boundaries as generally depicted in **Figure 5**. The area is enclosed by a line beginning at a point approximately four miles ENE of the City of Oakland, Douglas County, at the NE corner of T25S, R5W, Willamette Meridian, thence south to the SE corner of T25S, R5W; thence east to the NE Corner of T26S, R4W; thence south to the SE corner of T27S, R4W; thence west to the SE corner of T27S, R5W; thence south to the SE corner of T30S, R5W; thence west to the SW corner of T30S, R6W; thence north to the NW corner of T29S, R6W; thence west to the SW corner of T28S, R7W thence north to the NW corner of T27S, R7W; thence east to the NE corner of T27S, R7W; thence north to the NW corner of T26, R6W; thence east to the NE corner of T26S, R6W; thence north to the NW corner of T25S, R5W; thence east to the point of beginning.

(5) The boundaries of the Willamette Valley Open Burning Control Area are generally depicted in Figures 1 and 2. The area includes all of Benton, Clackamas, Linn, Marion, Multnomah, Polk, Washington and Yamhill Counties and that portion of Lane County east of Range 7 West.

(6) The Klamath Basin Open Burning Control Area is located in Klamath County with boundaries generally depicted in Figure 6. The area is enclosed by a line beginning at the corner common to northwest corner of Section 31, Township 37 South, Range 9 East of the Willamette Meridian and southwest corner of Section 30 T37S, R9E W.M.; thence east approximately two miles to the northeast corner of Section 32; thence south approximately four miles to the southeast corner of Section 17, T38S, R9E W.M.; thence east approximately one mile to the southwest corner of Section 15,; thence north approximately one mile to the northwest corner of Section 15; thence east approximately 2 miles to the northeast corner of Section 14; thence south approximately one mile to the northwest corner of section 24; thence east approximately one mile to the northeast corner of Section 24; thence south approximately three miles to the southeast corner of Section 36; thence east approximately four miles to the northeast corner of Section 3, T39S, R10E W.M.; thence south approximately three miles to the southeast corner of Section 15; thence west approximately two miles to the southwest corner of Section16; thence south approximately two miles to the southeast corner of Section 29; thence west approximately five miles to the southwest corner of Section 27, T39S, R9E; thence north approximately one mile to the northeast corner of Section 27; thence west approximately four miles to the southwest corner of Section 24, T39S R8E; thence north approximately two miles to the northeast corner of Section 13; thence west approximately one mile to the southwest corner of Section 11; thence north approximately four miles to the northwest corner of Section 26 T38S, R8E; thence west one mile to the southwest corner of Section 22; thence north approximately one mile to the northwest corner of Section 22; thence west approximately one mile to the southwest corner of Section 16; thence north approximately one mile to the northeast corner of Section 16; thence west approximately one mile to the southwest corner of Section 8; thence north approximately two miles to the northwest corner of Section 5; thence east to the northeast corner of Section 1; thence north approximately one mile to the point of beginning.

(7) "Special Open Burning Control Areas" are established around cities within the Willamette Valley Open Burning Control Area. The boundaries of these special open burning control areas are determined as follows:

(a) Any area in or within three miles of the boundary of any city of more than 1,000 but less than 45,000 population;

(b) Any area in or within six miles of the boundary of any city of 45,000 or more population;

(c) Any area between areas established by this rule where the boundaries are separated by three miles or less;

(d) Whenever two or more cities have a common boundary, the total population of these cities will determine the applicability of subsection (a) or (b) of this section and the municipal boundaries of each of the cities must be used to determine the limit of the special open burning control area.

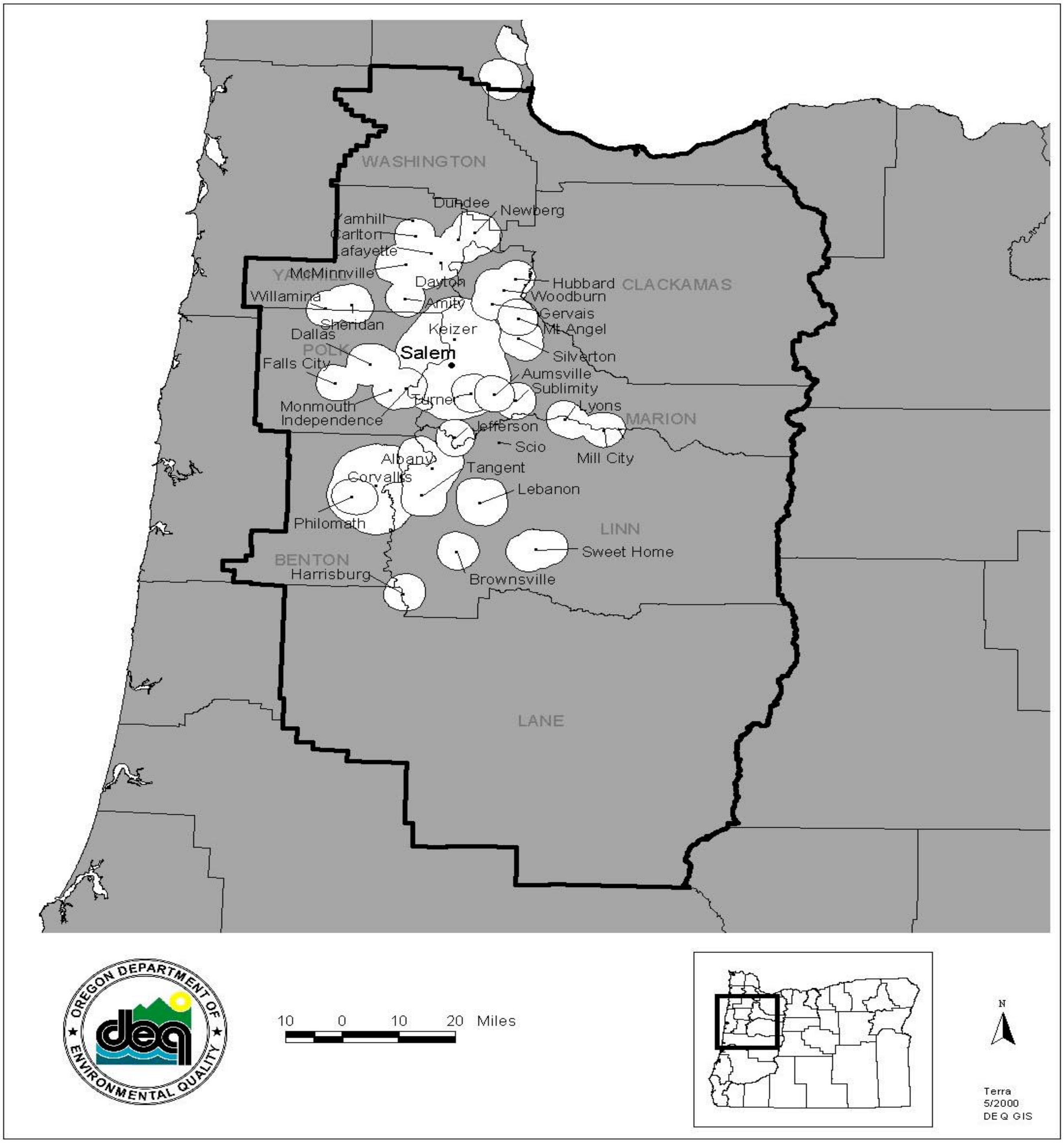
(8) A domestic burning ban area around the Portland metropolitan area is generally depicted in **Figure 1A**. This area encompasses parts of the special control area in Clackamas, Multnomah and Washington Counties. Specific boundaries are listed in OAR 340-264-0120(5), 340-264-0130(5) and 340-264-0140(5). Domestic burning is prohibited in this area except as allowed pursuant to OAR 340-264-0180.

[**NOTE**: This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

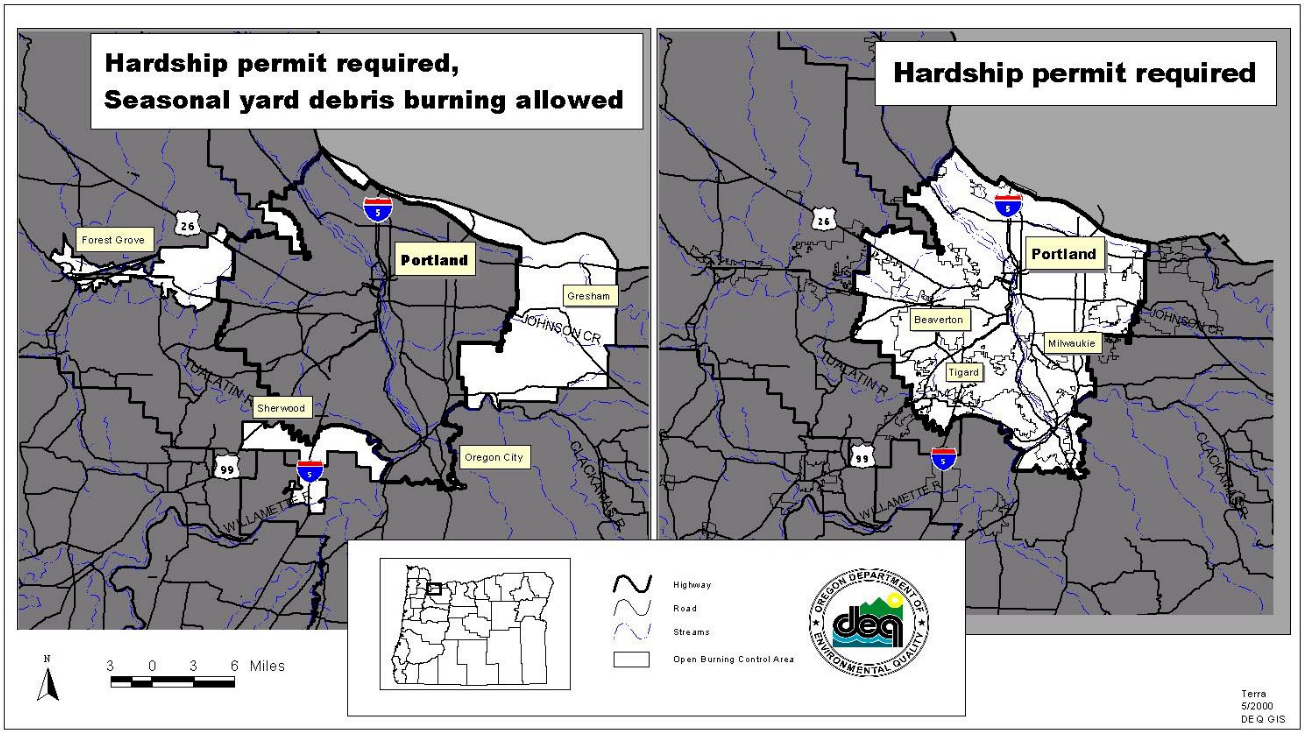
[ED. NOTE: The Figure(s) referenced in this rule is not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025
Hist.: DEQ 27-1981, f. & ef. 9-8-81; DEQ 10-1984, f. 5-29-84, ef. 6-16-84; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0115; DEQ 21-2000, f. & cert. ef. 12-15-00 Renumbered from 340-264-0200.

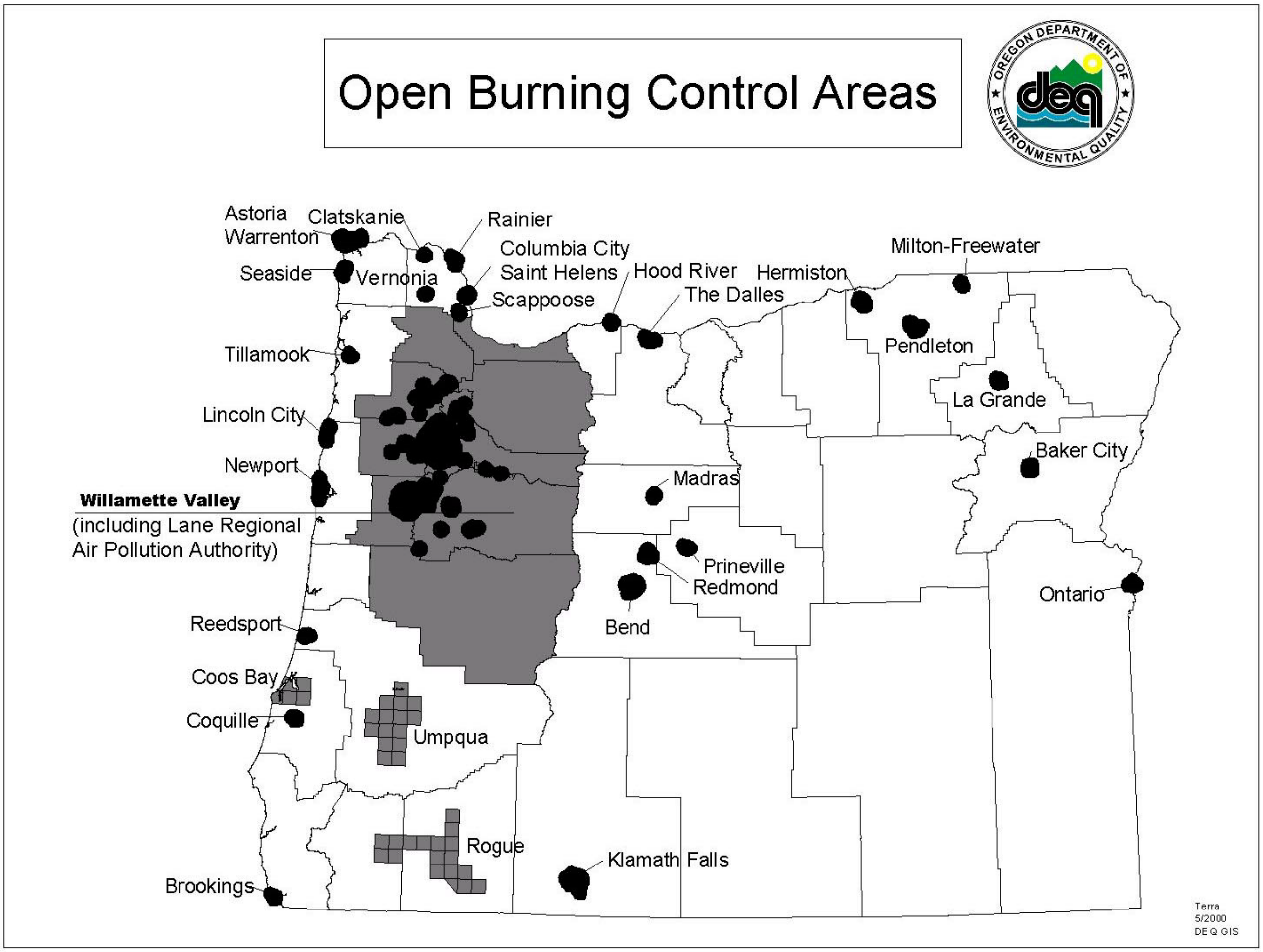
340-264-0078
Figure 1
WILLAMETTE VALLEY OPEN BURNING CONTROL AREA



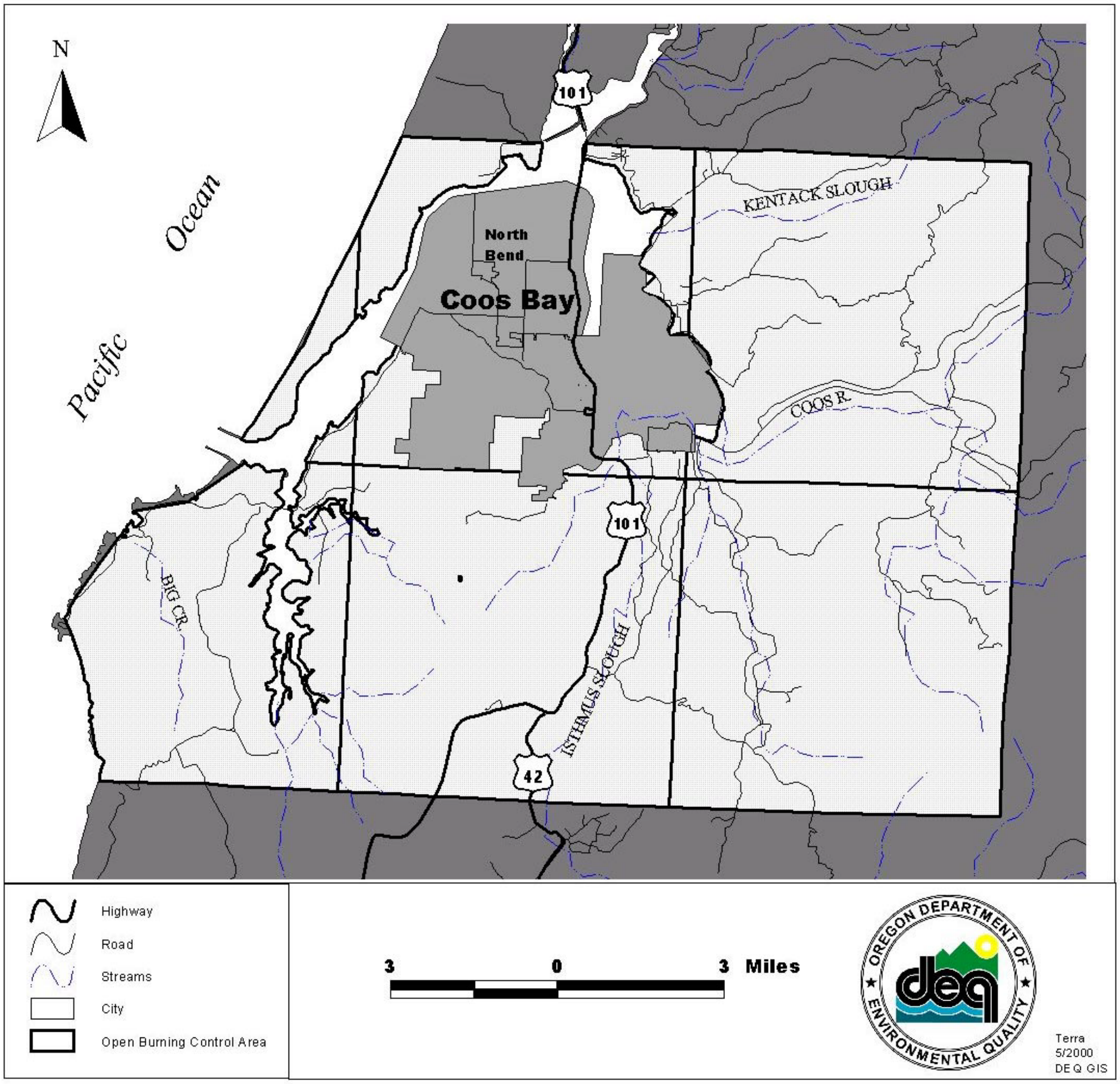
340-264-0078
Figure 1A
METROPOLITAN AREA BACKYARD BURNING BOUNDARIES



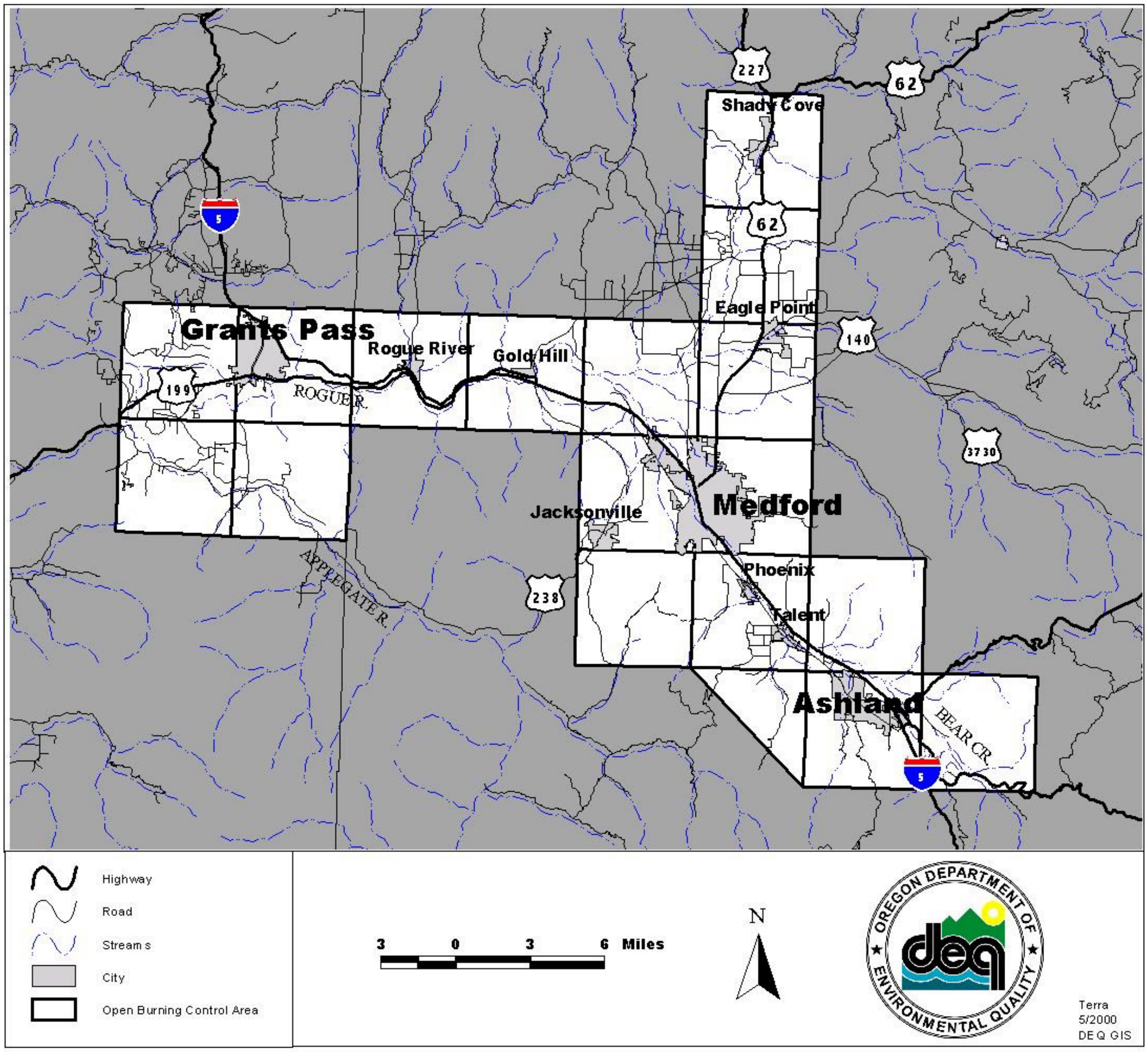
340-264-0078
Figure 2



340-264-0078
Figure 3
COOS BAY OPEN BURNING CONTROL AREA

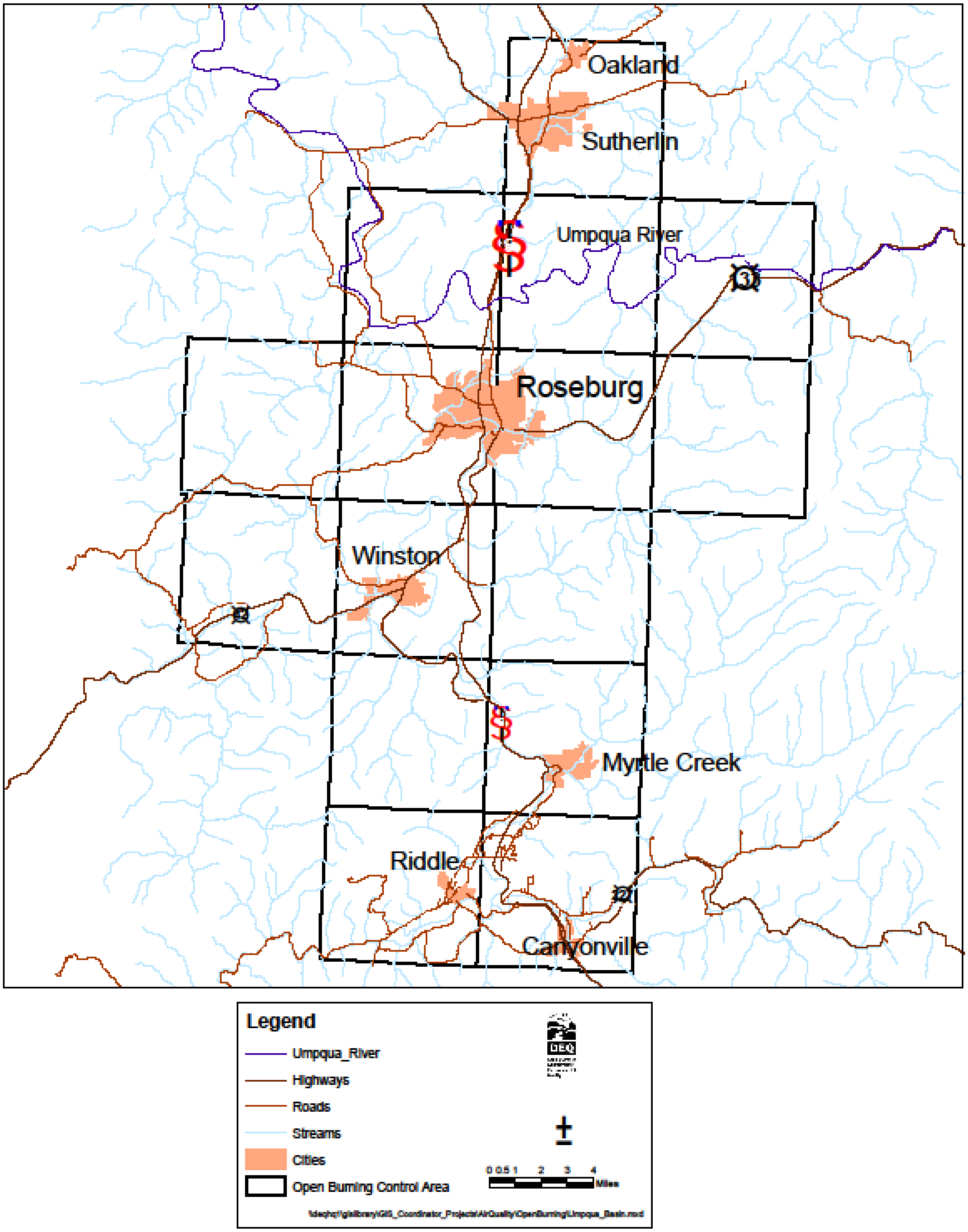


340-264-0078
Figure 4
ROGUE BASIN OPEN BURNING CONTROL AREA



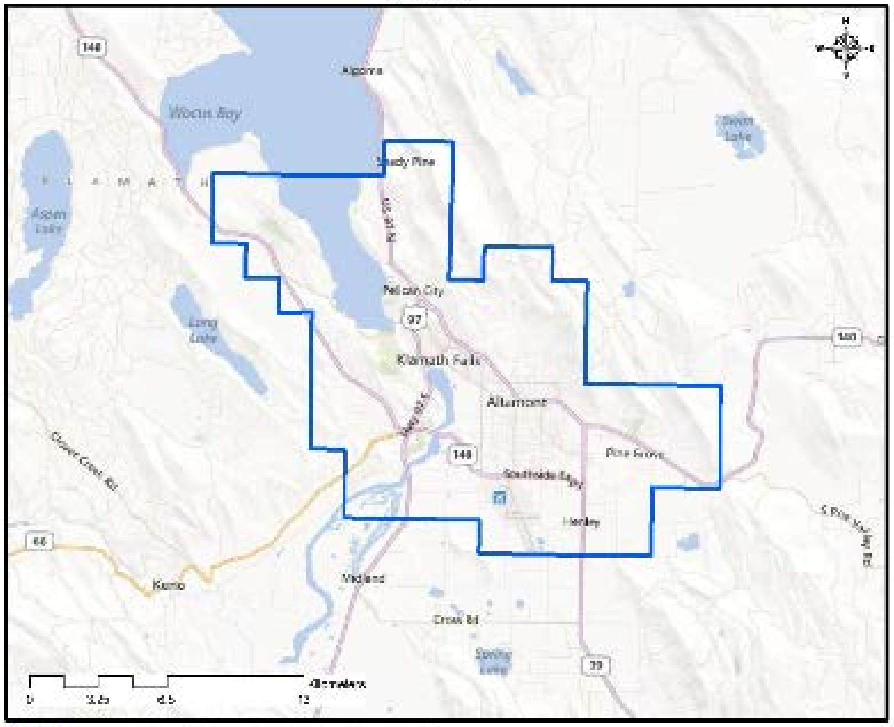
340-264-0078
Figure 5

Umpqua Basin Open Burning Control Area



340-264-0078

Figure 6



Klamath Basin Open Burning Control Area

340-264-0080

County Listing of Specific Open Burning Rules

Except as otherwise provided, in addition to the general requirements and prohibitions listed in OAR 340-264-0050 and 340-264-0060, specific prohibitions of Agricultural, Commercial, Construction, Demolition, Domestic, and Industrial open burning are listed in separate rules for each county. The following list identifies the rule containing prohibitions of specific types of open burning applicable to a given county:

(1) Baker County -- OAR 340-264-0100.

(2) Benton County -- OAR 340-264-0110.

(3) Clackamas County -- OAR 340-264-0120.

(4) Clatsop County -- OAR 340-264-0100.

(5) Columbia County -- OAR 340-264-0150.

(6) Coos County -- OAR 340-264-0170.

(7) Crook County -- OAR 340-264-0100.

(8) Curry County -- OAR 340-264-0100.

(9) Deschutes County -- OAR 340-264-0100.

(10) Douglas County -- OAR 340-264-0170.

(11) Gilliam County -- OAR 340-264-0100.

(12) Grant County -- OAR 340-264-0100.

(13) Harney County -- OAR 340-264-0100.

(14) Hood River County -- OAR 340-264-0100.

(15) Jackson County -- OAR 340-264-0170.

(16) Jefferson County -- OAR 340-264-0100.

(17) Josephine County -- OAR 340-264-0170.

(18) Klamath County -- OAR 340-264-0175.

(19) Lake County -- OAR 340-264-0100.

(20) Lane County -- OAR 340-264-0160.

(21) Lincoln County -- OAR 340-264-0100.

(22) Linn County -- OAR 340-264-0110.

(23) Malheur County -- OAR 340-264-0100.

(24) Marion County -- OAR 340-264-0110.

(25) Morrow County -- OAR 340-264-0100.

(26) Multnomah County -- OAR 340-264-0130.

(27) Polk County -- OAR 340-264-0110.

(28) Sherman County -- OAR 340-264-0100.

(29) Tillamook County -- OAR 340-264-0100.

(30) Umatilla County -- OAR 340-264-0100.

(31) Union County -- OAR 340-264-0100.

(32) Wallowa County -- OAR 340-264-0100.

(33) Wasco County -- OAR 340-264-0100.

(34) Washington County -- OAR 340-264-0140.

(35) Wheeler County-- OAR 340-264-0100.

(36) Yamhill County -- OAR 340-264-0110.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented ORS 468A.025
Hist.: DEQ 123, f. & ef. 10-20-76; DEQ 23-1979, f. & ef. 7-5-79; DEQ 1-1981(Temp), f. & ef. 1-9-81; DEQ 7-1981(Temp), f. & ef. 2-17-81; DEQ 8-1981(Temp), f. & ef. 3-13-81; DEQ 27-1981, f. & ef. 9-8-81; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0045; DEQ 21-2000, f. & cert. ef. 12-15-00

Open Burning Requirements

340-264-0100

Baker, Clatsop, Crook, Curry, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Lincoln, Malheur, Morrow, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco and Wheeler Counties

Open burning requirements for the counties of Baker, Clatsop, Crook, Curry, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Lincoln, Malheur, Morrow, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco and Wheeler:

(1) Industrial open burning is prohibited, except as provided in OAR 340-264-0180.

(2) Agricultural open burning is allowed subject to OAR 340-264-0050(5) and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(3) Commercial open burning:

(a) Commercial open burning is prohibited within Lincoln County except as provided in OAR 340-264-0180.

(b) Commercial open burning is allowed outside of open burning control areas subject to OAR 340-264-0050, 340-264-0060 and 340-264-0070, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal. Commercial open burning, unless authorized pursuant to 340-264-0180, is prohibited within three miles of the corporate city limits of the following open burning control areas. In addition, commercial open burning is prohibited in any area meeting the test in 340-264-0078(1):

(c) In Baker County, the City of Baker City;

(d) In Clatsop County, the Cities of Astoria, Seaside and Warrenton;

(e) In Crook County, the City of Prineville;

(f) In Curry County, the City of Brookings;

(g) In Deschutes County, the Cities of Bend and Redmond;

(h) In Hood River County, the City of Hood River;

(i) In Jefferson County, the City of Madras;

(j) In Malheur County, the City of Ontario;

(k) In Tillamook County, the City of Tillamook;

(l) In Umatilla County, the Cities of Hermiston, Milton-Freewater and Pendleton;

(m) In Union County, the City of La Grande;

(n) In Wasco County, the City of The Dalles.

(4) Construction and Demolition open burning outside of an open burning control area is allowed subject to the requirements and prohibitions of local jurisdictions, the State Fire Marshal, OAR 340-264-0050, 340-264-0060, and 340-264-0070. Construction and Demolition open burning, unless authorized pursuant to OAR 340-264-0180, is prohibited within three miles of the corporate city limits of the following open burning control areas. In addition, construction and demolition burning is prohibited in any area meeting the standard in OAR 340-264-0078(1):

(a) In Baker County, the City of Baker City;

(b) In Clatsop County, the Cities of Astoria, Seaside and Warrenton;

(c) In Crook County, the City of Prineville;

(d) In Curry County, the City of Brookings;

(e) In Deschutes County, the Cities of Bend and Redmond;

(f) In Hood River County, the City of Hood River;

(g) In Jefferson County, the City of Madras;

(h) In Lincoln County, the Cities of Lincoln City and Newport;

(i) In Malheur County, the City of Ontario;

(j) In Tillamook County, the City of Tillamook;

(k) In Umatilla County, the Cities of Hermiston, Milton-Freewater and Pendleton;

(l) In Union County, the City of La Grande;

(m) In Wasco County, the City of The Dalles.

(5) Domestic open burning is allowed subject to the requirements and prohibitions of local jurisdictions, the State Fire Marshal, and OAR 340-264-0050, 340-264-0060 and 340-264-0070.

(6) Slash burning on forest land within open burning control areas not regulated by the Department of Forestry under the Smoke Management Plan is prohibited, except as provided in OAR 340-264-0180.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025
Hist.: DEQ 27-1981, f. & ef. 9-8-81; DEQ 6-1992, f. & cert. ef. 3-11-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 14-1999, f. & cert. ef. 10-14-99, Renumbered from 340-023-0055; DEQ 21-2000, f. & cert. ef. 12-15-00

340-264-0175

Klamath County

Open burning requirements for Klamath County:

(1) Open burning control areas:

(a) The Klamath Basin open burning control area as generally described in OAR 340-264-0078(6) and depicted in **Figure 6** is located in Klamath County;

(2) Industrial open burning is prohibited unless authorized pursuant to OAR 340-264-0180.

(3) Agricultural open burning is allowed subject to OAR 340-264-0050(5) and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(4) Commercial open burning is prohibited within the Klamath Basin open burning control areas and within three miles of the corporate city limits of other areas that meet the standard in OAR 340-264-0078(1), unless authorized pursuant to 340-264-0180. Commercial open burning is allowed in all other areas of this county subject to 340-264-0050, 340-264-0060 and 340-264-0070 and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(5) Construction and Demolition open burning is prohibited within the Klamath Basin open burning control areas and within three miles of the corporate city limits of other areas that meet the standard within OAR 340-264-0078(1), unless authorized pursuant to 340-264-0180. Construction and Demolition open burning is allowed in other areas of these counties subject to 340-264-0050, 340-264-0060 and 340-264-0070, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(6) Domestic open burning is allowed subject to OAR 340-264-0050, 340-264-0060, 340-264-0070 and section (7) of this rule, and the requirements and prohibitions of local jurisdictions and the State Fire Marshal.

(7) Slash burning on forest land within open burning control areas not regulated by the Department of Forestry under the Smoke Management Program is prohibited, except as provided in OAR 340-264-0180.

[**NOTE:** This rule is included in the State of Oregon Clean Air Act Implementation Plan as adopted by the Environmental Quality Commission under OAR 340-200-0040.]

[ED. NOTE: The figures referenced in this rule are not printed in the OAR Compilation. Copies are available from the agency.]

Stat. Auth.: ORS 468 & ORS 468A
Stats. Implemented: ORS 468A.025

Klamath Falls Particulate Matter ($PM_{2.5}$) Attainment Plan

Interagency Agreement to Reduce Particulate Emissions from Winter Road Sanding

May, 2012

This agreement, effective the date shown on the signature page, is between Oregon Department of Environmental Quality (ODEQ), Oregon Department of Transportation (ODOT), Klamath County, and City of Klamath Falls, for the purpose of minimizing adverse air quality impacts related to particulate matter from winter road sanding activity.

Objective

This agreement recognizes that the Klamath Falls Nonattainment Area has violated the 24-hour National Ambient Air Quality Standard (NAAQS) for fine particulate matter (PM2.5). The objective of this agreement is to minimize air quality impacts from winter road sanding in the Klamath Falls PM2.5 Non-Attainment Area (map provided in Appendix A). Road dust generated from winter traction materials applied during the snow and ice season is entrained and suspended in air in a form of fine fraction particulates contributing to reduced air quality.

Procedure

In response to this issue, Klamath County, City of Klamath Falls, and ODOT agree to apply measures to mitigate the generation of road dust associated with winter traction materials including the material selection, application, and collection. The measures will be applied only when their effects do not compromise safety.

Klamath County, City of Klamath Falls, and ODOT agree to:

- Select durable material that is less likely to breakdown through road wear whenever available and cost effective.
- When deemed appropriate and as funding permits, apply de-icing agents in conjunction with abrasive material to spread it more easily and to help anchor the abrasives into the ice or snow on the road's surface.
- Limit the amount of material used and only sand intersections, hills, curves, and known trouble areas on roads that are critical for safety.
- Apply materials with appropriate equipment to limit spillage and redundant application of materials. Calibrate equipment at least one time per year for optimum application rates and avoid applying more material than necessary for safety.
- Schedule the removal of abrasive materials as early as possible to shorten the period of dust generation. It is expected to be done at least once a year at the end of season, or more often if possible.

- Ensure that only South Coast Air Management District certified sweepers or equivalent technologies are purchased in future for use in the Klamath Falls PM2.5 Non-Attainment Area. The current list of certified sweepers approved is in Appendix B. Equivalent sweepers are listed in Appendix C.

Reporting

- At the end of the winter vehicle traction season, or by June 30, of each year, submit to DEQ for the nonattainment area the following information:
  - Approximate amount of sanding material applied during the previous winter season.
  - Approximate amount of sanding material picked up during the previous winter season.
  - Types of equipment used to pick up sanding material.
  - Alternatives to sanding used, if any
    - Include anti-icing agents used
    - Geothermal roadways heated where sanding was not used
    - Other alternatives
  - Other methods used to reduce re-entrained road dust from roadways within the nonattainment area.
  - Road paving.

This agreement is entered into on the final date all signatures are signed:

For the Department of Environmental Quality ______ 6/26/12
JOAN STEVENS-SCHWENGER FOR ANDY GINSBURG
Andrew Ginsburg Date

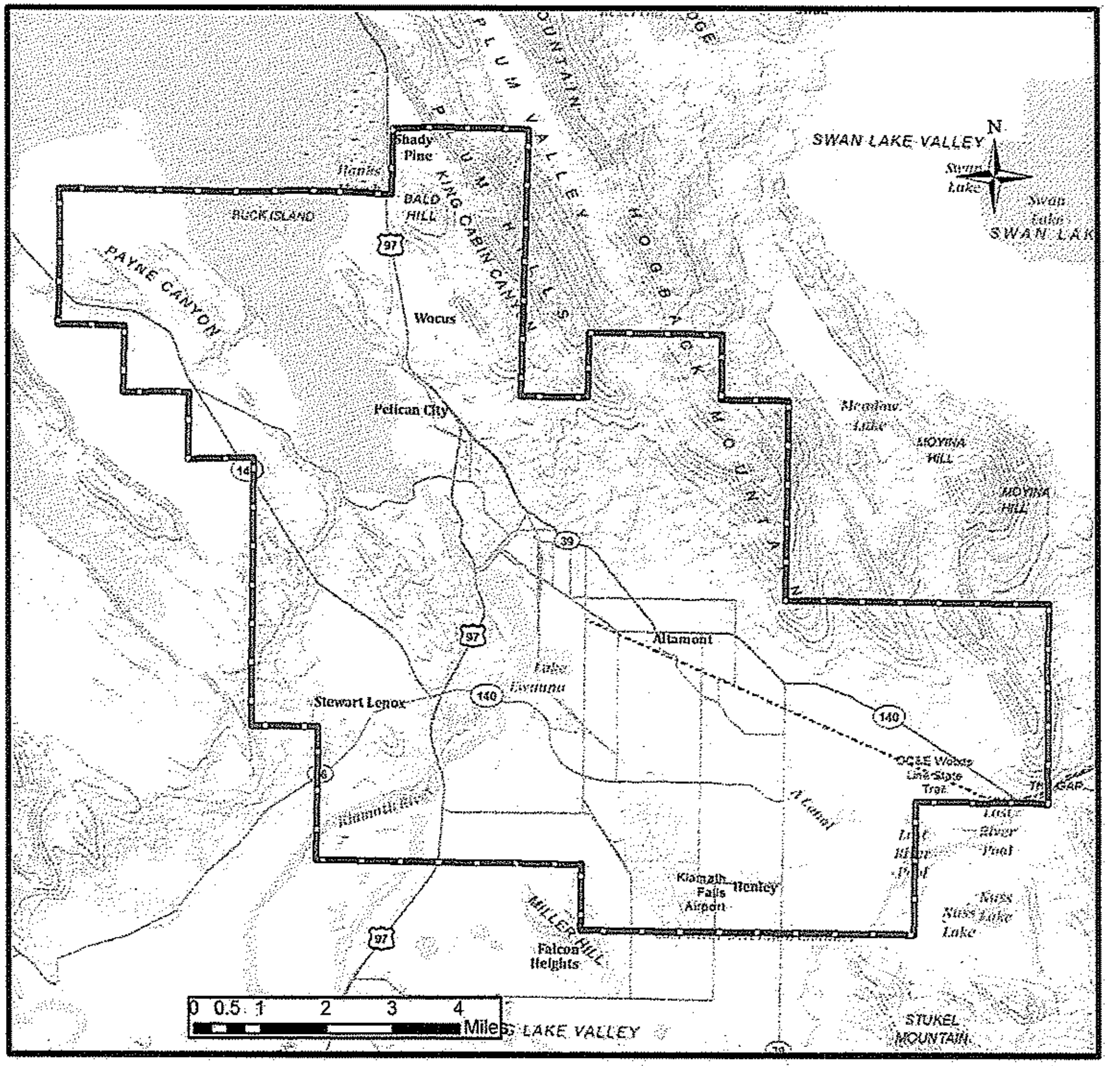
For the City of Klamath Falls ______ 5/30/12
Mark Willrett Date

For Klamath County ______ MAY 07 2012
Stan Strickland Date

For the Oregon Department of Transportation ______ 5-18-12
Michael Stinson Date

APPENDIX A

Klamath Falls



Date: 8/9/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\OpenBurning_Other\KFalls_OpenBurningOther_GIS\2008_KFalls_OpenBurningOther.mxd

Legend

Non-Attainment Area

APPENDIX B

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE 1186 CERTIFIED* STREET SWEEPERS AS OF MARCH 11, 2010 THE FOLLOWING IS A LIST OF STREET SWEEPING EQUIPMENT THAT HAS CURRENTLY BEEN CERTIFIED FOR SCAQMD RULE 1186. ALL CERTIFIED EQUIPMENT MUST BE OPERATED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. FUTURE TESTING MAY QUALIFY ADDITIONAL EQUIPMENT. CALL 1 (800) CUT-SMOG FOR THE CURRENT LIST. * In order to ensure compliance with Rule 1186 requirements, all certified equipment must be operated and maintained in accordance with the manufacturer's specifications. End users are responsible for ensuring that the dust control systems are in place for each certified sweeper. Note: The make and model of the sweeper must have the dust control system(s) specified above to be in compliance. (Standard or older models may not have all the systems). Please contact the manufacturer if you would like to ensure that your sweeper(s) are Rule 1186 compliant. 1

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
CHALLENGER MANUFACTURING	CHALLENGER	☐ THREE (3) 0.03 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ FOUR (4) 0.03 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BETWEEN THE MAIN BROOM AND THE CONVEYOR ☐ WATER PUMP TO PROVIDE 25 POUNDS PER SQUARE INCH WATER PRESSURE DURING OPERATION; MAXIMUM OF 45 POUNDS PER SQUARE INCH
ELGIN	AIR CUB (LX/DX) CROSSWIND FURY	☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ LOUVERED CENTIFUGAL DUST SEPARATOR ☐ ONE (1) 0.06 INCH DIAMETER ORIFICE NOZZLE CENTRALLY LOCATED ABOVE FAN INLET IN THE HOPPER ☐ TWO (2) 0.047 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SUCTION TUBE ☐ FOUR (4) 0.051 INCH DIAMETER ORIFICE

		NOZZLES LOCATED AT EACH SIDE BROOM ☐ PUMP TO PROVIDE 40 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	CROSSWIND J	☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ S-TRAP CENTRIFUGAL SEPARATOR ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE HOPPER ☐ THREE (3) 0.059 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE SUCTION TUBE ☐ THREE (3) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
	MODEL*	**DUST CONTROL SYSTEMS***
ELGIN	PELICAN P & S PELICAN SE (WET SUPPRESSION)	☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BETWEEN THE MAIN BROOM AND THE CONVEYOR ☐ TWO (2) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	PELICAN P (WATERLESS SUPPRESSION)	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ TWO CENTRIFUGAL DUST EVACUATION FANS ☐ SYNTHETIC MULTI-POCKET FILTER WITH HYDRAULIC SHAKER FOR DUST REMOVAL

ELGIN	PELICAN P (COMBINATION)	☐ ALL OF THE FEATURES OF THE WET AND WATERLESS SUPPRESSION PELICAN P STREET SWEEPER WITH THE EQUIPMENT OPERATED IN EITHER THE WET OR WATERLESS MODE
ELGIN	EAGLE E EAGLE F EAGLE (CNG) BROOM BEAR ROAD WIZARD	☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BETWEEN THE MAIN BROOM AND THE CONVEYOR ☐ THREE (3) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	EAGLE F (WATERLESS)	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ CENTRIFUGAL DUST EVACUATION FAN ☐ SYNTHETIC MULTI-POCKET FILTER WITH HYDRAULIC SHAKER FOR DUST CONTROL
ELGIN	EAGLE F (COMBINATION)	☐ ALL OF THE FEATURES OF THE WET AND WATERLESS EAGLE F STREET SWEEPER WITH THE EQUIPMENT OPERATED IN EITHER THE WET OR WATERLESS MODE

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
ELGIN	GEOVAC	

		☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED IN THE HOPPER ☐ TWO (2) 0.059 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SUCTION TUBE ☐ TWO (2) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES LOCATED AT THE EXTENSION BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	WHIRLWIND MV	☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED IN THE HOPPER ☐ TWO (2) 0.059 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SUCTION TUBE ☐ TWO (2) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ FOUR (4) 0.60 INCH DIAMETER ORIFICE NOZZLES LOCATED AT THE EXTENSION BROOM

		☐ PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
JOHNSTON	310	☐ FOUR (4) 0.072 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT SPRAY BAR ☐ TWO (2) 0.072 INCH DIAMETER ORIFICE NOZZLES PER EACH GUTTER BROOM ☐ ONE (1) 0.026 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE FAN SUCTION HOOD ☐ WATER PUMP TO PROVIDE 50 POUNDS PER SQUARE INCH WATER PRESSURE
JOHNSTON	3000 MX450 4000 4000 SDS MST 350	☐ ENCLOSED ELEVATOR SYSTEM ☐ STEEL OR MIXED POLYESTER MAIN PICK UP BROOM ☐ ONE (1) 0.072 INCH DIAMETER ORIFICE NOZZLE PER EACH GUTTER BROOM ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES PER EACH SIDE OF THE MAIN PICK UP BROOM ☐ THREE (3) 0.057 INCH DIAMETER ORIFICE NOZZLES IN SPRAY BAR LOCATED BEHIND THE MAIN PICK UP BROOM ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN SPRAY BAR LOCATED UNDERNEATH THE CAB ☐ WATER PUMP TO PROVIDE 40 POUNDS PER SQUARE INCH WATER PRESSURE
MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***

JOHNSTON	VT605 VT610 VT605 VT650	☐ TWO (2) 0.039 INCH DIAMETER ORIFICE NOZZLES PER GUTTER BROOM ☐ THREE (3) 0.042 INCH DIAMETER ORIFICE NOZZLES PER SUCTION BROOM ☐ THREE (3) 0.039 INCH DIAMETER ORIFICE NOZZLES PER SUCTION NOZZLE ☐ MULTI-POSITION SUCTION NOZZLE TWO ARM FACILITY ☐ ONE (1) 0.042 INCH DIAMETER ORIFICE NOZZLE FOR THE IMPELLER FAN ☐ WATER PUMP TO PROVIDE 50 POUNDS PER SQUARE INCH WATER PRESSURE
JOHNSTON	770 CYCLONE	☐ THREE (3) 0.067 INCH DIAMETER ORIFICE NOZZLES FOR GUTTER BROOMS ☐ TWO (2) 0.07 INCH DIAMETER ORIFICE NOZZLES FOR CENTER CURTAIN ☐ FOUR (4) 0.055 INCH DIAMETER ORIFICE NOZZLES FOR FRONT BUMPER ☐ TWO (2) 0.067 INCH DIAMETER ORIFICE NOZZLES FOR FRONT CURB SPRAY ☐ TWO (2) 0.07 INCH DIAMETER ORIFICE NOZZLES ON LEFT AND RIGHT SIDE OF PICK UP HEAD ☐ THREE (3) 0.082 INCH DIAMETER ORIFICE NOZZLES FOR PICK UP HEAD FRONT SIDE ☐ SEVEN (7) 0.079 INCH DIAMETER ORIFICE NOZZLES FOR PICK UP HEAD REAR SIDE ☐ THREE (3) 0.079 INCH DIAMETER ORIFICE NOZZLES FOR WINDROW PATH ☐ TWO (2) 0.045 INCH DIAMETER ORIFICE NOZZLES FOR PICK UP HEAD SUCTION ☐ ONE (1) 0.079 INCH DIAMETER ORIFICE NOZZLE FOR BLOWER FAN OUTLET

☐ PUMP TO PROVIDE 50 POUNDS PER SQUARE INCH WATER PRESSURE

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
SCHWARZE	EV-1	☐ TWELVE (12) POLYESTER DRY FILTER CARTRIDGES (MAINTAINED TO ENSURE PROPER INTEGRITY) ☐ FILTRATION CLEANED THREE TIMES PER MINUTE ☐ FILTRATION SYSTEM ACTIVE AT ALL TIMES
SCHWARZE	EV-2	☐ EIGHT (8) POLYESTER DRY FILTER CARTRIDGES (MAINTAINED TO ENSURE PROPER INTEGRITY) ☐ FILTRATION SYSTEM OPERATED AT ALL TIMES ☐ EACH FILTER CLEANED THREE TIMES PER MINUTE
SCHWARZE	DXR	☐ POLYESTER DRY FILTER CARTRIDGES (MAINTAINED TO ENSURE PROPER INTEGRITY) ☐ FILTRATION SYSTEM ACTIVE AT ALL TIMES ☐ FILTRATION CLEANED FOUR TIMES PER MINUTE AND A HALF
SCHWARZE	A4000	☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON THE SWEEPING

		HEAD ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES INSIDE HOPPER ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES INSIDE HOPPER ON SPRAY BAR ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE
SCHWARZE	M5000/M6000	☐ FIVE (5) 0.036 INCH DIAMETER ORIFICE NOZZLES ON MAIN BROOM ☐ THREE (3) 0.036 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE
MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
SCHWARZE	A 7000/ A 8000/ A 9000	☐ SAWTOOTH DUST SEPARATION SCREEN, SELF DUMPING DUST SEPARATOR, FAN CENTRIFUGE ☐ FIVE (5) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON THE SWEEPING HEAD ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON HEAD INTAKE TUBE ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN RIGHT HAND GUTTER BROOM ☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON HOPPER SPRAY BAR ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN LEFT HAND GUTTER BROOM (REQUIRED IF BOTH GUTTER BROOMS ARE

		USED)
SCHWARZE	S348-I/ S348-LE	☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES ON HOPPER SPRAY BAR ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN HOPPER ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES ON RIGHT HAND GUTTER BROOM ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE
STEWART-AMOS	STARFIRE S-4, S-5, AND S-6	☐ FOUR (4) 0.05 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BEWEEN THE MAIN BROOM AND THE ELEVATOR ☐ FOUR (4) 0.05 INCH DIAMETER ORIFICE NOZZLES LOCATED BENEATH THE FRONT BUMPER OF THE CHASSIS ☐ TWO (2) 0.05 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT OF EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 40 POUNDS PER SQUARE INCH WATER PRESSURE
MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
PYTHON	S2000	☐ FOUR (4) 0.008 INCH DIAMETER ORIFICE NOZZLES MOUNTED ABOVE AND AHEAD OF A 36 INCH FILL DIAMETER REAR BROOM ☐ WATER LINE WITH 0.02 INCH DIAMETER ORIFICE AND THREE (3) 0.06 DIAMETER OUTLETS ABOVE EACH 42 INCH DIAMETER GUTTER BROOM ☐ PUMP TO PROVIDE 24 POUNDS PER

		SQUARE INCH WATER PRESSURE DURING OPERATION *PLEASE NOTE THAT THE GUTTER AND REAR BROOM SIZES ARE DIFFERENT THAN THE STANDARD MODEL*
PYTHON	S3000	☐ FOUR (4) 0.008 INCH DIAMETER ORIFICE NOZZLES MOUNTED ABOVE AND AHEAD OF REAR BROOM ☐ WATER LINE WITH 0.02 INCH DIAMETER ORIFICE AND THREE (3) 0.06 DIAMETER OUTLETS ABOVE EACH GUTTER BROOM ☐ PUMP TO PROVIDE 24 POUNDS PER SQUARE INCH WATER PRESSURE DURING OPERATION
TENNANT	CENTURION	☐ SEVEN (7) 0.0925 INCH DIAMETER ORIFICE NOZZLES ON SPRAY BAR UNDERNEATH THE CAB ☐ TWO (2) 0.0925 INCH DIAMETER ORIFICE NOZZLES PER GUTTER BROOM ☐ (GUTTER BROOMS CAN BE OPERATED WITHOUT WATER SPRAYS IF FULLY ENCLOSED SHROUD SYSTEM IS UTILIZED AND MAINTAINED PER THE MANUFACTURERS SPECIFICATIONS) ☐ THREE (3) 0.0925 INCH DIAMETER ORIFICE NOZZLES ON SPRAY BAR ABOVE CONVEYOR ☐ 300 GALLON WATER TANK ☐ WATER PUMP TO PROVIDE MINIMUM OF SEVEN GALLONS PER MINUTE ☐ SINGLE FAN VACUUM SYSTEM ☐ GLAZED, POLYESTER FILTER SYSTEM (MAINTAINED TO ENSURE PROPOER INTEGRITY)

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
TENNANT	SENTINEL	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ DUAL FAN VACUUM SYSTEM (OPERATED AT ALL TIMES) ☐ SYNTHETIC-SINGED POLYESTER FILTER (MAINTAINED TO ENSURE PROPER INTEGRITY)
TENNANT	830 I / 830 II	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ DUAL FAN VACUUM SYSTEM (OPERATED AT ALL TIMES) ☐ SYNTHETIC-SINGED POLYESTER FILTER (MAINTAINED TO ENSURE PROPER INTEGRITY)
TYMCO	210 300 350 435	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ CENTER DEBRIS DEFLECTOR ASSEMBLY PERPENDICULAR TO THE PICK UP HEAD ☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLE FOR EACH GUTTER BROOM ☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER ☐ ONE (1) 0.063 INCH DIAMETER ORIFICE

		NOZZLE LOCATED IN BLOWER HOUSING ☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH.
MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
TYMCO	600 600 BAH FHD 500X	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ CENTER DEBRIS DEFLECTOR ASSEMBLY PERPENDICULAR TO THE PICK UP HEAD ☐ FRONT DEBRIS DEFLECTOR CURTAIN ASSEMBLY PARALLEL TO THE PICK UP HEAD ☐ LOW EMISSION DUST GUARDS (ONLY APPLICABLE TO CABOVER TRUCKS) ☐ THREE (3) 0.063 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ ONE (1) 0.093 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER ☐ ONE (1) 0.093 INCH DIAMETER ORIFICE NOZZLE LOCATED IN BLOWER HOUSING ☐ TWO (2) [MINIMUM] HOPPER BAFFLE CURTAINS ☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH.
TYMCO	DST - 4	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ SELF CONTAINED MULTIPLE FILTRATION SYSTEM UTILIZING PTFE MEMBRANE FILTERS

MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
TYMCO	DST - 6	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ SELF CONTAINED MULTIPLE FILTRATION SYSTEM UTILIZING PTFE MEMBRANE FILTERS ☐ THREE (3) 0.063 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ ONE (1) 0.094 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER ☐ TWO (2) [MINIMUM] HOPPER BAFFLE CURTAINS ☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH

☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH 32 INCH DIAMETER GUTTER BROOM
☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLES FOR EACH 32 INCH DIAMETER GUTTER BROOM
☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER
☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH.

VACALL	VS10/10D, VF10 VS13/13D, VF13 VS14/14D, VF14 VS16/16D, VF16 VS20/20D, VF20	☐ FOUR (4) 0.062 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT OF EACH 36 INCH GUTTER BROOM ☐ FOUR (4) 0.062 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT OF THE TRANSFER BROOM ☐ TEN (10) 0.125 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE PICK UP HEAD ☐ SIX (6) 0.181 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SCRUBBER COLLAR OF THE PICK UP HEAD ☐ 48 INCH POWER VACUUM NOZZLE ☐ MINIMUM 300 GALLON GRAVITY FEED WATER SUPPLY SYSTEM WITH WATER CONTINOUSLY SUPPLIED TO ALL NOZZLES ☐ LOW VELOCITY DUST COLLECTION AIR CHAMBER ☐ MINIMUM OF SIX (6) EXPANDED METAL SCREENS

APPENDIX A-21

Design Value

Klamath Falls was designated Nonattainment based on measurements at the DEQ monitor site at Peterson School where the PM2.5 FRM and speciation monitors are located. The base year for the attainment demonstration is 2008, and th base monitoring period for calculating the DV are the years 2006 – 2010. The 2008 baseline DV is 45.1 ug/m3, which was developed following the methodology in the Guidance, as shown in the following table.

Year	DV ug/m3
2006	47.5
2007	39.6
2008	52.2
2009	44.0
2010	34.6
Baseline DV	**45.1**

Design days of concern.

In examining temperature data for the Klamath Falls DV days, EPA noticed there were four days with both high measured PM2.5 and higher than average winter time temperatures. Three of these days are in 2007 (11/5, 11/8, and 11/14) and one day in 2010 (11/13).

It was considered that the high levels of PM2.5 on these days could be the result of smoke intrusion from prescribed burning events outside of the NAA based on the reasonable assumption that high temperatures would be inversely correlated with residential wood heating, the presumed major contributor to high ambient levels of PM2.5, and that less residential wood burning should have occurred.

In order to evaluate the significance that prescribed burning may have had on these days, burn information was obtained from the Oregon Dept of Forestry (ODF) for 2007, and NOAA MODIS imagery of fires was obtained from the WRAP - FETS (Fire Emissions Tracking System) for 2010. In addition, wind speed, wind direction, temperature, and nephelometer (b scat) data was acquired from the DEQ Peterson School Monitor for these days.

These data have been compiled and presented in a series of spreadsheets for each of the four days of concern, and include plots of temperature / PM2.5, windspeed / PM2.5, and wind direction / PM2.5. Information about the burns that could reasonably impact the monitor is also provided in the charts, including location, distance and direction to the fire from the monitor. In addition, forward trajectories were plotted for each of the burns using the NOAA-ARL program HYSPLIT.

The results of this brief analysis show that prescribed burning on these days did not significantly impact the Peterson School monitor, and that high PM2.5 measurements were the results of local emissions sources, most likely from residential wood heating. A full description of the demonstration is provided in Appendix A-23-1 and A-23-2.

APPENDIX A-22

Dispersion Modeling

AERMOD is the dispersion model used to estimate the actual contributions of industrial point and prescribed burning sources at the monitored concentration. AERMOD is an EPA guideline models and was run under the Lakes Environmental AERMOD View GUI version 7.4.0. Basic model parameters and inputs include:

Met data: surface from DEQ Peterson School monitor, 2004-2008
upper air from Medford NWS, 2004-2008

Receptors: 401 discrete Cartesian receptors at 600 m "grid" resolution, plus 7 additional receptors at saturation survey sampler sites.

Industrial sources: modeled at discrete stack locations and parameters. Emissions by the EI technical staff for 2008 and 2014 for three operating scenarios: Typical Season Day (TSD) Actual emissions, Plant Site Emission Limits (PSELs), and 100% of capacity to operate. Emissions data and other industrial source model parameters are available upon request.

Prescribed burning sources: modeled at discrete locations for day of study. Details of procedures used to locate and to estimate emissions are described below.

Because of concern about the effects on dispersion and PM2.5 concentrations as a result of low level temperature inversions, the model was run with simulated constraints on convective and mechanical mixing heights. Limiting maximum convective mixing heights to 20 meters had virtually no affect on modeled concentrations. Limiting mechanically generated mixing heights to 200 meters gave concentrations within 10% of no limits. Concentrations with mechanical mixing heights below 200 meters were higher but at wind speeds well below those observed. It was concluded that the modeled results using the unconstrained met data was representative of actual conditions.

Industrial Point Source Effective Emissions.

All permitted industrial point sources impacting the nonattainment area were included in the dispersion modeling study. Separate model runs were made for 2008 TSD actual emissions, and for 2014 TSD actual emissions, 2014 PSELs, and 2014 100% capacity emissions. The 2008 results were used to calculate the industrial source effective emissions, and the 2014 results were used as part of the calculations to derive the Relative Response Factors (RRFs) that predict the future year DV.

Modeled concentrations were predicted at the 98th %tile for all 408 receptors in the domain. Of particular interest is the receptor located at the Peterson School monitor, and the receptors in a grid of 2.4 km square centered on the monitor. This grid size is twice the size of a neighborhood scale grid of 1.2 km, and was chosen to characterize the concentration gradient in the vicinity of the monitor, and to provide a robust estimate of the modeled concentration at the monitor. A summary of results for 2008 actual emission rates is shown in the table below.

Table 6-1. Modeled industrial sources at Peterson School.

Klamath Falls Industrial Point Sources Model period 2004-2008	2008: Actuals	
	98th %tile 24hr avg	
DV = 45.1	ug/m3	% of DV
Peterson School	0.307	0.68%
2.4 km grid mean	0.320	0.71%

For the purpose of estimating an effective emission rate a value of 1.0% is used. That is to say, industrial point sources contribute 1.0% of the 45.1 DV, or about 0.45 ug/m3. The calculation of the industrial source effective emissions are shown below.

<u>Prescribed Burning Effective Emissions</u>.

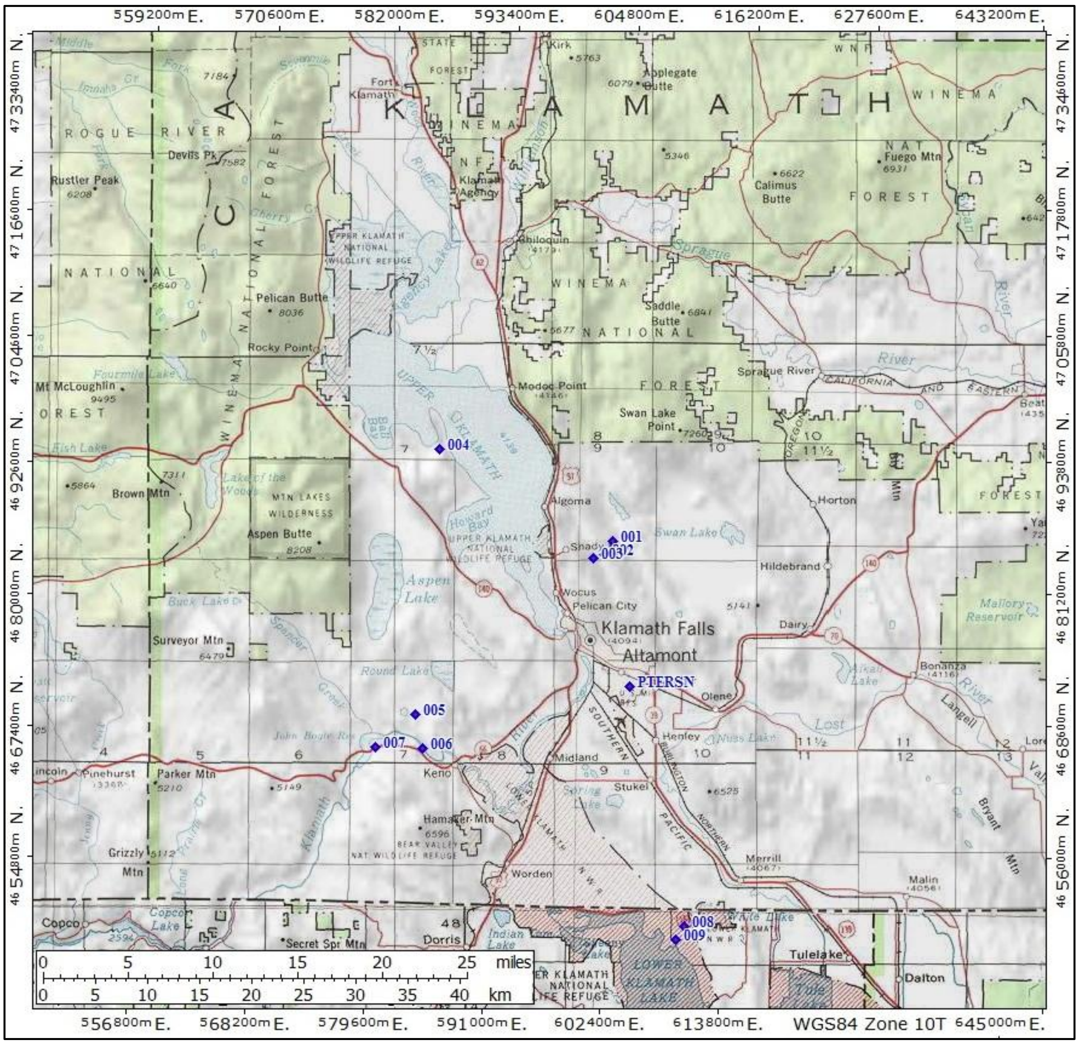
Effective emissions for prescribed burning outside the NAA were estimated by dispersion modeling of episodes that could have had a potential impact at the Peterson School monitor on Design Days used to calculate the DV. The period 2006-2008 was used because of the availability of processed meteorological data for use in AERMOD. Because of the limited coverage of NOAA satellite data used for fire locations, the year 2007 was chosen for the analysis. The Design Day 11/23/2007, with a measured concentration of 39.6 ug/m3 at Peterson School, had eight prescribed burns outside the NAA and was chosen as an example scenario to model burn impacts at Peterson School.

Because data on fuel loading, burn temperature with corresponding plume heights, and burn duration were not available, default parameters were made based on the prescribed and agriculture burn experience and information from Idaho DEQ. The EPA SCREEN3 model was run to test a range of parameters, in particular burn temperature and plume height. The plume height that seemed most appropriate for estimating impacts from prescribed burning near Klamath Falls was a height of about 2000 ft, or about 600 m. This is considered conservative for the long range transport to Peterson School. The parameters used in AERMOD for this study were:

Release ht: 3.0 m
"stack" velocity: 2.0 m/s
"stack" diameter: 100 m
Ambient T: 26.3 F (270 K)

Burn T: 401 F (478 K)
Emissions: 1.0 g/s (unit emission rate)

In addition to the modeling parameters, other assumptions include a burn rate of 14 tons/burn of PM2.5 based on EPA estimates (from Sonoma Tech using satellite data, pixel size, and fuel loading from land cover data---for references, check with C. Swab). Each burn is assumed to have occurred over a period of two days. Burn sites are from NOAA satellite data. For the day of the analysis, 11/23/2007, eight burns were identified within a radius of 35 km. as shown in the map below.



Sites located in relatively close proximity, were grouped, with their emissions, into four composite sites for input to the model. The model was run for three days (11/21-11/23). Results for 11/23, the day of interest, is shown in the table below.

Table 6-2. Modeled prescribed burning concentrations at Peterson School.

Fire	Date	Modeled Conc. At 1 g/s ug/m3	Emissions at 14 tons pm25 over 2 days lbs/hr	g/s	estimated impact ug/m3	number fires in group	Total all fires ug/m3	Model Day PetrsnSch ug/m3	Prescrb Burn Contribution %
Location 2	11/23/07	0.0004	583.3	73.5	0.026	3	0.079	39.6	0.20%
Location 4	11/23/07	0.0007	583.3	73.5	0.053	1	0.053	39.6	0.13%
Location 6	11/23/07	0.0012	583.3	73.5	0.088	3	0.265	39.6	0.67%
Location 8	11/23/07	0.0020	583.3	73.5	0.148	2	0.297	39.6	0.75%
All locs	11/23/07						0.694	39.6	**1.75%**

The results show that for 11/23/2007, Prescribed Burning contributes a modeled contribution of 0.694 ug/m3, or 1.75% of the FRM Peterson School sample. It is proposed that Prescribed Burning be considered to contribute 1.75 % of the total DV mass at Peterson School, and that this value be used to calculate and effective emission rate.

APPENDIX A-23-1
Rollback Modeling

Introduction.

The method chosen to demonstrate attainment for Klamath Falls is a rollback/rollforward proportional model that assumes a linear correlation between emissions and measured concentrations. Rollback/forward was chosen over a regional grid model, such as CMAQ or CAMx, for the following reasons:

1) Photochemistry plays a minor role in PM2.5 formation in Klamath Falls which is dominated by organic carbon (OC) primarily the result of winter season residential wood smoke, with highest measure concentrations occurring in evening hours during periods of high burning activity, frequent temperature inversions, and stagnant air,
2) Secondary PM2.5, including sulfate, nitrate, and secondary organic aerosols (SOAs), are minor constituents of total PM mass,
3) The NAA is small and bowl shaped – surrounded on three sides by elevated terrain. With low mixing heights and light winds during periods of high concentration, it is assumed pollutants are relatively well-mixed and concentration gradients low within the highly populated portion of the non-attainment area. A typical configuration for CMAQ or CAMx would not resolve the spatial patterns in $PM_{2.5}$ within the non-attainment area much more than the rollback/forward box model.
4) The relative ease of use of the rollback/forward model facilitated troubleshooting, quality control, and sensitivity testing.

The EPA Guideline on Air Quality models (EPA, 2005) addresses the choice of models for analyzing PM2.5 concentrations, and in 5.2.2.1 a states:

> *Treating secondary components of PM2.5, such as sulfates and nitrates, can be a highly complex and resource-intensive exercise. Control agencies with jurisdiction <u>over areas with secondary PM–2.5 problems are encouraged to use models which integrate chemical and physical processes</u> important in the formation, decay and transport of these species (e.g., Models-3/CMAQ 38 or REMSAD 41). <u>Primary components can be simulated using less resource-intensive techniques</u>.* [emphasis added]

This language suggests that for NAAs without secondary PM2.5 problems, the PM2.5 attainment demonstration in which primary components are the major component can be made using simpler, less resource-intensive techniques. Though not stated explicitly in this section of the Guidelines, this simpler technique could include a proportional rollback/rollforward model.

Secondary PM2.5, including sulfate, nitrate, and SOAs, will be included in the rollback model. Because levels of secondary PM2.5, as well as their precursor emissions, are relatively low, they will be included in the rollback with a Relative Response Factor (RRF) of 1.0, that is, the level of secondary PM2.5 species will be held constant from the 2008 baseline year to the 2014 future year. This is considered a conservative approach as reductions in residential wood smoke with corresponding reductions in organic carbon (the target of control strategies to reach attainment) will also reduce emissions of secondary PM2.5 precursors. In addition, reductions in motor vehicle emissions from existing rules will increasingly work their way through the vehicle fleet.

Rollback.

The rollback model is based on the assumption that there is a direct correlation between emissions of a pollutant and measured concentrations of that pollutant in the same airshed, and that changes in emissions will result in corresponding changes in concentration. This correlation is then used to predict future concentrations based on future emissions. The change in concentrations from the change in emissions is represented by the relative reduction factor RRF. An RRF of less than 1.0 indicates a reduction in emissions-concentrations; an RRF greater than1.0 indicates an increase. This relationship is summarized in the following equation.

(DVF) = (RRF) (DVB)

Where,

(DVB) = the Design Value Baseline, developed from the monitored concentration (ug/m3)
(RRF) = relative response factor (ratio of the future concentration to the baseline concentration
(DVF) = the Design Value Future predicted at the monitor (ug/m3)

The rollback model as used here has four main parts:

1) a table that calculates the PM mass available for increases and decreases in the model, by species, based on the SANDWICH speciated FRM mass
2) the 2008 Baseline table that calculates speciated mass for each source category in the model (and associated Source Category and Speciation Profile tables)
3) the 2014 Future Year table that calculates speciated mass for each source category based on emissions changes since the Baseline Year together with a calculated total RRF for changes between Baseline and Future Year
4) a table that applies the total RRF to each Design Day in the 2008 DV in order to predict the Future Year DV.

Species mass used for rollback.

The SANDWICH method speciates FRM PM2.5 mass (regulatory concentration that determines attainment) based on the SASS and URG speciation monitor data from Peterson School. The Mass for Rollback table below shows what portion of that mass, by species, is available for increases or decreases in the rollback model, and what portion is held constant from the Baseline to the Future Year, that is, assigned an RRF of one.

Mass for Rollback	*DV = 45.1 - 0.5 =*	**44.6**						
	SANDWICH Fraction							
	7.0%	**74.4%**	**2.6%**	**1.6%**	**9.6%**	**4.2%**	**0.7%**	**100.1%**

Emission Category	EC ug/m3	OC ug/m3	Crust ug/m3	SO4 ug/m3	NO3 ug/m3	H20 ug/m3	NH3 ug/m3	Total ug/m3
Background	*0.10*	*0.60*						*0.70*
Anthropogenic SOA		*1.34*						*1.34*
Biogenic SOA		*0.45*						*0.45*
Inorganics				*0.71*	*4.28*			*5.00*
Water						*1.87*		*1.87*
Ammonia							*0.31*	*0.31*
Total Bkg+SA+Other	***0.10***	***2.38***	***0.00***	***0.71***	***4.28***	***1.87***	***0.31***	***9.66***
Calculated DV Mass	*3.13*	*33.18*	*1.16*					
Net Mass for Rolling	***3.03***	***30.80***	***1.16***					***35.00***
Total Roll + Non-roll								***44.66***

A row by row description of the table is as follows:

Row 1: The 45.1 ug/m3 DV includes an assumed contamination of 0.5 ug/m3, leaving a net 44.6 ug/m3 actual mass for the rollback
Row 3: Speciation fractions of FRM PM mass using SANDWICH method (Appendix A-5)
Row 6: Estimated background EC and OC from (Appendix A-6-1, and A-6-2)
Row 7: Estimated Anthropogenic SOA PSU study Appendices A-6-1, and A-6-2, 14)
Row 8: Estimated Biogenic SOA from PSU study (Appendices A-6-1, and A-6-2, 14)
Row 9: Secondary Inorganic Aerosols estimated from DEQ speciation data (Appendix A-6-1, and A6-2)
Row 10: Water fraction from SANDWICH
Row 11: Ammonia from SANDWICH
Row 12: Total mass by species that will be constant from Baseline to Future Year
Row 13: Calculated mass for EC, OC, and PM Other (crustal) as SANDWICH fraction of DV
Row 14: Net speciated mass that is used in the rollback.

EC, OC, and Other PM (crustal) are the PM2.5 species that will used in the rollback model.

<u>Baseline 2008 rollback table</u>.

The 2008 portion of the rollback lists the major source categories from the emissions inventory, their emission rates, and source profiles that speciate the PM2.5 in the inventory into the active species used in the rollback (EC, OC, and Other PM).

<u>Source Categories</u>

Multiple source categories were used in the rollback reflecting those source types considered to be significant in the analysis. Because residential wood heating is the largest PM2.5 emissions source, based on its percentage of emissions from all sources, and because proposed controls of that source type could be selectively applied by device type, residential wood heating emissions are defined at the level of device type. Source categories used in the rollback are shown in the table below.

1	Waste Disposal
2	Small Non-Permitted Fossil Fuel Combustion
3	Fireplace
4	Insert Non-Cert

5	Insert Cert (Non-Cat)
6	Insert Cert (Cat)
7	Stove Non-Cert
8	Stove Cert (Non-Cat)
9	Stove Cert (Cat)
10	Pellet /Stove Cert
11	Central Furnace
12	Prescribed Burns
13	Other Burning/Cooking
14	Fugitive Dust (road agg piles, sanding, dust)
15	Non-Road + Marine
16	Aircraft
17	Rail
18	Passenger Vehicles
19	Trucks
20	Other On-road
21	Misc small point sources
22	Points-Actual TSD
	Points-PSEL
	Points-100% capacity

Details of source type, device type, and the methodologies for estimating their emissions are described in the Emissions Inventory section of this report.

Speciation Profiles

The rollback is based on a speciated emissions inventory. Emissions from source categories in the inventory were initially estimated as total PM2.5, and source profiles were used to allocate emissions to individual PM2.5 species. Since SO4 and NO3 are held constant in the rollback, the components of concern in the speciation are OC, EC, and Other PM. Speciation profiles were taken primarily from EPA Speciated 4.2 and 4.3 (EPA, 2006b).

Category ID	Category	Profile Description	Composite Profile Number	EC	OCM	OPP
			Speciate 4.2 + 4.3		OCM=OC+NOCM OPP = residual (Pmother)	
1	Waste Disposal	natural gas	91112	38.400	34.580	16.320
2	Small Fossil Fuel Combust	natural gas	91112	38.400	34.580	16.320
3-11	All RWC devices	RWC	91031	5.579	52.818	40.853
12	Prescribed Burns	Prescribed burning	91109	10.927	85.321	2.012
13	Other Burning/Cooking	Other Burning/Cooking (2/3*charbroiling + 1/3*meatfrying)	67%[91116]+33%[91135]	2.704	89.336	6.777
14	Fugitive Dust	Paved road dust	91108	1.045	13.640	84.388
15	Non-Road + Marine	Non-Road + Marine (3/4*HDDV+ 1/4*non-catalyst gas exhaust)	0.75*[91106]+0.25*[91113]	60.888	31.312	7.464
16	Aircraft	Aircraft	3861	63.078	31.787	1.148
17	Rail	heavy duty diesel	91106	77.124	21.948	0.518
19	Trucks	heavy duty diesel	91106	77.124	21.948	0.518
18	Passenger Vehicles	Passenger Vehicles 90 % + 10%	90%[91122]+10%[91162]	17.619	68.657	11.247
20	Other On-road	catalytic gas engines	91122	19.004	68.657	9.708
21	Misc small points	natural gas	91112	38.400	34.580	16.320
22	Points	natural gas	91112	38.400	34.580	16.320
		Misc ag and structural fires	2.5	4.406	8.768	81.126
		RWC - Favoring control strategy	3273	10.860	63.600	25.320
		RWC - Disfavoring control strategy	421012.5	4.500	38.700	56.800
		Unpaved road dust	91100	0.097	7.639	91.141
		Ag soil	91101	0.020	4.315	95.404
		Wildfires	91102	9.489	78.501	9.738
		Ag and open burn	91103	10.900	65.994	19.310
		Construction dust	91107		6.463	92.115
		sand and gravel mining	91111		0.000	99.593
		non-catalytic gas engines	91113	12.178	59.403	28.299
		pulp and paper and industrial wood boilers	91114	3.709	49.156	40.609
		distillate oil	91115	10.000	35.000	36.000
		char broiling	91116	4.056	93.824	1.840
		residual oil	91117	1.000	1.400	53.600
		dairy soil	91118	5.160	44.562	31.358
		light duty diesel	91162	5.160	68.657	25.103
		plywood drying	91128	8.000	70.000	16.224
		sawmill	91131	3.800	62.300	32.668
		meat frying	91135		80.360	16.650
		LPG CNG > natural gas	91156	6.700	68.567	8.283
		light duty diesel	91162	51.414	44.407	2.359
		landfills	91112	38.400	34.580	16.320

<u>Baseline half of the Rollback</u>

The Baseline half (2008) of the Rollback incorporates information and data described in previous tables, including, 1) effective emissions, 2) speciated PM2.5 mass for rollback, 3) source categories, and 4) speciation profiles. The Future Year half (2014) follows and is described in the next section.

The upper portion of the Baseline Table repeats the speciated PM2.5 mass data, and shows in the first row (Background + Secondary Aerosols + Other) concentrations that are either in the background or are not overall important contributors to total mass. The relative increases and decreases in these concentrations are considered to be minor, and these concentrations are considered constant from 2008 to 2014, and will be added back to total mass in 2014.

Concentrations that will be explicitly modeled are shown in the row Net Mass for Rolling, and in this example are EC (3.03 ug/m3), OC (30.80 ug/m3), and Crust - PM Other (1.16 ug/m3).

The lower portion of the table shows the source categories, their associated effective emissions (either actual or calculated), and the speciation profile fractions based on profiles unique to each source category. The next group of columns shows the speciation of emissions based on the source profile fractions, and the relative percentage that each source category contributes to each of three species (EC, OC, and Other).

Based on their percentage contribution for each species, the last group of columns calculates the concentrations for each source category for each species. This calculation uses the total EC, OC, and Other concentrations that are available for roll, as shown in the upper portion of the table, as described above.

As a check, the totals match. From the speciated PM2.5 mass data at the top of the table, total mass is 44.66 ug/m3 (of which 35.00 ug/m3 was available for rolling), and at the bottom of the table, the total speciated mass by category is 35.00 ug/m3 plus 9.66 ug/m3, giving an overall total of the same 44.66 ug/m3.

The last group of columns with species-specific concentrations for each source category provides the basis for ratio Future emissions to Baseline emissions in order to estimated Future concentrations.

Rollback Baseline Year: 2008

	Mass for Rollback EC	OC	Crust	SO4	NO3	H20	NH3	Total
Total Bkg+SA+Other	0.10	2.38	0.00	**0.71**	**4.28**	**1.87**	**0.31**	**9.66**
Calculated DV Mass	3.13	33.18	1.16					
Net Mass for Rolling	**3.03**	**30.80**	**1.16**					35.0
Total Roll + Non-roll								**44.66**

DEQ ID	Source Category	PM2.5 Effective Emissions lbs/day	Emissions as %	Speciation Profile EC fraction	OCM fraction	PMOther fraction	Speciated Emissions EC lbs/day	OCM lbs/day	PMOther lbs/day	EC %	OCM %	PMOther %	Effective Source Concentrations EC ug/m3	OCM ug/m3	PMOther ug/m3	SO4 ug/m3	NO3 ug/m3	H20 ug/m3	NH3 ug/m3	Total ug/m3
1	Waste Disposal	50.4	1.6%	0.384	0.346	0.163	19.3	17.4	8.2	3.6%	1.1%	0.8%	0.11	0.34	0.01					
2	Small Non-Permit Fossil Fuel combust	36.3	1.1%	0.384	0.346	0.163	13.9	12.6	5.9	2.6%	0.8%	0.6%	0.08	0.24	0.01					
3	Fireplace	1093.0	33.9%	0.089	0.519	0.385	97.3	567.7	420.3	18%	35.8%	39.3%	0.56	11.02	0.46					
4	Insert Non-Cert	435.9	13.5%	0.089	0.519	0.385	38.8	226.4	167.6	7.3%	14.3%	15.7%	0.22	4.40	0.18					
5	Insert Cert (Non-Cat)	18.8	0.6%	0.089	0.519	0.385	1.7	9.8	7.2	0.3%	0.6%	0.7%	0.01	0.19	0.01					
6	Insert Cert (Cat)	105.1	3.3%	0.089	0.519	0.385	9.4	54.6	40.4	1.8%	3.4%	3.8%	0.05	1.06	0.04					
7	Stove Non-Cert	525.5	16.3%	0.089	0.519	0.385	46.8	272.9	202.0	8.8%	17.2%	18.9%	0.27	5.30	0.22					
8	Stove Cert (Non-Cat)	117.3	3.6%	0.089	0.519	0.385	10.4	60.9	45.1	2.0%	3.8%	4.2%	0.06	1.18	0.05					
9	Stove Cert (Cat)	56.4	1.7%	0.089	0.519	0.385	5.0	29.3	21.7	0.9%	1.8%	2.0%	0.03	0.57	0.02					
10	Pellet /Stove Cert	33.2	1.0%	0.089	0.519	0.385	3.0	17.2	12.8	0.6%	1.1%	1.2%	0.02	0.33	0.01					
11	Central Furnace	18.8	0.6%	0.089	0.519	0.385	1.7	9.8	7.2	0.3%	0.6%	0.7%	0.01	0.19	0.01					
12	Prescribed Burns	56	1.75%	0.089	0.519	0.385	6.2	48.2	1.1	1.2%	3.0%	0.1%	0.04	0.94	0.00					
13	Other Burning/Cooking	59.0	1.8%	0.089	0.519	0.385	1.6	52.7	4.0	0.3%	3.3%	0.4%	0.01	1.02	0.00					
14	Fugitive Dust (road agg piles, sand, dust)	113	3.5%	0.109	0.853	0.020	1.2	15.4	95.3	0.2%	1.0%	8.9%	0.01	0.30	0.10					
15	Non-Road + Marine	20.6	0.6%	0.027	0.893	0.068	12.5	6.5	1.5	2.4%	0.4%	0.1%	0.07	0.13	0.00					
16	Aircraft	18.7	0.6%	0.010	0.136	0.844	11.8	6.0	0.2	2.2%	0.4%	0.0%	0.07	0.12	0.00					
17	Rail (6)	39.9	1.2%	0.609	0.313	0.075	30.8	8.8	0.2	5.8%	0.6%	0.0%	0.18	0.17	0.00					
18	Passengr Vehicles (5)	134.8	4.2%	0.631	0.318	0.011	23.7	92.5	15.2	4.5%	5.8%	1.4%	0.14	1.80	0.02					
19	Trucks (4)	219.2	6.8%	0.771	0.219	0.005	169.1	48.1	1.1	31.8 %	3.0%	0.1%	0.97	0.93	0.00					
20	Other On-road (7)	10.0	0.3%	0.176	0.687	0.112	1.9	6.9	1.0	0.4%	0.4%	0.1%	0.01	0.13	0.00					
21	Misc small point sources	33.1	1.0%	0.771	0.219	0.005	12.7	11.5	5.4	2.4%	0.7%	0.5%	0.07	0.22	0.01					
22	Points-Actual TSD	32	1.0%	0.190	0.687	0.097	12.4	11.2	5.3	2.3%	0.7%	0.5%	0.07	0.22	0.01					
	Total	3228	100.0%				531.3	1586.2	1068.8	100%	100.0%	100.0%	3.03	30.8	1.16					35.0
	Total Bkg+SA+Other												0.10	2.38	0.00	0.71	4.28	1.87	0.31	9.66
	Total with Bkg+SA+Other												3.03	30.8	1.16	0.71	4.28	1.87	0.31	44.66

Future Year half of the rollback

The Future Year rollback table follows the structure of 2008. The upper portion shows the speciated PM2.5 mass data, and in particular the species concentrations that were held constant from 2008 to 2014, that is those concentrations from background and secondary aerosols that were not explicitly modeled in the rollback.

The left set of columns shows the 2008 total PM2.5 emissions and their respective speciated concentrations for each source category. Only concentrations for EC, OC, and Other are shown. The right set of columns shows the 2014 data, including total predicted PM2.5 emissions by source category, and the ratio of these emissions to their 2008 counterpart. Thus, for example, the ratio of 2014 to 2008 emissions for Waste Disposal is 0.86, or a reduction of 14% emissions for this source category.

The ratio of 2014/2008 inventory emissions for each source category are applied to their speciated concentrations to estimate speciated concentrations for 2014. (That is, the ratio of emissions as inventoried, not as adjusted to Effective Emissions.) The concentrations are summed for each species to which are then added the concentrations that were held constant from 2008. Thus, for example, total OC from all source categories for 2014 is 18.48 ug/m3 to which is added 2.38 ug/m3 from the concentration of OC held constant.

The Relative Response Factor (RRF) is calculated for each species by ratioing the total 2014 concentrations to total 2008 concentrations. For example, the RRF for OC of 0.629 = 20.86/33.18. In order to apply the RRFs to the Design Day concentrations for calculating the Future Year DV, the species-specific RRFs are multiplied by the species percentage of their contribution to total DV PM2.5 mass from the SANDWICH method. Thus, for OC based its contribution of 74.4% to total PM2.5, its weighted RRF is 0.468. After all species-specific RRFs have been weighted a total RRF is calculated. In this example, the total RRF is 0.698, which will be used to factor the 2008 Design Days in order to calculate a 2014 DV.

Rollback Future Year: 2014 with concentrations and total RRF

Emission Category	EC ug/m3	OC ug/m3	Crust ug/m3	SO4 ug/m3	NO3 ug/m3	H20 ug/m3	NH3 ug/m3	Total ug/m3
Sandwhich %	7.0%	74.4%	2.6%	1.6%	9.6%	4.2%	0.7%	
Total Bkg+SA+Other	**0.10**	**2.38**	**0.00**	**0.71**	**4.28**	**1.87**	**0.31**	**9.66**
Calculated DV Mass	3.13	33.18	1.16					
Net Mass for Rolling	3.03	30.80	1.16					35.00
Total Roll + Non-roll								44.66

	Baseline Year:2008					**Future Year: 2014**									
		2008	Effective Source Concentrations			2014	2008/14	Concentations After Reductions/Increases							
DEQ ID	Source Category	Emissions lbs/day	EC ug/m3	OCM ug/m3	PMOther ug/m3	Emissons lbs/day	emissions ratio	EC ug/m3	OCM ug/m3	PMOther ug/m3	SO4 ug/m3	NO3 ug/m3	H20 ug/m3	NH3 ug/m3	Total
1	Waste Disposal	50.4	0.11	0.34	0.01	43.3	0.86	0.095	0.3	0.0					
2	Small Non-Permitted Fossil Fuel Combustion	36.3	0.08	0.24	0.01	38.1	1.05	0.084	0.3	0.0					
3	Fireplace	1093.0	0.56	11.02	0.46	895.6	0.82	0.455	9.0	0.4					
4	Insert Non-Cert	435.9	0.22	4.40	0.18	210.3	0.48	0.107	2.1	0.1					
5	Insert Cert (Non-Cat)	18.8	0.01	0.19	0.01	13.2	0.70	0.007	0.1	0.0					
6	Insert Cert (Cat)	105.1	0.05	1.06	0.04	73.1	0.70	0.037	0.7	0.0					
7	Stove Non-Cert	525.5	0.27	5.30	0.22	210.2	0.40	0.107	2.1	0.1					
8	Stove Cert (Non-Cat)	117.3	0.06	1.18	0.05	76.8	0.66	0.039	0.8	0.0					
9	Stove Cert (Cat)	56.4	0.03	0.57	0.02	36.8	0.65	0.019	0.4	0.0					
10	Pellet /Stove Cert	33.2	0.02	0.33	0.01	21.4	0.65	0.011	0.2	0.0					
11	Central Furnace	18.8	0.01	0.19	0.01	10.7	0.57	0.005	0.1	0.0					
12	Prescribed Burns	56	0.04	0.94	0.00	458.9	1.00	0.035	0.9	0.0					
13	Other Burning/Cooking	59.0	0.01	1.02	0.00	59.0	1.00	0.009	1.0	0.0					
14	Fugitive Dust (road agg piles, sanding, dust)	113	0.01	0.30	0.10	183.2	0.96	0.006	0.3	0.1					
15	Non-Road + Marine	20.6	0.07	0.13	0.00	15.4	0.75	0.054	0.1	0.0					
16	Aircraft	18.7	0.07	0.12	0.00	19.3	1.03	0.070	0.1	0.0					
17	Rail (6)	39.9	0.18	0.17	0.00	30.5	0.77	0.135	0.1	0.0					
18	Passengr Vehicles (5)	134.8	0.14	1.80	0.02	85.5	0.63	0.086	1.1	0.0					
19	Trucks (4)	219.2	0.97	0.93	0.00	105.6	0.48	0.465	0.5	0.0					
20	Other On-road (7)	10.0	0.01	0.13	0.00	7.9	0.79	0.009	0.1	0.0					
21	Misc small point sources	33.1	0.07	0.22	0.01	41.1	1.24	0.090	0.3	0.0					
22	Points-Actual TSD	32	0.07	0.22	0.01	717.7	0.95								
	Points-PSEL					1732.1	2.30								
	Points-100% capacity					1675.7	2.22								
	Point Sources Chosen from Inputs on DV	**32**	0.08	0.13	0.03	**1732.1**	2.30	0.16	0.5	0.0					
	Total		3.03	30.80	1.16			**2.09**	**21.22**	**0.80**					
	Total Bkg+SA+Other		0.10	2.38	0.00			**0.10**	**2.38**	**0.00**	**0.71**	**4.28**	**1.87**	**0.31**	
	Total with Bkg+SA+Other		3.13	33.18	1.16			**2.19**	**23.60**	**0.80**	**0.71**	**4.28**	**1.87**	**0.31**	33.77
	Species-specific RRF							0.698	0.711	0.689	1	1	1	1	
	RRF multiplied by Sandwich %							0.049	0.529	0.018	0.016	0.096	0.042	0.007	0.756

Note: values shown in this table are as an example, and may differ from those used in the final calculation.

Future Year Design Value (DV)

The following table lists the design days in descending order for each year of the period 2006-2010. For each year, columns show concentrations for Baseline, Future Year, Baseline without points, and Future Year without points. The "without points" data are concentrations with the contribution from industrial point sources removed, and will be used later in the unmonitored area analysis (UMAA).

For each day, Baseline values are factored by the RRFs from the rollback table in order to predict Future Year concentrations. For example, the highest day in 2007 (1/18), has a concentration of 55.6 ug/m3. When multiplied by the total RRF of 0.698, and with the addition of the default 0.5 ug/m3 blank mass, the Future Year value is predicted to be 39.3 ug/m3. The third highest (98^{th} %tile) value for each year is then entered into the DV table, described later, to calculate the Baseline and Future Year DVs.

The design days are listed in descending order with the highest of these days falling in the two quarters of the PM2.5 "season" (1^{st} and 4^{th} quarters). There are two exceptions for the days of 7/4/2006 and 9/25/2009. The 2009 event is a documented wild fire event for which an application has been submitted for exclusion as an Exceptional Event. In anticipation of EPA approval for that Exceptional Event classification, that day has been removed from consideration in the DV calculation.

The 7/4/2006 fireworks event has not been removed because the effect on the final DV is minimal. As shown in the table, the 98^{th} % day (1/23/2006) in the Baseline is 47.5 ug/m3. Applying the total RRF from the Rollback table of 0.698 and adding back the 0.5 ug/m3 of sample blank contamination gives a Future Year concentration of 33.67 ug/m3 for that day. It is assumed that the relatively high concentration on7/4/2006 was the result of particulate from fireworks, and that residential wood smoke played no role in July. As a result, emissions reductions in the Future Year from controls of residential wood heating do not apply and the RRF used to factor the Baseline concentration is 1.0. So the Future Year concentration for 7/4 is unchanged from the Baseline value of 34.0 ug/m3. However, now the 2006 98^{th} percentile value for the Future Year is 34.0, not 33.67 ug/m3, and it is this value that is used in the DV table.

The concentrations the Design Day table that are used in the Design Value Table are color coded to match their locations. Note that the highest value for 2009 on 9/25 is ignored, and that the third highest value is actually on the fourth day (1/10).

Future Year = (Base Year (2008) x Sum of RRF for each modeled species) + 0.5 ug/m3 (blank)

2006

find 98th%tile = 3rd HH

MM	DD	Base	Future	Base No Pts	Future No Pts
12	31	52.6	40.26	52.31	39.71
12	4	51.2	39.21	50.91	38.67
1	23	47.5	36.41	47.21	35.91
7	4	34	34.00	33.71	25.84
12	19	34	26.20		25.84
12	1	33.9	26.13		25.77
10	29	32.1			
12	7	30.8			
10	26	30			
1	2	29.2			
12	28	27.8			
11	10	26.3			
1	5	25.1			
11	1	24.5			
12	16	23.9			
2	25	22.9			
2	7	21.3			
10	23	20.4			
10	17	18.4			
1	26	15.9			
12	22	15.5			
3	12	15.4			
9	29	14.7			
9	11	14.1			
11	16	14.1			
1	20	14			
6	28	14			
9	8	12.5			
11	19	12.4			
10	14	12			
5	11	11.1			
10	2	11			

2007

MM	DD	Base	Future	Base No Pts	Future No Pts
1	18	55.6	42.53	55.31	41.95
1	15	39.7	30.51	39.41	30.09
11	23	39.6	30.44	39.31	30.02
1	24	35.3	27.19	35.01	26.81
11	14	34.2	26.35		25.99
11	8	33.0	25.45		25.10
11	5	30.0	23.18		22.86
1	21	29.9			
1	30	29.2			
10	21	28.6			
12	23	25.9			
11	26	25.6			
10	24	24.3			
2	2	24.0			
3	10	22.9			
11	11	22.9			
2	17	22.6			
10	27	22.3			
2	5	19.3			
11	2	18.8			
3	4	18.3			
1	3	17.2			
12	26	16.5			
3	13	15.6			
10	30	15.4			
10	15	15.1			
4	3	14.8			
7	17	13.9			
12	8	13.1			
2	20	12.4			
12	20	12.2			
2	23	11.7			

2008

MM	DD	Base	Future	Base No Pts	Future No Pts
12	17	74.1	56.52	73.81	55.74
1	19	57.3	43.82	57.01	43.21
12	23	52.2	39.96	51.91	39.41
2	9	39.4	30.29	39.11	29.87
2	12	37	28.47	36.71	28.08
11	29	36.9	28.40		28.01
12	5	34	26.20		25.84
12	11	32.6	25.14		24.80
7	2	32.5	32.50		32.50
11	23	31			
11	14	30.8			
2	27	29.1			
2	18	28.4			
8	7	26.3			
12	26	25.9			
11	17	25.8			
12	8	25.5			
6	29	23.1			
10	27	23.1			
12	2	22.5			
11	20	21.2			
3	10	20.6			
10	30	20.4			
11	5	20.4			
1	25	20.3			
10	24	20			
1	22	19.6			
10	15	19.3			
9	12	18.3			
3	31	16.8			
7	29	16.5			
9	9	16.3			

2009

MM	DD	Base	Future	Base No Pts	Future No Pts
9	25	62.5	62.50		62.50
12	9	53.9	41.25	53.61	40.68
11	15	48.3	37.01	48.01	36.50
1	10	44	33.76	43.71	33.30
12	24	40.6		40.31	
1	16	36.3			
11	30	34.6			
11	9	30			
12	3	29.7			
12	30	28.5			
1	31	27.2			
11	12	26.1			
12	12	25.7			
10	31	25.2			
2	3	24.2			
11	18	23.7			
12	6	20.5			
10	25	20			
2	18	19.9			
1	13	18.6			
11	3	18.5			
1	28	18.1			
12	27	18.1			
1	4	17.4			
10	16	16.2			
11	24	15.7			
3	20	15.5			
12	18	15.5			
8	8	15.3			
10	28	15.3			
4	4	14.5			
3	14	14.3			

2010

MM	DD	Base	Future	Base No Pts	Future No Pts
11	25	52.7	40.34	52.41	39.78
1	2	37.6	28.92	37.31	28.53
1	5	34.6	26.66	34.31	26.29
11	28	33.2	25.60	32.91	25.25
2	1	32.7	25.22		24.88
11	13	30.5	23.56		23.24
12	16	28.3			
12	22	26.6			
11	4	24.2			
12	31	23.8			
1	14	23.7			
2	28	22.2			
11	16	21.5			
1	8	20.1			
2	22	19.4			
1	23	19.1			
4	17	18.6			
1	26	18.2			
11	10	17.2			
12	1	17.2			
11	19	17			
2	13	16.1			
2	10	15.3			
10	26	15.2			
10	20	15			
3	24	14.9			
3	27	14.9			
11	1	14.8			
4	26	13.8			
2	19	13.5			
12	10	12.9			
9	17	12.7			

Note: values shown in this table are as an example, and may differ from those used in the final calculation.

The Design Value Table pulls together the Design Day concentrations for each year, and calculates the Design Value based on the averaging algorithm from the EPA PM2.5 attainment modeling guidance. The colors in the table sections below match the locations in the Design Day table from which the concentrations come.

2008	98th Percentile or Design Value	98th Percentile or Design Value When Permitted Sources are Excluded from the Analysis
2006	47.5	47.2
2007	39.6	39.3
2008	52.2	51.9
2009	44.0	43.7
2010	34.6	34.3
Baseline DV	**45.1**	**44.8**
2014	98th Percentile or Design Value	98th Percentile or Design Value When Permitted Sources are Excluded from the Analysis
2006	36.4	35.9
2007	30.4	30.0
2008	40.0	39.4
2009	33.8	33.3
2010	26.7	26.3
Future DV	**34.6**	**34.1**

As shown in the table, the 2014 Future Year Design Value is 33 ug/m3, which shows predicted attainment at the Peterson School monitor. This Design Value is based on Industrial Point Source emissions at permitted or PSEL emissions, with the exception of Columbia Forest Products. Columbia Forest Products has a "synthetic minor" permit with an annual limit below its capacity. For this source, emissions are based on 100% capacity. Predicted 2014 Actual emissions for all industrial sources are well below permitted limits.

APPENDIX A-23-2

Rollback Modeling and Emission Reduction Control Measures

Further reductions can be expected from implementation of other strategies and control strategies, which are discussed elsewhere in the Plan. The results from the current predicted 2014 inventory together with a sample of potential additional programs are summarized in the table below.

Klamath Falls Rollback Scenarios

Scenario	lbs/day	PM2.5 Emissions lbs/day	Change in PM2.5 Emissions lbs/day	no change 2014 DV ug/m3	w/ change 2014 DV ug/m3	RRF	DV Change from Base 2014 ug/m3
Base: 2014 PSEL Pts		1732.1		**34.6**		0.756	
2014 Actual Pts		717.7	1014.4	34.2		0.747	-0.4
Current Programs							
If **no** Klamath Falls Clean Air calls			2233		59.4	1.307	24.84
If **no** Woodstove Changeout Program			87		35.56	0.777	0.96
If **no** Heat Smart			26		33.1	0.762	0.28
if **no** MACT on Collins and Jeldwen			376		34.7	0.759	0.14
Control Strategies							
Public awareness			-53		34.0	0.743	-0.60
New Fireplace Standards			-10		34.5	0.754	-1.12
RACT* - Opacity standards			-31		34.3	0.748	-0.35
Contingency Measures							
Prohibit fireplace use			-528		29.0	0.626	-5.62
RACT* - CEM and COMs for boilers			0			0.0	

APPENDIX A-24
Unmonitored Area Analysis

An additional analysis, or unmonitored area analysis (UMAA), was used to evaluate future year DVs in other areas of the NAA. There was particular concern about the effect of near-source impacts from industrial sources, and attention was given to estimating these concentrations together with concentrations from all other sources. The UMAA was based on a saturation survey conducted by DEQ in the 2010-2011 winter season, in which seven monitors, including a reference monitor at the Peterson School site, were located in areas to the north and west of Peterson School and operated on four separate days. The goal was to evaluate the distribution of PM2.5 concentrations across broad areas of the NAA, to assess the representativeness of the Peterson School site as a neighborhood monitor for the NAAA, and to develop representative 2014 background DVs (that is, 2014 DVs without industrial sources impacts) for areas of the NAA.

Two of the saturation survey monitors were located in neighborhoods adjacent to industrial sources and were most useful in establishing 2014 no point DVs. The FD#4 site, which is 6.6 km west of Peterson School lies just north (0.5 km) of the Columbia Forest Products facility, and the Pelican School sampler site in the north part of the NAA lies just south of Jeldwen.

The first step in developing no point DVs was to normalize the average concentrations over four days at the sample sites with the average concentration over the same period at Peterson School. These concentrations were then ratioed with the DV at Peterson School in order to estimate equivalent DVs at the sampler sites. The saturation survey results and ratios to Peterson School are shown in the following table.

Saturation Survey with DV ratios

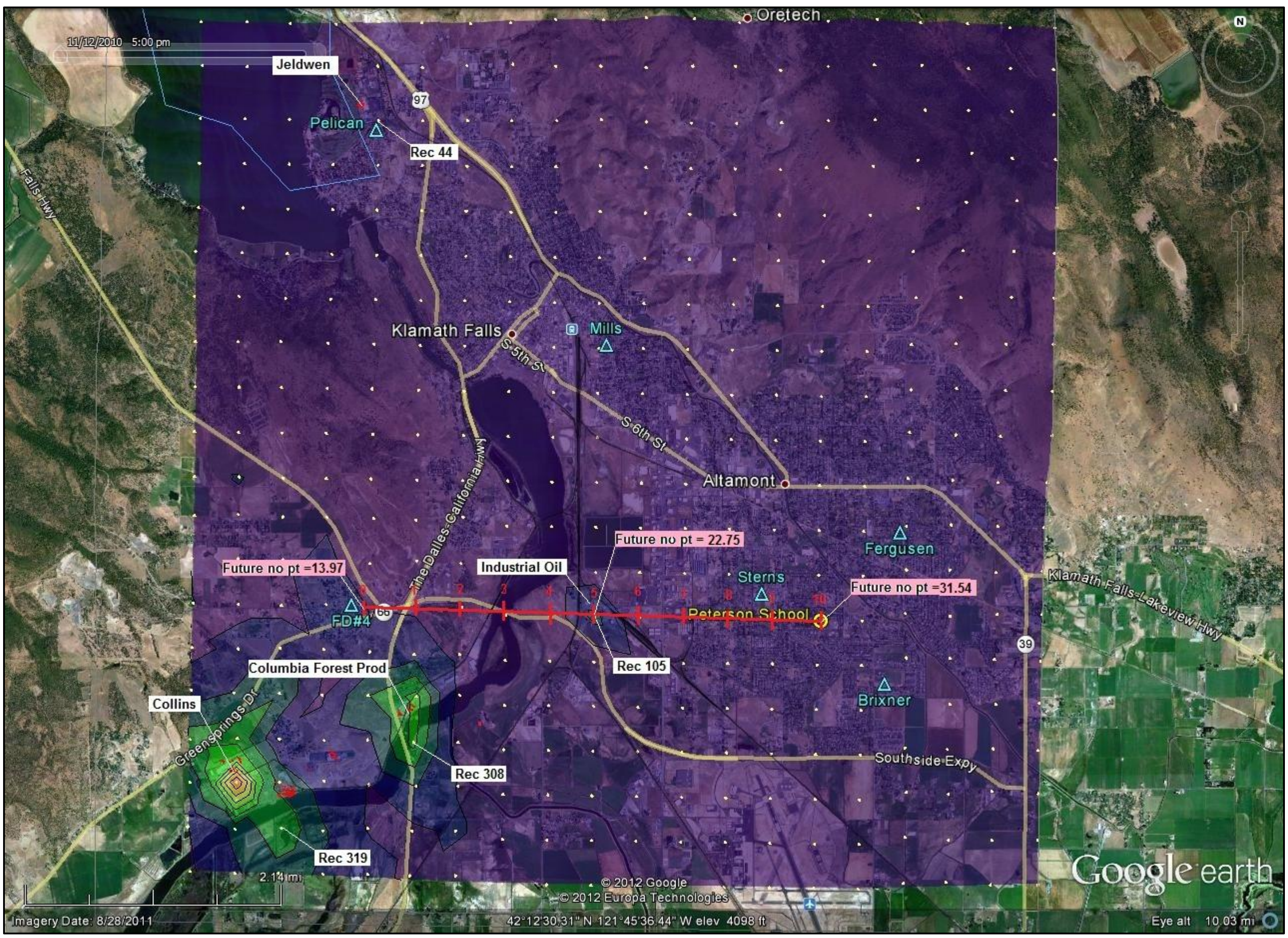
Location	Lat	Lon	Day1 ug/m3	Day2 ug/m3	Day3 ug/m3	Day4 ug/m3	Average ug/m3	Ratio of site to Ptrsn	2008 DV using Ratio ug/m3	AERMOD Pts 2008 Actuals 98%tile ug/m3	2008 DV w/o pts ug/m3	2014 DV w/o pts ug/m3
Peterson	42.1902	-121.7313	25.1	29.6	22.6	28.0	26.33	1.00	**45.1**	0.31	44.8	31.5
Brixner	42.1827	-121.721	25.7	19.9	14.6	24.1	21.08	0.80	36.1			
Fergusen	42.201	-121.7185	20.3	17.1	14.6	21.1	18.28	0.69	31.3			
FD#4	42.1923	-121.8077	12.2	10.1	10.3	19.3	12.98	0.49	22.2	2.38	19.9	14.0
Mills	42.2236	-121.7663	11.3	7.5	8.5	14.2	10.38	0.39	17.8			
Pelican	42.2495	-121.8038	7.8	1.5	8.7	10.8	7.20	0.27	12.3	1.45	10.9	7.7
Sterns	42.1936	-121.741	25.6	26.0	21.0	9.7	20.58	0.78	35.2			

In order to derive a 2008 non-industrial DV concentration for FD#4, the 2008 modeled point source contribution at FD#4 was subtracted from the total 2008 DV for that site. This concentration was then multiplied by the ratio of the 2008/2014 DVs (without points), which in this example is 0.704. The result, as shown in the table above, is 14.0 ug/m3, which is the 2014 DV for FD#4 without industrial point sources. This value was then considered a representative estimate of the 2014 PM2.5 DV concentration, without point source contributions, for the western portion of the NAA near major industrial sources, particularly Collins and Columbia Forest Products.

A second similar concentration was estimated for the area approximately midway between Peterson School and FD#4, near the location of the Industrial Oils facility. Using Peterson School as an anchor to the east, and the FD#4 site as an anchor to the west, a trend analysis of PM2.5 concentrations was made, based on the saturation survey results, to estimate the gradient of concentrations along the transect. Of particular interest was the concentration at the mid-point of the transect at station 5, which is located near the receptor with the highest modeled industrial concentration, primarily from Industrial Oil. Following the same steps as for FD#4 and Pelican, described above, the non-industrial 2014 DV concentration is estimated to be 22.8 ug/m3, and with the addition of the 2014 AERMOD industrial modeled concentrations the 2014 DV at this location is 30.1 ug/m3.

A third "no points DV" was estimated for the north portion of the NAA near the Jeldwen facility. A saturation survey sampler was located at Pelican School in the neighborhood adjacent to Jeldwen, and in the same fashion as for FD#4, a 2014 without points DV of 7.7 ug/m3 was estimated for this neighborhood. The Peterson School, FD#4, and the Pelican School results are shown in the table above.

The map below shows a plot of the 2008 modeled industrial concentration with the industrial facilities and their highest modeled receptors identified. The yellow dots are AERMOD receptor locations, and the saturation sample sites are shown in light blue. The transect between Peterson school and FD#4, the stations used in the trend analysis, and the estimated 2014 non-industrial DVs at three locations are shown in red.

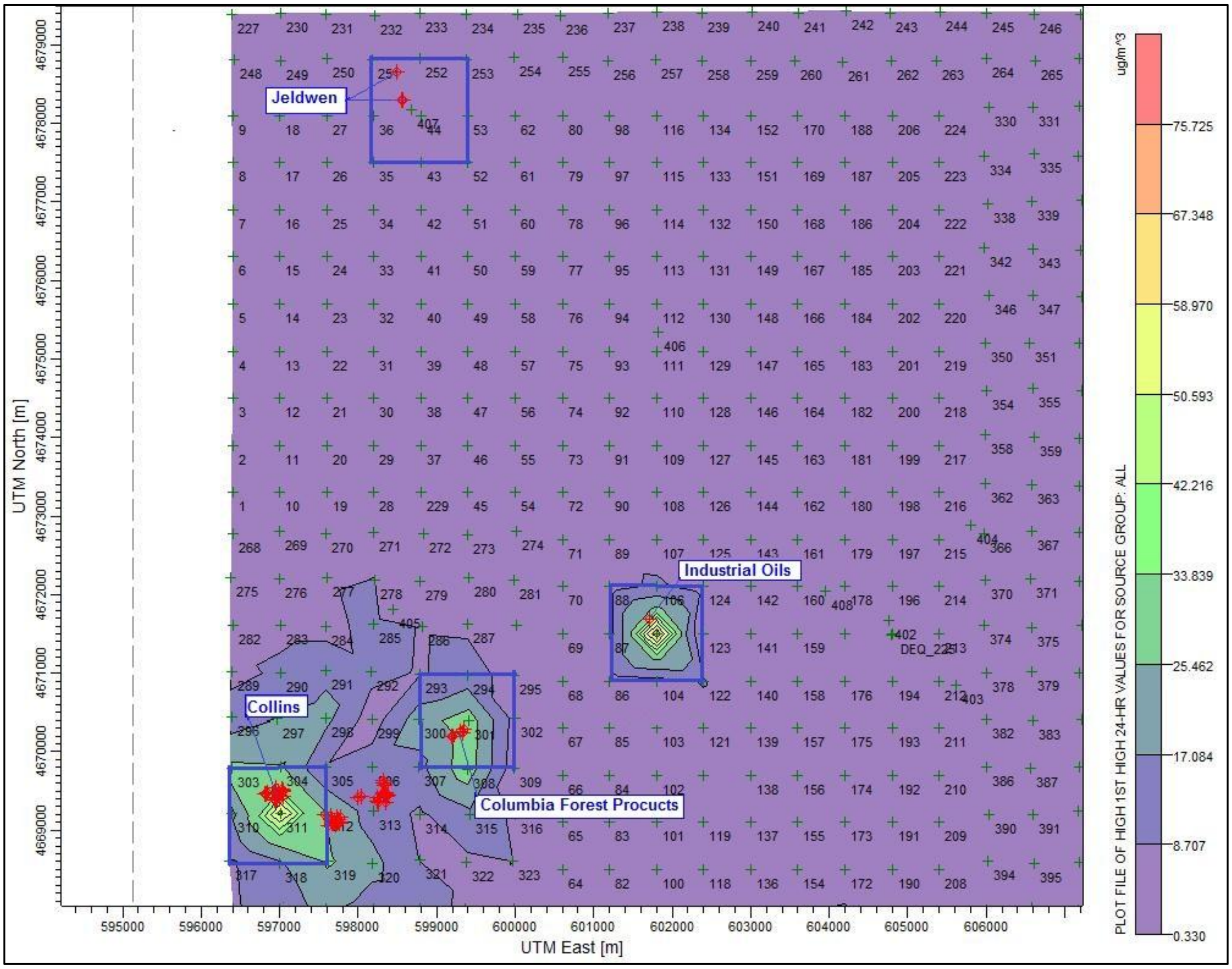


In order to estimate the 2014 DV in areas near industrial facilities, AERMOD was run using 2014 permitted emissions (Plant Site Emission Limit, or PSEL) for the industrial facilities. In order to simulate neighborhood scale concentrations, 1.2 km grids were centered on the facilities and modeled concentrations at the corners and center of the grids (five values for each grid) were averaged (EPA, 2006a). These average concentrations were then added to the 2014 non-industrial DVs that were representative for each facility: 14.0ug/m3 for Collins and Columbia Forest Products, 22.8 ug/m3 for Industrial Oils, and 7.7 ug/m3 for Jeldwen. The results are shown in the table below.

Neighborhood Scale 2014 DV: model results at 98 %tile
1.2 km grid avg as Neighborhood scale

Industrial Facility	Average modeled points			"Background" Concentration w/o Points	Average "Bkg" plus Points		
	PSEL	100% Cap	Actuals		PSEL	100% Cap	Actuals
	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
Collins	12.26	9.08	4.29	14.0	26.2	23.1	18.3
Columbia Forest Products	7.24	11.44	3.78	14.0	21.2	25.4	17.8
Independent Oil (Generic PSEL)	7.36	1.99	1.27	22.8	30.1	24.7	24.0
Jeldwen	1.19	1.14	0.46	7.7	8.9	8.8	8.1

The four industrial facilities modeled for the UMAA, and their associated 1.2 km grids, are shown in the following figure.



The results of the UMAA using the approach described above, show that the areas surrounding the industrial facilities in Klamath Falls, at a neighborhood monitoring scale, are in attainment for the 2014 Future Year. This supplements the attainment demonstration for the Peterson School monitor that also shows attainment for 2014.

APPENDIX A-25

CONFORMITY

DETERMINATION OF VEHICLE EMISSION INSIGNIFICANCE FOR KLAMATH FALLS NONATTAINMENT AREA

DEQ finds that emissions from motor vehicles are insignificant and therefore the nonattainment area is exempt from regional emissions analysis requirements. Still, all projects for the nonattainment area must comply with the project level or "hot-spot" analysis requirements as specified in the state and federal conformity regulations.

Transportation Emissions for Conformity

Federal and state transportation conformity regulations require that mobile source emissions resulting from the implementation of transportation plans and transportation improvement program meet certain criteria to ensure compliance with the Clean Air Act. Conformity ensures that transportation plans and Transportation Implementation Programs (TIPs) are consistent with or conform to the State Implementation Plan (SIP) for the area. Transportation conformity applies to areas designated nonattainment under the Clean Air Act section 172 – Nonattainment Plan Provisions in General. DEQ proposes that on-road directly emitted $PM_{2.5}$ and NO_x for the Klamath Falls nonattainment area (NAA) are insignificant for regional transportation conformity purposes.

Provisions in 40CFR118 and 119 require transportation plans, TIPs and projects to satisfy a regional emissions analysis for relevant precursors. However, section 40CFR93109(m) of this rule states that an area is not required to do a regional emissions analysis if the SIP demonstrates that motor vehicle emissions of that pollutant or precursor are an insignificant contributor to the areas air quality problem. DEQ evaluated the on-road direct emissions for $PM_{2.5}$ and NO_x emissions.

In consideration of making an insignificant determination for regional transportation for conformity purposes, DEQ evaluated the emission inventory and future estimated emissions, the filter sample analyses, source analysis of the filter sample, the effectiveness of control strategies, and the significance of emissions from on-road emission sources as a contributor to nonattainment.

In Klamath Falls and surrounding area, residential wood combustion is the largest source of emissions and transportation emissions are a relatively small portion of the overall set of emission sources. It makes sense to focus on the causes of nonattainment rather than transportation, providing the most environmental benefit based on this plan. DEQ has determined that transportation emissions are insignificant and to exempt regional transportation conformity analysis requirements.

Specifically, DEQ evaluated the following factors to determine that on-road direct $PM_{2.5}$, and NO_x emissions are insignificant contributors to Klamath Falls Nonattainment Area air quality problems:

1. The percent of motor vehicle emissions in the context of the total emission inventory;

2. The current state of air quality as determined by monitoring data for the $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS);

3. The absence of SIP motor vehicle control measures;

4. The historical trends and future projections of growth in motor vehicle emissions.

1. The percent of motor vehicle emissions in context of the total emission inventory

DEQ determined the percent of motor vehicle emissions in the total emission inventory for direct PM2.5, nitrogen oxides and other pollutants. We determined that total carbonaceous material (TCM) or direct $PM_{2.5}$ was the primary contributor to the nonattainment status in Klamath Falls. Nitrogen oxides (NOx), that forms particulate matter as secondary aerosol from transportation sources, are a minor contributor to the overall mass found on the filter sample.

NOx emissions represented less than 10 percent of the total mass on the filter. These emissions are present in the atmosphere from vehicle emissions, industrial and residential sources. The formation of nitrate can be accomplished in the atmosphere by complex chemistry involving nitrogen oxides or other sources of nitrogen. When there is cool weather and fog in Klamath Falls, occasionally we find higher concentrations of nitrates on the filter sample in Klamath Falls. We speculate that during these episodes most of the nitrate is formed. DEQ reviewed the higher concentrations of nitrate on the speciated filter samples and chose a reasonably high concentration of nitrate to be used in our analysis to provide a conservative analysis that could be held constant over time. See the discussion of the monitor results below.

As part of the NAA analysis, DEQ analyzed tail pipe, brake wear and tire wear emissions. 40CFR93-102(b)(3) states that re-entrained road dust emissions is considered insignificant for $PM_{2.5}$ by default. Table 1a depicts the percentage of the inventory associated with the on-road $PM_{2.5}$ emissions for a worst case day. The worst case day is considered a series of days where the ambient emission concentrations are at the highest and roughly represents a 98th percentile day. Table 1b is a typical day which was used in the modeling. DEQ used the Motor Vehicle Emissions Simulator (MOVES) model to calculate emissions from vehicles.

Table 1a Percent of direct $PM_{2.5}$ tailpipe, brake and tire wear emissions from vehicles compared to the total emission inventory for 2008, 2014 and 2037 on the worst case day in pounds per day

	2008	2014	2037
Motor vehicle emissions (lbs/day)	537	308	156
Total emission inventory (lbs/day)	5420	4266	4209

Percent of total	9.9%	7.2%	3.7%

Vehicle Emissions Simulator (MOVES) model to calculate emissions from vehicles.

Table 1b Percent of direct $PM_{2.5}$ tailpipe, brake and tire wear emissions from vehicles compared to the total emission inventory for 2008 and 2014 on a typical case day in pounds per day

	2008	2014
Motor vehicle emissions (lbs/day)	364	199
Total emission inventory (lbs/day)	4430	3361
Percent of total	8.2%	5.9%

There is a significant drop in daily emissions between 2008 and 2014; 43-45% in 6 years resulting in about a 7% drop per year. This is due to Oregon's Low Emission Vehicle (LEV) program, lower sulfur in the fuel, diesel retrofits and new car technology. DEQ used EPAs MOVES guidance to account for the low emission vehicle (LEV) credits (based on the Oregon adoption of the LEV standards beginning with 2009 models) currently being seen in Oregon as well as Klamath Falls and predict them into the future to 2037. DEQ modified the MyLEVs script to reflect the California LEV program per EPA guidance. Oregon has a requirement for 10% ethanol blended into gasoline as a requirement year around, not just in the winter months in CO limited areas. There was a drop in sulfur content of conventional gasoline, gasohol and conventional diesel fuel. There was a significant change between 2008 and 2014 and is carried through to 2037. In the MOVES model, DEQ used standard protocol to calculate these reductions in emissions between 2008 and 2014. DEQ also included the new car emission control technology as the basic fleet identified in 2008 is replaced. There is another 50% drop in emissions between 2014 and 2037 which is also an expected result of a continued implementation of low emission vehicle requirements, fuel changes and other statewide requirements.

Further, a more recent analysis conducted by Oregon Department of Transportation shows that DEQ overestimated diesel emissions because the vehicle mix for large commercial transport vehicles is lower than previously thought. DEQ's analysis above is therefore conservative by significantly overestimating diesel emissions. Single unit trucks are 68 percent lower and combination trucks are 48 percent lower, reducing the $PM_{2.5}$ emissions from diesel usage. The reductions are not reflected in either Table 1a or 1b above or Table 2 below.

Table 2 depicts the percentage of the inventory associated with the on-road $PM_{2.5}$ emissions on an annual average basis. We assume that there will be a similar annual emission reduction in 2037 as in the worst case day.

Table 2 Percent of direct $PM_{2.5}$ tailpipe, brake and tire wear emissions from vehicles compared to the total emission inventory for 2008, and 2014 on an annual basis in tons per year.

	2008	2014
Motor vehicle emissions (tons/yr)	66.5	36.3
Total emission inventory (tons/yr)	654.7	600.5
Percent of total	10.2%	6.0%

Nitrogen oxide emission (NOx) inventories were conducted in addition to the $PM_{2.5}$ emission inventory. Although pounds per day and tons per year are higher than direct $PM_{2.5}$ the secondary formation of particulate matter from NOx is much lower and considered insignificant for both transportation conformity purposes and for attainment demonstration purposes. Below are Tables 3a, 3b and 4 showing the daily and annual emission inventories of NOx.

Table 3a Percent of NOx tailpipe emissions from vehicles compared to the total emission inventory for 2008, 2014 and 2037 on the worst case day in pounds per day

	2008	2014	2037
Motor vehicle emissions (lbs/day)	7990	4834	1915
Total emission inventory (lbs/day)	15,483	13,291	10,372
Percent of total	52%	36%	18%

Table 3b Percent of NOx tailpipe emissions from vehicles compared to the total emission inventory for 2008, and 2014 on a typical day in pounds per day.

	2008	2014
Motor vehicle emissions (lbs/day)	7844	4716
Total emission inventory (lbs/day)	12,252	9,918
Percent of total	64%	48%

Table 4 Percent of NOx tailpipe emissions from vehicles compared to the total emission inventory for 2008, and 2014 on an annual basis in tons per year.

	2008	2014
Motor vehicle emissions (tons per year)	1432	861
Total emission inventory (tons per year)	2236	1810
Percent of total	64%	48%

DEQ predicts a similar drop in percentage to the worst case day emissions in 2014 in 2037 due to the same reductions anticipated from Oregon's adoption of LEV standards and new car emission control technology as a fleet is replaced.

On-road represents 52% of the total nitrogen oxides (NO_x) emissions for the worst case day and 64% for the annual. Despite the high percentages of NOx, nitrates, the particulate fraction on the filter, are a relatively low quantity from the filter sample speciation and the Positive Matrix Factorization (PMF) analysis as described below.

DEQ used filter sample speciation to help define source contributions in the modeling effort DEQ conducted. A rollback model was used for the Attainment Demonstration. In the rollback modeling for the $PM_{2.5}$ Attainment Demonstration, DEQ found that the direct daily on-road emissions of $PM_{2.5}$ are 8.9% of total emissions in 2008 and 7.0% of the total in 2014. Table 5 shows the breakdown.

Table 5 –Rollback Modeling Results that includes Secondary Aerosol including nitrate

Source	2008 Typical day lbs/day	2008 Daily Concentration µg/m^3	2014 Typical day lbs/day	2014 Daily Concentration µg/m^3
Industrial Area Non-road & Other	4066	31.0	3462	20.7
On-road	364	4.0	199	2.3
subtotal	4430	35.0	3661	23.0
Nitrate		4.3		4.3
Other background and $PM_{2.5}$ formed by secondary aerosols		5.4		5.4
Grand Total	4430	45	3661	33

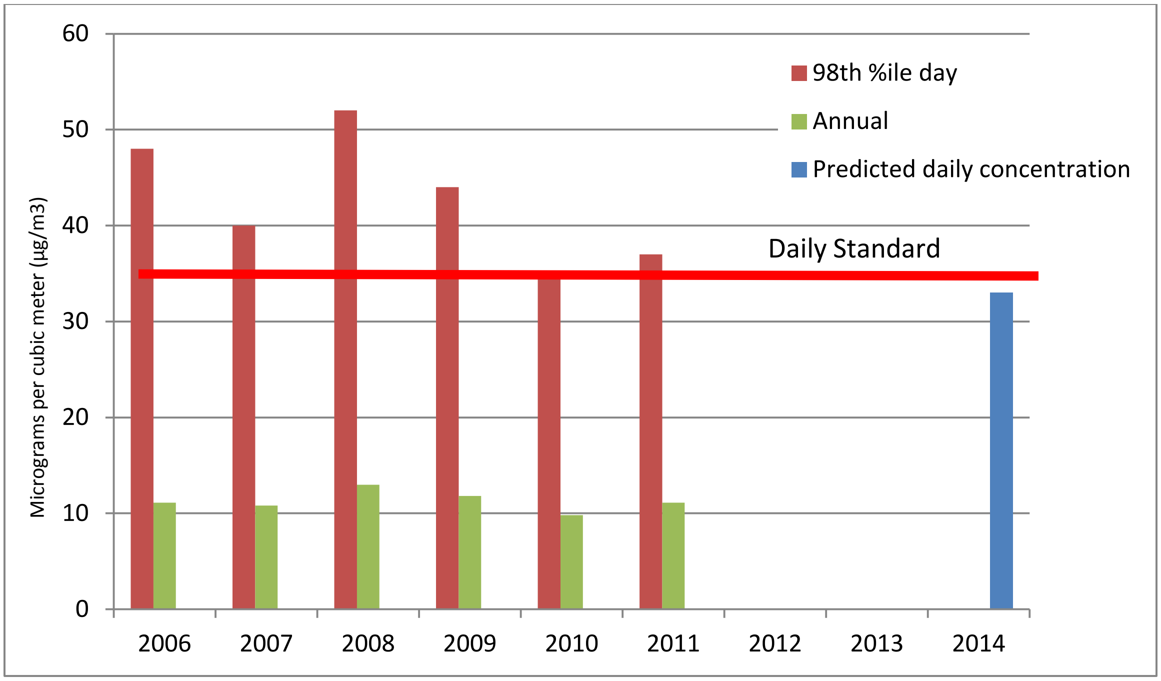
The emission inventory breakdown for nitrogen oxides at first glance is complicated because of the seeming high percentage of NOx contributed to motor vehicles, but it is important to note that nitrate is the particulate fraction of the filter sample and it is a small portion of the overall concentration. It is difficult to know how the nitrate is formed due to complex atmospheric chemistry and therefore DEQ used conservative assumptions. In our species apportionment (see #2 below) we assumed that 9.6% of the total filter sample was nitrate. This figure was rounded up to allow for variability in the sample results. The method of secondary formation of Nitrate from NOx is not well defined. Therefore, by assuming all nitrate is entirely from vehicles also provides a very conservative assumption. Further, we are conservatively assuming that the nitrate will remain high on the filter sample from year to year because we don't know when nitrate will be formed or exactly how because conditions need to be right for the formation (such as fog and cool temperatures). Another conservative assumption is that all nitrate, other secondarily formed particulate and background particulate will remain constant over time and will not reduce in concentration on the filter sample. Even with all these conservative assumptions, it appears nitrogen oxides will decline over time both in quantity and percent of motor vehicle emissions. Direct $PM_{2.5}$ emissions are 8.9% percent of the total and nitrate is less than 10% of the total in 2008. If the nitrate concentration remained the same year after year as a conservative assumption, in 2014 the transportation related concentration of NOx would remain constant and direct fine particulate matter would be around 7% from transportation sources. In 2037, direct $PM_{2.5}$ emissions transportation related contributions would drop to about 4% of the total with a constant concentration of NOx. Since the overall emission inventory for both direct $PM_{2.5}$ and NOx drop over time (see Tables 1,2, 3 and 4), the total concentrations are also substantially reduced despite a similar percent contribution.

One of the sources of both direct $PM_{2.5}$ and NOx comes from diesel emissions. DEQ has made a conscientious effort to control diesel emissions by retrofits and better fuel and improved engines in Klamath Falls. In addition, Oregon Department of Transportation recently pointed out that our vehicle fleet mix was likely skewed toward the large diesel trucks, effectively providing an overestimate of diesel emissions in Klamath Falls. Consequently, DEQ is further portraying a conservative emission estimate by overestimating diesel emissions.

2. The current state of air quality as determined by monitoring data for the $PM_{2.5}$ national ambient air quality standard.

$PM_{2.5}$ ambient concentrations since 2001 were fairly steady through 2008. However, since the County revised its residential woodstove curtailment ordinance in late 2007, ambient concentrations over the last few years in Klamath Falls appear to decline in line with the predicted value in 2014. It is currently unclear whether the decline is due to the revised residential woodstove curtailment or whether it is due to inter-year variability of meteorology. However, the curtailment program appears to be working and the ambient concentration trajectory looks promising. Figure 1 shows the concentrations for both daily and annual ambient concentrations.

Figure 1 – Ambient $PM_{2.5}$ Concentrations in micrograms per cubic meter



DEQ in conjunction with EPA collected speciation data over a number of years and conducted a material or mass balance analysis that was used in the Attainment Demonstration. The Attainment Demonstration identified the species components of $PM_{2.5}$ and their relative concentration in relationship to the design value. The components were weighted to their relative influence on the filter sample. The design value is 45 micrograms per cubic meter (µg/m^3) for 2008 and 33 µg/m^{3}for 2014 (see Table 5). Table 6 lists the vehicle categories and their relative contribution to the total mass.

Table 6: Attainment Demonstration design value based on filter sample speciation in micrograms per cubic meter (µg/m^3) in 2014.

Species	2008 Passenger Vehicles µg/m^3	2008 Trucks µg/m^3	2008 Other On-road µg/m^3	2014 Passenger Vehicles µg/m^3	2014 Trucks µg/m^3	2014 Other On-road µg/m^3
Organic Carbonaceous Mass	1.80	0.93	0.13	1.1	0.5	0.1
Elemental Carbon	0.14	0.97	0.01	0.09	0.47	0.01
Other Particulate	0.02	0.00	0.00	0.00	0.00	0.00

Table 7 shows the speciation of the remaining compounds, nitrate, sulfate, ammonia and water were estimated for the design value using conservative assumptions that would predict higher numbers than normally expected. Nitrate was one of those compounds. To further these conservative assumptions, nitrate along with the other compounds were held constant through time and would not vary being part of the background concentration.

Table 7: Attainment Demonstration design value also included Nitrate, Sulfate, Ammonia and Water that were held constant through 2014.

Species	Design Value Concentration in $\mu g/m^3$
Nitrate	4.28
Sulfate	0.71
Ammonia (NH3)	0.31
Water	1.87

From the speciation data, EPA provided DEQ with a Positive Matrix Factorization (PMF) study that helped identify sources of emissions from filter sample information. This tool is a modeling exercise to determine the potential sources that impact the filter sample. The results from the PMF study are shown in Table 8 below:

Table 8: Positive Matrix Factorization (PMF) study – Identifies potential sources

Factors	Data from 7/2009 to 3/2011 in percent
Wood Smoke	64.6%
OP Rich	23.3%
Nitrate Rich	4.7%
Fugitive Dust	3.7%
Sulfate Rich	3.1%
Urban/Industrial	1.8%
Unattributed Mass	-1.2%

The data from July 2009 to March 2011 uses recent analytical methodology for organic carbon and has six factors. Earlier data shows higher nitrate levels on the filter sample. Previous analysis indicates that nitrate rich could be as high as 12% of the total. EPA's and DEQ's analysis shows woodsmoke clearly the leading contributor to nonattainment. DEQ believes that by focusing reduction strategies on wood smoke and OP rich sources, the Klamath Nonattainment area will meet attainment. OP rich sources are those that show a decayed organic carbon aerosol, also thought to come from woodburning or forest smoke. Since organic carbonaceous mass and elemental carbon were high on the filter sample, it would stand to reason that wood smoke and a decomposed organic carbon (OP Rich) would play an important role in those deposits on the filter. There is a fairly wide range of values for nitrate, but both are relatively low compared to the total. Nitrate rich, sulfate rich and fugitive dust were lower percentages and play less of a role in DEQ's attainment demonstration in the plan. The PMF analyses support the emission inventory findings in viewing motor vehicles as a smaller contributor to $PM_{2.5}$ on polluted winter days.

3. The absence of State Implementation Plan motor vehicle control measures

Klamath Falls is a small community in a rural setting that is well planned and has plenty of expansion opportunities. Yet, there are no state implementation plan motor vehicle control measures that will be effective in reducing $PM_{2.5}$ emissions to meet the standard. In the overall scheme of air quality management, developing a regional budget for conformity purposes will not protect Klamath Falls from exceeding the standard again. The Klamath Falls attainment plan relies upon significant residential wood combustion emission reductions through a mandatory woodstove curtailment ordinance and other measures aimed at wood smoke emission reductions. Klamath Falls is an isolated community within Klamath County with no significant influence from any of the surrounding communities or other counties. The rural nature of Klamath Falls and its location in the Klamath Basin leads DEQ to conclude that regionally generated pollutants from transportation are generated locally and are not transported from one community to another.

Typical transportation emission reduction strategies rely upon the reduction of Vehicle Miles Traveled (VMT) and individual tailpipe emission reduction strategies. To control VMT, there is a national effort to restrict additional lane miles. Due to the rural nature of this community, lane miles are not congested and there has not been an increase in lane miles in this community. Very few roads have been built in the community in the last 20 years. Klamath Falls is a low density area, slow growing, and stable community without the traditional congestion seen in major metropolitan areas. The congestion rating in Klamath Falls is low. In a document called "Klamath Falls Westside Refinement Plan, Transportation Systems Plan", May 2005, all intersections analyzed except one were level-of-service A, B or C. These intersections will continue to degrade but at a slow manageable pace. In 2025, there may need to be additional upgrades at some of the intersections, but greater than 50% of these intersections will still remain in A through C rating without upgrades.

There are no control measures that will reduce VMT further in this small community. VMT reduction would be difficult in an area where the Klamath Basin Transit system is well established and ridership is the best that can be expected. A 1995 study by the Oregon Department of Transportation states that there are 25-27,000 riders per month on the Klamath Basin Transit and 40 percent of those are elderly. Carpooling is occurring based on convenience and short travel distances are not conducive to added VMT reductions. Biking and walking is encouraged but not emphasized in this rural community where transportation is culturally different than a city environment. Oregon's land-use laws already control sprawl and limit growth to an urban growth boundary promotes good transportation planning.[1]

There are no local control measures that can materially reduce tail pipe emissions further. Klamath Falls does not have a Metropolitan Planning Organization. The community is smaller than 50,000 people (city population is roughly 21,000 and the greater area is roughly 46,000) and

[1] See Oregon's Land-use laws at http://oregon.gov/LCD/goals.shtml especially goals 12 and 14.

too small to effectively implement many transportation programs. A vehicle inspection program would not significantly reduce tailpipe emissions for direct $PM_{2.5}$ and will unlikely reduce NO_x emissions significantly to the point where it is justifiable. In Oregon, vehicle inspection programs are established for larger cities and for ozone and carbon monoxide nonattainment areas. Klamath Falls is neither. Newer vehicles are not as likely to degrade causing excessive emissions. EPA underestimated the degree that vehicle owners would repair their vehicles once a check engine light came on. Rural areas like Klamath Falls that do not have inspection programs or On-board Diagnostic (OBD) programs can have a voluntary repair programs that are effective and will not degrade the airshed.

Klamath Falls, the County and ODOT all are active in sweeping roadways with high efficiency sweepers and limiting the use of roadsanding material in the winter.

DEQ has worked with the local school districts to retrofit 45 school buses in the Klamath Falls area. There has also been an effort to reduce idling around schools.

Conformity rules will continue to require project level conformity or “Hot-spot” analyses for those potential large projects that may contribute to exceedances in unanticipated areas. Currently, there are no large projects planned in the Transportation Implementation Plan for Klamath Falls.

4. The historical trends and future projections of growth in motor vehicle emissions

The historical trends in motor vehicle emissions are downward. DEQ uses the worst case winter day to correspond to the 24-hour average standard for $PM_{2.5}$. $PM_{2.5}$ is the predominant pollutant that must be addressed by reduction strategies and focuses on residential wood combustion reductions. Despite a steady upward trend of 1.29% per year in vehicle miles traveled (VMT) (see Figure 2), DEQ calculates a total vehicle emission of 537 lbs per day in 2008 for a worst case day (see Figure 3). In 2014, emissions drop to 308 lbs per day and in 2037 they drop further to 156 lbs per day. Tailpipe and brake and tire wear are further broken down (see Figure 4 and Table 5).

Figure 2 Predicted vehicle miles traveled in 2008, 2014 and 2037 as calculated by Oregon Department of Transportation (ODOT) Daily Motor Vehicles Traveled (VMT)

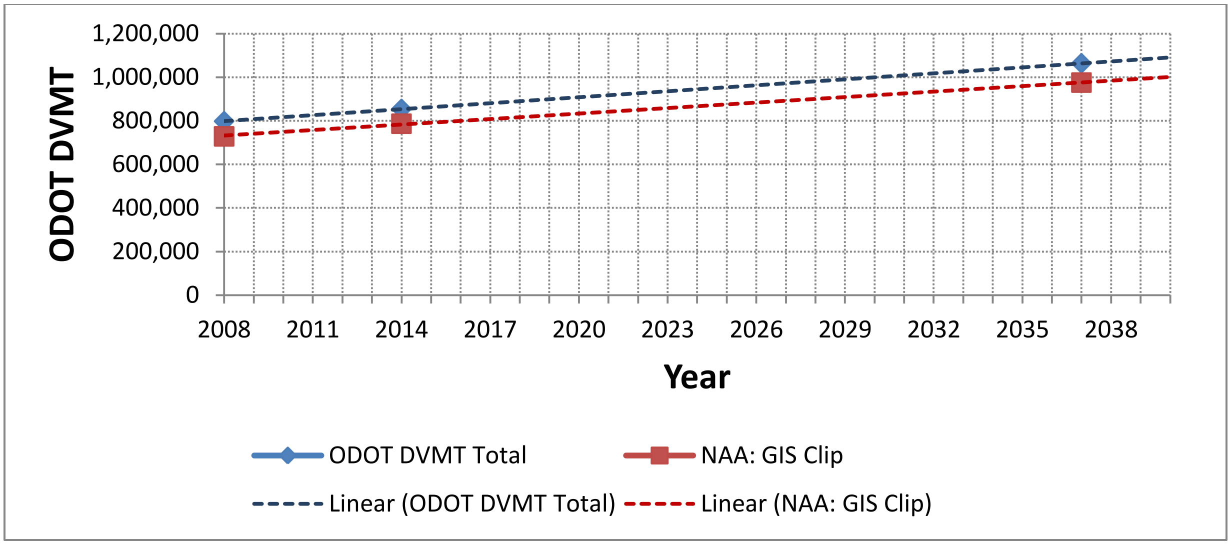


Figure 3 Total emission estimates for 2008, 2014 and 2037 total sources of emissions including on-road motor vehicles for a worst case winter day.

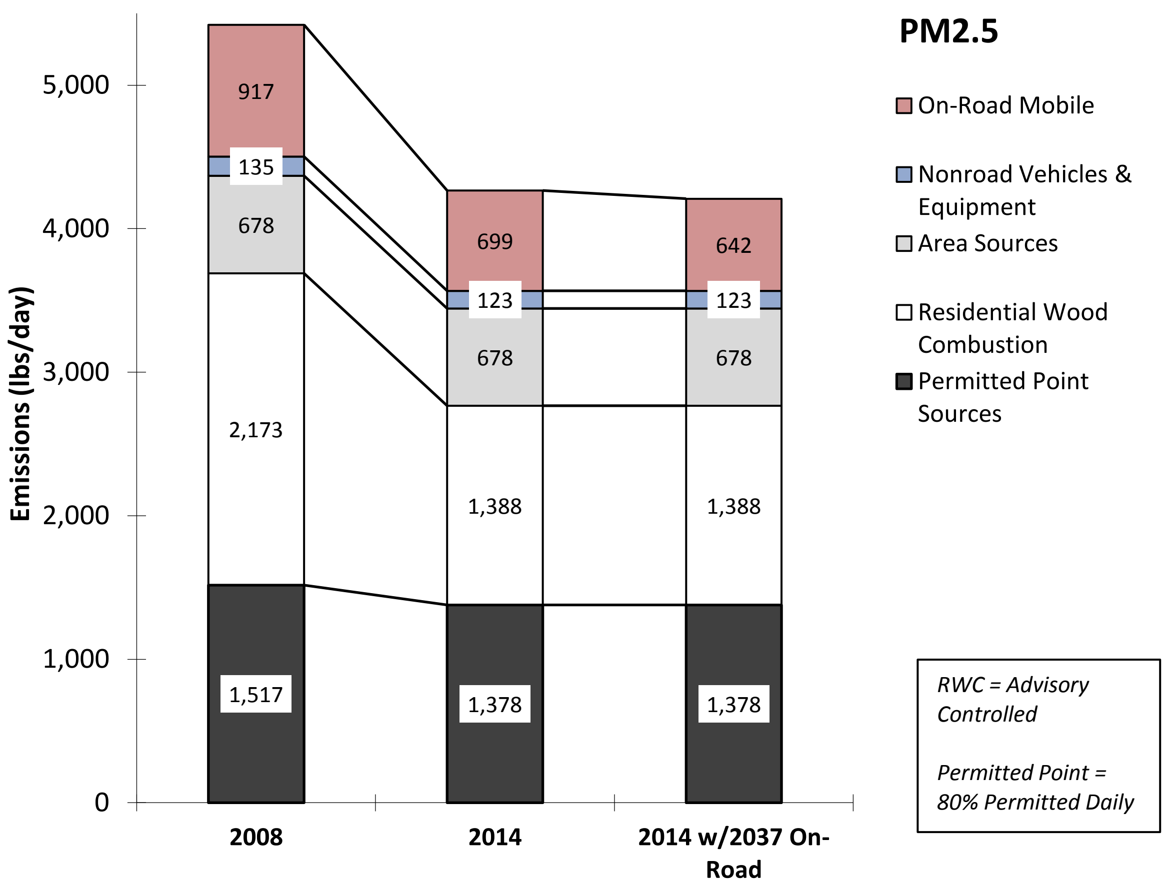


Figure 4 Breakdown of brake and tire wear and tailpipe emissions on a worst case day emissions

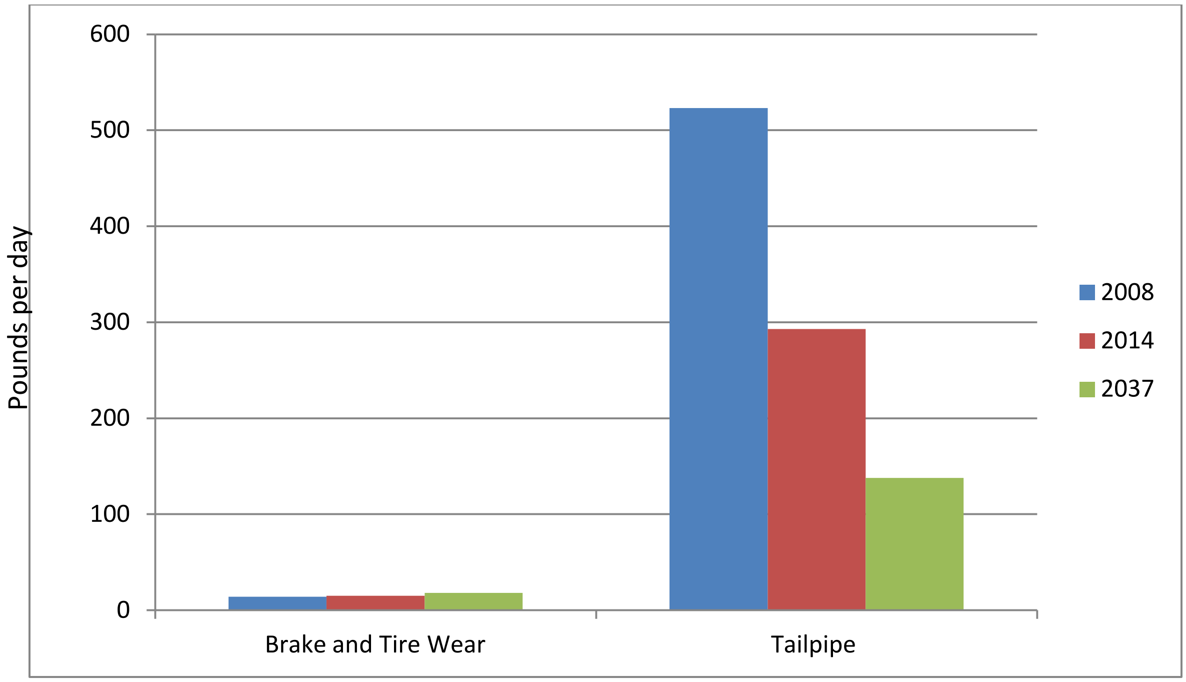


Table 9 On-road $PM_{2.5}$ tailpipe, brake and tire wear emissions for a worst case day in lbs per day

	2008	2014	2037
Brake and Tire Wear	14	15	18
Tailpipe Emissions	523	293	138

Table 10 On-road $PM_{2.5}$ tailpipe, brake and tire wear emissions for a typical season day in lbs per day

	2008	2014
Brake and Tire Wear	14	15
Tailpipe Emissions	350	184

Table 11 On-road $PM_{2.5}$ tailpipe, brake and tire wear emissions - annual emissions in tons per year

	2008	2014
Brake and Tire Wear	2.6	2.7
Tailpipe Emissions	63.9	33.6

Table 12 On-road NO_x tailpipe emissions for a worst case day

	2008	2014	2037
Tailpipe Emissions	7990	4834	1915

Figure 5 Nitrogen Oxides for a worst case day

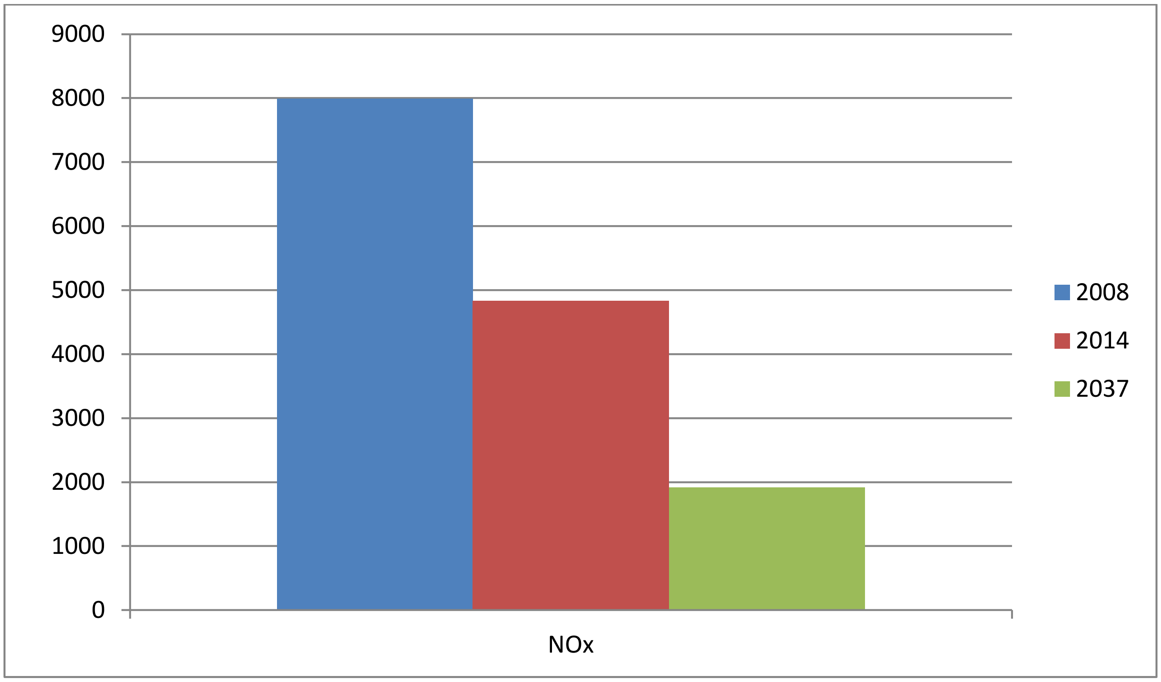


Table 9, 10 and 11 show the worst case day, the typical season day and the annual average emission inventory for $PM_{2.5}$. These tables show a reduction in overall emissions although there is a slight increase in brake and tire wear similar to Figure 4. Table 12 and Figure 5 shows the NO_x emission reduction between 2008 and 2037 from the tailpipe emissions. DEQ expects similar tailpipe reduction emissions for all pollutants over the subsequent years. Tailpipe emissions go down over time due to Oregon's Low Emission Vehicle regulations (LEV II/Tier 2 emissions standards) that will make up an increasing percentage of the fleet.

Should Oregon Low Emission Vehicle (LEV) III standards be implemented later this year as we expect, the 2037 tailpipe emissions will be reduced further. OR-LEV III will further address non-methane organic gases (NMOG) + NOx and other criteria pollutants.

Conclusion

DEQ considers Klamath Falls vehicle emissions to be insignificant and has demonstrated them to be insignificant based on criteria in 40CFR93.109(m). A regional emissions analysis is not necessary in Klamath Falls to meet and maintain attainment for $PM_{2.5}$. Direct emissions of $PM_{2.5}$ and NOx emissions from tailpipe and brake and tire wear are insignificant when compared to the total inventory. Total nitrate found on the filter sample are less than 10 percent and considered insignificant for conformity purposes. Filter sample data and the PMF study show low concentrations of nitrate and resulting nitrate rich factors. There are no viable transportation control strategies in Klamath Falls. Overall trends in total emissions from vehicles are downward through 2037 based on dramatic reductions in tailpipe emissions despite modest increases in brake and tire wear emissions and holding nitrate constant. Because of these findings DEQ has concluded that vehicle emissions are insignificant for conformity purposes and that a regional emissions analysis should be exempted from conformity. Project level conformity analyses will still occur to prevent future unintended exceedances of the standard.

Other Tests

DEQ has addressed the proposed adequacy finding by discussing the following minimum criteria in accordance with 40CFR93.118(e)(4):

1. The request will be endorsed by the Governor of Oregon (or his designee) and will be subject to a public hearing conducted by DEQ in August.
2. DEQ consulted with federal, state and local agencies regarding the documentation for this preliminary finding.
3. The motor vehicle emissions budget will not be necessary for a regional emissions analysis based on our finding and subject to EPA's adequacy finding for an exemption from regional emissions analysis requirements. However, should there not be an adequacy finding, the budget will be the current 2008 emission inventory figure.
4. The motor vehicle emissions budget when considered together with all other emissions sources will be consistent with applicable requirements for reasonable further progress for attainment of the standards. DEQ expects emissions from vehicles to continue to decline as shown above to 2037.
5. The vehicle emissions are consistent with and clearly related to the emissions inventory. The control measures in the attainment plan address emission reductions necessary to bring Klamath Falls into attainment by 2014 including a contingency plan should Klamath Falls fail to meet the deadline.
6. Klamath Falls has a PM_{10} maintenance plan and a CO maintenance plan. PM_{10} emissions are heavily weighted toward dust and the $PM_{2.5}$ emission inventory is a significant fraction of the PM_{10} emissions. Although there is a budget for PM_{10} emissions from vehicles in the maintenance plan, the PM_{10} and $PM_{2.5}$ pollutants are calculated differently and should not interfere with previously budgeted amounts. The CO plan again is a different pollutant and the $PM_{2.5}$ plan will not affect the CO analysis. Additionally, the PM_{10} plan and the CO plan are only for the urban growth boundary. The $PM_{2.5}$ nonattainment area is much larger than the urban growth boundary with different vehicle miles traveled that form the base of the emissions inventory.

APPENDIX A-26

References

Frank, N., 2006: “Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities” *J. Air Waste Mange. Assoc.*, 56, 500-511.

U.S. EPA, (2005), 40CFR, Part 51, Appendix W, Revision to the Guideline on Air Quality Models, 68 FR 68235-68236, November 9, 2005.

U.S. EPA, (2006a), 40 CFR Parts 53 and 58, Revisions to Ambient Air Monitoring Regulations, FR 71 61236- 61328, October 17, 2006.

U.S. EPA, (2006b), “SPECIATE 4.0 Speciation Database Development Documentation – Final Report,” EPA/600/r-06-161, November 2006, Office of Research and Development, RTP, NC.

U.S. EPA, (2007), “Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze”, EPA-454/B-07-002.

Attachment 4

Evidence that the state followed the Administrative Procedures Act

4.1 Public notice in the Secretary of State's Oregon Bulletin, August 1, 2012, publication

4.2 Certificate and Order for Filing Permanent Administrative Rules, filed December 11, 2012, and effective December 11, 2012

OREGON BULLETIN

Supplements the 2012 *Oregon Administrative Rules Compilation*

Volume 51, No. 8
August 1, 2012

For June 18, 2012–July 13, 2012

Published by
KATE BROWN
Secretary of State

Address: Department of Environmental Quality, 811 SW Sixth Ave., Portland, OR 97204-1390
Telephone: (503) 229-6878

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Rule Caption: Oregon Clean Fuels Program for fuel suppliers and producers of transportation fuels.

Date:	Time:	Location:
8-24-12	8:30 a.m.	811 SW Sixth Ave. Portland, OR 97204
8-24-12	8:30 a.m.	165 East 7th Ave., Suite 100 Eugene, OR 97401 (teleconference location)
8-24-12	8:30 a.m.	221 Stewart Ave., Suite 201 Medford, OR 97501 (teleconference location)
8-24-12	8:30 a.m.	475 NE Bellevue, Suite 110 Bend, OR 97701 (teleconference location)
8-24-12	8:30 a.m.	700 SW Emigrant, #330 Pendleton, OR 97801 (teleconference location)

Hearing Officer: EQC Chair Blosser
Stat. Auth.: 2009 OL Ch. 754, House Bill 2186 (2009) & ORS 468A.050
Stats. Implemented: 2009 OL Ch. 754, House Bill 2186 (2009) & ORS 468A.050
Proposed Adoptions: 340-253-0000, 340-253-0040, 340-253-0060, 340-253-0100, 340-253-0200, 340-253-0250, 340-253-0310, 340-253-0320, 340-253-0330, 340-253-0340, 340-253-0400, 340-253-0450, 340-253-0500, 340-253-0600, 340-253-0630, 340-253-0650, 340-253-1000, 340-253-1010, 340-253-1020, 340-253-1030, 340-253-2000, 340-253-2100, 340-253-2200, 340-253-2300, 340-253-3000, 340-253-3010, 340-253-3020, 340-253-3030, 340-253-3040, 340-253-3050, 340-253-3060, 340-253-3070
Last Date for Comment: 8-31-12, 5 p.m.
Summary: Climate change poses a serious threat to Oregon's economy, environment and public health. Transportation sources account for approximately one third of all greenhouse gas emissions in Oregon that lead to climate change. The 2009 Oregon Legislature passed HB 2186 that authorized the Oregon Environmental Quality Commission to adopt rules that would reduce lifecycle emissions of greenhouse gases from Oregon's transportation fuels by 10 percent over a 10-year period. These proposed rules provide the regulatory framework to implement HB 2186, and are now referred to as the Oregon Clean Fuels Program.

The Oregon Clean Fuels Program would be implemented in two phases – Phase 1 would be a reporting phase beginning in 2013, and Phase 2 would be a later greenhouse gas emissions reduction phase. Phase 1 would require Oregon fuel producers and importers to register, keep records and report the volumes and carbon intensities of the fuels they provide in Oregon. Phase 2 would require regulated parties to reduce the average carbon intensity of gasoline and diesel fuel they provide in Oregon each year to meet the clean fuel standard for that year. Regulated parties could select the strategy that works best for them to meet the requirement, such as providing more biofuels, natural gas or electricity, or by purchasing clean fuel credits from suppliers of lower-carbon fuels.

Phase 1 is intended to provide DEQ and regulated parties time to fully develop record-keeping and reporting protocols and systems. It would also allow DEQ to gather data about Oregon's transportation fuels that will help inform DEQ and decision makers about the feasibility of moving ahead with the next phase of the program. If DEQ recommends moving forward to propose Phase 2 of the program, DEQ would initiate a new rulemaking process, including new advisory committees to gather new input on the design of the Phase 2 rules and it's fiscal and economic impact. Phase 2 can only be implemented if:

• The Oregon Legislature adopts a bill to remove the statutory 2015 sunset that currently applies to the Oregon Clean Fuels Program; and

• The Oregon Environmental Quality Commission adopts rules to remove a regulatory deferral of Phase 2 of the Oregon Clean Fuels Program.

Rules Coordinator: Maggie Vandehey
Address: Department of Environmental Quality, 811 SW Sixth Ave., Portland, OR 97204-1390
Telephone: (503) 229-6878

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Rule Caption: Klamath Falls PM2.5 Attainment Plan.

Date:	Time:	Location:
8-21-12	1 p.m.	OIT, Mazama Rm. 3201 Campus Dr. Klamath Falls, OR 97601
8-21-12	7 p.m.	OIT, Mazama Rm. 3201 Campus Dr. Klamath Falls, OR 97601

Hearing Officer: DEQ employee
Stat. Auth.: ORS 468, 468A, 468.020, 468A.025, 468A.460 & 477
Stats. Implemented: ORS 468.020, 468A.010–468A.025, 468A.035, 468A.515, 468A.555, 468A.612 & 468A.085
Proposed Adoptions: 340-240-0500 – 340-240-0630, 340-262-1000, 340-264-0175
Proposed Amendments: 340-200-0040, 340-204-0010, 340-204-0030, 340-225-0090, 340-240-0010, 340-240-0030, 340-264-0040, 340-264-0078, 340-264-0080, 340-264-0100
Last Date for Comment: 8-28-12, 5 p.m.
Summary: The Oregon Department of Environmental Quality is proposing to adopt rules as part of an attainment plan that will bring the Klamath Falls area into compliance with National Ambient Air Quality Standards for fine particulate, or PM2.5, by the federal deadline of December 2014. These amendments, if adopted, will be submitted to the U.S. Environmental Protection Agency (EPA) as a revision to the State Implementation Plan, which is a requirement of the federal Clean Air Act. The attainment plan specifies how the community will meet the particulate standard by the federal Clean Air Act deadline of December 2014, including who will conduct the work, and when and how it will be done.

The attainment plan, based on recommendations from DEQ's citizen advisory committee, is a comprehensive mixture of emission reduction strategies consisting of local ordinances, DEQ regulations, and non-regulatory elements including incentives and education. The plan contains additional strategies recommended by the local advisory committee that provide a margin of safety. The plan also provides contingency measures to meet the PM2.5 standard should the community fail to reduce particulate emissions by the 2014 deadline. The proposed attainment plan will aid the state and the community in controlling emissions to ensure clean air in Klamath Falls.

Since residential wood burning emissions comprise most of the harmful particulate emissions in Klamath Falls, most of the proposed particulate reductions will come from enhancements to the community's woodstove curtailment program, implemented through local ordinances. Other attainment strategies include continuing the program of replacing polluting uncertified woodstoves, a public awareness and education program and DEQ rules requiring reasonably available controls to reduce particulate from industrial sources.

If the attainment plan fails to achieve the federal standard by December 2014, additional regulations in the contingency plan will further reduce particulate emissions from wood burning and industry. The proposed rules will increase regulatory flexibility by allowing new or expanded industrial facilities in Klamath Falls to meet existing federal requirements to offset their emissions by removing woodstoves from homes, thereby decreasing wood burning emissions. Historically, industry has only offset emissions by purchasing unused emission credits from other industrial facilities. These cred-

its are not widely available, which could limit economic growth in the area.
Rules Coordinator: Maggie Vandehey
Address: Department of Environmental Quality, 811 SW Sixth Ave., Portland, OR 97204-1390
Telephone: (503) 229-6878

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Department of Fish and Wildlife
Chapter 635

Rule Caption: Adopt Rule to Establish and Authorize Coquille Tribe Clam Harvest Permits.

Date:	Time:	Location:
9-7-12	8 a.m.	Hermiston Conference Center 415 S. Highway 395 Hermiston, OR 97838

Hearing Officer: Fish & Wildlife Commission
Stat. Auth.: ORS 496.138
Stats. Implemented: ORS 506.129 & 507.030
Proposed Adoptions: Rules in 635-041
Proposed Amendments: Rules in 635-041
Proposed Repeals: Rules in 635-041
Last Date for Comment: 9-7-12, 8 a.m.
Summary: Adopted rule authorizes the Department to issue, upon annual request from the Coquille Indian Tribe of Oregon (Coquille Tribe), a Coquille Tribal Clam Harvest Permit for exclusive use by the Coquille Tribal members. The methods of take, special area regulations, seasons, and any other restrictions remain identical to those pertaining to sport harvest of clams. The individual Coquille Clam Harvest Permit is valid only within the Coos Bay Estuary, and does not authorize trespass upon private lands or entry or use on private or public lands where landowner permission has not been obtained, or where gathering of clams is precluded by any other statute or rule. Housekeeping and technical corrections to the regulations may occur to ensure rule consistency.
Rules Coordinator: Therese Kucera
Address: Department of Fish and Wildlife, 3406 Cherry Ave. NE, Salem, OR 97303
Telephone: (503) 947-6033

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Rule Caption: Adopt Rule to Establish and Authorize Siletz Tribe Clam Harvest Permits.

Date:	Time:	Location:
9-7-12	8 a.m.	Hermiston Conference Center 415 S. Highway 395 Hermiston, OR 97838

Hearing Officer: Fish & Wildlife Commission
Stat. Auth.: ORS 496.138
Stats. Implemented: ORS 506.129 & 507.030
Proposed Adoptions: Rules in 635-041
Proposed Amendments: Rules in 635-041
Proposed Repeals: Rules in 635-041
Last Date for Comment: 9-7-12, 8 a.m.
Summary: Adopted rule authorizes the Department to issue, upon annual request from the Confederated Tribes of the Siletz Indians of Oregon (Siletz Tribe), a Siletz Tribal Clam Harvest Permit for exclusive use by the Siletz Tribal members. The methods of take, special area regulations, seasons, and any other restrictions remain identical to those pertaining to sport harvest of clams. The individual Siletz Clam Harvest Permit is valid only within Lincoln County, and does not authorize trespass upon private lands or entry or use on private or public lands where landowner permission has not been obtained, or where gathering of clams is precluded by any other statute or rule. Housekeeping and technical corrections to the regulations may occur to ensure rule consistency.
Rules Coordinator: Therese Kucera
Address: Department of Fish and Wildlife, 3406 Cherry Ave. NE, Salem, OR 97303
Telephone: (503) 947-6033

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Rule Caption: Adopt Rule Amendments Related to 2013 Oregon Sport Fishing Regulations.

Date:	Time:	Location:
9-7-12	8 a.m.	Hermiston Conference Center 415 S. Highway 395 Hermiston, OR 97838

Hearing Officer: Fish & Wildlife Commission
Stat. Auth.: ORS 496.138, 496.146, 496.162, 497.121 & 506.119.
Stats. Implemented: ORS 496.004, 496.009, 496.138, 496.146, 496.162, 506.109 & 506.129.
Proposed Adoptions: Rules in 635-011, 635-013, 635-014, 635-016, 635-017, 635-018, 635-019, 635-021, 635-023, 635-039, 635-500
Proposed Amendments: Rules in 635-011, 635-013, 635-014, 635-016, 635-017, 635-018, 635-019, 635-021, 635-023, 635-039, 635-500
Proposed Repeals: Rules in 635-011, 635-013, 635-014, 635-016, 635-017, 635-018, 635-019, 635-021, 635-023, 635-039, 635-500
Last Date for Comment: 9-7-12, 8 a.m.
Summary: These rules modify sport fishing regulations for finfish, shellfish, and marine invertebrates for 2013. Housekeeping and technical corrections to the regulations may occur to ensure rule consistency.
Rules Coordinator: Therese Kucera
Address: Department of Fish and Wildlife, 3406 Cherry Ave. NE, Salem, OR 97303
Telephone: (503) 947-6033

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Department of Human Services,
Children, Adults and Families Division:
Child Welfare Programs
Chapter 413

Rule Caption: Changing OARs affecting Child Welfare programs.

Date:	Time:	Location:
8-28-12	8:30 a.m.	500 Summer St. NE, Rm. 251 Salem OR

Hearing Officer: Annette Tesch
Stat. Auth.: ORS 418.005
Stats. Implemented: ORS 183.411-183.685, 411.095 & 418.005
Proposed Amendments: 413-010-0500
Last Date for Comment: 8-30-12, 5 p.m.
Summary: OAR 413-010-0500 about contested case hearings is being amended to correct its cross-reference to the policy and rules about records check requirements for relative caregivers, foster parents, adoptive resources, and other persons in the household.

In addition, the above rules may also be changed to reflect new Department terminology and to correct formatting and punctuation.

Written comments may be submitted until August 30, 2012 at 5:00 p.m. Written comments may be submitted via e-mail to Annette.Tesch@state.or.us, faxed to 503-373-7032, or mailed to Annette Tesch, Rules Coordinator, DHS - Child Welfare Programs, 500 Summer Street NE, E-48, Salem, Oregon, 97301. The Department provides the same consideration to written comment as it does to any oral or written testimony provided at the public hearing.
Rules Coordinator: Annette Tesch
Address: Department of Human Services, Children, Adults and Families Division: Child Welfare Programs, 500 Summer St. NE, E-48, Salem, OR 97301-1066
Telephone: (503) 945-6067

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Rule Caption: Changing OARs affecting Child Welfare programs.

Date:	Time:	Location:
8-28-12	8:30 a.m.	500 Summer St. NE, Rm. 251 Salem, OR

Hearing Officer: Annette Tesch
Stat. Auth.: ORS 418.005
Stats. Implemented: ORS 409.185, 418.005, 418.015 & 419B.005–419B.050
Proposed Amendments: 413-015-0470

Secretary of State
Certificate and Order for Filing

Attachment 4.2, page 1

PERMANENT ADMINISTRATIVE RULES

I certify that the attached copies are true, full and correct copies of the PERMANENT Rule(s) adopted on 12/06/2012 by the

Department of Environmental Quality — 340
Agency and Division — Administrative Rules Chapter Number

Maggie Vandehey — (503) 229-6878
Rules Coordinator — Telephone

811 SW Sixth Ave., Portland, OR 97204-1390
Address

To become effective Upon filing. Rulemaking Notice was published in the August 2012 Oregon Bulletin.

RULE CAPTION

Klamath Falls PM2.5 Attainment Plan
Not more than 15 words that reasonably identifies the subject matter of the agency's intended action.

RULEMAKING ACTION
Secure approval of new rule numbers with the Administrative Rules Unit prior to filing.

ADOPT:
340-240-0500, 340-240-0510, 340-240-0520, 340-240-0530, 340-240-0540, 340-240-0550, 340-240-0560, 340-240-0570, 340-240-0580, 340-240-0610, 340-240-0620, 340-240-0630, 340-262-1000, 340-264-0175

AMEND:
340-200-0040, 340-204-0010, 340-225-0090, 340-240-0010, 340-240-0030, 340-264-0040, 340-264-0078, 340-264-0080, 340-264-0100

REPEAL:

RENUMBER:

AMEND AND RENUMBER:

Statutory Authority:
ORS 468, 468A, 468.020, 468A.025, 468A.460, 477

Other Authority:
N/A

Statutes Implemented:
ORS 468.020, 468A.010, 468A.015, 468A.020, 468A.025, 468A.035, 468A.515, 468A.555, 468A.612, 468A.085

RULE SUMMARY

The Oregon Department of Environmental Quality has adopted rules as part of an attainment plan that will bring the Klamath Falls area into compliance with National Ambient Air Quality Standards for fine particulate, or PM2.5, by the federal deadline of December 2014. These amendments will be submitted to the U.S. Environmental Protection Agency (EPA) as a revision to the State Implementation Plan, which is a requirement of the federal Clean Air Act. The attainment plan specifies how the community will meet the particulate standard by the federal Clean Air Act deadline of December 2014, including who will conduct the work, and when and how it will be done.

The attainment plan, based on recommendations from DEQ's citizen advisory committee, is a comprehensive mixture of emission reduction strategies consisting of local ordinances, DEQ regulations, and non-regulatory elements including incentives and education. The rules increase regulatory flexibility by allowing new or expanded industrial facilities in Klamath Falls to meet existing federal requirements to offset their emissions by removing woodstoves from homes, thereby decreasing wood burning emissions. The rules also include other requirements for industries in the area, woodstove requirements, and updated definitions.

Maggie Vandehey	maggie.vandehey@state.or.us	12-11-12 3:31p.m.
Rules Coordinator Name	Email Address	Date Filed

Attachment 5

Evidence of adequate public notice

5.1 Affidavit of Publication: Herald and News, July 20, 2012, edition

AFFIDAVIT OF PUBLICATION
STATE OF OREGON, COUNTY OF KLAMATH

I, Jeanine P. Day, Finance Director, being duly sworn, depose and say that I am the principle clerk of the publisher of the Herald and News, a newspaper in general circulation, as defined by Chapter 193 ORS, printed and published at 2701 Foothills Blvd, Klamath Falls, OR 97603 in the aforesaid county and state; that I know from my personal knowledge that the Legal#14475 OREGON DEPARTMENT OREGON DEPARTMENT OF ENV a printed copy of which is hereto annexed, was published in the entire issue of said newspaper for: 1

Insertion(s) in the following issues:
07/20/2012

Total Cost: $105.50

Jeanine P Day

Subscribed and sworn by Jeanine P Day before me on:
20th day of July in the year of 2012

Debra A Gribble

Notary Public of Oregon
My commision expires on May 15, 2016

OFFICIAL SEAL
DEBRA A GRIBBLE
NOTARY PUBLIC - OREGON
COMMISSION NO. 468355
My Commission Expires MAY 15, 2016

Oregon Department of Environmental Quality Notice of Public Hearing on Proposed Klamath Falls PM2.5 Attainment Plan.

The Oregon Department of Environmental Quality is proposing to adopt rules as part of an attainment plan that will bring the Klamath Falls area into compliance with National Ambient Air Quality Standards for fine particulates, or PM2.5, by the federal deadline of December 2014. The attainment plan specifies how the community will meet the fine particulate standard, including who will conduct the work, and when and how it will be done. The plan is a comprehensive mixture of emission reduction strategies consisting of local ordinances, DEQ regulations, and non-regulatory elements including incentives and education. These amendments, if adopted, will be submitted to the U.S. Environmental Protection Agency as revisions to the State Implementation Plan (SIP) required by the federal Clean Air Act. DEQ will hold public hearings on the proposed plan and associated rules in Klamath Falls at 1:00pm and 7:00pm, August 21, 2012, at the Oregon Institute of Technology, 3201 Campus Drive, Mazama/Scott Room. Oral and written comments will be accepted at the hearing.

The rulemaking documents are available online at: http://www.deq.state.or.us/regulations/proposedrules.htm or by contacting Aida Biberic at (503) 229-5280.

Written comments may be mailed to 811 SW 6th Avenue, Portland, OR 97204 or emailed to KlamathFallsSIP@deq.state.or.us.

The comment period ends at 5:00 pm on August 28, 2012.

#14475 July 20, 2012

Attachment 6

Certification of public hearing

See paragraph #3 of cover letter and Attachment 7.1 and 7.2

Attachment 7

Compilation of public comment and department's response

7.1 Presiding Officer's Report for rulemaking hearing on August 21, 2012, dated August 29, 2012

7.2 Presiding Officer's Report for rulemaking hearing on August 21, 2012, dated August 29, 2012

7.3 Summary of public comment and agency response, dated September 18, 2012

State of Oregon
Department of Environmental Quality **Memorandum**

Presiding Officer's Report

Date: Aug. 29, 2012

To: Environmental Quality Commission

From: Rachel Sakata, Air Quality Planning

Subject: Presiding Officer's Report for Rulemaking Hearing
Title of Proposal: Klamath Falls $PM_{2.5}$ Attainment Plan and Rules
Hearing Date and Time: August 21, 2012, 1 to 3 p.m.
Hearing Location: Mazama/Scott Room, 3201 Campus Drive, College Union Building, Klamath Falls, Oregon

DEQ convened the rulemaking hearing on the proposal referenced above at 2:29 p.m. and closed it at 2:41 p.m. Attendees were asked to sign registration forms if they wished to present comments. They were also advised that the hearing was being recorded.

Thirty-six people attended the hearing; four people provided oral comments, one who included some written material to be included in the record, and one person provided written testimony.

Before taking comments, Larry Calkins, Natural Resources Specialist, gave a presentation on the development and contents of the Klamath Falls $PM_{2.5}$ attainment plan, rulemaking proposal, and the rulemaking process in general. He informed attendees that the proposed attainment plan and rules were scheduled for commission action in December 2012.

The following is a summary of the oral comments received at the hearing. DEQ will include these comments, along with the written comments, in the summary of comments and agency responses for this proposed rulemaking.

Delbert Bell, retired, provided comments about how the issue is a personal one for him. He testified how his late wife passed away due to respiratory and heart problems, therefore he can associate with many people in Klamath who say they have respiratory problems. Delbert thanked DEQ and Larry Calkins for working to clean up the air.

Catherine Cappel, citizen, provided comments about a recent public radio station program regarding development of a biomass plant in Russell, Massachusetts. She summarized the program, stating that the biomass plant was rejected because a Massachusetts state study indicated the greenhouse gases generated from building the plant would negate any job or energy benefits created by the plant. The program stated that a biomass plant will emit 30 percent more carbon dioxide than coal plants and 60 percent more than natural gas plants. She submitted the program transcript to DEQ indicating her hope that DEQ would review it before making any decisions. Ms. Cappel was concerned about how Klamath's air quality could be poor when there weren't any wildfires, but there could be smoke from wildfires or from Jeld-Wen's slash burning. She also testified that she had respiratory problems and did not want to see the addition of one or two biomass plants in the community to increase the probability of poor air quality.

Jaye Weiss, citizen, testified that she and her 30 neighbors do not agree with Commissioner Linthicum's comments that the poor air quality monitored in one location should not represent the entire Klamath basin. She wants clean air all the time, not bad air quality on one day which gets averaged out with the clean days. She supports DEQ's efforts to clean the air. Ms. Weiss also testified that it's misleading to say industrial sources will meet all the standards for $PM_{2.5}$, but they may not meet other standards. She reiterated that Klamath citizens should be able to breathe clean air all the time.

Michael Lamb, citizen, testified that there is a serious problem regarding air quality. He thinks DEQ needs to put a monitor at the site of poor air quality, not where it is clean, so DEQ knows if there is a problem. Mr. Lamb commented on the biomass plant and hopes that the science is correct in that the emissions will not be a problem for Klamath. He also supports wood burning, as it's a renewable fuel, but only if it's done properly. He thinks the woodstove changeout program should continue, especially if DEQ can get federal government funding for it, since they are the ones who put Klamath into this status. He testified that the area needs enforcement, as the area has made major changes over the past 20 years and can continue to do so.

Robert Anderson, citizen, provided written comments stating that in the fall and winter there is pollution coming from Medford, and that he can see it coming over the mountains. His question to the DEQ was why it wasn't monitored.

DEQ closed the hearing at 2:41 p.m.

State of Oregon
Department of Environmental Quality **Memorandum**

Presiding Officer's Report

Date: Aug. 29, 2012

To: Environmental Quality Commission

From: Rachel Sakata, Air Quality Planning

Subject: Presiding Officer's Report for Rulemaking Hearing
Title of Proposal: Klamath Falls $PM_{2.5}$ Attainment Plan and Rules
Hearing Date and Time: August 21, 2012, 7:00 to 9:00 p.m.
Hearing Location: Mazama/Scott Room, 3201 Campus Drive, College Union Building, Klamath Falls, Oregon

DEQ convened the rulemaking hearing on the proposal referenced above at 8:32 p.m. and closed it at 9:01 p.m. Attendees were asked to sign registration forms if they wished to present comments. They were also advised that the hearing was being recorded.

Twenty people attended the hearing; eight people provided oral comments.

Before taking comments, Larry Calkins, Natural Resources Specialist, gave a presentation on the development and contents of the Klamath Falls $PM_{2.5}$ attainment plan, rulemaking proposal, and the rulemaking process in general. He informed attendees that the proposed attainment plan and rules were scheduled for commission action in December 2012.

The following is a summary of the oral comments received at the hearing. DEQ will include these comments, along with the written comments, in the summary of comments and agency responses document for this proposed rulemaking.

Bill Brown, retired educator and former Klamath County Commissioner testified. He provided the history of Klamath Falls regarding its economic state in Oregon, the woodsmoke problem back in the 70s, and how improvements were put in place in the 1980s and 1990s to clean up the air. He remembered when PM_{10} was an issue, and how in 2007 the standard changed from PM_{10} to $PM_{2.5}$. He mentioned how the air quality zone was expanded, how the monitoring data used to determine compliance was used after the fact (utilizing 2004 data), and that forest fires occurring at the time and really contributed smoke to the area and thinks this may have contributed to the problem. He did not support DEQ’s plan for going forward because he didn’t think $PM_{2.5}$ was going to be the end. He stated that EPA wanted $PM_{1.5}$, instead of $PM_{2.5}$, and predicts that EPA will change or lower the standard that will put the community back into nonattainment and the problem will be here again. He thinks the plan is cumbersome and DEQ should draw a line in the sand as there is no guarantee the standard won't change again.

Hugh Thompson, citizen, testified that 99 percent of the time there is no pollution, but if you look out at the valley you can see the pollution just lying there. He thinks if DEQ has more monitors in different locations and elevations then the results would come out much differently and shouldn't judge it by just one monitor. As for the biomass facility, the wind is going to blow emissions in Klamath and won't stay out.

Pauletta Welker, citizen, testified that instead of pollution burden on individual should tighten regulations on industry. The biomass plant that is outside the nonattainment area should not have to be subject to less regulation. She suggests DEQ extend the nonattainment boundary to Keno.

Greg Beckman, citizen, testified about his concern regarding truck traffic going to a biomass plant and its potential emissions. He offered solutions to address the truck traffic, specifically to require all trucks going to the biomass plant be permitted, and must go through opacity testing at an inspection terminal every 90 days. The trucks would also be required to have weight limit sensors and the engines would have to meet federal and state emission requirements. Mr. Beckman also provided comments on the monitoring, by suggesting put the monitor on a trailer, power it by solar energy, and place it in various locations at one month intervals. This would allow for up to 20 separate sampling locations, in which the results could be averaged. He also suggested the biomass plant emissions be sampled within the stack, not above it, as even one inch above the stack allows fresh air to be entrained into the stack and change the readings.

Gail Whitsett, citizen, testified with a serious of questions for the DEQ.

1) Is there a quantitative delineation of the air shed and what is its size in square miles?
2) Does the airshed stop at the border of Jackson and Deschutes counties and the California border? DEQ should technically define the total airshed, which should include California's Tule Lake basin which is part of the Klamath basin.
3) It's not clear that DEQ knows which sources are contributing. Wildfires, controlled slash burning, refuge burning, agricultural burning, all these come into the city because it is the lowest lying area. It is not fair to penalize the people of Klamath for all of these other sources of particulate matter; it's unreasonable and not scientific.
4) It is unreasonable and scientifically inaccurate to have only one location for the monitor to determine compliance for the entire airshed. The monitoring station has no air movement where doing the testing. Would propose at least three monitors in a triangulated area to get a better sense of conditions. This would be more accurate for air quality at a given time.
5) Does DEQ seek to have a total ban on fireplaces and woodburning in the county?
6) Has DEQ quantified the number of persons from the local Medical Examiner that have died from Klamath County air pollution? Do you think anyone has actually died because of conditions in Klamath? Shouldn't DEQ conduct a study before enforcing air quality standards that are unreasonable?

7) Has DEQ studied the economic impact of implementing its new rules? What is the cost in job losses, cost to community in terms of compliance for citizens and industries, and estimated fines and violations? How many companies will not relocate to the basin? How much have local businesses paid in fines for air quality violations?
8) DEQ comes to the Legislature every biennium and asks for more money. The state is in severe monetary distress and it would make sense to cut back on state employees and spending and encourage job growth and business growth.
9) Are federal agencies required to comply with the burn day schedule, such as the Forest Service and Bureau of Reclamation?

Mark Gaffney, citizen, testified that he thinks Oregon needs the biomass plant. He stated that biomass was necessary because fuel loading in the forests has been accumulating, there is not rapid decomposition, and the area is building up to a huge fire event like the recent one in Colorado. He suggested thinning out the forests, conducting some underburning, which will cause smoke, but that it will be less overall than a forest fire. Mr. Gaffney also testified that the biomass should probably be located elsewhere, such as out east near Beatty or on Highway 97 where its emissions will have no effect on the basin.

Tom Mallams, citizen, testified that he believes the particulate matter standard will likely get lowered again, based on past history. He also testified that the California fire emissions should not be counted as part of the PM2.5 estimations in Klamath Falls, as Klamath is being penalized for California's poor air quality coming into the area as background emissions. He indicated that for monitoring, the agencies' approach to monitoring, while mandated, should not require putting the monitor in the worst location. Instead, monitoring should be placed in multiple locations and have the results averaged. Mr. Mallams testified that common sense is lacking in the rules that are being used against the citizens of Klamath Falls and that it does not allow economic growth.

Dennis Linthicum, Klamath County Commissioner testified about the monitoring, in that there should be multiple monitoring locations that are averaged, instead of just one monitor location at Peterson School. He indicated that if DEQ or EPA are going to operate under the federal Data Quality Act, that legislation would require the agencies to follow quality guidelines that ensure the quality, utility, objectivity and integrity of the data and information that the agency disseminates. He testified that EPA should allow Klamath Falls citizens to correct invalid and incorrect information, and to allow people with scientific backgrounds and degrees to criticize the methodology and provide input. Commissioner Linthicum did not see any avenues for this provision. He also testified by not allowing citizens to use their woodstove for efficient and low cost fuel and heat during wintertime is ridiculous, when recent surrounding forest fires in Lakeview and in California are burning. This burning is equivalent to every citizen in Klamath County putting an acre and a half of timber in their fireplaces in a two week period. Commissioner Linthicum also stated the particulate matter standard will continue to change and be lowered, at the detriment to the health and prosperity of citizens. He also wanted to be on record that during the open microphone Q&A session there were many ideas getting verbalized that may or may not get put into the written record, and recommended that they get recorded and a transcript provided in future meetings.

DEQ closed the hearing at 9:01 p.m.

Summary of Public Comment and Agency Responses
Klamath Falls $PM_{2.5}$ Attainment Plan and Rules
Sept. 18, 2012

This document summarizes public comment received and DEQ's responses on the Klamath Falls $PM_{2.5}$ Attainment Plan and Rules. DEQ had a public comment period from July 20 through Sept. 4, 2012. DEQ held two public hearings in Klamath Falls, Oregon, on Aug. 21, 2012.

Comments are summarized by issue category. All persons who provided comments are listed at the back of this document. At the end of this document a table assigns numbers to individuals who submitted comments. These commenter numbers follow each comment summarized below. The full public record is available for review by the public at the Portland DEQ office at 811 SW 6th Ave. Copies are available upon request.

1. Industrial Sources
a. In general
1) Comment: Strict enforcement of the $PM_{2.5}$ standard, requiring restrictions on industry will be bad for businesses, the struggling economy, and jobs in Klamath Falls. The $PM_{2.5}$ standard is an arbitrary number that is killing business in the area. Businesses are leaving the area for more "business friendly" locations. Commenters strongly oppose DEQ's plans to make air quality restrictions even more stringent in Klamath County. (2, 16, 18, 19, 20)
Response: DEQ is responsible for collaborating with communities that violate federal air pollution health standards to develop a plan that must decrease the pollution to safe levels. In working with the Klamath Falls Air Quality Advisory Committee and other community members during the last two years, DEQ has extensively considered impacts on local businesses and the economy. The proposed plan elements minimize local economic impacts as much as possible, and include increased flexibility for new or expanded industries by allowing emission offsets from woodstove change outs. When an area is designated as nonattainment, federal requirements automatically apply for industrial sources, such as requiring the most stringent control equipment for new or expanding sources or reasonable control measures, such as opacity standards, operation and maintenance plans, and fugitive plans, for existing sources. While DEQ recognizes that these restrictions may prevent some industries from expanding or moving to Klamath Falls, they are designed to help clean up the air and ensure the health of all residents. Despite the existing stringent requirements, DEQ is aware of at least two proposals from new businesses planning to locate in the Klamath Falls area. In addition, if DEQ does not adopt a plan the federal restrictions become more stringent, such as a higher offset ratio requirement for industry, and the area could even risk losing federal highway funds, both of which could have negative economic impacts.

As required by the Clean Air Act, the U.S. Environmental Protection Agency has established the $PM_{2.5}$ standard to protect public health based on its review of current health studies. The $PM_{2.5}$ particulate standard is not an arbitrary number. It was developed by an independent panel of scientists who evaluated all relevant medical and scientific data and recommended a concentration, which was then vetted through an extensive public review process.
2) Comment: DEQ provided data showing that local industry has only a one percent contribution to the $PM_{2.5}$ levels in the Klamath Falls nonattainment area. However, the draft attainment plan is requiring a 50% reduction for opacity and grain loading standards. This could cause significant capital expenditures for some facilities. It is contrary to the reported community desire that industry restrictions will be relative to their contribution and the agency's sensitivity to fiscal impacts on businesses still recovering from the economic downturn. (25)
Response: It is true that local industry contributes to about one percent of the total $PM_{2.5}$ at Peterson School based on modeling DEQ conducted. The modeling also showed that the concentrations of emissions dropped off substantially after the property line, but there still were significant ambient emissions near the facility. DEQ expects all sources of pollution to be addressed throughout the nonattainment area, and not just at Peterson School. To minimize economic impacts on industry, DEQ proposes to remove the contingency plan elements that set a lower grain loading standard and require monitoring of operating conditions at wood products dryers. DEQ proposes to maintain the industrial contingency measure requiring monitoring at large facility wood fired boilers. The requirements proposed in DEQ rules are consistent with reducing industrial contributions in proportion to their contributions and should not be overly burdensome to any source in the Klamath Basin.
b. Permitting
1) Comment: Just because industry meets the air quality standards doesn't mean they meet all the (ambient) standards. (5)
Response: In a nonattainment area such as Klamath Falls, DEQ considers both industrial contributions to pollutant levels in the entire airshed and compliance with ambient standards in the immediate vicinity of the facility. Under DEQ's statewide permitting regulations, industrial facilities in Klamath Falls have, or will have permit requirements that prohibit them from violating ambient standards for pollutants such as PM_{10}, NOx, SOx, and CO based on modeling or estimates of the maximum emissions at the plant site. In addition, DEQ modeled emissions from all existing industrial sources in the Klamath nonattainment area and determined these sources did not exceed the standard within the nonattainment area other than that at Peterson School. $PM_{2.5}$ is closely linked to PM_{10}, and as permits are renewed, $PM_{2.5}$ requirements will be incorporated into permit. In the interim, PM_{10} is the surrogate for $PM_{2.5}$.
2) Comment: Require emission levels for any new business that burns wood or fossil fuels as part of its operations to not exceed the $PM_{2.5}$

standard (16)
Response: DEQ requires any facility that burns wood or fossil fuels that exceeds 10 MMBTU per hour to obtain a permit to construct or operate. Permit conditions require these facilities to comply with specific emission-related controls including PM. Currently the permits have requirements for PM_{10} that are being used as a surrogate for $PM_{2.5}$ until the $PM_{2.5}$ specific emission-related controls can be included in permits, which is expected at the facility's next permit renewal.
c. Biomass facilities
1) Comment: DEQ is pushing for a biomass facility that will create air quality concerns, yet trying to address air pollution at the same time. (1)
Response: In the case of both the proposed biomass facilities, the Oregon Energy Facility Siting Council has the authority to approve its location in Klamath Falls. DEQ has a limited role in the location of new energy facilities. DEQ does not advocate for new facility placement or decide where facilities choose to locate. After a facility has been granted permission to build in an area by the Energy Facility Siting Council and local city and county land-use authorities, DEQ's responsibility is to ensure that the facility follows state and federal environmental laws and regulations, including an evaluation of whether any additional requirements are necessary to ensure a violation of an ambient air quality standard will not be caused substantially by emissions from the source. For the biomass facility that has been issued a permit, DEQ evaluated the source's emissions, the impact the emissions will have on the ambient air quality, and the proposed pollution control equipment. DEQ concluded that additional requirements, beyond what is required by the regulations, was not necessary. If a facility shows that it can comply with existing air quality regulations and DEQ determines that additional requirements are not necessary, DEQ is legally required to issue a permit.
2) Comment: There is concern about truck traffic going to a biomass plant and the pollution it would generate. Trucks should not be able to pollute more than they are allowed under state or federal rules. A solution would be to have all trucks going to biomass plant be permitted (with a tag) and every 90 days require them to pass opacity testing. There should also be weight limit sensors on these trucks so they don't tear up the road. (11)
Response: Overall, DEQ found that trucks in the Klamath Falls area do not contribute significantly to $PM_{2.5}$ levels. Using upper end estimates for the number of trucks, DEQ determined that the emission contribution from all vehicles in Klamath Falls was less than 12 percent of the total emissions on the worst days and truck traffic to the plant would be a small fraction of that total. However, DEQ appreciates the concerns about increased truck traffic expected in connection with the proposed biomass facility, Klamath Bioenergy, LLC, and recognizes that localized diesel emissions can increase health risks. DEQ shall consider promoting clean diesel measures with local point sources and communicate weight restriction concerns to the Oregon Department of Transportation, which has authority in this area. DEQ has rules regarding opacity and engine

emissions for trucks and should any of these trucks exceed the standards, the public can contact DEQ at 1-888-997-7888 or by visiting DEQ's website at http://www.deq.state.or.us/aq/vip/purpose.htm#smoking.
3) Comment: Instead of placing the burden for reducing pollution on individuals, DEQ should tighten regulations on industry. The biomass plant that is outside the nonattainment area should not have to be subject to less regulation. (10, 21)
Response: The proposed biomass plant Klamath Falls Bioenergy, LLC, is subject to DEQ's permitting requirements although not to the most stringent requirements that would apply if it were located inside the nonattainment area . This includes operating requirements to ensure it meets the required emission standards and a requirement that the facility's emissions cannot impact the nonattainment area.
4) Comment: According to a state of Massachusetts study, the greenhouse gases generated from building a local biomass plant in Massachusetts would negate any job or energy benefits created by the plant. The biomass plant will emit 30% more carbon dioxide than coal plants and 60% more than natural gas plants. (4)
Response: DEQ acknowledges the submission of the Massachusetts study. While DEQ cannot estimate the greenhouse gas contribution versus the job or energy benefits generated by the proposed biomass plant in Klamath Falls, as it has not yet been built, DEQ will require the facility to follow local permitting requirements. This includes requirements to report any CO2 emissions if they are over a certain threshold. At this time, EPA has exempted new biomass facilities from greenhouse gas permitting, and is evaluating them to determine if they are carbon neutral.
5) Comment: There is concern that the addition of biomass plants will increase probability of poor air quality and increase emissions in Klamath Falls. The American Lung Association opposes biomass plants because their emissions pose unacceptable health risks. There is a wealth of information and studies regarding the plants' emission problems. (4, 9, 21)
Response: The proposed biomass plants in Klamath Falls will have $PM_{2.5}$ emissions. The biomass plant that is locating just outside the nonattainment area, Klamath Falls Bioenergy, LLC, has had its potential emissions modeled and DEQ has evaluated its emissions. Based on its evaluation, DEQ concluded this potential facility meets the applicable standards and requirements and has issued a permit. The emissions from this facility have a minimal impact on the Klamath Falls airshed and will not hinder progress towards attaining the $PM_{2.5}$ standard. The biomass plant proposed for inside the nonattainment area has not yet submitted an application for a permit, and DEQ will evaluate its emissions and its impact once the information is submitted. This facility will need to offset any $PM_{2.5}$ emission increases with decreases from other facilities or woodstoves.

6) Comment: The biomass plant pollution should be sampled within the stack, not above it, even by 1 inch where fresh air can be entrained into the stack and change the readings. (11)
Response: When source tests are conducted, sampling is done in compliance with EPA and DEQ specifications. This includes sampling within the stack. The Klamath Falls Bioenergy, LLC facility will be equipped with a continuous opacity meter that is located within the exhaust stack.
7) Comment: The biomass plant should be located elsewhere, where the emissions will not have an effect on the basin, for example out on Highway 97, out east near Beatty, or completely outside the basin. (13, 21)
Response: DEQ does not determine where a proposed industrial facility will locate. Specifically for an energy generating facility such as a biomass plant, the Oregon Energy Facility Siting Council has the authority to approve the final location of a biomass plant. The location must also be consistent with local land use and zoning requirements. DEQ's role is to ensure compliance with any applicable air, water and land quality permitting requirements.
8) Comment: Does DEQ really think converting another 2000+ woodstoves to higher efficient devices will solve the problem of addressing emissions from the biomass plant? (20)
Response: Converting significant percentages of old uncertified woodstoves will help solve the exceedances of the ambient air quality standard in Klamath Falls by substantially reducing the concentration of $PM_{2.5}$ emissions in the ambient air, and at the same time keeping residents who heat with wood warm in the winter. The woodstove changeout program is not related to permitting of the Klamath Falls Bioenergy, LLC, plant. The plant has been granted a permit by DEQ because it had met all the applicable legal requirements, including installation of stringent emission controls and a modeling analysis showing that emissions from the facility will not cause or significantly contribute to violations of the $PM_{2.5}$ standard at any location.
2. Monitoring
a. Number of monitors
1) Comment: If you have more monitors in different locations and elevations then the evaluation of compliance with the particulate standard in Klamath Falls would come out much differently. You can't judge conditions by just one monitor and you should take the average of multiple

monitors. The current federal method for determining the standard is erroneous and not equitable. (9, 14, 15, 31)
Response: DEQ acknowledges that there is only one monitor to determine compliance; however, the Peterson School location is the most appropriate place for a monitor. EPA has very specific requirements on the location of monitors and how to evaluate the data. For example, the monitor must be located near areas with sensitive populations. Schools represent areas where there are sensitive populations such as children. In addition, DEQ has conducted numerous monitoring studies throughout the years to ensure Peterson School is the most representative location of high particulate impacts for the Klamath Falls area. DEQ has also put in temporary monitors to get a sense of conditions in other locations throughout the area but has retained the Peterson School location for the required federal reference monitor. Even if DEQ were to place additional federal monitors in the area, EPA requirements still mandate that the data be taken from the highest violating monitors, not an average of all the monitors in the area.
2) Comment: If DEQ or EPA is going to operate under the federal Data Quality Act, it should "issue and follow quality guidelines, that ensure the quality, utility, objectivity and integrity of the data and information that the agency disseminates". It should allow people who have degrees and backgrounds in science and these technologies to criticize the methodology being used and allow input to it and correct invalid, incorrect, and specious information. Is there a chance for Klamath Falls citizens to do that with regards to the monitoring process? (15)
Response: EPA has recently proposed revisions and asked for public comment on the $PM_{2.5}$ standard including its monitoring requirements. Klamath Falls residents were welcome to provide comments on EPA's process for monitoring and the data it uses. DEQ annually invites public comment on Oregon's Air Quality Monitoring Plan. DEQ develops each state air monitoring plan based on EPA monitoring requirements, EPA's monitoring reference methods and quality assurance requirements. For information on how to review the monitoring plan or provide comments, contact Anthony Barnack at barnack.anthony@deq.state.or.us
3) Comment: Residents should have clean air all the time, not bad air quality on one day which gets averaged out with the clean days that are monitored. (5)
Response: DEQ agrees with this comment. The proposed $PM_{2.5}$ Attainment Plan is designed to decrease the amount of particulate under conditions that cause unhealthy air days.
b. Location of monitors

4) Comment: We need to put a monitor at the site of poor air quality, not where it is clean, so we know if there is a problem. (6)
Response: DEQ has established the Peterson School monitor as the most appropriate location, based on EPA's specific requirements on the location of monitors. The Peterson School location is one of the most polluted areas in Klamath Falls and is located near an area with children, a sensitive population.
5) Comment: The Peterson School monitor should be on a trailer, be powered by solar energy, and driven around town to take a one month sampling and moved to different locations. From that sampling, DEQ should take the averages to understand air quality. Under this process there would be 20 sampling stations as opposed to just one. (11)
Response: In the past, DEQ has put in temporary monitors, also known as saturation monitors, to get a sense of conditions in other locations throughout the area. DEQ has retained the Peterson School location for the required federal reference monitor. Even if DEQ were to place additional federal monitors in the area, EPA requirements still mandate that the data be taken from the highest violating monitors, not an average of all the monitors in the area.
3.Residential Wood Burning
a. In general
1) Comment: A commenter supports wood burning, as it's a renewable fuel, but only if it's done properly. (5)
Response: *DEQ agrees wood can be a renewable fuel that, when burned properly, has much lower emissions than not burning properly in a wood burning appliance.*
2) Comment: Does DEQ seek to have a total ban on fireplaces and wood burning in the county? (12)
Response: No, DEQ does not seek to have a total ban on fireplaces and wood burning in the county. DEQ recognizes that there are many people who rely on wood burning as an alternate source of heat. DEQ does, however, encourage people to limit their use of fireplaces and to employ proper burning practices in the winter months when air quality is forecasted to be poor, to protect the health of Klamath Falls citizens. In addition, DEQ encourages citizens with old, uncertified woodstoves or fireplaces to replace them with newer, more efficient burning devices.

3) Comment: Not allowing citizens to use their woodstove for efficient and low cost fuel and heat during wintertime is ridiculous, when recent surrounding forest fires in Lakeview and in California are burning. This burning is equivalent to every citizen in Klamath county putting an acre and a half of timber in their fireplaces in a two week period. (15)
Response: DEQ and the county only prohibit uncertified woodstove use during red and yellow advisory days, which are days where poor air quality is forecasted. DEQ agrees that the recent forest fires in Lakeview and California are a serious concern. However, the burning of wood in people's homes, if conducted improperly, can create community health issues on critical days in the winter. While summer pollutant spikes from forest fires can be higher than pollution caused by wood burning, winter episodes of high particulate occur throughout the winter months and reach hourly levels in a range that is similar to impacts from forest fires, between 35 and 90 micrograms per cubic meter.
4) Comment: DEQ should require removal and replacement of uncertified stoves for any remodel of a home. (16)
Response: *Requiring uncertified stove removal and replacement during remodeling would further accelerate the rate of woodstove changeout and reduce particulate pollution. DEQ will provide this suggestion to the appropriate county officials for their consideration.*
b. Curtailment Program
1) Comment: The area needs enforcement, as the area has made major changes over the past 20 years and can continue to do so. Active enforcement with fines needs to be part of the air quality plan. (5, 28)
Response: DEQ agrees that enforcement of the woodstove curtailment ordinance is critical to meeting the federal particulate standard. The residents of Klamath County have worked hard to clean up their air over the past 20 years, with a long history of identifying and working to solve problems with particulate pollution. One of the key strategies in the attainment plan that will help Klamath Falls comply with the standard is enforcement of the current curtailment program. This includes a focus on habitually violating offenders, increased patrols on red and yellow days, and increased awareness and public outreach regarding the curtailment program.
c. Changeout Program
1) Comment: Replacing woodstoves with other alternatives (at DEQ's estimated cost of $41.53/month) is a lot of money for retired or out of work folks. (2)
Response: DEQ recognizes that additional costs from sources of heat other than wood can be a burden for retired or unemployed residents. However, the proposed plan encourages rather than requires woodstove replacement, and allows continued use of wood heating during

curtailment periods for those with economic hardships.
2) Comment: The woodstove changeout program should continue, especially if we can get government funding for it, since they are the ones who put Klamath into this status. (5)
Response: DEQ agrees that the woodstove changeout program should continue and will seek funding from federal, state and local sources.
3) Comment: Use money from DEQ permits and fines to fund the changeout program. Have a tiered program to offer full assistance to low income residents and rebates to other residents. (16)
Response: *Permit fees and fines go directly to the State of Oregon's General Fund; DEQ cannot allocate these funds to go directly to woodstove changeouts. However, DEQ does work with companies that must pay fines to try and encourage them to fund a changeout program in lieu of paying a fine through a Supplemental Environmental Project. DEQ agrees a tiered changeout program that offers full assistance to low income residents and rebates to other residents is a system that has worked in the past and would benefit the residents of Klamath Falls*.
d. Education
1) Comment: DEQ should require the County to send out educational materials yearly on proper ways to burn. This should be funded by the DEQ. (16)
Response: *The county currently sends out educational materials on proper ways to burn, and will be increasing its efforts to educate the public as one of the strategies recommended in the attainment plan. DEQ currently provides the county financial assistance to help in these efforts.*
e. Offsets
1) Comment: The proposed language in Divisions 225-0090 and 240-0550 goes too far in that it does not ensure that emissions from the new or modified major sources wouldn't cause a new violation in the nonattainment area. Rather than a complete exemption from the requirement for a net air quality benefit in paragraph 225-0090 (2)(a)(E) the rule must include a new provision in paragraph (E) similar to the safeguards in the provision for small local energy projects. (17)
Response: DEQ agrees that new or modified major sources should show that offsetting their emissions by changing out woodstoves will not cause or contribute to a new violation of National Ambient Air Quality Standards. DEQ shall revise the proposed regulations to include this provision.

2) Comment: There should be no cap and trade tax that requires business to buy pollution credits to pay for non-compliant woodstoves. This will further discourage businesses to locate here and will cause others to close their doors. (18, 19, 20)
Response: The emission offset requirement differs from a "cap and trade" program. While cap and trade programs apply to all sources, new and existing of a given type within a geographic area, the offset provisions apply only to new 'major' sources of $PM_{2.5}$. In any nonattainment area, such as Klamath Falls, new or expanding major industrial facilities are required to offset their proposed emission increases with an equal reduction in pollution from another source. Typically, a proposed new or expanding facility would obtain these offsetting emission reductions, or "emission offsets" from another local industrial source. However, emission offsets are difficult to obtain and their scarcity can become an obstacle to industrial growth. In Klamath Falls, DEQ is proposing to provide these facilities more flexibility by allowing woodstove emission reductions to be used to offset increases in industrial emissions. Woodstove emissions occur in the heart of residential areas and their reduction would provide a direct health benefit to that community. This would also help ensure that the area continues to make progress towards meeting particulate standards. *DEQ's permitting requirements also ensure that the proposed emission increases from the industrial facility do not cause or contribute to violations of the standards at any location. This approach provides a new solution to the problem of scarce emission offsets and allows more flexibility for a new or expanding business to satisfy DEQ requirements and be built. DEQ's proposed revision helps the Klamath Falls economy by providing additional flexibility to new and expanding businesses while still protecting public health.*
4. Forest and Agricultural Burning
1) Comment: Wildfire smoke or prescribed burning smoke causes health concerns. (4)
Response: Wildfire smoke does cause health concerns. Although DEQ and EPA can often excuse wildfire smoke from the data base for nonattainment area reasons, it can still cause health problems for many people. In 2004, DEQ prepared a Wildfire Natural Events Action Plan. Under this plan, the State Forestry Department helps DEQ determine the type and extent of the smoke impacts in communities such as Klamath Falls. DEQ works with the local county health departments, such as Klamath County Environmental Health Program, to issue messages to the public on how to protect themselves during smoke events. The county can issue statements, work with local schools and civic organizations to determine which outdoor events should be cancelled and what specific warnings should be given. DEQ is committed to protecting the health of citizens during all smoke events.
2) Comment: Wildfires, controlled slash burning, refuge burning, agricultural burning, all these come into the city because it is the lowest lying

area. Specifically, the U.S. Forest Service's slash burns create poor air quality for days at a time. It is not fair to penalize the people of Klamath for all of these other sources of PM; it's unreasonable, not scientific, and it's still unclear that we know how much fires are contributing versus other sources. It's not fair to blame woodstove users. (12, 18)
Response: DEQ agrees it is not reasonable to penalize the residents of Klamath Falls for sources of PM that do not originate in the Klamath Falls nonattainment area. In the case of wildfires, these are beyond the community's control. Wildfires are typically an act of nature and any exceedances of the standard that occur from wildfire smoke can often be excused from the calculations used to determine compliance with the standard. As for other sources of burning, controlled slash burning is done in accordance with the Oregon Smoke Management Plan rules as administered by Oregon Department of Forestry. Refuge and agricultural burning is regulated by the Klamath County Clean Air Ordinance in Klamath County. Burning on refuge or agricultural lands is prohibited on yellow and red days. In California, Siskiyou and Modoc Counties regulate agricultural and forest land burning (including refuge burning) through their smoke management program. These counties have agreed not to allow smoke to enter the Klamath nonattainment area. Although the residents of Klamath Falls can visually see prescribed burning smoke at a distance, it does not necessarily mean that the smoke is significantly impacting the area.
3) Comment: Are federal agencies required to comply with the burn days schedule, such as the forest service and Bureau of Reclamation? (12)
Response: *Federal forest land management agencies are required to comply with the Oregon Smoke Management Plan. This includes avoiding any smoke impacts on the Klamath Falls nonattainment area during any federal land burning.*
4) Comment: Does agricultural burning have to follow the local ordinance of no burning on Red and Yellow days? If this is the case could it be made clearer in the plan? (29)
Response: Yes, agricultural burning is expected to follow red and yellow advisory calls. DEQ will clarify this requirement in the plan.
5. Fugitive dust
1) Comment: There should be no more regulations and/or controls on fugitive dust or dirt from business, private property or farm operations. (18, 19, 20)
Response: The 1991 Klamath Falls PM_{10} plan and the 2002 PM_{10} Maintenance Plan included fugitive dust control because dust can be a significant source of PM_{10}. Because dust is a less significant source of $PM_{2.5}$, the only related regulations proposed in the $PM_{2.5}$ plan require industry to document their best practices to control fugitive emissions (that may include dust controls) and prepare an operations and maintenance plan.

6. Other Smoke Sources
1) Comment: In the fall and winter there is pollution coming from Medford, and it is visible over the mountains. Why isn't it monitored? (6)
Response: Typical sources of fall and winter pollution would be from forest burning, such as smoke from pile burning that can travel across the mountains and settle into Klamath Falls. All forest burning (federal and private) from the west side of the Cascade mountains is regulated by the Oregon Smoke Management Plan as administered by Oregon Department of Forestry. ODF keeps records of all burning that occurs and uses meteorologists to determine if a burn is permitted. While smoke from prescribed forest burning can often be seen from Klamath Falls, the smoke management plan requires the Department of Forestry to avoid any actual smoke intrusions into the Klamath Falls nonattainment area. *When Klamath Falls has an exceedance of the standard, in nearly all cases it is due to stagnant air movement and night time inversions that trap the air near the surface of the ground. It would be unlikely during these episodes to have significant pollution contributions from outside of the basin.*
2) Comment: The California emissions coming across should not be counted; it is wrong to penalize Klamath Falls for California's poor air quality coming into the area. (14)
Response: If the emissions coming from California are caused by a forest fire smoke intrusion, then these exceedances of the standard that occur from wildfire smoke can often be excused from the calculations used to determine compliance with the standard through an exceptional events request. *DEQ conducted additional research to identify background emissions coming from California, by installing a monitor on Stateline Road near Merrill. DEQ found that the background emissions coming from California were low, typically between 5-15 μg/m3. These emissions do not appear to have much of an impact on the area. Instead, much of the poor air quality in Klamath can be seen during stagnant weather conditions in the wintertime. Emissions begin to build in the early evening, peak around midnight, and then drop back down the following morning. This is primarily due to woodstove use as people come home, light their woodstoves to heat the home, and then leave the next morning.*
3) Comment: DEQ is focusing on wood-burning as the primary contributor to poor air quality that is present for much of the year. The Klamath basin has a very large number of old diesel vehicles belching out black smoke. DEQ should require vehicle emissions testing in the Klamath Basin. Furthermore, the exemption for the vehicles greater than 8500 pounds should be eliminated and the exemption for vehicles more than 20 years old should be changed to vehicles manufactured before 1972, or other such date when vehicle emission standards went into effect. (27)
Response: Overall, DEQ found that diesel emissions in the Klamath Falls area are not a primary contributor to violations of the $PM_{2.5}$ levels. DEQ

determined that the emission contribution from all diesel vehicles in Klamath Falls was at most 10 percent of the total emissions on the worst days. However, DEQ recognizes that diesel emissions can increase health risks. DEQ has rules regarding engine emissions for trucks and should any of these trucks exceed the standards, the public can contact DEQ at 1-888-997-7888 or by visiting DEQ's website at http://www.deq.state.or.us/aq/vip/purpose.htm#smoking.
7. Economic
1) Comment: A commenter is concerned that DEQ actions will have negative impacts on the economy, peace, and freedoms in Klamath Falls (1)
Response: DEQ acknowledges concerns about the impacts of efforts to control air pollution. To incorporate diverse interests and community values, DEQ has collaborated extensively with Klamath Falls residents and local elected officials. Through this process, DEQ has developed a plan to address air quality problems using reasonably available methodologies that target the main sources of pollution in the community.
2) Comment: Has DEQ studied the economic impact of the implementation of its new rules, including loss of jobs, cost of compliance, estimated fines, enforcement costs for citizens and industries, and the costs of no new businesses locating in the area? (12)
Response: Yes, DEQ has prepared a fiscal impact statement as part of this rulemaking. This document includes estimations of the economic impact, cost of compliance, and the effects on businesses. The fiscal statement was also considered, discussed and revised by the Klamath Falls Air Quality Advisory Committee at a public meeting.
3) Comment: DEQ comes to the Legislature every biennium and asks for more money. The state is in severe monetary distress and it would make sense to cut back on state employees and spending and encourage job growth and business growth. (12)
Response: DEQ has developed the Klamath Falls Attainment plan to bring the area back into compliance with the federal air quality standards. Klamath Falls will benefit economically from complying with the air quality standard because that will allow the existing more stringent requirements on industry to be lifted. DEQ along with all other state agencies have cut their budgets in response to the economic downturn, including layoffs.
8. General
a. PM standard
1) Comment: The government's idea of what is good for residents of Klamath Falls is messing with our sanity, health and business. (1, 31)

Response: DEQ acknowledges that, for the average resident, the requirements and the response to the requirements can be perplexing. However, DEQ has spent over two years working with residents in the community to develop a workable plan. The plan provides for minimal elements to address the requirements. The ultimate goal is to protect the health of all the residents in Klamath Falls.
2) Comment: A commenter predicts that EPA will change or lower the standard which will put the community back into nonattainment and the problem will be here again. The commenter thinks the current plan is cumbersome and we should draw a line in the sand and asks if the government can guarantee the standard will remain at $PM_{2.5}$ or not change to PM1.5. Many commenters think both the current and any new standard (e.g. PM1.5) will be burdensome to the health and prosperity of residents. (2, 8, 14,15)
Response: EPA reviews the adequacy of the National Ambient Air Quality Standards once every five years as required by law; however, this review does not mean that the standard will change. Periodically, EPA and the Clean Air Scientific Advisory Committee must look at the latest medical research to determine if current standards still adequately protect public health. If the standards are found to be adequate, EPA proposes no change. If the standards are not adequate, EPA proposes the appropriate change. In EPA's most recent review of the standard, it has proposed to retain the daily fine particulate standard at the current level. *DEQ understands it is challenging and frustrating for communities like Klamath Falls to address the tightening of particulate standards over the past several decades. DEQ believes there are several important things to keep in mind. First, all the effort and actions taken over the years to reduce fine particulate in Klamath Falls have made air quality in the community significantly healthier. This has been of great value to the residents of Klamath Falls, especially children, those with existing medical problems, and the elderly, who are all most at risk from air pollution. Second, the investments made to date in reducing air pollution have made violations of the new fine particulate standard less severe and easier to manage. While Klamath Falls does violate the new $PM_{2.5}$ standard, the solutions and a return to attainment are all within reach, due in large part to the past work of reducing air pollution in the community. Last, it is important to keep in mind that EPA only tightens national ambient air quality standards when there is compelling scientific evidence that the current standards are inadequate to protect public health. Tightening a standard can make things more challenging for a community; however, the main goal is to ensure a healthily community for all citizens. Once adequate standards are set, DEQ works with local communities to consider both the environmental and economic health of a community as action to meet standards are developed.*
3) Comment: The commenters disagree with implementation of $PM_{2.5}$ standard. DEQ should not accept any rule or mandate from EPA that is not fully funded. DEQ should not blindly follow EPA in imposing rules or regulations. (16, 18, 20, 31)

Response: DEQ has been delegated by EPA authority to operate the air quality program for the state of Oregon. Should DEQ not accept the air quality program from EPA, the federal government would step in and establish an air quality program in Oregon. Regardless of which agency runs the program, the requirements to bring the area back into attainment would still apply, as the residents of Klamath Falls are breathing unhealthy air.
4) Comment: These rules should not be accepted prior to the full disclosure of the scientific studies that support the current $PM_{2.5}$ standard. These measurements are not nor have they been substantiated to be actual hazards. It would appear that the goal is no particulate matter being the only acceptable level. (31)
Response: The U.S. Environmental Protection Agency has established the $PM_{2.5}$ standard to protect public health based on its review of current health studies. In setting standards, EPA is guided by the Clean Air Scientific Advisory Committee, whose job is to evaluate the latest, peer reviewed medical research on the effects of air pollution and public health and make a recommendation on standards needed to adequately protect the public, including sensitive populations like children. Therefore, the $PM_{2.5}$ particulate standard is not an arbitrary number, but the result of a deliberate, thoughtful, and very complex process of evaluating the science of air pollution and public health. For more information about the Clean Air Scientific Advisory Committee and their work reviewing the $PM_{2.5}$ health effects information, please visit: http://yosemite.epa.gov/sab/sabpeople.nsf/WebCommittees/CASAC
b. DEQ Hearing Process
1) Comment: During the open microphone Q&A there were many ideas expressed that may or may not get put into the written record. The commenter would like to recommend that they get recorded and that the transcript be provided in future meetings. (15)
Response: Thank you for this suggestion. DEQ purposefully does not tape record the information and Q&A session. We want this time to be an informal discussion during which individuals feel comfortable to express themselves and have an interchange of ideas. Many people come to the informational session to find out more about what is going on and are not always interested in testifying or may want to think about their testimony and provide it in writing to DEQ. On the other hand, individuals who want to make a formal statement on the record can and should provide formal testimony. There is no reason why a comment or question asked during the Q&A cannot be asked again during formal testimony.
c. Other
1) Comment: It seems Klamath Falls is constantly being picked on for one cause or another (re: PM, water quality, endangered species, dam removal). Agriculture is another genre that is being restricted every year with more controls. Does DEQ ever question where food might come

from if this continued restriction is to persist or is the motive to stop agriculture? (20)
Response: There are no new strategies in this plan that address agriculture. Any air quality-related strategies that address agriculture have been in place for over 20 years. Klamath Falls has been nonattainment in the past, the community has rallied to meet the challenge and ultimately meet the standards, and DEQ expects it will again.
9. Health Issues
a. Personal Health
*1) Comme*nt: A commenter stated that his wife died due to respiratory failure and heart problems aggravated by particulate pollution in the area. (3)
Response: DEQ acknowledges this commenter's loss and staff members noted that they were sorry to hear of her passing.
2) Comment: Has DEQ quantified the number of persons from the local medical examiner that have died from Klamath County air pollution? Does DEQ think anyone has actually died because of conditions in Klamath Falls? Shouldn't DEQ conduct a study before enforcing air quality standards that are unreasonable? (12)
Response: The National Ambient Air Quality Standards are set by EPA based on recommendations of the Clean Air Act Science Advisory Committee and its review of hundreds of medical studies from around the country. These studies, old and new, clearly and consistently show that high air pollution levels can cause adverse health consequences in many citizens, including respiratory disease, heart attacks, and in some cases premature death.
b. Biomass Plant Health Concerns
*1) Comme*nt: A commenter is concerned that the addition of biomass plants will increase the probability of poor air quality and increase emissions in the Klamath Falls area. (4, 9)
Response: The proposed biomass plants in Klamath Falls will have $PM_{2.5}$ emissions. The owners of the biomass plant that wishes to locate just outside the nonattainment area has modeled its potential emissions and DEQ has evaluated its air quality impacts. Based on its evaluation, DEQ concluded this facility meets the applicable standards and requirements and has issued it a permit. The emissions from this facility have a minimal impact on the Klamath Falls airshed and will not hinder progress towards attaining the $PM_{2.5}$ standard. The biomass plant proposed for inside the nonattainment area has not yet submitted an application for a permit, and we will evaluate its emissions and its impact once the information is

submitted to DEQ. This facility will need to offset any $PM_{2.5}$ emission increases with decreases from other facilities or woodstoves.
c. Wildfire Health Concerns
*1) Comme*nt: Wildfire smoke or prescribed burning smoke causes health concerns. (4)
Response: Wildfire smoke does cause health concerns. DEQ maintains a Wildfire Natural Events Action Plan to help guide DEQ's response to major smoke intrusions in a community from wildfire smoke. The plan describes coordination actions for DEQ with state and federal forest management agencies, and local city and county health officials. Given the typical magnitude of uncontrollable forest fires, the plan's primary focus is providing the pubic with information about the severity of smoke impacts and how to protect themselves during smoke events. City and county governments can issue updates to the public and work with local schools and civic organizations to determine which outdoor events should be cancelled and what specific warnings should be given. DEQ is committed to protecting public health and also recognizes the practical limits of reducing smoke during wild fire events.
d. General Air Quality
*1) Comme*nt: A commenter is concerned about the state of air quality throughout the entire basin, recognizing that there can be poor air quality conditions at Peterson School versus cleaner air for areas above the inversion layer. All Klamath citizens should be able to breathe clean air all the time. Supports DEQ's efforts to clean the air. (5)
Response: DEQ agrees that everyone deserves clean air and is especially concerned about residents who are most sensitive to air pollution like children, the elderly and those who have respiratory and heart problems.
*2) Comme*nt: A commenter states that there is a serious air quality problem. (6)
Response: DEQ agrees that the larger area near Peterson School is above the National Ambient Air Quality Standards. These standards are health based standards set by EPA for the entire country.
10. Attainment Plan
a. Strategies & Contingency Measures
1) Comment: Some key recommendations from the Klamath Falls Advisory Committee were not adopted as reduction strategies or contingency measures. These seem to be effective in other areas with similar issues. Please explain why the following were not adopted: (17) 1) Focus enforcement of woodstove curtailment on habitual violators 2) Amend County ordinance to mandate a minimum fine for a second burning violation

3) Prohibit the use of all uncertified woodstoves and inserts
Response: DEQ collaborated with the Klamath County Commission to develop the best, most acceptable strategies for the community. While DEQ recommended strategies to achieve a greater margin of compliance, the commissioners decided that the strategies chosen were sufficient to achieve compliance with the standard. Specifically, (1) The county commissioners determined that they already focused enforcement of woodstove curtailment on habitual violators, and it was not necessary to further emphasize this enforcement strategy. (2) The county commissioners decided that a minimum fine was unnecessary and that compliance was occurring without a minimum fine. (3) The commissioners further determined that prohibiting the use of all uncertified woodstoves and inserts was overly burdensome. The county commissioners did support seeking more funding to changeout woodstoves on a regular basis and the requirement for ASTM certified fireplaces. *DEQ agrees the proposed strategies are sufficient to meet the federal $PM_{2.5}$ standard, but recognizes that by not adopting full suite of strategies recommended by the advisory committee, the Klamath County Commission elected to reduce the safety margin for compliance with the standard. A smaller safety margin or buffer for compliance increases the chance that the community will not achieve healthy air as scheduled and also experience the additional burdens of the contingency measures.*
2) Comment: More emission reductions may be gained by implementing measures, such as increased citations regarding compliance with the existing woodstove ordinance. (17)
Response: DEQ agrees that compliance with the current ordinance is critical to the success of the strategies. County officials have stated their belief that they can obtain compliance without an increase in citations because once a violator knows of the requirement and the potential fine he or she begins to comply with the ordinance. The county's approach is one of issuing a warning letter and then a citation. They view this approach as an individual educational approach. In the last three years of implementation, this approach appears to be working.
3) Comment: When modified, the current strategies for the Klamath County ordinance reduce $PM_{2.5}$ by 9.2 ug/m3, instead of by 10.9 ug/m3. This increases the final 2014 design value by 2 ug/m3. This is an inconsistency in a strategy calculation – can you clarify this calculation? (17)
Response: DEQ agrees with the comments on using a different methodology for calculating the effectiveness of woodstove curtailment. Based on woodstove advisory calls and county enforcement records, DEQ will make a more conservative assumption and change its estimate of curtailment effectiveness from 74 to 69 percent, and update the plan to include the revised values.

4) *Comment*: Our analysis for a fireplace standard calculated a smaller emission reduction (0.2 μg/m^3) than what is stated in the plan (1.2 μg/m^3). This difference would increase the final 2014 design value by 1 μg/m^3. Can you clarify how you arrived at 1.2 μg/m^3 for the ASTM fireplace standard?

Response: DEQ agrees with the commenter on using its methodology for calculating the number and emissions of fireplaces affected by the ASTM fireplace standard. DEQ overestimated the number of fireplaces that would be affected by this strategy giving us a higher reduction overall. DEQ will change the plan to reflect the revised calculations, which results in a 0.2 μg/m3 reduction for this strategy.

5) Comment: If DEQ is taking credit for allowing only ASTM fireplaces as a contingency measure, DEQ rules and the Klamath County ordinance must be aligned. The DEQ rules for the fireplace contingency does not go into effect until March 1, 2015 (OAR 340-240-0630), whereas the county ordinance has it taking effect immediately. This contingency measure must state it will take effect immediately. (17)

Response: DEQ is changing the rule to have the contingency take effect automatically, when contingency measures would be required, which is on March 1, 2015. DEQ will not have the last quarter of 2014 data until after the quality assurance of this data is determined and will need until March 1 to determine whether Klamath Falls has met the standard. DEQ will also recommend to the county to have its effective date set as March 1 for consistency.

6) Comment: The text in the “Contingency Measures” of the attainment plan states that OAR 340-240-0630 prohibits the use of fireplaces during the winter woodheating season. However, OAR 340-240-0630 prohibits fireplace emissions from exceeding the ASTM standard for fireplaces installed after March 1, 2015, and the County Ordinance prohibits the use of non-ASTM certified fireplaces during the winter season. DEQ needs to resolve the language in the plan, rules, and ordinance to be consistent. (17)

Response: DEQ is including a rule to mirror the Klamath County ordinance in OAR 340-240-0630. DEQ is also modifying the plan to ensure consistency with the rules and ordinance.

7) Comment: In Division 262, if you retain the 20% opacity standard it cannot be considered a contingency measure as it is already implemented in Klamath County ordinance 406.150. However we are supportive of a general 20% opacity standard or 0% (no visible emissions) standard during burn bans. (17)

Response: DEQ plans to retain the 20 percent opacity standard but does not take credit for any new reductions. As the commenter explains, it is

already in the Klamath County ordinance.
8) Comment: Strategy 3.2.1.2.10 Wood Burning Survey by inventorying wood burning devices through tax statements will have an inflammatory impact on wood stove owners. The Committee's final report states that this strategy will have no impact on emissions. Cooperation of stove owners is critical to success of the plan and this strategy should not be included in the plan or rules. The role of government should be to solve problems with a minimal intrusion into citizen's lives. (30)
Response: DEQ collaborated with the Klamath County Commission to develop the best, most acceptable strategies for the community. After consulting with the county, DEQ did not include this specific strategy as part of the attainment plan in order for the area to reach compliance with the standard.
9) Comment: The commenter believes that DEQ's plan for new strategies is ill-founded and will ultimately serve little if any beneficial purpose. If adopted, complying with the proposed strategies will result in local industry having to expend an incredible amount of time and expense to comply with these new rules without any significant return in improving air quality, especially since industry is such a tiny part of the $PM_{2.5}$ nonattainment problem. How can the Department propose an array of costly reduction strategies and contingency measures knowing the net result will very likely not significantly improve air quality? The Department should focus its efforts on addressing the significant sources in the Klamath Basin. (23)
Response: It is true that local industry contributes to about one percent of the total $PM_{2.5}$ *at Peterson School based on modeling DEQ conducted. The modeling also showed that the concentrations of emissions dropped off substantially outside the facility property line, but there still were significant ambient emissions near the facility. DEQ expects all sources of pollution to be addressed throughout the nonattainment area, and not just at Peterson School. Therefore, DEQ proposes eliminating the older 40 percent opacity standard*~~s~~ *to phase out devices that were grandfathered since 1972. The attainment plan requirements proposed in DEQ rules are consistent with reducing industrial contributions in proportion to their contributions and should not be overly burdensome to any source in the Klamath Basin.* *In addition, DEQ recognizes those contingency measures that must be implemented immediately should Klamath County not meet the standard in 2014, will be primarily achieved through its controls of woodsmoke emissions via the requirement to only allow ASTM-certified fireplaces to be used in the winter months. Therefore, DEQ will remove the contingency plan elements that set a lower grain loading standard and require monitoring of operating conditions at wood products dryers instead.*
b. Conformity

1) Comment: If EPA finds that motor vehicle emissions are a significant contributor to air quality problems, DEQ will need to provide a motor vehicle emissions budget for the nonattainment area with the official submission and remove the finding of insignificance from the final plan. (17)
Response: DEQ will change the plan to provide an emissions budget for regionally significant projects should EPA disagree with the proposed determination of insignificance.
c. Appendices
1) Comment: It is difficult to identify and navigate the contents of the multiple appendices. Please include a table of contents. (17)
Response: DEQ will prepare a table of contents for the appendices
d. General
1) Comment: There should be no change to the current air quality management plan. (18, 19, 20)
Response: DEQ is sensitive to the community's concern about not increasing the number of strategies in the plan; however, there are several federally required elements that must be incorporated into the attainment plan. This includes identifying emission reduction strategies that will ensure the area will meet the $PM_{2.5}$ standard and contingency strategies that will go into effect immediately should the area not meet the standard. These measures are necessary to ensure the residents of Klamath Falls will be breathing clean air.
11. Industrial Rules
a. OAR 340-204-0010
1) Comment: The phrase "Condensable water, other than combined water" in definition 22 as proposed by DEQ defines water as a pollutant, which it clearly is not. Further, EPA method 201A clearly states in Section 4.0 that this method cannot be used to measure particulate matter emissions where water droplets are present. 40 CFR 50.5 defines filterable $PM_{2.5}$ as well as other particulate matter definitions. Note that "condensable water" is nowhere to be found in the particulate matter definitions set forth in the federal regulations pertaining to state implementation plans. DEQ should simply adopt the particulate matter definitions in 40CFR Part 51. There needs to be a clear distinction between the definition of $PM_{2.5}$ and the methods used to measure $PM_{2.5}$ emissions. The Department has failed to address measurement of $PM_{2.5}$ emissions that may include entrained water droplets present in the gaseous effluent. (23)
Response: DEQ understands the concern about the difficulties measuring particulate matter in a stack with entrained water droplets. However, DEQ thinks the commenter obtained the definition from Division 200. In this definition, the inclusion is for condensed particulate not condensed or

condensable water. EPA Method 201A addresses wet stacks.
2) Comment: Appendix M to 40 CFR Part 51 provides a list of suggested methods for states to implement. A limited number of these tests measure $PM_{2.5}$. Development of methods for determining the presence of entrained water droplets is underway but likely several years off. EPA has concerns about using EPA method 5 to determine an estimate of filterable $PM_{2.5}$ emissions. Monitoring from a wet gas stream is challenging and has not been addressed successfully despite considerable effort. Therefore, particle size distributions after a wet control device are theoretical calculations. This approach for measuring filterable and condensable particulate from stacks containing entrained water droplets should only be used as a stop-gap measure until the Agency develops or approves a wet stack particle sizing method that is scientifically defensible. The Department should adopt the EPA definitions for particulate matter and needs to address measurement of $PM_{2.5}$ emissions from sources with entrained water droplets, and provide some flexibility in the methods to be used for this measurement. (23)
Response: DEQ understands the difficulty of stack sampling for $PM_{2.5}$, especially with entrained water droplets. Quantifying $PM_{2.5}$ emissions is important for establishing Plant Site Emissions Limits and, in this respect, DEQ has considerable flexibility for identifying appropriate test methods for unique sources. However, $PM_{2.5}$ test methods would not be appropriate for determining compliance with DEQ's grain loading standards (i.e., the proposed 0.1 gr/dscf) that are based on total particulate matter. Oregon DEQ Method 5 is required in most cases to determine compliance with the grain loading standards because it measures both the filterable and condensable particulate matter. In some cases, EPA methods for measuring filterable and condensable particulate matter may be suitable alternatives to Oregon DEQ Method 5. Note, DEQ has decided to remove the 0.1 grains per dry standard cubic foot proposed standard in the contingency measure section for those sources that were built prior to 1972, which would eliminate the need for any stack sampling.
b. OAR 340-225-0090
1) Comment: The commenter understands DEQ's desire to allow new sources to establish their own PM10 and $PM_{2.5}$ offsets by replacing fireplaces or uncertified woodstoves within the nonattainment area. However, the commenter objects to the notion that a new source can develop offsets without being subject to meeting the "Net Air Quality Benefit" rules for these types of offsets. If the Department waives "net Air Quality Benefit" for new sources, then the Department should eliminate the "Net Air Quality Benefit" requirement for the use of existing emission reduction credits within the Klamath nonattainment area. (23)
Response: The purpose of this rule is to encourage new sources to use wood stove and fireplace reductions as offsets. Wood stoves are the main source of $PM_{2.5}$ in Klamath Falls. DEQ is proposing an alternate way for facilities to show a "Net Air Quality Benefit". DEQ has already conducted the modeling and accounted for these types of offsets when developing these rules. Additionally, there is a benefit to the overall airshed that would not be captured in the "Net Air Quality Benefit" analysis helping solve the air quality problem. Other credits from industrial sources often

come from a single point source and when used may not solve the air quality problem in Klamath Falls. Even with a more flexible offsets approach, DEQ still requires a facility to model their emissions and demonstrate they will not cause or contribute to a violation of standards at any location.
c. OAR 340-240-0500 through 0630
1) Comment: It is wrong for DEQ to propose additional rules that require industry to control added pollution on an expedited schedule because the advisory committee's recommendations have been rejected. There has not been discussion with local Title V permitted sources regarding any additional pollution control equipment. It isn't fair to require opacity limits, fugitive emission plans and operation and maintenance plans in addition to the requirements in the Title V permit. A corrective action should have been taken if Title V facilities were lacking in these areas. The proposed requirements are redundant and inappropriate. (23)
Response: The general approach to regulation of industrial sources under the Clean Air Act has been to phase out older, higher-emitting sources, and replace them with newer, better-controlled emission sources. For large sources, there are specific provisions for requiring better controls when a source is modified. Because the Klamath Falls area is not in attainment of the ambient air quality standards, it is appropriate for some of the older sources that have not had to go through a control technology evaluation, to at least meet the requirements established for sources installed after 1972. The fugitive emission plan and the operation and maintenance plan are required in all Oregon nonattainment areas and are intended to improve management at each facility focusing the facility on these items. Most of the facilities in the Klamath Basin already are already required to meet the opacity limitations.
d. OAR 340-240-510
1) Comment: The attainment plan proposes reducing opacity limits for industry. For the commenter's facility it will include a reduction from 40 percent opacity to 20 percent opacity limit for wood fired boilers. During normal operating, the boilers can meet the limit. However, during the boiler grate cleaning process, opacity has the potential to exceed 20 percent but can be maintained within the current 40 percent limit. Grate cleaning takes 45 minutes with a portion of the time exceeding the 20 percent limit. It occurs twice a day. The proposed rule change will require significant capital expenditure to address a limited annual exposure. This burden is placed on a source that is a portion of the one percent contribution to the total $PM_{2.5}$ levels in the nonattainment area: (25)
Response: Although the impacts of industrial emissions are very low at the DEQ monitoring site, our analysis shows that the impacts from industrial sources could be significant at other locations within the Klamath Falls nonattainment area. DEQ used compliance source test data in the models, so it is important that industrial emissions remain at or below the levels used in the model to ensure that industrial sources will not cause a problem at some other location within the nonattainment area. For all sources, the measured opacity during compliance source tests has been less than 20% opacity. Therefore, DEQ believes that it is important to establish a 20% opacity limit for all sources within the nonattainment area.

DEQ understands the concern for grate cleaning activities and the potential added expense of complying with a 20% limit during those operations for older boilers. DEQ agrees that it is questionable whether the facility can meet the 20% limit during grate cleaning activities. The commenter notes that grate cleaning takes 45 minutes twice per day and that the boiler is not able to meet the 20% opacity limit during that time. However, many facilities across Oregon have a 20% limit and can conduct their operations including grate cleaning within this limitation. To address potentially unique situations, DEQ has modified the rule to add a provision for grate cleaning for pre-1972 boilers. The revised rule will allow a source to have between 20% and 40% opacity during grate cleaning operations (i.e., retain the current 40% opacity standard during grate cleaning), provided the grate cleaning operations are conducted in accordance with a plan approved by DEQ that will minimize the emissions to the extent practicable during the grate cleaning operations.
***e.* OAR 340-240-520**
1) Comment: This proposed rule change requiring a site-specific control plan for fugitive emissions is supported. However, there is a concern about "Full or partial enclosure of materials stockpiled in cases where application of oil, water or chemicals are not sufficient to prevent particulate matter from becoming airborne." A proposed change in the language should include "Full or partial enclosure of materials stockpiled <u>or other best management practices</u> in cases where application of oil, water, or chemicals are not sufficient to prevent particulate matter from becoming airborne." (25)
Response: DEQ agrees with the suggested change and has incorporated it into the proposed rule.
***f.* OAR 340-240-530**
1) Comment: Commenter agrees with the requirement for an operation and maintenance plan (25)
Response: DEQ agrees with the commenter because it is good practice to maintain emissions at the lowest practicable level at a particular facility.
2) Comment: Under 340-240-0030(43) the definition of "source" is described. What is the definition of "regular permit requirements"? If a source is subject to "regular permit requirements" but does not emit or have the potential to emit particulate matter, would the "source" still be subject to the operation and maintenance requirements? Also, what is meant by "excessive" in "excessive emissions"? Most sources already report on excess emissions. (22)
Response: DEQ agrees that "Regular permit requirements" is not defined. DEQ has modified the proposed rule to clarify that the requirement is to

develop and implement operations and maintenance plans, but only for process and control equipment that emits particulate matter than from fugitive emission sources, which are covered under 340-240-0520. Only those particle matter-related requirements would be subject to the operation and maintenance plan. DEQ also added "implement" to the first sentence to ensure that the permittee will not only prepare an operations and maintenance plan, but that they will also implement it. Excessive emissions are the same as excess emissions.
g. OAR 340-240-0540
1) Comment: Using the dates specified in the regulation, the date of October 15, 2014 under 340-240-0540(1)(f) to demonstrate compliance does not provide enough buffer between the requirements listed in a through e above. This could cause some sources to be out of compliance with the regulations. What mechanism will the "source" need to use to demonstrate compliance? (22)
Response: DEQ expects the sources to be in compliance with the standards in this section by Oct. 15, 2014. DEQ changed (e) to be 14 months rather than 16 months to provide a sixty-day compliance determination window.
h. OAR 340-240-590
1) Comment: A commenter states that the current grain loading standard limits will be a 50% reduction of the current permitted limits. Based on past source test results the facility was able to meet the current grain loading standard, but under the proposed limit it would not. Therefore, it would obligate the facility to invest a significant capital expenditure to guarantee compliance with the proposed grain loading limit including ongoing operation and maintenance of the control equipment. This is a burden placed on an industry that one percent of the contribution to total $PM_{2.5}$ levels in the nonattainment area. (25)
Response: DEQ agrees that these are measures that may obligate the facility to invest a significant capital expenditure to guarantee compliance. EPA is not allowing DEQ to take credit for these contingency measures because contingency measures need to be automatically implemented, and the equipment installations will take time to order, install and test to show compliance with the new standard. Public comments on this plan support limited restrictions on industry. Therefore, DEQ will remove OAR 340-240-0590, which is the grain loading standard of 0.1 grains per dry standard cubic feet and OAR 340-240-0600, which is the compliance schedule for grain loading from the Contingency Section. DEQ will also remove the parameter monitor requirements for the dryers in OAR 340-240-0610, but maintain the Continuous Emissions Monitor requirement for a wood-fired boiler in the Contingency Section. Should Klamath Falls not meet the standard by 2014, DEQ feels that it should have an ability to assure compliance for every 24-hour period with the opacity standard. The only way to assure the opacity standard is continually met is with an opacity meter or parameter monitoring on the wood-fired boilers.
i. OAR 340-240-0610
1) Comment: CEMS/COMS would be required on each boiler at another significant expenditure. This is a burden placed on an industry that is

only responsible for one percent of the contribution to total $PM_{2.5}$ levels in the nonattainment area. Some of the sources listed within the proposed regulation are sources that are subject or could be subject to MACT regulations. To comply with the proposed rule may be impracticable due to measures required under MACT. There is an allowance under 340-240-0610(2)(b) that provides an exception for wood-fired boilers. A similar exception should be available for other sources. One commenter specifically objected to the requirement to put CEMS on natural gas-fired or steam-heated fiber dryers by stating it was not appropriate for Title V sources to spend time and expenses to design, construct and install CEMs units. (22, 23, 25)

Response: Continuous monitoring systems, including continuous emission monitors (CEMS), continuous opacity monitoring systems (COMS) and continuous parameter monitoring systems (CPMS), are a contingency measure and are at an appropriate level considering the source contribution to the airshed. Continuous monitoring systems provide more assurance of compliance at all times, which is very important for an area with a demonstrated air quality problem. Compliance at night is especially important when there could be an inversion and an air quality problem. DEQ has removed the portion of this rule requiring monitoring from a fiber dryer.

12. Other DEQ Rules

1) Comment: In OAR 340-240-0570, the phrasing “applicable Clean Air Act deadline” is not defined in the regulations nor does it contain a citation to the controlling authority establishing the attainment date. We suggest revising to “…should the area not achieve attaintment by the applicable attainment date of December 14, 2014.” or “should the area not achieve attainment by the applicable attainment date established pursuant to 42 U.S.C. 7502(a)(2).” (17)

Response: DEQ agrees and has revised the rule in response to this comment.

2) Comment: There is a possible typo 340-240-0630: “No fireplace as defined by OAR 340-~~3~~262-0450, installed after March 1, 2015 ….”(26)

Response: DEQ agrees and has revised the rule in response to this comment.

13. Nonattainment boundary

1) Comment: The boundary should include a far wider area, such as to Keno, Falcon Heights area, and Merrill, to include more of the population and industry within the basin. All of Klamath County should be governed by the attainment plan. (10, 21)

Response: DEQ considered including Keno, Merrill, and other areas outside the current nonattainment boundary, but determined through a scientific evaluation that emissions from those areas were not directly contributing to the air quality problem. As part of designating the Klamath

Falls as nonattainment, DEQ and EPA worked to identify the nonattainment boundary for the area. This included a review of all the sources contributing to the area, where they were located, and how they affected air quality. EPA finalized and determined the boundary by using the County Air Quality Zone as a guideline since it provided the best representation of those sources that contribute to the $PM_{2.5}$ problem in Klamath Falls.
2) Comment: Is there a quantitative delineation of the air shed and what is its size in square miles? (12)
Response: Yes, the Klamath Falls nonattainment area airshed is 99.5 square miles.
3) Comment: Does the airshed stop at the border of Jackson and Deschutes counties and the California border? Air pollution does not stop at the borders and should technically define the total airshed, including California's Tule Lake basin which is part of the Klamath basin. (12)
Response: It is correct that a designation of a complete airshed would include the Tule Lake basin. The Klamath Basin extends up Klamath Lake and into California including Tule Lake. However, based on the studies DEQ has done, the major impact area in the basin is located east of Washburn way and south of Foothills Boulevard. It is north of the airport and west of highway 140. EPA requires DEQ to set the boundary to include all potential sources of pollution that would impact the monitor set at Peterson School, which is why the current nonattainment boundary was selected.
14. Draft ordinance
1) Comment: There was a mistake in the published copy of the Proposed Klamath County Ordinance. The mistake occurs in Section 406.250 of the draft ordinance where working days required mistakenly refers to the "ten (10) working days" of the original Ordinance. The Proposed Ordinance should only require a "five (5) working day" period for application and review of Variance Certificates. (24)
Response: *DEQ agrees and regrets the mistake. A revised and signed final ordinance will replace the draft proposed ordinance and be formally submitted with the Attainment Plan to the Environmental Quality Commission and EPA.*

Comment #	Commenter	Affiliation
1	Anonymous	
2	Lisa Johnson	citizen
3	Delbert Bell	citizen
4	Catherine Cappel	citizen
5	Jaye Weiss	citizen
6	Michael Lamb	citizen
7	Robert Anderson	citizen
8	Bill Brown	Retired educator, former Klamath County Commissioner
9	Hugh Thompson	citizen
10	Pauletta Welker	citizen
11	Greg Beckman	citizen
12	Gail Whitsett	Citizen
13	Mark Gaffney	Citizen
14	Tom Mallams	Citizen
15	Dennis Linthicum	Klamath County Commissioner
16	Dennis Jefcoat	Citizen
17	Debra Suzuki	EPA, Region 10
18	Earl Wesser	citizen
19	Rod Marlin	Citizen
20	Pat Dencer	citizen
21	Adrienne Hedgecock	citizen
22	Bonnie Basden	Jeld-Wen
23	Jess Brown	Collins
24	Dennis Linthicum	Klamath County
25	Glenn Keown	Columbia Forest Products
26	Max Hueftle	Lane Regional Air Protection Agency
27	Ralph Eccles	OHSU Faculty
28	Dave Potter	citizen
29	Jim Carey	Klamath County Public Health

30	Kevin Rafferty	citizen
31	Randy Shaw	Coldwell Banker realtor