TransAlta™

TransAlta Centralia Generation LLC
913 Big Hanaford Road
Centralia, Washington
USA 98531

(360) 736-9901
www.transalta.com

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DEPARTMENT OF ECOLOGY
AIR QUALITY PROGRAM

VIA FEDERAL EXPRESS

Alan Newman
Washington Department of Ecology
Air Quality Program
P.O. Box 47600
300 Desmond Drive
Lacey, WA 98504-7600

Re: TransAlta Centralia Generation, LLC's Comments on Mercury Reduction Provisions of Proposed Agreement

Dear Mr. Newman:

TransAlta Centralia Generation, LLC ("TransAlta") appreciates the opportunity to provide its comments on the proposed Agreement with the Department of Ecology ("Ecology") to reduce mercury emissions voluntarily from the Centralia Power Plant ("Centralia Plant"). The Centralia Plant has a history of voluntarily reducing emissions.

In the mid-1990s, the former owners of the Centralia Plant participated in a voluntary process with Ecology, the U.S. Environmental Protection Agency, the National Park Service, the Forest Service, and the Southwest Clean Air Agency to reach an agreement on reducing emissions of sulfur dioxide and nitrogen oxides. This Collaborative Decisionmaking ("CDM") Process led to the installation of controls at the Centralia Plant and significant emission reductions since 2001. The CDM Process was endorsed by then Vice-President Al Gore as the model for a consensus approach to setting "Best Available Retrofit Technology" limits for power plants to improve visibility at national parks and other federal lands.

TransAlta participated in Ecology's recent stakeholder process to develop a program to implement EPA's Clean Air Mercury Rule ("CAMR"). TransAlta was preparing to comply with Ecology's proposal when the CAMR was overruled by a federal court. In response to concerns that EPA will take several years to adopt a replacement mercury rule, TransAlta requested that reductions of mercury emissions be included in the Agreement.

Under the Agreement, the Centralia Plant has already commenced monitoring mercury emissions and will install pollution controls by 2012. According to the National Association of Clean Air Agencies website, in the absence of CAMR only 12 other states have proceeded with mercury control requirements. The majority of states are waiting for EPA's adoption of a new rule. The Agreement will place the State of Washington as one of the leaders in reducing mercury emissions.

Please contact me if you have any questions regarding these comments.

Sincerely,

Louis G. Florence Jr.

Lou Florence
Plant Manager, Centralia

cc: Richard DeBolt, TransAlta, Director External Relations
Robert Elliott, Director, Southwest Clean Air Agency

TRANSALTA'S COMMENTS ON PROPOSED ORDER NO. 6426 AND SUPPORT DOCUMENT FOR BART DETERMINATION FOR TRANSALTA CENTRALIA GENERATION, LLC POWERPLANT

1997 BART DETERMINATION

As context for the current BART proceeding, it is important to understand the background of the 1997 BART Determination for the Centralia Plant. The 1997 BART Determination was made with direct participation and approval of the Department of Ecology ("Ecology"), the U.S. Environmental Protection Agency ("EPA"), the National Park Service, the U.S. Forest Service and the Southwest Clean Air Agency (formerly known as "Southwest Air Pollution Control Agency"). In 1997 those federal and state agencies determined BART for the Centralia Plant and agreed it would not be subject to future BART requirements. In reliance on the agencies' determination, from 2000 to 2002 the Centralia Plant invested millions of dollars installing sulfur dioxide and nitrogen oxide ("NOx") controls.

The following bullets summarize key events in the prior BART proceeding. A more detailed summary is provided in the "White Paper: 1997 BART Determination for the Centralia Power Plant" (Nov. 2009) ("BART White Paper") attached hereto.

- SWCAA adopted the original RACT order for the Centralia Plant in 1995. The BART process began in 1995 when the National Park Service commented to the Department of Ecology ("Ecology") that the 1995 RACT order for the Centralia Plant did not meet BART requirements and that the Centralia Plant's emissions contributed to visibility impairment at Mt. Rainier National Park. The National Park Service requested Ecology to make a finding that visibility impairment at the Park was reasonably attributable to the Centralia Plant and to impose BART limits. The National Park Service suggested in a series of letters and comments that if the limits in the 1995 RACT order were not lowered to meet BART requirements, there could be "lengthy and potentially litigious regulatory proceedings" to set BART limits (see BART White Paper).

- The owners of the Centralia Plant entered into the Collaborative Decisionmaking ("CDM") Process in December 1995 with the National Park Service, the EPA, the Forest Service, Ecology, the SWCAA, and the Puget Sound Air Pollution Control Agency. The Centralia Plant owners and the agencies initiated the CDM Process to develop a consensus on emission controls that would meet BART requirements but avoid the lengthy, resource-intensive and potentially adversarial BART process.

- In December 1996, the participants in the CDM Process reached a consensus on emission reductions that met BART requirements based on the installation of sulfur dioxide "scrubbers," "low NOx" (nitrogen oxide) burners, and existing technology for particulate matter.

- In a letter to SWCAA, dated September 3, 1997, EPA stated: "[T]he CDM Process has resulted in a proposed regulatory approach for the Centralia Plant that we anticipate will constitute BART." The EPA, the Forest Service, the National Park Service and the CPP wrote letters requesting SWCAA to make a BART determination when it issued the Reasonably Available Control Technology ("RACT") Order. At the same time, the agencies in the CDM Process agreed that the CPP would not be subject to future BART proceedings for the same pollutants.

- In 1997 SWCAA issued the RACT Order imposing the emission reductions agreed to during the CDM Process. SWCAA made a finding that the emission limits in the RACT Order were equal to or more stringent than BART under federal and state regulations (40 CFR 51, Subpart P; WAC 173-400-151, and SWAPCA 400-151) for sulfur dioxide (SO_2), particulate matter and NOx and that the CPP would not be subject to future BART proceedings: "**SWAPCA concludes that after consultation with the Federal Land Managers, the EPA and the Washington Department of Ecology and a review of the BART criteria, the emission limits and control strategies identified for the Centralia Plant have been deemed to meet or exceed limitations that might have otherwise been required under a more time consuming and expensive BART regulatory process. As a result, the Centralia Plant shall not be subject to a similar visibility evaluation in the future for the same pollutants as provided in 40 CFR 51.302(c)(4)(v)(B).**" [Centralia Plant Technical Support Document ("RACT TSD"), Sec. 1, p. 24 (12/8/97), Ex. 1 to BART White Paper]

- In reliance on representations by the federal and state agencies that the RACT Order satisfied BART requirements, the Centralia Plant installed the emission controls representing BART between 2000 and 2002. The SO_2 "scrubbers" were installed at a capital cost of $190 million and have an annual O&M cost of $23 million. They were originally expected to reduce emissions by about 80,000 tpy (90%) but have operated at a higher removal efficiency in recent years. The low NOx burners were installed at a capital cost of $14 million and reduced emissions by an estimated 7000 tpy (about 30%) compared with a 1990's baseline emission rate. The Flex Fuel Project is reducing emissions of SO_2 and NOx even more significantly.

- In 2003, EPA confirmed that the SO2 and particulate matter BART determination continued to be valid, but stated that new technology for NOx might require lower emission limits. The BART White Paper explains why EPA's comment on BART for NOx is erroneous and the legal rationale for the conclusion that a BART determination may not be revised based on new technologies.

<u>MEDIATION BY DEPARTMENT OF ECOLOGY AND TRANSALTA</u>

When Ecology initiated the BART process in 2007 and requested a BART analysis from the Centralia Plant, TransAlta submitted an earlier version of the White Paper explaining that BART only applies once to a source and that the agencies involved in the 1997 BART determination agreed at the time that BART for the Centralia Plant would not be reconsidered in the future. To avoid an adversarial proceeding to resolve the question of current BART applicability, Ecology and TransAlta agreed to mediate the issue.

Through the mediation the parties reached an agreement on the BART limit for NOx in the Proposed BART Order. The Proposed BART Order is designed to comply with current federal and state BART guidelines and requirements. It is not a compromise and does not set less stringent requirements than would otherwise apply. Ecology's Support Document and TransAlta's BART analyses explain in detail compliance of the Proposed BART Order with the current BART guidelines.

2009 BART ANALYSIS AND PROPOSED BART DETERMINATION

A. BART Factors

The specific steps in a BART analysis are identified in the Code of Federal Regulations (CFR) at 40 CFR 51, Appendix Y, Section IV (2005) ("EPA BART Guidelines"). Ecology has adopted the EPA BART Guidelines essentially verbatim in state guidance, "Best Available Retrofit Technology Determinations under the Federal Regional Haze Rule" (June 12, 2007) ("Ecology BART Guidelines"). A BART analysis must consider the following factors:

1. The identification of available and technically feasible retrofit control options.
2. Consideration of pollution control equipment in use at the source (which affects the availability of options and their impacts).
3. The costs of compliance with the control options.
4. The remaining useful life of the facility.
5. The energy and non-air quality environmental impacts of compliance.
6. The degree of visibility improvement that may reasonably be anticipated from the use of BART.

For this proceeding, TransAlta retained CH2M Hill to prepare the BART Analysis for the Centralia Plant ("CH2M Hill BART Analysis," July 2008) and Environ (formerly, Geomatrix) to perform the visibility modeling. CH2M Hill's BART Analysis considered the BART factors for five control cases: pre-NOx and SO_2 controls (pre-2000), the Flex Fuel Project (fuel switching from Centralia Mine coal to Powder River Basin coal), installation of SNCR, installation of SCR on one unit, and installation of SCR on both units. Although the current low NOx technology meets the Ecology BART Guidelines, TransAlta has agreed with Ecology that the current technology coupled with the Flex Fuel Project would be the basis for the proposed BART Order.

B. EPA Used Low NOx Burner Technologies Installed by Centralia Plant in 2001 – 2002 as Basis to Set Presumptive BART Limit

The low NOx burners and separated overfire air controls (referred to collectively as "LNC3") installed at the Centralia Plant in 2001 and 2002 is the same technology that EPA used to set the presumptive BART limit for Centralia Plant-type electric generating units ("EGUs") in the EPA BART Guidelines. For the type of tangentially-fired boilers at the Centralia Plant that burn subbituminous coal, the EPA BART Guidelines set a presumptive standard of 0.15 lb/mmBtu NOx. The presumptive standard is not a mandatory limit; states are allowed to set alternative limits based on a balancing of the BART factors listed above.

To set the presumptive standard for tangential-fired boilers burning subbituminous coal, EPA surveyed all of the 72 such EGUs nationwide and based the presumptive BART standard on emission levels achieved by the 24 of the 72 plants that have installed LNC3. See EPA, "Technical Support for BART NOx Limits for Electric Generating Units Excel Spreadsheet" (EPA-HQ-OAQ-0002-0067-0446, April 15, 2005) ("TSD") (modified to include only tangential-fired boilers) (Ex. 1 attached hereto).

EPA's specific method for setting the presumptive standard was the determination that 75 percent of the EGUs greater than 200 MW could achieve the presumptive standard through the application of LNC3. For the other 25 percent lacking space for over-fire air controls, EPA assumed that ROFA was feasible and would meet the standard. Specifically, EPA stated:

- "In today's action, EPA is setting presumptive NOx limits for EGUs larger than 750 MW. EPA's analysis indicates that the large majority of the units can meet these presumptive limits at relatively low costs. Because of differences in individual boilers, however, there may be situation where the use of such controls would not be technically feasible and/or cost-effective.... Our presumption accordingly may not be appropriate for all sources.... It is possible, however, that some EGUs may not have adequate space available. In such cases, other NOx combustion control technologies could be considered such as Rotating Opposed Fire Air ("ROFA"). The limits provided were chosen at levels that approximately 75 percent of the units could achieve with current combustion control technology. The costs of such controls in most cases range from just over $100 to $1000 per ton. Based on our analysis, however, we concluded that approximately 25 percent of the units could not meet these limits with current combustion control technology. However, our analysis indicates that all but a very few of these units could meet the presumptive limits using advanced combustion controls such as rotating opposed fire air ("ROFA"), which has already been demonstrated on a variety of coal-fired units. Based on the data before us, the costs of such controls in most cases are less than $1500 per ton... ."

70 Fed. Reg. at 39134 - 39135.

EPA estimated the average cost of LNC3 for tangentially-fired, subbituminous burning units to be $281.00/ton. 70 Fed. Reg. 39135 (July 6, 2005). EPA considers this to be "cost-effective" for purposes of a BART NOx determination for Centralia Plant-type units.

Based on EPA's survey (TSD), the two units at the Centralia Plant are the only units in the nation with LNC3 installed that did not meet the presumptive standard (although one other unit with LNC3 emitted at a rate of .17 lb/mmBtu in 2004). There is no clear explanation why the LNC3 controls at the Centralia Plant do not achieve the presumptive standard. With respect to the ROFA alternative, the CH2M Hill BART Analysis explains that it has not been demonstrated commercially for the large units at the Centralia Plant, so under the EPA BART Guidelines, it is not considered technically feasible.

Consistent with EPA's conclusion that BART for tangentially-fired units is achievable through LNC3, the EPA BART Guidelines conclude that the significantly more costly post-combustion controls, such as SCR, are not cost-effective and are not BART for most types of EGUs, including tangential-fired boilers:

- ". . . [We] are not establishing presumptive limits based on the installation of SCR. Although States may in specific cases find that the use of SCR is appropriate, we have not determined that SCR is generally cost-effective for BART across unit types." 70 Fed. Reg. at 39136.

In sum, the Centralia Plant's current controls are the type on which the presumptive BART limit is set. The Centralia Plant installed the BART-level controls ten to fifteen years prior to the BART deadline for other similar units.

C. Flex Fuel Project

In addition to the Centralia Plant's LNC3 controls, the fuel switch from the use of local coal to Powder River Basin ("PRB") coal, referred to as the "Flex Fuel Project," is a basis for setting the proposed BART limit. Since the closure of the Centralia Mine in 2006, TransAlta has been evaluating various sources of coal from the PRB of Wyoming and Montana for use in its boilers at the Centralia Plant. The Centralia Plant has burned blends of local and PRB coal in the past, but is planning to burn 100 percent PRB coal for the foreseeable future.

The PRB coals are "cleaner" in several respects than local coals, e.g., lower sulfur, ash and nitrogen contents. To address the specific characteristics of PRB coal, the Centralia Plant has implemented several safety and efficiency projects. The Flex Fuel Project was implemented for Unit 2 during 2008 and for Unit 1 during the spring of 2009.

The slagging and fouling characteristics of PRB coal increase the heat rates of the boilers compared with Centralia Mine coal. The Flex Fuel Project incorporates physical changes to the pressure parts in each boiler's convective pass that improve heat transfer. No changes to the fuel delivery equipment, burners, combustion air system, or steam turbine are being made. The Flex Fuel Project allows the boilers to burn PRB coal more efficiently, but does not increase the boilers' potential steam generating capacity.

The boiler changes reduce the boiler susceptibility to ash deposition. The major individual pressure part changes include: (a) reheater replacement to maximize sootblower cleaning effectiveness on the tube assembly surface areas, and (b) additional low temperature superheater and economizer heat transfer surface area to result in a lower flue gas exit temperature. Miscellaneous safety and nonpressure boiler changes include: (a) twenty new retractable steam sootblowers and eight new steam wallblowers for each unit to help reduce the slagging and fouling in the boiler furnace and convective heat transfer surfaces; (b) hydrojets cleaning system to maintain heat transfer effectiveness inside the furnace and lower the flue exhaust gas temperature.

The Flex Fuel Project includes no changes to the current LNC3 controls. The Flex Fuel Project is, however, expected to enable reductions in overall NOx emissions by:

1. use of lower fuel nitrogen content coals,
2. improved boiler firing condition flexibility through reduced boiler exit gas temperatures allowing optimized use of the LNC3 separated over-fire air (SOFA) low-NOx equipment. (e.g., boiler exit gas temperatures reduced due to improved boiler sootblowing, hydrojets and heat transfer area improvements),
3. vendor engineering support and contractual boiler NOx performance guarantees enabled by reduced boiler exit gas temperatures, and
4. vendor boiler combustion "tuning" support during Flex Fuel Project commissioning, including support on use of current low-NOx equipment.

The annualized cost of the Flex Fuel Project is $11,184,197.00 (see TransAlta, "Supplement to BART Analysis for Centralia Power Plant," Dec. 2008, referred to herein as "BART Supplement"). Based on the estimated NOx reductions of 3139 tons/yr., the cost-effectiveness of the Flex Fuel Project is $3563/ton.

D. NOx Emission Reductions from Proposed BART Order

The proposed BART emission rate for NOx is 0.24 lb/mmBtu on a 30-day average. The baseline emission rate for calculating annual emission reductions is 0.30 lb/mmBtu. The Centralia Plant's 30-day rolling average emissions from 2003 through 2007 were in the range of 0.28 to 0.29 lb/mmBtu during numerous periods. (BART Supplement, Table 5). Based on this data, a conservative approach assumes that the Plant's baseline 30-day rolling average emission rate is 0.30 lb/mmBtu for purposes of evaluating and setting BART limits. (This rate also roughly corresponds to the maximum hourly emission rate of 0.304 lb/mmBtu during the 2003 – 2005 period, which is the baseline rate used in Environ's visibility modeling for the BART analysis.)

Annual NOx reductions are estimated by comparing the projected annual emissions to the annual average emissions during the 2003 – 2005 baseline. Annual average NOx emissions from December 1, 2003 through November 31, 2005 were 15,695 tons. Based on the ratio of the baseline emission rate of 0.30 lb/mmBtu to the proposed BART rate of 0.24 lb/mmBtu (20% reduction), the BART limit is estimated to reduce emissions by 3139 tons/year to 12,556 tpy.

E. Visibility Improvement from Proposed BART Order: Model Results

Environ's modeling of the baseline emission rate estimates 505 days of impairment (BART Supplement). The modeled number of days greater than 0.5 deciviews at Mount Rainier National Park ("MRNP") for the proposed 0.24 lb/mmBtu limit is 488.

The Flex Fuel Project has a co-benefit of burning low sulfur PRB coal that further reduces emissions by 1287 tpy. Although the visibility benefits of the SO2 reductions were not modeled separately for the Proposed BART, the model results for the actual SO2 emission rates in 2006 and 2007 provides a basis for estimating such benefits (see BART Supplement, Tables). Even though the modeled NOX emission levels were higher than required by the Proposed BART Order, Table 4-1 of the BART Supplement shows that the number of days exceeding 0.5 dV at MRNP was only 471, which is due to the lower SO2 from the PRB coal burned during that period. This indicates that the visibility improvement from the SO2 reductions is at least as great as the NOx reductions from the Proposed BART Order.

F. Visibility Improvement Based on Source Apportionment: NOx Emissions from the Centralia Plant Contribute Less than 1 Percent of the Visibility Impairment at Mount Rainier National Park (MRNP)

To understand the extent of visibility improvement from emission reductions by the Centralia Plant, comparing its relative impact on visibility with other sources is necessary. As shown in the CH2M Hill BART Analysis (July 2008), nitrates formed by NOx emissions contributed less than 10 percent of the observed visibility extinction in MRNP on both the best and worst days in 2005. Data for other years show similar contributions from NOx emissions.

According to a source apportionment study conducted by the Western Regional Air Partnership (WRAP), about 11 percent of the nitrate in Mt. Rainier National Park can be attributed to all industrial point sources. The Centralia Plant contributes only a portion of that 11 percent. Therefore, on the best and worst visibility days, NOx emissions from the Centralia Plant at most contribute less than one percent of the total extinction budget. This suggests that further reductions in the Centralia Plant's NOx emissions would not improve visibility significantly in the MRNP or other Class I areas. See also Western Regional Air Partnership, "Attribution of Haze Report (Phase 1)" (excerpts from section on MRNP) (March 14, 2005) (attached hereto as Ex. 2).

G. LNC3 as BART is Consistent with BART Determinations by Other Western States

To date, 80 percent of the BART determinations for EGUs in six western states have concluded that low NOx burners and OFA similar to the Centralia Plant's LNC3 technology meet BART. More to the point, low NOx burners and OFA have been determined to be BART for 19 of the 20 tangential-fired boilers. ("Western State EGU BART Determinations (September 2009)" (source: Western Regional Air Partnership, wrapair.org) (attached hereto as Ex. 3).[1]

Of the 32 non-tangential boilers, low NOx burners and OFA have been determined to be BART for 23 units, SNCR has been determined to be BART for eight units, and SCR has been determined to be BART for one 25 MW unit. The emission limits for the eight SNCR units ranges from 0.19 to 0.35 lb/mmBtu.

The Proposed BART Order is consistent with the majority of BART determinations for other EGUs in the West.

H. Comparison of SNCR with Proposed BART

In anticipation of stakeholder questions regarding SNCR, a comparison of the Proposed BART Order with SNCR supports the selection of the current control technology and the Flex Fuel Project as the basis for BART.

1. Emission Rates

Based on a baseline rate of 0.30 lb/mmBtu and a 25 percent reduction factor for SNCR, projected emissions with SNCR would be 0.23 lb/mmBtu, which is basically equivalent to the proposed BART limit of 0.24 lb/mmBtu.

2. Cost/Ton Emission Reduction

SNCR is estimated to reduce the Centralia Plant's NOx emissions by about 25 percent, or 3,800 tons per year, at a cost of about $2,300 per ton with a margin of -20 percent to plus 50 percent. As noted above, the EPA BART Guidelines estimated $281/ton as the average BART cost-effective standard, with $1500/ton as the upper end for ROFA when SOFA is not technically feasible. The cost of SNCR is outside of the "reasonable" BART range set by the EPA BART Guidelines.

Ecology's discussion in its TSD, pp. 25-26, states their assumption that under Executive Order 09-05, the remaining useful life of the Plant for purposes of BART is through 2025. The Ecology BART Guidelines provide that controls must be installed

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[1]The one exception for a tangential-fired unit is Wyoming's determination that SCR is BART for Naughton Unit 3 on the basis that the visibility improvement warrants the cost of $2830/ton of NOx reduction. This cost appears to be uniquely low for SCR. (Wyoming DEQ BART Application Analysis AP-6402, http://deq.state.wy.us/aqd/BART/6042ana_BART.pdf). This compares with the SCR cost of about $9000/ton for the Centralia Plant units. Note also that the BART emission limit for the Wyoming unit is 0.37 lb/mmBtu, which is 50 percent higher than the proposed limit of 0.24 lb/mmBtu for the Centralia Plant.

within five years of EPA's approval of the BART State Implementation Plan ("SIP"). Based on this assumption, if Ecology finalizes and submits the SIP by the end of 2009 and EPA approves the SIP by the end of 2010, SNCR would be required to be installed by 2015, which means that the remaining useful life would be ten years - from 2015 to 2025. The CH2M Hill BART Analysis cost calculations are based on the assumption of 15 years. Based on the assumption of a ten year useful life, the cost of SNCR becomes significantly higher than $2300 per ton.

3. Visibility Improvement

Environ's visibility modeling (BART Supplement) confirms that the visibility improvement from the Proposed BART Order and SNCR are virtually identical. The modeled number of days greater than 0.5 deciviews at Mount Rainier National Park ("MRNP") for the proposed 0.24 lb/mmBtu limit is 488, and for SNCR is 484.

SUMMARY OF BART FACTOR ANALYSIS FOR THE CENTRALIA PLANT

1. The identification of available and technically feasible retrofit control options.

   The Centralia Plant's BART Analysis considered the existing LNC3 controls, fuel switching (Flex Fuel Project), SNCR, and SCR, which are the primary available and technically feasible controls. ROFA and other technologies were considered not available or feasible.

2. Consideration of pollution control equipment in use at the source (which affects the availability of options and their impacts).

   The existing LNC3 controls were required by the 1997 BART Determination and are the technology that the EPA relied on to set the presumptive BART limit for tangential-fired boilers.

3. The costs of compliance with the control options.

   To comply with the 1997 BART Determination, the Plant spent about $190 million on SO_2 controls and about $14 million on NO_x controls in 2001 and 2002 to reduce emissions by an estimated 87,000 tpy. The annualized cost of the Flex Fuel Project is $11,184,197.00. The capital and O&M costs of SNCR and SCR are significant and not cost-effective based on the EPA BART Guidelines. Post-combustion NO_x controls are estimated to range from $2300/tpy (SNCR) to $9800/tpy (SCR), which compares to $230/tpy for the Plant's existing LNC3 and $281/tpy estimated by EPA for the average BART cost nationwide.

4. The remaining useful life of the facility.

   Assuming the Centralia Plant's likely remaining useful life is 10 years increases the cost of SCR and SNCR and confirms they are not cost-effective for purposes of BART.

5. The energy and non-air quality environmental impacts of compliance.

   The ammonia slip from SNCR would likely reduce the recyclability of fly ash.

6. The degree of visibility improvement that may reasonably be anticipated from the use of BART.

   The Proposed BART Order and SNCR are projected to result in similar visibility improvement. According to regional source attribution modeling by the Western Regional Air Partnership, the Plant's NOx emissions cause less than 1 percent of the visibility impairment at Mt. Rainier National Park. Mobile sources contribute most of the NOx.

   The use of PRB coal provides a visibility benefit from reduced SO2 emissions at least as significant as the Proposed BART Order's NOx reductions.

CONCLUSION

The primary purpose of the BART Guidelines is to identify cost-effective technologies to reduce EGU emissions and improve visibility at federal Class 1 areas. EPA set the BART presumptive standard for EGUs, and tangential-fired boilers in particular, based on a level that most boilers meet using technology similar to that installed by the Centralia Plant seven years ago. Well in advance of most other EGUs, the Centralia Plant installed the LNC3 NOx control technologies relied on by EPA to set the presumptive standard.

The key factors in the BART analysis are cost and visibility improvement. The proposed BART limit is nearly the same as a SNCR emission rate and will achieve nearly the same visibility improvement. Source attribution studies and state emission inventories indicate that the Centralia Plant's contribution to visibility impairment at Class 1 areas is less than one percent. The Centralia Plant's remaining useful life eliminates post-combustion controls from consideration as BART.

A BART determination requiring post-combustion controls would be inconsistent with the agencies' BART Guidelines and would penalize the Centralia Plant by making it one of the only tangentially-fired facilities in the nation required by BART to install such controls. Based on relevant considerations, the Centralia Plant's current LNC3 technology with the Flex Fuel Project is the appropriate technology and 0.24 lb/mmBtu is the appropriate limit.

ATTACHMENT A: CLARIFICATIONS, CORRECTIONS AND PROPOSED EDITS TO TECHNICAL SUPPORT DOCUMENT AND PROPOSED REGULATORY ORDER

1. TSD, pp. 3, 44 and 45: The TSD references "the use of a sub-bituminous coal from the Powder River Basin or other coal that will achieve similar emission rates." The TSD, p. 45, and the Proposed Order state: "1.3 Coal used shall be a sub-bituminous coal from the Powder River Basin or other coal that will achieve similar emission rates." The Proposed Order, para. 3 states: "3. Determination of compliance with the rolling annual average nitrogen and sulfur coal content limitation will commence at midnight of October 30, 201, based on coal nitrogen and sulfur content testing during the prior year." The TSD, pp. 44 – 45 states: "A coal meeting the nitrogen and sulfur content of the Jacobs Ranch Upper Wyodak coal depicted in Appendix A, Table A-2 is considered to be a PRB coal or equivalent coal."

   TransAlta Comment: BART is defined as an "emission limit." RCW 70.94.030(7). The Proposed BART Order would set a NOx "emission limit" of 0.24 lb/mmBtu monthly average. TransAlta does not object to specifying that the Centralia Plant must use a coal that will achieve the nitrogen dioxide emission limit, but coal content limits are not appropriate BART emission limits. Further, there is no legal basis for including a SO2 coal content limit in a BART order for NOx. TransAlta requests that the coal content requirements in the Proposed BART Order be removed and that the Proposed Order be revised to state: "1.3 Coal used shall be a sub-bituminous coal from the Powder River Basin or other coal that will achieve the nitrogen dioxide emission rate."

2. TSD, p. 5: The TSD references a letter dated October 16, 1995, from the National Park Service stating the "belief that some or all of the haze [at MRNP] was attributable to emissions from the Centralia coal fired power plant."

   TransAlta Comment: The National Park Service letter states that the Centralia Plant "is certainly not the only source of visibility impairment affecting Class I national park and wilderness areas."

3. TSD, p. 11: "The Flex Fuel project is a series of actions being undertaken by the company to accommodate the exclusive use of subbituminous coals with ash, nitrogen and sulfur contents similar to PRB sub-bituminous coals."

   TransAlta Comment: It would be more accurate to delete the reference to "exclusive." Changes to the boilers were made to accommodate a variety of PRB coals, as well as local coal.

4. TSD, p. 26: "To meet the requirement of the executive order, the likely economic lifetime of the current configuration of the Centralia Plant and any new emission control equipment would be 16 years."

   TransAlta Comment: For the reasons explained in the body of TransAlta's comments, for BART purposes the projected lifetime is "10 years" rather than "16 years."

ATTACHMENT B: RESPONSE TO COMMENTS BY SIERRA CLUB

On behalf of the Sierra Club, Dr. Sahu submitted comments to SWCAA regarding BART during the recent public comment period on the Title V Operating Permit for the Centralia Plant. Several of the comments reflect a misunderstanding of the Proposed BART Order. This section corrects those misunderstandings and responds to several of Dr. Sahu's comments.

- <u>Sierra Club Comment No. 2</u>: "[I]t appears that a number of documents that are relevant to the consideration of NOx control have been withheld by the Department of Ecology. . . ."

  <u>TransAlta Response</u>: TransAlta is not aware of any relevant BART documents submitted to Ecology that have been withheld.

- <u>Sierra Club Comment No. 6</u>: "TransAlta, the permitting entity and Ecology should clarify whether the Flex Fuel project is a purely efficiency driven project in which heat input and emissions will not increase or if it involves debottlenecking the boiler island in any manner."

  <u>TransAlta Response</u>: The Flex Fuel Project will not increase emissions compared with the historic NSR baseline period. Projected emissions are less than baseline emissions.

- <u>Sierra Club Comment No. 8</u>: "Ecology erroneously declares SCR to be technically infeasible. . . ."

  <u>TransAlta Response</u>: The TSD, p. 21, clarifies that SCR is "economically infeasible," not technically infeasible.

- <u>Sierra Club Comment No. 9</u>: "[T]here is not supporting documentation for the [SCR] costs."

  <u>TransAlta Response</u>: The CH2M Hill BART Analysis and Appendix A (July 2008) provide detailed documentation on the SCR cost estimate.

- <u>Sierra Club Comment No. 10</u>: "There seems to be much confusion regarding the choice of baseline periods."

  <u>TransAlta Response</u>: The BART Supplement explains in detail the selection of 0.30 lb/mmBtu as the baseline for evaluating cost-effectiveness:

  > "The emission data in Table 5 (attached) demonstrates that the Centralia Plant's 30-day rolling average emissions from 2003 through 2007 were in the range of 0.28 to 0.29 lb/mmBtu during numerous

periods. Based on this data, a conservative approach assumes that the Plant's baseline 30-day rolling average emission rate is 0.30 lb/mmBtu for purposes of evaluating and setting BART limits. This rate also roughly corresponds to the maximum hourly emission rate of 0.304 lb/mmBtu during the 2003 – 2005 period, which is the baseline rate used in ENVIRON's (formerly Geomatrix) visibility modeling for the BART Analysis and for this supplement (see attached Tables)."

Case 1a - Installation of SOA Nox combustion controls for units with no prior controls, or which had controls installed before 1997. For units with controls installed in or after 1997, install incremental controls if the max (LNBO or LNC3) control not installed. For Cyclone, apply Coal Reburn if no prior controls installed. For Cell Burners, install Combustion Controls if the unit had no controls or controls were installed before 1997. For Stokers install OFA. Not including existing SCR or SNCR units in the Control Case NOx Rate.

State	Plant Name	ORISPL	Unit ID	Boiler Type	2004 Nox Controls	Action	Hg ICR Primary Coal	Pre Control Rate	2004 NOx Rate (lbs/mmBtu)
AL	Barry	3	4	T	LNC2 (Installed: 03/16/1998 -- Still in service)	Increment to LNC3	Bituminous	0.65	0.27
AL	Barry	3	5	T	LNC2 (Installed: 05/28/1998 -- Still in service)	Increment to LNC3	Bituminous	0.68	0.33
AL	Gorgas	8	10	T	LNC2 (Installed: 12/19/1999 -- Still in service), SCR (Installed: 05/23/2002 -- Still in service)	None - SCR	Bituminous	0.73	0.23
AL	E C Gaston	26	5	T	LNC2 (Installed: 12/19/1993 -- Still in service)	Add Current LNC3	Bituminous	0.78	0.42
AL	Widows Creek	50	8	T	LNC2 (Installed: 06/12/1998 -- Still in service), SCR (Installed: 05/01/2004 -- Still in service)	None - SCR	Bituminous	0.63	0.30
AR	White Bluff	6009	1	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.29	0.31
AR	White Bluff	6009	2	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.34	0.29
AR	Independence	6641	1	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.34	0.25
AZ	Cholla	113	2	T		Add Current LNC3	Subbituminous	0.42	0.30
AZ	Cholla	113	3	T		Add Current LNC3	Subbituminous	0.36	0.31
AZ	Cholla	113	4	T		Add Current LNC3	Subbituminous	0.38	0.32
AZ	Navajo Generating Station	4941	1	T	O (Installed: Original -- Still in service)	Add Current LNC3	Bituminous	0.41	0.36
AZ	Navajo Generating Station	4941	2	T	O (Installed: Original -- Still in service)	Add Current LNC3	Bituminous	0.41	0.36
AZ	Navajo Generating Station	4941	3	T	O (Installed: Original -- Still in service)	Add Current LNC3	Bituminous	0.37	0.31
CO	Cherokee	469	4	T	LNC3 (Installed: 11/01/1990 -- Still in service)	Add Current LNC3	Bituminous	0.51	0.33
CO	Comanche (470)	470	1	T		Add Current LNC3	Subbituminous	0.24	0.32
CO	Valmont	477	5	T	LNC3 (5/1/1990-)	Add Current LNC3	Bituminous	0.66	0.33
CO	Hayden	525	H2	T	LNC3 (Installed: 06/01/1999 -- Still in service)	None - Max controls installed in or after 1997	Bituminous	0.45	0.33
CT	Bridgeport Harbor Station	568	BHB3	T	LNC2 (Installed: 12/01/1993 -- Still in service)	Add Current LNC3	Subbituminous	0.56	0.14
DE	Edge Moor	593	4	T	LNB (Installed: 04/01/1980 -- Still in service), LNC1 (Installed: 04/01/1980 -- Still in service)	None - 2004 rate = CC1a rate	Bituminous	0.55	0.25
FL	Crystal River	628	1	T	LNC1 (Installed: 10/01/1999 -- Still in service)	Increment to LNC3	Bituminous	0.79	0.38
FL	Crystal River	628	2	T		Add Current LNC3	Bituminous	0.38	0.40
FL	Lansing Smith	643	1	T		Add Current LNC3	Bituminous	0.71	0.48
FL	Lansing Smith	643	2	T	LNC3 (Installed: 03/01/1993 -- Still in service)	Add Current LNC3	Bituminous	0.63	0.39
GA	Bowen	703	1BLR	T	LNC2 (Installed: Original -- Still in service)	Increment to LNC3 (assum LNC2 installed in or after 1997)	Bituminous	0.67	0.25
GA	Bowen	703	2BLR	T	LNC2 (Installed: Original -- Still in service)	Increment to LNC3 (assum LNC2 installed in or after 1997)	Bituminous	0.65	0.25
GA	Bowen	703	3BLR	T	LNC2 (Installed: Original -- Still in service)	Increment to LNC3 (assum LNC2 installed in or after 1997)	Bituminous	0.58	0.25
GA	Bowen	703	4BLR	T	LNC2 (Installed: Original -- Still in service)	None - 2004 Nox Rate = Floor Rate	Bituminous	0.58	0.24
GA	Jack McDonough	710	MB1	T	O (Installed: 04/01/1999 -- Still in service), LNC2 (Installed: 11/01/1995 -- Still in service)	None - 2004 Nox Rate Less Than CC1a Control Rate	Bituminous	0.66	0.26
GA	Jack McDonough	710	MB2	T	O (Installed: 04/01/1999 -- Still in service), LNC2 (Installed: 05/01/1995 -- Still in service)	Add Current LNC3	Bituminous	0.60	0.27
GA	Mitchell	727	3	T		Add Current LNC3	Bituminous	0.61	0.67
GA	Yates	728	Y6BR	T	LNC2 (Installed: 11/01/1992 -- Still in service), O (Installed: 04/01/1999 -- Still in service)	Add Current LNC3	Bituminous	0.67	0.28
GA	Yates	728	Y7BR	T	LNC2 (Installed: 03/01/1994 -- Still in service), O (Installed: 04/01/1999 -- Still in service)	None - 2004 rate less than CC 1a rate	Bituminous	0.66	0.26
GA	Kraft	733	3	T		Add Current LNC3	Bituminous	0.40	0.56
GA	Wansley (6052)	6052	1	T	LNC3 (Installed: Original -- Still in service)	None - 2004 Rate = Floor	Bituminous	0.73	0.24
GA	Wansley (6052)	6052	2	T	LNC3 (Installed: 01/01/1995 -- Still in service)	None - 2004 Rate less than Floor	Bituminous	0.67	0.23
GA	Scherer	6257	1	T	O (Installed: Original -- Still in service)	None - 2004 Rate less than Floor	Bituminous	0.52	0.16
GA	Scherer	6257	2	T	O (Installed: Original -- Still in service)	None - 2004 Nox Rate below the Floor	Bituminous	0.35	0.16
IA	Milton L Kapp	1048	2	T	LNC1 (08/25/1995)	Add Current LNC3	Subbituminous	0.80	0.14
IA	Burlington (IA)	1104	1	T	LNC3 (11/01/1993) OFA (11/01/1993)	Add Current LNC3	Subbituminous	0.63	0.17
IA	Ames	1122	7	T		Add Current LNC3	Subbituminous	0.60	0.38
IA	Ottumwa	6254	1	T	LNC1 (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.69	0.33
IL	Joliet 29	384	71	T	LNC3 (Installed: 01/22/2000 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.32	0.12
IL	Joliet 29	384	72	T	LNC3 (Installed: 01/22/2000 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.32	0.12
IL	Joliet 29	384	81	T	LNC3 (Installed: 04/12/2001 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.46	0.13
IL	Joliet 29	384	82	T	LNC3 (Installed: 04/12/2001 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.46	0.13

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IL	Waukegan	883	8	T	LNC3 (Installed: 09/11/1999 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.41	0.15
IL	Will County	884	4	T	LNC3 (Installed: 09/10/1999 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.31	0.14
IL	Baldwin Energy Complex	889	3	T	LNC2 (Installed: 04/17/1994 -- Still in service)	None - 2004 rate less than CC 1a rate	Bituminous	0.67	0.10
IL	Wood River Power Station	898	5	T		None - 2004 rate less than CC 1a rate	Bituminous	0.61	0.16
IL	Dallman	963	33	T	SCR (Installed: 04/15/2003 -- Still in service)	None - SCR	Bituminous	0.55	0.28
IL	Newton	6017	1	T	LNC3 (Installed: 12/01/1994 -- Still in service)	None - 2004 rate less than CC 1a rate	Subbituminous	0.47	0.13
IL	Newton	6017	2	T	LNC1 (Installed: 12/01/1982 -- Still in service)	None - 2004 rate less than CC 1a rate	Subbituminous	0.39	0.12
IN	Harding Street Station (EW Stout)	990	70	T	LNC3 (Installed: 05/20/1994 -- Still in service)	Add Current LNC3	Bituminous	0.71	0.32
IN	Petersburg	994	1	T	LNC3 (Installed: 11/30/1995 -- Still in service)	Add Current LNC3	Bituminous	0.56	0.27
IN	Petersburg	994	2	T	LNC3 (Installed: 08/01/1994 -- Still in service), SCR (Installed: 05/19/2004 -- Still in service)	None - SCR	Bituminous	0.63	0.21
IN	Petersburg	994	3	T	LNC1 (Installed: Original -- Still in service), SCR (Installed: 05/08/2004 -- Still in service)	None - SCR	Bituminous	0.33	0.24
IN	Cayuga	1001	1	T	LNC2 (Installed: 10/07/1993 -- Still in service)	Add Current LNC3	Bituminous	0.42	0.32
IN	Cayuga	1001	2	T	LNC2 (Installed: 06/09/1993 -- Still in service)	Add Current LNC3	Bituminous	0.47	0.36
IN	Wabash River	1010	6	T	LNC2 (Installed: 05/31/1994 -- Still in service)	Add Current LNC3	Bituminous	0.37	0.41
IN	Whitewater Valley	1040	2	T	LNC2 (Installed: 09/21/1996 -- Still in service)	Add Current LNC3	Bituminous	0.71	0.33
KS	Lawrence Energy Center	1250	5	T		None - 2004 rate less than CC 1a rate	Bituminous	0.56	0.19
KS	Tecumseh Energy Center	1252	10	T		Add Current LNC3	Subbituminous	0.44	0.32
KS	Jeffrey Energy Center	6068	1	T		Add Current LNC3	Subbituminous	0.36	0.32
KS	Jeffrey Energy Center	6068	2	T		Add Current LNC3	Subbituminous	0.47	0.30
KY	E W Brown	1355	2	T	LNC1 (Installed: 03/08/1995 -- Retired: 09/30/2003), LNC3 (Installed: 11/03/2002 -- Still in service)	None - Max Controls Already Installed	Bituminous	0.59	0.32
KY	E W Brown	1355	3	T	LNC3 (Installed: 12/15/1992 -- Still in service)	Add Current LNC3	Bituminous	0.57	0.31
KY	Ghent	1356	1	T	LNC2 (Installed: 01/05/1994 -- Still in service), SCR (Installed: 04/01/2004 -- Still in service)	None - SCR	Bituminous	0.56	0.26
KY	Ghent	1356	2	T	LNC3 (Installed: Original -- Still in service)	Add Current LNC3	Bituminous	0.48	0.27
KY	Cane Run	1363	6	T		Add Current LNC3	Bituminous	1.02	0.31
KY	Mill Creek	1364	1	T		None - 2004 rate less than CC 1a rate	Bituminous	0.76	0.27
KY	Mill Creek	1364	2	T		None - 2004 rate less than CC 1a rate	Bituminous	0.79	0.27
KY	Elmer Smith	1374	2	T	LNC1 (Installed: 12/01/1994 -- Retired: 03/31/2004), LNC2 (Installed: 12/01/1994 -- Still in service), SNCR (Installed: 05/01/2004 -- Still in service)	None - SNCR	Bituminous	0.86	0.28
KY	H L Spurlock	6041	2	T	LNC1 (Installed: 03/02/1981 -- Still in service), SCR (Installed: 07/01/2002 -- Still in service)	None - SCR	Bituminous	0.39	0.23
KY	Trimble County	6071	1	T	LNC1 (Installed: Original -- Still in service), SCR (Installed: Original -- Still in service)	None - SCR	Bituminous	0.62	0.22
LA	R S Nelson	1393	6	T	LNC1 (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.20	0.24
MA	Brayton Point	1619	1	T	LNC3 (Installed: 06/01/1994 -- Still in service)	None - 2004 rate less than CC 1a rate	Bituminous	0.70	0.23
MA	Brayton Point	1619	2	T	LNC3 (Installed: 11/15/1994 -- Still in service)	None - 2004 rate less than CC 1a rate	Bituminous	0.70	0.24
MD	Dickerson	1572	3	T	LNC1 (Installed: 12/31/1999 -- Still in service)	Increment to LNC3	Bituminous	No Data	0.35
MD	Morgantown	1573	1	T	LNC3 (Installed: 05/20/1995 -- Still in service)	Add Current LNC3	Bituminous	0.95	0.45
MD	Morgantown	1573	2	T	LNC3 (Installed: 04/20/1994 -- Still in service)	Add Current LNC3	Bituminous	0.95	0.41
MI	J H Campbell	1710	1	T	LNC1 (Installed: 01/01/1995 -- Retired: 01/30/2001), LNC3 (Installed: 04/27/2001 -- Still in service)	None - Max controls installed in or after 1997	Bituminous	0.69	0.16
MI	St. Clair	1743	7	T	LNC2 (Installed: 04/01/2001 -- Still in service)	Increment to LNC3	Subbituminous	0.31	0.17
MI	Trenton Channel	1745	9A	T	LNC2 (Installed: 12/22/2000 -- Still in service)	None - 2004 Rate less than Floor rate	Bituminous	0.33	0.17
MI	Presque Isle	1769	2	T		Add Current LNC3	Subbituminous	0.75	0.44
MI	Presque Isle	1769	3	T	LNC1 (Installed: 05/25/2001 -- Still in service)	Increment to LNC3	Subbituminous	0.75	0.38
MI	Presque Isle	1769	4	T	LNC1 (Installed: 10/22/2002 -- Still in service)	Increment to LNC3	Subbituminous	0.75	0.38
MN	Clay Boswell	1893	3	T	O (Installed: 01/01/1997 -- Still in service)	Add Current LNC3	Subbituminous	0.42	0.38
MN	Clay Boswell	1893	4	T	LNC1 (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.38	0.33
MN	Sherburne County	6090	1	T	LNC1 (Installed: 05/01/1976 -- Still in service)	Add Current LNC3	Subbituminous	0.45	0.23
MN	Sherburne County	6090	2	T	LNC3 (Installed: 04/01/1977 -- Still in service)	Add Current LNC3	Subbituminous	0.45	0.22
MO	Montrose	2080	3	T	O (Installed: 01/02/1970 -- Still in service)	Add Current LNC3	Subbituminous	0.34	0.33
MO	Labadie	2103	1	T	LNC3 (Installed: 12/31/1993 -- Still in service)	None - 2004 Rate = Floor	Subbituminous	0.62	0.12
MO	Labadie	2103	2	T	LNC3 (Installed: 10/31/1994 -- Still in service)	None - 2004 Rate = Floor	Subbituminous	0.62	0.12
MO	Labadie	2103	3	T	LNC3 (Installed: 05/31/1993 -- Still in service)	None - 2004 Rate less than Floor	Subbituminous	0.62	0.11
MO	Labadie	2103	4	T	LNC3 (Installed: 03/31/1992 -- Still in service)	None - 2004 Rate = Floor	Subbituminous	0.62	0.12
MO	Blue Valley	2132	3	T		None - 2004 Nox Rate = CC1a Control Rate	Bituminous	0.79	0.29
MO	Rush Island	6155	1	T	LNC3 (Installed: 01/31/1995 -- Still in service)	None - 2004 Rate less than Floor	Subbituminous	0.63	0.10
MO	Rush Island	6155	2	T	LNC3 (Installed: 12/31/1995 -- Still in service)	None - 2004 Rate less than Floor	Subbituminous	0.63	0.11
MS	Daniel Electric Generating Plant	6073	1	T		Add Current LNC3	Subbituminous	0.27	0.30
MS	Daniel Electric Generating Plant	6073	2	T		Add Current LNC3	Subbituminous	0.28	0.28
MT	J E Corette	2187	2	T	OFA (7/1/1997-)	Add Current LNC3	Subbituminous	0.65	0.28

MT	Colstrip	6076	1	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.51	0.34
MT	Colstrip	6076	2	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.57	0.40
NC	Roxboro	2712	2	T	LNC2 (Installed: 12/15/1996 -- Still in service), OFA (Installed: 12/15/1996 -- Still in service)	None - 2004 Nox Rate Less Than CC1a Control Rate	Bituminous	0.76	0.28
NC	Cliffside	2721	5	T	LNC1 (Installed: 01/01/1995 -- Still in service), SCR (Installed: 04/01/2002 -- Still in service)	None - SCR	Bituminous	0.51	0.20
NC	Marshall	2727	1	T	LNC1 (Installed: 10/01/1995 -- Still in service)	Add Current LNC3	Bituminous	0.48	0.30
NC	Marshall	2727	2	T	LNC3 (Installed: 10/01/1995 -- Still in service)	Add Current LNC3	Bituminous	0.61	0.28
NC	Marshall	2727	3	T	LNC3 (Installed: 10/01/1995 -- Still in service)	Add Current LNC3	Bituminous	0.52	0.31
NC	Marshall	2727	4	T	LNC3 (Installed: 12/10/1994 -- Still in service)	None - CC1a Controlled Rate = 2004 Rate	Bituminous	0.70	0.28
ND	Coal Creek	6030	1	T	LNC3 (Installed: 04/30/1999 -- Still in service)	None - Max controls installed in or after 1997	Lignite	0.55	0.22
ND	Coal Creek	6030	2	T	LNC3 (Installed: 05/29/1998 -- Still in service)	None - Max controls installed in or after 1997	Lignite	0.82	0.24
NE	North Omaha	2291	4	T		Add Current LNC3	Subbituminous	0.38	0.33
NV	Mohave	2341	1	T		Add Current LNC3	Bituminous	0.38	0.42
NV	Mohave	2341	2	T		Add Current LNC3	Bituminous	0.46	0.38
NY	Dynegy Danskammer	2480	4	T	OFA (Installed: 01/01/1994 -- Still in service)	None - 2004 Nox Rate Less Than CC1a Control Rate	Bituminous	0.62	0.24
OH	Walter C Beckjord	2830	5	T	LNC1 (Installed: 04/01/1995 -- Still in service)	Add Current LNC3	Bituminous	0.72	0.46
OH	Walter C Beckjord	2830	6	T	LNC1 (Installed: 04/01/1995 -- Still in service)	Add Current LNC3	Bituminous	0.71	0.33
OH	Lake Shore	2838	18	T		Add Current LNC3	Bituminous	0.45	0.31
OH	Conesville	2840	4	T		Add Current LNC3	Bituminous	0.53	0.43
OH	Conesville	2840	5	T		Add Current LNC3	Bituminous	0.44	0.37
OH	Conesville	2840	6	T		Add Current LNC3	Bituminous	0.44	0.38
OH	Hamilton	2917	9	T	LNC1 (Installed: 06/06/2000 -- Still in service)	Increment to LNC3	Bituminous	0.60	0.33
OK	Muskogee	2952	4	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.44	0.30
OK	Muskogee	2952	5	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.41	0.34
OK	Northeastern	2963	3313	T	LNC1 (Installed: 06/30/1979 -- Still in service)	Add Current LNC3	Subbituminous	0.53	0.39
OK	Northeastern	2963	3314	T	LNC1 (Installed: 06/30/1980 -- Still in service)	Add Current LNC3	Subbituminous	0.53	0.40
OK	Sooner	6095	1	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.33	0.39
OK	Sooner	6095	2	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.42	0.34
PA	Portland	3113	2	T	LNC3 (Installed: 06/06/1993 -- Still in service)	Add Current LNC3	Bituminous	0.66	0.33
PA	Conemaugh	3118	1	T	LNC3 (Installed: 12/12/1994 -- Still in service)	Add Current LNC3	Bituminous	0.65	0.34
PA	Conemaugh	3118	2	T	LNC3 (Installed: 12/12/1994 -- Still in service)	Add Current LNC3	Bituminous	0.71	0.32
PA	Keystone	3136	1	T	LNC3 (Installed: 04/15/1995 -- Still in service), SCR (Installed: 04/18/2003 -- Still in service)	None - SCR	Bituminous	0.79	0.24
PA	Keystone	3136	2	T	LNC3 (Installed: 04/27/1994 -- Still in service), SCR (Installed: 02/09/2003 -- Still in service)	None - SCR	Bituminous	0.79	0.23
PA	Brunner Island	3140	2	T	LNC3 (Installed: 06/12/1994 -- Still in service)	Add Current LNC3	Bituminous	0.71	0.34
PA	Brunner Island	3140	3	T	LNC3 (Installed: 11/20/1994 -- Still in service)	Add Current LNC3	Bituminous	0.83	0.37
PA	Montour	3149	1	T	LNC3 (Installed: 06/01/1995 -- Still in service), SCR (Installed: 06/01/2001 -- Still in service)	None - SCR	Bituminous	0.95	0.27
PA	Montour	3149	2	T	LNC3 (Installed: 06/05/1994 -- Still in service), SCR (Installed: 06/01/2000 -- Still in service)	None - SCR	Bituminous	0.46	0.25
PA	Mitchell Power Station	3181	33	T	LNC3 (Installed: 05/01/1994 -- Still in service)	None - 2004 rate less than CC 1a rate	Bituminous	0.68	0.25
PA	Cheswick	8226	1	T	LNC2 (03/01/1993) SCR (04/30/2003)	None - SCR	Bituminous	0.71	0.31
SC	Canadys Steam	3280	CAN1	T	LNC1 (Installed: 04/01/1999 -- Still in service)	Increment to LNC3	Bituminous	0.45	0.39
SC	Canadys Steam	3280	CAN2	T	LNC1 (Installed: 04/01/1999 -- Still in service)	Increment to LNC3	Bituminous	0.60	0.40
SC	Williams	3298	WIL1	T	LNC1 (09/01/1998)	Increment to LNC3	Bituminous	0.87	0.32
TN	Bull Run	3396	1	T	SCR (Installed 5/12/2004; Still in Service)	None - SCR	Bituminous	0.67	0.35
TX	Big Brown	3497	1	T	LNC1 (Installed: 06/01/2001 -- Still in service)	None - 2004 Rate less than Floor	Lignite	0.40	0.14
TX	Big Brown	3497	2	T	LNC1 (Installed: 11/01/2001 -- Still in service)	None - 2004 Rate less than Floor	Lignite	0.34	0.14
TX	Martin Lake	6146	1	T	LNC1 (Installed: 04/01/2001 -- Still in service)	None - 2004 Nox Rate = Floor Rate	Lignite	0.36	0.17
TX	Martin Lake	6146	2	T	LNC1 (Installed: 04/01/2001 -- Still in service)	None - 2004 Rate = Floor	Lignite	0.35	0.17
TX	Monticello	6147	1	T	LNC1 (Installed: 05/01/2002 -- Still in service)	None - 2004 Nox Rate below the Floor	Lignite	0.31	0.15
TX	Monticello	6147	2	T	LNC1 (Installed: 05/01/2003 -- Still in service)	None - 2004 Nox Rate below the Floor	Lignite	0.40	0.15
TX	Coleto Creek	6178	1	T	LNC1 (06/30/1980-10/20/2001) LNC3 (10/20/2001)	None - Max controls installed in or after 1997	Bituminous	0.38	0.16
TX	Sam Seymour	6179	1	T		None - 2004 rate less than CC 1a rate	Subbituminous	0.34	0.10
TX	Sam Seymour	6179	2	T		Add Current LNC3	Subbituminous	0.29	0.15
TX	J T Deely	6181	1	T	LNC1 (Installed: Original -- Still in service)	Increment to LNC3 - b/c 2004 rate near floor rate, and LNC1 appears to be installed after 1997.	Subbituminous	0.31	0.14
TX	J T Deely	6181	2	T	LNC1 (Installed: Original -- Still in service)	Increment to LNC3 - b/c 2004 rate near floor rate, and LNC1 appears to be installed after 1997.	Subbituminous	0.31	0.14
TX	Harrington Station	6193	061B	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.27	0.29
TX	Harrington Station	6193	062B	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.38	0.31
TX	Sandow	6648	4	T	LNC1 (12/01/2002)	Increment to LNC3	Lignite	0.43	0.20
UT	Hunter (Emery)	6165	1	T	LNC1 (Installed: 06/01/1999 -- Still in service)	Increment to LNC3	Bituminous	0.50	0.35

UT	Hunter (Emery)	6165 2	T	LNC1 (Installed: 10/01/1997 -- Still in service)	Increment to LNC3	Bituminous	0.55	0.35
UT	Huntington	8069 1	T	LNC1 (Installed: 06/01/1997 -- Still in service)	Increment to LNC3	Bituminous	0.52	0.34
UT	Huntington	8069 2	T	LNC1 (Installed: 06/01/1998 -- Still in service)	Increment to LNC3	Bituminous	0.43	0.36
VA	Chesterfield Power Station	3797 5	T	SCR (Installed: 06/17/2002 -- Still in service), LNC2 (Installed: 11/27/1998 -- Still in service)	None - SCR	Bituminous	0.62	0.24
VA	Chesterfield Power Station	3797 6	T	LNC3 (Installed: 12/09/1999 -- Still in service), SCR (Installed: 05/26/2004 -- Still in service)	None - SCR	Bituminous	0.73	0.20
VA	Chesapeake	3803 4	T	SCR (Installed: 06/25/2003 -- Still in service), O (Installed: Original -- Retired: 12/31/1999)	None - SCR	Bituminous	0.54	0.35
VA	Possum Point Power Station	3804 4	T	LNC1 (Installed: 05/13/1996 -- Still in service)	None - Stopped burning Coal in 2003, 2004 - PNG fired	NA	0.61	0.10
WA	Centralia	3845 BW21	T	LNC3 (Installed: 06/13/2002 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.40	0.27
WA	Centralia	3845 BW22	T	LNC3 (Installed: 06/08/2001 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.45	0.26
WI	South Oak Creek	4041 7	T	(Installed: 01/23/2002 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.66	0.14
WI	South Oak Creek	4041 8	T	(Installed: 01/08/2003 -- Still in service)	None - Max controls installed in or after 1997	Subbituminous	0.67	0.14
WI	Weston	4078 3	T	OFA (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.26	0.25
WI	Genoa	4143 1	T	LNC3 (12/31/1993)	Add Current LNC3	Bituminous	0.75	0.37
WI	Columbia	8023 1	T		None - 2004 rate less than CC 1a rate	Subbituminous	0.46	0.14
WI	Columbia	8023 2	T		Add Current LNC3	Subbituminous	0.49	0.35
WV	Fort Martin Power Station	3943 1	T		Add Current LNC3	Bituminous	0.72	0.30
WV	Mount Storm Power Station	3954 1	T	03/02/2003 -- Still in service)	None - SCR	Bituminous	0.88	0.37
WV	Mount Storm Power Station	3954 2	T	04/12/2003 -- Still in service)	None - SCR	Bituminous	0.76	0.42
WV	Mount Storm Power Station	3954 3	T	05/27/2004 -- Still in service)	None - SCR	Bituminous	0.86	0.45
WY	Dave Johnston	4158 BW44	T		Add Current LNC3	Subbituminous	0.55	0.35
WY	Naughton	4162 1	T		Add Current LNC3	Subbituminous	0.42	0.58
WY	Naughton	4162 2	T		Add Current LNC3	Subbituminous	0.55	0.56
WY	Naughton	4162 3	T	LNC2 (Installed: 06/01/1999 -- Still in service)	Increment to LNC3	Subbituminous	0.62	0.41
WY	Jim Bridger	8066 BW71	T	LNC1 (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.63	0.43
WY	Jim Bridger	8066 BW72	T	LNC1 (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.51	0.45
WY	Jim Bridger	8066 BW73	T	LNC1 (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.42	0.45
WY	Jim Bridger	8066 BW74	T	LNC1 (Installed: Original -- Still in service)	Add Current LNC3	Subbituminous	0.41	0.44

WESTERN REGIONAL AIR PARTNERSHIP

Attribution of Haze Report (Phase I)

Geographic Attribution for the Implementation of the Regional Haze Rule

Prepared for the:

Western Regional Air Partnership
Western Governors' Association
1515 Cleveland Place, Suite 200
Denver, CO 80202

Prepared by:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, Colorado 80525
(970) 484-7941
www.air-resource.com

March 14, 2005

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List of Acronyms

Acronym	Definition
AIRS	Aerometric Information Retrieval System
AoH	Attribution of Haze (WRAP Workgroup)
APACE	The Atmospheric Particulate Carbon Exchange
AQS	Air Quality System
ARL	Air Resources Laboratory
BC	Boundary condition
BCON	Boundary concentration
BEIS3	Biogenic Emissions Inventory System version 3
BRAVO	Big Bend Regional Aerosol & Visibility Observations study
CARB	California Air Resources Board
CASTNet	Clean Air Status and Trends Network (monitoring network)
CEM	Continuous Emissions Monitoring
CENRAP	Central Regional Air Planning Association
CMAQ	Community Multiscale Air Quality
COHA	Causes of Haze Assessment
DRI	Desert Research Institute
DV	Deciview
EC	Elemental carbon
EDAS	Eta Data Assimilation System (meteorological data fields)
EDMS	Emissions Data Management System
EGAS	Economic Growth Analysis System
EGU	Electric generating unit
EI	Emissions inventory
EIA-767	Energy Information Administration Form 767
EPA	Environmental Protection Agency
ETS	Emissions Tracking System
FEJF	Fire Emissions Joint Forum (WRAP Forum)
FNL	Global Forecast System Final analysis (meteorological data fields)
GCVTC	Grand Canyon Visibility Transport Commission
GEAR	Gas phase chemistry solver.
GEOSCHEM	Global chemical-transport model
HYSPLIT	Hybrid-Single Particle Lagrangian Integrated Trajectory (dispersion/trajectory model)
IAS	Integrated Assessment System
IC	Initial condition
ICON	Initial concentration

List of Acronyms (Cont.)

Acronym	Definition
IMPROVE	Interagency Monitoring of Protected Visual Environments (monitoring network)
km	Kilometer
mi	Mile
Mm^{-1}	Inverse megameter (units of light extinction)
MM5 data	Fifth-generation Penn State/NCAR Mesoscale Model (meteorological field)
MOBILE6	Motor vehicle emissions factor model
MSF	Mobile Sources Forum (WRAP Forum)
NADP	National Atmospheric Deposition Program (monitoring network)
NCAR	National Center for Atmospheric Research
NEI	National Emissions Inventory
NH_3	Ammonia
NOAA	National Oceanic and Atmospheric Administration
NONROAD	Model for off-road emissions
NO_x	Oxides of nitrogen
NP	National Park
OC	Organic carbon
PM	Particulate matter
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
PM_{10}	Particulate matter less than 10 microns in diameter
PMC	Coarse particulate matter, between 2.5 and 10 microns in diameter
PSU	Pennsylvania State University
RH	Relative humidity
RHR	Regional Haze Rule
RMC	Regional Modeling Center
RPO	Regional Planning Organization
RRF	Relative Reduction Factors
SEARCH	Southeastern Aerosol Research and Characterization (monitoring network)
SIP	State implementation plan
SMOKE	Sparse Matrix Operator Kernel Emissions
SO_2	Sulfur dioxide
SO_4	Sulfate
STN	Speciation Trends Network (monitoring network)

List of Acronyms (Cont.)

Acronym	Definition
TIP	Tribal implementation plan
TRA	Trajectory Regression Analysis (attribution method)
TSSA	Tagged Species Source Apportionment (attribution method)
VIEWS	Visibility Information Exchange Web System (visibility web site)
VMT	Vehicle miles traveled
VOC	Volatile organic carbon compounds
VR	Visual range
WA	Wilderness Area
WinHaze	Visual Air Quality Modeler
WRAP	Western Regional Air Partnership

- Calculated intercept value. This probably represents some combination of global background and method uncertainty. It is not clear how the intercept values should be interpreted in light of analysis uncertainty.

- Summary of the differences between TSSA and TRA results. This is presented as a list of regions where the TRA attribution percentage is either greater or less than the TSSA attribution by at least 10. (The non-intercept method was used for this comparison because it performed better statistically than the intercept method.) In many cases the largest differences exist between TSSA and TRA attributions to Canada, Mexico, and the Pacific Ocean. These differences are likely due to uncertainties in the Phase I emissions inventories for these regions. Some differences are believed to be related to the "edge effect" described in Section 2. (A specific example of a site likely affected by the "edge effect" is presented later in this section.)

Tables summarizing the TRA attribution results by source region for each Class I area are not presented in this report but can be found on the project Web site in the same Excel spreadsheet noted above (http://www.wrapair.org/forums/aoh/ars1/documents/Attribution_Tables_TSSA_and_TRA.xls). The degree to which TRA results corroborate TSSA results needs to be reviewed for each Class I area, and states and tribes are encouraged to perform these reviews for Class I areas under their jurisdiction.

Mount Rainier National Park

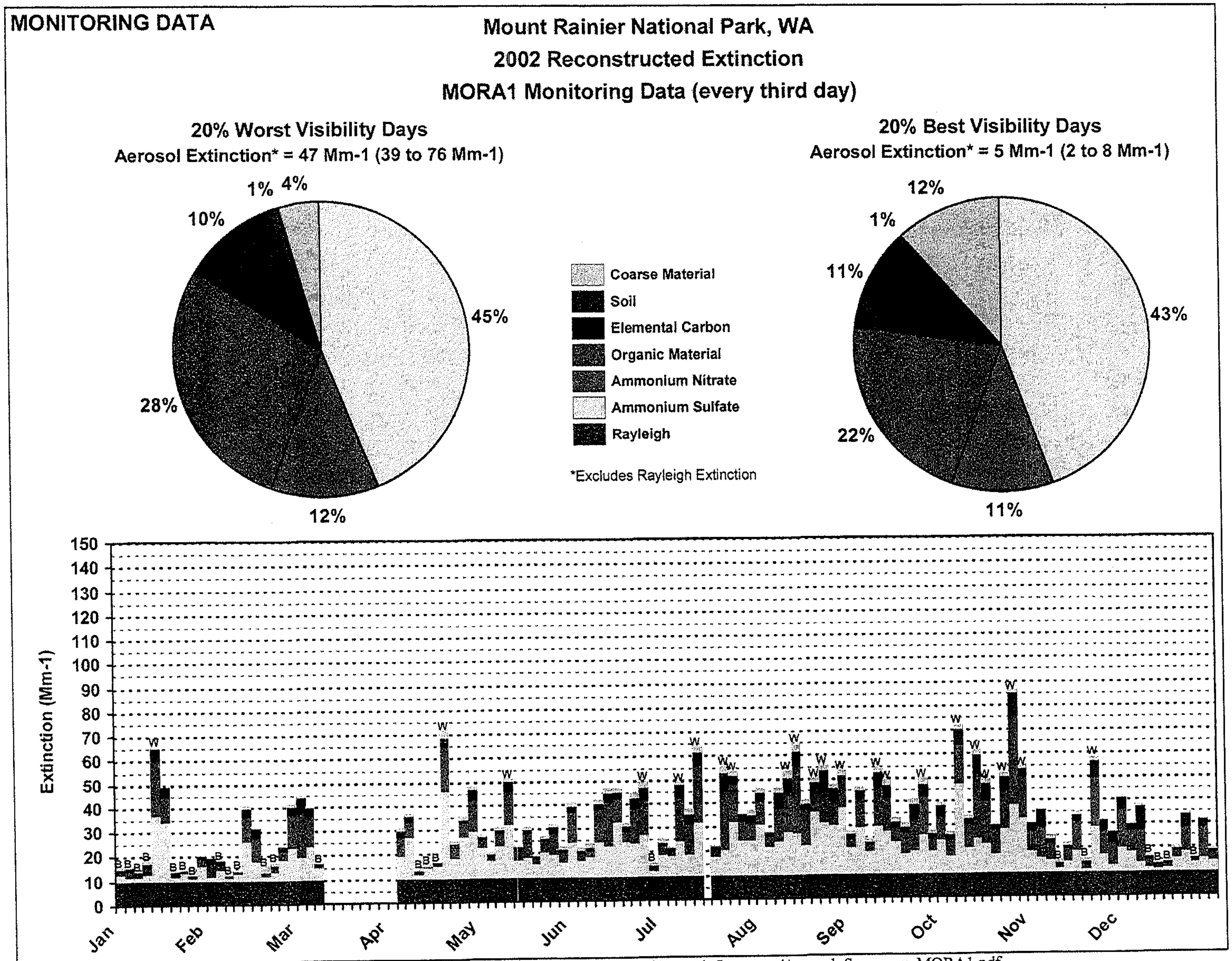
According to IMPROVE monitoring data, the average aerosol extinction for the 20% worst visibility days at Mount Rainier NP is 47 Mm^{-1}. The contribution from ammonium sulfate is approximately 45%, or about 21 Mm^{-1}. The contribution from ammonium nitrate is approximately 12%, or 6 Mm^{-1}. This can be seen in Figures 4-13a and 4-13b, which present timelines of IMPROVE monitoring data (a) and CMAQ model results (b) for 2002. A general sense of model performance at this site can be gauged by comparing the timeline plots. It is difficult to fine tune the model for an entire year, expecting good model performance during periods of both high and low extinction. The model clearly does not predict the monitoring data day-to-day, nor does it yield similar aerosol extinction averages of the 20% worst visibility days. (Note that the best and worst days for each timeline are determined by monitored and modeled data, respectively.) Comparisons between the timelines should focus on whether the species seasonal trends and episodes are similar. At Mount Rainier NP, organic material and ammonium sulfate may be reasonably predicted by the model in terms of there seasonal magnitudes. However, modeled ammonium nitrate is over predicted on average by about a factor of 8. This raises concerns about the TSSA method to attribute nitrate at Mount Rainier. As discussed below, the TSSA method attributes sulfate and nitrate nearly identically, and this may indicate that while the model performance for nitrate is poor, the attribution results could be reasonable. (Detailed model performance is available at the RMC Web site: http://pah.cert.ucr.edu/aqm/308/cmaq.shtml).

Figure 4-14a presents the attribution results for sulfate from the TSSA (top) and TRA (bottom) methods. Both methods identify Washington as the most significant geographic source of sulfate (TSSA estimates ~71% contribution; TRA estimates ~51% contribution). The largest discrepancy is between the contributions attributed to Canada (TSSA ~1%; TRA ~21%). The lower contribution in TSSA results may be reflective of the state of the emissions inventories for Canada. The TRA results indicate a contribution from the Pacific Ocean of approximately 28%. This source region was not evaluated by TSSA. The "Other" contribution in the TSSA results is ~25%, which is close to the expected value of about 20%.

Figure 4-14b presents the source apportionment results for sulfate (top) and nitrate (bottom) from the TSSA method. The results for sulfate and nitrate show a similar pattern of source strength from all geographic regions with a much larger fraction of mobile sources in the nitrate attribution.

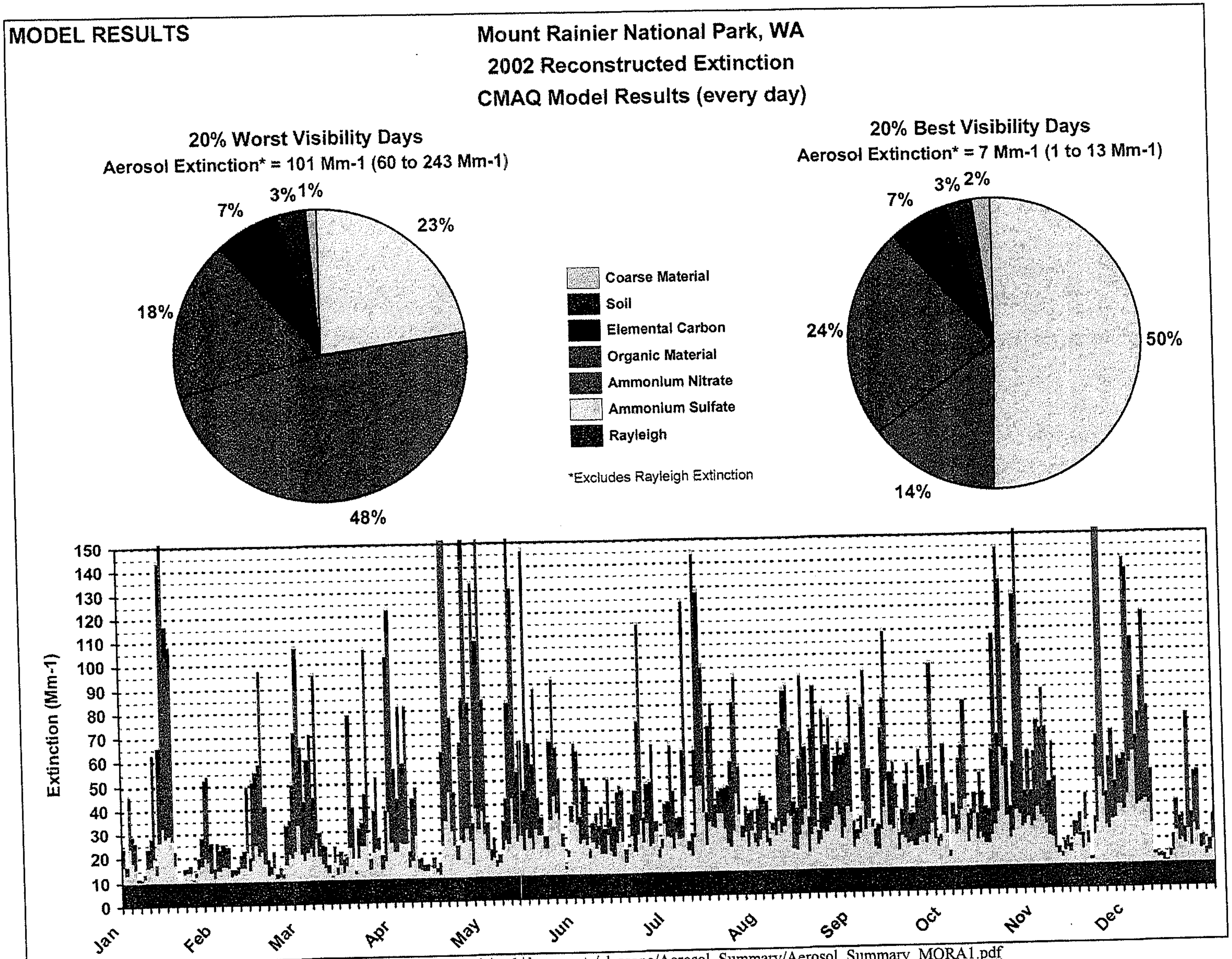
Review of the state (Figures 4-15a and 4-15b) and regional SO_2 and NO_x emissions maps (Figures 2-2a and 2-2b) confirms that there are significant sources of both species within Washington and nearby states, and within the area of meteorological influence suggested by the residence time back trajectory map for Mount Rainier NP (Figure 4-16). The color scaling on the residence time map indicates the fraction of the total time that back trajectory paths fell in a given grid cell. The darker blue regions indicate predominant flow patterns from northeast, northwest, west, and southwest of the park. Additional trajectory maps (sulfate difference maps and conditional probability maps), available on the COHA Web site (http://www.coha.dri.edu/web/general/trajgallery/gallery_wa_mtrainer.html), can be reviewed to better understand the relationship between high/low sulfate loading and historical wind patterns.

An image simulating various aerosol conditions using WinHaze Visual Air Quality Modeler (Ver. 2.9.6) is not available for this site.



http://www.wrapair.org/forums/aoh/ars1/documents/classone/Aerosol_Summary/Aerosol_Summary_MORA1.pdf

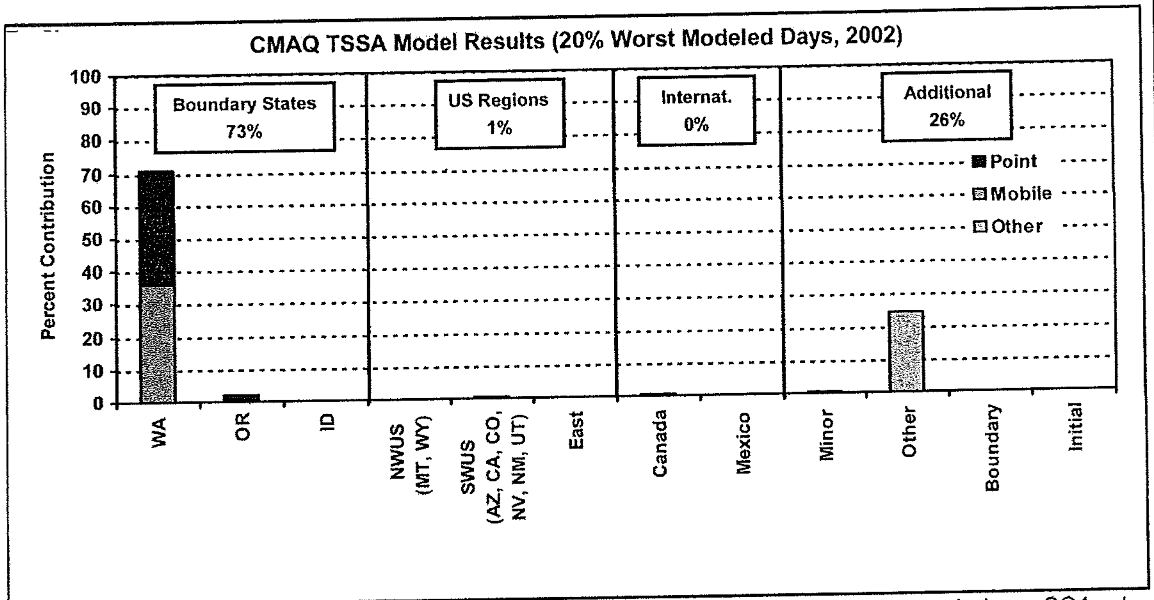
Figure 4-13a. 2002 timeline of IMPROVE monitoring data for Mount Rainier NP.



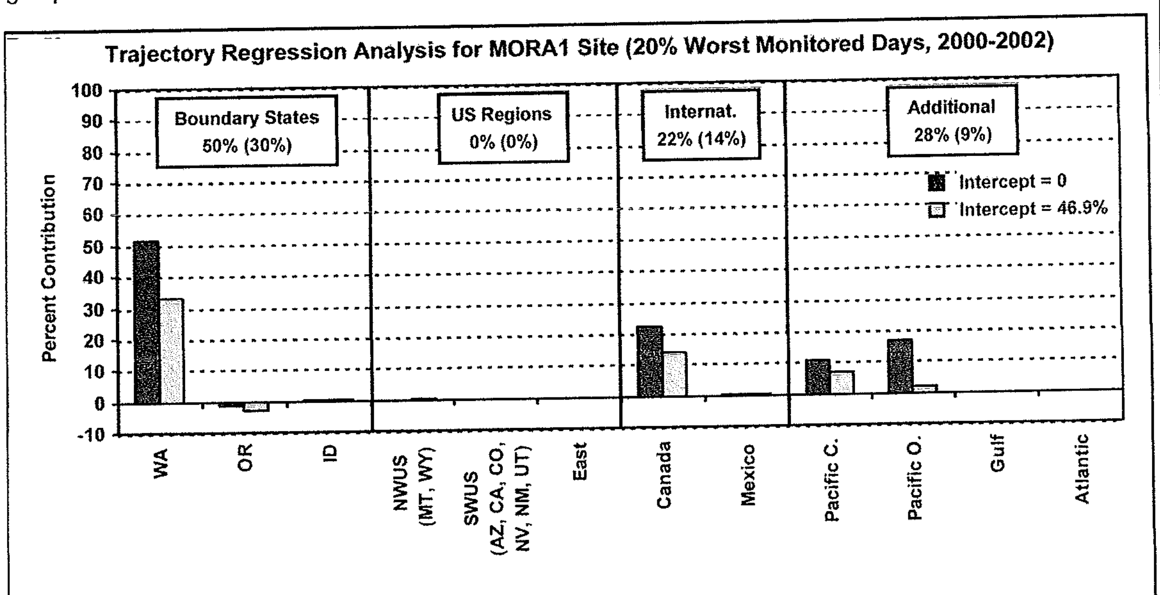
http://www.wrapair.org/forums/aoh/ars1/documents/classone/Aerosol_Summary/Aerosol_Summary_MORA1.pdf

Figure 4-13b. 2002 timeline of CMAQ model results for Mount Rainier NP.

Mount Rainier National Park, WA
SO4 Source Apportionment Method Comparison



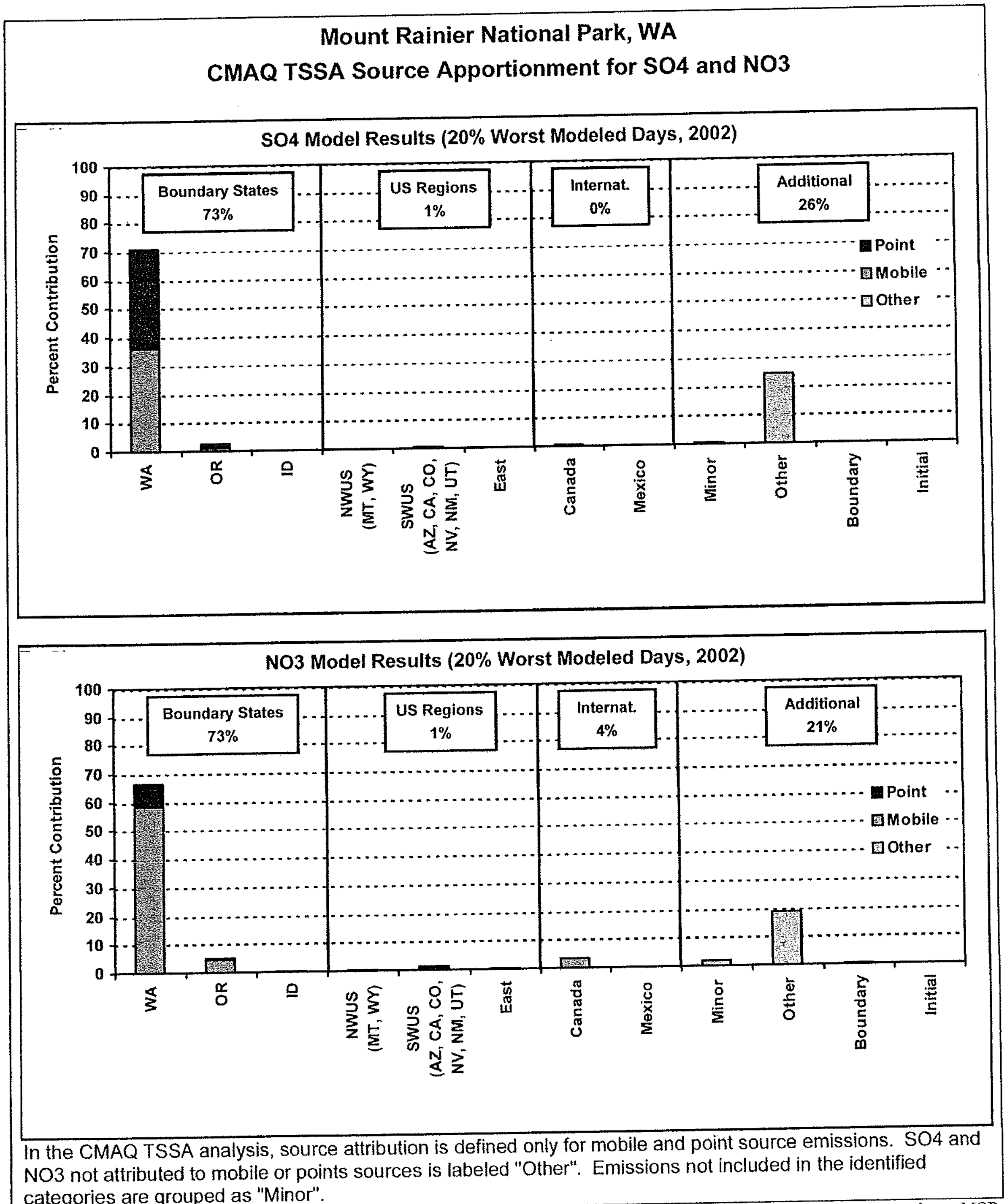
In the CMAQ TSSA analysis, source attribution is defined only for mobile and point source emissions. SO4 not attributed to mobile or points sources is labeled "Other". Emissions not included in the identified categories are grouped as "Minor".



Trajectory regression analysis attributes monitoring results using back trajectory residence times and measured pollutant values. Regional percent sums are indicated with non-zero intercept values in parentheses. Categories in the "Additional" grouping do not directly correspond to categories listed in the CMAQ TSSA

http://www.wrapair.org/forums/aoh/ars1/documents/classone/Source_Apportionment_Comparisons/Source_Apportionment_Comparisons_MORA1.pdf

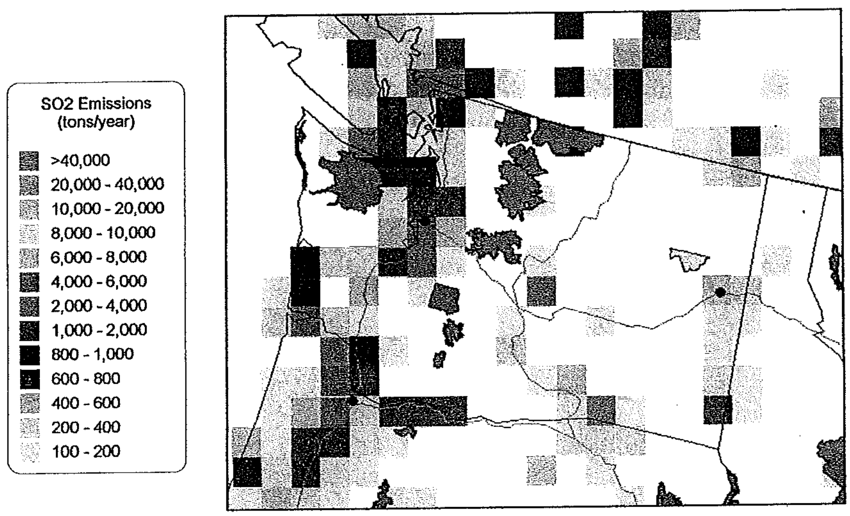
Figure 4-14a. Sulfate TSSA and TRA source apportionment method comparison for Mount Rainier NP.



http://www.wrapair.org/forums/aoh/ars1/documents/classone/Source_Apportionment_Comparisons/Source_Apportionment_Comparisons_MORA1.pdf

Figure 4-14b. Sulfate and nitrate TSSA source apportionment results for Mount Rainier NP.

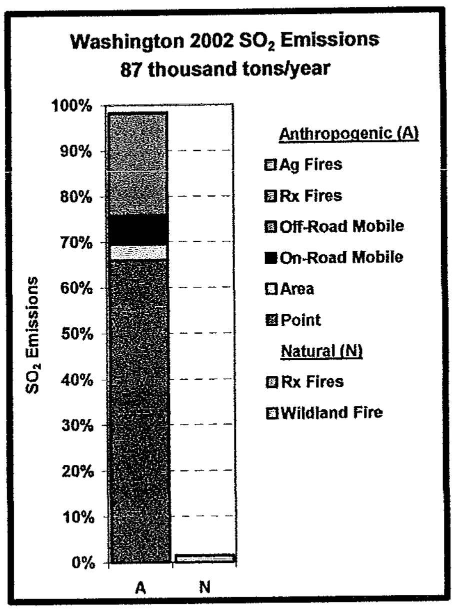
Washington SO_2 Emissions
WRAP Interim 2002 Inventory



Emissions from all available source categories are indicated according to magnitude in 36x36km squares. Class I Areas are indicated in green, dotted lines indicate interstate highways and black dots indicate major cities.

Sulfur oxide gases (SOx) are formed when sulfur containing fuels, such as oil or coal, are burned, when gasoline is extracted from oil or when metals are extracted from ore. In Washington, 2002 emissions of SO_2 were dominated by point sources.

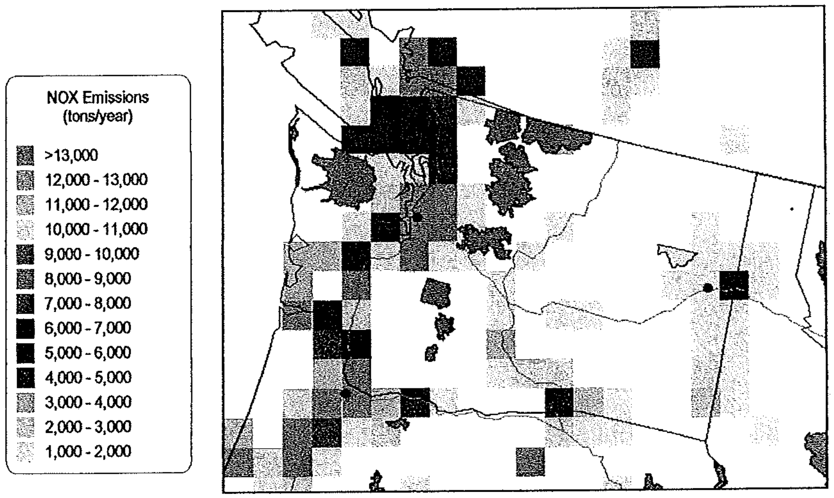
SO_2 dissolves in water vapor to form acid, and contributes to the formation of sulfate compounds (e.g. $(NH_4)_2SO_4$). These compounds can block the transmission of light, contributing to visibility reduction on a regional scale in our Class I Areas.



http://wrapair.org/forums/aoh/ars1/documents/regional/Washington_Emissions_Maps.pdf

Figure 4-15a. Washington emissions map for SO_2. Emissions from all available source categories are indicated according to magnitude in 36x36km grid cells. Class I areas are indicated in green, dotted lines indicate interstate highways, and black dots indicate major cities.

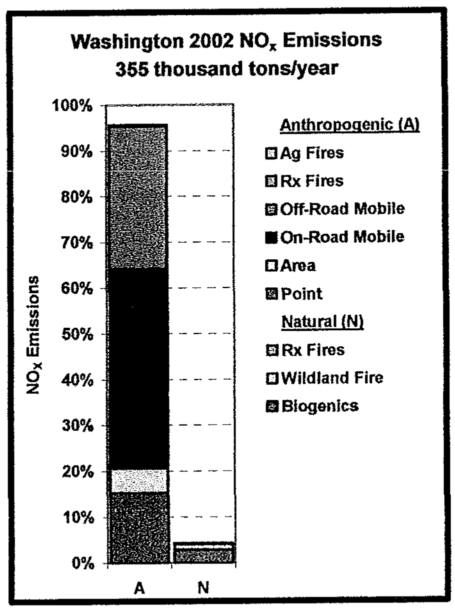
Washington NO_X Emissions
WRAP Interim 2002 Inventory



Emissions from all available source categories are indicated according to magnitude in 36x36km squares. Class I Areas are indicated in green, dotted lines indicate interstate highways and black dots indicate major cities.

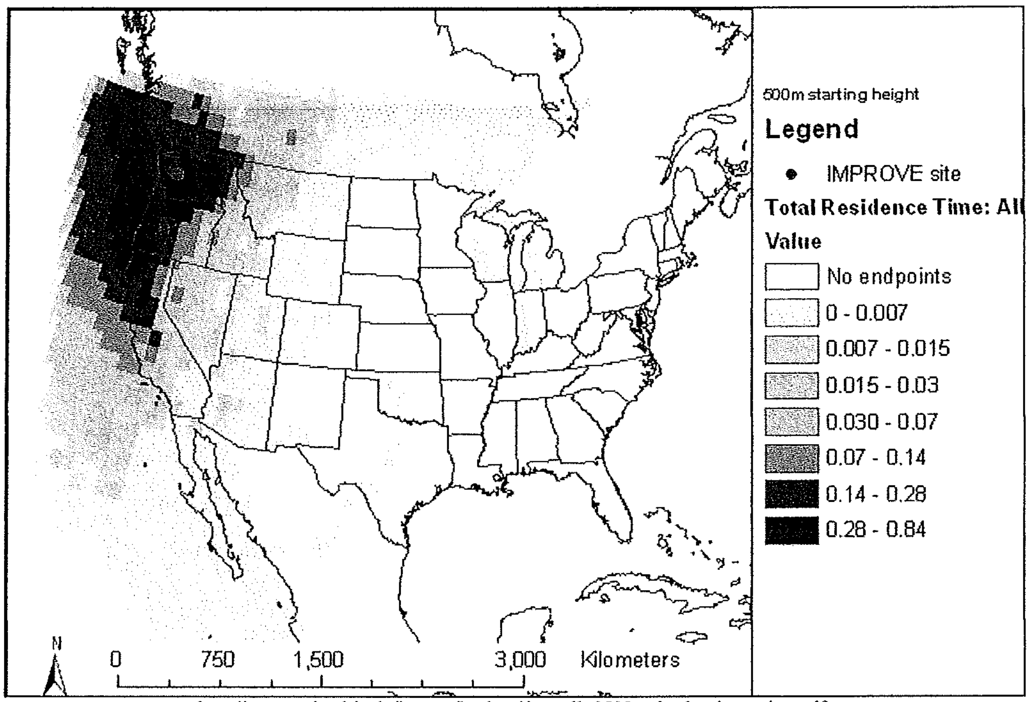
Nitrogen oxides (NO_X) form when fuel is burned at high temperatures. In Washington, 2002 emissions of NO_X were dominated by mobile sources (on-road and off-road) and point sources (industrial, commercial, and residential sources that burn fuel).

NO_X emissions are highly reactive and can form nitrate compounds (e.g. NH_4NO_3). These compounds can block the transmission of light, contributing to visibility reduction on a regional scale in our Class I Areas.



http://wrapair.org/forums/aoh/ars1/documents/regional/Washington_Emissions_Maps.pdf

Figure 4-15b. Washington emissions map for NO_x. Emissions from all available source categories are indicated according to magnitude in 36x36km grid cells. Class I areas are indicated in green, dotted lines indicate interstate highways, and black dots indicate major cities.



http://www.coha.dri.edu/images/backtraj/wa_all_0500m_backtraj_mtrainer.gif

Figure 4-16. Residence time map for Mount Rainier NP (2000 – 2002). The location of the IMPROVE monitoring site is marked in red. Darker blue colors indicate predominant flow patterns.

WESTERN STATE EGU BART DETERMINATIONS (OCTOBER 2009)

Source Information (wrapair.org)				
State	Plant Name	Unit	Nitrogen Oxides BART Controls	BART Short Term Limt (lbs/MM Btu or pph)
AK	GVEA HEALY 327 MM BTU/HR	Unit 1 (25 MW)	SCR	0.07 lb/MMBtu
AZ	ARIZONA ELECTRIC POWER-APACHE POWER PLANT	Units 1-3		
		Unit 1 (? MW)		
		Unit 2 (195 MW)		
		Unit 3 (195 MW)		
AZ	ARIZONA PUBLIC SERVICE - CHOLLA POWER PLANT	Units 1-4		
		Unit 1 (114 MW)		
		Unit 2 (300 MW) (tang)		
		Unit 3 (300 MW) (tang.)		
		Unit 4 (425 MW) (tang.)		
AZ	SALT RIVER PROJECT - CORONADO POWER PLANT	Units 1-2		
		Unit 1 (411 MW)		
		Unit 2 (411 MW)		
CO	COLORADO SPRINGS UTILITIES-MARTIN DRAKE PLANT	Units 5-7		
		Unit 5 (548 MMBtu/Hr)	Overfire Air	0.35 lb/MM (Annual AVG)
		Unit 6 (861 MMBtu/Hr)	Overfire Air	0.35 lb/MM (Annual AVG)
		Unit 7 (1336 MMBtu/Hr)	Overfire Air	0.35 lb/MM (Annual AVG)
CO	PUBLIC SERVICE CO - VALMONT	Unit 5 (186 MW)	Low NOx Burners w/OFA	0.28 lb/MM (30 Day AVG)
CO	PUBLIC SERVICE CO CHEROKEE PLANT	Unit 4 (325 MW) (tang.)	Low NOx Burners w/OFA	0.28 lb/MM (30 Day AVG)
CO	PUBLIC SERVICE CO COMANCHE PLANT	Units 1-2		
		Unit 1 (352 MW) (tang.)	Low NOx Burners	0.15 lb/MM (Annual AVG)
		Unit 2 (325 MW)	Low NOx Burners	0.15 lb/MM (Annual AVG)
CO	PUBLIC SERVICE CO HAYDEN PLANT	Units 1-2		
		Unit 1 (184 MW)	Low NOx Burners	0.39 lb/MM (Annual AVG)
		Unit 2 (262 MW)	Low NOx Burners	0.28 lb/MM (Annual AVG)
CO	PUBLIC SERVICE CO PAWNEE PLT	Unit 1 (505 MW)	Low NOx Burners w/OFA	0.23 lb/MM (30 Day AVG)
CO	TRI STATE GENERATION CRAIG	Units 1-2		
		Unit 1 (428 MW)	Low NOx Burners w/OFA	0.30 lb/MM (Annual AVG)
		Unit 2 (428 MW)	Low NOx Burners w/OFA	0.30 lb/MM (Annual AVG)
CO	COLORADO ENERGY NATIONS	Units 4-5		
		Unit 4 (360 MMBtu/Hr)	Low NOx Burners w/OFA	115 pph (30 Day AVG)
		Unit 5 (650 MMBtu/Hr)	Low NOx Burners w/OFA	182 pph (30 Day AVG)
MT	PP&L MONTANA J E CORETTE SES	Unit 2 (154 MW) (tang.)		
MT	PP&L, MONTANA COLSTRIP Plant	Units 1-2		
		Unit 1 (307 MW) (tang.)		

EXHIBIT 3

Blumberg No. 5118

		Unit 2 (307 MW)		
ND	BASIN ELECTRIC POWER COOP - LELAND OLDS	Units 1-2		
		Unit 1 (216 MW)	SNCR w/OFA	0.190
		Unit 2 (440 MW) (cycl)	SNCR w/OFA	0.350
ND	GREAT RIVER ENERGY - COAL CREEK	Units 1-2		
		Unit 1 (550 MW) (tang.)	Low NOx Burners w/SOFA	0.170
		Unit 2 (550 MW) (tang.)	Low NOx Burners w/SOFA	0.170
ND	GREAT RIVER ENERGY - STANTON	Unit 1 (188 MW)	SNCR w/OFA	0.29 (lignite)/0.23 (subbituminous)
ND	MINNKOTA POWER COOP INC - MILTON R YOUNG	Units 1-2		
		Unit 1 (257 MW) (cycl)	SNCR w/OFA	0.360
		Unit 2 (477 MW) (cycl)	SNCR w/OFA	0.350
NM	PNM, SAN JUAN	Units 1-4		
		Unit 1 (350 MW)		
		Unit 2 (360 MW)		
		Unit 3 (544 MW)		
		Unit 4 (544 MW)		
NV	NEVADA POWER CO - REID GARDNER	Units 1-3		
		Unit 1 (110 MW)	ROFA w/ Rotamix	0.20 lb/MM
		Unit 2 (110 MW)	ROFA w/ Rotamix	0.20 lb/MM
		Unit 3 (110 MW)	ROFA w/ Rotamix	0.28 lb/MM
NV	SIERRA PACIFIC POWER CO - FORT CHURCHILL	Units 1-2		
		Unit 1	Low NOx Burners w/FGR	0.20 lb/MM
		Unit 2	Low NOx Burners w/FGR	0.16 lb/MM
NV	SIERRA PACIFIC POWER CO. - TRACY GENERATING STATION	Units 1-3		
		Unit 1	Low NOx Burners w/FGR	0.15 lb/MM
		Unit 2	Low NOx Burners w/FGR	0.12 lb/MM
		Unit 3	Low NOx Burners w/FGR	0.19 lb/MM
OR	PORTLAND GENERAL ELECTRIC - BOARDMAN	600 MW Unit	Low NOx Burners w/MOFA	0.23 lb/MM
Tribal (AZ)	SALT RIVER PROJECT - NAVAJO GENERATING STATION	Units 1-3 (tang.)		
Tribal (NM)	ARIZONA PUBLIC SERVICE-FOUR CORNERS POWER PLANT	Units 1-5		
UT	PACIFICORP - HUNTER POWER PLANT	Units 1-2		
		Unit 1 (480 MW) (tang.)	Low NOx Burners w/SOFA	0.26 lb/MM
		Unit 2 (480 MW) (tang.)	Low NOx Burners w/SOFA	0.26 lb/MM
UT	PACIFICORP - HUNTINGTON POWER PLANT	Units 1-2		
		Unit 1 (tang.)	Low NOx Burners w/SOFA	0.26 lb/MM
		Unit 2 (tang.)	Low NOx Burners w/SOFA	0.26 lb/MM
WA	CENTRALIA (TRANSALTA CENTRALIA GENERATION LLC)	Units 1-2		
		Unit 1 (tang.)	Low NOx Burners w/SOFA	0.24 lb/MM
		Unit 2 (tang.)	Low NOx Burners w/SOFA	0.24 lb/MM

WY	BASIN ELECTRIC POWER COOP - LARAMIE RIVER	Units 1-3		
WY	BASIN ELECTRIC POWER COOP - LARAMIE RIVER	Unit 1 (550MW)	Low NOx Burners w/OFA	0.23 lb/MM
WY	BASIN ELECTRIC POWER COOP - LARAMIE RIVER	Unit 2 (550MW)	Low NOx Burners w/OFA	0.23 lb/MM
WY	BASIN ELECTRIC POWER COOP - LARAMIE RIVER	Unit 3 (550MW)	Low NOx Burners w/OFA	0.23 lb/MM
WY	PACIFICORP - DAVE JOHNSTON	Units 3-4		
WY	PACIFICORP - DAVE JOHNSTON	Unit 3 (230MW)	Low NOx Burners w/OFA	0.28 lb/MM
WY	PACIFICORP - DAVE JOHNSTON	Unit 4 (330MW) (tang)	Low NOx Burners w/OFA	0.15 lb/MM
WY	PACIFICORP - JIM BRIDGER	Units 1-4		
WY	PACIFICORP - JIM BRIDGER	Unit 1 (530MW) (tang)	Low NOx Burners w/OFA	0.26 lb/MM
WY	PACIFICORP - JIM BRIDGER	Unit 2 (530MW) (tang)	Low NOx Burners w/OFA	0.26 lb/MM
WY	PACIFICORP - JIM BRIDGER	Unit 3 (530MW) (tang)	Low NOx Burners w/OFA	0.26 lb/MM
WY	PACIFICORP - JIM BRIDGER	Unit 4 (530MW) (tang)	Low NOx Burners w/OFA	0.26 lb/MM
WY	PACIFICORP - NAUGHTON	Units 1-3		
WY	PACIFICORP - NAUGHTON	Unit 1 (160MW) (tang)	Low NOx Burners w/OFA	0.26 lb/MM
WY	PACIFICORP - NAUGHTON	Unit 2 (210MW) (tang)	Low NOX Burners w/OFA	0.26 lb/MM
WY	PACIFICORP - NAUGHTON	Unit 3 (330MW) (tang)	LNB w/OFA and SCR	0.07 lb/MM
WY	PACIFICORP - WYODAK	Unit 1 (335MW) (tang)	Low NOx Burners w/OFA	0.23 lb/MM