Attribution of Haze Phase 2
Draft Work Plan
08/17/05

INTRODUCTION

Phase 1 of the Attribution of Haze (AoH) project was designed to provide state and tribal air regulators with an initial, regional assessment of the attribution of haze within the WRAP region for their Class I areas and to develop an effective framework for Phase 2 of the project. As described in the Phase 1 final report, the goals for Phase 2 are to:

- Refine Phase 1 techniques for use in Phase 2.
- Reduce uncertainty and address the remaining uncertainty in modeled data and attribution results.
- Analyze the differences between modeled results for 2002 and the projected 2018 base case, and between the 2018 base case and 2018 results projected with various control strategies.
- Develop additional analytical approaches (e.g., receptor modeling, trends analysis, determination of the representativeness of baseline data set).
- Make regional haze technical and ancillary data and desired analysis tools directly available to states and tribes through a Web site.

The Phase 2 analysis is intended to focus on regional analyses of regional emissions reductions from technology requirements and/or emissions management programs, and include an assessment of the impact from WRAP states to nearby Class I areas in CENRAP. The Phase 2 methods are not intended to identify specific or localized additional control technologies or strategies, although they may provide some useful information in this regard. Individual point sources and local or Class I area-specific control programs will not be addressed directly by the AoH workgroup. Further analyses by individual states and tribes for smaller geographic areas may be necessary for some Class I areas. Phase 2 efforts will include identification of the impacts of both controllable and uncontrollable, and natural and anthropogenic emissions. The effects of various control strategies on visibility improvement by 2018 will be used as part of the analysis of reasonable progress demonstration, as required by the Regional Haze Rule. Implications for reaching natural visibility conditions will also be investigated.

The AoH Phase 2 project will include, integral to these analyses, development of a web-based Technical Support System (TSS). The TSS will be a repository and interactive review tool for data, analytical results, emissions inventories, air quality modeling results, source attribution analyses, and ancillary contextual data and GIS displays. The major goals of the TSS are to provide states and tribes with:

- A single web-based location for access and display of technical data, display of analytical results, and the reference location for related documentation to support the regional haze implementation plans (SIPs and TIPs) for the WRAP region.

- Specific analysis tools to synthesize technical and contextual data and GIS layers, conduct analyses, and store results for subregional/local/Class I area-specific regional haze planning.

- The analysis and display tools for Phase 2 analyses, and the technical support documentation reference for WRAP region SIPs and TIPs for regional haze.

AOH TEAM MEMBERS

The AoH Phase 2 team consists of Air Resource Specialists (ARS), Cooperative Institute for Research in the Atmosphere (CIRA), ENVIRON, Image Matters, and the AoH work group. Table 1 outlines the primary contacts and major responsibilities of each AoH Team member.

Table 1
Team Members and Responsibilities

Team Member	Primary Contacts	Responsibilities
Phase 2 Analysis		
ARS	Joe Adlhoch Cassie Archuleta	Analysis lead, responsible for compilation and interpretation of attribution and related results, and communication with AoH and Implementation work groups
ENVIRON	Gerry Mansell Ralph Morris	Emissions inventory development and modeling results (predominantly funded under separate contract)
CIRA	Shawn McClure Rodger Ames	TSS development will directly support Phase II analysis (funded under separate contract)
AoH Work Group		Provide oversight and review of analyses and products
TSS Development		
ARS	Joe Adlhoch	Contractual lead and development support, responsible for coordination among team members and communication with AoH and Implementation work groups
CIRA	Shawn McClure Rodger Ames	Design/development lead and hosting; acquire appropriate data sets; use other team members for development support as appropriate (funded under separate contract)
ENVIRON	Gerry Mansell Ralph Morris	Transfer of emissions, modeling, and attribution data to CIRA; development support for GIS applications as required
Image Matters	Jeff Ehman John Davidson	Architectural/technical design; metadata template and catalog development; data discovery, viewing, and access capability - design and implementation; interoperability standards and specifications; GIS application support as required; documentation
AoH Work Group		Provide oversight and review of web site development and products

PROJECT TASKS

The AoH Phase 2 tasks have been separated into three categories: Analysis Project; Technical Support System; and Travel. In some cases there is considerable overlap between tasks associated with the Analysis Project and TSS; ultimately the TSS will provide all data and data analyses used in the Analysis Project. The Travel task covers all face-to-face communications between the AoH Team and WRAP work groups.

Analysis Project

1. **Solicit and define user requirements from the appropriate WRAP work groups**.

Both the AoH and Implementation work groups delivered significant feedback on the presentation of data and analyses during the AoH Phase 1 project. For Phase 2, Phase I presentation products and the associated web site will be enhanced. Also, Phase 2 will require additional data and analyses presentations not developed during Phase 1 (e.g., presentations of 2018 emissions and model results, glide slope calculations, etc.). The AoH Team will prepare a checklist of required products based on Phase 1 experiences and anticipated Phase 2 needs, and review this checklist with the AoH and Implementation work groups for final approval. Review of the checklists with WRAP work groups will occur at scheduled August and September 2005 meetings. Full development of all enhancements and new products will continue throughout the course of the project. The anticipated new products include:

- Presentation of control strategies
- Display of modeled changes in emissions and visibility (for 2018)
- Results from modified TSSA analysis (for 2002 and possibly 2018)
- Results from positive matrix factorization (PMF) analysis (for 2002 and possibly 2018)
- RHR calculations for baseline period (2000 – 2004) monitoring data
- Monitoring data trends
- Visibility glide slopes

2. **Prepare suite of data products based on final 2002 emissions, modeling, and attribution results**.

Data products similar to (or in some cases identical to) Phase 1 products will be generated based on final 2002 emissions inventories, modeling results, and modeled attribution results. Based on the outcome of the TSS scoping study (Task 6), selected products will be provided in an enhanced form on the TSS. Note that 2002 monitoring data summaries will not have changed since Phase 1. This work is anticipated to begin in September 2005 and be completed within 30 days of delivery of final modeling and attribution results (estimated to be completed in November or December 2005). A technical memorandum will be issued outlining the general changes between Phase 1 and Phase 2 results for 2002 emissions, modeling, and attribution results.

3. **Define the weight of evidence (WOE) approach to be applied to AoH Phase 2 data**.

The AoH Team will work with the AoH work group to define how a WOE approach will be applied to evaluate the attribution results, and benefits of emissions reductions in 2018. Required are an evaluation of which data categories and analyses to included, and how confidence in results is to be judged. This work is anticipated to begin in August 2005 and preliminary recommendations presented to the AoH work group in September 2005.

4. **Interpret 2018 results and implications for showing progress under the Regional Haze Rule**.

Once 2018 emissions, modeling, and attribution results are available (anticipated starting in January 2006), the AoH Team will begin synthesizing them with the 2002 results. The Team will work with the AoH work group to interpret the results. Basic questions to be answered include: Which Class I areas will show reasonable progress along the glide path? How have changes in emissions from each state and tribe affected the predicted aerosol loading at each Class I area? Are changes in attribution patterns discernable in the data? How can uncertainties in results be best characterized? How are results to be used in SIPs and TIPs? Work for this task is anticipated to begin in late 2005 and continue through mid-2006, and will be the subject of several AoH work group meetings in 2006.

5. **Prepare draft and final AoH Phase 2 analysis report**.

The final Phase 2 report will document the process, inputs, and results of the Phase 2 analyses, as well as identify how well recommendations from Phase 1 were able to be incorporated into Phase 2. It is anticipated that a draft final report will be issued by August 2006, and following a comment period, finalized by October 2006. This document will be strongly supported by the TSS, and will constitute the final regional Technical Support Document.

Technical Support System

6. **Perform TSS requirements analysis and scoping study**.

The AoH Team will perform a two (2) month scoping study to accomplish the following goals:

- Refine and prioritize requirements and map them to specific development tasks
- Design the overall system architecture
- Define contractor roles and apportion development tasks
- Prototype certain key software components to determine initial and future implementation recommendations and budget estimates

- Define protocols for acquiring, transferring, and disseminating data resources
- Define realistic goals for this project based on requirements and available resources

The two main products of the scoping study will be:

- A logical and physical model of the TSS architecture
- A more detailed project plan and budget

While the immediate goal of the TSS is to provide the resources required for creating the 2007 SIPs and TIPs, it is the intention of the AoH Team to design the TSS such that it does not become obsolete with the completion of these documents. The correct choice of architecture at the beginning of the project will ensure that the TSS continues to provide data retrieval and analyses services well beyond the 2007 deadline. The scoping study is expected to occur from August through October 2005. A technical memorandum will be issued describing in detail the results of the TSS scoping study and a presentation will be made to the AoH work group at the November 2005 meeting.

7. **Acquire and prepare the relevant databases**.

At this time (pending recommendations from the scoping study outlined in Task 6), the AoH Team believes that the optimum configuration for accessing and controlling the major TSS databases requires those databases to exist locally on the TSS server. The TSS server will reside at CIRA and the web site will be hosted by CIRA. Each database will require some level of processing, format conversion, or abridgement prior to integration with the TSS. In some cases it will be practical to provide only summaries of large databases. Many of these databases will not require updates over time, but required updates would be handled by AoH Team members. A wide variety of databases will be required to achieve the goals of the TSS, including:

- *Monitoring data for the 2000 – 2004 baseline period (Source: CIRA – VIEWS web site).* These data consist of daily speciated aerosol samples for specific monitoring sites within WRAP.

- *Emissions data for 2002 and projected for 2018 (Source: WRAP EDMS; RMC – ENVIRON).* These data consists of gridded and point emissions for the entire RPO domain. Emissions for data are temporally and spatially variable.

- *Air quality modeling data for 2002 and 2018 (Source: RMC – ENVIRON).* These data consist of gridded particulate and gaseous pollutant data across the entire RPO domain.

- *Air quality model evaluation results for 2002 (Source: RMC – ENVIRON).* These data consist of various comparisons between modeling and monitoring data.

- *Air quality model relative reduction factors (RRFs) to be applied to 2002 monitoring data (Source: RMC – ENVIRON).* These data are derived from 2002 and 2018 modeling results, and consist of gridded values across the entire RPO domain.

- *Attribution results for 2002 (and 2018?) (Sources: TSSA supplied by RMC – ENVIRON; TRA and PMF supplied by DRI).* These data represent three (3) independent methods to characterize the attribution of particulate species as modeled at Class I areas.

- *Relevant GIS databases (starting with those identified for WRAP by ENVIRON) (Sources: ENVIRON and Image Matters).* These data are in various formats and are required to give geographical, population, land use, transportation infrastructure, and other context to the other air quality-related databases.

Acquisition of these databases will begin either during, or in some cases, following completion of the TSS scoping study. Most of the databases will be integrated with the TSS by early 2006, and integration of new data is expected to continue through the course of the project.

8. **Develop data review interfaces based on user requirements**.

Phase I products will be enhanced and additional products will be developed for the TSS based on the specific recommendations of Tasks 1 and 6. While specific details regarding TSS functionality will be outlined in the scoping study memorandum, anticipated functionality includes:

- Easy access, retrieval, and review of appropriate data and analyses
- Interactive tools which will allow the user to review emissions, monitoring, modeling, attribution, and other results in conjunction with user-selected GIS layers and spatial extents.

These products and tools will be developed in a progressive series of prototyping and evaluation stages through late 2005 and early 2006. By February or March of 2006, a first draft of the TSS will be made available for broad user review. Development and enhancement of TSS functionality will continue through the end of the project.

9. **Develop data exchange protocols and guidelines**.

The AoH Team will develop a suite of data exchange protocols and guidelines to facilitate the submittal and dissemination of data in a consistent and efficient manner. These guidelines will direct formatting conventions, reporting units, and organizational structure, and will be designed to be compatible with existing and commonly used data standards. Once these guidelines are in place, mechanisms for data submission will be developed and implemented. Some anticipated formats that the TSS will be designed to support are:

- Static files: ASCII, Excel, PowerPoint, Word, PDF
- Databases: MS SQL Server, MS Access, other ODBC data sources (Oracle, Sybase, etc.)
- GIS data: ESRI Shape files, OGIS layers, etc.

This work will occur in parallel with Task 8. The complexity of the final functionality will depend on the recommendations of the scoping study. While important, this feature is not required to assist states and tribes meet their 2007 deadlines.

10. **Develop method to capture online user feedback**.

Since constructive feedback from potential TSS users will be crucial to development success, a user interface will be developed to collect user feedback online. Users will be encouraged to utilize this interface to make suggestions regarding the usability, functionality, and general appeal of the TSS, as well as to verify the accuracy and relevance of the data and data products. All feedback will be captured and stored so that topics can be cross referenced and specific tasks can be categorized, prioritized, and incorporated as necessary into the project plan. This feature will appear on the TSS web site during the scoping study to solicit comments early in the project.

Travel

11. **Travel to provide progress reports and solicit project feedback at WRAP meetings**.

It is expected that approximately eight (8) two-day meetings will be attended by AoH Team members during course of the project. When possible, to keep travel costs at a minimum, only one representative from the AoH Team will attend required meetings. This representative will present progress reports for both the Phase 2 analysis and TSS projects.

LEVEL OF EFFORT AND PROJECT SCHEDULE

The anticipated budget for the AoH Phase 2 and TSS projects is $250,000. Table 2 describes the proposed allocation of these resources by task. These allocations may change based on the recommendations of the scoping study. Allocation of resources among Team members also will be based primarily on the recommendations of the scoping study.

Table 3 outlines the anticipated timing of each task for the Phase 2 analysis, TSS development, and travel. A more detailed schedule of the entire AoH Phase 2 project can be found in the Attribution of Haze Phase 2 Project Plan (link: http://wrapair.org/forums/aoh/PhaseII/AoH_Phase_II_Project_Plan.pdf).

Table 2
Proposed Budget by Task

Task	Description	Responsibility		Approx. Cost ($)
		Primary	Support	
AoH Phase 2 Analysis				
1	Solicit and Define User Requirements	ARS	CIRA ENVIRON Image Matters	5,000
2	Prepare Data Products for 2002	ARS		10,000
3	Define WOE Approach	ARS	ENVIRON	5,000
4	Interpret 2018 Results	ARS	ENVIRON CIRA	20,000
5	Prepare AoH Phase 2 Report	ARS		15,000
TSS Development				
6	Prepare TSS Scoping Study	CIRA ENVIRON Image Matters	ARS	30,000
7	Acquire/Prepare Databases	CIRA	ENVIRON Image Matters ARS	30,000
8	Develop Data Review Interfaces	CIRA	ENVIRON Image Matters ARS	90,000
9	Develop Data Exchange Protocols	CIRA ENVIRON Image Matters		10,000
10	Develop Method to Capture Feedback	CIRA		5,000
Travel				
11	Travel (based on 8 two-day meetings)	ARS	CIRA ENVIRON Image Matters	30,000

Table 3
Project Timing by Task

Month	AoH Phase 2 Analysis					TSS Development					Travel
	Task(s)					Task(s)					Task
	1	2	3	4	5	6	7	8	9	10	11
August 2005											
September 2005											
October 2005											
November 2005											
December 2005											
January 2006											
February 2006											
March 2006											
April 2006											
May 2006											
June 2006											
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