

**Meeting Summary**  
**WRAP Attribution of Haze Workgroup**  
**Hilton Hotel – Salt Lake City, UT**  
**September 21-22, 2004**

**Attendees:**

<u>Name</u>	<u>Affiliation</u>
Joe Adlhoch	ARS
Cassie Archuleta	ARS
Tom Moore	WRAP
Mark Fitch	Arizona DEQ
Cara Casten	Wyoming DEQ
Wayne Leipold	Phelps Dodge Copper Company
Brock LeBaron	Utah DAQ
Bob Kotchenruther	EPA Region X
Don Arkell	WESTAR
Jason Walker	NW Band Shoshone Nation
Bob Palzer	Sierra Club
Steve Arnold	Colorado Dept of Public Health and Environment
Tina Suarez-Murias (via phone)	California ARB
Marc Pitchford	NOAA
Lee Alter	WRAP
Michael Brady	Colorado Springs Utilities
Ernie Wessman	Pacificorp
Jan Miller	Utah DAQ
Matt Carlyle	Utah DAQ
Cheryl Heying	Utah DAQ
Janis Peterson	U.S. Forest Service, Region 6
Cathy Messerschmitt	National Tribal Environmental Council
Lori Campbell	Nevada DEQ
Jean-Paul Huys	Nevada DEQ
Mary Uhl (via phone)	New Mexico DEQ
Rosanne Sanchez	New Mexico ED
Gail Tonnesen	UC Riverside
Lee Gribovicz	Wyoming DEQ
Trista Glazier	Montana DEQ
Kathy VanDame	
Rich Spratt	

**Meeting Summary**

Immediately prior to the AoH Workgroup meeting Gail Tonnesen held a training course designed to introduce AoH members to the basics of the modeling used by RMC specifically for the AoH project. For further information about the training contact Gail Tonnesen or Tom Moore.

The goals of the AoH Workgroup meeting were to:

- review emissions inventory data available for analysis
- discuss methods for incorporating EI, modeling, and monitoring data into report products
- review 2002 source apportionment modeling results
- receive an update on COHA progress
- review a detailed outline and approach for structuring the AoH Project Report.

Presentations were given by Joe Adlhoch and Cassie Archuleta of ARS, Gail Tonnesen of UC Riverside, and Mark Pitchford of NOAA (on behalf of the COHA project).

The next AoH conference call was confirmed for Friday, October 8, at 10am MDT. The next in-person AoH meeting was confirmed for the week of November 15, to be held in conjunction with the Dust Emissions Joint Forum and a training by DRI related to IMPROVE particulate monitoring data sets. Final agenda times will be decided soon.

### **Overview of WRAP “Interim” 2002 EIs**

The ARS presentations used for this discussion can be found at:

[http://wrapair.org/forums/aoh/ars1/documents/WRAP\\_092104\\_part1a\\_ARS.ppt](http://wrapair.org/forums/aoh/ars1/documents/WRAP_092104_part1a_ARS.ppt), and  
[http://wrapair.org/forums/aoh/ars1/documents/WRAP\\_092104\\_part1b\\_ARS.pdf](http://wrapair.org/forums/aoh/ars1/documents/WRAP_092104_part1b_ARS.pdf)

ARS began with a discussion of the AoH Strategic Plan, particularly the differences between Phase I and Phase II. Phase I (the current effort, to be completed by early 2005) results should describe the geographic apportionment and source categories of emissions affecting CIAs on a *regional* scale. It should also outline what is expected to be feasible in the Phase II effort. Phase II (to begin during Summer 2005) will attempt to produce more detailed, *sub-regional*, results, though will likely not identify specific sources. It was noted that the process and framework used in Phase I should support efforts in Phase II.

ARS briefly outlined the 3 major data sets used in the project (emissions inventories, modeling data, and monitoring data) and then described the sources, coverage, and known limitations of each emissions inventory category. Point, area, and mobile source EI coverage showed holes in two Mexican states bordering Texas. This data was collected for the BRAVO study five years ago, but may not have made it into the current modeling efforts. ARS will investigate this further and report back to the workgroup. In the final report ARS will describe EI coverage and recommend to AoH what EI information should be filled in for Phase II.

Display of emissions used for model boundary conditions were discussed, using a products generated by RMC (using a plotting program called PAVE). The consensus was that this is important, but it will take some effort to correctly display this information in a useful way. Gail confirmed that the RMC is tracking boundary emissions in their TSSA analysis. Some AoH participants suggested that the scale of the boundary conditions emissions should be displayed as extinction or deciview rather than micrograms/meter squared. This may be possible for some species. (Since the deciview scale is not linear with species mass concentration, that unit should not be used for this particular product.)

It was decided that when displaying emissions data in the final report, ARS should focus the view on the WRAP region. As several participants pointed out, a map that paints the eastern U.S. emissions greater than western U.S. emissions may make it difficult to convince policy makers that western emissions are important.

County-level display of emissions was determined acceptable when discussing the effects at state CIAs. ARS showed two examples of this display, a “hatch” and “density” map. The individual dots in the “density” map are easily confused with point sources, so this type of map was rejected. Grid cell-level display of emissions with visible county boundaries was recommended as preferable. This also would be a better tool for describing emissions when displaying results for tribal CIAs. ARS will work with RMC to display EI information in this way.

ARS displayed a comparison between 2002 interim EIs and 2003 reported EIs for the state of California. Differences in cataloging source types were discussed. California ARB was concerned that SO<sub>2</sub> from non-road mobile sources was high, and included emissions that California might not have control over. Ernie Wessman suggested that we need to identify all emissions, not just those that states can control. Tom Moore confirmed that plane take offs and landings and ships out to 25 miles off the coast are included in this category. Tom suggested that California, Oregon, and Washington should discuss this issue and come up with a recommendation on how to handle it.

Better time resolution of some EI categories is required. For example, daily resolution on fire data is reasonable, because it is compiled in that way; monthly resolution on biogenic data is reasonable because it is important to see the seasonal changes, but since it is generated from a model, daily values probably have no value. In general, ARS should display emissions in a time resolution that is reasonable for the EI category.

## **Methods for Incorporating EI, Modeling, and Monitoring Data**

The ARS presentation used for this discussion can be found at:

[http://wrapair.org/forums/aoh/ars1/documents/WRAP\\_092104\\_part2\\_ARS.ppt](http://wrapair.org/forums/aoh/ars1/documents/WRAP_092104_part2_ARS.ppt)

ARS presented several concepts and possible products for the AoH report. The major decisions and suggestions made by the workgroup are listed below.

### **Clustering**

- AoH Phase I is intended to make assessments that are regional in scale.
- Clustering is best done as the end, as a result of analyses.
- Groupings can be determined by similar aerosol composition (correlations between sites), emissions source regions/categories (TSSA results), meteorology (COHA residence time trajectory and transport regression analyses), and geography.
- Groupings can also be determined by percentage of haze attributable to a given state.
- Different clusters could be determined for individual pollutants, although not likely during Phase I.
- Clustering analyses can be done for state and tribal CIAs in a similar way.

### **Residence Time and Transport Regression Maps**

- DRI has prepared residence time maps based on HYSPLIT back trajectories (using EDAS data for continental US, FNL data for Alaska and Hawaii).
- While these are useful for analysis, there was some discussion about whether these should be included in the final report.
- ARS showed several examples of residence time maps and it was decided that ratio or difference maps might be more useful and highlight differences better.
- DRI is currently performing transport regression analyses to assist in geographical source attribution.
- These analyses should be used in conjunction with RMC TSSA results and EI maps.

### **Aerosol Data Timelines**

- ARS showed aerosol extinction and species mass timeline plots for selected sites which highlighted the 20% worst days. An important point is that the worst mass days for some species don't fall on the worst extinction days.
- This aerosol information is available on the VIEWS and COHA web sites, and will be used for the AoH on-line CIA supporting reports. This information will also be used to describe site clusters.

### **GCVTC-Style Summaries**

- ARS presented a draft summary product based on the Grand Canyon Visibility Transport Commission work: 3 pie charts representing emissions from a geographical area, aerosol contributions to a CIA, and aerosol extinction contributions to a CIA.
- ARS was directed to make versions of this product with and without Rayleigh scattering, add deciview to the visibility pie chart, and to indicate what sources lead to each aerosol species.
- Some work needs to be done to refine this approach, and ARS will present updated versions during future conference calls/meetings.

## **Review of 2002 TSSA Results**

The RMC presentations used for this discussion can be found at:

[http://pah.cert.ucr.edu/aqm/308/meetings/AoH\\_September\\_2004/UCR\\_tssa\\_tracer\\_v3.ppt](http://pah.cert.ucr.edu/aqm/308/meetings/AoH_September_2004/UCR_tssa_tracer_v3.ppt), and  
[http://pah.cert.ucr.edu/aqm/308/meetings/AoH\\_September\\_2004/New-Results\\_tssa\\_Jan\\_July.ppt](http://pah.cert.ucr.edu/aqm/308/meetings/AoH_September_2004/New-Results_tssa_Jan_July.ppt)

RMC described recent work related to: testing boundary condition effects; testing of mass conservation algorithms; evaluating approaches to update aerosol tags; and attempts to speed up the TSSA algorithm. Only major discussion points will be described here.

The boundary conditions shown in results at the July AoH meeting were incorrect. RMC has corrected this error, but there is a possibility that some of it has been transferred elsewhere in the algorithm.

Aerosol mass in CMAQ and TSSA is not conserved. RMC can mitigate this problem, but cannot eliminate it.

Only point, area, mobile, and boundary conditions are tagged in the current TSSA analysis. Fire, biogenic, and dust emissions are lumped into the “Other” category. Only the top 20 contributing tagged source types are displayed for each CIA; the sum of the other categories are lumped into the “Rest” category. TSSA will be run with fire emissions tagged by sometime in November (maybe in time for inclusion in Phase I analysis).

The TSSA results shown to the workgroup represented the 20% worst extinction days for the given month. It was decided that results should be generated for the 20% worst days based on modeling and monitoring data for 2002. There was interest in seeing the comparison of annual timelines of both modeled and monitoring data at CIAs. The model may not hit the correct peak monitoring concentrations on the correct days, but the seasonality of both should be the same. ARS will work with RMC to generate this information.

It was suggested that the scale on the TSSA plots show a percent contribution to the whole, rather than micrograms/cubic meter. It was suggested that displaying the top 20 contributing tagged source types was too much because many of the bars are very low and the error on their magnitudes is likely large. Another suggestion was to invert the TSSA results to show the contributions by a single state to multiple CIAs.

There was some discussion regarding seemingly inaccurate results. For example, the Fort Peck, Montana, TSSA plot indicates that Mexican emissions are more of a contributor there than at sites in Wyoming. In both cases the contribution is very small, so it may be that the reported data is smaller than its uncertainty. This type of anomaly, if determined to be significant, will have to be noted and discussed on a case-by-case basis in the report.

### **Update on COHA Progress**

Marc Pitchford presented an update DRI’s progress on the COHA project. Marc’s presentation can be found at:

<http://wrapair.org/forums/aoh/meetings/040922c/Causes of Haze AssessmentUpdate.ppt>

The major discussion points during Marc’s presentation included:

- The trajectory regression analyses do not track or account for trajectory heights.
- Some values on the regression maps are negative (which is not intuitive), but may be within the uncertainty of the analysis.
- DRI will do analysis for sulfate and aerosol extinction only and annual summaries only.
- Final results should be available in November/December time frame. Tom Moore directed DRI to focus on regression analyses rather than conceptual models to ensure this delivery time.

## **AoH Phase I Report Outline**

The ARS presentation used for this discussion can be found at:

[http://wrapair.org/forums/aoh/ars1/documents/WRAP\\_092204\\_part3\\_ARS.ppt](http://wrapair.org/forums/aoh/ars1/documents/WRAP_092204_part3_ARS.ppt)

ARS presented several concepts and possible products for the AoH report. The major decisions and suggestions made by the workgroup are listed below:

- Gateway report should include broad descriptions of large regional areas in WRAP with major exceptions highlighted.
- Some visibility event types (intercontinental dust, fires) are best described as “episodic” rather than “regional”.
- RMC results will likely only apportion fire emissions between anthropogenic and natural.
- The term “equity issues” in the RFP was meant to cover topics including:
  - Do results lead all emissions sources to share in burden of clean up?
  - Are tribes given sufficient information for TIPS?
  - Are any states being left out or overburdened?