UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

March 6, 2009

EPA-CASAC-09-005

The Honorable Lisa P. Jackson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Subject: Consultation on Ambient Air Monitoring Issues Related to the Ozone NAAQS

Dear Administrator Jackson:

The Clean Air Scientific Advisory Committee (CASAC) Ambient Air Monitoring & Methods Subcommittee held a public teleconference on February 10, 2009, to consult with staff from EPA's Office of Air Quality Planning and Standards (OAQPS) on monitoring network design issues related to the National Ambient Air Quality Standards (NAAQS) for ozone (O_3) as promulgated in March 2008. The final rule revised both the primary and secondary standards and set identical, 8-hour standards of 0.075 ppm for both public health and welfare. The Agency is developing separate rules to support changes in the monitoring network requirements based on the revisions of the primary and secondary NAAQS and considering changes to the required ozone monitoring seasons.

The CASAC uses a consultation as mechanism for technical experts to provide comments to the Agency on the issues under consideration. In general, the Subcommittee is supportive of the Agency's efforts to increase the number O_3 monitors; however, as noted in the individual comments enclosed with this letter, outlying issues with deployment, siting, and state-specific coverage remain. As this is a consultation, we do not expect a formal response from the Agency. We thank the Agency for the opportunity to provide advice in the NAAQS review process.

Sincerely,

/Signed/

Dr. Armistead (Ted) Russell, Chair
CASAC AAMMS

Enclosures

Enclosure A

U.S. Environmental Protection Agency
Clean Air Scientific Advisory Committee
Ambient Air Monitoring and Methods Subcommittee

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*Dr. Prather did not participate in this CASAC AAMM Subcommittee activity.

Enclosure B

Comments received:

Mr. George Allen

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

Yes, these changes should result in an urban network that is "minimally adequate". Most urban areas are "ozone holes" due to NO scavenging; exceptions to this are very large urban areas such as NYC and LA. Still, urban ozone is an important monitoring need.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

While it is desirable to deploy network changes sooner than later, State, Local and Tribal Air Agencies ("SLT") are presently under substantial pressure to meet other required new monitoring such as NCore. At the same time, these agencies are under severe budgetary constraints that effect staffing levels, and this is expected to continue for the near future. To the extent that it does not adversely impact compliance designation, a staggered deployment schedule that extends the period for another year would probably be helpful to air agencies.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

Specifying this on a per state basis may not be the best way. Three may be excessive for RI and insufficient for TX. There are additional variables that could drive this need on a regional basis such as regional transport, transport over large bodies of water (allowing formation without sinks), etc. In general, for a pollutant like ozone that is often regionally transported, requiring any component of network siting design on a state by state basis may not be the best approach. A design that is relatively ignorant of state boundaries may be better.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

Site elevation and over-water transport are two factors that may need to be considered. Distance downwind from major precursor sources could be another.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

In these resource constrained times, a careful balance between meeting network objectives and the resources required to implement additional monitoring must be met.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

Setbacks from roadways or other local sources that may impact measured ozone may need to be increased, since non-urban ozone site are presumably regional in spatial scale.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

Any existing or future "third party" ozone sites should meet all siting and operational QC requirements required of SLT sites if data from those sites is going into AQS and would be used for meeting required network design goals and NAAQS compliance purposes.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

First, for something like the 50 largest cities, or perhaps locations of the 54 core STN sites, ozone should be measured year round for use in health effect studies. NCore will presumably provide this. For other sites, it may be difficult to determine an appropriate season from existing data if there are no year-round or extended season site data presently available that represent a given area. In these cases, an analysis of several year's worth of start and end ozone season months' data is the best that can be done; if there is a reasonable chance of an exceedance occurring outside of the current season, then the required monitoring season should be extended by at least one month. In the northeast US for example, it is clear that March needs to be included in the revised season. March has substantial solar radiation, and "leaf-out" does not occur until early May. These and perhaps other factors contribute to high observed ozone levels during that month from the limited year-round network currently in place. It is less likely that October needs to be included for this northeast example, since solar radiation is less than in

March. Still, for some northeast states, October may be appropriate to include in the ozone monitoring season.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

It might be informative for certain sites such as high-elevation transport locations to run year-round. Stratospheric intrusion can occur, and there is a level of ozone present that is of interest (from a non-compliance perspective) even in the winter. Another possible need for year-round monitoring might be the situation observed in Wyoming's Upper Green River Basin, where there are intensive natural gas wells in valley locations. It appears that the reported winter ozone is real and not an interference with the UV monitoring method; situations like these have the potential for increasing our understanding of ozone formation in non-traditional scenarios like this with cold temperatures and decreased incoming solar radiation. A related issue here is the lack of a viable commercial instrument for the EPA ozone reference method (chemiluminescent ethylene). Perhaps it is time for EPA to consider a new reference method that is reasonably free from interferences (Hg, VOCs, water vapor, etc) and is commercially available. Finally, if an ozone monitor is at a site where other monitors are run year-round, the incremental cost to continue ozone for the full year is relatively small, and the potential value for non-compliance use may turn out to be substantial. The significant cost-savings of turning off an ozone monitor for a few months is limited to sites where ozone is the only pollutant measured.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

Yes it is reasonable. For existing monitors, extending the season by a month or two does not have a large impact on SLT agency resources.

Dr. Judith C. Chow

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

Figure 1 of the Ozone monitoring document shows that there are many populated but unmonitored areas. Many of these areas have experienced substantial population and traffic growth, especially in the western and southeastern U.S. There is ample evidence that O_3 is transported over long-distances, as well as being locally generated, and that elevated concentrations can be found nearly everywhere (Bertschi and Jaffe, 2005; Choi et al., 2008; Dabdub et al., 1999; Goldstein et al., 2004; Guttorp et al., 1994; Hudman et al., 2004; Rao et al., 2003; Rosenthal et al., 2003; Spicer et al., 1979; Wolff et al., 1977). Elevated O_3 can also be generated by non-urban sources such as plantlife (Marr et al., 2002; Pun et al., 2002; Tao et al., 2003), fires (Bertschi and Jaffe, 2005; Preisler et al., 2005), and livestock (Howard et al., 2008). It is entirely appropriate to lower the population threshold for monitoring to protect urban public health.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

Maximum flexibility should be allowed for the addition of monitoring locations. It is better to: 1) thoroughly evaluate the potential measurement locations, 2) procure and install the best equipment, 3) train operators in its use, and 4) have an adequate shakedown period than to rush the process. It often takes a year or more to obtain the funding, permits, and infrastructure when a new air quality site is installed.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

It is not clear whether or not this would require three monitors in addition to those identified in Figure 2 of the Ozone monitoring document or would include those monitors. Perhaps columns could be added to Table 2 of the Ozone monitoring document that would include the number of current monitors in each state that are: 1) federal lands with sensitive ecosystems; 2) small towns (micropolises?); and 3) non-urban locations with expected high concentrations. Would this also

include existing monitors from non-compliance networks (e.g., the National Park Service's 2B O_3 monitors http://www.nature.nps.gov/air/Studies/portO3.cfm)? Looking at the large differences in areas of different states, the complex terrain in some states as opposed to others, and the existing densities of monitors in Figures 1 and 2 of the Ozone monitoring document, it would seem that a more refined allocation of monitoring locations based on a conceptual model of O_3 precursor locations, formation potential, and transport corridors might be more useful than an allocation of three monitors per state.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

Factors for measurement location should include: 1) presence of species susceptible to damage (Legge et al., 1995; Miller and McBride, 1999; Musselman et al., 2006; Paoletti, 2006; Prinz, 1985); 2) potential for high O_3 levels (transport, upslope/downslope flows, local generation) (Lee et al., 2007; Wager and Baker, 2006); and 3) logistics and cost-effectiveness. It might be more logical and cost-effective to extend the NPS network to additional IMPROVE (http://vista.cira.colostate.edu/views) sites where some infrastructure already exists. It would also be useful to think "beyond compliance" (Chow and Watson, 2008) and not require a full-scale compliance monitoring site at some of the remote locations.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

Additional objectives should include: 1) tracking trends in O_3 and precursors to evaluate accountability and relationships to other pollutants for O_3 SIPs (Cohan et al., 2007; Foley et al., 2003); 2) increasing understanding of O_3 chemistry and transport (Blanchard et al., 1999; Blanchard and Fairley, 2001; Blanchard and Stoeckenius, 2001; Milford et al., 1989; Milford et al., 1994; Sillman et al., 1997; Sillman, 1999; Sillman, 2001); 3) defining non-attainment areas according to established criteria (Clark County Department of Air Quality and Environmental Management, 2004; Seitz, 2000); and 4) forecasting effects of climate change on O_3 concentrations (Grewe, 2007; Jacob and Winner, 2009; Zeng et al., 2008).

Additional monitors might be needed at some locations for NO_2 and certain VOCs to better attain these objectives. For some remote forest exposure locations it might be more effective to use passive O_3 monitors (Bernard et al., 1999; Grosjean and Williams, II, 1992; Manning et al., 1996; Paoletti, 2006; Skelly et al., 2001).

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

No. O_3 monitors within the forest measure lower values than those outside or above the forest canopy because of the plant uptake (which also causes the damage). Both measurement types are important, as the difference indicates the exposure, so two nearby sites with different middle-scale to neighborhood-scale characteristics might be considered. Monitors within the shallow nighttime surface inversion often experience NO titration, even when they are somewhat distant from a roadway, due to the overnight trapping of pollutants. Monitors on a hilltop, tall building, or towers may better indicate O_3 exposure and carryover than surface-based monitors. It is difficult to locate sites very distant from some type of roadway as the sites need to be accessed regularly.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

All available data should be compiled and used for the defined objectives. As noted above, the information needed and acquired should dictate the number of monitors rather than an arbitrary assignment of a certain number of monitors to each state. Where a number of different networks or monitor types are used, there should be a comparison and evaluation of the operating conditions, including evidence of regular calibration, auditing, maintenance, precision, accuracy, and comparability.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

Some of the remote sites may not be easily accessible during winter owing to snow, and this should be considered. High O_3 concentrations can occur in winter, however, owing to reflection of sunlight from snowcover and concentration of precursors during the day within a shallow layer over the snow. O_3 is also correlated with HNO_3 (Aneja et al., 1994; Bottenheim and Sirois, 1996) that is a precursor to wintertime $PM_{2.5}$ nitrate levels and can be useful as part of a multi-pollutant control strategy development where $PM_{2.5}$ concentrations are also excessive.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

O_3 monitors should be operated year round wherever practical to evaluate multi-pollutant approaches and to determine the extent of elevated levels during winter. This is the case already

at most multi-pollutant monitoring sites. There may be instances at remote locations where access is denied due to weather, and it is probably not cost-effective to take extreme measures for such locations. At a minimum they should be operated year-round in areas that experience excessive $PM_{2.5}$ and O_3 concentrations.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

The same argument applies as above. It is better to phase in the changes in a logical manner than to set a mandate that will compromise quality and the utility of the data. It is probably less of a burden to extend the monitoring period than it is to locate new sites, but additional staff, training, and possibly instrumentation may be needed that will require some lead time.

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Mr. Bart Croes

These comments also reflect input from California Air Resources Board (ARB) staff responsible for implementing U.S. EPA monitoring requirements and using the data in ozone data analyses and health studies.

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

The requirement for one monitor to be placed in MSAs of population between 50,000 and less than 350,000 is clearly warranted in locations where there is the absence of a design value, primarily because of the large number of people potentially affected by any standard exceedances.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

Based on the experience in California, 18 months is adequate if funding is provided and implementation can be accomplished with existing staff. If funding and staff resources are not adequate, a staggered deployment schedule that extends over the following year should be considered. While attainment designations would be delayed by a year, this may not adversely affect control programs as any nonattainment areas with populations of this size are likely to be affected by ozone transport from larger, upwind cities, and will already be receiving the benefit of control programs in these areas.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

The choice of three non-urban monitors per state appears arbitrary with no acknowledgement of geographic size differences, potential for transport from upwind area or ozone severity. USEPA's impressive ozone modeling capabilities could be used to identify broad geographic areas where additional non-urban ozone monitoring is warranted.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

Factors that relate to the potential for higher ozone levels should be considered. These include proximity to upwind source regions, size of the source region, mixing ratios recorded at upwind monitors, smaller potential for deposition losses (shorter transport distances, transport over water bodies or areas with less vegetation), higher elevations (decoupled from night-time surface NO_X sources), and sunnier areas with higher photolysis rates.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, affect the minimum number of non-urban required monitors?

The resources available for equipment, shelters, operations and personnel should be considered. Non-urban ozone monitoring may be useful for ozone transport analyses and ozone model evaluation. Monitoring near ozone sensitive vegetation, especially areas where forest health or ecosystem monitoring is occurring, should be considered. I do not think these considerations should affect the minimum number of non-urban required monitors.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

Yes, they are still applicable to maintain uniform siting criteria throughout the entire network (urban and non-urban). Monitoring at higher elevations with snow during the winter needs to be seasonal to facilitate site access. More attention needs to be placed to setbacks from trees and other vegetation because of the potential for ozone deposition. And to setbacks from roadways as there is unlikely to be co-located NO_X monitoring to identify episodes of ozone titration.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

Other agencies would need to become part of their local Primary Quality Assurance Organization (PQAO) and follow uniform procedures, have staff take similar training, maintain same standard traceability, and submit data to USEPA's Air Quality System (AQS).

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

Provisions for high elevation sites with only seasonal access should be considered.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

The Health Effects Institute or other representations of the air pollution epidemiology community should be consulted as to where year-round ozone measurements would be useful for epidemiologic cohort studies.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

Yes, it is a reasonable schedule as the logistics are relatively straightforward.

Dr. Delbert J. Eatough

The subject of this charge is not my area of expertise. I have responded only to those questions where I think I can give useful input.

Urban Network Design Requirements

1. *Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?*

The proposed changes seem reasonable and adequate. The existence of Class 1 monitors covers many non-urban areas already and the NCORE site activation will give a reasonable year round data set.

2. *We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?*

If the final rulemaking is completed this year, increasing the deployment on a staggered basis, depending on the available data, to either two or three years (i.e., a one year extension for some, identified lower probability sites) seems reasonable.

Non-Urban Network Design Requirements

1. *We are considering a new requirement that each State operate a minimum of three non urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?*

The criteria for the three sites seems reasonable. The inclusion of a wilderness site as one might be relaxed if such sites already exist in the state. What happens if a state has no unmonitored MSA which models and other reasonable estimations indicates will be likely to exceed the 85% value?

WY is certainly an outlier in the data set. The observation that the high ozone concentrations in WY appear to be associated with VOC emissions from oil and gas recovery during winter inversions has implications for other areas. I have made an additional comment on this below.

2. *What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?*

3. *In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?*

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

Ozone Monitoring Season

1. *We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?*

There is evidence that even at low Ozone concentrations, there is photo oxidation of material during the winter which leads to high PM levels during inversions in high mountain valleys. This is seen, for example, in our studies on the composition and apportionment of PM in the Salt Lake City area during winter inversions (Long et al., 2003, 2005) Identifying some of these regions for year round joint ozone monitoring and fine particulate speciation would be useful. Salt Lake is one such location. Boise could well be another. Including some PM studies in the WY region where high winter ozone has been observed could be useful.

2. *We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside Ncore?*

See response to 1 in this section.

3. *We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?*

Yes.

References:

Russell W. Long, Norman L. Eatough, Nolan F. Mangelson, Wesley Thompson, Kyle Fiet, Scott Smith, Rachel Smith, Delbert J. Eatough, C. Arden Pope, William E. Wilson (2003). "The Measurement of PM2.5, Including Semi-Volatile Components, in the EMPACT Program: Results from the Salt Lake City Study and Implications for Public Awareness, Health Effects, and Control Strategies." Atmospheric Environment, 37; 4407-4417.

Russell W. Long, William K. Modey, Phillip S. Smith, Rachel Smith, Cristina Merrill, Joshua Pratt, Andrew Stubbs, Norman L. Eatough, Delbert J. Eatough, William C. Malm, and William E. Wilson. (2005) "One- and Three-Hour $PM_{2.5}$ Characterization, Speciation, and Source Apportionment Using Continuous and Integrated Samplers." Aerosol Science and Technology, 39:238-248.

Mr. Dirk Felton

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

The requirement to add monitors in MSAs as small as 50,000 may be burdensome to some monitoring agencies. One element that should be added to the regulation is the ability to waive the monitoring requirement if the State designates the MSA as non-attainment. With the new lower NAAQS, the non-attainment areas in some states cover large areas and several MSAs. It is quite possible that upwind, rural or transport oriented monitors and monitors in adjacent MSAs can adequately justify the determination of non-attainment for small MSAs without a monitor. The RA should also have the discretion of waiving additional monitors that either can't meet siting requirements in certain urban areas or where the cost to install a monitor is excessive and out of the reach of the monitoring agency.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

The schedule is appropriate only if monitoring agencies already have a suitable facility to install additional monitors. For these existing locations, the monitoring agencies will need calendar year 2010 to modify their network plan, to modify budgets and to purchase and install new equipment. The timeline should establish a start date of 2012 for completely new installations. This extra year will be needed because monitoring locations are very difficult to site in urban areas. In these areas, conventional monitoring shelters are usually either banned by building codes or can't be sited properly due to the cost of property and the density of tall structures. In some of these situations, monitoring agencies have to go to the expense of modifying existing buildings whether public or private to accommodate monitoring equipment.

Non-Urban Network Design Requirements

1. *We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?*

The plan to require three monitors per state is a bit too cookie cutter to adequately meet the monitoring needs in each state. Many states have multiple rural areas, some separated by mountains, that are distant from each other and are affected by separate upwind sources. It is likely that the plan for three non-urban monitors will only be adequate for a few states. The EPA

must be flexible and should encourage periodic discussions between OAQPS, the EPA Regional Offices, monitoring agencies and perhaps other stake holders such as health researchers to determine the minimum number and location of additional monitors.

2. *What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?*

The importance of altitude and local terrain is often overlooked in monitor siting. Rural monitors could be situated on a mountain top, on an elevated plateau or in a deep valley. These terrain features will affect local Ozone concentrations and could detrimentally reduce the scale of the monitor. Monitoring is expensive and rural monitors should be sited to represent large scales.

3. *In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?*

Transport is another objective that could be served by a suitably placed rural monitor. The installation of a transport monitor can be very important if it is used to help with attainment planning for downwind areas. The states that have non-attainment areas or whose emissions contribute to non-attainment areas should be provided with the resources to establish monitoring networks that exceed the minimum requirements.

4. *Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?*

The set-back distances from roads and other local sources for non-urban, rural monitors should be increased to the extent possible. Rural monitors should represent large spatial scales and influences such as NOx scavenging from nearby sources will alter the apparent Ozone concentration for the entire area represented by the monitor. Ideally, the monitor should be situated in a "typical" spot in the area to be represented by the new monitor. If the area is a nearly roadless Class 1 wilderness area, the monitor should be quite far from a road. If the non-urban monitor is actually representing a suburban commuter area outside of a larger MSA then it is acceptable to be closer to a roadway or other typical local sources.

5. *We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?*

It has yet to be demonstrated that CASTNET can reliably meet the QA requirements that would make their data comparable to state and local monitoring networks. The CASTNET network is operated by a contractor who is selected through a competitive bidding process. It is possible

that as the contract is awarded in future years to the same or another vendor, the data quality could vary.

State and local monitoring agencies should carefully evaluate the data quality of all of the monitors in their area. States should be permitted to audit the operation of either CASTNET or NPS monitors that potentially could be included as a component of a comprehensive state monitoring network.

Ozone Monitoring Season

1. *We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?*

In states with cold winters, seasonal roads or high altitude monitoring locations, it may not be possible to initiate monitoring on the proposed earlier start dates at every location. The EPA should permit reasonably delayed start dates if access to a monitoring location is prohibited or delayed due to snow or mud conditions.

Population exposure monitors should be given the highest priority for initial startup at the beginning of the monitoring season. The EPA should consider not changing the monitoring season for the non-urban and ecosystem oriented monitors. The data from these sites is likely to be less valuable when air temperatures are still relatively cold and sensitive vegetation is dormant or snow covered. Monitoring agencies utilize the period in between monitoring seasons to perform instrument maintenance, re-certify calibrators and train staff. Permitting delayed start dates for the non-urban monitors will also ease the difficulty of starting many monitors on the same date.

2. *We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?*

Due to the nature of NCore siting, most NCore sites will not be located where the Ozone concentrations are the highest. It would be appropriate to also monitor year round at one of the highest Ozone concentration sites for each non-attainment area. This will provide context for the NCore data.

3. *We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?*

A 2010 start date for a longer monitoring season for existing monitors would be acceptable if the regulation was finalized before the end of the first Quarter of 2009.

Dr. Phil K. Hopke

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

At least one monitor in each MSA with more than 50,000 is certainly warranted. I suggest a key consideration here has to be that the concentration of ozone is also critically important in control of PM given the role of oxidants in the formation of secondary particles. It is time we looked at the problem from a multiple pollutant perspective both in terms of the health effects and in terms of the control strategies. To do and fully protect public health requires that we have adequate measurements of all of the key pollutants in any area of reasonable population.

I would second George Allen's comment that we really should have a commercially available ethylene chemiluminescence monitor to use as a QA reference. It does not make a lot of sense to have as the FRM as monitor that no one can actually buy and use.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

At this point, state and local agencies are hard pressed for funding. At the same time, one would suggest that from a public health protection standpoint, it would be important to deploy the monitors as quickly as possible. However, there should be resources made available to the state, local, and tribal agencies to defray the costs of the redeployment or the acquisition of additional monitors.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

We consider Montana and Rhode Island equivalent in the need of monitors per unit area? This is clearly a very strange idea. We can certainly apply appropriate models and look at the real needs to monitor and where they will need to be placed in order to meet the underlying objectives. Given the disparity in the size of states, the distribution of population centers and where transported ozone represents a significant regional control problem, this requirement appears arbitrary. There are a number of small eastern states where this would not appear very sensible and other states where it will clearly be inadequate. Who is to decide whether or not to exceed

the minimum number? There needs to be a clearer definition of the criteria for siting the monitors and that would define the minimum number per area. We have adequate modeling capabilities that can provide good indications of the numbers of different ozone regions that exist in a state. We can also think about monitors located in contiguous states to potentially serve to cover an area as well. We need to be less fixated by the number of monitors and more ties to the underlying motivations for the monitoring and our best understanding of the atmospheric processes to deploy limited resources to provide the most benefit.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

We need to look at cumulative indices of exposure for the plants. We can estimate these exposures from appropriate modeling efforts and given the nature of the ecosystem, estimate the likely damage. If we are really interested in protecting the vegetation, then it is worth the effort to customize the plans for each major area of the country having significantly different types of vegetation.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

Clearly, a major concern for monitoring in rural areas is to provide critical data for model testing and validation. They also can provide some additional data for warning of pending ozone episodes in areas downwind of the monitor.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

Even in rural areas, there could be significant NO sources and one would want to site well away from such sources. We still want glass and Teflon inlets, etc.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

Clearly the monitoring locations have to meet the needs identified under question 2 above. The key issue is whether or not they can be operated with the same level of quality assurance as the SLAMS monitors. If so, fine.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

Again, we need to think in multiple pollutant terms. Secondary aerosol is still formed in the winter. Exposures to ozone and other pollutants occur. We will never sort out the requirements to protect health from the exposure mixture that the atmosphere produces without making year round measurements. If the SLAMS site is monitoring other pollutants, then the incremental cost of running that monitor all of the year is pretty minimal and well worth the extra effort and expense.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

Again, one needs to look at the needs for understanding the behavior of the suite of pollutants and whether ozone data would provide critical information needed to make the management judgments needed to adequately protect public health.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

It is not clear that it would be useful to do this uniformly across the country. It might make more sense to phase these into those areas that are most sensitive and where the data would prove most useful.

Dr. Rudolf Husar

Ozone Monitoring Season

1. *We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?*

I think that mandating a month-by-month fine tuned monitoring season to each state is unnecessary. If such adjustments for the shoulder seasons are in fact made, the states that have a short ozone season should be monitored less.

2. *We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?*

Regional/continental background sites and/or high elevation sites. These would document the spring stratospheric ozone, trans-continental (Asian) ozone transport and other larges-scale processes.

3. *We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?*

No comment. It is a feasibility issue.

Dr. Kazuhiko Ito

Urban Network Design Requirements

1. *Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?*

EPA may need to accommodate the concerns expressed by State air monitoring agencies and multi-state air planning organizations that these requirements ignore the needs that States and localities have for additional monitors to measure ozone levels in areas with populations under 350,000. Judging from the figure in the white paper, it looks like there may be about 20 MSAs with less than 350,000 people that may be near the border of non-attainment.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

It seems to me that there is no need to delay the deployment for the larger MSAs with existing sites even if setting up additional sites may take additional time, unless EPA needs to relocate some of the existing sites. I don't see disadvantage of a staggered deployment schedule if they are necessary.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

There must be something like "Data Quality Objectives" (DQO) to determine whether or not some specific number of monitors is sufficient to achieve the goal. Without knowing the goal in some numerical manner, this question cannot be concretely answered. I suppose the following questions are more specific.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

I am not familiar with the quantitative relationships (i.e., linear or non-linear?) between ozone and the effects on sensitive vegetations, but the siting of the monitors should consider: (1) the known quantitative relationship between ozone and the sensitive vegetation; (2) the spatial distribution of such vegetations; and, (3) prediction model of ozone concentrations over the areas where sensitive vegetations exist. The siting should be done to minimize the uncertainty

associated with the ozone prediction over the areas that are densely populated with such vegetations.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

I don't personally use them, but there are models (e.g., CMAQ) out there that predict air pollution levels including ozone. I imagine that prediction and model validation of these models rely on the locations of existing monitors. If EPA uses these models, why not also consider siting monitors where the model performance would improve.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

I took a quick look at Appendix E of 40 CFR part 58. Regarding the probe height, it says: "The probe or at least 80 percent of the monitoring path must be located between 3 and 15 meters above ground level." I am not sure if this height requirement is appropriate in determining the exposure of sensitive vegetation. Perhaps it needs to be lower, but one needs to know the concentration gradient (profile) of ozone near the ground to take into consideration scavenging of ozone by the surface characteristics including those of vegetations.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

I am not familiar with the difference in the procedures, analytical methods, or siting requirements between the CASTNET monitors vs. EPA monitors, so I cannot provide specific comments, but if they are comparable, then any CASTNET monitors that meet requirements in Questions 2, 3, and 4 above should be included.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

I am generally opposed to restricting the available data for research purposes. If the change results in shorter sampling periods, such decision needs to take into consideration the balance between the possible information to be lost vs. the information gained by additional sampling

locations (because you trade these two for a fixed budget, I assume). It should be noted that, as far as the health effects are concerned, the current NAAQS is NOT based on a clear-cut threshold below which we don't observe any effects. This means that, if we shutdown ozone monitoring for areas and periods we observe levels below the current standard, then we are eliminating the future data for research from which we will base our future standards! However, based on the EPA's presentation during the conference call, the only one state would have a shorter ozone season.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

If the spatial variation of ozone is not easily predicted in a MSA, additional year-round monitors may be needed to characterize such variations. Also, the seasonal cycles and the relationship between ozone and other pollutants must be different from city to city or region to region.

Also, as far as air pollution epidemiological studies are concerned, I sense that the more emphasis will be placed in multi-pollutant evaluation. Then, the NAAQS will also have to emphasize multi-pollutant context. If this happens, then, the longer the ozone sampling period, the better for the multi-pollutant evaluation. Based on the EPA's presentation during the conference call, many states would have longer ozone sampling seasons. I welcome this change.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

I am not familiar with the operational aspect of changing (extending) the ozone monitoring season, but given that the monitors are continuous analyzers, I don't imagine it would be unfeasible to do this for existing monitors ahead of the deployment schedule.

Dr. Donna Kenski

Urban Network Design Requirements:

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

I support the proposed change to require monitoring in MSAs of populations between 50,000 and 350,000, although I suggest that this requirement be tempered by an allowance to reduce monitoring if the data show little or no potential for exceeding the NAAQS. For example, if an area has a recent design value (within the last 5 years) less than 85% of the current NAAQS, the requirement for a new monitor could be waived (as Table D-2 of 40CFR part 58 App. D currently permits). Similarly, after 3 years of monitoring in these new areas, a resulting design value less than 85% of the standard should allow the states to remove or relocate the monitor in that area. The intent, as in Table D-2, is to characterize ozone concentrations in areas with significant population, but not insist on permanent monitors in areas where the data demonstrate little evidence of health impacts. In a few locations, from the map given, it looks like there are existing monitors very near the MSAs. EPA might consider substituting those on a case-by-case basis, if a state can provide supporting evidence (e.g., modeling or previous monitoring) that a nearby existing monitor can provide data that is representative of the MSA.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

EPA should allow the states at least a 1 year period from the time of rulemaking to the required operation of monitors. The proposed timeline seems adequate, assuming the states are allotted funding early in the process so they can make purchases of new equipment with sufficient lead time. A staggered deployment schedule might be useful for those few states with a lot of new sites (Texas?) but most states with only 2 or 3 new monitors would probably find it more efficient to make these changes at the same time; staggering deployment would unnecessarily complicate the process. Of course, when you combine the required new urban monitors with the new non-urban monitors, the numbers start to add up for all the states, in which case staggering deployment starts to make more sense.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three nonurban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

Certainly three is sufficient for most states, but surely too many for some (RI? CT? NJ?) and perhaps not enough for others. Can there be a more equitable distribution based on area? Or better yet, could we distribute them based on where we know vegetation is sensitive, and consider the non-urban monitors that we already have? It seems somewhat heavy-handed to make a blanket requirement for every state regardless of size, existing monitors, and sensitive vegetation.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

Expected concentration and the presence of sensitive species. One might want to consider the practical aspects like ease of access to the site, collocated equipment, etc. But ozone has harmful effects on agricultural and ornamental vegetation as well, so let's not restrict our ozone monitoring in nonurban areas to wilderness areas.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

This network really ought to consider geographic distribution without trying to parse equal numbers of monitors to each state. Plot the existing nonurban monitors (including state monitors, CASTNET and IMPROVE), find the holes, and add enough monitors to fill in the gaps. Terrain and likelihood of higher concentrations could also be factored in (we probably don't need as many monitors in North Dakota as in Texas). There's nothing inherently wrong with using some carefully modeled ozone data to estimate where highest concentrations in currently unmonitored areas might be.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

These non-urban monitors might be sited more like the IMPROVE monitors with respect to distance from any potential sources.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

These other network monitors should absolutely be considered in developing a non-urban network, and efforts toward harmonizing the various networks should continue. The presence of stable, long-term funding is probably the most important factor to consider, followed closely

by an adequate quality assurance program and some kind of network intercomparison to ensure reliable, comparable data with the other state monitors.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

Thank you for posting the additional information on the Camalier ozone season analysis. It seems to be a reasonable approach and I concur with the conclusion to increase ozone season in a number of states. Another approach, or factor to examine, is to look at the timing of exceedances or values >0.06 ppm throughout the year and statistically predict how likely those concentrations might occur before the start of the monitoring season. That is, if Wisconsin has recorded an ozone concentration of 0.076 as early as April 20 in the past, how are likely is it that a similar concentration might occur 6 days earlier, before the official season begins? The work of Rasmus Benestad in predicting extreme events seems like a promising approach (Benestad, R., EOS, Trans. AGU 89:41, 7 Oct 2008).

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

EPA should encourage, but not require, year-round monitoring at ozone sites. The NCore sites will provide a sufficient base of year-round monitoring and will include the collocated species that make it more useful for health and chemistry studies. Of course more data is always better, but it comes at a cost. At this point, I don't think there is sufficient added value to expanding the pool of year-round monitors (i.e., requiring all sites to monitor year-round) to justify the additional cost. If future health data demonstrate a pressing need for winter ozone data from additional sites, we could revisit this, but right now I don't think the need is there.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

Yes.

Dr. Thomas Lumley

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

The addition of monitors in lower-population areas is an important step in ensuring that the NAAQS protect the US population. I believe the current density of monitors in larger urban areas is sufficient if they are appropriately located in places where higher ozone concentrations are expected. A useful way to confirm this would be to summarize how many excedances of the proposed threshold in large urban areas were detected by only a single monitor

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

I have no relevant expertise on the feasibility of deploying monitors by 1/2011. If this schedule is feasible then postponing the deployment will significantly reduce the amount of data available in smaller urban areas by the next revision of the standards. My non-expert reading of economic forecasts suggests that state budgets are likely to still be strained by the current recession in 2010, so later deployment may be helpful for cost reasons.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

It is not clear to me that the number of monitors in each state should be the same. States may differ greatly both in the amount of publically significant ozone-sensitive vegetation and in the likelihood of high ozone levels. It seems more appropriate to customize the requirements to the actual risks.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

The likelihood of adversely high ozone concentrations; the sensitivity of the vegetation; the importance of the vegetation ecologically, as a public attraction, and as part of a more-or-less pristine wilderness area. In particular, since vegetation (unlikely human health) can safely be

assumed to be unaffected by natural background levels of ozone, monitoring should focus on areas where anthropogenic ozone impacts are likely to cause vegetation damage.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, affect the minimum number of non-urban required monitors?

I have no suggestions on this issue.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

Increasing required distances from roads may be appropriate. In an urban setting there are constraints on required distance from roads that are not present in non-urban areas. In addition, important ozone-sensitive vegetation is likely to live further from main roads than the typical member of the urban population.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

This seems appropriate. The monitors should be operated on the same schedule and have accuracy comparable to the urban monitors, and they should be sited so as to capture the potential ozone impacts that the standards protect against.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

I can’t think of any.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

Year-round monitoring at NCore stations plus extension of the monitoring season to capture `Moderate’ ozone levels at other stations seems sufficient.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable.

I have no relevant expertise on this issue.

Dr. Peter H. McMurry

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

Based on my reading of the document and comments from other committee members who are more knowledgeable than I on this topic, it seems reasonable to me.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

It is my understanding that the new ozone monitors would need to be operational at the beginning of the 2011 ozone monitoring season, not necessarily on January 1. This seems reasonable. Committee members pointed that given states' current financial difficulties, some flexibility may be advisable. I am sympathetic to this concern.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

I am among the group of Committee members who are perplexed by this specification. I agree with others that the focus needs to be on achieving adequate coverage. After studying Figure 1 I was only able to find one state (Montana) that currently has fewer than three sites (I recognize there may be other states whose sites do not meet the constraints defined by this proposal.)

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

Ozone may be a sentinel for climate change in some remote areas. Temperature changes will lead to changes in rainfall and vegetation. Biogenic emissions of compounds that react to produce ozone will be affected by those changes. Ozone concentrations might also be affected by temperature, which affects rates of reactions that produce ozone. If these processes were to affect ozone concentrations, long periods (years) of continuous monitoring (not only during the ozone NAAQS season) would be required to detect them. I am not expert on this topic, but certainly others are. I recognize that this is not a topic that falls within the primary ozone NAAQS, but it should be a consideration.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

Wherever possible, an effort should be made to qualify ozone monitors in other networks (CASTNET, NPS, etc) as FRM monitors. Also, ozone monitors should be located at sites where other species are also being measured.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

The clear message needs to be communicated to states that there is substantial value in operating ozone monitors year round, not only during the primary NAAQS ozone monitoring season. The potential value of such measurements in supporting model evaluation, assessing climate change impacts, etc., should be communicated so that states are aware of the benefits.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

There are compelling arguments for making year-round measurements wherever possible. These include (1) the possibility that instruments operate better when they are operated continuously, (2) the possibility that data can be used for many purposes other than meeting NAAQS requirements. EPA should communicate to state agencies the ways in which continuous ozone data could be of value. These include model evaluation, assessment of climate change on ozone concentrations, assessment of unanticipated impacts of new sources (e.g., emissions from Wyoming's energy industry), assessment of multi-pollutant health impacts when ozone is below NAAQS levels, etc. It should be emphasized that there is no known lower threshold for ozone health effects.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

I defer.

Mr. Richard L. Poirot

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

The proposed change is probably "sufficient" to ensure a minimally adequate network in urban areas, and the "logic" of affording "protection" to populations in smaller MSAs is reasonable. However, population levels – especially for cities as small as 50,000 – may not be the best predictor of (currently unmonitored) locations where exceedances of the new NAAQS are most likely, nor is a new monitor necessarily the best means to afford "protection" to a given population. Considering that the primary and secondary NAAQS are the same, and given the "suburban" nature of many existing monitoring sites, it can also become difficult to distinguish between urban and rural monitoring sites and objectives, and it might be more useful to think more in terms of an urban/rural continuum rather than separate networks with separate objectives.

Rather than deploying new monitoring "urban" sites strictly according to a MSA population-based formula, other desirable monitoring objectives that might be considered include:

- Minimize spatial interpolation errors and uncertainties – both for real-time mapping and for estimating longer-term exposure metrics for both health and sensitive vegetation,
- Improve forecasting ability (are there key locations - or kinds of locations - that the forecasters would like to see to help improve their forecast accuracy?),
- Evaluate/improve forecast (or SIP backcast) models (local, regional, continental, global),
- Evaluate/improve satellite estimates,
- Enhance consideration of multi-pollutant exposures and effects (and atmospheric chemistry) through collocation with other pollutant & meteorological measurements,
- Provide better indication of 'true' human exposure levels in inner city locations,
- Evaluate effects of control strategies or of projected population or industrial growth,
- Improve estimates of regional, transboundary and transcontinental transport, as well as regional and "policy-relevant" background concentrations.

For these reasons, EPA and the states should be encouraged to exercise substantial flexibility in implementing the new "urban" monitoring requirements. For example, I strongly endorse Dirk's suggestion to wave monitoring requirements for smaller MSAs which the state has designated nonattainment.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

States are currently under severe budgetary constraints. Given this and the difficulty that can be associated with establishing new monitoring sites in urban areas (as opposed to adding ozone monitors at existing monitoring sites), a 1/1/11 deadline may be overly ambitious. A phased schedule that provides more time is likely to result in better data quality in the long-term, especially if new site locations need to be established.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three nonurban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

While 3/state is an arbitrary proposal, the number generally seems about right given your stated multiple objectives (and/or is difficult to judge without knowing which existing "non-urban" sites may meet these criteria). In addition to the stated monitoring objectives, some of the additional objectives listed above for "urban" monitoring might also be considered in selecting new "rural" sites.

Sites at higher (relative) elevation can be especially valuable for evaluating transport contributions and model performance, but in many regions will also tend to measure higher concentrations. So some states may be reluctant to sample at such locations without specific incentives or perhaps special designation as "research sites" not subject to compliance determinations.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

As always, substantial value is added if ozone measurements are collocated with other measurements, and so adding ozone at IMPROVE sites would provide useful new information. It can also be noted that EPA research on effects of ozone on sensitive vegetation has been quite limited in recent years (decades), and so it could be valuable for EPA to form partnerships with Agencies like NPS, Forest Service and with academic groups to better coordinate monitoring and effects research activities. See for example the NPS "Ozone Risk Assessment for Vital Signs Networks" http://www.nature.nps.gov/air/Permits/ARIS/networks/ozoneRisk.cfm

Some emphasis might also be placed on monitoring (and/or effects research) in locations with high densities of ozone-sensitive plants or where ozone effects have been observed (such as foliar injury in FHA surveys), but where current ozone standards are not expected to be exceeded. Also, given CASAC recommendations in the last 2 ozone NAAQS reviews to adopt a more biologically relevant cumulative seasonal secondary standard, some emphasis might be placed on the kinds of locations where a SUM06 or W126 metric would be high relative to the 8-hour daily maximum.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design?

How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

See answers to previous questions. In addition, final decisions on the numbers of required new sites need to be balanced with considerations of alternate monitoring priorities – such as longer monitoring seasons.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

Given the blurred distinctions between urban and rural sites (& monitoring objectives), and for reasons of consistency, I think station and probe siting requirements should generally be the same for rural and urban monitors

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

Monitors not operated by State Agencies should be subject to the same QA/QC requirements imposed on state-operated sites.

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

The various anomalies in the page 20 map of proposed ozone season requirements by state look a little silly from a science perspective, and for various reasons, it might make more sense to require (or provide some incentives for) year-round sampling at some sites in all states. It would be useful to develop some estimates of the incremental costs of extending the ozone monitoring season – especially at sites where other monitoring demands year-round attention. I would think the incremental cost of running year-round at such sites would be relatively small (and there can also be problems & costs associated with shut-down/start-up operations). Additional data from these sites would also have the added value of providing useful information on multi-pollutant exposures and effects and on atmospheric chemistry. I think there's still much we don't understand about the (multiple) causes for the general springtime maxima, intercontinental transport, winter photochemistry, stratospheric intrusion, etc.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

I would think many of the NCore sites might not be sited to measure peak ozone levels (in any season – but especially) in cooler months, and/or might not be ideally sited to help indicate broad spatial patterns. Possibly it would be useful to require at least 1 rural site per state for year-round sampling. Also, it seems likely that the site characteristics to record maximum concentrations may be different in warm & cool seasons. For example, higher elevation / ridge top or "near water" sites often see highest concentrations in summer, while in-land valley locations might see higher concentrations in winter.

3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?

This seems reasonable in most cases. Some rural sites – especially at higher elevation – can be inaccessible in winter. Allowances should be made for such sites (which are also not likely to record the highest concentrations in cooler months).

Dr. Armistead Russell

Urban Network

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

I would not be overly aggressive in setting a schedule. First, I would ask the question as to what objective a specific cite addresses. Next, I would ask if the siting, and system could benefit from more thought than is allowed with the given schedule. Overall, I would argue for thoughtful flexibility.

Non-Urban Network

1. We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

My first reaction to this requirement was quite negative until reading about the proposed flexibility, and even that may not be enough. Given the large variety of resources that inform us about ozone across the US, I am not sure that we need three non-urban monitors in each state. I would look at the various available products (satellite data, annual modeling simulations, non-routine monitoring results (including special study monitors), the size of the state, population, etc., and use these to determine how many and where the monitors should go. As stated above, I would argue for thoughtful flexibility.

2. What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?

My view is that the agency, along with the states, should look at where information is critically missing. Use the modeling results (of more than just ozone), statistical analysis, satellite data (of more than just ozone) and current monitoring results to figure out where adding an ozone monitor to the network, preferably at a pre-existing (likely PM) monitoring site. I would hesitate to site any new ozone monitor where there is not some other monitor already. The information typically is not as valuable as it would be if information on more pollutants is available at the same site.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

I would be less worried about the modeling end (as a modeler)… we make too little use of the ones we have.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

Every city (> 350,000) should have at least one monitor going and reporting all year round. In regards to other monitors,

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

*3. We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors***?**

Yes.

Dr. Jay R. Turner

Urban Network Design Requirements

1. Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?

Monitoring should be conducted in all MSAs below 350,000 population to at least establish ozone air quality conditions. This is important given the role of ozone monitoring not only for NAAQS compliance determinations but also for AQI reporting. There should be flexibility in the timeline to deploy new monitors in such areas and the requirements to maintain monitoring in these smaller MSAs depending on the observed ozone levels.

2. We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?

What three-year period will be used for the first round of designations under the May 2008 NAAQS revisions? If the new data are expected to inform the decision-making on nonattainment area boundaries, then every effort should be made to get these monitors operating on a schedule consistent with the designation process. This might be particularly important for monitors being sited near the fringe areas of existing nonattainment areas or monitors being sited in smaller MSAs in counties near, but currently outside, existing nonattainment areas. MSAs smaller than 350,000 population and currently without ozone monitoring could have staggered implementation to provide the monitoring agencies with flexibility in allocation of resources (it would be shame to buy ozone monitors for each of smaller MSAs only to find that sustained monitoring in many such areas would not be a priority) and mindful of the additional burden on personnel to establish and operate these new sites.

Non-Urban Network Design Requirements

1. We are considering a new requirement that each State operate a minimum of three nonurban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?

With the pattern towards ratcheting down the ozone standard, I am concerned about the low density of non-urban monitoring downwind of (generally large) urban ozone nonattainment areas, especially in the Midwestern United States. It is not clear to me that we are capturing the spatial extent of the ozone impact in such cases. For example, a largely rural county at the downwind edge of a nonattainment area (but perhaps still within the MSA) might have the highest ozone design value; in this case, it should be determined whether the plume is causing

NAAQS violations further downwind. While these areas might have relatively low population, people living in these areas are impacted. (I respect the philosophical issues this might create with respect to a given urban area's impact on air quality in the immediate downwind counties in light of larger scale, regional transport and the complexities in attributing observed burdens to emission source regions, but the urban plume patterns should be a consideration at least in areas with geographically isolated nonattainment areas.) Given this need, together with the need for monitoring with respect to objectives relevant to the secondary standard, three non-urban monitors per state might be sufficient in some but not all cases.

2. *What factors should be considered in the siting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?*

Existing estimates of ozone concentration fields should be used to prioritize areas. States should be allowed to capitalize on existing monitoring conducted by other networks (e.g. CASTNET) to fulfill this monitoring objective.

3. In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?

See #1 above, which encourages placing additional emphasis on non-urban areas downwind of large urban ozone nonattainment areas.

4. Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?

No comments at this time.

5. We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?

See #2 above; States should determine whether existing non-urban ozone monitors that are potentially operated by another agency are in locations consistent with their prioritized list of sites based on estimated ozone levels. The daily maximum 8-hour average might not be best ozone metric for prioritizing such areas and other metrics should be considered (e.g. reflecting upon analyses and considerations for the secondary standard that were part of the mostrecent ozone NAAQS review process).

Ozone Monitoring Season

1. We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?

The analysis used to support adjustments to the state-specific ozone seasons seems reasonable.

2. We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?

Ozone monitors at NCore sites should be operated year-round. Many data analyses, including but not limited to health effects studies (including studies which might not be focused on ozone but include it as a possible confounder), would benefit from year-round data. Also, ozone data can be useful when validating performance of certain portions of chemical transport models that might be run for purposes other than ozone (e.g. fine PM).

3. *We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?*

What three-year period will be used for the first round of designations under the May 2008 NAAQS revisions? This information is important when considering the timelines for phasing in changes to the monitoring season.

Dr. Warren H. White

Ozone monitoring season – general comments

An indication of the incremental cost of extending an existing seasonal site to year-round operation is missing from the materials provided for discussion. The AAMMS does not need to know the actual dollars involved, but does need an approximate "exchange rate" between 12-month operation and, say, 8-month operation. What are typical marginal costs as a fraction of fixed costs?

I appreciate that a lot of experience and history has gone into the map of ozone monitoring seasons, but does it really have to be so complex and spatially resolved? Wyoming, for example, scheduled to start monitoring year-round, is entirely surrounded by states still scheduled to hibernate every winter. Is there any scientific rationale for creating this island defined by political rather than climatological or topographical boundaries? Note that Schnell et al. (2009) "suggest that similar ozone production [to that observed in Wyoming] during wintertime is probably occurring around the world under comparable industrial and meteorological conditions." I would prefer a uniform monitoring season everywhere, if only on aesthetic grounds, and would prefer it to be as long as we can afford, year-round if possible.

I don't feel strongly about extending the monitoring season at ozone-only sites, where nothing else is measured, because we wouldn't know how to interpret the resulting cold-weather data as an indication of other photochemical products and their aggregate effect on health and welfare. The NAAQS is set for ozone as "the indicator for a mix of O_3 and other photochemical oxidants" (Arnold et al., 2007), and the composition of the winter mix may differ from that of the summer mix on which most current evidence for ozone-related health effects is based. The presence of monitors for other variables should discourage shutting down a monitor for ozone.

References:

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Dr. Yousheng Zeng

Urban Network Design Requirements

In my opinion, it is appropriate to require at least one monitor in a small MSA (population 50,000-350,000) where no design value exists. However, if after a period of monitoring, the results are far below the ozone NAAQS, state agencies should be allowed to discontinue monitoring in the area. I would propose the following monitoring requirements in a sliding scale. In a MSA with population between 50,000 and 350,000, a minimum of one ozone monitoring station be required to collect valid monitoring data for at least one ozone season. If the maximum concentration during this season is below 50% of NAAQS, agencies may discontinue the monitoring until the MSA is bumped up to the next MSA category (i.e., 350,000-4,000,000) based on decennial MSA redefinition. If the maximum is equal to or above 50% of NAAQS, the monitoring must be continued for at least 3 years (3 seasons) to establish a design value for the MSA. The screening value of 50% of NAAQS is proposed as an example. Another screening value similar to this one may be established based on a static analysis on probability of design value being higher than 85% of NAAQS if one year maximum is below that screening value. If the design value is below 85% of NAAQS, the monitoring may be discontinued as EPA currently proposed. If the design value is equal to or above 85% of NAAQS, the monitoring must be continued until the design value drops below 85% of NAAQS for additional 3 consecutive years.

In regard to deployment schedule, I would propose the beginning of ozone season in 2011 instead of Jan. 1, 2011. This will give some agencies more time to install the monitoring stations without losing usable data. I also strongly support the idea of staggered deployment schedule. Agencies should be required to deploy at least one newly required monitoring station in the first required season within their jurisdiction (and one in each subsequent season if there is more than one newly required station). In combination with above proposed sliding scale, if an agency deploys the first station and the result for the first season is below 50% of NAAQS, the agency can relocate the station to the next newly required station. With this requirement and deployment approach, transportable monitoring trailers can be used to maximize resources and minimize cost.

Non-Urban Network Design Requirements

I agree with Dr. Hopke. It does not make sense to require a small state like Rhode Island and a large state like Montana with large non-urban areas to have equal number of monitors. EPA should develop different network design criteria and guidelines. They should include considerations of geographic coverage and level of ozone precursor emissions in the area. I would also add the concept of sliding scale and staggered deployment schedule outlined above. To cover large non-urban areas, EPA should consider requirements that would incentivize state agencies to use transportable (or even mobile) monitoring platforms. For example, a state agency can use one or two transportable monitor(s) to cover a large area by rotating them at pre-determined locations, one location per ozone season. If the monitoring result of a season at a location is below 50% of NAAQS, this location is screened out. With a combination of the

above proposed sliding scale and staggered deployment schedule, state agencies can assess large areas in a very cost effective manner.

I support the option of using existing monitoring stations (e.g., CASTNET monitors) to fulfill part of the new requirement.

Ozone Monitoring Season

I support the proposed increase in length of monitoring period. The monitoring period should be long enough so that there should not be ozone exceedances outside of the monitoring period. My only question is how confident EPA is in making this proposed requirement when only 45% of year-round monitoring data was analyzed.

I strongly agree that ozone monitors at NCore stations should be operated year-round. I don't know if PAMS stations are required to be operated year-round. There is some value to operate PAMS monitors year-round. This is not limited to ozone monitors at PAMS sites, but also applies to other pollutants. For example, if speciated VOC, along with ozone, are monitored year-round, it may provide some insight in ozone study, which is a major objective of PAMS network. In non-ozone season, stationary industrial sources of VOC typically emit at the level comparable to that of ozone season. These VOC may have a longer lifetime in the atmospheric during non-ozone season than during ozone season. Without strong atmospheric photochemical processes, the monitoring data during non-ozone season may preserve sources' characterization and influence better.

Making the change to monitoring period effective in 2010 for *existing monitors* seems feasible to me. However, more weight should be given to several AAMMS members who are more involved in SLAMS operations and may know some practical challenges.

Dr. Barbara Zielinska

Urban Network Design Requirements

1. *Considering the ozone minimum monitoring requirements that are already promulgated through 40 CFR Part 58, is the considered change to these requirements sufficient to ensure a minimally adequate network in urban areas?*

The proposed addition of one ozone monitor in urban areas with population between 50,000 and 350,000 is clearly appropriate in locations where there is an absence of an ozone design value. However, if after 3 years of monitoring a resulted design value is lower than 85% of the standard, the state should be allowed to remove or relocate the monitor in such areas.

2. *We are considering a timeline that would require newly required ozone monitors to be operational no later than January 1, 2011, based on the expectation that final rulemaking will be completed in 2009. Is this schedule appropriate or should EPA consider providing an additional year for new monitors to be deployed (or relocated)? What would be the advantages or disadvantages of a staggered deployment schedule?*

I am in favor of a staggered deployment schedule, especially when a new monitoring site is required. It is better to allow more time for purchasing adequate equipment, operator training, establishing QA/QC procedures, shake down period, etc.

Non-Urban Network Design Requirements

1. *We are considering a new requirement that each State operate a minimum of three non-urban ozone monitors to meet certain objectives (described above). Considering the stated objectives of the non-urban ozone monitoring requirements, is three required monitors per state sufficient?*

This depends on the specific State - one size does not fit all. Considering differences in a State geographic locations, presence or absence of protected areas downwind of major urban populations, sensitive vegetation, etc, , three non-urban ozone monitors may be sufficient for some States, but for some – may not. I suggest more detailed analysis; similar to that EPA has done for changes to required ozone monitoring season (Table 2 of the ozone review document). Variable patters of ozone temporal distribution in complex mountain terrain point to a need for higher number of monitoring sites in such areas than in other areas (Van Ooy and Carroll, 1995).

2. *What factors should be considered in the sitting of ozone monitors to assess impacts on ozone sensitive vegetation in national parks, wilderness areas, and other ecosystems?*

One of the most important factors is to consider the presence of the most ozone sensitive species in these areas. For example, Ponderosa pine, which is the main tree species in Sierra Nevada Mountains, is very sensitive to ozone exposure (Bytnerowicz et al., 2003). Thus, it is important to situate the monitors in proximity of these species during their physiological activity and active

uptake of gases. In addition, factors such as transport from large urban areas, enhanced photochemical activity in some areas, logistics, etc., should be considered.

3. *In addition to the objectives that have been described for non-urban ozone monitors, what other objectives should be considered in the final network design? How would the consideration of additional objectives, if any, effect the minimum number of non-urban required monitors?*

Additional objectives may include testing and evaluation of ozone models, ozone forecasting improvements and better understanding of policy relevant ozone background values.

4. *Current ozone monitoring regulations (described in Appendix E of 40 CFR part 58) include requirements for station and probe siting (e.g., vertical distance of inlets, set-back distances from roadways). Are these requirements (that have been developed for urban monitors) appropriate for non-urban ozone monitors? What changes, if any, should be considered?*

The additional requirements for non-urban ozone monitors may include appropriate distance from high trees and local roadways, placement of the monitors in open terrain and in proximity of sensitive vegetations.

5. *We believe that States should have the option of designating that existing non-urban ozone monitors that are potentially operated by another agency (e.g., CASTNET monitors operated by the National Park Service) be utilized for meeting certain non-urban minimum monitoring requirements. What factors should States use to determine if such monitors are appropriate to include in their networks?*

These monitors should meet the required technical quality and be able for continuous ozone monitoring. Integrated methods (such as passive ozone monitors), are convenient is some situations and may help in selection of "hot spots" where real time monitors should be placed (Arbaugh and Bytnerowicz, 2003). Diurnal variations in ozone concentrations are important in assessment of the ozone impact on sensitive vegetations. Real-time monitors which can be placed in remote locations (light, reliable, battery-operated; not requiring AC), such as 2B Technologies, Boulder CO, should be considered.

Additional comment: Efforts leading to a development of more biologically relevant ozone secondary standard, such as those taking currently place in Europe should be considered (Matyssek et al., 2007).

Ozone Monitoring Season

1. *We are considering changes to the required ozone monitoring seasons based on analyses of the patterns of ozone exceedances and occurrences of the Moderate level of the Air Quality Index, during periods outside of the currently required seasons. What other factors should be considered, if any, in the determination of the length of the required monitoring season for each State?*

Some sites, especially at high elevations, may have only seasonal access.

2. *We believe that ozone monitors that are located at NCore stations should be operated on a year-round monitoring schedule. Under what circumstances might it be appropriate to require year-round monitoring at other stations beside NCore?*

The year-round data from some urban monitoring sites may be important for ozone health effect study.

3. *We are considering that changes to the required ozone monitoring season be applicable to existing monitors beginning in 2010, one year ahead of the deployment schedule for newly required ozone monitors. Is this schedule reasonable for existing monitors?*

Yes, it seems reasonable.

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