

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

**Minutes of the Public Teleconference on June 12, 2014**

Date and Time: Thursday, June 12, 2014 – 11:30 a.m. to 1:15 p.m. Eastern Time

Location: Teleconference only.

Purpose: The purpose of the June 12, 2014 public teleconference was for the Clean Air Scientific Advisory Committee (CASAC) Air Monitoring and Methods Subcommittee (AMMS) to discuss the CASAC AMMS' draft report dated May 30, 2014 on the review of the scientific and technical aspects of a draft EPA document that supports a recommendation to adopt the Nitric Oxide-Chemiluminescence (NO-CL) method as a second Federal Reference Method (FRM) for measuring Ozone (O<sub>3</sub>).

Participants:

CASAC Air Monitoring and Methods Subcommittee (See Roster with affiliations, Attachment A):

Mr. George A. Allen  
Dr. David T. Allen  
Dr. Linda J. Bonanno  
Dr. Doug Burns  
Dr. Judith C. Chow  
Dr. Kenneth Demerjian  
Mr. Eric Edgerton  
Mr. Henry (Dirk) Felton  
Dr. Philip Fine  
Dr. Philip Hopke  
Dr. Rudolf Husar  
Dr. Daniel Jacob  
Dr. Peter H. McMurry  
Dr. Allen Robinson  
Dr. Armistead (Ted) Russell  
Dr. James Jay Schauer  
Dr. Jay Turner  
Dr. Yousheng Zeng

Drs. David Allen, Linda Bonanno, Doug Burns, Phil Hopke, Daniel Jacob, Peter McMurry, James Schauer and Yousheng Zeng could not participate during the June 12, 2014 public teleconference.

EPA SAB Staff:

Mr. Edward Hanlon, Designated Federal Officer

Other Attendees:

A list of persons who requested information on accessing the public teleconference line is provided in Attachment B.

Materials Available: The agenda and other meeting materials are available on the SAB website (www.epa.gov/sab) at the following CASAC AMMS June 12, 2014 public teleconference webpage:

<http://yosemite.epa.gov/sab/sabproduct.nsf/bf498bd32a1c7fd85257242006dd6cb/d58cb9cddb90b06d85257c5b004fdf18!OpenDocument&Date=2014-06-12>

### **Public Teleconference Summary**

The public teleconference was announced in the Federal Register<sup>1</sup> on March 13, 2014 and was conducted according to the public teleconference agenda<sup>2</sup>. A summary of the public teleconference follows.

### **Opening Statement**

Mr. Edward Hanlon, the Designated Federal Officer (DFO), opened the public teleconference, and made a brief opening statement noting that the CASAC AMMS operates under the Federal Advisory Committee Act (FACA). He noted the teleconference was open to the public and that meeting materials were posted on the CASAC website. He noted that AMMS members were appointed as Special Government Employees to provide individual expertise and advice, not to represent any organization. He stated that no members of the public had requested to present an oral statement during the April 3, 2014 public teleconference. He noted that the SAB Staff Office had identified no financial conflicts of interest or appearance of a loss of impartiality for any AMMS members for this teleconference. He also noted that minutes of the public teleconference were being taken to summarize discussions and action items in accordance with the requirements of FACA.

### **Introductory Remarks, Panel Introductions, Review Agenda**

Mr. George Allen, Chair of AMMS, then welcomed everyone. Mr. Allen noted that teleconference materials were posted on the EPA CASAC AMMS website. He noted the goals, purpose and objectives for the teleconference, and stated that during discussions on each charge question, the AMMS members would try to articulate a reflection of the AMMS's viewpoints, and that areas of consensus and differing viewpoints would be identified. Mr. Allen stated that there were two separate sessions for oral public comments during the teleconference (one near the beginning of the teleconference after discussion on the charge questions, and one near the end of the teleconference intended for clarifying comments from the public). He also noted that the AMMS members would listen to and consider public comments, each other on the AMMS, and EPA staff. He noted that the ultimate objective was to develop a written CASAC report that reflects advice drafted by CASAC AMMS.

Mr. Allen stated that while consensus was important, the final report will reflect the views of the CASAC. He noted that scientific issues would be articulated in the responses to the charge questions, and that if there was disagreement or dissenting views within those responses, those views would be articulated in the final CASAC report. He noted that the CASAC AMMS draft report would undergo a quality review process by the chartered CASAC, and that the chartered CASAC quality review teleconference on the draft CASAC report was scheduled for July 16<sup>th</sup>. He stated that the quality review would focus on the following questions: a) were the original charge questions adequately addressed?; b) are there any technical errors or omissions, or issues that are inadequately addressed within the draft report?; c) is the draft report clear and logical?;

and d) are the conclusions drawn or recommendations provided supported by the body of the draft report? He stated that near the end of the June 12<sup>th</sup> teleconference, he would summarize follow-up activities associated with this review. Mr. Allen then welcomed Dr. Russell Long, EPA Office of Research and Development (ORD), for his opening remarks.

## **EPA Remarks**

Dr. Russell Long, EPA ORD, made a brief opening statement. Dr. Long noted that EPA considered AMMS member comments and discussion from the April 3, 2014 AMMS teleconference, and developed the supplemental materials that were provided to AMMS for its consideration on May 5, 2014. He noted that data that he presented on the April 3, 2014 AMMS teleconference only included raw data, and that after the teleconference ORD made corrections to the data sets that were presented.

Dr. Long stated that the existing FRM for Ozone (Ethylene-Chemiluminescence Method, or ET-CL method) is very old, and that there is significant scatter in data plots from its application. He noted that ORD conducted span checks on all of its field studies that used the ET-CL method and assessed drift, operator error and calibrations on data produced using the ET-CL method, and the May 5, 2014 supplemental materials incorporated correction factors associated with assessment of these issues. He stated that the first half of data that ORD collected from Houston was spanned high (by 5 or 6%), and that after ORD respanned the instrument there were no further issues with the rest of the data. He stated that data that ORD collected from North Carolina using the ET-CL method had problems, and that ORD could not develop a correction factor for that data. Dr. Long noted that the May 5, 2014 supplemental materials included a comparison of data collected using the NO-CL and ET-CL methods, and that both methods compared well.

Dr. Long noted that EPA intends to further investigate the NO-CL and the scrubberless-ultraviolet measurement method (UV-SL), and that ORD was planning to conduct another field study in Colorado in late June 2014 in the Denver area. He noted that ORD would provide a shelter for the sampling equipment to be used in the Denver study so that humidity would not become a data issue. He noted that ORD would keep working on the scrubberless UV method and that ORD may propose this method as an FRM in the future if research results indicate this is a preferred method. He also stated that EPA would tighten the 40 CFR Part 53 requirements for the NO-CL method for monitoring Ozone so that they would be consistent with such requirements for monitoring carbon monoxide (CO) and sulfur dioxide (SO<sub>2</sub>).

An AMMS member stated concerns about the practicality of continuing the ET-CL method as a FRM for Ozone, noting that FRMs act as benchmarks and that as instruments age they become obsolete. Dr. Long noted that after the upcoming Denver field study, EPA might retire the ET-CL method as a FRM for Ozone. He noted that generally, EPA does not disqualify an FRM but rather just adds another FRM. He stated that to remove an FRM from the Code of Federal Regulations, EPA may need to coordinate with the Office of Management and Budget. He also noted that while the ET-CL method was obsolete because it was not produced commercially, it was a robust method and some entities may still want to use it.

Mr. Allen noted that his understanding was that a method does not have to be commercially available to be an FRM; Dr. Long noted that was correct. Mr. Allen also noted that unless an FRM was performing deficiently, it would continue on as a FRM for Ozone. He also noted that Mr. Will Ollison noted in his written public comments for the June 2014 AMMS teleconference<sup>3</sup> that in 1973, an FRM was removed due to performance problems. One AMMS member

commented that data from ORD ET-CL monitoring in the Research Triangle Park, NC (RTP) area indicated that the method was not operating properly. Mr. Allen responded that while the instrument did not work properly, the ET-CL method was fine. The AMMS member noted that if the instrument did not work properly, the ET-CL method should not be used. Mr. Allen stated that ORD ET-CL monitoring in Texas worked fine. Dr. Long noted that ORD's NC study occurred in 2012, and that ORD worked out the problems that were associated with the NC study. He noted that the ET-CL instrument performed very well when ORD used it in Houston in 2013, as indicated in ORD's May 5, 2014 comparison data. Dr. Long also noted that ORD was currently trying to demonstrate performance of the NO-CL method, not the ET-CL method.

One AMMS member asked what type of zero-air source ORD used for the NO-CL method. Dr. Long responded that ORD used an external zero air generator. He stated that this generator has several different scrubbers in it, and removes everything including Ozone, volatile organic compounds, and other chemicals. The AMMS member commented that ORD should identify what the residual error is (i.e., the equivalent of a signal in an ozone-free environment). Dr. Long agreed, and noted that was the principal of the scrubberless UV method.

An AMMS member asked if ORD would use a gas-phase scrubber if ORD used the UV method in the field. Dr. Long responded that ORD would use this type of scrubber in the field for the UV method, but that the studies conducted to date did not use this scrubber. The AMMS member noted that background air could be causing errors in ORD's data. Dr. Long responded that States do not use gas phase zero-air scrubbers but rather use charcoal scrubbers and other devices to remove contaminants. He noted that ORD accounted for zero error in its research because there is drift in calibration curves that can cause zero drift.

An AMMS member asked whether the interference equivalent and water vapor noted on Slides 9 and 12 of ORD's April 3, 2014 presentation were in parts per billion (ppb); Dr. Long responded yes. Dr. Long also noted that the results indicated on these slides should be rounded up to two decimal points. He further noted that to the best of his knowledge, the ET-CL method does not employ a dryer and that the NO-CL method proposed for FRM status does require operation with a dryer.

An AMMS member noted that sub-note 3 on Slides 9 and 12 of ORD's April 3, 2014 presentation is different than the CFR requirements and that the sub-note should be updated. Dr. Long agreed that sub-notes for the NO-CL method would be updated. Another AMMS member asked whether the NO-CL method analyzer had a Relative Humidity (RH) sensor to monitor RH in the airstream. The member strongly recommended that the manufacturer include loggable RH within their instrument. Dr. Long responded that this was a good suggestion.

## **Public Comments**

Mr. Allen noted that no members of the public had requested to present oral comments during the teleconference. He noted that it was important for the AMMS subcommittee to consider public comments, and that several sets of written public comments were submitted.

## **Discussion of AMMS Draft Report**

Mr. Allen noted he would go through the body of the May 30<sup>th</sup> draft CASAC Report and then the cover letter, and ask AMMS members if they have any questions or concerns regarding any of the draft responses to the charge questions or cover letter.

## **Response to Charge Question 1**

*Charge Question 1. What is the AMMS view on adding an additional O<sub>3</sub> FRM (as Appendix D-1 of the 40 CFR Part 50 Federal Regulation) for the purpose of establishing a new FRM that is implemented in analyzers currently in production status? This new O<sub>3</sub> FRM will serve as an additional FRM to supplement the current Ethylene-Chemiluminescence method, which is no longer being produced or supported.*

One AMMS member asked whether any AMMS member had concerns keeping the ET-CL method as an FRM. Mr. Allen noted this question may be policy, and that the ET-CL method has not been shown to be deficient. He further noted that it was acceptable to consider keeping the ET-CL method as an FRM since the instrument was working and was adequate. He also noted that if the instrument or the method was not working, then the topic should be further discussed. Mr. Allen then noted that AMMS members could comment on this topic in their individual comments.

An AMMS member commented that when the lead standard dropped by factor of 10, the lead FRM became obsolete since that FRM could not meet the current standard. The AMMS member noted this was not necessarily the case with Ozone since the new Ozone standard was not anticipated to drop by factor of 10. The AMMS member stated that since lower levels were anticipated than the current Ozone standard, the new FRM should have greater precision. Another AMMS member noted that it was scientifically acceptable to keep the ET-CL method as an FRM.

Another AMMS member noted that the ET-CL method was introduced twenty years ago and did not receive the same level of rigor as under the current method development. The member also noted that effects of water vapor on quenching and presence of alkenes may affect Ozone concentration. Mr. Allen noted that the original FRM has been retested since it became a FRM for Ozone and that while there are potential weak spots, current information indicates that the ET-CL method is accurate.

One AMMS member noted that there have been occasions where the ET-CL method has not performed well, such as in North Carolina and elsewhere. Mr. Allen noted that ORD conducted additional work after ORD's 2012 tests to get the ET-CL instrument up to performance level, and ORD's 2013 testing confirmed this. Dr. Long noted that deployment of the ET-CL method in Houston in 2013 performed very well. He noted that the scatter in Houston was based on operator error, spanning it 5% higher than the FRM, and that when ORD corrected that error the ET-CL method testing results agreed to a 99.99 correlation coefficient. Dr. Long noted that the ET-CL method became the Ozone FRM in 1976 and still meets the 40 CFR Part 53 test specifications. He noted that while he was comfortable if tighter specifications were developed for the ET-CL method, he did not expect State air agencies to routinely use the ET-CL method in the future, and that ORD was seeking to have the NO-CL method as an available FRM in the near future. Mr. Allen noted that since the ET-CL method exceeds ORD's suggested tighter performance requirements provided for this review by a large margin, the ET-CL method was robust.

An AMMS member asked whether the ET-CL method instruments used dryers to control humidity. Dr. Long noted that the ET-CL method does not have a dryer and that ORD did not run it with a dryer. He noted that the NO-CL and scrubberless UV methods do have drying mechanisms and that ORD paid attention to humidity to ensure water interference was assessed

and corrected for. Mr. Allen noted that Slide 12 of ORD's April 3, 2014 presentation shows the effect of water interference on the scrubberless UV method. Another AMMS member commented that the NO-CL method should require loggable RH testing measurements and include RH performance requirements and criteria.

An AMMS member recommended that EPA include more specific NO-CL method performance criteria beyond the requirements listed in Slides 9 and 12 of ORD's April 3, 2014 presentation table, including requirements for tolerance and limits on moisture. Mr. Allen noted that the CASAC could recommend that additional performance specifications be included in the NO-CL FRM description. He also suggested that the CASAC report could recommend that EPA include additional test specifications to cover the performance specification issues raised in Dr. Judy Chow's individual comments that were provided within Appendix A of the CASAC AMMS' draft report dated May 30, 2014. Another AMMS member recommended that EPA include operating environmental temperature test specifications within the NO-CL FRM specifications.

## **Response to Charge Question 2**

*Charge Question 2. What is the AMMS views on establishing the Nitric Oxide-Chemiluminescence (NO-CL) method (currently an FEM) as the new, additional O<sub>3</sub> FRM?*

One member recommended that the draft response include text that recommended that ORD include additional performance requirements in 40 CFR Part 53 Appendix D-1. Mr. Allen noted that the draft response should also recommend that ORD's material that described the FRM needs further detail and clarification, including additional performance requirements. He recommended that additional detail similar to what is included for the Ultraviolet Fluorescence Method for sulfur dioxide should be included in 40 CFR Part 53 Appendix D-1, including information on the measured wavelength range for this method, a schematic diagram, and relevant references to this method. He also noted that the NO-CL method should require loggable RH testing, and include loggable RH testing measurement performance requirements and criteria. He stated that the CASAC report could recommend that EPA include additional test specifications to cover the performance specification issues raised in Dr. Judy Chow's individual comments.

One AMMS member suggested that the draft CASAC report also recommend including operating environmental temperature test specifications within the NO-CL method specifications.

## **Response to Charge Question 3**

*Charge Question 3. Do any other ozone measurement methods exist that the AMMS recommends for consideration of possible promulgation as a new (additional) O<sub>3</sub> FRM?*

One member recommended that the draft response include text that recommended that ORD include additional performance requirements in 40 CFR Part 53 Appendix D-1. Another member noted that any chemical reaction with Ozone in the instrument would be unlikely to make a difference with the decay cycle in the formation of Ozone, and that there was no need to change any text in the draft letter on that topic.

Mr. Allen noted that ORD would continue field testing the UV-SL method and that an AMMS member had raised questions regarding whether air is dried from the generator. Dr. Long noted that since nitric oxide comes from the cylinder the air should be dried. An AMMS member

asked whether the air would be diluted; Dr. Long noted that the air would probably be diluted in the cylinder. The AMMS member noted that a fairly high concentration would likely be used and diluted which would allow a source of nitrous oxide (NO) at the site. Another member noted that pure NO was likely to be in the cylinder which would then be diluted, and noted that while this would indicate inefficiency in the conversion process, this conversion process was not relevant to this section of the draft report or the AMMS teleconference on June 12<sup>th</sup>. Dr. Long noted that the NO was 95% pure.

An AMMS member noted that the dew point range specification is between 10 and 20; Mr. Allen noted that this topic did not need to be included into the draft CASAC report.

An AMMS member asked whether the UV-CL method should have a chemical zero for its reference cycle. Mr. Allen responded in the affirmative. The AMMS member asked whether the reference channel provides an independent signal, and Dr. Long responded that the signal was generated by algorithms.

#### **Response to Charge Question 4**

*Charge Question 4. What is the AMMS views on the use of low-cost sensor technology to supplement regulatory ozone monitoring (i.e., in rural areas)?*

One AMMS member commented that this section of the draft CASAC report was too wordy, and Mr. Allen asked the member to send the DFO and himself suggested modifications to the draft text without changing any of the substance. The AMMS member also asked whether ORD's April 3 and May 5, 2014 supplemental materials provided calibration results for the ET-CL method. Mr. Allen noted that page 13 of the April 3 supplemental material provided scatterplots for this data.

Mr. Allen noted that at a recent EPA meeting in RTP, discussion on sensors occurred that might be relevant to this section of the report. An AMMS member noted that this sensor discussion focused more on particulate matter rather than on Ozone.

An AMMS member suggested that the second paragraph of this section's draft response should reference the Bart et.al. paper published within the past month in Environmental Science and Technology, and the text should note this is new material that highlights a particular sensor. Mr. Allen agreed that the text should be revised as suggested.

#### **Letter to the Administrator**

Mr. Allen noted that text on the need for performance specifications for the NO-CL FRM would be brought forward to the cover letter. He also noted that the background information that ORD provided to the AMMS for review should be dated January 2014, not January 2013. Dr. Long responded that ORD would add more descriptive information into the NO-CL FRM, and agreed that the background information provided by ORD was dated January 2014.

#### **Clarifying Public Comments**

Mr. Will Ollison of the American Petroleum Institute provided five clarifying comments for the AMMS member's consideration:

1. Mr. Ollison noted that ASTM Method D5149 Annex A2 documents a positive ET-CL FRM humidity bias that ranges 6%-12% across 7 replicate ET-CL FRM instruments tested at the specified 20,000 parts per million (ppm) water vapor interference concentration; at the 30,000 ppm levels experienced in Gulf coast cities such as Houston, the wet/dry ET-CL FRM bias ranged 10%-18%. At a 75 ppb O<sub>3</sub> standard level, the ET-CL FRM 20,000 ppm humidity positive interference bias would range between 4.5 – 9 ppb and 7.5-13.5 ppb at 30,000 ppm humidity. At both humidity levels the current O<sub>3</sub> ET-CL FRM would violate EPA's proposed revised chemiluminescence humidity performance specification of ± 5 ppb O<sub>3</sub>. With this humidity sensitivity and the revised water vapor performance specification, ET-CL FRM decertification would seem the better choice since the ET-CL FRM would no longer useful as a reference instrument.

2. Mr. Ollison noted that revised proposed performance specifications for the 254 nanometer (nm) UV absorption O<sub>3</sub> photometers should include testing for additional interference species (Spicer et al. 2010) such as Hg vapor and selected aromatic VOCs (e.g. phenols, styrenes, aldehydes, and nitro-aromatics) reported to interfere at urban ambient levels. Since there are likely to be a large number of such species, EPA should reconsider reducing the total allowable interference specification.

3. Mr. Ollison noted that EPA should consider revising the O<sub>3</sub> monitor linearity certification specification downward from 0-500 ppb to a range more nearly reflecting current urban ambient O<sub>3</sub> levels (e.g., 0-250 ppb).

4. Mr. Ollison noted that the 2 ppb zero offset noted in recent EPA testing of the scrubberless UV O<sub>3</sub> monitor (UV-SL) may stem from the 1½% dilution of only the scrubbed analysis stream by the photolyzed nitrous dioxide (N<sub>2</sub>O) titrant gas. The vendor currently makes a compromise by providing a 98.5% interference-free instrument in exchange for halving the annual N<sub>2</sub>O consumption. The Agency may wish to encourage vendors to replumb an FRM version of the UV-SL monitor with a balanced unphotolyzed N<sub>2</sub>O addition also to the sample stream for use in locations where a 100% interference-free UV-SL is needed to attain the standard.

5. Mr. Ollison noted that the draft CASAC report's charge question #3 draft response at page 5 notes the following:

*"The 2B Tech Model 211 can use either a photolysis cell to produce NO from an external cartridge of pure N<sub>2</sub>O, or a cylinder of high concentration NO. In routine operation, the Model 211 consumes approximately 6 m<sup>3</sup> per year of N<sub>2</sub>O. This should be taken into account when considering cost and space requirements for deployment."*

Mr. Ollison noted that in his experience, use of a N<sub>2</sub>O cartridge (ca. 8 liter-atmospheres of N<sub>2</sub>O) is a convenient mobile sampling option, being light, cheap (50¢), requiring no regulator, and adequate to supply a monitor for 12 hours. Both cartridges and cylinders, for fixed site continuous use, store relatively pure N<sub>2</sub>O as a liquid so the point of the above CQ #3 AMMS comment about the need to consider cost and space requirements is uncertain. Use of a 10,000 ppm NO/N<sub>2</sub> compressed gas cylinder required by the NO-CL O<sub>3</sub> monitor seems less convenient, requiring corrosive gas regulators/plumbing and presenting a more toxic accidental leakage hazard.

Lastly, Mr. Ollison noted that while he had hoped that the topic of altitude effects of mixing standards would have been raised at the May 2014 Ozone NAAQS meeting, the topic was not

discussed. He asked why this issue was not brought up at the May 2014 Ozone NAAQS meeting.

Mr. Allen noted that ORD's ET-CL method testing results from Houston were in the presence of water vapor, and that ORD's results from its Houston testing were fine. Mr. Allen also noted that if ORD eventually proposes to make the UV-SL method an FRM, ORD should add additional detail to Appendix D-1 to 40 CFR Part 50 for the UV-SL method.

The DFO requested that Mr. Ollison send him the details of his five points, so that the minutes of the teleconference would accurately describe his clarifying comments. Mr. Ollison agreed to send the DFO a summary of the points he raised on the teleconference.

### **Action Items and Next Steps**

Mr. Allen asked whether there was any concern by any AMMS members with moving the current draft CASAC report, as revised on this teleconference, to the chartered CASAC for quality review. No AMMS members expressed any concerns with moving the draft CASAC report forward to the chartered CASAC for quality review with revisions incorporated as discussed during the June 12, 2014 AMMS teleconference. Mr. Allen noted that since AMMS members concurred with sending the draft CASAC report to the chartered CASAC for quality review, he and the DFO would revise the draft CASAC report as discussed during the June 12, 2014 AMMS teleconference and send the revised draft CASAC report to the chartered CASAC Designated Federal Officer for posting on the charter CASAC teleconference website for quality review.

Mr. Allen noted that he and the DFO would develop minutes for the June 12, 2014 AMMS teleconference that would be posted onto the CASAC teleconference website when they are final. The DFO noted that AMMS members should send any changes to their individual member comments provided within Appendix A of the CASAC AMMS' draft report dated May 30, 2014 to the DFO within the next week.

Mr. Allen thanked the AMMS members for their efforts, the public commenters, and all those in attendance for their interest in the work of the AMMS. With the meeting business concluded, the DFO Mr. Hanlon adjourned the public teleconference at 1:15pm ET.

Respectfully Submitted:

*/signed/*

Mr. Edward Hanlon  
Designated Federal Officer  
Science Advisory Board

Certified as Accurate:

*/signed/*

Mr. George A. Allen, Chair  
Air Monitoring and Methods  
Subcommittee

NOTE AND DISCLAIMER: The minutes of this public teleconference reflect diverse ideas and suggestions offered by AMMS members during the course of deliberations within the public teleconference. Such ideas, suggestions and deliberations do not necessarily reflect consensus advice from the AMMS members. In addition, any mention of trade names or commercial products does not constitute a recommendation for use. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters or reports prepared and transmitted to the EPA Administrator following meetings or teleconferences.

### **Materials Cited**

The following meeting materials are available on the SAB website ([www.epa.gov/sab](http://www.epa.gov/sab)) at the following CASAC AMMS June 12, 2014 public teleconference webpage:

<http://yosemite.epa.gov/sab/sabproduct.nsf/bf498bd32a1c7fdf85257242006dd6cb/d58cb9cddb90b06d85257c5b004fdf18!OpenDocument&Date=2014-06-12>

<sup>1</sup> March 13, 2014 Federal Register Notice announcing the public teleconference (79 FR 14245 – 14246)

<sup>2</sup> Agenda for June 12, 2014 public teleconference

<sup>3</sup> Public comments submitted by Ollison, Will, 4-17-14

**ATTACHMENT A – ROSTER**  
**U.S. Environmental Protection Agency**  
**Clean Air Scientific Advisory Committee**  
**CASAC Air Monitoring and Methods Subcommittee (AMMS)**  
**Review of Federal Reference Method for Ozone: Nitric Oxide-Chemiluminescence**

**CHAIR**

**Mr. George A. Allen**, Senior Scientist, Northeast States for Coordinated Air Use Management (NESCAUM), Boston, MA

**MEMBERS OF AMMS**

**\*Dr. David T. Allen**, Professor, Department of Chemical Engineering, University of Texas, Austin, TX

**Dr. Linda J. Bonanno**, Research Scientist, Division of Air Quality, New Jersey Department of Environmental Protection, Trenton, NJ

**\*Dr. Doug Burns**, Research Hydrologist, New York Water Science Center, U.S. Geological Survey, Troy, NY

**Dr. Judith C. Chow**, Nazir and Mary Ansari Chair in Entrepreneurialism and Science, Research Professor, Division of Atmospheric Sciences, Desert Research Institute, Nevada System of Higher Education, Reno, NV

**Dr. Kenneth Demerjian**, Emeritus Professor and Director, Atmospheric Sciences Research Center, State University of New York, Albany, NY

**Mr. Eric Edgerton**, President, Atmospheric Research & Analysis, Inc., Cary, NC

**Mr. Henry (Dirk) Felton**, Research Scientist, Division of Air Resources, Bureau of Air Quality Surveillance, New York State Department of Environmental Conservation, Albany, NY

**Dr. Philip Fine**, Assistant Deputy Executive Officer, South Coast Air Quality Management District, Diamond Bar, CA

**Dr. Philip Hopke**, Director, Institute for a Sustainable Environment and Bayard D. Clarkson Distinguished Professor, Clarkson University, Potsdam, NY

**Dr. Rudolf Husar**, Professor of Energy, Environmental and Chemical Engineering, Washington University, St. Louis, MO

**\*Dr. Daniel Jacob**, Professor, Atmospheric Sciences, School of Engineering and Applied Sciences, Harvard University, Cambridge, MA

**Dr. Peter H. McMurry**, Professor, Department of Mechanical Engineering, University of Minnesota, Minneapolis, MN

**Dr. Allen Robinson**, Raymond J. Lane Distinguished Professor and Head, Department of Mechanical Engineering, and Professor, Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA

**Dr. Armistead (Ted) Russell**, Professor, Department of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA

**Dr. James Jay Schauer**, Professor, Department of Civil and Environmental Engineering, College of Engineering, University of Wisconsin - Madison, Madison, WI

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**Dr. Yousheng Zeng**, Board Member, Providence Holding Company, Baton Rouge, LA

**SCIENCE ADVISORY BOARD STAFF**

**Mr. Edward Hanlon**, Designated Federal Officer, U.S. Environmental Protection Agency, Science Advisory Board Staff, Washington, DC

\*Did not participate in this Review.

## ATTACHMENT B – Other Attendees

**List of Members of the Public Who Requested Information on Accessing the June 12, 2014  
Teleconference line:  
June 12, 2014**

<b>Name</b>	<b>Affiliation</b>
Deitrich, Casey	CQ Transcriptions
Farrington, Linda	Eli Lilly and Company
Hall, Eric	EPA
Jansen, John	The Southern Company
King, Patrick	Teledyne Advanced Pollution Instrumentation
Laredo-Zepeda, Connie	City of San Antonio
Long, Russell	EPA
Ollison, Will	American Petroleum Institute
Radick, Lea	Inside EPA