UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

September 09, 2009

EPA-CASAC-09-014

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

Subject: Comments and Recommendations Concerning EPA's Proposed Rule for the Revision of the National Ambient Air Quality Standards (NAAQS) for Nitrogen Dioxide

Dear Administrator Jackson:

The Clean Air Scientific Advisory Committee (CASAC) Oxides of Nitrogen Primary National Ambient Air Quality Standards (NAAQS) Review Panel held a public teleconference on August 10, 2009 to discuss the Environmental Protection Agency's (EPA) Proposed Rule for the Revision of the NAAQS for Nitrogen Dioxide (NO_2) published in the Federal Register on July 19, 2009 (74 FR 34404-34466). In that notice, EPA proposed to retain the current annual standard and institute a new one-hour standard based on a two-tier (area-wide and near-road) monitoring network. The proposal also described an alternative approach to setting a new one–hour standard, which would be based on area-wide monitors only.

Prior to reviewing the proposed rule, CASAC had provided advice to EPA on its *Integrated Science Assessment (ISA) for Oxides of Nitrogen – Health Criteria* and on EPA's draft *Risk and Exposure Assessment (REA) to Support the Review of the NO_2 Primary National Ambient Air Quality Standard.* The REA synthesized available scientific information discussed in the ISA to characterize NO_2 exposures and the associated risks with different profiles of exposure, but did not discuss the alternative monitoring scenarios described in EPA's July proposed rule. In reviewing the REA, CASAC supported a short-term standard for NO_2 and in reviewing the proposal, CASAC supports the proposed one-hour averaging time in EPA's proposed rule.

Since EPA's REA did not address NO_2 monitoring issues, the CASAC panel discussed monitoring issues, EPA's proposed monitoring approach, and proposed alternative approach extensively during the August teleconference. There was a split view on the two approaches among both CASAC and CASAC panel members with a majority of each favoring the Agency's proposed two-tiered monitoring network because they thought this approach would be more effective in limiting near-roadway exposures that may reach levels in the range at which some individuals with asthma may be adversely affected. Other members acknowledged the need for research and development of near-road monitoring data for criteria pollutants in general but favored retention of EPA's current area-wide monitoring for NO_2 regulatory purposes, due to the lack of epidemiological data based on near-roadway exposure measurements and issues related to implementing a near-road monitoring system for NO_2. CASAC panel

members agreed to present these different views in this letter, as there was not consensus. Enclosure A provides further comments about approaches to near-road monitoring.

Assuming that the Agency proceeds with the proposed two-tier monitoring approach, CASAC recommends the following:

1) retention of the current annual NO_2 standard.
2) establishment of a one-hour standard with the following characteristics:
   - use of NO_2 as the appropriate indicator.
   - a form based on a three-year average. The 98th percentile is preferred by CASAC for the form, given the likely instability of measurements at the upper range and the absence of data from the proposed two-tier approach.
   - the level of the one-hour NO_2 standard should be within the range of 80-100 ppb and not above 100 ppb. In its letter of December 2, 2008, CASAC strongly voiced a consensus view that the upper end of the range should not exceed 100 ppb, based on evidence of risk at that concentration. The lower limit of 80 ppb was viewed as reasonable by CASAC; selection of a value lower than 80ppb would represent a policy judgment based on uncertainty and the degree of public health protection sought, given the limited health-based evidence at concentrations below 100 ppb.

If the alternative monitoring approach is selected, CASAC recommends that a one-hour NO_2 standard be set in the range of 50 to 75 ppb, if protection is to be approximately equivalent to the range of 80-100 ppb with the two-tier approach.

CASAC members recognize that the Agency is moving quickly to promulgate the new NAAQS for NO_2 on a court-ordered schedule. However, the proposed rule involves a substantially new approach to monitoring that might have benefited from a more in-depth review by CASAC than was possible with the schedule for comments. In the enclosure, CASAC comments on the need for a comprehensive approach to developing a near-roadway network that would involve other pollutants, in addition to NO_2.

This letter summarizes the main recommendations from the CASAC, while the enclosed comments (Enclosure A) provide further detail. Enclosure B provides a panel roster. We hope that our comments will prove useful as you evaluate the current NAAQS for NO_2. If you have questions about our advice, please do not hesitate to contact me.

Sincerely,

/Signed/

Dr. Jonathan Samet, Chair
Clean Air Scientific Advisory Committee

Enclosures

NOTICE

This report has been written as part of the activities of the EPA's Clean Air Scientific Advisory Committee (CASAC), a federal advisory committee independently chartered to provide extramural scientific information and advice to the Administrator and other officials of the EPA. CASAC provides balanced, expert assessment of scientific matters related to issues and problems facing the Agency. This report has not been reviewed for approval by the Agency and, hence, the contents of this report do not necessarily represent the views and policies of the EPA, nor of other agencies within the Executive Branch of the federal government. In addition, any mention of trade names of commercial products does not constitute a recommendation for use. CASAC reports are posted on the EPA website at http://www.epa.gov/CASAC.

Enclosure A

General Comments on Proposed NO_2 Monitoring Requirements

A number of issues were identified by CASAC that are specific to roadside monitoring and the use of data from near-roadway monitors to determine attainment.

1. Support for EPA's two-tiered monitoring network for NO_2 regulatory monitoring

A majority of CASAC panelists supported the Agency's proposed two-tiered monitoring network because they thought this approach would be more effective in limiting near-roadway exposures that may reach levels in the range at which some people with asthma may be adversely affected, as indicated in clinical and controlled human exposure studies. Members also indicated support for near-road monitoring if EPA took steps to address concerns outlined in Section 2 of this enclosure.

Panel members also supported the proposed two-tiered approach because basing regulations on area-wide monitoring alone was problematic. Such an approach would require EPA to embed uncertainties and assumptions about the relationship between area-wide and road-side monitoring into the area-wide standard. Panel members supported the two-tiered approach as a means to start gathering specific information about roadside exposures that will be used for public health protection.

The area-wide monitoring utilizing existing sites should continue as proposed. The area-wide monitoring would provide a link to historically observed concentrations. It would thus support showing progress in reducing NO_x for NO_2, ozone and PM control programs and would also continue to support health analyses. In contrast, new roadside measurements of NO_2 alone would provide minimal information on near-road multi-pollutant exposures and may have limited value in supporting future health studies.

2. Support for alternative area-wide monitoring only for NO_2 regulatory monitoring [EPA solicited comment on a lower range of levels (>50 to <75 ppb) to provide a similar degree of public health protection to that intended by the proposed approach and proposed range of levels (in conjunction with the same forms as those proposed]

As noted in the Federal Register (July 15, 2009, pg. 34436):"In making judgments regarding the weight to place on the scientific evidence and exposure/risk information, the Administrator has considered the results of epidemiologic studies, controlled human exposure studies, and exposure/risk analyses as well as the uncertainties associated with this evidence and these analyses. Specifically, she notes the following: "The ISA concluded that epidemiologic studies provide the strongest support for the relationship between short-term exposure to NO_2 and respiratory morbidity." While it is recognized that the epidemiologic studies likely included people exposed along roadways among those affected populations, those epidemiologic studies that are relied upon by the Administrator (e.g., those displayed in Figures 4 and 5 of the Federal Register) did not generally use near-roadway exposure data, but instead usually relied upon conventional area-wide monitoring in developing their reported NO_2-health effects associations. As such, in the face of a lack of sufficient near-roadway health effects studies to develop direct

exposure-health effects relationships, it would be better to set the standard on the same area-wide monitoring basis as employed in the epidemiologic studies upon which it now relies.

Several CASAC panel members noted the difficulty of designing a roadside monitoring network for NO_2 at this time. Roadside monitors will be more likely to experience excursions of concentrations to very high values than area-wide monitors because they are nearer to sources and more susceptible to periods of high episodic emissions, low dispersion and other events that could lead to high peak monitored levels that are not reflective of more widespread levels (e.g., heavy congestion near a monitor, and trucks idling near the monitor). In the absence of more detailed roadside data collection, it will be difficult to identify the causes of extreme near-road NO_2 concentrations or to understand how such concentration values are reflected in exposures of nearby urban populations. Further data collection and analyses are needed to determine the causes and frequency of extreme concentrations monitored by near-road monitors and to understand how such peak concentrations relate to those measured in the current, population-oriented network.

The concentrations monitored will be very sensitive to the specific location of near-road monitors, including exact distance from the roadway, height of monitor inlet, orientation with respect to prevailing wind directions (during peak traffic periods), and other likely factors. Differences in the microscale environments of different roadside monitors may result in one area being out of attainment even though the area actually has similar, and possibly lower, maximum NO_2 levels than other areas. This possibility also exists for area-representative monitoring, but the likelihood of such non-representative values is reduced because the monitoring approach is not intended to capture the extreme upper end of the distribution. Various logistical considerations are likely to further constrain the options for establishing new roadside monitoring sites. Practical siting considerations could mean that selected locations will not be reflective of the maximum concentrations in the target area. Unless siting criteria are very tightly constrained, data may not be directly comparable across different cities or sites within cities.

To identify the locations with maximum NO_2 levels will be difficult, and the proposed approach may miss the locations where the maxima occur. The proposed approach to identification of monitor sites may be unsatisfactory in many locations, because it is based primarily on traffic count. Diesel trucks emit more NO_x than cars, and it would be expected that the actual maximum levels would be found in areas of high diesel activity (including rail yards and shipping) with reduced dispersion (e.g., street canyons). Open freeways that have high usage by light duty vehicles would not necessarily have the highest levels. In the design of a network to identify the maximum NO_2 levels in an area, we would support a more broad assessment to predict the locations having the likely highest NO_2 levels based upon investigation of model results [e.g., Community Multiscale Air Quality (CMAQ) and Land Use Regression (LUR) modeling, and Gaussian plume models, if available] and also emissions inventories. For example, CMAQ results, if available at a 4 or 12 km resolution, could be used to help inform analyses directed at identifying locations with likely higher area-wide NO_2 levels, although such analyses would be less informative on locations with the highest NO_2 levels in a city. The Agency could also use diesel truck activity. We note that the traffic data bases include activities by various classes of vehicles. Thus, we strongly support further analysis of the current NO_2

data, diesel truck activity data, model results, and emissions inventories, as well as vehicle activity data, to identify where area-representative sites might be placed to capture broad areas with higher NO_2 levels.

The use of diesel particle filters (DPFs) adds complexities to siting and to data interpretation. DPFs can lead to significant increases in the fraction of NO_2 in NO_x emissions. This phenomenon has been observed in London, England, where there have been NO_2 increases in areas where DPFs are being used, and it may increase the potential to have local NO_2 "hot spots" in locations with more presumably "cleaner" diesel vehicles in use. This phenomenon also will impact how near-road observations are related to more general population exposures.

CASAC is further concerned by the suggestion in the proposal that building tops may be used for monitor placement. This placement should be done with caution as building tops may not be informative of much higher NO_2 concentrations at lower heights where dispersion is limited.

The expected high spatial variability of roadside NO_2 concentrations also raises questions about the spatial representativeness of roadside monitor results. How large a non-attainment area is defined by a roadside violation? What population (if any) is assumed to be affected by the roadside concentrations? What is the public health message in presenting the results? Will the daily AQI for the county be driven by the relatively highest measurement from among neighborhood-scale (8-hr) ozone, (24-hour) $PM_{2.5}$ monitors and roadside 1-hour NO_2 – the latter of which by design does not represent the populations covered by the $PM_{2.5}$ and O_3 monitors? Would an effective control strategy be to reroute traffic from the high-speed urban freeway (with the monitor) onto low speed urban residential streets (without monitors)?

If the Administrator decides to adopt the alternative approach, monitoring issues remain.

1. Preferably the NO/NO_2 monitoring would be done in locations that include CO, ozone and PM species monitoring as well.
2. EPA should follow the CASAC recommendation in regard to the level of the standard.
3. Having the state/local air quality managers assess how the current network satisfies the goal of providing data representative of area-wide (not maximum) concentrations is appropriate. As noted above, the population threshold may be too low (it is not apparent that all cities with a population above 350,000 will have NO_2 levels approaching the potential revised standards), and such a choice needs further support and review. One could consider requiring that removal of NO/ NO_2 monitors not be allowed, and repositioning would need to have approval by the Regional Administrator. Further, each state could be required to have at least one NO_2 monitor sited to represent areas with higher NO_2 exposures. Giving the Regional Administrator discretion to require additional monitoring to address community impacts is justified based on appropriate analyses (e.g., using modeling and emissions data).
4. The definition of "area-wide" is not very specific, though it reflects the realities of monitoring. It would be useful to specify a minimum distance that a monitor could be placed from a major facility (including freeways and highways), e.g., that a monitor that is representative of area-wide NO/ NO_2 should not be placed within 100 m of a major

facility (with a further definition of major facility in terms of expected NO_x emissions; for roads this could be in terms of NO_x per 100m).

3. Characterizing near-road exposures for multiple pollutants

If EPA undertakes near-road monitoring, the Agency should proceed with care and seek advice and review of the design of the network by technical experts, such as those in the CASAC Ambient Air Quality Monitoring Subcommittee.

A smaller roadside network with more comprehensive measurements to better characterize near-road exposures to and gradients for a complex mixture of mobile source pollutants may provide more information than a new roadside monitoring network with hundreds of sites having only NO_x monitors and meteorological instrumentation. In addition to characterizing NO_2 and NO and meteorology, such monitoring should include CO, continuous PM, with speciation as possible (e.g., including elemental carbon or black carbon, continuous nitrate and sulfate, as possible, and possibly CO_2 and gaseous VOCs). Such an alternative network, as discussed below, would not be designed to have all monitors necessarily placed in locations with the highest NO_2 concentrations, but would also include locations that are impacted by heavy duty vehicle emissions, light duty vehicle emissions and suspended road dust Consideration would need to be given to the extent to which the network is designed with orientation towards areas with minimal dispersion (street canyons). Another siting criterion should be whether there is a location of interest near the roadway (e.g., a school, hospital, park, etc.) that may be attended or inhabited by persons in susceptible or vulnerable subpopulations. The need to have a more comprehensive set of measurements is highlighted by the likelihood of more extensive use of DPFs. If only NO_2 observations were available, it might appear that air quality was deteriorating, when in actuality significant reductions in particulate matter are occurring. This would affect how such observations might be used in assessing the impact of controls and associating pollutant concentration changes to health outcomes.

CASAC is very strongly supportive of a special-purpose monitoring network oriented towards roadside monitoring that is not used for attainment purposes at this point but for research. It would be designed to characterize pollutants in areas with high exposure to traffic-derived pollutants of all types, including heavy duty and light-duty vehicle emissions, tire and brake wear and road dust, and would include pollutants beyond NO and NO_2 as discussed above. Detailed meteorological measurements would be well justified at these more intensive sites, as would automatic traffic counters.

Further, such a special network would specifically include variability in terms of site location (different distances to the facility, different highway characteristics) and type of monitoring to provide the type of data that would better inform our understanding of pollutant dynamics, control strategy effectiveness, and how a future road-side network should be designed for use in attainment decisions and standard setting. Such a network should go in quickly to capture the changes in emissions that are occurring in response to various controls. Funding for such special purpose monitoring may have to come predominantly from EPA. One approach for establishing the monitoring would be through competitive grants to state and local agencies. The network would likely be limited in scope, possibly on the order of 20 to 50 sites and it could

evolve over time as information is gained. A single city might have multiple near-road special-purpose monitors to address issues in siting near-road monitors and to understand relationships between roadside concentrations and larger population exposures. Cities with various characteristics should be chosen for assessing near-road monitoring issues. This approach appears to fit well with a recent EPA document, "Ambient Air Monitoring Strategy for State, Local, and Tribal Air Agencies," which states:

> "With this background, EPA's Strategy currently recognizes (1) the importance of near roadway exposures, and (2) the need for further exploration of the meaning of these exposures to both NAAQS-oriented monitoring networks and air toxics networks. Monitoring near roadways has, to date, been limited to research-level monitoring. As monitoring networks evolve, it is vital that monitoring near roadways be further investigated and eventually integrated into the monitoring networks. Currently, EPA and others continue to evaluate strategies for incorporating this monitoring into the other components of the monitoring Strategy primarily as a means of determining health risks and impacts on urban attainment. EPA intends to consult with SLTs and other stakeholders about the eventuality of developing the near-roadway component of ambient monitoring. The primary consideration would be to operate a small number of sites spaced in varying geographical areas of the country in an initial attempt to address near-roadway issues. Outcomes from EPA's Office of Research and Development's (ORD) near-roadway studies that began in 2006 and extend through 2009 or 2010 would heavily influence where, how, and when a near-roadway monitoring pilot would occur."

If there is a mechanism to begin more comprehensive roadside monitoring but not include such data in attainment determination, then a two-tier monitoring approach is potentially attractive for support of health studies that could be used in future NAAQS reviews. However, as discussed above, such monitoring should not be limited to NO and NO_2 only, but also include CO, continuous PM mass, and continuous total carbon/elemental carbon (or black carbon). Without this additional data, the results would be significantly less informative. If, as part of the current CO and PM reviews, a network of roadside monitoring of all of these species was proposed and implemented, the data could potentially be used in supporting a future NAAQS revision for those species. The data would be more readily used in a multi-pollutant air quality control program and for the determination of the effectiveness of control measures. Monitoring of NO/NO_2 alone would not be as informative, particularly given the changing make-up of both light and heavy duty fleets, applied controls, and the change in traffic volumes.

4. Additional issues

The CASAC panel determined that the proposed data quality objectives are appropriate.

The chemiluminescent approach is appropriate. It would be good to improve and extend the technique to give both true NO_2 as well as NO_y. However, that would not be viable within the time frame of this rulemaking.

The justification for the meteorological measurements is unclear in regard to assessing attainment. The need for and uses of such data should be better supported. We agree that such monitoring would be very useful at comprehensive monitoring sites.

Enclosure B

ROSTER
U.S. Environmental Agency
Clean Air Scientific Advisory Committee
Oxides of Nitrogen Primary National Ambient Air Quality Standards Panel

CHAIR
Dr. Jonathan M. Samet, Professor and Chair, Department of Preventive Medicine, University of Southern California, Los Angeles, CA

CASAC MEMBERS
Dr. Joseph Brain, Philip Drinker Professor of Environmental Physiology, Department of Environmental Health, Harvard School of Public Health, Harvard University, Boston, MA

Dr. Ellis B. Cowling, University Distinguished Professor At-Large Emeritus, Colleges of Natural Resources and Agriculture and Life Sciences, North Carolina State University, Raleigh, NC

Dr. James Crapo, Professor of Medicine, Department of Medicine, National Jewish Medical and Research Center, Denver, CO

Dr. H. Christopher Frey, Professor, Department of Civil, Construction and Environmental Engineering, College of Engineering, North Carolina State University, Raleigh, NC*

Dr. Donna Kenski, Data Analysis Director, Lake Michigan Air Directors Consortium, Rosemont, IL*

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

CONSULTANTS
Prof. Ed Avol, Professor, Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA

Dr. John R. Balmes, Professor, Department of Medicine, Division of Occupational and Environmental Medicine, University of California, San Francisco, CA*

Dr. Terry Gordon, Professor, Environmental Medicine, New York University School of Medicine, Tuxedo, NY

Dr. Dale Hattis, Research Professor, Center for Technology, Environment, and Development, George Perkins Marsh Institute, Clark University, Worcester, MA

*Unable to participate in the August 10, 2009 CASAC Public Teleconference

Dr. Rogene Henderson, Senior Scientist Emeritus, Lovelace Respiratory Research Institute, Albuquerque, NM

Dr. Patrick Kinney, Associate Professor, Department of Environmental Health Sciences, Mailman School of Public Health , Columbia University, New York, NY

Dr. Steven Kleeberger, Professor and Lab Chief, Laboratory of Respiratory Biology, National Institute of Environmental Health Sciences, National Institutes of Health, Research Triangle Park, NC

Dr. Timothy V. Larson, Professor, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA

Dr. Kent Pinkerton, Professor, Regents of the University of California, Center for Health and the Environment, University of California, Davis, CA*

Dr. Edward Postlethwait, Professor and Chair, Department of Environmental Health Sciences, School of Public Health, University of Alabama at Birmingham, Birmingham, AL

Dr. Richard Schlesinger, Associate Dean, Department of Biology, Dyson College, Pace University, New York, NY

Dr. Christian Seigneur, Director, Centre d'enseignement et de recherche en environnement atmosphérique (CEREA), Ecole nationale des ponts et chaussées (ENPC), Université Paris-Est, CEREA - ENPC, Marne la Vallée, , France

Dr. Elizabeth A. (Lianne) Sheppard, Professor, Biostatistics and Environmental & Occupational Health Sciences, School of Public Health, University of Washington, Seattle, WA

Dr. Frank Speizer, Edward Kass Professor of Medicine, Channing Laboratory, Harvard Medical School, Boston, MA

Dr. George Thurston, Professor, Environmental Medicine, NYU School of Medicine, New York University, Tuxedo, NY

Dr. James Ultman, Professor, Chemical Engineering, Bioengineering Program, Pennsylvania State University, University Park, PA

Dr. Ronald Wyzga, Technical Executive, Air Quality Health and Risk, Electric Power Research Institute, Palo Alto, CA

SCIENCE ADVISORY BOARD STAFF

Dr. Angela Nugent, Designated Federal Officer, 1200 Pennsylvania Avenue, NW 1400F, Washington, DC, Phone: 202-343-9981, Fax: 202-233-0643, (nugent.angela@epa.gov)

*Unable to participate in the August 10, 2009 CASAC Public Teleconference