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October 4, 2007

Stephen L. Johnson, Administrator
U.S. Environmental Protection Agency
Air and Radiation Docket
Mail Code 6102T
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Attention: Docket I.D. No. EPA-HQ-OAR-2005-0172

Re: *Proposed Rule – National Ambient Air Quality Standards for Ozone*

Dear Administrator Johnson:

The Northeast States for Coordinated Air Use Management (NESCAUM) offer the following comments on the U.S. Environmental Protection Agency's (EPA's) proposal, published on July 11, 2007 in the Federal Register, entitled *National Ambient Air Quality Standards for Ozone* (72 FR 37818-37919). NESCAUM is the regional association of air pollution control agencies representing Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

Since the last review of the National Ambient Air Quality Standard (NAAQS or standard) for ozone, a new, robust and more sophisticated body of health studies has clearly shown that the current primary ozone NAAQS does not adequately protect public health from the adverse health effects of ozone. In light of this evidence, the EPA Administrator, EPA staff, and the Clean Air Scientific Advisory Committee (CASAC, the independent advisory group to the EPA) have all recognized the need for a more stringent ozone standard. Ozone exposure has the potential to affect healthy children and adults, as well as people with lung and cardiovascular disease. The health effects of ozone range from respiratory irritation to asthma, reduced lung function, and death. The NESCAUM states urge the EPA to set the primary ozone NAAQS within the CASAC-recommended range of 0.060 to 0.070 parts per million (ppm).

The CASAC strongly endorsed the EPA Staff Paper recommendation that a secondary ozone NAAQS in a form substantially different from the primary ozone NAAQS is necessary to protect vegetation. NESCAUM urges EPA to establish a secondary ozone NAAQS of the W126 form as proposed by EPA (see 72 FR 37883), and within the CASAC-recommended range of 7-15 ppm-hours. The upper end of EPA's proposed range of 7-21 ppm-hours would not afford adequate plant protection.

Primary Ozone Standard

Recommendation

NESCAUM agrees with the EPA Administrator, EPA Staff, and CASAC determinations that the current primary ozone NAAQS (0.08 ppm) does not protect public health with an adequate margin of safety. CASAC concluded that the standard should be "substantially reduced" in order to be protective of public health. Since the last ozone NAAQS review, a robust and more sophisticated body of health studies, from single and multi-city studies, as well as controlled clinical studies of healthy volunteers, has been amassed that clearly shows adverse health effects occur at concentrations that are lower than the current standard.

The EPA Administrator, EPA staff, and CASAC have all stated the need for a more stringent ozone NAAQS. EPA staff recommended a primary ozone NAAQS within the range of "somewhat below 0.080 ppm to 0.060 ppm."[1] CASAC unanimously recommended a range of 0.060-0.070 ppm.[2] Despite CASAC's recommendation, however, EPA has proposed a NAAQS ranging from 0.070-0.075 ppm (specified to the nearest thousandth ppm) and is requesting comment on retaining the current standard of 0.08 ppm. EPA's proposed range of 0.070-0.075 ppm is outside of the CASAC recommend range and only coincides with the upper range of that recommendation. NESCAUM is confounded as to why the EPA did not follow CASAC's unanimous recommendation for the primary ozone NAAQS and why EPA is accepting comments on maintaining the current standard. This is particularly perplexing as CASAC concluded that the current NAAQS is not supported by the relevant scientific data, a position with which the EPA Administrator has voiced agreement.[3]

The NESCAUM states strongly support establishing a primary ozone NAAQS within the CASAC-recommended range of 0.060-0.070 ppm. There is ample scientific evidence to support revising the primary ozone NAAQS to within the CASAC-recommended range in order to reflect an adequate margin of safety in protecting public health.

Health Studies Support an Ozone NAAQS within the Range of 0.060-0.070 ppm

A standard of not higher than 0.070 ppm can be justified based on current health data. For example, chamber data indicate significant effects at 0.08 ppm averaged over 6.6 hours in healthy adults; multi-city longitudinal data in asthmatic children show significant lung function

[1] EPA OAQPS Staff Paper, "Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information," EPA-452/R-07-007, July 2007 p. 6-86.

[2] Clean Air Scientific Advisory Committee (CASAC) Peer Review of EPA's 2nd Draft Ozone Staff Paper, October 24, 2006, EPA-CASAC-07-001.

[3] Testimony of Stephen L. Johnson, Administrator, US EPA, before the U.S. Senate Environment and Public Works Committee, Subcommittee on Clean Air and Nuclear Safety, July 11, 2007.

decrements (LFD) at ambient levels as low as 0.066 ppm averaged over 8 hours (99th percentile); and a large body of significant single-city and multi-city epidemiological studies document respiratory effects and premature mortality effects at ambient air concentrations ranging from about 0.040 – 0.090 ppm averaged over 8 hours (99th percentile).

Additionally, since the last ozone NAAQS review, a large number of new studies document the detrimental health effects associated with ozone exposure and demonstrate the need for a more stringent ozone NAAQS. Analyses of the current health data by EPA staff has led to the following conclusions:

1. "reinforces our judgments about causal relationships between [ozone] exposure and respiratory effects observed in the last review";

2. "broaden[s] the evidence of [ozone]-related associations to include additional respiratory-related endpoints, newly identified cardiovascular-related health endpoints, and mortality";

3. "[n]ewly available evidence has also identified increased susceptibility in people with asthma"; and

4. "advance[s]our understanding of potential mechanisms by which ambient [ozone], alone and in combination with other pollutants, is causally linked to a range of respiratory- and cardiovascular-related health endpoints."[4]

The health studies clearly demonstrate the need for an ozone NAAQS within the range of 0.060-0.070 ppm. The evidence also suggests that people with asthma, especially children, experience more serious health effects caused by ozone exposure. Therefore, studies of healthy subjects likely underestimate ozone related effects on asthmatics and other sensitive groups. Clearly, there is a compelling need to revise the ozone NAAQS to fall within the range of 0.060-0.070 ppm.

Limitations of the Studies Underscore the Need for a Stringent NAAQS

Some limitations of the health studies done to date suggest that health effects may occur at even lower ozone concentrations than observed in chamber studies and underscore the need for an even more stringent standard, as follows:

1. Significant lung function decrements were observed at 0.08 ppm for 6.6 hour in chamber studies in <u>healthy</u> adults. In these healthy adult studies, some respiratory symptoms were

[4] EPA OAQPS Staff Paper, "Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information," EPA-452/R-07-007, July 2007, pp. 6-7 to 6-8.

increased at 0.06 ppm for 6.6 hours, although this increase was not statistically significant. Evidence supports the expectation that asthmatics, particularly children, will be more sensitive and experience larger lung function decrements than healthy adults.

2. The EPA risk assessment focused only on four outcomes, and did not look at the effects of ozone on children four years of age or younger. This is clearly a gap in the health data and may further underestimate the health risks from ozone.

3. There is no clear evidence regarding a threshold concentration for ozone at which there are no observed health effects. This underscores the need to promulgate a health protective standard with an adequate margin of safety.

4. Chamber studies generally expose participants to ozone only, not to the mix of photochemical oxidants that is typically present in ambient air and for which ozone is used as an indicator. This may underestimate health risks from ozone.

5. The EPA risk assessment focused on quantifying accrued health benefits of reducing the ozone standard in just 12 metropolitan statistical areas (MSA). This likely underestimates aggregate health benefits because of the regional character of ozone that would extend benefits to adjacent areas beyond the MSA boundaries.

In addition, separate research groups recently analyzed the available health research in the U.S. and Europe, and independently and consistently found a strong linkage between increases in ozone and risk of premature death. Recent studies also indicate that ozone may contribute to cardiac morbidity. These health consequences have not been accounted for previously, thus the costs of not reducing ozone pollution are far higher than once believed.

Form of the NAAQS

NESCAUM supports EPA's proposal to specify the 8-hour ozone NAAQS to the nearest thousandth ppm. This reflects the precision that exists with current monitoring technology. It is not appropriate and does not ensure public health protection to employ rounding conventions to the nearest hundredth ppm as was done for the 1997 NAAQS.

NESCAUM generally supports the form of the three-year average of the annual fourth highest daily maximum 8-hour concentration.

EPA does not propose to change the method (Appendix P to Part 50 Section 2.1) to determine the daily maximum 8-hour average concentration, stating that "[g]enerally overlapping daily maximum 8-hour averages are not likely, except in those non-urban monitoring locations with less pronounced diurnal variation in hourly concentrations"(73 FR 37917). For high elevation sites and sites experiencing long range transport, however, overlapping daily maximum 8-hour averages have occurred for the current ozone standard and are likely to occur more often under a more stringent standard (see Appendix A, Figure 1). This could have significant policy ramifications, especially if the overlapping event is one of the ozone season's top four events affecting the design value for that site (see example in Appendix A, Figures 2 and 3). To address this particular situation for these types of sites, NESCAUM recommends that, when determining the daily maximum 8-hour average concentration for those sites, EPA factor in when the ozone production occurred and the associated 1-hour concentration pattern. If the 1-hour peak occurs before sunrise, then the 8-hour maximum should be assigned to the previous day (see Appendix A, Figures 2 and 3). As shown in Appendix A, Figure 4, determining the 8-hour maximum may be difficult. NESCAUM therefore recommends that the maximum determination be made on a case-by case basis.

Implications of Nonattainment

If the ozone standard is set within the CASAC's recommended range, then the number of people in the NESCAUM region who could directly benefit from air quality improvements to meet the new standard could increase by 16 million people, which is almost 40 percent of the population in our region. Increased public health protection could extend to nearly 97 percent of the people living in the Northeast. This is based on ozone control strategies within the Ozone Transport Region (OTR) that are planned to be in place by 2009 (i.e., ozone modeling projections for 2009). Increased protection for such a large population would result in significant health benefits to our region.

For the Northeast, the difference in population potentially affected by ozone pollution at the two ends of the CASAC-recommended range is about one million people. For a standard set at 0.070 ppm, about 40.4 million people could be affected in the Northeast. For a standard set at 0.060 ppm, that number could increase to 41.5 million.[5]

EPA, in its Regulatory Impact Analysis (RIA),[6] has stated that the health benefits of a NAAQS set at 0.070 ppm attained in 2020 could be in the billions of dollars, citing a range from as low as \$2.5 to \$24 billion per year[7] and as high as \$11 to \$33 billion per year. We note that EPA estimated health benefits on the order of \$17 billion per year in 2020 when it set the recent fine particle NAAQS.

NESCAUM conducted an analysis and estimated the magnitude and value of avoided adverse health endpoints that would result in attaining a range of proposed ozone primary NAAQS in

[5] The numbers are based on county level populations. For this comparison, the total population in the Northeast is 41.7 million.

[6] EPA OAQPS, "Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Ground-Level Ozone." EPA-452/R-07-008. July, 2007.

[7] EPA's RIA low end benefits estimates assume no causal relationship between ozone exposure and mortality. However, EPA in its 2nd Draft Ozone Staff Paper stated that "… the newly available information… broadens the evidence of O3 -related associations to include… mortality" (Pages 6-6 and 6-7).

2018 in the OTR[8] after implementing a suite of actual and hypothetical control programs, including some planned OTR control strategies and an enhanced electric power generation strategy (CAIR+). The use of this hypothetical control scenario is meant to create a base case in which the modeled region meets or is close to meeting the current ozone NAAQS; the measures incorporated in the base case are not necessarily the actual measures to be adopted by individual states for attaining the present ozone NAAQS. In estimating the benefits, NESCAUM used EPA's Environmental Benefits Modeling and Analysis Program (BenMAP), the same model EPA used in its RIA for the proposed ozone NAAQS. BenMAP can currently roll back monitored ozone data to user-specified standards and calculate the health benefits of the rollback. The results indicated that: (1) adopting an ozone NAAQS of 0.075 ppm (i.e., the upper limit of EPA's proposal) could result in an estimated 27 to 142 avoided premature deaths over the 2018 ozone season in the OTR. When added to the benefits from avoided morbidity endpoints, we estimated a monetary benefit of 192 to 918 million dollars over the 2018 ozone season; (2) adopting an ozone NAAQS of 0.070 ppm (i.e., the upper limit of the CASAC recommended range), could result in 43 to 220 avoided premature deaths in the OTR over the 2018 ozone season. When added to the benefits from avoided morbidity endpoints, we estimated an additional monetary benefit of 107 to 498 million dollars beyond the 0.075 ppm standard (total benefit of 300 million to 1.4 billion dollars after CAIR+); (3) adopting an ozone NAAQS at the lower end of the CASAC recommended range, 0.060 ppm, could result in an estimated 84 to 407 avoided premature deaths in the OTR over the 2018 ozone season. Compared to the 0.075 ppm scenario, the modeling indicates that a NAAQS set at 0.060 ppm could net almost twice the monetary benefit with a benefit of 394 million dollars to 1.7 billion dollars beyond the 0.075 ppm scenario (total benefit of 530 million to 2.6 billion dollars after CAIR+).

NESCAUM's BenMAP results indicate substantial benefits from revising the current ozone NAAQS to within the CASAC range. Even in this regard, however, we believe the benefit estimates are quite conservative and are likely substantially higher, for the following reasons:

- The rollback method uses unadjusted modeled 2018 ozone concentrations as proxies for monitored data that likely underestimate regional ozone levels,[9] therefore the extent of actual ozone reductions in the Northeast in 2018 may be greater than estimated in the rollback method.
- The ozone background level used of 0.040 ppm is higher than EPA's policy relevant background of 0.015 to 0.035 ppm, so ozone reductions could occur to lower levels than allowed in the rollback method employed here. Not accounting for lower

[8] The analysis included the entire state of Virginia, thus the results include incidences and monetized benefits beyond the DC metropolitan portion of Virginia within the Ozone Transport Region.

[9] In general, the model tends to underestimate ozone levels in most grid cells of the model domain during the full ozone season. In a subset of high peak ozone days, however, the model can overpredict ozone levels in some grid cells during some hours, but these incidents are spatially and temporally limited.

potential levels of ozone will reduce the estimated benefits of a more stringent ozone NAAQS.

- The estimated benefits do not include consideration of additional reductions in mortality and morbidity endpoints associated with reduced $PM_{2.5}$ due to NOx reductions needed to meet a more stringent ozone NAAQS. The EPA's Regulatory Impact Analysis indicates these can be in the billions of dollars, thus substantially increasing the projected benefits from a revised ozone NAAQS.
- The estimated health benefits do not include potential benefits from reduced volatile organic compound (VOC) emissions. Many VOCs are air toxics and can have health impacts apart from their contributions to ozone formation.
- The analysis covered the period May 15 through September 15, thus omitting four weeks of the ozone season. In addition, there may be adverse health impacts from ozone exposure during the non-ozone season, as elevated ozone values in the 0.060 ppm range have been monitored in portions of the domain outside the assumed ozone season.
- BenMAP calculates school absences based on the assumption that children are in school during all of May, two weeks in June, one week in August, and all of September. The estimated health benefits do not account for absences during summer school sessions.
- The focus on the primary ozone NAAQS in this analysis does not include benefits from non-health endpoints (i.e., welfare values), such as reduced losses in the agriculture and forestry sectors due to lower regional ozone levels.

Appendix B presents NESCAUM's analysis for the Northeast using BenMAP to monetize the health benefits associated with strengthening the ozone primary NAAQS.

Mandate to Solely Consider Health Effects when Setting a NAAQS

EPA must clearly distinguish its standard-setting obligations from attainment challenges. While EPA is required to conduct RIAs when proposing NAAQS revisions, which may include information about costs under various NAAQS scenarios, such analyses must not come into play in EPA's decision on setting the level of the NAAQS. EPA has an obligation under the Clean Air Act, as underscored in 2001 by the Supreme Court in *Whitman v. American Trucking*,[10] to set a NAAQS based solely on what is requisite to protect public health, without considering the costs of attainment. We expect EPA to uphold its obligation and set the ozone NAAQS within the recommended CASAC range in order to protect public health with an adequate margin of safety.

[10] Whitman v. American Trucking Associations, Inc., 531 U.S. 457 (2001).

EPA's Regulatory Impact Analysis Assumptions

Notwithstanding EPA's statutory obligation to set the NAAQS solely on public health considerations, we recognize that Executive Order # 12866 requires the Agency to conduct an RIA. The RIA, released on August 2, 2007, provides EPA's assessment of the potential benefits, costs, and economic impacts associated with the ozone NAAQS.

We note that the RIA did not include in its hypothetical ozone reduction strategies any consideration of reducing the NOx emission cap in the Clean Air Interstate Rule (CAIR). This strongly implies that EPA believes there will be no additional NOx reductions occurring on an eastern U.S. regional basis from electric generating units (EGUs). We find this perplexing. The original eastern U.S. EGU NOx emissions cap originated with the NOx SIP Call in the late 1990s. The NOx cap set under the NOx SIP Call was initially established specifically to address ozone nonattainment of the old 1-hour NAAQS (0.12 ppm) during the five-month ozone season in the East (May-September). While CAIR extended the EGU NOx reductions to occur year-round, it resulted in only marginal additional NOx reductions from the EGU sector *during the ozone season* (as the cap shifted from a nominal ozone season control level for EGUs of 0.15 lb/mmBTU to an annual control level of 0.12 lb/mmBTU). As such, EPA projected costs in its RIA assuming no changes to its federal NOx cap for EGUs, an approach that was clearly developed to address earlier, less stringent forms of the ozone NAAQS. EPA is now two generations removed from the 1-hour ozone NAAQS with its current proposal to revise the existing 8-hour standard. The reductions under the NOx SIP Call were extremely effective in helping many locations meet and maintain the old 1-hour ozone NAAQS as well as the current 8-hour ozone NAAQS.[11,12] It stands to reason that, with the second revision to the ozone NAAQS beyond the 1-hour ozone standard, additional regional EGU NOx reductions can be effective and are warranted.

EPA's approach in the RIA is to nest sub-regional NOx caps within the larger CAIR cap in the East, but without a change in the overall region-wide CAIR cap. As EPA notes, with this approach NOx emissions will likely be shifted out of the subregional nested caps into other areas of the East (and upwind of the Northeast). This is a throwback to the old and demonstrably failed approach under the 1-hour standard of focusing reductions on urban areas without a broader regional NOx strategy of sufficient rigor to support local efforts. As such, costs incurred at the local scale will be much higher as local areas must compensate for ozone transported from outside, forcing local areas to seek out increasingly hard to find additional NOx and VOC reductions from local sources. This is the same scenario that existed with the old 1-hour ozone NAAQS before the NOx SIP Call. With the success of that regional ozone strategy to meet and maintain older, less stringent standards, we find it difficult to comprehend why EPA's RIA

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[11] See EPA Air Trends Report for 1- and 8-Hour Ozone NAAQS at: http://www.epa.gov/airtrends/ozone.html#oznat

[12] See EPA 2006 NO_x Budget Report at: http://www.epa.gov/airmarkets/progress/nbp06.html

would ignore a more proactive and progressive regional (and likely less costly) approach in its hypothetical strategies for meeting a newly revised and more stringent standard.

Secondary Ozone Standard

Recommendation

NESCAUM supports EPA's option of establishing a secondary ozone NAAQS in a different form than the primary ozone NAAQS. NESCAUM supports establishing an ozone secondary NAAQS of the W126 form as defined in the proposal (72 FR 37883) and within the CASAC-recommended range of 7-15 ppm-hrs. NESCAUM does not support a secondary NAAQS above15 ppm-hrs. This would be above current annual W126 cumulative ozone levels typically observed across much of the NESCAUM region. It would have little practical effect in protecting forests and crops in the Northeast from the adverse impacts of prolonged ozone exposure. Furthermore, based on observed ozone damage to forests in the NESCAUM region at current ozone levels, a secondary NAAQS of the W126 form towards the lower end of the CASAC-recommended range would provide better protection in the NESCAUM region.

Equating the Secondary NAAQS to the Primary NAAQS is Inappropriate

NESCAUM does not support the option of establishing the ozone secondary NAAQS identical to the primary NAAQS. This is not a new position for NESCAUM, and we expressed similar support for a cumulative ozone secondary NAAQS different from the primary NAAQS when the ozone NAAQS was last revised in 1997. A secondary NAAQS based on cumulative, seasonal ozone exposure is more relevant to protecting economically or ecologically important forests, crops, and other sensitive vegetation, as compared to the shorter 8-hour averaged concentration form of the primary ozone NAAQS. The CASAC strongly endorsed the EPA Staff Paper recommendation that protection of vegetation "requires a secondary ozone NAAQS that is substantially different from the primary ozone NAAQS in averaging time, level and form."[13] The research community has also recognized for a number of years the need for a longer term secondary ozone NAAQS to protect vegetation.[14] Conversely, there appears to be little scientific basis for an ozone secondary NAAQS based on an 8-hour form identical to the primary NAAQS.

In light of the EPA Staff and CASAC recommendations, and the extensive body of historical and recent monitoring and research data upon which these recommendations were based, the option of equating the ozone secondary NAAQS with the 8-hour primary is inappropriate and clearly not supportable by the weight of scientific evidence.

[13] Letter from Dr. Rogene Henderson, Chair, CASAC, to EPA Administrator Stephen L. Johnson, "Clean Air Scientific Advisory Committee's (CASAC) Peer Review of the Agency's Final Ozone Staff Paper," March 26, 2007 (p. 3).

[14] *See, e.g.*,Heck WW, Cowling EB. 1997. The need for a long term cumulative secondary ozone standard – an ecological perspective. *EM* January 1997: 23-33.

We also strongly encourage EPA to avoid the flawed rationale employed in the previous 1997 ozone NAAQS review, i.e., that many of the benefits of a secondary NAAQS would be achieved if the primary NAAQS were attained. This rationale is flawed in at least two ways: first, ozone damage to vegetation persists in areas that attain the primary NAAQS; and second, the relationship between short-term 8-hour peak concentrations and longer-term seasonal aggregations is not constant, but varies over space and time. As EPA notes at 72 FR 37904, nonattainment overlap between an 8-hour primary NAAQS and an appropriately set W126 secondary NAAQS is inconsistent from year-to-year, making comparisons between the two based on extent of overlap inappropriate. EPA should set a secondary NAAQS on its own independent merits based on adverse welfare effects. Real or perceived relationships between primary and secondary nonattainment areas are irrelevant to setting the appropriate form and level of the secondary NAAQS.

Forest Ecosystem and Agriculture Sector Ozone Impacts

Scientific research shows that long-term, cumulative exposure to ozone reduces forest productivity.[15] Estimates of seasonal reductions in stem growth for many important eastern U.S. tree species exceeded 30 percent in recent average ozone years (2001, 2003), with additional growth decrements of 50 percent in a high ozone year (2002).[16] This not only has implications for forest health, but climate change as well. The reduced carbon uptake by trees and other vegetation due to damage from prolonged ozone exposure diminishes the potential effectiveness of forests as "carbon sinks" in removing carbon dioxide from the atmosphere. This is an important concern as policy makers evaluate and implement mitigation and adaptation options to address the threat of climate change.

A recent study also finds a linkage between decreased stream flows and increased water transpiration from forest canopies due to vegetation exposure to current ambient ozone levels in the eastern U.S.[17] This indicates that ozone pollution exposure, aggregated over the summer growing season, not only exacerbates the effects of drought upon forest growth, but upon stream health as well.

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[15] Broadmeadow M. 1998. Ozone and forest trees. *New Phytologist* 139: 123–125; Chappelka AH, Samuelson L. 1998. Ambient ozone effects on forest trees of the eastern United States: a review. *New Phytologist* 139: 91–108.

[16] McLaughlin SB, Nosal M, Wullschleger SD, Sun G. 2007. Interactive effects of ozone and climate on tree growth and water use in a southern Appalachian forest in the USA. *New Phytologist* 174: 109-124.

[17] McLaughlin SB, Wullschleger SD, Sun G, Nosal M. 2007. Interactive effects of ozone and climate on water use, soil moisture content and streamflow in a southern Appalachian forest in the USA. *New Phytologist* 174: 125-136.

In 2005, the National Park Service published the "Handbook for Assessment of Foliar Ozone Injury on Vegetation in the National Parks."[18] The Handbook references studies conducted in a number of national parks that have documented ozone-related foliar injury of plants. It describes the different types of ozone-related foliar injury, identifies ozone-sensitive species, and provides guidance to park managers and biologists to assess the level of ozone-related impacts on plants. The Handbook lists 65 plant species considered to be sensitive to ozone, i.e., "typically exhibit foliar injury at or near ambient ozone concentrations in fumigation chambers and/or are species for which ozone foliar injury symptoms in the field have been documented by more than one observer."[19] The report also indicates that "highly sensitive species of plants are injured when exposure levels increase only slightly above background."[20]

Chronically high ozone occurs across large areas that are important for agriculture, with crop yield reductions of five to 10 percent as ozone levels reach 0.050 to 0.070 ppm, depending on a crop's sensitivity. Crop losses are higher with higher ozone concentrations above 0.070 ppm.[21] The EPA Staff Paper estimates that the agriculture sector would see benefits of $290-$630 million annually (2000 dollars) if a standard of 13 ppm-hrs based on the W126 form was achieved nationally.[22] Other studies have also estimated significant benefits for reducing ozone, with annual dollar benefits to the agriculture sector in the billions.[23] These benefits are substantial, and we note that EPA did not include quantified monetized benefits for the agriculture sector (or other sectors) in its initial RIA.

The Upper End of EPA's Secondary NAAQS Proposal does not Afford Sufficient Protection

Adverse effects on forests and crops have been observed with seasonal ozone exposures below the upper end of the range proposed by EPA staff. For example, trained observers in the national Forest Health Monitoring program routinely observe foliar ozone damage symptoms in sensitive tree species in sections of the NESCAUM region and elsewhere in the eastern U.S. in locations

[18] National Park Service, Air Resources Division. Handbook for Assessment of Foliar Ozone Injury in the National Parks. Prepared by Robert Kohut, Boyce Thompson Institute, Cornell University. D-1688/ September 2005. See http://science.nature.nps.gov/im/monitor/protocoldb.cfm.

[19] Ibid, p. 15.

[20] Ibid, p. 13.

[21] Chameides WL, Kasibhatla PS, Yienger J, Levy H. 1994. The growth of continental-scale metro-agroplexes, regional ozone pollution, and world food production. *Science* 264: 74–77.

[22] EPA OAQPS Staff Paper, "Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information," EPA-452/R-07-003, January 2007 (pp. 7-51 & 7-52).

[23] *See* Adams RM, Crocker TD. 1989. The agricultural economics of environmental change: some lessons from air pollution. *J. Envtl. Mgmt.* 28: 295–307; Murphy JJ, Delucchi MA, McCubbin DR, Kim HJ. 1999. The cost of crop damage caused by ozone air pollution from motor vehicles. *J. Envtl. Mgmt.* 55: 273-289.

that are in attainment of current ozone primary and secondary NAAQS. These locations do not routinely experience 3-month seasonal 12-hour W126 levels as high as 21 ppm-hours, which is the upper end of EPA's proposed range.[24]

As noted by CASAC, "The absence of clear cut lower effects thresholds for sensitive vegetation combined with the lower recent estimates of policy-relevant background (typical range of 0.015 to 0.035 ppm) emphasizes the importance of efforts to reduce low- to mid-range environmental exposures below 0.060 ppm."[25] Based on Figures 7B-1 and 7B-2 in the Appendices to the EPA Staff Paper,[26] ozone concentrations in this range correspond most closely to the lower end of the proposed EPA and CASAC-recommended ranges for the W126 form of the secondary NAAQS. The upper end of EPA's proposed range is simply not protective of sensitive vegetation and forest ecosystems.

We also note that the map in Figure 7-6 of the EPA Staff Paper,[27] based on 2001 ozone data, indicates that much of the NESCAUM region may already be below even 15 ppm-hours. Yet, as noted earlier, forest damage is already occurring at these levels in this region.[28] This indicates that an ozone secondary NAAQS of the W126 form towards the lower end of the CASAC-recommended range would provide better protection against current adverse impacts on forests in the NESCAUM region.

Annual versus Multi-year Averaging of Ozone Secondary NAAQS

NESCAUM supports a W126 ozone secondary NAAQS that is based on an annual cumulative index rather than a three-year (or other multi-year) average of annual cumulative exposure. Adverse vegetation damage occurs on an annual basis. Averaging over multiple years for NAAQS stability purposes can dilute the adverse affects of chronically high ozone occurring over a single year across a multi-year period where the other years may be relatively low. Research indicates that there can be significant year-to-year variations in the extent of observed

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[24] Smith, G, Coulston J, Jepsen, J, Prichard, T. 2003. A national ozone biomonitoring program: Results from field surveys of ozone sensitive plants in northeastern forests (1994–2000), *Environ. Monit. Assess.* 87(3): 271−291.

[25] Letter from Dr. Rogene Henderson, Chair, CASAC, to EPA Administrator Stephen L. Johnson, "Clean Air Scientific Advisory Committee's (CASAC) Peer Review of the Agency's 2nd Draft Ozone Staff Paper," Oct. 24, 2006 (pp. 6-7).

[26] EPA OAQPS Staff Paper, "Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information," EPA-452/R-07-003, January 2007 (Appendices, pp. 7B-4 & 7B-5).

[27] EPA OAQPS Staff Paper, "Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information," EPA-452/R-07-003, January 2007 (p. 7-28).

[28] Smith, G, Coulston J, Jepsen, J, Prichard, T. 2003. A national ozone biomonitoring program: Results from field surveys of ozone sensitive plants in northeastern forests (1994–2000), *Environ. Monit. Assess.* 87(3): 271−291.

vegetation damage due to ozone;[29] therefore the desire for a "stable" secondary NAAQS should not outweigh the need to set the NAAQS at an annual level protective of the welfare values at risk.

If multi-year averaging is employed to promote a more "stable" NAAQS (as opposed to more stable ecological health), the level should be set lower than what otherwise would have been set for an annual NAAQS. A reduction of the needed annual level by at least one-third can help assure that the intended threshold is not exceeded in individual years. It would, however, be more straightforward to establish a protective level for the secondary NAAQS on an annual basis rather than as a multi-year average.

EPA Should Consider Exposure of Vegetation to Ozone over a Greater Period of Time, Including Nighttime Hours

As EPA notes, there can also be adverse effects on vegetation from ozone exposure occurring at night outside the 8 a.m. to 8 p.m. daytime hours proposed for the secondary standard (72 FR 37897; citing higher nighttime rural ozone levels where NOx scavenging is less prevalent). While EPA notes evidence of nighttime effects, it appears to discount the scientific literature as less certain relative to daytime effects. NESCAUM believes the literature on nighttime adverse ozone impacts is strong and can support an ozone secondary NAAQS that encompasses nighttime hours. This is important to the NESCAUM states as elevated nighttime ozone concentrations occur in many locations throughout the region. Examples include forested regions of coastal Maine as well as higher elevation sites in the Adirondacks of New York, the Berkshires of Massachusetts, the Green Mountains of Vermont, and the White Mountains of New Hampshire, which have experienced prolonged elevated ozone concentrations during the overnight hours. Musselman and Minnick (2000) note that even if ozone flux through leaf stomata is reduced at night relative to the day, it can still be high and is occurring when plant defenses are lower.[30] As a result, even assuming lower ozone flux, adverse impacts to vegetation at night can still occur.

NESCAUM further notes that the number of daylight hours during EPA's presumed 3-month growing season is greater than 12 hours at the latitudes of the NESCAUM region. At the latitudes of the NESCAUM region (39° N to 46° N), the number of daylight hours are greater than 12 from April to early September.

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[29] McLaughlin SB, Nosal M, Wullschleger SD, Sun G. 2007. Interactive effects of ozone and climate on tree growth and water use in a southern Appalachian forest in the USA. *New Phytologist* 174: 109-124.

[30] Musselman RC, Minnick TJ. 2000. Nocturnal stomatal conductance and ambient air quality standards for ozone. Atmos. Envt. 34: 719-734.

NESCAUM does not Support Setting a Suite of Secondary NAAQS

Due to the broad a regional nature of ozone in the eastern United States, it makes little practical sense to establish a suite of ozone secondary standards according to vegetation type and location. Many rural agricultural and Class I areas are affected by pollution sources across a broad area. Attempting to plan for potentially different standards affected by a multitude of regional sources will be a difficult planning exercise and adds an unnecessary level of complication. For a regional ozone problem, the control strategy will be driven by the most stringent standard in the region, making less stringent standards immaterial to establishing the needed level of controls.

Computing the Daily Index Value (D.I.) and Missing Data Substitution Scheme

EPA indicates the need for a missing data substitution scheme so that every hour used in the W126 calculation has an ozone concentration (72 FR 37918). The W126 index uses a cumulative instead of averaging scheme, so every hour needs to have a value to compute the index. Below is a suggested scheme for including missing data.

Computing the Monthly Cumulative Index (W126)

NESCAUM is concerned that the approach used by EPA with Equation 2 can lead to unrealistic results for the W126 (see 72 FR 37919). Using an average that may potentially be based on only a small portion of the month (as specified in Equation 2) to substitute for missing data when monthly data recovery is less than 75 percent can grossly over- or under-estimate a W126 because ozone conditions during a small time period (e.g., five percent of the relevant daylight hours) may include a much higher percentage of low or high ozone hours than what may be typical for the month. We illustrate this with an example from an ozone monitoring site at Cadillac Mountain in Acadia National Park in Maine. Putting aside for purposes of this example that March is outside the ozone season in Maine, this illustrates that the W126 estimated using EPA's missing date approach leads to an unrealistically high W126 for the March-May 2006 period. During this period, there was an ozone event at the end of March (fourth highest event for the "season" at Cadillac Mountain) just after the monitoring site started operating on March 29. If these concentrations over the space of three days (March 29, 30, and 31) become the basis for determining the March portion of the cumulative ozone index according to Equation 2 at 72 FR 37919, the 3-month W126 becomes 15.161 ppm-hours. This is clearly an extreme outlier and well outside the range of the other 3-month W126 values seen between 1995 and 2006 (see Table 1).

In place of Equation 2, NESCAUM suggests the following missing data substitution scheme for all months with less than 100 percent completeness:

1. For one or two hour missing data gaps, use a simple interpolation scheme.
2. For three or more hour missing data gaps:

- Fill in using data from the closest representative monitoring site. "Representative" means that both sites measure ozone plumes from identical source regions;
- If data from a representative monitoring site are not available, then fill in using a technique approved by the administrator.

Table 1. Three-month adjusted W126 values for ozone (ppm-hrs) at Cadillac Mountain, Acadia National Park, Maine from 1995-2006.

3-Month Adjusted W126	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
March-May	n/a	3.958	4.144	7.792	4.002	2.391	4.752	4.186	4.451	4.209	2.910	15.161
April-June	n/a	6.758	9.023	10.965	7.583	5.203	9.164	6.623	8.199	5.680	6.650	7.223
May-July	2.557	7.802	10.091	13.417	10.394	6.686	11.289	8.711	10.144	6.243	6.067	9.930
June-August	4.105	9.268	10.664	11.019	11.826	6.686	10.804	11.197	10.288	6.479	7.724	8.239
July-September	4.547	6.683	7.840	9.217	9.976	4.417	8.132	11.210	5.704	5.404	5.088	5.638
August-October	2.952	4.027	4.628	4.192	5.408	2.237	4.581	8.488	1.491	2.523	3.334	1.111
Maximum 3-Month W126	4	9	11	13	12	7	11	11	10	6	8	15

To be consistent with data handling conventions for the primary Ozone NAAQS, NESCAUM recommends the following revisions (in bold) to Section 4.3 of Appendix P to Part 50:

a) The secondary ambient O_3 air quality standard is met when the annual maximum W126 value based on a consecutive 3-month period at an O_3 air quality monitoring site is less than or equal to [7 to 15] ppm-hours. The number of significant figures in the level of the standard dictates the rounding convention for comparing the computed W126 value with the level of the standard. The first decimal place of the computed W126 value is rounded, with values equal to or greater than of 0.5 rounding up.

b) This requirement is met for the three month period at a monitoring site if O_3 concentrations are available (before substituting for missing data) for at least 90% of the possible index hours with a minimum data completeness in any one month of at least 75% of the possible index hours.

c) Months with W126 values greater than the level of the standard shall not be ignored on the ground that they have less than complete data. Thus, in computing the 3-month W126 value, months with less than 75% data completeness (before substituting for missing data) shall be included in the computation if the 3-month W126 value is greater than the level of the standard.

Air Quality Index

NESCAUM commends EPA for soliciting comment on changes to the Air Quality Index (AQI) to reflect changes to the ozone NAAQS (72 FR 37882) at this point in time. Since the AQI is the major risk communication tool used to inform the public of potential and past exceedances of the NAAQS, it is critical that any updates to the AQI occur as expeditiously as possible.

NESCAUM recommends that the AQI yellow-to-orange breakpoint (AQI breakpoint of 101, "Unhealthy for Sensitive Groups") be set at a level to protect public health with an adequate margin of safety. EPA should therefore set this breakpoint, and the primary ozone NAAQS, consistent with the CASAC-recommended ozone NAAQS range, at a number between 0.060-0.070 ppm.

Furthermore, the AQI labeling, particularly for "Moderate," and "Unhealthy for Sensitive Groups" should be reexamined and modified to better reflect the fact that many people, including healthy adults and children, may be sensitive to ozone exposures. EPA currently indicates that, during "Moderate" AQI days, there may be a "moderate health concern for *a very small number of people*" (emphasis added) and during "Unhealthy for Sensitive Groups" AQI days, "people with lung disease are at greater risk from exposure to ozone…*[t]he general public is not likely to be affected when the AQI is in this range*" (emphasis added).

Moreover, the AQI should undergo a comprehensive review and overhaul, given that it is now dealing with multiple pollutants and is being used for different purposes than when it was initially established. EPA should also consider changing to a simpler AQI numbering scheme, such as is used with the UV-index[31] (i.e., 0-15) or the Canadian AQHI scheme[32] (i.e., 0-10+). Earlier this year, the NESCAUM states requested of EPA that it conduct an overhaul of the AQI (see Appendix C), and stand ready to work with the agency on this effort.

Potential Monitoring Network Changes

Moving to a primary ozone NAAQS of 0.070 ppm or lower may result in the need for additional sites to properly reflect non-urban population exposures. In addition, depending on the final NAAQS level, the ozone (and possibly the PAMS (photochemical assessment monitoring stations)) season may need to be extended. NESCAUM supports efforts that would better characterize public exposure to ozone, and urges that EPA be prepared to provide funding support for states to carry out such efforts.

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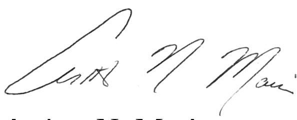
[31] See: http://www.epa.gov/sunwise/uvindex.html

[32] See: http://www.epa.gov/airnow//2007conference/tuesday/bruin.ppt

Setting a new, distinct and protective secondary standard to protect vegetation and other welfare impacts will also have monitoring program impacts. This will present challenges to EPA and the states, especially since rural monitors are scarce. NESCAUM recommends that EPA and the states explore together how the CASTNET (Clean Air Status and Trends Network) program might be augmented and made more efficient and cost-effective to assist in that regard.

Thank you for the opportunity to comment. If you or your staff has any questions regarding the issues raised in this letter, please contact Paul Miller at the NESCAUM office at 617-259-2016.

Sincerely,



Arthur N. Marin
Executive Director

Appendix A:	Summary of Maine DEP's Analysis Determining Daily Maximum 8-hour Ozone Average Concentrations
Appendix B:	NESCAUM's Benefits Analysis of the Proposed Ozone NAAQS using BENMAP
Appendix C:	February 8, 2007 Letter from NESCAUM to U.S. EPA on the Air Quality Index

Cc: NESCAUM Directors
Lydia Wegman, EPA/OAQPS
David J. McKee, EPA/OAQPS

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NESCAUM COMMENTS ON EPA'S PROPOSED NAAQS FOR OZONE
APPENDIX A

Summary of Maine DEP's Analysis Determining Daily Maximum 8-Hour Ozone Average Concentrations

Figure 1.

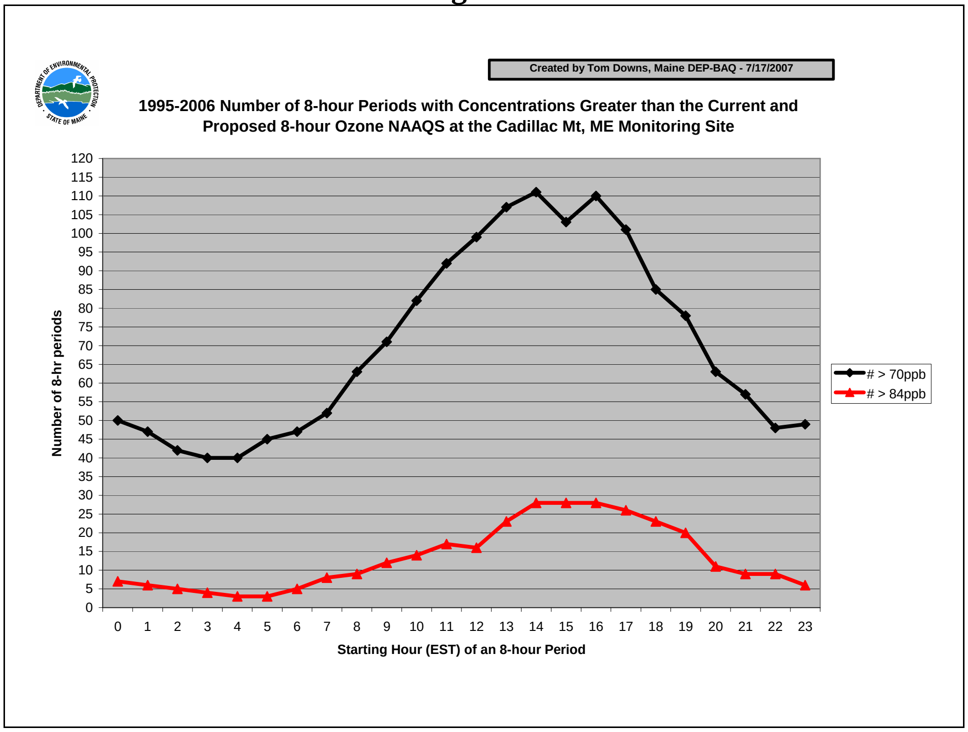


Figure 2.

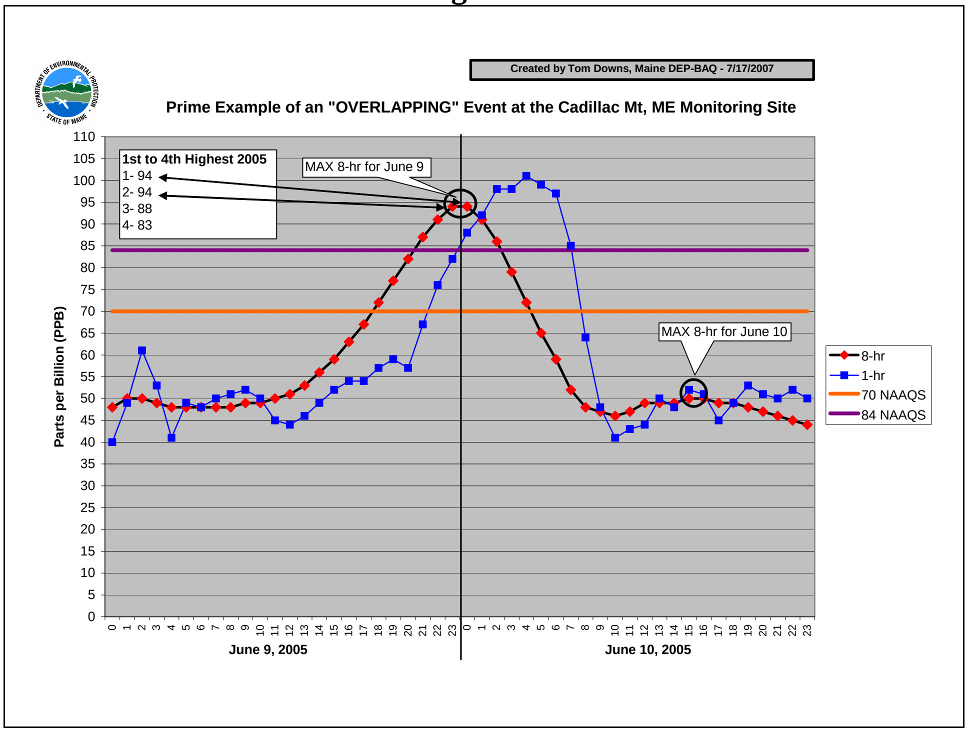


Figure 3.

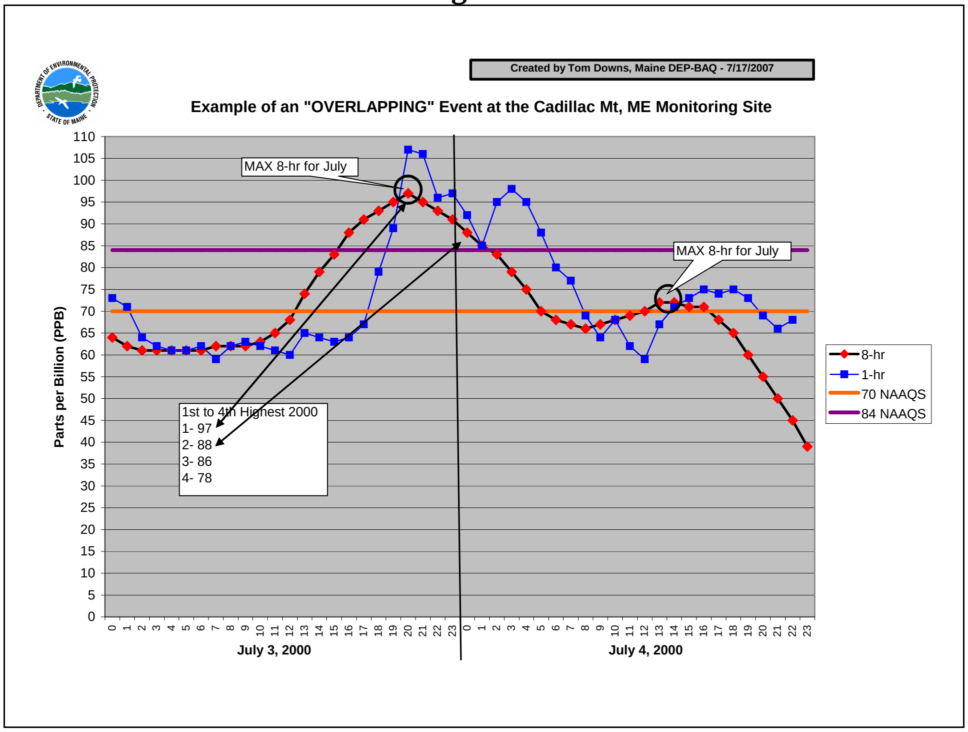
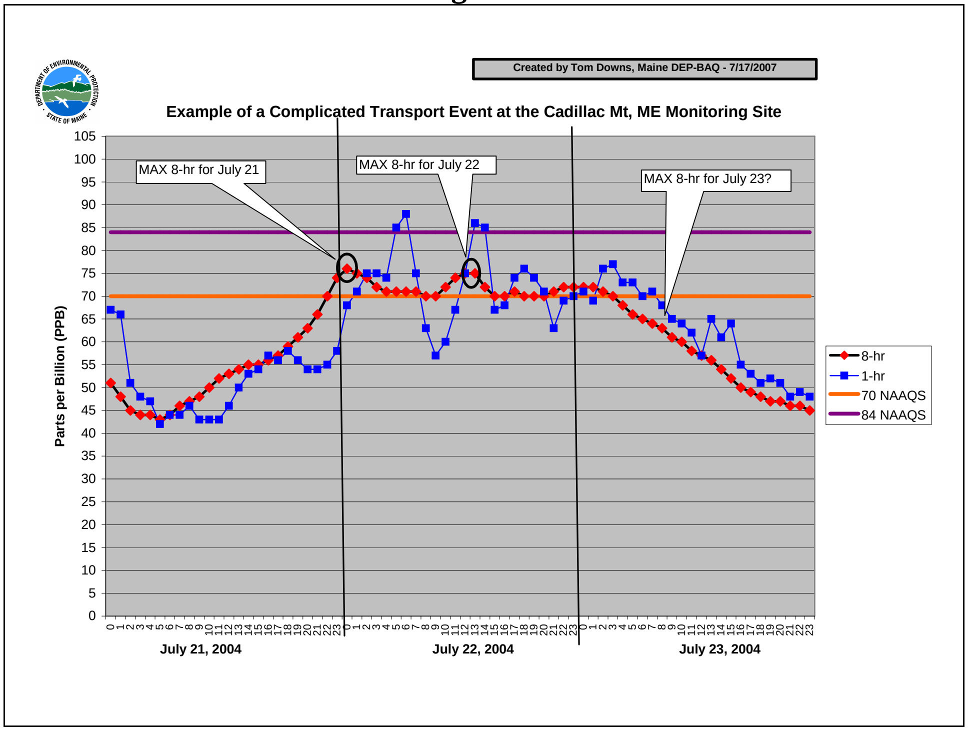


Figure 4.



NESCAUM COMMENTS ON EPA'S PROPOSED NAAQS FOR OZONE
APPENDIX B

NESCAUM's Benefits Analysis of the Proposed Ozone NAAQS using BenMAP

NESCAUM's Benefits Analysis of the Proposed Ozone NAAQS using BenMAP

Overview and Input Assumptions:

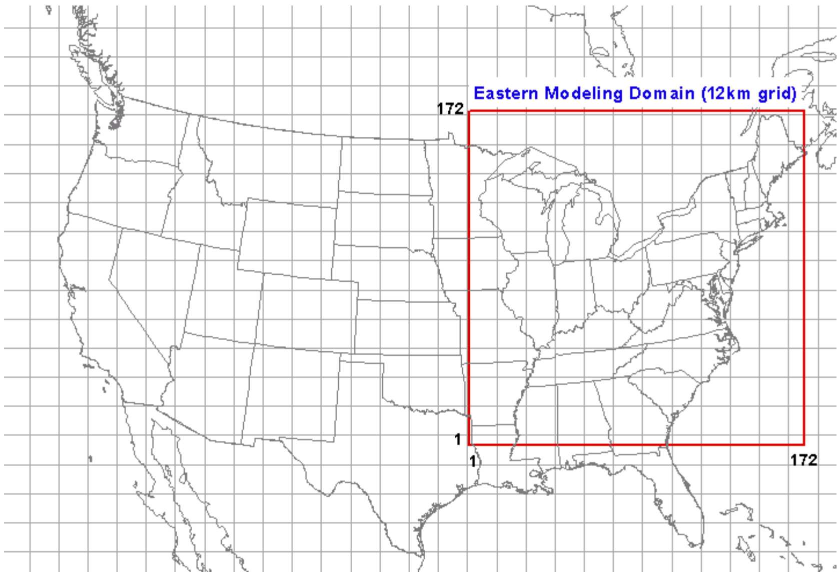
To assess the benefits of alternative ozone standards, NESCAUM estimated the magnitude and value of avoided adverse health endpoints that would result in attaining a range of proposed ozone primary NAAQS in 2018. The purpose of this benefits analysis is to estimate what additional benefits can be accrued by reducing ozone levels to various attainment levels beyond levels reached by a suite of actual and hypothetical control programs – in this case the "Beyond On The Way" (BOTW) programs and the "Clean Air Interstate Rule Plus" (CAIR+) program[1] – that states in the Ozone Transport Region (OTR) have considered in planning efforts to attain the current 8-hour ozone NAAQS.

Future and current year ozone modeling was performed by the New Hampshire Department of Environmental Services using the California Photochemical Grid Model (CALGRID). The model output reflects expected hourly ozone concentrations in 2018 after implementing a suite of assumed BOTW control strategies in the OTR and the CAIR+ program in the eastern United States. The use of this hypothetical control scenario is meant to create a base case in which the modeled region meets or is close to meeting the current ozone NAAQS. Use of projected ozone levels in 2018 in a scenario attaining the current 8-hour NAAQS (0.08 ppm) avoids attributing to a revised primary ozone NAAQS that portion of monetized health benefits that would occur in any event from meeting the current NAAQS. The hypothetical measures incorporated in the base case, however, are not necessarily the actual measures to be adopted by individual states for attaining the present ozone NAAQS.

The model domain covers the northeastern, central, and southeastern United States with 172x172 12 km grid cells (Figure 1).

[1] For details on the BOTW and CAIR+ assumptions, see:
http://www.marama.org/reports/MANEVU_Emission_Projections_TSD_022807.pdf and
http://www.marama.org/visibility/CAIR/CAIR_CAIRPlus_FDReport_053007v1.pdf

Figure 1. Modeling domain used for CALGRID modeling study. Gridlines are shown at 180 km intervals (15 x 15 12km cells).



Using the CALGRID modeled concentrations that have included all BOTW measures and CAIR+ as our baseline, we estimated the benefits of attaining three alternative 8-hour standards, 60 ppb, 70 ppb, and 75 ppb (4^{th} highest daily 8-hour max) in the OTR using the U.S. Environmental Protection Agency's (EPA's) Environmental Benefits Modeling and Analysis Program (BenMAP). BenMAP can currently roll back monitored ozone data to user specified standards and calculate the health benefits of the rollback. To take advantage of BenMAP's rollback capabilities, we reformatted the CALGRID model output data to a monitor format that the tool would accept. This was done by first generating a file that contained modeled values for all the monitors in our domain for the period of May 15 through September 15. Each monitor's hourly modeled values were defined as the 2018 CALGRID modeled concentrations for the grid cell in which the monitor resides. In addition to monitors that already existed, we supplied modeling data for grid cells with more than 25,000 people not containing a monitor. This was done by adding a new monitor at the center of the grid cell.

In our comparisons of 2002 CALGRID modeled data and 2002 monitored data, we found that the model generally underestimated monitored ozone concentrations. We therefore expect that our approach of using solely modeling data to represent concentrations in 2018 will give a conservative estimate of the benefits of attainment (i.e., underestimate the monetized health benefits). Furthermore, we do not include consideration of health benefits from reductions in fine particulate matter ($PM_{2.5}$) that may occur as a result of reductions in ozone precursors.

The 2018 CALGRID modeling data was rolled back to each of the various health standards using BenMAP's quadratic rollback method. The quadratic rollback method is based on an algorithm developed by Horst and Duff (1995), where large values are reduced proportionally more than small values while just achieving the standard. We set a background level of 40 ppb, which specifies the portion of the ozone concentration that was not be affected by the rollback. Our assumed ozone background is higher than the policy relevant background used by the EPA of 0.015 to 0.035 ppm (72 FR 37857), thus is conservative and will tend to underestimate monetized health benefits.

BenMAP's rollback method occurs in two steps. First, it calculates each monitor's 4th highest 8-hr max value and determines whether the monitor is in or out of attainment of the specified standard. It then develops a list of target metric values for each monitor by rolling back each day's 8-hr max value using the quadratic method to meet the attainment standard. In the second step, BenMAP rolls back the hourly values at each monitor on each day to arrive to a set of hourly concentrations that meet the target metric value calculated in the first step. The overall method therefore gives new hourly values at each monitor that place it in attainment of the defined standard.

After rolling back the monitor values to the defined attainment standard, the monitor concentrations were interpolated to a 12 km grid in BenMAP using the Voronoi Neighbor Averaging algorithm. We then calculated the benefits of the rollback within each grid cell and aggregated these benefits across each state within the domain.

The health benefits of the model data rollback are calculated by applying concentration response functions. These functions, derived from published epidemiological studies, calculate the health response from a change in ozone concentration, taking into account the population within each grid cell and the baseline incidence rate. For our analysis, we chose five studies on ozone mortality and 14 studies on respiratory-based adverse health endpoints, including hospital admissions due to respiratory disease, emergency room visits due to asthma, school absence days, and decreased worker productivity. Using the reduced incidences attributed to improved air quality, BenMAP calculates the value of reduction using a variety of Cost of Illness (COI) and Willingness to Pay (WTP) valuation functions available within BenMAP. Table 1 describes the studies we used in this rollback analysis.

Table 1. Health studies used in BenMAP rollback analysis

Health Endpoint	Metric	Study	Study Location	Study Population
Mortality	24 Hour Mean	Bell et al. 2004	95 US Cities	All Ages
	1 Hour Max	Ito et al. 2005	7 US Cities	All Ages
	24 Hour Mean	Huang et al. 2005	19 US Cities	All Ages
	1 Hour Max	Levy et al. 2005	US	All Ages
	24 Hour Mean	Bell et al. 2005	US	All Ages
Hospital Admissions-Respiratory	24 Hour Mean	Schwartz 1995 (all respiratory)	New Haven, CT	>64 Years, pooled estimate
	24 Hour Mean	Schwartz 1994a (pneumonia)	Detroit, MI	
	24 Hour Mean	Schwartz 1994b (pneumonia)	Minneapolis, MN	
	24 Hour Mean	Moolgavkar et al 1997 (pneumonia)	Minneapolis, MN	
	24 Hour Mean	Schwartz 1994b (COPD)	Detroit, MI	
	24 Hour Mean	Moolgavkar et al 1997 (COPD)	Minneapolis, MN	
	1 Hour Max	Bernett et al. 2001	Toronto, CN	<2 Years
Asthma Related ER Visits	5 Hour Mean	Weisel et al. 1995	New Jersey	All ages, Pooled Estimate
	5 Hour Mean	Cody et al. 1992	New Jersey	
	1 Hour Max	Stieb et al. 1995	New Bruswick, CN	
	24 Hour Mean	Stieb et al. 1996	New Bruswick, CN	
School absence days	8 Hour Mean	Gilliland et al. 2001	Southern California	6-11 Years, Pooled Estimate
	1 Hour Max	Chen et al. 2000	Washoe Co, NV	
Worker Productivity	24 Hour Mean	Crocker and Horst 1981	Nationwide	Outdoor workers, 18-65

Results:

Applying the health impact and valuation functions to estimated changes in ozone concentrations gave estimates in reductions in adverse health effects and the associated value of this reduction. Tables 2 through 4 show the estimated reductions in incidences attributed to attaining three ozone standards beyond implementation of CAIR+ and BOTW measures for the District of Columbia and each state belonging to the Ozone Transport Region. Tables 5 through 7 show estimated value of these reductions.[2] For incidence results, we have presented each non-mortality health endpoint separately (with a combined incidence for respiratory hospital admissions in the elderly and children under 2 years of age) while mortality is shown as the range of the five mortality studies used. In the valuation tables, we have presented the combined value of all non-mortality health endpoints and the range of estimates from the five mortality studies used in this analysis.

[2] The entry for Virginia in each of the tables is for the entire state, thus includes incidences and monetized benefits beyond the DC metropolitan portion of Virginia within the Ozone Transport Region.

Table 2. Rollback from 2018 CAIR+ to 60 ppb Ozone Standard, Estimated Avoided Incidences

State	*ER Visits, Asthma*	*Hospital Admissions, All Respiratory Endpoints, >64 Years and <2 Years*	*School Loss Days*	*Loss of Income Due to Decreased Worker Productivity*	*Mortality (Range of Five Studies)*
CT	9.3	79.7	21,933	103,880	3.8 - 19.3
DE	2.5	25.2	6,316	69,363	1.1 - 5.8
DC	2.3	20.7	4,145	11,509	1.1 - 5.2
ME	0.2	3.2	602	25,807	0.2 - 0.8
MD	23.9	234.4	55,316	337,687	10.6 - 47.3
MA	9.9	84.8	24,077	117,724	3.8 - 21.6
NH	0.8	6.9	1,993	17,097	0.3 - 1.6
NJ	33.0	290.0	80,844	358,430	14.1 - 73.3
NY	36.3	309.2	89,418	336,746	13.8 - 78.1
PA	39.6	396.5	89,286	921,220	24.4 - 104.3
RI	1.9	16.8	4,611	27,456	0.8 - 4.4
VT	0.0	0.1	20	444	0 - 0
VA	23.9	235.0	56,209	445,286	10 - 45
OTR Total	183.5	1,702.5	434,770	2,772,649	84 - 406.7

Table 3. Rollback from 2018 CAIR+ to 70 ppb Ozone Standard, Estimated Avoided Incidences

State	*ER Visits, Asthma*	*Hospital Admissions, All Respiratory Endpoints, >64 Years and <2 Years*	*School Loss Days*	*Loss of Income Due to Decreased Worker Productivity*	*Mortality (Range of Five Studies)*
CT	5.3	46.1	12,982	54,523	2 - 11.5
DE	1.4	13.9	3,552	34,442	0.6 - 3.2
DC	1.6	14.9	3,045	7,821	0.8 - 3.9
ME	0.0	0.4	70	3,919	0 - 0.1
MD	15.4	157.0	37,628	200,285	6.7 - 32.1
MA	2.1	19.0	5,125	27,980	0.8 - 4.9
NH	0.1	0.8	209	2,222	0 - 0.2
NJ	18.8	171.8	48,642	202,596	7.9 - 44.4
NY	13.1	117.4	34,045	108,546	5 - 29.6
PA	22.4	228.4	53,610	480,424	13.2 - 62.6
RI	0.7	6.8	1,877	11,201	0.3 - 1.8
VT	-	-	-	-	0 - 0
VA	13.8	137.4	33,568	219,802	5.3 - 25.5
OTR Total	94.8	913.8	234,352	1,353,762	42.7 - 219.7

Table 4. Rollback from 2018 CAIR+ to 75 ppb Ozone Standard, Estimated Avoided Incidences

State	*ER Visits, Asthma*	*Hospital Admissions, All Respiratory Endpoints, >64 Years and <2 Years*	*School Loss Days*	*Loss of Income Due to Decreased Worker Productivity*	*Mortality (Range of Five Studies)*
CT	3.4	29.2	8,251	33,192	1.3 - 7.2
DE	0.8	7.8	2,031	18,085	0.3 - 1.8
DC	1.4	12.4	2,557	6,425	0.6 - 3.2
ME	0.0	0.0	1	25	0 - 0
MD	11.8	120.7	29,178	142,763	5 - 24.7
MA	0.2	2.1	572	3,772	0.1 - 0.6
NH	0.0	0.2	52	540	0 - 0
NJ	12.3	113.1	32,303	134,709	5.1 - 29.5
NY	7.1	64.2	18,735	53,422	2.7 - 16.2
PA	14.8	150.1	35,947	300,149	8.6 - 41.7
RI	0.2	1.7	469	3,710	0.1 - 0.5
VT	-	-	-	-	0 - 0
VA	9.7	94.8	23,469	134,217	3.5 - 16.9
OTR Total	62	596	153,565	831,008	27.3 - 142.4

Table 5. Rollback from 2018 CAIR+ to 60 ppb Ozone Standard, Estimated Value of Avoided Incidences

State	***Total Value of Avoided Respiratory Endpoints-*** *Hospital Admissions >64 Years and <2 Years, Asthma ER Visits, School Loss Days, Decreased Worker Productivity (Millions of 2000$)*	***Mortality-*** *Range of Five Studies (Millions of 2000$)*
CT	2.78	23.99 - 121.97
DE	0.85	7.18 - 36.42
DC	0.60	7.16 - 33.07
ME	0.12	1.21 - 5.21
MD	7.44	66.89 - 298.59
MA	3.00	23.89 - 136.18
NH	0.25	1.83 - 10.07
NJ	10.13	88.74 - 462.5
NY	10.89	86.8 - 492.55
PA	13.11	153.72 - 658.38
RI	0.59	5.3 - 27.74
VT	0.00	0.03 - 0.18
VA	7.55	62.89 - 283.66
OTR Total	57.30	529.62 - 2566.52

Table 6. Rollback from 2018 CAIR+ to 70 ppb Ozone Standard, Estimated Value of Avoided Incidences

State	***Total Value of Avoided Respiratory Endpoints-*** *Hospital Admissions >64 Years and <2 Years, Asthma ER Visits, School Loss Days, Decreased Worker Productivity (Millions of 2000$)*	***Mortality-*** *Range of Five Studies (Millions of 2000$)*
CT	1.61	12.91 - 72.26
DE	0.47	3.67 - 20.38
DC	0.43	4.9 - 24.39
ME	0.01	0.15 - 0.67
MD	4.96	42 - 202.68
MA	0.65	5.36 - 30.7
NH	0.03	0.2 - 1.11
NJ	6.00	49.7 - 279.88
NY	4.10	31.45 - 186.69
PA	7.59	83.22 - 395.06
RI	0.24	2.03 - 11.34
VT	0.00	0 - 0
VA	4.38	33.37 - 160.99
OTR Total	30.48	268.96 - 1386.14

Table 7. Rollback from 2018 CAIR+ to 75 ppb Ozone Standard, Estimated Value of Avoided Incidences

State	***Total Value of Avoided Respiratory Endpoints-*** *Hospital Admissions >64 Years and <2 Years, Asthma ER Visits, School Loss Days, Decreased Worker Productivity (Millions of 2000$)*	***Mortality-*** *Range of Five Studies (Millions of 2000$)*
CT	1.02	8.08 - 45.73
DE	0.26	2.02 - 11.47
DC	0.36	4.02 - 20.48
ME	0.00	0 - 0.02
MD	3.80	31.6 - 155.93
MA	0.07	0.64 - 3.55
NH	0.01	0.05 - 0.27
NJ	3.96	32.47 - 186.15
NY	2.24	17.01 - 102.4
PA	5.00	53.99 - 263.19
RI	0.06	0.52 - 2.89
VT	0.00	0 - 0
VA	3.01	21.86 - 106.62
OTR Total	19.79	172.25 - 898.72

The results above show that adopting an ozone NAAQS of 0.075 ppm (i.e., the upper limit of EPA's proposal) after CAIR+ could result in an estimated 27 to 142 avoided premature deaths over the 2018 ozone season in the OTR. When added to the benefits from avoided morbidity endpoints, we estimate a monetary benefit of 192 to 918 million dollars over the 2018 ozone season. By contrast, adopting an ozone NAAQS of 0.070 ppm (i.e., the upper limit of the CASAC recommended range), could result in 43 to 220 avoided premature deaths in the OTR over the 2018 ozone season. When added to the benefits from avoided morbidity endpoints, we estimate an additional monetary benefit of 107 to 498 million dollars beyond the 0.075 ppm standard (total benefit of 300 million to 1.4 billion dollars after CAIR+). Finally, adopting an ozone NAAQS at the lower end of the CASAC recommended range, 0.060 ppm, could result in an estimated 84 to 407 avoided premature deaths in the OTR over the 2018 ozone season. Compared to the 0.075 ppm scenario, the modeling indicates that a NAAQS set at 0.060 ppm, could net almost twice the monetary benefit with a benefit of 394 million dollars to 1.7 billion dollars beyond the 75 ppb standard (total benefit of 530 million to 2.6 billion dollars after CAIR+).

The BenMAP results indicate substantial benefits from revising the current ozone NAAQS to within the CASAC range. Even in this regard, however, we believe the benefit estimates are quite conservative and are likely substantially higher, for the following reasons:

- The rollback method uses unadjusted modeled 2018 ozone concentrations as proxies for monitored data that likely underestimate regional ozone levels,[3] therefore the extent of actual ozone reductions in the Northeast in 2018 may be greater than estimated in the rollback method.
- The ozone background level used of 0.040 ppm is higher than EPA's policy relevant background of 0.015 to 0.035 ppm, so ozone reductions could occur to lower levels than allowed in the rollback method employed here. Not accounting for lower potential levels of ozone will reduce the estimated benefits of a more stringent ozone NAAQS.
- The estimated benefits do not include consideration of additional reductions in mortality and morbidity endpoints associated with reduced $PM_{2.5}$ due to NOx reductions needed to meet a more stringent ozone NAAQS. The EPA's Regulatory Impact Analysis indicates these can be in the billions of dollars, thus substantially increasing the projected benefits from a revised ozone NAAQS.
- The estimated health benefits do not include potential benefits from reduced volatile organic compound (VOC) emissions. Many VOCs are air toxics and can have health impacts apart from their contributions to ozone formation.
- The analysis covered the period May 15 through September 15, thus omitting four weeks of the ozone season. In addition, there may be adverse health impacts from ozone exposure during the non-ozone season, as elevated ozone values in the 0.060 ppm range have been monitored in portions of the domain outside the assumed ozone season.
- BenMAP calculates school absences based on the assumption that children are in school during all of May, two weeks in June, one week in August, and all of September. The estimated health benefits do not account for absences during summer school sessions.
- The focus on the primary ozone NAAQS in this analysis does not include benefits from non-health endpoints (i.e., welfare values), such as reduced losses in the agriculture and forestry sectors due to lower regional ozone levels.

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[3] In general, the model tends to underestimate ozone levels in most grid cells of the model domain during the full ozone season. In a subset of high peak ozone days, however, the model can overpredict ozone levels in some grid cells during some hours, but these incidents are spatially and temporally limited.

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NESCAUM COMMENTS ON EPA'S PROPOSED NAAQS FOR OZONE
APPENDIX C

February 8, 2007 Letter from NESCAUM to EPA on the Air Quality Index

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Dear Mr. Page and Ms. Wegman:

I am writing on behalf of the NESCAUM member agencies to urge the U.S. Environmental Protection Agency (EPA) to revise the Air Quality Index (AQI) for fine particulate matter (PM-2.5). The goal is to ensure that this key risk communication tool continues to provide effective guidance to the public regarding the threat posed by elevated levels of air pollution. The Northeast states support lowering the category cut points to levels that ensure adequate public health protection in light of recent revisions to the PM-2.5 National Ambient Air Quality Standard (NAAQS). We also urge EPA to reexamine and reassess overall AQI methodologies, including considering other pollutants or surrogates, to better protect public health.

NESCAUM supported EPA establishing health protective AQI cut points for the 1997 PM-2.5 NAAQS and believes that a conservative approach should be used for the new standards. Under the 1997 PM NAAQS, EPA set the PM-2.5 cut point between yellow (unhealthy for unusually sensitive populations) and orange (unhealthy for sensitive groups) at a level below the NAAQS, reflecting the significant health risk posed by PM-2.5. In the short term, EPA should consider this approach when establishing AQI cut points for the 2006 PM-2.5 NAAQS revisions.

We understand that EPA is considering modest changes to the PM-2.5 AQI, shifting the yellow to orange transition from 40 to 35 $\mu g/m^3$, changing the orange to red cut point from 65 to 45 $\mu g/m^3$, and leaving the green to yellow cut point at 15 $\mu g/m^3$. Doing so would not adequately reflect the change in the daily NAAQS (65 to 35 $\mu g/m^3$, both at the 98th percentile). NESCAUM believes that a conservative AQI is warranted and recommends the cut points listed in the table below:

Category Cut Point	NESCAUM Recommendation (daily mean in $\mu g/m^3$)
Green – Yellow	12
Yellow – Orange	30
Orange – Red	40

This recommendation is consistent with the EPA staff paper's upper limit of 35 μg/m^3 at the 99th percentile for the daily standard, which is approximately equivalent to 30 μg/m^3 at the 98th percentile. The orange-to-red cut point should be lowered to a level slightly above the daily NAAQS, to 40 μg/m^3. Even a daily mean of 40 μg/m^3 will likely reflect much higher shorter term concentrations that are well over the 35 ug/m^3 daily NAAQS. Therefore, a stringent cut point for this category would better protect public health. We also support setting the green-to-yellow cut point (where health messaging begins) at 12 μg/m^3, based on the Clean Air Scientific Advisory Committee recommendations (12-14 μg/m^3 annual), the California annual standard (12 μg/m^3), and the NESCAUM states' general support for an annual standard of 12 μg/m^3. We understand that such changes in the AQI may make it more challenging for our state air quality forecasters, but the trade-off in public health protection is well worth the effort.

In addition, we believe it is time for EPA to undertake a substantial review of the AQI and its methodologies in light of its more recent uses and the new controlling form of the daily PM NAAQS. While the AQI worked well for its earlier usages (e.g., presenting air quality data from the previous day and making general forecasts), it is not well designed to for its current uses (e.g., forecasting real-time exposures with additional messaging at lower levels approaching the standard). Public health protection would be better served if EPA and the states worked together to overhaul the AQI in light of the multiple purposes it now serves. This should include looking at adjustments of the AQI to reflect shorter averaging times and to consider additional contaminants.

We would appreciate the opportunity to discuss NESCAUM's recommendation with you in greater detail. Since it is unclear whether representatives from our member states will be attending the February 2007 National Air Quality Conference in Orlando, we would appreciate your considering other options to solicit input from the Northeast states. Please contact George Allen at 617-259-2035 or me at 617-259-2017 if you have any questions.

Sincerely,

Arthur N. Marin
Executive Director

cc: NESCAUM Directors
Susan Stone - EPA/OAQPS
Richard Wayland - EPA/OAQPS
John E. White - EPA/OAQPS
Phil Dickerson - EPA/OAQPS