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VIA ELECTRONIC MAIL

Dr. Elizabeth A. Sheppard
Clean Air Scientific Advisory Committee
U.S. Environmental Protection Agency
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RE: Comments of the Sierra Club Regarding Draft Policy Assessment for the Reconsideration of the Ozone National Ambient Air Quality Standards – EPA–HQ–OAR–2018–0279

Dear Dr. Sheppard:

The Sierra Club appreciates the opportunity to submit comments to the Clean Air Scientific Advisory Committee (CASAC) regarding the U.S. EPA's draft Policy Assessment (PA) for the reconsideration of the ozone National Ambient Air Quality Standards. In light of CASAC's prior findings—including substantial scientific evidence of adverse effects, including decreased lung function, increased respiratory symptoms, and increased airway inflammation at 70 parts per billion (ppb)[1]—the Sierra Club is deeply dismayed by EPA staff's proposal to retain the current under-protective primary and secondary ozone standards. A primary standard of 70 parts per billion fails to protect the public health—and particularly the health of sensitive populations such as children, asthmatics, the elderly, and outdoor workers—with an adequate margin of safety. Moreover, the secondary welfare standard that EPA proposes to retain has been found to be unlawful by the D.C. Circuit Court of Appeals twice and must be updated using a biologically relevant form and at an environmentally protective level.

While there are myriad limitations with EPA's draft Policy Assessment, in these comments Sierra Club focuses on two discrete but important aspects of EPA's review of the primary standard.

First, as discussed in detail below, EPA's increasingly heavy reliance on its exposure assessment to justify setting the standard at a level that may not be safe for all groups is morally repugnant and unlawful. From a scientific perspective, EPA's methodology for estimating exposures of concern—and particularly for estimating multiple exposures of concern—is fundamentally flawed. EPA cannot continue to rely on its exposure assessment and must set the primary standard at a level that protects groups like children attending outdoor summer camps and outdoor workers that spend significant amounts of time active outdoors during the summer ozone season.

[1] Letter from CASAC Chair Dr. H. Christopher Frey to U.S. EPA Administrator Gina McCarthy re: Second Draft Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards (EPA-CASAC-14-004), ii, June 26, 2014.

Second, EPA's truncation conventions in the calculation of design values have no scientific basis and pointlessly water down the protectiveness of the standard. As explained below, CASAC should urge EPA to jettison its truncation conventions. If the conventions are retained, EPA must adjust the level of the standard downward to provide the health protections it claims.

The Sierra Club urges CASAC to carefully review the scientific bases underpinning the Draft Policy Assessment and provide clear recommendations to EPA about how to address any shortcomings.

I. EPA's RELIANCE ON ITS HEALTH RISK AND EXPOSURE ASSESSMENT IS LEGALLY IMPERMISSIBLE AND SCIENTIFICALLY MISPLACED

EPA's Draft PA continues to rely heavily on the agency's exposure assessment from 2020 that it used to support the prior retention of the primary standard. As part of joint comments on the draft 2020 standard, Sierra Club raised a number of concerns with EPA's reliance on the 2020 exposure assessment. EPA in its response to comments either failed to address or provided inadequate responses to these concerns. Consequently, Sierra Club reiterates these concerns as they continue to apply to the Draft PA.

A. EPA's treatment of the exposure and risk analysis is arbitrary

EPA points to the exposure assessment to claim that small percentages of key populations (including children and asthmatic children) would experience multiple exposures of concern in areas just meeting the current 70 ppb standard.[2] EPA's approach is inconsistent with the Clean Air Act, which promises air in which people can engage in their normal range of activity free from adverse effects. Moreover, due to critical limitations of the APEX model discussed below, EPA's exposure assessment provides inadequate support for EPA's population-level claims. First, APEX uses high-level demographic variables to establish activity profiles. But EPA has failed to establish that these high-level demographic variables are predictive of time spent outdoors with elevated ventilation rates, the critical metric for predicting exposures of concern. Second, APEX's modeling of individuals is flawed and systematically underestimates the likelihood of multiple exposures of concern for simulated individuals, thereby overstating the protectiveness of the modeled air quality standards. Critically, EPA's assessment provides no relevant information for key groups, including outdoor workers and summer camp attendees, who are most likely to experience harmful effects due to prolonged ozone exposure.

1. The Clean Air Act requires NAAQS to be set without consideration of how often people will intersect with unsafe air

EPA's reliance on its exposure assessment is unlawful and inconsistent with the Clean Air Act (Act). Section 109 of the Act mandates that EPA set the NAAQS at a level that allows the public to spend time outdoors engaged in their normal activities and that the air will be clean enough to "protect the public's health with an adequate margin of safety." This mandate "carries the promise that ambient air in all parts of the country shall have no adverse effects upon any American's health." 116 Cong. Rec. 42,381 (Dec. 18, 1970) (remarks of Senator Muskie, floor manager of the conference agreement). Indeed, EPA has previously recognized this to be the case:

[2] 85 Fed. Reg. at 498560, Tbl. 2; Draft PA at 3-63 – 3-66 & Tbl. 3-3.

> Standards must be based on a judgment of a safe air quality level and not on an estimate of how many persons will intersect given concentration levels. EPA interprets the Clean Air Act as providing citizens the opportunity to pursue their normal activities in a healthy environment.

44 Fed. Reg. at 8210.

Through the Draft PA, EPA is unlawfully using its exposure assessment to subvert this mandate. EPA relies on the exposure assessment to recommend a standard that results in levels of air quality that are unsafe for people engaging in normal outdoor activity based on EPA's projection that only a small percentage of people will experience multiple exposures of concern. As set forth below, EPA's methodology for projecting exposures of concern is flawed and systematically understates the fraction of people who will experience harmful exposures. Especially in light of these deficiencies with EPA's model, a precautionary and protective approach must be applied. When such uncertainties suggest that it might be unsafe to be active outside, or that some at-risk groups could experience more frequent exposures of concern than indicated by the modeling, EPA must act in favor of protecting sensitive groups.

2. EPA fails to show that the APEX model provides meaningful estimates of population-level exposures for the urban areas analyzed

Assuming the urban areas EPA selected for its exposure assessment were representative in all the ways that EPA has claimed[3]—which, as discussed below, it has not established[4]—EPA fails to demonstrate that APEX provides data that meaningfully reflect population-level exposures. This is because the demographic variables that APEX uses to assign activity profiles have not been demonstrated to correlate with whether people are likely to spend extended periods of time outdoors at moderate levels of physical activity—the preconditions for exposures of concern. While acknowledging that "a single profile does not, in isolation, provide information about the study population," EPA claims that "a distribution of profiles represents a random sample drawn from the study area population" and, "[a]s such, the statistical properties of the distribution of simulated profiles are meant to reflect statistical properties of the population in the study area."[5] But EPA fails to establish that this is so.

APEX functions by "[c]onstruct[ing] an activity event sequence (a minute-by-minute time-series) by selecting a sequence of appropriate daily activity diaries for the simulated individual (using demographic and other influential variables)."[6] "**[A]ctivity patterns of the sampled individuals** (e.g., the specification of indoor and other microenvironments, the duration of time spent in each) **are assumed by the model to be similar to individuals with similar demographic characteristics**, according to activity data such as diaries compiled in EPA's Consolidated Human Activities Database (CHAD)."[7] According to the model's documentation, these demographic characteristics are: age, gender, race, and work status.[8] But EPA provides no regression analysis (R^2 value) or other quantitative

[3] 85 Fed. Reg. at 49854/2.
[4] See Section 7, *infra*.
[5] 2020 Policy Assessment at 3D-20; *see also* 2022 Draft Policy Assessment at 3D-16.
[6] 2020 Policy Assessment at 3D-16.
[7] APEX, Version 5.2: Volume I: User's Guide (Oct. 2019), at 3, available at https://www.epa.gov/sites/production/files/2019-12/documents/apex52_usersguide_vol1_october2019.pdf (hereinafter APEX Documentation, Vol. I).
[8] APEX Documentation Vol. I at 21.

or qualitative analysis to establish that these variables alone or in combination reasonably and accurately or explain the amount of time an individual spends outdoors engaging in moderate (or higher) levels of exertion. If these variables do not capture the relevant variability in this metric, then an extrapolation of behavior from thousands of simulated individuals based exclusively on their demographic characteristics does not provide reliable information about how many people would experience exposures of concern.[9]

In its December 2020 Response to Comments document, EPA claims that it is "not relying on age, gender, race and work status as [sic] sole basis for estimation of population exposure in the study areas."[10] That is understood. Nevertheless, EPA concedes that "[t]he variables age, gender, race and work status are used to identify a sample activity pattern to draw from the CHAD for simulation in APEX."[11] The fact that "[t]he APEX model generates each simulated person or profile by probabilistically selecting values for a set of profile variables, including demographic variables, health status and physical attributes (e.g., residence with air conditioning, height, weight, body surface area) and ventilation rate" does not rectify or address the fundamental problem with EPA's approach.[12] The individuals in the simulated study areas could perfectly mimic the health status and physical attributes of the actual underlying population, but if the activity diaries are being assigned based on variables that do not accurately predict individuals' activity patterns—and most importantly their time spent outdoors with elevated ventilation rates—the model results will not accurately reflect population level exposures.

Indeed, EPA provides no evidence that the variables used to assign diaries from CHAD account for the variability in time spent outdoors with elevated ventilation rates. Instead it merely engages in circular reasoning, stating:

> For example, to account for the variability in activity patterns dependent on age, such as time spent outdoors and associated activities performed, the APEX model assigns age-specific diaries from CHAD to simulate age-specific individuals' locations visited and physical activities performed and thus accounts for when time expenditure varies due to influential individual attributes such as age.[13]

Certainly assigning diaries based on age will account for the age-specific variability in activity patterns. But EPA nowhere shows what fraction of the variability in activity patterns are accounted for by age or, indeed, by any of the four basic demographic factors it used to assign activity journals (age, gender, race, and work status). If these variables collectively do not account for most of the variability in activity patterns, EPA's ability to extrapolate population-level exposure impacts from activity simulations based on those four factors will be fatally limited.

3. EPA fails to show that the APEX model provides meaningful estimates of individual exposures

[9] There are other limitations with APEX as well, including the fact that "The population activity pattern data supplied with APEX (CHAD activity data) are compiled from a number of studies in different areas and for different seasons and years. Therefore, the combined data set may not constitute a representative sample." APEX Documentation, Vol. I at 5.
[10] EPA, Response to Comments (Dec. 2020), at 10 (hereinafter RTC).
[11] EPA, RTC at 10.
[12] *Id.*
[13] *Id.* at 11.

The population-level problems with APEX are compounded by equally profound individual-level issues with the model. EPA acknowledges that "exposures could be underestimated for some population groups that are frequently and routinely outdoors during the summer (e.g., outdoor workers, children)."[14] In particular, "longitudinal activity patterns do not exist for these and other important population groups (e.g., those having respiratory conditions other than asthma), thus limiting the extent to which the exposure model outputs reflect these groups that might routinely experience high exposure concentrations."[15] Given EPA's focus on assessing multiple exposures of concern, this reliance on modeling that fails to accurately represent the groups most likely to experience such multiple exposures is fatal to EPA's reliance on its exposure modeling.

APEX models exposures in a way that homogenizes individuals based on demographic characteristics and mutes important variability. As the model's documentation explains, "APEX creates seasonal or year-long sequences of activities for a simulated individual by sampling human activity data from more than one subject in CHAD," resulting in "uncertainty . . . about season-long exposure event sequences."[16] EPA acknowledges that "[t]his approach **can tend to underestimate the variability from person to person because each simulated person essentially becomes a composite or an 'average' of several actual people in the underlying activity data (which tends to dampen the variability)**."[17]

For example, "[s]imulated individuals are assigned activity diaries longitudinally without regard to occupation or school schedule . . . ."[18] Rather, "[o]nce APEX identifies the basic personal attributes of a simulated individual . . . and daily air temperatures . . ., activity pattern data obtained from CHAD . . . are then selected based on age, sex, temperature category, and day of the week."[19] The model does recognize the need for autocorrelation in developing longitudinal activity pattern sequences,[20] but EPA selected a method for autocorrelating (the diversity & autocorrelation method) that produces lower estimates of multiple exposures of concern than, for example, the Markov-chain clustering method it considered.[21] And EPA has not shown that <u>any</u> of the autocorrelation methods it evaluated provides a reasonable simulation of groups such as outdoor workers or children attending summer camp that consistently spent long periods of time outdoors with elevated levels of respiration. Notably, EPA in its December 2020 response to comments did not address the autocorrelation issue at all.

4. Key groups are not appropriately modeled or considered in the exposure assessment

Due at least in part to the limitations discussed above, key groups that are most likely to experience multiple exposures of concern or are particularly vulnerable are not appropriately modeled or considered in EPA's exposure assessment.

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[14] 2020 Policy Assessment at 3-72; *cf.* 2022 Draft Policy Assessment at 3-33 – 3-34 ("Children and outdoor adult workers, are at increased risk largely due to their generally greater time spent outdoors while at elevated exertion rates (including in summer afternoons and early evenings when O_3 levels may be higher).") .
[15] 2020 Policy Assessment at 3-72.
[16] APEX Documentation Vol. I, at 5.
[17] *Id*.
[18] 2020 Policy Assessment at 3D-92.
[19] *Id.* at 3D-54.
[20] With regard to the three alternate methods for longitudinal activity pattern sequences that EPA considered, EPA explains that Che et al. (2014) found: "little difference was observed across the methods with regard to estimates of the mean exposures of simulated individuals. Differences were observed, however, in the number of multiday exposures exceeding a selected benchmark concentration." *Id.* at 3D-60.
[21] *See id.*

a. Children attending outdoor summer camps

Every year more than 14 million children, and adults, attend camps in the United States, in addition to over 1.5 million camp workers.[22] Most camps last for at least a week,[23] and many for a month or two,[24] frequently offering overnight camps. The most popular camper age is 9-12 years old,[25] and the majority of camp activities take place outdoors. According to one survey, over 75 percent of both overnight and day camps said campers spent more than seven hours a day outside in the open air and only one camp reported less than two hours a day spent in the open air.[26] Studies of children at summer camps, where they experience sustained outdoor activity, show that short-term ozone exposure is associated with decreased respiratory function,[27] even when restricted for levels above 60 ppb.[28] Studies of children at summer camp with asthma have also shown increased risk of respiratory symptoms on high pollution days as well as decreases in lung function.[29]

EPA's exposure assessment does not meaningfully address summer camp attendees. As noted above, in APEX "[s]imulated individuals are assigned activity diaries longitudinally without regard to occupation or school schedule . . . ."[30] The model does not attempt to simulate children whose summer days are primarily spent engaging in outdoor activity. Epidemiological studies looking at active children who spend significant time outdoors call into question the representativeness of EPA's modeling. For example, McConnell et al. showed that active children who played three or more sports growing up in communities with eight-hour ozone levels ranging from 55.8 to a maximum of 69 ppb were three times more likely to develop asthma than their peers in communities with lower ozone levels, ranging from 30.6 to 50.9 ppb.[31] EPA's exposure assessment provides no meaningful information about these regularly active children.

b. Outdoor workers

There are millions of outdoor workers in the United States. According to the Bureau of Labor Statistics, in 2014 there were approximately 29 million workers in industries with outdoor work including agriculture, forestry, fishing, and hunting (2.1 million), construction (7.0 million), leisure and

[22] American Camp Association, ACA Facts and Trends, available at http://www.acacamps.org/media/aca-facts-trends (accessed Sept. 9, 2020).
[23] American Camp Ass'n, Camper Enrollment Report 2017, at 4, available at https://www.acacamps.org/sites/default/files/resource_library/2017_CamperEnrollmentReport.pdf.
[24] *Id.*
[25] *Id.* at 16.
[26] P.A. James & K.A. Henderson, Camps and Nature Report (2007), *available at* http://www.acacamps.org/sites/default/files/images/research/understand/camps_nature_report.pdf.
[27] *See e.g.*, P.L. Kinney, G.D. Thurston, M. & Raizenne (1996). The effects of ambient ozone on lung function in children: A reanalysis of six summer camp studies, *Env. Health Perspect.*, 104(2): 170-174; .D. Thurston, M. Lippmann, M.B. Scott, & J.M. Fine (1997). Summertime haze air pollution and children with asthma, *Am. J. of Resp. and Crit. Care Med.*, 155(2): 654-660.
[28] Spektor, D.M., et al. (1988). Effects of ambient ozone on respiratory function in active, normal children, *Am. Rev. of Resp. Disease*, 137(2): 313-320.
[29] D. Thurston, M. Lippmann, M.B. Scott, & J.M. Fine (1997). Summertime haze air pollution and children with asthma, *Am. J. of Resp. and Crit. Care Med.*, 155(2): 654-660.
[30] 2020 Policy Assessment at 3D-92.
[31] R. McConnell et al. (2002). Asthma in exercising children exposed to ozone: A cohort study, Lancet, 359(9304): 386-391.

hospitality (12.5 million), mining, quarrying, and oil and gas extraction (0.5 million), transportation and warehousing (4.2 million), and utilities (0.6 million).[32] EPA acknowledges that, "in 2020 about 4% of civilian workers were required to spend more than two-thirds of their workday outdoors," and that this figure was between 80 and 90 percent among construction, landscaping, and groundskeeping workers, and a "high percentage" for other employment sectors including highway maintenance, protection services, extraction and other construction trades like engineers and equipment operators.[33] EPA further noted that "[s]uch jobs often include physically demanding tasks and involve increased ventilation rates, increasing the potential for exposure to O_3."[34]

As in 2020, EPA acknowledges that it again did not attempt to simulate outdoor workers in its current review of the primary standard.[35] Instead it points back to the "limited analysis" (single study area, single year) that was conducted in the 2014 Health Risk and Exposure Assessment (HREA)[36] and acknowledges that:

> The exposures and risk estimates for this subgroup for the single study area and air quality scenario assessed indicated a greater percentage of outdoor workers experience single and multi-day exposures than that estimated for the full adult population, differing by about a factor of 5 or more depending on the benchmark level and number of days per year.[37]

Indeed, the results of the 2014 analysis confirm that outdoor workers face outsize risks of adverse effects in areas just meeting a range of standards, including the current 70 ppb standard. As EPA explained in the 2014 HREA:

> The percents of people experiencing one or more FEV1 decrements ≥ 15% during the 2006 O_3 season in Atlanta are 3.6 times higher for outdoor workers than for the general population (ages 19-35) under the existing [75 ppb] standard, and range up to 5.3 times higher for the alternative standards [down to 60 ppb]. The percents of people experiencing six or more FEV1 decrements ≥ 15% during the 2006 O3 season in Atlanta are 24 times higher for outdoor workers than for the general population under the existing [75 ppb] standard, and range up to 150 times higher for the alternative standards [down to 60 ppb].[38]

For the current 70 ppb standard, EPA's modeling found that 3.2 percent of outdoor workers would experience at least one FEV1 decrement of 15 percent or greater and nearly 1 percent (0.93%) would experience <u>six or more</u> such FEV1 decrements. Moreover, EPA recognizes that the results of its "limited" analysis "suggest that results for the full adult population would likely underestimate exposures and risks for outdoor workers" and acknowledges the "limited number of CHAD diary days

[32] Bureau of Labor Statistics, Jobs for People Who Love Being Outdoors (July 2017), at Chart 1, available at https://www.bls.gov/careeroutlook/2017/article/outdoor-careers.htm.
[33] 2022 Draft Policy Assessment at 3-34 n.45.
[34] *Id*.
[35] *Id.* at 3-148 ("In the current exposure and risk analysis, outdoor workers were not evaluated as a separate population subgroup."); *cf.* 2020 Policy Assessment at 3-62.
[36] 2022 Draft Policy Assessment at 3-148.
[37] *Id*.
[38] 2014 Health Risk and Exposure Assessment at 6-28.

available for outdoor workers," which would cause the APEX modeling to underpredict adult exposures.[39] The present 70 ppb standard is plainly inadequate to protect this vulnerable group.

c. Asthmatics

Despite its recognition that, under similar exposure circumstances, the health risk to asthmatics is "greater . . . relative to other population groups,"[40] EPA's exposure assessment irrationally and arbitrarily presumes asthmatics will experience identical lung function decrements to healthy individuals when confronted with the same exposures of concern.

EPA acknowledges that controlled human exposure studies are conducted using health young adults[41] and "recognize[s] the lack of evidence from controlled human exposure studies at the lower concentrations of greatest interest (e.g., 60, 70 and 80 ppb) for children and for people of any age with asthma."[42] Thus, EPA concludes, "the health effects documented in controlled human exposure studies of healthy adults may [] contribute to more severe outcomes when occurring in people with asthma."[43]

Irrationally, in its exposure assessment, EPA nevertheless presumes asthmatics will experience the same lung function decrements as healthy people for a given exposure, extrapolating FEV decrements for asthmatics based on the same susceptibility as healthy individuals.[44] EPA even caveats that: "there is uncertainty regarding the interpretation of the exposure and risk estimates and the extent to which they represent the populations at greatest risk of O3-related respiratory effects."[45] But EPA still plows forward undaunted with its reliance on the exposure assessment to purportedly show exposure risks to asthmatics are acceptable. This is arbitrary.

5. EPA arbitrarily fails to acknowledge or account for averting behavior

The 2020 exposure assessment irrationally ignores the possibility that the results are influenced by averting behavior, a possibility EPA analyzed and discussed in 2015, but entirely failed to address in the 2020 or current reviews. In 2015, EPA recognized that many people, including children, avert outdoor activity and that its exposure estimates may be inaccurate due to their failure to capture averting behavior. In discussing activity diaries in that review, EPA noted that "we do not know if any diary day represents the activities of an individual who averted,"[46] and EPA conducted a "no averting" simulation to address this possibility.

In the 2022 draft Policy Assessment, averting is nowhere discussed.[47] Yet, EPA fails to offer any explanation why the possibility that averting behavior influenced the activity diaries relied on in the APEX modeling is no longer an issue. If the activities documented in the activity diaries were

[39] 2022 Draft Policy Assessment at 3-148.
[40] 2020 Policy Assessment at 3-71.
[41] *Id*.
[42] 85 Fed. Reg. at 49857.
[43] *Id.*; 2020 Policy Assessment at 3-71.
[44] 2020 Policy Assessment at 3-66.
[45] *Id.* at 3-72; *see also* 85 Fed. Reg. at 49857-58.
[46] 2014 Health Risk and Exposure Assessment at 5-53, n. 27.
[47] The only mention of "averting" was in the context of cataloging studies used to populate the CHAD database. *See* 2022 Draft Policy Assessment at 3D-53 & 3D-Attachment3-11.

influenced by averting and reflect the actions of people who chose to stay inside due to poor air quality, this further undercuts the representativeness of EPA's exposure modeling by understating the amount of time people would spend outdoors with healthier air.

6. EPA has failed to rationally explain the basis for limiting its exposure assessment to eight cities or for the eight cities chosen

EPA's exposure assessment accompanying the current proposal is far more limited than for the 2015 standard. Whereas EPA evaluated 15 urban areas, accounting for 19 million school age children and 85 million people aged 5 to 95,[48] the "streamlined"[49] list of eight study areas in the present exposure assessment represent less than half (42 million people) of the prior analysis.[50] While EPA acknowledges that "the exposure and risk analyses are not intended to provide a comprehensive national assessment,"[51] it fails to provide a rational basis for limiting the assessment to the degree and in the manner it did.

EPA's criteria for selection of urban study areas are inadequately explained. In the 2020 Policy Assessment, EPA states that it "developed criteria" for selection of urban areas for the exposure and risk analysis.[52] But it provides no information on how those criteria were developed or why they are appropriate. EPA simply asserts—without explanation—that the set of areas "was chosen to ensure it reflects the full range of air quality and exposure variation expected in major urban areas in the U.S. with air quality that just meets the current standard."[53] It is not clear how (or whether) most of the identified criteria bear on whether the set of chosen areas reflects the full range of air quality and exposure variation expected in major U.S. urban areas. Among other things:

- EPA fails to explain why the urban study areas used in this analysis should be a subset of those from the 2014 Health Risk and Exposure Assessment.[54]
- EPA fails to provide any basis for either its lower bound Combined Statistical Area/Metropolitan Statistical Area population of 2 million or its upper bound of 10 million.[55] Instead, EPA irrationally claims that those arbitrarily-selected bounds demonstrate that "[t]he eight study areas represent a variety of circumstances with regard to population exposure to short-term concentrations of O3 in ambient air."[56] To the contrary, they merely demonstrate that EPA selected urban within apparently arbitrary population bounds.
- EPA fails to explain why the urban study areas must have at least 10 ambient air monitors.[57] Beyond the fact that the number 10 itself is arbitrary, eliminating urban areas with fewer than 10 monitors makes little sense because EPA's modeling does not have an accurate way of modeling people's movement around the study area. Other than having the ability to model commuting behavior, the model presumes that activity occurs within a given air district. EPA provides no

[48] 2014 Final HREA at 5-10, Tbl. 5-1 (Aug. 29, 2014).
[49] 85 Fed. Reg. at 49854/2.
[50] 2020 Policy Assessment at 3C-14, Tbl. 3C-1.
[51] *Id.* at 3-61.
[52] *Id.* at 3D-16.
[53] 85 Fed. Reg. at 49854/2.
[54] 2020 Policy Assessment at 3D-16.
[55] *Id.* at 3D-17.
[56] 85 Fed. Reg. at 49854/2.
[57] 2020 Policy Assessment at 3D-17.

indication of why APEX modeling of an urban area with fewer than 10 ambient air monitors would be less accurate than one with 10 or more.

Ultimately, EPA's selection of study cities is arbitrary because EPA did not even adhere strictly to its own criteria. For example, EPA included Sacramento even though its 2015-2017 DV was 86 ppb, a concern that CASAC flagged in its consensus letter.[58] And EPA excluded cities from the prior review that meet its criteria, including Cleveland, OH, Washington, DC, and Houston, TX,[59] without adequate explanation.

7. Other issues with the exposure assessment

There are a number of additional problems with EPA's exposure assessment that further render the Agency's reliance on it arbitrary and unlawful. These include:

- Inadequate consideration of environmental justice: While EPA acknowledges in numerous places that there are strong correlations between asthma prevalence and race, EPA did not address correlations between asthma and race in attributing asthma prevalence to simulated study populations.[60]
- Failure to follow CASAC advice regarding quantitative uncertainty analysis: CASAC commented in its consensus letter that EPA failed to provide uncertainty bounds on its exposure and risk estimates, explaining that the ranges presented "represent variability between cities, not uncertainty."[61] CASAC noted that "this type of uncertainty is a prime candidate for a quantitative uncertainty analysis because there are estimates on the uncertainties associated with the air quality estimates."[62] Yet EPA has not addressed this in its final Policy Assessment or proposed rule. This was irrational.
- Failure to adequately address CASAC advice regarding model performance evaluation: In its consensus letter on the policy assessment, CASAC urged that, "[i]n addition to the ozone [model performance evaluation] MPE, it would be useful to perform an MPE for the ozone precursors (NOx and VOCs)."[63] CASAC explained that, "[i]f the precursor concentrations don't match the observations, the HDDM sensitivity results may not be accurate even if the ozone concentrations match observations."[64] Nevertheless, EPA did not provide a model performance evaluation for ozone precursors in its final Policy Assessment or proposed rule. This was arbitrary.
- Failure to address EPA's own analysis showing a lower standard would significantly reduce exposures of concern for sensitive groups: Even if EPA's reliance on its exposure assessment were not arbitrary, EPA fails to articulate a rational basis for rejecting lower standards, which (per EPA's modeling) substantially reduce and nearly eliminate exposures of concern for children and asthmatic children—two important sensitive groups.[65]

[58] CASAC Policy Assessment Letter at 10.
[59] The 2015-2017 design value for Houston is 81 ppb, which is just outside EPA's range of 60 to 80 ppb, but notably much closer to that range than Sacramento (DV of 86 ppb).
[60] 2020 Policy Assessment at 3D-25.
[61] CASAC Policy Assessment Ltr. at 10.
[62] *Id.* at 10.
[63] *Id.* at 11.
[64] *Id.*
[65] *Cf.* 2020 Policy Assessment at 3-66, Tbl. 3-4 *with id.* at 3-69, Tbl. 3-5.

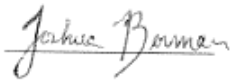
II. IN CALCULATING OZONE DESIGN VALUES, EPA MUST EITHER MODIFY ITS TRUNCATION CONVENTIONS OR ADJUST THE LEVEL OF THE STANDARD DOWNWARD

EPA's truncating conventions result in up to approximately 1.6 parts per billion of under-protection in the level of the NAAQS that needs to be accounted for when setting the next ozone standard. As EPA explains in the Draft PA, when calculating design values, EPA truncates the 8-hour maximum daily average at the monitor to three decimal places when measuring in parts per million and then truncates a second time when calculating the 3-year average.[66] Even assuming EPA is correct that three decimal digits represents "the typical measurement precision associated with most O3 monitoring instruments," it does not follow that truncating residual digits is more appropriate (or health-protective) than rounding where the monitors report ozone levels with greater precision. Indeed, truncation at the monitor alone has the potential to reduce reported 8-hour daily maximum ozone values by up to a full part per billion.

Likewise, EPA identifies no health-based or other policy justification for truncating a second time when calculating the 3-year average of 4th highest 8-hour daily maximum values rather than a more mathematically accurate approach such as rounding (or simply identifying any 3-year average that exceeds 70 ppb as a violation of the standard). Imagine a hypothetical monitor with 4th highest 8-hour maximum daily ozone levels of 71.9, 71.9 and 70.9 ppb in three consecutive years. Under a straight-forward averaging approach, this monitor would have a 3-year average of 71.57 ppb and would violate the 70 ppb standard by nearly 1.57 ppb. Under EPA's double truncation methodology, the 4th-highest 8-hour maximum ozone levels would first be truncated to 71, 71 and 70 ppb. The resulting three-year average of 70.67 ppb would again be truncated, yielding a three-year average of 70 ppb, which EPA would regard as meeting the 70 ppb standard. EPA's truncation approach treats the additional 1.57 ppb of actual ozone that was dropped as though it did not exist and was not causing harm.

EPA's current approach to calculating design values is scientifically untenable. Either EPA needs to modify its truncation conventions so that its design value calculations more accurately reflect monitored ozone levels, or EPA needs to adjust the standard downward to account for the omitted ozone. Doing neither despite EPA's health protective mandate in setting the NAAQS is arbitrary and unlawful.

Respectfully submitted,



Joshua Berman
Senior Attorney
Sierra Club

[66] *See* Draft PA at 2-14 ("Hourly average O3 concentrations at the monitoring sites used for assessing whether an area meets or exceeds the NAAQS are required to be reported in ppm to the third decimal place, with additional digits truncated, consistent with the typical measurement precision associated with most O3 monitoring instruments"); *id.* at 2-15 n.19 ("Design values are reported in ppm to the third decimal place, with additional digits truncated. This truncation step also applies to the initially calculated 8-hour average concentrations (Appendix 2A, section 2A.1).); *see also* 40 CFR part 50, Appendix P, section 2.1.

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