

From: [Palumbo, Antonette](#)
To: [Eastvold, Jonathan C.](#)
Cc: [Vetterhoffer, Dana](#); [Bloomberg, David E.](#); [Davis, Rory](#)
Subject: Illinois EPA's Response to JCAR's Questions
Date: Friday, January 8, 2021 12:45:00 PM

Mr. Eastvold,

Below are the Illinois EPA's responses to your questions. As a preliminary matter, however, the Agency notes that Stop EtO's comments were not timely provided to the Illinois Pollution Control Board or the Agency during the approximate year that this rulemaking has been pending. During this time, two hearings took place, in June and September of 2020. At both, Illinois EPA witnesses were available to answer questions regarding the rule proposal and the Agency's technical support for the rule, including the reasons the monitoring locations were selected. Participants were allowed to file testimony or post-hearing comments, or make comments during the hearings, posing questions and offering any suggestions or recommendations for amending the regulatory proposal. All proceedings were held in accordance with the applicable requirements for rulemaking proceedings. Neither Stop EtO nor any other member of the public filed a public comment with the Board, provided oral public comment during the designated times at the hearings, filed testimony, asked questions of the Agency witnesses, or suggested revisions to the rule proposal.

This public comment from Stop EtO was instead received by the clerk of the Board on December 14, 2020, two and a half months after the Board's deadline for submitting public comments and one day before JCAR's scheduled meeting. While the Illinois EPA supports the public's ability to participate in the rulemaking process, the more appropriate and useful mechanism to participate would have been during the Board's rulemaking proceeding, when the Agency, the Board, and other members of the public would have had an opportunity to thoroughly review and substantively respond to the comments. Notably, prior to filing the rulemaking with the Board, the Agency expressly reached out via both phone and e-mail to Stop EtO via Nancy Loeb with the Bluhm Legal Clinic. Illinois EPA sent a draft copy of the rule and noted that the legislation required the Agency to file the rulemaking by December 18, 2019. Ms. Loeb replied with comments on December 9, 2019, stating, "I am writing these comments on behalf of Stop EtO in Lake County." It is clear that Stop EtO was aware that the rulemaking was about to be filed, and the organization was given every opportunity to timely participate in the Board's process, yet it did not.

No substantive changes to the rule are warranted, and none should be made, as evidenced by the record in the Board's proceeding that has been developed over the past year, including the Illinois EPA's technical support, pre-filed testimony, responses to Board questions, and hearing testimony. Notwithstanding, the Agency's responses to your questions are set forth below. Note that the Illinois EPA is only addressing the questions you specifically asked to be addressed, not the entirety of the comments and presentation that was attached by Stop EtO, because much of it deals with topics that are outside the scope of this rulemaking. These topics only relate to ethylene oxide ("EtO") generally and have been addressed earlier by the Illinois EPA in other contexts, including in two calls with Stop EtO and via a response to a letter the organization sent to the Illinois EPA Director.

IEPA maintains that the proposed testing locations are far enough away from known ethylene oxide emitters to prevent artificially high measurements of background EtO because "it has appeared that EtO is a highly localized pollutant" (transcript of 6/25

hearing, p. 21).

1. On what evidence is this claim based?

When calling EtO a localized pollutant, the Illinois EPA means that like many pollutants, EtO begins to disperse as soon as it is emitted such that concentrations of the pollutant are highest near the emitting source and decrease greatly with distance; as such, concentrations that may cause greater risks to human health would likely be found closer to a known source of emissions.

The evidence on which this is based is one of the most basic principles of air pollution tracking and modeling, the gaussian plume equation. In very simple terms, the concentration of a pollutant “plume” disperses and decreases vertically and horizontally from the plume centerline as the distance from the emitting location increases, with the pollutant plume essentially expanding in a conical shape. This has the effect of dispersing the pollutant over a wider area but reducing the amount of pollutant in each part of that area, thus reducing the concentration of the pollutant. Meteorology, turbulence, and terrain can affect dispersion rates as well.

The highest concentrations of EtO typically occur nearest to the emitting source, and EtO levels decrease (i.e. disperse) as distance increases. This is why the Illinois EPA describes EtO as a localized pollutant. It only takes a relatively short distance for the concentration to disperse to the point that it is indistinguishable from the background level. This feature has been observed in numerous EtO monitoring programs where concentrations near a source are consistently much higher than those further away, even when the wind is blowing in a direction towards a more distant monitor. By the time the plume reaches such a distance, it has widened and dispersed (mixed out) to the point that the concentration is extremely low.

When Illinois EPA previously analyzed EtO modeling for placement of samplers at various sites, the modeling showed that the concentrations dropped off so significantly with distance such that concentrations originating from the source could not be differentiated from the background at a distance of around or less than one kilometer. As such, the proposed monitoring locations are far enough away from known EtO emitters to eliminate concerns about impact on the ambient concentrations.

Stop EtO identified supposed problems with the model used for EtO and many other pollutants, AERMOD, alleging, “once you get beyond 0.5 mile or more, the AERMOD model greatly underestimates the impact of EtO around these facilities.” This appears to be based on Stop EtO’s own contractor’s analysis. The presentation attached to Stop EtO’s comments recommends using the RLINE or CALPUFF models instead. AERMOD, however, is the state-of-the-art model, approved by USEPA. It is acknowledged that it may not be as accurate beyond 50 kilometers, but that is a much further distance than is being discussed here and AERMOD is the soundest model to use in this situation.

Furthermore, neither of the other two suggested models is appropriate. RLINE is still under development, meaning it is not ready or approved for full use. This Community Modeling and Analysis System website (University of North Carolina Institute for the Environment, <https://www.cmascenter.org/r-line/>) states, “It should be noted that the RLINE model is not appropriate for regulatory applications ... because it has not undergone the extensive testing and comprehensive evaluation for such regulatory use.” A USEPA webinar from 2019 (<https://www.epa.gov/sites/production/files/2020-02/documents/aermod-19191-r-line->

[additions-webinar-2019.pdf](#)) states that AERMOD is “EPA’s recommended near-field dispersion model for regulatory applications” and “EPA’s preferred model since 2005.” Since the RLINE model is not ready or approved for full use, it is incorrect to suggest it should be used in place of AERMOD for these purposes.

As for CALPUFF, as the Stop EtO-provided slide (p. 32) notes, it is recommended for far-field emission levels. A distance of three or four miles (roughly 4.5 to 6.5 kilometers) is not considered a far-field distance – that would be on the order of 50 kilometers – and thus AERMOD is the appropriate model to use.

In summary, it would be inappropriate to use the suggested RLINE or CALPUFF model instead of AERMOD for EtO modeling.

2. **How should this claim be reconciled with the following sources?**
(Specifically, if we do not know where background EtO is coming from, how do we know that measurements from a testing site 3 or 4 miles from a known source will not be inflated due to that proximity—especially given the 120-day half-life of atmospheric EtO? Wouldn’t that half-life give EtO molecules time to go much further than 3-4 miles?)

- A. USEPA FAQ on EtO (<https://www.epa.gov/hazardous-air-pollutants-ethylene-oxide/frequent-questions-basic-information-about-ethylene-oxide#distance>):

“I would like to know how exactly ethylene oxide travels in the air/through the wind, and on average, what is the distance/range for which surrounding communities should be concerned of cancer risks as well? Ethylene oxide can last in the air for weeks and can be transported with prevailing winds. At higher temperatures, especially above 50 degrees Fahrenheit, and stronger winds, we would expect ethylene oxide to transport farther away from the emission source more effectively.”

- B. American Chemistry Council, Ethylene Oxide Product Stewardship Guidance Manual (2007)

(https://www.americanchemistry.com/ProductsTechnology/Ethylene-Oxide/EO-Product-Stewardship-Manual-3rd-edition/EO-Product-Stewardship-Manual-Environmental-Effects-of-Ethylene-Oxide.PDF):

“Earlier studies suggested that EO is not persistent in air due to washout by rain and degradation by chemical processes. However, more recent work has indicated that EO was not readily deposited by rain, and the dominant chemical removal process is the reaction with the hydroxyl radical. Based on the most recent determinations of the average atmospheric hydroxyl radical concentration and its reaction rate with EO, the atmospheric half-life of EO is estimated to be 105 days.”

- C. World Health Organization, “Concise International Chemical Assessment Document 54: Ethylene Oxide”, section 5.1

(<https://www.who.int/ipcs/publications/cicad/en/cicad54.pdf>) :

“The atmospheric half-lives for ethylene oxide following vapour-phase reactions with photochemically produced hydroxyl radicals, assuming an atmospheric concentration of 1×10^6 radicals/cm³, were estimated to be 120 days (Atkinson, 1986), 99 days (Lorenz & Zellner, 1984), 151 days (C. Zetzsch, personal communication, 1985, cited in Atkinson, 1986), and

between 38 and 382 days (Howard et al., 1991).

The theoretical atmospheric lifetimes (approximately $1.43 \times t^{1/2}$) for ethylene oxide were estimated at ~200 days (Bunce, 1996) and 330 days (Winer et al., 1987) and were calculated based on the reaction with hydroxyl radicals at a concentration of 8.0×10^5 and 1.0×10^6 radicals/cm³, respectively. Such lifetimes are expected to be long enough to allow a very small percentage of the amount emitted to reach the stratosphere (Bunce, 1996).

- D. IEPA Technical Support Document Attachment A: “Update on Ethylene Oxide Monitoring Activities (A Presentation of Lewis Weinstock, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, 10/3/19)”, page 14:

“Summary – Current Measurement Challenges with EtO ... What don’t we know: ... What are the sources of EtO being measured away from known sources?”

This question seems to confuse the half-life of an individual molecule and how long the molecule lasts in the air with the concentration of such molecules in the ambient atmosphere. The two concepts are very different. It is nearly certain that individual molecules of EtO will travel much further than three or four miles; however, the half-life of the chemical and its persistence in the atmosphere are irrelevant in this discussion of a monitor’s proximity to an emission source, because the concentrations of the pollutant become very diffuse in a much shorter timeframe than the half-life of EtO due to plume dispersion, as discussed above.

The half-life of EtO and its resistance to washout by rain (your question mentions 120 days, but different sources provide different estimates, ranging from roughly two to five months) may suggest that a global background is contributing to EtO concentrations everywhere, but it is not relevant to the monitor locations that the Illinois EPA has selected. The half-life of the EtO molecule has nothing to do with whether or not concentrations will be higher in a more localized area near an emitting source.

Contextual information about the causes of higher and lower concentration measurements is always an important part of air monitoring studies. A portion of the question states, “if we do not know where background EtO is coming from,” but background EtO is, through use of that term, essentially everywhere – it is in the background, though there may be different levels in different locations. If there is air pollution known to be coming from a specific source, then it would not be considered part of the “background” until it disperses so fully as to be essentially untraceable as to its origin. To account for this, as noted below, the Illinois EPA selected monitoring sites to be far enough away from permitted/known sources of EtO while also considering the fact that urban and rural areas will potentially have differing levels of nonpoint contributions from automobiles, cigarette smoke, etc. The Agency specifically avoided recommending ambient monitor placements near permitted sources of EtO, and also avoided major highways as much as possible, while also taking into account the fact that many Illinoisans live near such transportation arteries and thus cannot be ignored when selecting sites.

As noted in the TSD, “The monitoring locations were selected to provide ethylene oxide concentration data from a diverse cross section of locations in Illinois. Monitoring locations would sample densely populated urban areas in Illinois (Chicago and Metro-East St. Louis areas), as well as rural areas (Nilwood and Bondville). The monitoring locations are also

spread out geographically, consistent with the Section 9.16(n) (text from P.A. 101-22) requirement to “determine the ambient levels of ethylene oxide throughout the State.” The Agency selected sites to meet the requirements and goals of this legislative language, in a manner that is consistent with the known science related to EtO.

3. Would any harm be done by switching testing sites to the ones suggested by Stop EtO?

Yes. There are a number of reasons why the Illinois EPA cannot and should not switch testing sites, especially to the ones suggested by Stop EtO. First and foremost, doing so would not involve “switching,” but rather adding at least two sites. The Northbrook and Schiller Park sites are both appropriate for monitoring ambient EtO as Chicago-area urban sites that are not impacted by any nearby permitted EtO emitters, and both already monitor hazardous air pollutants, so the Agency would not cease monitoring EtO at these locations when all the equipment is already there and samples are already being captured for hazardous air pollutant analysis. Furthermore, as noted earlier, it is entirely appropriate to monitor in these two locations to obtain information on urban areas. Failure to include them would be directly contrary to the legislative language to “determine the ambient levels of ethylene oxide throughout the State” as it would be ignoring more densely populated areas of the State.

There is also no reason to change the Alton monitoring site because the prior source of EtO for which Stop EtO is concerned, St. Anthony’s Hospital, ceased EtO sterilization and had the sterilizer at the facility removed from its permit. The hospital no longer uses nor emits EtO. This information was conveyed by the Illinois EPA’s Air Quality Planning Section Manager, Mr. David Bloomberg, to Ms. Loeb, who had commented on behalf of Stop EtO, via email on December 10, 2019, in response to the Stop EtO comments received in the outreach process prior to the rulemaking being filed with the Board. As such, there is no technically-based reason to change this monitoring site. Indeed, as the Illinois EPA explained to the Board, this is an important monitoring site for this study because it increases the geographic spread of the monitors throughout the State, as discussed above.

Monitoring sites are not interchangeable. The monitoring sites proposed by the Illinois EPA and approved by the Board were selected in order to address the mandate of the legislation (see quote from the TSD in response to Question 2), not to “artificially drive up baseline EtO ambient levels in favor of the chemical industry,” as suggested by Stop EtO. The sites at issue were selected because the Agency has access to them, and the sites have been reviewed to ensure they are or can be adequately equipped to properly conduct the required monitoring. As noted in the Agency’s Responses to Prefiled Questions, “Illinois EPA has already considered a number of factors in selecting locations for its proposed ETO monitoring sites, including whether the monitor is in an urban or rural area, its location in the State, whether appropriate equipment can be placed at the monitor, and whether staff are able to maintain the monitor on an appropriate schedule.” As discussed in documents filed with the Board and at hearing, additional factors included logistical concerns, electricity availability, and Agency monitoring staff availability. The Agency must also always consider whether contractual agreements allow additional monitors to be placed at a site, whether additional electrical power is necessary and who is paying for such, whether property owners will allow Illinois EPA staff to add site visits to those that are already occurring (a particularly difficult subject during the ongoing COVID-19 pandemic), whether the location meets siting criteria, etc.

As mentioned previously, in choosing the EtO monitoring sites, the Illinois EPA took into

account permitted/known EtO emitters and considered aspects such as automobile exhaust and other nonpoint sources when choosing sites to represent urban versus rural areas. The sites that were chosen by the Agency are completely appropriate and not improperly impacted by known EtO sources. Some of them are indeed in urban areas, but that is by design in order to also properly represent areas of the State with denser populations and to satisfy the legislative mandate.

The Illinois EPA disagrees with the characterization of the selected monitoring sites as “controversial.” Just because questions are now raised that could and should have been resolved during the Board’s rulemaking process does not create a controversy such that appropriate locations should be changed at this late stage. Rather, the relevant data to determine siting criteria and appropriateness were gathered and considered by the Illinois EPA, and the decision on monitoring is based on those data as well as a scientific, technical, and logistical analysis by the designated air pollution control authorities. That analysis clearly supports the selected sites and no information has been presented that indicates otherwise. Moreover, Stop EtO’s request to change monitoring sites lacks analysis and technical support, and instead is based on incorrect claims that the Illinois EPA is attempting to bias the data.

None of the locations suggested by Stop EtO are appropriate, with two being unusable for this purpose. The suggested monitoring location in Lisle has limited space available, with inadequate room for the type of monitoring equipment needed to sample EtO. The Illinois EPA is also not certain that the electrical capacity at the site is sufficient to add an EtO monitor at the location, even if the space were large enough. As such it is not a viable site for this monitoring program.

The Lawndale monitoring location is part of the Illinois monitoring network but, like most monitoring sites, the property is not owned by the State and in fact this site is operated by the Cook County Department of Environment and Sustainability on Illinois EPA’s behalf. As such, the access agreement for this site is with Cook County, not the Illinois EPA, and Cook County personnel handle the monitors at the site while Illinois EPA staff do not have routine access to the site. Additionally, it is unclear if there is adequate space or electrical capacity for an EtO monitor at this site. Once again, this is not a viable site for this monitoring program.

The monitoring site in Zion is a very rural site. This poses two issues: First, it creates a redundancy in the sites selected, as the Illinois EPA has already chosen two rural sites for this study, Bondville and Nilwood. As such, monitoring data from Zion would not contribute meaningful additional information regarding the ambient concentration of EtO in rural areas of the State. Second, the Zion monitoring site requires significant additional travel for Agency monitoring staff, and this amount of travel would use additional Agency resources and staff time for a redundant monitoring site. Thus, Zion is not an appropriate site for this monitoring program.

In conclusion, Stop EtO has suggested in its comments that the use of the Northbrook, Schiller Park, and Alton monitoring sites is improper. As noted above in response to Question #2, the TSD explained that the monitoring locations were selected to provide a diverse cross section of locations with a combination of rural and urban areas geographically spread out. None of these locations is near enough to a permitted/known EtO source to cause an impact; all are appropriately located. Concentrating too many of the monitors in rural areas, as Stop EtO is suggesting, is inconsistent with the Section 9.16(n) (text from P.A. 101-22) requirement to “determine the ambient levels of ethylene oxide throughout the State.” (Emphasis added). For

all of the reasons provided above, the Illinois EPA strongly opposes switching three of the proposed sites for the three sites suggested by Stop EtO.

Sincerely,
Antonette Palumbo
Assistant Counsel

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From: [McGill, Richard](#)
To: [Brown, Don](#)
Subject: docket PC in R20-18; FW: R20-18, Illinois EPA's Response to JCAR's Questions
Date: Friday, January 8, 2021 2:11:49 PM
Attachments: [Illinois EPA's Response to JCAR's Questions.msg](#)

Good afternoon, Mr. Clerk:

Please docket—as a public comment in R20-18—this forwarded email from IEPA to the Board, including the attached email between IEPA and JCAR.

Thank you.

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From: Palumbo, Antonette <Antonette.Palumbo@illinois.gov>
Sent: Friday, January 8, 2021 12:53 PM
To: Tipsord, Marie <Marie.Tipsord@illinois.gov>; Kaminski, Mark <Mark.Kaminski@Illinois.gov>
Subject: R20-18, Illinois EPA's Response to JCAR's Questions

Good afternoon Marie and Mark,

Attached please find a conversation between the Illinois EPA and JCAR regarding R20-18, Proposed New 35 Ill. Adm. Code Part 249 Ethylene Oxide Ambient Air Monitoring. We recommend this be put in the docket as a public comment.

Thank you,
Antonette Palumbo

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