

## **RECOMMENDED ACTIONS BY THE SOUTHEAST MICHIGAN MODELING AND MEASUREMENTS STEERING COMMITTEE**

### **Southeast Michigan Ozone Attainment Status**

The year 2020 is the third and final year to serve as the basis for ozone design values determining the next attainment status of the Southeast Michigan (SEMI) region. Whether the region “bumps-up” to Moderate Nonattainment, benefits from a one-year extension in its Marginal Nonattainment status, or attains the National Ambient Air Quality Standard (NAAQS) depends critically on three monitors most in danger of having a design value exceeding the ozone NAAQS:

1. Port Huron (which cannot have a fourth highest 8-hour average ozone concentration exceeding 66 ppb in 2020);
2. Oak Park (which cannot have a fourth highest 8-hour average ozone concentration exceeding 69 ppb in 2020);
3. East 7 Mile Rd. (which cannot have a fourth highest 8-hour average ozone concentration exceeding 70 ppb in 2020).

A fourth highest 8-hour average ozone concentration exceeding 70 ppb in 2020 at any of these three monitors would normally trigger a bump-up.

### **Options for a Section 179B(b) Petition and an Ozone Attainment Demonstration**

If a SEMI ozone exceedance event should occur in 2020, some regulatory relief may be obtained by filing a U.S. Clean Air Act Section (CAA) 179B(b) petition that demonstrates attainment of the NAAQS “but for emissions emanating from outside the United States.” While such a petition does not demonstrate actual attainment, it would allow SEMI to maintain its Marginal Nonattainment status if the petition is approved by the Environmental Protection Agency (EPA).

Michigan industry has funded and continues to fund studies to demonstrate that nearby (from Canada) and long-range (e.g., from Asia) international anthropogenic emissions contribute at least a few parts per billion (ppb) to ozone design values in Michigan nonattainment areas. However, draft guidance from the EPA regarding such demonstrations appears to set a much higher standard of evaluation for long-range transport than can be met by these previous studies, especially given the new policy precedents that could be set. Given the delay in starting this exercise, the shrinking time period for producing an acceptable analysis, and the uncertainties and complex technical issues involved, preparation of an approvable 179B(b) petition based on long-range transport may not be possible.

EPA air officials have acknowledged the need to account for long-range transport, but the precedents that could be set in acknowledging these contributions are difficult to align with the Clean Air Act unless they are clearly attributed to specific international transport events, as opposed to broad and diffuse sources. However, if the 2019 trends of lower ozone continue into 2020, near-field contributions from Canada may be sufficient to meet the requirements of CAA 179 B(b), so that accounting for long-range transport may not be necessary, lending to a more “traditional” CAA 179 B(b) petition.

The SEMI non-attainment area is immediately across the Detroit River and Lake St. Clair from two industrialized cities in Canada, namely Windsor and Sarnia. Trajectory analyses performed by technical staff of the Lake Michigan Air Directors Consortium (LADCO) indicate that ozone exceedances in SEMI can sometimes occur during periods of easterly wind, when Canadian sources are likely to make a significant contribution to the ozone design values at key regulatory monitors. Previous EPA policy admits this circumstance as a viable basis for a 179B(b) petition.

In addition to International Transport petitions under CAA 179B(b), flagging monitoring data that have been impacted by exceptional events to lower design values is also an option. In the past, states downwind of Michigan have submitted successful exceptional event demonstrations for wildfires that occurred upwind of Michigan where the plume traveled across the state. Michigan has not yet pursued such a demonstration. For an exceptional event demonstration to be successful, the plume must be shown to impact the state on policy-relevant, high ozone days. Various industry groups have met with EPA Region 5 leadership and air staff to request coordination across Region 5 and with LADCO when exceptional events impact the Midwest, with the aim of “pushing” the information to the states, instead of having each state “re-invent the wheel” for each event. A successful exceptional event demonstration can sufficiently lower ozone design values, and on that basis demonstrate attainment.

While the methods discussed above are promising, alternative analyses should also be explored that directly provide for an explicit ozone attainment demonstration to increase the probability of a successful outcome for the State of Michigan in meeting the CAA requirements. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) seeks an ozone attainment strategy that remains open to all viable options, including an ozone attainment demonstration in the case of a bump-up. This recommendation puts forward a strategy that equally serves all options in a timely way.

#### **A Proposed 2020 Field Study**

The SEMI Modeling and Measurements Steering Committee proposes a small six-week field study during the summer of 2020 to provide forensic data on cross-border pollution transport that can also be used to evaluate meteorological and ozone model simulations of contemporaneous ozone exceedances in SEMI. Analyses of the data may then be used to support either a 179B(b) petition based on Canadian emission source contributions to the observed ozone exceedances, or to provide a baseline episode for a future ozone attainment demonstration. Two specific projects are recommended.

#### ***Project #1: Meteorological Measurements, WRF Simulation, and Model Performance Evaluation for a 2020 Episode (Estimated Cost: \$100,000)***

EGLE has ongoing collaborations on atmospheric modeling with LADCO and the U.S. Forest Service (USFS). A fundamental need is the ability to account for complex lake breeze effects on pollutant transport in the SEMI region and bordering areas of Canada. Wind data is needed to assess these complex wind flows during ozone exceedances. Moreover, a high-resolution meteorological model simulation, preferably with the Weather Research Forecasting (WRF) model, is needed to understand wind flows in areas where no observational data are available.

In this project, the USFS would make Sonic Detection and Ranging (SODAR) measurements (i.e., the use of sound pulses to measure vertical variations in wind) in SEMI during ozone exceedances in the summer of 2020; and provide simulations/projections of atmospheric conditions during the field study. After the field study, LADCO will work with the USFS and an outside contractor to develop and evaluate a retrospective WRF model simulation of the appropriate air flow episodes. This would provide the baseline meteorology for a future ozone attainment demonstration, as well as a basis for source-receptor studies, including an exceptional event demonstration (should such an event occur during the field study) or CAA 179B(b) petition. Note that the participation of the USFS is only anticipated for activities that are neutral regarding regulatory options pursued by EGLE in the aftermath of the field study, so that the USFS is not perceived to support any regulatory outcome.

***Project #2: Development of Chemical Fingerprints during a 2020 Ozone Episode (Estimated Cost: \$300,000)***

Another key data need for proper development of ozone attainment strategies is speciated, high-temporal-resolution Volatile Organic Compound (VOC) measurements in the SEMI region, especially in the absence of any established Photochemical Assessment Monitoring Stations (PAMS). In this project, an advanced mobile laboratory equipped with a Proton Transfer Reaction—Mass Spectrometer (PTR-MS) and other real-time instruments would provide speciated chemical measurements at the key regulatory monitors in SEMI during ozone exceedances in the summer of 2020. These measurements would be analyzed using Positive Matrix Factorization (PMF), a commonly used source apportionment technique, to develop chemical fingerprints identifying specific emission sources on both sides of the U.S.-Canada border contributing most to the observed ozone exceedances. This information would then be used by EGLE to develop a 179B(b) petition based on ozone contributions from Canadian emission sources, and might also inform an exceptional event demonstration, if warranted. It would also be used to test source-receptor relationships in air quality model simulations for an attainment demonstration.

The latest versions of the PTR-MS technique are far superior to conventional methods based on gas chromatography (GC). It is now possible to measure ambient VOC concentrations below 1 part per trillion (ppt), i.e. background levels, in less than 1 second (compared to hourly, ppb-level PAMS GC measurements). It is also possible to detect a much larger array of VOCs, including oxygenates, at very high mass resolution, so that isomers are more easily distinguished. Field studies with new-generation PTR-MS instruments have already been conducted, including the Fire Influence on Regional to Global Environments and Air Quality Experiment (FIREX-AQ), a joint venture led by NOAA and NASA.

When paired with a wind analysis based on concurrent meteorological data, the PMF source apportionment technique can then narrow the list of sources and geographical locations that contribute to observed ozone exceedances based on the types and ratios of VOCs associated with each identified chemical fingerprint. This analysis can then inform an air quality modeling simulation that would explicitly quantify the ozone contributions of the implicated sources.

**Canadian Participation**

The 2020 field study described above is especially timely because Environment and Climate Change Canada (ECCC) has indicated a willingness to provide similar meteorological and chemical measurements on the Canadian side of the international border during the same period. This would considerably leverage Michigan's efforts to produce either a 179B(b) petition or an ozone attainment demonstration, as it would lead to a better understanding and quantification of Canadian industrial emissions that may contribute to SEMI ozone exceedances.

**Anticipated Outcomes**

Armed with data from the proposed 2020 field study, it will be possible to submit a CAA 179B(b) petition to EPA by December 2021, to be evaluated by the EPA in January 2022 according to its anticipated timetable. An exceptional event demonstration, if feasible, would have to wait until after the 2020 ozone season is ended, and would likely also be submitted by December 2021, to be evaluated by the EPA in January 2022. Should a bump-up occur (most likely in February 2022), an ozone attainment demonstration would be submitted before the anticipated submission deadline around March-April 2023 using a baseline modeling episode developed from the 2020 field study.