Ambient Air Sampling/Monitoring Plan for Ethylene Oxide Near Sterigenics, Willowbrook, Illinois

May 2018

Introduction

This plan describes the ambient air monitoring activities that the U.S. Environmental Protection Agency (EPA) Region 5 Air and Radiation Division (ARD) plans to monitor adjacent to the Sterigenics facility and take several grab samples in the neighborhoods near the Sterigenics facility in Willowbrook, Illinois.

Section 1: Project Description

1.1 Overview

Healthcare facilities and commercial sterilization facilities often use ethylene oxide (EtO) to sterilize moisture and heat-sensitive medical instruments. In December 2016, EPA updated EtO from a "probable human carcinogen" to a "human carcinogen," while increasing its lifetime inhalation cancer risk estimate about 60 times. This means that EPA now believes EtO is considerably more potent, and more likely to induce cancer in humans than previously thought. The updated EtO cancer potency information supports the need to reduce EtO air emissions where it impacts human health. The 2014 draft National Air Toxics Assessment (NATA) also suggests that estimated cancer risks posed by ethylene oxide (EtO) in the vicinity of Willowbrook, Illinois require further evaluation. In response to this and in order to prepare for the release, EPA has developed this plan for monitoring EtO in the ambient air in the neighborhoods surrounding Sterigenics in Willowbrook, Illinois.

1.2 Project Objective

The objective of the ambient air monitoring activities is to reliably detect and quantify ambient air EtO concentration near the Sterigenics facility with EPA Method TO-15 via 12-hour and grab samples. This would provide a basis for additional actions by EPA, state, and local agencies including, but not limited to, additional air monitoring, EtO inhalation exposure assessment, and enforcement.

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Section 2: Project Monitoring Design

2.1 Site Selection

Sterigenics in Willowbrook, Illinois is one of several commercial EtO sterilizers in the United States where NATA and more refined AERMOD modeling shows elevated risk. The modeling demonstrates the likely area of highest impact. Also R5's Emergency Relocation Site is located in the same industrial complex at 600A Joliet Road, Willowbrook, Illinois. This location will facilitate air monitoring logistics such as site accessibility, security, and electrical access if needed.

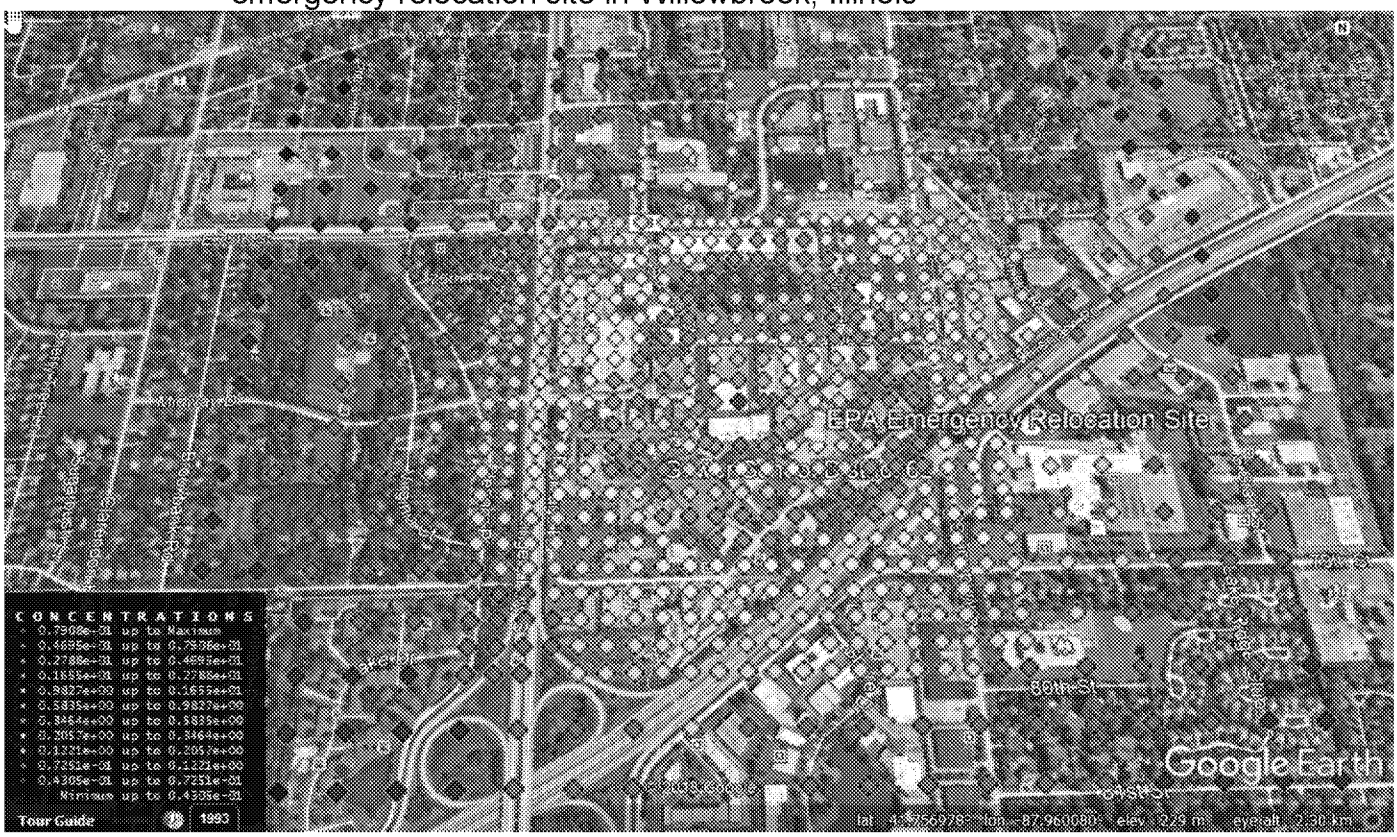
2.2 Monitor Siting

The EPA will follow the monitor siting criteria detailed in the Code of Federal Regulations (CFR) Chapter 40 Section 58, Appendix E, where relevant and appropriate for this monitoring program. EPA and its contractors will consider monitor placement guidelines such as the following:

- Locating the canister in an area that has an unobstructed air flow, especially in the direction of any recognized sources of target analytes (following EPA R5's SOP for canister sampling),
- Avoiding locations that are directly influenced by nearby adjacent, biasing emission sources (e.g., boiler stacks, backup generators, school-bus idling areas) to the extent possible,
- Avoiding locations where reactive surfaces may cause chemical changes in the air sampled,
- Documenting the sampler siting location with information such as digital pictures of the site from the eight cardinal directions, and GPS coordinates.

Figure 1 provides an aerial perspective of the Sterigenics facility.

Figure 1: Map of modeling around the Sterigenics facility and EPA's emergency relocation site in Willowbrook, Illinois



2.3 Meteorological Measurements

EPA R5 will measure meteorological data with a portable meteorological station located on the rooftop of EPA's emergency relocation site. Measured parameters will include at a minimum wind speed and wind direction).

The MET One sonic wind speed/wind direction sensor (Model MET One Instrument Model (50.5H S/N P22210), automatic directional alignment (3269 S/N R12024) and data logger (Model 466A S/N R12129) was serviced and certified in April/May 2018 and will be certified annually, as necessary and appropriate, and follow the manufacturer's procedures and QA Handbook Volume IV. It was also NIST certified. The meteorological data collected will include wind speed and wind direction. Met data will be downloaded at the end of each sampling event.

As with siting of the air sampling equipment, EPA R5 will follow the standard meteorological monitoring equipment siting criteria (Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements Version 2.0) where relevant and appropriate for this monitoring program. EPA R5 will site the meteorological monitoring equipment in accordance with the guidelines previously specified in this document for the air sampling equipment, whenever possible. Exceptions to these siting procedures may be necessary due to logistical factors such as security and power availability.

2.4 Measured Pollutant

The site-specific pollutant that the EPA will monitor is EtO (IUPAC name: oxirane, CAS # 75-21-8). ERG will perform the sample analysis for this initial screening.

Section 3: Monitoring Protocols

3.1 Sampling Frequency, Duration, and Quantity

EPA R5 will conduct ambient air sampling during two separate days and one night. Two 12 hour sampling events will be consecutive to obtain one 12 hour day and one 12 hour night sample. Sampling day(s) will be coordinated with ERG and OAQPS regarding this schedule. It is anticipated plan is:
Composite samples (3 events @ 5 12 hr canisters each plus 1 backup = 16 12 hour canisters)
3- 12 hour canisters downwind
1- 12 hr duplicate canister (with a downwind canister)
1- 12 hr upwind
1- extra (backup)

Grab samples (3 events @ 7 grab samples each plus 1 backup = 22 grab sample canisters)
1- upwind
1- near the modeled MIR location
4- downwind
1- duplicate grab sample (with downwind canister)
1- extra (backup)
The field sampling staff will select the grab sampling location based on prevailing wind direction the day of the sampling, such that it is downwind of the facility.

3.2 Field Sampling Methods

Consistency of measurement is necessary to achieve the program objectives described above. The ability to accurately detect pollutant concentrations and evaluate the data to assess the degree to which associated health risks may be present, requires a considerable level of standardization. To achieve these objectives, these ambient air monitoring activities will follow EPA Method TO-15 for the sample collection.

The sampling apparatus will consist of SUMMA or fused silica-lined, 6-liter canisters and critical orifice passive sampling kits that are calibrated for 18 12-hour and 24 grab samples without the use of electricity. The field sampling staff will place the canisters in the field and manually start and stop the sample collection. The inlet height will be approximately 2 meters at the fixed location and at approximately 1.5m for the grab sampling locations. The sampler should remain under vacuum (negative pressure) after sample collection, and delivered to ERG.

The field sampling staff will collect one collocated sample per sampling event. The collocated sample will require a separate sample inlet for each canister at the collocated site. The field sampling staff will select the collocated sampling location based on prevailing wind direction

the day of the sampling, such that it is downwind of the facility. Should the winds that day be light and variable, the field sampling contractor will select the collocated sampling location from the locations that are historically downwind of the facility. Samples will be logged on a chain of custody form provided by ERG, and the form and samples will be sent to ERG.

3.3 Sample Analysis Methods

Like the field sample collection, the analysis of the samples collected for these ambient air monitoring activities will follow EPA Method TO-15.

The analytical laboratory will use sample pre-concentration and Gas Chromatograph (GC)/Mass Selective Detector analysis in Selected-ion Monitoring/Scan mode; will perform GC/Mass Spectrometer calibration curves of EtO; and will use daily Continuing Calibration Verification checks to ensure proper QA/Quality Control (QC) of sample analyses. For instance, the analytical laboratory will use the collocated sample to check method precision.

The analytical laboratory determined the minimum detection limits that will be used to ensure that detection goals are met. The Minimum Detection Limit (MDL) established for EtO by ERG is 0.0502 parts per billion volume (ppbv) or 0.0907 micrograms per cubic meter (ug/m^3).

Along with the analysis of the canisters, to facilitate the field sampling, ERG is responsible for the cleaning of the canisters and sampling apparatus and preparing these and delivering them to R5. ERG will also be responsible for calibrating and verifying the correct operation of the flow controllers to ensure the validity of the 12-hour and grab samples.

Once the sample analysis is validated, ERG will send the data report and data summary to OAQPS and EPA R5.

Section 4: Data Reporting Requirements

4.1 Sample Data

Quality assured ambient monitoring data will be reported by ERG to OAQPS and EPA R5 in ppbv and ug/m^3. ERG will report the date of the sample as the end date of the collection of that sample.

All data, including values below the MDL, will be reported to the OAQPS and EPA R5. Data should not be substituted (e.g., ½ MDL.) If necessary, ERG will report data with the units of ppbv and will use the National Air Toxics Trends Station Technical Assistance Document (Data Management Section) flags. For instance, the data tables will include these QA data flags for data below the MDL and for null data.

4.2 Meteorological Data

Meteorological data will be collected in 1 second intervals utilizing a Met One Sonic wind speed/wind director sensor, automatic directional alignment model and data stored on a data logger.

Section 5: Quality Assurance Project Plan

All environmental data operations associated with EPA's air toxics ambient monitoring program must fully comply with the EPA Publication QA/G5: "Guidance for Quality Assurance Project Plans" (http://www.epa.gov/quality/qa_docs.html). Thus, this monitoring program will follow the national Quality Assurance Project Plan (QAPP) developed by ERG and EPA R5, in accordance with this guidance document.

Section 6: Roles and Responsibilities

EPA R5 is responsible for

- Determining sampling locations
- Site setup and monitoring
- Gathering access information for the sampling locations,
- Establishing and operating the monitoring site(s) and using the sampling and analysis methodology described in this plan, and
- Complying with all other standards and protocols described in this plan, including the timely handling of incoming and outgoing sample media.
- Field sampling activities
- Coordinating the monitoring activities during the sampling period

EPA Headquarters (EPA HQ), through the Office of Air Quality Planning and Standards (OAQPS) is responsible for coordinating with ERG to provide canisters and analyze the canisters after sampling. EPA OAQPS will work jointly with EPA R5 to support data analyses and the development of plans for follow-up actions.

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