FIELD SAMPLING PLAN

Ethylene Oxide Monitoring – Characterization of South Charleston and Institute, West Virginia

Revision 0
December 2021

West Virginia Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0475

Approved:

Signature & Date: Renu M. Chakrabarty Digitally signed by: Renu M. Chakrabarty DN: CN = Renu M. Chakrabarty email = renu.m.chakrabarty@wv.gov C = US O = WV Department of Environmental Protection OU = WVDEP Date: 2021.12.14 15:12:43 -05'00'

Renu M. Chakrabarty, Assistant Director, Air Monitoring, Laboratory & Air Toxics, DAQ, WVDEP

Signature & Date: ALICE CHOW Digitally signed by ALICE CHOW Date: 2021.12.15 09:28:56 -05'00'

Alice Chow, Chief, Air Quality Analysis Branch, ARD, EPA Region 3

Signature & Date: VERENA JOERGER Digitally signed by VERENA JOERGER Date: 2021.12.14 15:19:57 -05'00'

Verena Joerger, Project QA Coordinator - Air Quality Analysis Branch, ARD, EPA Region 3

Signature & Date: HOWARD SCHMIDT Digitally signed by HOWARD SCHMIDT Date: 2021.12.15 09:22:05 -05'00'

Howard Schmidt, Technical Lead - Air Quality Analysis Branch, ARD, EPA Region 3

Contents

Executive Summary 4
Field Sampling Plan Identifying Information 5
Field Sampling Plan Project Personnel 7
Project Organizational Chart 8
Field Sampling Plan Communication Pathways 9
FSP Conceptual Model 11
Sample Scheduling 12
Emissions and Modeling Characterization 12
Site Selection 12
National Ambient Concentrations and Method Detection Limit 17
FSP Field Quality Control 20
FSP Analytical Services 21
Analytical Services 21
FSP Sample Handling System and Data 22
Appendix A – Modeling Checklists 23
Appendix B – Monitoring Site Photos 30

List of Tables

Table 1 List organizational partners (stakeholders) and identify the connection with lead organization (i.e. air monitoring agency): 5
Table 2 Distribution List 6
Table 3 This table identifies key project personnel for each organization performing tasks defined in this FSP. 7
Table 4 Communication Pathways 9
Table 5 Key personnel 10
Table 6 Field quality control from the QAPP and SOP. 20
Table 7 Sample Handling and Data Management 22

List of Figures

Figure 1 Project organizational chart 8
Figure 2 EtO monitoring locations including project background site. 13
Figure 3 EtO monitoring sites in South Charleston shown with modeled risk isopleths based on 2017 emissions and 2019 meteorological data. 14
Figure 4 Wind rose from South Charleston facility. 15
Figure 5 EtO monitoring sites in Institute shown with modeled risk isopleths based on 2017 emissions and 2019 meteorological data. 16
Figure 6 Wind rose from Institute facility. 17
Figure 7 National average EtO concentrations at various locations across the US. 18
Figure 8 National average EtO excess lifetime cancer risk from inhalation at various locations across the US. 19

Executive Summary

The West Virginia Department of Environmental Protection, Division of Air Quality (DAQ) will conduct short-term Ethylene Oxide (EtO) air sampling in South Charleston and Institute, West Virginia for subsequent laboratory analysis by the United States Environmental Protection Agency (EPA) national contractor, Eastern Research Group, Inc. (ERG), to assess atmospheric concentrations. Sampling locations will be a combination of fenceline, on-site, and off-site near facilities with known EtO air emissions.

Sampling will be conducted using a summa canister sampler. Each sample will be collected over a 24-hour period. Sampling will take place over an approximately three-month period. Sampling will consist of four (4) sets of 24-hour sampling around each area, as well as at a project background location. The sampler will be equipped with an air sampling assembly (supplied by ERG) consisting of a filter, sample tube, critical orifice, flow regulator and vacuum gauge. The exposed canister will be shipped to the EPA contract laboratory (ERG) for analysis by GC-MS.

DAQ will review the sampling results to determine any presence of EtO; perform short-term air dispersion modeling; and characterize the study area. EPA will provide funding for the lab analyses, and advisory assistance such as in technical matters and in quality review.

Field Sampling Plan Identifying Information

Site Name: South Charleston, WV, 437 MacCorkle Avenue SW, 25303
Union Carbide Corporation (03-54-039-00003) - 440.026 km Easting, 4,246.927 km Northing, Zone 17
Covestro LLC (03-54-039-00102) - 439.65 km Easting, 4,247.000 km Northing, Zone 17

Site Name: Institute, WV, 250 Carbide Road, Dunbar, WV 25064, ALTIVIA Institute Industrial Park
Union Carbide Corporation (03-54-039-00005) – 432.189 km Easting, 4,248.754 km Northing, Zone 17
Specialty Products US, LLC (03-54-039-00682) – 432.189 km Easting, 4,248.754 km Northing, Zone 17

Lead Organization/Air Monitoring Agency: USEPA/WV Department of Environmental Protection Division of Air Quality
Contract Laboratory Name: Eastern Research Group, Inc. (ERG)
Contract Laboratory Address: 601 Keystone Park Drive 700, Morrisville, NC 27560-9998

Table 1 List organizational partners (stakeholders) and identify the connection with lead organization (WVDEP-DAQ):

Organization Partners/Stakeholders	**Connection/ Role**
EPA Region 3	Review and approval of QAPP & FSP; funding for lab analyses, advice on technical issues and QA
Eastern Research Group (ERG), Inc. National Contract Lab	Perform EtO analysis of collected summa canisters
Union Carbide Corporation, Specialty Products, and Covestro	Provide sampling location access; provide operational and emissions data for sampling days, provide available meteorological data

Table 2 Distribution List

FSP Recipients	Title	Phone Number	E-mail Address & Phone Number
EPA Region 3 - Air & Radiation Division			
Alice Chow	Chief, Air Quality Analysis Branch	(215) 817-4380	chow.alice@epa.gov
Verena Joerger	Air Quality Analysis Branch	(215) 814-2218	joerger.verena@epa.gov
Howard Schmidt	Air Quality Analysis Branch	(215) 814-2133	schmidt.howard@epa.gov
Jessica Fry Chamberlin	Air Quality Analysis Branch	(215) 814-2121	fry.jessica@epa.gov
Carol Ann Gross-Davis, Ph.D.	Air Quality Analysis Branch	(215) 814-5738	gross-davis.carolann@epa.gov
WVDEP-DAQ			
Renu Chakrabarty	Assistant Director of Air Monitoring, Lab & Air Toxics	(304) 414-1249	renu.m.chakrabarty@wv.gov
Mike Egnor	Air Toxics Coordinator	(304) 414-1255	michael.egnor@wv.gov
Mark Drake	Environmental Resources Program Manager 1	(304) 414-1254 (304) 389-7530	s.mark.drake@wv.gov
Tyler Fewell	Environmental Resource Specialist 1	(304) 389-6720	tyler.fewell@wv.gov
Jason Thomas	Chemist 3	(681) 587-1172	jason.thomas@wv.gov
Keith Foreman	Micro Computer Support Specialist 2	(304) 414-1260	keith.m.foreman@wv.gov
Jon McClung	Air Modeling/Planning	(304) 414-1277	jon.d.mcclung@wv.gov
Jay Fedczak	EH&S Delivery Manager Union Carbide Corporation (UCC)	(304) 747-1354	JPFedczak@dow.com
Marianne McClure	EH&S/Operations Leader, Specialty Products, LLC	(304) 550-0351	marianne.f.mcclure@iff.com
Barbara Buck	Site Manager, Covestro LLC	(304) 550-2742	barbara.buck@covestro.com
Matthew Harris	HSEQ Manager, Covestro LLC	(304) 533-4905	matthew.harris@covestro.com
Tim Skiles	EH&S Manager, ALTIVIA Services, LLC	(304) 759-1245	tskiles@altivia.com

Field Sampling Plan Project Personnel

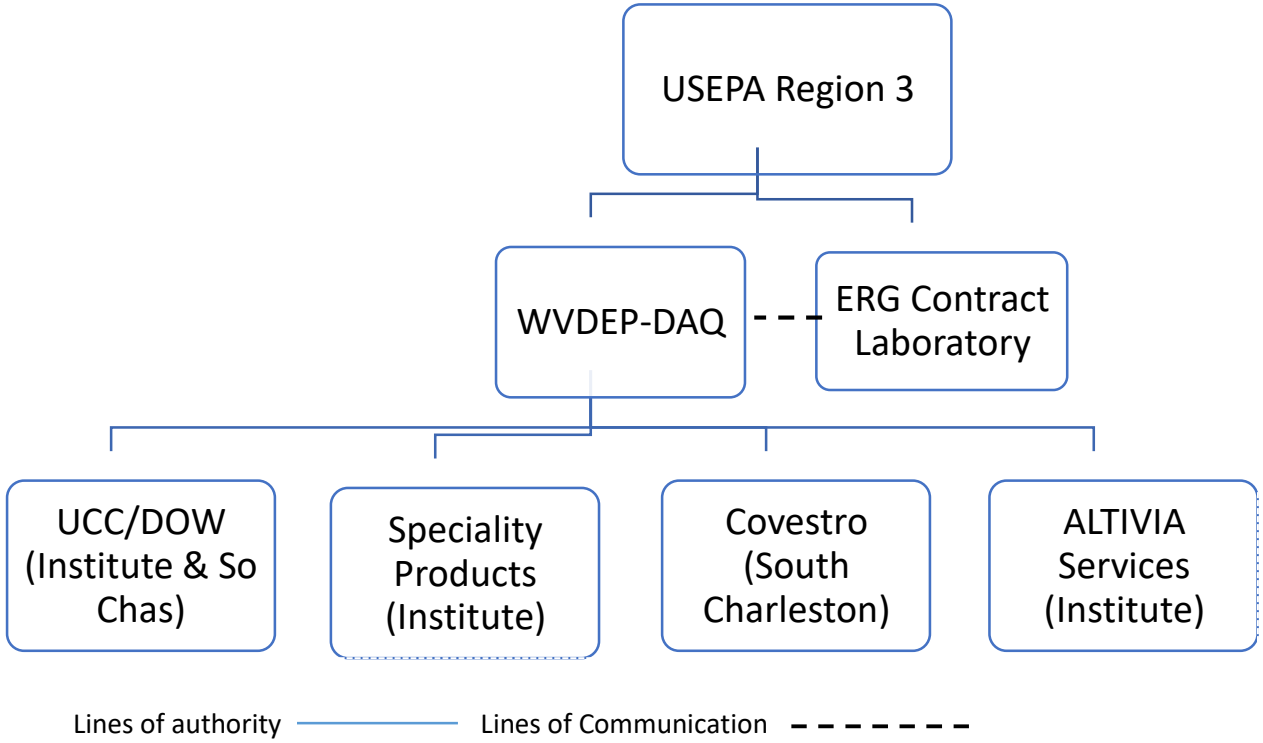
Table 3 This table identifies key project personnel for each organization performing tasks defined in this FSP.

Name	**Project Title/Role**
Alice Chow, USEPA Region 3	EPA regional liaison for project coordination
Verena Joerger, USEPA Region 3	EPA Project QA coordinator
Howard Schmidt, USEPA Region 3	EPA Project Technical Lead
Julie Swift, ERG laboratory	ERG Laboratory program manager
Renu Chakrabarty	WVDEP DAQ coordination of state ambient sampling
Mike Egnor	WVDEP DAQ air toxics coordinator and facility liaison
Mark Drake	WVDEP DAQ coordination of field sampling operations & backup operator
Tyler Fewell	WVDEP DAQ Site Operators - coordination of sampler installation and operation, QA, sample tracking and shipping
Jason Thomas	WVDEP DAQ sampler installation and operation at background site & backup operator; SOP author; QA review
Keith Foreman	WVDEP DAQ QA review
Jon McClung	WVDEP DAQ air modeling
Jay Fedczak	Union Carbide Corporation (UCC) facility contact
Marianne McClure	Specialty Products US, LLC facility contact
Barbara Buck and Matthew Harris	Covestro LLC facility contacts
Tim Skiles	ALTIVIA Institute site contact
Sharon Cibrik	WV DHHR, Office of Laboratory Services site contact

Project Organizational Chart

Provide a concise organizational chart for the project, including reporting relationships between all organizations involved in the project. Charts must include lines of responsibility and lines of communication.

Figure 1 Project organizational chart



Field Sampling Plan Communication Pathways

This worksheet documents specific issues (communication drivers) that will trigger the need to communicate with other project personnel or stakeholders. Its purpose is to ensure there are procedures in place for providing the appropriate notifications and generating the appropriate documentation when handling important communications.

Table 4 Communication Pathways

Communication Driver	Organization	Name	Procedure (timing, pathway, documentation, etc.)
Field/sampling issue	WVDEP-DAQ	Tyler Fewell, Jason Thomas	Notify Mark Drake & Renu Chakrabarty
Canister shipment/receiving issue/ COC	WVDEP-DAQ	Mark Drake	Notify ERG & Renu Chakrabarty
Site access issue at South Charleston	UCC/DOW	Jay Fedczak	Contact Tyler Fewell, Mark Drake, Renu Chakrabarty
Site access issue at Institute	Specialty Products	Marianne McClure	
Site access issue at Institute	ALTIVIA	Tim Skiles	
Site access issue at Hygiene Lab	WVDHHR	Sharon Cibrik	
FSP changes prior to field work	WVDEP-DAQ	Renu Chakrabarty	Communicate with EPA R3 & ERG on any changes to the FSP
FSP changes during project execution	WVDEP-DAQ	Renu Chakrabarty	
Field equipment corrective actions	WVDEP-DAQ	Tyler Fewell, Jason Thomas, Mark Drake	Notify ERG and Renu Chakrabarty of any equipment issues
Laboratory issue	ERG	Julie Swift	Notify Renu Chakrabarty of any lab issues
QA field issue	WVDEP-DAQ	Mark Drake, Jason Thomas, Keith Foreman	Notify Renu Chakrabarty
EtO-emitting operation changes/field sampling impacts	WVDEP-DAQ	Mike Egnor	Notify Tyler Fewell, Mark Drake, Jason Thomas, Renu Chakrabarty
Emissions data, meteorological data	WVDEP-DAQ	Mike Egnor Jon McClung	Notify facility contact

Table 5 Key personnel

Title/Role	Organization	Responsibilities
Site Operator	WVDEP-DAQ	Operate & maintain air sampling site, perform quality assurance activities
Field Operations Supervisor	WVDEP-DAQ	Identify, coordinate/perform corrective actions
Laboratory Analyst	ERG	Task Lead for EtO/ERG
Laboratory Project officer	Julie Swift – ERG	Program Manager/ERG
EPA R3 Project QA and Technical Lead	Howard Schmidt	Review QAPP, SOP and field sampling plans; QA review
EPA R3 point of contact	Alice Chow	Provide project review and serve as a liaison for funding between ERG contract laboratory and agency
Facility points of contact:	UCC, Specialty Products, Covestro, ALTIVIA	Site access, process operations scheduling/notification, emissions data, meteorological data

FSP Conceptual Model

The DAQ will conduct short-term EtO air sampling in South Charleston and Institute, West Virginia for subsequent laboratory analysis by the EPA national contractor, ERG, to assess atmospheric concentrations. Sampling locations will be a combination of fenceline, on-site, and off-site near facilities with known EtO air emissions.

Sampling will be conducted using a summa canister sampler. To the extent possible, the canister will be situated at an approximate breathing height (5-6 feet from the ground). Further, to the extent possible, sampling will occur when the most EtO-emitting processes are in operation at the facilities. Each sample will be collected over a 24-hour period. Sampling will consist of four (4) sets of 24-hour sampling around each area, as well as a project background location (see Table 6 for a list of all sampling locations). Sampling will take place over an approximately three-month period. The sampler will be equipped with an air sampling assembly (supplied by ERG) consisting of a filter, sample tube, critical orifice, flow regulator and vacuum gauge. The exposed canister will be shipped to ERG Inc., for analysis by GC-MS.

DAQ will review the sampling results to determine any presence of EtO; perform short-term air dispersion modeling; and characterize the study area. EPA will provide funding for the lab analyses, and advisory assistance such as in technical matters and in quality review. Additional details on the review process and report content are contained in the QAPP.

EPA's National Air Toxics Assessment (NATA) review identified 25 communities across the United States as potentially having the highest cancer risk from EtO air emission. Two of these communities - South Charleston and Institute – are in West Virginia. DAQ performed a detailed review of EtO emissions and updated air dispersion modeling inputs,and conducted air dispersion modeling.

The DAQ has identified the monitoring sites herein based upon the updated long-term AERMOD modeling results. EPA has also used the DAQ model inputs to update their Human Exposure Model. Additional information may be found at: https://www.epa.gov/hazardous-air-pollutants-ethylene-oxide/inspector-general-follow-ethylene-oxide-0.

EPA's regulatory default-approved air dispersion model for complex terrain to predict ambient pollutant concentrations is AERMOD. The results from AERMOD are then used by EPA's Human Exposure Model (HEM) to predict risks associated with chemicals emitted into ambient air, assuming a lifetime of exposure (70 years) and incorporating EPA's cancer risk health benchmark. AERMOD predicts a maximum concentration, while HEM predicts a maximum concentration incorporating population.

AERMOD has been validated and promulgated for regulatory use by EPA using comparisons of modeled performance to extensive monitored data, and can be relied on for regulatory use. Comparisons used in the validation of EPA's model were not paired in time and space. Therefore, although characterization of the project area will use both monitoring and modeling results, unpaired comparison in time and space is more appropriate.

For all samples, ERG's chain of custody sheets will be used to document sample custody. An example ERG COC can be found in the SOP. The DAQ will be solely responsible for sampler operation and sample collection. USEPA's contract laboratory, ERG Inc., will be responsible for analysis of the samples for EtO.

Project Background

A location in Guthrie, WV was chosen as the project background site since there are no known sources of EtO emissions and yet it is close to the site-oriented monitoring (approximately 5.25 air miles from the South Charleston facility, and approximately 7 air miles from the Institute facility). The project background concentration will be subtracted from the source-oriented monitoring results prior to use alongside short-term modeling concentrations in the study area characterization. Another review without background correction will performed as well.

Sample Scheduling

To the extent possible, sampling will occur when the most EtO-emitting processes are in operation at the facilities. DAQ will coordinate with the facilities, while also implementing available resources to maintain the National Ambient Air Quality Standards (NAAQS) and State or Local Air Monitoring Stations (SLAMS) statewide network.

As soon as EPA approves the QAPP, SOP and FSP, and releases funding, DAQ will contact ERG for canisters and will begin sampling. This may occur in fourth quarter 2021.

Emissions and Modeling Characterization

Each of the four (4) facilities that emit EtO within the study area will be sent a checklist to identify which processes operated during each sampling period, and provide air emissions estimates during this period. Meteorological data will be provided by UCC South Charleston. An example of these checklists is included as an appendix. The DAQ will use this information to perform short-term modeling over the period sampled. These modeling concentrations will be used to characterize the study area.

Site Selection

Siting priority is to sample at the highest concentration locations predicted by long-term modeling, while also ensuring sampling security and data integrity. Therefore, sampling locations were selected on this basis and are a combination of fenceline, on-site, and off-site near facilities with known EtO emissions.

EPA Region 3 has indicated concerns with the summa canister timers, and therefore, a manual setup and takedown will occur for this limited sampling effort. This manual operation is resource and time intensive, and site selection must consider ensuring the 24 hr ±2hr timeline is met for each sample. Timely access to the sampling locations is important to maintain data integrity.

Figure 2 shows the monitoring locations, including the project background site in Guthrie, WV. A scale is provided on the map which shows an area approximately 11 miles by 8 miles. A Table in Appendix B provides details on each of the EtO monitoring sites, including location and property ownership providing access to the site. Photos of each site are provided in Appendix B.

Figure 2 EtO monitoring locations including project background site.

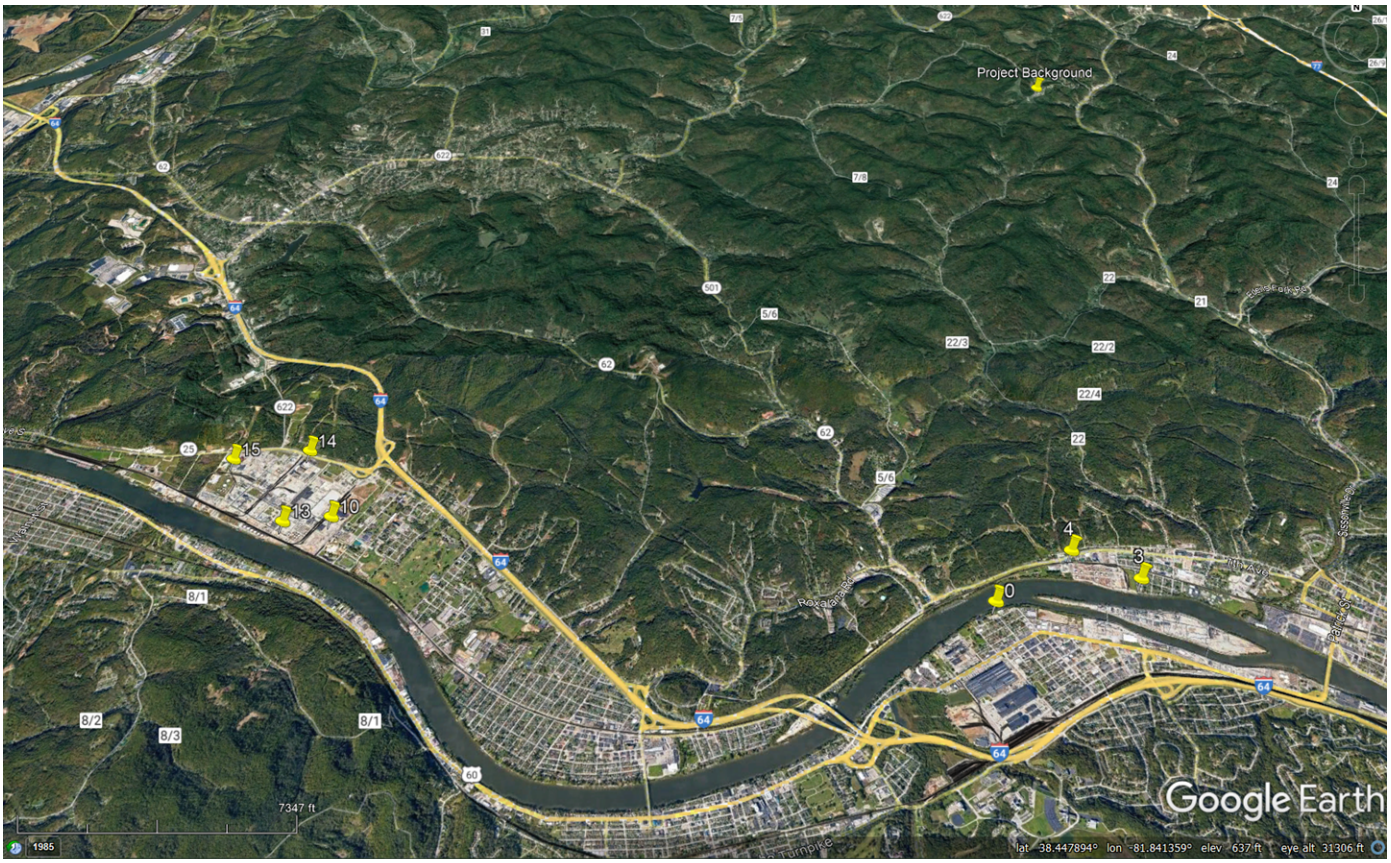


Figure 3 shows the EtO monitoring sites in South Charleston overlayed on the modeled risk isopleths from UCC's 2017 EtO emissions and 2019 meteorological data.

Figure 3 EtO monitoring sites in South Charleston shown with modeled risk isopleths based on 2017 emissions and 2019 meteorological data.

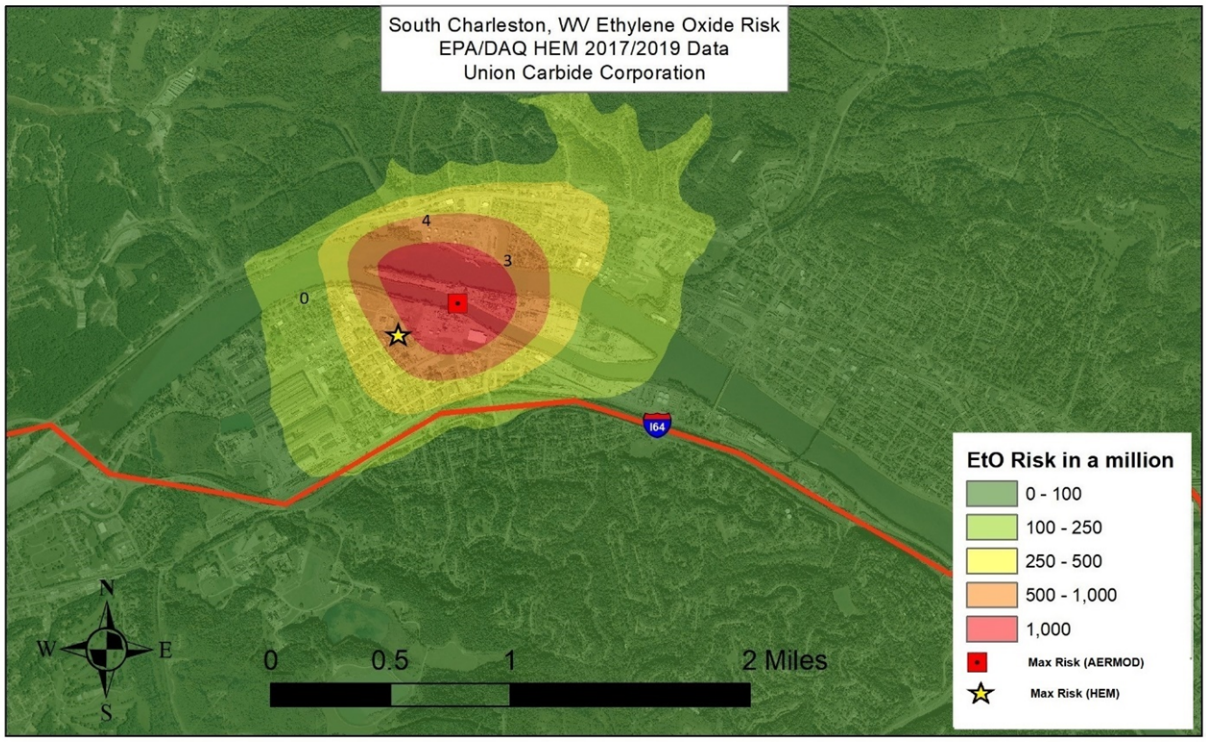


Figure 4 is a wind rose from the South Charleston facility indicating the wind generally comes *from* the North and North-Northeast at lower speeds, and higher wind speeds tend to come *from* the West-Southwest. Air dispersion modeling was performed using one year of meteorological data – the four months from the South Charleston site and the remainder of the data from the Institute site. While there are gaps in this meteorological data, it provides general information regarding this portion of the project area.

Figure 4 Wind rose from South Charleston facility.

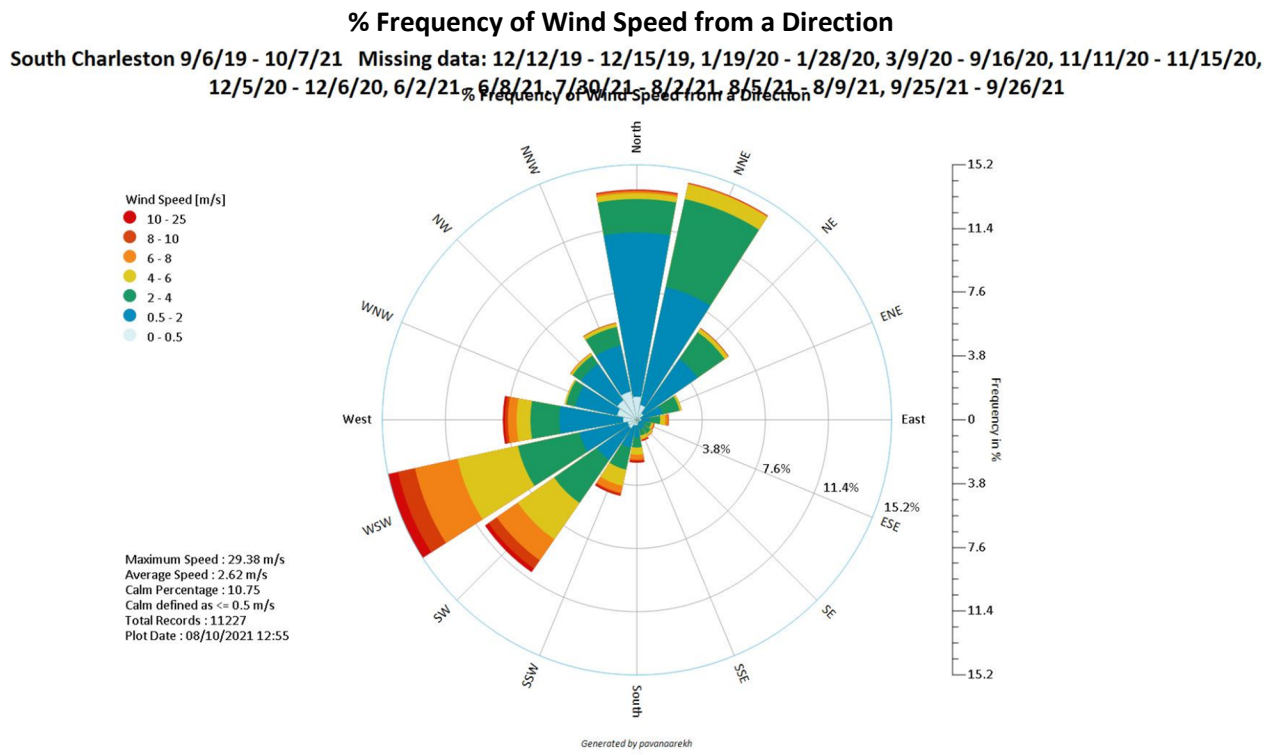


Figure 5 shows the EtO monitoring sites in Institute overlayed on the modeled risk isopleths from UCC's 2017 EtO emissions and 2019 meteorological data.

Figure 5 EtO monitoring sites in Institute shown with modeled risk isopleths based on 2017 emissions and 2019 meteorological data.

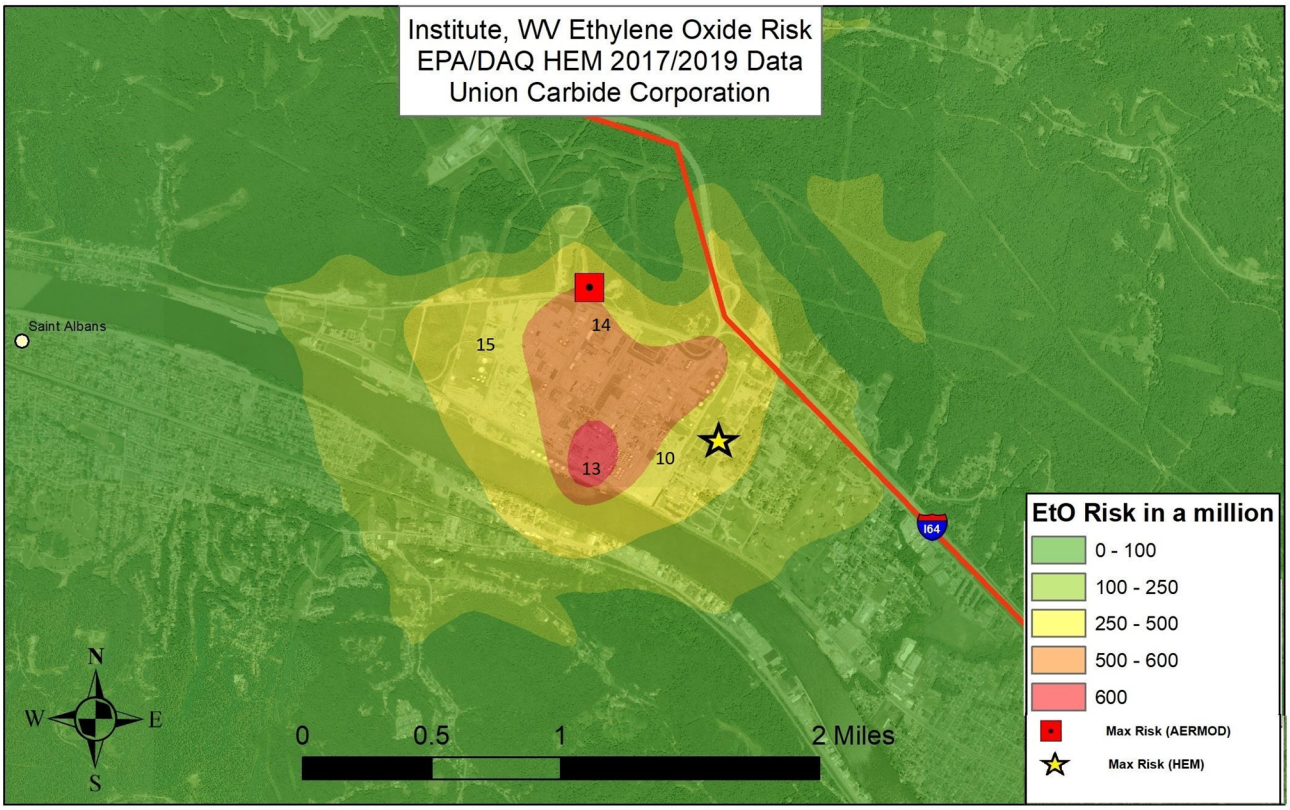
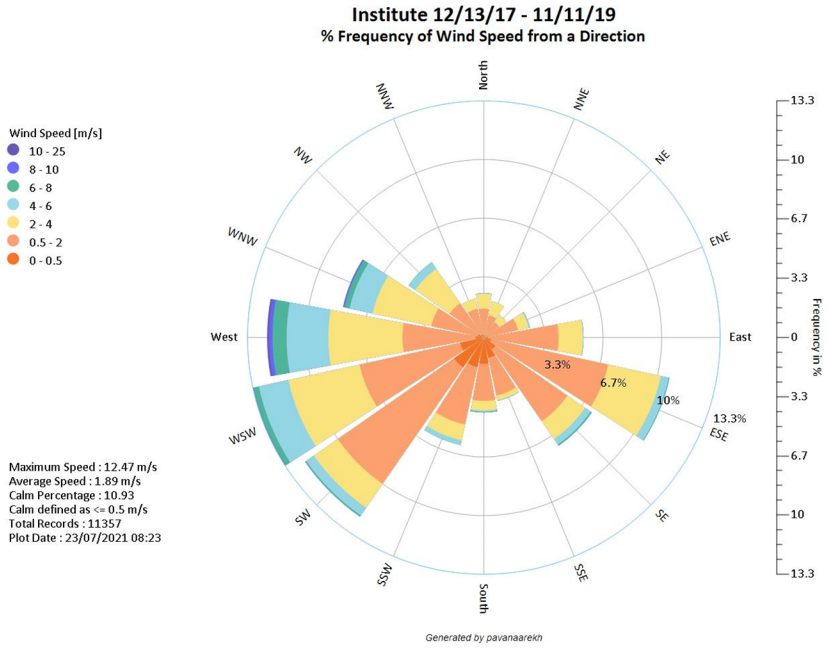


Figure 6 is a wind rose from the Institute facility indicating the majority of the wind comes *from* the westerly direction, and there is portion of the time that wind comes *from* the East-Southeast.

Figure 6 Wind rose from Institute facility.



<u>National Ambient Concentrations and Method Detection Limit</u>

In 2018 EPA added EtO to the suite of pollutants to be monitored at National Air Toxics Trends Stations (NATTS) sites as well as other locations. EPA established the NATTS network to obtain high-quality, long-term monitored air toxics trends data across the country. Based on data available in EPA's Air Quality System (AQS), EtO appears to be present across the county at (sometimes at extremely low levels), even when no known sources of emissions are nearby. The AQS data is periodically updated, and can be obtained at https://www.epa.gov/aqs.

One challenge in monitoring for EtO is that the method detection limit (MDL) – the lowest concentration that can be measured with confidence – is above EPA's acceptable lifetime cancer threshold. Reported MDLs range from 0.022 ppbv – 0.092 ppbv, which equates to 201 – 842 excess cancer risk probability in one million over a 70 year lifetime. EPA has established a generally acceptable threshold of 100 in one million lifetime cancer risk (NATA FAQ: https://www.epa.gov/national-air-toxics-assessment/nata-frequent-questions). The currently available monitoring method cannot show that an area is exposed to a level lower than the MDL that can be achieved. ERG's EtO MDL is 0.0262 ppbv which is approximately 273 in one million lifetime inhalation cancer risk. The current analytical MDL is not low enough to evaluate 100 in one million risk.

Figure 7 shows the average EtO concentrations at various NATTS and non-NATTS sites across the country. While there is a range of concentrations, the national average ambient concentration of EtO based on data currently available is 0.104 ppbv. Figure 8 shows national EtO concentrations in terms of excess lifetime cancer risk. Figure 8 shows that the national average excess lifetime cancer risk from EtO inhalation is approximately 954 in one million. At Grayson Lake, KY, where there are no known sources of EtO emissions, the average EtO concentration is equivalent to approximately 1,016 in one million (0.111 ppbv).

Figure 7 National average EtO concentrations at various locations across the US.

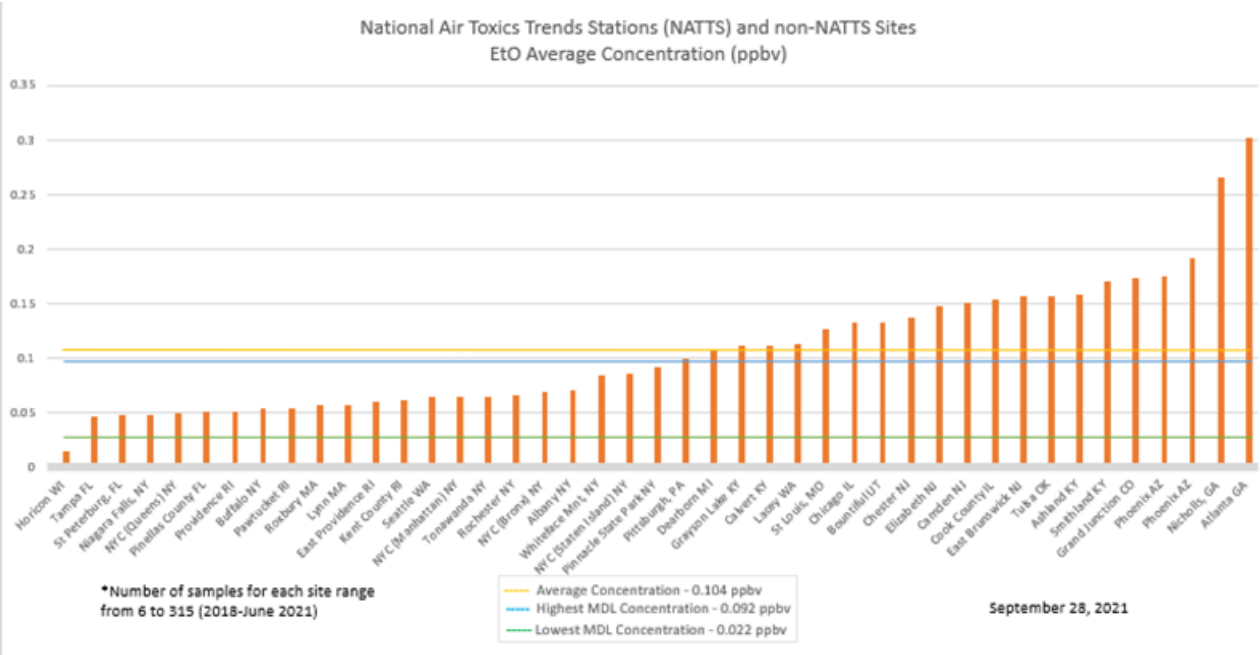
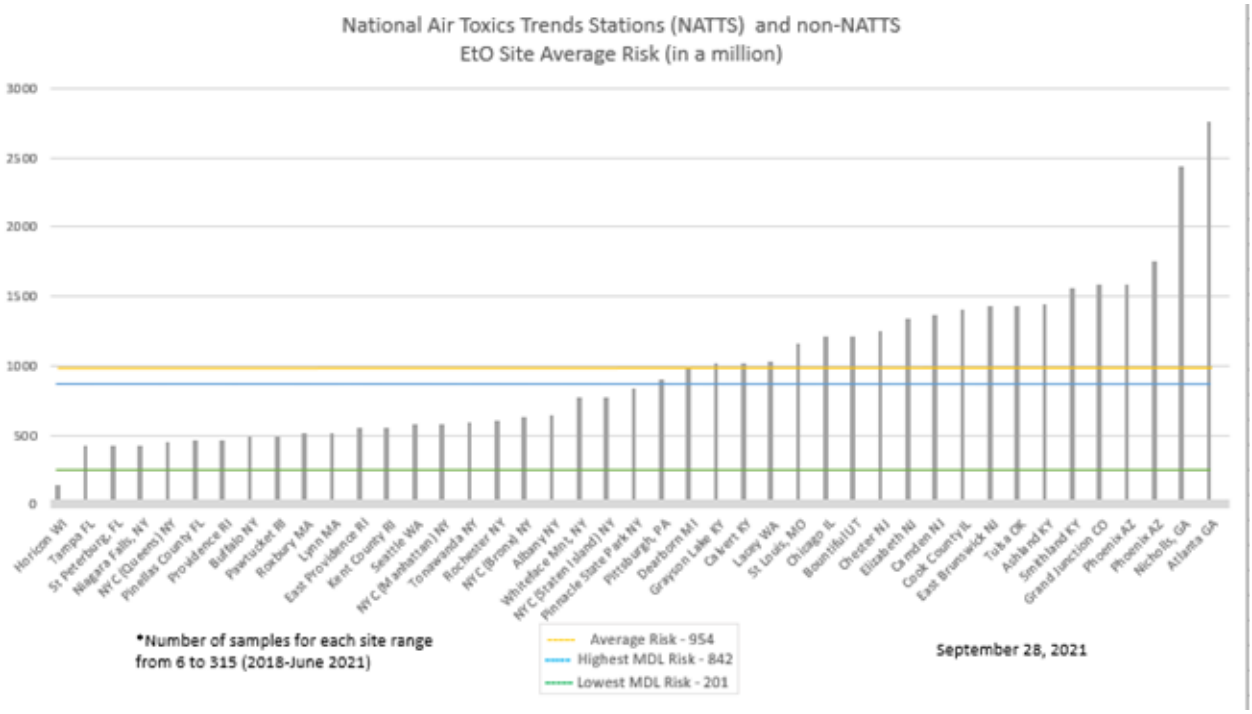


Figure 8 National average EtO excess lifetime cancer risk from inhalation at various locations across the US.



FSP Field Quality Control

The QA/QC procedure for this project will meet the requirements the Ethylene Oxide Monitoring Study QAPP; Collection of Ethylene Oxide Samples Using Passive Sampling Technique SOP; and ERG's Support for the EPA National Monitoring Programs (UATMP, NATTS, CSATAM, PAMS, and NMOC Support) QAPP, 2020. Critical elements of the FSP Field Quality Control are listed below.

Table 6 Field quality control from the QAPP and SOP.

Parameter	Description/ Frequency	Acceptance Criteria	Corrective Action
Canister starting pressure	Each field sample	Vacuum ≥ -28 inHg or per ERG QAPP/ SOP	If criteria not met, use spare canister.
Sample leak check	Each field sample	≤1 inHg over 5 minutes or per ERG QAPP/DAQ SOP	Tighten connectors and try test again. If fails again, replace canister sampler assembly and re-test.
Final canister pressure	Each field sample	Ideally between 2 to 8 inHg. Field sample compared to ERG received sample should be < 3 in Hg per ERG QAPP	Note final pressure on COC
Sampling duration	Each field sample	24 hours ± 2 hour	Note sample duration on COC
Precision (Collocated sample)	Once during project	Per ERG ±25% of primary	Same a Field Sample
Trip blank	Once during project	Per ERG < 3X MDL or 0.20 ppbv, whichever is lower	NA

FSP Analytical Services

Analytical Services

Laboratory Name: USEPA contract laboratory Eastern Research Group, Inc. (ERG)
Laboratory Contact Name: Julie L. Swift
Analytical Instrument: Gas Chromatograph - Mass Spectrometer
Analysis Method: Compendium Method TO-15
Lab Reference QAPP: ERG-QAPP-0344-6; 2020
Data Storage Location: ERG, 601 Keystone Park Drive, Suite 700, Morrisville, NC 27560
Lab MDL: 0.0262 ppbv (approximately 273 in one million lifetime inhalation cancer risk).

Target Compound

EtO results will be reviewed to determine its presence and concentration.

EtO has both chronic cancer and noncancer inhalation health benchmarks.

EPA's Health Effects Notebook for Ethylene Oxide provides additional information on various health benchmarks from chronic and acute inhalation: https://www.epa.gov/sites/default/files/2016-09/documents/ethylene-oxide.pdf

FSP Sample Handling System and Data

This worksheet identifies components of the project-specific sample handling system. Record personnel (and their organizational affiliations) who are primarily responsible for ensuring proper handling, custody, and storage of field samples from the time of collection, to laboratory delivery, to final sample disposal.

Table 7 Sample Handling and Data Management

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT		
Activity	**Personnel/Organization Responsible**	**Comment**
Canister and sampler assembly	Julie Swift ERG, Inc	
Sample Collection	Tyler Fewell, Jason Thomas, Mark Drake	24-hour samples, manual on/off
Coordination of Shipment	Mark Drake	
Type of Shipment/Carrier	Mark Drake	
Sample Chain of Custody	Julie Swift ERG, Inc	
SAMPLE RECEIPT AND ANALYSIS		
Activity	**Personnel/Organization Responsible**	**Comment**
Sample Receipt	Julie Swift ERG, Inc	
Sample Custody and Storage	Julie Swift ERG, Inc	
Sample Preparation	Julie Swift ERG, Inc	
Sample Determinative Analysis	Julie Swift ERG, Inc	
SAMPLE ARCHIVING AND DISPOSAL		
Activity	**Personnel/Organization Responsible**	**Comment**
Sample Disposal	Julie Swift ERG, Inc	Sample is consumed in analysis
DATA MANAGEMENT		
Activity	**Personnel/Organization Responsible**	**Comment**
Data Package	Excel and PDF file	Per EPA schedule

Appendix A – Modeling Checklists

Union Carbide Corporation
South Charleston, WV
Plant ID 03900003

Monitoring Period Start (Date/Time)	
Monitoring Period End (Date/Time)	

Oxide Adducts Point Sources

Operating? Yes	Operating? No	Point Source	Emissions for Monitoring Period (lb/hr)
		E704	
		E705	
		E706	
		E707	
		E708	
		T9120	
		T9121	
		T9128	
		T9129	
		T9151	
		T9180	
		T9181	
		T9182	
		T9186	
		T9187	
		T9223	
		T9228	
		T9502	
		T9504	
		T9505	
		T9507	
		T9509	
		T9510	
		T9511	
		T9512	
		T9553	
		T9554	
		T9555	
		T9556	
		T9562	
		T9563	
		T9565	
		T9568	
		T9569	
		T9612	
		T9614	

		T9615	
		T9616	
		T9617	
		T9619	
		T9622	
		T9624	
		T9625	
		T9627	
		T9629	
		T9632	
		T9634	
		T9635	
		T9637	
		T9640	
		T9643	
		T9645	
		T9646	
		T9649	
		T9734	
		T9736	
		T9738	
		T9749	
		T9798	
		T9812	
		T9814	
		T9815	
		T9822	
		T9824	
		T9825	

		L001TT1	
		L001TT2	
		L001TT3	
		L001TT4	
		L001TT5	
		L001TT6	

Oxide Adducts Fugitive Sources

		EO Header and Reactor 2	
		Reactors 4 and 5	
		Reactor 6	
		Reactor 7	
		Western Tip of Island	
		Lower Island Bridge	

****

TRITON- DOW/UCC - South Charleston WV - ALL Sources (Point and Fugitive)
TRITON- South Charleston WV - Point Sources

Operating? Yes	Operating? No	Point Source	Emissions for Monitoring Period (lb/hr)
		E10813	
		L001	
		L002	
		L003	
		L004	
		T8313	
		T8314	
		T8320	
		T8322	
		T8323	
		T8331	
		T8334	
		T8343	
		T8344	
		T8360	
		T8361	
		T8363	
		T8364	
		T8373	
		T8380	
		T8381	
		T8383	
		T8390	
		T8391	
		T8392	
		T8393	
		T8420	

TRITON Fugitive Sources

		Header Fugitives THF	
		Reactor Fugitives TRF	
		Fugitives Near Covestro	

****

Chemical Mixing - South Charleston

Operating? Yes	Operating? No	Point Source	Emissions for Monitoring Period (lb/hr)
		Chemical Mixing	

Covestro
South Charleston, WV
Plant ID 0390102

Monitoring Period Start (Date/Time)	
Monitoring Period End (Date/Time)	

Operating? Yes	Operating? No	Point Source	Emissions for Monitoring Period (lb/hr)
		1RX	
		2RX	
		3RX	
		789RX	
		Fugitive Source	
		EO03 Fugitives - CEO03F	
		PhaseIV Fugitives - CPIVF	

Union Carbide Corporation - Institute, WV
Ethylene Oxide Distribution
Plant ID 3900005

Monitoring Period Start (Date/Time)	
Monitoring Period End (Date/Time)	

Operating? Yes	Operating? No	Point Source	Emissions for Monitoring Period (lb/hr)
		EODISTFL	
		Fugitive Source	
		Railcar Unloading	
		Pumps/Diked Area	
		Tanks Area	
		Flare Area	
		Area Near Rt. 25	

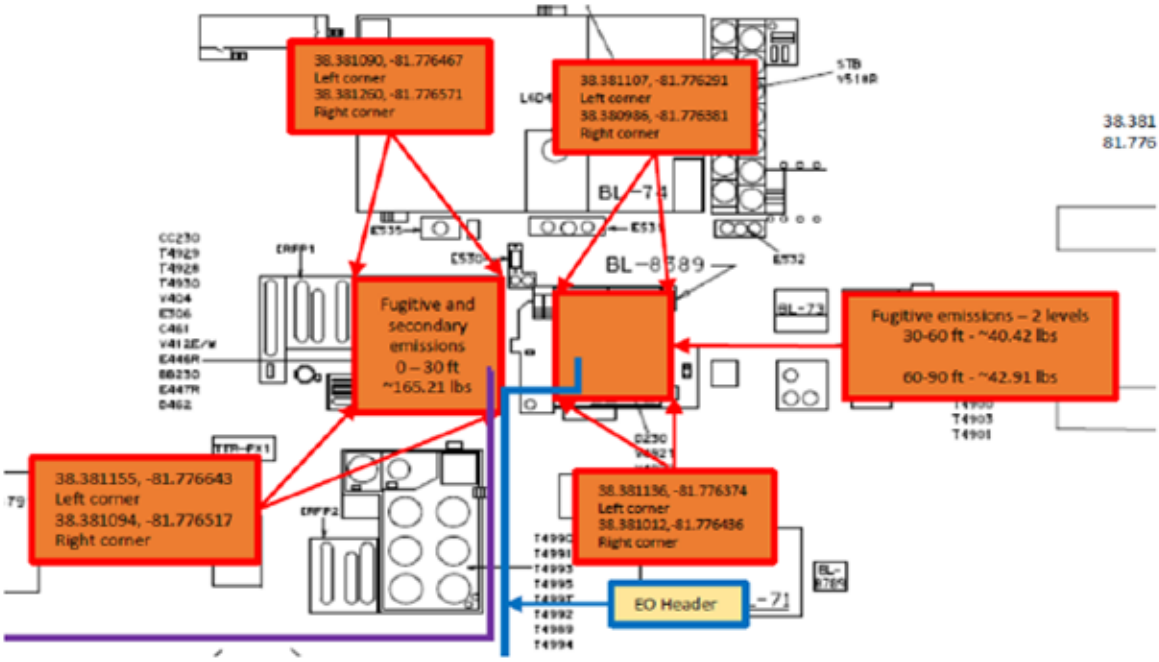
Specialty Products US LLC (POLYOX)
Institute, WV
Plant ID 03900682

Monitoring Period Start (Date/Time)	
Monitoring Period End (Date/Time)	

Polyox - Institute Point Sources

Operating? Yes	Operating? No	Point Source	Emissions for Monitoring Period (lb/hr)
		221A	
		230M	
		230L	
		230K	
		230O	
		230HH	

Polyox - Institute Fugitive Sources

		POLYVOL1		(0 - 30 feet release height)
		BL8389A		(30 - 60 feet release height)
		BL8389B		(60 - 90 feet release height)

Fugitive release heights (from prior submittal for 2017 emissions):