

**West Virginia  
Department of Environmental Protection**

**Ethylene Oxide in the  
Institute and South Charleston Areas**

September 30, 2022



# Introduction

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Mike Egnor, PE, Air Toxics Coordinator  
WVDEP - Division of Air Quality



# What has WVDEP done?

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- August 2018 – EPA publicly released the National Air Toxics Assessment (NATA)
- NATA identified four census tracts in the Kanawha Valley for further investigation



# What has WVDEP done?

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- WVDEP requested the state Department of Health and Human Resources (DHHR) Bureau of Public Health (BPH) to review EtO associated cancer rates in the Kanawha Valley
  - DHHR compared Kanawha County vs. West Virginia using the WV Cancer Registry
  - No elevated levels of breast, lymphoma, or leukemia cancers found for Kanawha County as a whole
  - Kanawha County is not significantly higher than other counties in the state



# What has WVDEP done?

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- 2019: Requested the most recent and accurate emissions data and onsite meteorological data
- Visited the Institute and South Charleston facilities
- Updated the model with the more accurate emissions and meteorological data
  - The locations and level of risk changed as a result



# What has WVDEP done?

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- December 2019: Issued press release identifying the elevated risk factor of ethylene oxide
- Jan 2020: Formally requested EPA to prioritize the review of 40 CFR 63 Subpart PPP (Polyethers Polyols Production)



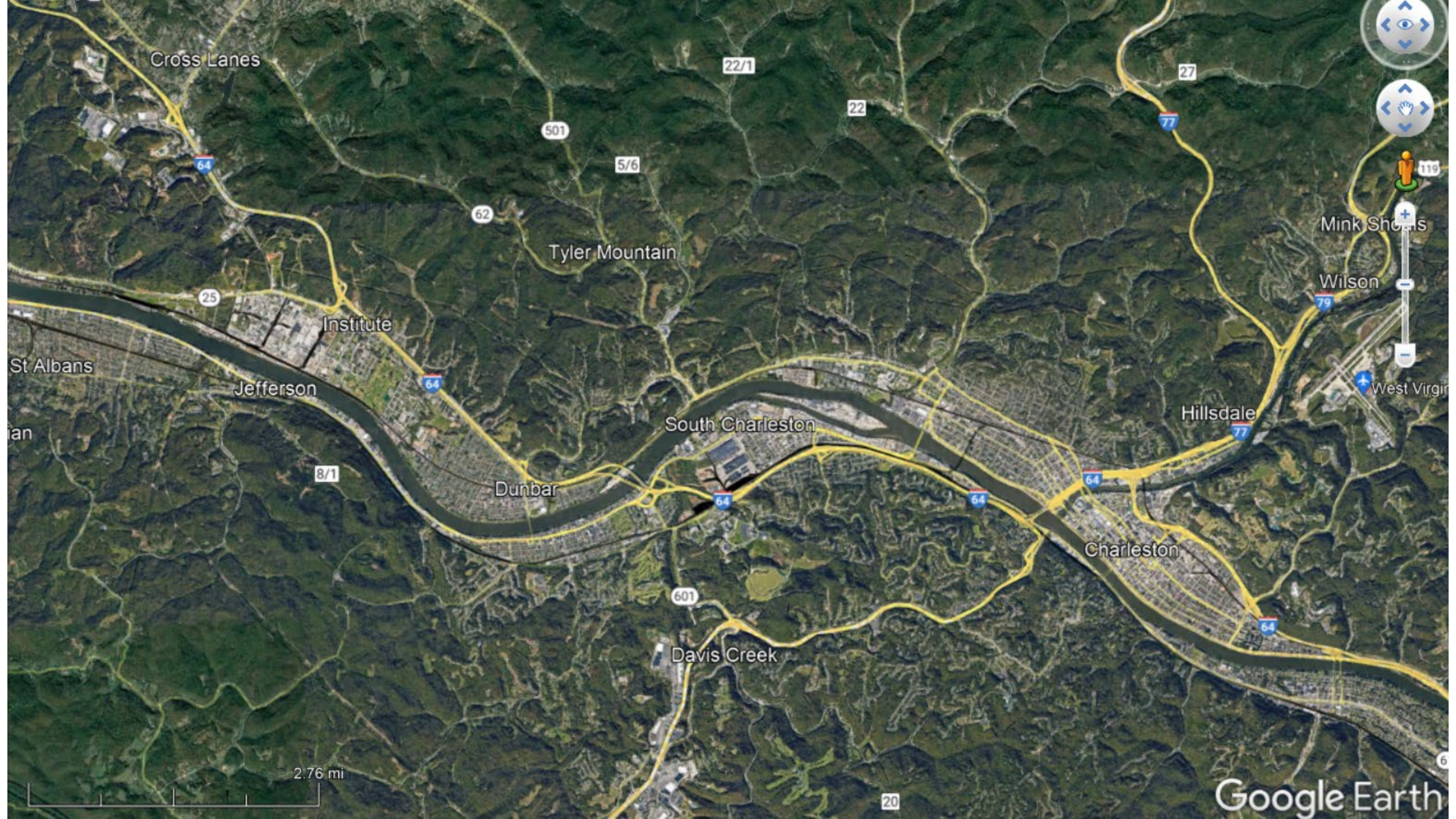
# Facilities in the Kanawha Valley that emit EtO

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- Institute
  - Union Carbide Corporation
  - Specialty Products US, LLC
- South Charleston
  - Union Carbide Corporation
  - Covestro LLC







Cross Lanes

22/1

501

5/6

22

27

25

62

Tyler Mountain

Institute

Jefferson

8/1

Dunbar

South Charleston

601

Davis Creek

20

79

Mink Sh

Wilson

Hillsdale

Charleston

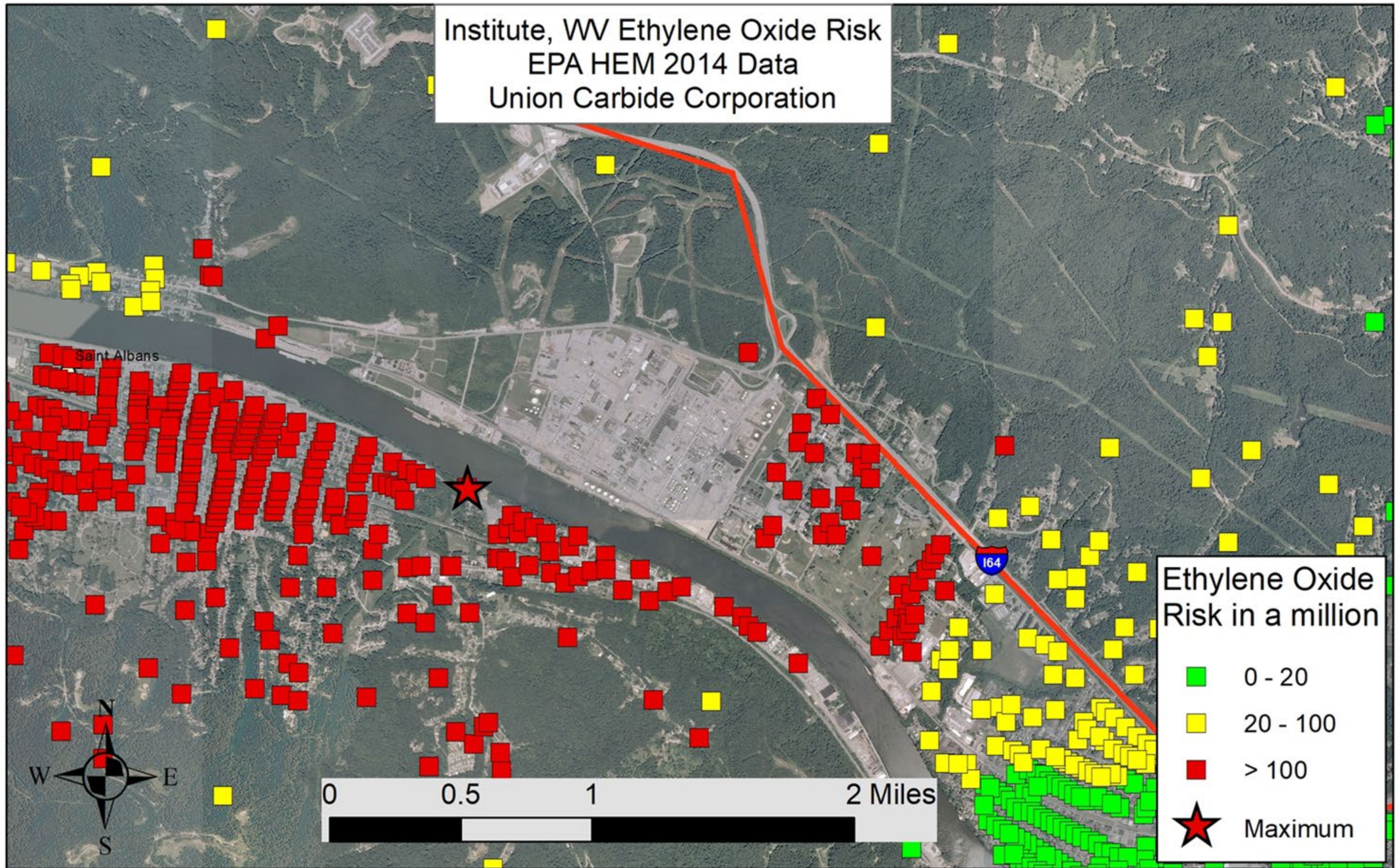
West Virgin

2.76 mi

Google Earth

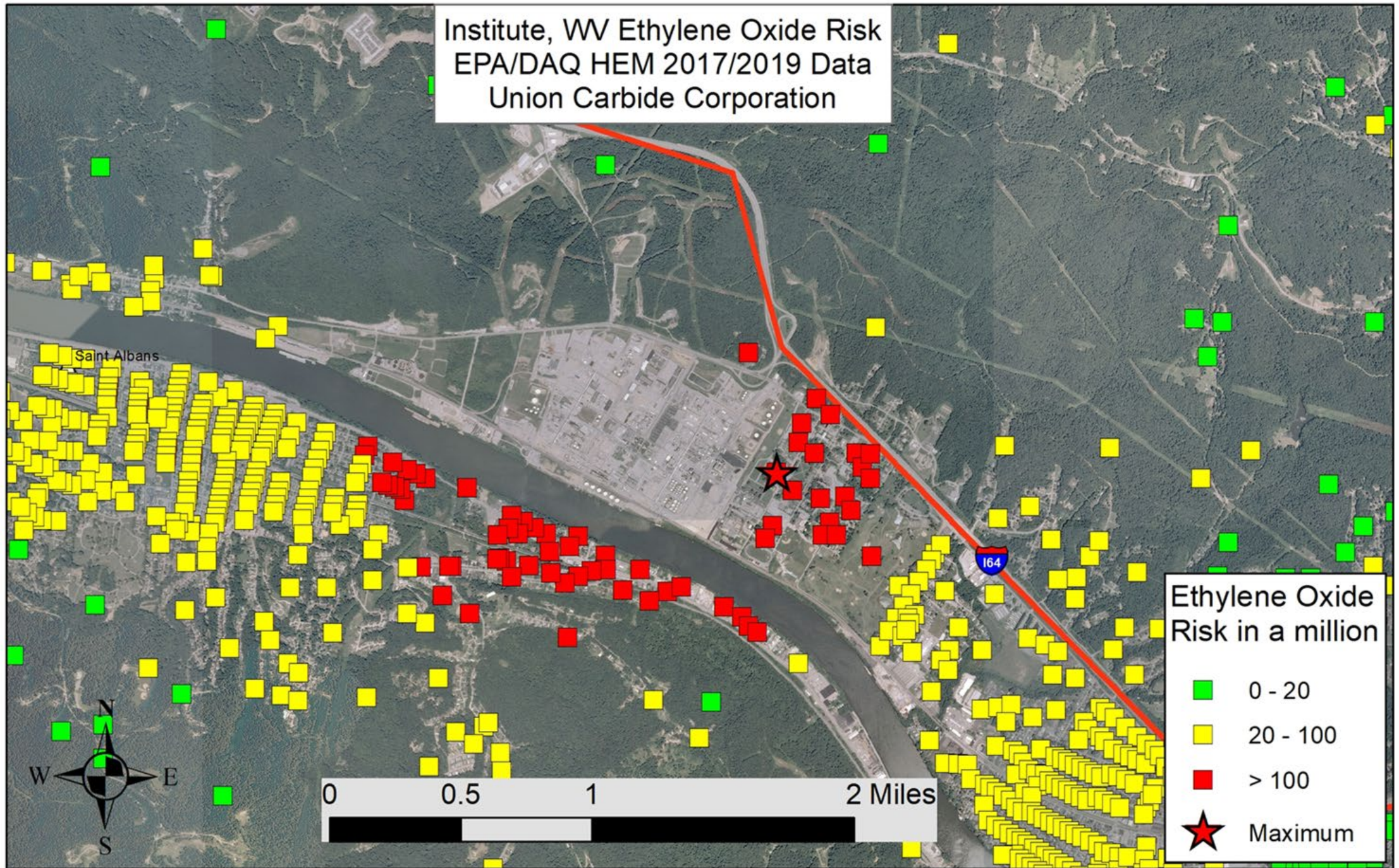


Institute, WV Ethylene Oxide Risk  
EPA HEM 2014 Data  
Union Carbide Corporation





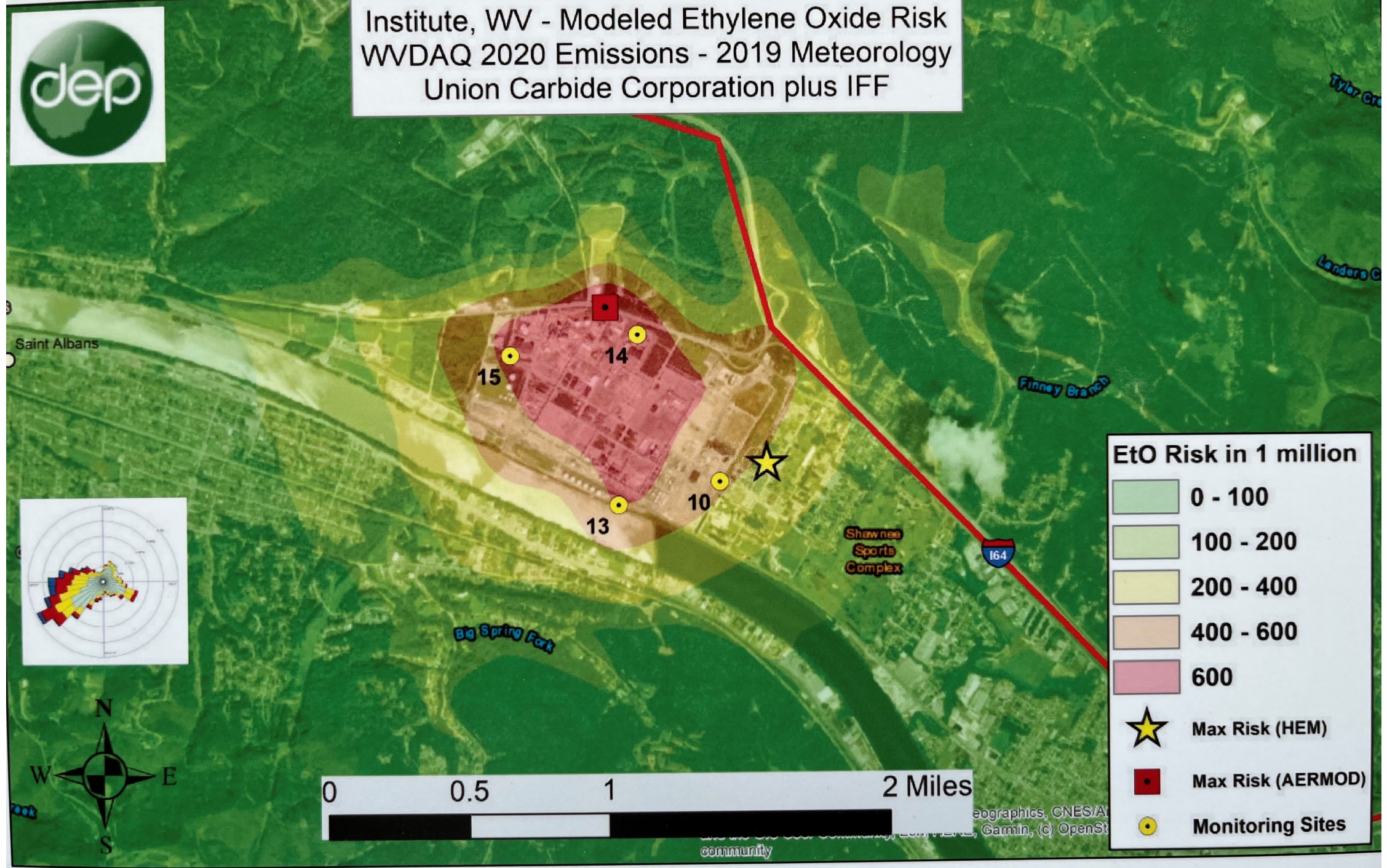
Institute, WV Ethylene Oxide Risk  
EPA/DAQ HEM 2017/2019 Data  
Union Carbide Corporation







Institute, WV - Modeled Ethylene Oxide Risk  
WVDAQ 2020 Emissions - 2019 Meteorology  
Union Carbide Corporation plus IFF

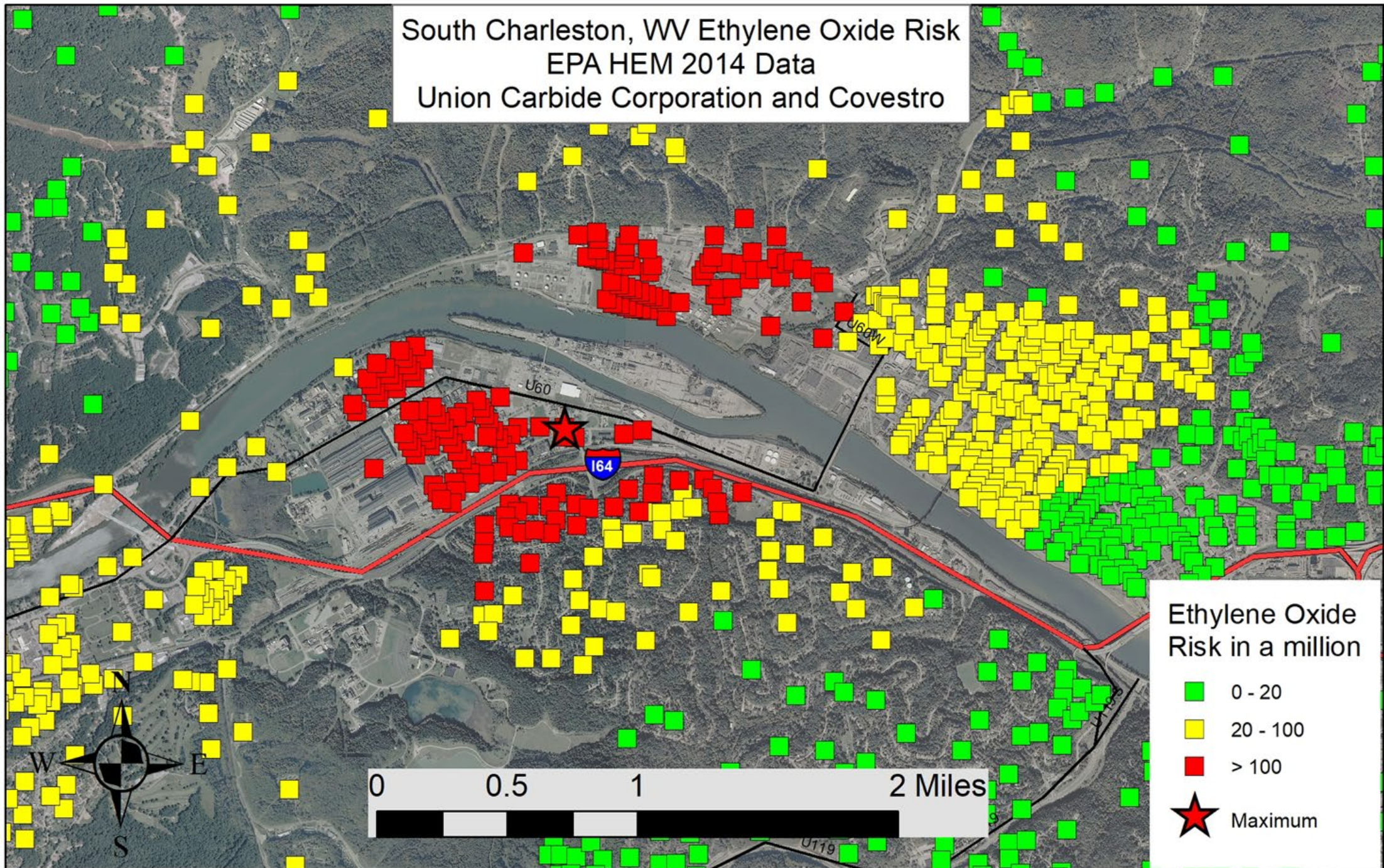


EtO Risk in 1 million

- 0 - 100
- 100 - 200
- 200 - 400
- 400 - 600
- 600
- ★ Max Risk (HEM)
- Max Risk (AERMOD)
- Monitoring Sites

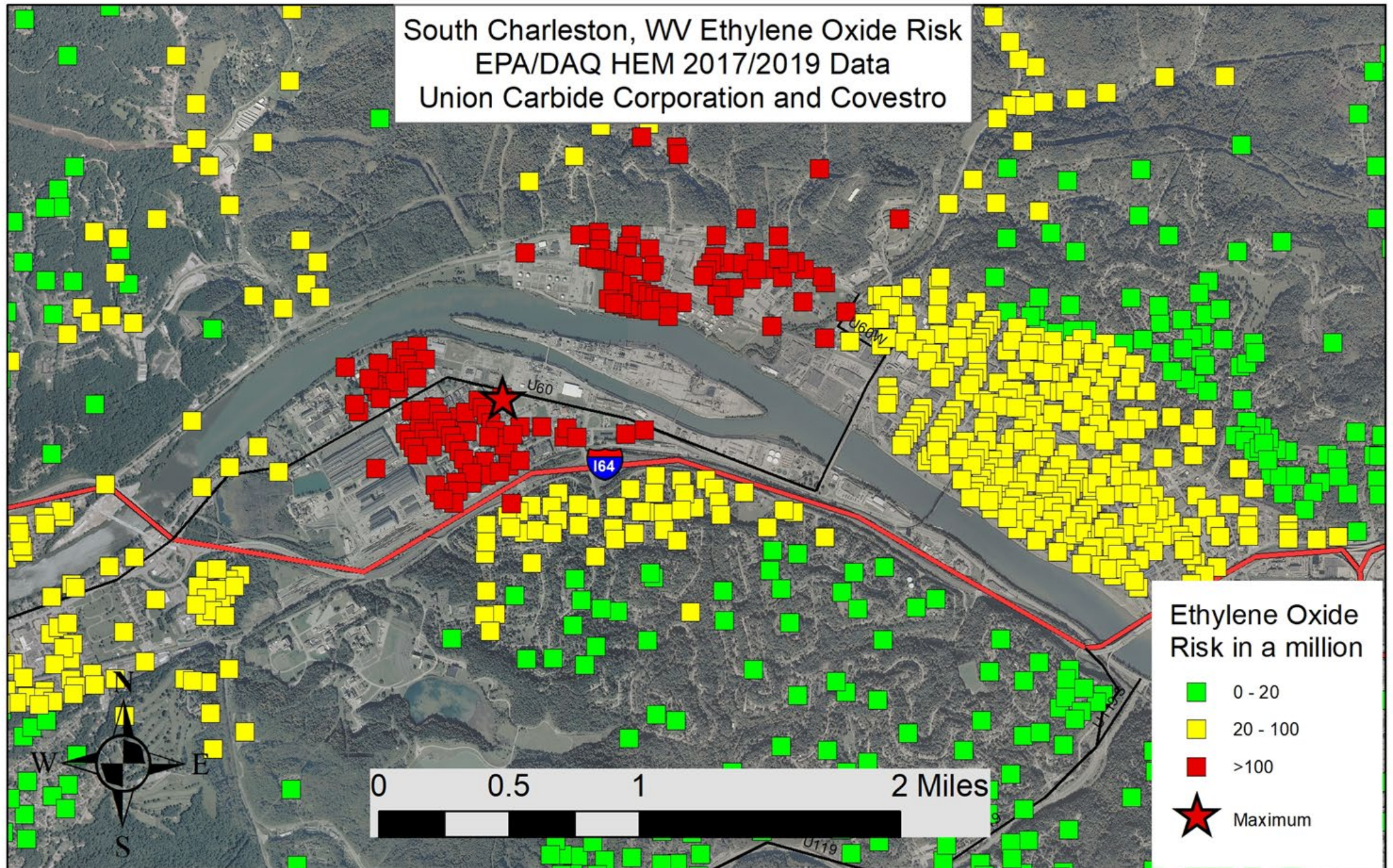


South Charleston, WV Ethylene Oxide Risk  
EPA HEM 2014 Data  
Union Carbide Corporation and Covestro





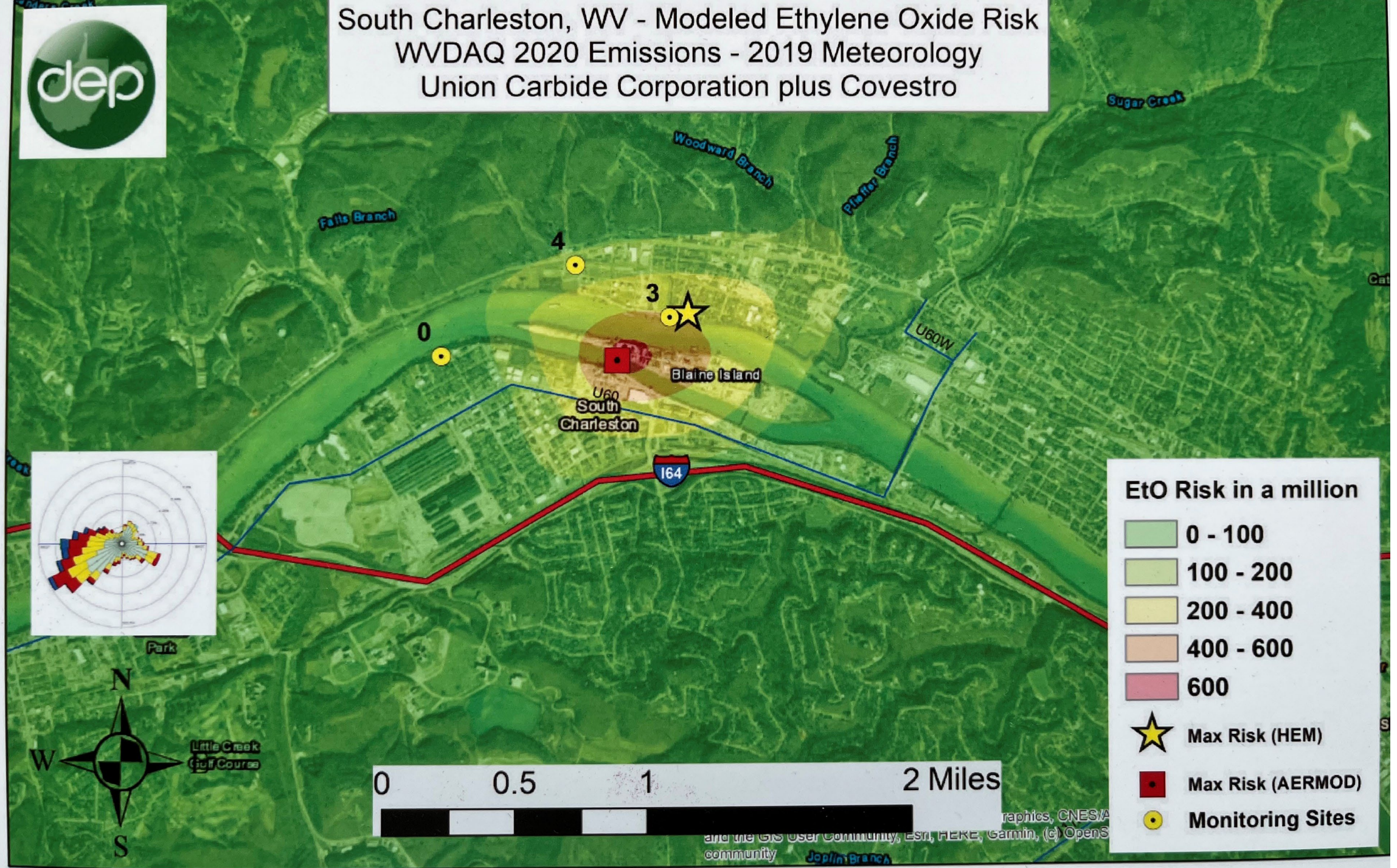
South Charleston, WV Ethylene Oxide Risk  
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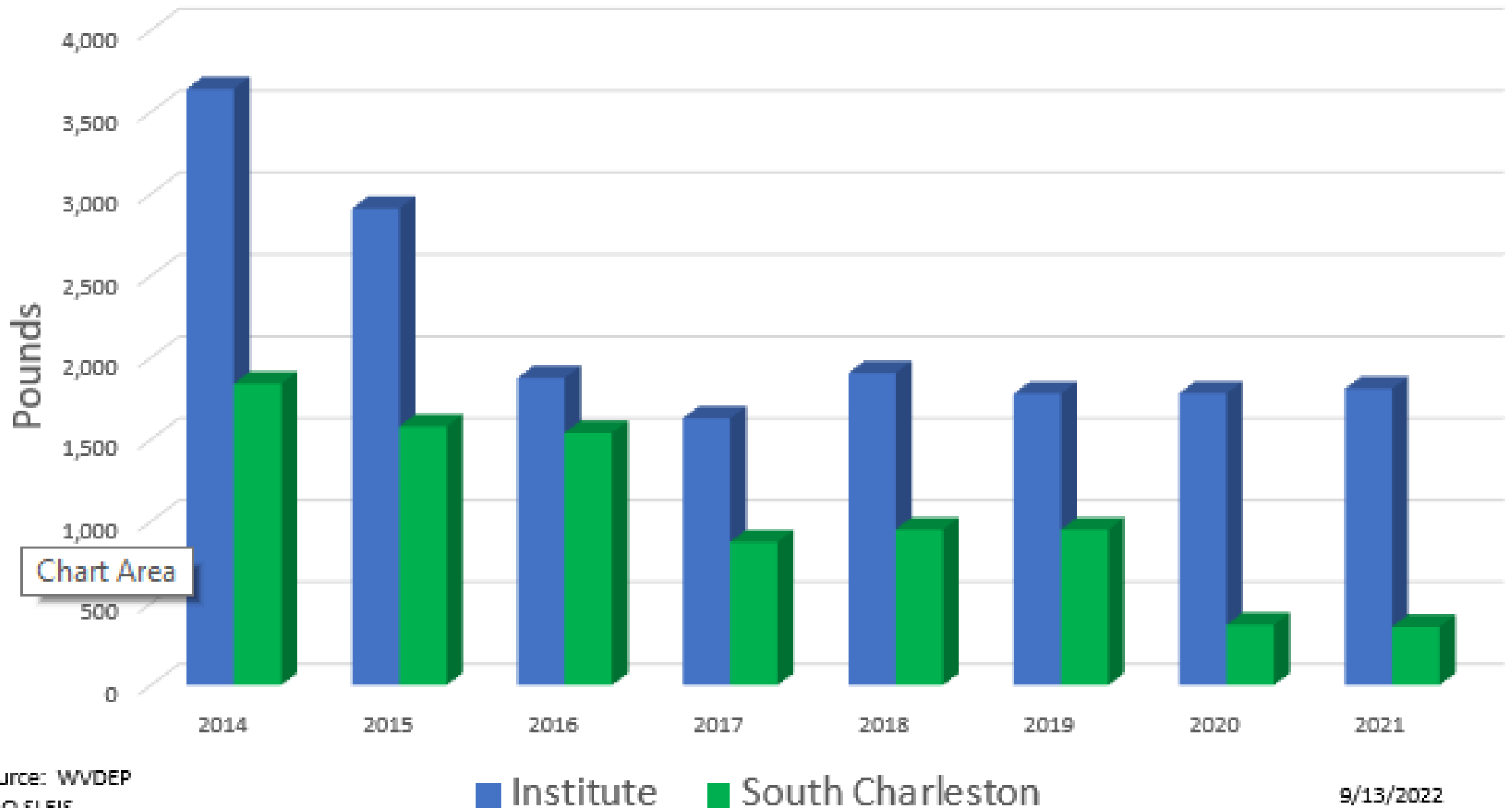


South Charleston, WV - Modeled Ethylene Oxide Risk  
WVDAQ 2020 Emissions - 2019 Meteorology  
Union Carbide Corporation plus Covestro





# Total Ethylene Oxide Emissions in the Kanawha Valley



# What has WVDEP done?

## More accurate emissions estimates

		2014	2015	2016	2017	2018*	2019	2020	2021
		SLEIS EtO Emissions	SLEIS EtO Emissions	SLEIS EtO Emissions	SLEIS EtO Emissions	SLEIS EtO Emissions	SLEIS EtO Emissions	SLEIS EtO Emissions	SLEIS EtO Emissions
		(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
Union Carbide	South Charleston	1,656	1,397	1,385	709	776	756	209	239
Covestro	South Charleston	185	183	156	165	175	195	160	118
Union Carbide	Institute	3,641	2,911	1,876	1,631	1,764	900	952	820
Specialty Products	Institute	N/A	N/A	N/A	N/A	143	881	831	990
		5,482	4,491	3,417	2,505	2,858	2,732	2,152	2,167
		* Specialty Products was split from Union Carbide Institute November 26, 2018							
	South Charleston	1,841	1,580	1,541	874	951	951	369	357
	Institute	3,641	2,911	1,876	1,631	1,906	1,781	1,783	1,810

Source: WV DEP DAQ SLEIS





# What has WVDEP done?

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- Four (4) sets of short-term monitoring in both the South Charleston and Institute areas
- Worked with UCC to do an additional seven (7) sets of short-term fence-line and background monitoring (114 ICR from EPA)
- Released the monitoring results after analyzed by the lab and Q/A'd by DAQ







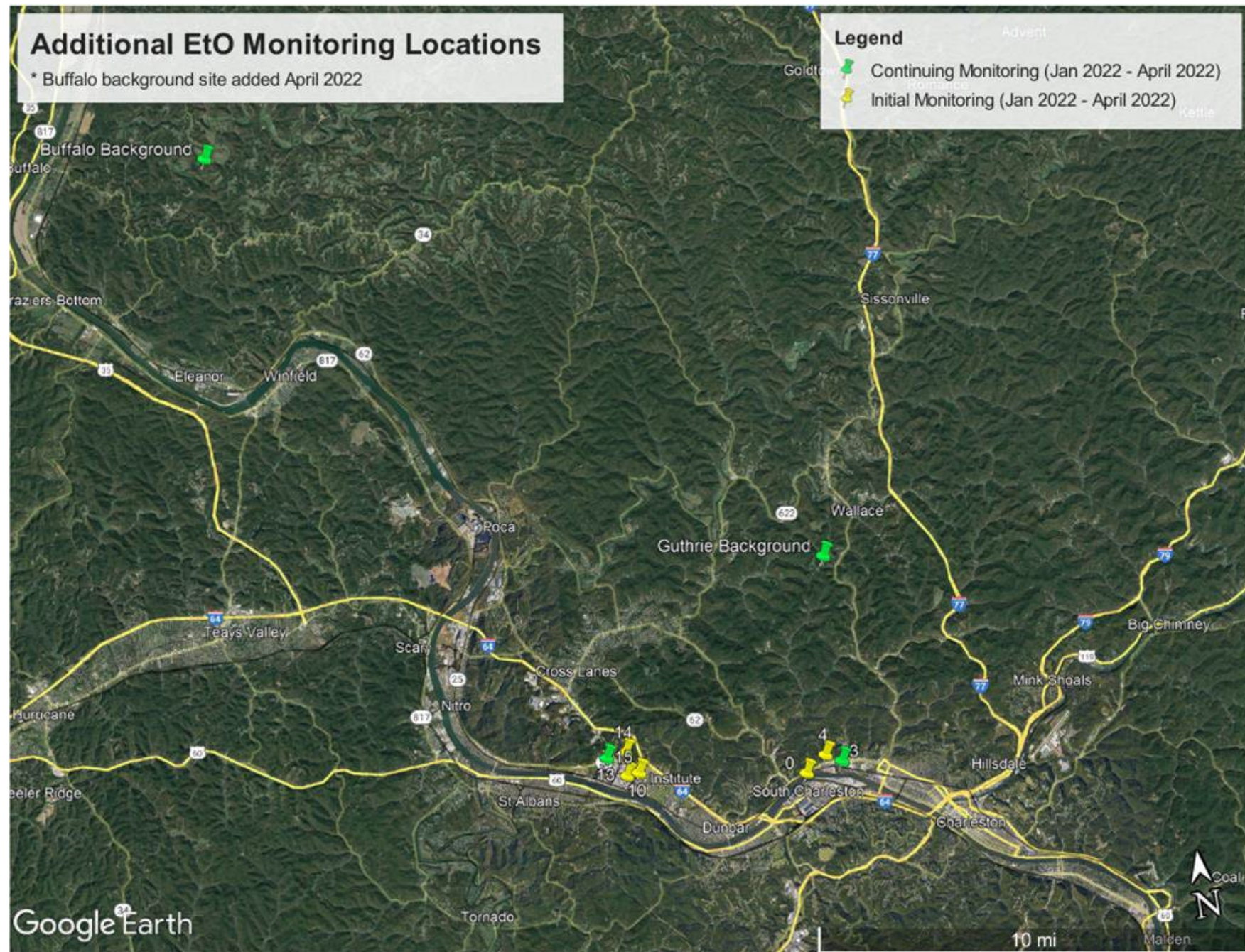


## Additional EtO Monitoring Locations

\* Buffalo background site added April 2022

### Legend

- Continuing Monitoring (Jan 2022 - April 2022)
- Initial Monitoring (Jan 2022 - April 2022)





# What has WVDEP done?

## Ethylene Oxide Initial Monitoring Results

Sample Location	Jan. 25-26, 2022	Feb. 15-16, 2022	March 23-24, 2022	April 25-26, 2022***
	Results (ppbv)*	Results (ppbv)*	Results (ppbv)*	Results (ppbv)*
Guthrie Background **	0.0361	0.0884	0.0321	0.271
#0 South Charleston, WV	Nondetect	Not exposed	0.08	0.146
#3 North Charleston, WV	0.0165	0.0227	0.155	0.221
#4 North Charleston, WV	0.0121	0.088	0.0794	0.277
#10 Institute, WV	0.0821	0.0996	0.182	0.674
#13 Institute, WV	0.0375	0.204	0.0714 (co-located)	0.124
#14 Institute, WV	0.0376	0.0958	0.119	0.514
#15 Institute, WV	0.0505	1.3	0.447	0.183
#16 Buffalo, WV Background**	N/A	N/A	N/A	0.365

\* Concentrations measured in parts per billion by volume (ppbv)

\*\* Background site: This is an area with no known emitters of Ethylene Oxide

\*\*\* April 26-27, 2022 for #0 South Charleston, #3 North Charleston and #4 North Charleston

Method Detection Level (MDL) for the January through March sampling = 0.0261 ppb

Method Detection Level (MDL) for the June sampling = 0.048 ppb

MDL is the minimum concentration of a substance that can be measured and reported with 99% confidence that the concentration is greater than zero.







UCC I1

14

15 UCC I6

3rd Ave

Carroll Rd

25

25

64

64

Institute  
Institute

UCC I2

Barton Dr

UCC I5

UCC I4

UCC I3

10

13

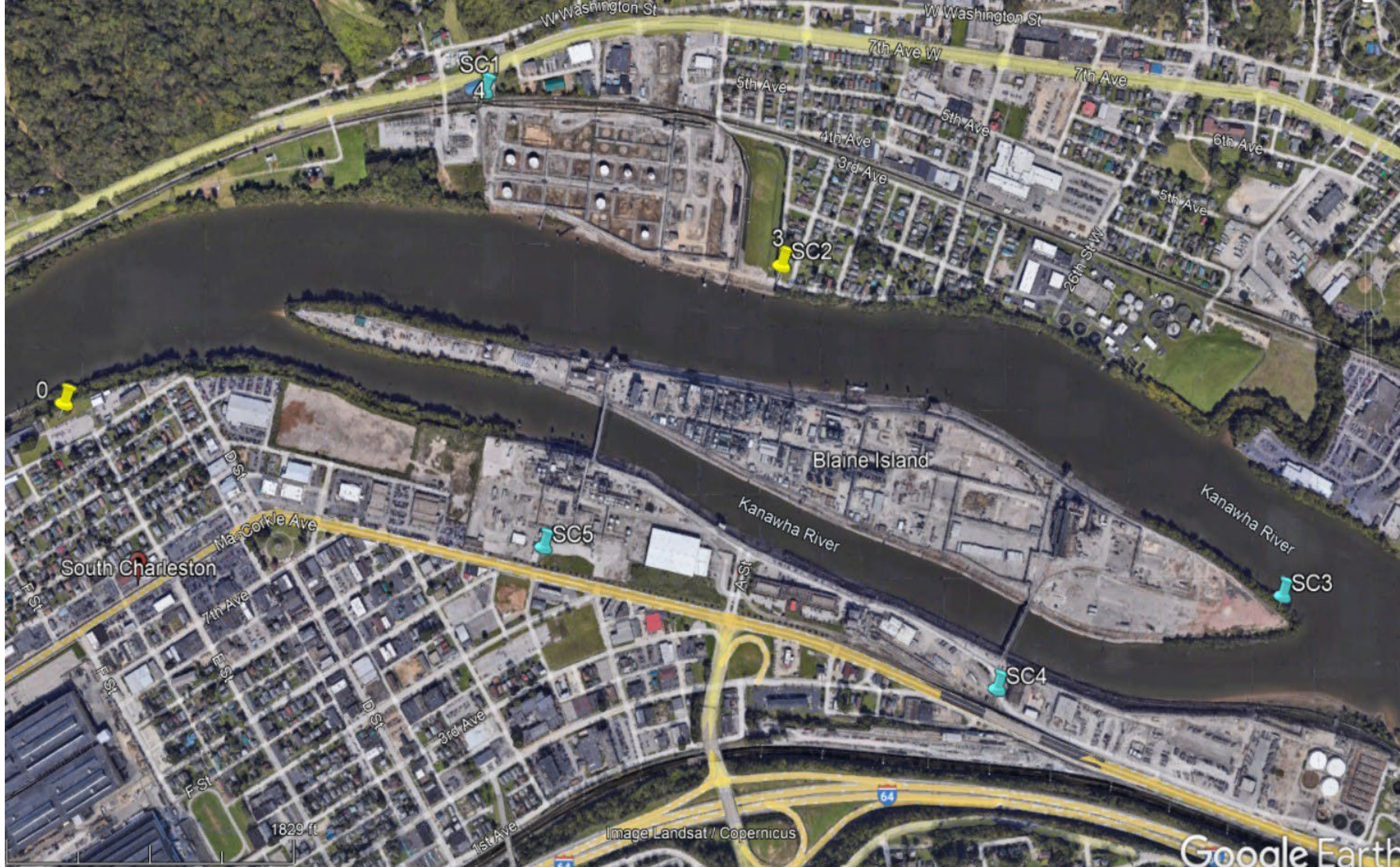
Kanawha River

Kanawha St  
Maccorkle Ave

1596 ft

Google Earth







# What has WVDEP done?

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## Ethylene Oxide Monitoring Results

Sample Location	May 24-25, 2022	May 31-June 1, 2022	June 7-8, 2022	June 14-15, 2022	June 22-23, 2022	June 28-29, 2022	July 5-6, 2022
	Results (ppbv)*	Results (ppbv)*	Results (ppbv)*	Results (ppbv)*	Results (ppbv)*	Results (ppbv)*	Results (ppbv)*
Guthrie Background **	0.0733	0.296	0.636	0.95	0.817	0.495	0.552
#3 North Charleston, WV	0.184	0.257	0.762	2.48	0.979	1.23	***
#15 Institute, WV	1.23	1.93	0.571	1.76	1.65	2.36	***
#16 Buffalo, WV Background**	0.169	0.109	0.714	0.122	0.354	0.151	0.486

\* Concentrations measured in parts per billion by volume (ppbv)

\*\* Background site: This is an area with no known emitters of Ethylene Oxide

\*\*\* Results voided/invalidated by the lab

Method Detection Level (MDL) for the May through July sampling = 0.048 ppb

MDL is the minimum concentration of a substance that can be measured and reported with 99% confidence that the concentration is greater than zero.



# What has WVDEP done?

	May 24-25, 2022	May 31-June 1, 2022	June 7-8, 2022	June 14-15, 2022	June 22-23, 2022	June 28-29, 2022	July 5-6, 2022
Site	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
I1	0.07	0.18	0.28	0.17	0.22	0.18	0.10
I2	0.06	0.12	0.33	0.32	0.23	0.13	0.05
I3	0.09	0.12	0.20	0.13	0.10	0.13	0.14
I4	0.06	0.06	0.11	0.08	0.18	0.10	0.06
I5	0.10	0.09	0.15	0.23	0.18	0.62	0.10
I6*	1.07	0.98	0.29	0.60	0.70	0.51	0.81
I6 Collocated*	1.11	0.08	0.42	1.14	0.70	**	0.78
DEP #15	1.23	1.93	0.57	1.76	1.65	2.36	***
* I6 and I6 Collocated are located at nearly same location as DEP #15							
** - No sample was taken							
*** Voided/invalidated by the lab							



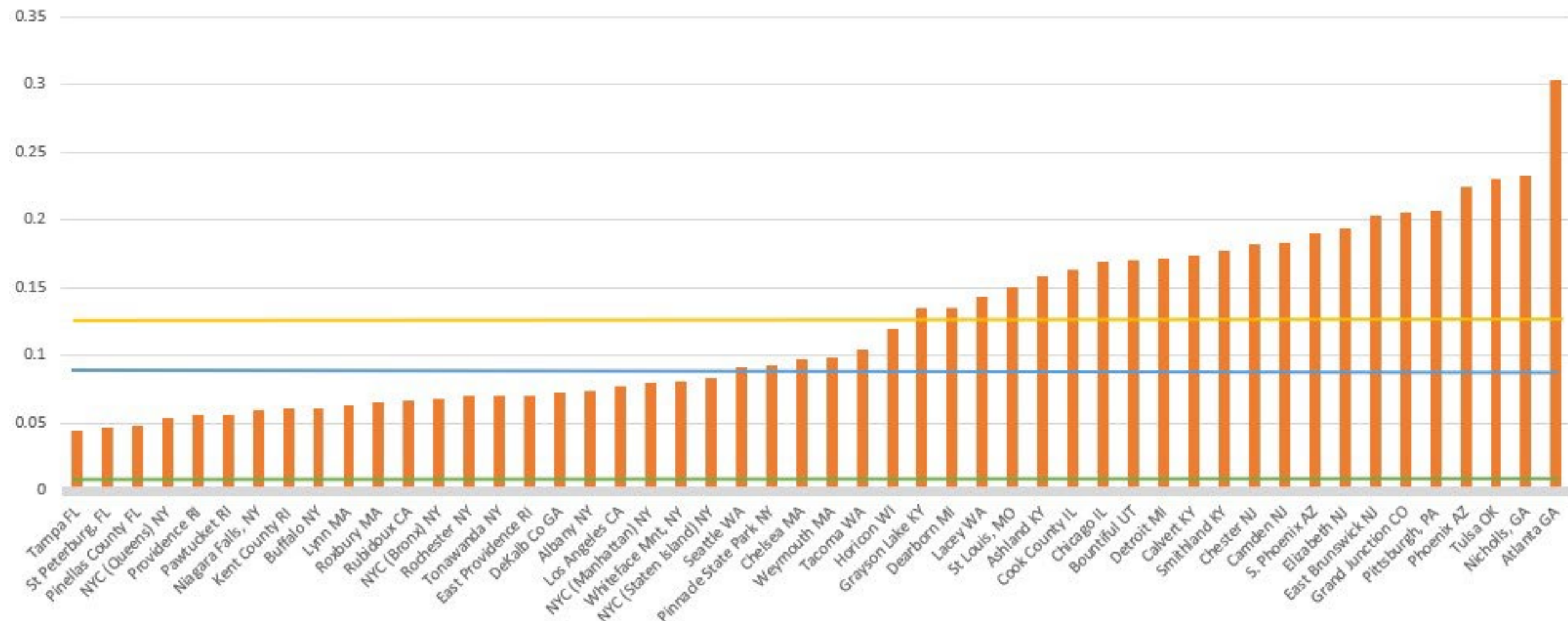


# What has WVDEP done?

	May 24-25, 2022	May 31-June 1, 2022	June 7-8, 2022	June 14-15, 2022	June 22-23, 2022	June 28-29, 2022	July 5-6, 2022
Site	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
SC1	0.05	0.10	0.38	0.08	0.07	0.05	0.97
SC2*	0.01	0.08	0.01	0.21	0.03	0.06	0.22
DEP #3	0.18	0.26	0.76	2.48	0.98	1.23	***
SC3	0.07	0.07	0.17	0.09	0.09	0.30	0.18
SC3 Collocated	0.06	0.03	0.14	0.20	0.14	0.06	0.19
SC4	0.05	0.11	0.08	0.21	0.13	0.05	0.08
SC5	0.01	0.01	0.01	0.01	0.01	0.01	0.01
* SC2 is located at nearly same location as DEP #3							
** - No sample was taken							
*** Voided/invalidated by the lab							



# National Air Toxics Trends Stations (NATTS) and non-NATTS EtO Average Concentration (ppbv) non-zeros

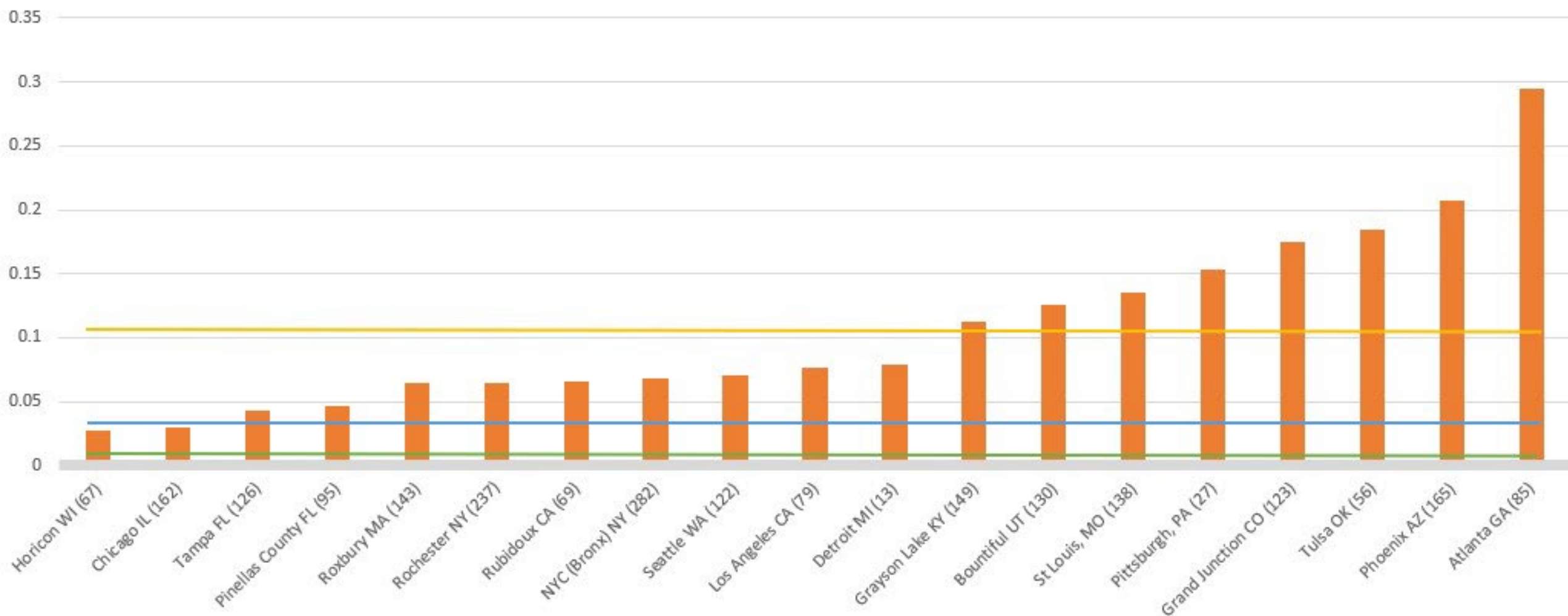


\*Number of samples for each site range from 6 to 437 (2018-November 2021)

--- Average Concentration - 0.122 ppbv  
 --- Highest MDL Concentration - 0.092 ppbv  
 --- Lowest MDL Concentration - 0.008 ppbv



# National Air Toxics Trends Stations (NATTS) EtO Average Concentration (ppbv)



() - Number of samples for each site  
(2018-November 2021)

Average Concentration - 0.107 ppbv  
Highest Current MDL Concentration - 0.034 ppbv  
Lowest Current MDL Concentration - 0.008 ppbv

May 27, 2022

# What has WVDEP done?

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- Public Outreach:
  - Met with Elected Officials and Higher Education Representatives on August 10, 2021
  - Had a Virtual Community Meeting on September 23, 2021
  - Established an EtO Webpage and Mailing List
  - Had a Community Open House on March 26, 2022 at the Dunbar Recreation Center in Dunbar
  - Had an Update Meeting on August 18, 2022 at the Schoenbaum Center in North Charleston
  - Attend monthly South Charleston and Western Kanawha Valley Community Advisory Panel (CAP) meetings
  - The WVDEP's Environmental Advocate provides updates on EtO through virtual town hall meetings





# What has WVDEP done?

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- Worked with the four EtO emitting facilities in Institute and South Charleston to provide written commitments to work practice standards greater than required by state and federal regulations
- These may include:
  - Repairing components with detected leaks at levels lower than what is considered a leak by applicable regulations
  - Increase monitoring frequency of potential leak points
  - Reducing the number of fugitive components by replacing them with welded connections



# What has WVDHHR BPH done?

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- Conducted updated cancer-mapping - released June 9, 2022
- Findings include:
  - Kanawha County does not rank in the top 10 for any of the EtO related cancers
  - There are no cancer clusters for EtO related cancers around the Institute and South Charleston areas





# What has EPA done?

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- Updated the NATA with a new air toxics risk screening tool - AirToxScreen
  - Will use more current emissions data
  - 2018 AirToxScreen currently Available
  - Data from 2017 AirToxScreen emissions indicated that all census tracts in West Virginia are under the 100 in 1 million cancer risk level
  - Data from 2018 AirToxScreen shows 1 census tract with above 100 in 1 million cancer risk level

<https://www.epa.gov/AirToxScreen>





# What is WVDEP doing?

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- Modeling actual EtO emissions
- Comparing air monitoring data with air modeling results
- Developing a final report on the short-term monitoring



# Summary

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- WVDEP has been working with EPA, the facilities, and DHHR to accurately identify and address the associated risks
- Questions remain regarding the revised EPA risk factor for EtO
- Questions remain regarding the background levels of EtO
- Questions remain regarding concentrations reported “near” the MDL and the summa canister method (TO-15, TO-15A)
- WVDEP is committed to continued dialogue with the community and holding additional meetings as new information becomes available





# Additional Resources

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- The WVDEP has a webpage dedicated to EtO:  
<https://dep.wv.gov/daq/Air%20Toxics/EthyleneOxide/Pages/default.aspx>
- [michael.egnor@wv.gov](mailto:michael.egnor@wv.gov)

