GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Ethylene Oxide in Georgia

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EPA Region 4 Fall Air Directors' Meeting
Gulfport, Mississippi
October 17, 2019

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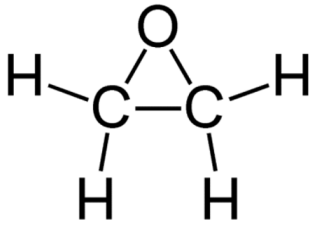
OUTLINE



- Background
- NATA Modeling
- Sterigenics Modeling
- Becton Dickinson Modeling
- Modeling at Other Facilities
- Monitoring

ETHYLENE OXIDE

- Ethylene oxide is a flammable, colorless gas used to make other chemicals that are used in making a range of products, including antifreeze, textiles, plastics, detergents, and adhesives.
- Also, ethylene oxide is used to sterilize medical equipment (e.g., kits and catheters) that cannot be sterilized by other methods (e.g., steam and irradiation).

HEALTH RISKS

- Studies show that breathing air containing elevated ethylene oxide levels over many years increases the risk of some types of cancers:
  - White blood cell cancers
    - non-Hodgkin's lymphoma, myeloma, and lymphocytic leukemia
  - Breast cancer in females

NATIONAL AIR TOXICS ASSESSMENT

- The National Air Toxics Assessment (NATA) is EPA's ongoing review of air toxics in the U.S.
  - NATA estimates the cancer risks from breathing outdoor sources of air toxics over many years at the census tract level.
  - NATA combines results from dispersion models (local impacts) and photochemical grid models (regional impacts).
- EPA developed NATA as a screening tool to help state, local, and tribal air agencies identify which pollutants, emission sources, and places they may wish to study further.
- Released to the public on August 22, 2018
  - Based on 2014 National Emissions Inventory (NEI) and 2014 Toxics Release Inventory (TRI)

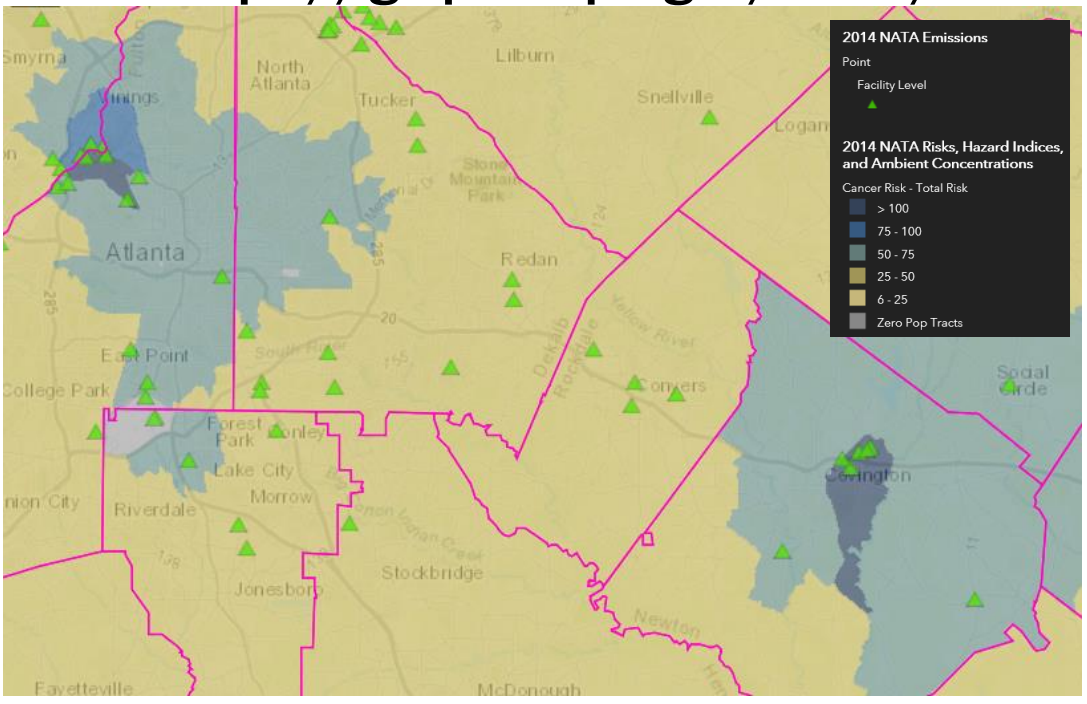
UPDATED IRIS VALUE

- The Integrated Risk Information System (IRIS) value for ethylene oxide was updated in December 2016:
  - Inhalation Unit Risk (IUR) = 0.003 per $\mu g/m^3$
- Elevated risk due to the mutagenic mode of action through early-life exposures:
  - Modified IUR for EtO = 0.005 per $\mu g/m^3$

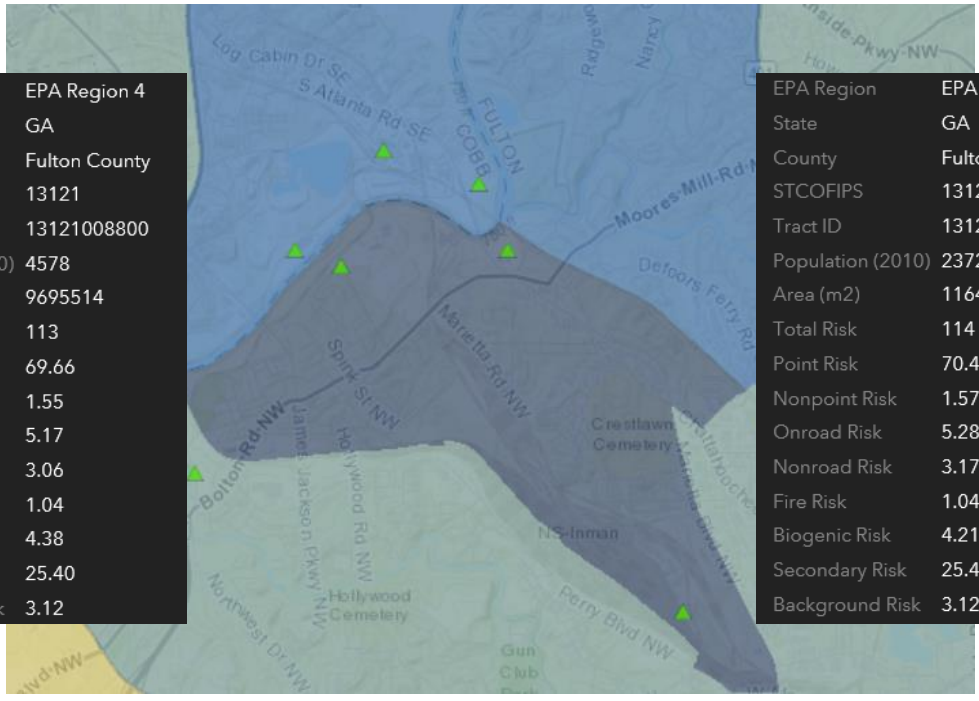
"ACCEPTABLE" CONCENTRATIONS

- EPA's NATA used (100/1,000,000) individual risk for the purpose of determining "acceptable risk" (AR) in their national assessment:
  - EPA's AR Exposure Concentration = Cancer Risk/Modified IUR = (100/1,000,000)/(0.005/µg/m^3) = **0.02 µg/m^3**
- According to the GA EPD's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*, the annual Acceptable Ambient Concentration (AAC) for ethylene oxide uses (1/1,000,000) individual risk and is calculated as:
  - GA EPD's Annual AAC = Cancer Risk/IUR = (1/1,000,000)/(0.003/µg/m^3) = **0.00033 µg/m^3**

https://gispub.epa.gov/NATA/



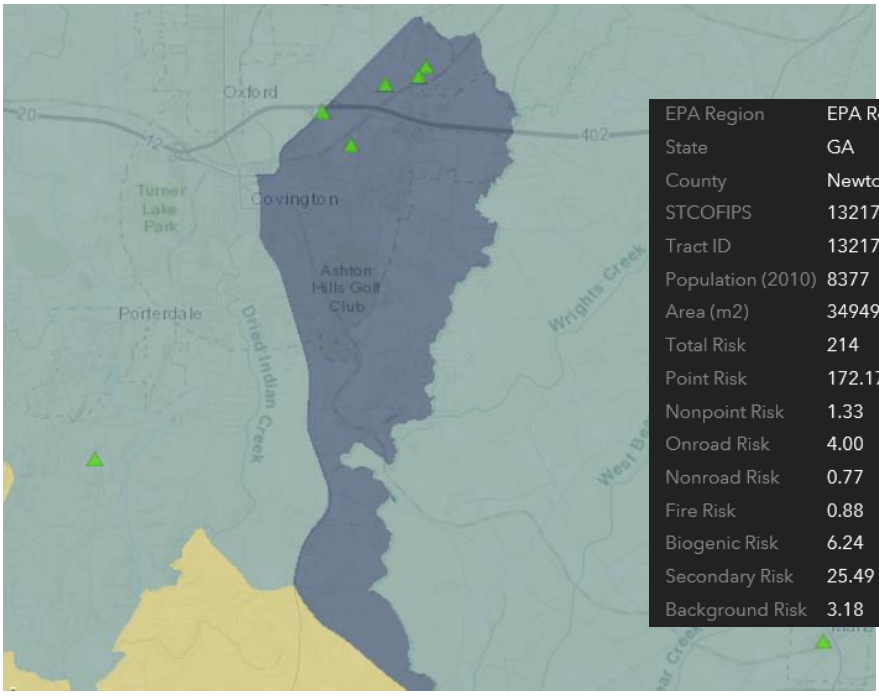
RISK IN ATLANTA



EPA Region	EPA Region 4
State	GA
County	Fulton County
STCOFIPS	13121
Tract ID	13121008800
Population (2010)	4578
Area (m2)	9695514
Total Risk	113
Point Risk	69.66
Nonpoint Risk	1.55
Onroad Risk	5.17
Nonroad Risk	3.06
Fire Risk	1.04
Biogenic Risk	4.38
Secondary Risk	25.40
Background Risk	3.12

EPA Region	EPA Region 4
State	GA
County	Fulton County
STCOFIPS	13121
Tract ID	13121008903
Population (2010)	2372
Area (m2)	1164215
Total Risk	114
Point Risk	70.45
Nonpoint Risk	1.57
Onroad Risk	5.28
Nonroad Risk	3.17
Fire Risk	1.04
Biogenic Risk	4.21
Secondary Risk	25.40
Background Risk	3.12

RISK IN COVINGTON



EPA Region	EPA Region 4
State	GA
County	Newton County
STCOFIPS	13217
Tract ID	13217100300
Population (2010)	8377
Area (m2)	34949619
Total Risk	214
Point Risk	172.17
Nonpoint Risk	1.33
Onroad Risk	4.00
Nonroad Risk	0.77
Fire Risk	0.88
Biogenic Risk	6.24
Secondary Risk	25.49
Background Risk	3.18

EMISSION SUMMARY (lbs/year)

YEAR	STERIGENICS	BD - COVINGTON	
1987	89,010.0	75,306.0	
1988	22,834.0	96,863.0	
1989		101,755.0	
1999	10,900.0	16,978.0	
2009	2,483.0	5,261.0	
2013	3,312.0	6,829.6	
2014	**3,189.0**	**692.6**	Emissions modeled in NATA
2015	3,574.0	771.2	
2016	226.0	726.9	
2017		657.4	
2018		656.3	
2019	**206.1**	**657.4**	Emissions modeled by EPD – Current Scenario
2020	**37.6**	**106.7**	Emissions modeled by EPD – Proposed Scenario*

*Proposed emissions are preliminary and subject to change

EMISSION SUMMARY (lbs/year)

Sterigenics

Emissions	Current (lbs/year)	Proposed* (lbs/year)
Point	17.7	17.7
Fugitives	188.4	19.9
Total	206.1	37.6

*Proposed emissions are preliminary and subject to change

Becton Dickinson - Covington

Emissions	Current (lbs/year)	Proposed* (lbs/year)
Point	101.7	101.7
Fugitives	555.7	5.0
Total	657.4	106.7

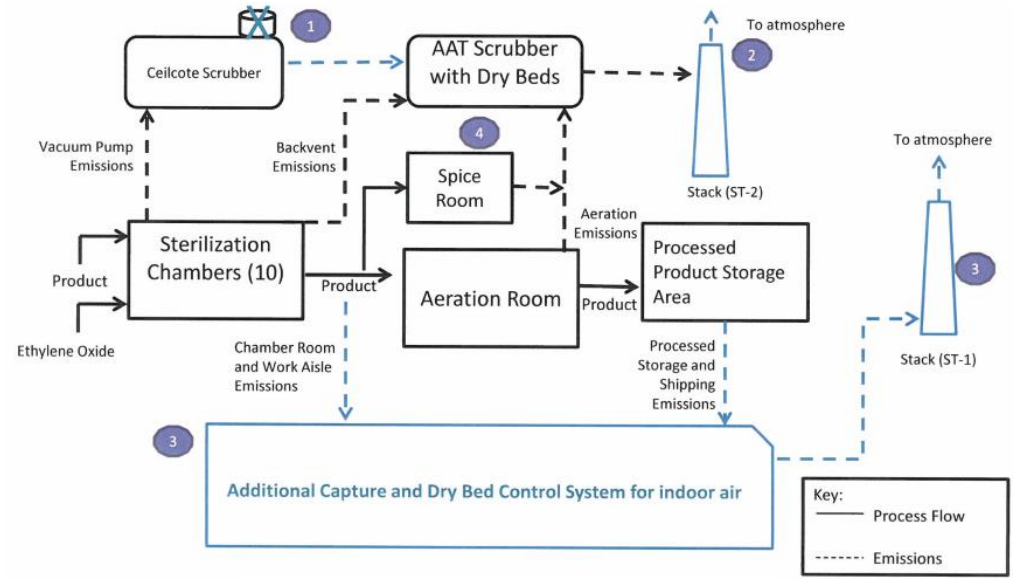
*Proposed emissions are preliminary and subject to change

GA EPD MODELING

- Contacted facilities to get updated emission rates, stack parameters, and building dimensions
- Followed procedures in GA EPD's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*
  - No receptors inside property boundary
  - AERMOD dispersion model (v18081)
  - 5 years of hourly meteorological data (2014 - 2018)
  - Annual average concentration at each receptor
- Final modeling reports submitted to APB Branch Chief on June 7, 2019

STERIGENICS (SMYRNA, GA)

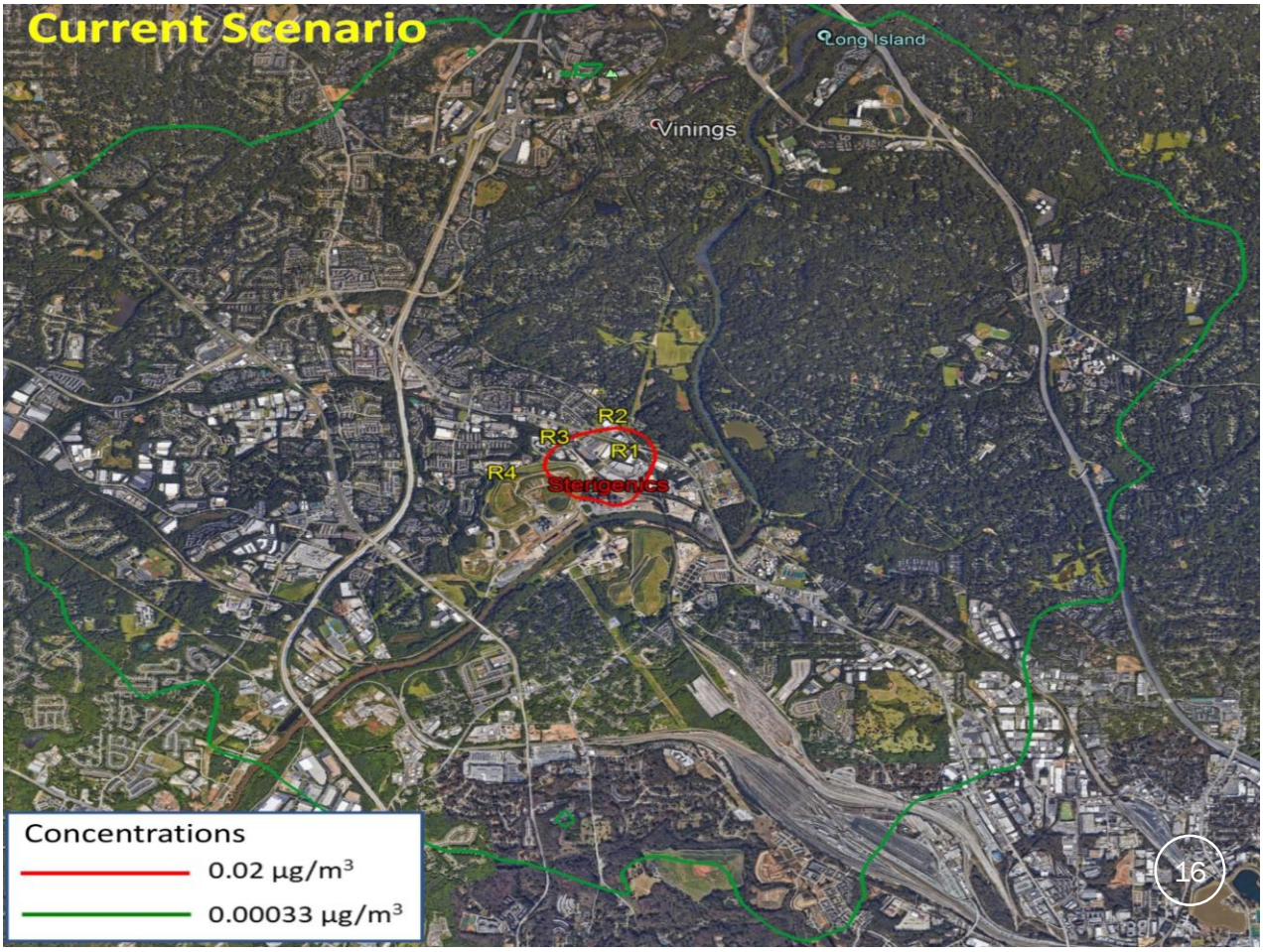
STERIGENICS PERMIT APPLICATION



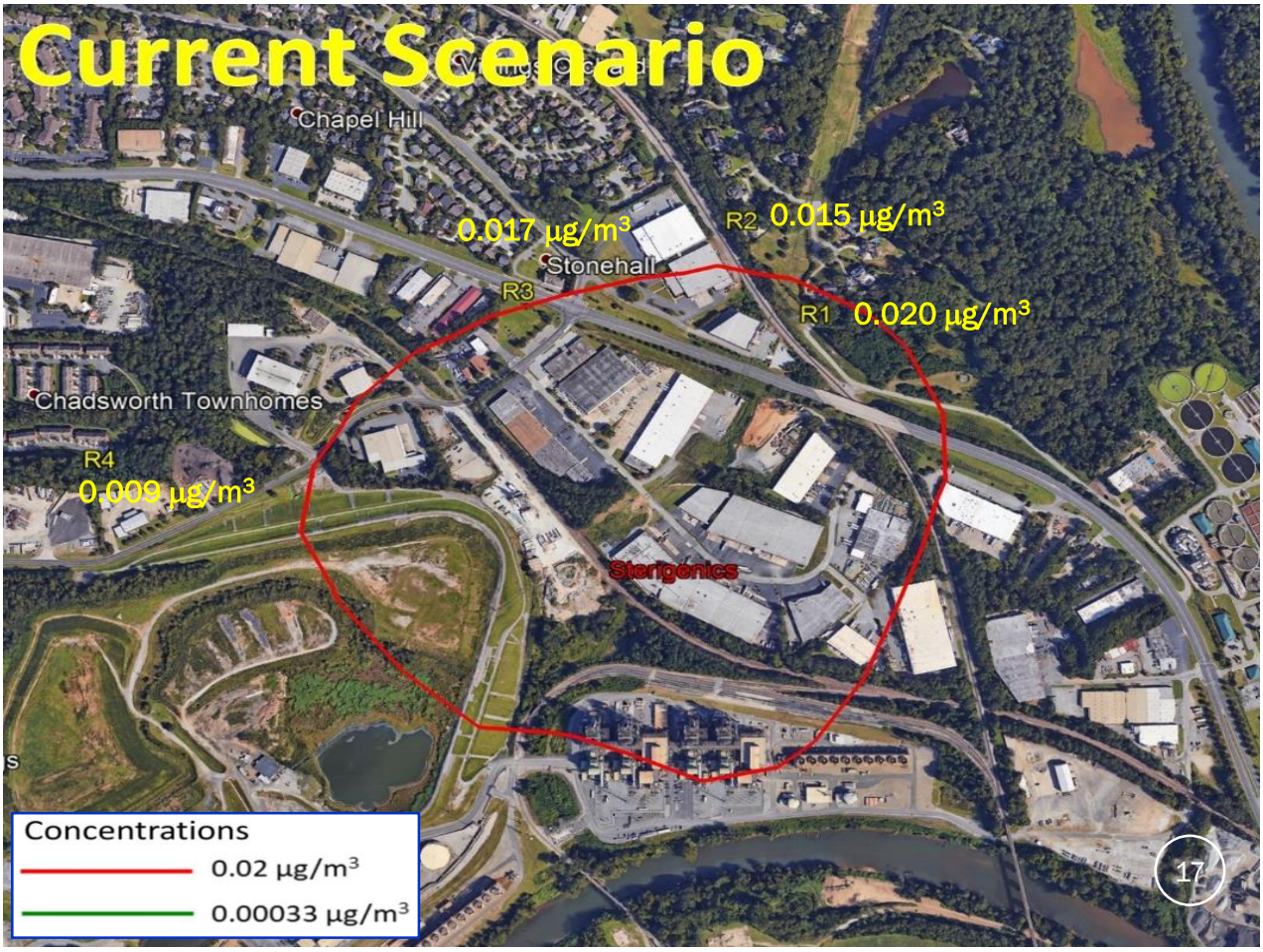
Process Flow Diagram
(Changes noted in Blue)

Additional Capture/Control Equipment:

1) Route Ceilcote emissions to AAT Scrubber and eliminate Ceilcote stack
2) Route AAT scrubber to an 80 foot stack. Eliminate AAT stack.
3) Installation of capture and control system for indoor air in processed areas and route to an 80 foot stack.
4) Build a dedicated room for processed spices and duct to existing AAT scrubber.


Current Scenario
Long Island
Vinings
R2
R3
R1
R4
Sterigenics
Concentrations
0.02 µg/m³
0.00033 µg/m³
16

16


Current Scenario
Chapel Hill
0.017 µg/m³
R2 0.015 µg/m³
Stonehall
R3
R1 0.020 µg/m³
Chadsworth Townhomes
R4
0.009 µg/m³
Sterigenics
Concentrations
0.02 µg/m³
0.00033 µg/m³
17

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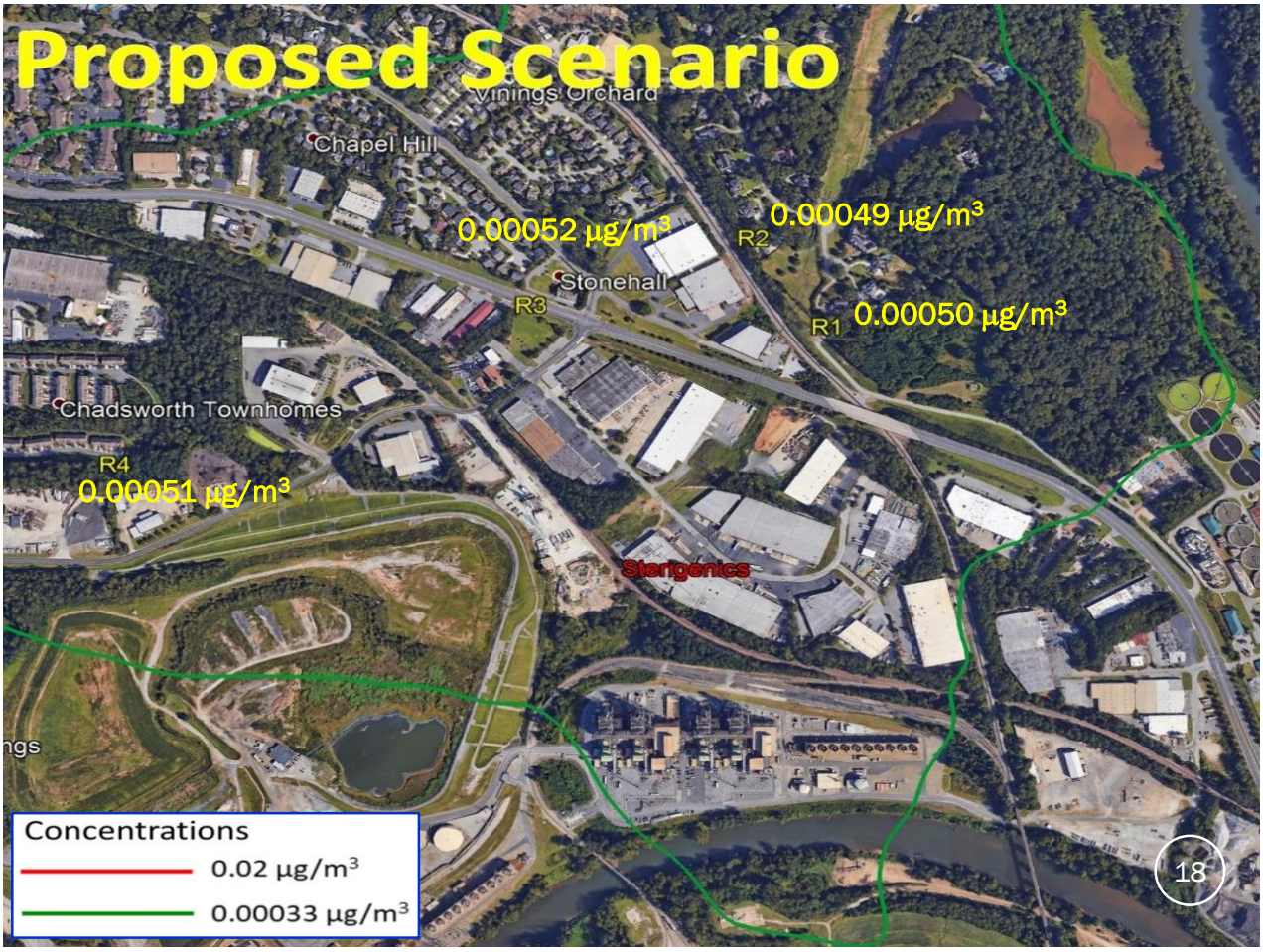
Proposed Scenario
Vinings Orchard
Chapel Hill
0.00052 µg/m³
R2
0.00049 µg/m³
Stonehall
R3
R1
0.00050 µg/m³
Chadsworth Townhomes
R4
0.00051 µg/m³
Sterigenics
ngs
Concentrations
0.02 µg/m³
0.00033 µg/m³
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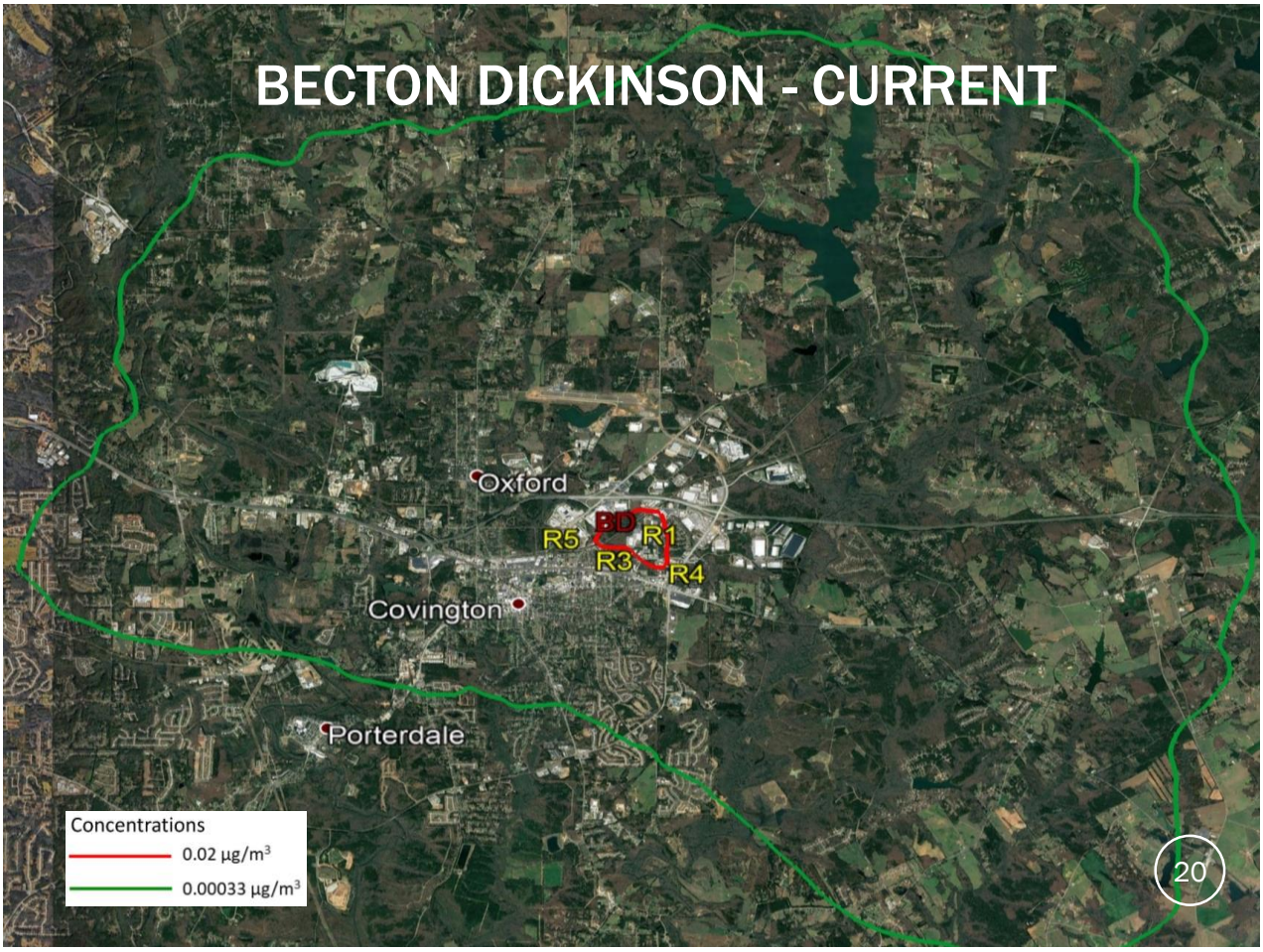
BECTON DICKINSON (COVINGTON, GA)


BECTON DICKINSON - CURRENT
Oxford
BD
R5
R1
R3
R4
Covington
Porterdale
Concentrations
0.02 µg/m³
0.00033 µg/m³
20

20


BECTON DICKINSON - CURRENT
0.012 µg/m³
R5
BD
0.028 µg/m³
R1
0.009 µg/m³
R2
R3
0.006 µg/m³
0.010 µg/m³
R4
Concentrations
0.02 µg/m³
0.00033 µg/m³
21

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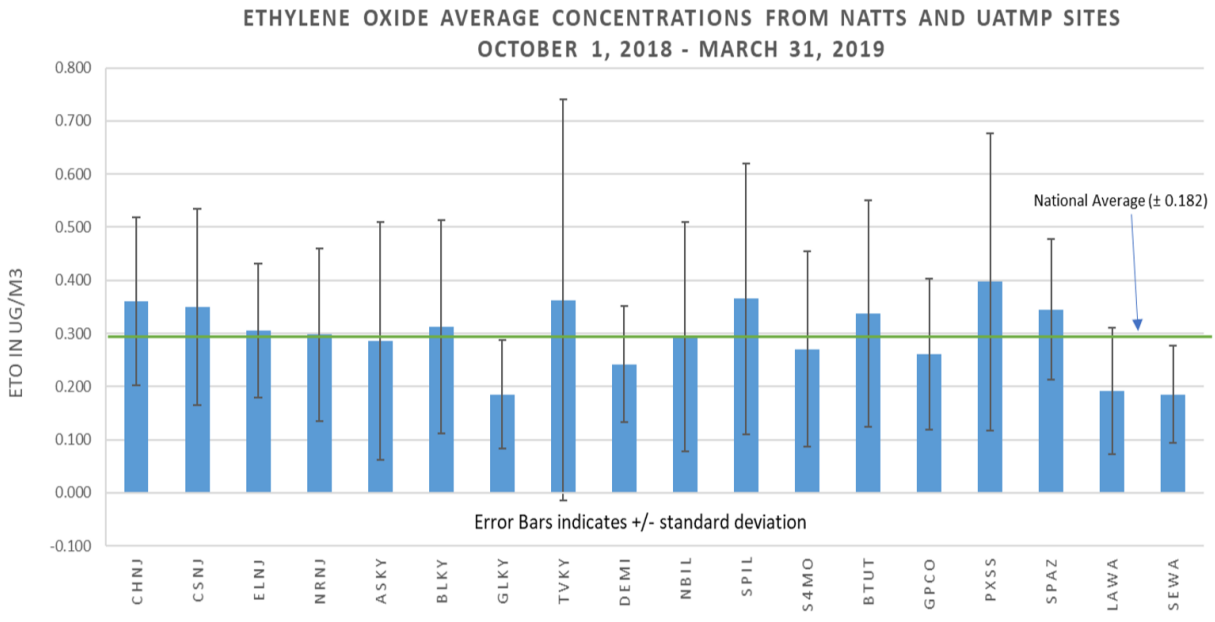
OTHER FACILITIES TO BE EVALUATED

- **Becton Dickinson – Madison**
  - Requested permit revision and modeling
- **Sterilization Services of Georgia – Atlanta**
  - Currently reviewing permit revision and modeling
- **Stepan – Winder**
  - Requested modeling input files
- **Kendall Patient Recovery – Augusta**
  - Currently performing modeling
- **AnewMed – Tucker**
  - Facility is in the process of permanently closing down
- **Innovative Chemical Technologies - Cartersville**
  - Requested air permit application and modeling

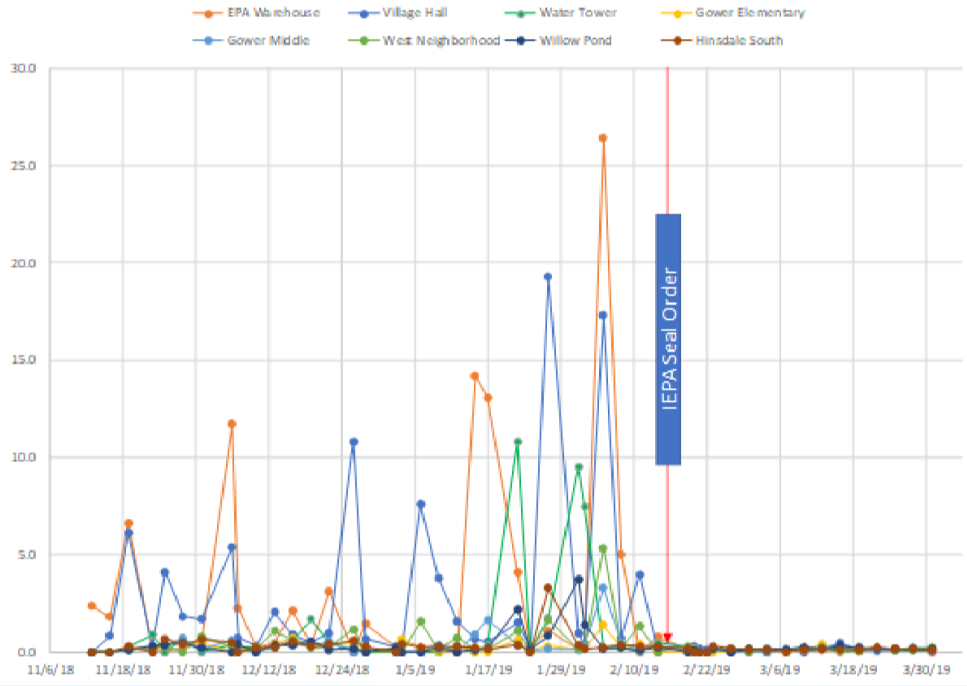
ETHYLENE OXIDE MONITORING

NATIONAL EtO MONITORING



U.S. EPA, "Air Quality Monitoring & Other Technical Updates" presented at the AAPCA 2019 Fall Business Meeting (August 28, 2019)

WILLOWBROOK EtO ($\mu g/m^3$)

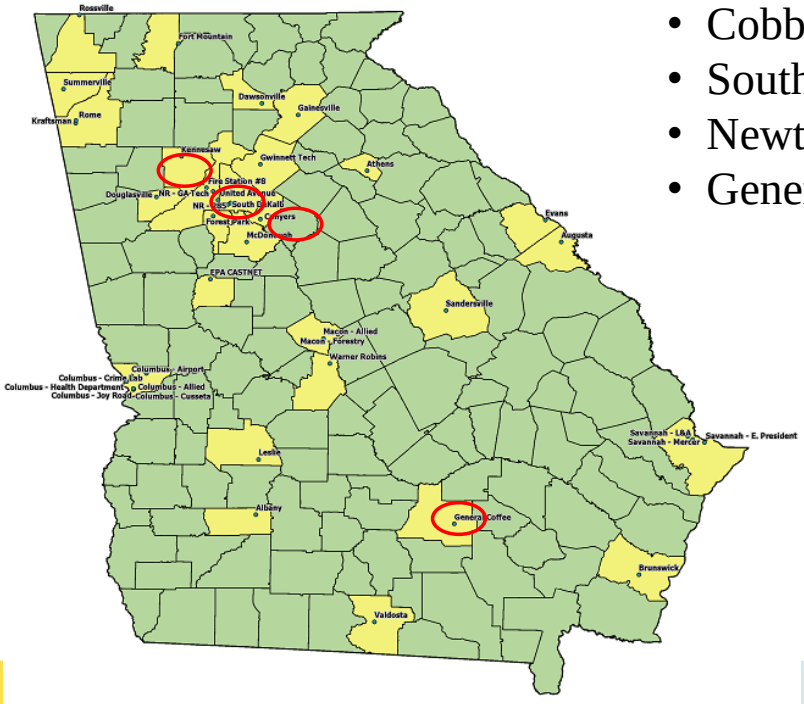


U.S. EPA, "Air Quality Monitoring & Other Technical Updates" presented at the AAPCA 2019 Fall Business Meeting (August 28, 2019)

GA EPD MONITORING APPROACH

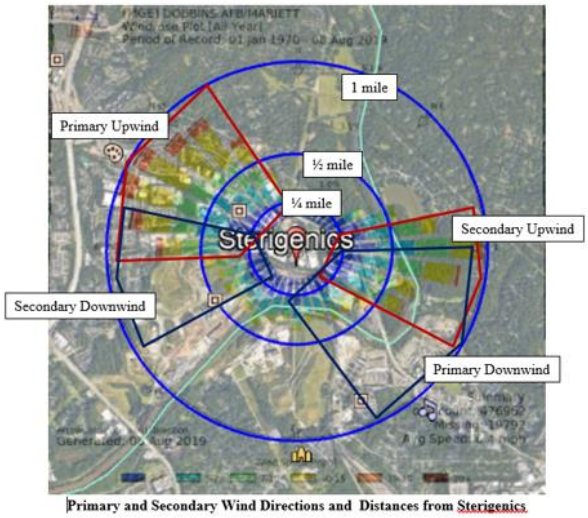
- Long-term monitoring study (~ 6 months)
- Collect samples once every 6 days over 24 hours in 4 quadrants within ¼-mile of Sterigenics and Becton Dickinson fencelines each sample day
- Once a month – sample one location side-by-side
- Once a month – compare ¼-mile concentrations vs. ½-mile or 1-mile concentrations
- Sample at South DeKalb on each sample day
- Sample at General Coffee twice a month
- Sample at near-road I-285 monitor
- Using EPA's contract laboratory for analysis

GA EPD MONITORING SITES

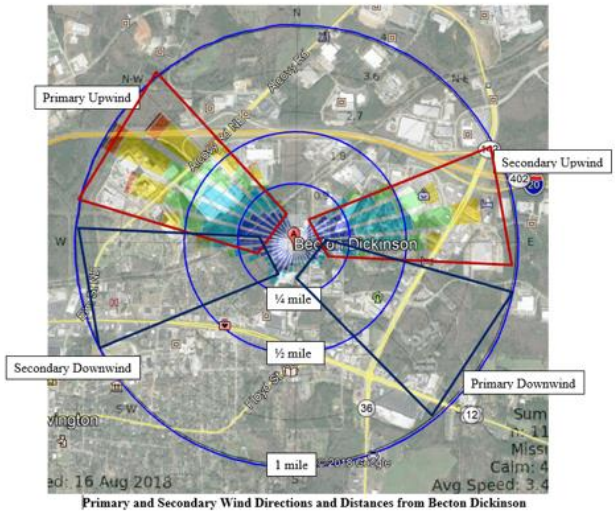


- Cobb County
- South DeKalb
- Newton
- General Coffee

GA EPD MONITORING LOCATIONS



Primary and Secondary Wind Directions and Distances from Sterigenics



Primary and Secondary Wind Directions and Distances from Becton Dickinson

Looking at upwind and downwind in the primary and secondary air directions. Comparing concentrations at ¼-mile, ½-mile, and 1-mile at each location.

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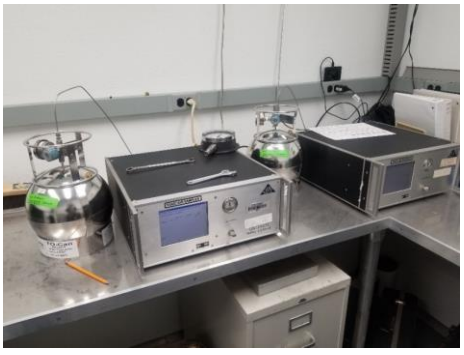
GA EPD MONITORING EQUIPMENT



South DeKalb NATTs Sampler

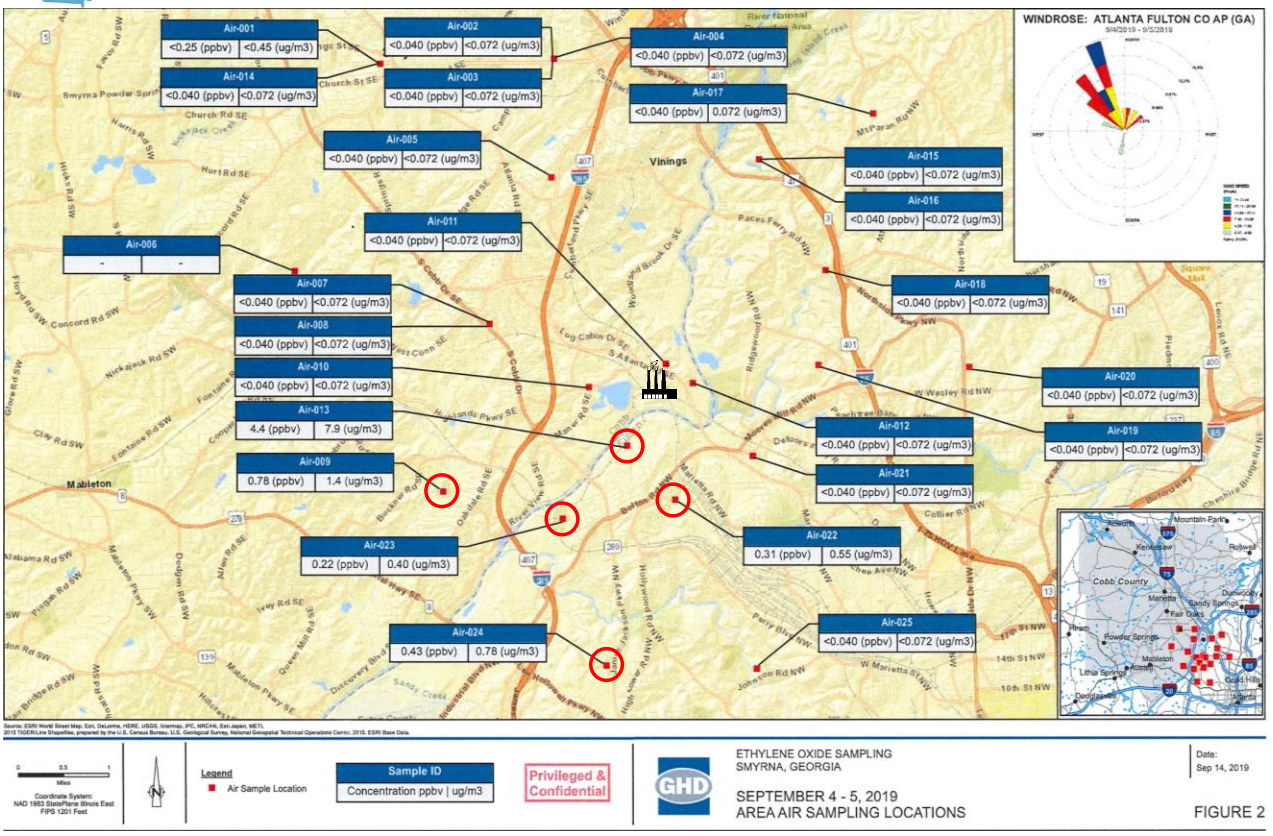
Passive sampler for study

Sampler at General Coffee

GA EPD MONITORING - STATUS UPDATE

- Monitoring Plan and QAPP approved by EPA
- Sampling at ¼-mile began late September at both facilities
  - Waiting on results
- Will locate at ½-mile and 1-mile distances to compare to ¼-mile distance
- Results (26 – 30 data points each week) will be posted on EPD's website after validated
  - ***https://epd.georgia.gov/ethylene-oxide-information***

LOCAL COUNTY MONITORING



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