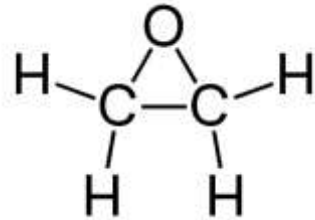




Department of  
Environmental  
Conservation



# Ethylene Oxide Ambient Measurements

Jacqueline Perry

New York State Department of Environmental Conservation  
Division of Air Resources - Bureau of Air Quality Surveillance

NESSAUM Air Toxics and Public Health Committee Meeting/Training  
November 14th, 2019

# Instrumentation

Entech 7200 Preconcentrator (sample 200 cc)

Agilent 7890B GC (1.8 ml/min from -30° C to 220° C)

Agilent 5977B MSD (Full Scan Mode)



PAMS and TO-15  
compounds are  
determined concurrently

Routine identification of  
trans-2-butene gives an  
edge to identifying  
ethylene oxide

# Method Issues – Retention Time

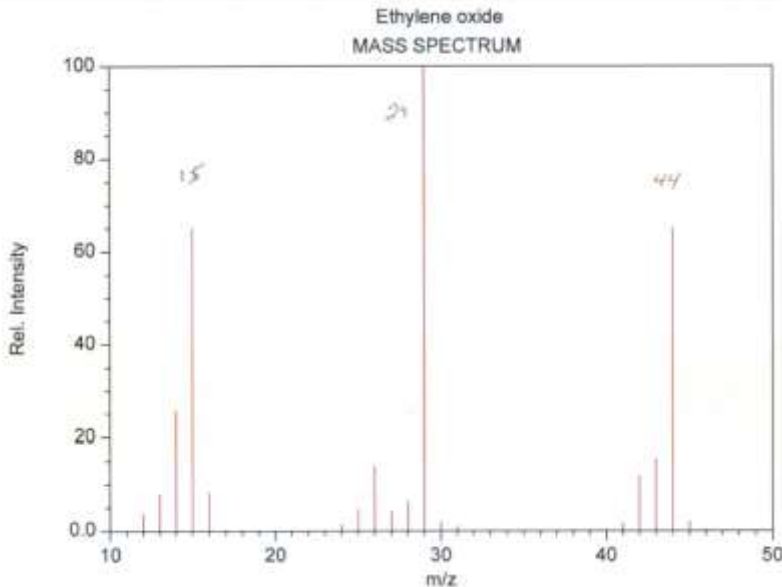
Retention time of EtO and trans-2-butene are similar

Name	Ethylene oxide 44 43 Retention time	Ethylene oxide 29 44 Results Retention time	trans-2- butene 56 29 Retenti on time
roomair etosim	9.67	9.67	9.688
072919 eto 0x05 etosim c	9.67	9.67	
072919 eto ppb etosim c	9.652	9.642	
072919 blank etosim c			
albso072019 etosim	9.67	9.679	9.688
pinn072019 etosim	9.67	9.67	9.697
bs072019 etosim	9.67	9.67	9.697
rt072019 etosim	9.67	9.67	9.697
bp072019 etosim	9.679	9.67	9.697
q2072019 etosim	9.67	9.67	9.688
072919 0x1 pams d etosim		9.679	9.688
072919 pams d etosim	9.679	9.679	9.688
072919 eto 0x1 d etosim	9.679	9.679	
072919 eto 0x25 d etosim	9.679	9.67	
072919 eto 0x5 d etosim	9.661	9.651	
072919 eto ppb d etosim	9.652	9.652	

Higher EtO concentrations have shorter RTs



# Method Issues – Ion Selection



NIST Chemistry WebBook (<https://webbook.nist.gov/chemistry>)

We quantify EtO with Ion 44 because 29 has a contribution from trans-2-butene but carbon dioxide must be controlled

# Method Issues – Ion Selection

Sample	Ethylene oxide 44 43	Ethylene oxide 29 44	trans-2-butene 56 29
Name	Final Conc.	Final Conc.	Final Conc.
roomair etosim	0.0787	0.0823	0.0032
072919 eto 0x05 etosim c	0.0517	0.0513	
072919 eto ppb etosim c	1.0009	0.9895	
072919 blank etosim c	0	0	0
albo072019 etosim	0.1086	0.1924	0.1635
pinn072019 etosim	0.1311	0.1301	0.0042
bs072019 etosim	0.1004	0.1032	0.0098
rt072019 etosim	0.1122	0.1166	0.0056
bp072019 etosim	0.0931	0.0968	0.0101
q2072019 etosim	0.0883	0.097	0.0198
072919 0x1 pams d etosim	0	0.0755	0.1445
072919 pams d etosim	0.0081	3.6109	7.225
072919 eto 0x1 d etosim	0.0918	0.0912	0
072919 eto 0x25 d etosim	0.2524	0.2513	0
072919 eto 0x5 d etosim	0.5012	0.5022	0
072919 eto ppb d etosim	0.9987	1.01	0

29 has a contribution from trans-2-butene



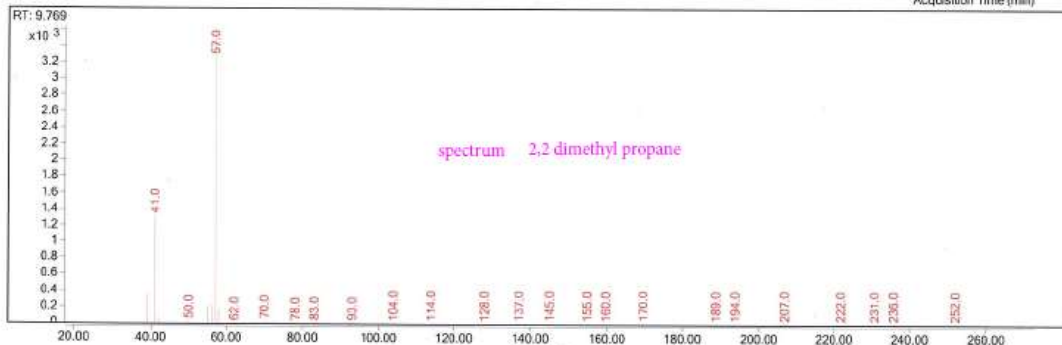
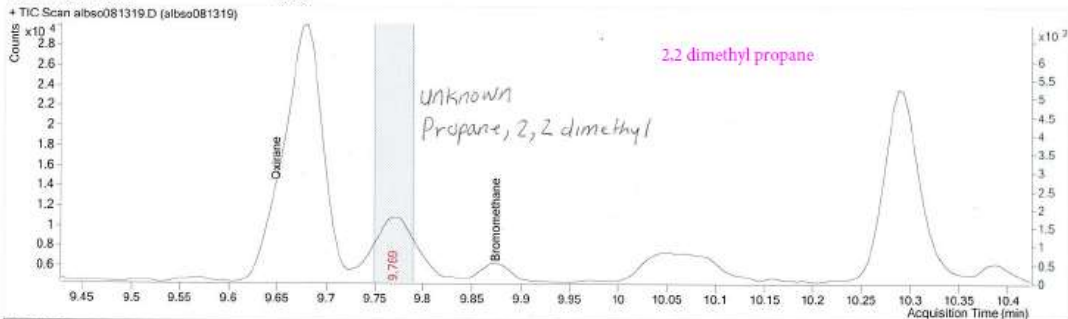
# Method Issues – “Unknown” Interferant

In addition to trans-2-butene (2,2-dimethylpropane)

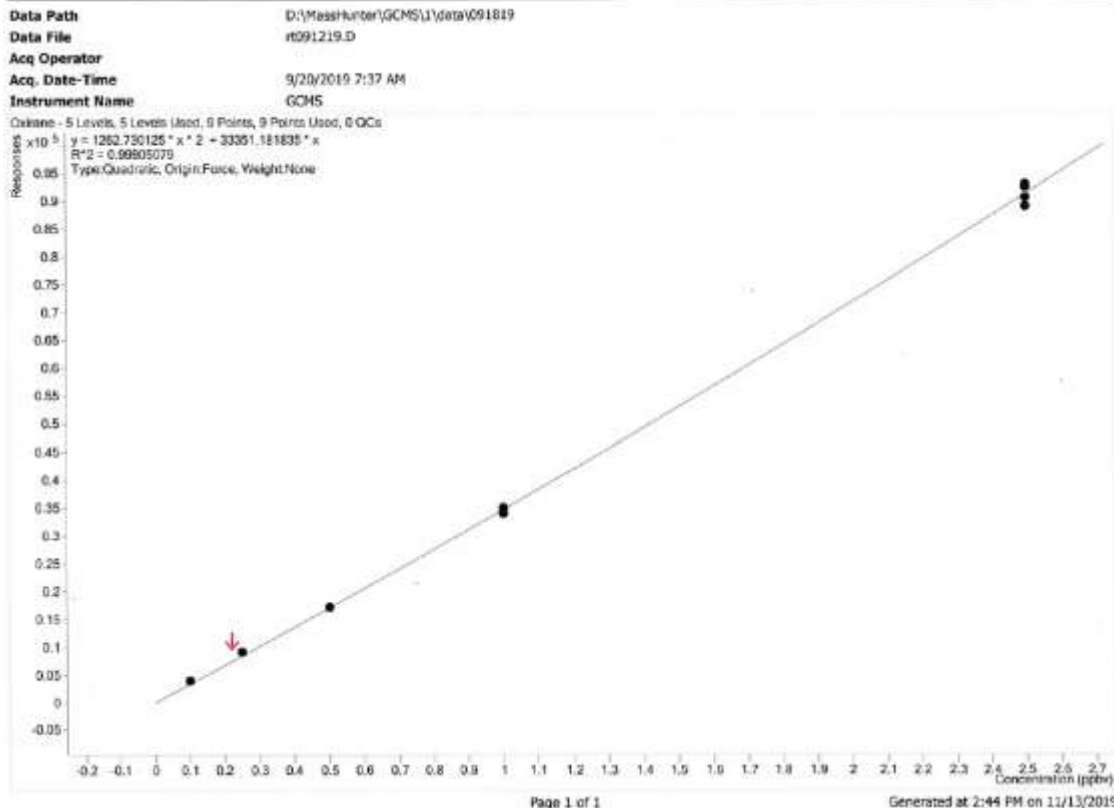
## Sample Information Window



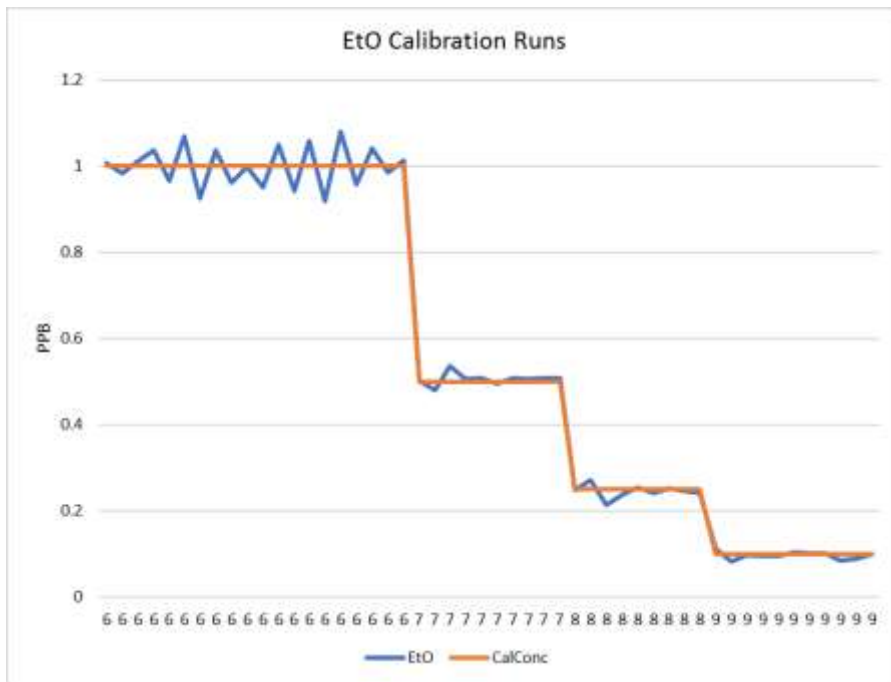
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Data File albs081319.D  
Acq Operator  
Acq. Date-Time 8/21/2019 5:37 AM  
Instrument Name GCMS



# Method Issues - EtO Calibration Curve



# Method Issues - EtO Cal Runs



EtO is polar so instrument response is less certain at higher concentrations



Data Path

D:\MassHunter\GCMS\1\data\082119

Data File

aliso081319.D

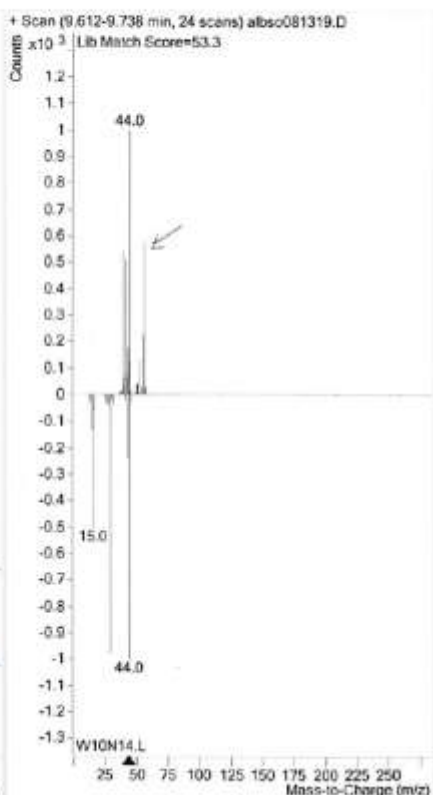
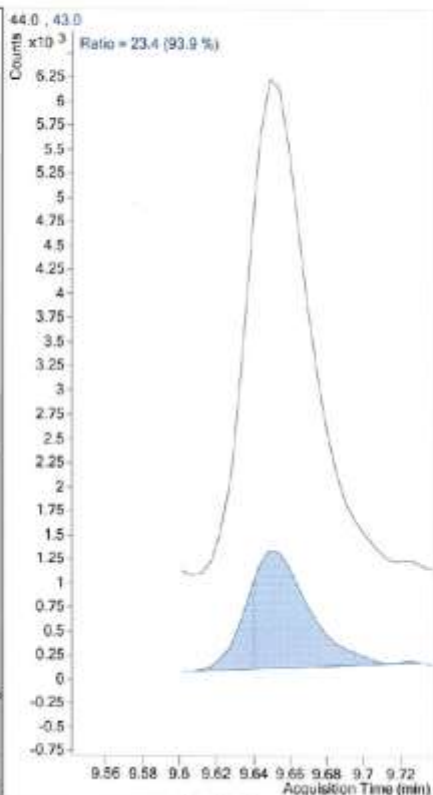
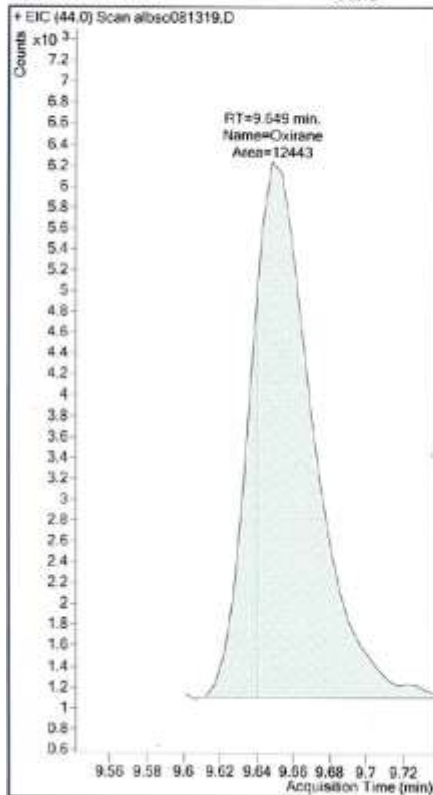
Acq Operator

Acq. Date-Time

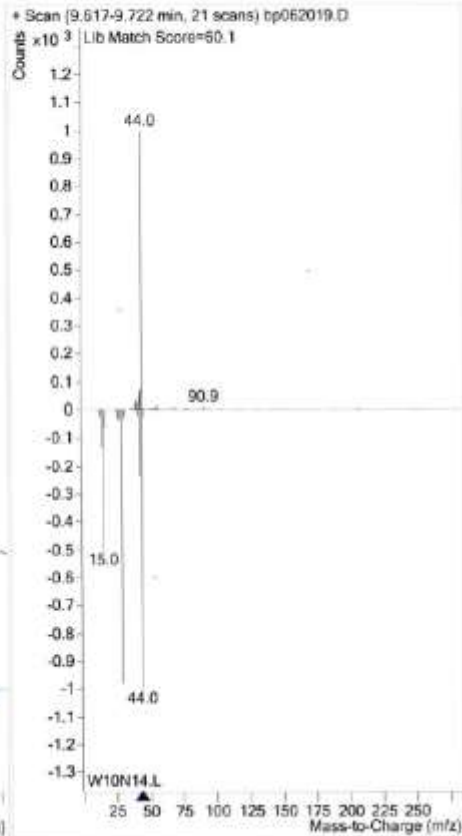
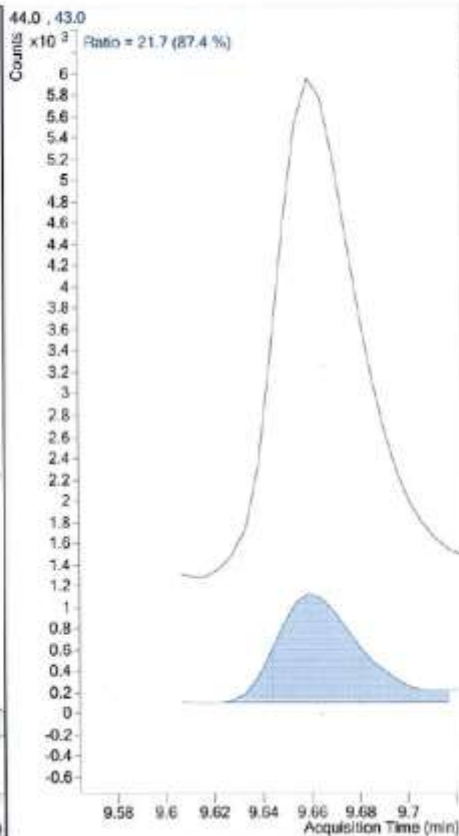
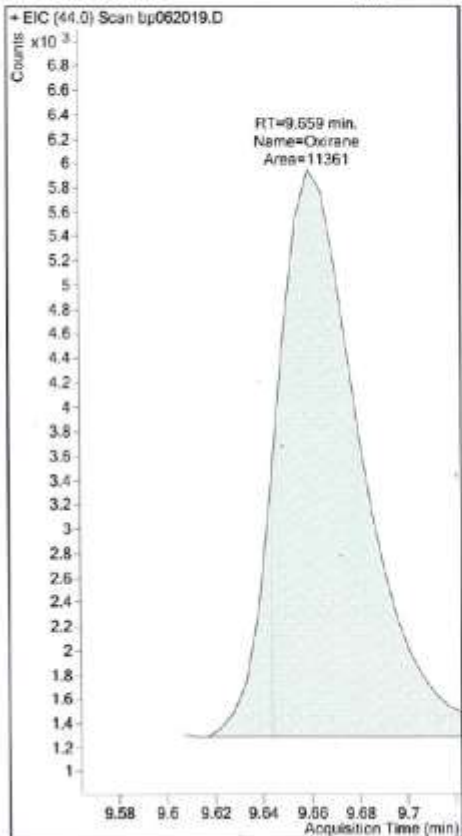
8/21/2019 5:37 AM

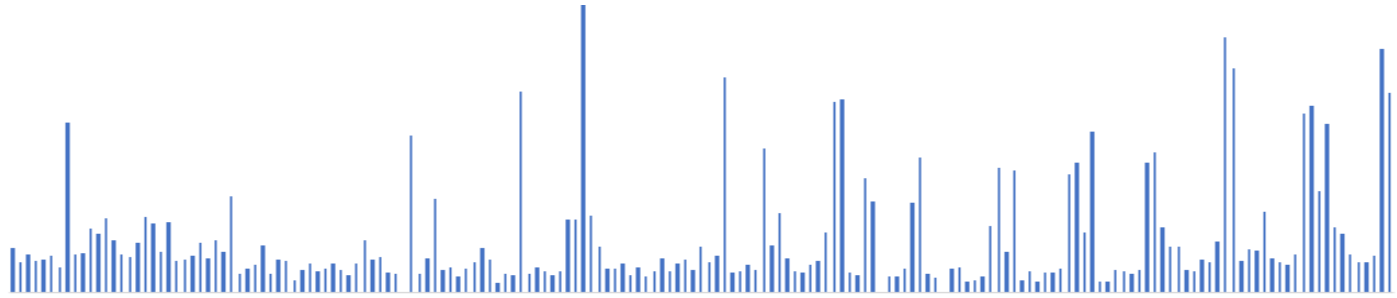
Instrument Name

GCMS



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Acq Operator  
Acq. Date-Time 6/28/2019 1:47 AM  
Instrument Name GCMS



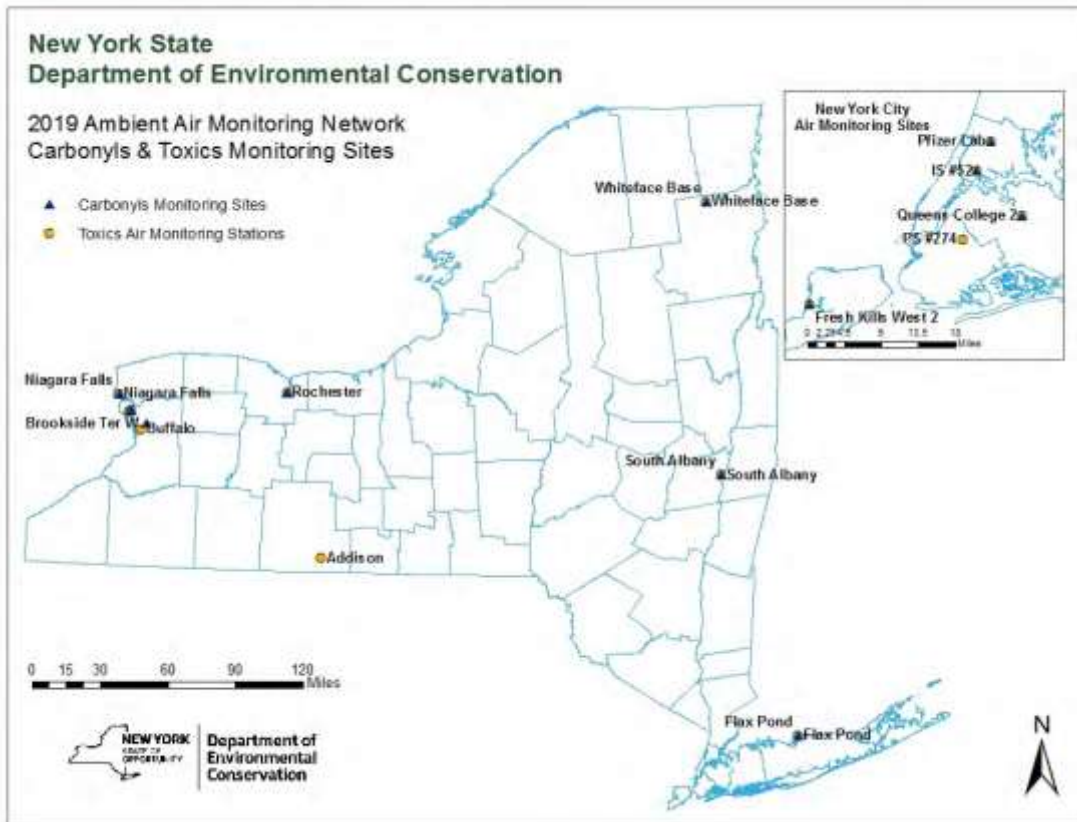


# Results

## Ambient Data NY Sites

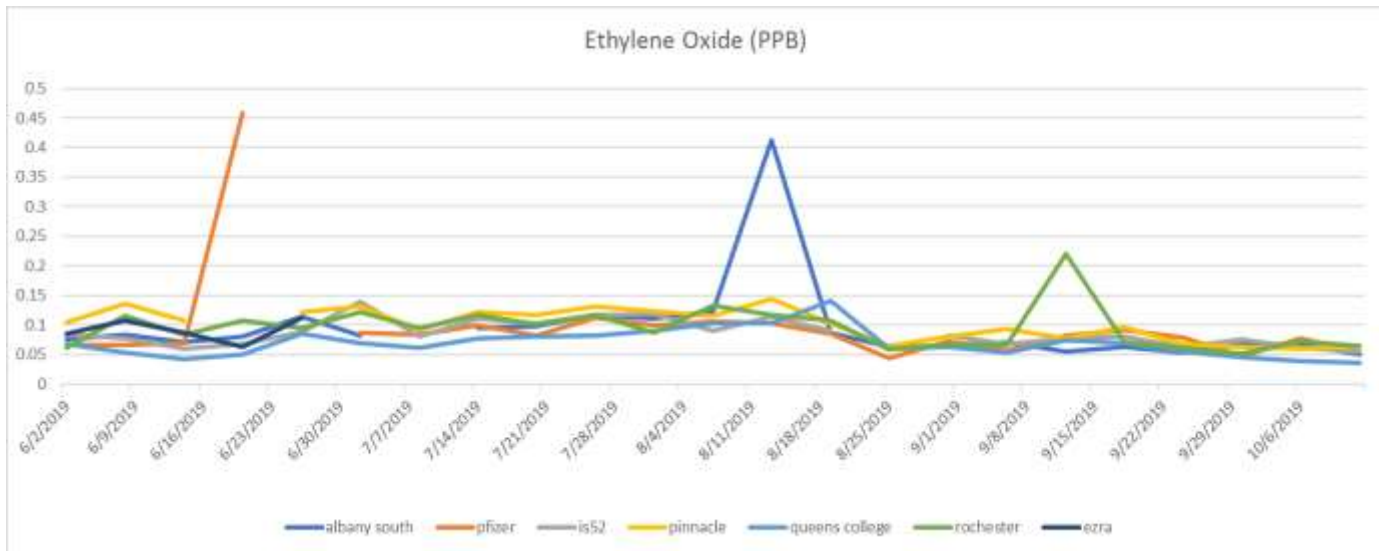


# NYS Air Toxics Monitoring Network



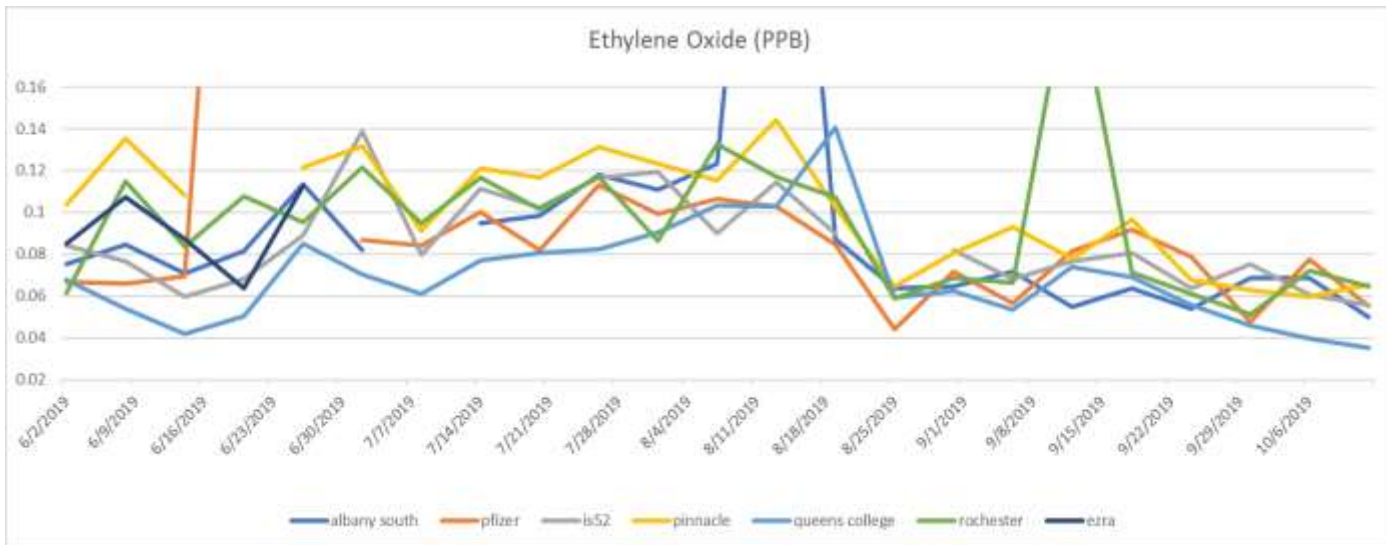
# EtO – Ambient Data

Urban slightly Lower  
Rural slightly Higher



# EtO – Ambient Data

Same Data  
Reduced Y-Axis



Data Path

D:\MassHunter(GCMS1)\data\091819

Data File

rt091219.D

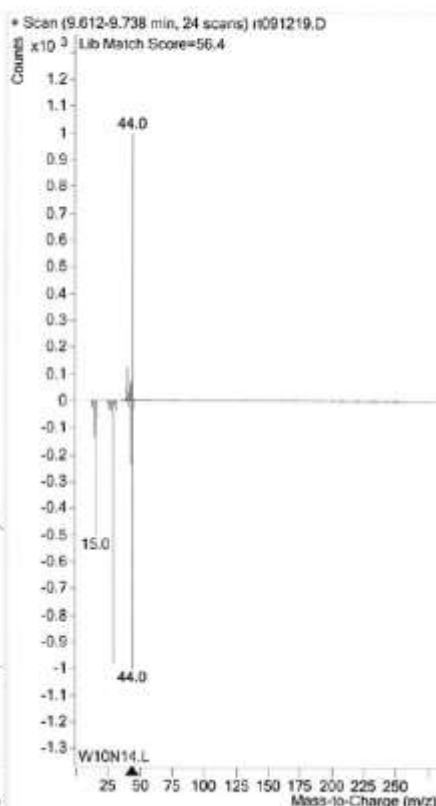
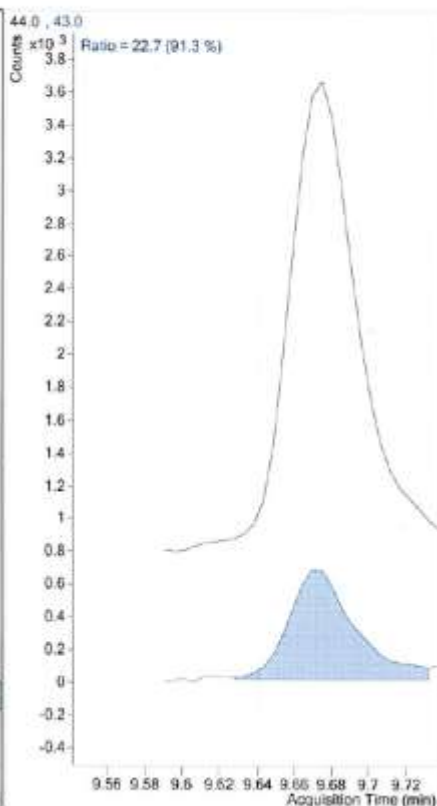
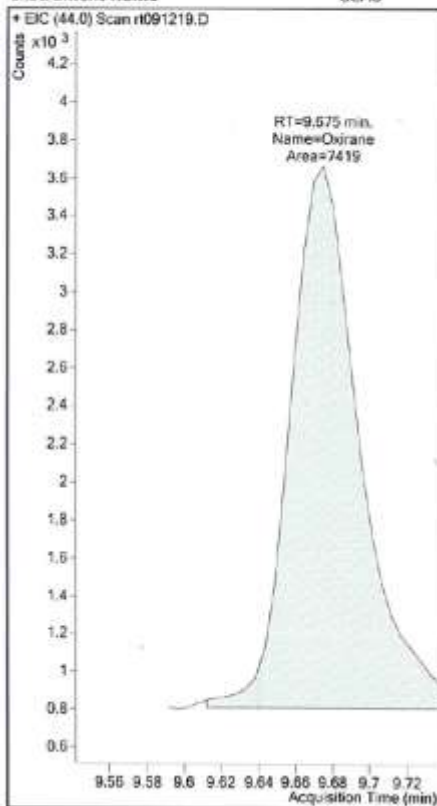
Acq Operator

Acq. Date-Time

9/20/2019 7:37 AM

Instrument Name

GCMS



# Conclusions

- EtO Analysis is difficult but can be accomplished with careful attention to detail
- EtO has periodic “source” impacts
- EtO has a distinct background that appears to have a temperature dependence



# Thank You

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- 518-402-8508

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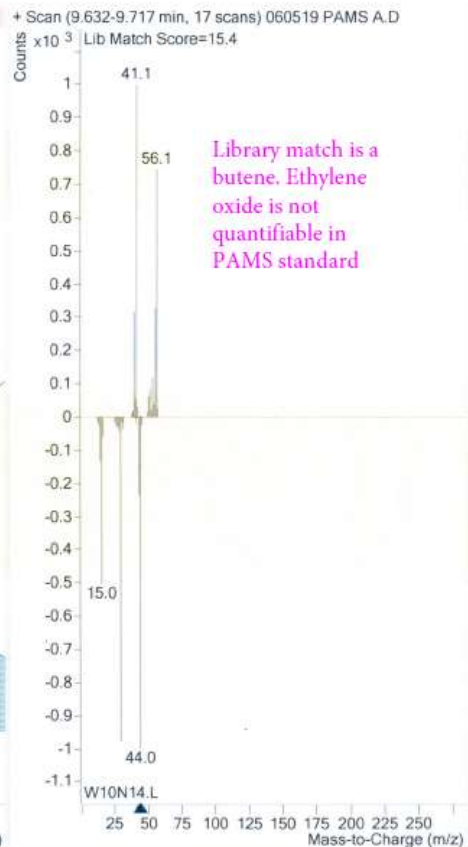
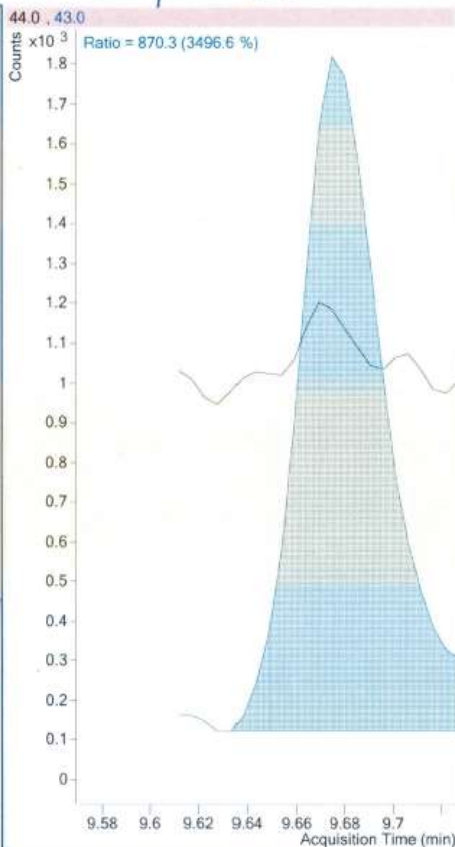
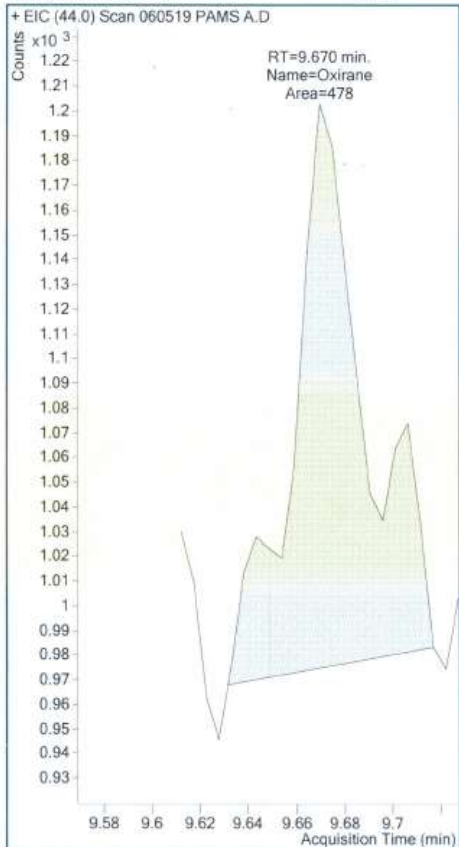
Department of  
Environmental  
Conservation



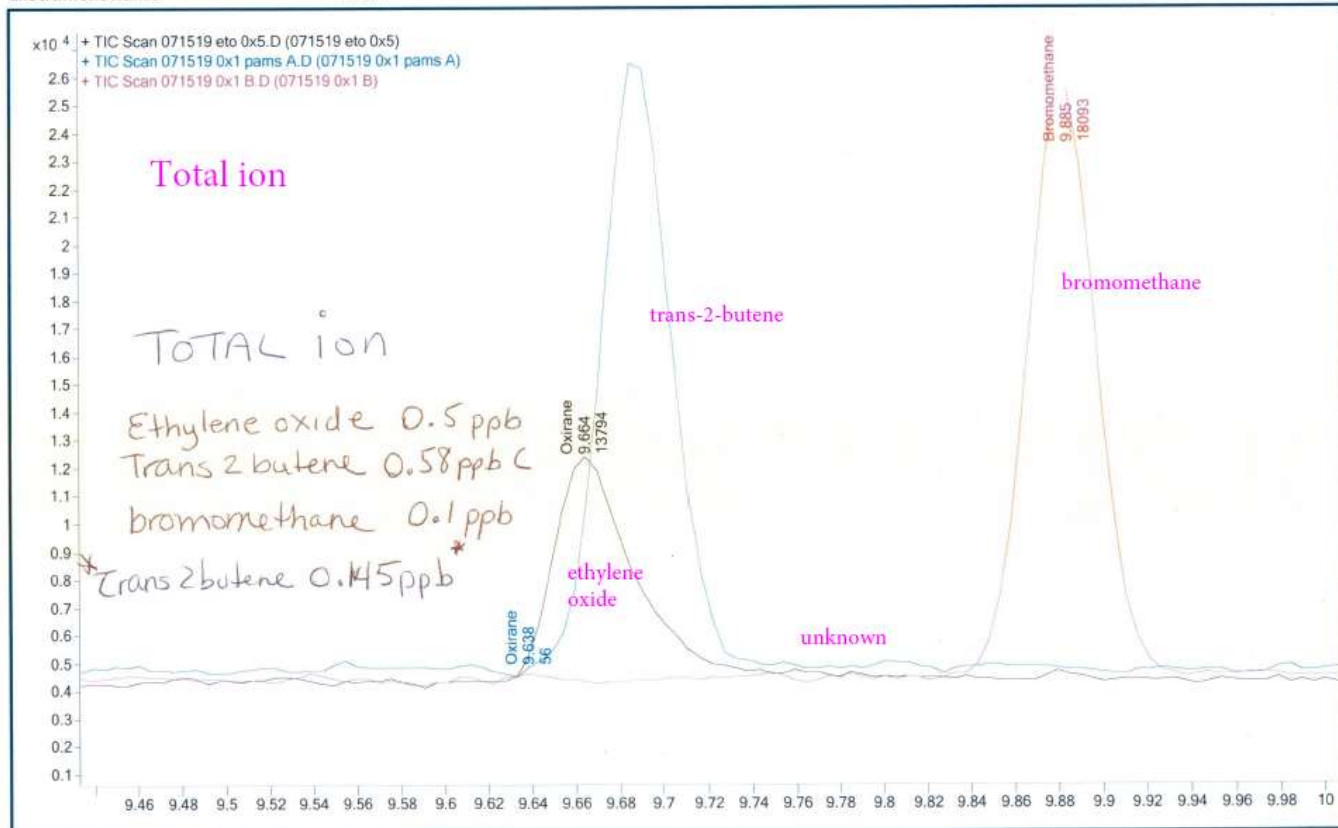
Data Path  
Data File  
Acq Operator  
Acq. Date-Time  
Instrument Name

D:\MassHunter\GCMS\1\data\060519  
060519 PAMS A.D  
6/5/2019 9:34 PM  
GCMS

2018 PAMS Retention Standard  
ethylene oxide identification



Data Path D:\MassHunter\GCMS\1\data\071519  
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Acq Operator  
Acq. Date-Time 7/18/2019 1:20 AM  
Instrument Name GCMS

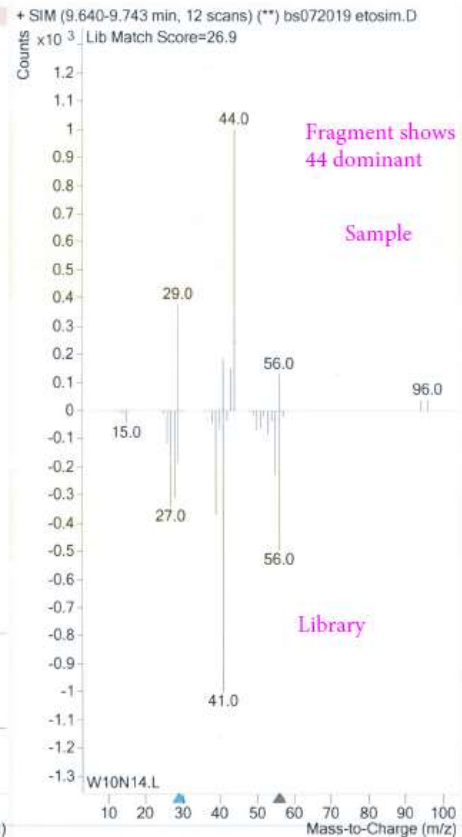
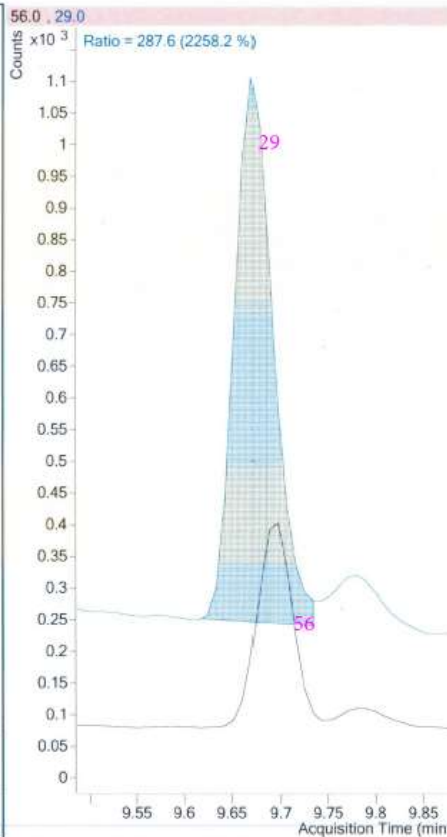
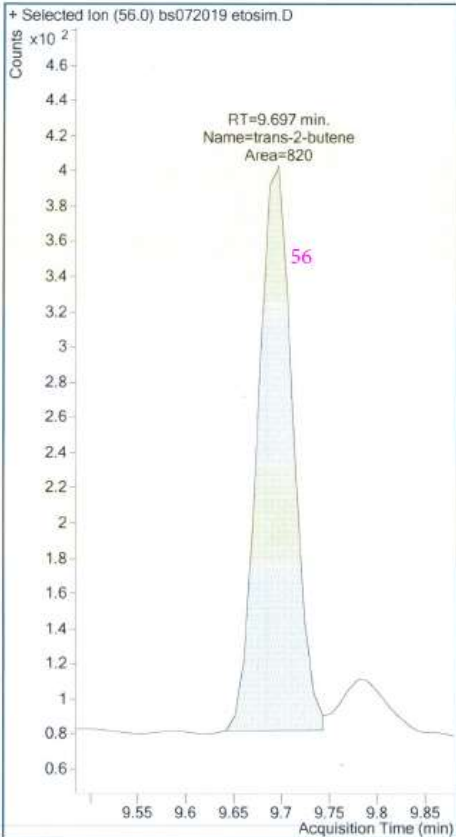


Data Path  
Data File  
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Acq. Date-Time  
Instrument Name

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bs072019 etosim.D

SIM ANALYSIS IS52 NATTS

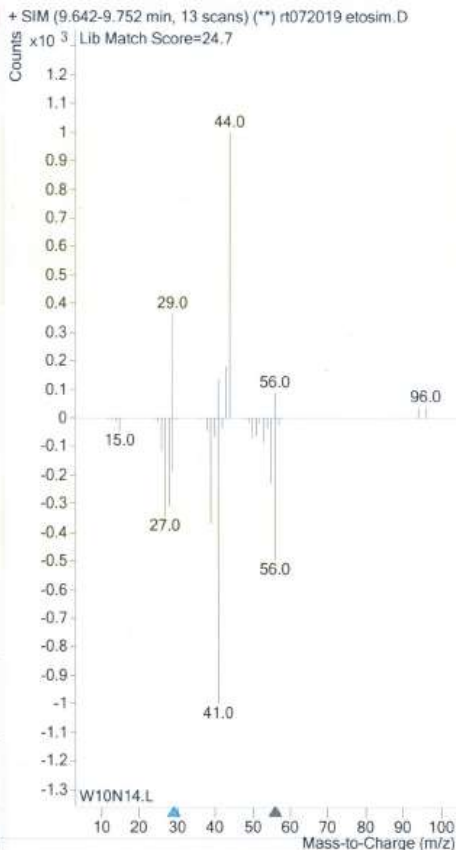
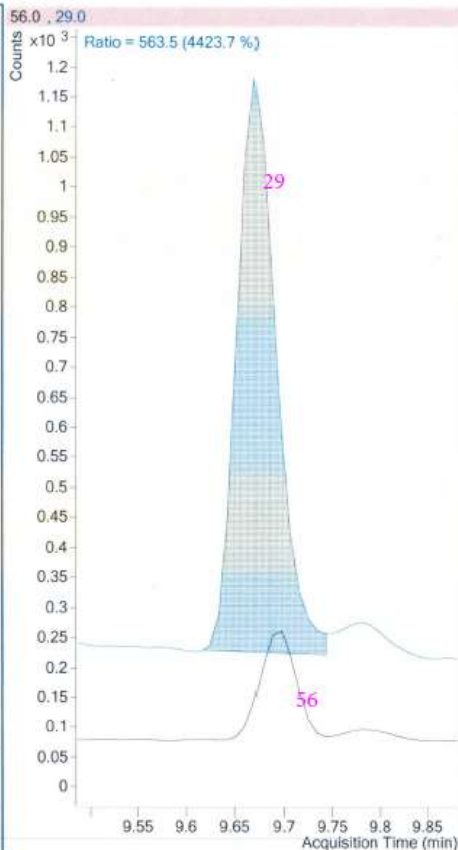
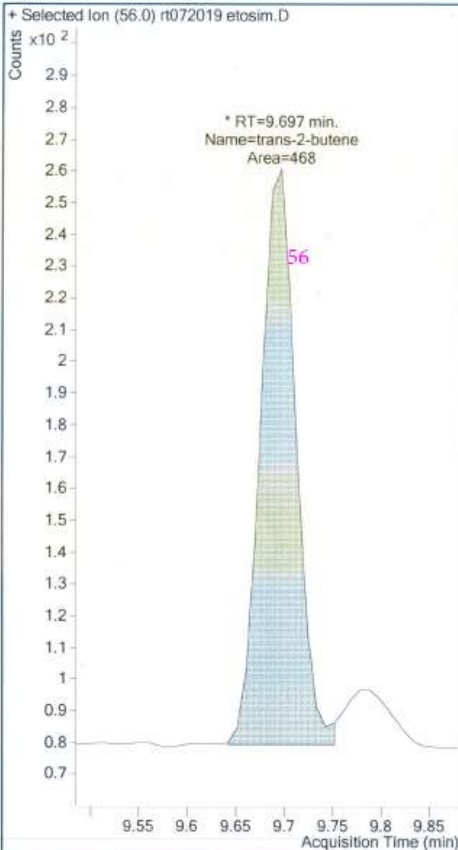
7/31/2019 4:50 AM  
GCMS



Data Path  
Data File  
Acq Operator  
Acq. Date-Time  
Instrument Name

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rt072019 etoism.D  
7/31/2019 5:56 AM  
GCMS

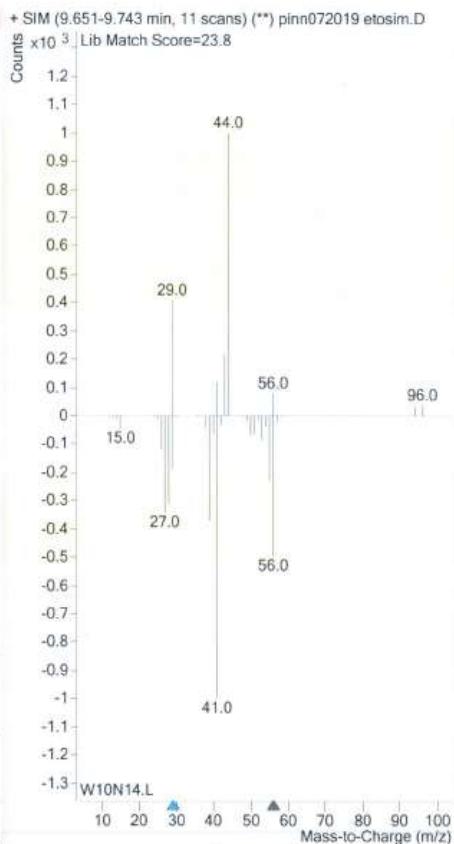
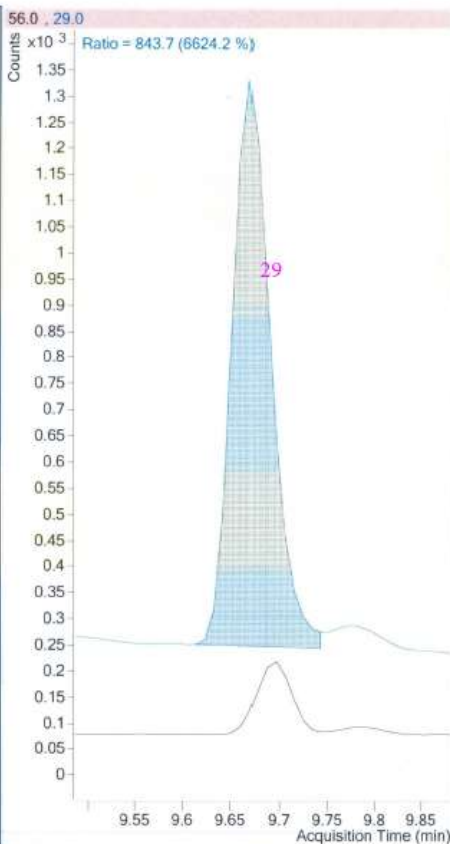
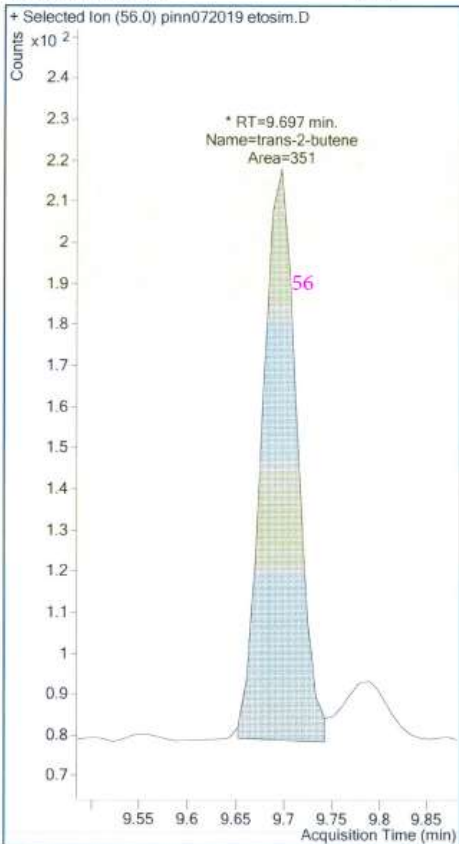
SIM ANALYSIS ROCHESTER NATTS



Data Path  
Data File  
Acq Operator  
Acq. Date-Time  
Instrument Name

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pinn072019 etoisim.D  
7/31/2019 3:43 AM  
GCMS

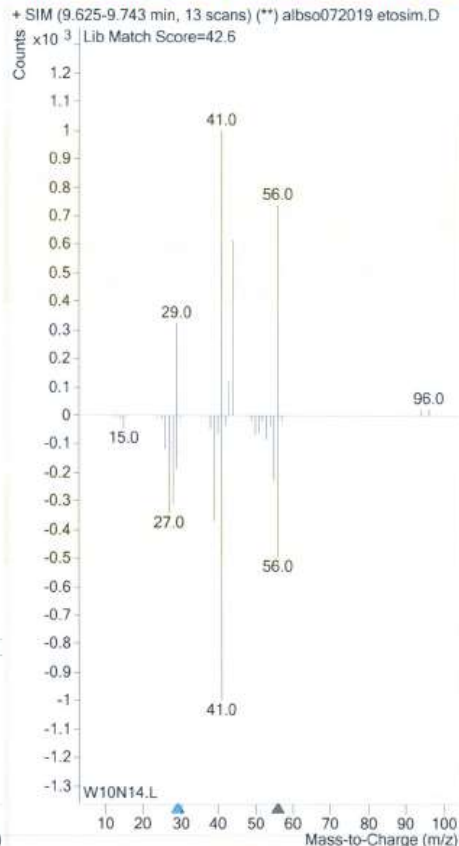
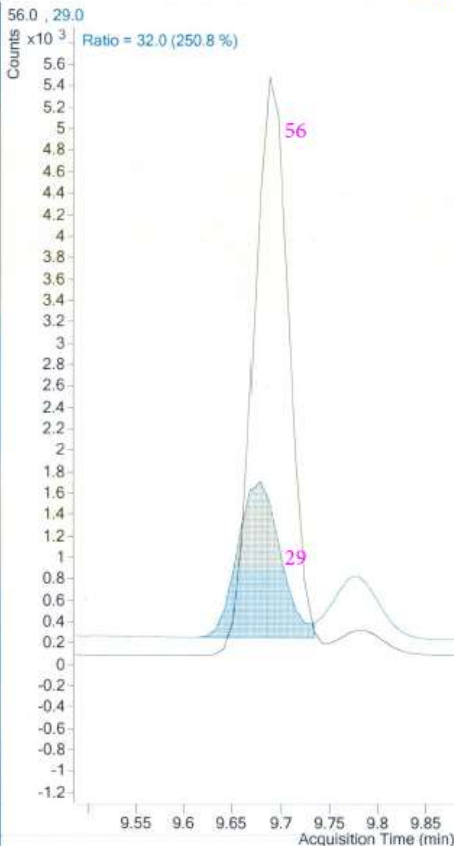
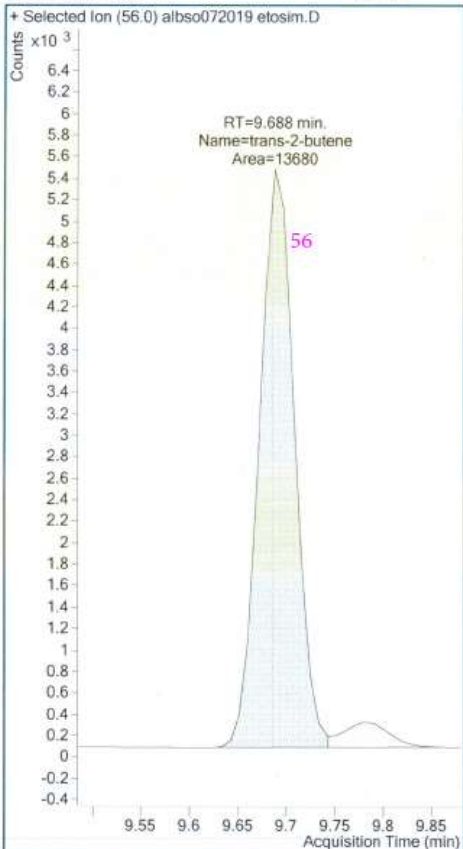
### SIM ANALYSIS PINNACLE RURAL



Data Path  
Data File  
Acq Operator  
Acq. Date-Time  
Instrument Name

D:\MassHunter\GCMS\1\data\072919 etoism  
albo072019 etosim.D  
7/31/2019 2:37 AM  
GCMS

SIM ANALYSIS ALBANY INDUSTRIAL/URBAN  
TRANS-2-BUTENE DOMINANT therefore ion 29  
contribution is from trans-2-butene or ethylene oxide



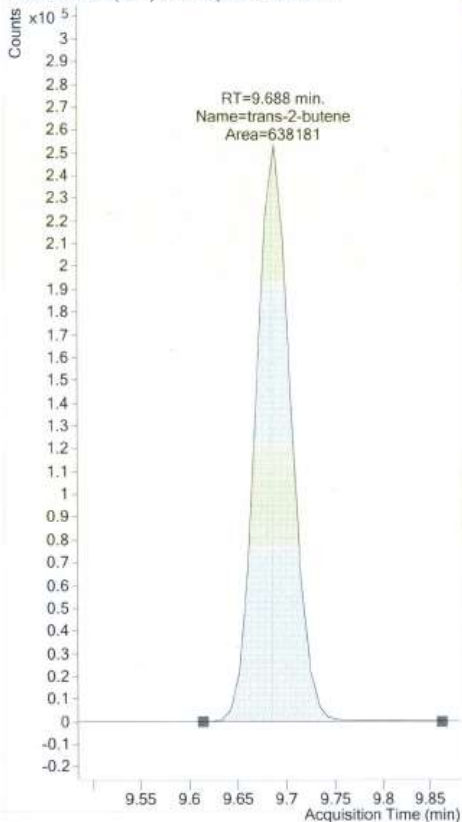


Data Path  
Data File  
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Acq. Date-Time  
Instrument Name

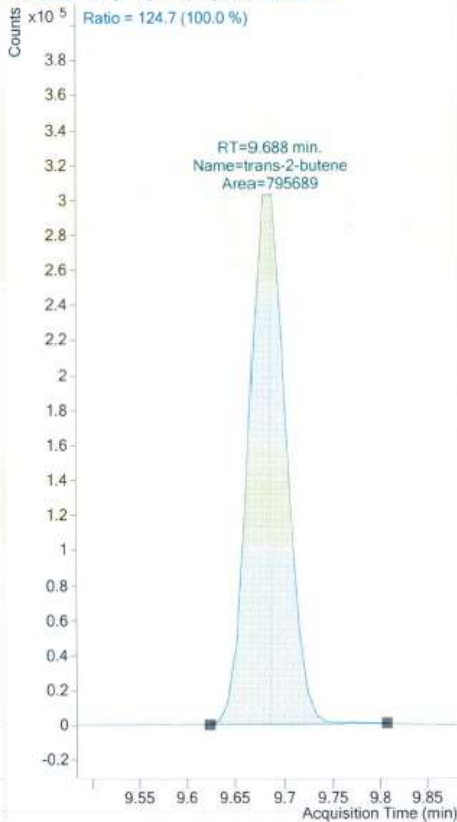
D:\MassHunter\GCMS\1\data\072919 etoism  
072919 pams d etosim.D  
7/31/2019 10:22 AM  
GCMS

Trans-2-butene in SIM mode  
SIM ions 29,44,43,56,

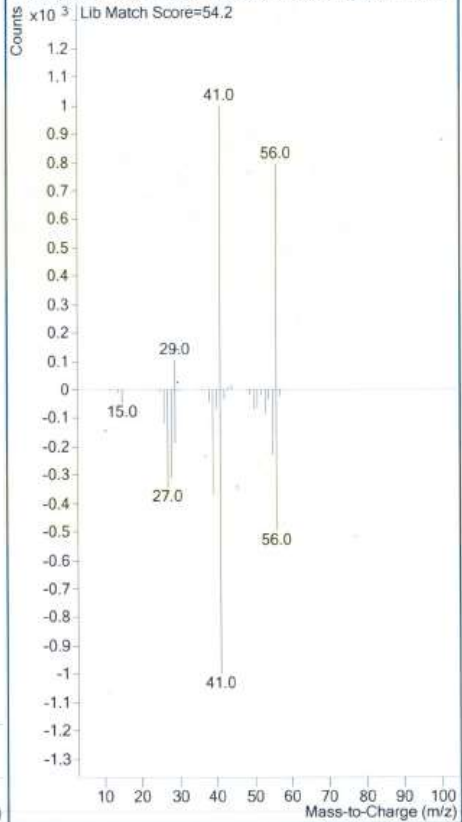
+ Selected Ion (56.0) 072919 pams d etosim.D



+ Selected Ion (41.0) 072919 pams d etosim.D



+ SIM (9.615-9.862 min, 28 scans) (\*\*) 072919 pams d etosi...



Data Path

D:\MassHunter\GCMS\1\data\072919 etoism

Data File

albo072019 etosim.D

Acq Operator

ALBANY SIM mode

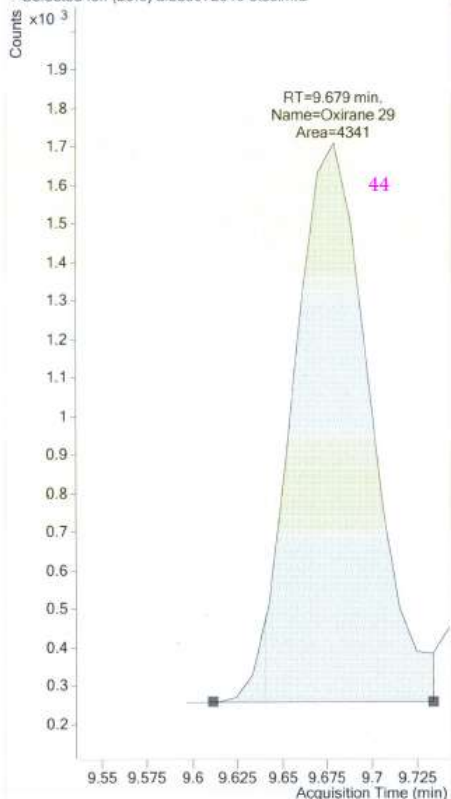
Acq. Date-Time

7/31/2019 2:37 AM

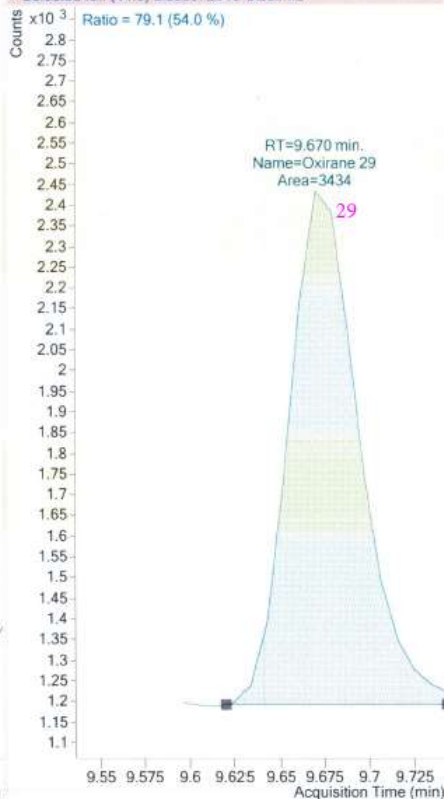
Instrument Name

GCMS

+ Selected Ion (29.0) albo072019 etosim.D



+ Selected Ion (44.0) albo072019 etosim.D



+ SIM (9.611-9.734 min, 14 scans) (\*\*) albo072019 etosim.D

