WEEKLY REPORT FOR WEEK 27 (FEBRUARY 4, 2019 – FEBRUARY 9, 2019)

Report No. 53005-81-RPT-040
Revision 0

September 2019

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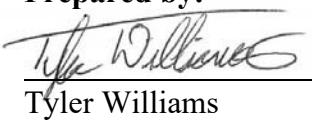

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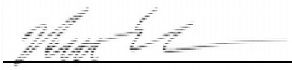
Tyler Williams

Reviewed by:



Date: 09/24/2019

Matthew Erickson, Ph.D.

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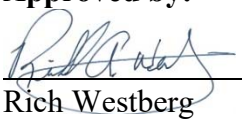

Date: 09/24/2019

Rich Westberg

Record of Revision

Revision	Date	Pages/Sections Changed	Brief Description
0	09/2019	All	Original Issue.

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Figures

Tables

Acronyms and Abbreviations

AOP	Abnormal Operating Procedure
COPC	Chemical of Potential Concern
DNPH	2,4-dinitrophenylhydrazine
DR	Deficiency Report
MDL	Method Detection Limit
ML	Mobile Laboratory
NDEA	N-nitrosodiethylamine
NDMA	N-nitrosodimethylamine
NEMA	N-nitrosomethylethylamine
NMOR	N-nitrosomorpholine
OEL	Occupational Exposure Limit
PTR-MS	Proton Transfer Reaction – Mass Spectrometer
QA	Quality Assurance
QC	Quality Control
RL	Reporting Limit

1.0 INTRODUCTION

During the week of February 3, 2019, through February 9, 2019, TerraGraphics personnel operated the Mobile Laboratory (ML) in execution of a winter background study at pre-determined locations on and off the Hanford Site. The ML successfully measured ambient concentrations of volatile and semi-volatile organic compounds at six locations (Figure 1-1).

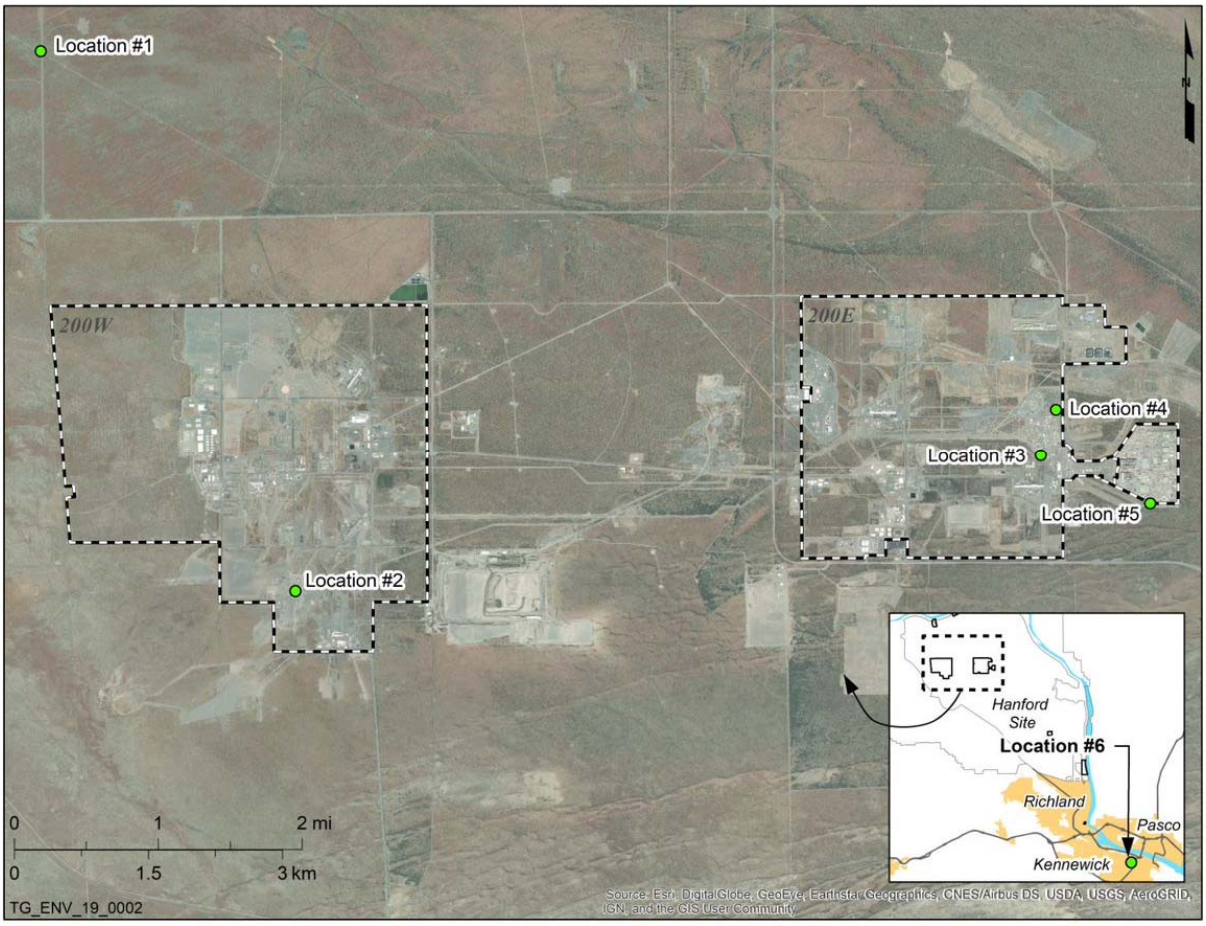

Figure 1-1. Background Study Locations.

Tables of measurement results are provided in the following sections. The basis of comparison for ML measurements has been occupational exposure limits (OELs). The OEL is an 8-hour, time-weighted average that establishes a limit for personnel exposures to hazardous chemicals. It is the exposure level to which a person may be exposed for 8 hours/day, 40 hours/week for 40 years and have no expectation of adverse health effects. In this study, area vapor concentration measurements were made to better understand the hazardous vapor exposures that workers may receive. These measurements are only compared to OEL concentrations to give them context. It is neither accurate nor appropriate to interpret these short duration measurements (2 seconds) as worker exposure levels. Since the OEL is defined as a time-weighted average, it is more appropriate to compare them to daily average vapor concentrations.

2.0 FEBRUARY 4, 2019 – FEBRUARY 5, 2019 – STUDY SITE #4

All time reported in this document are recorded in Pacific Standard Time.

2.1 Quality Assessment

Data from February 4, 2019, were assessed using Procedure 17124-DOE-HS-102, "Mobile Laboratory Data Processing – Analysis." A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Deficiency Report (DR) DR19-004 was initiated to adequately document a loss of approximately four hours of DAQFactory®[1] data during the morning of February 5, 2019. See Appendix A for the full DR. This instance will be discussed in detail in a subsequent monthly summary report.

2.2 Summary

The ML personnel performed background sampling from February 4, 2019 to February 5, 2019, at study Site 4. Site 4 is located downwind of the AN Tank Farm. The ML arrived at Site 4 at 08:24 on February 4, 2019. The Quality Assurance/Quality Control (QA/QC) zero-air/sensitivity checks were performed on the LI-COR®[2] CO_2 monitor, the Picarro NH_3 analyzer, and the Proton Transfer Reaction – Mass Spectrometer (PTR-MS) beginning at 07:44. Collection of confirmatory samples started at 08:38. At 12:30, the ML staff contacted the Subject Matter Expert (SME) for a third party check before departure. The SME performed a remote start of NO^+ automation mode at 15:00.

[1] DAQFactory is a registered trademark of AzeoTech, Inc., Ashland, Oregon.
[2] LI-COR is a registered trademark of LI-COR, Inc., Lincoln, Nebraska.

Figure 2-1. Mobile Laboratory Site #4 for the Duration of the Monitoring Period.

The ML staff returned to Site 4 at 11:20 on February 5, 2019. At 11:29, the confirmatory sorbent samples were disconnected from the sampling station. The ML relocated to Site 5 by 11:56.

Figure 2-2 provides meteorological information obtained from the ML mounted weather station for the time period of sampling at Site 4.

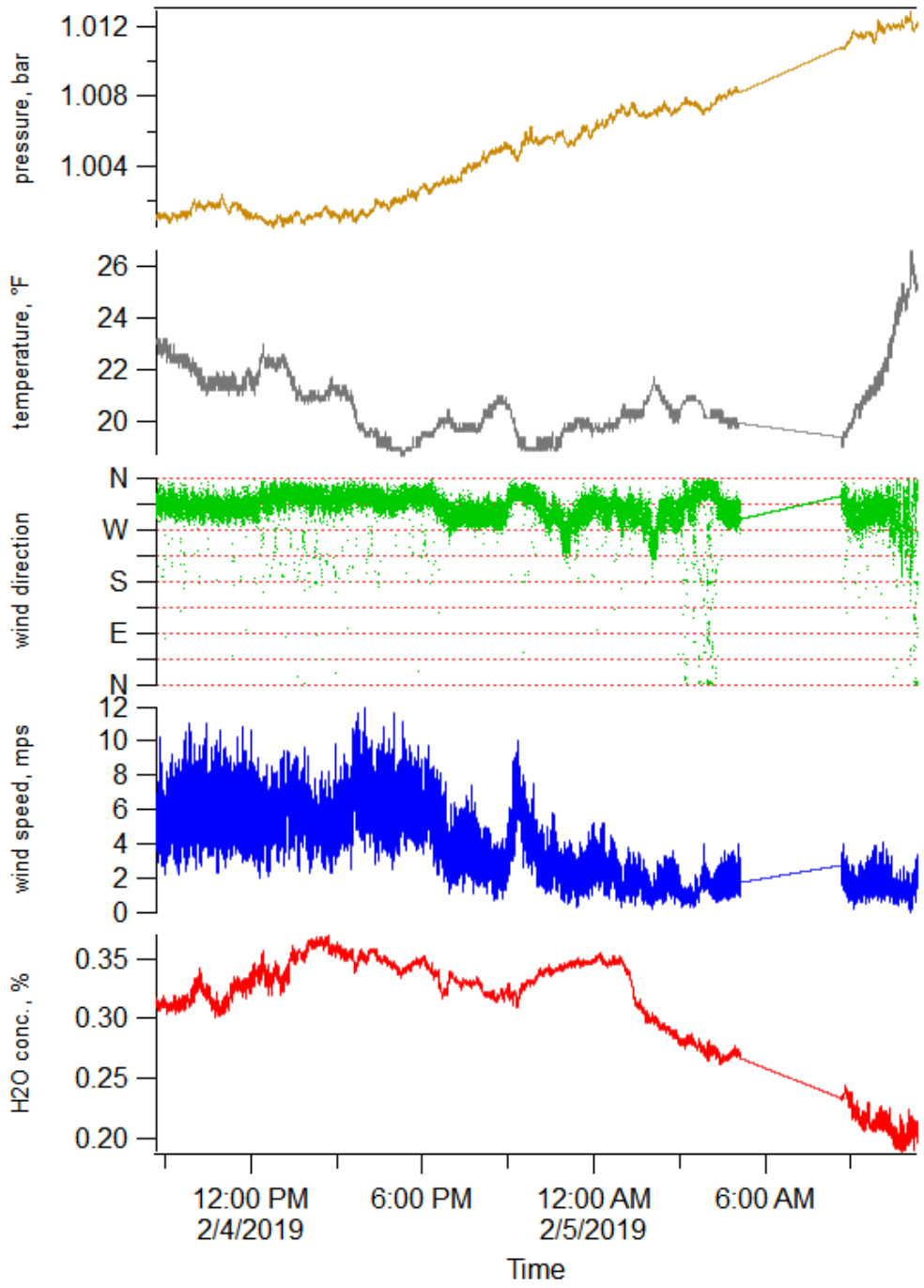

Figure 2-2. Weather Data.

2.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-MS,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were collected on alternative media sources as shown in Table 2-1.

Table 2-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
4	02/04/19	Thermosorb®[3]/N	EL33301	08:41	14:41	360
4	02/04/19	Carbotrap®[4]-300	A060081	08:41	14:41	360
4	02/04/19	LpDNPH	190204-A	08:41	11:41	180

[3] Thermosorb is a registered trademark of Ellutia Limited Company, Cambridgeshire, United Kingdom.
[4] Carbotrap is a registered trademark of Sigma-Aldrich Co., LLC, St. Louis, Missouri.

Table 2-2. Statistical Information for the Monitoring Period of February 4, 2019 – February 5, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	0.010	4.901	1.580	32.250	10.757	4.483
2	formaldehyde	300	1.302	<1.302	N/A	N/A	0.753	<1.302
3	methanol	200000	1.839	2.411†	0.158	6.556	12.900	2.415
4	acetonitrile	20000	0.070	<0.070	N/A	N/A	0.077	<0.070
5	acetaldehyde	25000	2.070	<2.070	N/A	N/A	1.041	<2.070
6	ethylamine	5000	0.055	<0.055	N/A	N/A	0.142	<0.055
7	1,3-butadiene	1000	0.122	<0.122	N/A	N/A	0.051	<0.122
8	propanenitrile	6000	0.121	<0.121	N/A	N/A	0.141	<0.121
9	2-propenal	100	0.314	<0.314	N/A	N/A	0.157	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	N/A	N/A	0.303	<0.149
11	methyl isocyanate	20	0.061	<0.061	N/A	N/A	0.084	<0.061
12	methyl nitrite	100	0.117	<0.117	N/A	N/A	0.183	<0.117
13	furan	1	0.053	<0.053	N/A	N/A	0.053	<0.053
14	butanenitrile	8000	0.040	<0.040	N/A	N/A	0.062	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	N/A	N/A	N/A*	N/A*
16	butanal	25000	0.063	<0.063	N/A	N/A	0.077	<0.063
17	NDMA**	0.3	0.020	<0.020	N/A	N/A	0.038	<0.020
18	benzene	500	0.230	<0.230	N/A	N/A	3.390	<0.230
19	2,4-pentadienenitrile + pyridine	300, 1000	0.084	<0.084	N/A	N/A	0.268	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	N/A	N/A	0.104	<0.050
21	2-methylfuran	1	0.046	<0.046	N/A	N/A	0.049	<0.046
22	pentanenitrile	6000	0.029	<0.029	N/A	N/A	0.052	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20,30	0.048	<0.048	N/A	N/A	0.043	<0.048
24	NEMA**	0.3	0.027	<0.027	N/A	N/A	0.029	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	N/A	N/A	0.063	<0.035
26	hexanenitrile	6000	0.029	<0.029	N/A	N/A	0.059	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	N/A	N/A	0.041	<0.030
28	NDEA**	0.1	0.023	<0.023	N/A	N/A	0.030	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	N/A	N/A	0.183	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	N/A	N/A	0.067	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	N/A	N/A	0.037	<0.035

Table 2-2. Statistical Information for the Monitoring Period of February 4, 2019 – February 5, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.029	<0.029	N/A	N/A	0.052	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	N/A	N/A	0.041	<0.032
34	NMOR**	0.6	0.017	<0.017	N/A	N/A	0.031	<0.017
35	butyl nitrate	2500	0.019	<0.019	N/A	N/A	0.035	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	N/A	N/A	0.064	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	N/A	N/A	0.046	<0.028
38	2-pentylfuran	1	0.029	<0.029	N/A	N/A	0.039	<0.029
39	biphenyl	200	0.031	<0.031	N/A	N/A	0.037	<0.031
40	2-heptylfuran	1	0.136	<0.136	N/A	N/A	0.216	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	N/A	N/A	0.044	<0.184
42	2-octylfuran	1	0.013	<0.013	N/A	N/A	0.039	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	N/A	N/A	0.031	<0.132
44	PCB	1000	0.139	<0.139	N/A	N/A	0.092	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	N/A	N/A	0.045	<0.025
46	furfural acetophenone	1	0.119	<0.119	N/A	N/A	0.202	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.059 ppb and the median value was <0.034 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers.							
**	Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.].							
ND	COPC Averages below the MDL.							
†	COPC Averages between the RL and the MDL.							
	COPC Averages >100% of the OEL.							
	COPC Averages 50-100% of the OEL.							
	COPC Averages 10-50% of the OEL.							

Figure 2-3 through Figure 2-21 display a selection of 16 chemical of potential concern (COPC) signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period February 4, 2019, to February 5, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

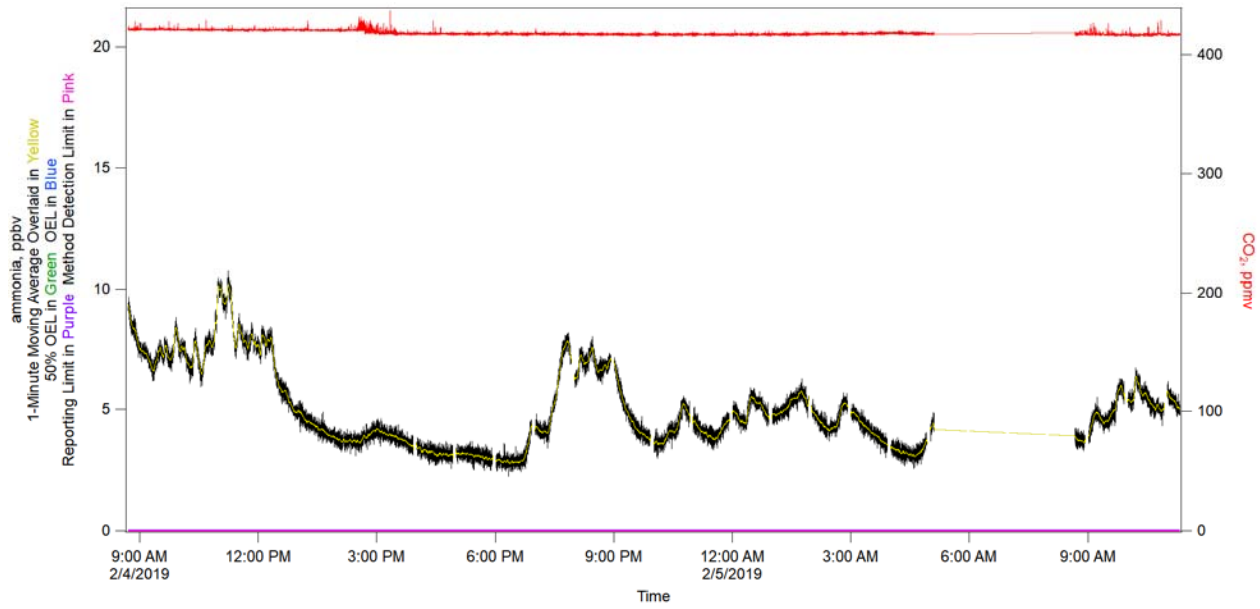

Figure 2-3. Ammonia.

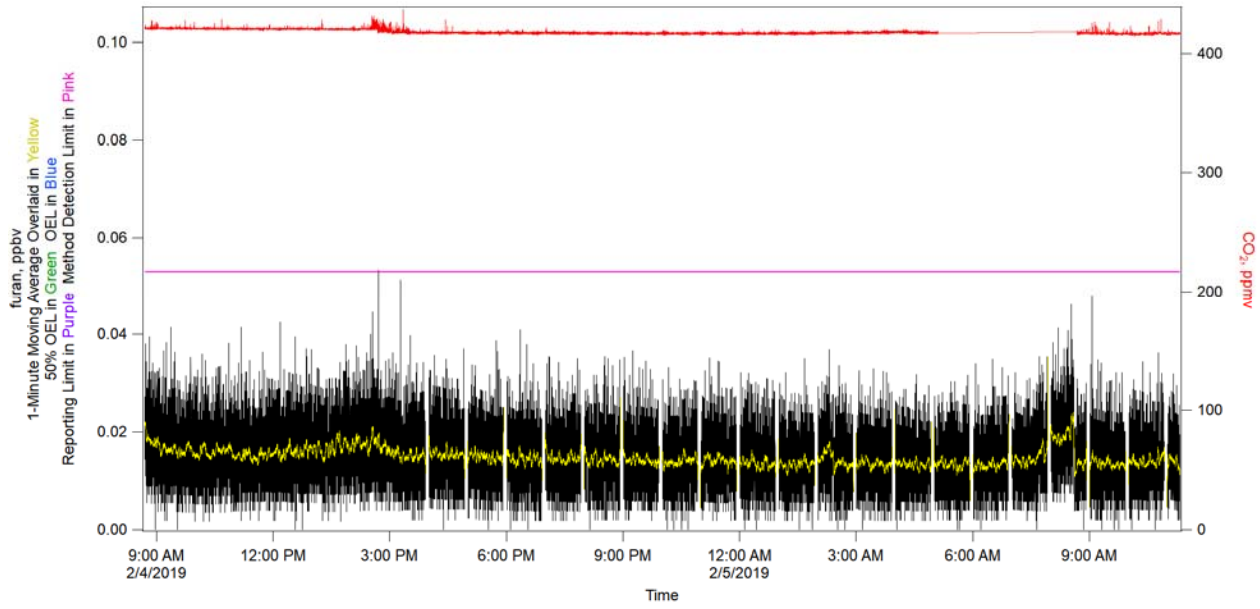

Figure 2-4. Furan.

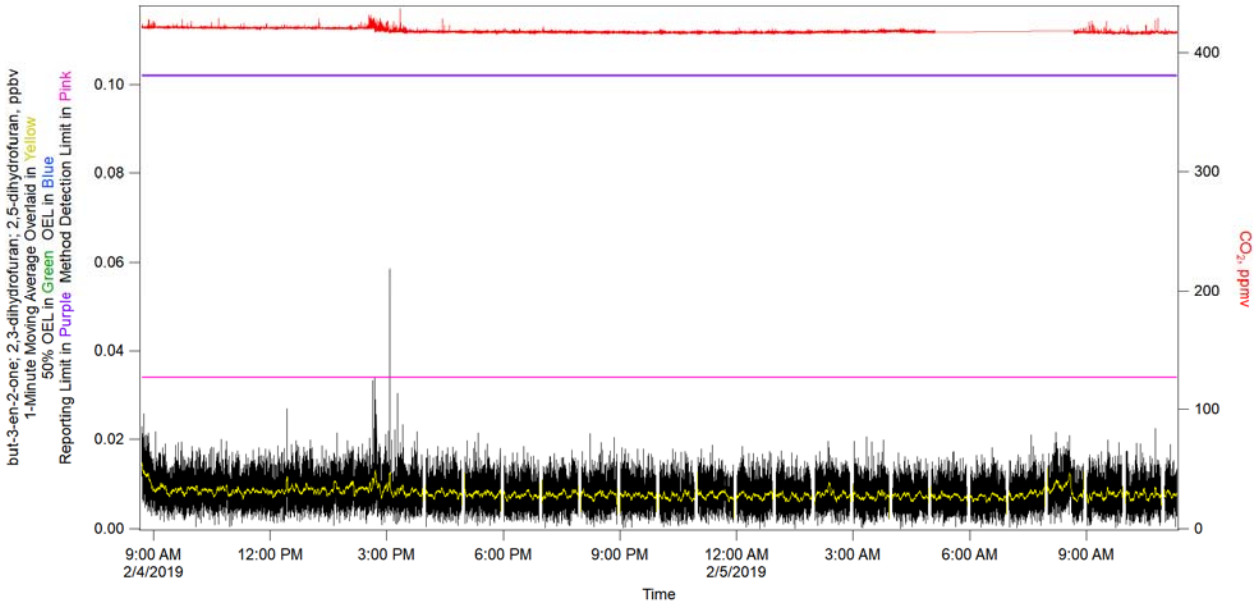

Figure 2-5. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

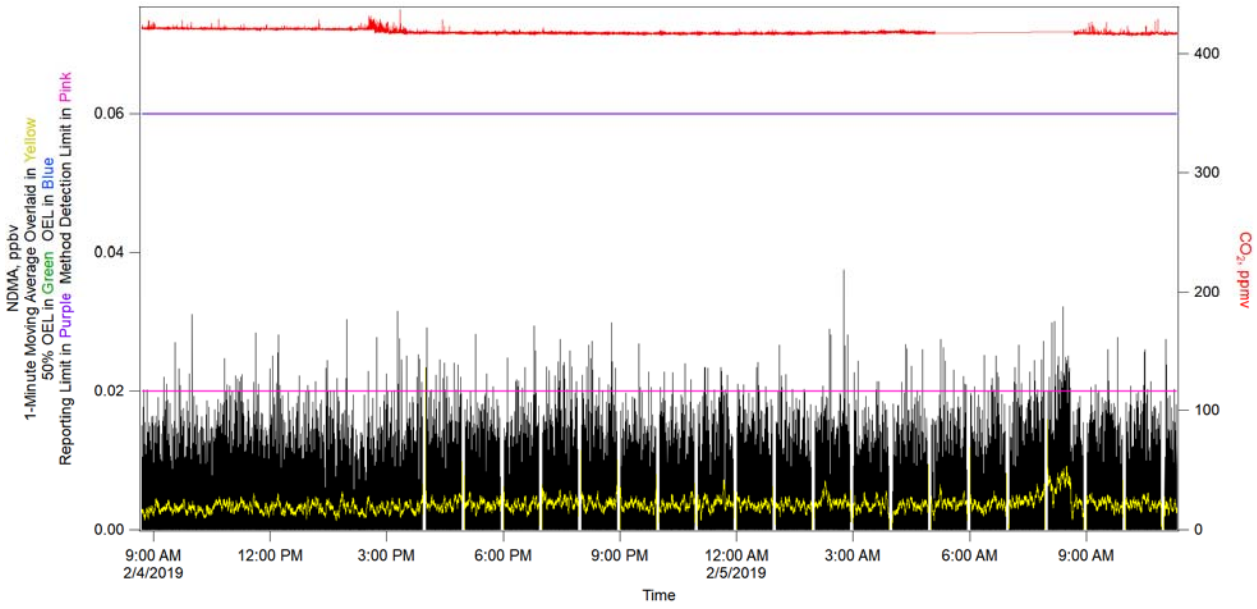

Figure 2-6. N-nitrosodimethylamine (NDMA).

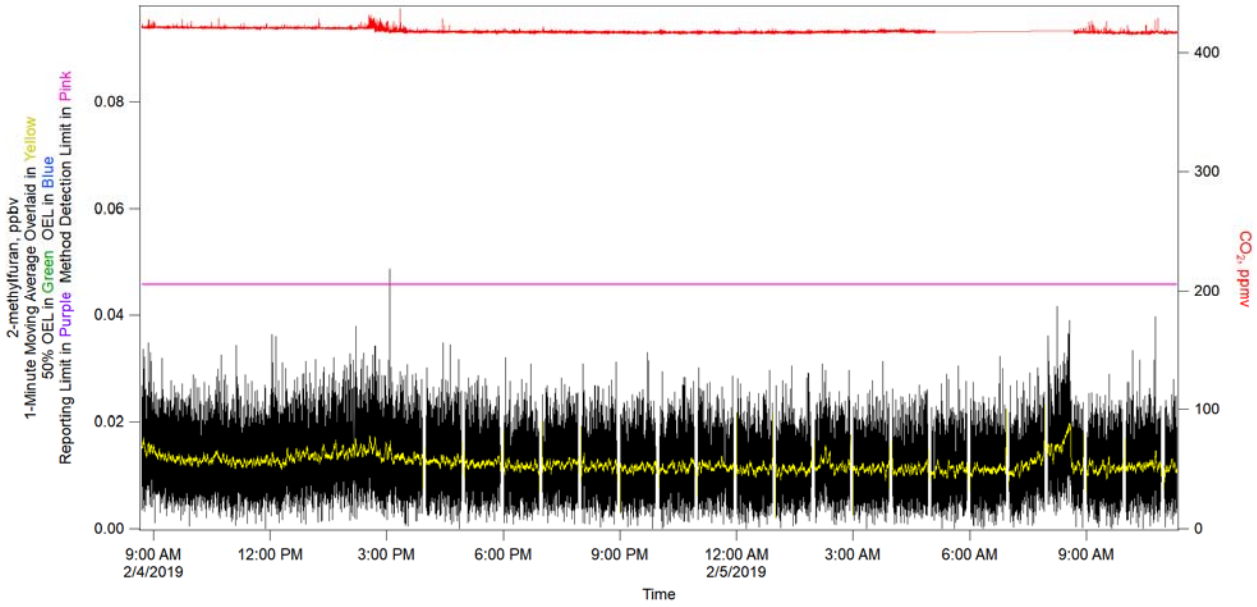

Figure 2-7. 2-methylfuran.

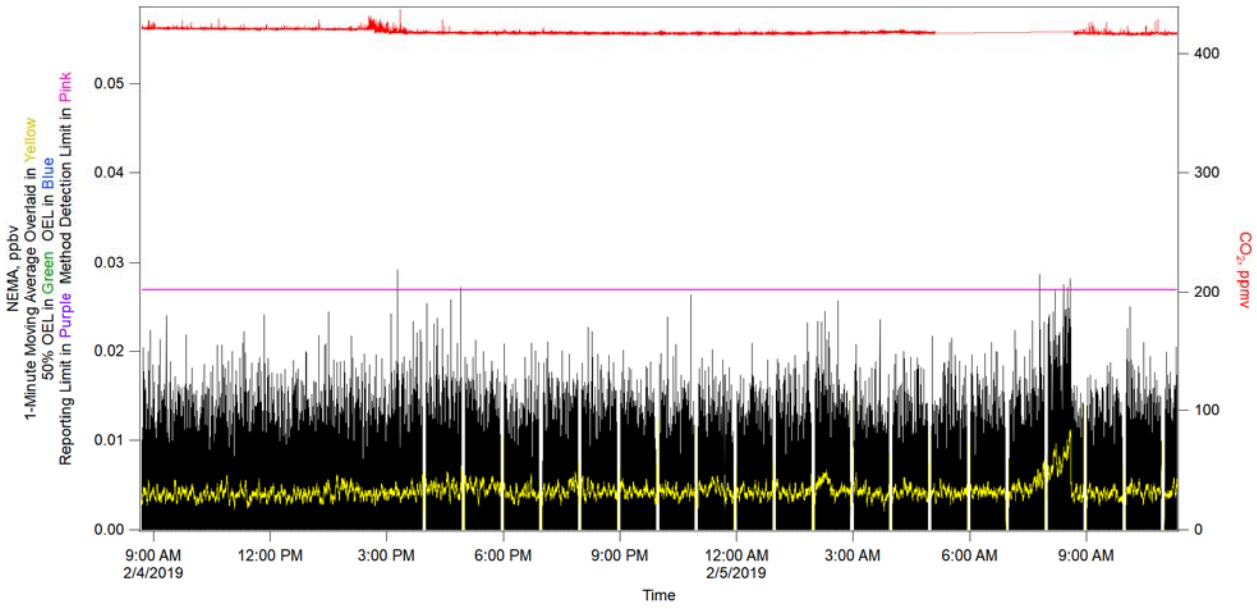

Figure 2-8. N-nitrosomethylethylamine (NEMA).

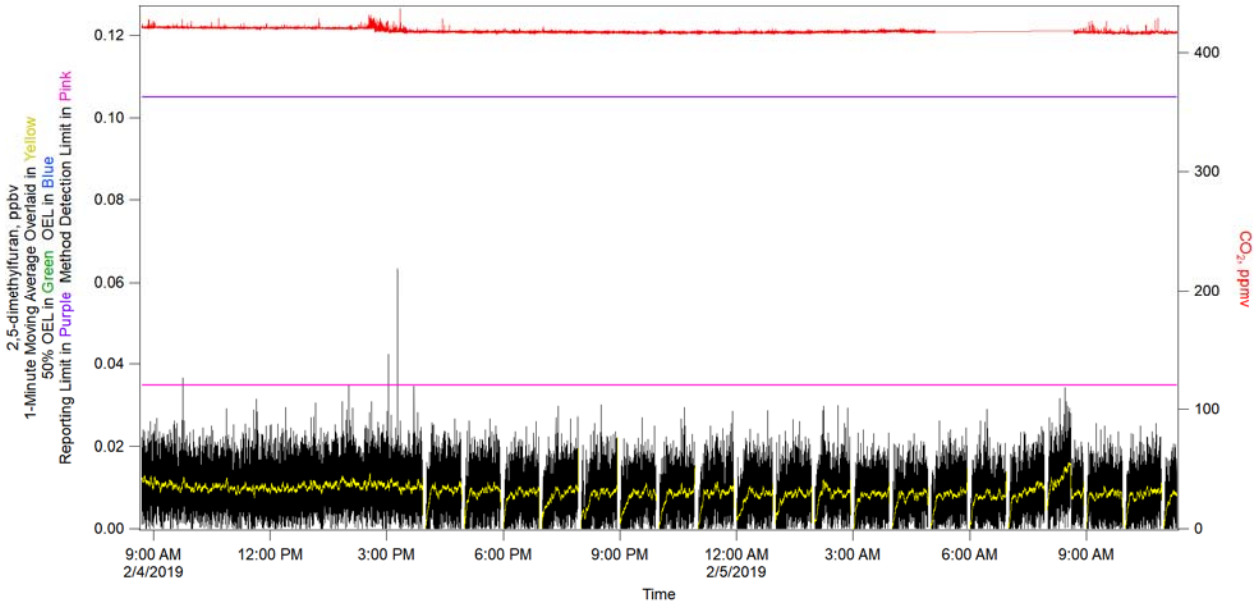

Figure 2-9. 2,5-dimethylfuran.

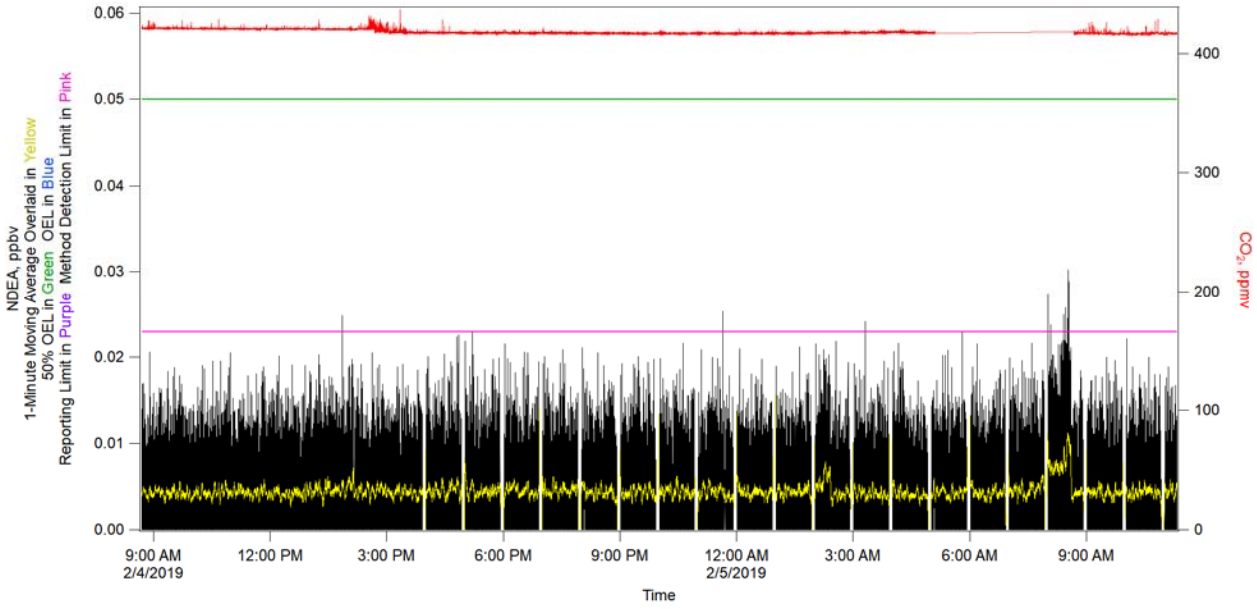

Figure 2-10. N-nitrosodiethylamine (NDEA).

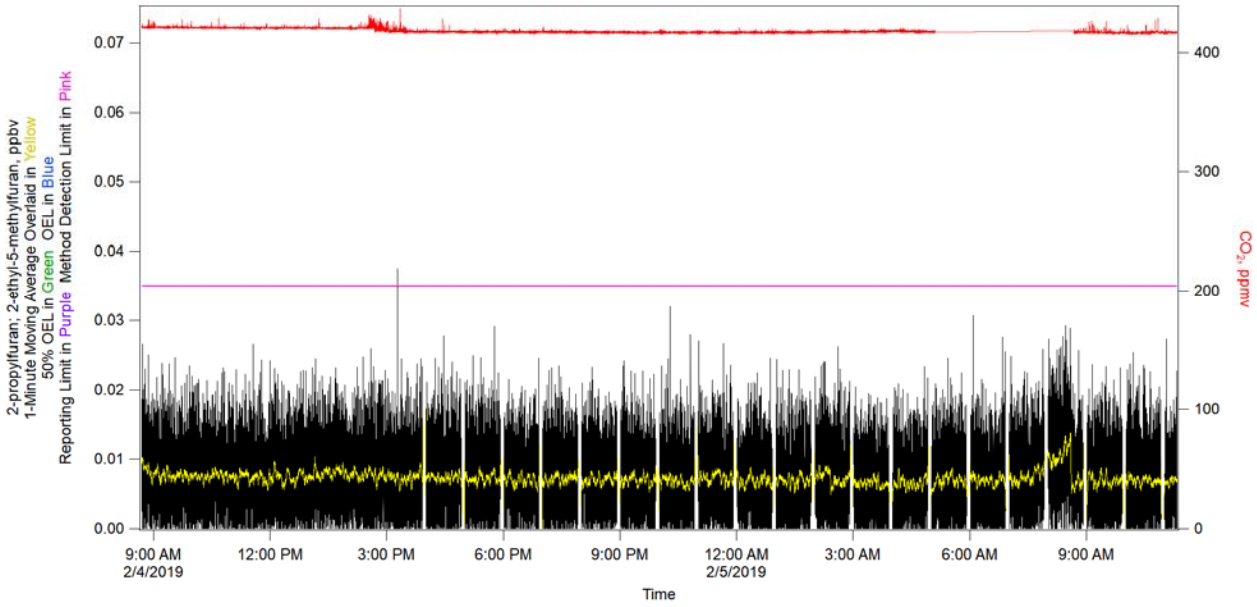

Figure 2-11. 2-propylfuran + 2-ethyl-5-methylfuran.

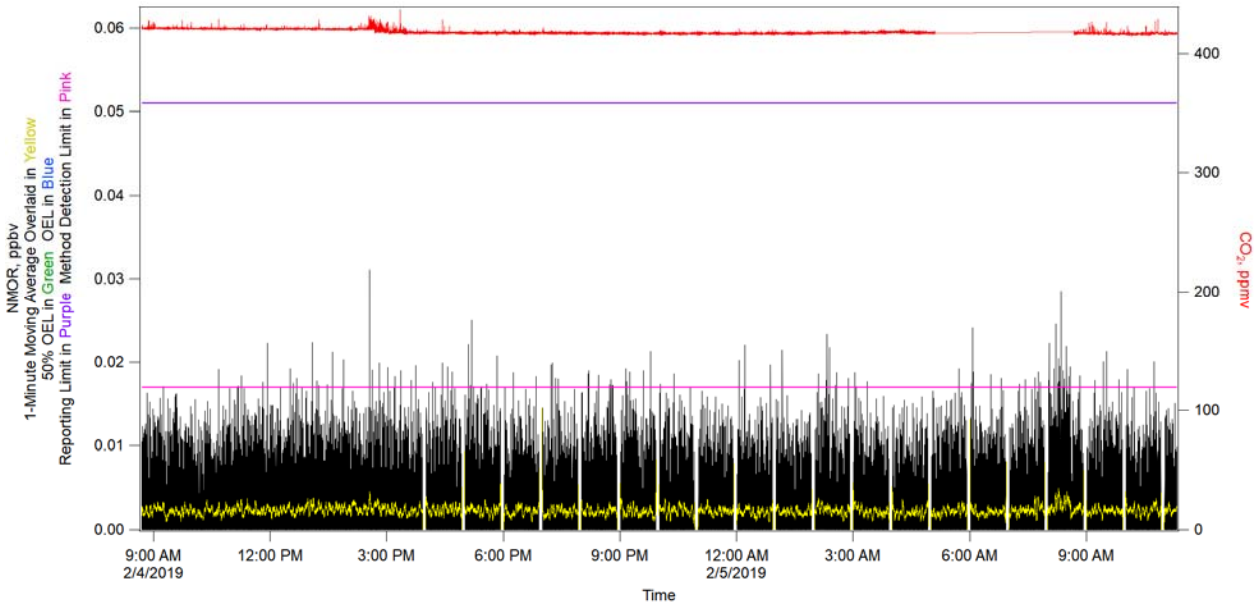

Figure 2-12. N-nitrosomorpholine (NMOR).

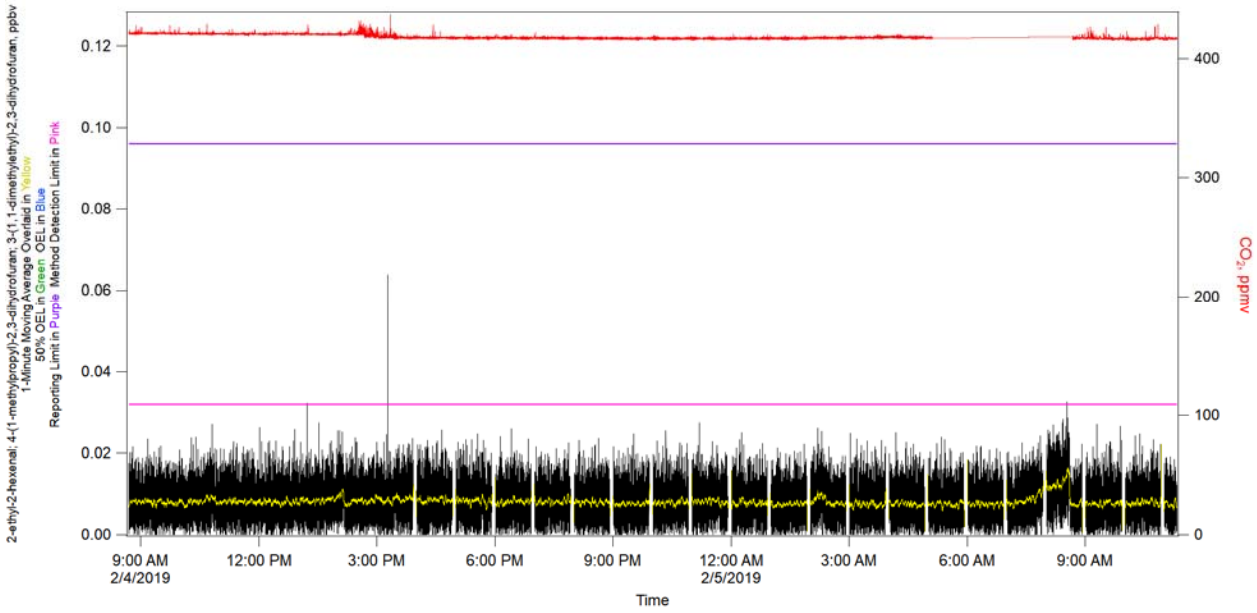

Figure 2-13. 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1-1-dimethylethyl)-2,3-dihydrofuran.

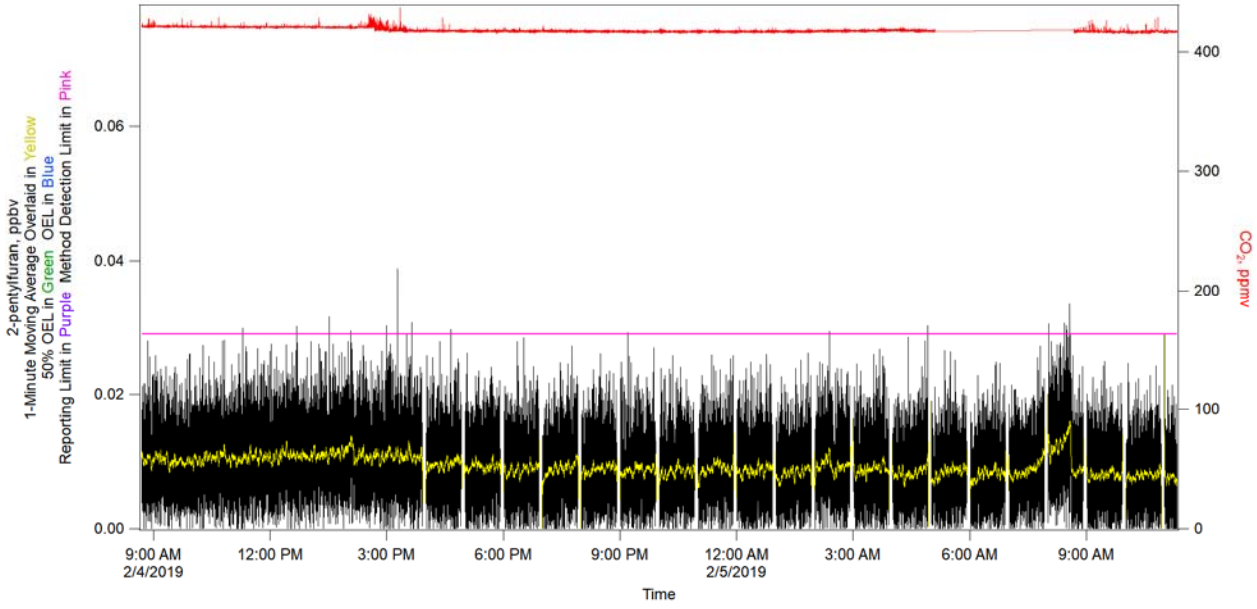

Figure 2-14. 2-pentylfuran.

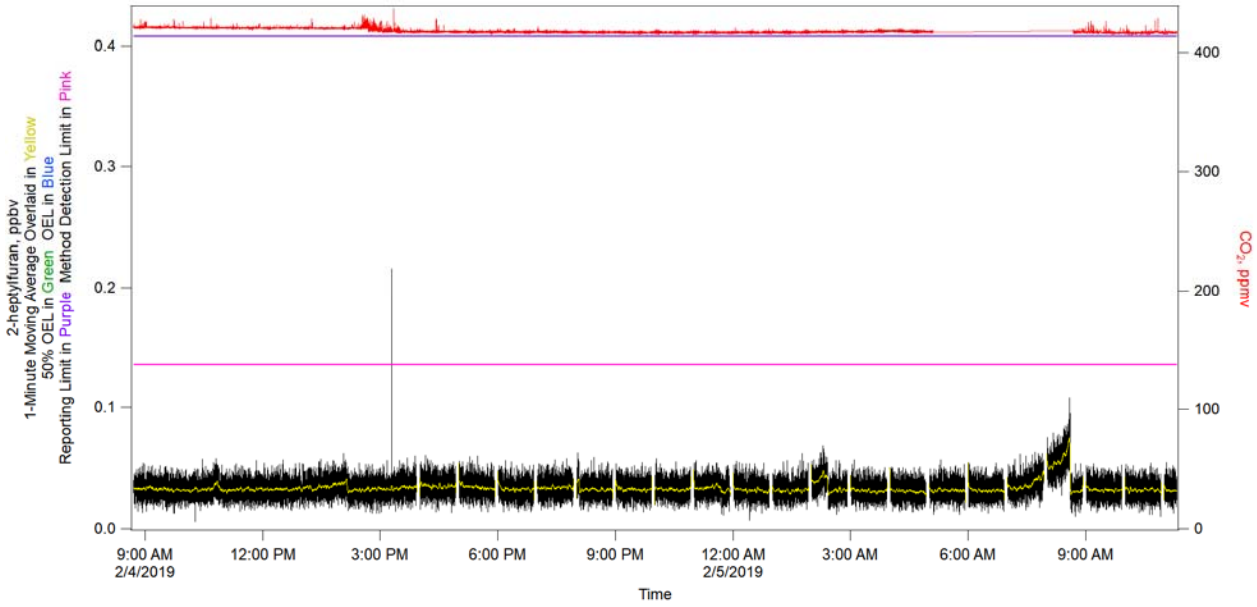

Figure 2-15. 2-heptylfuran.

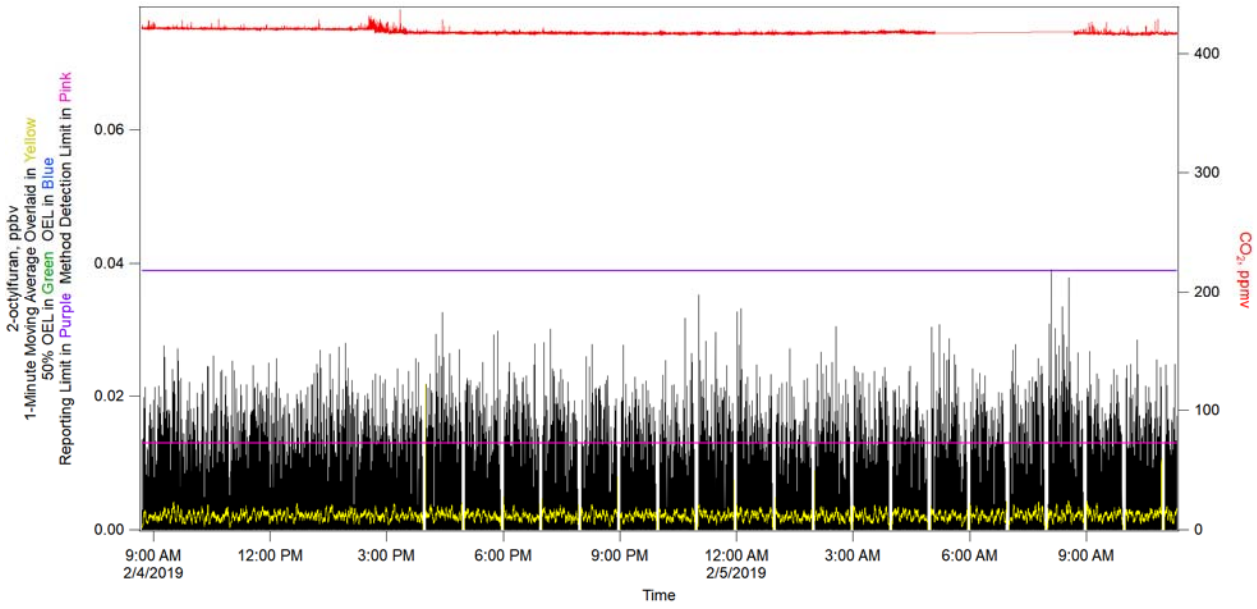

Figure 2-16. 2-octylfuran.

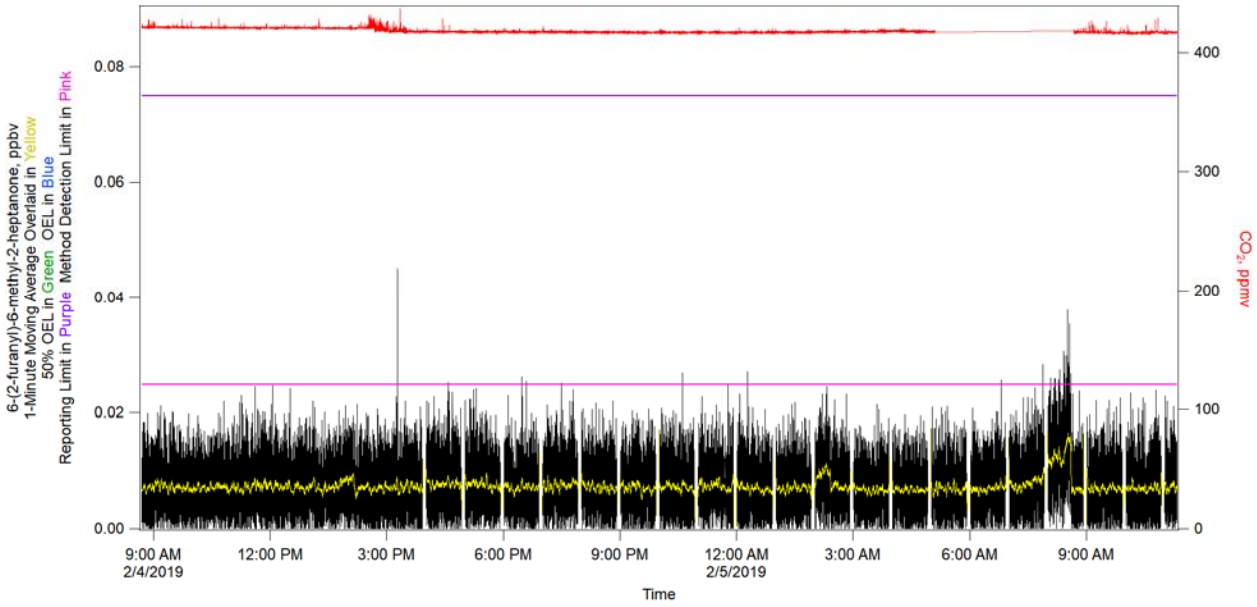

Figure 2-17. 6-(2-furanyl)-6-methyl-2-heptanone.

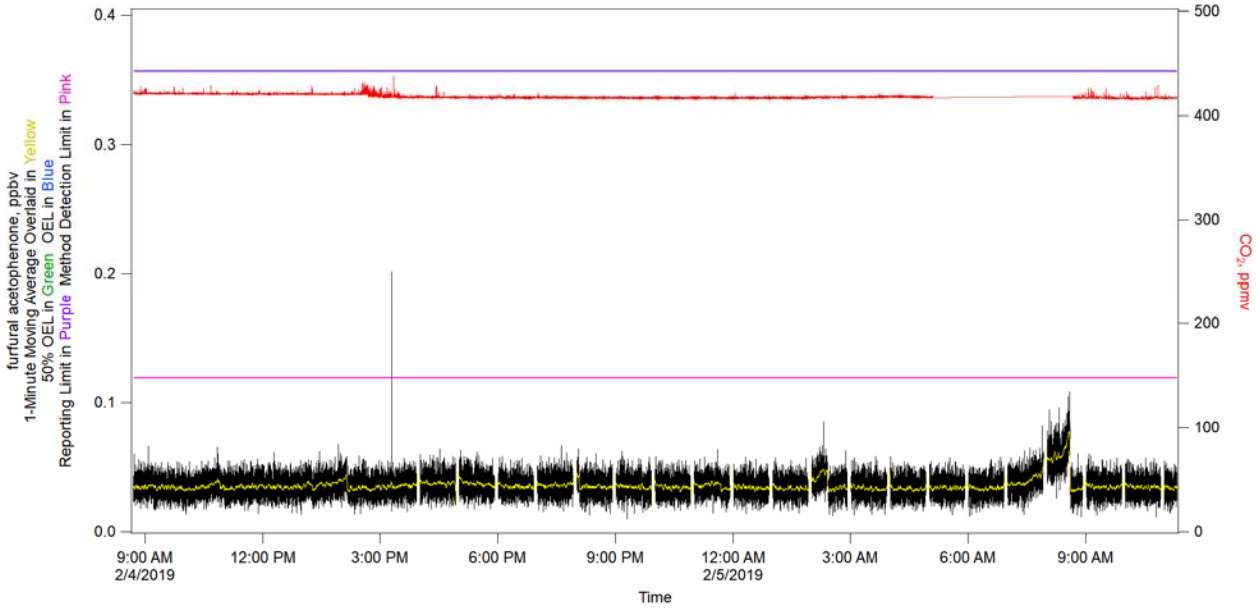

Figure 2-18. Furfural Acetophenone.

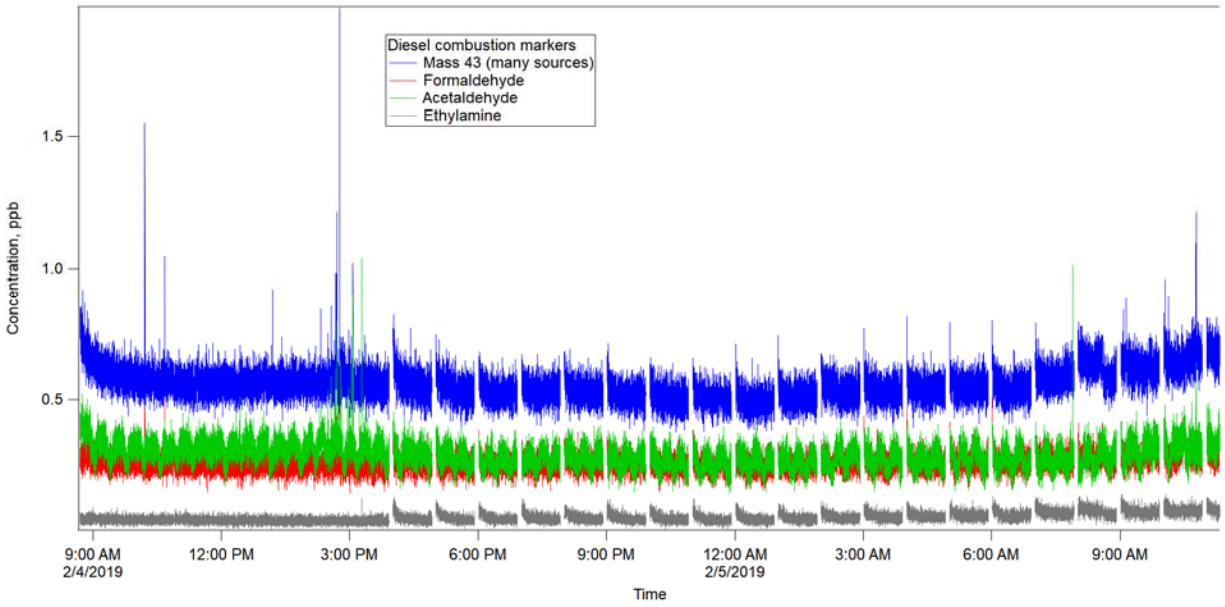

Figure 2-19. Diesel Combustion Markers.

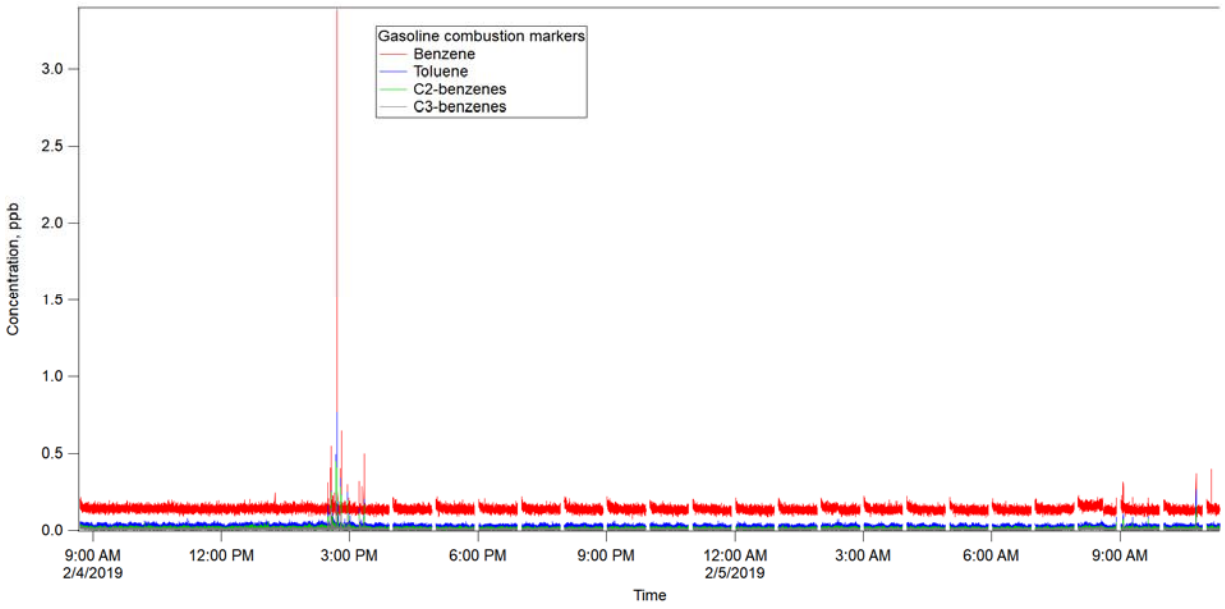

Figure 2-20. Gasoline Combustion Markers.

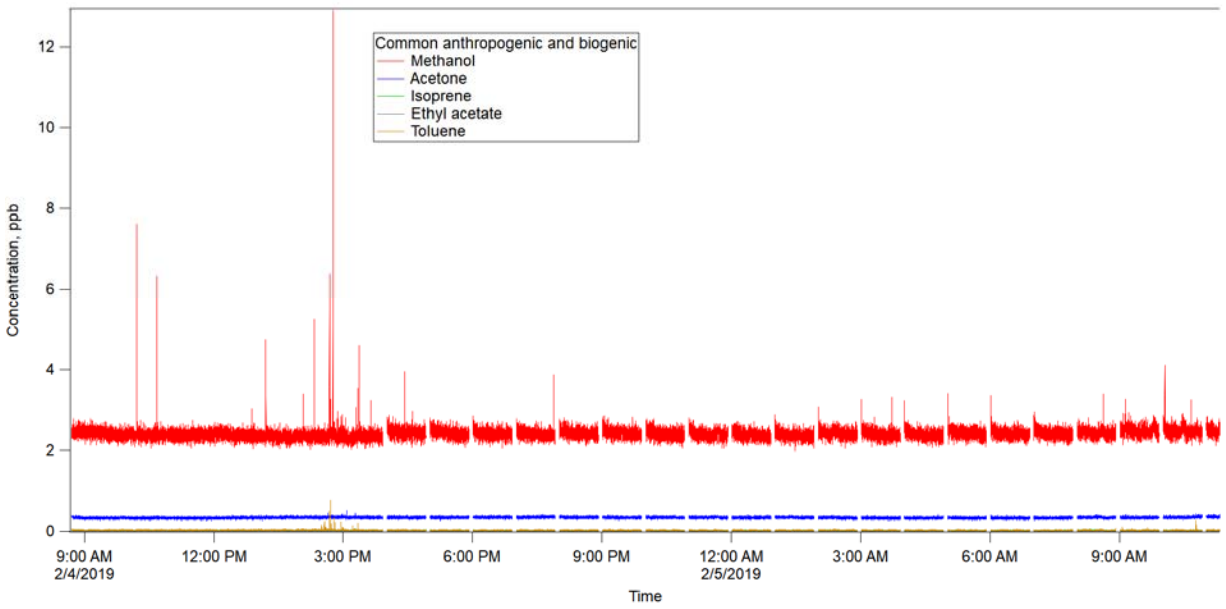

Figure 2-21. Plant and Human Markers.

3.0 FEBRUARY 5, 2019 – FEBRUARY 6, 2019 – STUDY SITE #5

3.1 Quality Assessment

Data from February 5, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. DR19-004 was initiated to adequately document a loss of approximately four hours of DAQFactory data during the morning of February 5, 2019. See Appendix A for the full DR. This instance will be discussed in detail in a subsequent monthly summary report.

3.2 Summary

The ML personnel performed background sampling from February 5, 2019, to February 6, 2019, at study Site 5. Site 5 is located southeast of the Waste Treatment Facility. This site was chosen as it may provide data related to stack emission dispersion downwind of the tank farm ventilation and a baseline point for future reference once the Waste Treatment Facility begins operation. The ML arrived at Site 5 at 11:56 on February 5, 2019. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, the Picarro NH_3 analyzer, and the PTR-MS beginning at 11:46. Collection of confirmatory samples started at 12:19. At 16:45, the ML staff contacted the SME for a third party check before departure from the ML. The SME performed a remote start of NO^+ automation mode at 19:10.

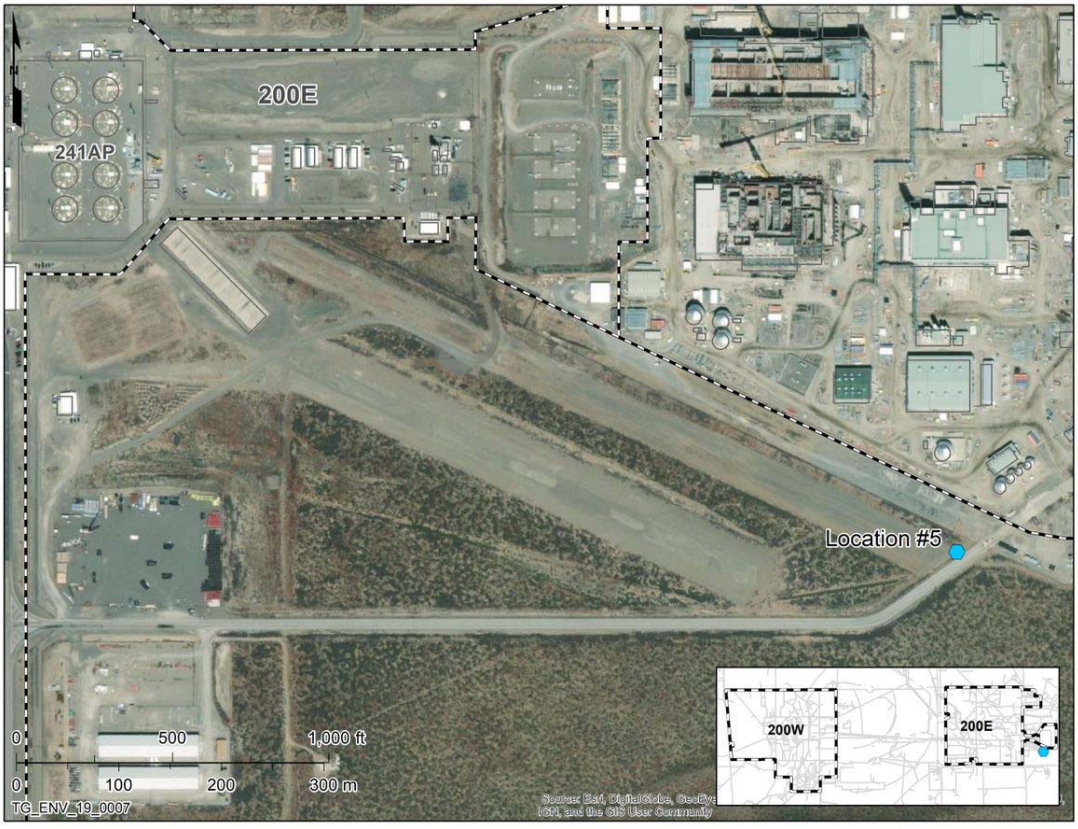

Figure 3-1. Mobile Laboratory Site #5 for the Duration of the Monitoring Period.

The ML staff returned to Site 5 at 08:45 on February 6, 2019. At 09:00, the confirmatory sorbent samples were disconnected from the sampling station. The ML relocated to Site 6 by 10:00.

Figure 3-2 provides meteorological information obtained from the ML mounted weather station for the time period of sampling at Site 5.

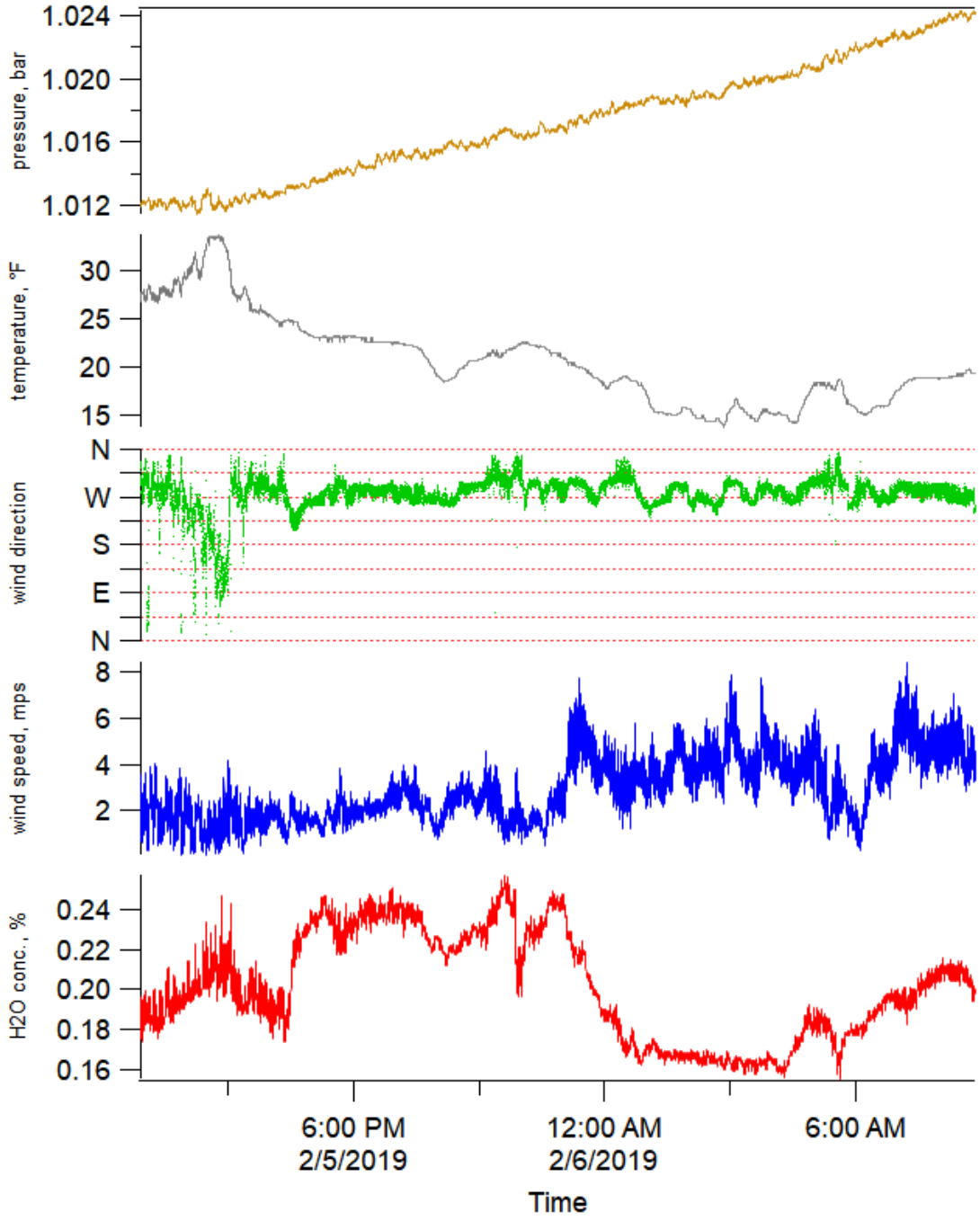

Figure 3-2. Weather Data.

3.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

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Confirmatory air samples were collected on alternative media sources as shown in Table 3-1.

Table 3-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
5	02/05/19	Thermosorb/N	EL33314	12:53	18:53	360
5	02/05/19	LpDNPH	190205-A	12:19	15:19	180

Table 3-2. Statistical Information for the Monitoring Period of February 5, 2019 – February 6, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	0.010	4.565	1.408	30.832	9.431	4.643
2	formaldehyde	300	1.302	<1.302	N/A	N/A	0.620	<1.302
3	methanol	200000	1.839	2.436†	0.147	6.016	6.006	2.441
4	acetonitrile	20000	0.070	<0.070	N/A	N/A	0.070	<0.070
5	acetaldehyde	25000	2.070	<2.070	N/A	N/A	1.427	<2.070
6	ethylamine	5000	0.055	0.078†	0.020	25.614	0.176	0.078
7	1,3-butadiene	1000	0.122	<0.122	N/A	N/A	0.082	<0.122
8	propanenitrile	6000	0.121	<0.121	N/A	N/A	0.085	<0.121
9	2-propenal	100	0.314	<0.314	N/A	N/A	0.340	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	N/A	N/A	0.305	<0.149
11	methyl isocyanate	20	0.061	<0.061	N/A	N/A	0.064	<0.061
12	methyl nitrite	100	0.117	<0.117	N/A	N/A	0.476	<0.117
13	furan	1	0.053	<0.053	N/A	N/A	0.090	<0.053
14	butanenitrile	8000	0.040	<0.040	N/A	N/A	0.043	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	N/A	N/A	N/A*	N/A*
16	butanal	25000	0.063	<0.063	N/A	N/A	0.097	<0.063
17	NDMA**	0.3	0.020	<0.020	N/A	N/A	0.030	<0.020
18	benzene	500	0.230	<0.230	N/A	N/A	0.999	<0.230
19	2,4-pentadienenitrile + pyridine	300, 1000	0.084	<0.084	N/A	N/A	0.094	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	N/A	N/A	0.052	<0.050
21	2-methylfuran	1	0.046	<0.046	N/A	N/A	0.066	<0.046
22	pentanenitrile	6000	0.029	<0.029	N/A	N/A	0.036	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	N/A	N/A	0.068	<0.048
24	NEMA**	0.3	0.027	<0.027	N/A	N/A	0.029	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	N/A	N/A	0.045	<0.035
26	hexanenitrile	6000	0.029	<0.029	N/A	N/A	0.032	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	N/A	N/A	0.034	<0.030
28	NDEA**	0.1	0.023	<0.023	N/A	N/A	0.034	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	N/A	N/A	0.076	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	N/A	N/A	0.121	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	N/A	N/A	0.037	<0.035

Table 3-2. Statistical Information for the Monitoring Period of February 5, 2019 – February 6, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.029	<0.029	N/A	N/A	0.033	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	N/A	N/A	0.033	<0.032
34	NMOR**	0.6	0.017	<0.017	N/A	N/A	0.044	<0.017
35	butyl nitrate	2500	0.019	<0.019	N/A	N/A	0.026	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	N/A	N/A	0.033	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	N/A	N/A	0.030	<0.028
38	2-pentylfuran	1	0.029	<0.029	N/A	N/A	0.031	<0.029
39	biphenyl	200	0.031	<0.031	N/A	N/A	0.032	<0.031
40	2-heptylfuran	1	0.136	<0.136	N/A	N/A	0.102	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	N/A	N/A	0.043	<0.184
42	2-octylfuran	1	0.013	<0.013	N/A	N/A	0.033	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	N/A	N/A	0.030	<0.132
44	PCB	1000	0.139	<0.139	N/A	N/A	0.050	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	N/A	N/A	0.031	<0.025
46	furfural acetophenone	1	0.119	<0.119	N/A	N/A	0.107	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.124 ppb and the median value was <0.034 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers.							
**	Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.].							
ND	COPC Averages below the MDL.							
†	COPC Averages between the RL and the MDL.							
	COPC Averages >100% of the OEL.							
	COPC Averages 50-100% of the OEL.							
	COPC Averages 10-50% of the OEL.							

Figure 3-3 through Figure 3-21 display a selection of 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period February 5, 2019, to February 6, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

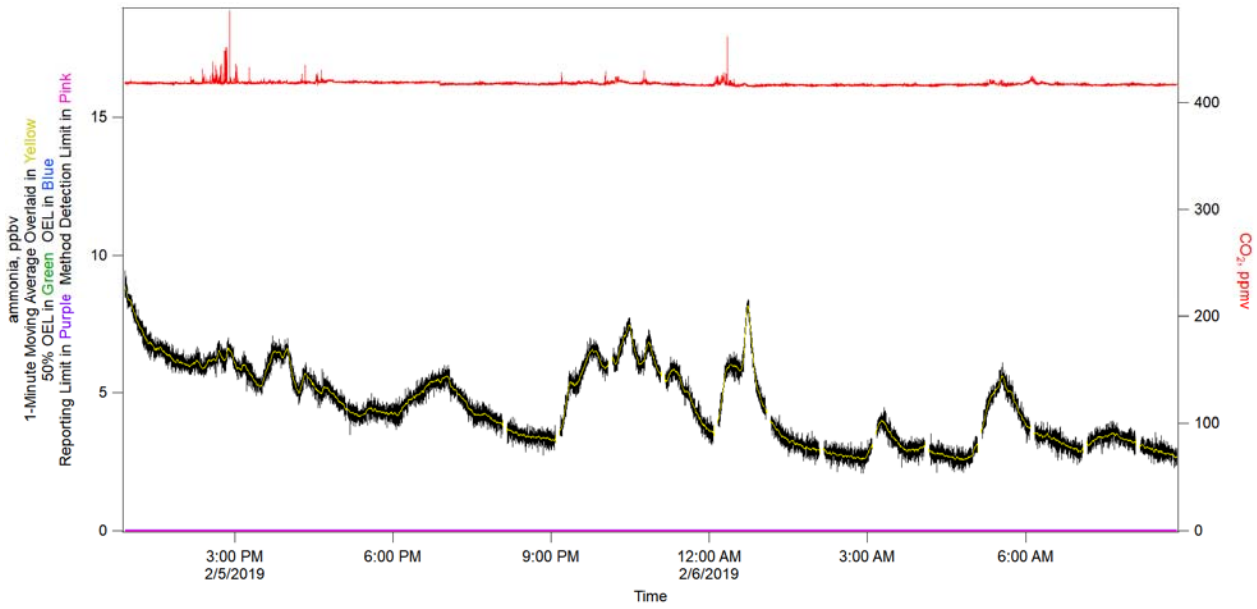

Figure 3-3. Ammonia.

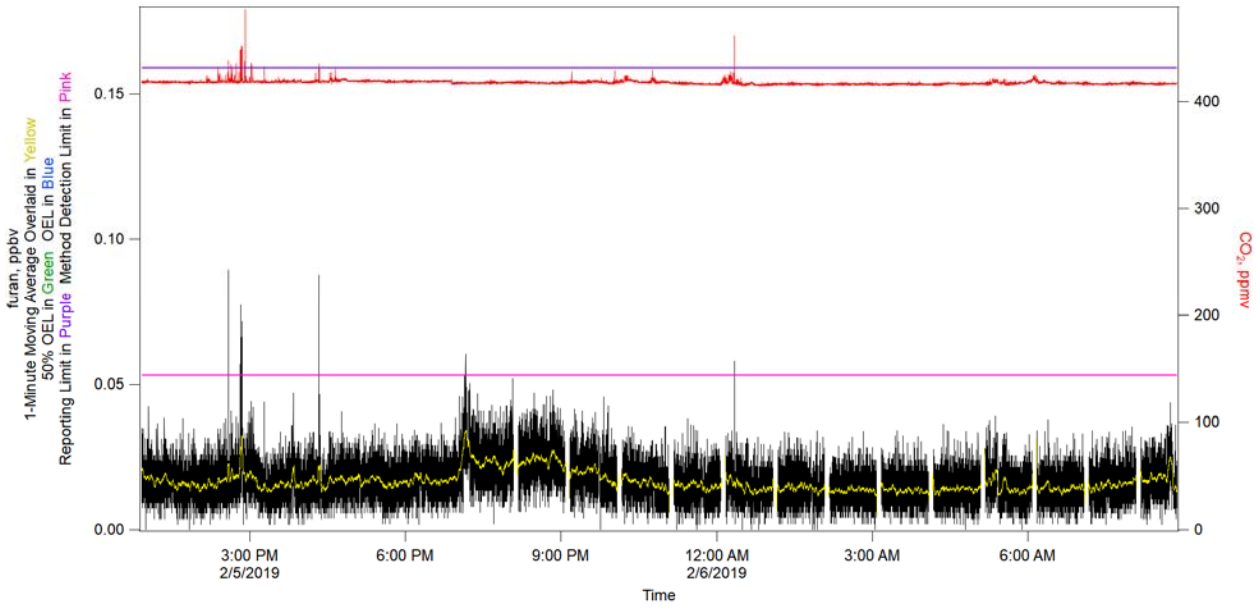

Figure 3-4. Furan.

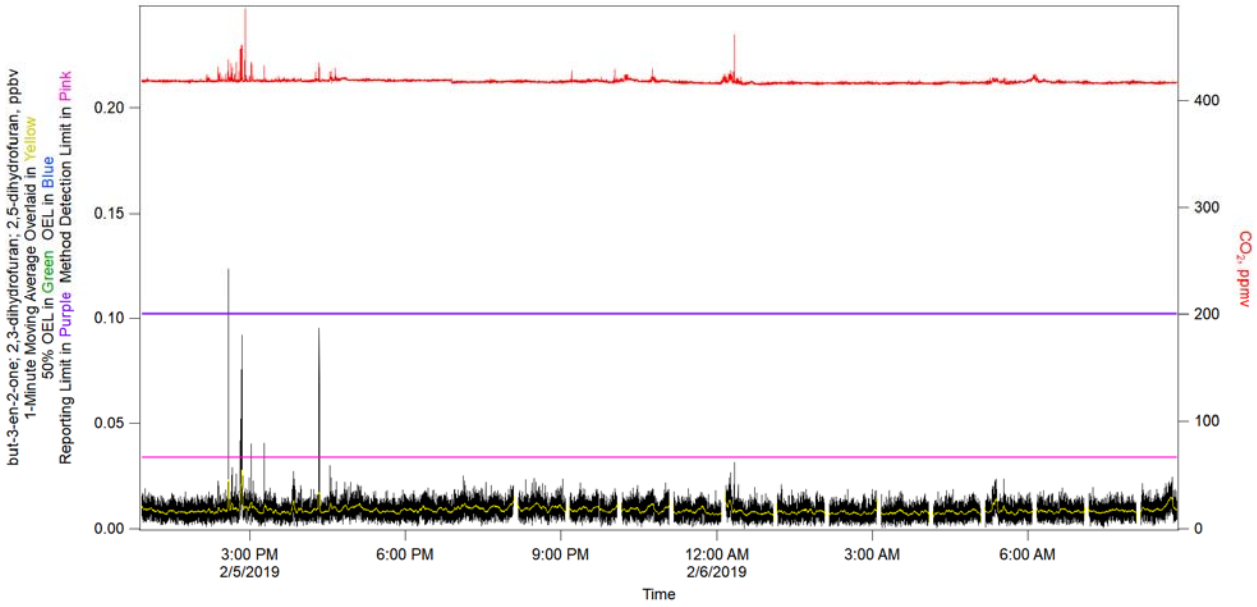

Figure 3-5. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

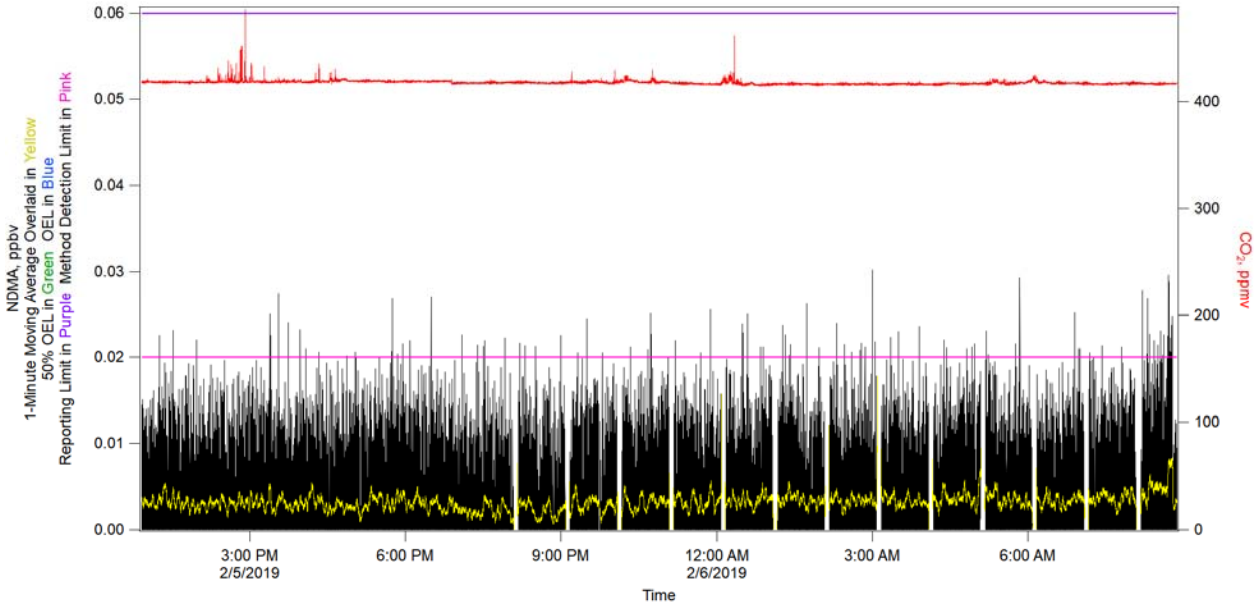

Figure 3-6. N-nitrosodimethylamine (NDMA).

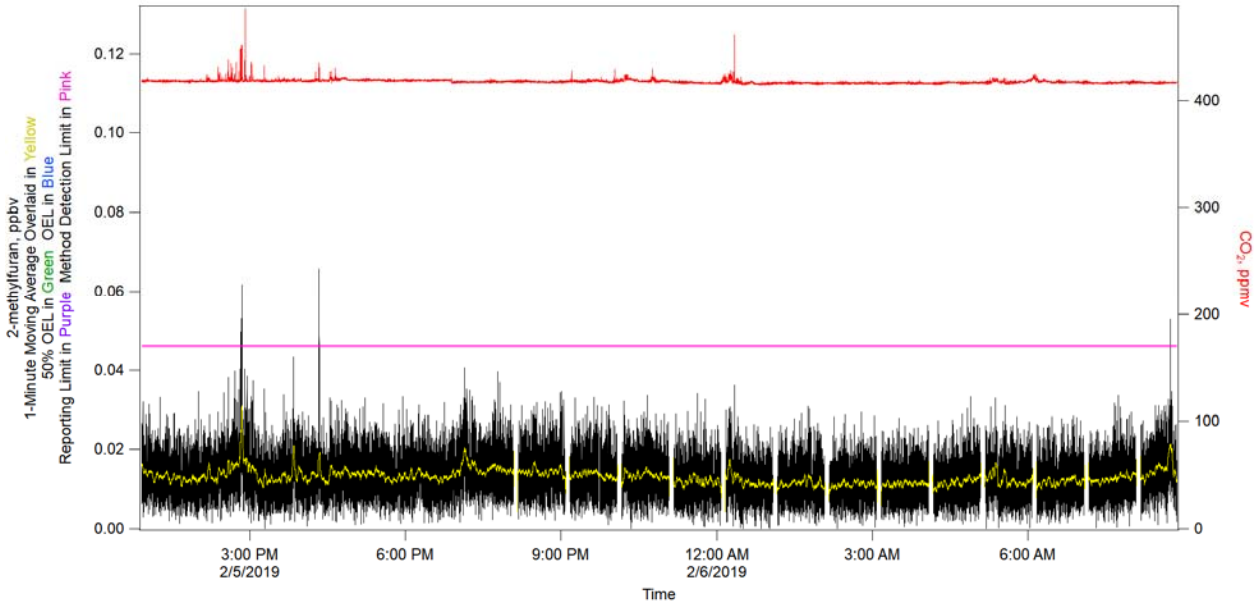

Figure 3-7. 2-methylfuran.

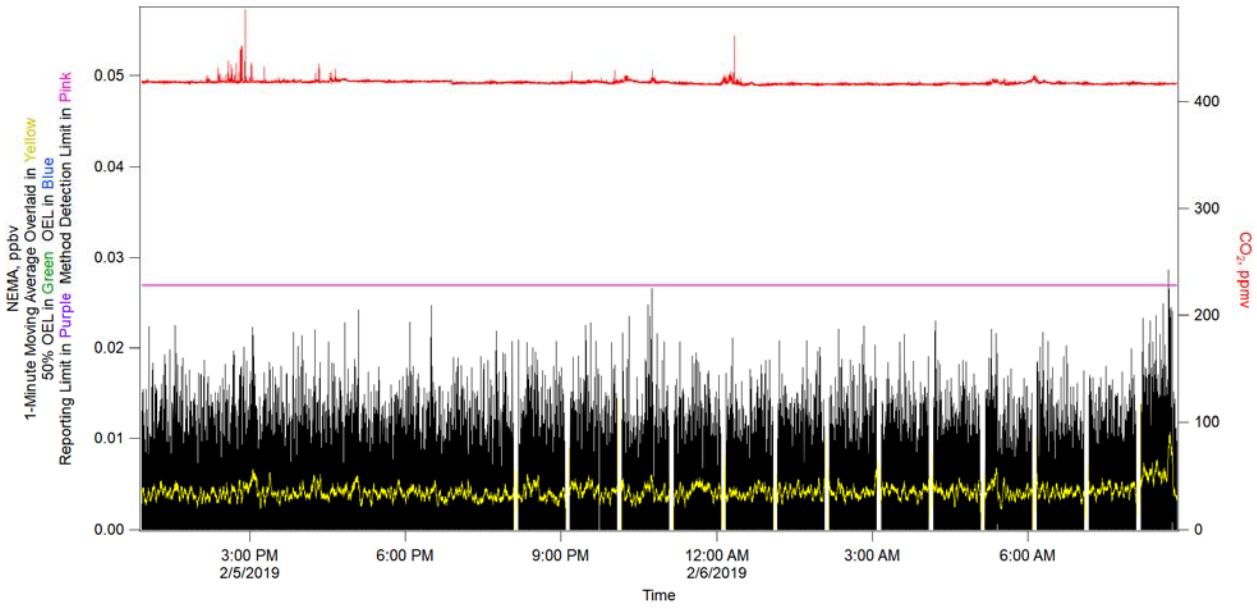

Figure 3-8. N-nitrosomethylethylamine (NEMA).

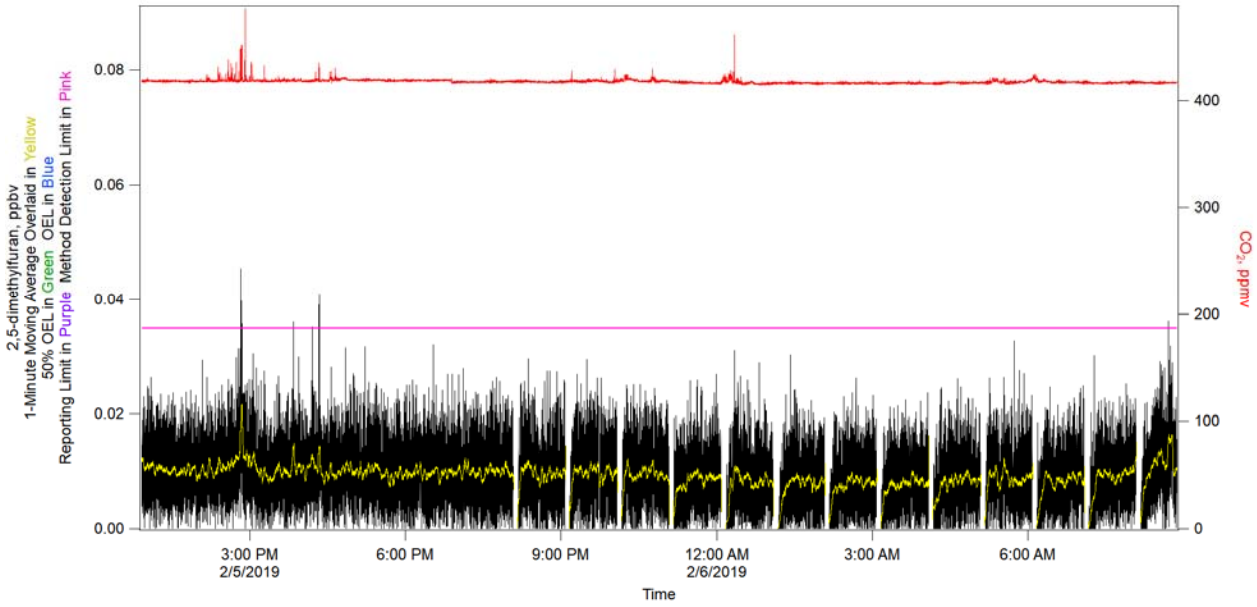

Figure 3-9. 2,5-dimethylfuran.

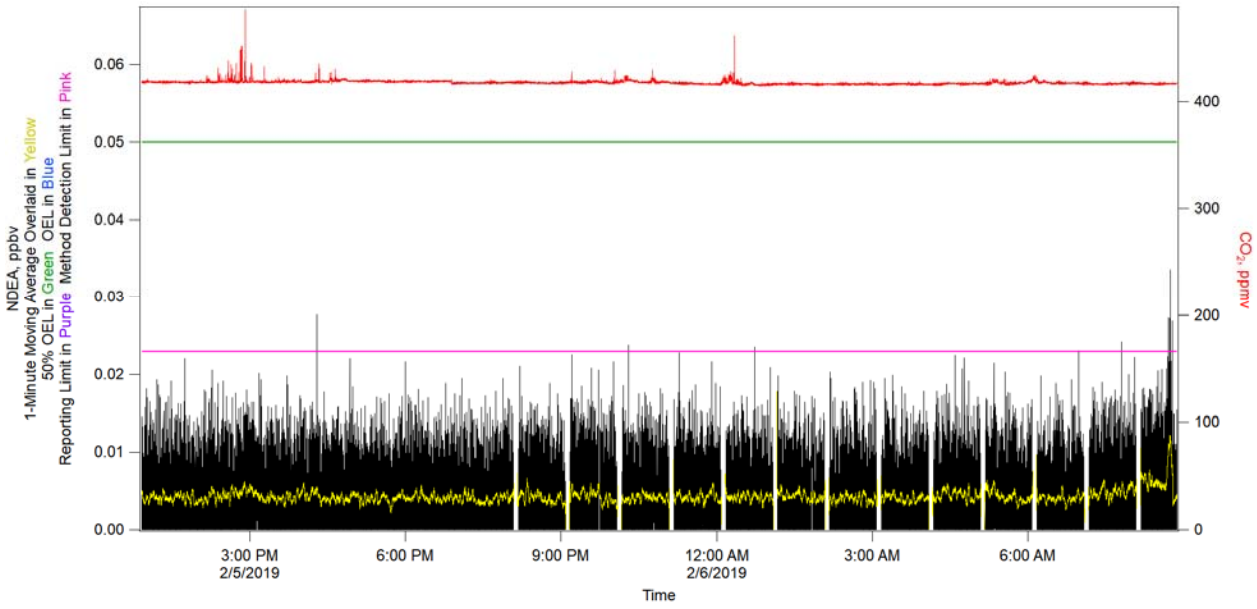

Figure 3-10. N-nitrosodiethylamine (NDEA).

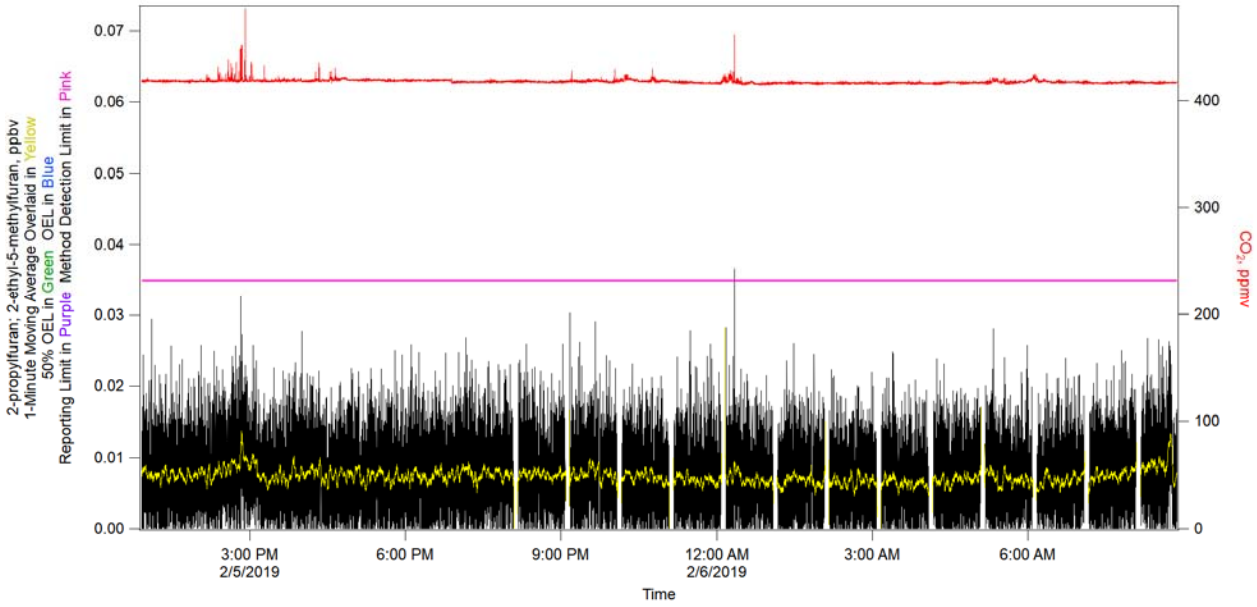

Figure 3-11. 2-propylfuran + 2-ethyl-5-methylfuran.

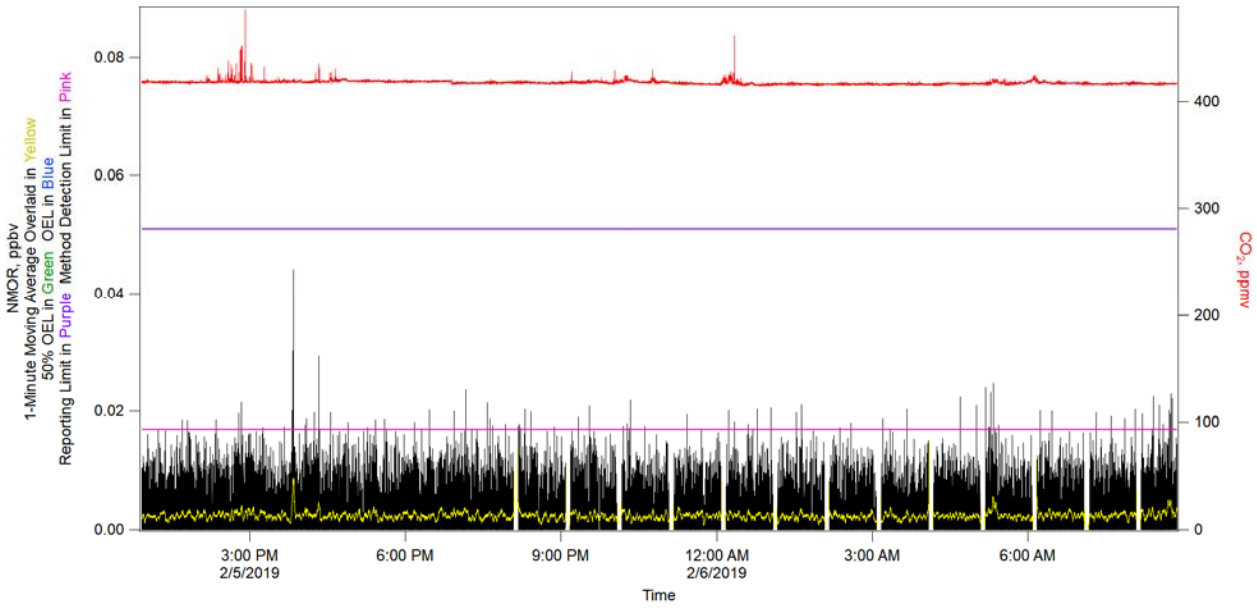

Figure 3-12. N-nitrosomorpholine (NMOR).

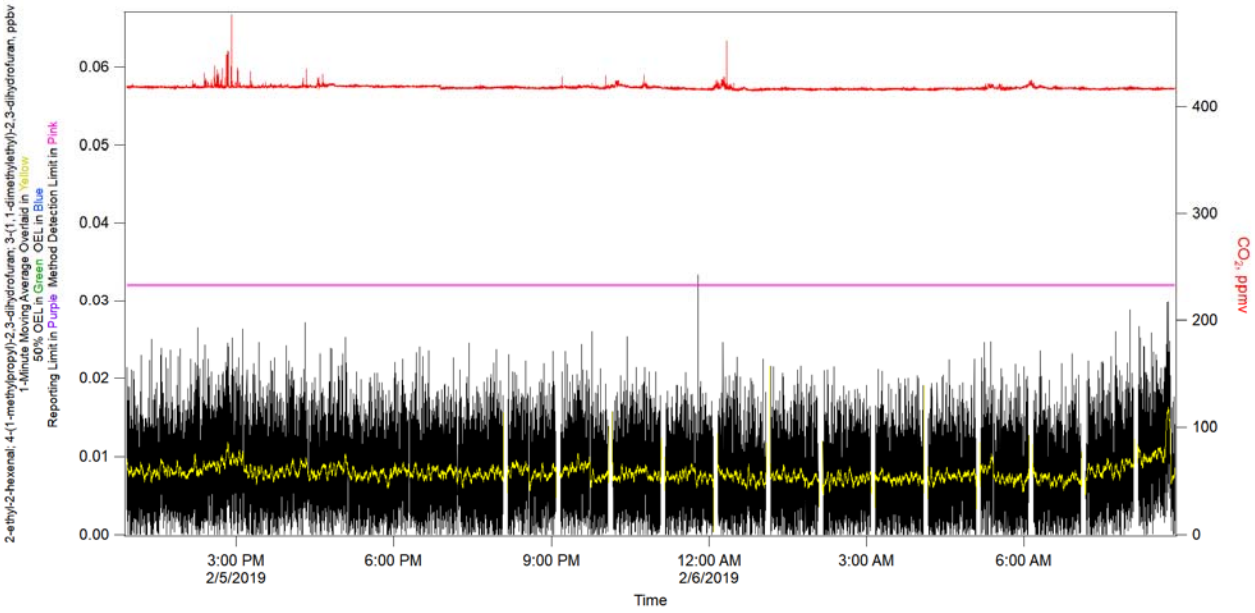

Figure 3-13. 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1-1-dimethylethyl)-2,3-dihydrofuran.

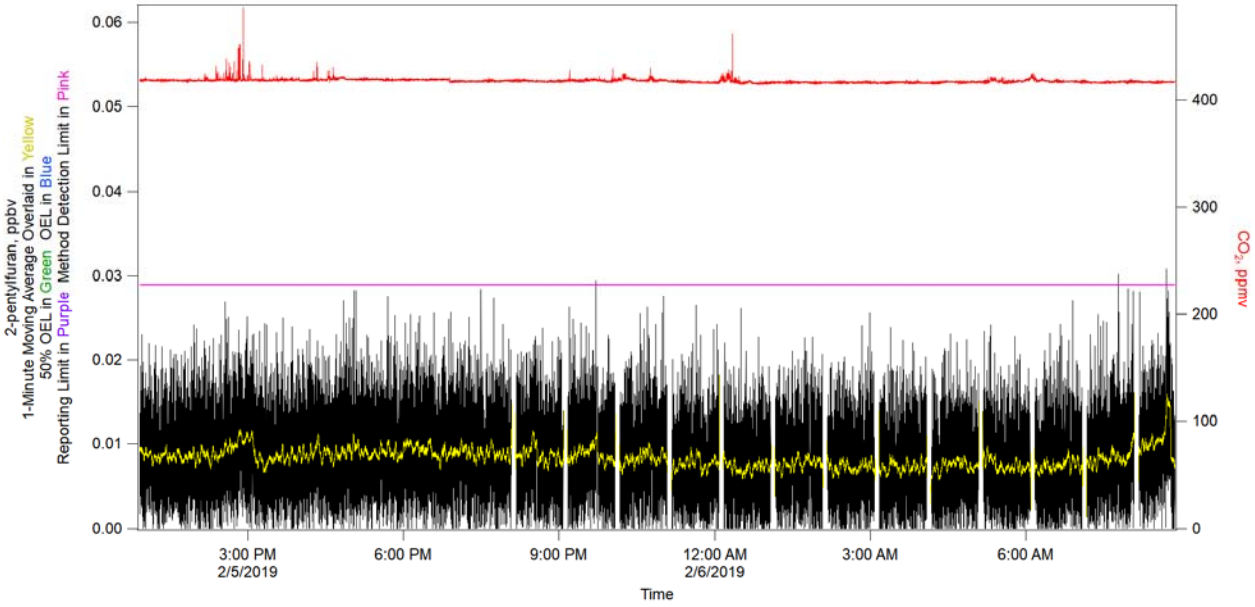

Figure 3-14. 2-pentylfuran.

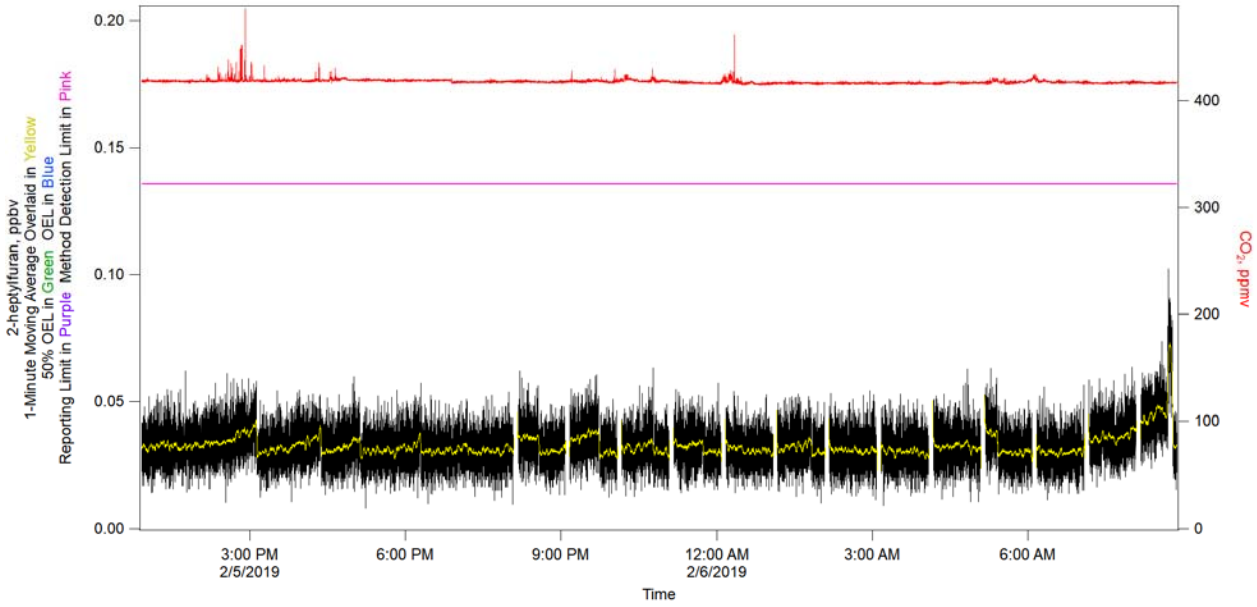

Figure 3-15. 2-heptylfuran.

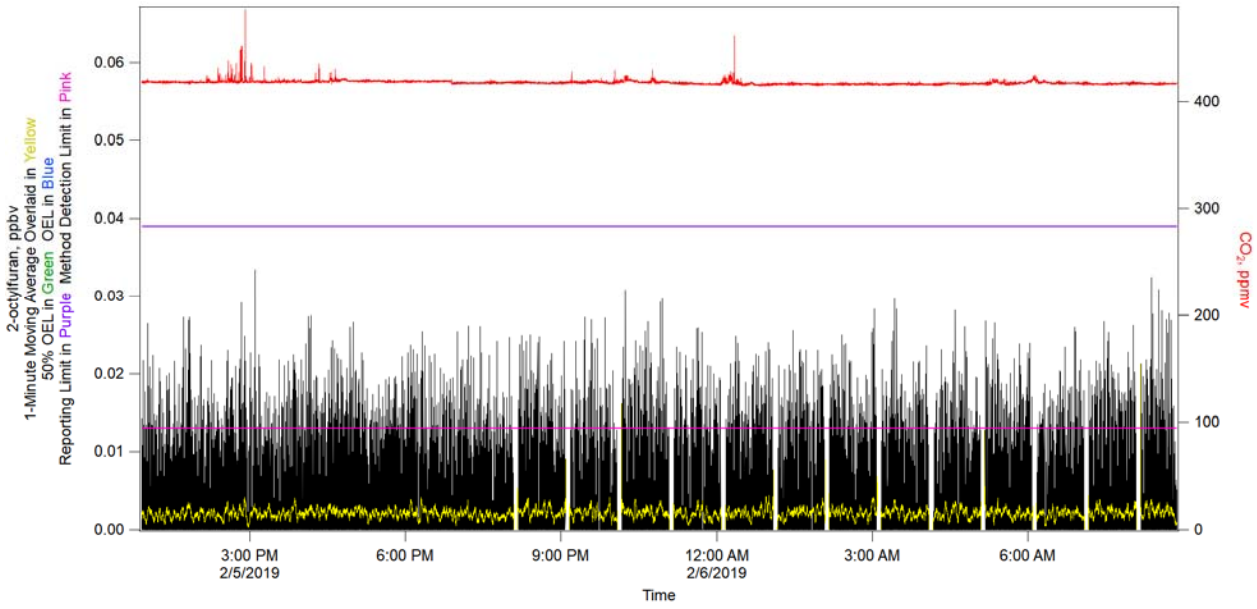

Figure 3-16. 2-octylfuran.

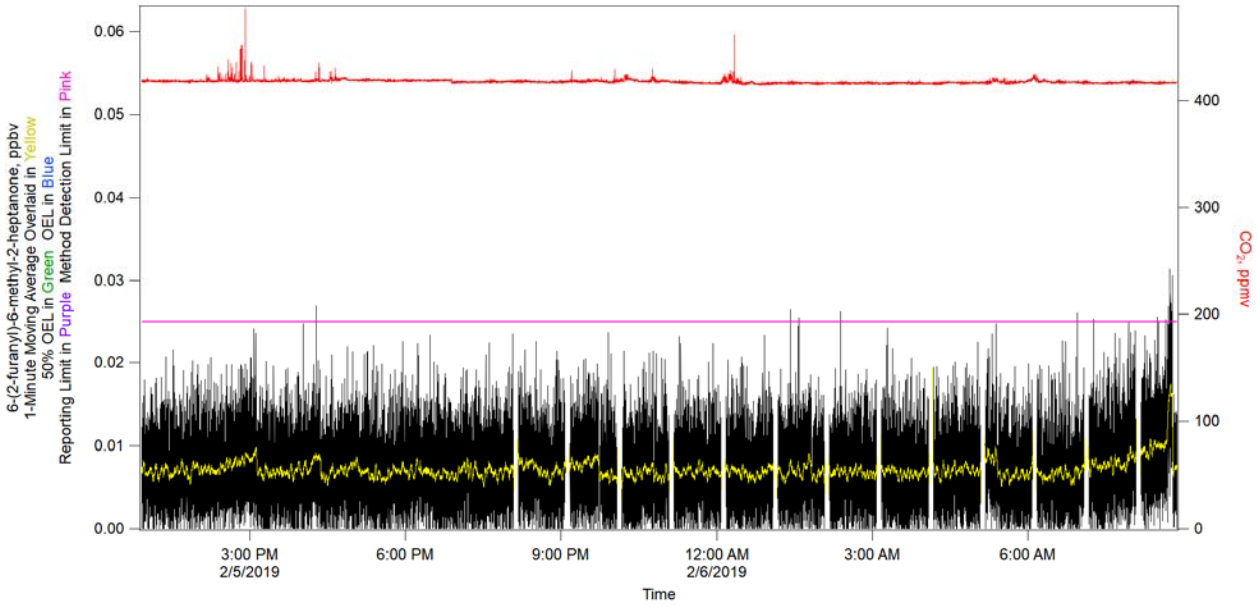

Figure 3-17. 6-(2-furanyl)-6-methyl-2-heptanone.

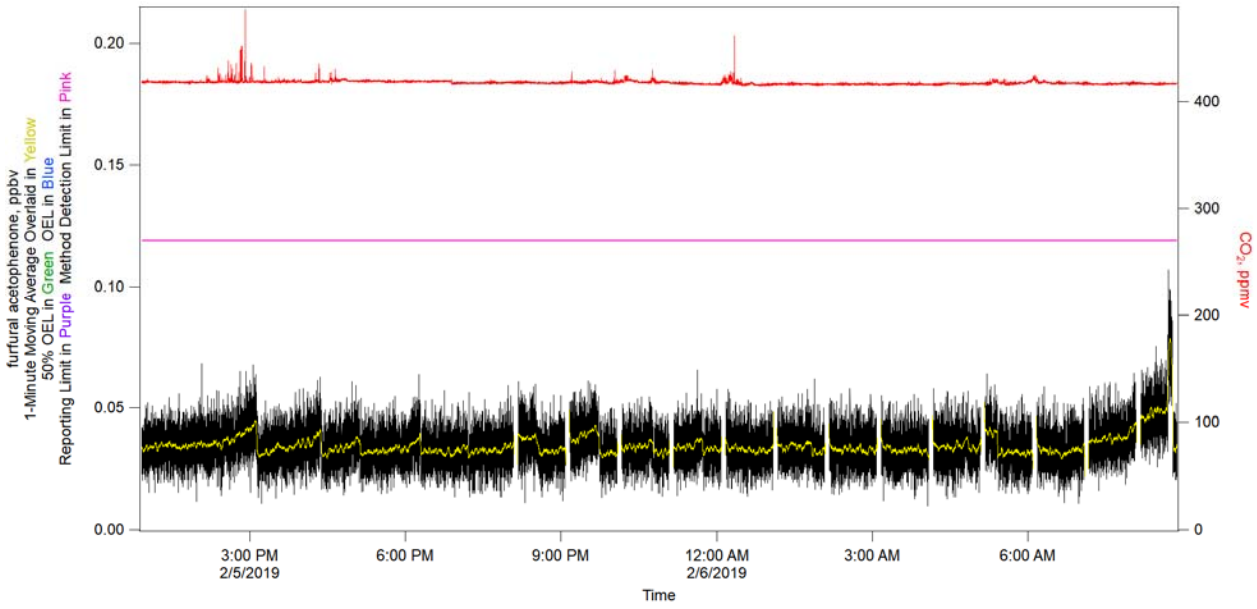

Figure 3-18. Furfural Acetophenone.

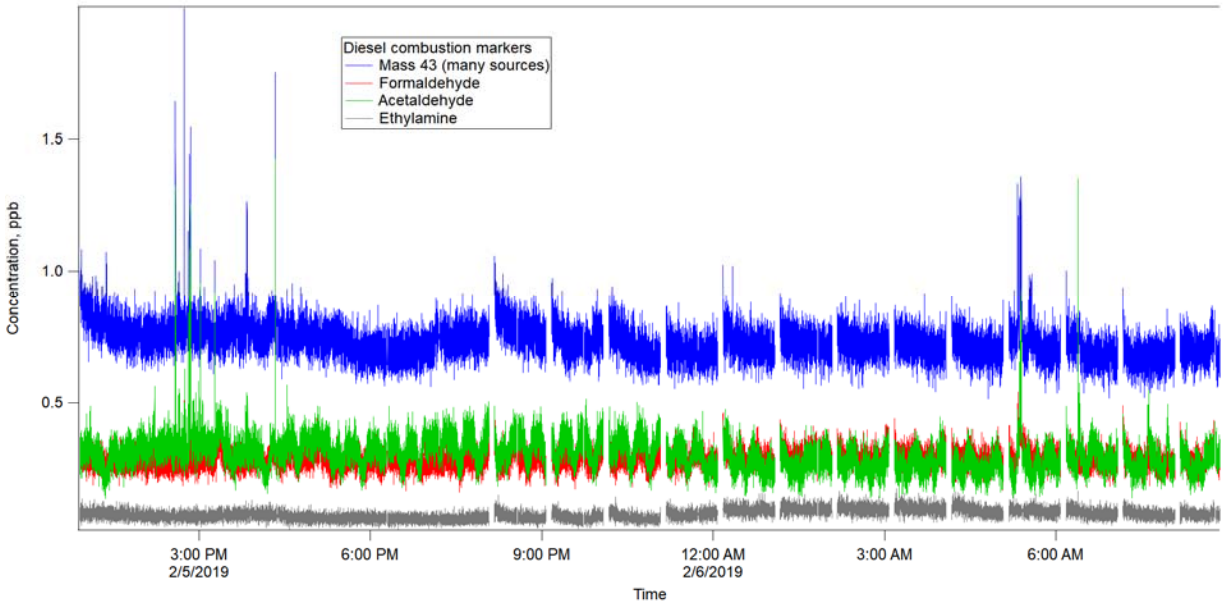

Figure 3-19. Diesel Combustion Markers.

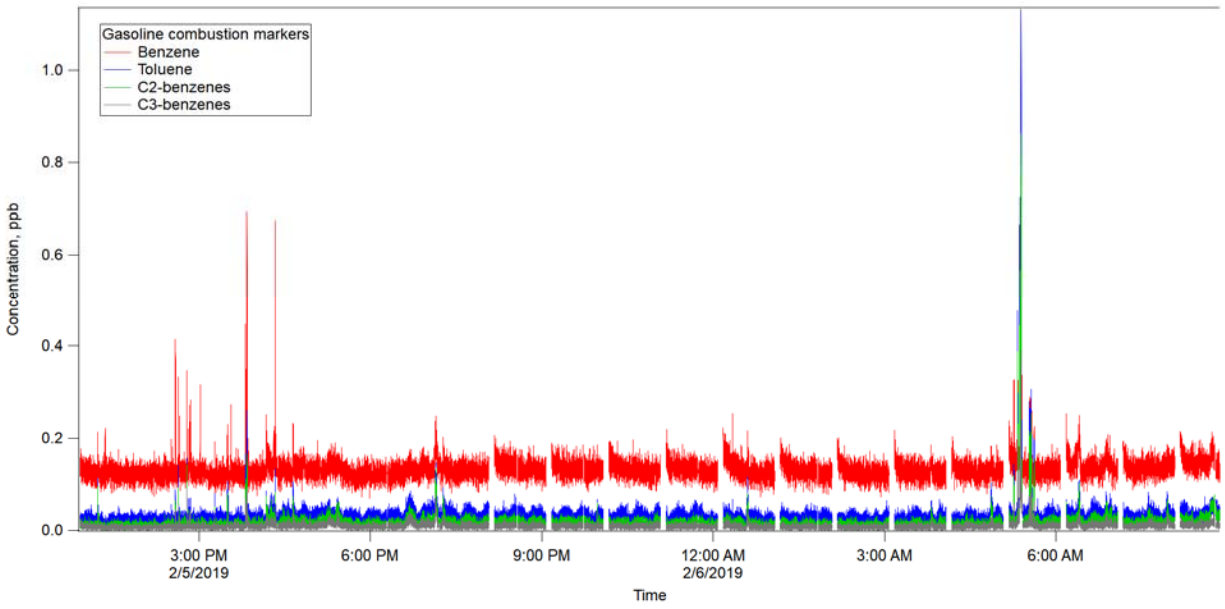

Figure 3-20. Gasoline Combustion Markers.

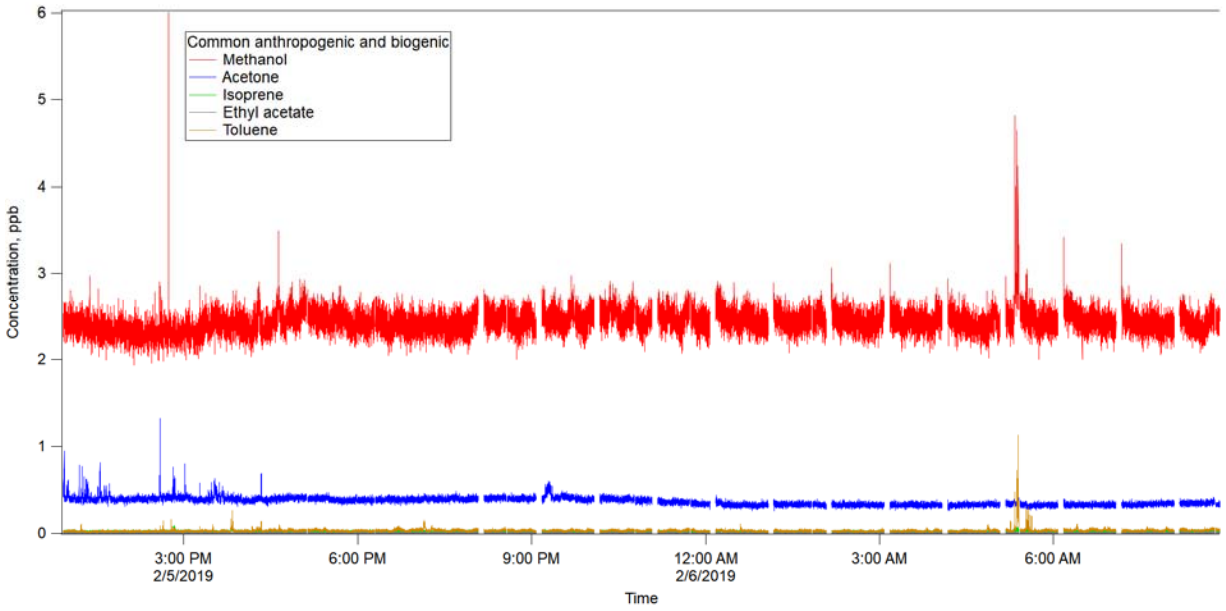

Figure 3-21. Plant and Human Markers.

4.0 FEBRUARY 6, 2019 – FEBRUARY 7, 2019 – STUDY SITE #6

4.1 Quality Assessment

Data from February 6, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004, *Mobile Laboratory Operational Procedure,* was adequately documented and all checks passed the acceptance limits.

4.2 Summary

The ML personnel performed background sampling from February 6, 2019, to February 7, 2019, at study Site 6. Site 6 is located near the intersection of US Highway 395 and Clearwater Avenue in Kennewick, Washington. This site was chosen as a representative of commercial and heavy-traffic emissions as it includes heavy traffic patterns of mixed vehicle types and light commercial activity including a variety of eating establishment. The ML arrived at Site 6 at 10:00 on February 6, 2019. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, the Picarro NH_3 analyzer, and the PTR-MS beginning at 09:14. Collection of confirmatory samples started at 10:14. At 14:55, the ML staff contacted the SME for a third party check before departure.

Figure 4-1. Mobile Laboratory Site #6 for the Duration of the Monitoring Period.

The ML staff returned to Site 6 at 07:50 on February 7, 2019. At 08:02, the confirmatory sorbent samples were disconnected from the sampling station. The ML relocated to Site 3 by 09:23.

Figure 4-2 provides meteorological information obtained from the ML mounted weather station for the time period of sampling at Site 6.

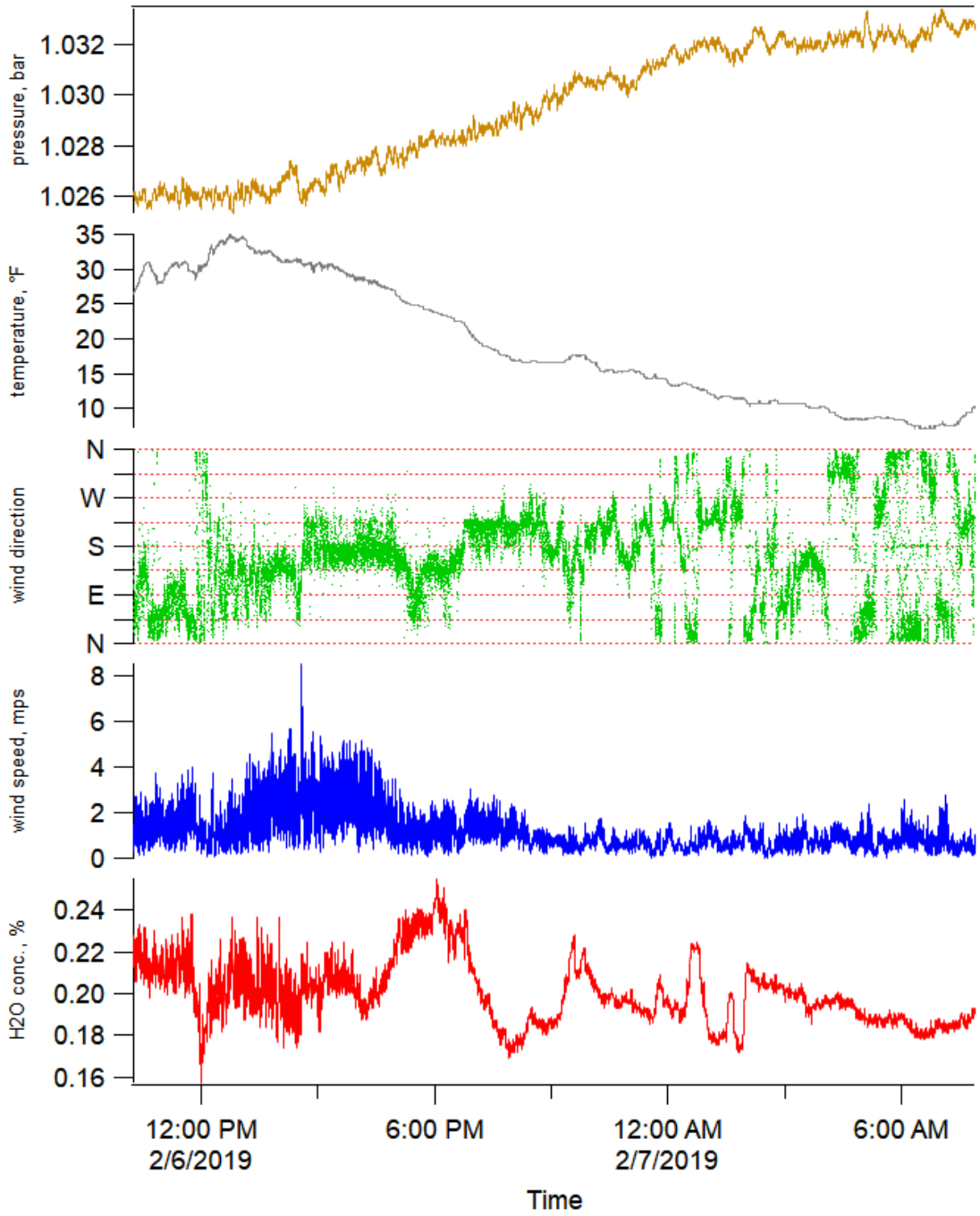

Figure 4-2. Weather Data.

4.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-MS,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were collected on alternative media sources as shown in Table 4-1.

Table 4-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
6	02/06/19	Thermosorb/N	EL33315	10:14	16:14	360
6	02/06/19	Thermosorb/N	EL33312	10:14	16:14	360
6	02/06/19	Carbotrap-300	A052438	10:14	16:14	360
6	02/06/19	Carbotrap-300	A052357	10:14	16:14	360
6	02/06/19	LpDNPH	190206-A	10:14	13:14	180
6	02/06/19	LpDNPH	190206-B	10:14	13:14	180

Table 4-2. Statistical Information for the Monitoring Period of February 6, 2019 – February 7, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	0.010	10.201	3.885	38.083	24.037	9.666
2	formaldehyde	300	1.302	<1.302	N/A	N/A	1.120	<1.302
3	methanol	200000	1.839	3.111†	0.664	21.356	17.379	3.257
4	acetonitrile	20000	0.070	<0.070	N/A	N/A	3.271	<0.070
5	acetaldehyde	25000	2.070	<2.070	N/A	N/A	5.341	<2.070
6	ethylamine	5000	0.055	0.100†	0.030	30.215	0.218	0.104
7	1,3-butadiene	1000	0.122	<0.122	N/A	N/A	0.385	<0.122
8	propanenitrile	6000	0.121	<0.121	N/A	N/A	3.306	<0.121
9	2-propenal	100	0.314	<0.314	N/A	N/A	4.864	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	N/A	N/A	10.965	<0.149
11	methyl isocyanate	20	0.061	<0.061	N/A	N/A	0.513	<0.061
12	methyl nitrite	100	0.117	<0.117	N/A	N/A	0.784	<0.117
13	furan	1	0.053	0.064†	0.037	58.349	0.477	0.058
14	butanenitrile	8000	0.040	<0.040	N/A	N/A	0.962	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	N/A	N/A	N/A*	N/A*
16	butanal	25000	0.063	<0.063	N/A	N/A	0.211	<0.063
17	NDMA**	0.3	0.020	<0.020	N/A	N/A	0.033	<0.020
18	benzene	500	0.230	0.419†	0.267	63.778	5.391	0.378
19	2,4-pentadienenitrile + pyridine	300, 1000	0.084	<0.084	N/A	N/A	0.393	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	N/A	N/A	0.085	<0.050
21	2-methylfuran	1	0.046	0.055†	0.031	56.160	0.282	0.049
22	pentanenitrile	6000	0.029	<0.029	N/A	N/A	0.196	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	N/A	N/A	0.521	<0.048
24	NEMA**	0.3	0.027	<0.027	N/A	N/A	0.035	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	N/A	N/A	0.188	<0.035
26	hexanenitrile	6000	0.029	<0.029	N/A	N/A	0.070	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	N/A	N/A	0.050	<0.030
28	NDEA**	0.1	0.023	<0.023	N/A	N/A	0.033	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	N/A	N/A	0.104	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	N/A	N/A	0.692	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	N/A	N/A	0.139	<0.035

Table 4-2. Statistical Information for the Monitoring Period of February 6, 2019 – February 7, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.029	<0.029	N/A	N/A	0.054	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	N/A	N/A	0.047	<0.032
34	NMOR**	0.6	0.017	<0.017	N/A	N/A	0.154	<0.017
35	butyl nitrate	2500	0.019	<0.019	N/A	N/A	0.309	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	N/A	N/A	0.053	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	N/A	N/A	0.035	<0.028
38	2-pentylfuran	1	0.029	<0.029	N/A	N/A	0.050	<0.029
39	biphenyl	200	0.031	<0.031	N/A	N/A	0.041	<0.031
40	2-heptylfuran	1	0.136	<0.136	N/A	N/A	0.119	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	N/A	N/A	0.054	<0.184
42	2-octylfuran	1	0.013	<0.013	N/A	N/A	0.044	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	N/A	N/A	0.039	<0.132
44	PCB	1000	0.139	<0.139	N/A	N/A	0.052	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	N/A	N/A	0.037	<0.025
46	furfural acetophenone	1	0.119	<0.119	N/A	N/A	0.119	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.848 ppb and the median value was <0.034 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers.							
**	Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.].							
ND	COPC Averages below the MDL.							
†	COPC Averages between the RL and the MDL.							
	COPC Averages >100% of the OEL.							
	COPC Averages 50-100% of the OEL.							
	COPC Averages 10-50% of the OEL.							

Figure 4-3 through Figure 4-21 display a selection of 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period February 6, 2019, to February 7, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

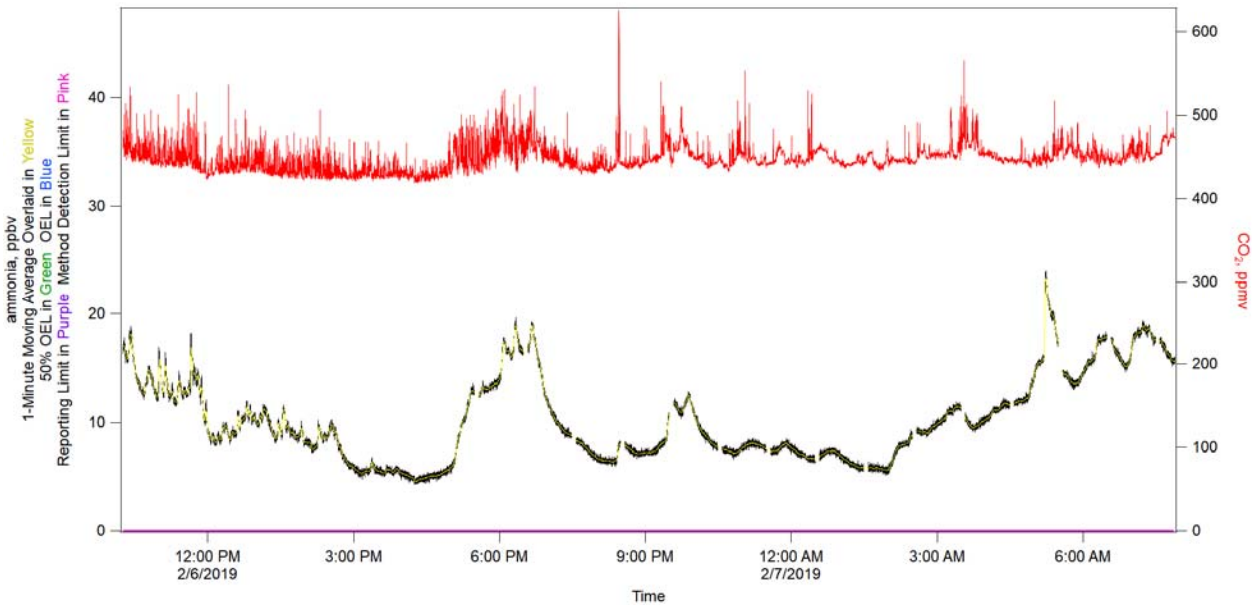

Figure 4-3. Ammonia.

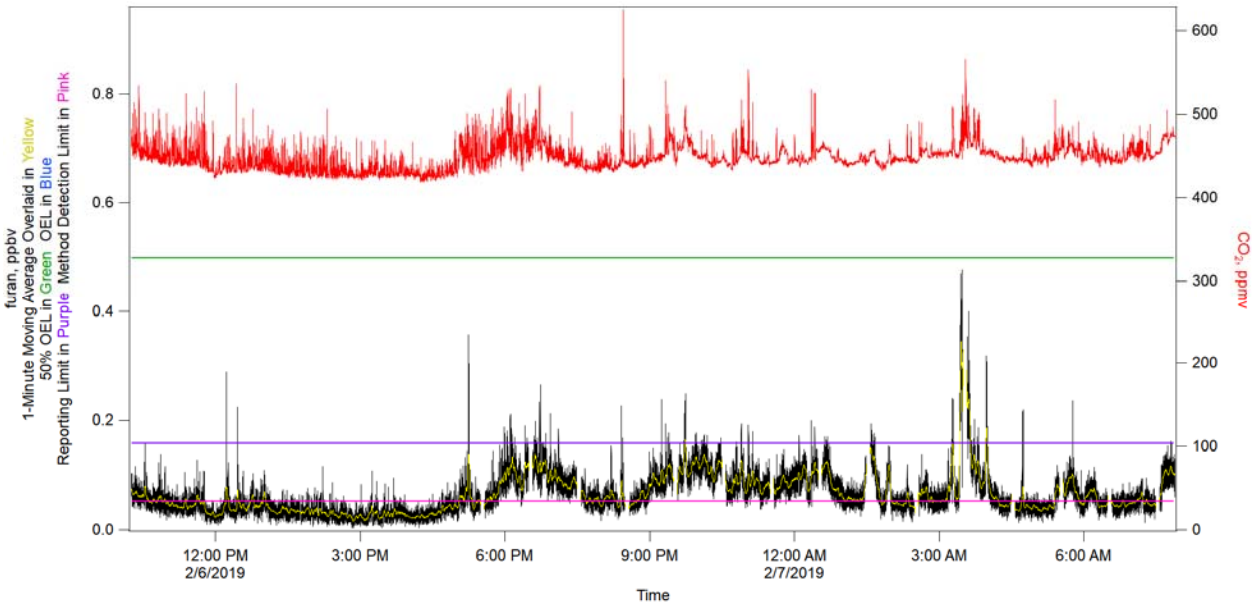

Figure 4-4. Furan.

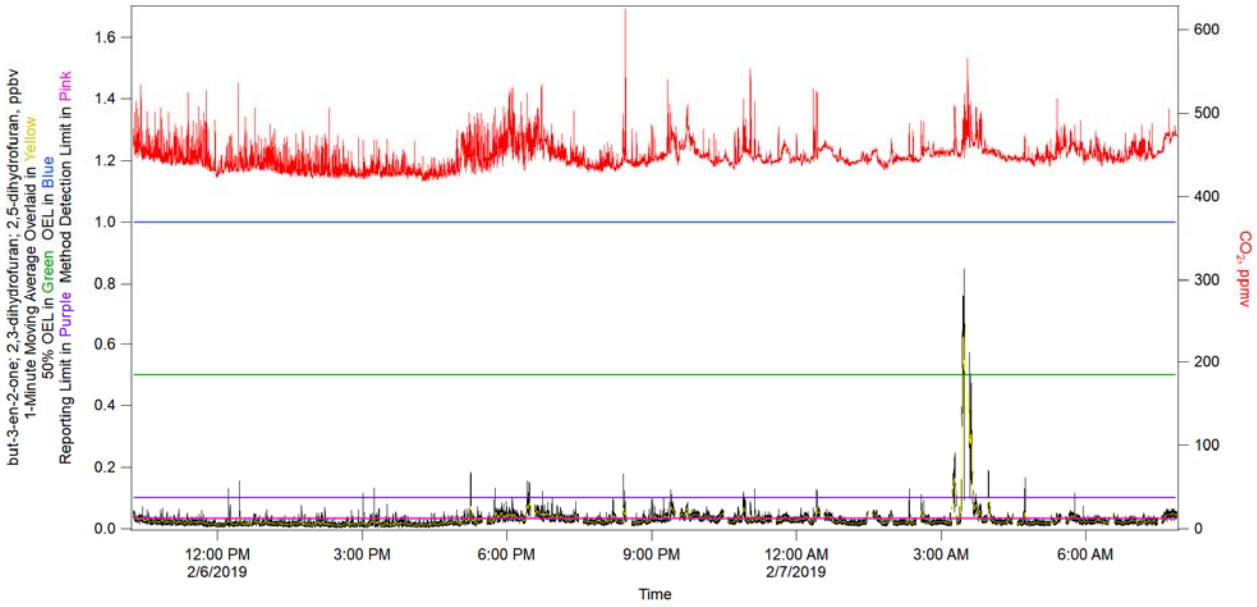

Figure 4-5. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

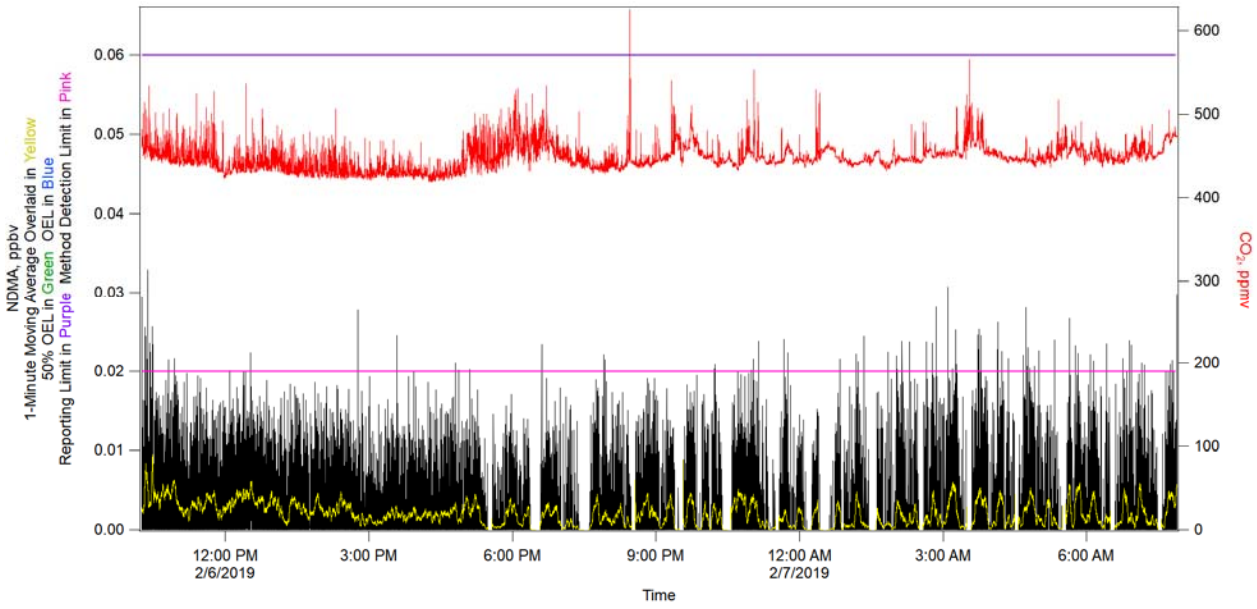

Figure 4-6. N-nitrosodimethylamine (NDMA).

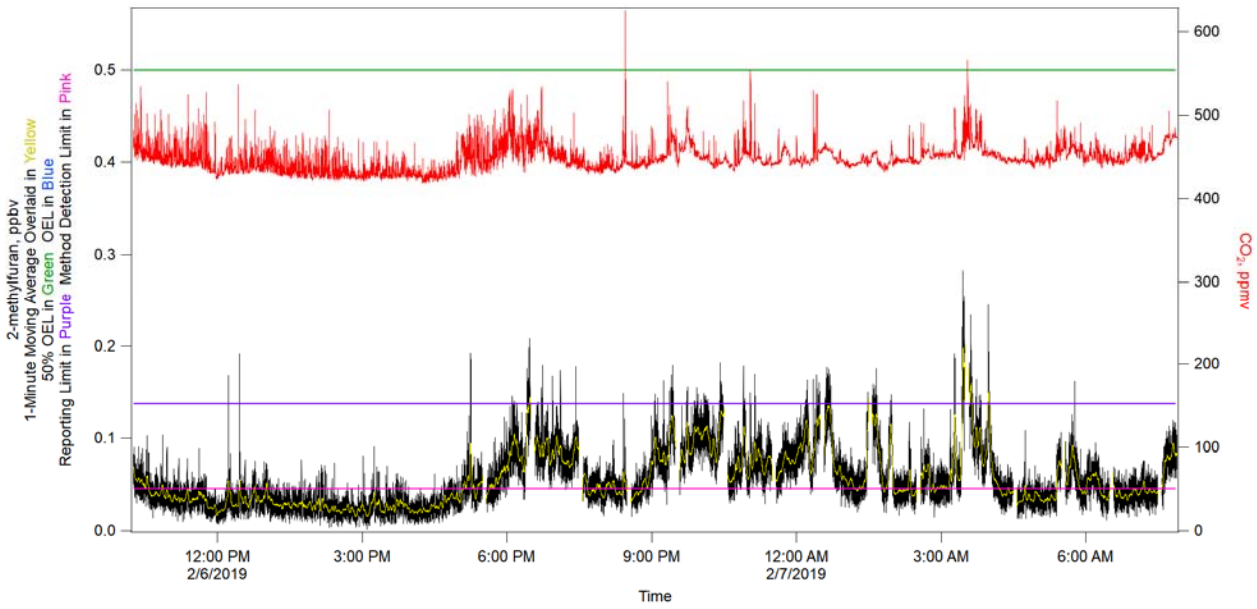

Figure 4-7. 2-methylfuran.

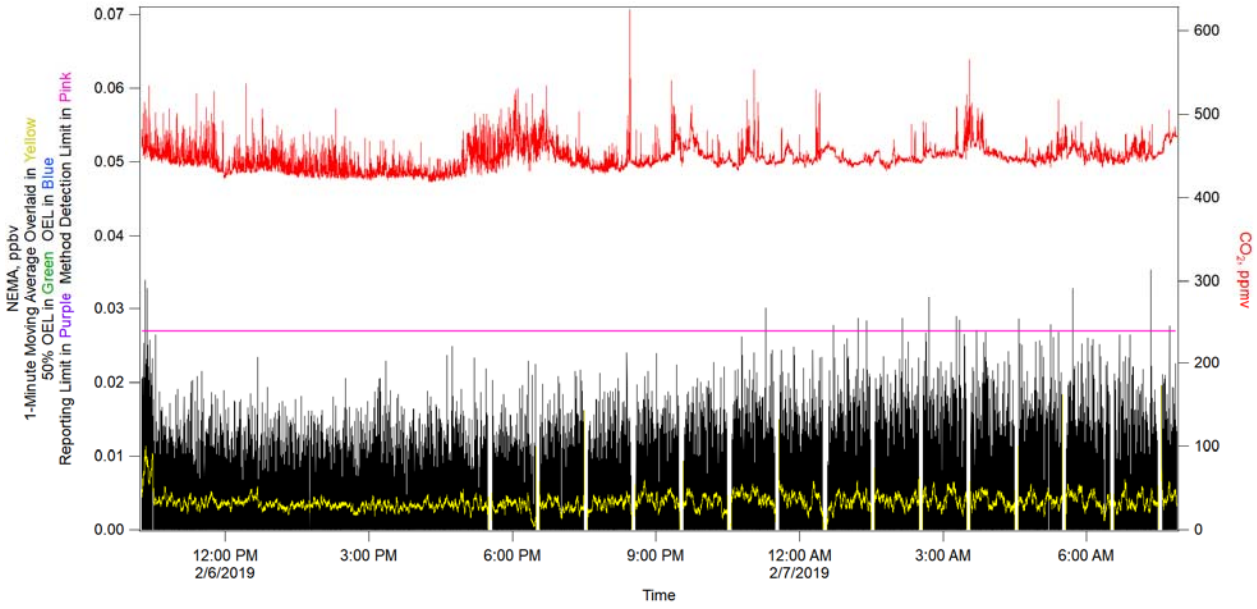

Figure 4-8. N-nitrosomethylethylamine (NEMA).

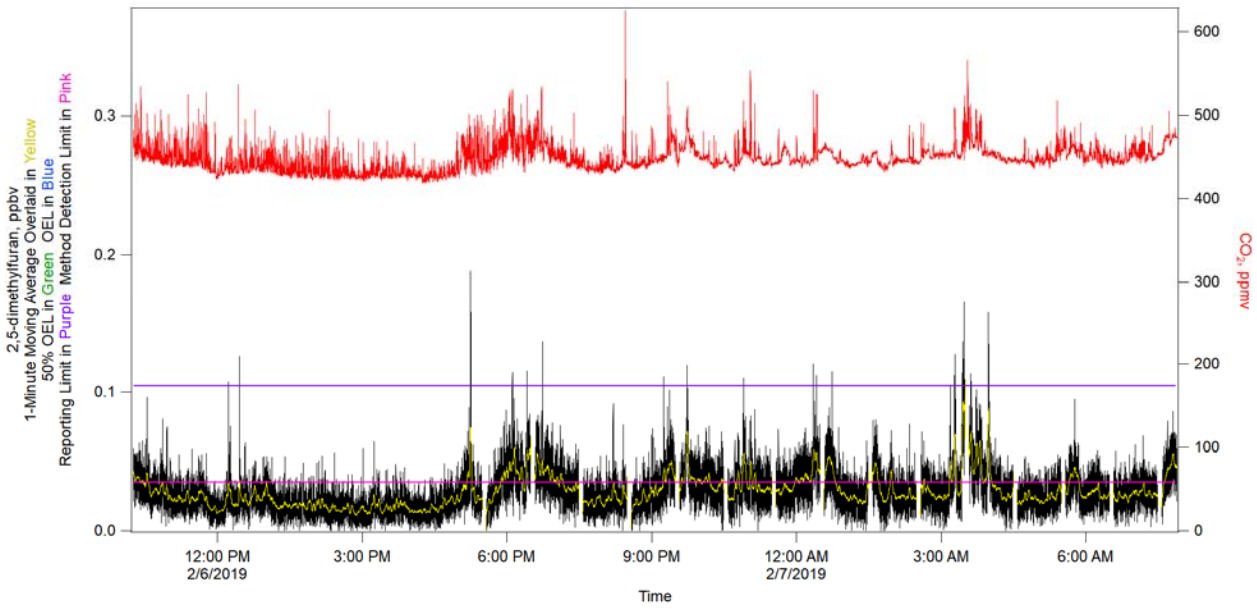

Figure 4-9. 2,5-dimethylfuran.

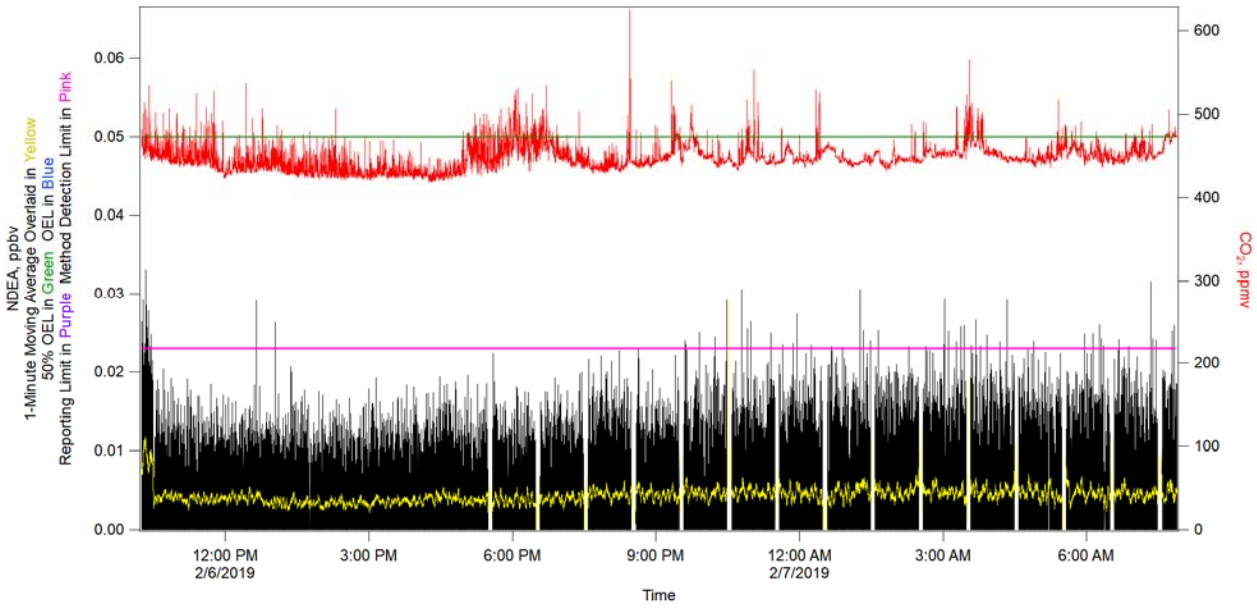

Figure 4-10. N-nitrosodiethylamine (NDEA).

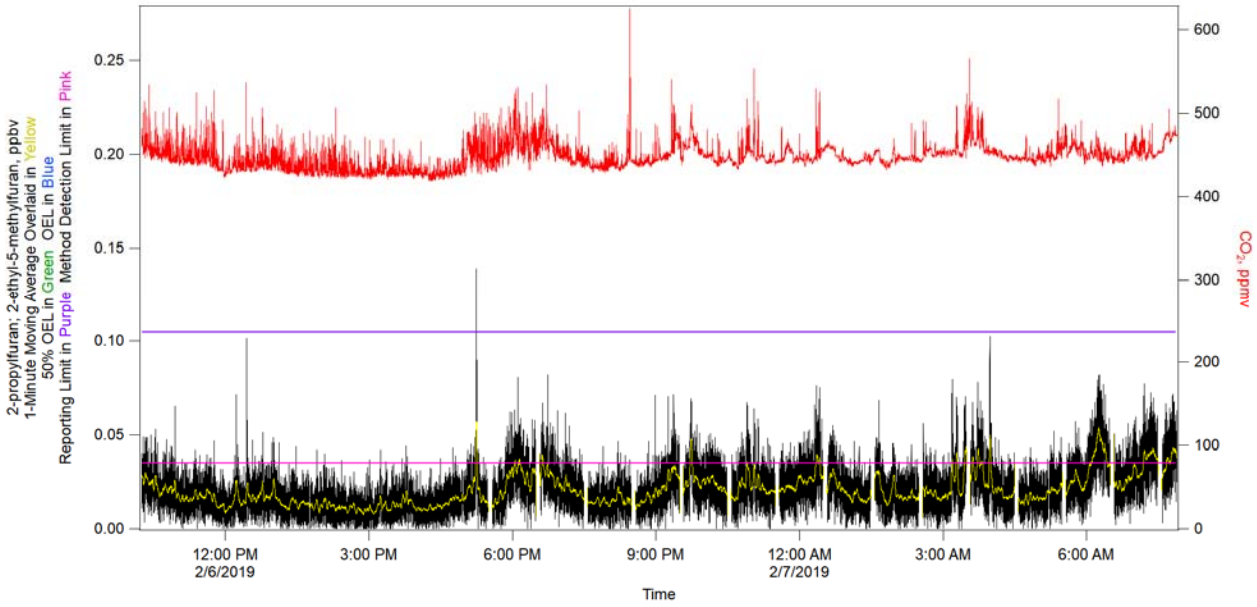

Figure 4-11. 2-propylfuran + 2-ethyl-5-methylfuran.

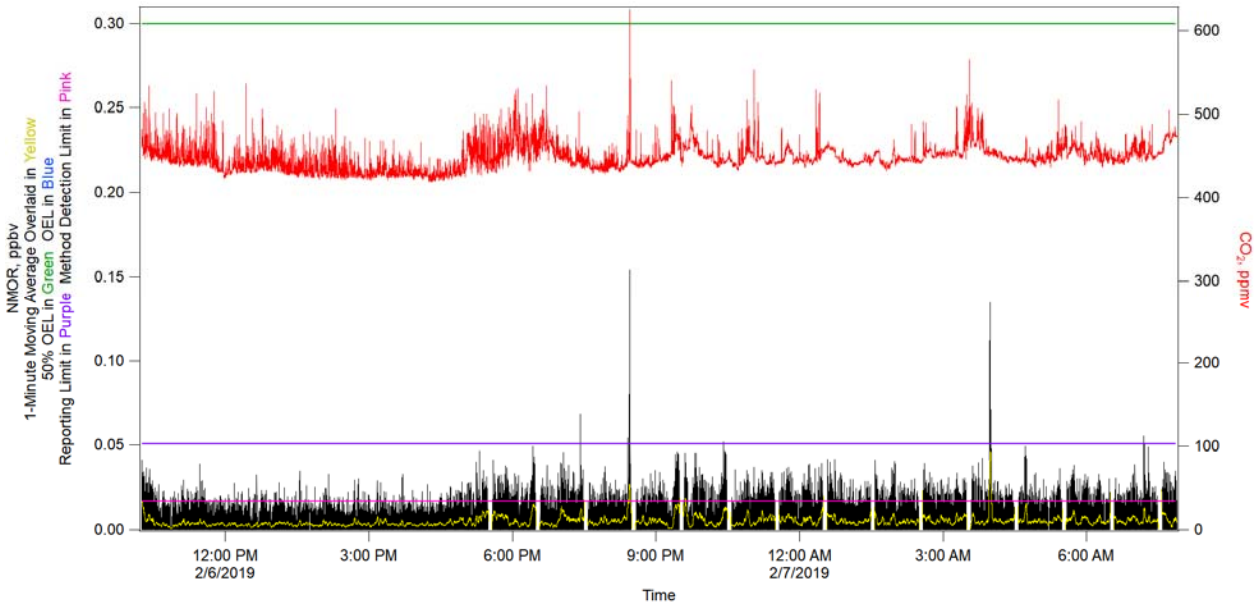

Figure 4-12. N-nitrosomorpholine (NMOR).

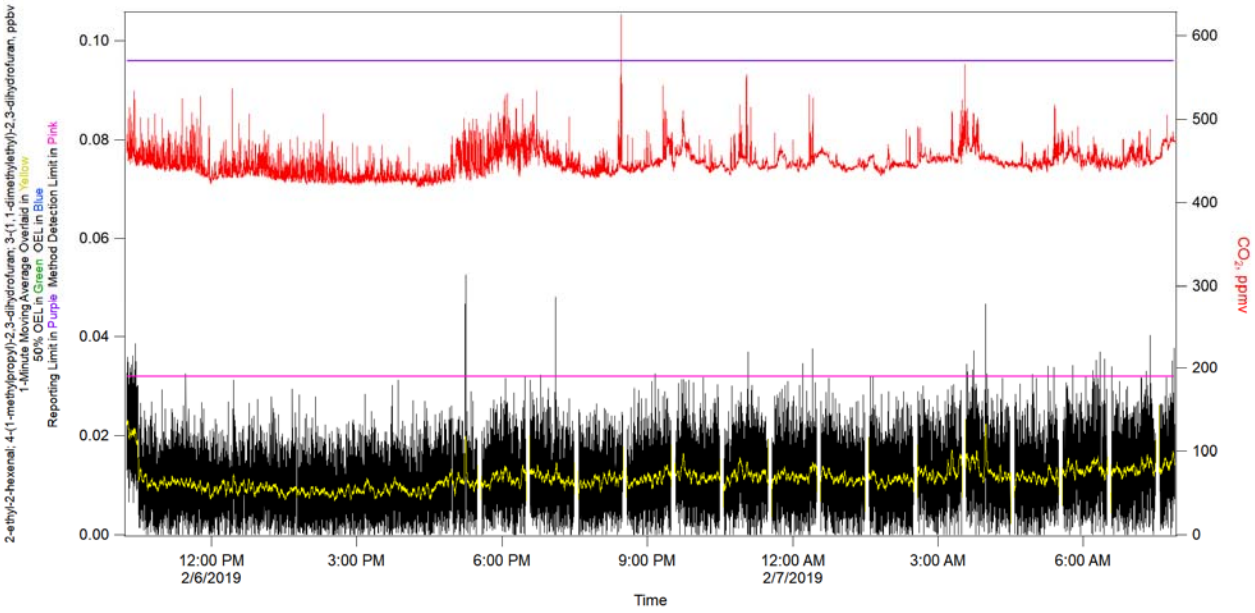

Figure 4-13. 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1-1-dimethylethyl)-2,3-dihydrofuran.

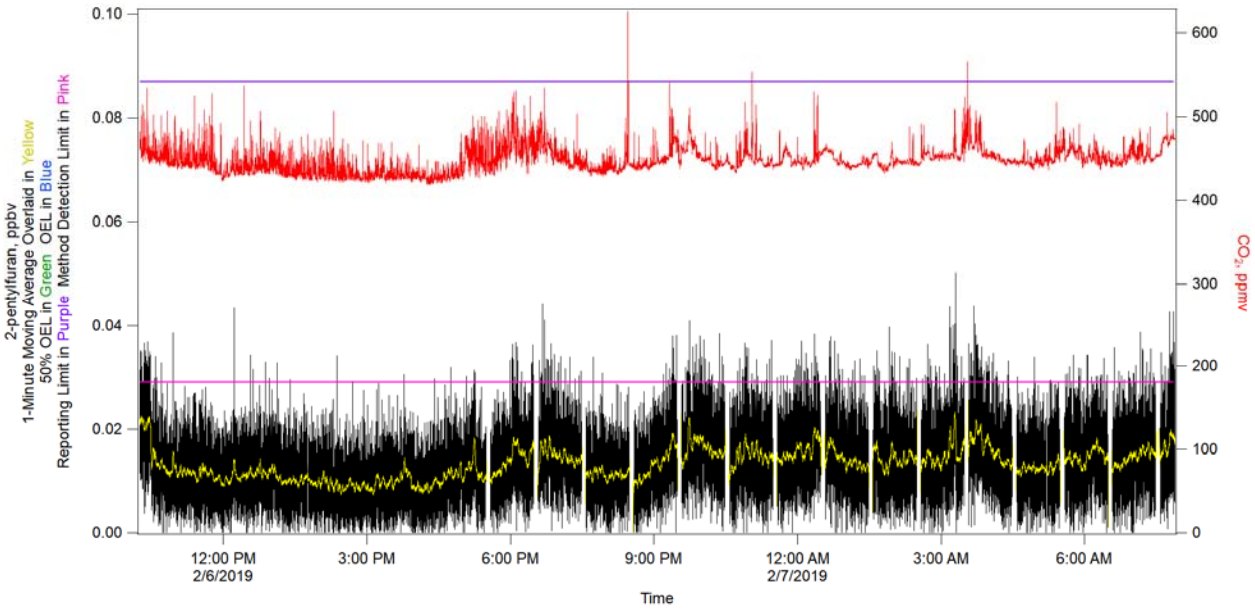

Figure 4-14. 2-pentylfuran.

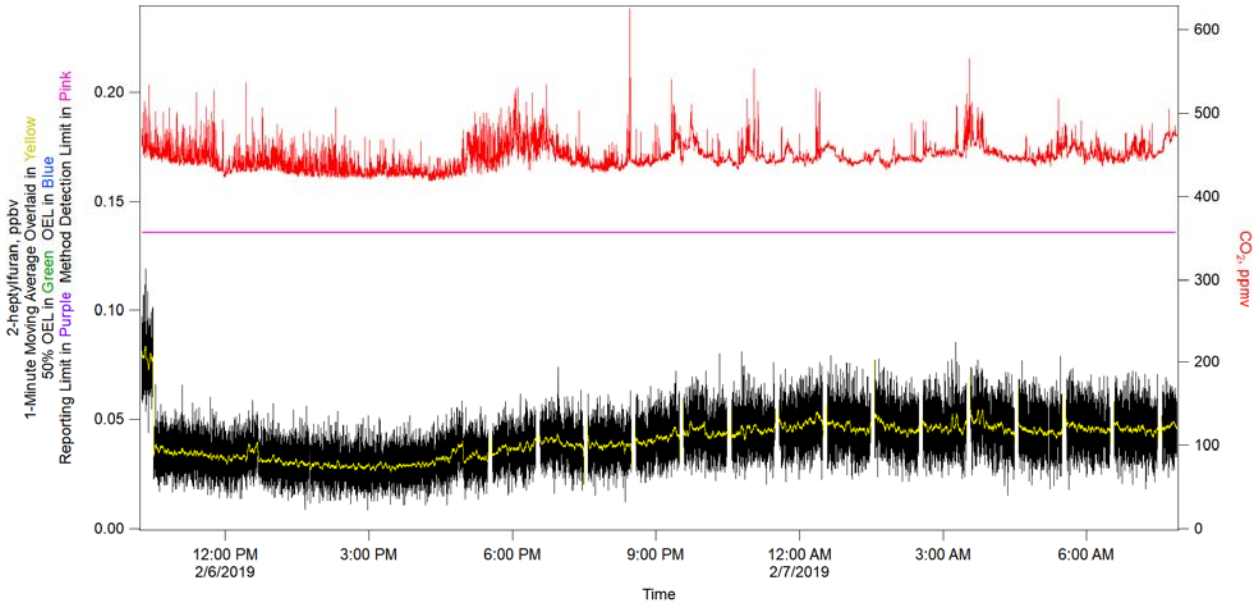

Figure 4-15. 2-heptylfuran.

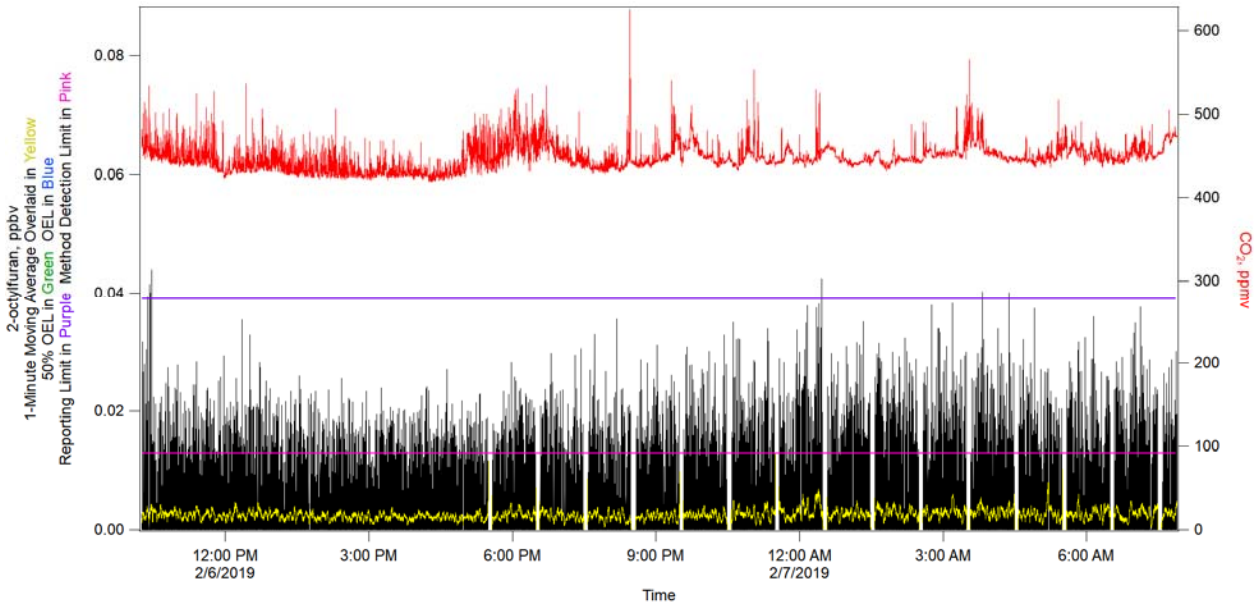

Figure 4-16. 2-octylfuran.

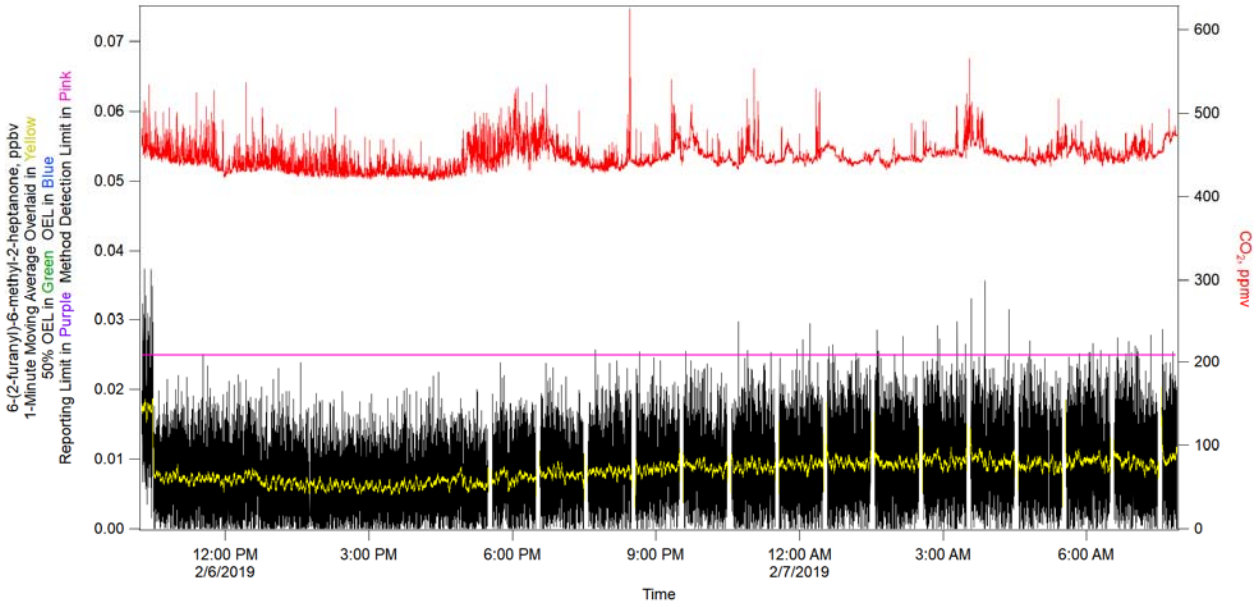

Figure 4-17. 6-(2-furanyl)-6-methyl-2-heptanone.

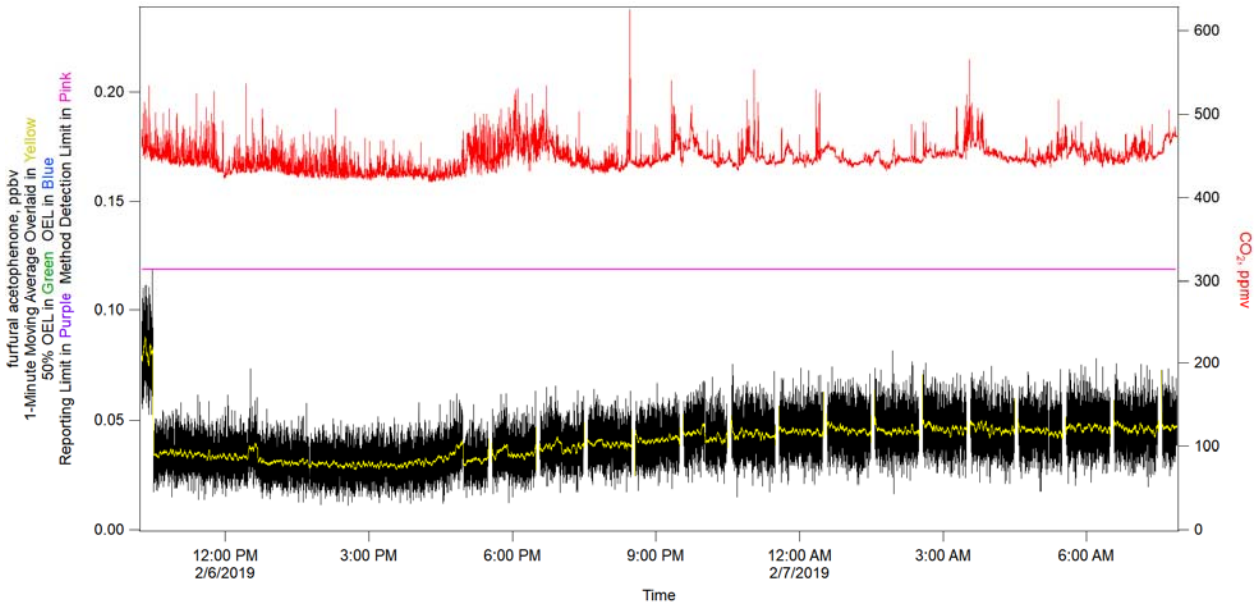

Figure 4-18. Furfural Acetophenone.

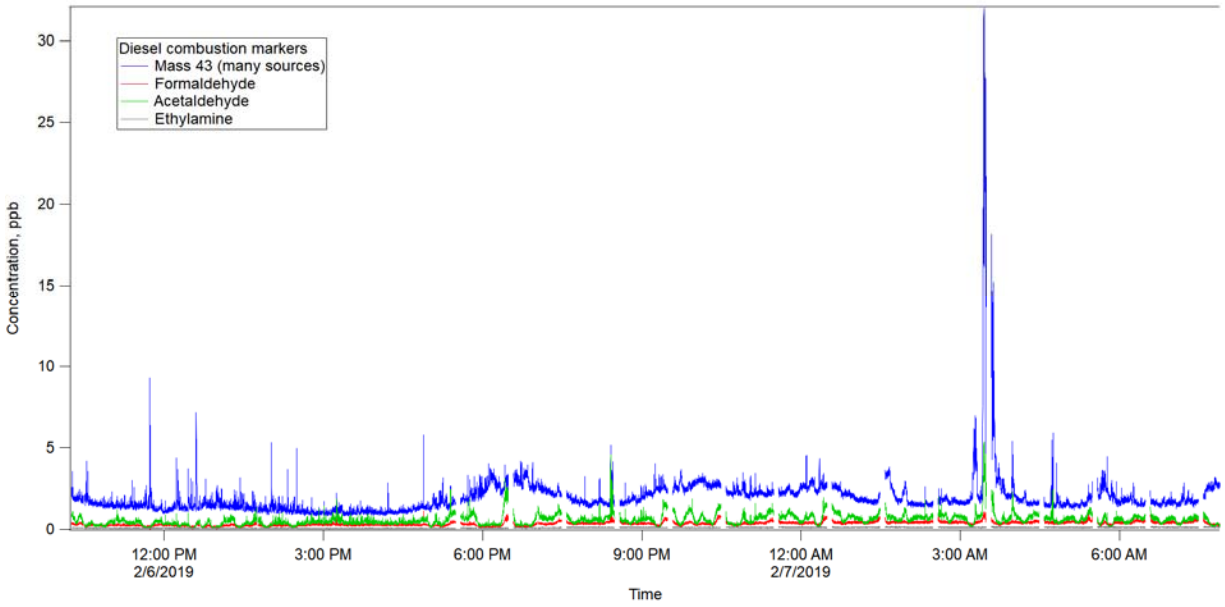

Figure 4-19. Diesel Combustion Markers.

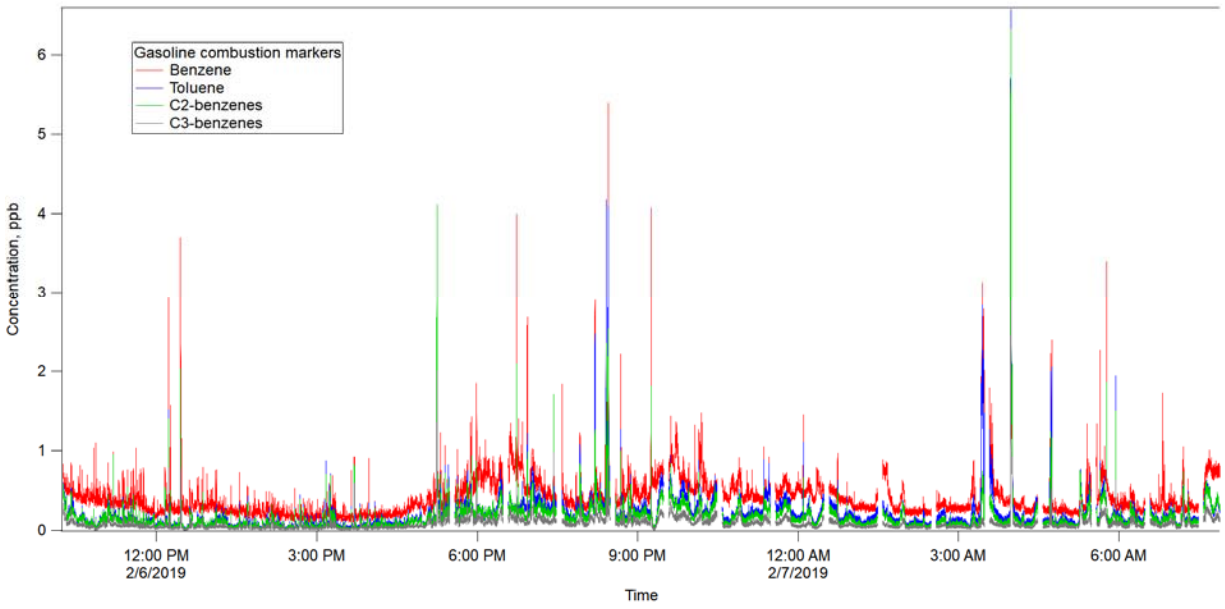

Figure 4-20. Gasoline Combustion Markers.

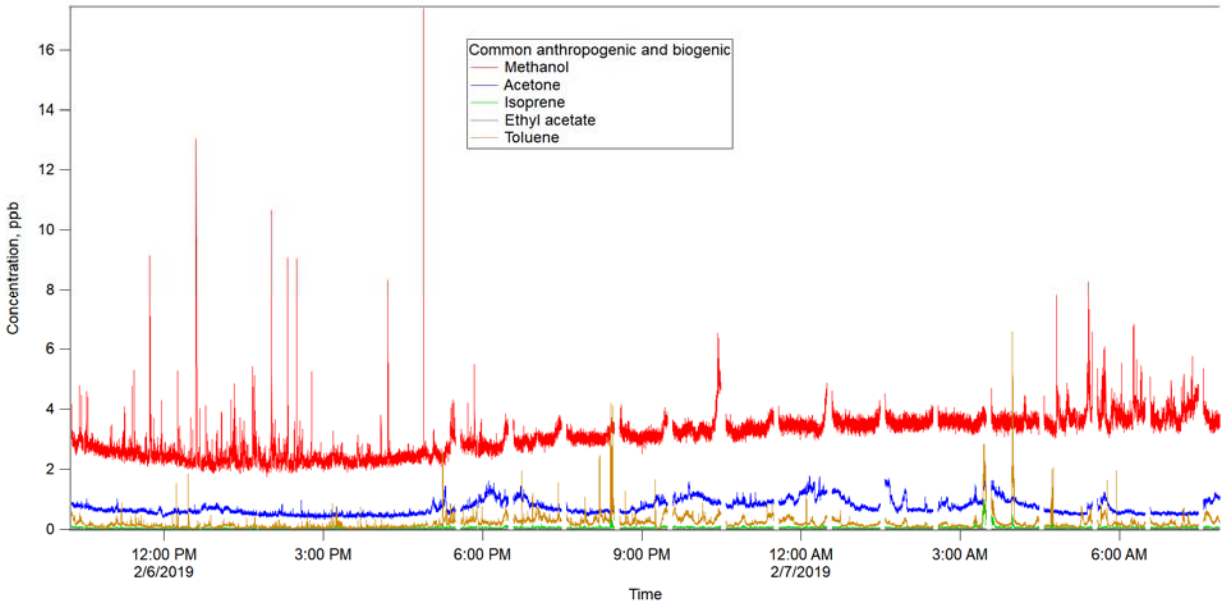

Figure 4-21. Plant and Human Markers.

5.0 FEBRUARY 7, 2019 – FEBRUARY 8, 2019 – STUDY SITE #3

5.1 Quality Assessment

Data from February 7, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004 was adequately documented and all checks passed the acceptance limits.

5.2 Summary

The ML personnel performed background sampling from February 7, 2019, to February 8, 2019, at study Site 3. Site 3 is located near the corner of 4th and Buffalo just to the west of the 242-A Evaporator. This site historically has seen the occurrence of several Abnormal Operating Procedure (AOP)-015 events (reports of unusual odors). The ML arrived at Site 3 at 09:23 on February 7, 2019. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, the Picarro NH_3 analyzer, and the PTR-MS beginning at 8:10. Collection of confirmatory samples started at 09:39. At 14:28, the ML staff contacted the SME for a third-party check before departure. The SME performed a remote start of NO^+ automation mode at 16:02.

Figure 5-1. Mobile Laboratory Site #3 for the Duration of the Monitoring Period.

The ML staff returned to Site 3 at 08:10. At 08:15, the confirmatory sorbent samples were disconnected from the sampling station. The ML relocated to Site 5 by 08:38.

Figure 5-2 provides meteorological information obtained from the ML mounted weather station for the time period of sampling at Site 3.

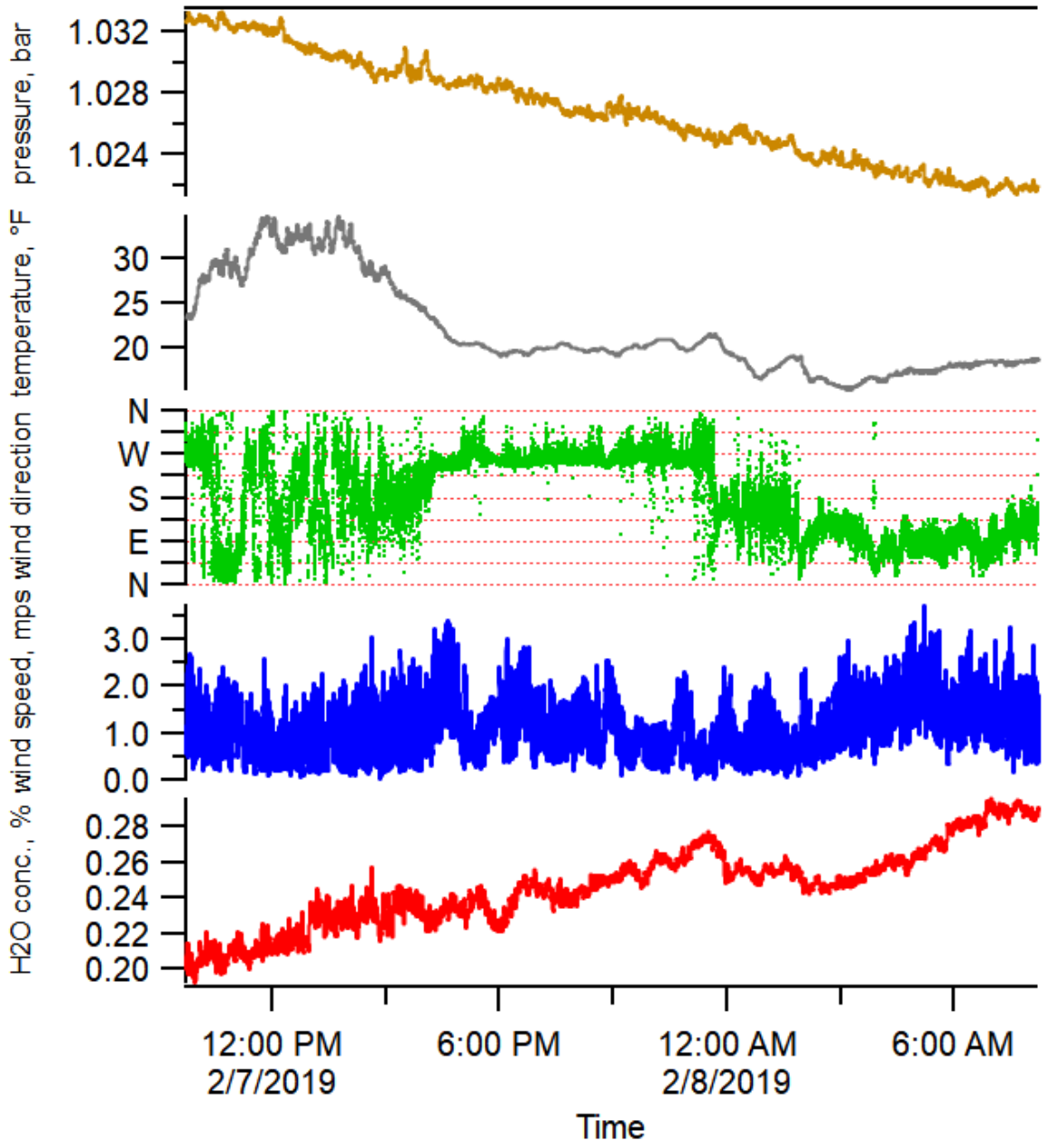

Figure 5-2. Weather Data.

5.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-MS,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were collected on alternative media sources as shown in Table 5-1.

Table 5-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
3	02/07/19	Thermosorb/N	EL33303	09:39	15:39	360
3	02/07/19	Carbotrap-300	A060174	09:39	15:39	360
3	02/07/19	LpDNPH	190207-A	09:39	12:39	180

Table 5-2. Statistical Information for the Monitoring Period of February 7, 2019 – February 8, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	0.010	10.359	5.897	56.930	23.919	7.859
2	formaldehyde	300	1.302	<1.302	N/A	N/A	0.715	<1.302
3	methanol	200000	1.839	2.288†	0.251	10.984	7.715	2.286
4	acetonitrile	20000	0.070	<0.070	N/A	N/A	2.875	<0.070
5	acetaldehyde	25000	2.070	<2.070	N/A	N/A	2.555	<2.070
6	ethylamine	5000	0.055	0.060†	0.017	27.647	0.260	0.059
7	1,3-butadiene	1000	0.122	<0.122	N/A	N/A	0.077	<0.122
8	propanenitrile	6000	0.121	<0.121	N/A	N/A	0.617	<0.121
9	2-propenal	100	0.314	<0.314	N/A	N/A	0.876	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	N/A	N/A	1.149	<0.149
11	methyl isocyanate	20	0.061	<0.061	N/A	N/A	0.105	<0.061
12	methyl nitrite	100	0.117	<0.117	N/A	N/A	1.155	<0.117
13	furan	1	0.053	<0.053	N/A	N/A	0.168	<0.053
14	butanenitrile	8000	0.040	<0.040	N/A	N/A	0.456	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	N/A	N/A	N/A*	N/A*
16	butanal	25000	0.063	<0.063	N/A	N/A	0.150	<0.063
17	NDMA**	0.3	0.020	<0.020	N/A	N/A	0.048	<0.020
18	benzene	500	0.230	<0.230	N/A	N/A	2.755	<0.230
19	2,4-pentadienenitrile + pyridine	300, 1000	0.084	<0.084	N/A	N/A	0.201	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	N/A	N/A	0.078	<0.050
21	2-methylfuran	1	0.046	<0.046	N/A	N/A	0.139	<0.046
22	pentanenitrile	6000	0.029	<0.029	N/A	N/A	0.062	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	N/A	N/A	0.174	<0.048
24	NEMA**	0.3	0.027	<0.027	N/A	N/A	0.039	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	N/A	N/A	0.124	<0.035
26	hexanenitrile	6000	0.029	<0.029	N/A	N/A	0.053	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	N/A	N/A	0.049	<0.030
28	NDEA**	0.1	0.023	<0.023	N/A	N/A	0.038	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	N/A	N/A	0.130	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	N/A	N/A	1.193	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	N/A	N/A	0.105	<0.035

Table 5-2. Statistical Information for the Monitoring Period of February 7, 2019 – February 8, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.029	<0.029	N/A	N/A	0.041	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	N/A	N/A	0.049	<0.032
34	NMOR**	0.6	0.017	<0.017	N/A	N/A	0.040	<0.017
35	butyl nitrate	2500	0.019	<0.019	N/A	N/A	0.046	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	N/A	N/A	0.048	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	N/A	N/A	0.038	<0.028
38	2-pentylfuran	1	0.029	<0.029	N/A	N/A	0.050	<0.029
39	biphenyl	200	0.031	<0.031	N/A	N/A	0.046	<0.031
40	2-heptylfuran	1	0.136	<0.136	N/A	N/A	0.170	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	N/A	N/A	0.060	<0.184
42	2-octylfuran	1	0.013	<0.013	N/A	N/A	0.053	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	N/A	N/A	0.036	<0.132
44	PCB	1000	0.139	<0.139	N/A	N/A	0.065	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	N/A	N/A	0.042	<0.025
46	furfural acetophenone	1	0.119	<0.119	N/A	N/A	0.178	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.173 ppb and the median value was <0.034 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers.							
**	Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.].							
ND	COPC Averages below the MDL.							
†	COPC Averages between the RL and the MDL.							
	COPC Averages >100% of the OEL.							
	COPC Averages 50-100% of the OEL.							
	COPC Averages 10-50% of the OEL.							

Figure 5-3 through Figure 5-21 display a selection of 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period February 7, 2019, to February 8, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

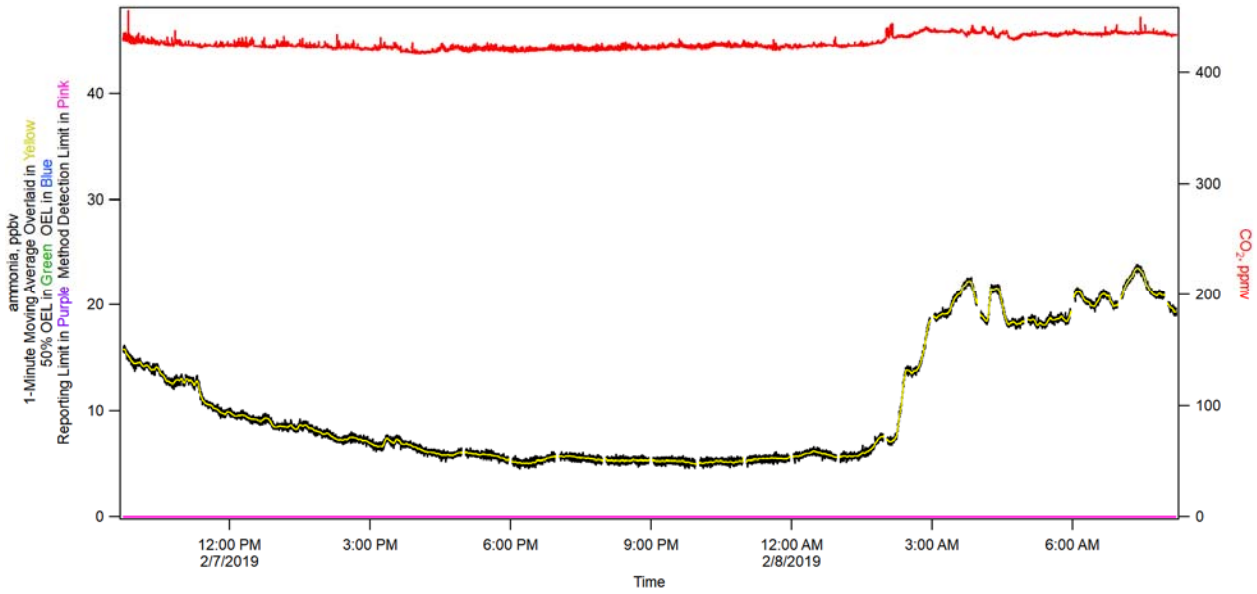

Figure 5-3. Ammonia.

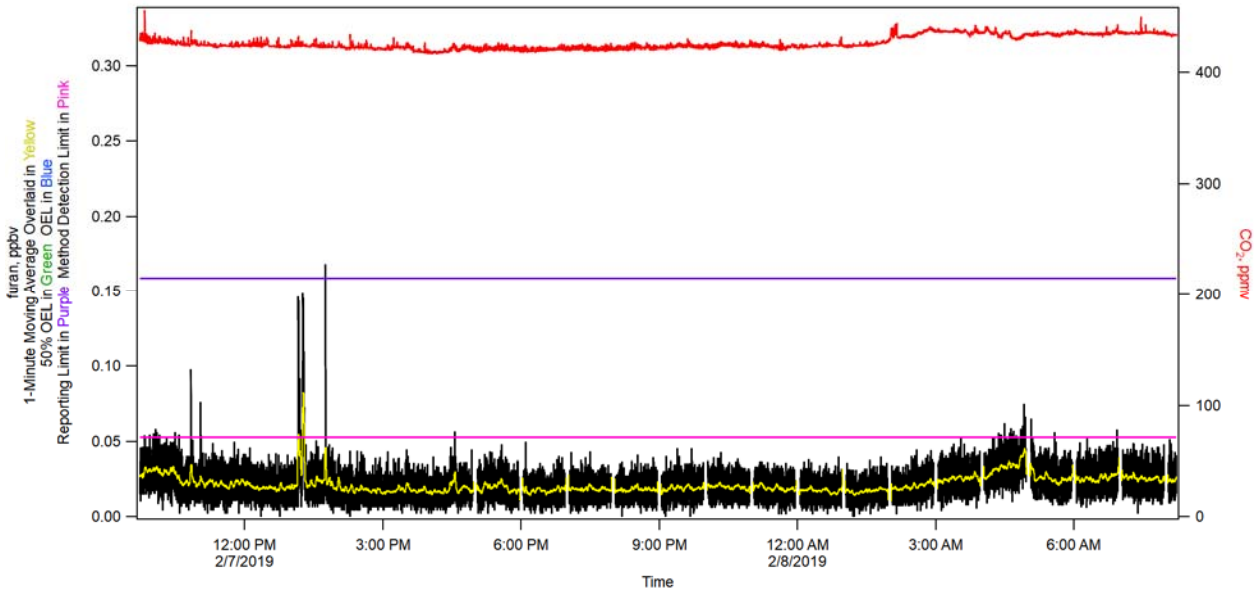

Figure 5-4. Furan.

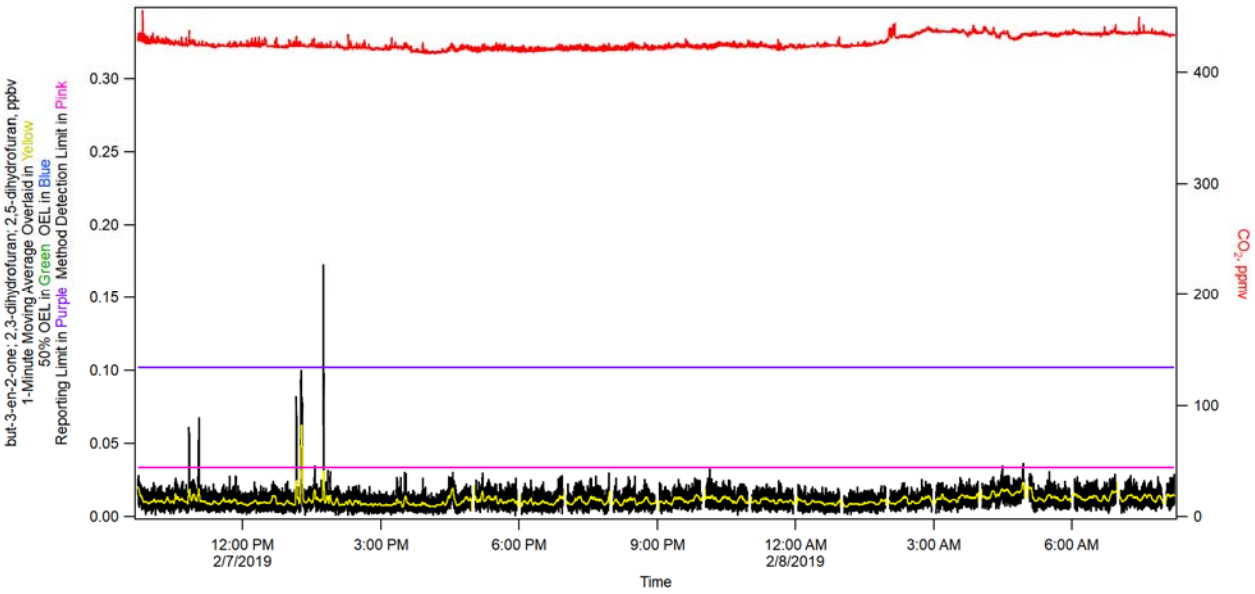

Figure 5-5. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

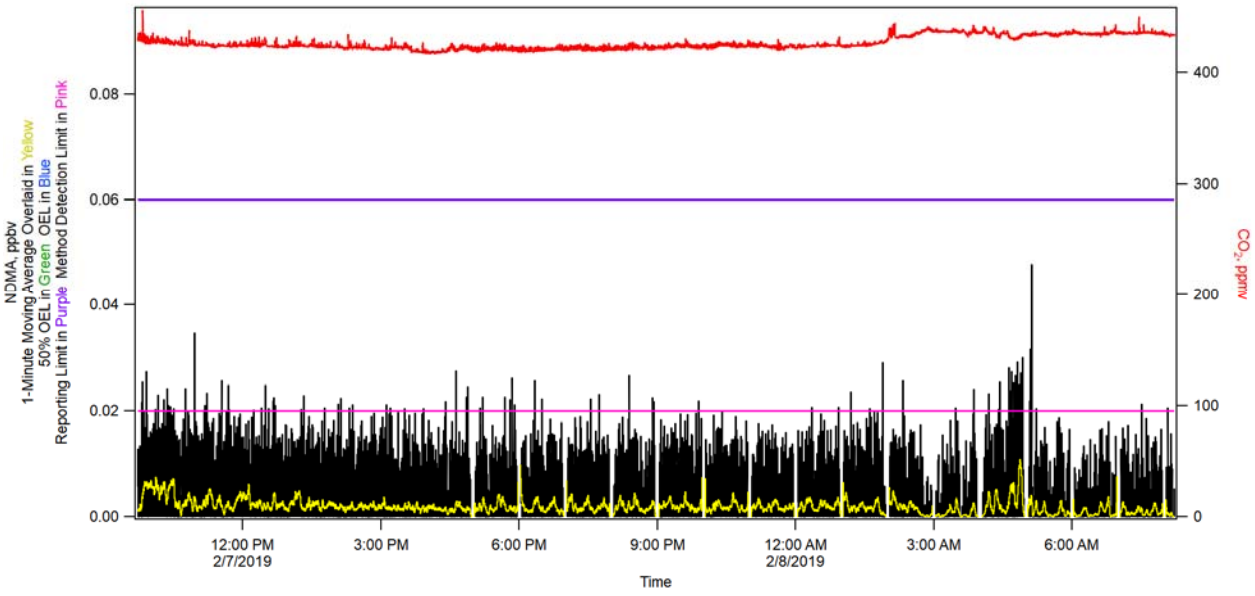

Figure 5-6. N-nitrosodimethylamine (NDMA).

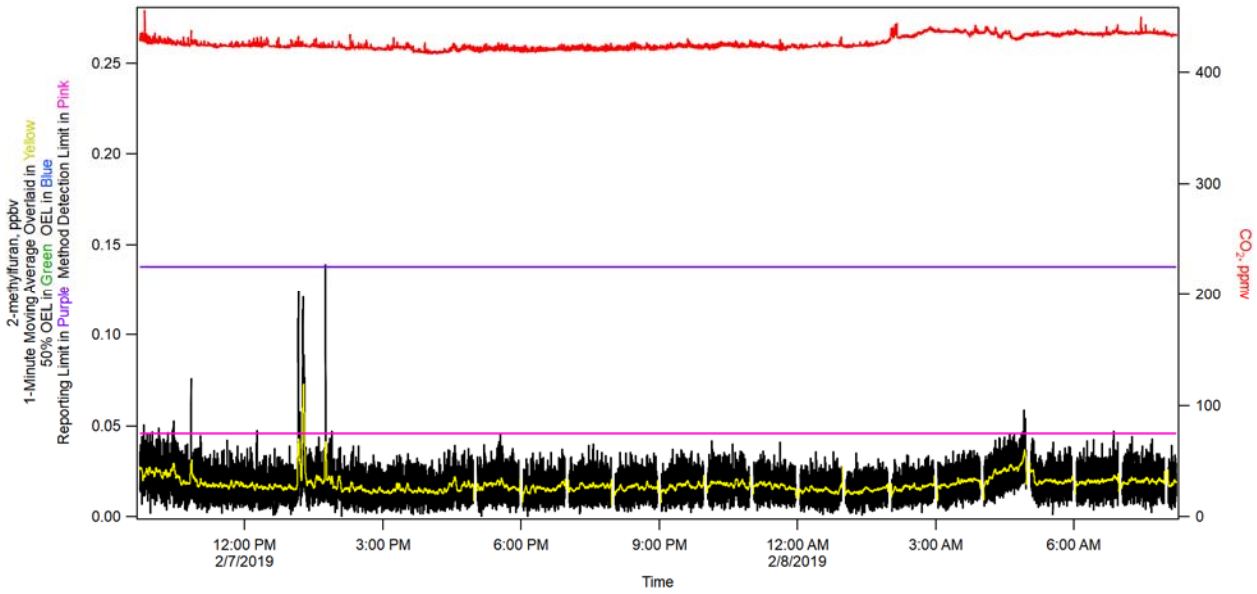

Figure 5-7. 2-methylfuran.

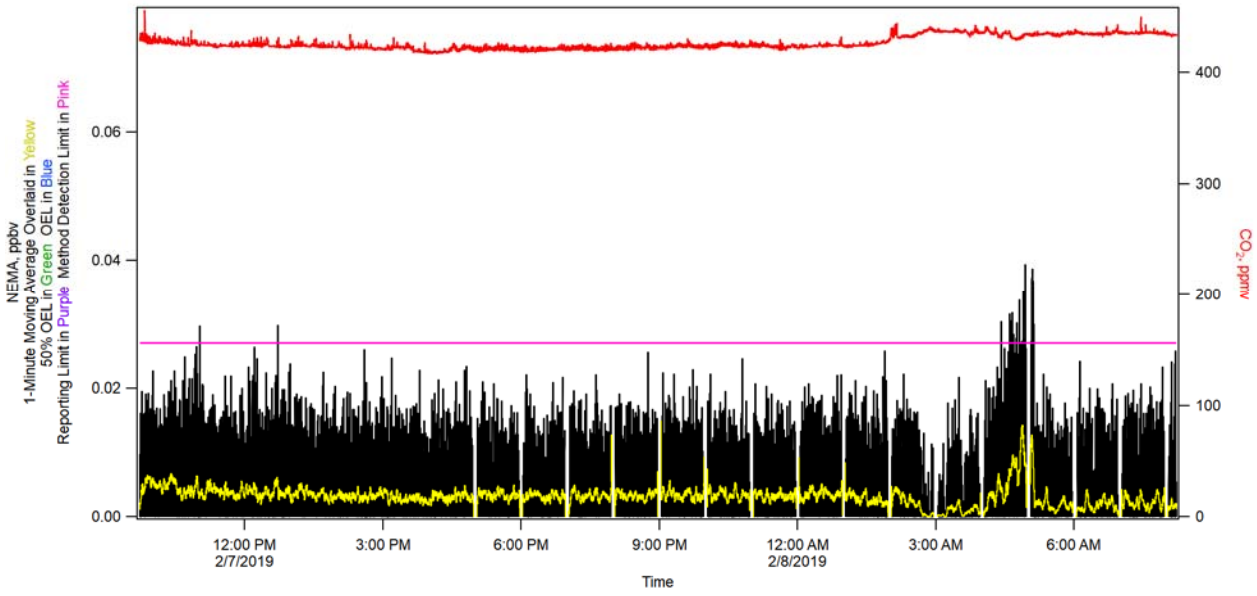

Figure 5-8. N-nitrosomethylethylamine (NEMA).

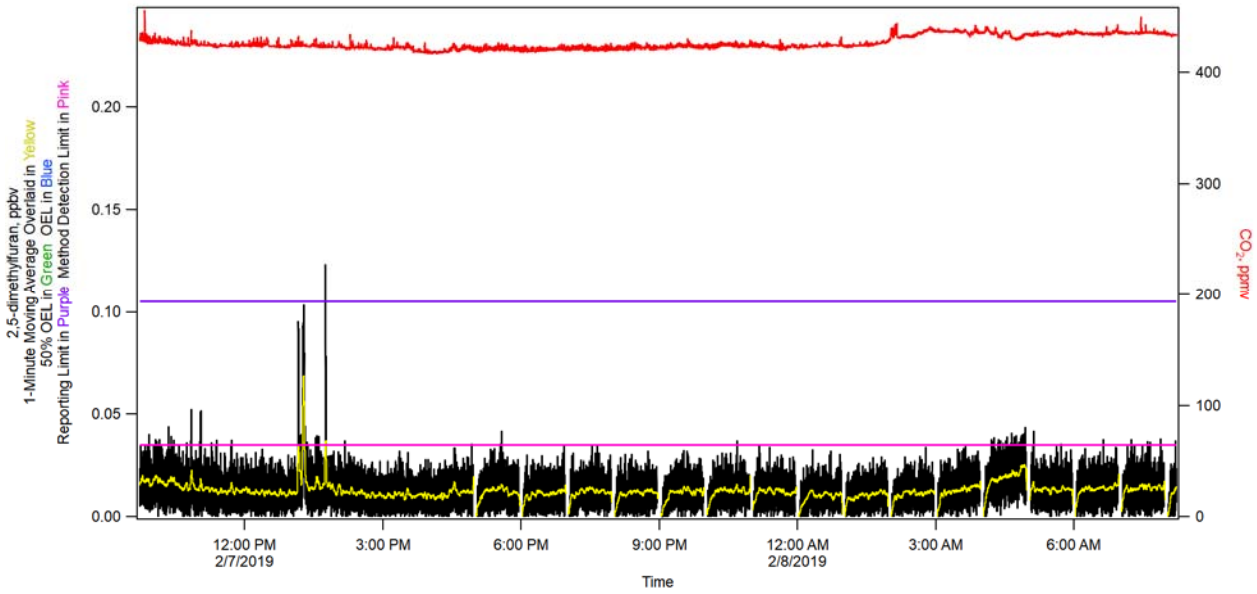

Figure 5-9. 2,5-dimethylfuran.

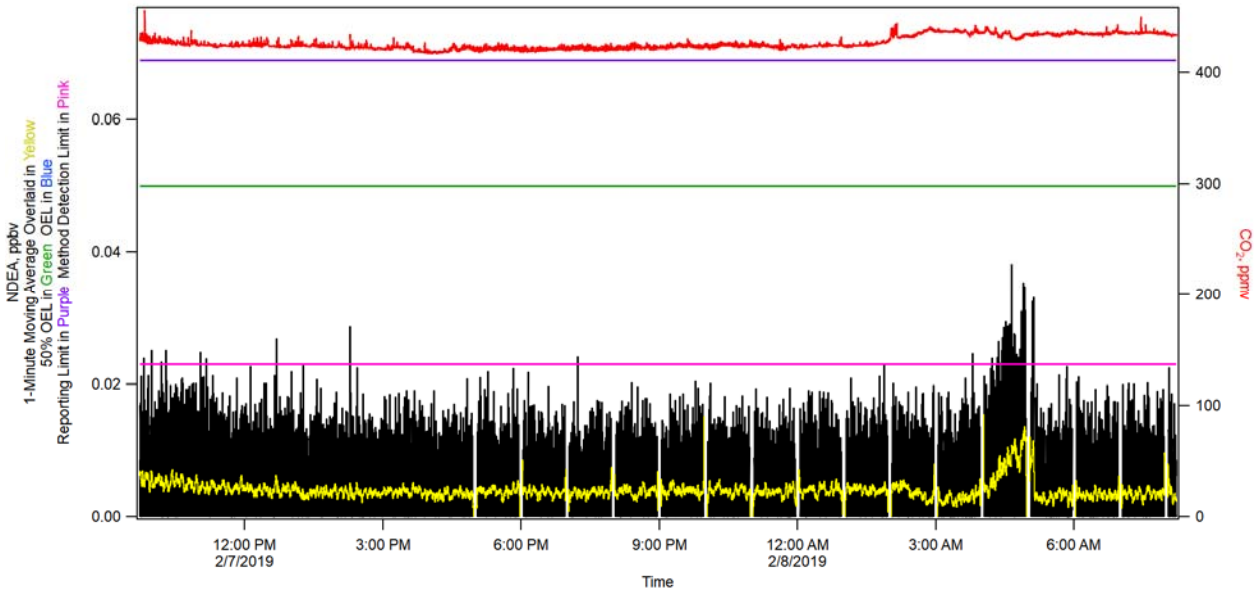

Figure 5-10. N-nitrosodiethylamine (NDEA).

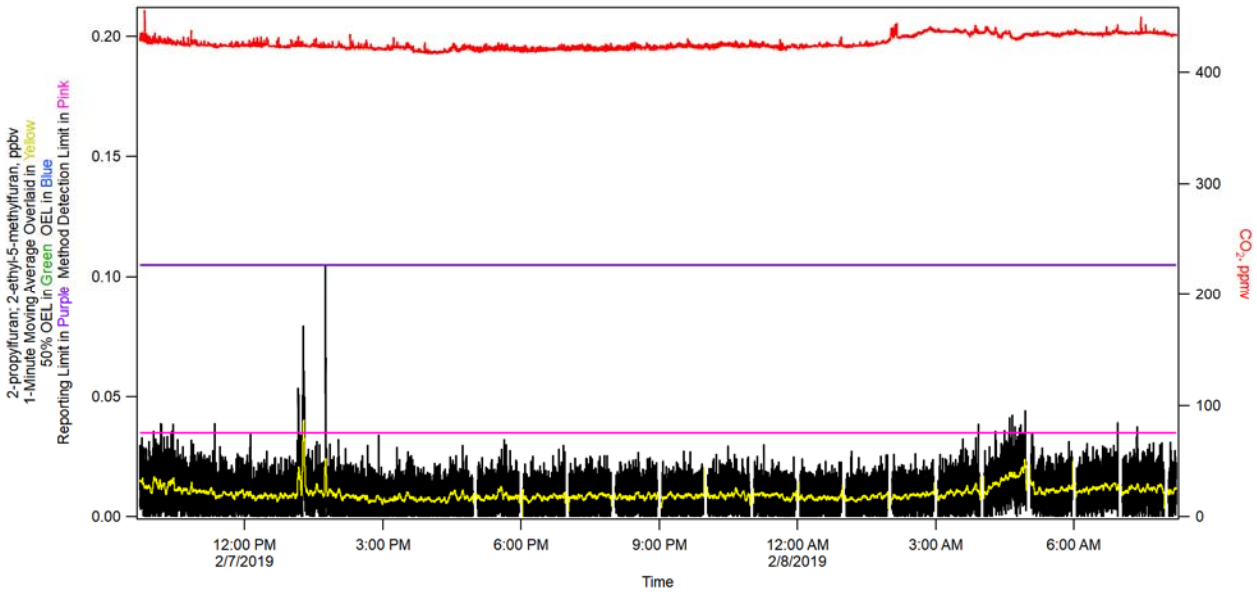

Figure 5-11. 2-propylfuran + 2-ethyl-5-methylfuran.

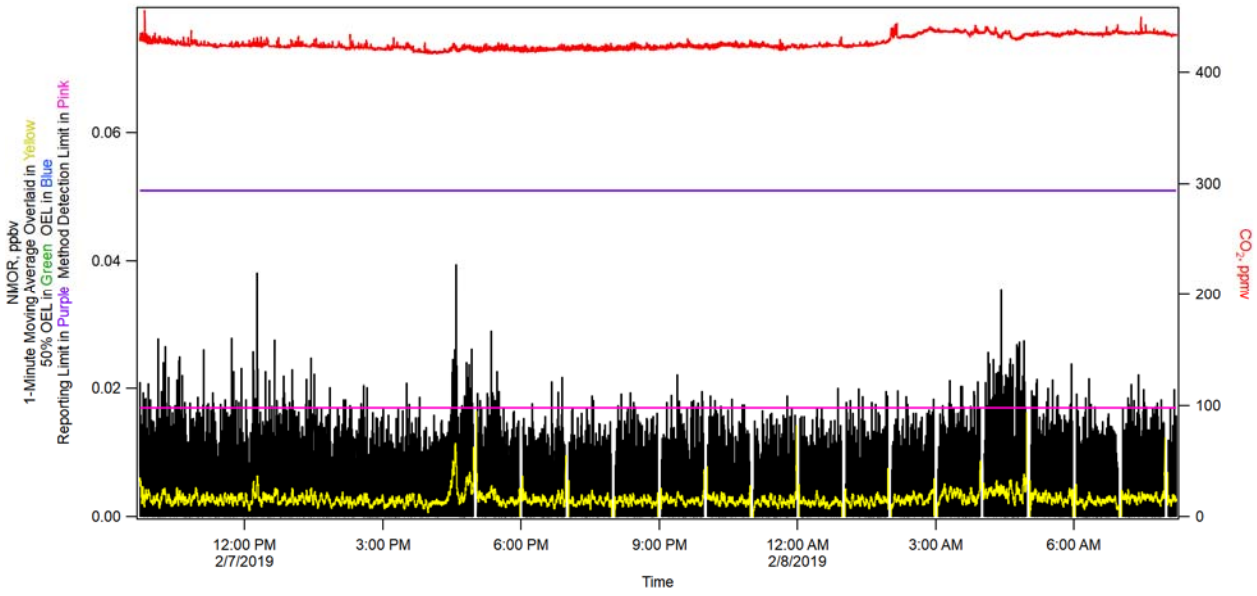

Figure 5-12. N-nitrosomorpholine (NMOR).

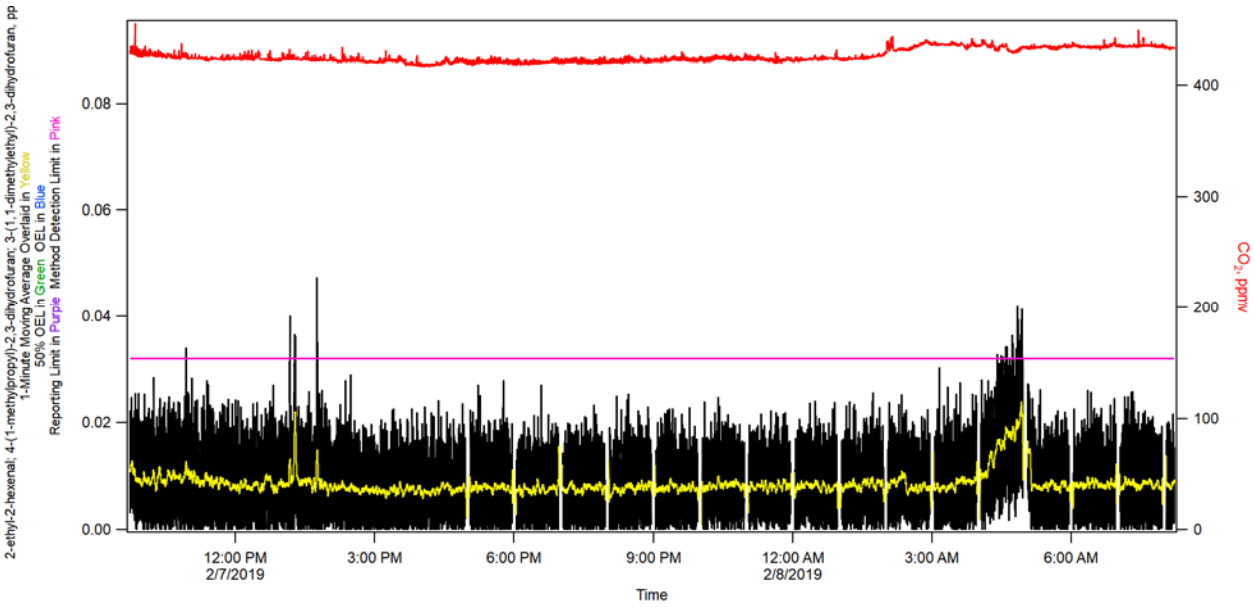

Figure 5-13. 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1-1-dimethylethyl)-2,3-dihydrofuran.

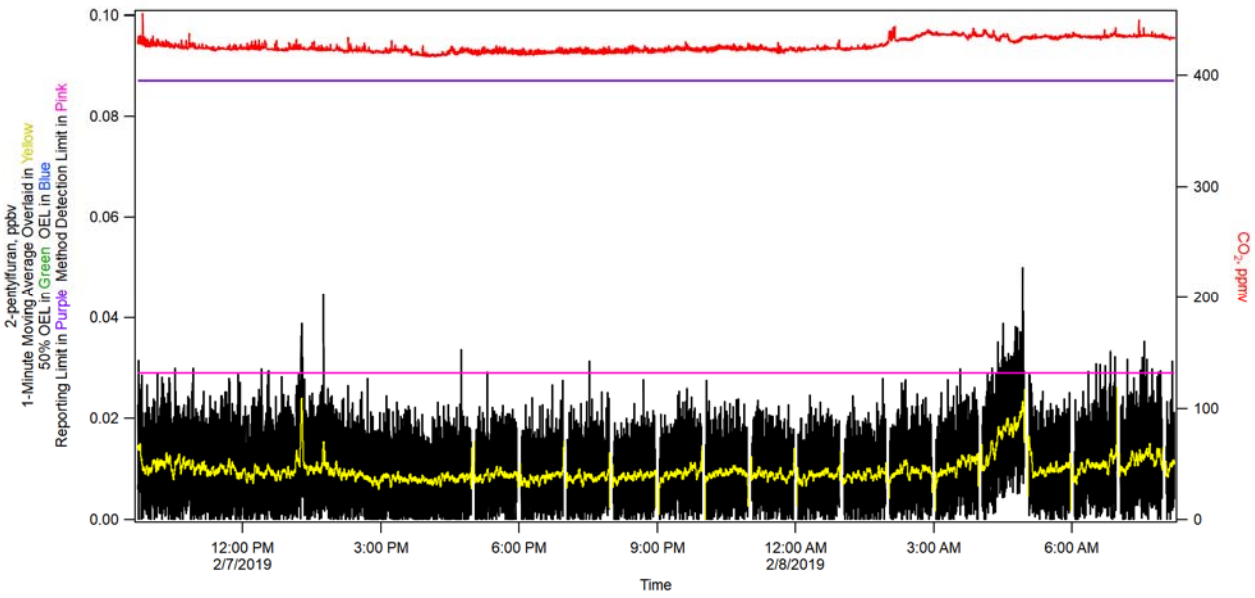

Figure 5-14. 2-pentylfuran.

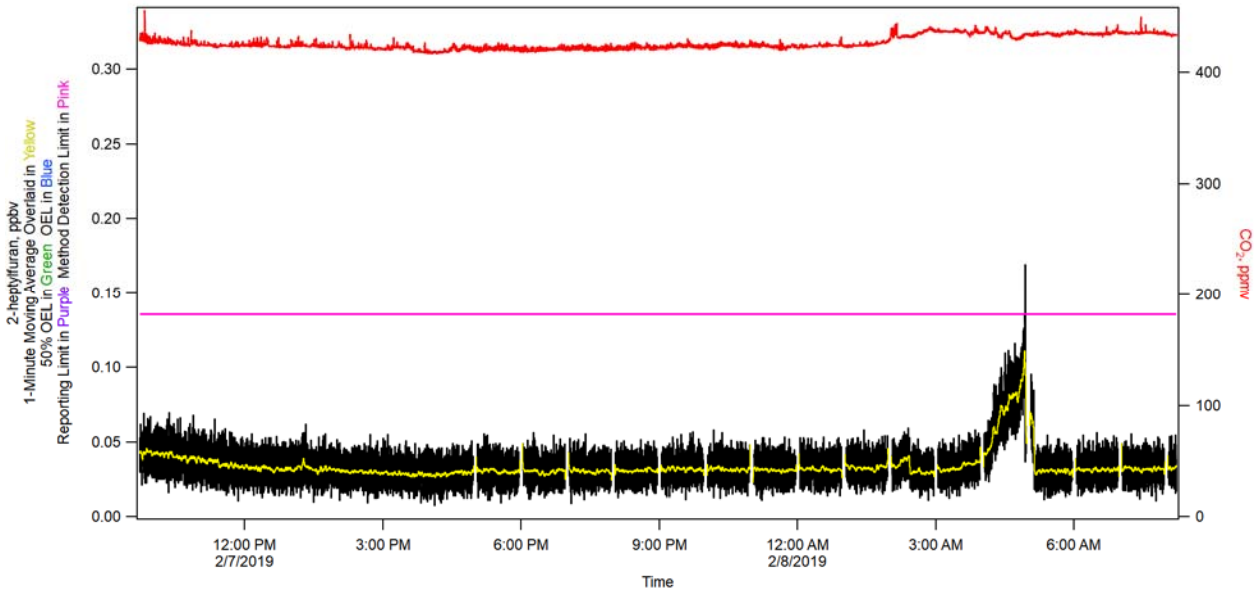

Figure 5-15. 2-heptylfuran.

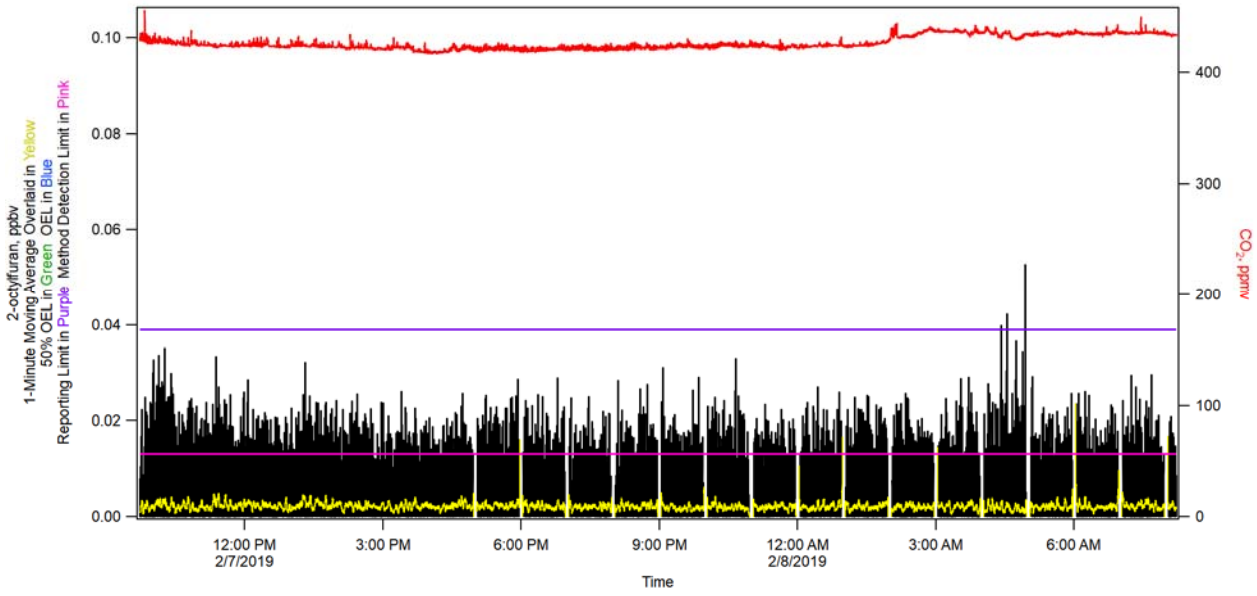

Figure 5-16. 2-octylfuran.

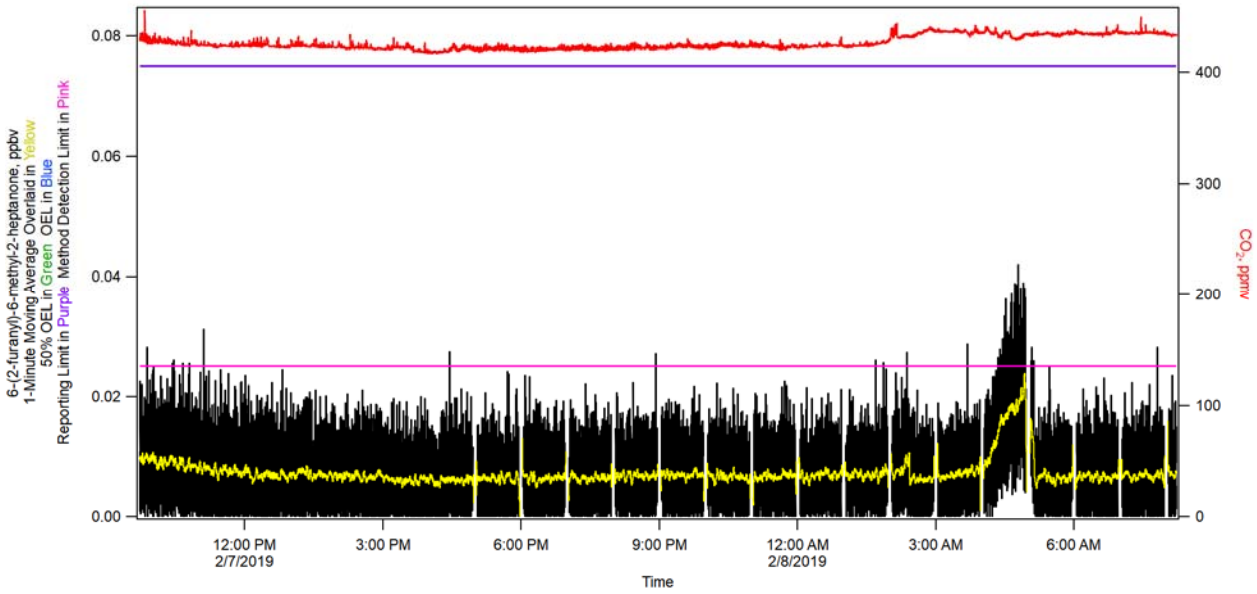

Figure 5-17. 6-(2-furanyl)-6-methyl-2-heptanone.

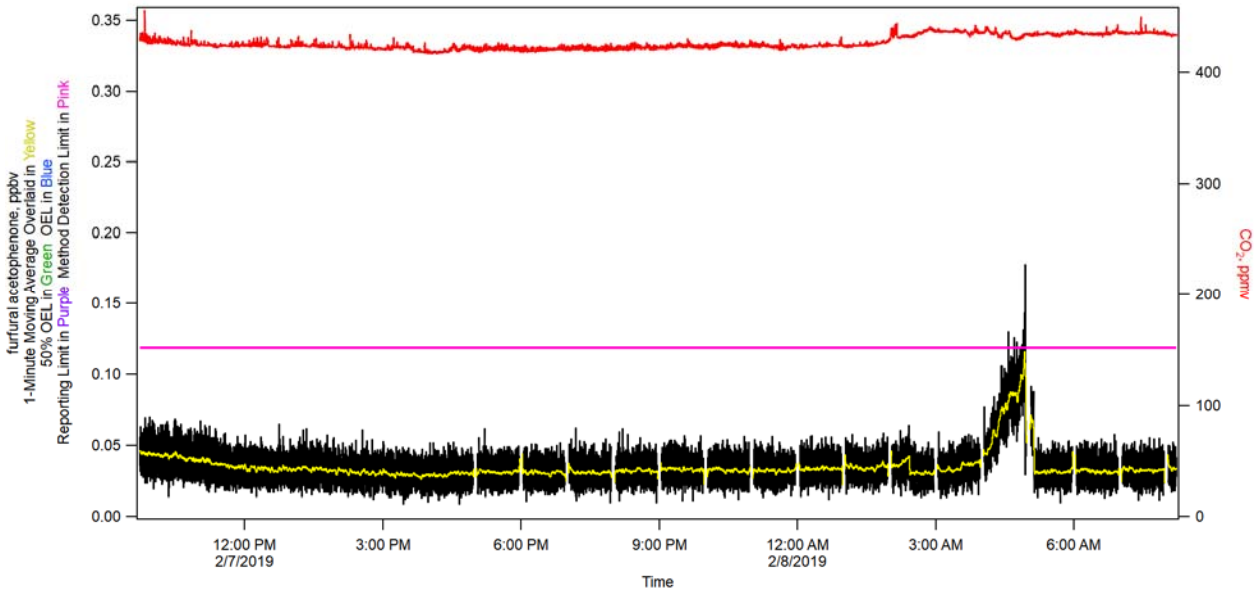

Figure 5-18. Furfural Acetophenone.

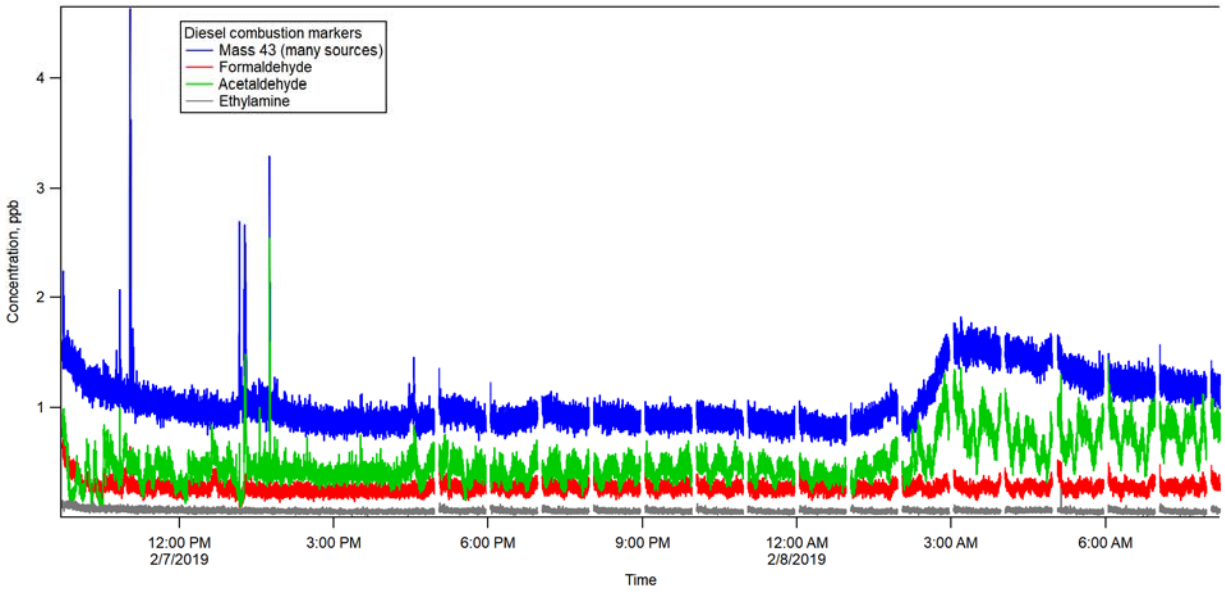

Figure 5-19. Diesel Combustion Markers.

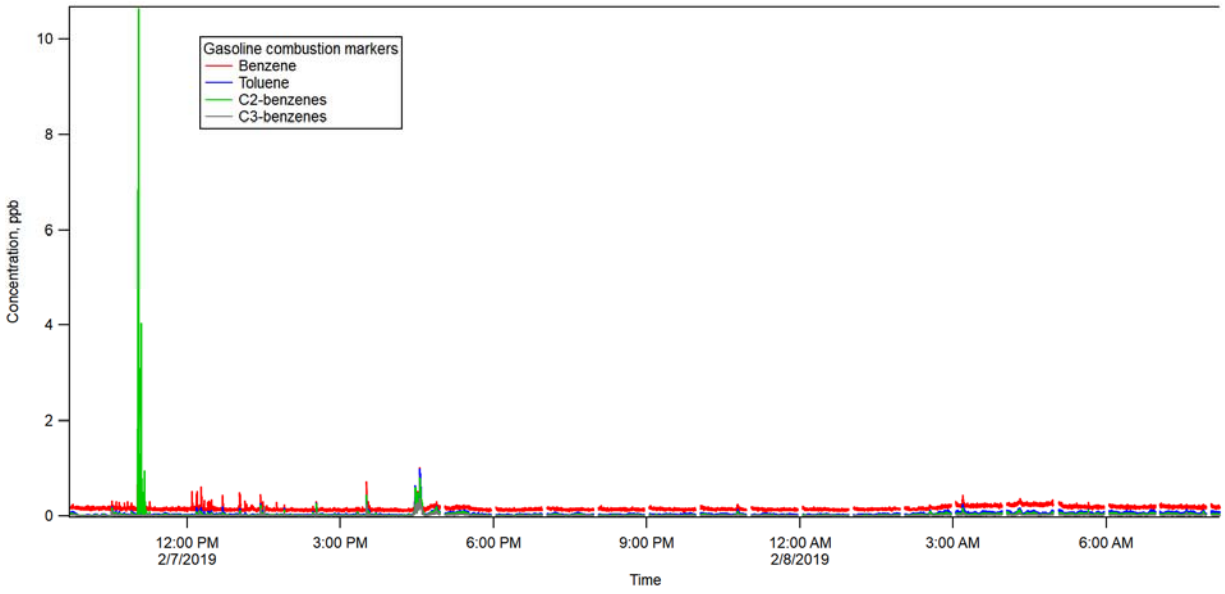

Figure 5-20. Gasoline Combustion Markers.

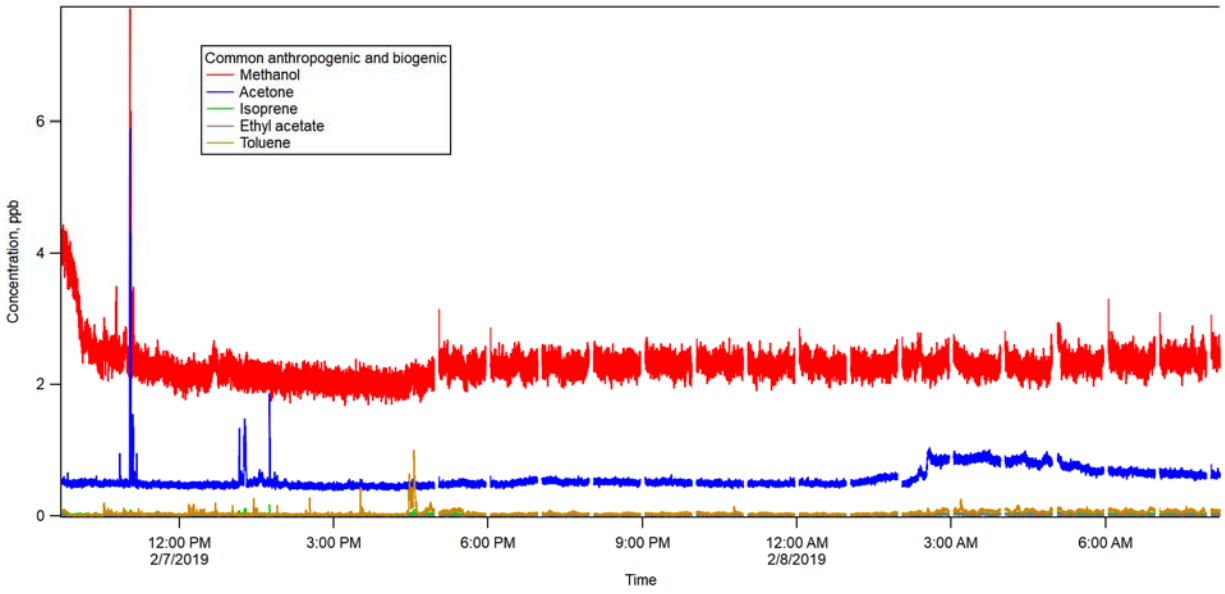

Figure 5-21. Plant and Human Markers.

6.0 FEBRUARY 8, 2019 – FEBRUARY 9, 2019 – STUDY SITE #5

6.1 Quality Assessment

Data from February 8, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004 was adequately documented and all checks passed the acceptance limits.

6.2 Summary

The ML personnel performed background sampling from February 8, 2019, to February 9, 2019, at study Site 5. Site 5 is located southeast of the Waste Treatment Facility. This site was chosen as it may provide data related to stack emission dispersion downwind of the tank farm ventilation and a baseline point for future reference once the Waste Treatment Facility begins operation. The ML arrived at Site 5 at 08:38 on February 8, 2019. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, the Picarro NH_3 analyzer, and the PTR-MS beginning at 08:30. No confirmatory samples were collected during this monitoring period. The ML personnel departed the site at 09:35 after a third-party remote check was performed. The SME performed a remote start of NO^+ automation mode at 10:50.

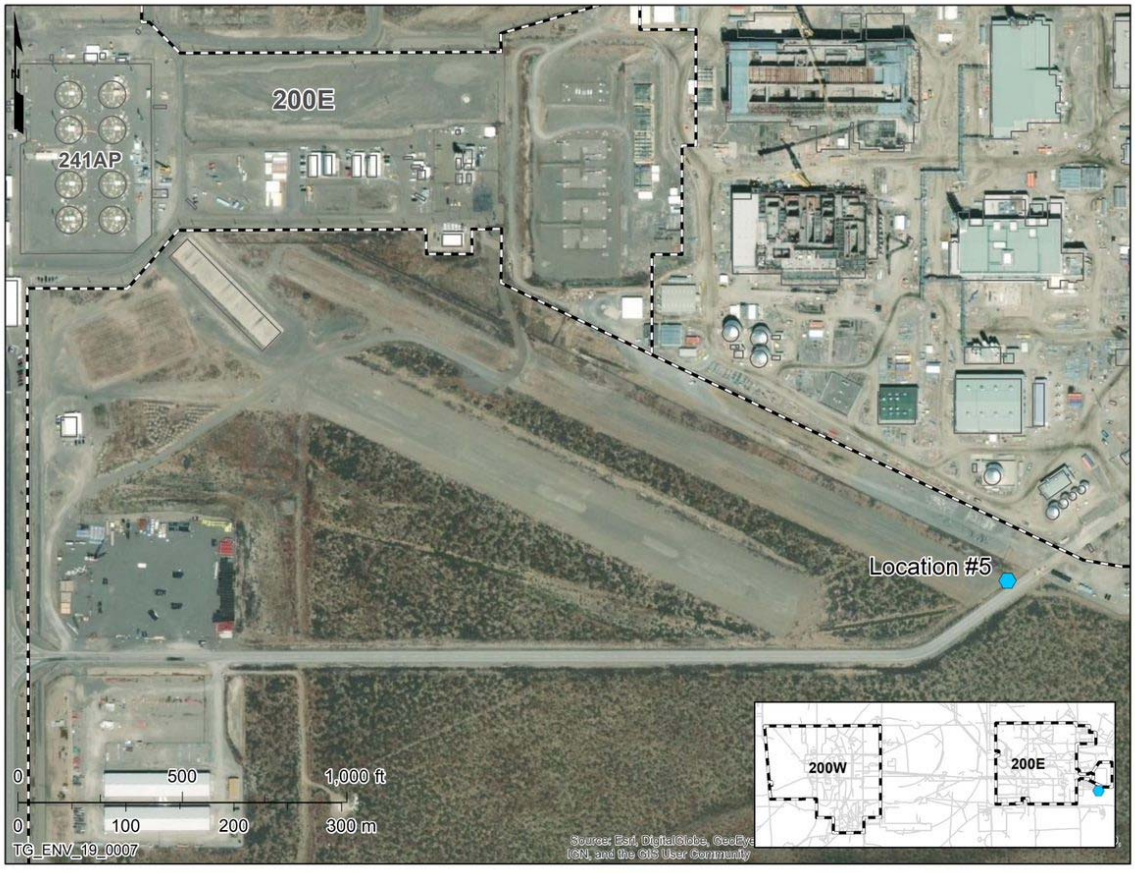

Figure 6-1. Mobile Laboratory Site #5 for the Duration of the Monitoring Period.

The ML staff returned to Site 5 at 08:56. The ML relocated to Site 6 by 10:26.

Figure 6-2 provides meteorological information obtained from the ML mounted weather station for the time period of sampling at Site 5.

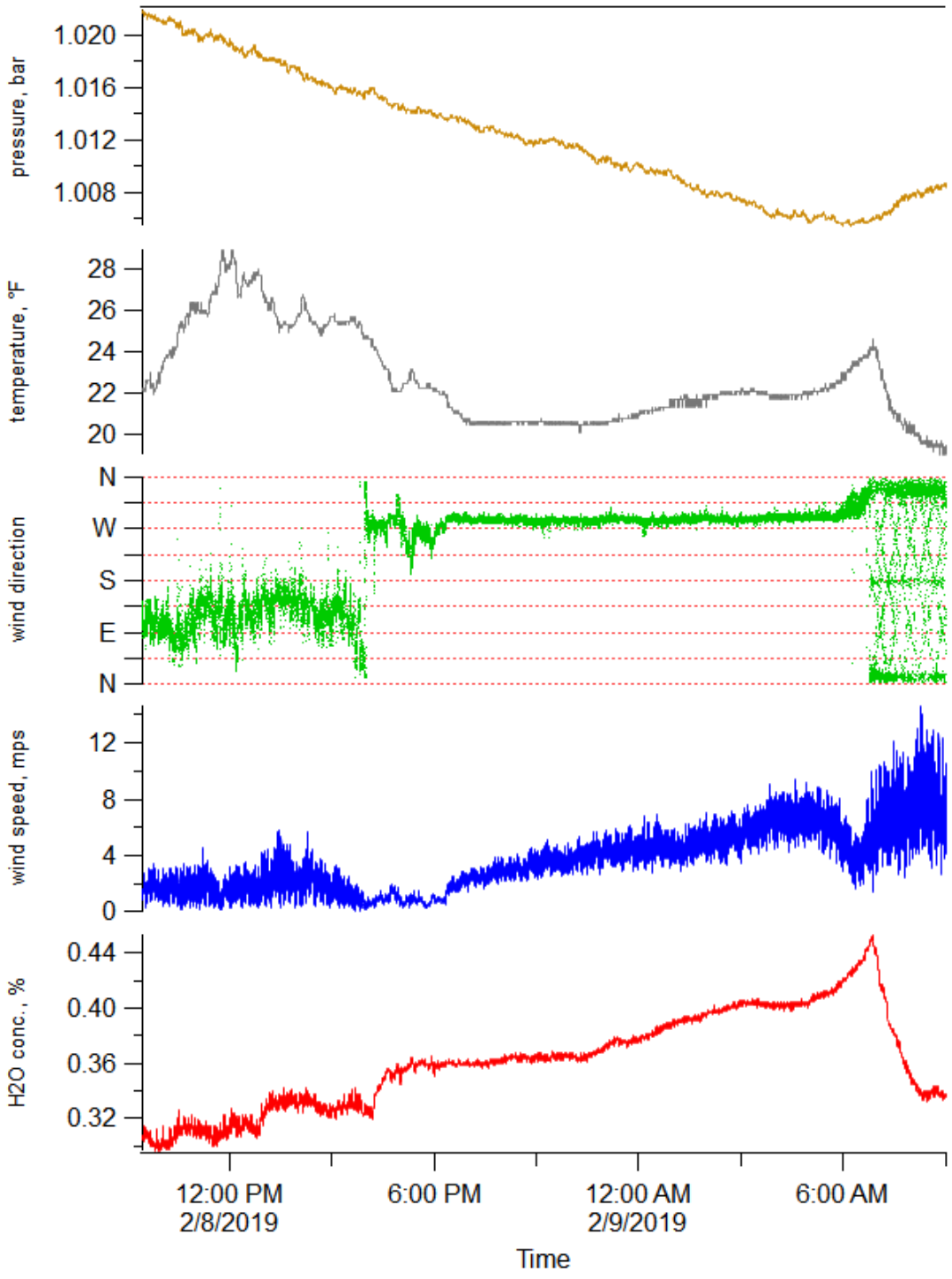

Figure 6-2. Weather Data.

6.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-MS,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this monitoring period.

Table 6-1. Statistical Information for the Monitoring Period of February 8, 2019 – February 9, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	0.010	9.335	4.714	50.501	23.513	7.944
2	formaldehyde	300	1.302	<1.302	N/A	N/A	1.606	<1.302
3	methanol	200000	1.839	2.312†	0.184	7.965	17.943	2.320
4	acetonitrile	20000	0.070	<0.070	N/A	N/A	0.255	<0.070
5	acetaldehyde	25000	2.070	<2.070	N/A	N/A	4.505	<2.070
6	ethylamine	5000	0.055	<0.055	N/A	N/A	0.302	<0.055
7	1,3-butadiene	1000	0.122	<0.122	N/A	N/A	0.388	<0.122
8	propanenitrile	6000	0.121	<0.121	N/A	N/A	0.489	<0.121
9	2-propenal	100	0.314	<0.314	N/A	N/A	0.917	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	N/A	N/A	2.084	<0.149
11	methyl isocyanate	20	0.061	<0.061	N/A	N/A	0.178	<0.061
12	methyl nitrite	100	0.117	<0.117	N/A	N/A	1.362	<0.117
13	furan	1	0.053	<0.053	N/A	N/A	0.257	<0.053
14	butanenitrile	8000	0.040	<0.040	N/A	N/A	0.192	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	N/A	N/A	N/A*	N/A*
16	butanal	25000	0.063	<0.063	N/A	N/A	0.170	<0.063
17	NDMA**	0.3	0.020	<0.020	N/A	N/A	0.035	<0.020
18	benzene	500	0.230	<0.230	N/A	N/A	6.495	<0.230
19	2,4-pentadienenitrile + pyridine	300, 1000	0.084	<0.084	N/A	N/A	0.497	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	N/A	N/A	0.101	<0.050
21	2-methylfuran	1	0.046	<0.046	N/A	N/A	0.211	<0.046
22	pentanenitrile	6000	0.029	<0.029	N/A	N/A	0.063	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	N/A	N/A	0.143	<0.048
24	NEMA**	0.3	0.027	<0.027	N/A	N/A	0.066	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	N/A	N/A	0.128	<0.035
26	hexanenitrile	6000	0.029	<0.029	N/A	N/A	0.055	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	N/A	N/A	0.116	<0.030
28	NDEA**	0.1	0.023	<0.023	N/A	N/A	0.029	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	N/A	N/A	0.291	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	N/A	N/A	0.744	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	N/A	N/A	0.106	<0.035

Table 6-1. Statistical Information for the Monitoring Period of February 8, 2019 – February 9, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.029	<0.029	N/A	N/A	0.030	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	N/A	N/A	0.055	<0.032
34	NMOR**	0.6	0.017	<0.017	N/A	N/A	0.253	<0.017
35	butyl nitrate	2500	0.019	<0.019	N/A	N/A	0.103	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	N/A	N/A	0.033	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	N/A	N/A	0.061	<0.028
38	2-pentylfuran	1	0.029	<0.029	N/A	N/A	0.091	<0.029
39	biphenyl	200	0.031	<0.031	N/A	N/A	0.030	<0.031
40	2-heptylfuran	1	0.136	<0.136	N/A	N/A	0.204	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	N/A	N/A	0.149	<0.184
42	2-octylfuran	1	0.013	<0.013	N/A	N/A	0.039	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	N/A	N/A	0.038	<0.132
44	PCB	1000	0.139	<0.139	N/A	N/A	0.078	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	N/A	N/A	0.094	<0.025
46	furfural acetophenone	1	0.119	<0.119	N/A	N/A	0.263	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.127 ppb and the median value was <0.034 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers.							
**	Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.].							
ND	COPC Averages below the MDL.							
†	COPC Averages between the RL and the MDL.							
	COPC Averages >100% of the OEL.							
	COPC Averages 50-100% of the OEL.							
	COPC Averages 10-50% of the OEL.							

Figure 6-3 through Figure 6-21 display a selection of 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period February 8, 2019, to February 9, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

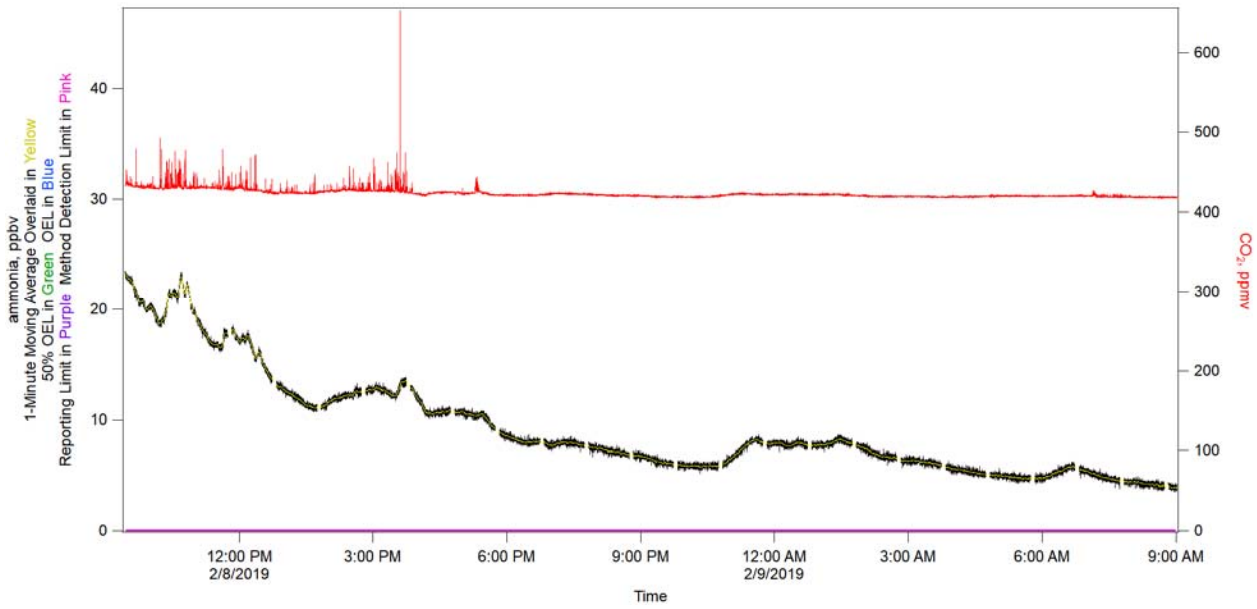

Figure 6-3. Ammonia.

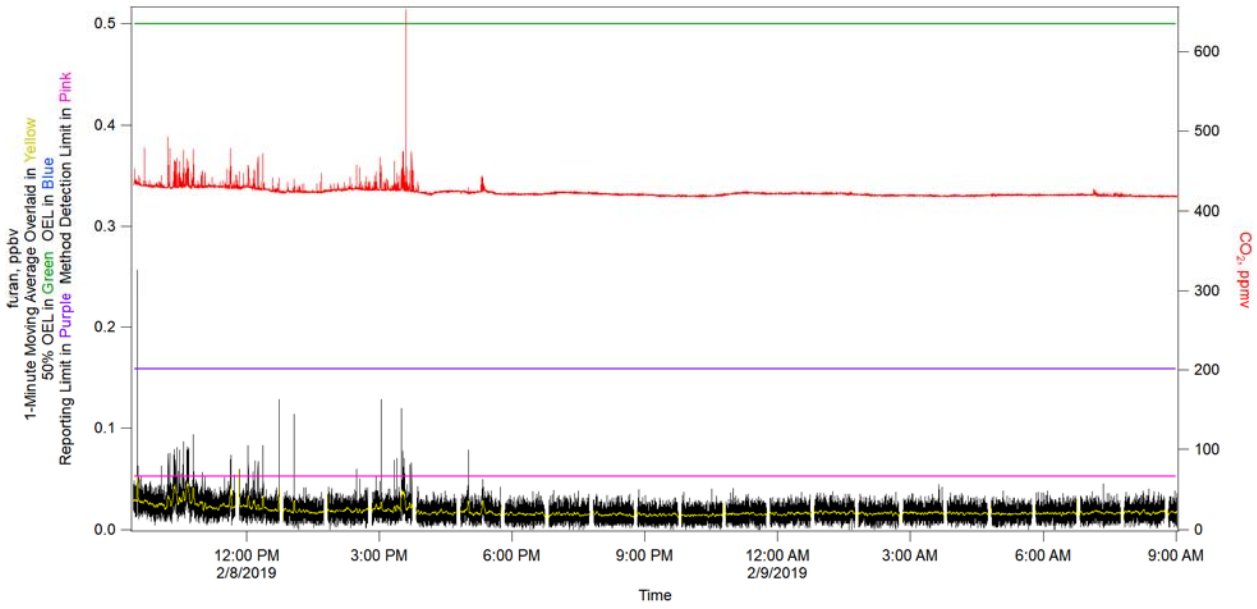

Figure 6-4. Furan.

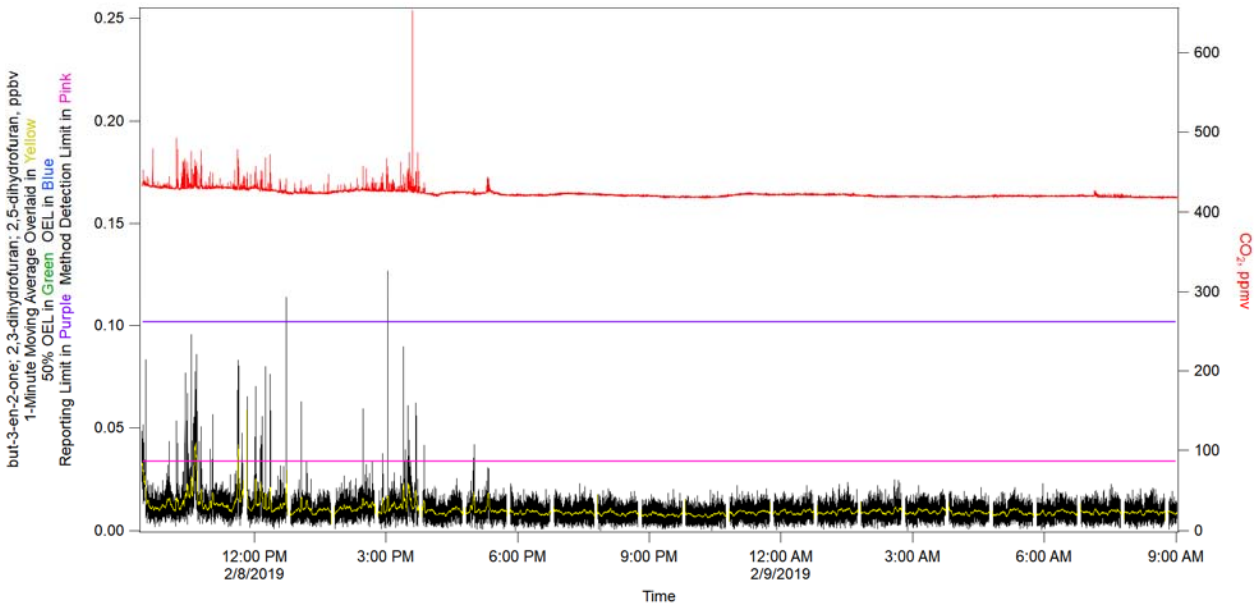

Figure 6-5. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

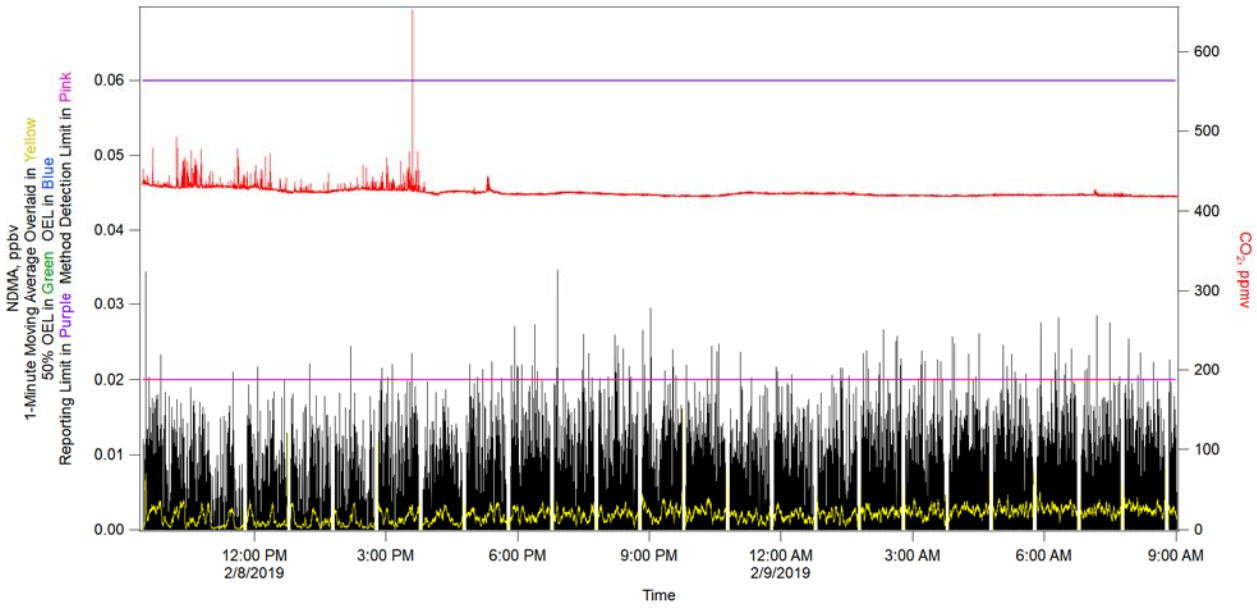

Figure 6-6. N-nitrosodimethylamine (NDMA).

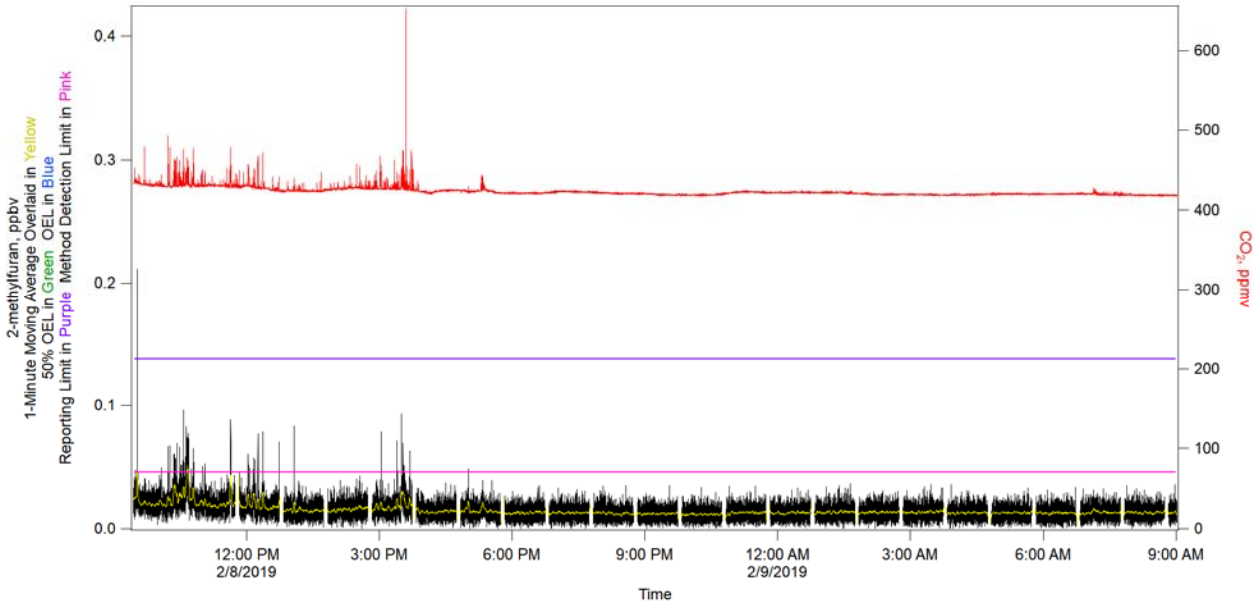

Figure 6-7. 2-methylfuran.

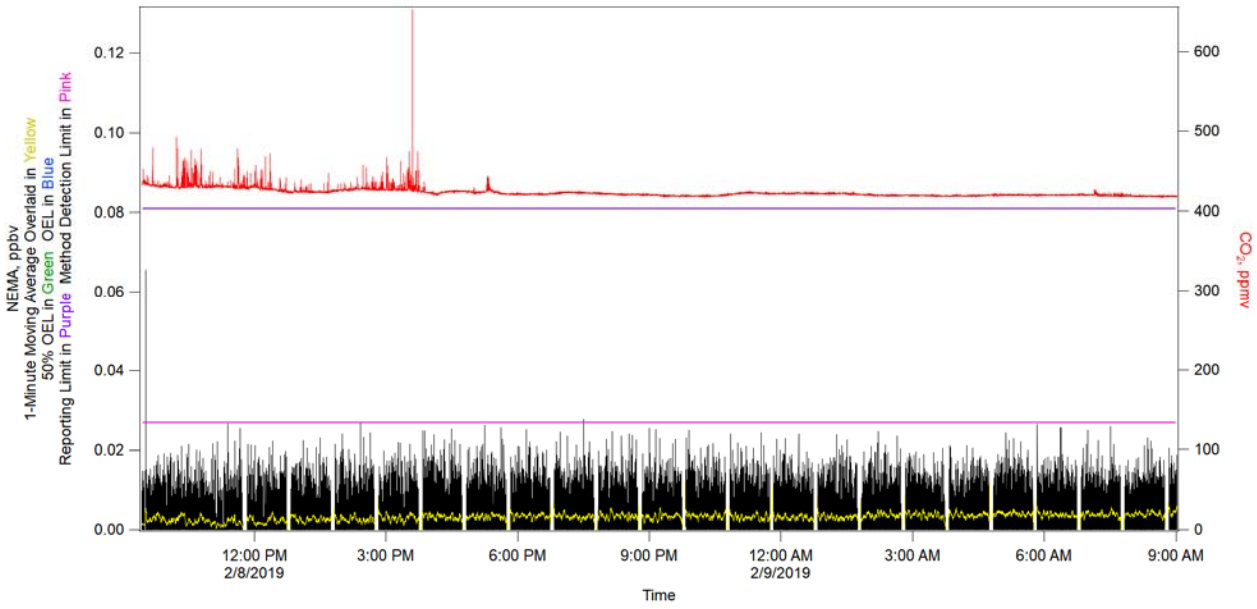

Figure 6-8. N-nitrosomethylethylamine (NEMA).

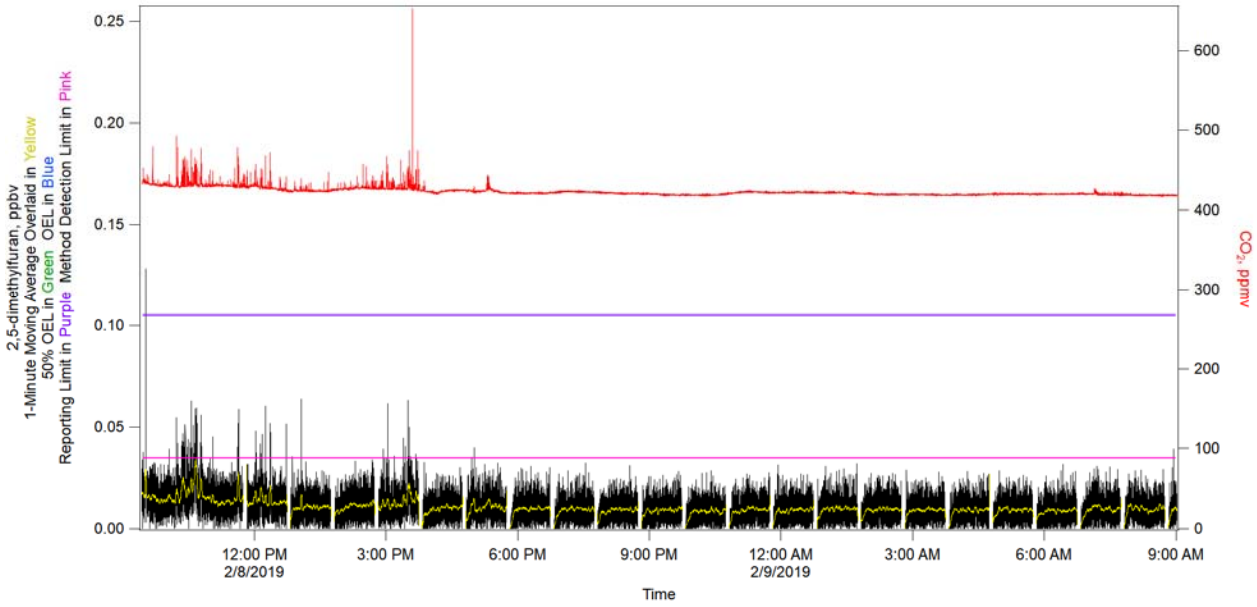

Figure 6-9. 2,5-dimethylfuran.

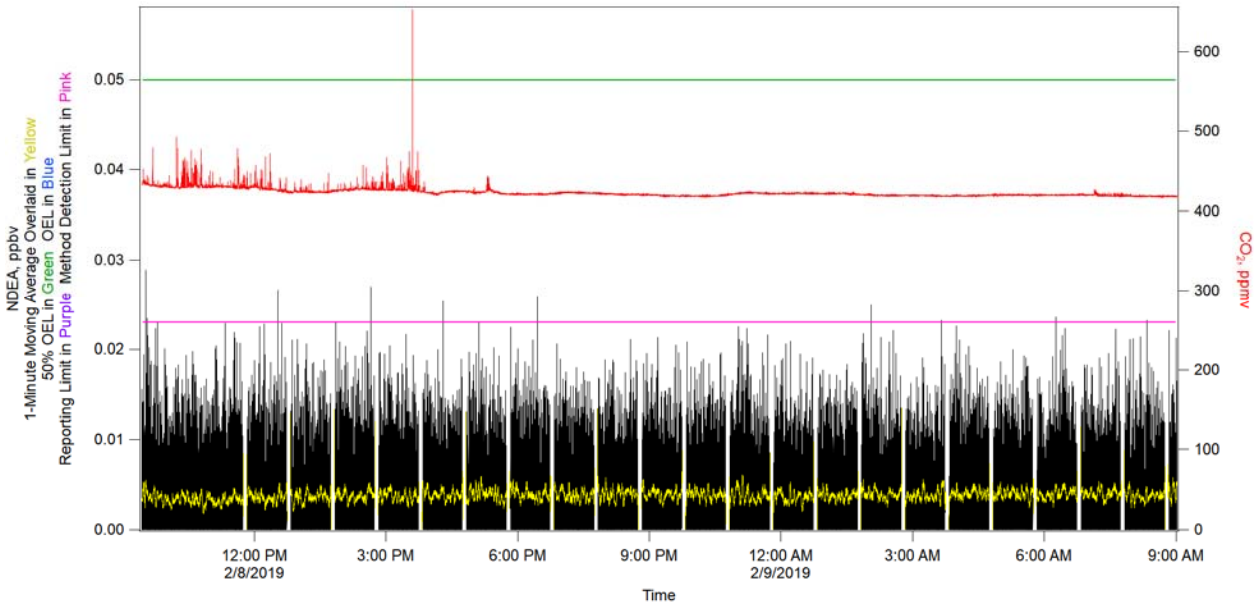

Figure 6-10. N-nitrosodiethylamine (NDEA).

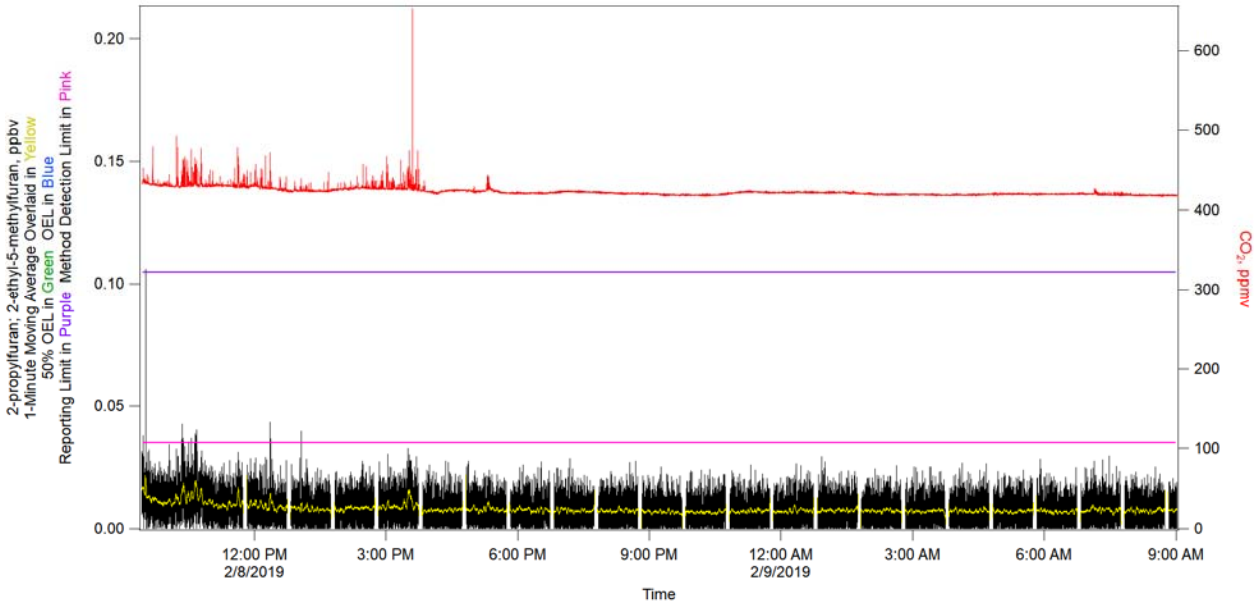

Figure 6-11. 2-propylfuran + 2-ethyl-5-methylfuran.

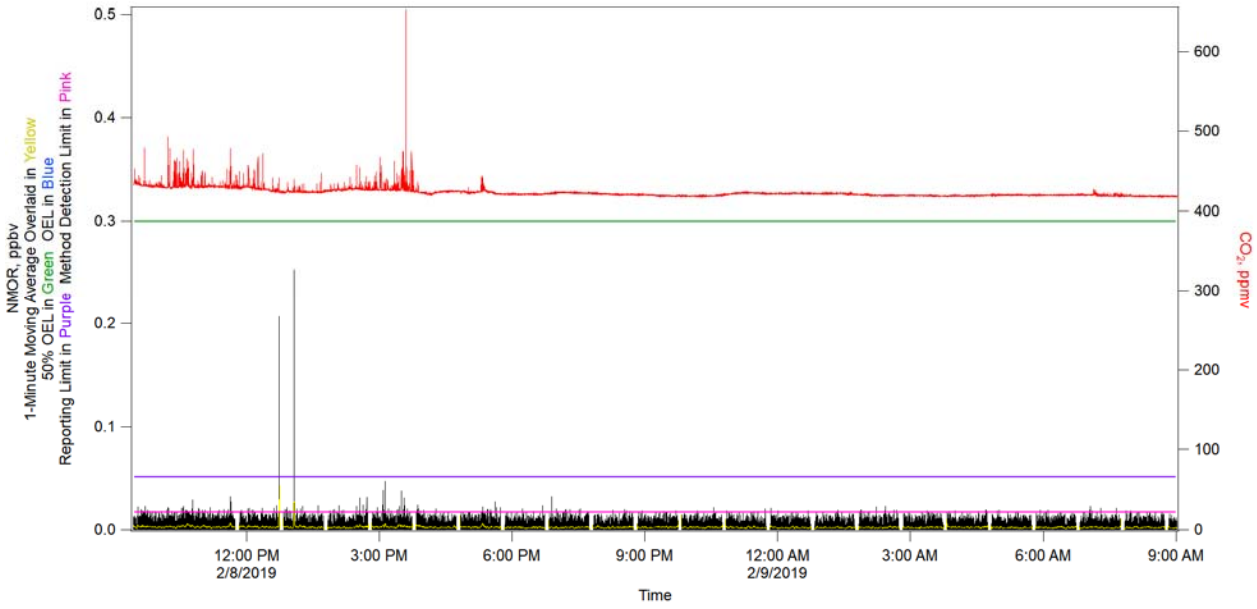

Figure 6-12. N-nitrosomorpholine (NMOR).

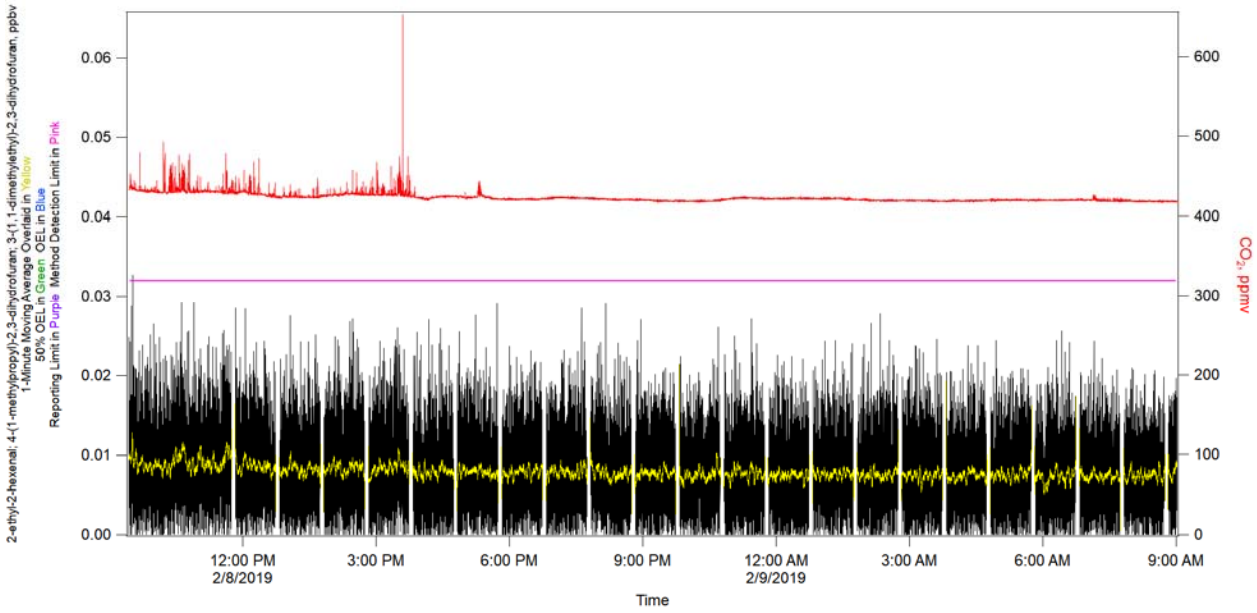

Figure 6-13. 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1-1-dimethylethyl)-2,3-dihydrofuran.

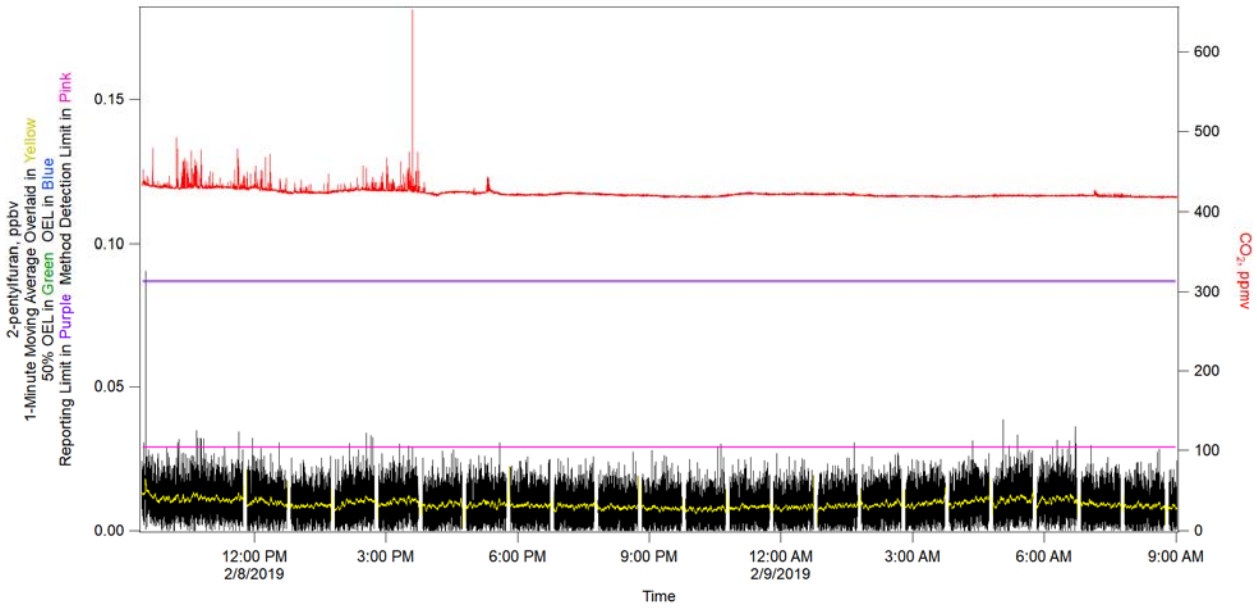

Figure 6-14. 2-pentylfuran.

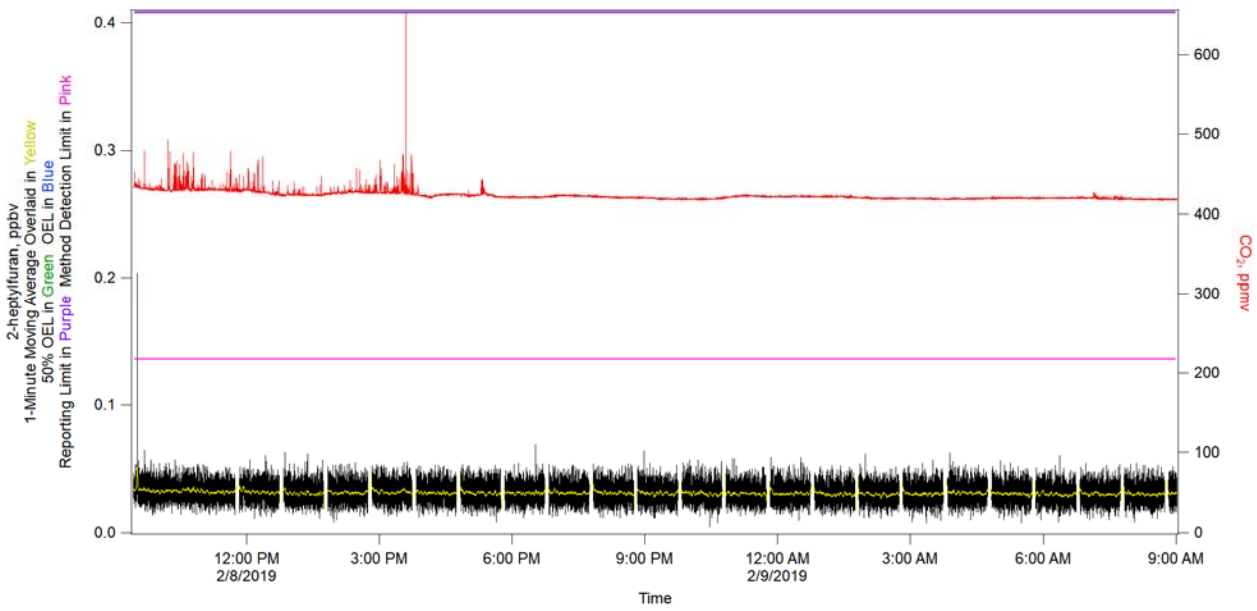

Figure 6-15. 2-heptylfuran.

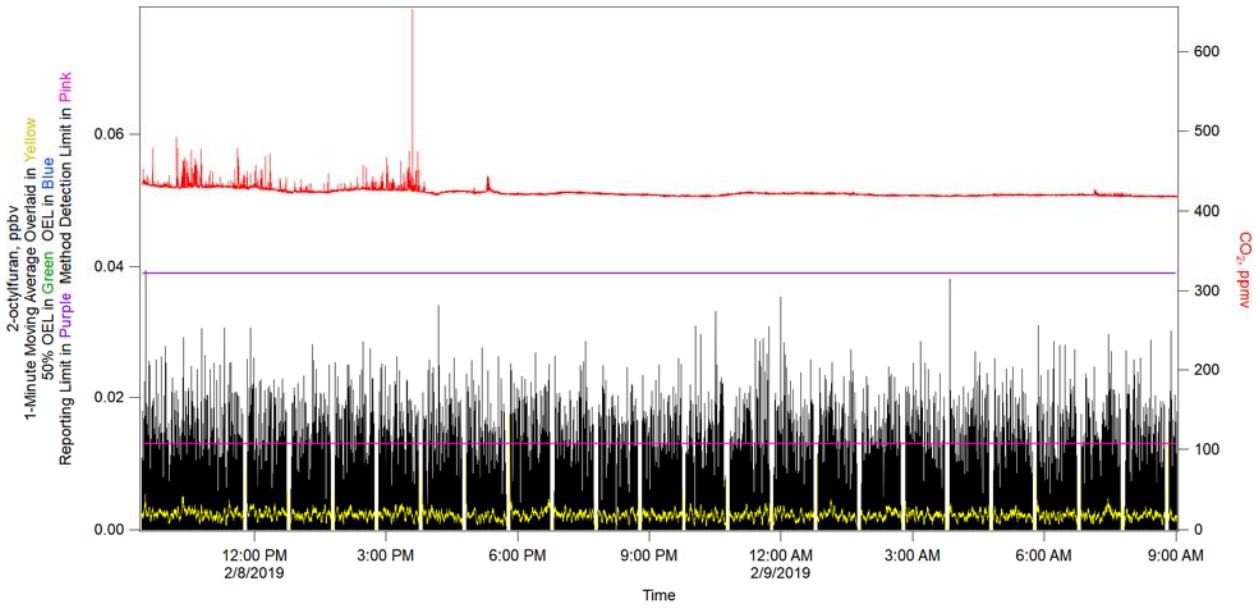

Figure 6-16. 2-octylfuran.

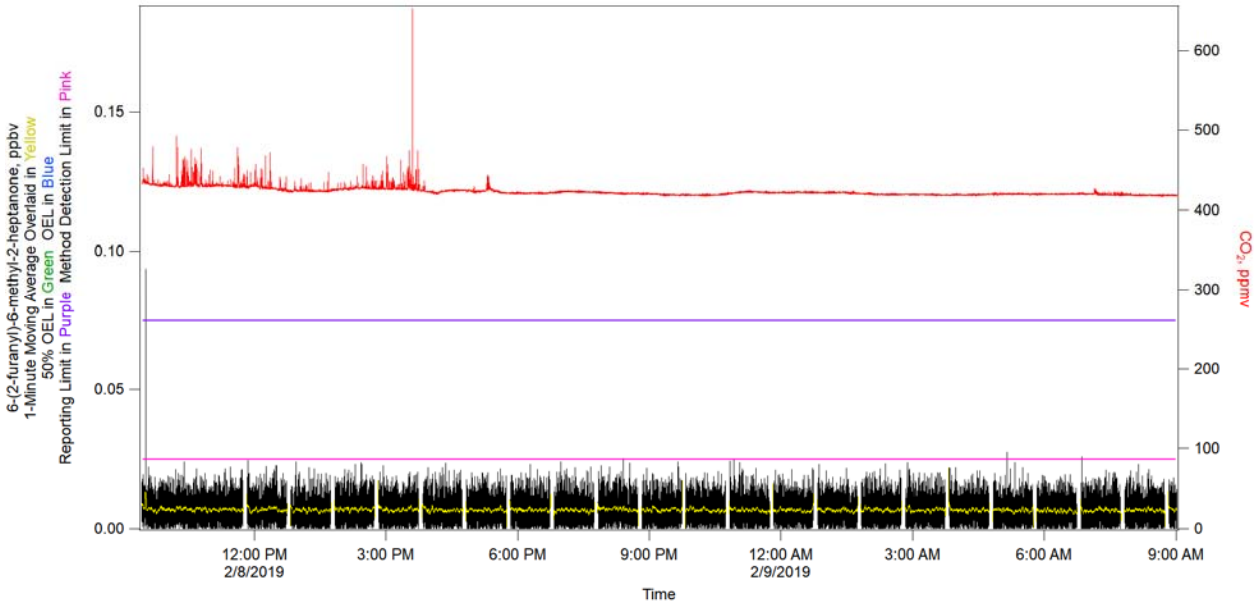

Figure 6-17. 6-(2-furanyl)-6-methyl-2-heptanone.

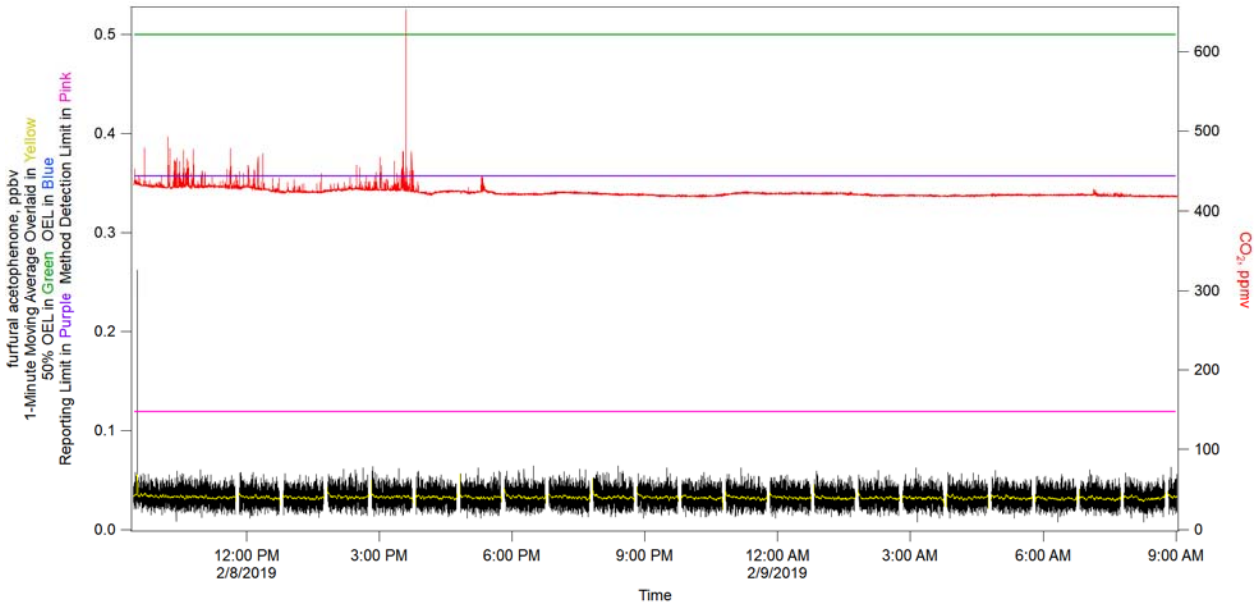

Figure 6-18. Furfural Acetophenone.

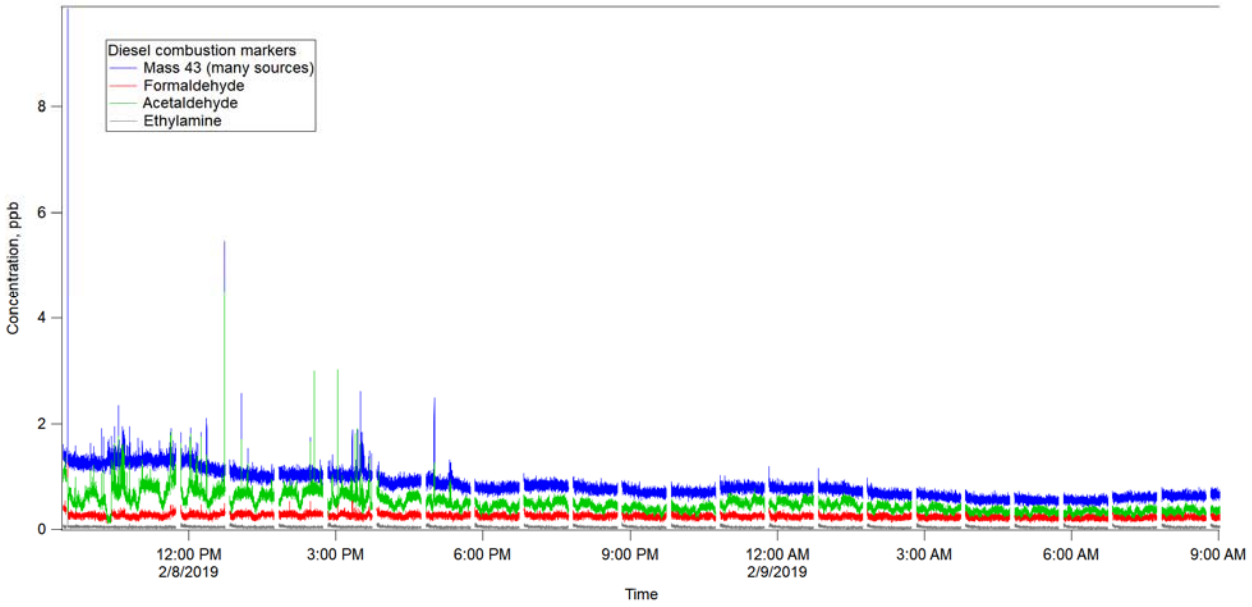

Figure 6-19. Diesel Combustion Markers.

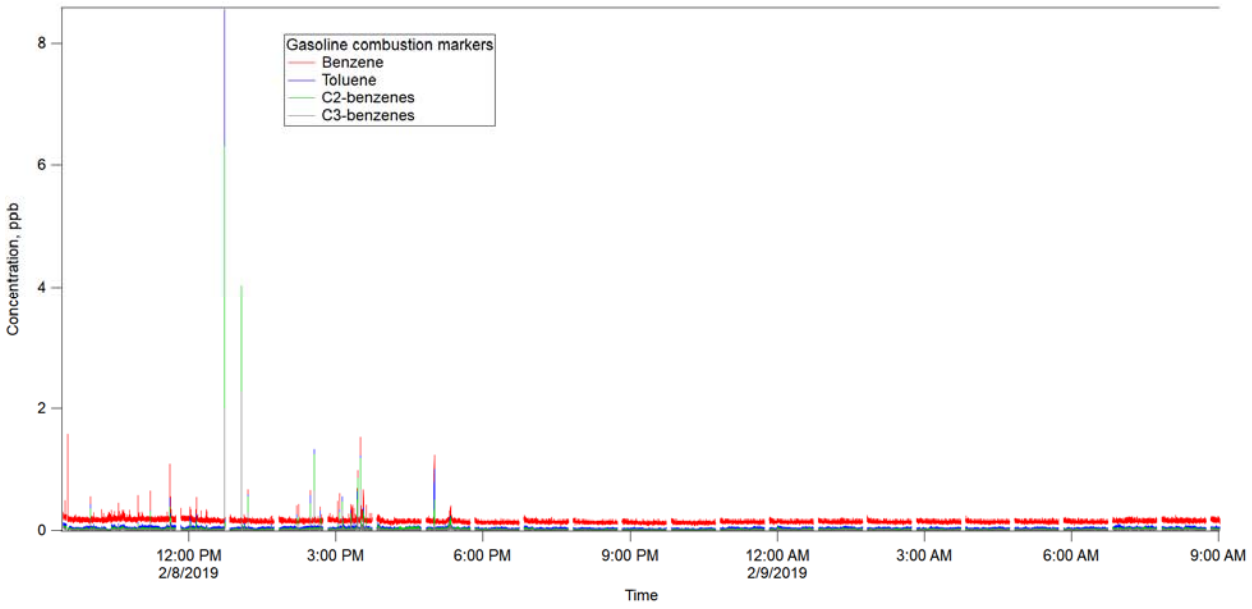

Figure 6-20. Gasoline Combustion Markers.

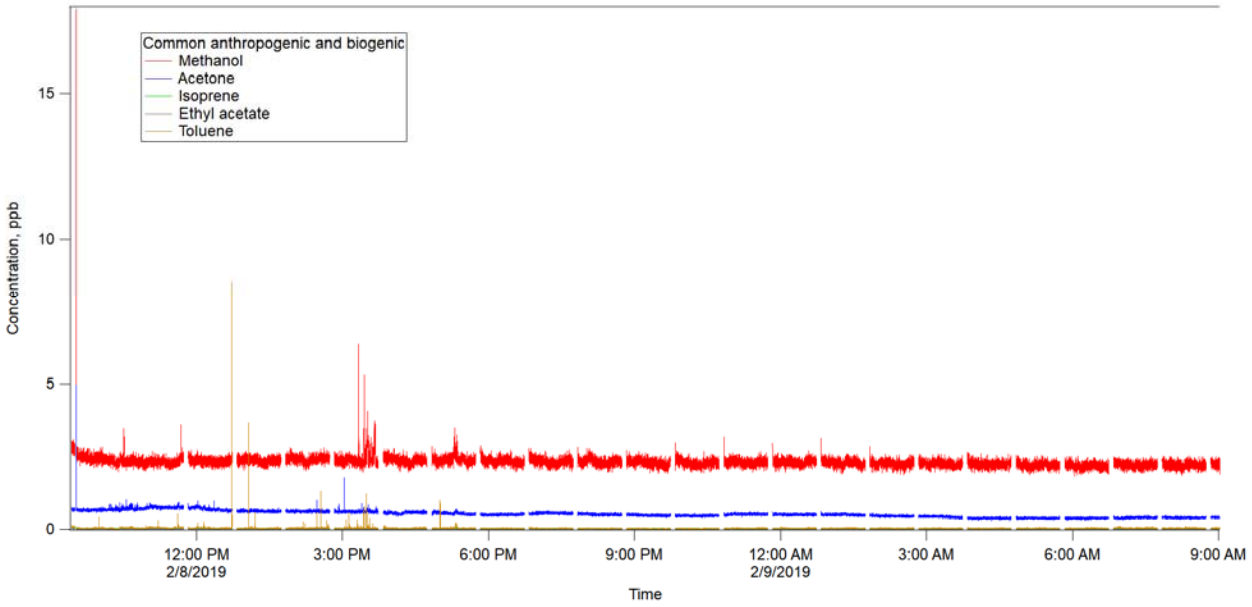

Figure 6-21. Plant and Human Markers.

7.0 FEBRUARY 9, 2019 – FEBRUARY 10, 2019 – STUDY SITE #6

7.1 Quality Assessment

Data from February 9, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004 was adequately documented and all checks passed the acceptance limits.

7.2 Summary

The ML personnel performed background sampling from February 9, 2019, to February 10, 2019, at study Site 6. The ML arrived at Site 6 at 10:26 on February 9, 2019. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, the Picarro NH_3 analyzer, and the PTR-MS beginning at 09:08. No confirmatory samples were collected during this monitoring period. The ML personnel departed the site at 10:48 after a third-party remote check was performed. The SME performed a remote start of NO^+ automation mode at 10:49.

Figure 7-1. Mobile Laboratory Site #6 for the Duration of the Monitoring Period.

The ML staff returned to Site 6 at 07:45. The ML arrived at the TerraGraphics shop at 08:36.

Figure 7-2 provides meteorological information obtained from the ML mounted weather station for the time period of sampling at Site 6.

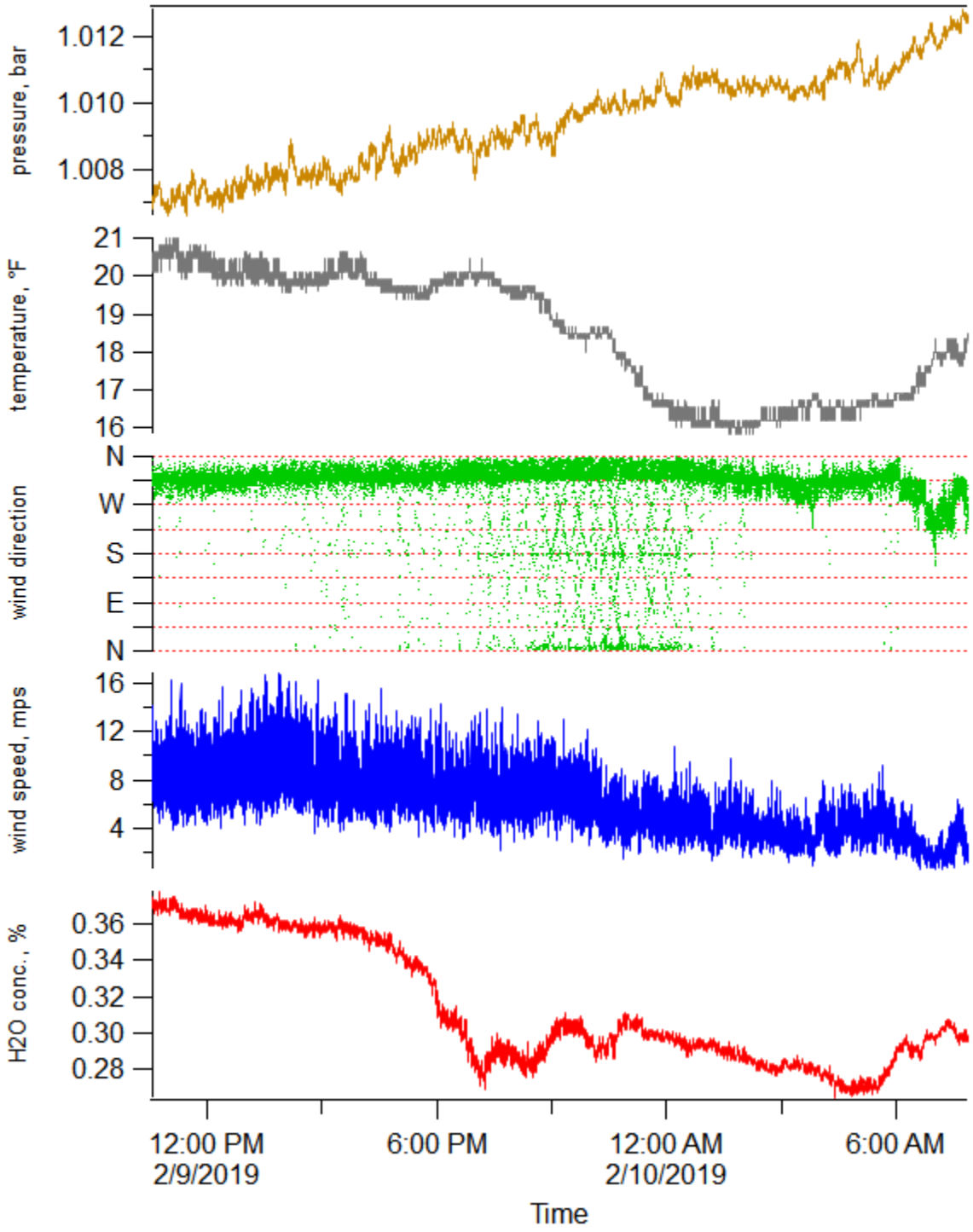

Figure 7-2. Weather Data.

7.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-MS,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this monitoring period.

Table 7-1. Statistical Information for the Monitoring Period of February 9, 2019 – February 10, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	0.010	2.976	0.855	28.731	6.684	2.693
2	formaldehyde	300	1.302	<1.302	N/A	N/A	0.850	<1.302
3	methanol	200000	1.839	2.382†	0.279	11.729	15.843	2.367
4	acetonitrile	20000	0.070	<0.070	N/A	N/A	0.099	<0.070
5	acetaldehyde	25000	2.070	<2.070	N/A	N/A	1.880	<2.070
6	ethylamine	5000	0.055	<0.055	N/A	N/A	0.134	<0.055
7	1,3-butadiene	1000	0.122	<0.122	N/A	N/A	0.114	<0.122
8	propanenitrile	6000	0.121	<0.121	N/A	N/A	0.201	<0.121
9	2-propenal	100	0.314	<0.314	N/A	N/A	0.271	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	N/A	N/A	0.611	<0.149
11	methyl isocyanate	20	0.061	<0.061	N/A	N/A	0.061	<0.061
12	methyl nitrite	100	0.117	<0.117	N/A	N/A	0.191	<0.117
13	furan	1	0.053	<0.053	N/A	N/A	0.069	<0.053
14	butanenitrile	8000	0.040	<0.040	N/A	N/A	0.106	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	N/A	N/A	N/A*	N/A*
16	butanal	25000	0.063	<0.063	N/A	N/A	0.122	<0.063
17	NDMA**	0.3	0.020	<0.020	N/A	N/A	0.034	<0.020
18	benzene	500	0.230	<0.230	N/A	N/A	6.110	<0.230
19	2,4-pentadienenitrile + pyridine	300, 1000	0.084	<0.084	N/A	N/A	0.392	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	N/A	N/A	0.044	<0.050
21	2-methylfuran	1	0.046	<0.046	N/A	N/A	0.054	<0.046
22	pentanenitrile	6000	0.029	<0.029	N/A	N/A	0.043	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	N/A	N/A	0.069	<0.048
24	NEMA**	0.3	0.027	<0.027	N/A	N/A	0.028	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	N/A	N/A	0.042	<0.035
26	hexanenitrile	6000	0.029	<0.029	N/A	N/A	0.033	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	N/A	N/A	0.034	<0.030
28	NDEA**	0.1	0.023	<0.023	N/A	N/A	0.025	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	30	0.106	<0.106	N/A	N/A	0.060	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	N/A	N/A	0.284	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	N/A	N/A	0.032	<0.035
32	heptanenitrile	6000	0.029	<0.029	N/A	N/A	0.029	<0.029

Table 7-1. Statistical Information for the Monitoring Period of February 9, 2019 – February 10, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
33	4-methyl-2-hexanone	500	0.032	<0.032	N/A	N/A	0.035	<0.032
34	NMOR**	0.6	0.017	<0.017	N/A	N/A	0.049	<0.017
35	butyl nitrate	2500	0.019	<0.019	N/A	N/A	0.046	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	N/A	N/A	0.029	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	N/A	N/A	0.030	<0.028
38	2-pentylfuran	1	0.029	<0.029	N/A	N/A	0.036	<0.029
39	biphenyl	200	0.031	<0.031	N/A	N/A	0.028	<0.031
40	2-heptylfuran	1	0.136	<0.136	N/A	N/A	0.062	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	N/A	N/A	0.040	<0.184
42	2-octylfuran	1	0.013	<0.013	N/A	N/A	0.033	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	N/A	N/A	0.029	<0.132
44	PCB	1000	0.139	<0.139	N/A	N/A	0.037	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	N/A	N/A	0.033	<0.025
46	furfural acetophenone	1	0.119	<0.119	N/A	N/A	0.065	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.051 ppb and the median value was <0.034 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers.							
**	Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.].							
ND	COPC Averages below the MDL.							
†	COPC Averages between the RL and the MDL.							
	COPC Averages >100% of the OEL.							
	COPC Averages 50-100% of the OEL.							
	COPC Averages 10-50% of the OEL.							

Figure 7-3 through Figure 7-21 display a selection of 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period February 9, 2019 to February 10, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

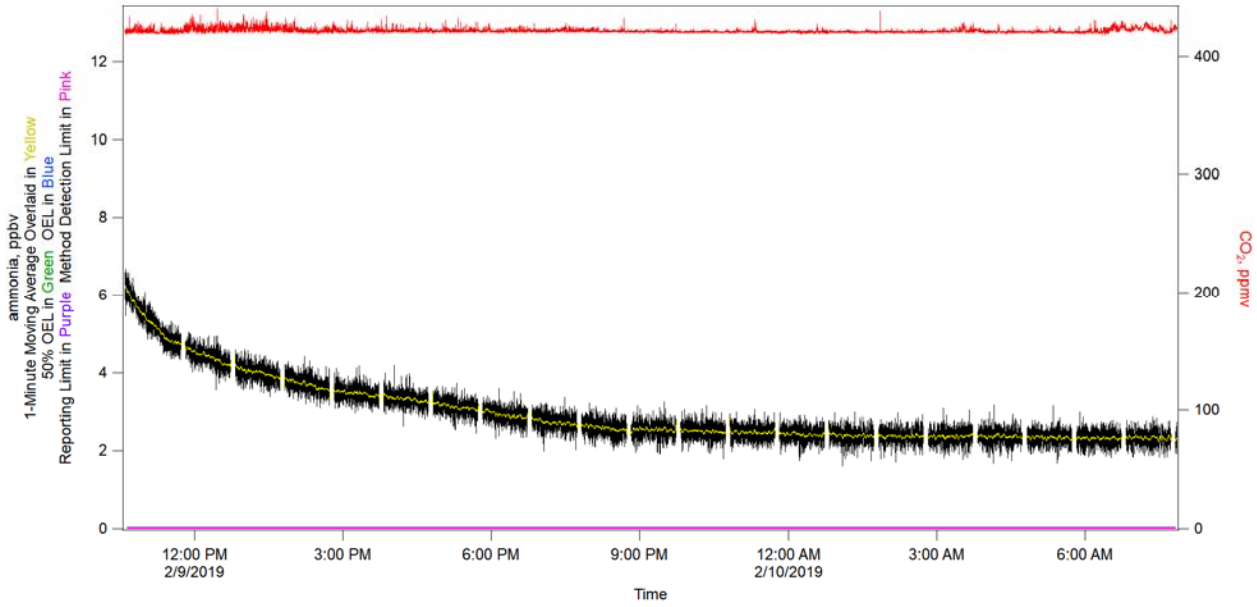

Figure 7-3. Ammonia.

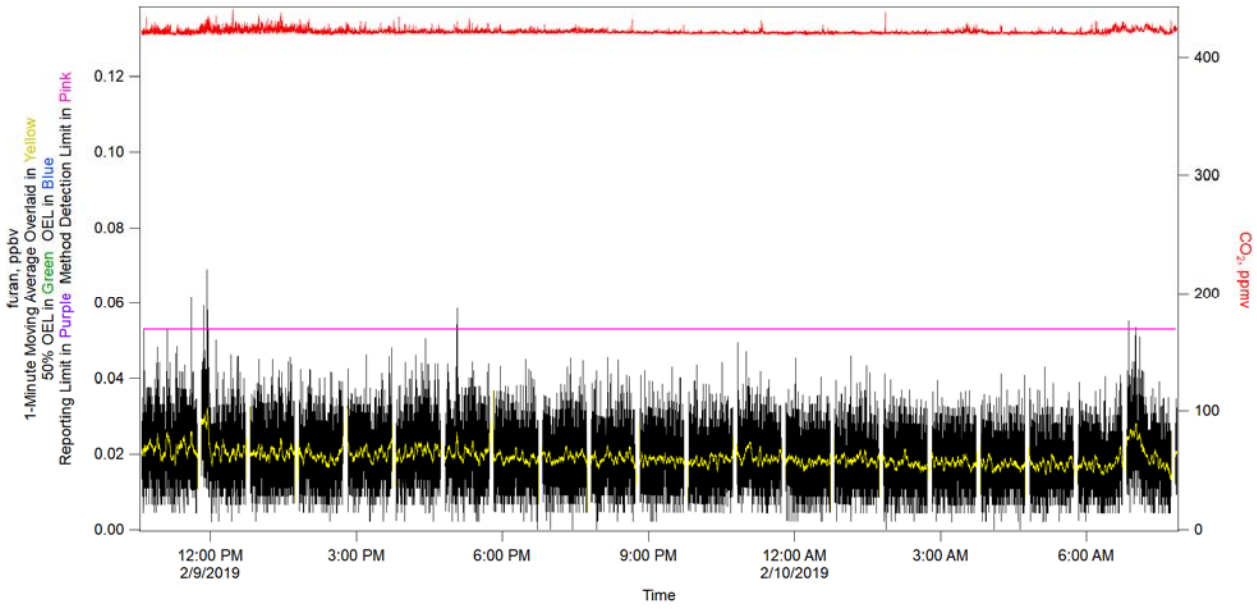

Figure 7-4. Furan.

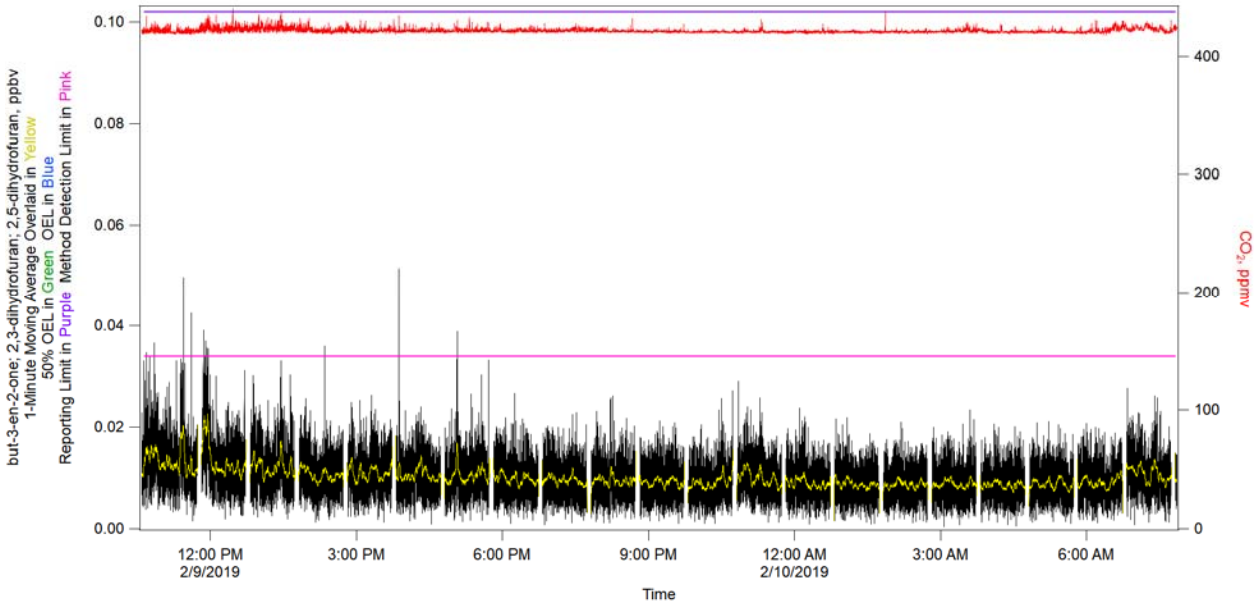

Figure 7-5. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

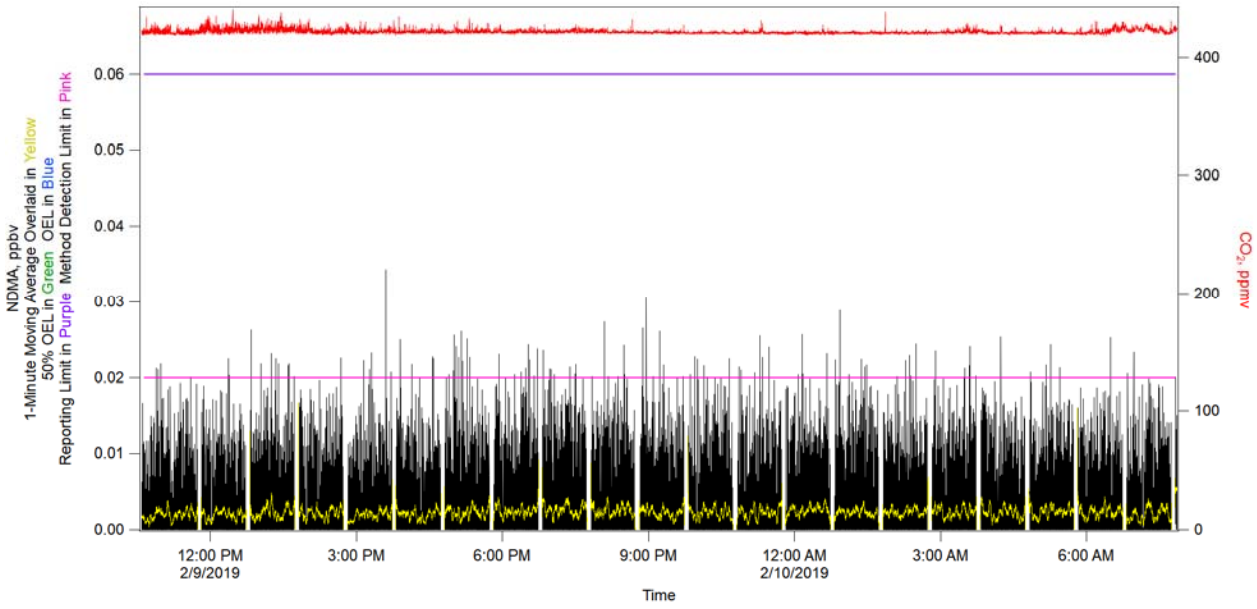

Figure 7-6. N-nitrosodimethylamine (NDMA).

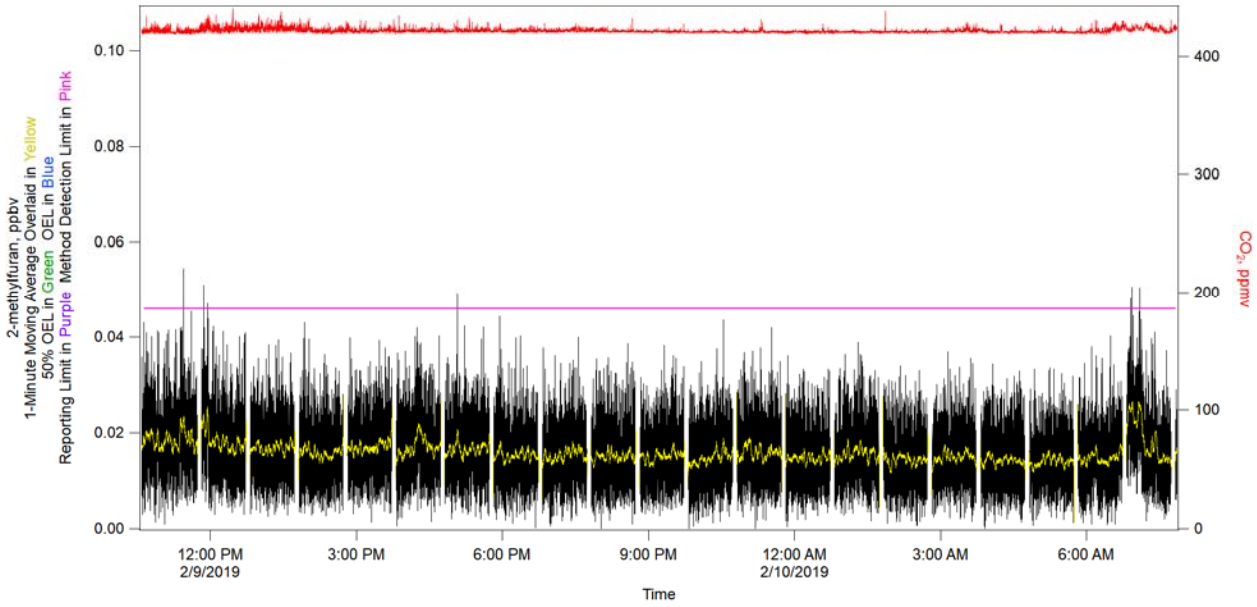

Figure 7-7. 2-methylfuran.

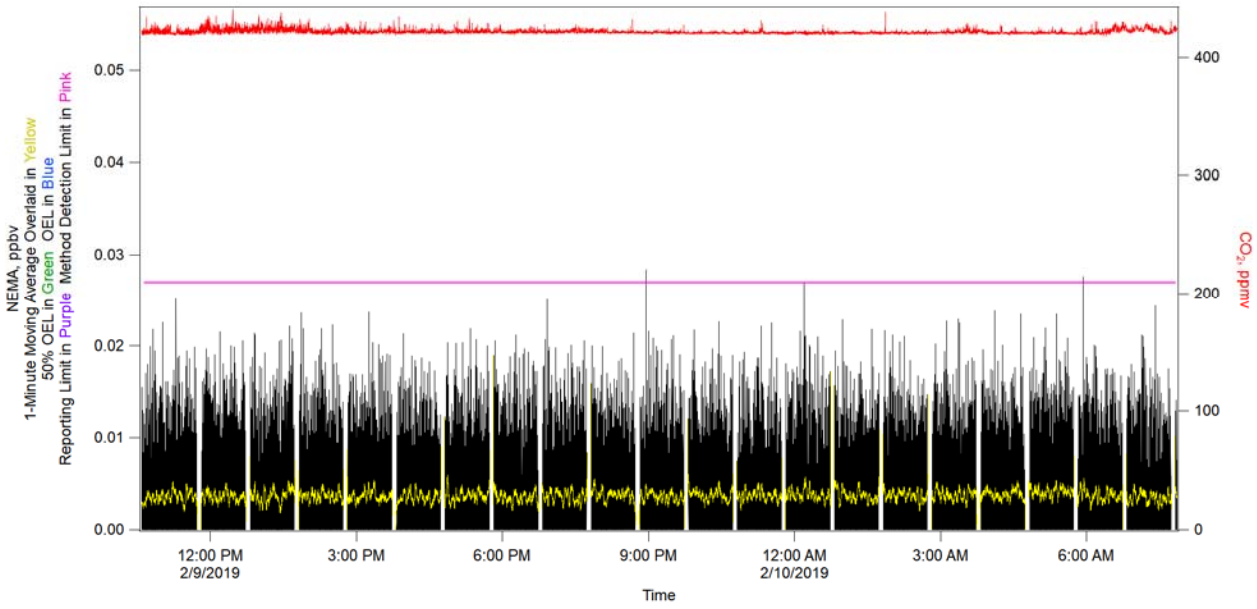

Figure 7-8. N-nitrosomethylethylamine (NEMA).

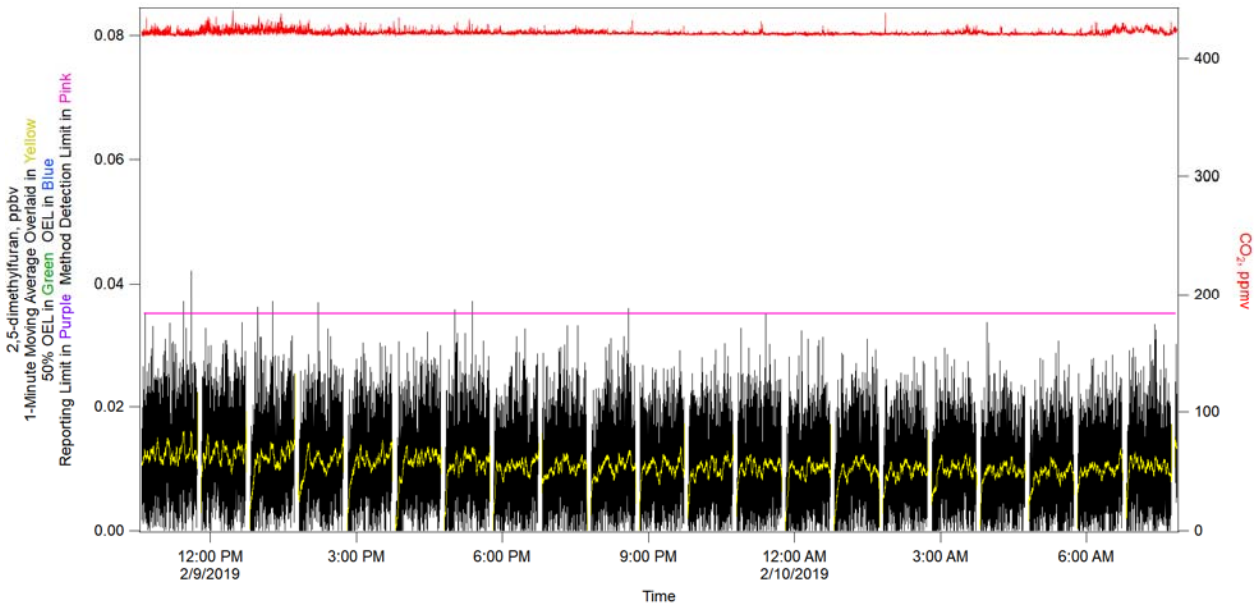

Figure 7-9. 2,5-dimethylfuran.

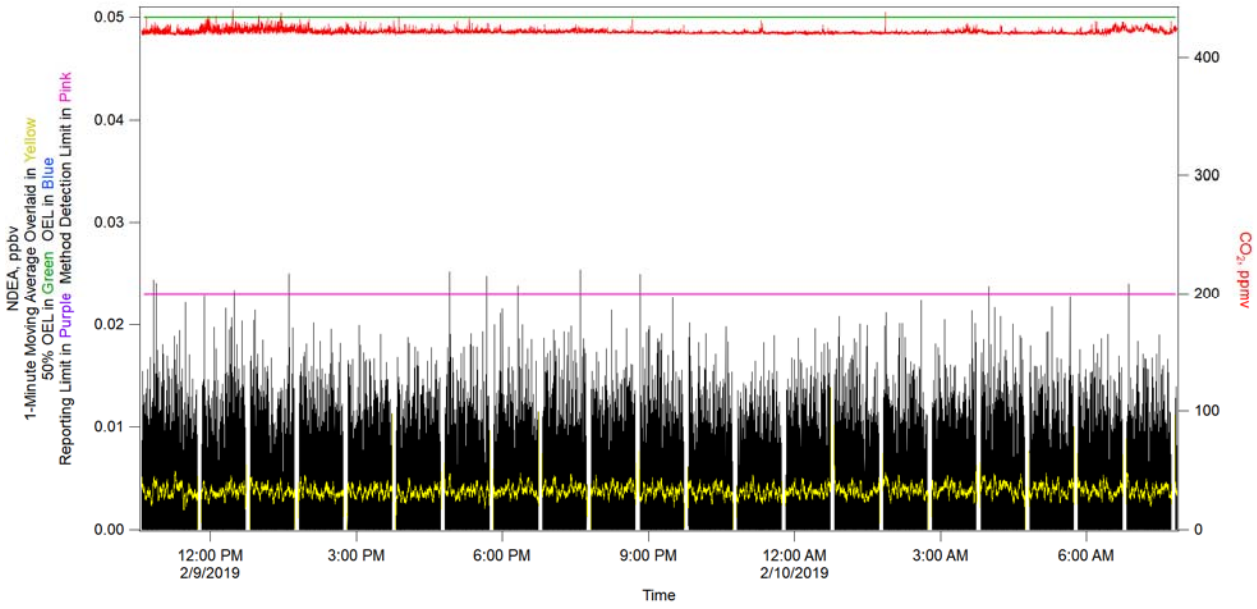

Figure 7-10. N-nitrosodiethylamine (NDEA).

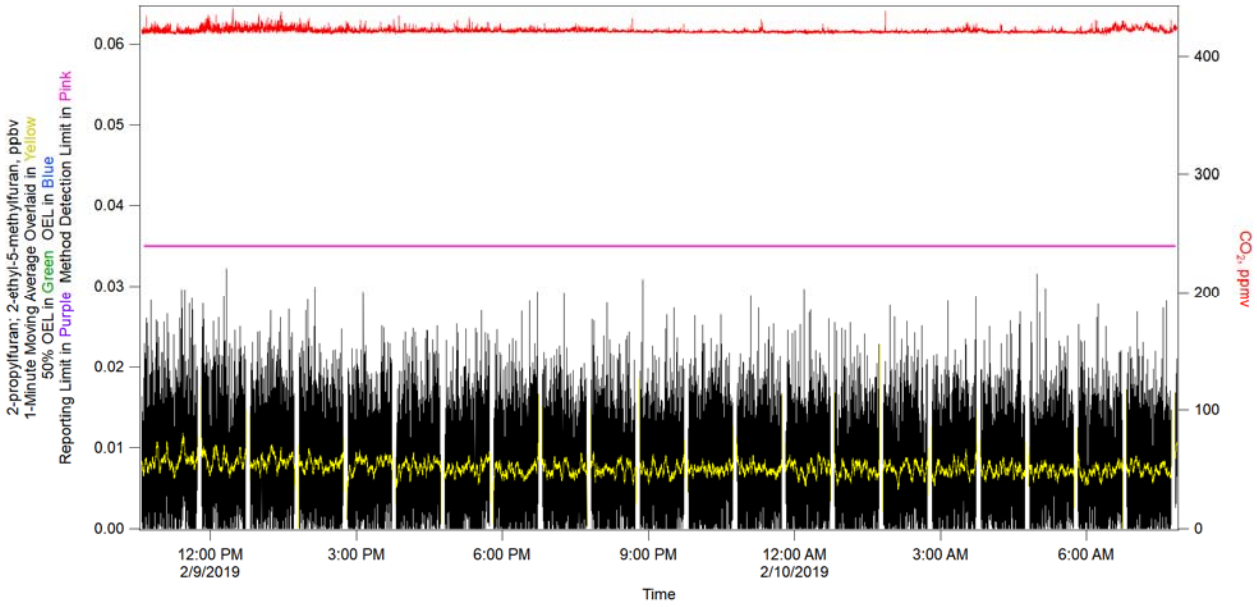

Figure 7-11. 2-propylfuran + 2-ethyl-5-methylfuran.

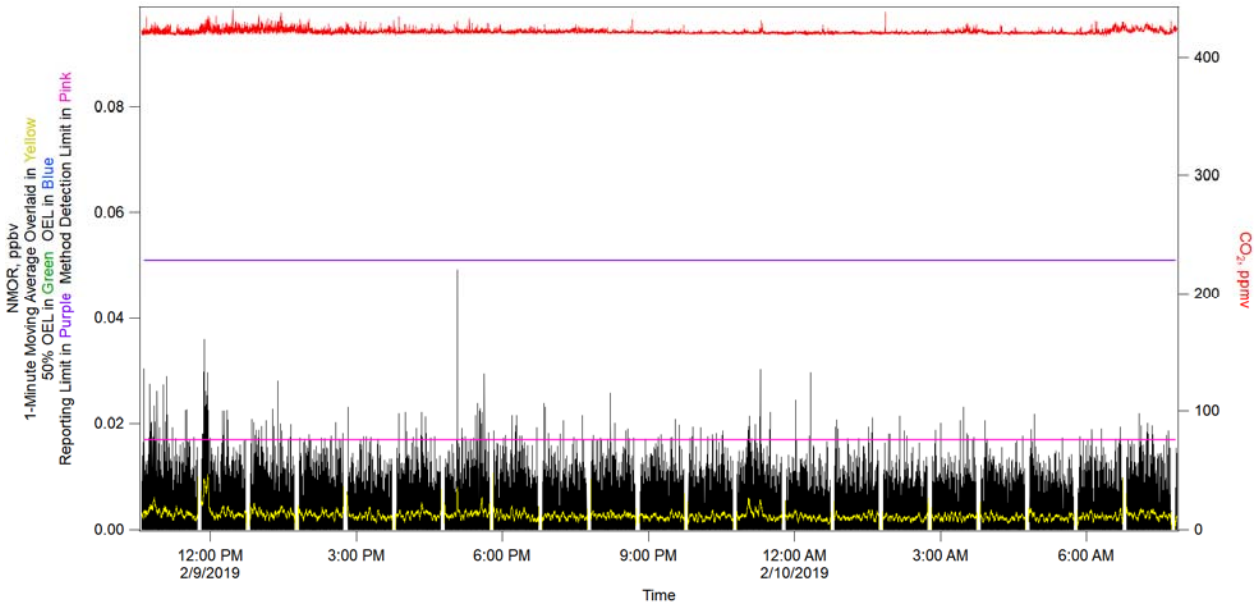

Figure 7-12. N-nitrosomorpholine (NMOR).

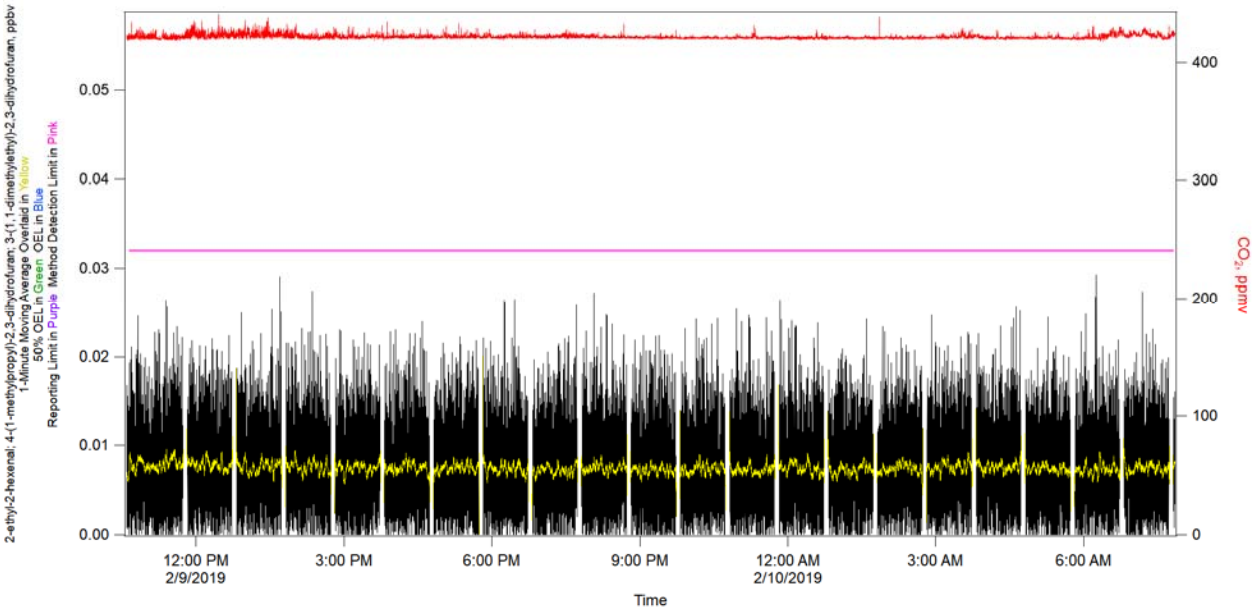

Figure 7-13. 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1-1-dimethylethyl)-2,3-dihydrofuran.

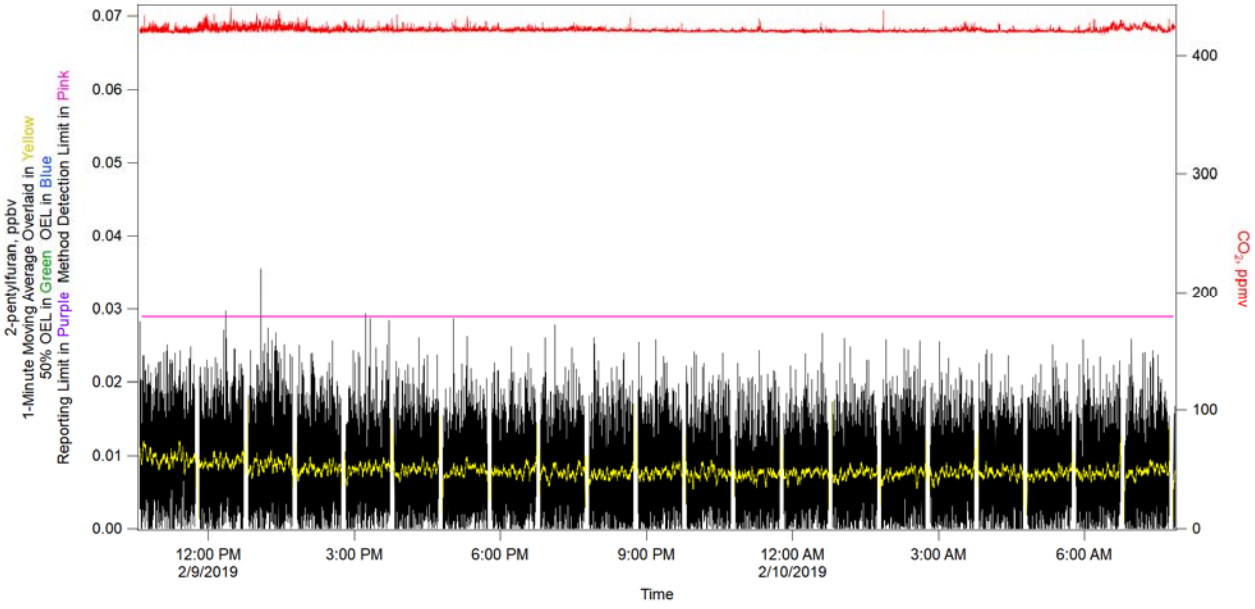

Figure 7-14. 2-pentylfuran.

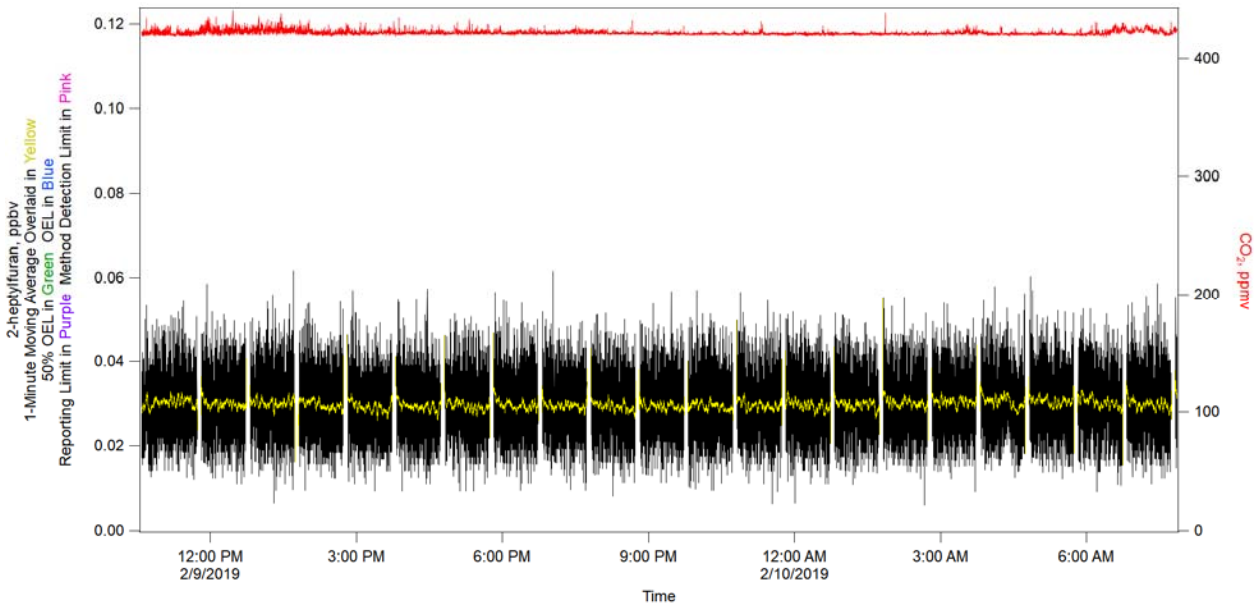

Figure 7-15. 2-heptylfuran.

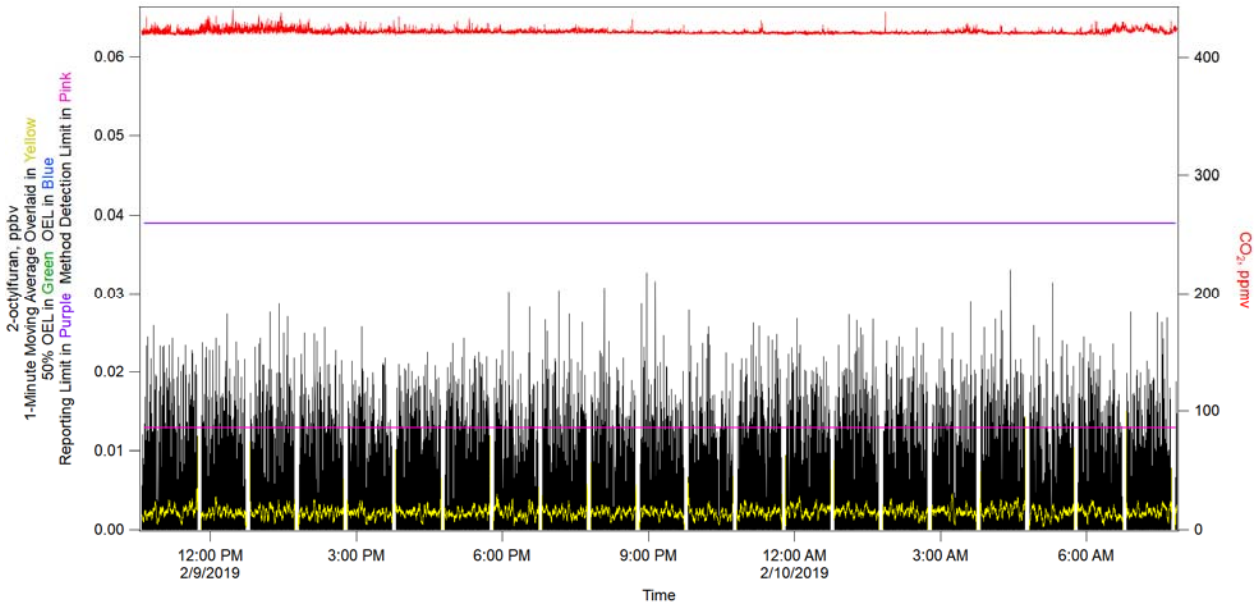

Figure 7-16. 2-octylfuran.

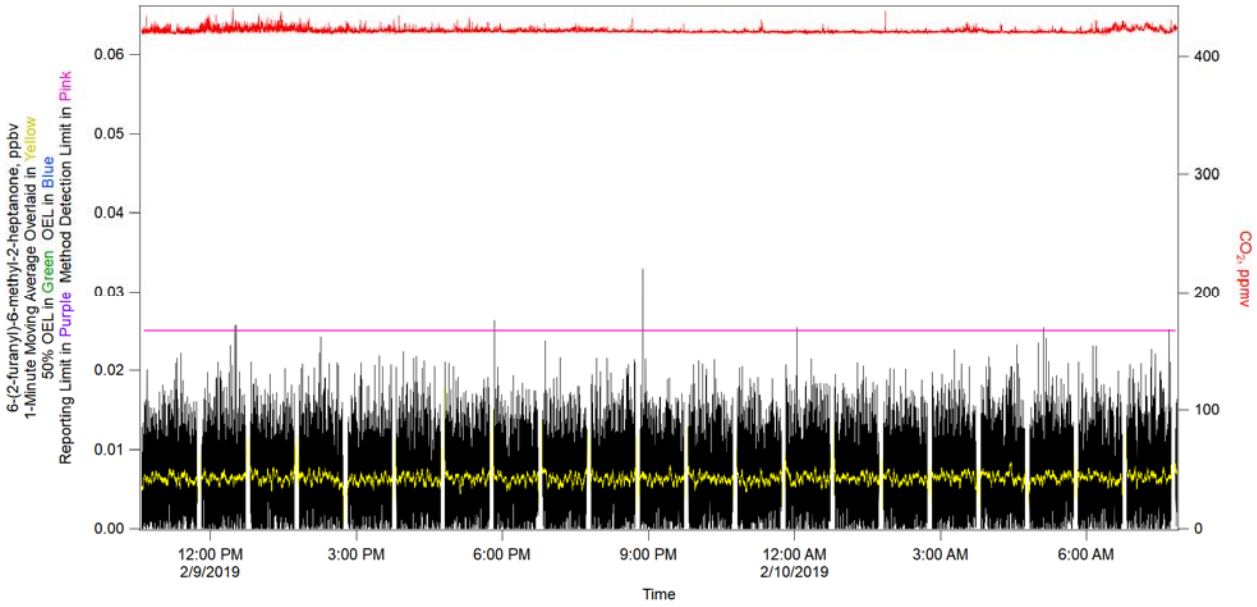

Figure 7-17. 6-(2-furanyl)-6-methyl-2-heptanone.

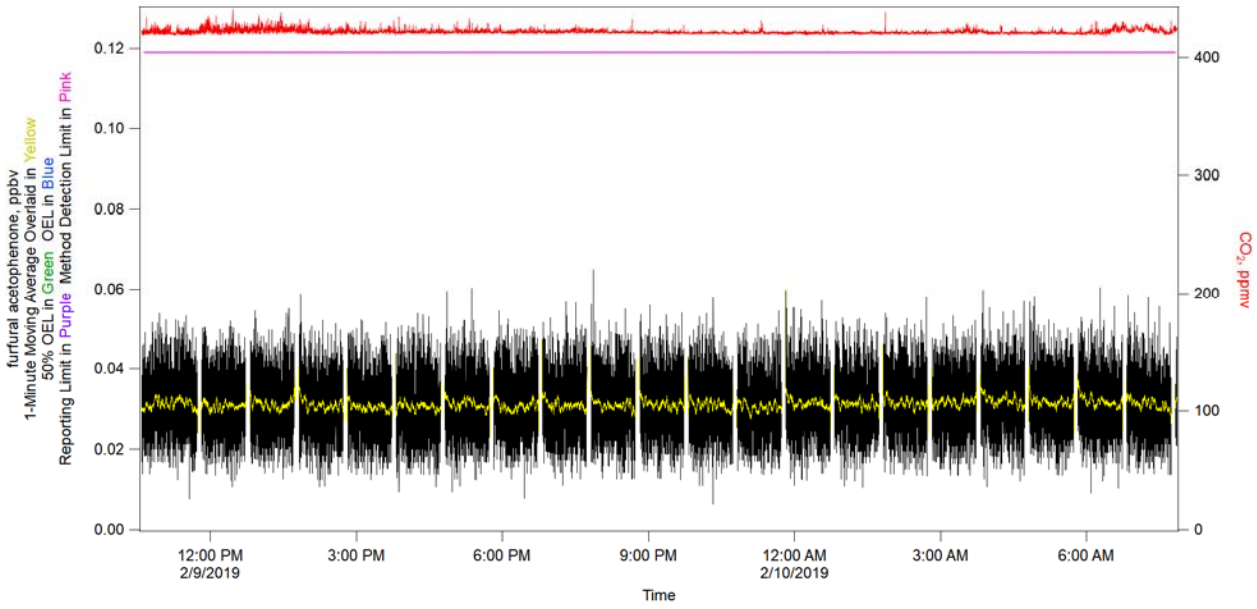

Figure 7-18. Furfural Acetophenone.

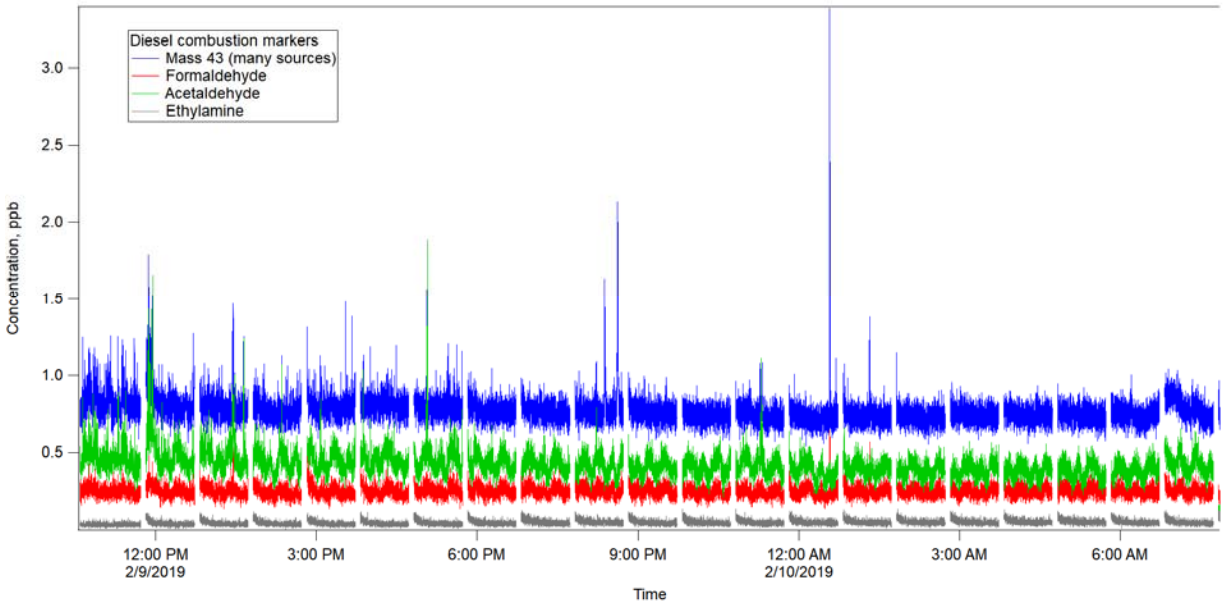

Figure 7-19. Diesel Combustion Markers.

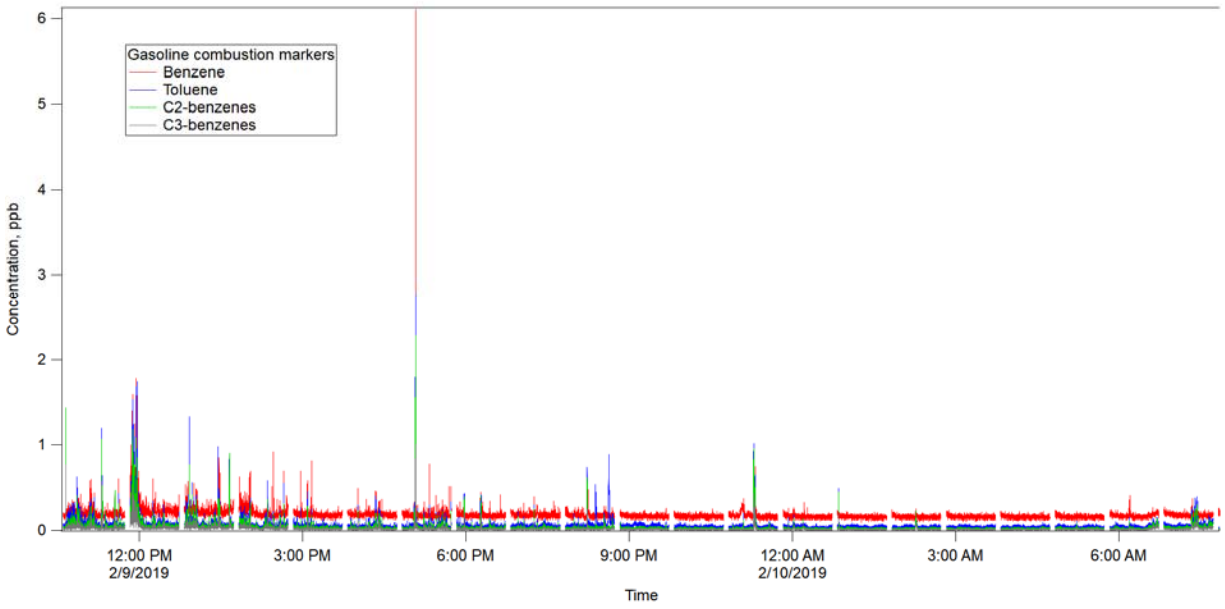

Figure 7-20. Gasoline Combustion Markers.

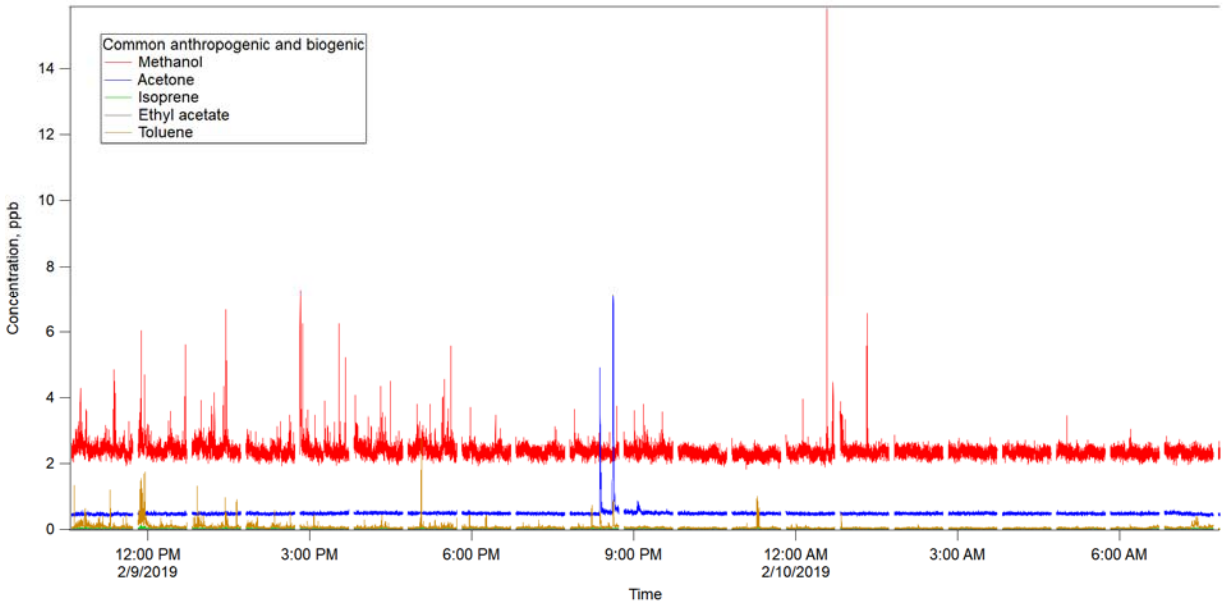

Figure 7-21. Plant and Human Markers.

8.0 REFERENCES

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