WEEKLY REPORT FOR WEEK 7
(SEPTEMBER 17, 2018 – SEPTEMBER 22, 2018)

Report No. 53005-81-RPT-016
Revision 0
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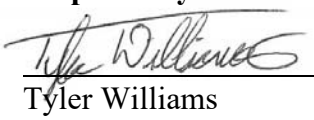

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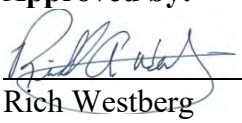

Date: 09/25/2019

Rich Westberg

Record of Revision

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

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Figures

Tables

Acronyms

AOP	Abnormal Operating Procedure
COPC	Chemical of Potential Concern
CSO	Central Shift Office
ML	Mobile Laboratory
NDEA	N-nitrosodiethylamine
NDMA	N-nitrosodimethylamine
NEMA	N-nitrosomethylethylamine
NMOR	N-nitrosomorpholine
OEL	Occupational Exposure Limit
PPE	Personal Protective Equipment
PST	Pacific Standard Time
PTR-MS	Proton Transfer Reaction – Mass Spectrometer
PTR-TOF	Proton Transfer Reaction – Time of Flight
QA	Quality Assurance
QC	Quality Control

1.0 SEPTEMBER 17, 2018 – SX PAVING

1.1 Quality Assessment

Data from September 17, 2018, 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. Report No. 66409-RPT-004, *Mobile Laboratory Operational Procedure*, was adequately documented and all checks passed the acceptance limits.

1.2 Summary

All times reported in this document are recorded in Pacific Standard Time (PST).

On September 17, 2018, the Mobile Laboratory (ML) performed area monitoring on the Hanford Site in support of the SX Paving Project.

The ML arrived on site and checked in with the Central Shift Office (CSO) at 05:23. Prior to arrival, the quality assurance/quality control (QA/QC) zero-air/sensitivity checks were initiated on the LI-COR®[1] CO_2 monitor, the Picarro Ammonia analyzer, and the Proton Transfer Reaction-Mass Spectrometer (PTR-MS) at 05:02. The ML began mobile monitoring of SX at 05:41. The ML started the monitoring period at the southeast corner of SX Farm. Due to unstable winds, the ML transitioned to various locations throughout the day, in order to remain downwind from the paving-related activities.

At 13:48, the ML staff checked out with the CSO and returned to the TerraGraphics warehouse in Pasco, WA, at 14:38.

Table 1-1. Mobile Laboratory Sampling Mode Throughout the Monitoring Period.

Time	Location	Sampling Mode
05:41 - 06:09	SX Farm (SE corner of farm)	Mobile Area Sampling
06:09 - 07:10	SX Farm (East side of farm)	Mobile Area Sampling
07:10 - 07:52	SX Farm (West side of farm)	Mobile Area Sampling
07:52 - 09:02	SX Farm (East side of farm)	Mobile Area Sampling
09:02 - 10:16	SX Farm (South side of farm)	Mobile Area Sampling
10:16 - 11:56	SX Farm (West side of farm)	Mobile Area Sampling
11:56 - 13:30	SX Farm (SW corner of farm)	Mobile Area Sampling

[1] LI-COR is a registered trademark of LI-COR, Inc., Lincoln, Nebraska.

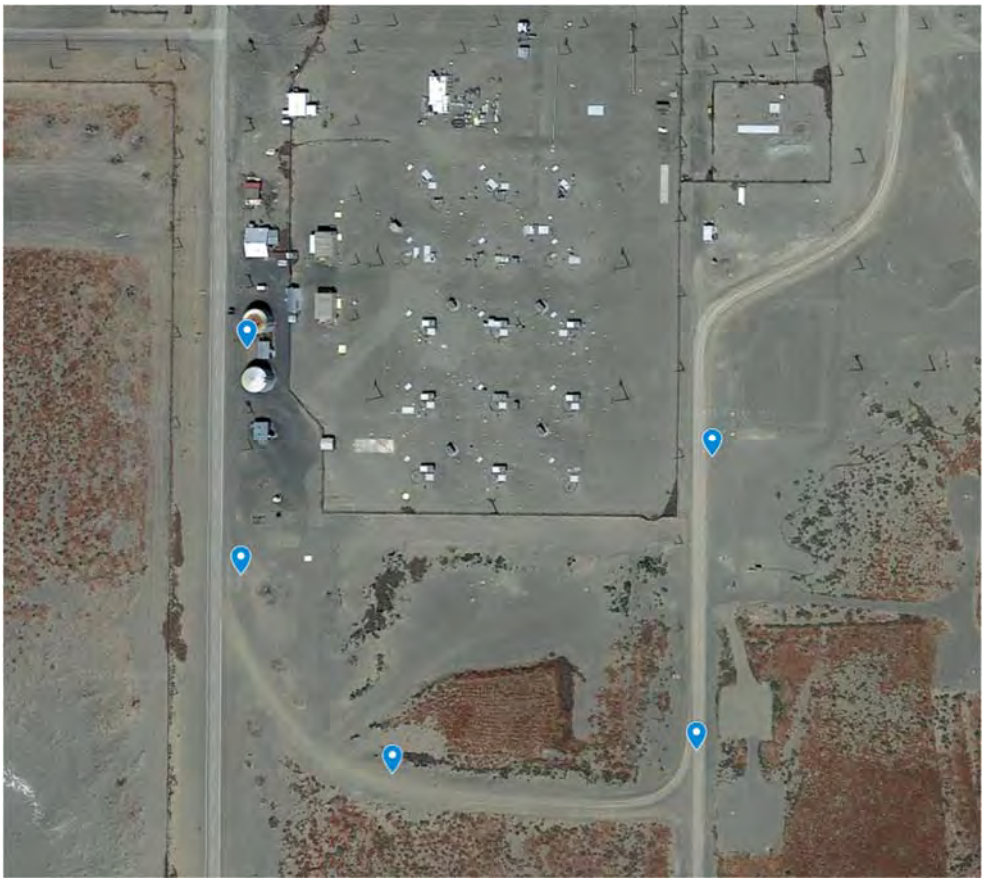

Figure 1-1. Mobile Laboratory Location for the Duration of the Monitoring Period.

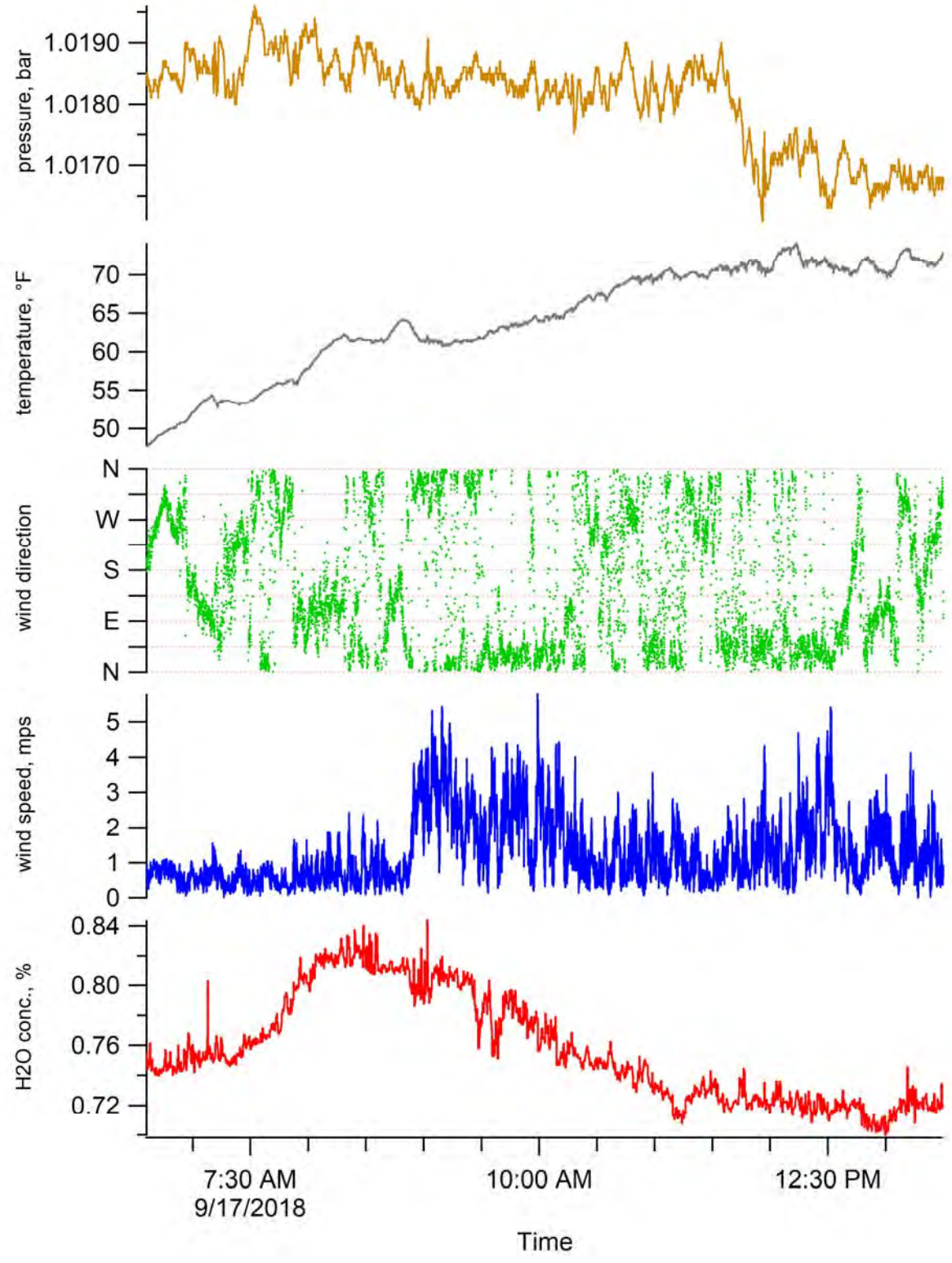

Figure 1-2. Weather Data for the Duration of Monitoring Period.

1.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- Proton Transfer Reaction – Time of Flight (PTR-TOF) 6000 X2,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

Table 1-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 17, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	4.083	0.786	19.250	7.166	4.005
2	formaldehyde	300	0.776	0.233	30.071	5.445	0.726
3	methanol	200000	7.467	2.455	32.879	68.746	6.578
4	acetonitrile	20000	0.177	0.033	18.645	0.548	0.174
5	acetaldehyde	25000	2.401	1.234	51.388	19.886	1.979
6	ethylamine	5000	0.028	0.015	54.708	0.103	0.024
7	1,3-butadiene	1000	0.272	0.729	268.116	21.113	0.082
8	propanenitrile	6000	0.069	0.054	77.243	1.366	0.060
9	2-propenal	100	0.184	0.148	80.269	2.298	0.139
10	1-butanol; butenes	20000	0.446	0.972	217.821	27.786	0.209
11	methyl isocyanate	20	0.044	0.023	51.329	0.169	0.041
12	methyl nitrite	100	0.139	0.086	61.833	0.696	0.105
13	furan	1	0.039	0.026	67.828	0.409	0.033
14	butanenitrile	8000	0.033	0.047	143.753	1.354	0.023
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	100, 1, 1	0.055	0.041	75.174	N/A*	N/A*
16	butanal	25000	0.158	0.110	69.709	0.741	0.111
17	NDMA**	0.3	0.037	0.044	117.628	0.333	0.024
18	benzene	500	0.165	0.235	142.072	4.351	0.102
19	2,4-pentadienenitrile + pyridine	300, 1000	0.038	0.023	59.397	0.348	0.033
20	2-methylene butanenitrile	30	0.026	0.033	126.832	0.971	0.019
21	2-methylfuran	1	0.040	0.031	77.569	0.262	0.031
22	pentanenitrile	6000	0.025	0.042	168.107	1.167	0.016
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.052	0.041	79.369	0.289	0.038
24	NEMA**	0.3	0.021	0.027	131.945	0.212	0.010

Table 1-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 17, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
25	2,5-dimethylfuran	1	0.068	0.029	43.133	0.271	0.065
26	hexanenitrile	6000	0.065	0.041	62.456	1.190	0.058
27	2-hexanone (MBK)	5000	0.053	0.021	39.034	0.154	0.051
28	NDEA**	0.1	0.155	0.066	42.578	0.400	0.156
29	butyl nitrite + 2-nitro-2-methylpropane	100, 30	0.573	0.056	9.807	0.811	0.570
30	2,4-dimethylpyridine	500	0.182	0.146	80.058	3.526	0.162
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.121	0.038	31.147	0.311	0.119
32	heptanenitrile	6000	0.173	0.040	23.239	0.937	0.170
33	4-methyl-2-hexanone	500	0.151	0.032	21.237	0.286	0.149
34	NMOR**	0.6	0.020	0.033	163.198	0.387	0.000
35	butyl nitrate	2500	0.089	0.029	32.877	0.211	0.087
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.142	0.033	23.049	0.410	0.140
37	6-methyl-2-heptanone	8000	0.136	0.029	21.374	0.262	0.134
38	2-pentylfuran	1	0.117	0.031	26.528	0.248	0.116
39	biphenyl	200	0.114	0.034	29.369	0.235	0.114
40	2-heptylfuran	1	0.516	0.077	14.953	2.174	0.506
41	1,4-butanediol dinitrate	50	0.160	0.032	20.214	0.293	0.158
42	2-octylfuran	1	0.003	0.015	451.455	0.191	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.004	0.020	451.883	0.238	0.000
44	PCB	1000	0.180	0.030	16.597	0.311	0.178
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.095	0.025	26.315	0.199	0.094
46	furfural acetophenone	1	0.452	0.051	11.201	0.693	0.449

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.477 ppb and the median value was 0.040 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 studies [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., 2017].

The following figures display a selection of chemical of potential concern (COPC) signals, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 17, 2018.

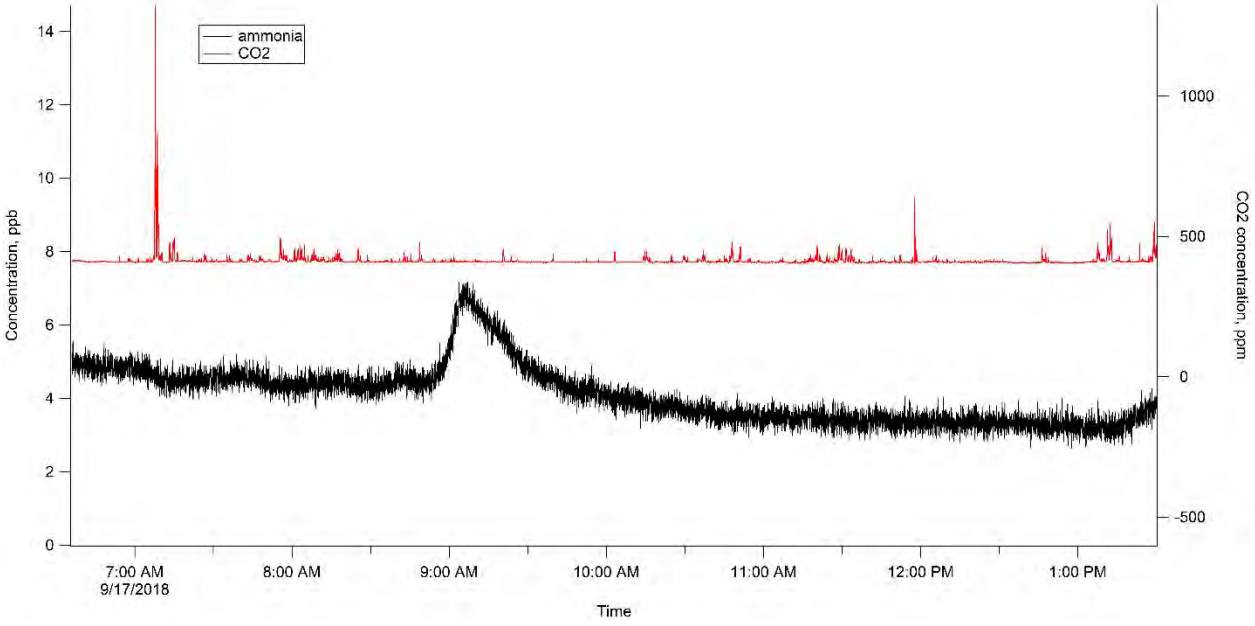

Figure 1-3. Ammonia.

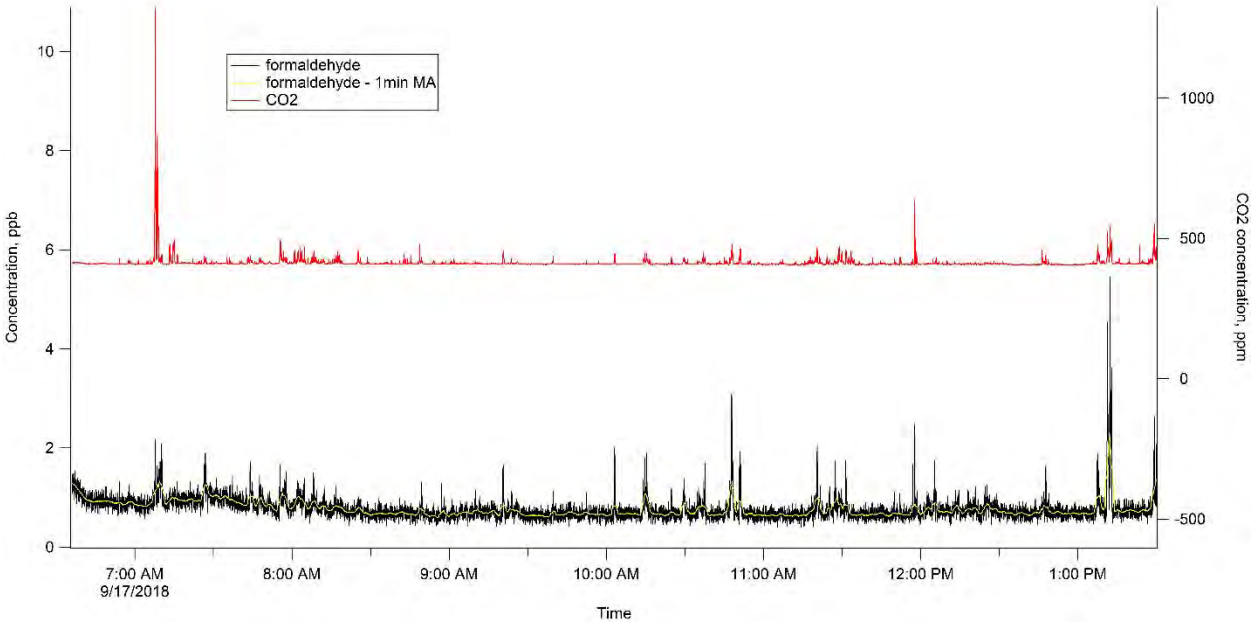

Figure 1-4. Formaldehyde.

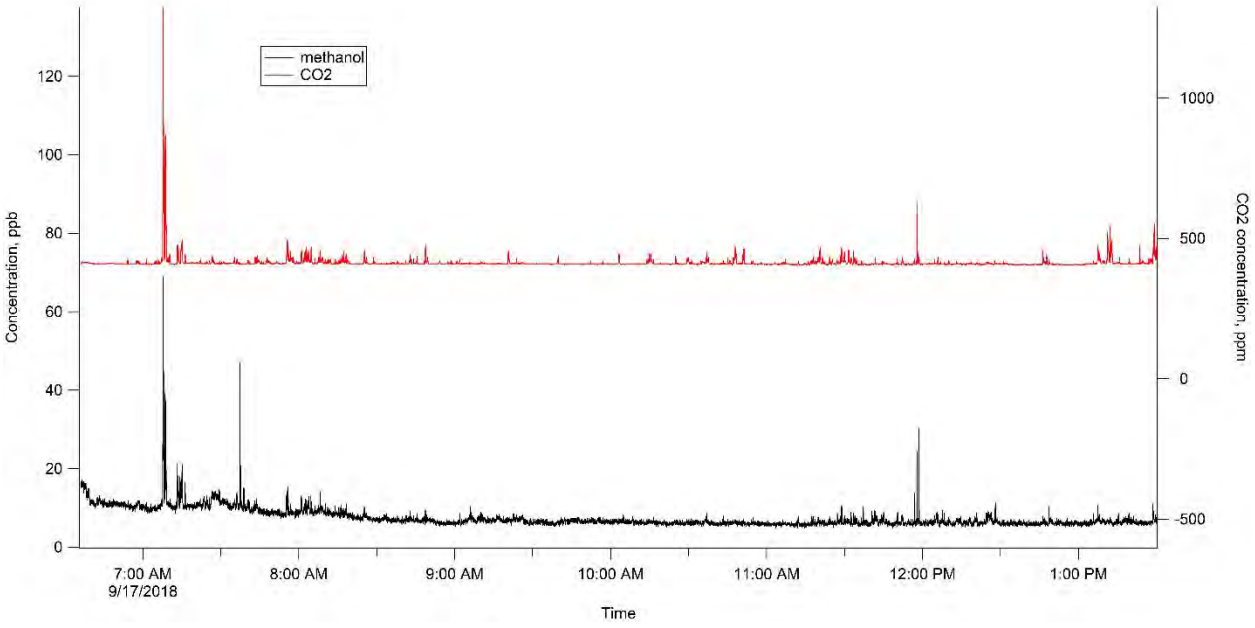

Figure 1-5. Methanol.

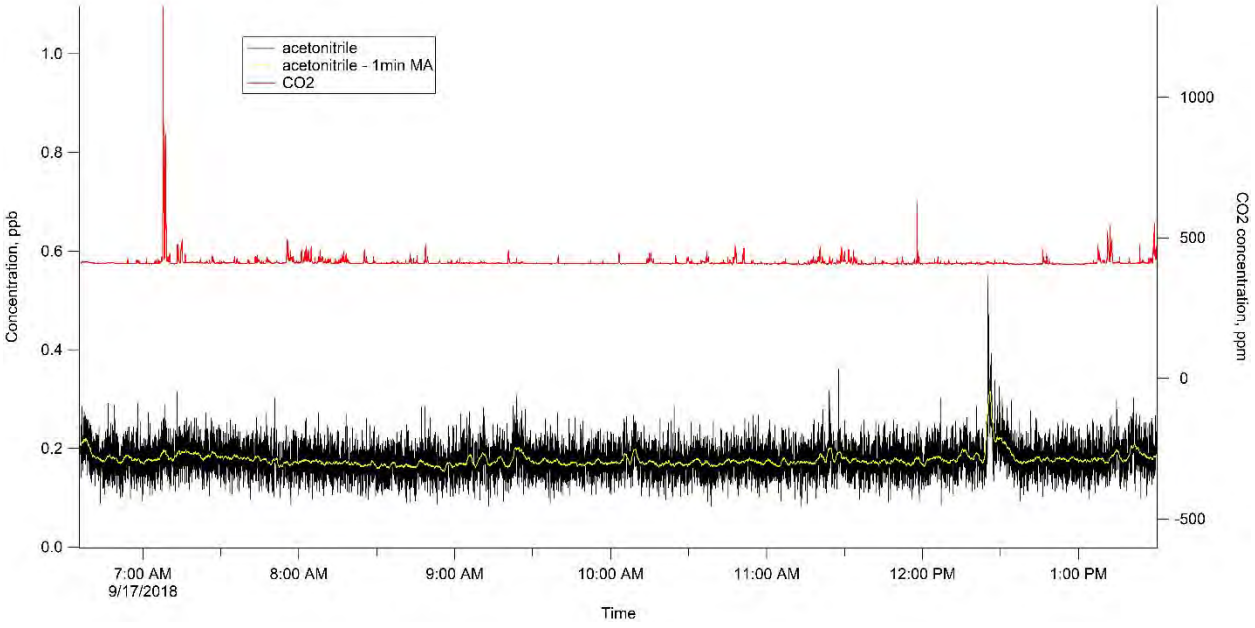

Figure 1-6. Acetonitrile.

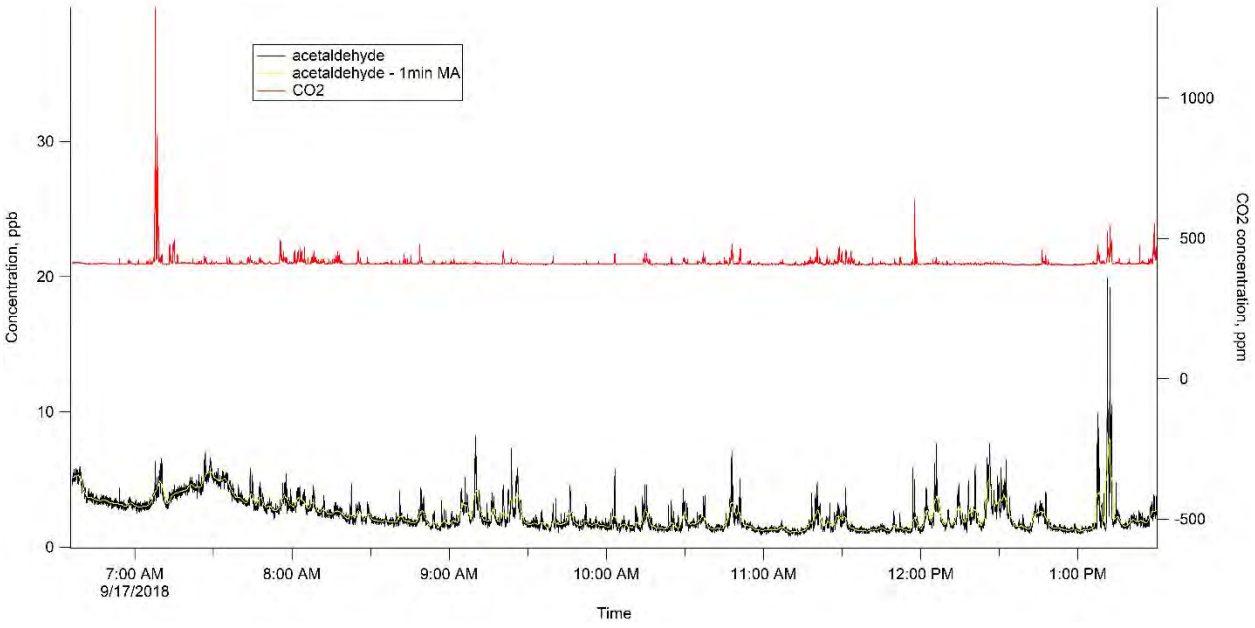

Figure 1-7. Acetaldehyde.

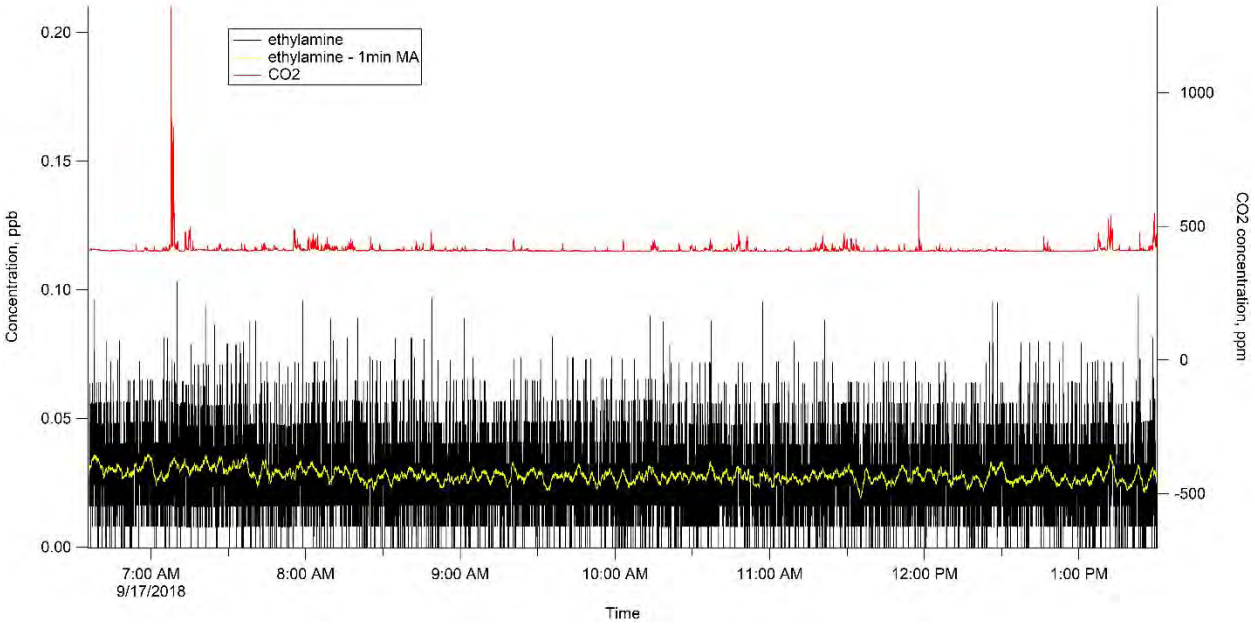

Figure 1-8. Ethylamine.

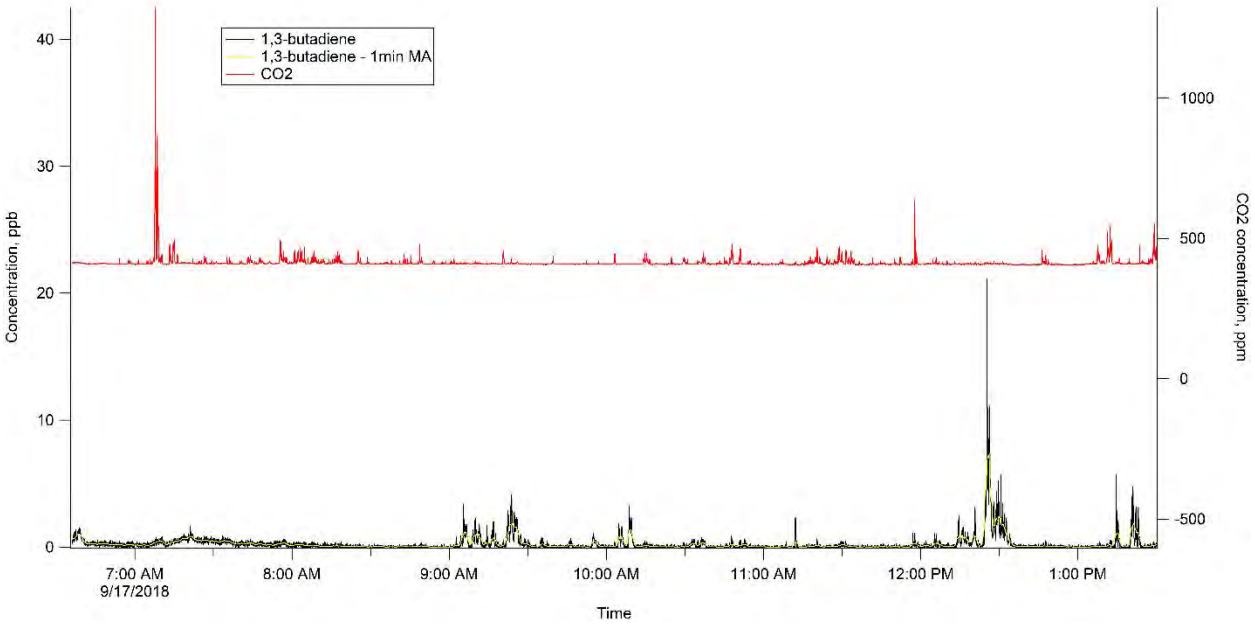

Figure 1-9. 1,3-butadiene.

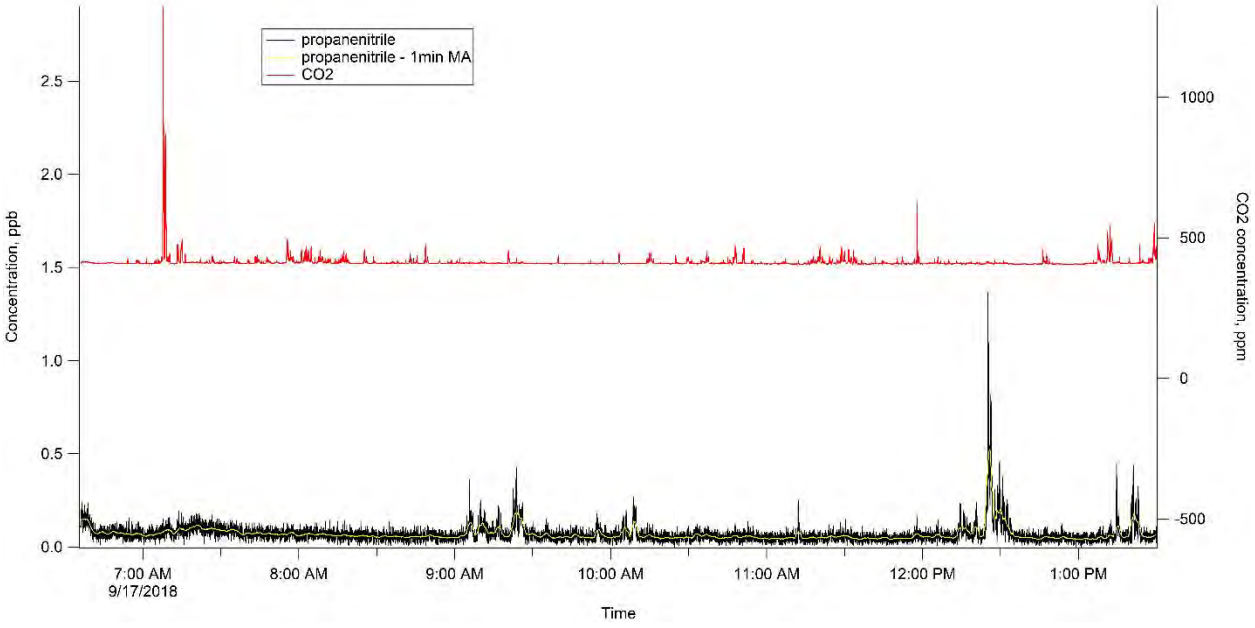

Figure 1-10. Propanenitrile.

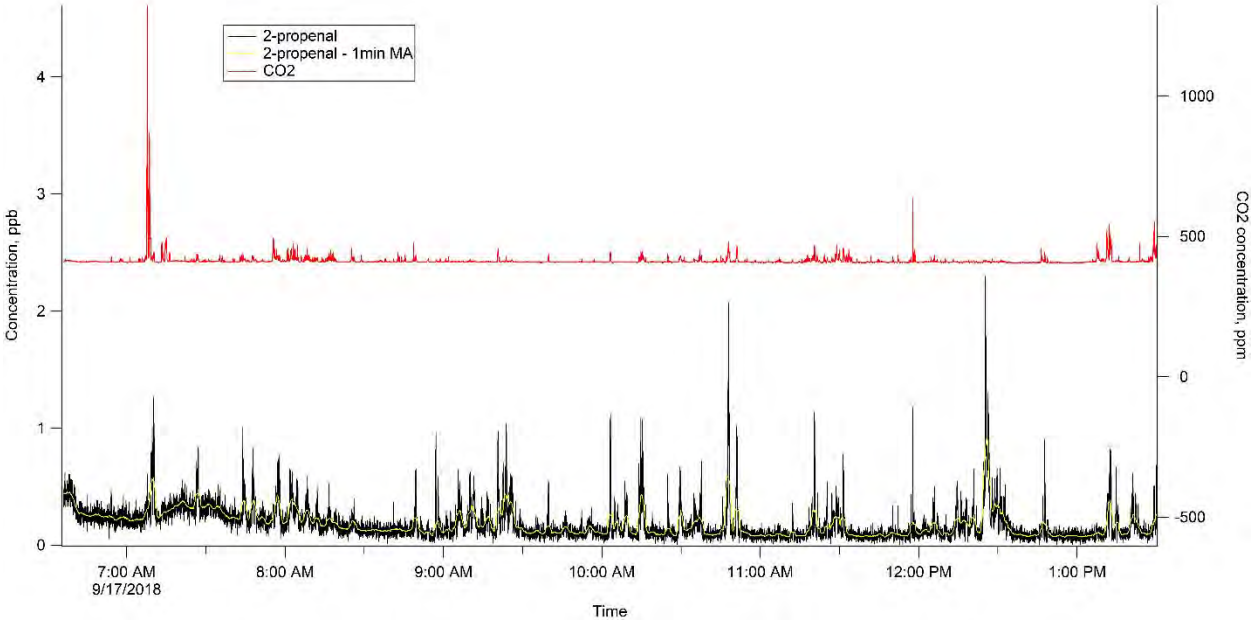

Figure 1-11. 2-propenal.

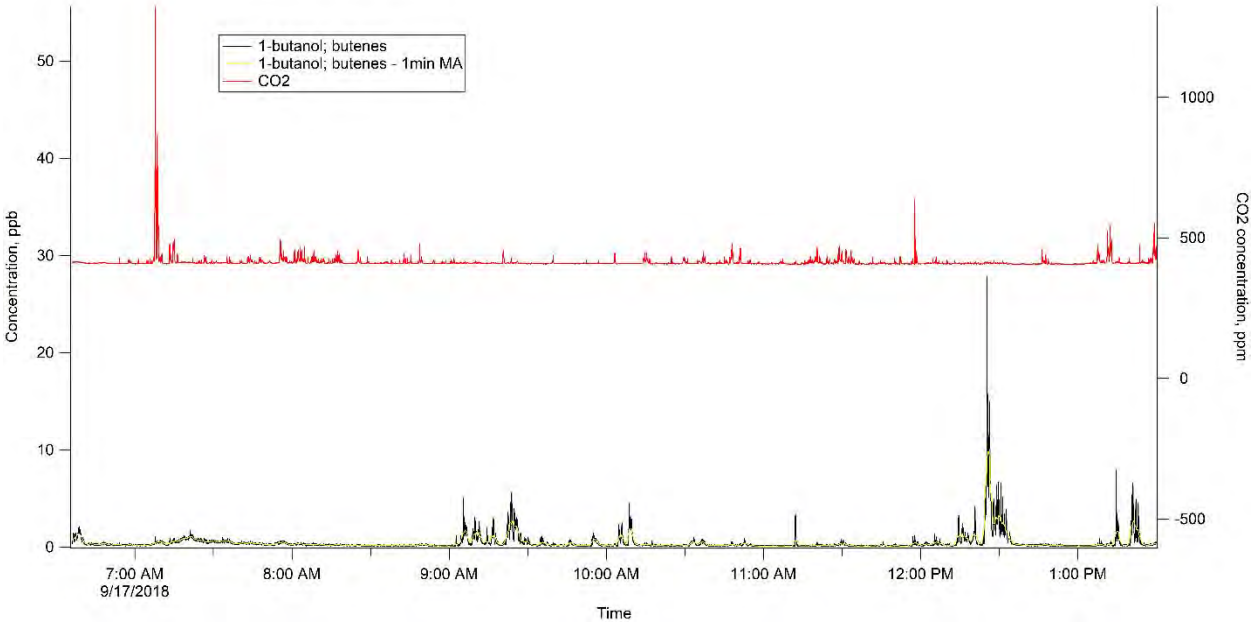

Figure 1-12. 1-butanol; Butenes.

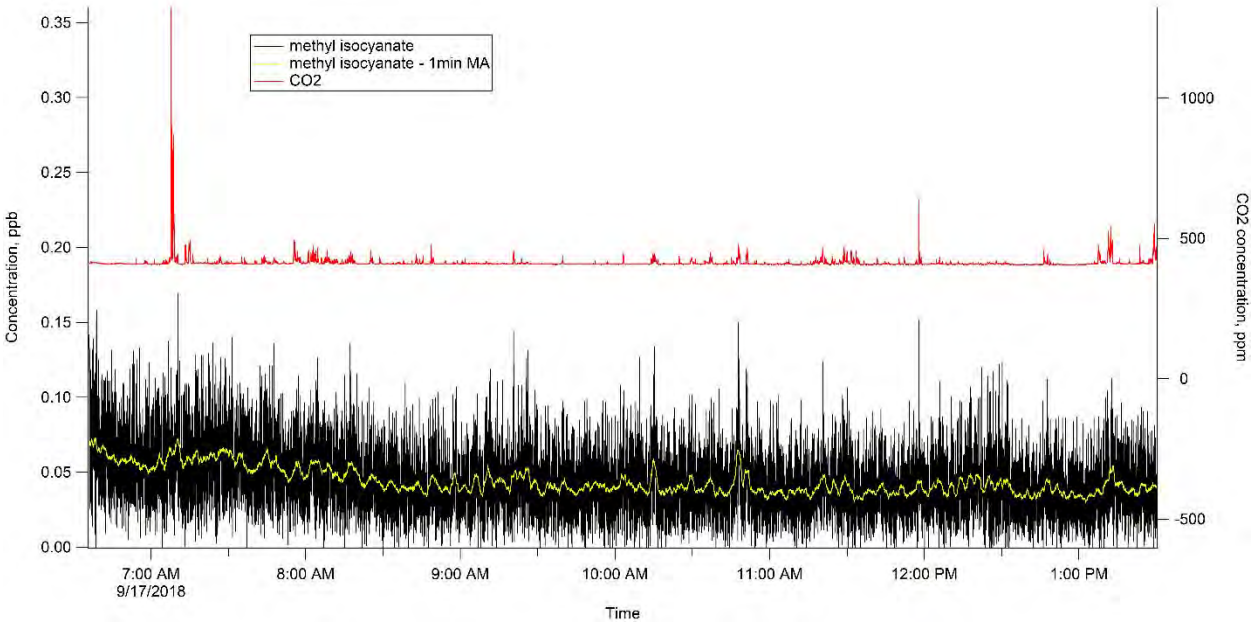

Figure 1-13. Methyl Isocyanate.

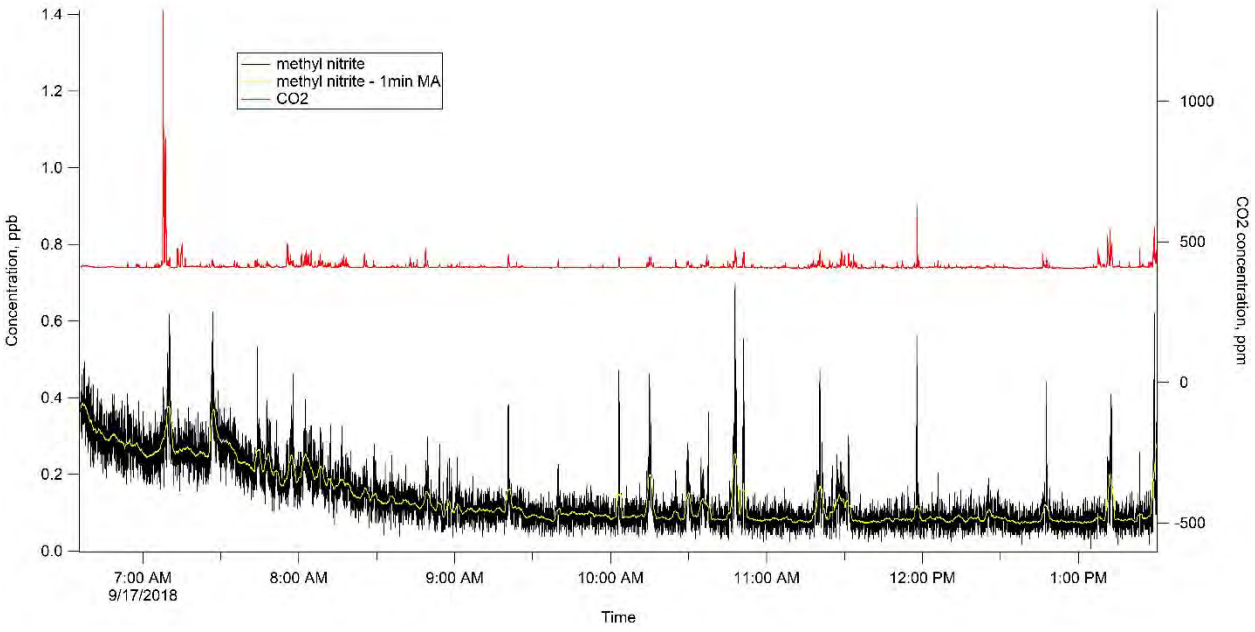

Figure 1-14. Methyl Nitrite.

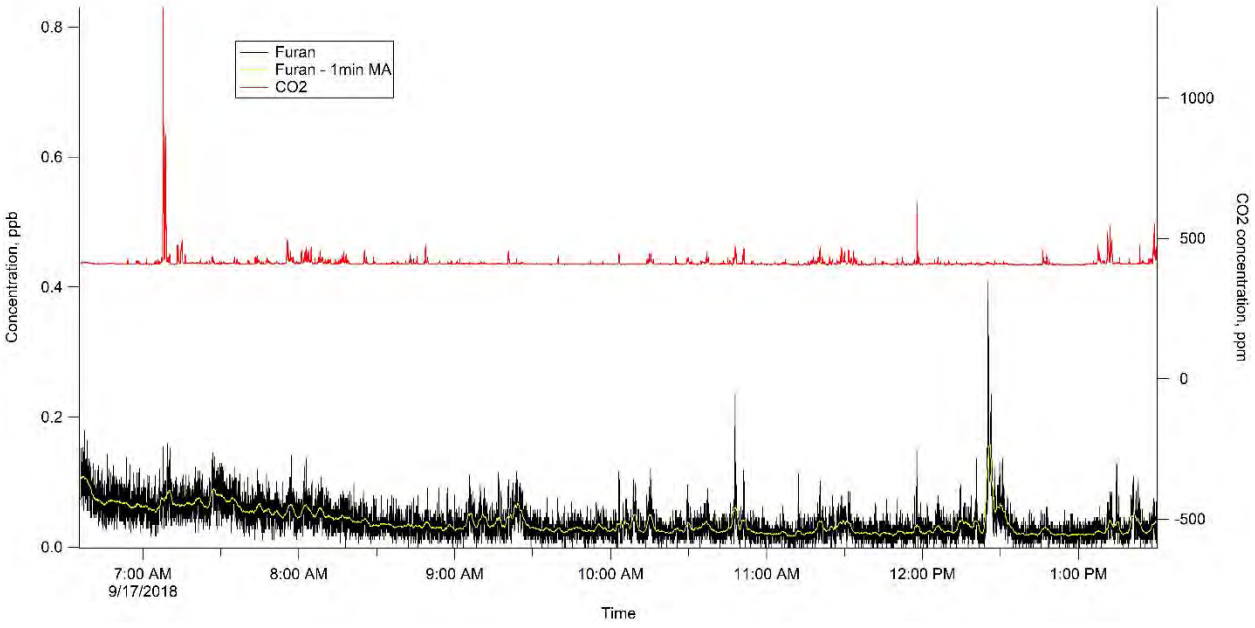

Figure 1-15. Furan.

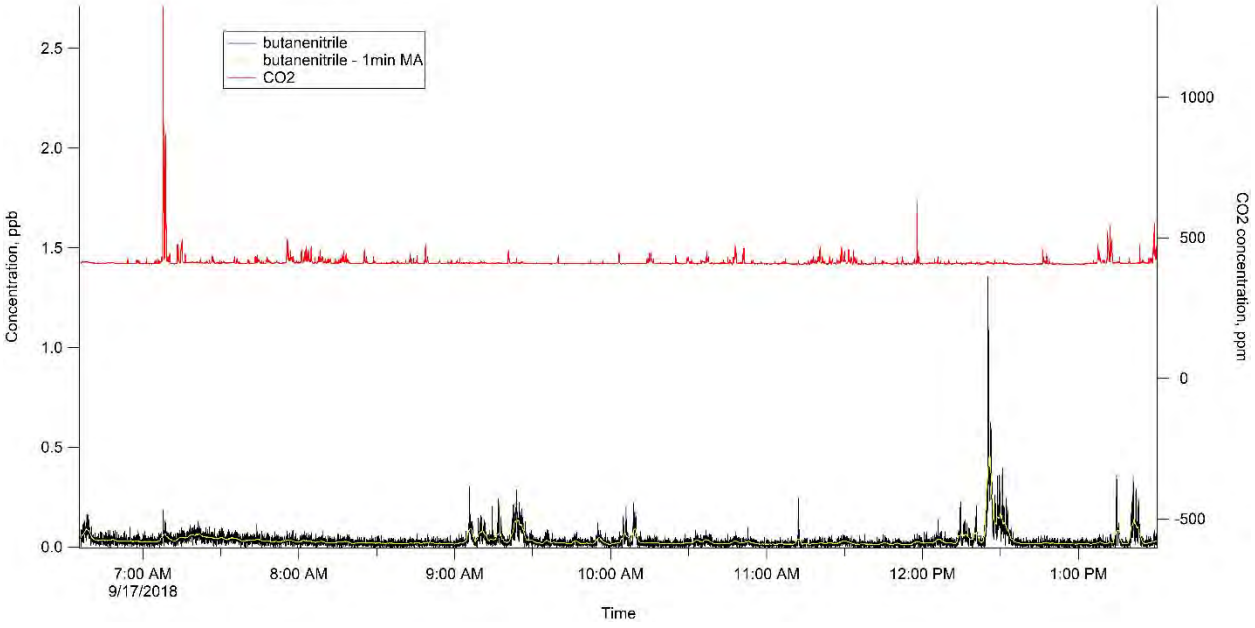

Figure 1-16. Butanenitrile.

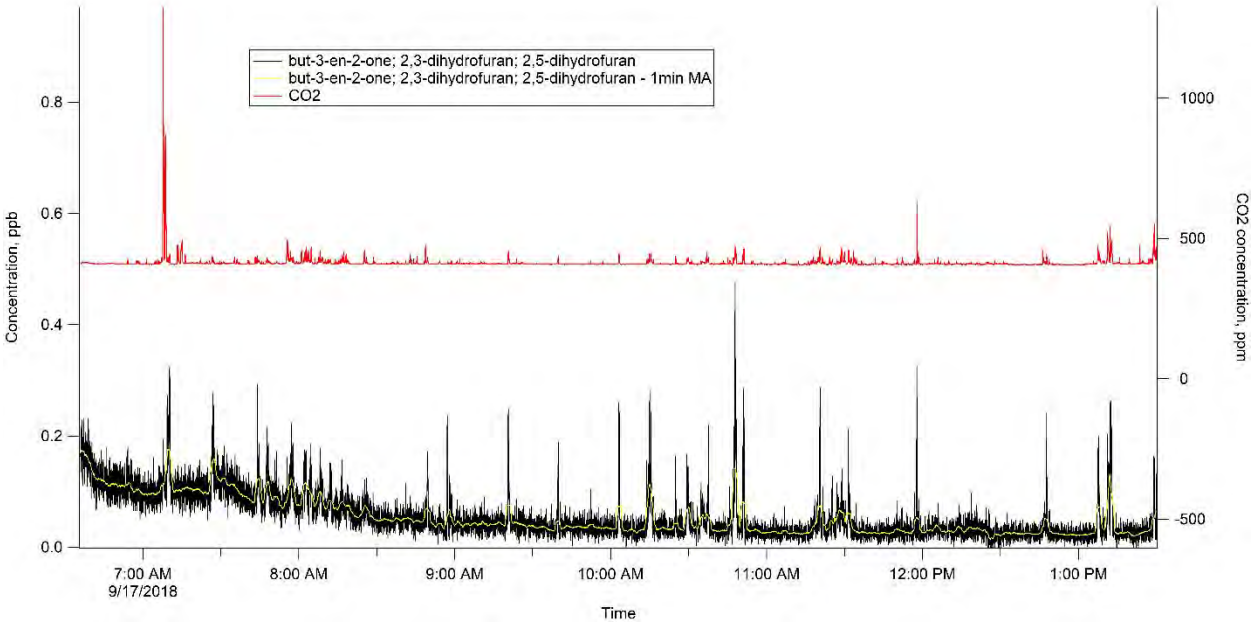

Figure 1-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

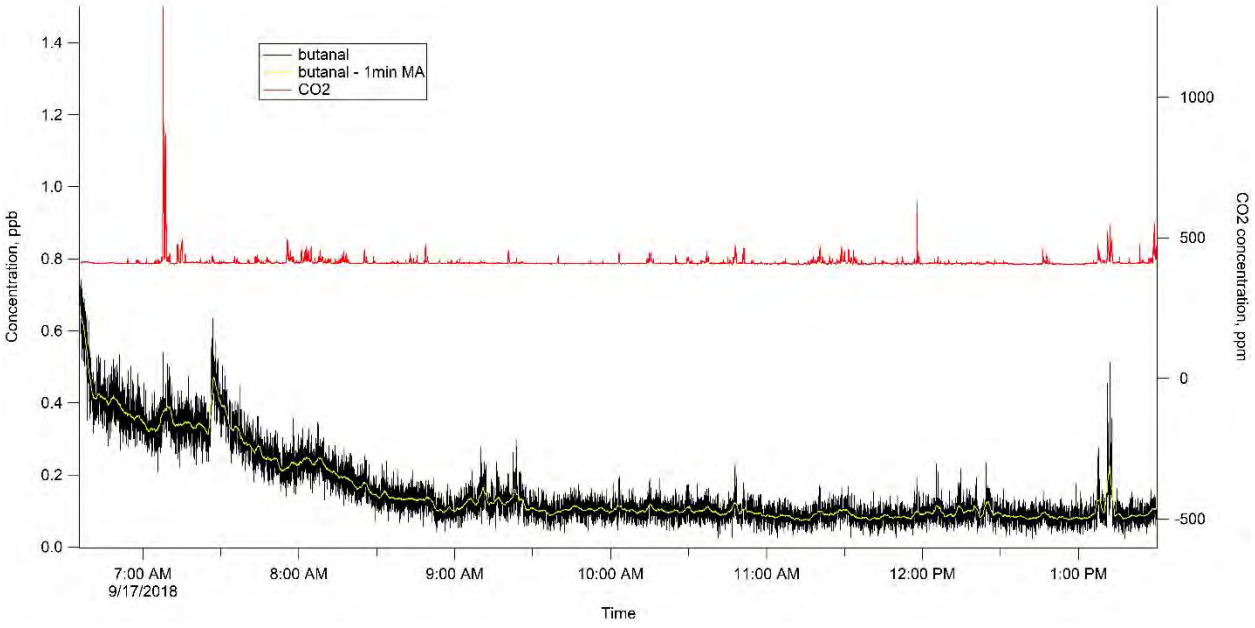

Figure 1-18. Butanal.

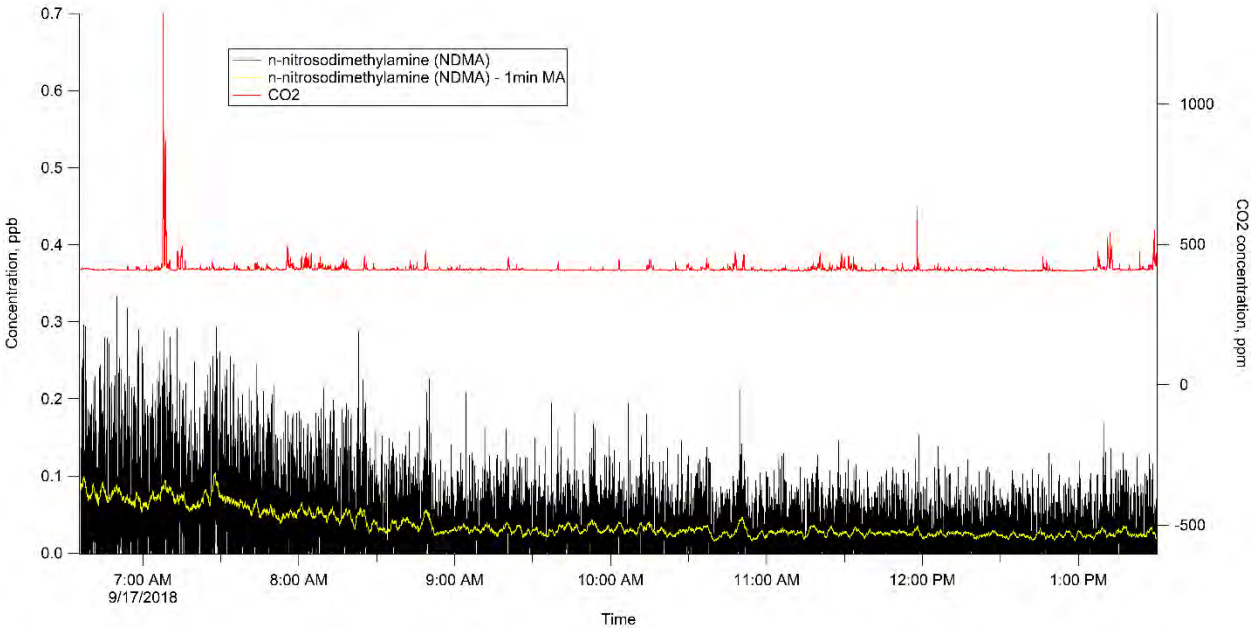

Figure 1-19. N-nitrosodimethylamine (NDMA).

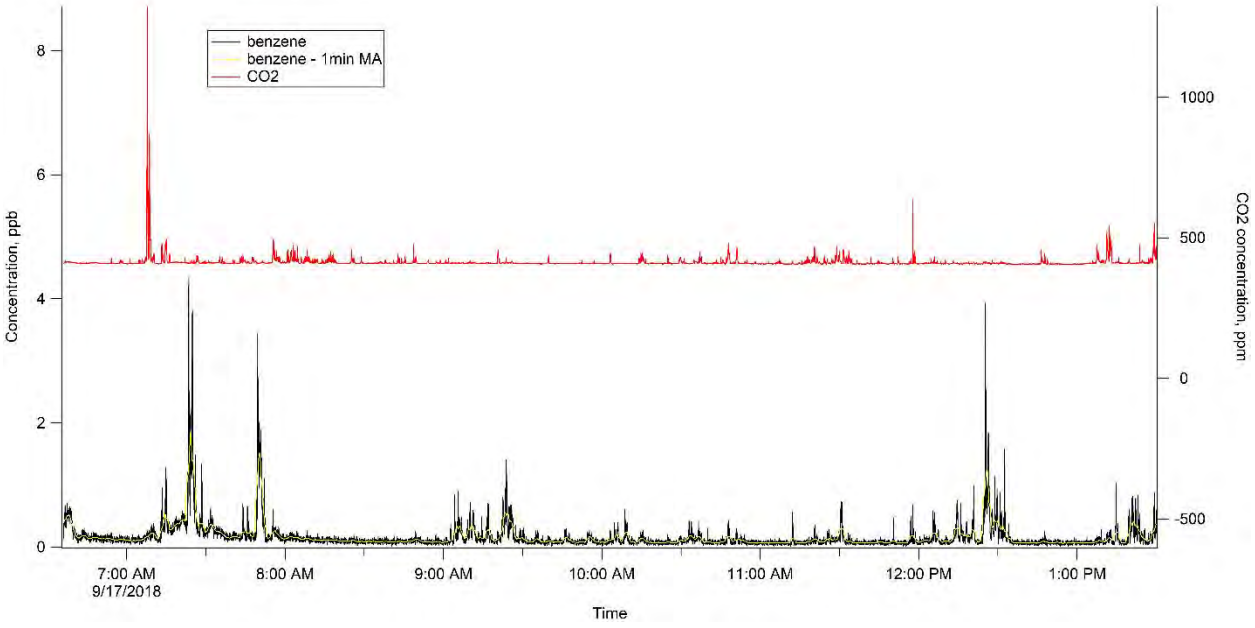

Figure 1-20. Benzene.

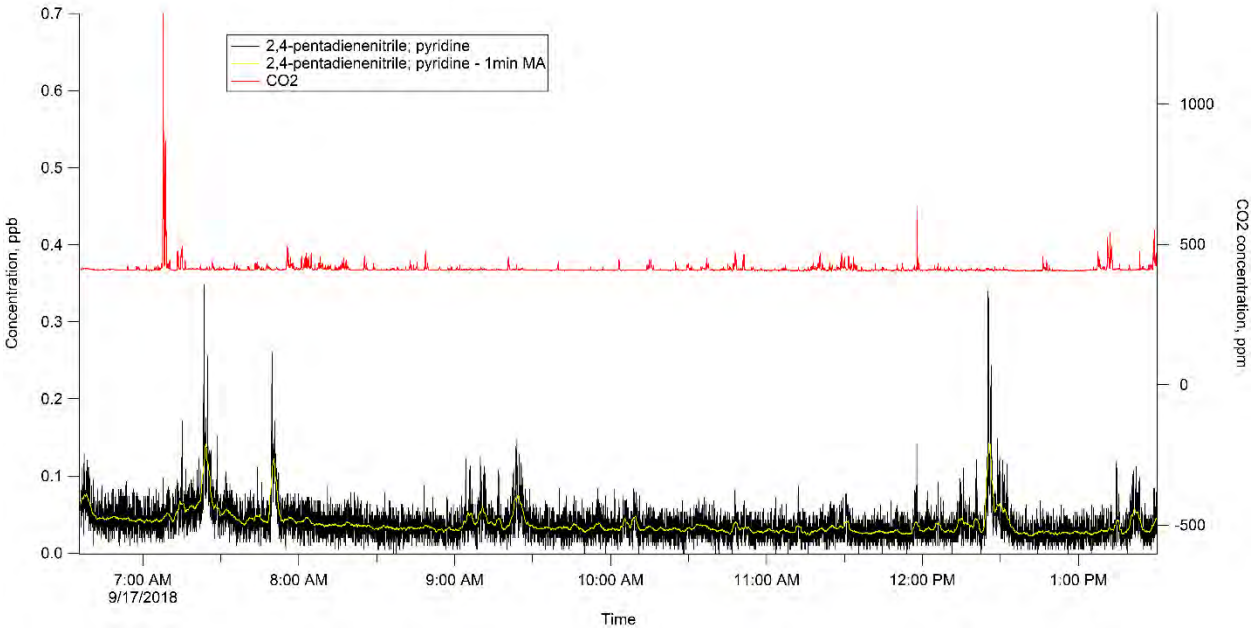

Figure 1-21. 2,4-pentadienenitrile; Pyridine.

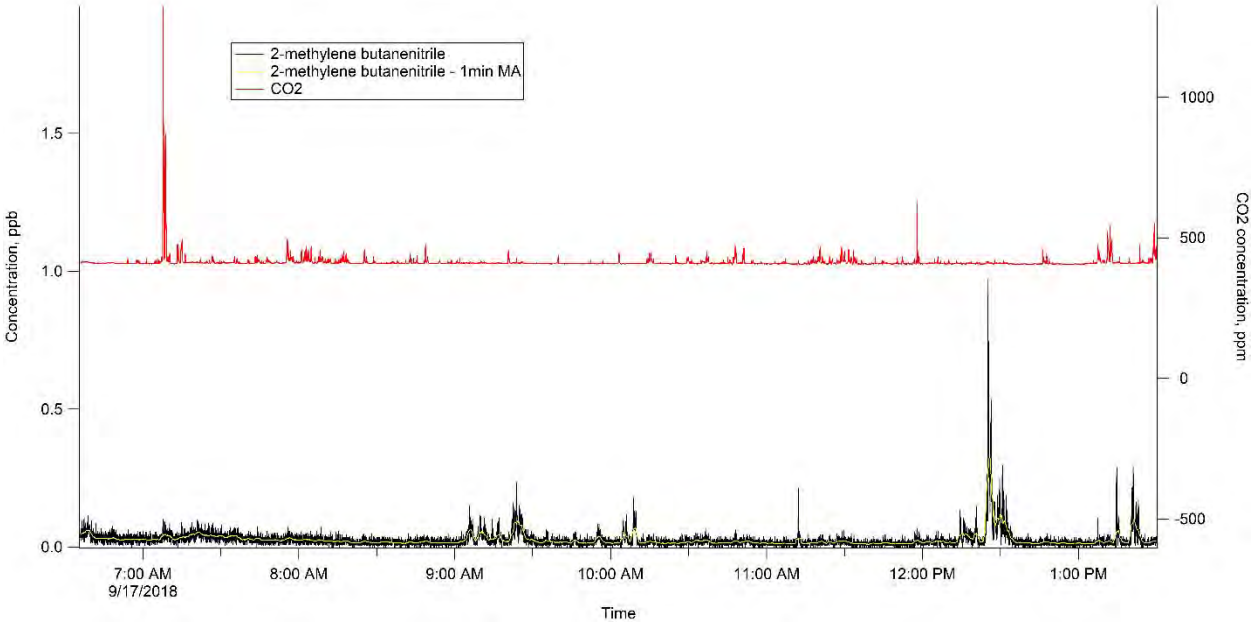

Figure 1-22. 2-methylene Butanenitrile.

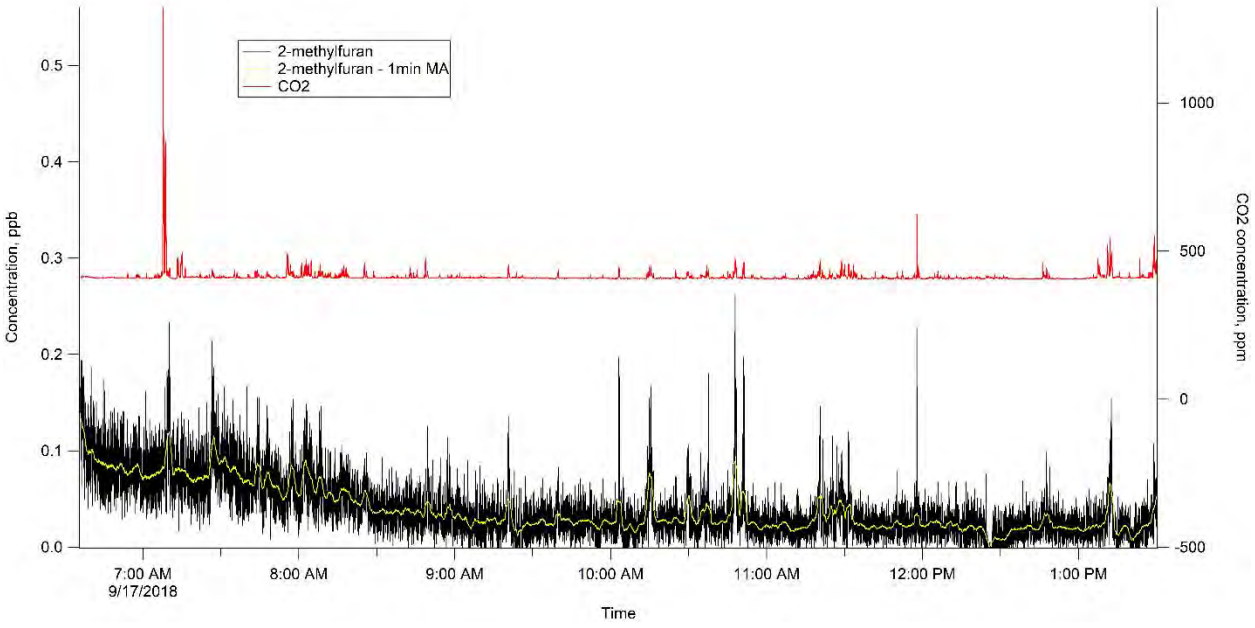

Figure 1-23. 2-methylfuran.

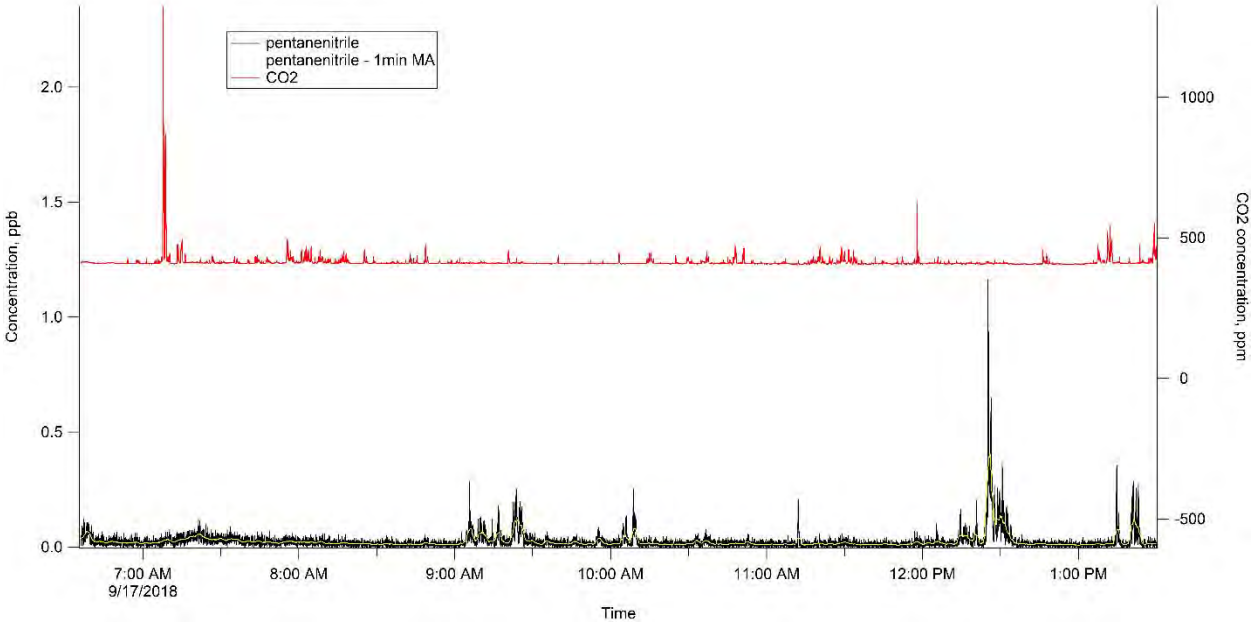

Figure 1-24. Pentanenitrile.

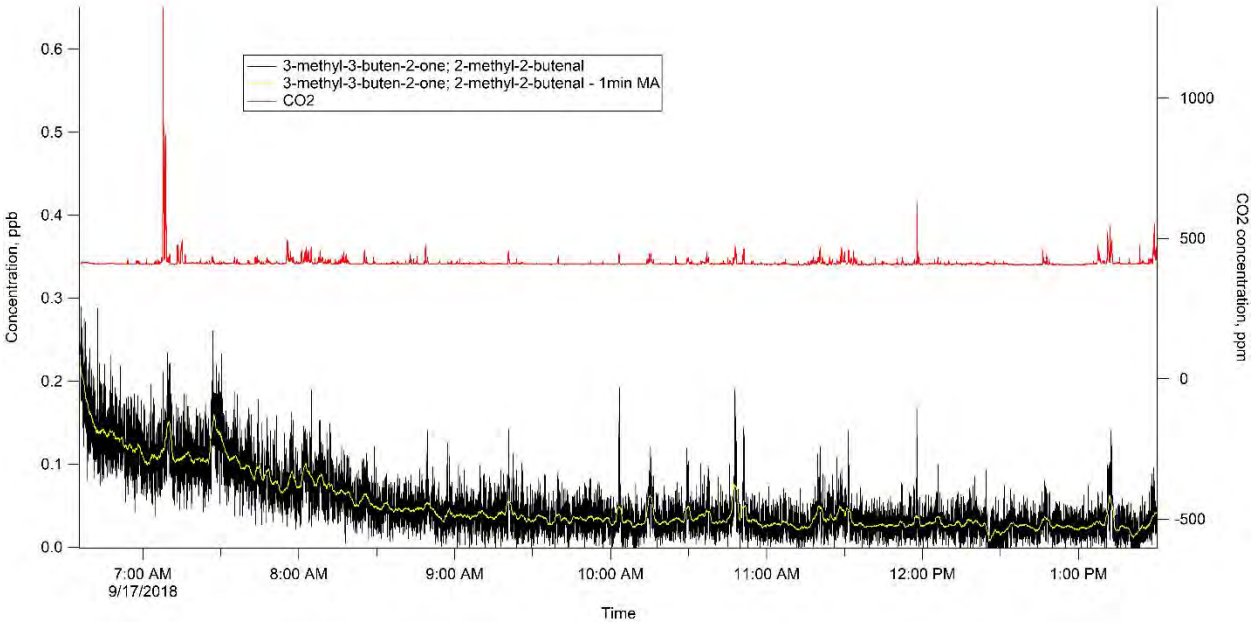

Figure 1-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

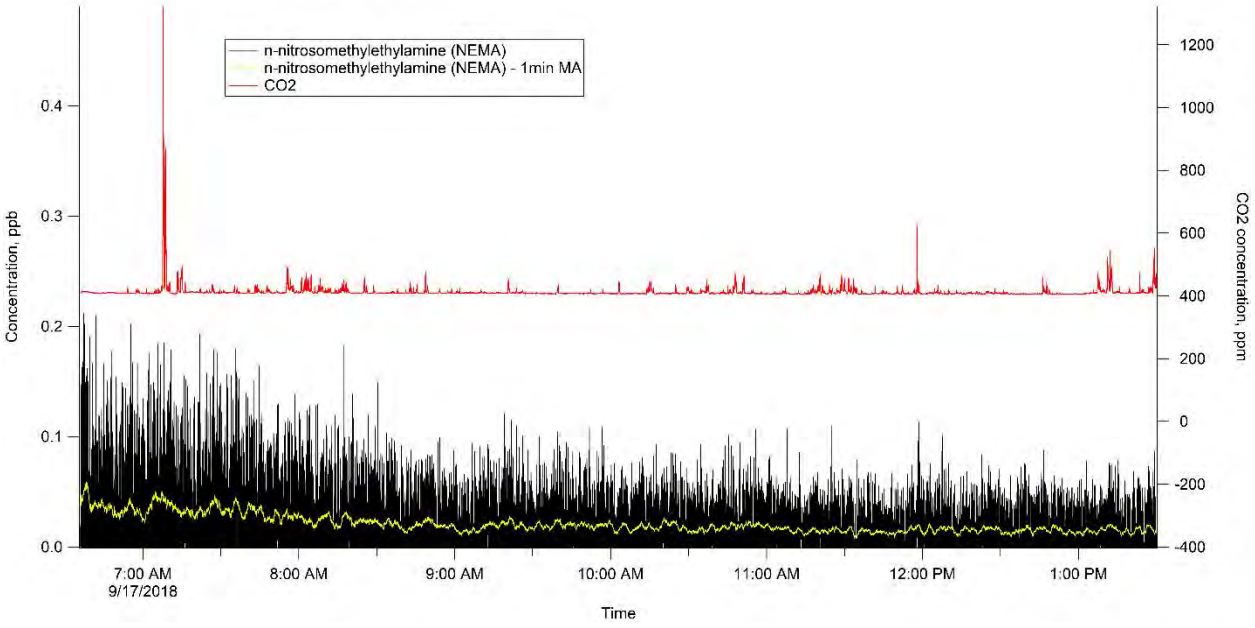

Figure 1-26. N-nitrosomethylethylamine (NEMA).

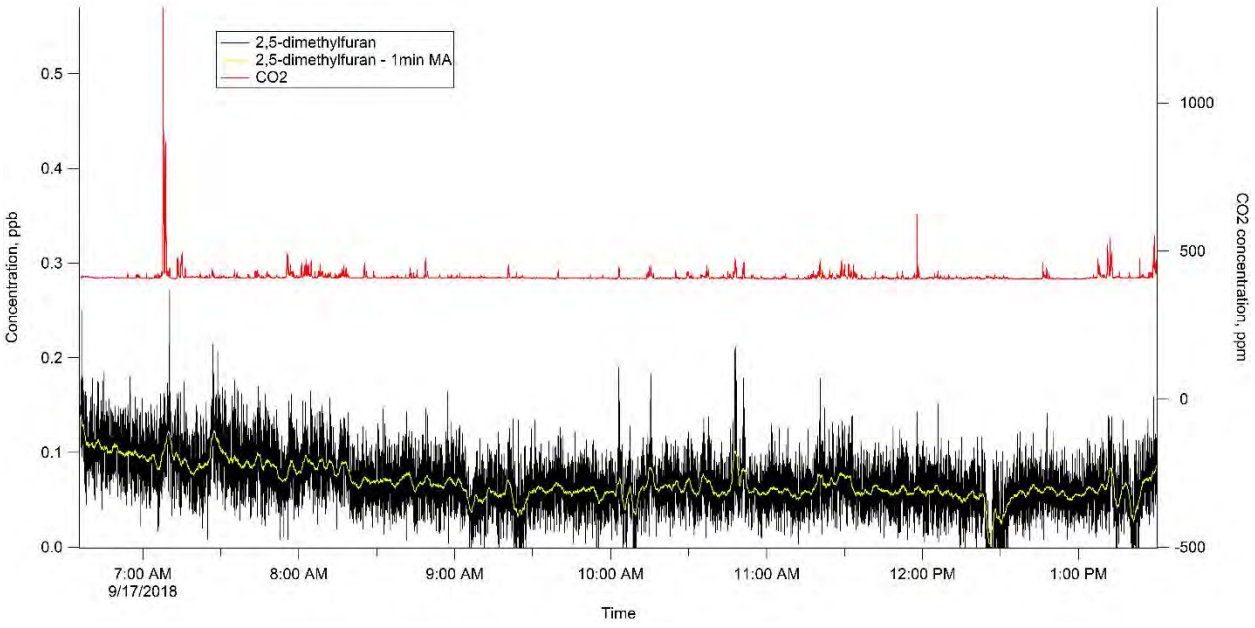

Figure 1-27. 2,5-dimethylfuran.

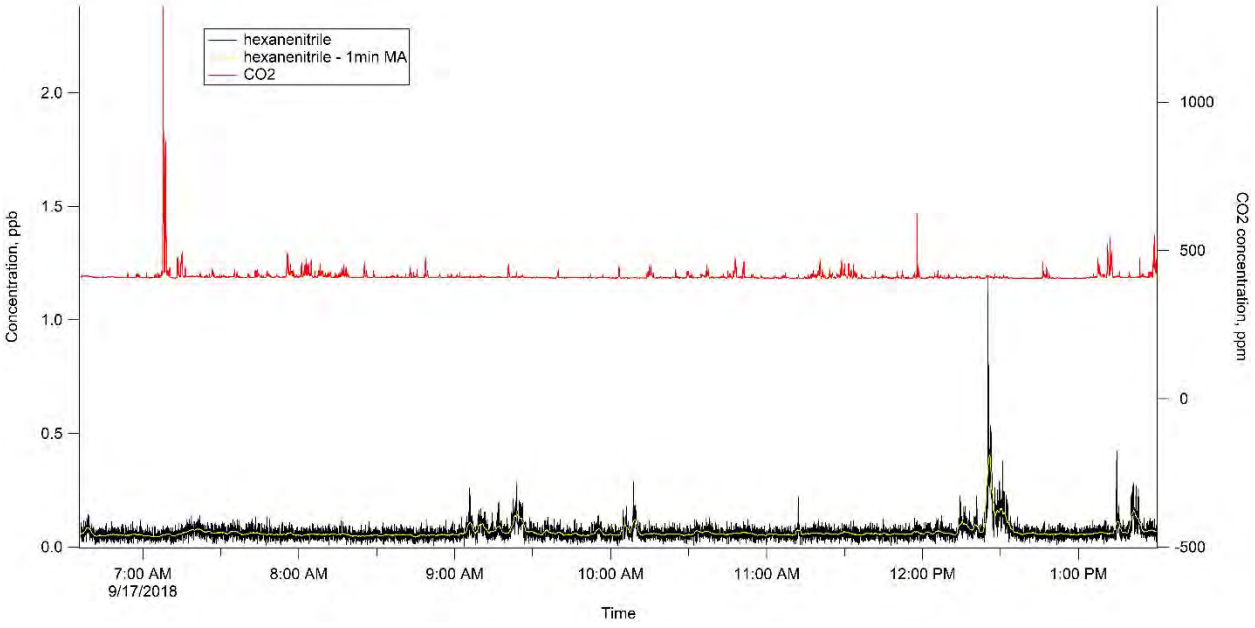

Figure 1-28. Hexanenitrile.

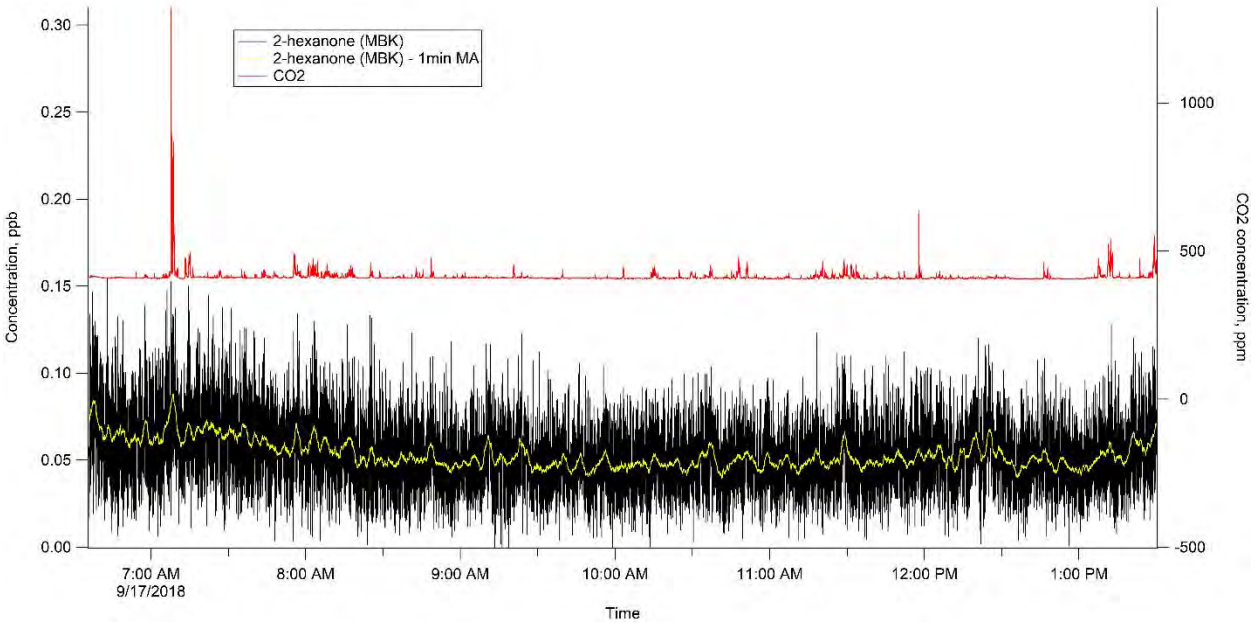

Figure 1-29. 2-hexanone (MBK).

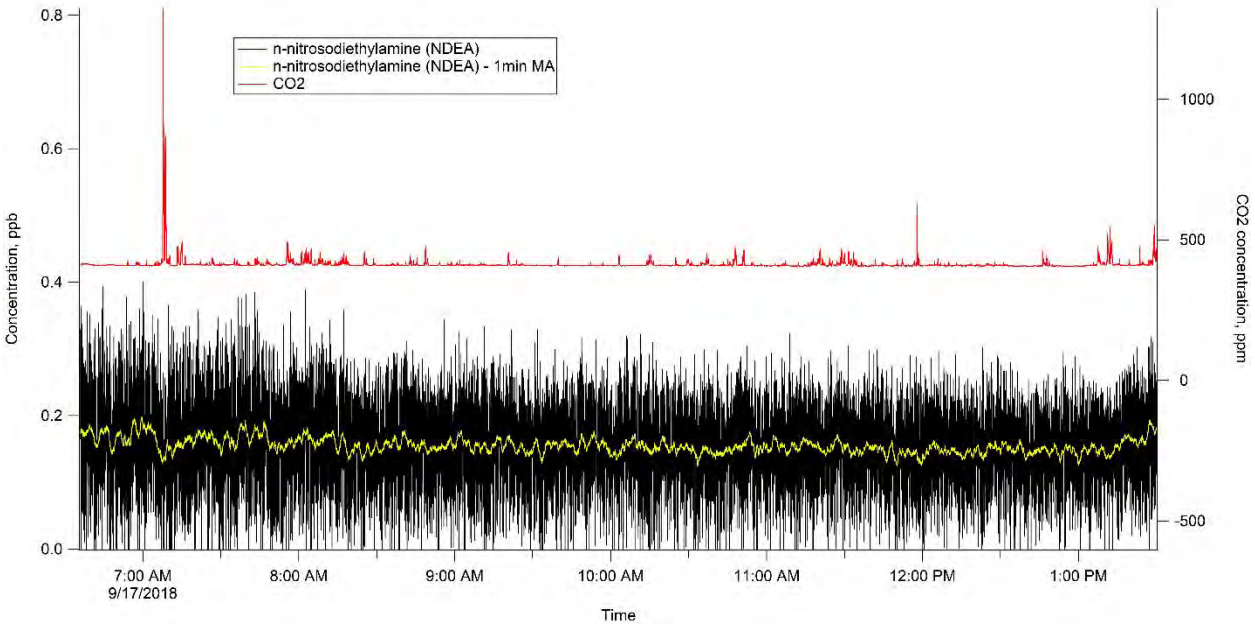

Figure 1-30. N-nitrosodiethylamine (NDEA).

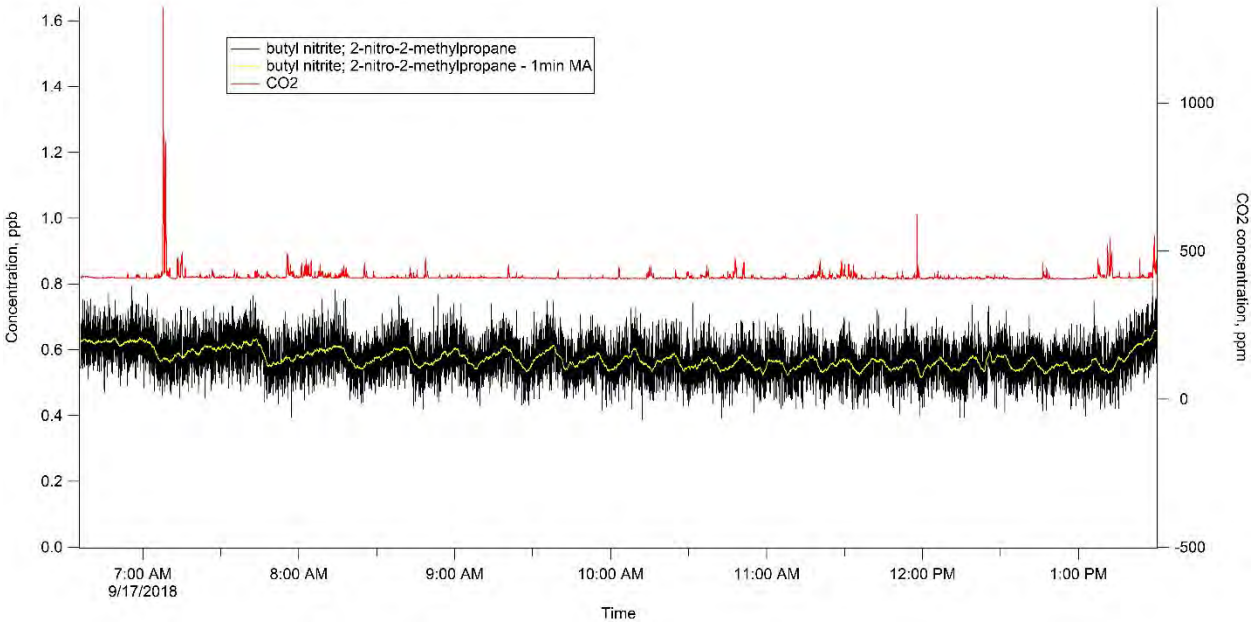

Figure 1-31. Butyl Nitrite; 2-nitro-2-methylpropane.

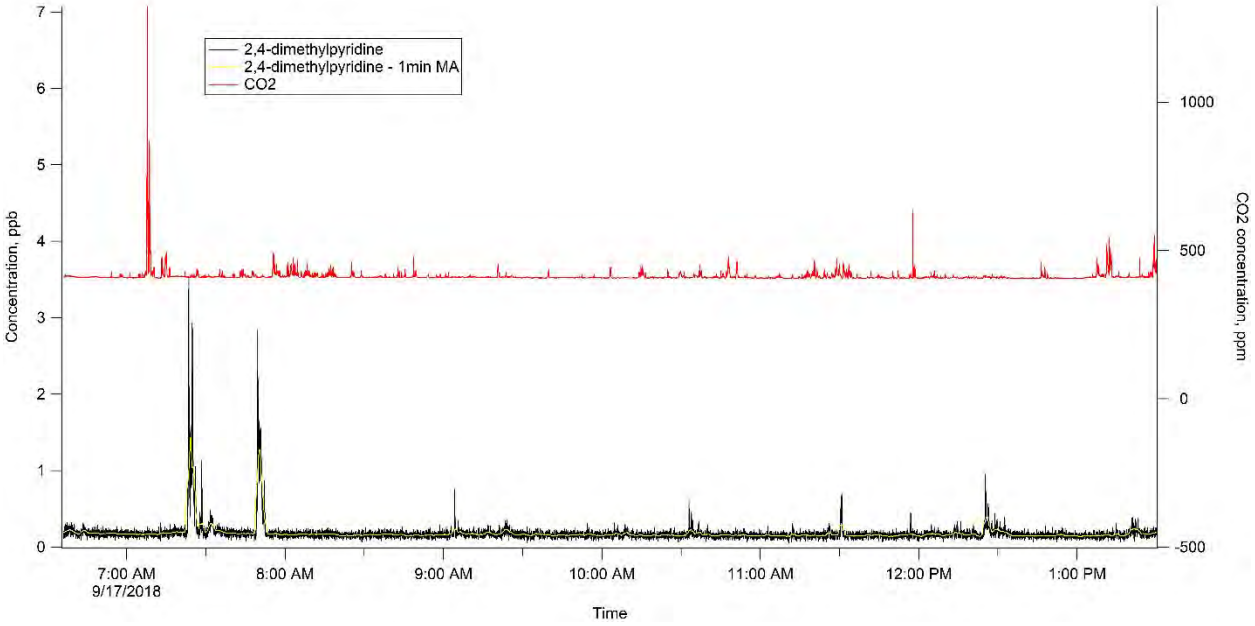

Figure 1-32. 2,4-dimethylpyridine.

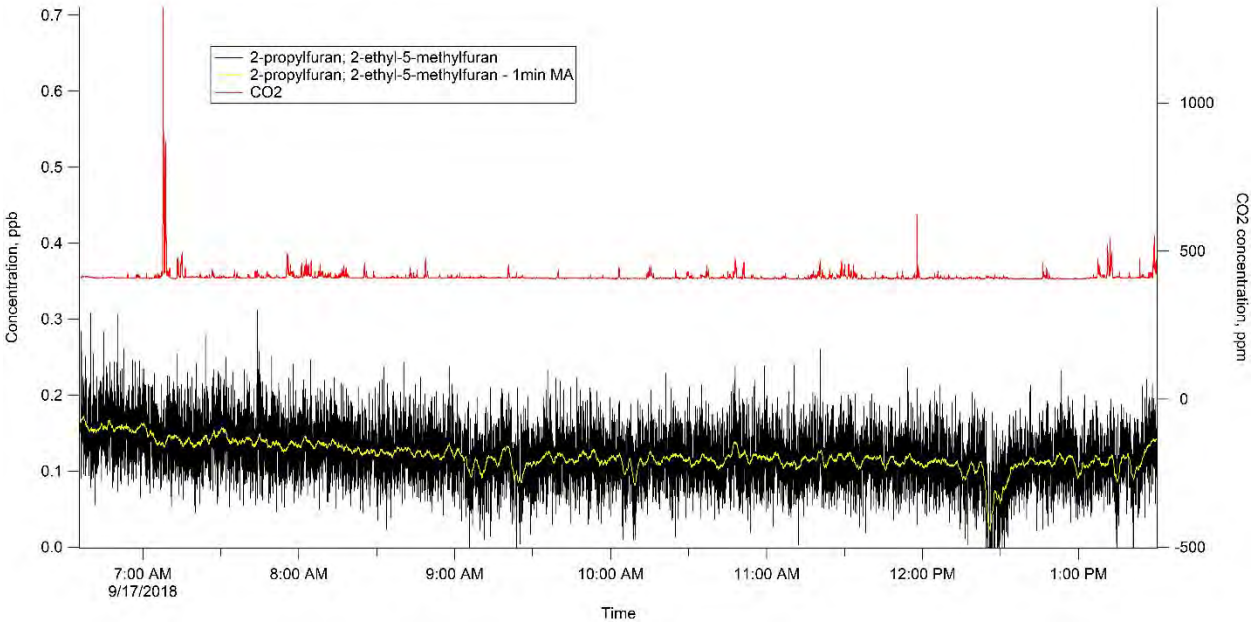

Figure 1-33. 2-propylfuran; 2-ethyl-5-methylfuran.

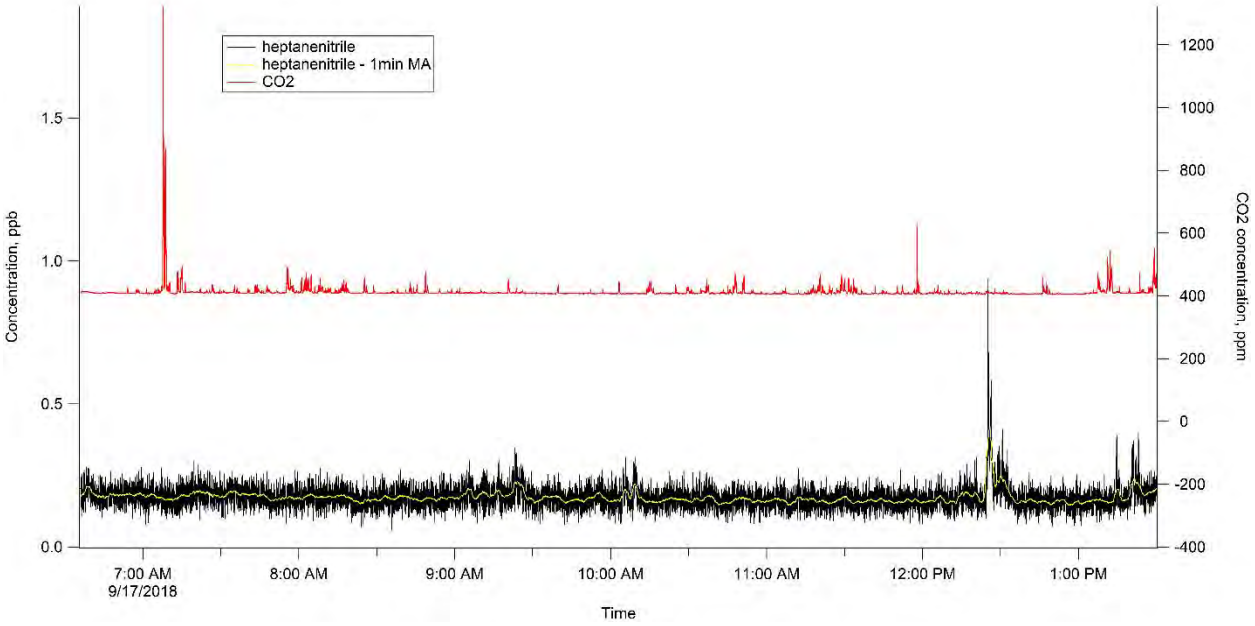

Figure 1-34. Heptanenitrile.

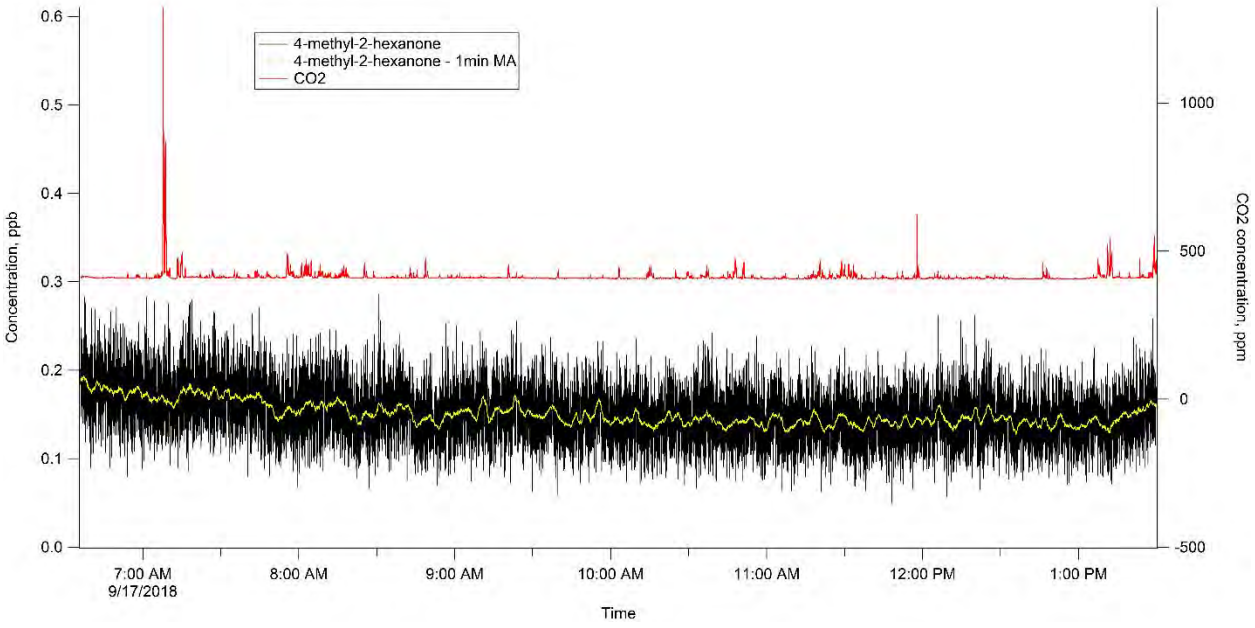

Figure 1-35. 4-methyl-2-hexanone.

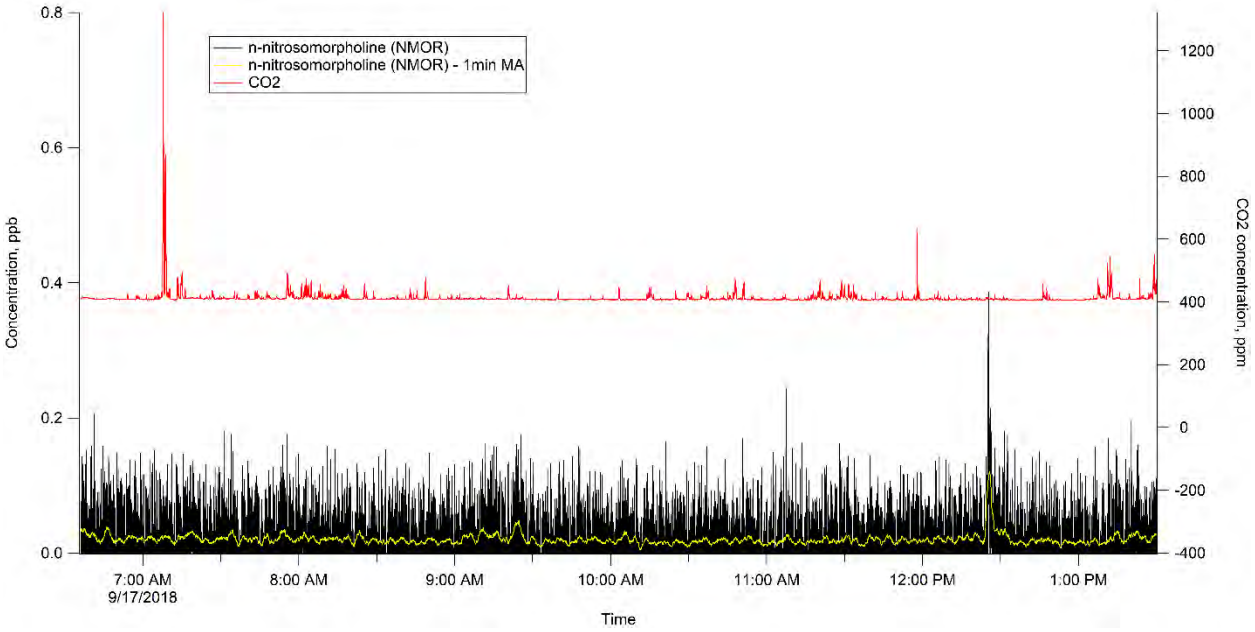

Figure 1-36. N-nitrosomorpholine (NMOR).

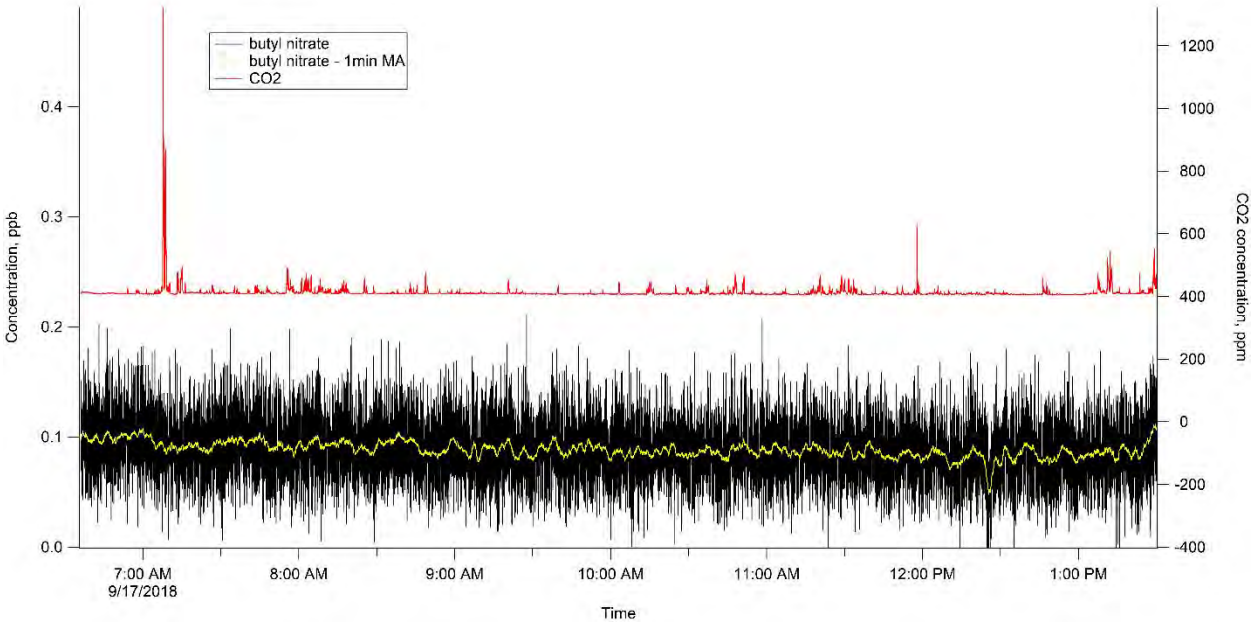

Figure 1-37. Butyl Nitrate.

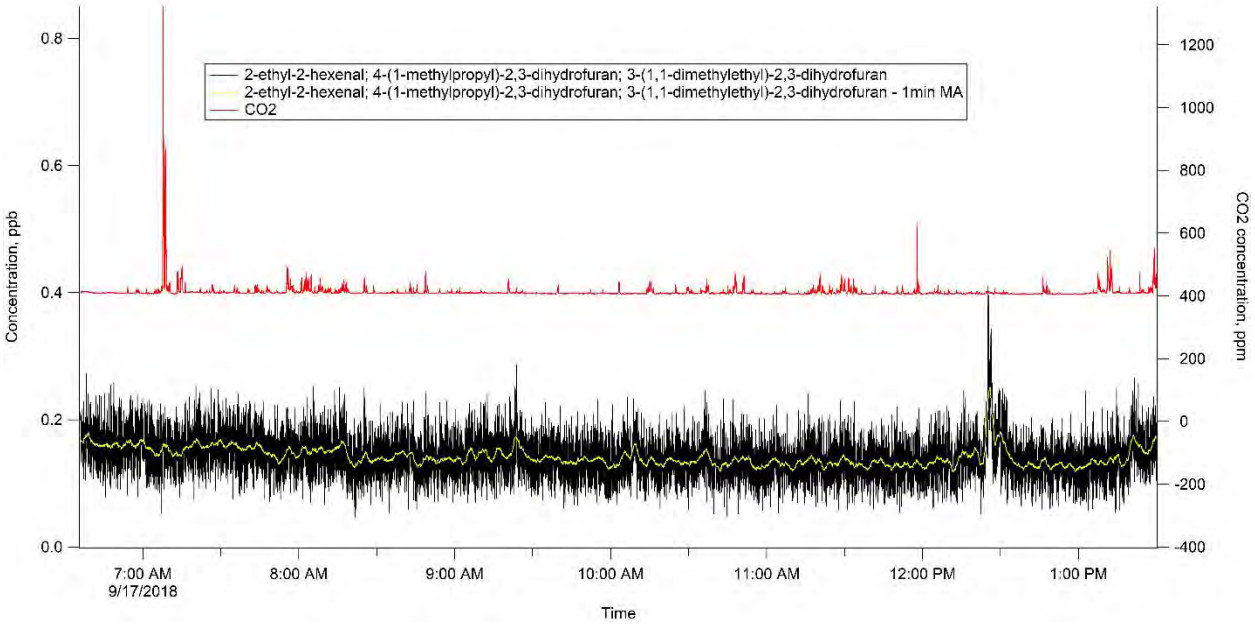

Figure 1-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

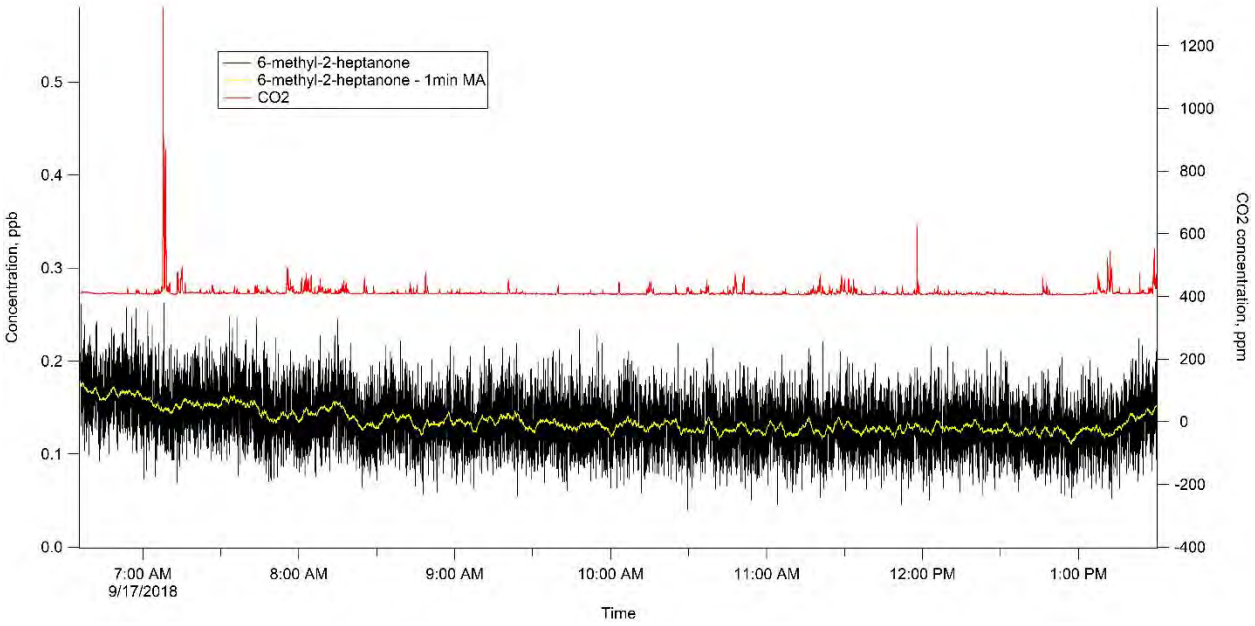

Figure 1-39. 6-methyl-2-heptanone.

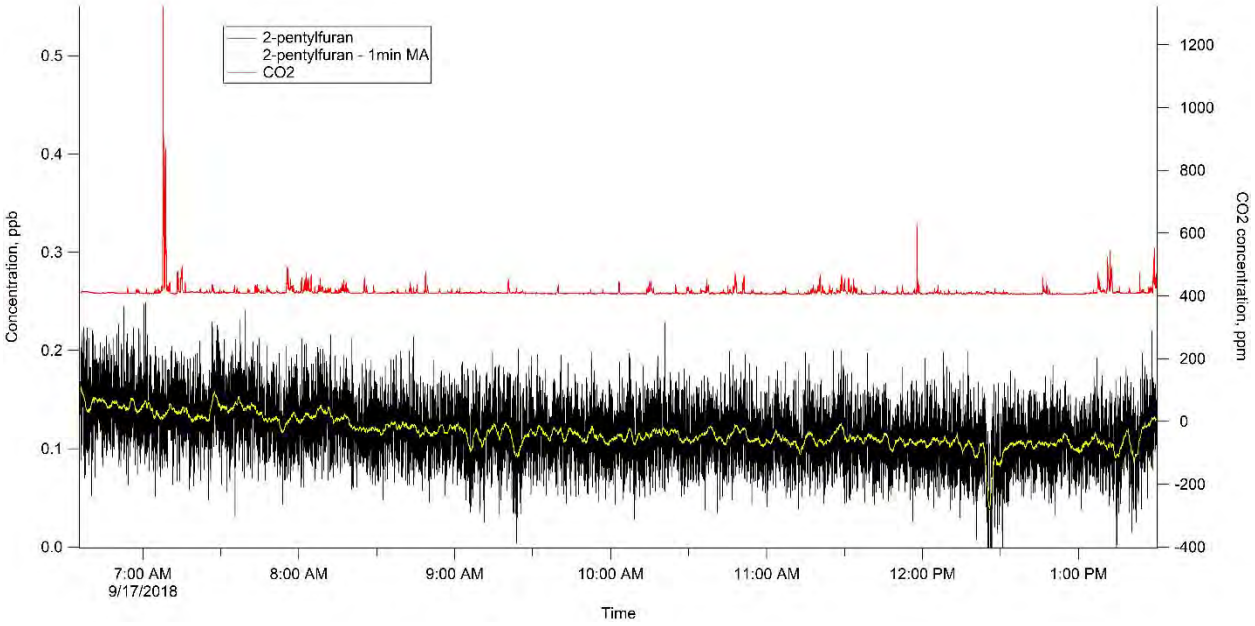

Figure 1-40. 2-pentylfuran.

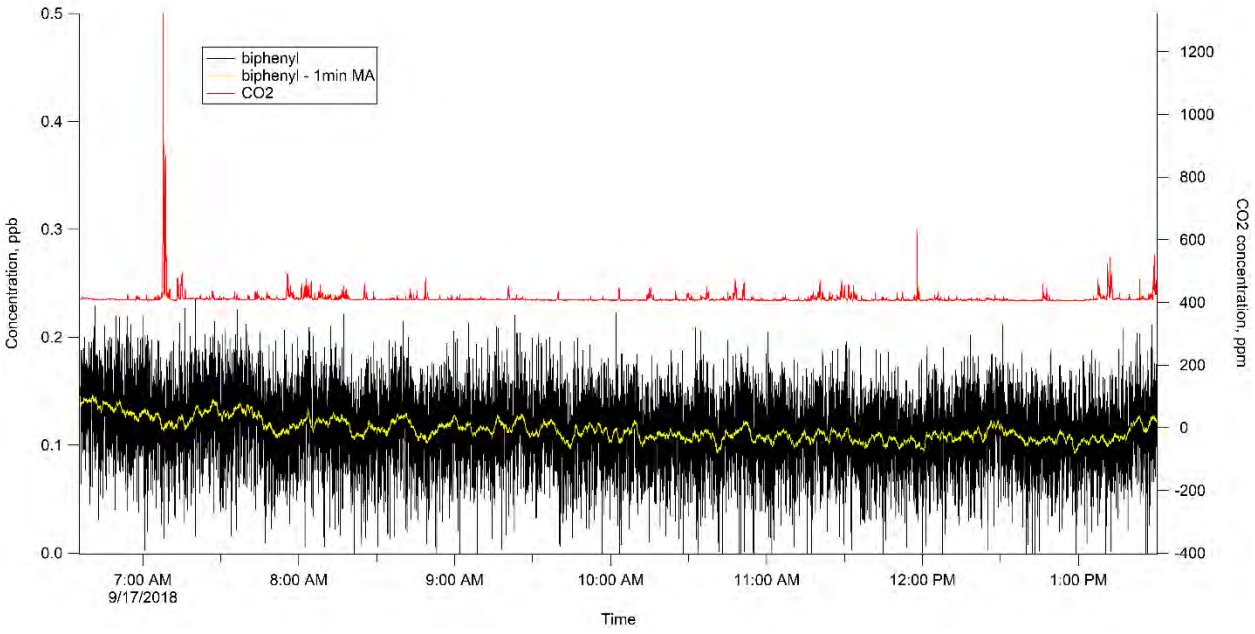

Figure 1-41. Biphenyl.

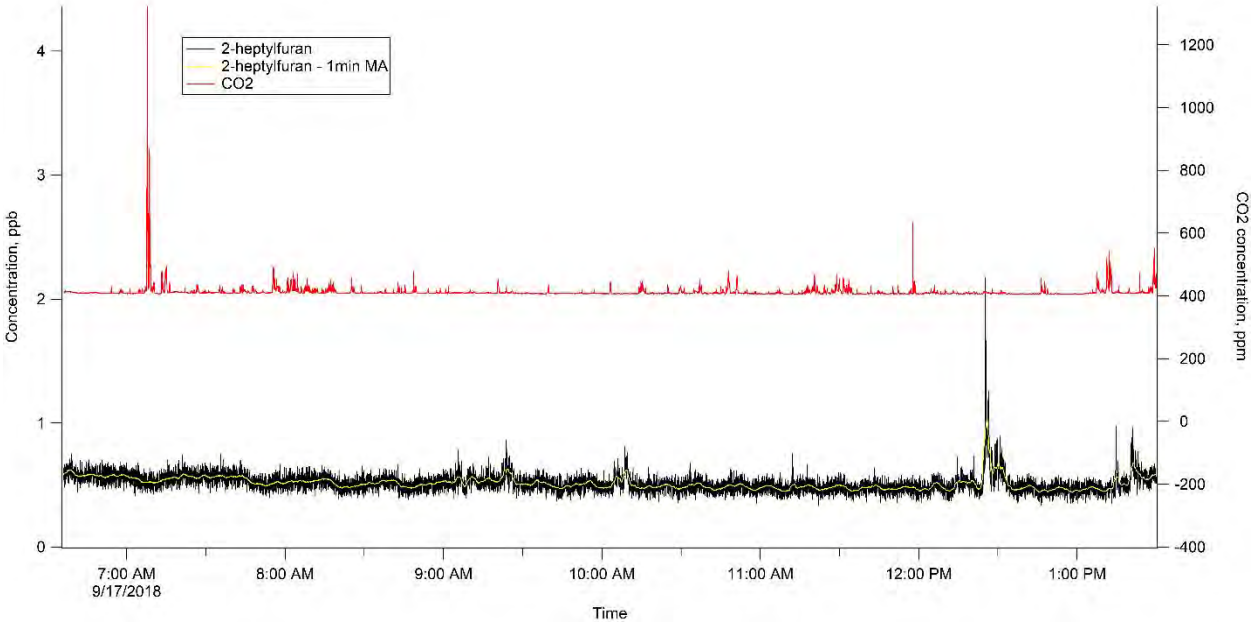

Figure 1-42. 2-heptylfuran.

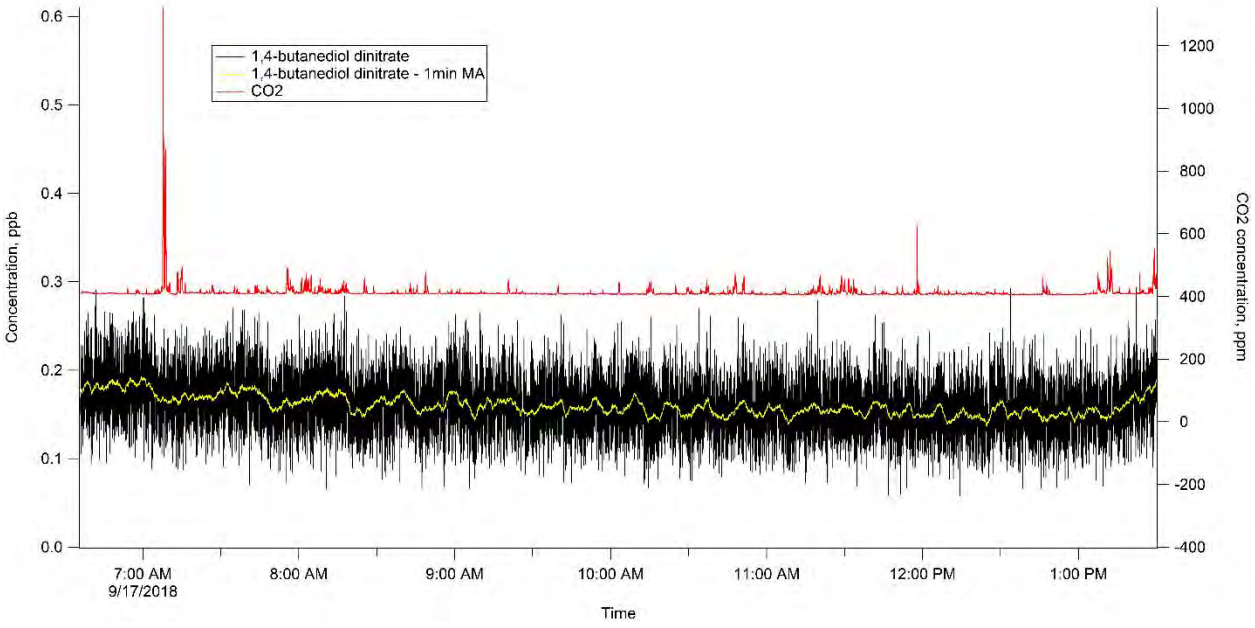

Figure 1-43. 1,4-butanediol Dinitrate.

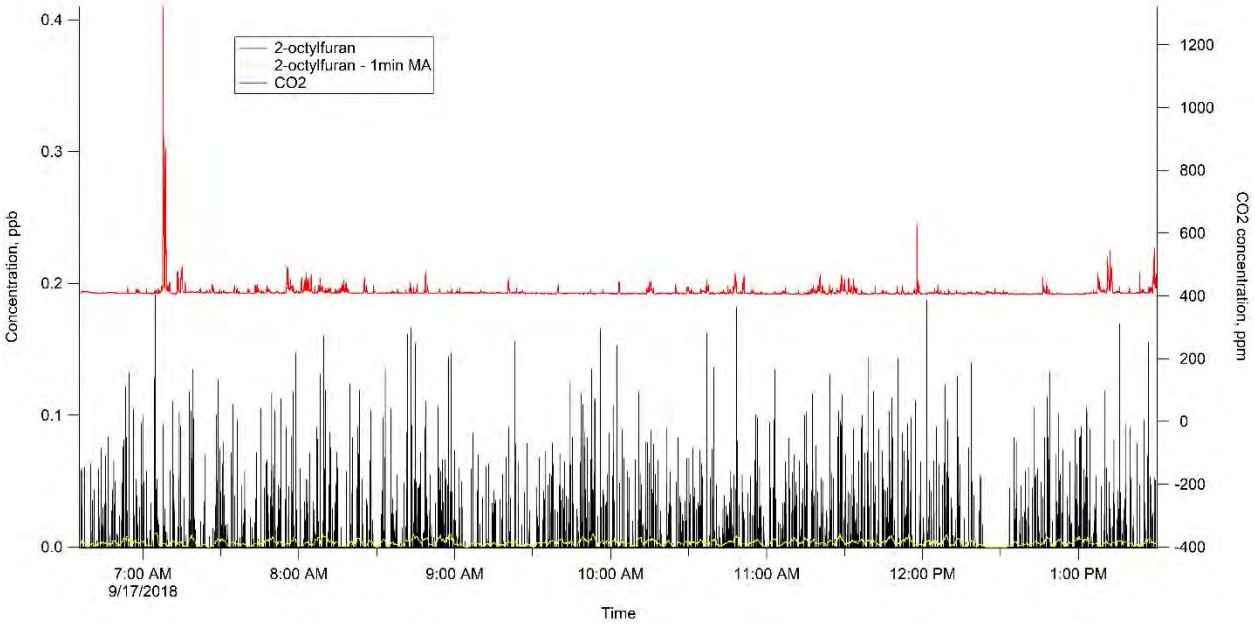

Figure 1-44. 2-octylfuran.

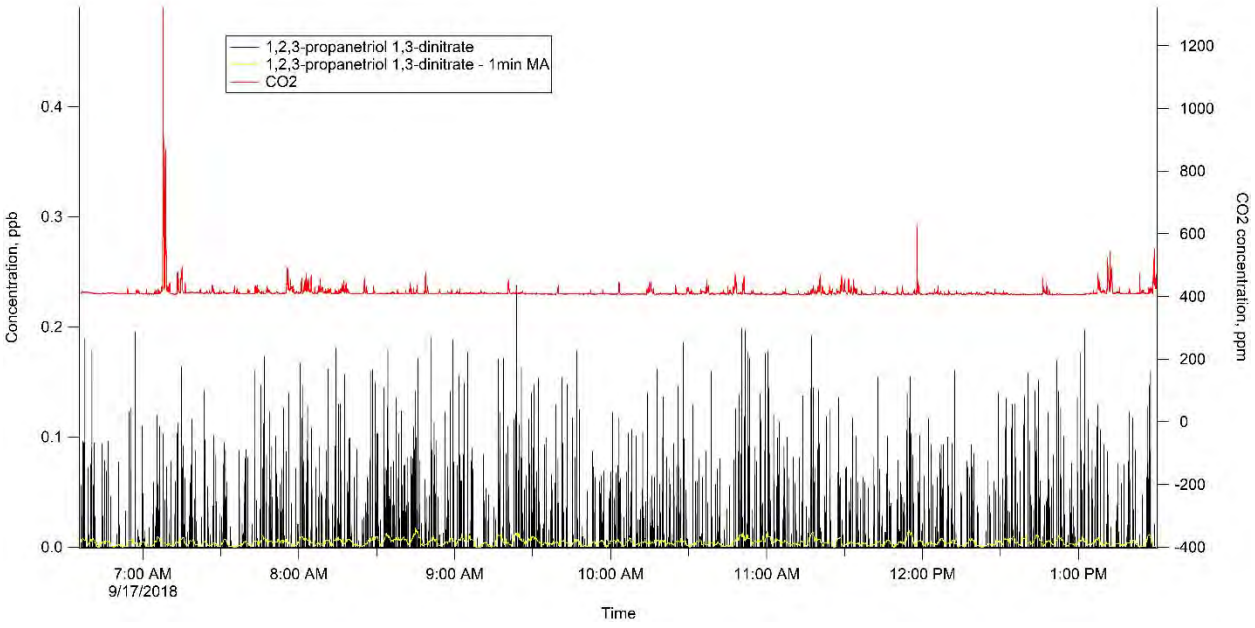

Figure 1-45. 1,2,3-propanetriol 1,3-dinitrate.

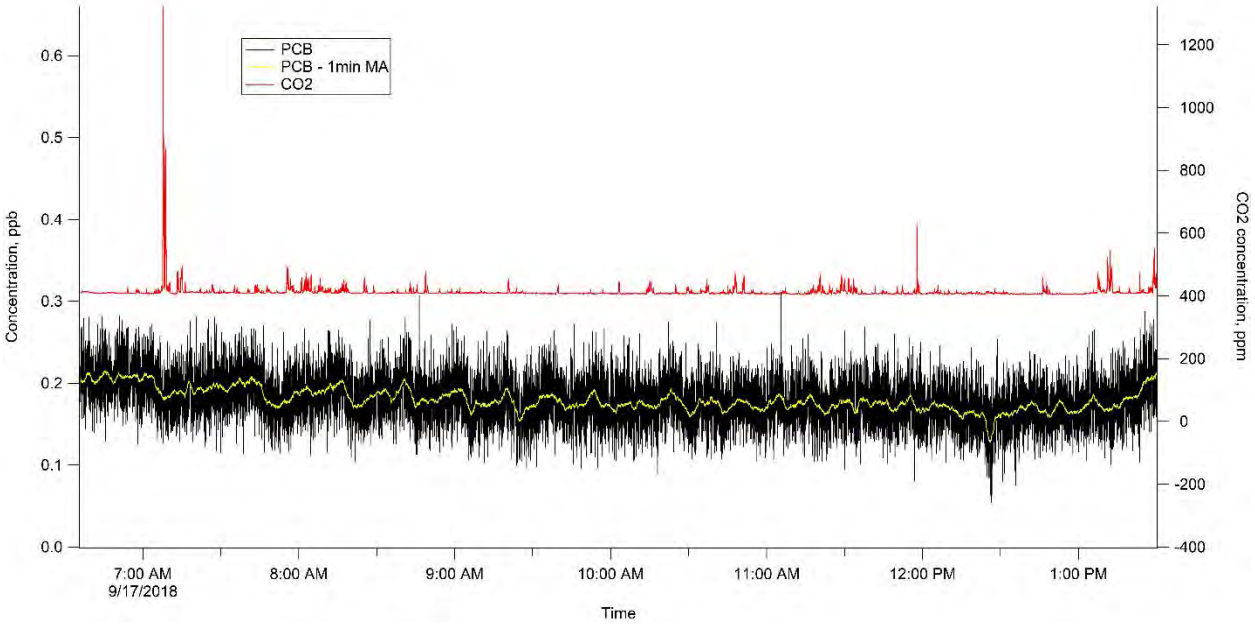

Figure 1-46. PCB.

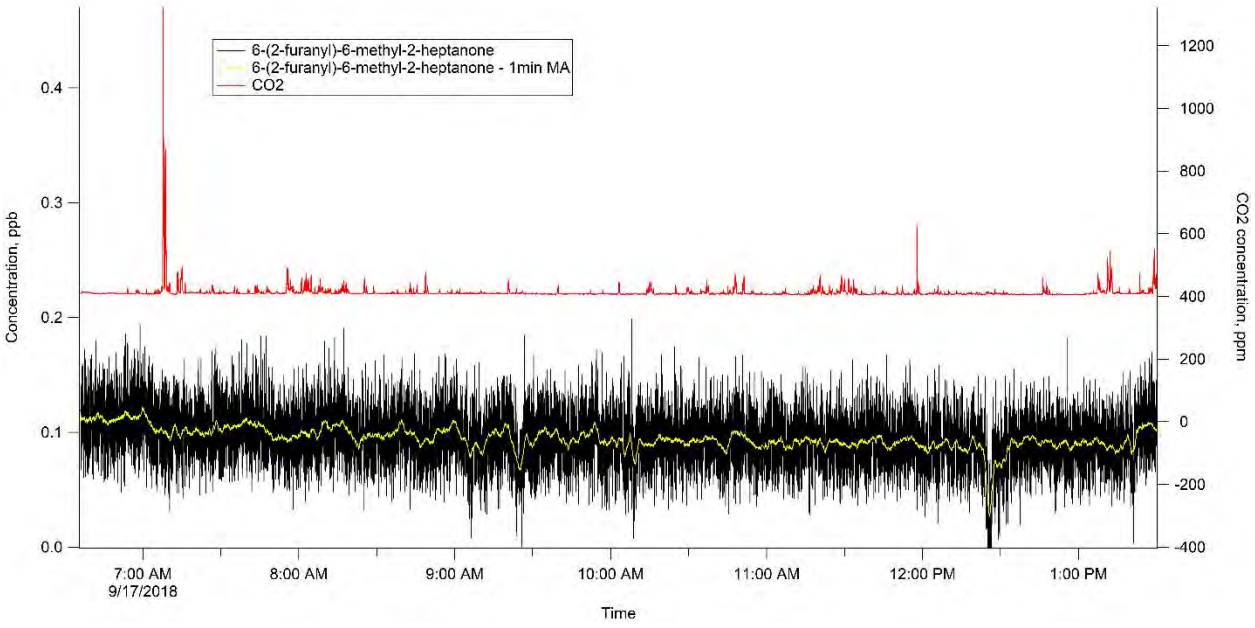

Figure 1-47. 6-(2-furanyl)-6-methyl-2-heptanone.

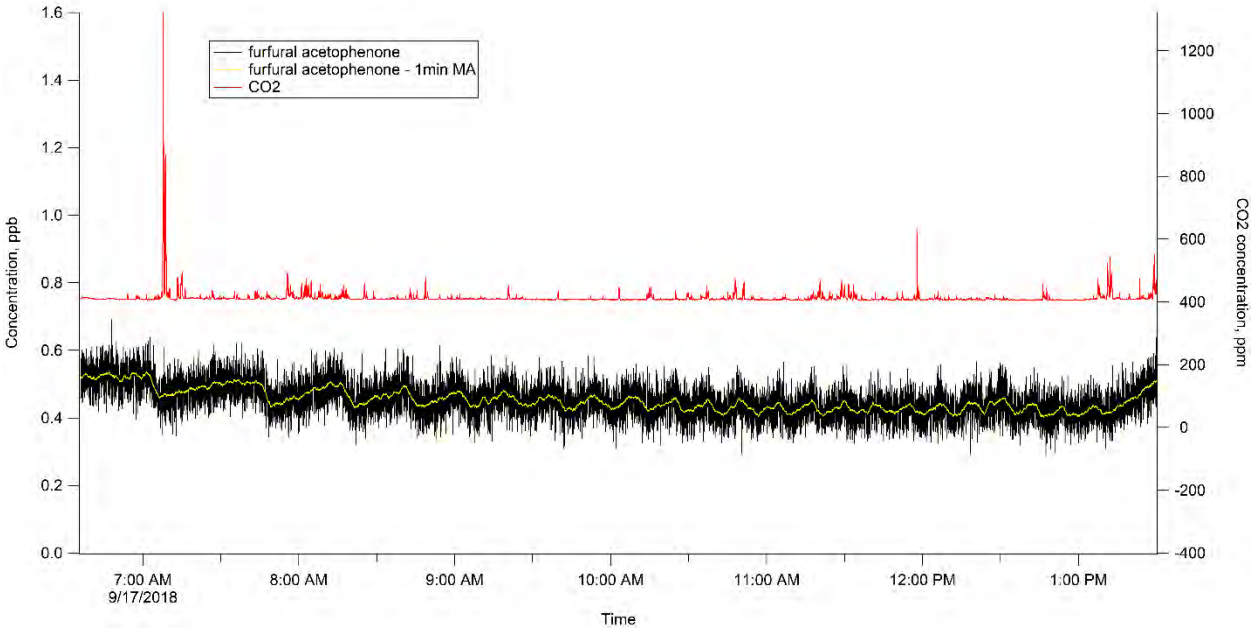

Figure 1-48. Furfural Acetophenone.

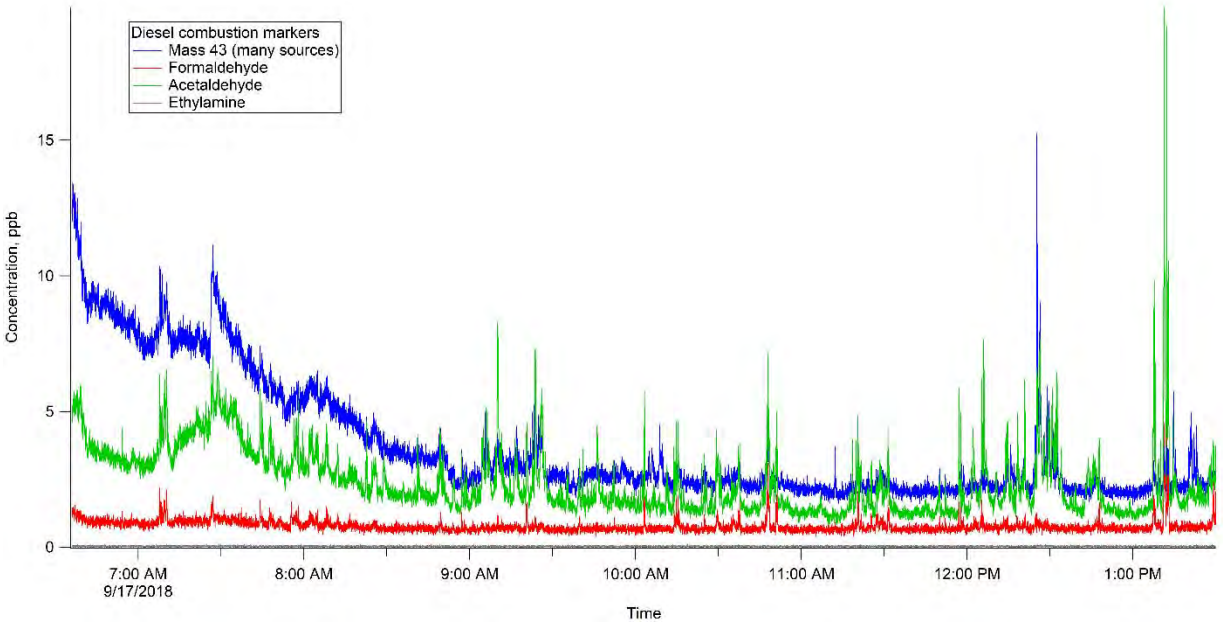

Figure 1-49. Diesel Combustion Markers.

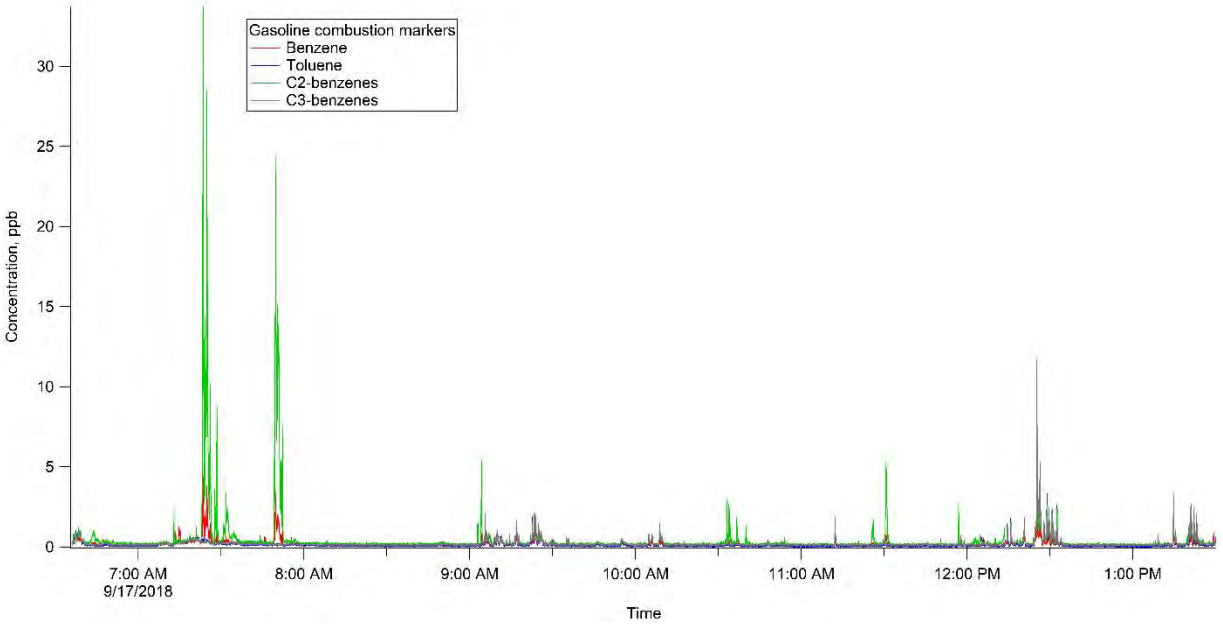

Figure 1-50. Gasoline Combustion Markers.

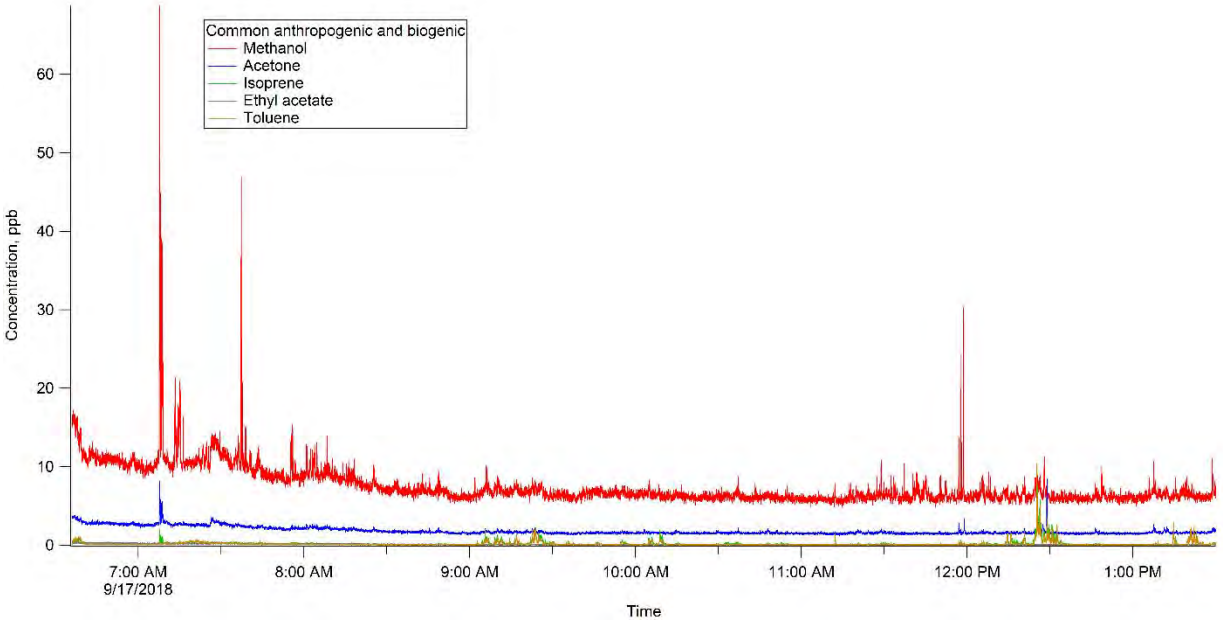

Figure 1-51. Plant and Human Markers.

2.0 SEPTEMBER 18, 2018 – SX PAVING

2.1 Quality Assessment

Data from September 18, 2018, were assessed using Procedure 17124-DOE-HS-102. A Data Acceptance 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.

2.2 Summary

On September 18, 2018, the ML performed area monitoring on the Hanford Site in support of the SX Paving Project.

The ML arrived on site and checked in with the CSO at 05:38. Prior to arrival, a QA/QC zero-air/sensitivity check was performed on the LI-COR CO_2 monitor and the PTR-MS at 04:26. At 05:52, the ML arrived at SX Farm and began mobile monitoring near the southeast corner of the farm. The ML was positioned between the east entrance and southeast corner of the farm for the next four hours. At approximately 09:15, an SX Farm worker noticed a metallic taste in his/her mouth and notified appropriate personnel. At 10:08, the ML was relocated to the southwest corner of the farm. Around 10:30, the Abnormal Operating Procedure (AOP)-015 was announced over the CSO-issued radio. It was not until this time that the ML staff were made aware of the event. Workers were observed exiting the farm and congregating at the staging area shortly after the CSO announcement.

The ML remained on the southwest corner of the farm for about 30 minutes until continuing to monitor various locations around the farm for the rest of the afternoon. All SX Farm workers were observed to have left the SX Farm area by 13:05.

At 13:59, the ML staff checked out with the CSO and departed the site for the TerraGraphics warehouse in Pasco, WA. The QA/QC zero-air/sensitivity check on the Picarro Ammonia Analyzer was initiated at 13:39 during transport to the CSO.

Table 2-1. Mobile Laboratory Sampling Mode Throughout the Monitoring Period.

Location #	Time	Location	Sampling Mode
1	06:00 - 07:21	SX Farm (SE corner of farm)	Mobile Area Sampling
2	07:21 - 07:30	SX Farm [SE side of farm (closer to fence line)]	Mobile Area Sampling
3	07:30 - 08:04	SX Farm (East side of farm)	Mobile Area Sampling
4	08:04 - 10:08	SX Farm (SE corner of farm)	Mobile Area Sampling
5	10:08 - 10:48	SX Farm (SW corner of farm)	Mobile Area Sampling
6	10:48 - 10:55	SX Farm (SE corner of farm)	Mobile Area Sampling
7	10:55 - 11:07	SX Farm (South of farm)	Mobile Area Sampling
8	11:07 - 11:27	SX Farm (West of farm)	Mobile Area Sampling
9	11:27 - 11:39	SX Farm (SW of farm)	Mobile Area Sampling
10	11:39 - 13:25	SX Farm (S of farm)	Mobile Area Sampling

Table 2-2. AOP-015 Event Timeline.

Time	Sequence of Events	Sampling Mode
~09:15	SX farm worker(s) reported smell/taste (notify appropriate personnel).	Mobile Area Sampling
10:11	ML staff observed asphalt smell while parked near SW corner of SX Farm.	Mobile Area Sampling
10:29	ML personnel noted a strong gasoline/diesel fuel smell while parked near SW corner of farm.	Mobile Area Sampling
10:33	CSO announced the AOP-015 over radio.	Mobile Area Sampling
10:33	ML staff called CSO & WRPS ML Project Manager, George Weeks, for instruction.	Mobile Area Sampling
10:33	ML instructed by George Weeks to monitor AOP-015 event – ML located near SW corner of farm.	Mobile Area Sampling
11:06	ML staff talked with Tracy Snyder (WRPS) about details of the event.	Mobile Area Sampling
12:02	ML Staff observed two workers enter the farm with monitoring equipment.	Mobile Area Sampling
12:08	ML staff observed workers with monitoring equipment leave farm.	Mobile Area Sampling
13:05	ML staff noted all workers had evacuated farm.	Mobile Area Sampling

Statistical analysis of a time-series of data can provide a valuable metric for comparing different observation regimes. Rather than reporting daily averages included in typical ML weekly reports, the September 18, 2018, observations were segmented into four periods. The periods were selected based on the order of activities related to the AOP-015 event.

- **Time Period 1 (5:52 to 8:00 AM PST)** captures the period before the AOP-015 event occurred and provides a valuable baseline of typical observations around SX Farm during the paving project.
- **Time Period 2 (8:00 to 10:00 AM)** captures the time period of when the AOP-015 event is believed to have occurred.
- **Time Period 3 (10:00 AM to 12:00 PM PST)** captures the activity when the AOP-015 event was announced by the CSO.
- **Time Period 4 (12:00 to 1:30 PM PST)** represents a baseline for when paving activity has ceased and all related personnel have left the SX Farm area.

Table 2-3. Time Periods used in Statistical and Graphical Analysis.

Name	Time Period	Description
Time Period 1	05:52 AM – 8:00 AM PST	Before AOP-015 Event
Time Period 2	08:00 AM – 10:00 AM PST	During AOP-015 Event (First Half)
Time Period 3	10:00 AM – 12:00 PM PST	During AOP-015 Event (Second Half)
Time Period 4	12:00 PM – 1:30 PM PST	After AOP-015 Event

Figure 2-1. Mobile Laboratory Location for the Duration of the Monitoring Period (Refer to Table 1-1 for Location Number Reference).

Figure 2-2. Mobile Laboratory Location During Time in Which AOP-015 was Initiated.

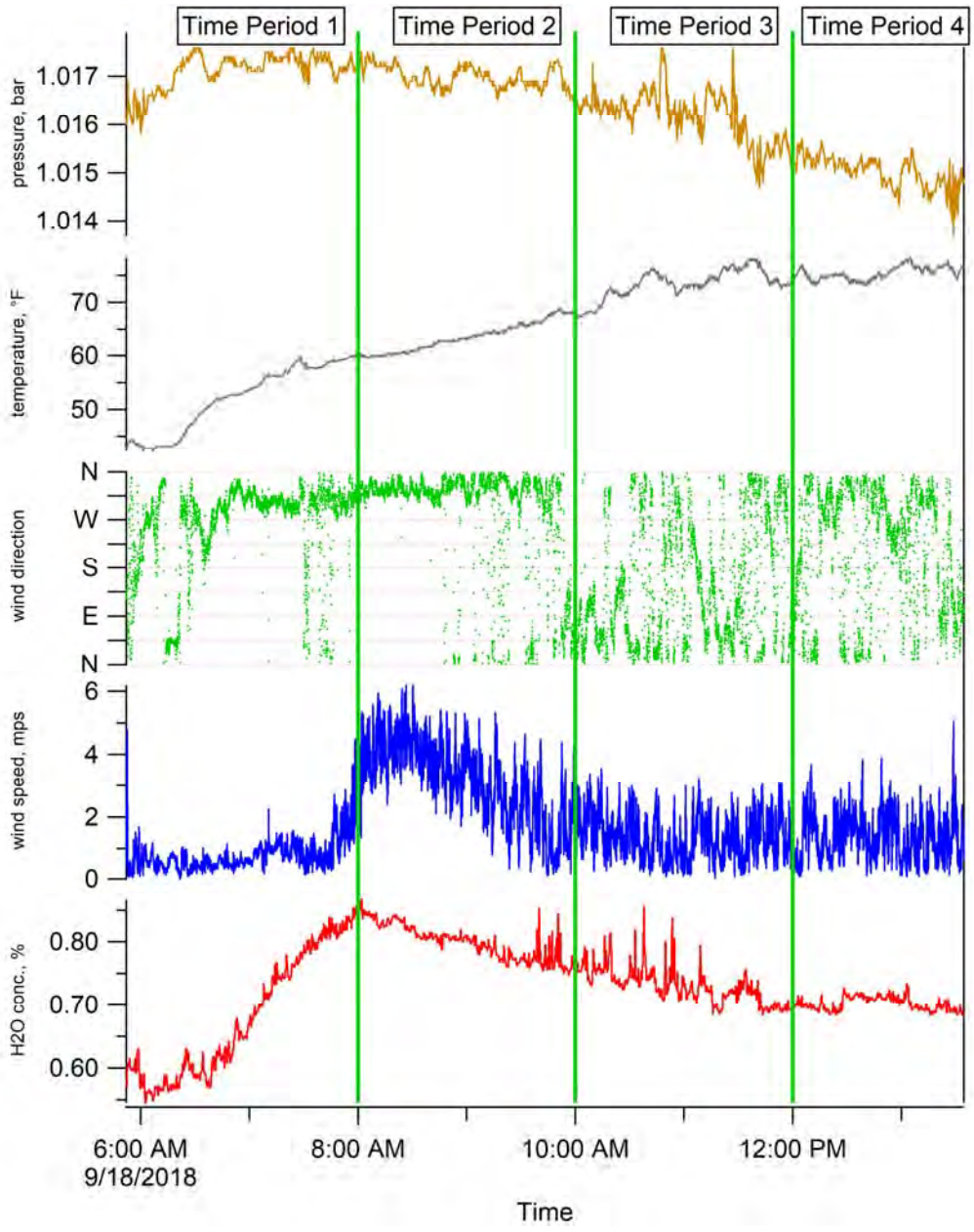

Figure 2-3. Weather Data for the Duration of Monitoring Period.

Samples Collected
Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

2.3 Chemicals of Potential Concern

Table 2-4. Chemical of Potential Concern Maximum and Median for Each Time Period. (2 Sheets)

			Time Period 1 (05:52 - 08:00 PST)		Time Period 2 (08:00 - 10:00 PST)		Time Period 3 (10:00 - 12:00 PST)		Time Period 4 (12:00 - 13:30 PST)	
COPC #	COPC Name	OEL (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)
1	ammonia	25000	8.453	5.671	5.876	4.173	5.066	4.371	4.784	3.953
2	formaldehyde	300	5.129	1.309	3.077	0.749	6.030	0.801	4.393	0.844
3	methanol	200000	221.285	14.309	12.412	7.658	16.641	7.406	23.103	7.553
4	acetonitrile	20000	0.423	0.185	0.320	0.160	1.007	0.177	0.450	0.180
5	acetaldehyde	25000	29.835	6.232	25.147	2.006	25.397	1.810	19.010	1.706
6	ethylamine	5000	0.105	0.032	0.110	0.024	0.090	0.024	0.091	0.024
7	1,3-butadiene	1000	1.964	0.310	1.830	0.066	17.511	0.087	1.207	0.102
8	propanenitrile	6000	0.438	0.074	0.209	0.060	1.239	0.055	0.383	0.055
9	2-propenal	100	3.435	0.342	1.741	0.134	4.855	0.115	1.237	0.120
10	1-butanol; butenes	20000	2.546	0.343	2.467	0.236	23.508	0.222	3.446	0.238
11	methyl isocyanate	20	0.297	0.055	0.159	0.039	0.308	0.037	0.126	0.038
12	methyl nitrite	100	1.620	0.241	0.801	0.105	2.333	0.098	2.506	0.101
13	furan	1	0.428	0.061	0.178	0.028	0.288	0.027	0.239	0.023
14	butanenitrile	8000	0.221	0.033	0.164	0.023	1.072	0.021	0.184	0.022
15	but-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran	100, 1, 1	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
16	butanal	25000	0.614	0.249	0.429	0.118	0.755	0.103	0.407	0.109
17	NDMA**	0.3	0.313	0.042	0.194	0.022	0.198	0.018	0.183	0.019
18	benzene	500	2.389	0.204	1.003	0.107	13.003	0.099	2.197	0.093
19	2,4-pentadienenitrile; pyridine	300,1000	0.186	0.043	0.107	0.033	0.835	0.029	0.185	0.029
20	2-methylene butanenitrile	30	0.150	0.028	0.133	0.019	0.819	0.018	0.069	0.014
21	2-methylfuran	1	0.459	0.066	0.289	0.032	0.162	0.025	0.165	0.023
22	pentanenitrile	6000	0.164	0.024	0.169	0.016	1.105	0.015	0.080	0.015
23	3-methyl-3-buten-2-one; 2-methyl-2-butenal	20, 30	0.525	0.076	0.296	0.036	0.228	0.029	0.187	0.032
24	NEMA**	0.3	0.230	0.014	0.140	0.010	0.116	0.009	0.102	0.009
25	2,5-dimethylfuran	1	0.328	0.072	0.283	0.056	0.154	0.055	0.155	0.058
26	hexanenitrile	6000	0.181	0.063	0.214	0.065	1.044	0.070	0.165	0.068
27	2-hexanone (MBK)	5000	0.163	0.055	0.131	0.048	0.151	0.052	0.144	0.056
28	NDEA**	0.1	0.406	0.185	0.361	0.165	0.349	0.156	0.335	0.159
29	butyl nitrite; 2-nitro-2-methylpropane	100, 30	0.864	0.615	0.752	0.571	0.762	0.561	0.736	0.563
30	2,4-dimethylpyridine	500	0.384	0.194	0.308	0.165	1.417	0.162	0.462	0.159
31	2-propylfuran; 2-ethyl-5-methylfuran	1	0.300	0.098	0.259	0.087	0.271	0.079	0.285	0.084

Table 2-4. Chemical of Potential Concern Maximum and Median for Each Time Period. (2 Sheets)

			Time Period 1 (05:52 - 08:00 PST)		Time Period 2 (08:00 - 10:00 PST)		Time Period 3 (10:00 - 12:00 PST)		Time Period 4 (12:00 - 13:30 PST)	
COPC #	COPC Name	OEL (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)
32	heptanenitrile	6000	0.334	0.191	0.304	0.172	0.739	0.168	0.273	0.166
33	4-methyl-2-hexanone	500	0.295	0.169	0.271	0.150	0.285	0.144	0.271	0.146
34	NMOR**	1	0.297	0.000	0.220	0.000	0.541	0.000	0.179	0.000
35	butyl nitrate	2500	0.220	0.096	0.207	0.087	0.201	0.085	0.198	0.087
36	2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1 1	0.301	0.156	0.246	0.140	0.392	0.136	0.261	0.136
37	6-methyl-2-heptanone	8000	0.265	0.149	0.237	0.134	0.238	0.130	0.233	0.132
38	2-pentylfuran	1	0.242	0.132	0.229	0.129	0.234	0.114	0.209	0.110
39	biphenyl	200	0.285	0.133	0.229	0.117	0.219	0.113	0.225	0.112
40	2-heptylfuran	1	0.789	0.573	0.750	0.511	1.913	0.499	0.644	0.490
41	1,4-butanediol dinitrate	50	0.328	0.178	0.291	0.160	0.282	0.154	0.275	0.154
42	2-octylfuran	1	0.223	0.000	0.171	0.000	0.231	0.000	0.197	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.237	0.000	0.216	0.000	0.216	0.000	0.197	0.000
44	PCB	1000	0.325	0.199	0.282	0.179	0.311	0.174	0.266	0.175
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.211	0.107	0.183	0.095	0.194	0.091	0.182	0.090
46	furfural acetophenone	1	0.716	0.505	0.610	0.453	0.610	0.437	0.573	0.436

* The maximum peak values for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran can be found in the footnote of the tables of their respective time period. 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 studies [Spring 2018 background study 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 2017].

Table 2-5. Chemical of Potential Concern Statistical Information for Time Period 1 of September 18, 2018. (2 Sheets)

Time Period 1 (05:52 - 08:00 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
1	Ammonia	25000	5.699	0.669	11.731	8.453	5.671
2	Formaldehyde	300	1.325	0.375	28.329	5.129	1.309
3	Methanol	200000	15.155	12.018	79.303	221.285	14.309
4	Acetonitrile	20000	0.188	0.034	18.184	0.423	0.185
5	Acetaldehyde	25000	6.986	3.549	50.801	29.835	6.232
6	Ethylamine	5000	0.035	0.017	48.507	0.105	0.032
7	1,3-butadiene	1000	0.396	0.334	84.560	1.964	0.310
8	Propanenitrile	6000	0.086	0.045	52.552	0.438	0.074
9	2-propenal	100	0.369	0.175	47.542	3.435	0.342
10	1-butanol; butenes	20000	0.529	0.471	88.956	2.546	0.343
11	methyl isocyanate	20	0.058	0.025	42.905	0.297	0.055
12	methyl nitrite	100	0.250	0.082	32.992	1.620	0.241
13	Furan	1	0.063	0.026	41.891	0.428	0.061
14	Butanenitrile	8000	0.042	0.031	73.933	0.221	0.033
15	but-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran	100, 1, 1	0.117	0.051	43.701	N/A*	N/A*
16	Butanal	25000	0.252	0.059	23.257	0.614	0.249
17	NDMA**	0.3	0.052	0.050	95.697	0.313	0.042
18	Benzene	500	0.281	0.200	71.317	2.389	0.204
19	2,4-pentadienenitrile; pyridine	300, 1000	0.047	0.020	42.611	0.186	0.043
20	2-methylene butanenitrile	30	0.030	0.018	59.465	0.150	0.028
21	2-methylfuran	1	0.071	0.034	47.565	0.459	0.066
22	Pentanenitrile	6000	0.031	0.024	79.615	0.164	0.024
23	3-methyl-3-buten-2-one; 2-methyl-2-butenal	20, 30	0.080	0.033	41.784	0.525	0.076
24	NEMA**	0.3	0.027	0.033	120.572	0.230	0.014
25	2,5-dimethylfuran	1	0.073	0.034	47.010	0.328	0.072
26	Hexanenitrile	6000	0.067	0.026	39.351	0.181	0.063
27	2-hexanone (MBK)	5000	0.057	0.023	40.115	0.163	0.055
28	NDEA**	0.1	0.182	0.074	40.343	0.406	0.185
29	butyl nitrite; 2-nitro-2-methylpropane	100, 30	0.619	0.062	9.999	0.864	0.615
30	2,4-dimethylpyridine	500	0.201	0.046	22.895	0.384	0.194
31	2-propylfuran; 2-ethyl-5-methylfuran	1	0.099	0.059	59.135	0.300	0.098

Table 2-5. Chemical of Potential Concern Statistical Information for Time Period 1 of September 18, 2018. (2 Sheets)

Time Period 1 (05:52 - 08:00 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
32	Heptanenitrile	6000	0.192	0.035	18.353	0.334	0.191
33	4-methyl-2-hexanone	500	0.171	0.034	19.809	0.295	0.169
34	NMOR**	0.6	0.006	0.026	417.806	0.297	0.000
35	butyl nitrate	2500	0.098	0.031	31.405	0.220	0.096
36	2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100,1, 1	0.158	0.031	19.793	0.301	0.156
37	6-methyl-2-heptanone	8000	0.150	0.029	19.461	0.265	0.149
38	2-pentylfuran	1	0.133	0.030	22.782	0.242	0.132
39	Biphenyl	200	0.133	0.035	26.305	0.285	0.133
40	2-heptylfuran	1	0.574	0.060	10.461	0.789	0.573
41	1,4-butanediol dinitrate	50	0.179	0.035	19.528	0.328	0.178
42	2-octylfuran	1	0.003	0.016	480.876	0.223	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.004	0.020	459.825	0.237	0.000
44	PCB	1000	0.201	0.031	15.583	0.325	0.199
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.108	0.026	24.100	0.211	0.107
46	furfural acetophenone	1	0.508	0.055	10.898	0.716	0.505

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.986 ppb and the median value was 0.108 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 studies [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., 2017].

Table 2-6. Chemical of Potential Concern Statistical Information for Time Period 2 of September 18, 2018. (2 Sheets)

Time Period 2 (08:00 - 10:00 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
1	Ammonia	25000	4.315	0.447	10.355	5.876	4.173
2	Formaldehyde	300	0.766	0.156	20.373	3.077	0.749
3	Methanol	200000	7.758	0.627	8.081	12.412	7.658
4	Acetonitrile	20000	0.162	0.029	17.881	0.320	0.160
5	Acetaldehyde	25000	2.553	2.317	90.780	25.147	2.006
6	Ethylamine	5000	0.028	0.015	54.450	0.110	0.024
7	1,3-butadiene	1000	0.179	0.282	157.440	1.830	0.066
8	Propanenitrile	6000	0.064	0.029	45.333	0.209	0.060
9	2-propenal	100	0.160	0.117	72.731	1.741	0.134
10	1-butanol; butenes	20000	0.363	0.351	96.534	2.467	0.236
11	methyl isocyanate	20	0.041	0.020	48.365	0.159	0.039
12	methyl nitrite	100	0.112	0.049	43.976	0.801	0.105
13	Furan	1	0.033	0.018	54.081	0.178	0.028
14	Butanenitrile	8000	0.028	0.022	79.089	0.164	0.023
15	but-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran	100, 1, 1	0.055	0.032	58.513	N/A*	N/A*
16	Butanal	25000	0.123	0.036	29.167	0.429	0.118
17	NDMA**	0.3	0.031	0.032	105.568	0.194	0.022
18	Benzene	500	0.135	0.093	69.015	1.003	0.107
19	2,4-pentadienenitrile; pyridine	300, 1000	0.034	0.015	43.498	0.107	0.033
20	2-methylene butanenitrile	30	0.023	0.015	66.261	0.133	0.019
21	2-methylfuran	1	0.035	0.022	64.531	0.289	0.032
22	Pentanenitrile	6000	0.021	0.018	85.709	0.169	0.016
23	3-methyl-3-buten-2-one; 2-methyl-2-butenal	20, 30	0.040	0.024	60.419	0.296	0.036
24	NEMA**	0.3	0.020	0.023	119.531	0.140	0.010
25	2,5-dimethylfuran	1	0.057	0.027	47.693	0.283	0.056
26	Hexanenitrile	6000	0.068	0.025	36.200	0.214	0.065
27	2-hexanone (MBK)	5000	0.050	0.019	38.259	0.131	0.048
28	NDEA**	0.1	0.163	0.066	40.539	0.361	0.165
29	butyl nitrite; 2-nitro-2-methylpropane	100, 30	0.571	0.052	9.067	0.752	0.571
30	2,4-dimethylpyridine	500	0.168	0.034	20.199	0.308	0.165

Table 2-6. Chemical of Potential Concern Statistical Information for Time Period 2 of September 18, 2018. (2 Sheets)

Time Period 2 (08:00 - 10:00 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
31	2-propylfuran; 2-ethyl-5-methylfuran	1	0.088	0.051	58.061	0.259	0.087
32	Heptanenitrile	6000	0.174	0.032	18.277	0.304	0.172
33	4-methyl-2-hexanone	500	0.152	0.030	19.872	0.271	0.150
34	NMOR**	0.6	0.005	0.021	448.530	0.220	0.000
35	butyl nitrate	2500	0.088	0.029	32.633	0.207	0.087
36	2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100,1, 1	0.141	0.029	20.625	0.246	0.140
37	6-methyl-2-heptanone	8000	0.135	0.027	19.755	0.237	0.134
38	2-pentylfuran	1	0.130	0.029	22.271	0.229	0.129
39	Biphenyl	200	0.117	0.033	27.978	0.229	0.117
40	2-heptylfuran	1	0.515	0.049	9.474	0.750	0.511
41	1,4-butanediol dinitrate	50	0.161	0.031	19.511	0.291	0.160
42	2-octylfuran	1	0.003	0.015	461.657	0.171	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.005	0.021	456.462	0.216	0.000
44	PCB	1000	0.180	0.027	15.042	0.282	0.179
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.096	0.024	24.797	0.183	0.095
46	furfural acetophenone	1	0.454	0.043	9.492	0.610	0.453

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.492 ppb and the median value was 0.050 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 studies [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., 2017].

Table 2-7. Chemical of Potential Concern Statistical Information for Time Period 3 of September 18, 2018. (2 Sheets)

Time Period 3 (10:00 - 12:00 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
1	Ammonia	25000	4.338	0.281	6.472	5.066	4.371
2	Formaldehyde	300	0.850	0.322	37.877	6.030	0.801
3	Methanol	200000	7.518	0.741	9.853	16.641	7.406
4	Acetonitrile	20000	0.181	0.045	24.715	1.007	0.177
5	Acetaldehyde	25000	2.351	1.693	72.009	25.397	1.810
6	Ethylamine	5000	0.028	0.015	53.465	0.090	0.024
7	1,3-butadiene	1000	0.312	0.902	288.802	17.511	0.087
8	Propanenitrile	6000	0.069	0.069	99.642	1.239	0.055
9	2-propenal	100	0.157	0.209	132.931	4.855	0.115
10	1-butanol; butenes	20000	0.527	1.210	229.529	23.508	0.222
11	methyl isocyanate	20	0.040	0.021	53.150	0.308	0.037
12	methyl nitrite	100	0.126	0.165	130.798	2.333	0.098
13	Furan	1	0.030	0.024	77.626	0.288	0.027
14	Butanenitrile	8000	0.034	0.056	163.558	1.072	0.021
15	but-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran	100, 1, 1	0.041	0.042	102.126	N/A*	N/A*
16	Butanal	25000	0.109	0.043	39.230	0.755	0.103
17	NDMA**	0.3	0.027	0.029	109.014	0.198	0.018
18	Benzene	500	0.173	0.496	286.729	13.003	0.099
19	2,4-pentadienenitrile; pyridine	300, 1000	0.036	0.036	100.182	0.835	0.029
20	2-methylene butanenitrile	30	0.026	0.041	155.549	0.819	0.018
21	2-methylfuran	1	0.027	0.017	61.417	0.162	0.025
22	Pentanenitrile	6000	0.026	0.053	201.876	1.105	0.015
23	3-methyl-3-buten-2-one; 2-methyl-2-butenal	20, 30	0.032	0.018	57.146	0.228	0.029
24	NEMA**	0.3	0.018	0.021	118.015	0.116	0.009
25	2,5-dimethylfuran	1	0.055	0.027	49.202	0.154	0.055
26	hexanenitrile	6000	0.078	0.052	67.082	1.044	0.070
27	2-hexanone (MBK)	5000	0.054	0.021	38.275	0.151	0.052
28	NDEA**	0.1	0.155	0.062	40.061	0.349	0.156
29	butyl nitrite; 2-nitro-2-methylpropane	100, 30	0.563	0.052	9.156	0.762	0.561

Table 2-7. Chemical of Potential Concern Statistical Information for Time Period 3 of September 18, 2018. (2 Sheets)

Time Period 3 (10:00 - 12:00 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
30	2,4-dimethylpyridine	500	0.172	0.072	41.697	1.417	0.162
31	2-propylfuran; 2-ethyl-5-methylfuran	1	0.080	0.051	64.106	0.271	0.079
32	heptanenitrile	6000	0.173	0.043	25.015	0.739	0.168
33	4-methyl-2-hexanone	500	0.146	0.030	20.246	0.285	0.144
34	NMOR**	0.6	0.007	0.034	464.935	0.541	0.000
35	butyl nitrate	2500	0.086	0.029	33.026	0.201	0.085
36	2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran;3-(1,1-dimethylethyl)-2,3-dihydrofuran	100,1, 1	0.139	0.032	23.084	0.392	0.136
37	6-methyl-2-heptanone	8000	0.131	0.026	19.807	0.238	0.130
38	2-pentylfuran	1	0.114	0.029	25.582	0.234	0.114
39	Biphenyl	200	0.113	0.032	28.445	0.219	0.113
40	2-heptylfuran	1	0.509	0.082	16.175	1.913	0.499
41	1,4-butanediol dinitrate	50	0.156	0.031	20.054	0.282	0.154
42	2-octylfuran	1	0.003	0.016	448.846	0.231	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.005	0.020	443.882	0.216	0.000
44	PCB	1000	0.175	0.027	15.554	0.311	0.174
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.091	0.024	26.376	0.194	0.091
46	furfural acetophenone	1	0.438	0.041	9.366	0.610	0.437

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.716 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 studies [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., 2017].

Table 2-8. Chemical of Potential Concern Statistical Information for Time Period 4 of September 18, 2018. (2 Sheets)

Time Period 4 (12:00 - 13:30 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
1	Ammonia	25000	3.964	0.241	6.072	4.784	3.953
2	Formaldehyde	300	0.917	0.341	37.155	4.393	0.844
3	Methanol	200000	7.624	0.759	9.958	23.103	7.553
4	Acetonitrile	20000	0.182	0.032	17.395	0.450	0.180
5	Acetaldehyde	25000	2.081	1.461	70.225	19.010	1.706
6	Ethylamine	5000	0.028	0.015	53.419	0.091	0.024
7	1,3-butadiene	1000	0.133	0.135	101.211	1.207	0.102
8	Propanenitrile	6000	0.060	0.028	45.927	0.383	0.055
9	2-propenal	100	0.132	0.075	56.961	1.237	0.120
10	1-butanol; butenes	20000	0.284	0.179	62.900	3.446	0.238
11	methyl isocyanate	20	0.040	0.019	46.809	0.126	0.038
12	methyl nitrite	100	0.154	0.203	132.038	2.506	0.101
13	Furan	1	0.027	0.017	60.604	0.239	0.023
14	Butanenitrile	8000	0.024	0.016	65.625	0.184	0.022
15	but-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran	100, 1, 1	0.040	0.031	78.180	N/A*	N/A*
16	Butanal	25000	0.113	0.034	29.854	0.407	0.109
17	NDMA**	0.3	0.028	0.030	108.890	0.183	0.019
18	Benzene	500	0.127	0.130	102.591	2.197	0.093
19	2,4-pentadienenitrile; pyridine	300, 1000	0.031	0.015	48.365	0.185	0.029
20	2-methylene butanenitrile	30	0.018	0.010	56.371	0.069	0.014
21	2-methylfuran	1	0.026	0.016	60.709	0.165	0.023
22	pentanenitrile	6000	0.017	0.012	68.999	0.080	0.015
23	3-methyl-3-buten-2-one; 2-methyl-2-butenal	20, 30	0.035	0.019	54.823	0.187	0.032
24	NEMA**	0.3	0.017	0.021	121.490	0.102	0.009
25	2,5-dimethylfuran	1	0.059	0.024	40.981	0.155	0.058
26	hexanenitrile	6000	0.070	0.023	32.205	0.165	0.068
27	2-hexanone (MBK)	5000	0.058	0.021	36.633	0.144	0.056
28	NDEA**	0.1	0.157	0.064	40.710	0.335	0.159
29	butyl nitrite; 2-nitro-2-methylpropane	100, 30	0.564	0.051	9.029	0.736	0.563

Table 2-8. Chemical of Potential Concern Statistical Information for Time Period 4 of September 18, 2018. (2 Sheets)

Time Period 4 (12:00 - 13:30 PST)							
COPC #	**COPC Name**	**OEL (ppb)**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. %**	**Max (ppb)**	**Median (ppb)**
30	2,4-dimethylpyridine	500	0.161	0.035	21.509	0.462	0.159
31	2-propylfuran; 2-ethyl-5-methylfuran	1	0.087	0.048	55.339	0.285	0.084
32	heptanenitrile	6000	0.168	0.030	17.973	0.273	0.166
33	4-methyl-2-hexanone	500	0.147	0.029	19.672	0.271	0.146
34	NMOR**	0.6	0.004	0.018	462.753	0.179	0.000
35	butyl nitrate	2500	0.089	0.028	32.133	0.198	0.087
36	2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100,1, 1	0.137	0.028	20.754	0.261	0.136
37	6-methyl-2-heptanone	8000	0.133	0.027	20.189	0.233	0.132
38	2-pentylfuran	1	0.111	0.026	23.671	0.209	0.110
39	Biphenyl	200	0.112	0.033	29.547	0.225	0.112
40	2-heptylfuran	1	0.490	0.044	9.008	0.644	0.490
41	1,4-butanediol dinitrate	50	0.155	0.031	19.898	0.275	0.154
42	2-octylfuran	1	0.004	0.016	429.017	0.197	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.005	0.020	417.674	0.197	0.000
44	PCB	1000	0.176	0.026	15.024	0.266	0.175
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.092	0.023	25.037	0.182	0.090
46	furfural acetophenone	1	0.436	0.040	9.213	0.573	0.436

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.335 ppb and the median value was 0.033 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 studies [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., 2017].

The following figures display the chemicals of potential concern (COPC) signals, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 18, 2018. The four time periods identified earlier are annotated for clarity.

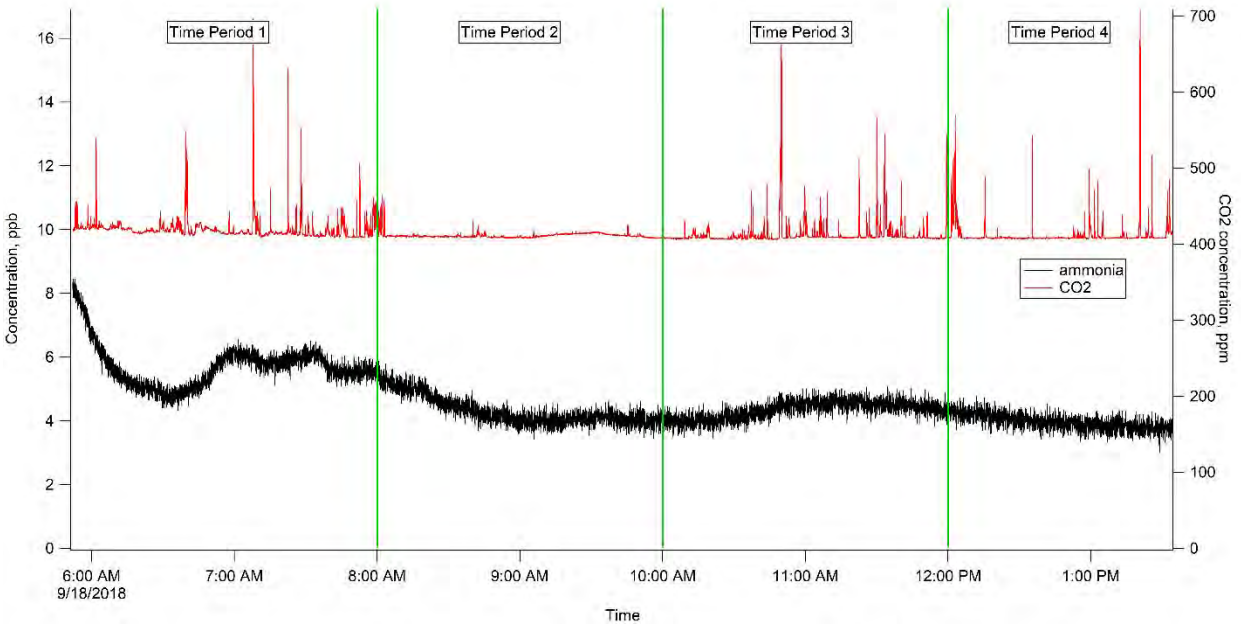

Figure 2-4. Ammonia.

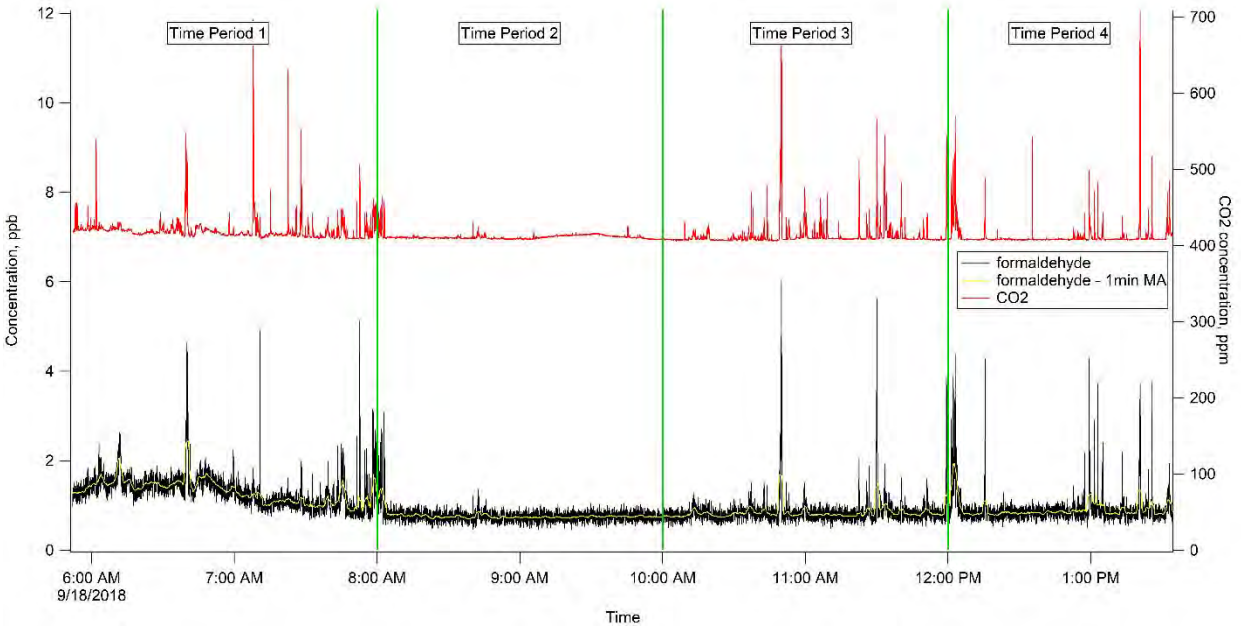

Figure 2-5. Formaldehyde.

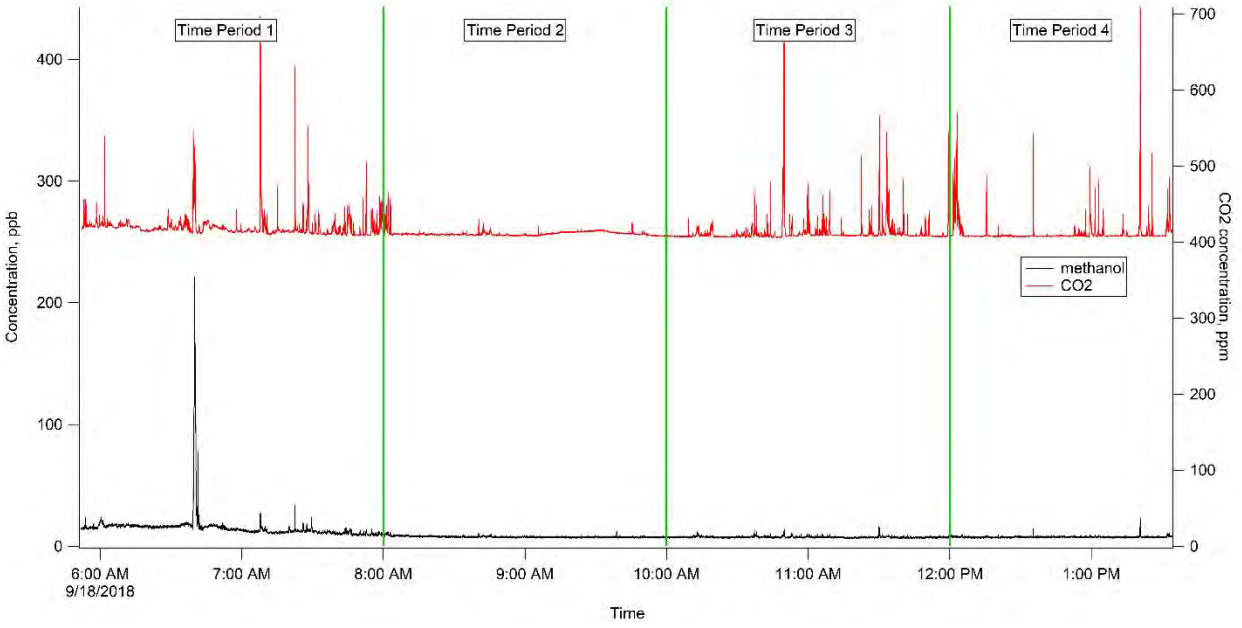

Figure 2-6. Methanol.

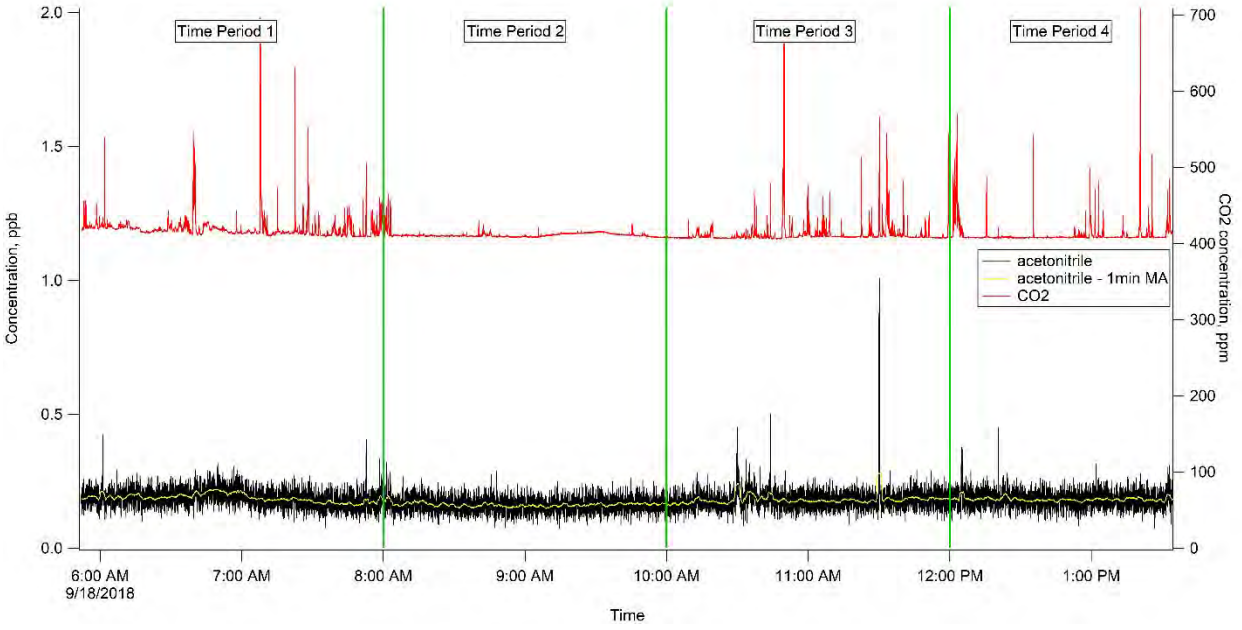

Figure 2-7. Acetonitrile.

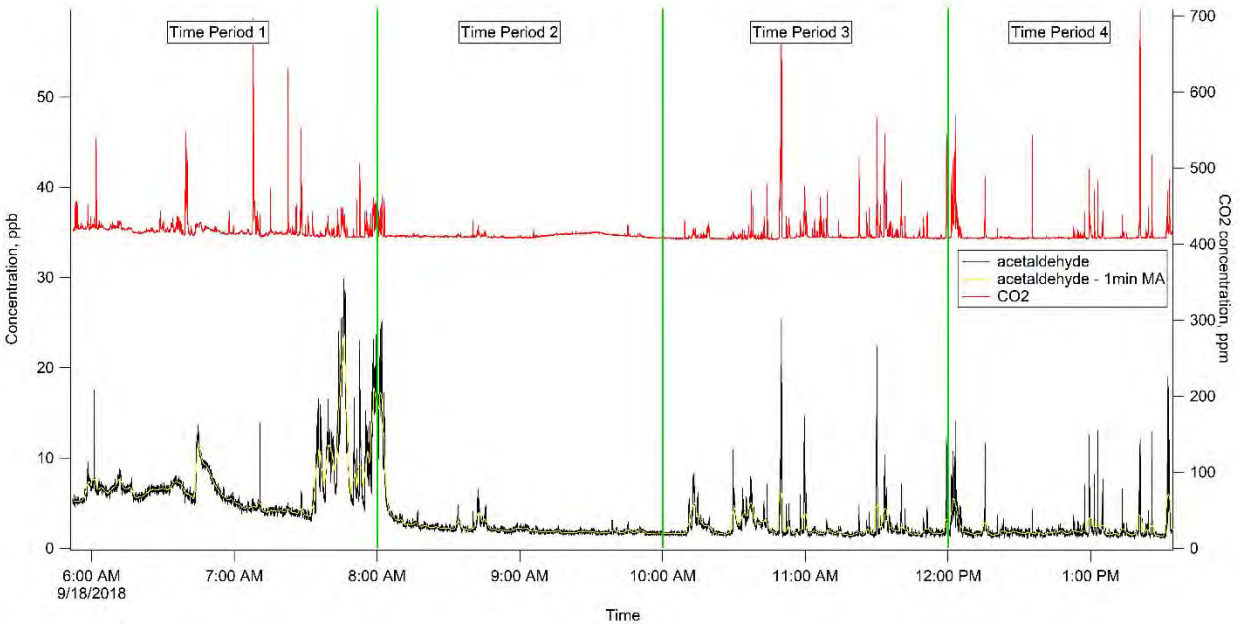

Figure 2-8. Acetaldehyde.

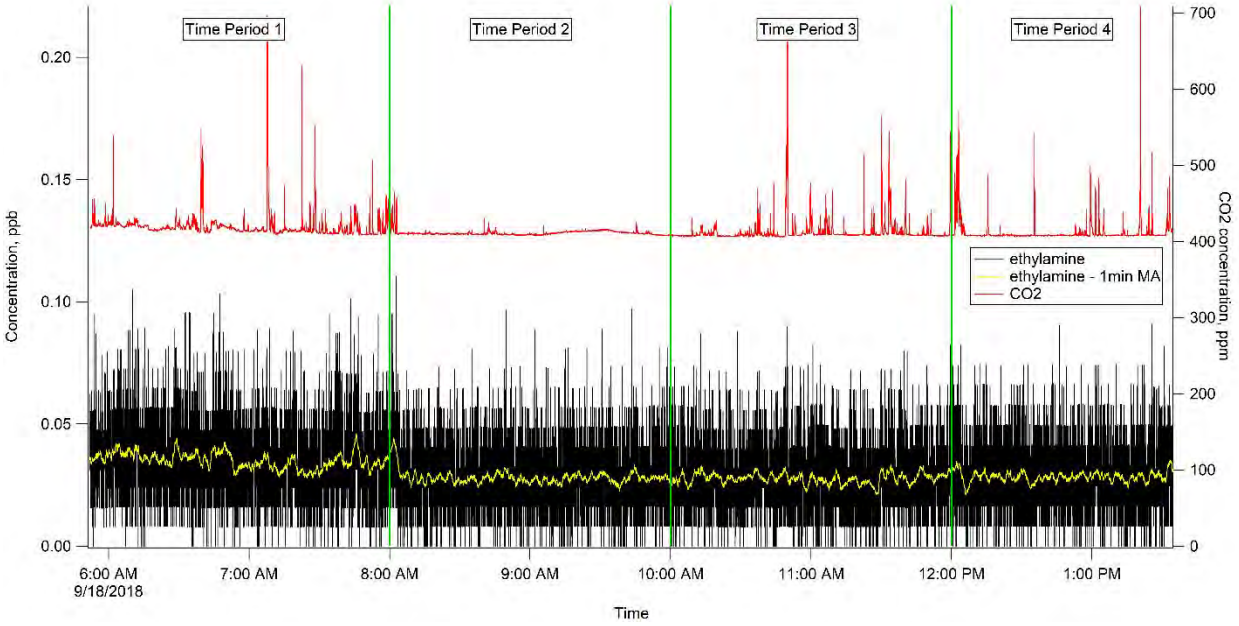

Figure 2-9. Ethylamine.

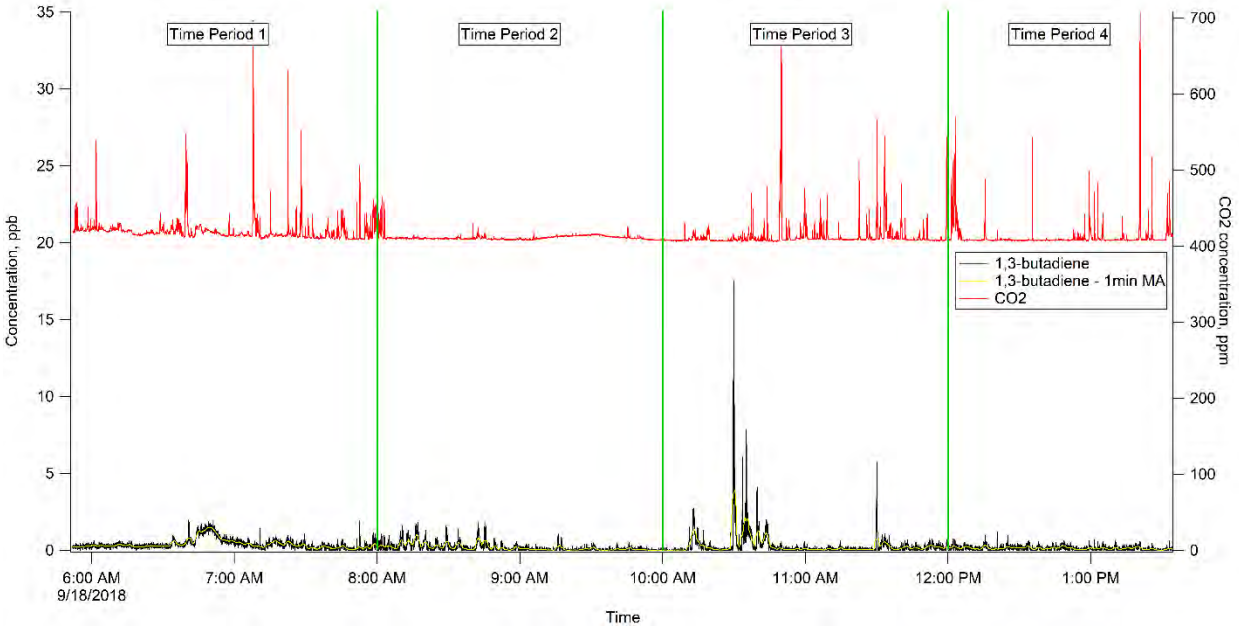

Figure 2-10. 1,3-butadiene.

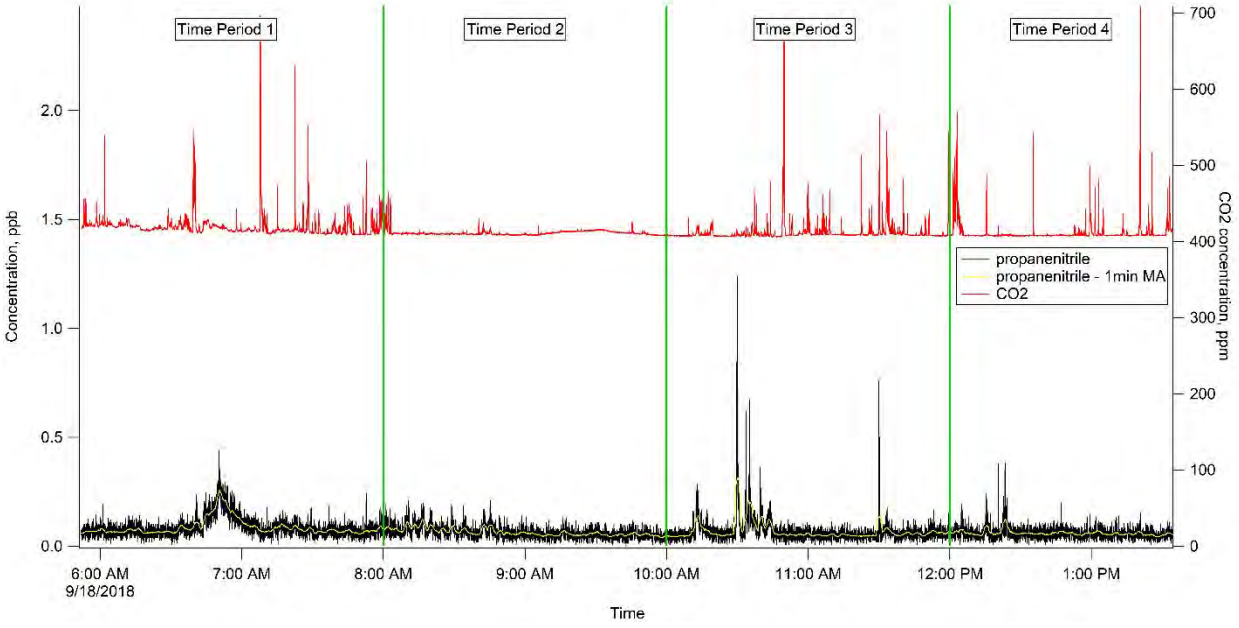

Figure 2-11. Propanenitrile.

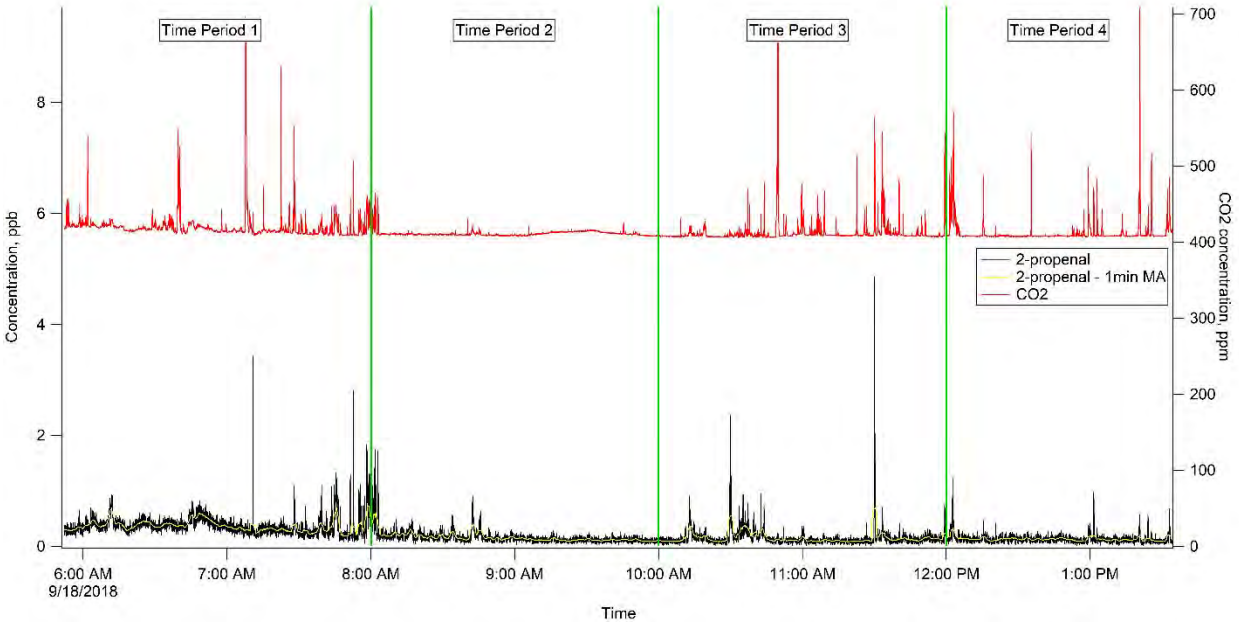

Figure 2-12. 2-propenal.

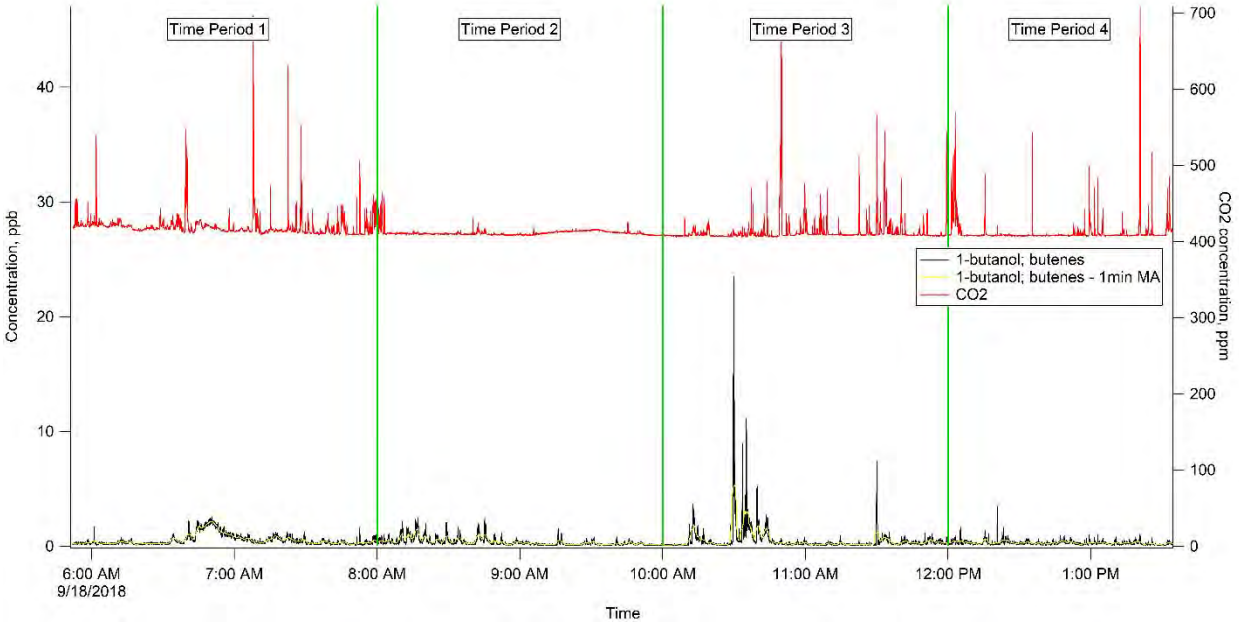

Figure 2-13. 1-butanol; Butenes.

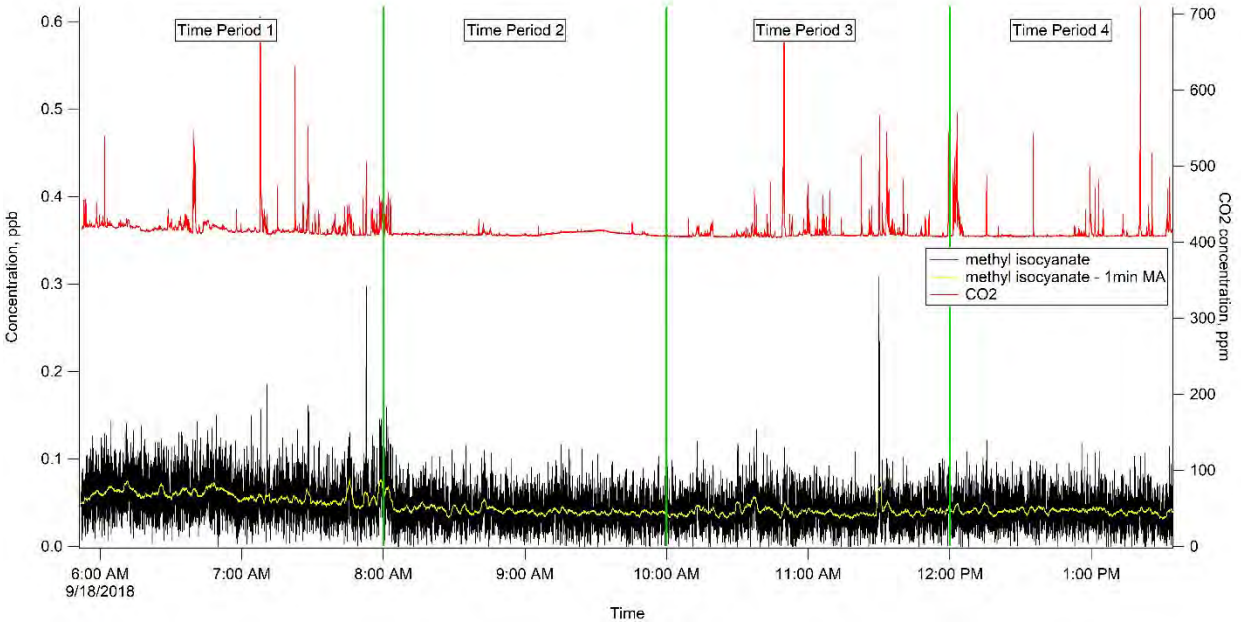

Figure 2-14. Methyl Isocyanate.

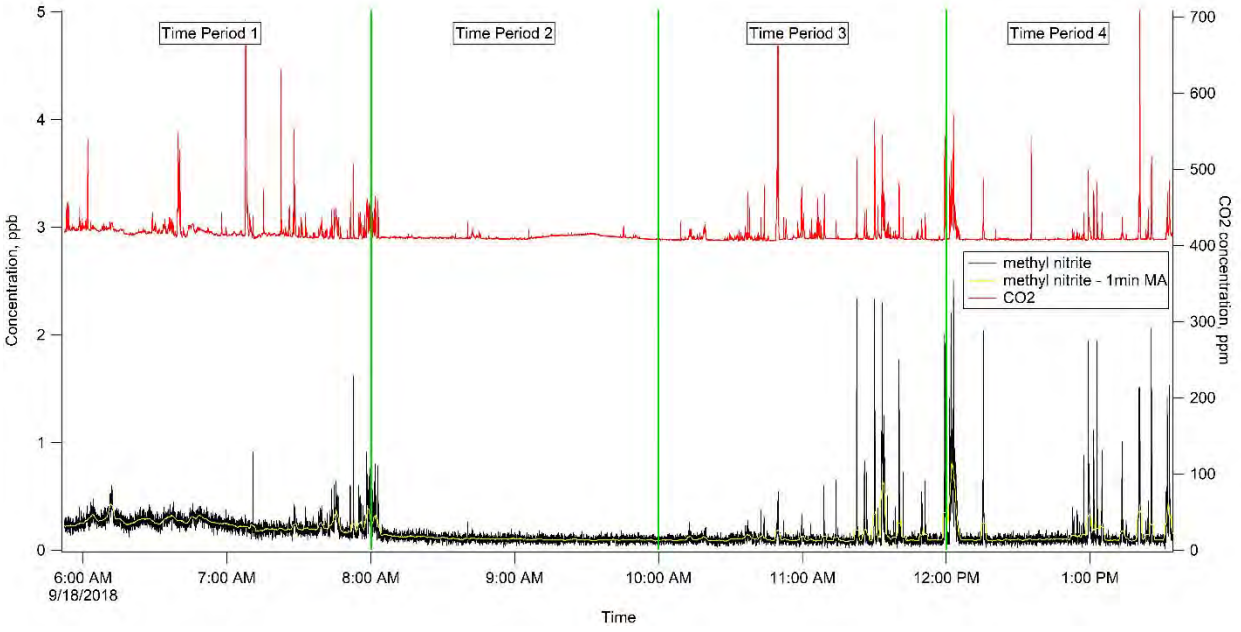

Figure 2-15. Methyl Nitrite.

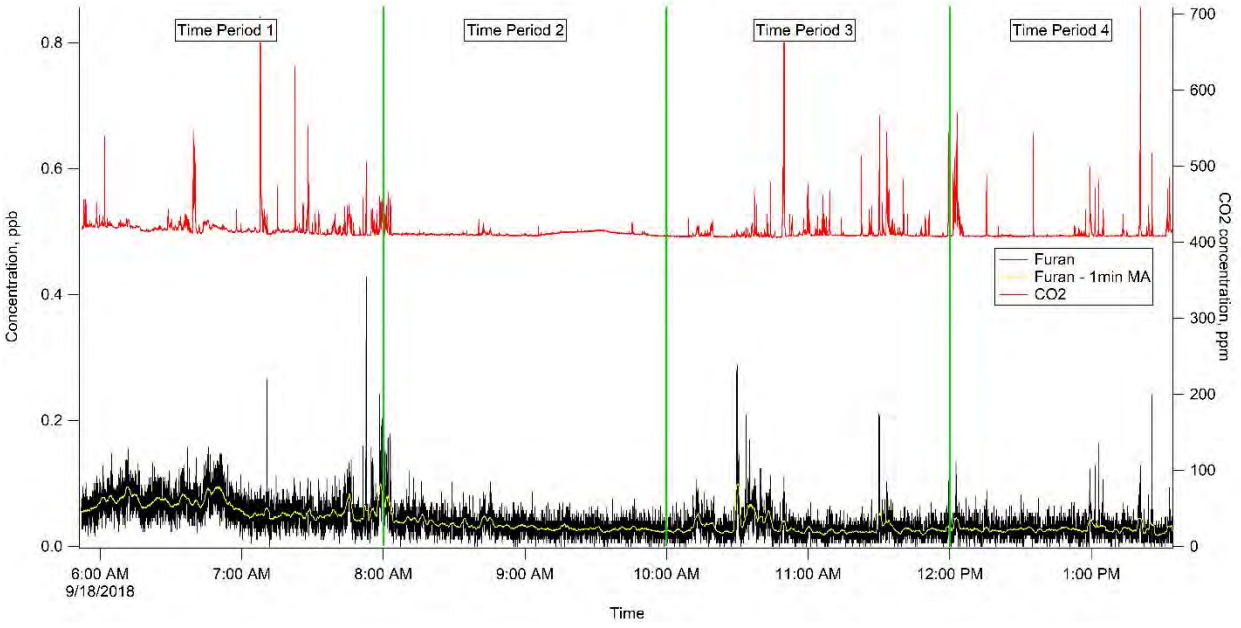

Figure 2-16. Furan.

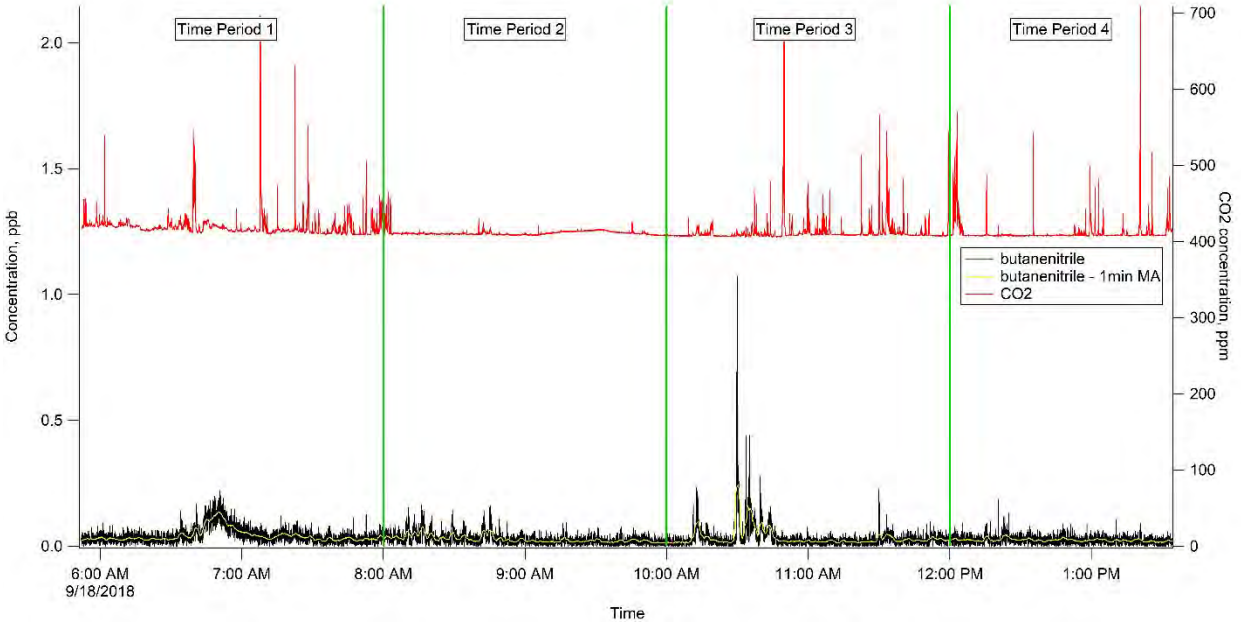

Figure 2-17. Butanenitrile.

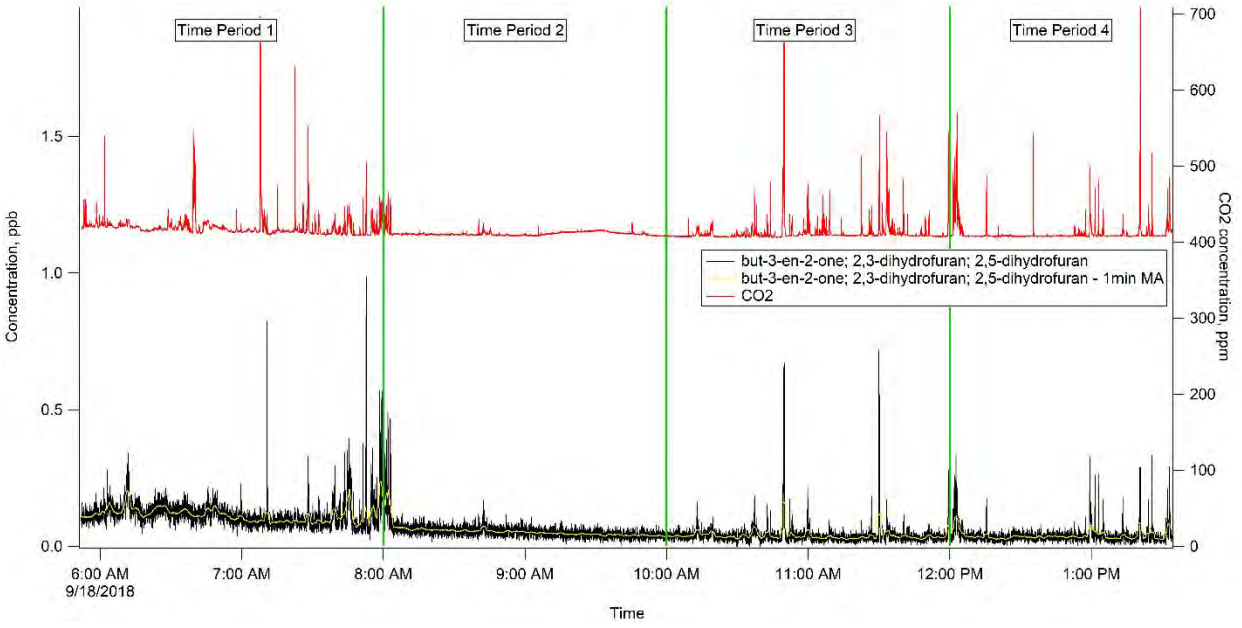

Figure 2-18. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

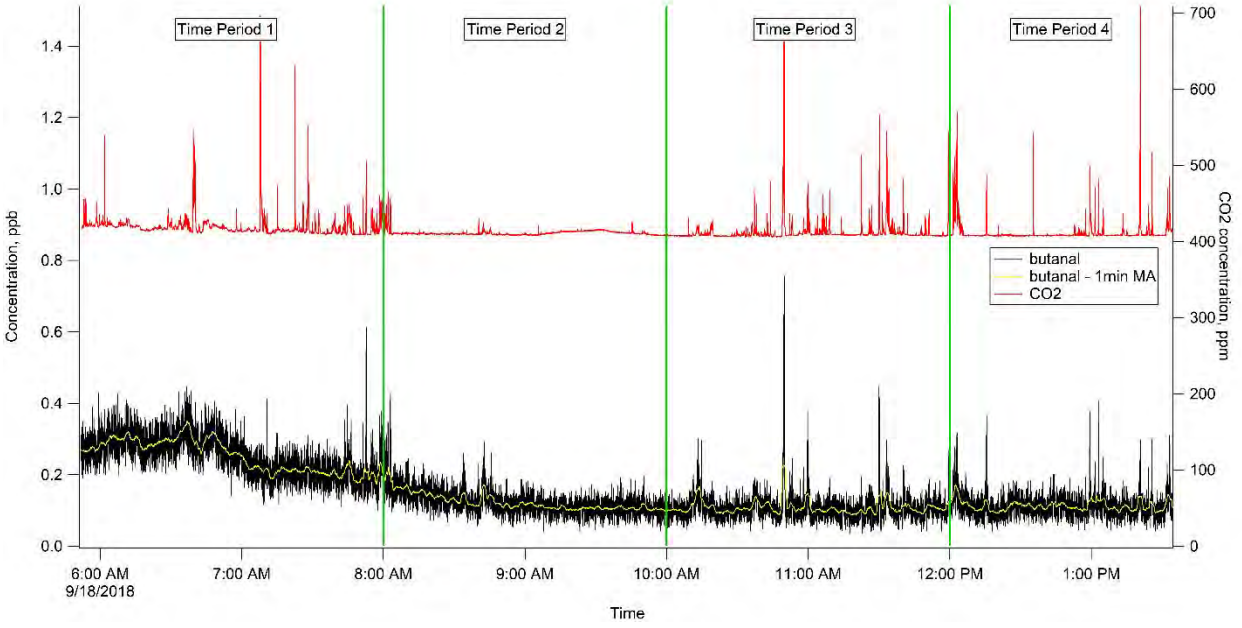

Figure 2-19. Butanal.

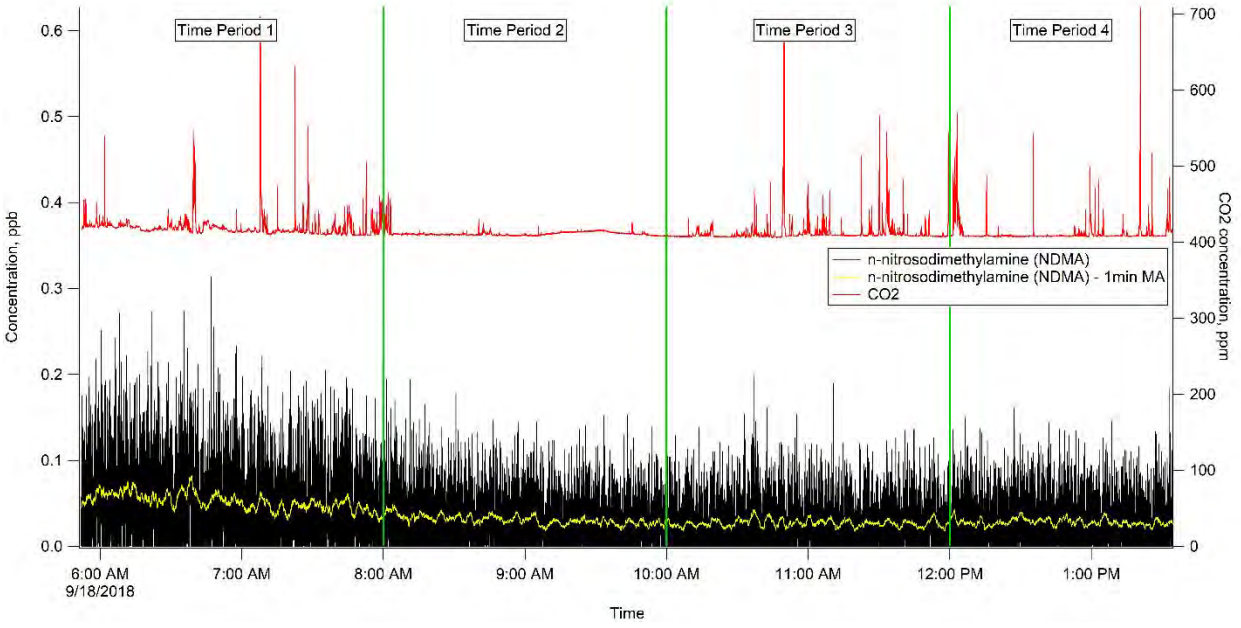

Figure 2-20. N-nitrosodimethylamine (NDMA).

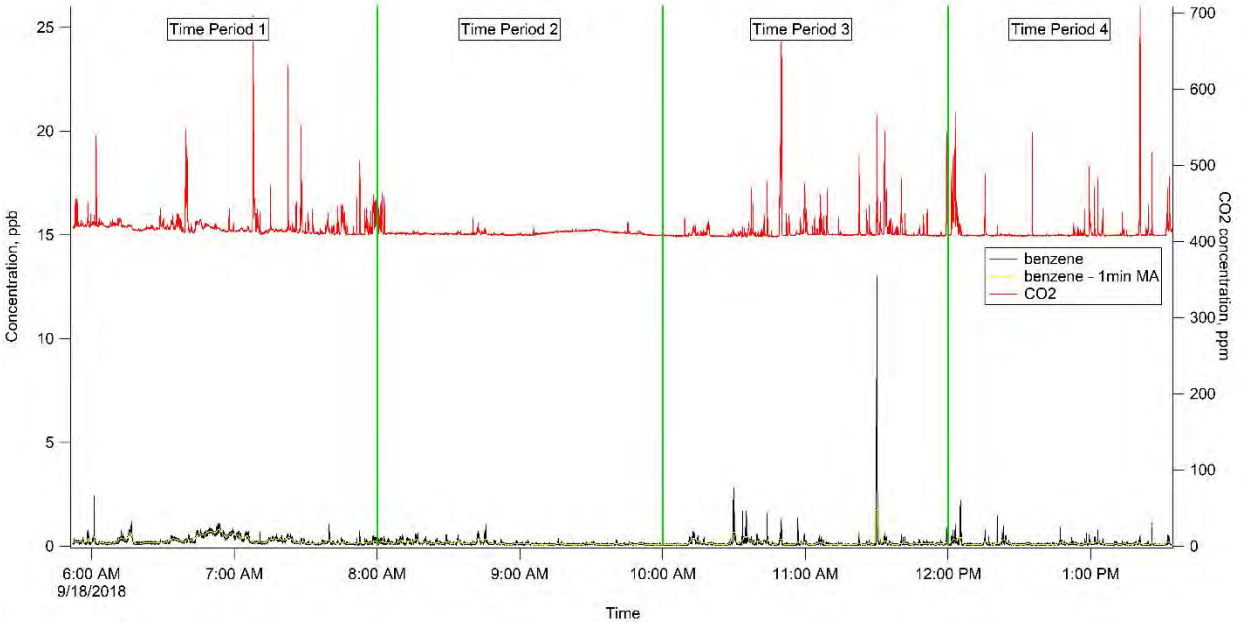

Figure 2-21. Benzene.

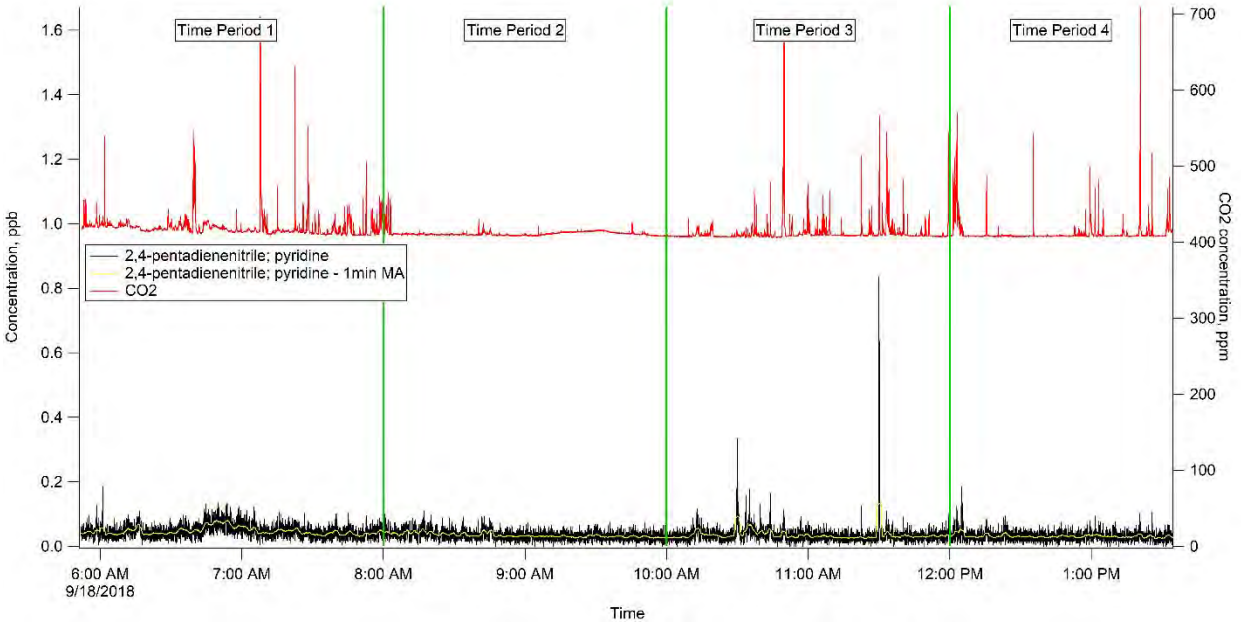

Figure 2-22. 2,4-pentadienenitrile; Pyridine.

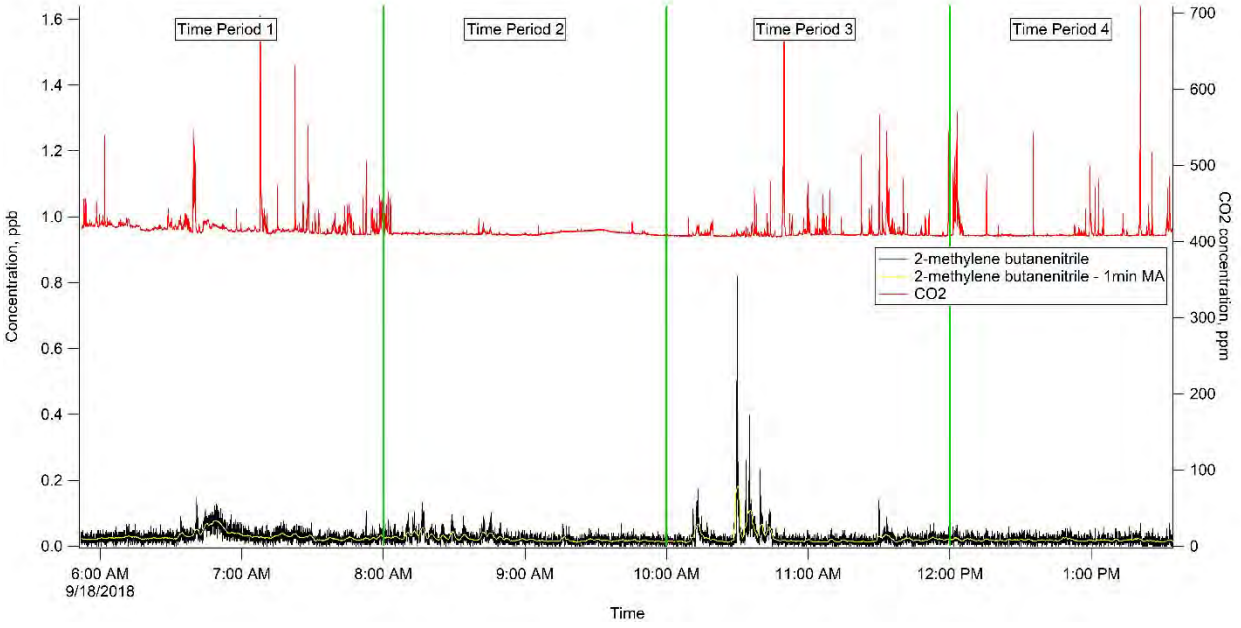

Figure 2-23. 2-methylene Butanenitrile.

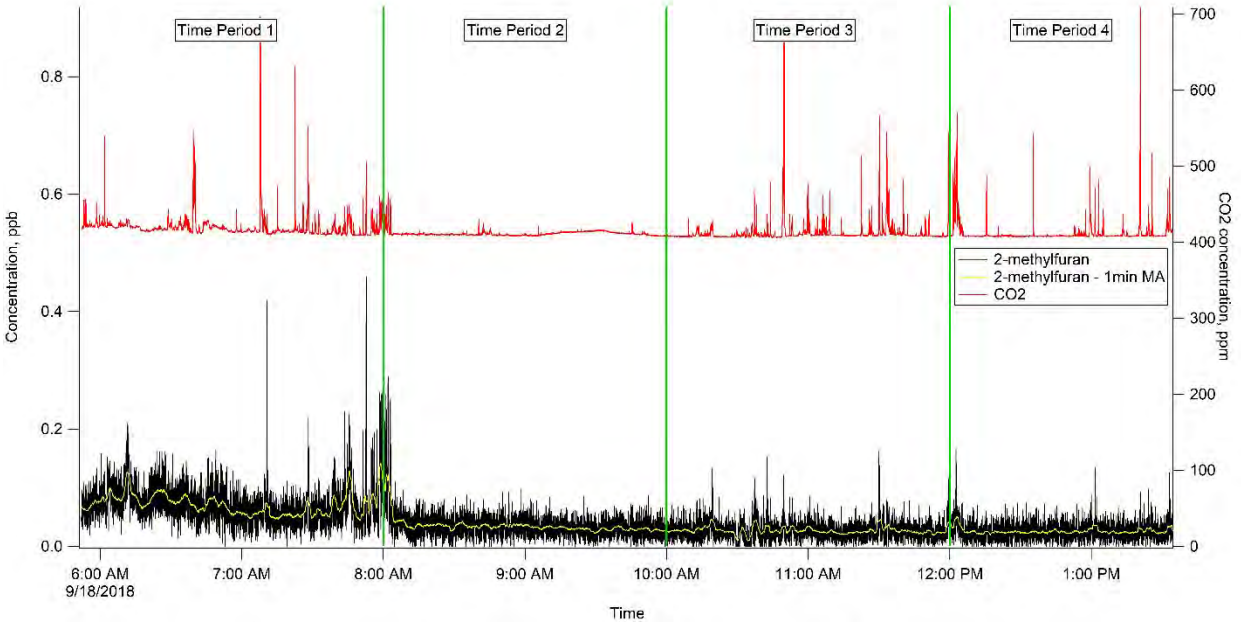

Figure 2-24. 2-methylfuran.

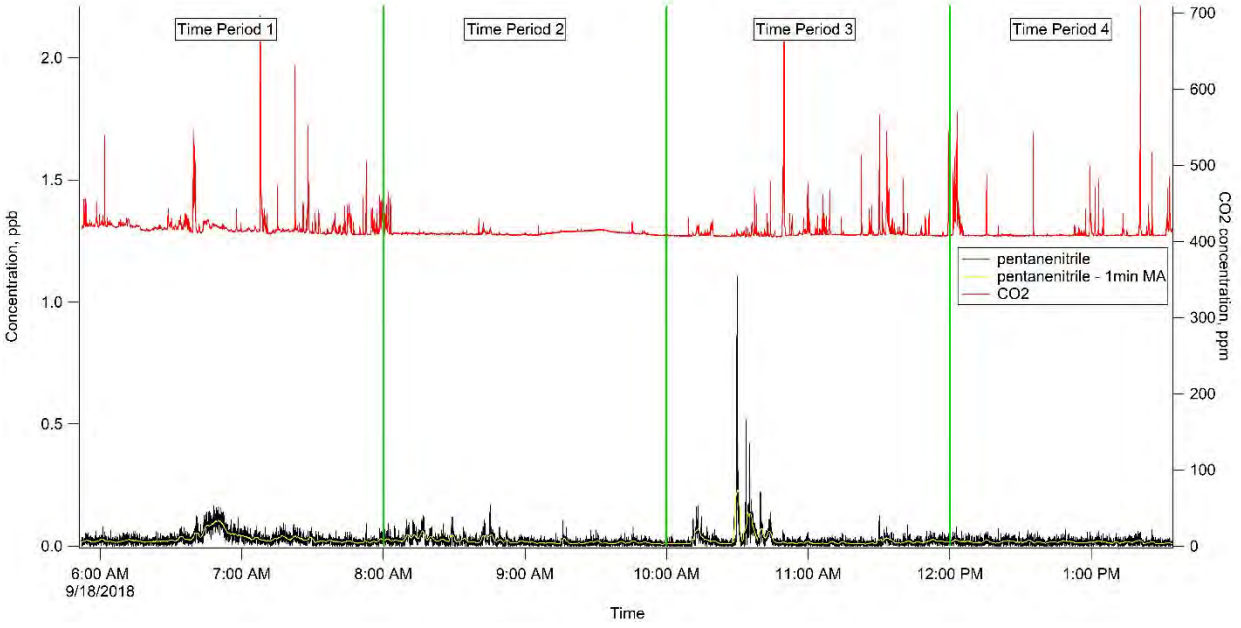

Figure 2-25. Pentanenitrile.

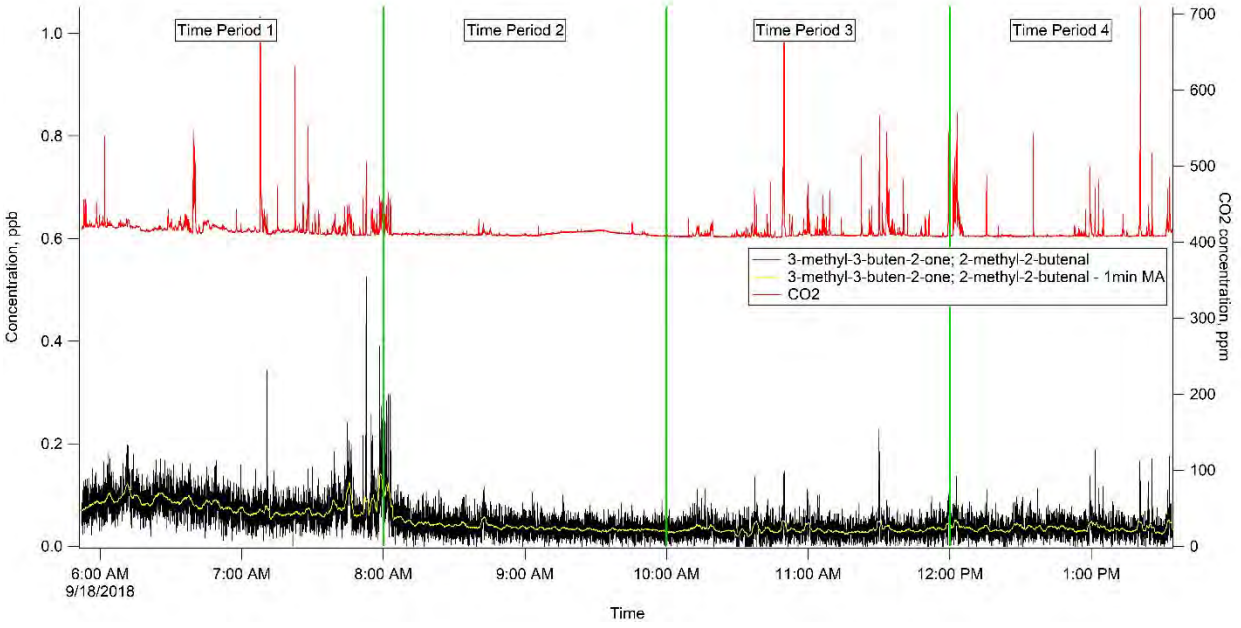

Figure 2-26. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

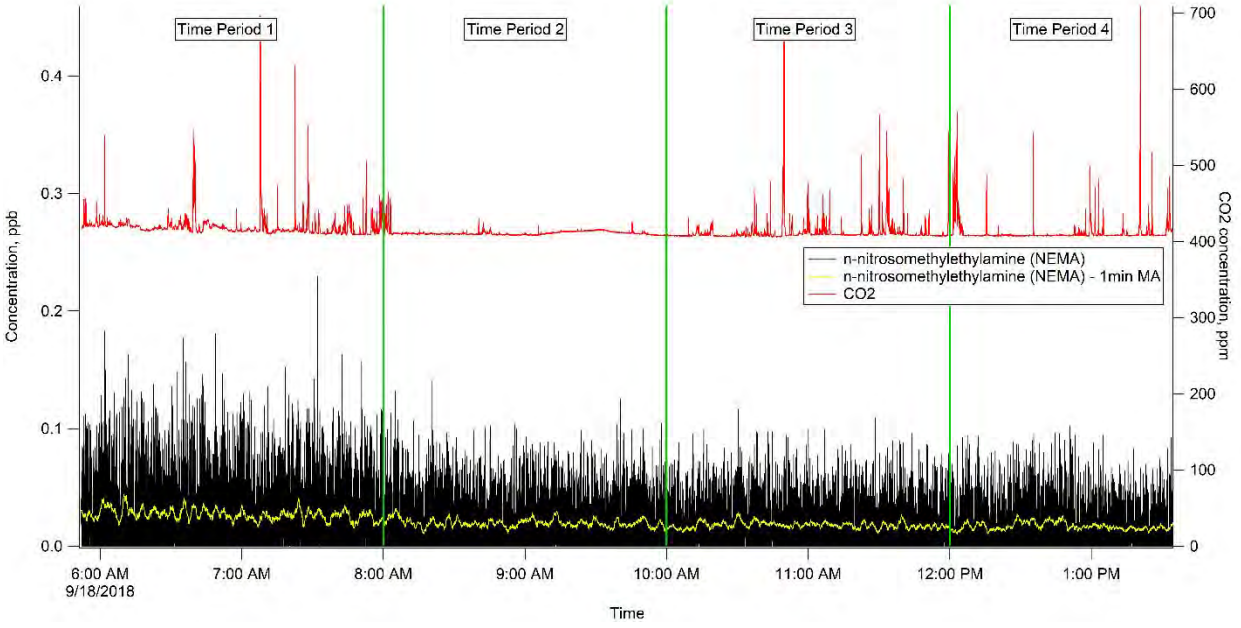

Figure 2-27. N-nitrosomethylethylamine (NEMA).

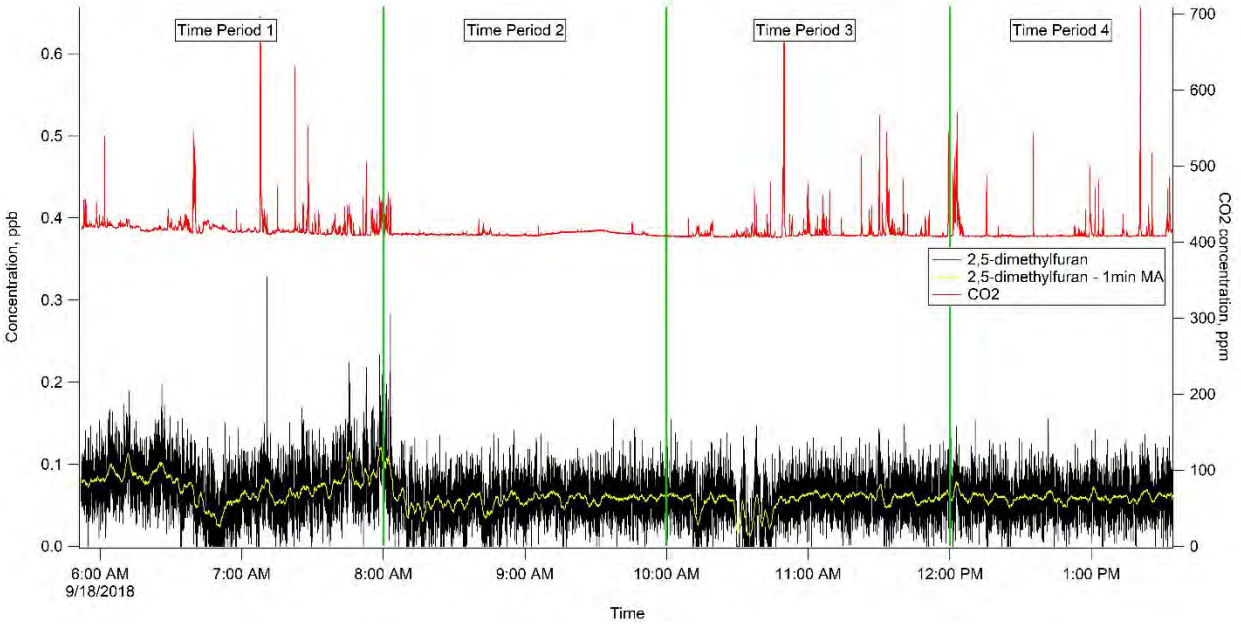

Figure 2-28. 2,5-dimethylfuran.

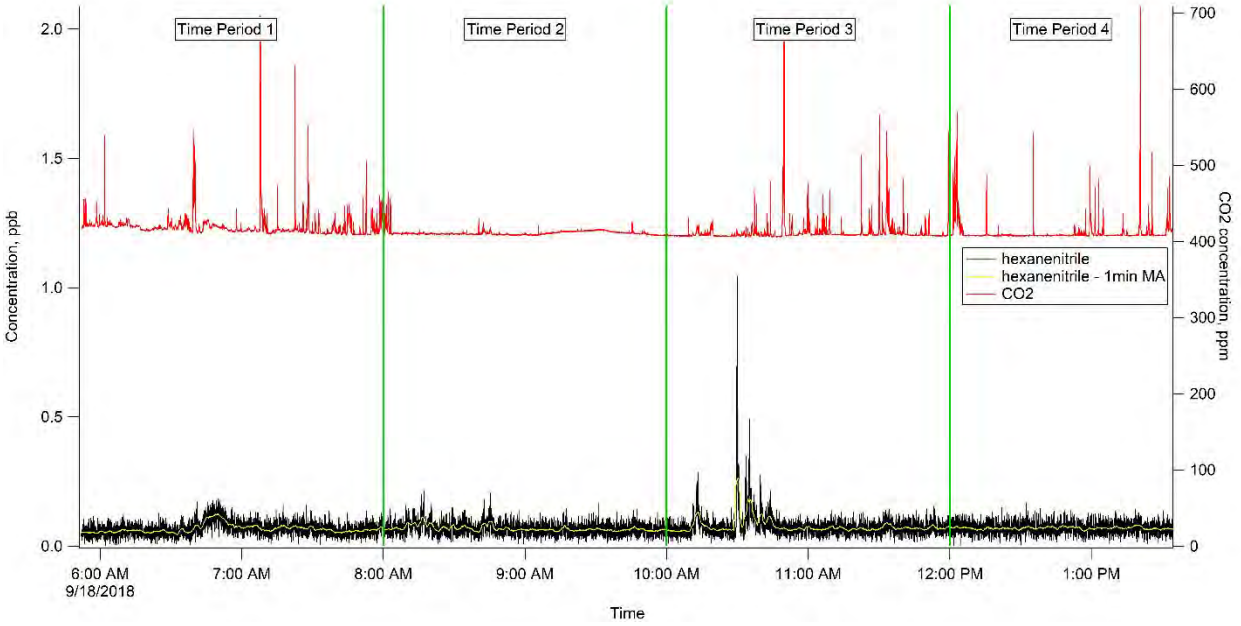

Figure 2-29. Hexanenitrile.

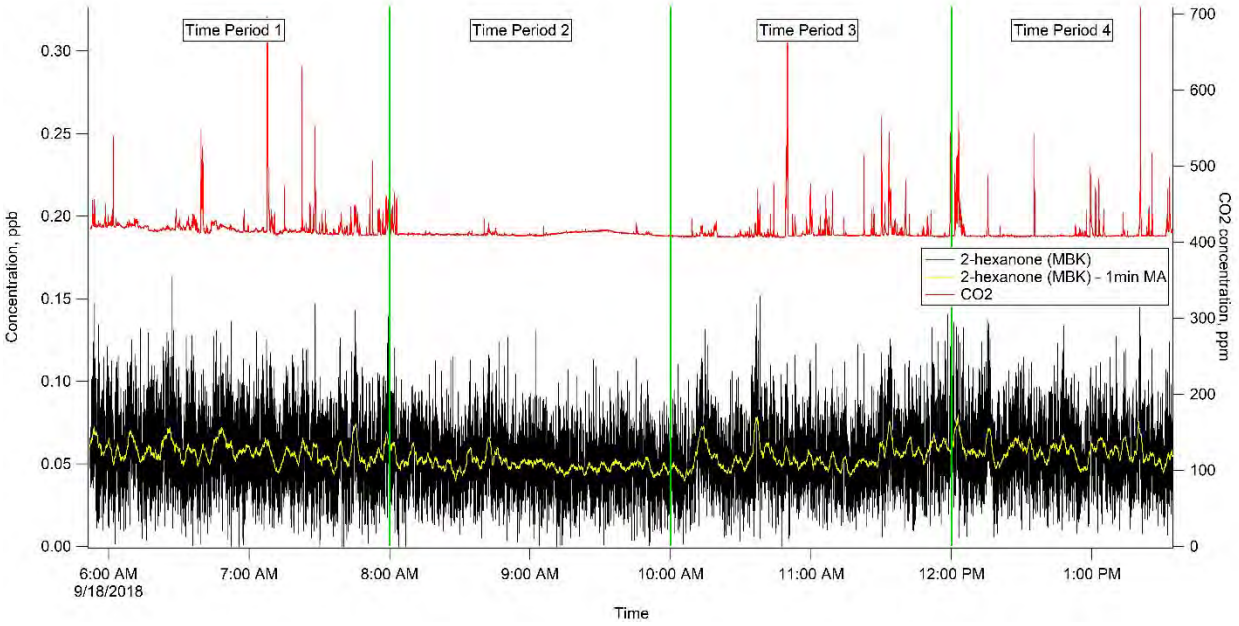

Figure 2-30. 2-hexanone (MBK).

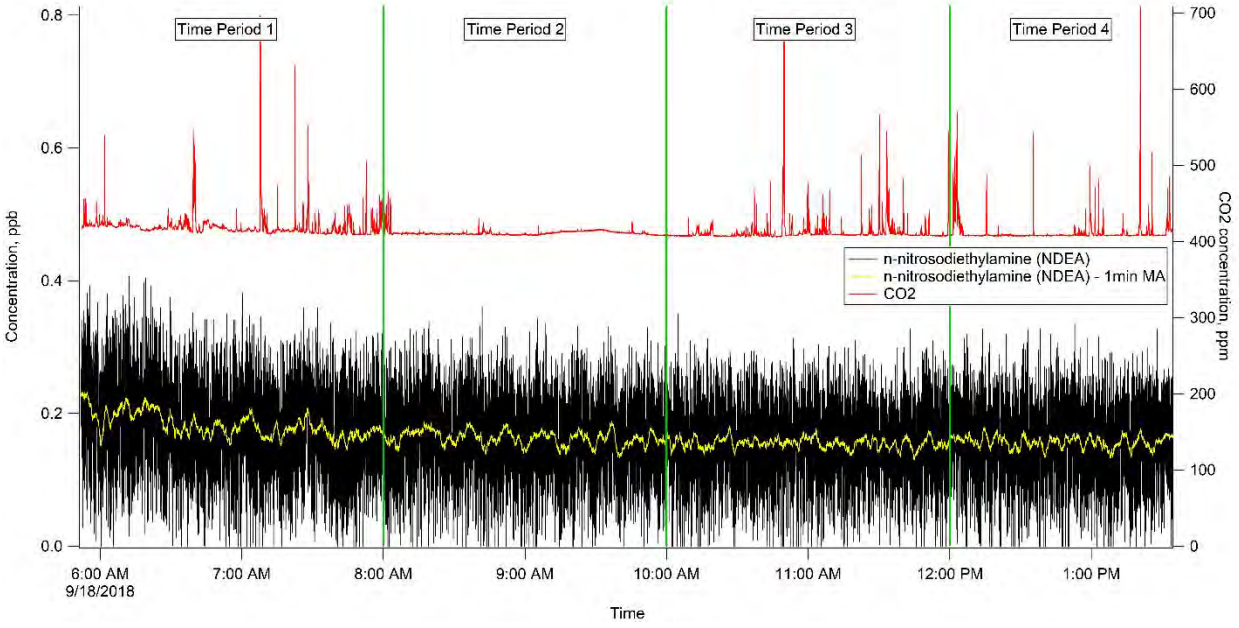

Figure 2-31. N-nitrosodiethylamine (NDEA).

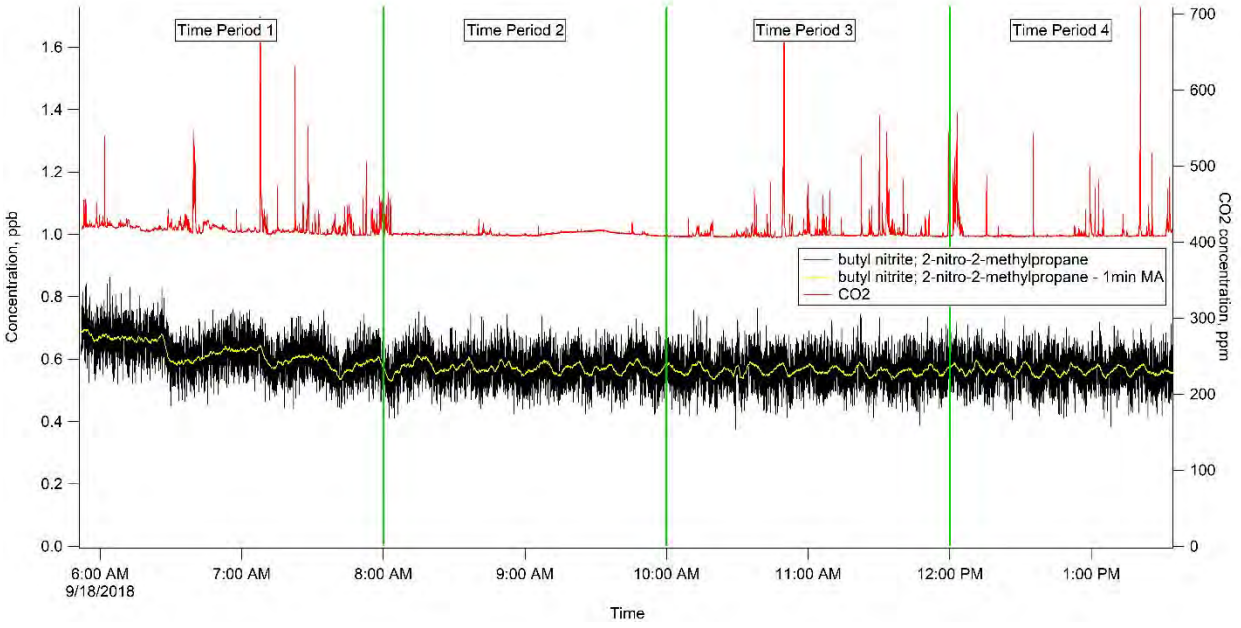

Figure 2-32. Butyl Nitrite; 2-nitro-2-methylpropane.

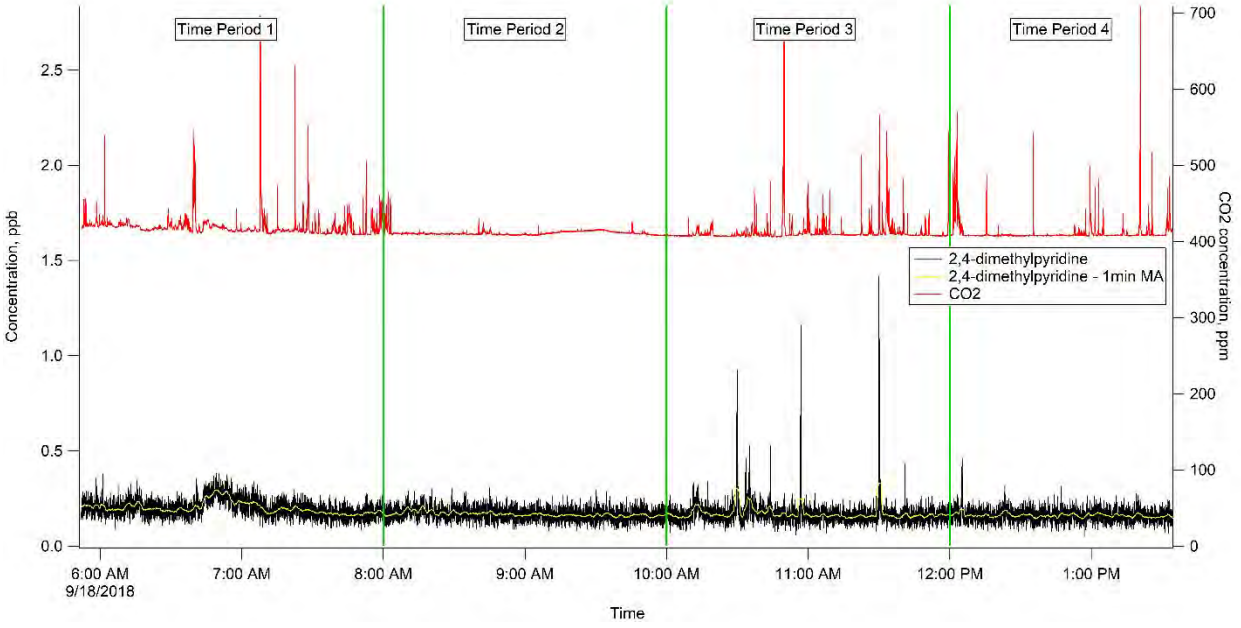

Figure 2-33. 2,4-dimethylpyridine.

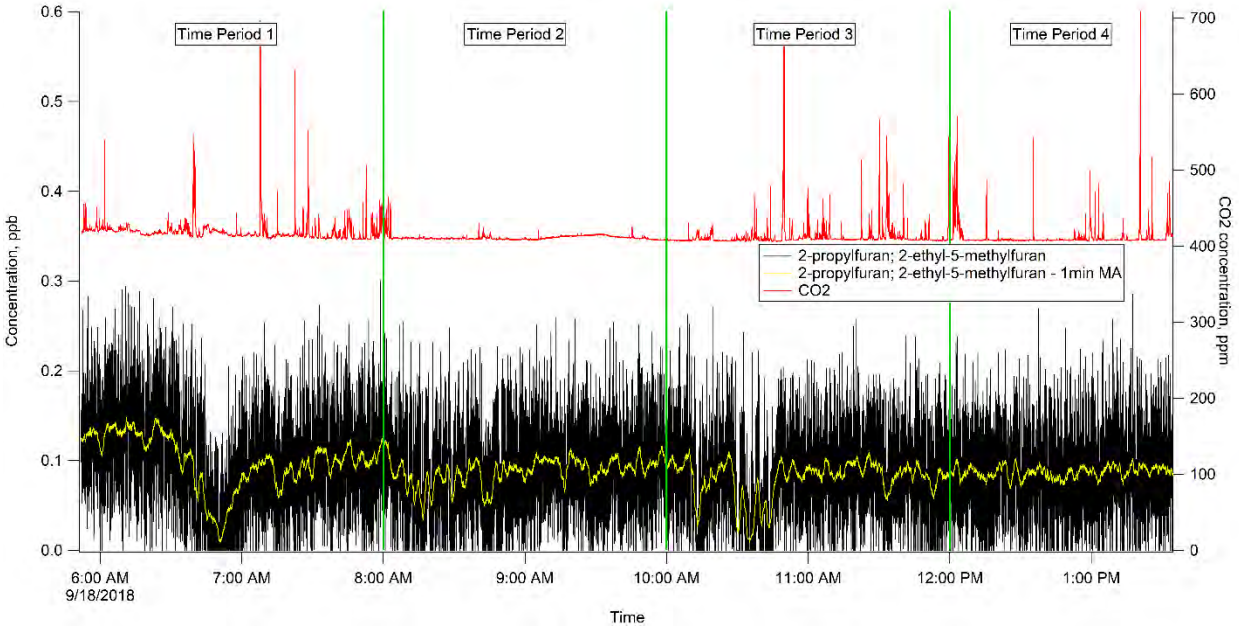

Figure 2-34. 2-propylfuran; 2-ethyl-5-methylfuran.

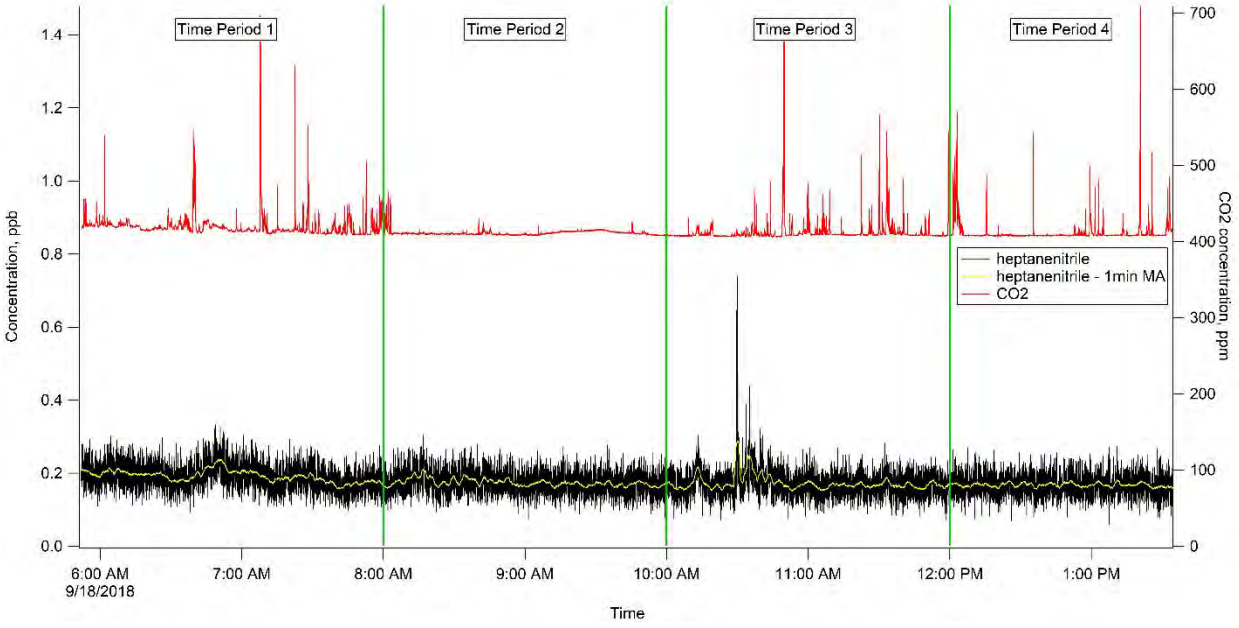

Figure 2-35. Heptanenitrile.

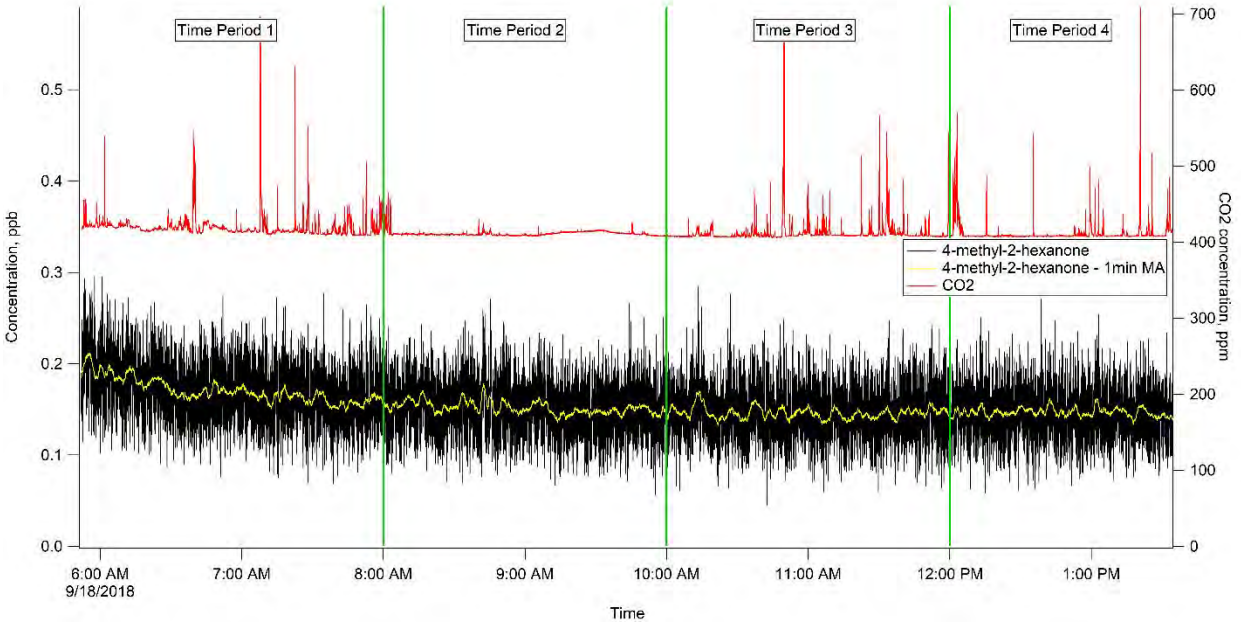

Figure 2-36. 4-methyl-2-hexanone.

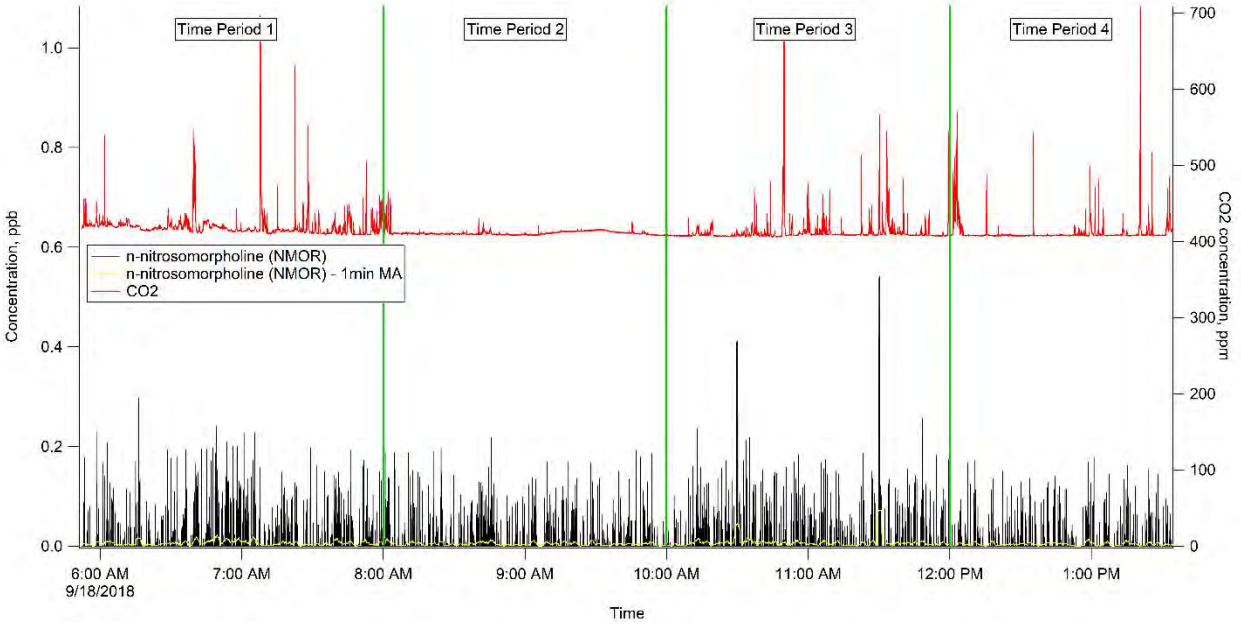

Figure 2-37. N-nitrosomorpholine (NMOR).

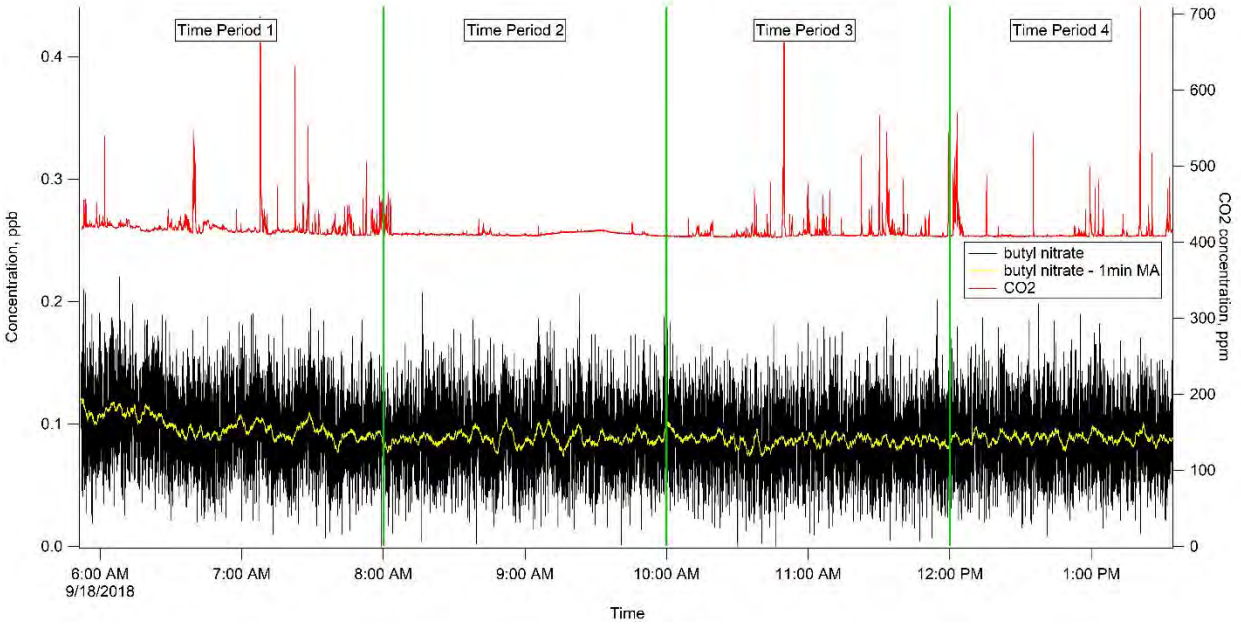

Figure 2-38. Butyl Nitrate.

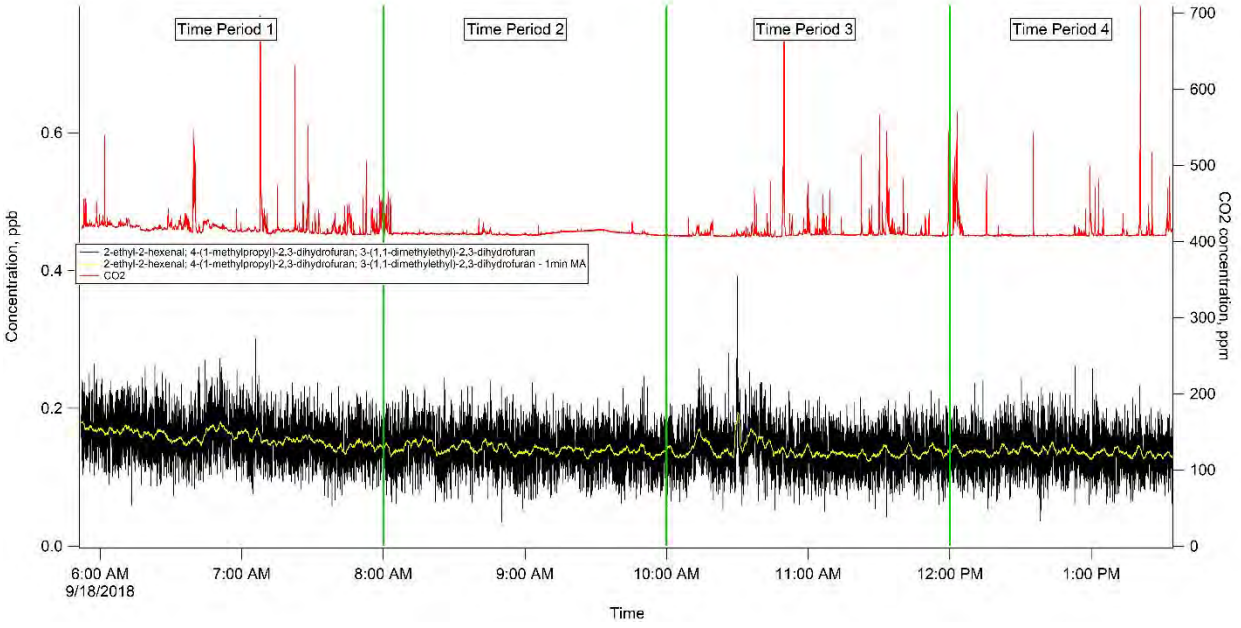

Figure 2-39. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

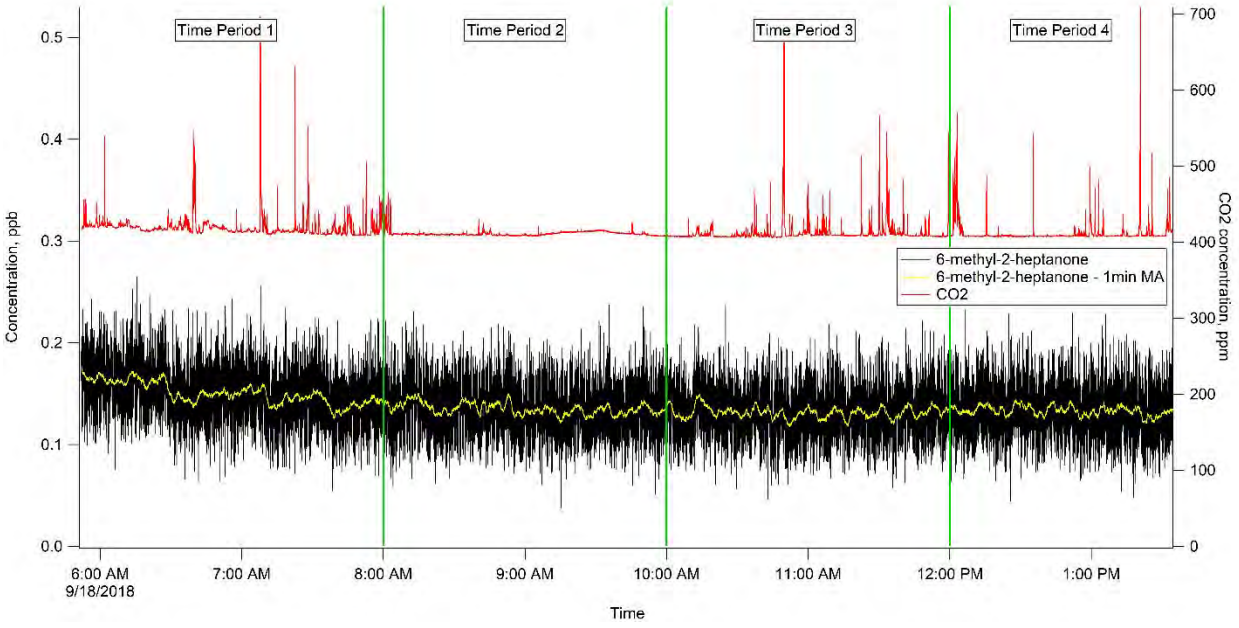

Figure 2-40. 6-methyl-2-heptanone.

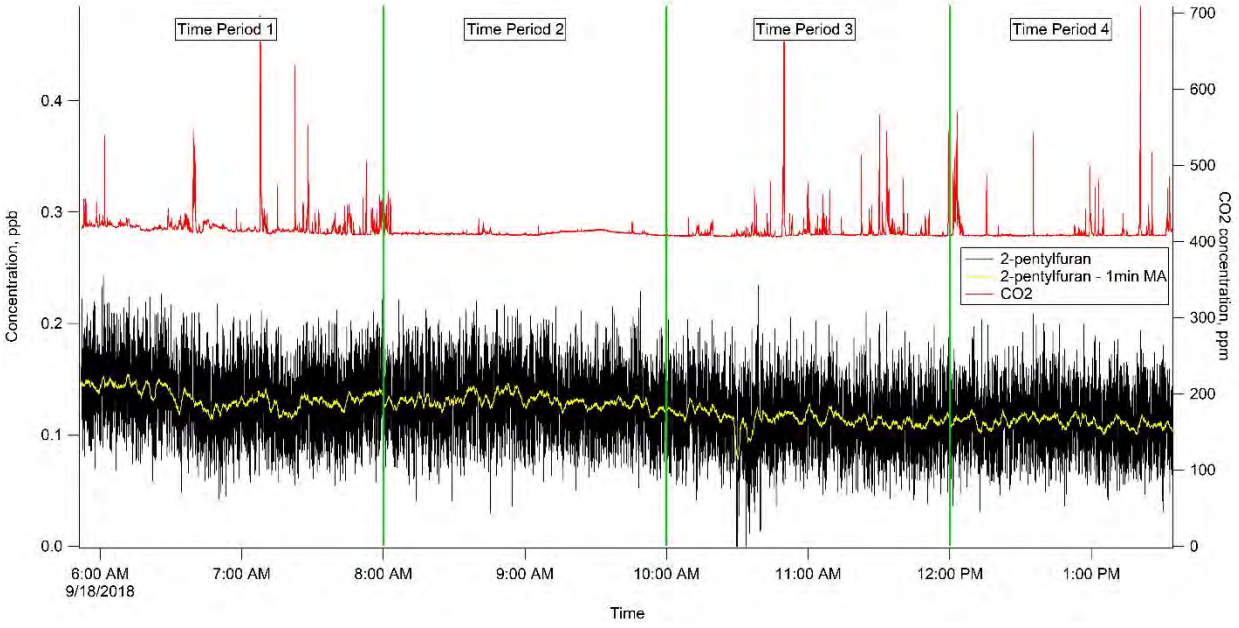

Figure 2-41. 2-pentylfuran.

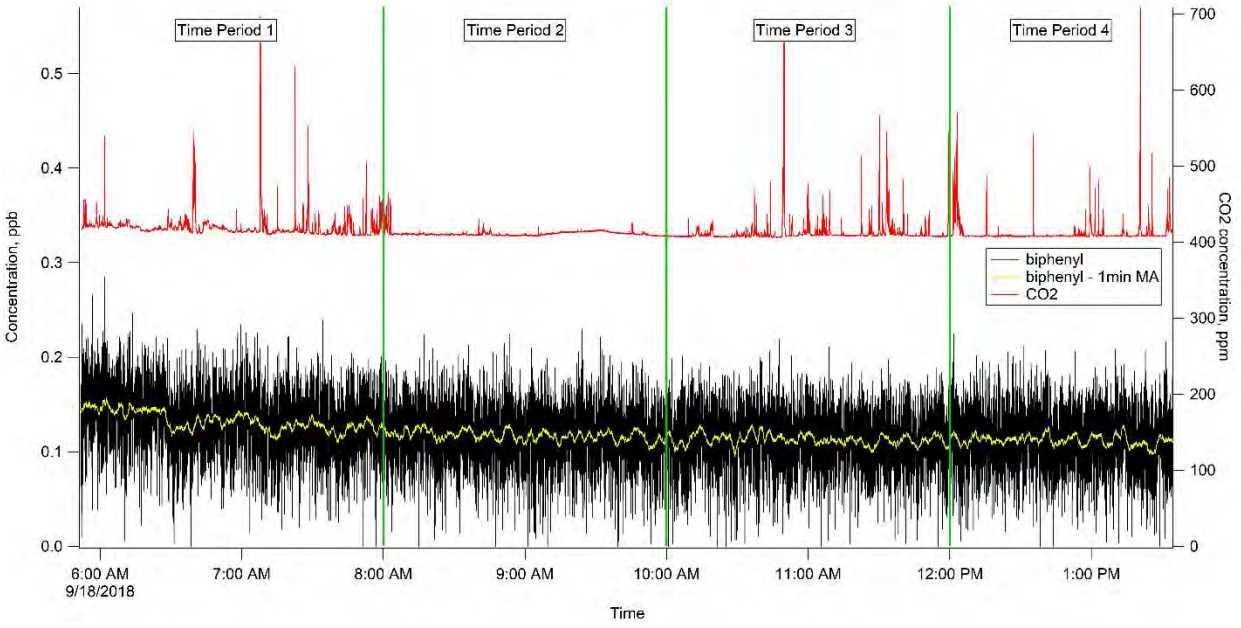

Figure 2-42. Biphenyl.

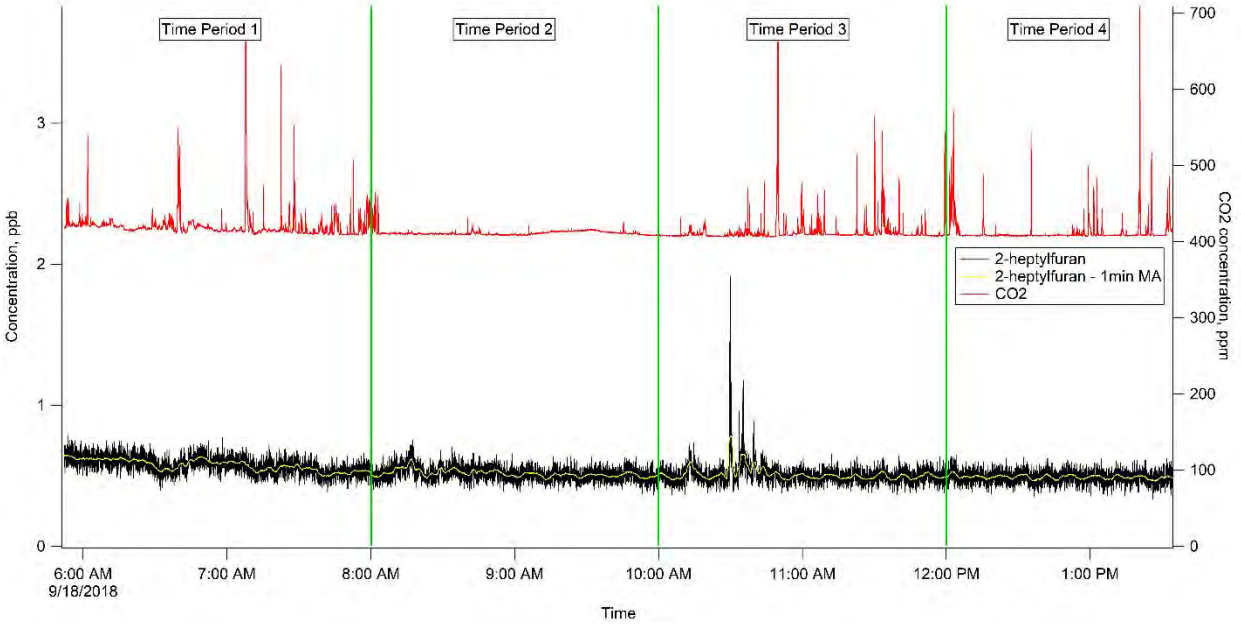

Figure 2-43. 2-heptylfuran.

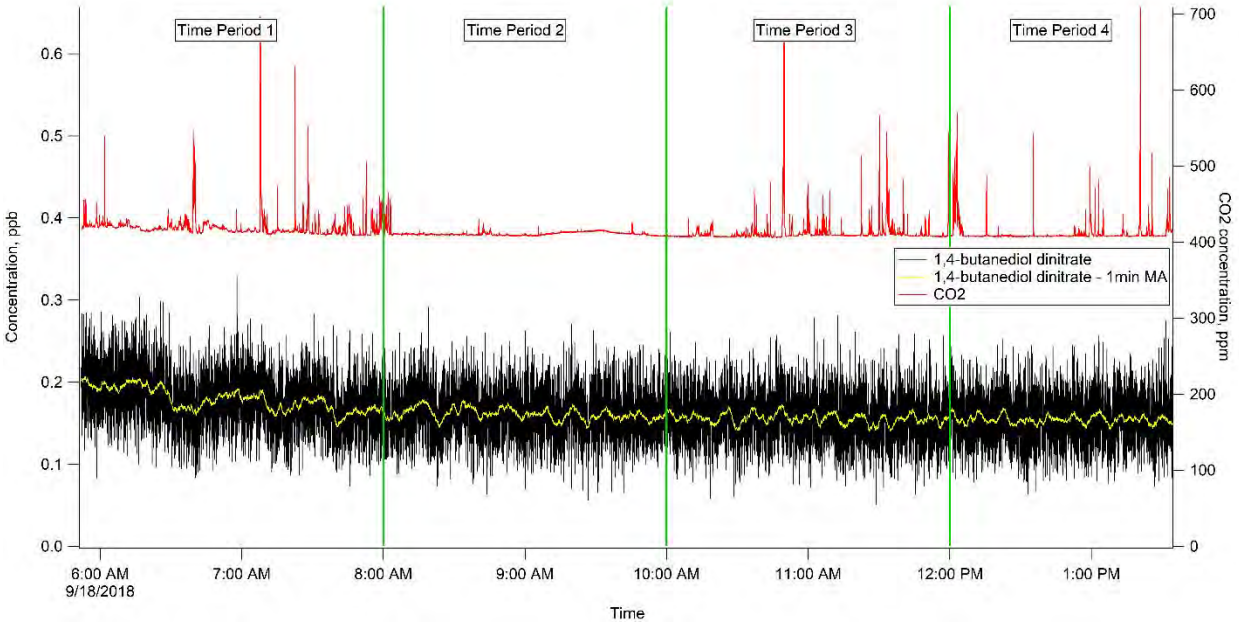

Figure 2-44. 1,4-butanediol Dinitrate.

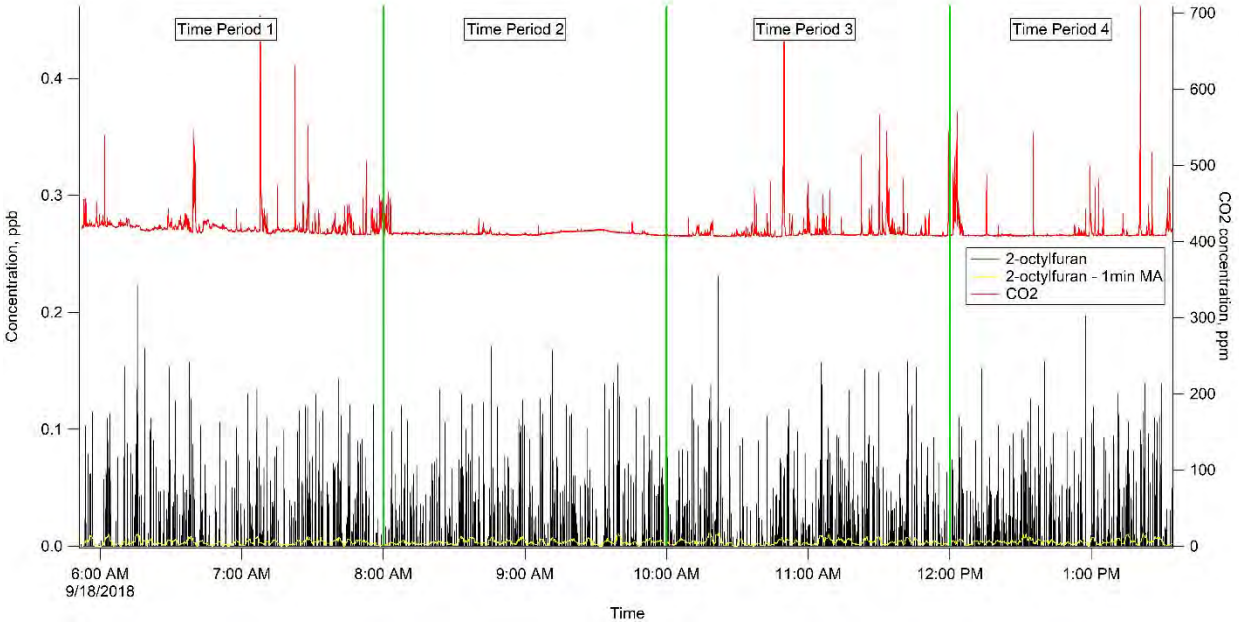

Figure 2-45. 2-octylfuran.

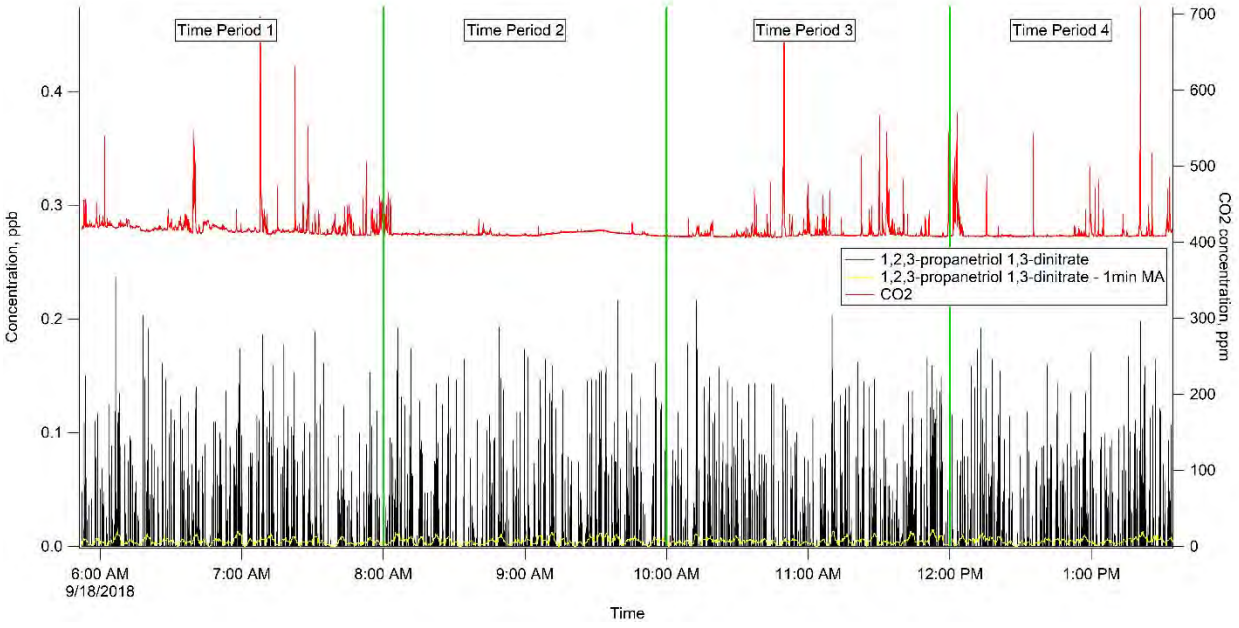

Figure 2-46. 1,2,3-propanetriol 1,3-dinitrate.

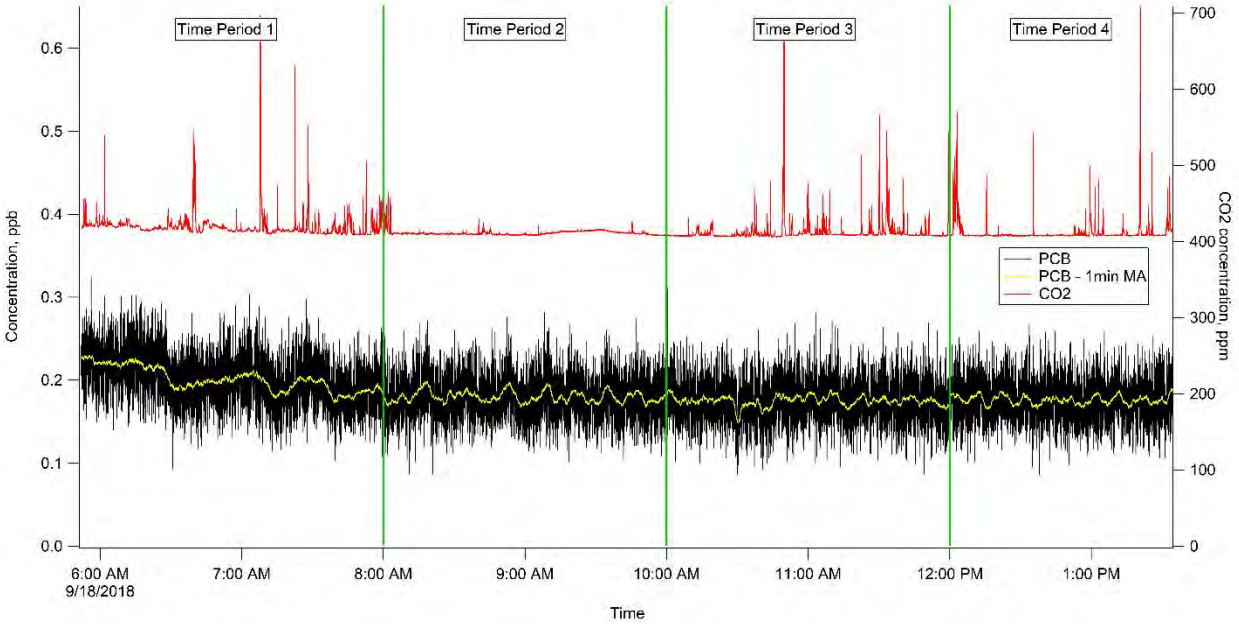

Figure 2-47. Polychlorinated Biphenyl (PCB).

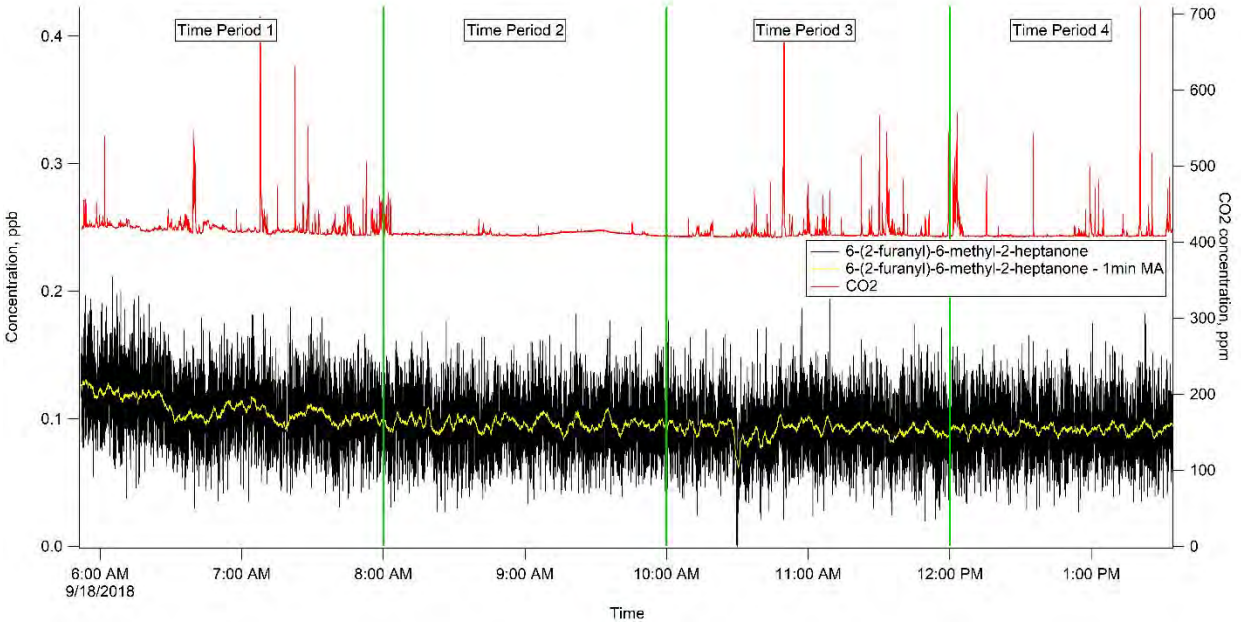

Figure 2-48. 6-(2-furanyl)-6-methyl-2-heptanone.

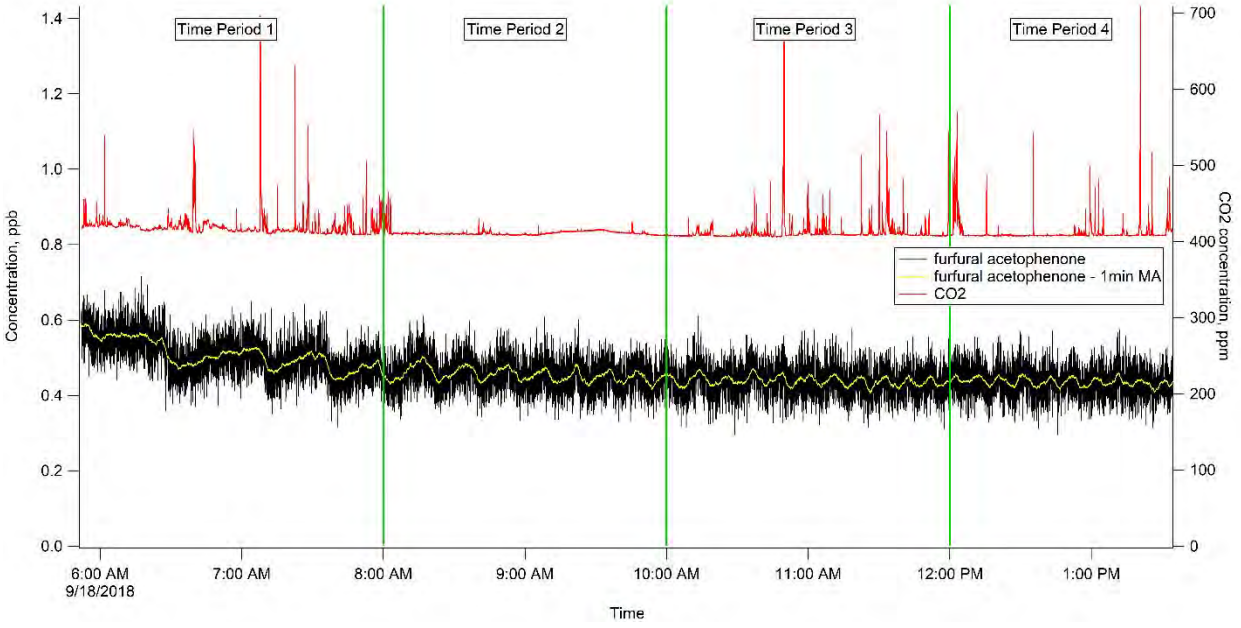

Figure 2-49. Furfural Acetophenone.

2.4 Odor Compounds

Table 2-9. Odor Maximum and Median for Each Time Period.

		Time Period 1 (05:52 - 08:00 PST)		Time Period 2 (08:00 - 10:00 PST)		Time Period 3 (10:00 - 12:00 PST)		Time Period 4 (12:00 - 13:30 PST)	
Odor #	**Odor Name**	**Max (ppb)**	**Median (ppb)**	**Max (ppb)**	**Median (ppb)**	**Max (ppb)**	**Median (ppb)**	**Max (ppb)**	**Median (ppb)**
1	methyl mercaptan	0.180	0.074	0.174	0.060	0.159	0.062	0.172	0.069
2	dimethylsulfide; ethanethiol	0.520	0.141	0.428	0.099	0.242	0.096	0.237	0.090
3	allyl mercaptan	0.079	0.000	0.067	0.003	0.070	0.005	0.063	0.004
4	1-propanethiol; isopropyl mercaptan	0.085	0.011	0.078	0.009	0.210	0.011	0.081	0.011
5	2-butene-1-thiol	0.106	0.008	0.085	0.007	0.084	0.009	0.094	0.008
6	diethyl sulfide; 2-methylpropane-2-thiol	0.632	0.131	0.629	0.096	5.516	0.092	0.347	0.090
7	thiopropanal sulfuroxide	0.065	0.002	0.054	0.002	0.053	0.003	0.058	0.005
8	dimethyl disulfide	0.055	0.000	0.056	0.000	0.099	0.000	0.047	0.000
9	1-pentanethiol; 2,2-dimethylpropane-1-thiol	0.743	0.238	0.968	0.204	5.721	0.194	0.419	0.193
10	benzenethiol	0.321	0.000	0.312	0.000	0.253	0.000	0.276	0.000
11	diallyl sulfide	0.264	0.045	0.250	0.042	0.200	0.039	0.210	0.041
12	methyl propyl disulfide	0.161	0.000	0.166	0.000	0.134	0.000	0.134	0.000
13	methylbenzenethiol	0.395	0.023	0.377	0.020	0.368	0.012	0.343	0.014
14	dimethyl trisulfide	0.270	0.133	0.223	0.127	0.243	0.123	0.226	0.123
15	(1-oxoethyl) thiophene	0.260	0.120	0.219	0.107	0.231	0.103	0.246	0.100
16	(1-oxopropyl) thiophene	0.286	0.089	0.213	0.081	0.236	0.077	0.224	0.077
17	dipropyl disulfide	0.217	0.099	0.186	0.089	0.211	0.087	0.193	0.086
18	methyl propyl trisulfide	0.265	0.100	0.224	0.091	0.226	0.087	0.231	0.084
19	dimethyl tetrasulfide	0.245	0.118	0.233	0.107	0.214	0.103	0.213	0.102
20	dipropyl trisulfide	0.240	0.000	0.222	0.000	0.220	0.000	0.243	0.000
21	diphenyl sulfide	0.231	0.044	0.189	0.039	0.218	0.036	0.203	0.034

Table 2-10. Odor Statistical Information for Time Period 1 of September 18, 2018.

Time Period 1 (05:52 - 08:00 PST)						
Odor #	**Odor Name**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. (ppb)**	**Max (ppb)**	**Median (ppb)**
1	methyl mercaptan	0.073	0.024	33.041	0.180	0.074
2	dimethylsulfide; ethanethiol	0.153	0.056	36.713	0.520	0.141
3	allyl mercaptan	0.008	0.012	158.859	0.079	0.000
4	1-propanethiol; isopropyl mercaptan	0.015	0.014	95.185	0.085	0.011
5	2-butene-1-thiol	0.015	0.018	120.695	0.106	0.008
6	diethyl sulfide; 2-methylpropane-2-thiol	0.161	0.097	60.397	0.632	0.131
7	thiopropanal sulfuroxide	0.007	0.009	134.541	0.065	0.002
8	dimethyl disulfide	0.005	0.008	162.030	0.055	0.000
9	1-pentanethiol; 2,2-dimethylpropane-1-thiol	0.241	0.118	48.712	0.743	0.238
10	benzenethiol	0.014	0.037	264.324	0.321	0.000
11	diallyl sulfide	0.052	0.045	87.311	0.264	0.045
12	methyl propyl disulfide	0.005	0.016	296.885	0.161	0.000
13	methylbenzenethiol	0.063	0.080	127.846	0.395	0.023
14	dimethyl trisulfide	0.135	0.029	21.068	0.270	0.133
15	(1-oxoethyl) thiophene	0.118	0.045	38.246	0.260	0.120
16	(1-oxopropyl) thiophene	0.090	0.039	43.465	0.286	0.089
17	dipropyl disulfide	0.100	0.030	30.308	0.217	0.099
18	methyl propyl trisulfide	0.097	0.057	58.272	0.265	0.100
19	dimethyl tetrasulfide	0.120	0.034	28.530	0.245	0.118
20	dipropyl trisulfide	0.021	0.039	189.709	0.240	0.000
21	diphenyl sulfide	0.050	0.043	86.788	0.231	0.044

Table 2-11. Odor Statistical Information for Time Period 2 of September 18, 2018.

Time Period 2 (08:00 - 10:00 PST)						
Odor #	**Odor Name**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. (ppb)**	**Max (ppb)**	**Median (ppb)**
1	methyl mercaptan	0.061	0.022	36.082	0.174	0.060
2	dimethylsulfide; ethanethiol	0.106	0.040	37.788	0.428	0.099
3	allyl mercaptan	0.008	0.011	126.127	0.067	0.003
4	1-propanethiol; isopropyl mercaptan	0.013	0.013	100.126	0.078	0.009
5	2-butene-1-thiol	0.013	0.015	117.866	0.085	0.007
6	diethyl sulfide; 2-methylpropane-2-thiol	0.122	0.083	67.965	0.629	0.096
7	thiopropanal sulfuroxide	0.007	0.009	128.120	0.054	0.002
8	dimethyl disulfide	0.005	0.008	150.042	0.056	0.000
9	1-pentanethiol; 2,2-dimethylpropane-1-thiol	0.213	0.111	52.212	0.968	0.204
10	benzenethiol	0.015	0.037	243.639	0.312	0.000
11	diallyl sulfide	0.049	0.042	86.361	0.250	0.042
12	methyl propyl disulfide	0.006	0.017	283.705	0.166	0.000
13	methylbenzenethiol	0.058	0.074	127.667	0.377	0.020
14	dimethyl trisulfide	0.128	0.028	21.632	0.223	0.127
15	(1-oxoethyl) thiophene	0.104	0.042	40.566	0.219	0.107
16	(1-oxopropyl) thiophene	0.083	0.037	45.333	0.213	0.081
17	dipropyl disulfide	0.090	0.029	32.552	0.186	0.089
18	methyl propyl trisulfide	0.087	0.052	60.102	0.224	0.091
19	dimethyl tetrasulfide	0.108	0.032	29.491	0.233	0.107
20	dipropyl trisulfide	0.019	0.036	189.410	0.222	0.000
21	diphenyl sulfide	0.045	0.039	87.871	0.189	0.039

Table 2-12. Odor Statistical Information for Time Period 3 of September 18, 2018.

Time Period 3 (10:00 - 12:00 PST)						
Odor #	**Odor Name**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. (ppb)**	**Max (ppb)**	**Median (ppb)**
1	methyl mercaptan	0.065	0.023	34.837	0.159	0.062
2	dimethylsulfide; ethanethiol	0.098	0.027	27.043	0.242	0.096
3	allyl mercaptan	0.009	0.011	118.242	0.070	0.005
4	1-propanethiol; isopropyl mercaptan	0.015	0.015	101.790	0.210	0.011
5	2-butene-1-thiol	0.014	0.015	110.673	0.084	0.009
6	diethyl sulfide; 2-methylpropane-2-thiol	0.153	0.270	176.862	5.516	0.092
7	thiopropanal sulfuroxide	0.007	0.009	123.545	0.053	0.003
8	dimethyl disulfide	0.006	0.009	153.975	0.099	0.000
9	1-pentanethiol; 2,2-dimethylpropane-1-thiol	0.232	0.241	103.640	5.721	0.194
10	benzenethiol	0.016	0.037	235.792	0.253	0.000
11	diallyl sulfide	0.045	0.040	88.547	0.200	0.039
12	methyl propyl disulfide	0.006	0.018	280.872	0.134	0.000
13	methylbenzenethiol	0.053	0.071	134.648	0.368	0.012
14	dimethyl trisulfide	0.124	0.027	22.072	0.243	0.123
15	(1-oxoethyl) thiophene	0.102	0.043	41.872	0.231	0.103
16	(1-oxopropyl) thiophene	0.079	0.037	46.350	0.236	0.077
17	dipropyl disulfide	0.088	0.029	32.505	0.211	0.087
18	methyl propyl trisulfide	0.084	0.051	61.503	0.226	0.087
19	dimethyl tetrasulfide	0.104	0.031	29.775	0.214	0.103
20	dipropyl trisulfide	0.020	0.038	188.822	0.220	0.000
21	diphenyl sulfide	0.042	0.039	92.116	0.218	0.036

Table 2-13. Odor Statistical Information for Time Period 4 of September 18, 2018.

Time Period 4 (12:00 - 13:30 PST)						
Odor #	**Odor Name**	**Ave. (ppb)**	**St. Dev. (ppb)**	**Rel. St. Dev. (ppb)**	**Max (ppb)**	**Median (ppb)**
1	methyl mercaptan	0.069	0.024	34.061	0.172	0.069
2	dimethylsulfide; ethanethiol	0.092	0.025	26.770	0.237	0.090
3	allyl mercaptan	0.009	0.011	123.971	0.063	0.004
4	1-propanethiol; isopropyl mercaptan	0.015	0.015	98.345	0.081	0.011
5	2-butene-1-thiol	0.013	0.015	113.848	0.094	0.008
6	diethyl sulfide; 2-methylpropane-2-thiol	0.095	0.035	36.476	0.347	0.090
7	thiopropanal sulfuroxide	0.009	0.009	110.650	0.058	0.005
8	dimethyl disulfide	0.005	0.008	146.957	0.047	0.000
9	1-pentanethiol; 2,2-dimethylpropane-1-thiol	0.183	0.074	40.569	0.419	0.193
10	benzenethiol	0.015	0.037	246.826	0.276	0.000
11	diallyl sulfide	0.047	0.041	88.402	0.210	0.041
12	methyl propyl disulfide	0.006	0.016	280.904	0.134	0.000
13	methylbenzenethiol	0.054	0.072	133.121	0.343	0.014
14	dimethyl trisulfide	0.123	0.027	22.033	0.226	0.123
15	(1-oxoethyl) thiophene	0.100	0.043	42.666	0.246	0.100
16	(1-oxopropyl) thiophene	0.078	0.036	45.869	0.224	0.077
17	dipropyl disulfide	0.088	0.029	33.037	0.193	0.086
18	methyl propyl trisulfide	0.081	0.052	63.741	0.231	0.084
19	dimethyl tetrasulfide	0.103	0.031	29.937	0.213	0.102
20	dipropyl trisulfide	0.020	0.038	185.219	0.243	0.000
21	diphenyl sulfide	0.042	0.039	93.218	0.203	0.034

The following figures display potential odor-causing compounds, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 18, 2018.

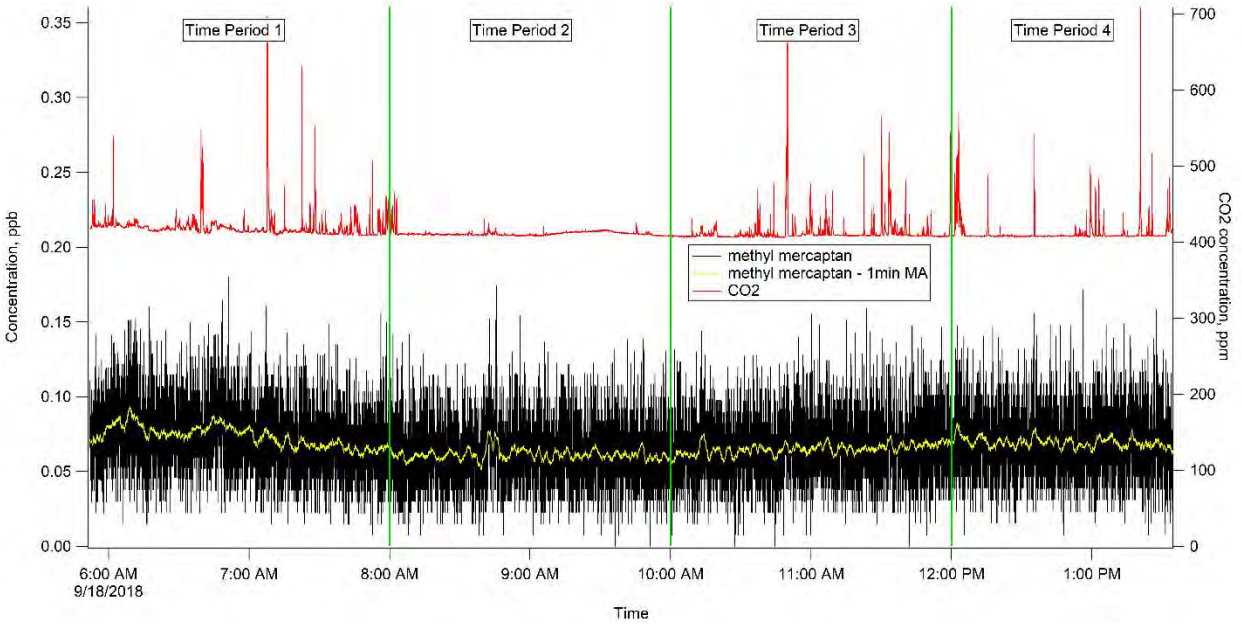

Figure 2-50. Methyl Mercaptan.

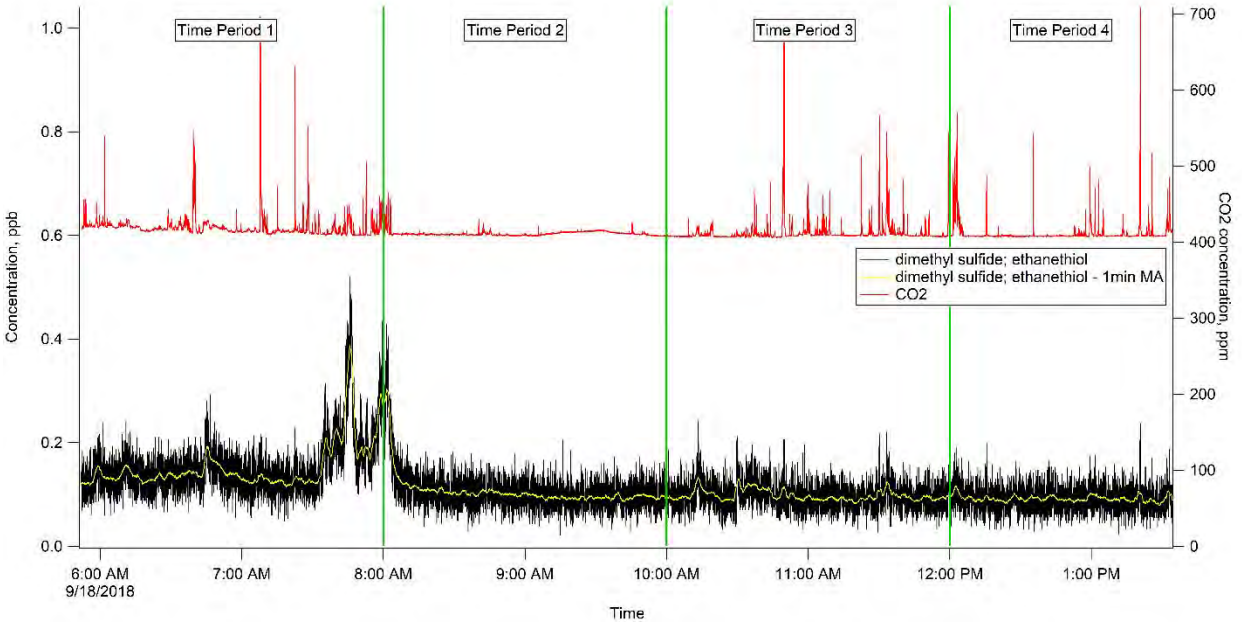

Figure 2-51. Dimethyl Sulfide; Ethanethiol.

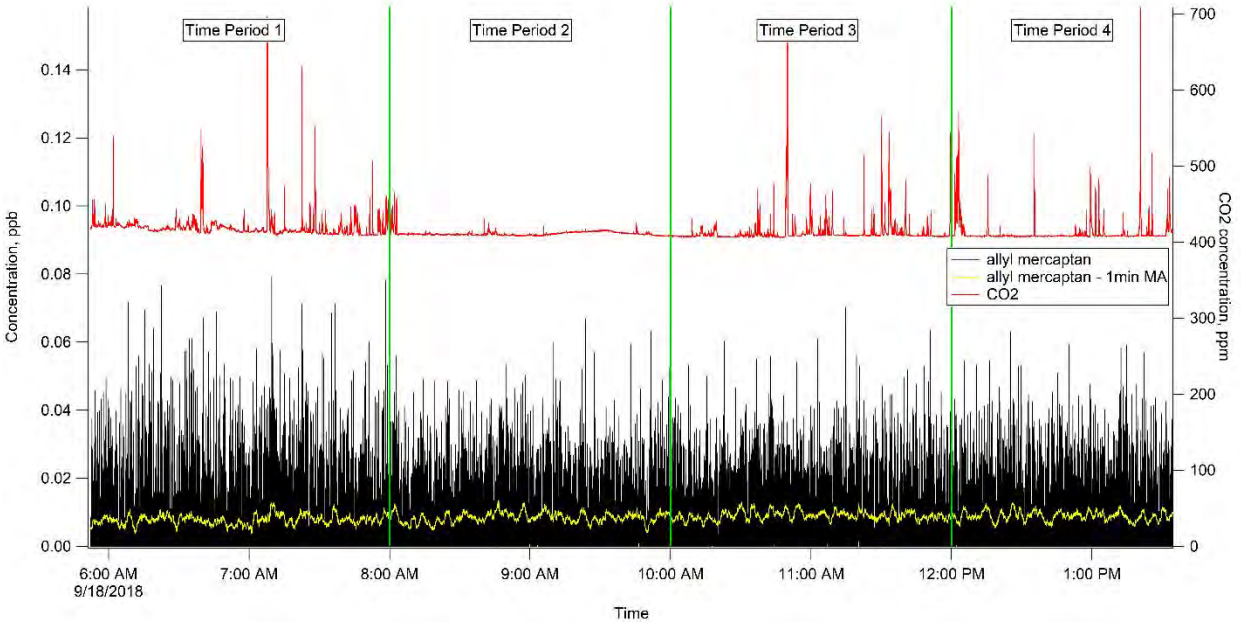

Figure 2-52. Allyl Mercaptan.

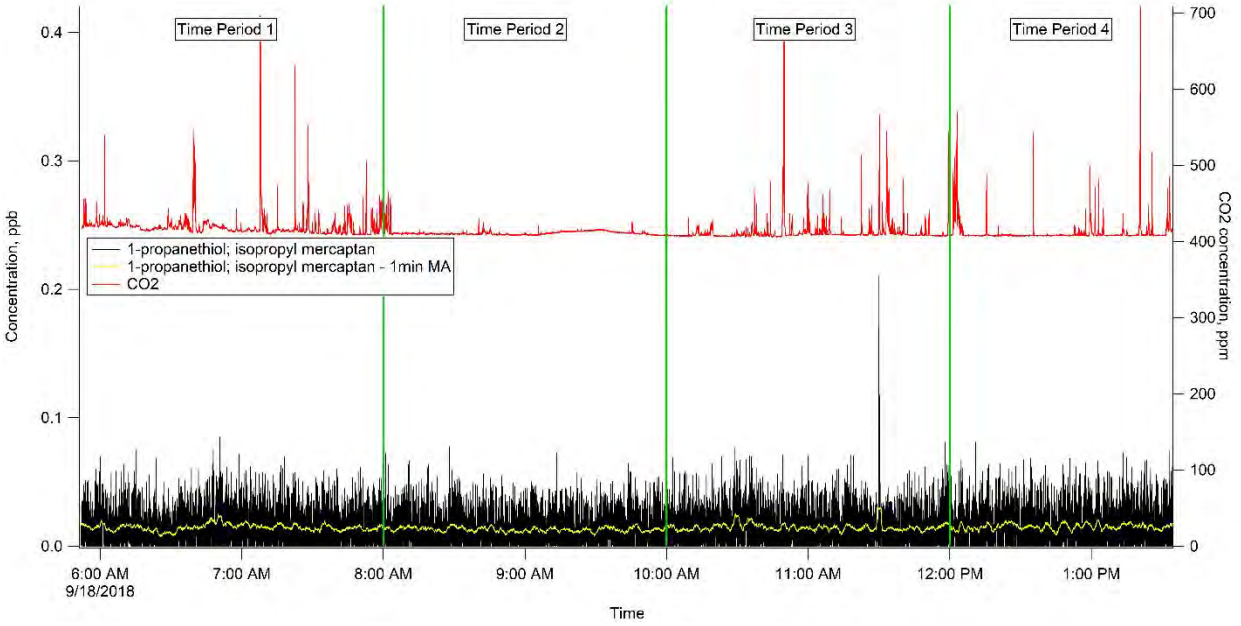

Figure 2-53. 1-propanethiol; Isopropyl Mercaptan.

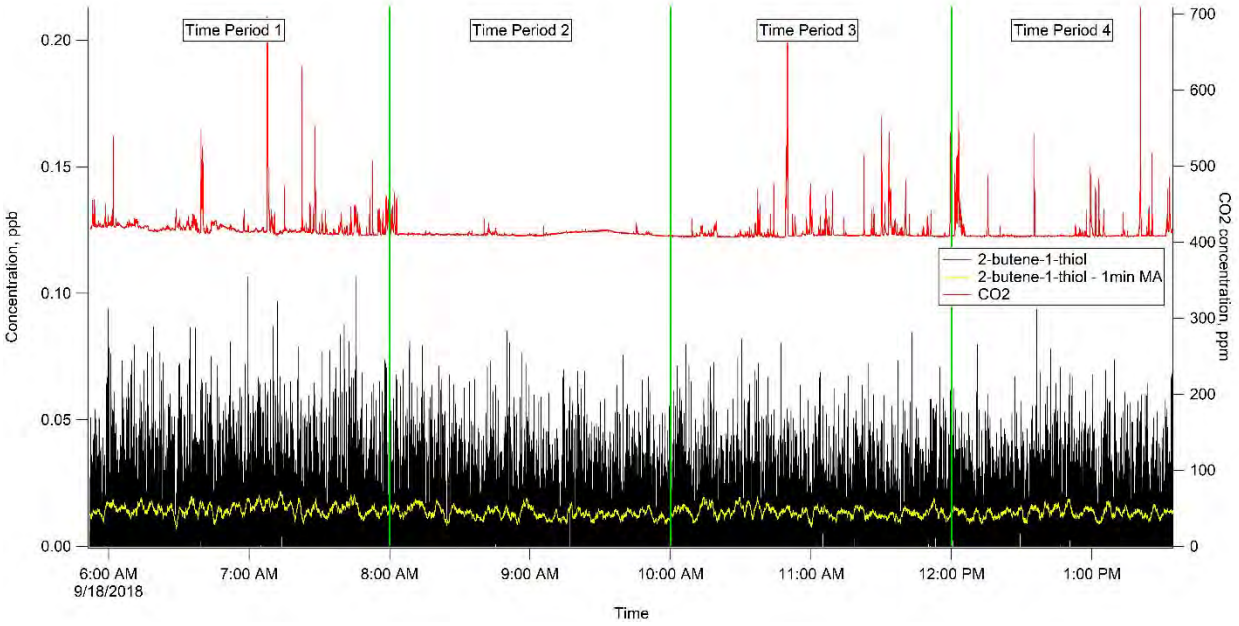

Figure 2-54. 2-butene-1-thiol.

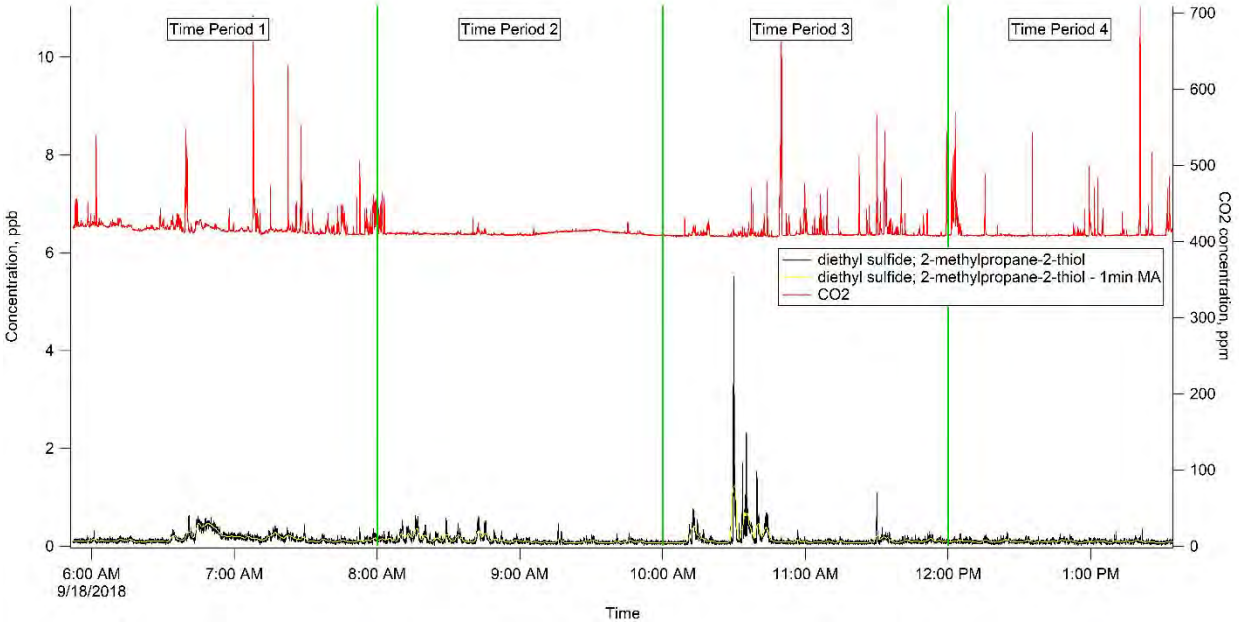

Figure 2-55. Diethyl Sulfide; 2-methylpropane-2-thiol.

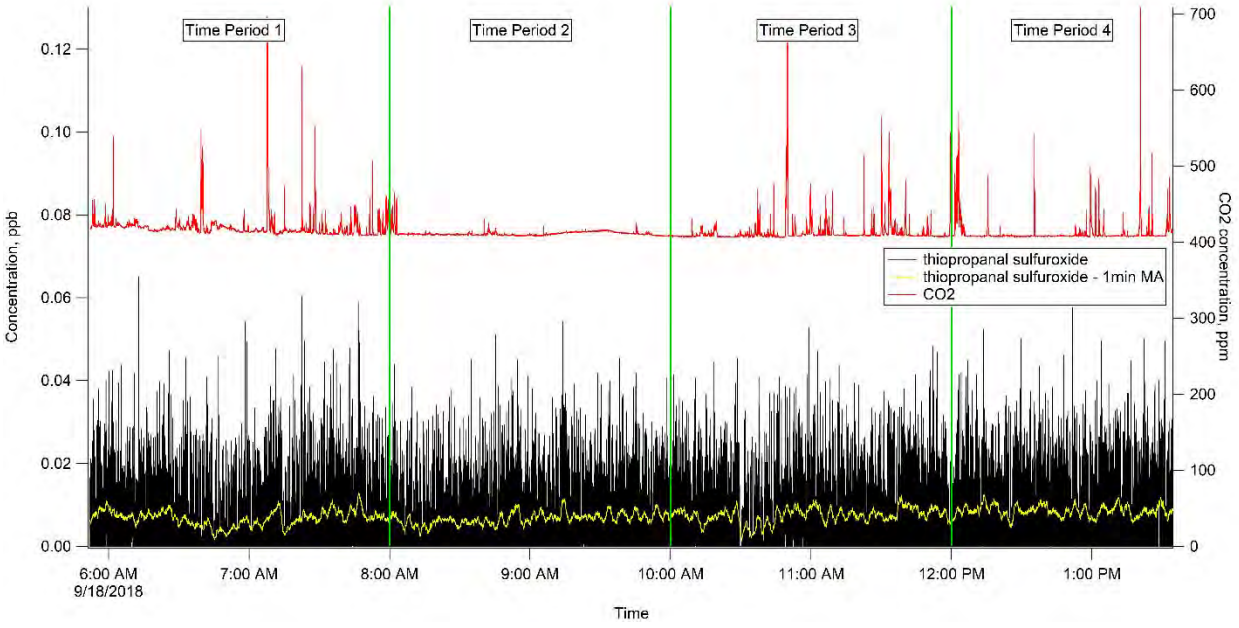

Figure 2-56. Thiopropanal Sulfuroxide.

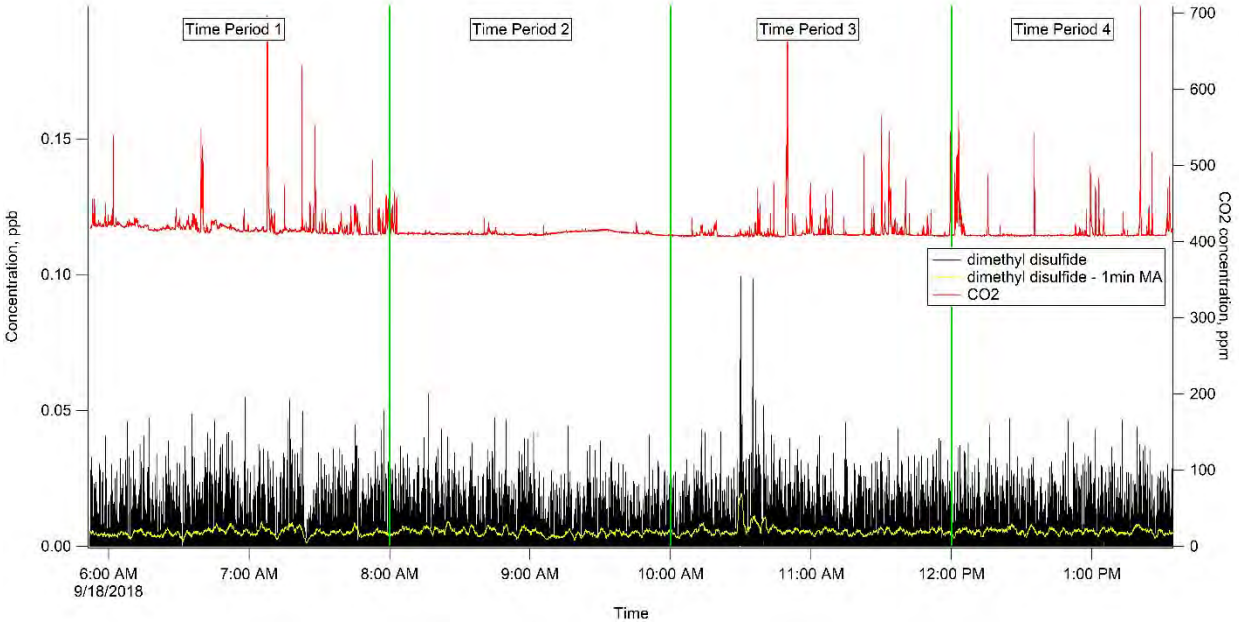

Figure 2-57. Dimethyl Disulfide.

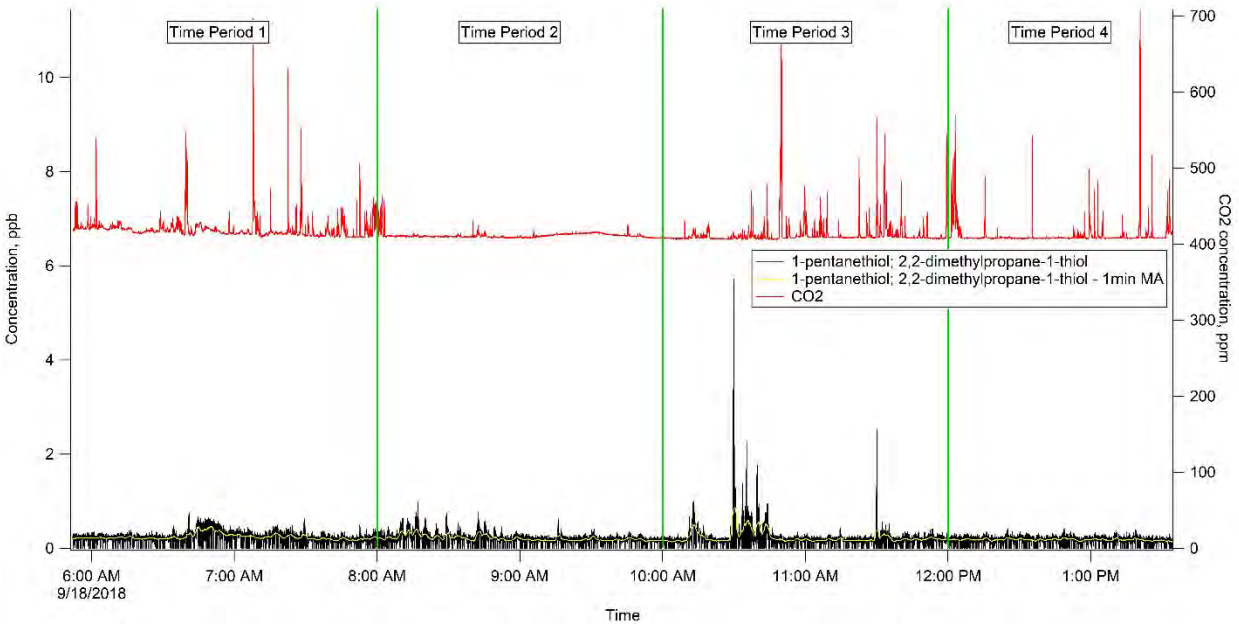

Figure 2-58. 1-pentanethiol; 2,2-dimethylpropane-1-thiol.

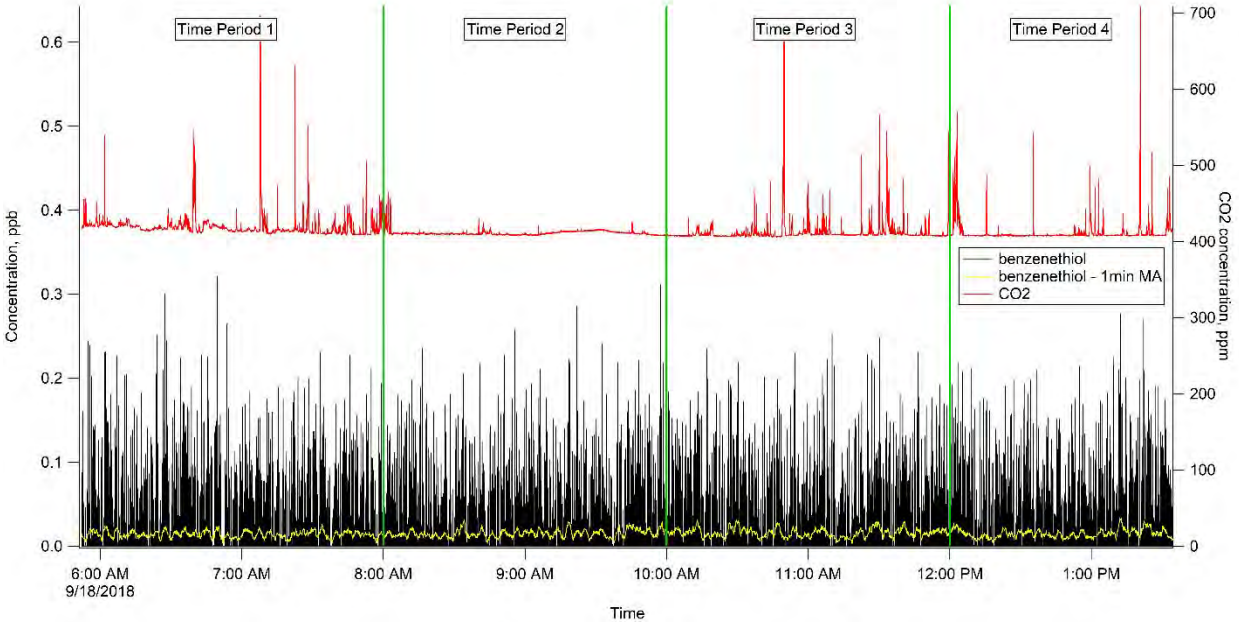

Figure 2-59. Benzenethiol.

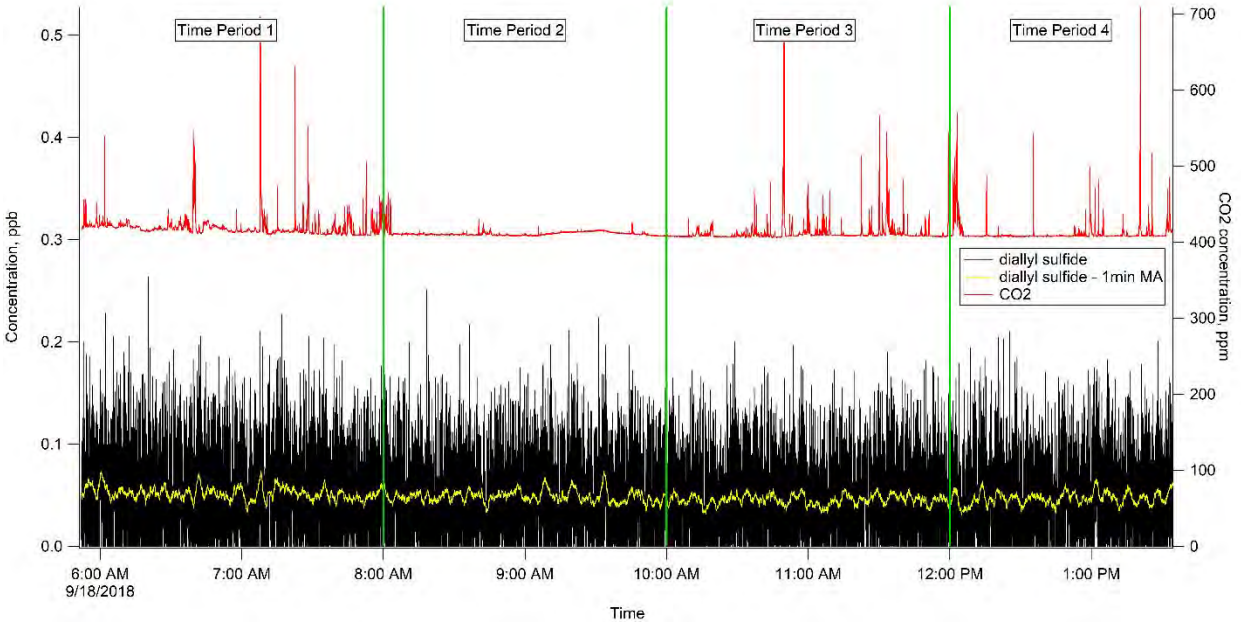

Figure 2-60. Diallyl Sulfide.

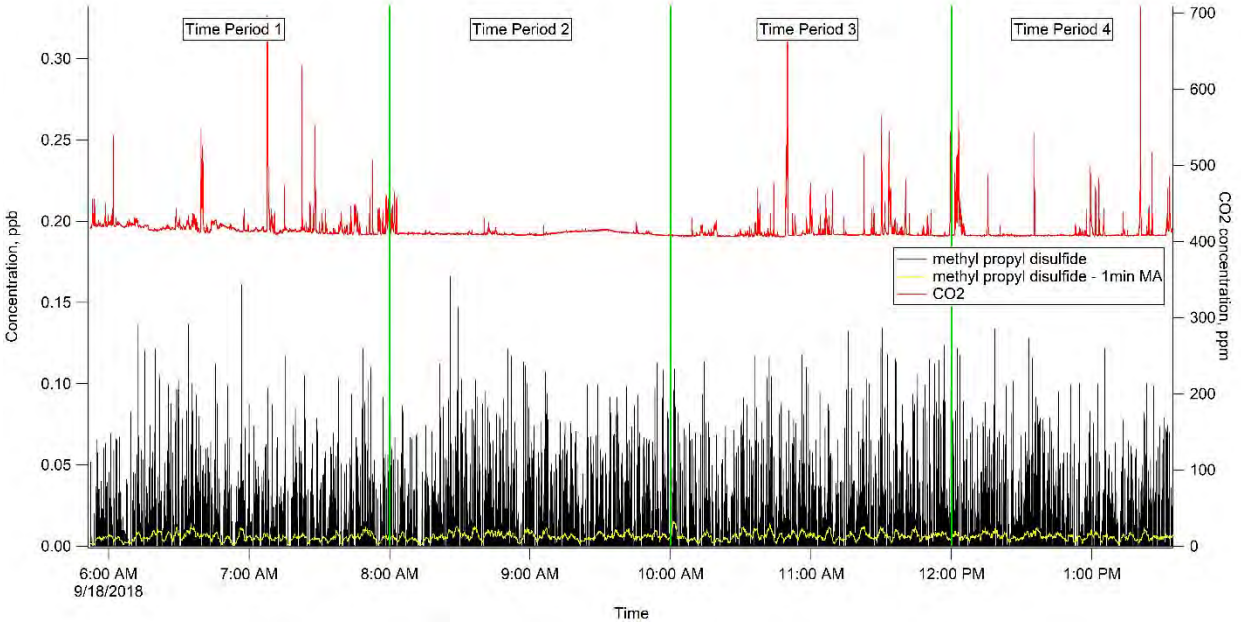

Figure 2-61. Methyl Propyl Disulfide.

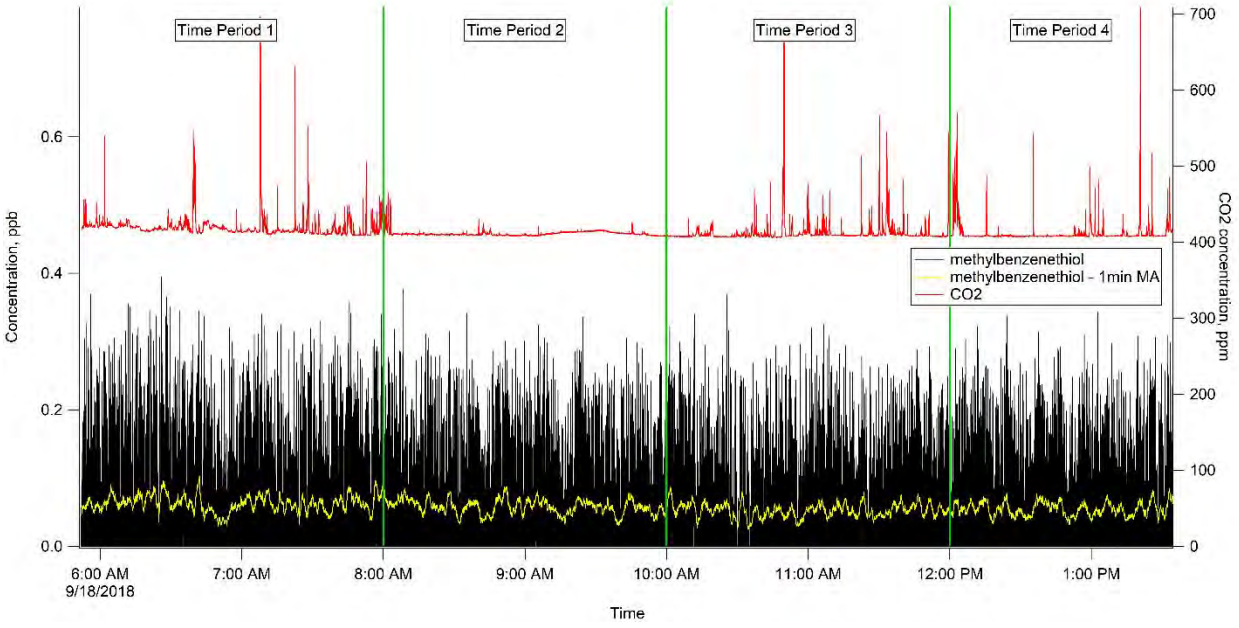

Figure 2-62. Methylbenzenethiol.

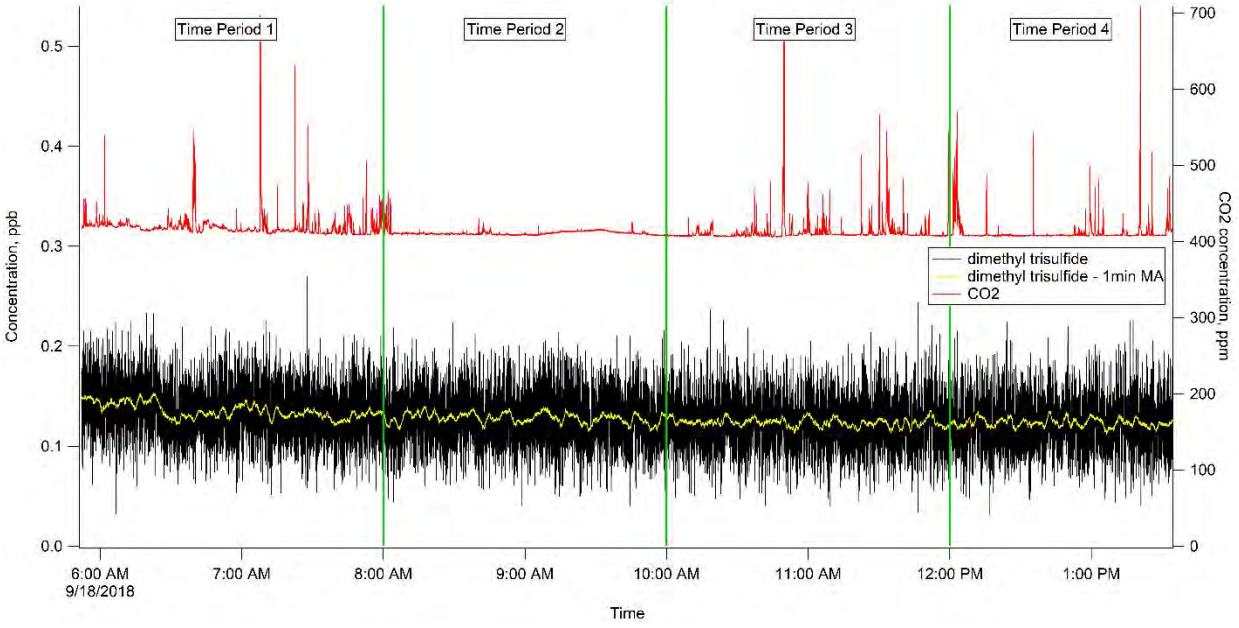

Figure 2-63. Dimethyl Trisulfide.

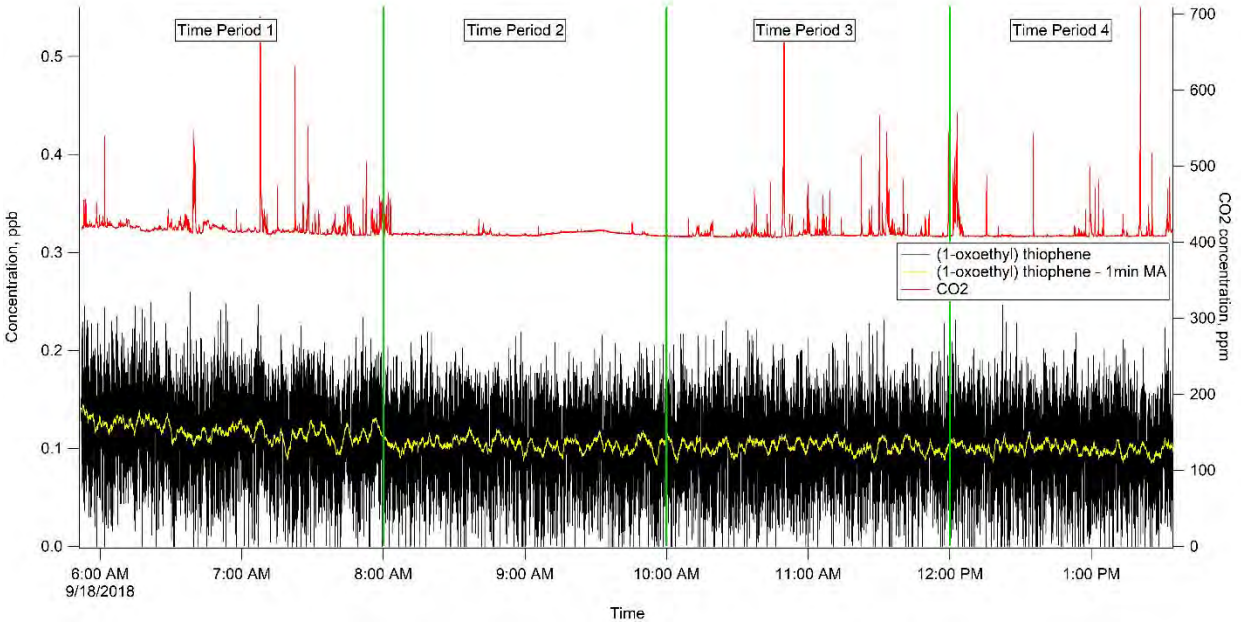

Figure 2-64. (1-oxoethyl) Thiophene.

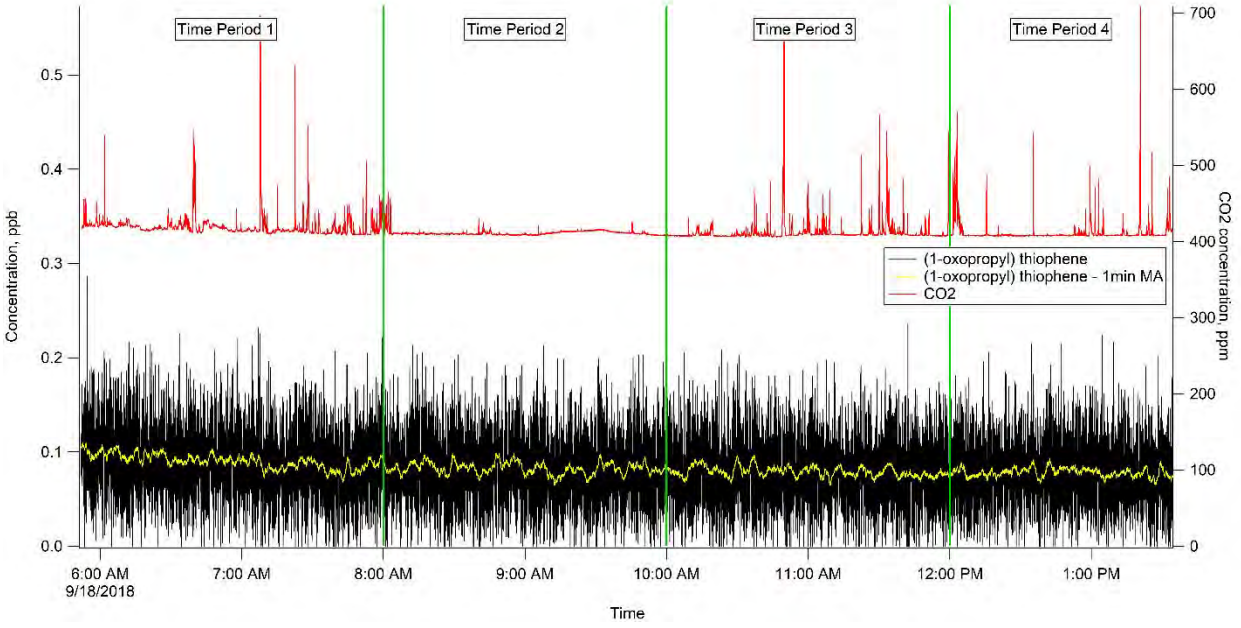

Figure 2-65. (1-oxopropyl) Thiophene.

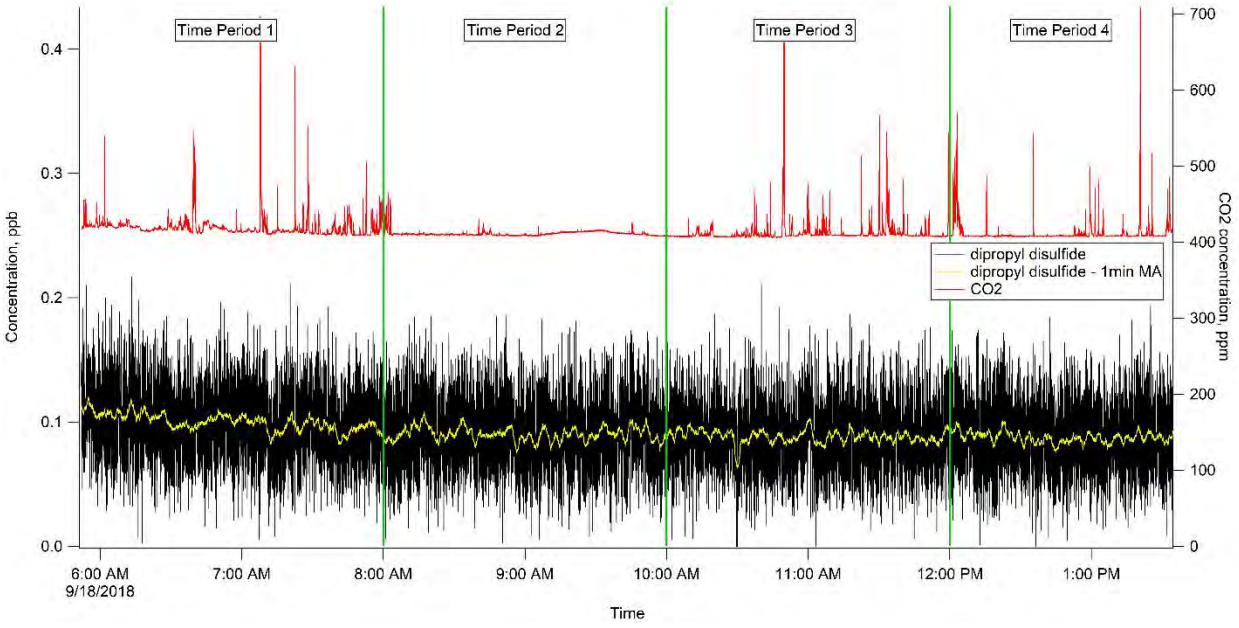

Figure 2-66. Dipropyl Disulfide.

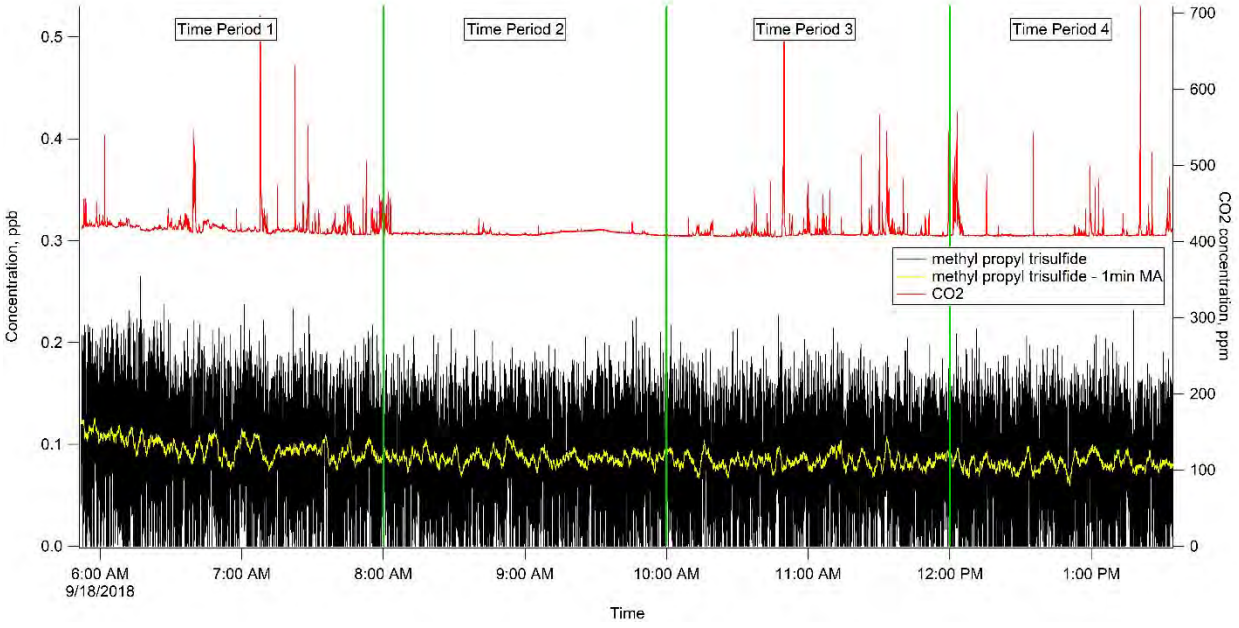

Figure 2-67. Methyl Propyl Trisulfide.

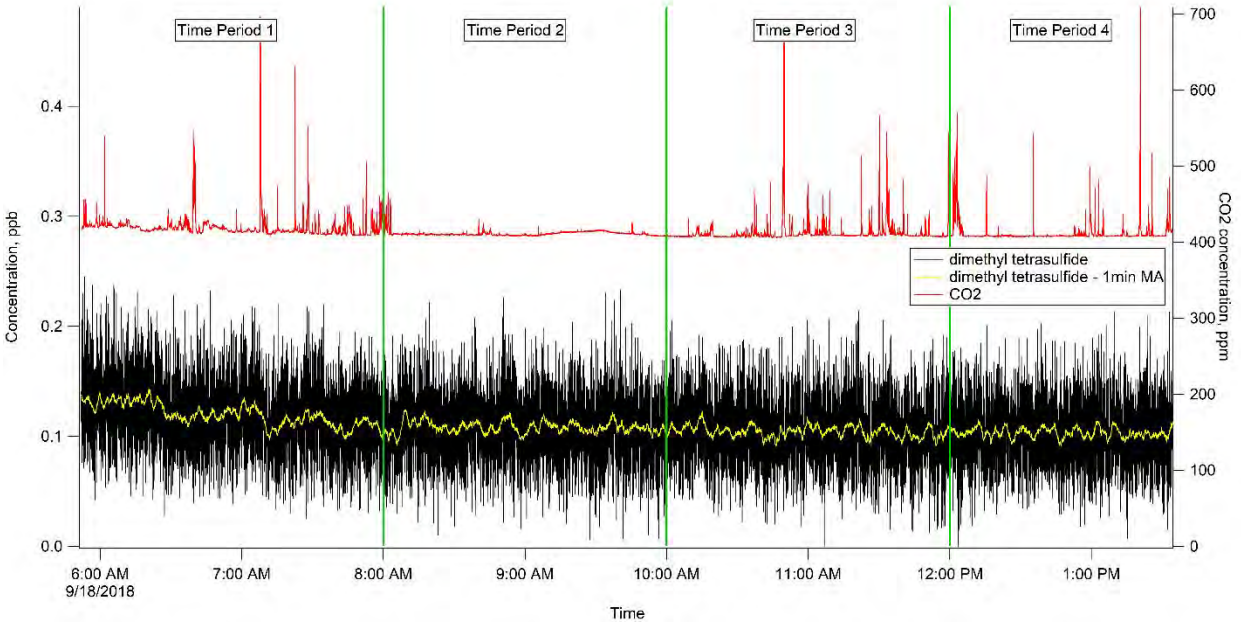

Figure 2-68. Dimethyl Tetrasulfide.

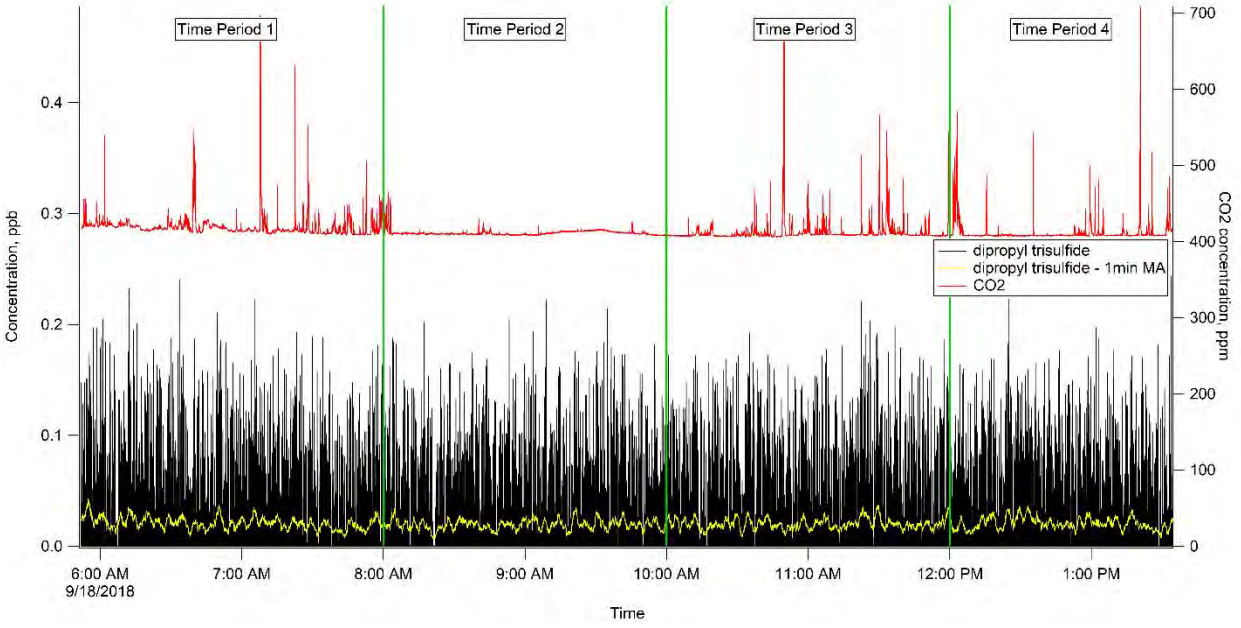

Figure 2-69. Dipropyl Trisulfide.

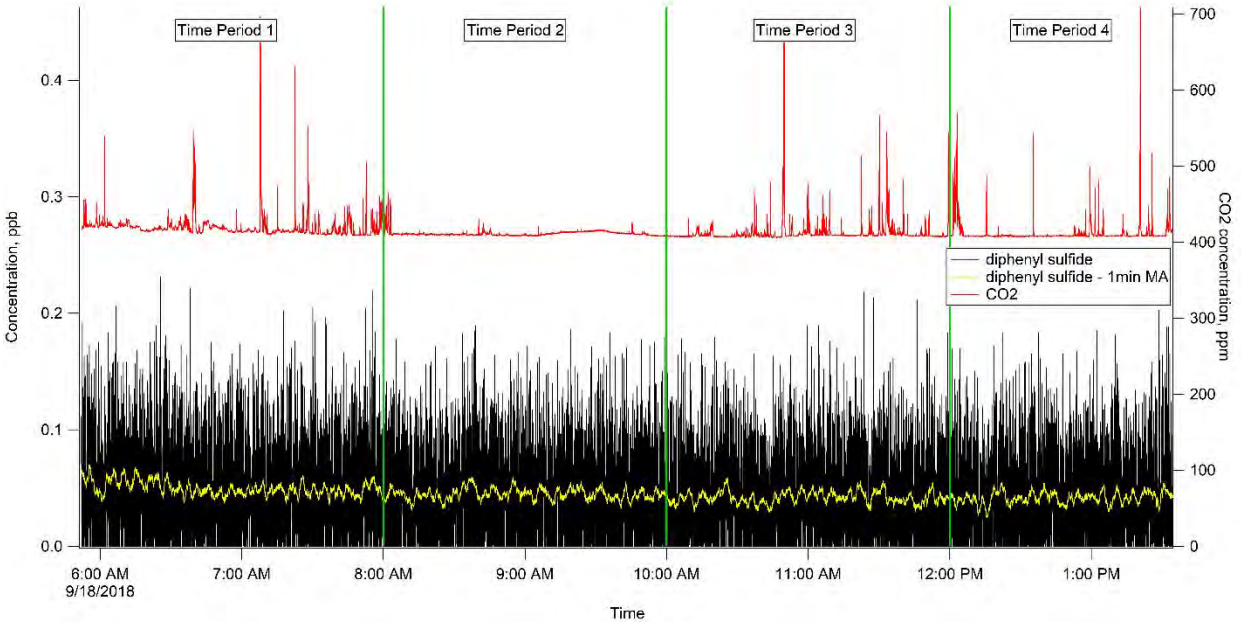

Figure 2-70. Diphenyl Sulfide.

2.5 Other Compounds

In addition to the COPCs and odor compounds, a complete visual inspection of all resolved peaks was performed. This includes inspection of identified and unidentified species. Unidentified species where the empirical formula is known are labeled with their empirical formula. Other unidentified species are named after their general chemical class, e.g., C_2-benzenes or naphthenic monoaromatics. Where two species share a chemical class, their protonated mass numbers are used to distinguish between them.

The following tables show a subset of the identified and unidentified species that saw a response. A total of 193 unidentified peaks are resolved during the data workup process but cannot be attributed to a particular species with any confidence. Among the 193 unidentified species, 98 were observed to show a response during the visual inspection of the data. The 98 compounds showed similar trends and appear to be from similar sources. Only a few species that could be attributed to an empirical formula (9-13 in the tables) or that could be attributed to a tentatively identified class of compounds (14-18 naphthenic monoaromatics and 19-23 bicycloalkanes) were included below.

None of the compounds in Tables 2-14 through 2-18 have established Hanford OELs and comparison of any of these compounds to existing occupational standards is beyond the scope of this discussion.

Table 2-14. Other Compounds Maximum and Median for Each Time Period.

		Time Period 1 (05:52 - 08:00 PST)		Time Period 2 (08:00 - 10:00 PST)		Time Period 3 (10:00 - 12:00 PST)		Time Period 4 (12:00 - 13:30 PST)	
#	Name	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)	Max (ppb)	Median (ppb)
1	methyl acetate	0.773	0.394	0.459	0.179	0.567	0.154	0.583	0.159
2	ethyl acetate	0.275	0.128	0.213	0.066	0.148	0.049	0.145	0.049
3	toluene	3.382	0.228	1.160	0.088	15.300	0.072	3.497	0.070
4	C_2-benzenes	2.882	0.363	1.292	0.224	12.614	0.214	3.195	0.211
5	C_3-benzenes	1.750	0.294	1.308	0.208	11.211	0.193	1.581	0.194
6	naphthalene	0.251	0.109	0.238	0.093	0.293	0.089	0.202	0.089
7	C_4-benzenes	1.229	0.408	1.208	0.342	8.909	0.321	0.577	0.316
8	C_3H_7N	0.240	0.051	0.216	0.041	1.491	0.038	0.152	0.038
9	C_5H_{10}	0.936	0.084	0.906	0.063	7.776	0.058	1.244	0.066
10	C_6H_{10}	1.089	0.126	1.175	0.089	12.027	0.079	0.463	0.093
11	C_6H_{12}	0.728	0.047	0.494	0.037	5.395	0.033	0.753	0.036
12	C_7H_{12}	0.952	0.134	1.143	0.123	9.611	0.120	0.462	0.126
13	C_8H_{14}	1.005	0.290	0.937	0.253	6.202	0.249	0.516	0.244
14	naphthenic monoaromatics (Indane)	1.910	1.469	1.985	1.334	4.653	1.317	1.612	1.312
15	naphthenic monoaromatics (m133)	1.270	0.662	1.275	0.583	7.821	0.565	0.744	0.553
16	naphthenic monoaromatics (m147)	1.276	0.686	1.396	0.608	8.364	0.585	0.869	0.575
17	naphthenic monoaromatics (m161)	1.166	0.720	1.291	0.638	5.505	0.617	0.825	0.606
18	naphthenic monoaromatics (m175)	1.006	0.743	1.117	0.673	2.890	0.650	0.845	0.636
19	bicycloalkanes (m109)	2.210	1.704	2.426	1.608	7.093	1.574	1.929	1.569
20	bicycloalkanes (m123)	0.397	0.206	0.514	0.186	2.526	0.179	0.349	0.178
21	bicycloalkanes + monoterpenes (m137)	0.939	0.687	0.906	0.610	2.585	0.589	0.766	0.578
22	bicycloalkanes (m151)	0.487	0.150	0.484	0.131	3.431	0.128	0.305	0.125
23	bicycloalkanes (m165)	1.016	0.740	1.050	0.663	3.439	0.640	0.830	0.627

Table 2-15. Other Statistical Information for Time Period 1 of September 18, 2018.

Time Period 1 (05:52 - 08:00 PST)						
#	Name	Ave. (ppb)	St. Dev. (ppb)	Rel. St. Dev. (ppb)	Max (ppb)	Median (ppb)
1	methyl acetate	0.400	0.098	24.479	0.773	0.394
2	ethyl acetate	0.127	0.047	36.632	0.275	0.128
3	Toluene	0.365	0.342	93.816	3.382	0.228
4	C_2-benzenes	0.488	0.334	68.543	2.882	0.363
5	C_3-benzenes	0.404	0.280	69.301	1.750	0.294
6	Naphthalene	0.111	0.036	32.594	0.251	0.109
7	C_4-benzenes	0.449	0.141	31.398	1.229	0.408
8	C_3H_7N	0.059	0.035	59.069	0.240	0.051
9	C_5H_{10}	0.154	0.169	109.451	0.936	0.084
10	C_6H_{10}	0.206	0.200	96.921	1.089	0.126
11	C_6H_{12}	0.092	0.110	119.245	0.728	0.047
12	C_7H_{12}	0.194	0.157	80.944	0.952	0.134
13	C_8H_{14}	0.332	0.142	42.740	1.005	0.290
14	naphthenic monoaromatics (Indane)	1.468	0.122	8.309	1.910	1.469
15	naphthenic monoaromatics (m133)	0.678	0.111	16.328	1.270	0.662
16	naphthenic monoaromatics (m147)	0.703	0.113	16.038	1.276	0.686
17	naphthenic monoaromatics (m161)	0.725	0.091	12.512	1.166	0.720
18	naphthenic monoaromatics (m175)	0.743	0.072	9.743	1.006	0.743
19	bicycloalkanes (m109)	1.707	0.117	6.874	2.210	1.704
20	bicycloalkanes (m123)	0.211	0.045	21.051	0.397	0.206
21	bicycloalkanes + monoterpenes (m137)	0.688	0.073	10.594	0.939	0.687
22	bicycloalkanes (m151)	0.161	0.059	36.524	0.487	0.150
23	bicycloalkanes (m165)	0.740	0.075	10.089	1.016	0.740

Table 2-16. Other Statistical Information for Time Period 2 of September 18, 2018.

Time Period 2 (08:00 - 10:00 PST)						
#	Name	Ave. (ppb)	St. Dev. (ppb)	Rel. St. Dev. (ppb)	Max (ppb)	Median (ppb)
1	methyl acetate	0.183	0.056	30.725	0.459	0.179
2	ethyl acetate	0.066	0.034	52.357	0.213	0.066
3	toluene	0.144	0.148	102.829	1.160	0.088
4	C_2-benzenes	0.259	0.125	48.222	1.292	0.224
5	C_3-benzenes	0.254	0.147	57.886	1.308	0.208
6	naphthalene	0.095	0.033	34.454	0.238	0.093
7	C_4-benzenes	0.380	0.127	33.559	1.208	0.342
8	C_3H_7N	0.047	0.029	61.797	0.216	0.041
9	C_5H_{10}	0.106	0.118	111.699	0.906	0.063
10	C_6H_{10}	0.146	0.158	108.196	1.175	0.089
11	C_6H_{12}	0.063	0.074	117.378	0.494	0.037
12	C_7H_{12}	0.170	0.139	81.723	1.143	0.123
13	C_8H_{14}	0.283	0.112	39.496	0.937	0.253
14	naphthenic monoaromatics (Indane)	1.343	0.097	7.232	1.985	1.334
15	naphthenic monoaromatics (m133)	0.604	0.101	16.785	1.275	0.583
16	naphthenic monoaromatics (m147)	0.639	0.123	19.312	1.396	0.608
17	naphthenic monoaromatics (m161)	0.664	0.110	16.541	1.291	0.638
18	naphthenic monoaromatics (m175)	0.684	0.081	11.779	1.117	0.673
19	bicycloalkanes (m109)	1.626	0.129	7.930	2.426	1.608
20	bicycloalkanes (m123)	0.198	0.055	27.739	0.514	0.186
21	bicycloalkanes + monoterpenes (m137)	0.615	0.062	10.166	0.906	0.610
22	bicycloalkanes (m151)	0.142	0.058	40.753	0.484	0.131
23	bicycloalkanes (m165)	0.668	0.067	10.017	1.050	0.663

Table 2-17. Other Statistical Information for Time Period 3 of September 18, 2018.

Time Period 3 (10:00 - 12:00 PST)						
#	Name	Ave. (ppb)	St. Dev. (ppb)	Rel. St. Dev. (ppb)	Max (ppb)	Median (ppb)
1	methyl acetate	0.156	0.050	32.332	0.567	0.154
2	ethyl acetate	0.050	0.029	58.645	0.148	0.049
3	Toluene	0.219	0.695	317.746	15.300	0.072
4	C_2-benzenes	0.354	0.669	188.672	12.614	0.214
5	C_3-benzenes	0.310	0.561	180.777	11.211	0.193
6	Naphthalene	0.092	0.034	37.337	0.293	0.089
7	C_4-benzenes	0.405	0.416	102.768	8.909	0.321
8	C_3H_7N	0.054	0.072	133.361	1.491	0.038
9	C_5H_{10}	0.157	0.406	258.372	7.776	0.058
10	C_6H_{10}	0.209	0.566	270.671	12.027	0.079
11	C_6H_{12}	0.096	0.266	277.863	5.395	0.033
12	C_7H_{12}	0.233	0.476	203.773	9.611	0.120
13	C_8H_{14}	0.323	0.324	100.492	6.202	0.249
14	naphthenic monoaromatics (Indane)	1.347	0.199	14.796	4.653	1.317
15	naphthenic monoaromatics (m133)	0.630	0.350	55.554	7.821	0.565
16	naphthenic monoaromatics (m147)	0.676	0.421	62.238	8.364	0.585
17	naphthenic monoaromatics (m161)	0.690	0.312	45.239	5.505	0.617
18	naphthenic monoaromatics (m175)	0.688	0.170	24.769	2.890	0.650
19	bicycloalkanes (m109)	1.632	0.308	18.863	7.093	1.574
20	bicycloalkanes (m123)	0.212	0.142	66.983	2.526	0.179
21	bicycloalkanes + monoterpenes (m137)	0.607	0.120	19.753	2.585	0.589
22	bicycloalkanes (m151)	0.160	0.166	103.591	3.431	0.128
23	bicycloalkanes (m165)	0.663	0.146	22.040	3.439	0.640

Table 2-18. Other Statistical Information for Time Period 4 of September 18, 2018.

Time Period 4 (12:00 - 13:30 PST)						
#	Name	Ave. (ppb)	St. Dev. (ppb)	Rel. St. Dev. (ppb)	Max (ppb)	Median (ppb)
1	methyl acetate	0.162	0.050	30.858	0.583	0.159
2	ethyl acetate	0.049	0.029	58.713	0.145	0.049
3	toluene	0.148	0.232	156.495	3.497	0.070
4	C_2-benzenes	0.255	0.168	65.674	3.195	0.211
5	C_3-benzenes	0.217	0.094	43.205	1.581	0.194
6	naphthalene	0.090	0.031	34.633	0.202	0.089
7	C_4-benzenes	0.324	0.051	15.770	0.577	0.316
8	C_3H_7N	0.040	0.022	53.343	0.152	0.038
9	C_5H_{10}	0.087	0.091	104.021	1.244	0.066
10	C_6H_{10}	0.109	0.064	58.551	0.463	0.093
11	C_6H_{12}	0.047	0.047	100.892	0.753	0.036
12	C_7H_{12}	0.137	0.054	39.531	0.462	0.126
13	C_8H_{14}	0.251	0.056	22.386	0.516	0.244
14	naphthenic monoaromatics (Indane)	1.312	0.080	6.114	1.612	1.312
15	naphthenic monoaromatics (m133)	0.555	0.053	9.595	0.744	0.553
16	naphthenic monoaromatics (m147)	0.579	0.056	9.744	0.869	0.575
17	naphthenic monoaromatics (m161)	0.608	0.056	9.142	0.825	0.606
18	naphthenic monoaromatics (m175)	0.637	0.052	8.113	0.845	0.636
19	bicycloalkanes (m109)	1.572	0.096	6.105	1.929	1.569
20	bicycloalkanes (m123)	0.181	0.034	18.986	0.349	0.178
21	bicycloalkanes + monoterpenes (m137)	0.580	0.051	8.756	0.766	0.578
22	bicycloalkanes (m151)	0.128	0.036	28.563	0.305	0.125
23	bicycloalkanes (m165)	0.631	0.051	8.107	0.830	0.627

The following figures display other compounds, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 18, 2018.

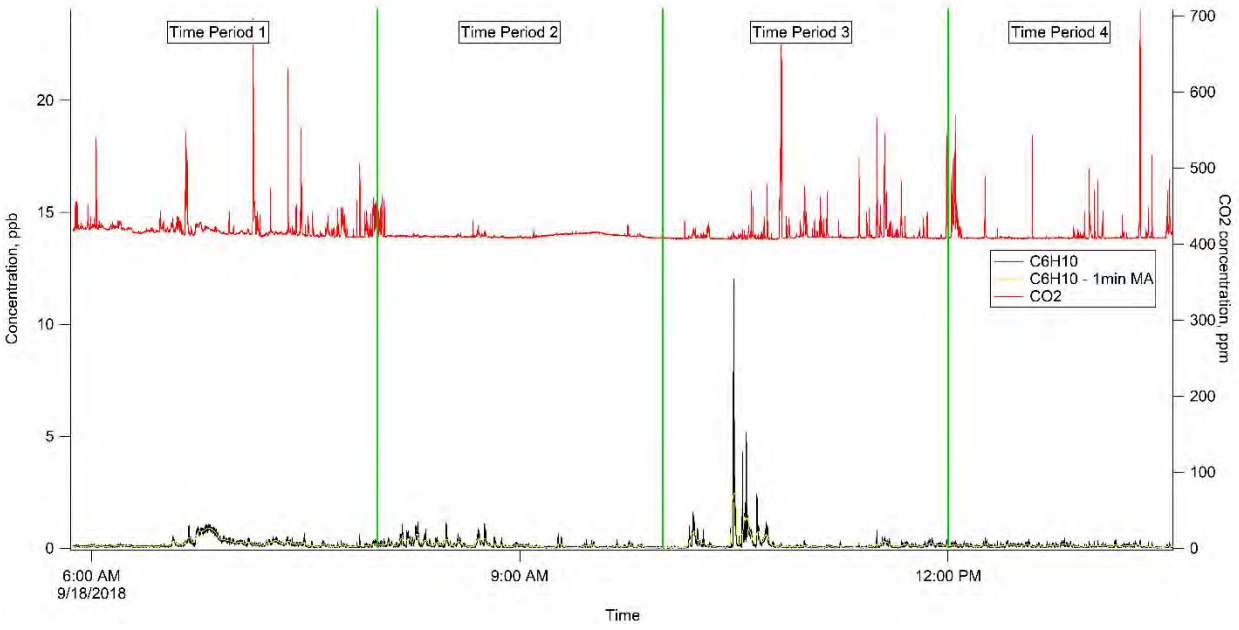

Figure 2-71. C_6H_{10}.

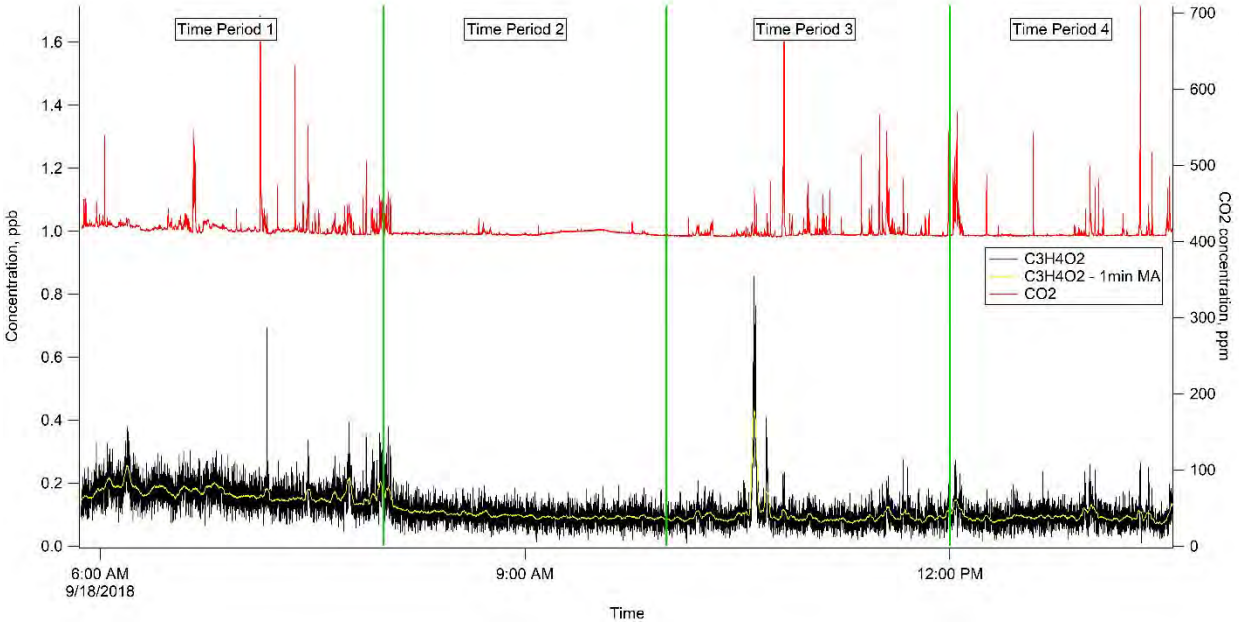

Figure 2-72. $C_3H_4O_2$.

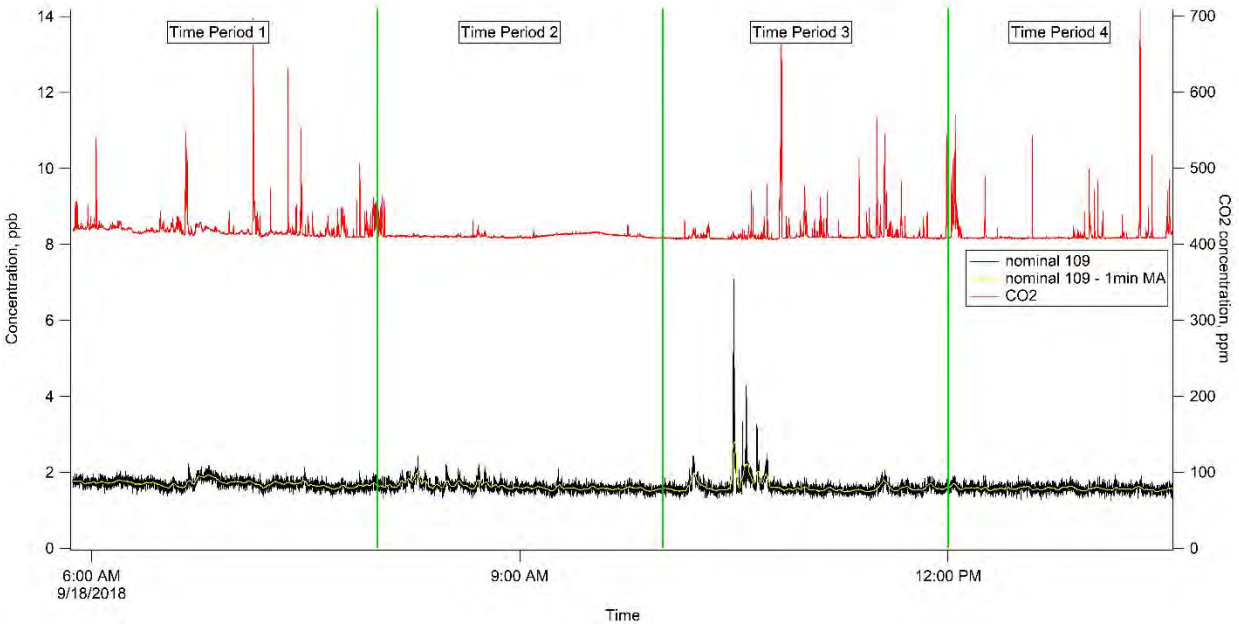

Figure 2-73. Nominal 109 Tentatively Identified as a Bicycloalkane (the Other Bicycloalkanes Showed the Same Trend).

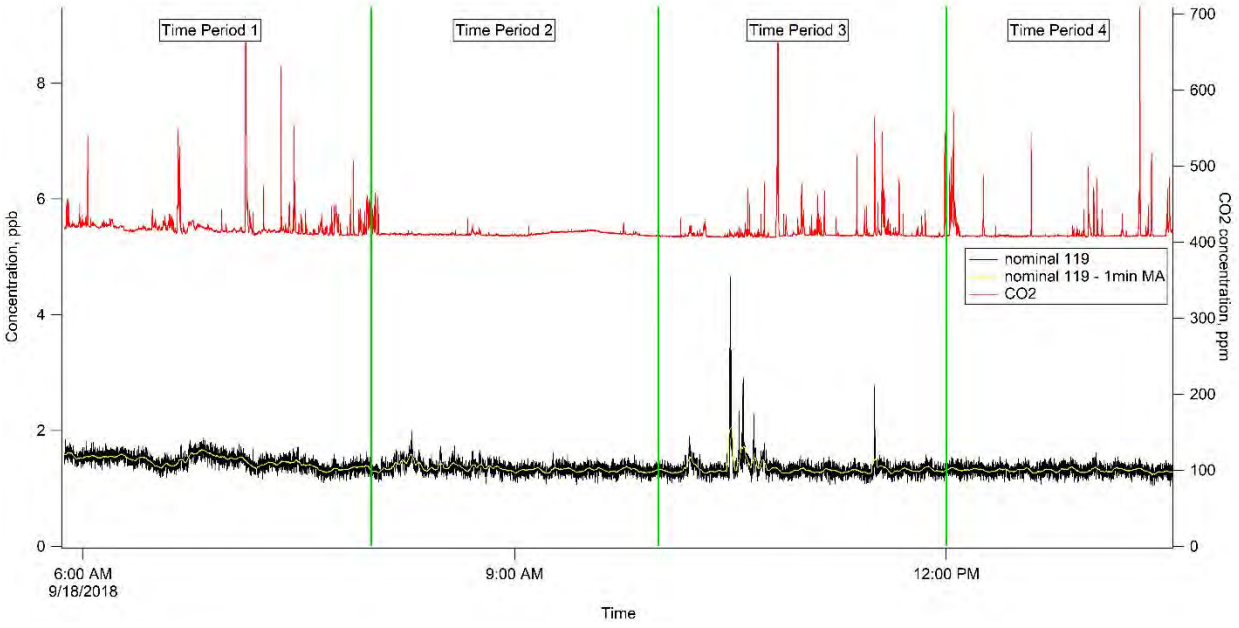

Figure 2-74. Nominal 119 Tentatively Identified as Indane (the Other Naphthenic Monoaromatics Showed the Same Trend).

2.6 Preliminary Analysis and Discussion

During all four periods, most of the plumes appear to be consistent with typical emissions from the paving activities, which is primarily asphalt and vehicle exhaust. Responses in aromatics (benzene, toluene, xylenes+ethyltoluene, etc.) are typically the largest signals which is expected with these sources (Chong, et al, 2014, "Volatile Organic Compounds in Asphalt Pavement Construction and Their Health Effects on Workers"). Some of the furans show responses (furan, 2-methylfuan, but-3-en-2-one+2,3-dihydrofuran+2,5-dihydrofuran) within some of these plumes were more frequently observed than the other COPCs during the day's monitoring and were well below OELs. Ammonia showed little response and stayed constant at a typical background that has been observed in the area (~5 ppbv). Among the odor-causing compounds, the most prevalent were diethyl sulfide+ and 1-pentanethiol+2,2-dimethylpropane-1-thiol which often responded within the asphalt and vehicle exhaust plumes. Given the low levels across all the COPCs, and lack of rise of any of the COPC concentrations over the time period analyzed, the data do not suggest that the AOP-015 event was a result of tank vapors. In addition, the odor-causing compounds were only present in a low abundance suggesting that they are also an unlikely cause of the AOP-015 event. It is notable that the ML was sampling downwind approximately 100 to 200 feet away from the work activity, and thus transport will affect the ability to detect tank waste plumes at the ML location. This initial analysis does not see significant differences between the four periods, with the exception of two unique plumes that occurred during period 3.

The first plume occurred at approximately 10:30, which was minutes before the CSO announced the AOP-015 event. At the time of the 10:30 plume, the ML operators smelled a strong gasoline/diesel fuel smell and the PTR-MS showed large responses at a large number of compounds both identified and unidentified. Figure 2-75 displays some representative species during this plume. The presence of many of these species is consistent with previous work observing gasoline fuel constituents (Gueneron, 2015, "PTR-MS Fragmentation Patterns of Gasoline Hydrocarbons"). The ML operators have observed the paving crew spraying equipment, tools, and footwear with a bottle filled from a diesel cannister. This diesel may have been the source of the odor that the ML staff observed at 10:30. If there is routine use of diesel to spray tools and boots, then this could be a source of odor.

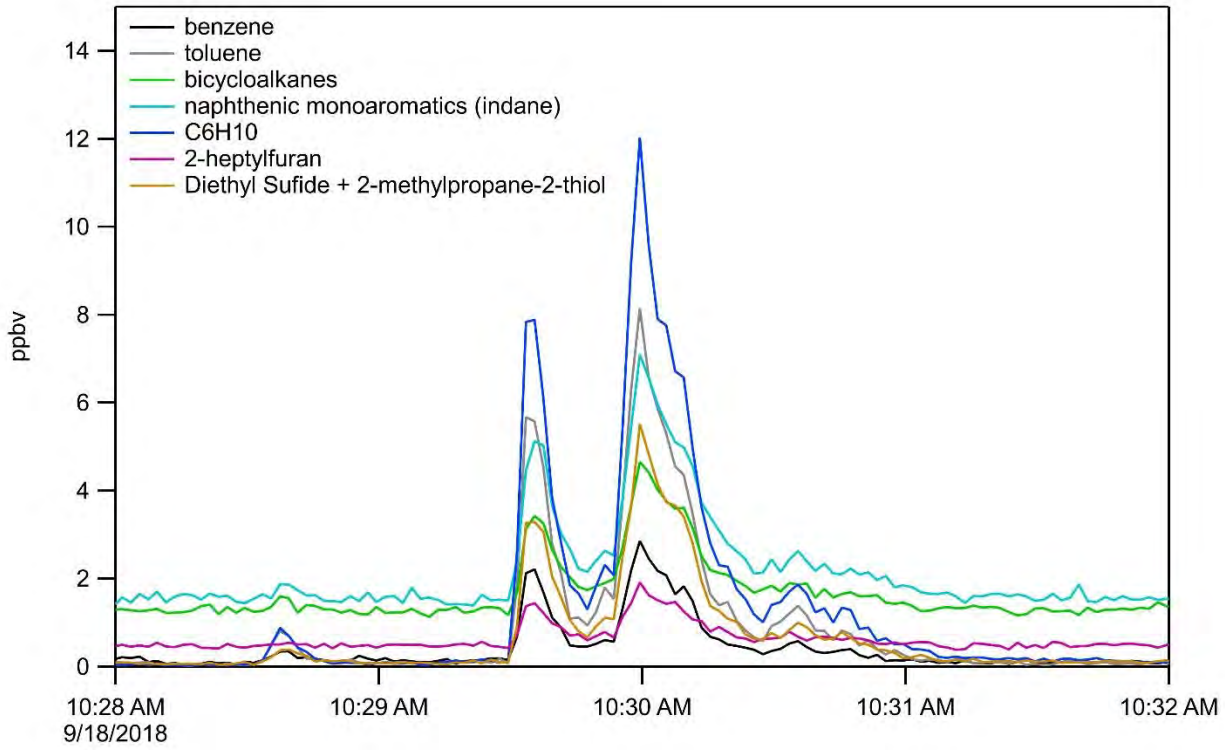

Figure 2-75. Responses of Select Species when Gasoline/Diesel Smell Occurred.

The second unique plume occurred at approximately 10:37 and a smaller one at 10:43, shortly after the first unique plume. Figure 2-76 shows the responses of $C_3H_4O_2$ (nominal mass 73, m/z 73) and an unidentified ion at nominal mass 87 (m/z 87). Figure 2-76 also shows benzene to represent the response of typical sources observed in the area (asphalt, exhaust). The $C_3H_4O_2$ and nominal mass 87 do not correlate well with benzene, which suggests a unique source. These plumes cannot be attributed to a specific source at this time. A mass difference of 14 between species can signify that the two species have a similar base structure, but the larger species has one additional alkyl substitution group (a CH_3 instead of an H for net mass increase of 14). Following this pattern and the observation that species with similar structures often have similar sources, a tentative formula of $C_4H_6O_2$ could be attributed to nominal mass 87. Further investigation is required to determine the source and speciation of these compounds, but there was no rise in the background levels of COPCs associated with these two plumes.

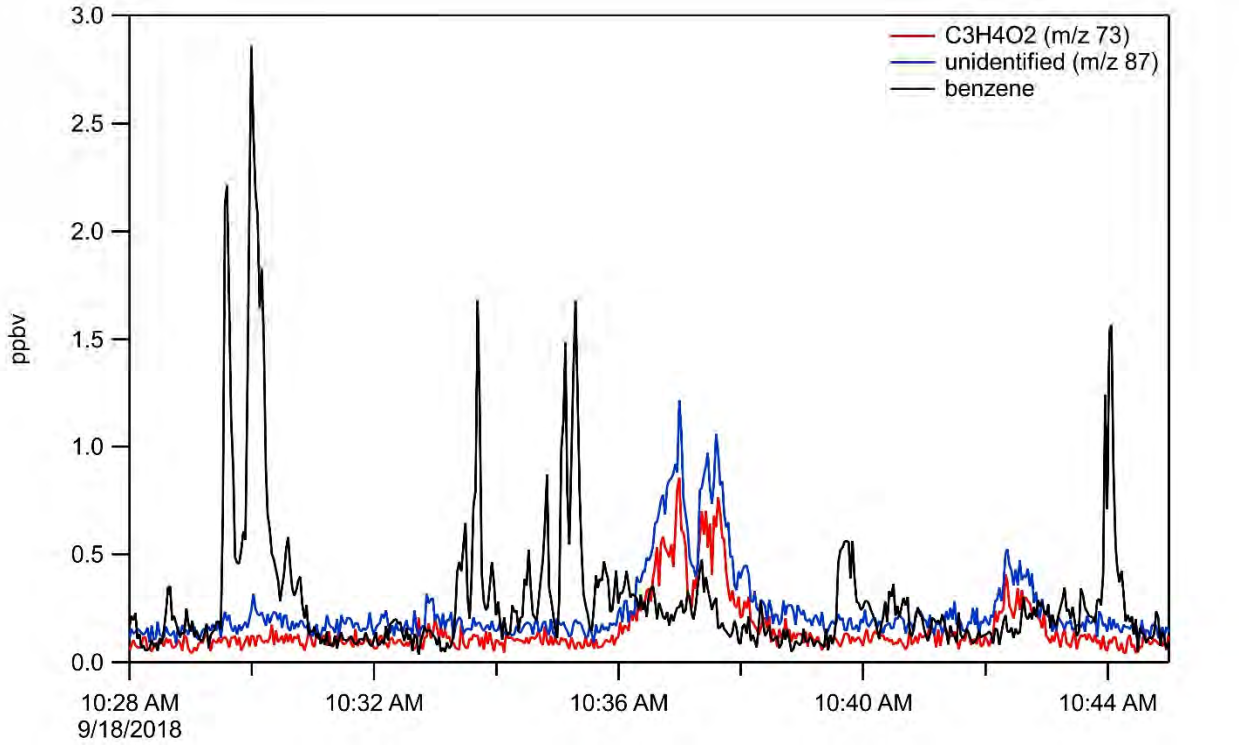

Figure 2-76. Responses of Two Species, $C_3H_4O_2$ (m/7 73) and Unidentified m/z 87, Species During a Unique Plume.

Benzene is shown in Figure 2-76 above to represent the typical plumes from normal paving activities and the non-response of $C_3H_4O_2$ and unidentified m/z 87 within the plumes.

3.0 SEPTEMBER 19, 2018 – SX PAVING

3.1 Quality Assessment

Data from September 19, 2018, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments.

3.2 Summary

On September 19, 2018, the ML performed general area monitoring of the Hanford Site in support of the SX Paving Project.

The ML arrived on site and checked in at the CSO at 05:53. A QA/QC zero-air/sensitivity check began at 04:23 on the CO_2 monitor and PTR-MS prior to arrival. The ML staff began mobile monitoring of SX Farm at 06:15. From 07:30 to 12:56, the ML performed side port sampling in various downwind locations around SX Farm.

The ML staff checked out with the CSO at 13:59. The QA/QC zero-air/sensitivity check of the Picarro ammonia analyzer was performed beginning at 14:07. The ML returned to the TerraGraphics warehouse at 15:22.

Table 3-1. Mobile Laboratory Sampling Mode throughout the Monitoring Period.

Time	Location	Sampling Mode
06:15 - 07:30	SX Farm (survey loop)	Mobile Area Sampling
07:30 - 07:48	SX Farm (East side of farm)	Side Port Sampling
07:48 - 09:35	SX Farm (SE corner of farm)	Side Port Sampling
09:35 - 11:28	SX Farm (South side of farm)	Side Port Sampling
11:28 - 12:56	SX Farm (West side of farm)	Side Port Sampling
12:56 - 13:28	SX Farm (West side of farm)	Mobile Area Sampling

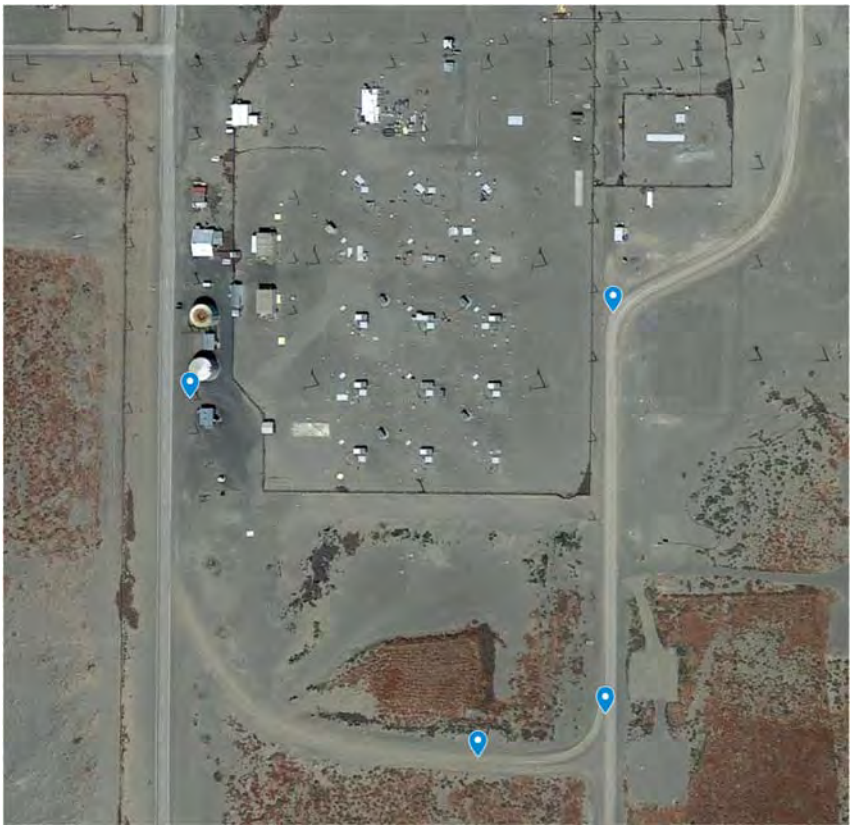

Figure 3-1. Mobile Laboratory Location for the Duration of the Monitoring Period.

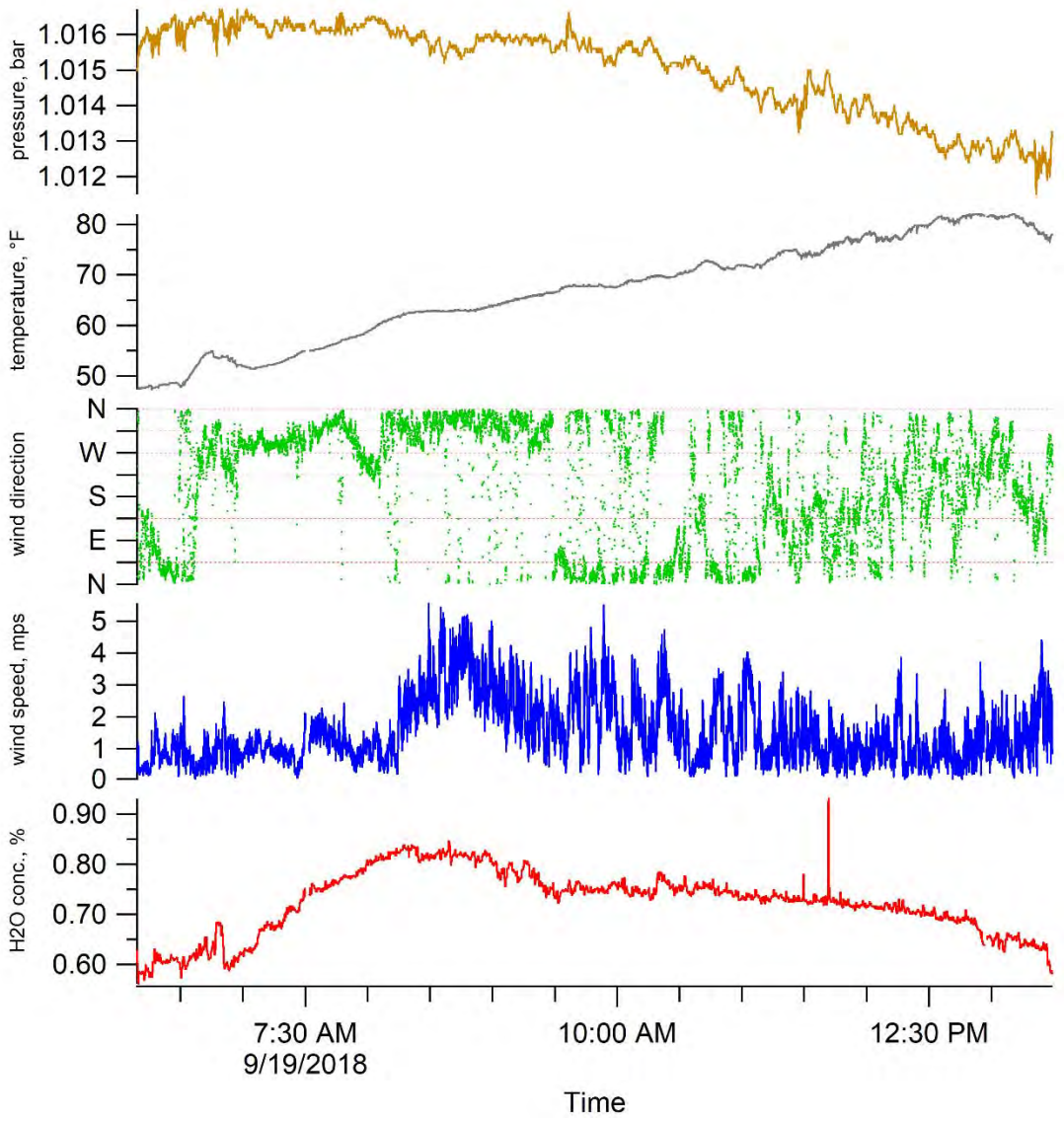

Figure 3-2. Weather Data for the Duration of the Monitoring Period.

3.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

Table 3-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 19, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	4.603	1.151	24.999	9.824	4.142
2	formaldehyde	300	1.103	0.595	53.936	24.963	0.978
3	methanol	200000	11.988	11.275	94.053	498.027	9.419
4	acetonitrile	20000	0.184	0.059	31.801	2.659	0.179
5	acetaldehyde	25000	3.711	4.430	119.389	246.129	2.906
6	ethylamine	5000	0.031	0.016	52.632	0.187	0.031
7	1,3-butadiene	1000	0.397	2.442	615.259	123.787	0.134
8	propanenitrile	6000	0.097	0.186	192.835	8.952	0.073
9	2-propenal	100	0.250	0.320	127.855	11.374	0.187
10	1-butanol+ butenes	20000	1.430	4.503	314.881	175.386	0.429
11	methyl isocyanate	20	0.048	0.028	58.775	0.454	0.045
12	methyl nitrite	100	0.165	0.164	99.478	7.160	0.136
13	furan	1	0.044	0.050	113.253	2.236	0.039
14	butanenitrile	8000	0.042	0.165	392.944	8.739	0.025
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	100, 1, 1	0.071	0.058	81.528	N/A*	N/A*
16	butanal	25000	0.168	0.101	60.059	3.857	0.149
17	NDMA**	0.3	0.036	0.038	106.445	0.311	0.027
18	benzene	500	0.259	0.671	259.341	29.105	0.128
19	2,4-pentadienenitrile + pyridine	300, 100	0.043	0.055	127.239	2.343	0.034
20	2-methylene butanenitrile	30	0.032	0.111	350.935	5.580	0.019
21	2-methylfuran	1	0.045	0.031	68.962	0.441	0.040
22	pentanenitrile	6000	0.033	0.163	490.960	8.562	0.018
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.047	0.034	72.825	0.931	0.041
24	NEMA**	0.3	0.022	0.027	121.535	0.204	0.012
25	2,5-dimethylfuran	1	0.068	0.029	41.889	0.331	0.066
26	hexanenitrile	6000	0.072	0.123	169.605	6.037	0.062
27	2-hexanone (MBK)	5000	0.059	0.031	52.312	0.796	0.055
28	NDEA**	0.1	0.169	0.067	39.567	0.401	0.171
29	butyl nitrite + 2-nitro-2-methylpropane	100, 30	0.619	0.060	9.720	1.563	0.618
30	2,4-dimethylpyridine	500	0.224	0.271	120.953	8.222	0.182

Table 3-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 19, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.127	0.037	29.246	0.317	0.126
32	heptanenitrile	6000	0.190	0.091	47.926	4.595	0.183
33	4-methyl-2-hexanone	500	0.161	0.046	28.580	1.361	0.157
34	NMOR**	0.6	0.021	0.044	211.402	1.562	0.000
35	butyl nitrate	2500	0.094	0.030	32.142	0.220	0.093
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.153	0.046	30.113	1.722	0.149
37	6-methyl-2-heptanone	8000	0.143	0.032	22.026	0.730	0.141
38	2-pentylfuran	1	0.131	0.033	25.023	0.639	0.130
39	biphenyl	200	0.124	0.036	28.627	0.342	0.124
40	2-heptylfuran	1	0.559	0.188	33.579	8.871	0.546
41	1,4-butanediol dinitrate	50	0.184	0.035	18.905	0.321	0.183
42	2-octylfuran	1	0.004	0.017	449.107	0.228	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.005	0.022	435.489	0.267	0.000
44	PCB	1000	0.203	0.031	15.306	0.336	0.202
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.100	0.026	26.082	0.211	0.099
46	furfural acetophenone	1	0.487	0.051	10.532	0.700	0.483

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 1.747 ppb and the median value was 0.059 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 studies [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., 2017].

The following figures display a selection of COPC signals, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 19, 2018.

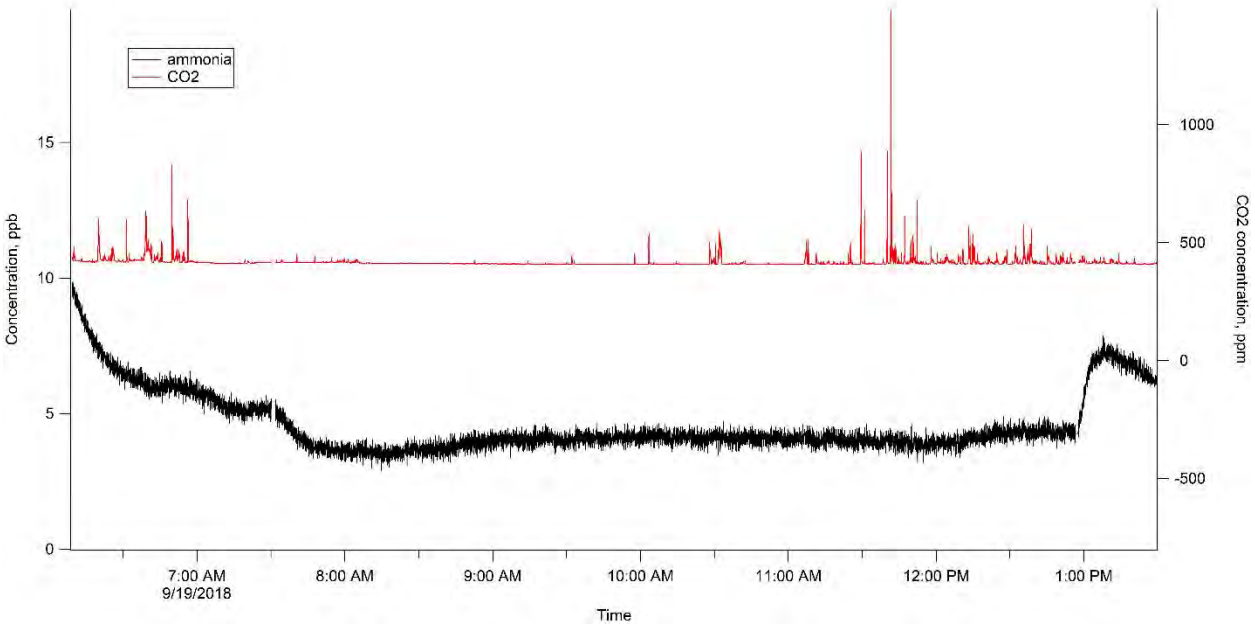

Figure 3-3. Ammonia.

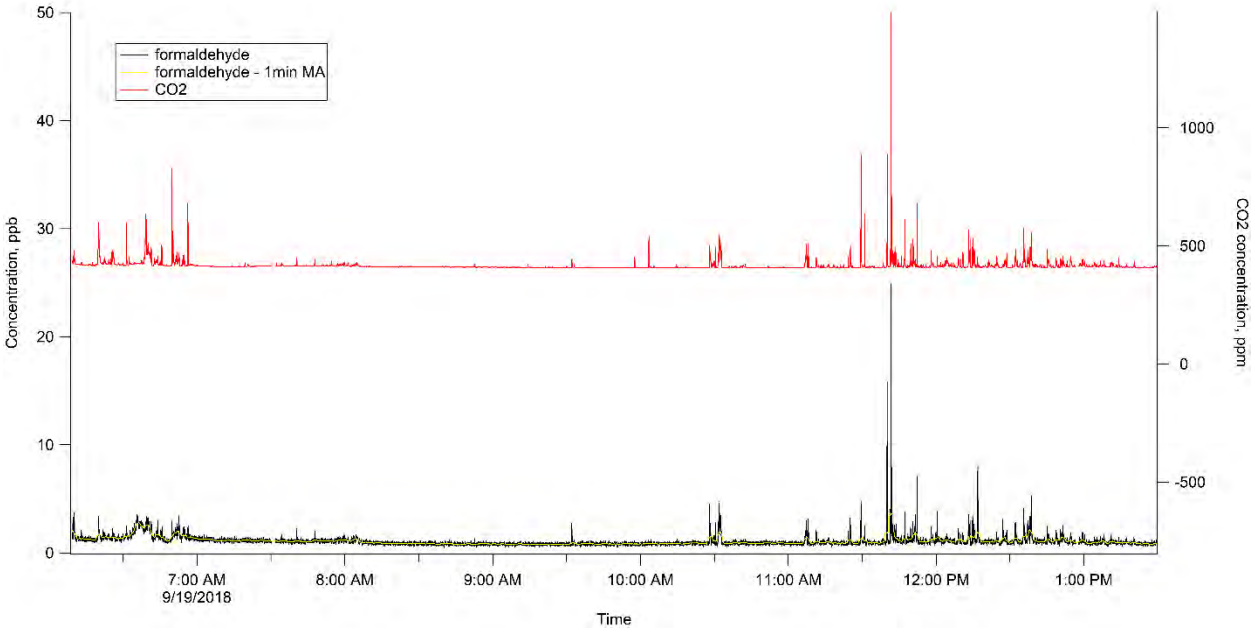

Figure 3-4. Formaldehyde.

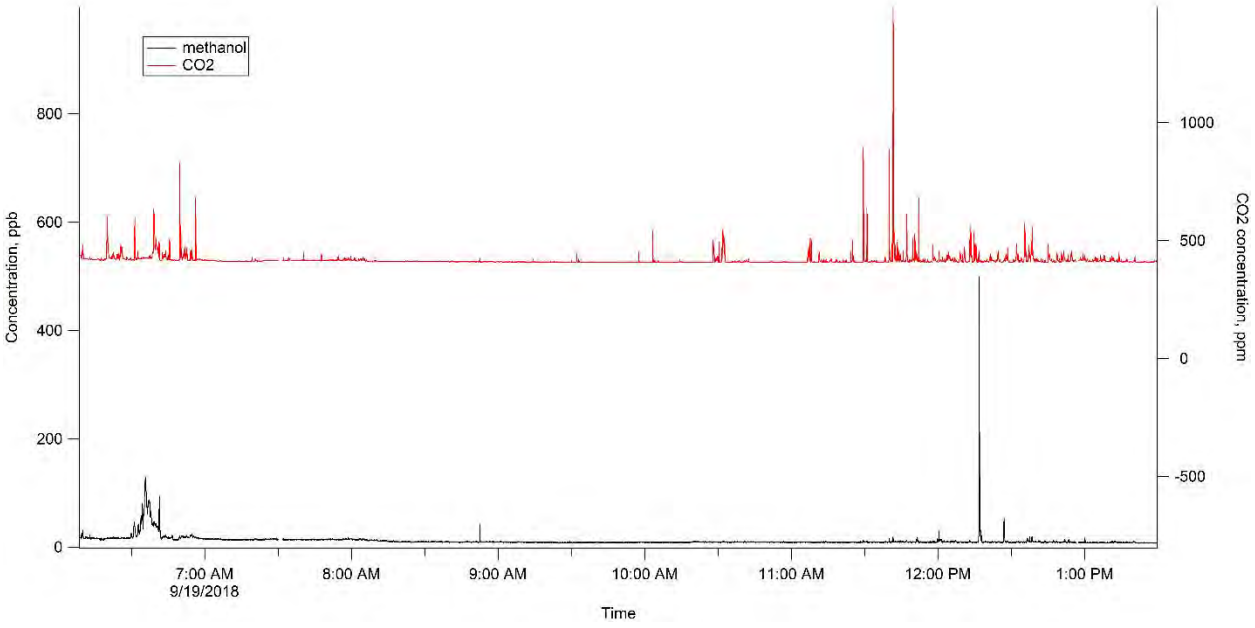

Figure 3-5. Methanol.

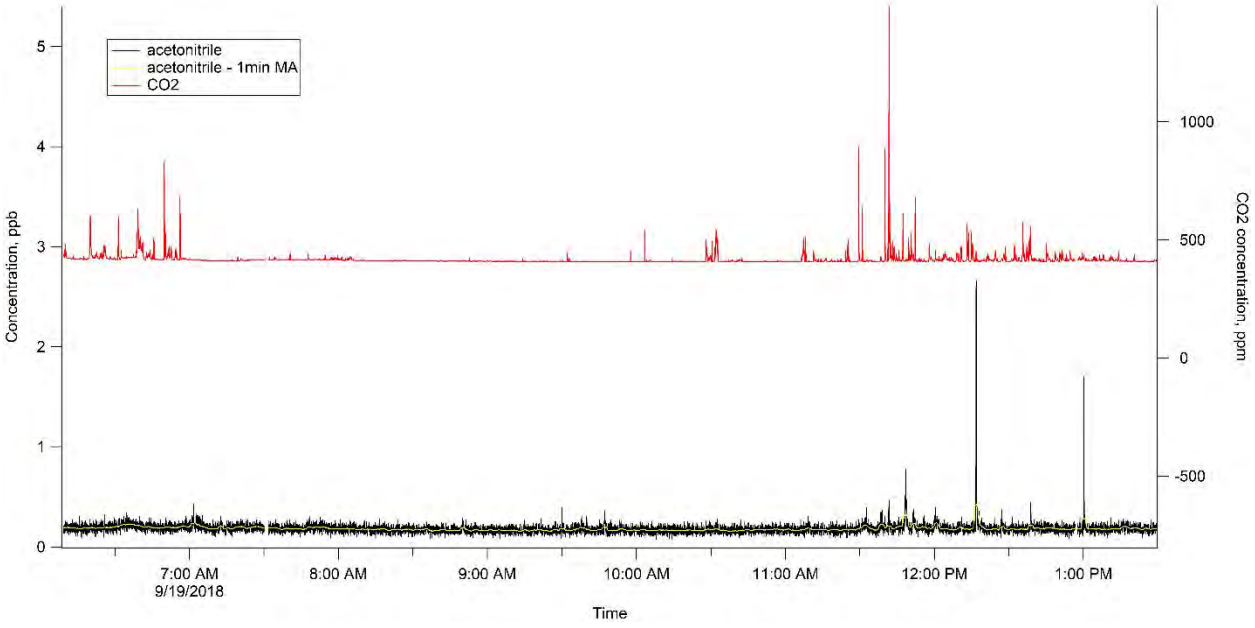

Figure 3-6. Acetonitrile.

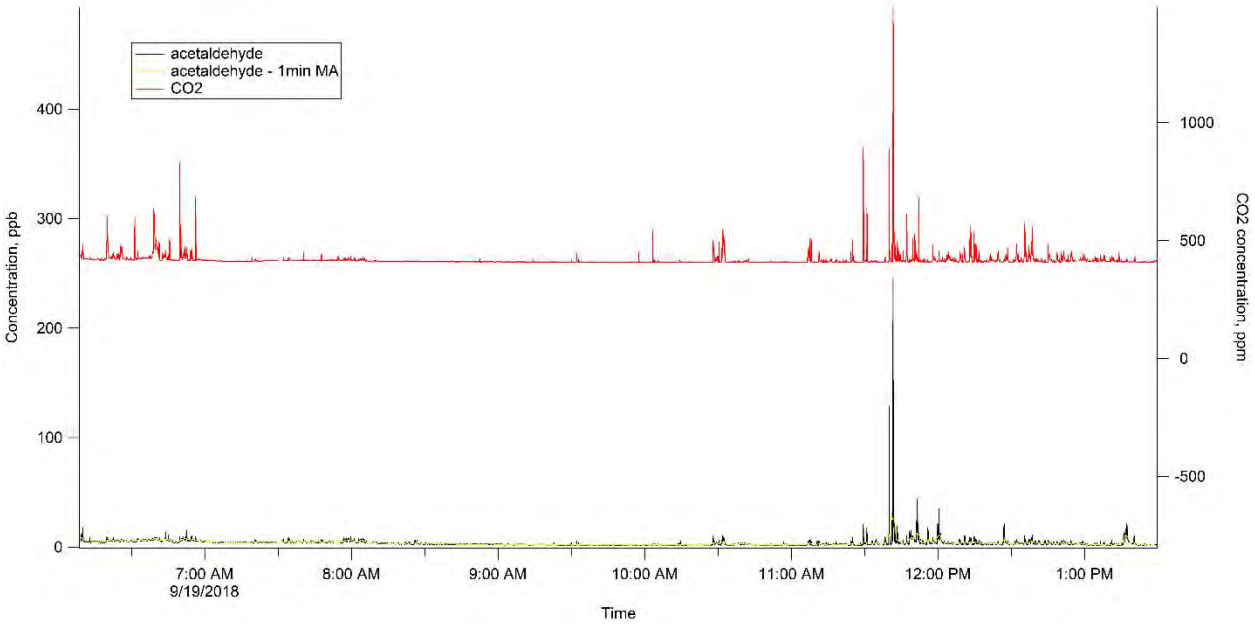

Figure 3-7. Acetaldehyde.

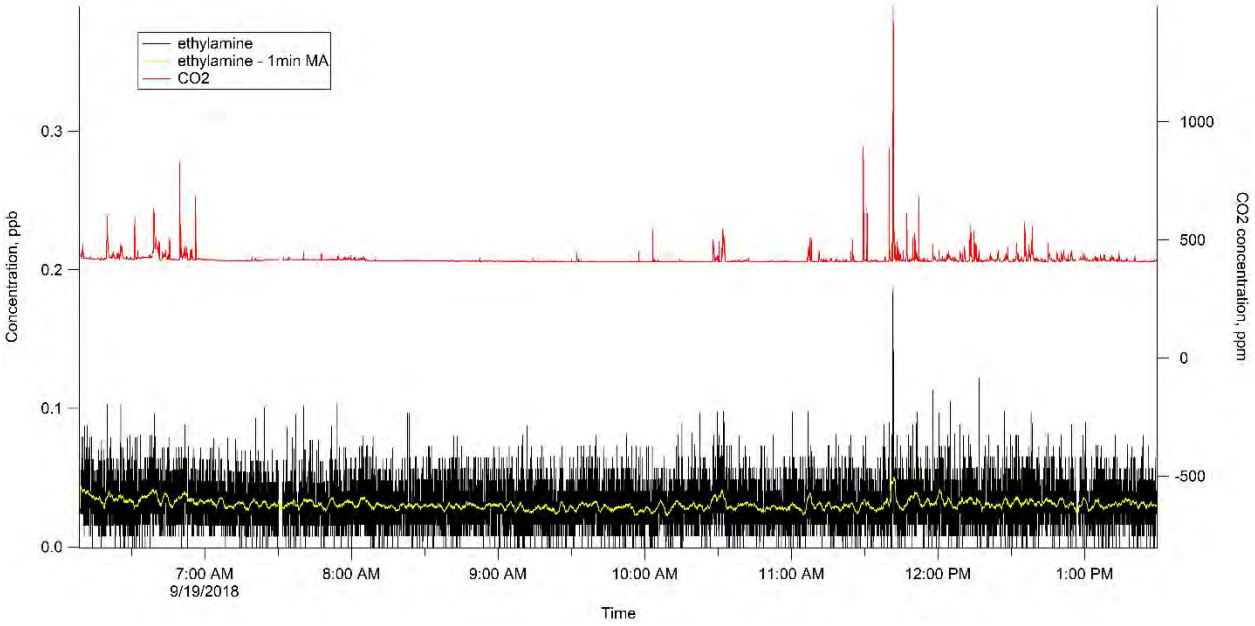

Figure 3-8. Ethylamine.

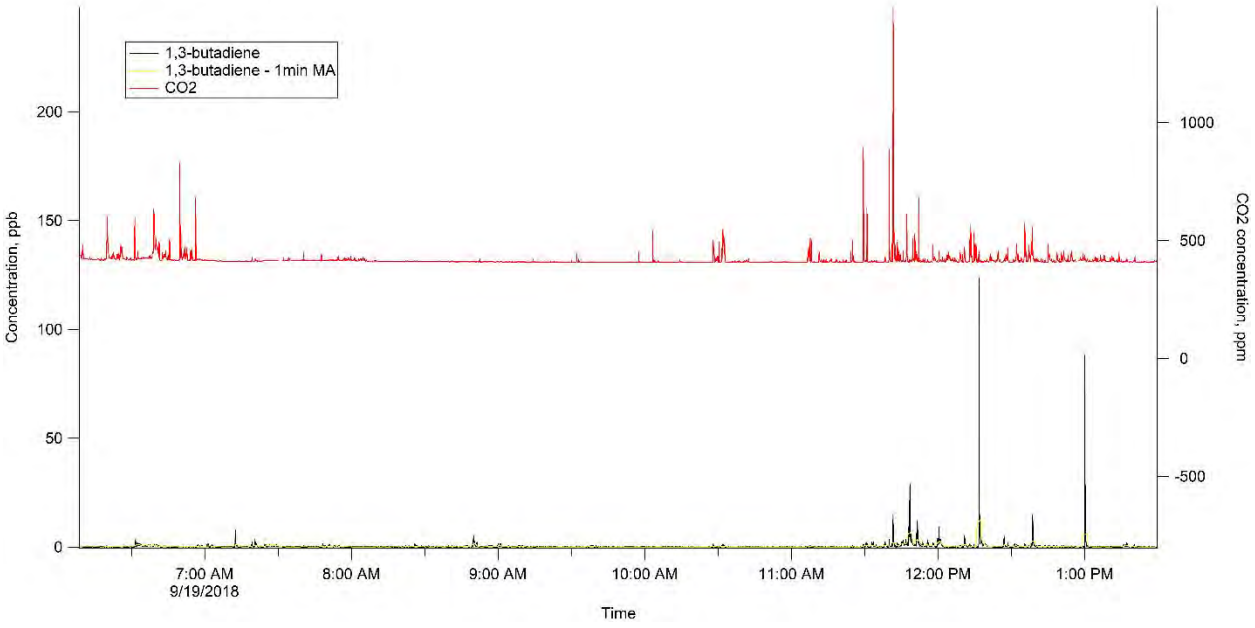

Figure 3-9. 1,3-butadiene.

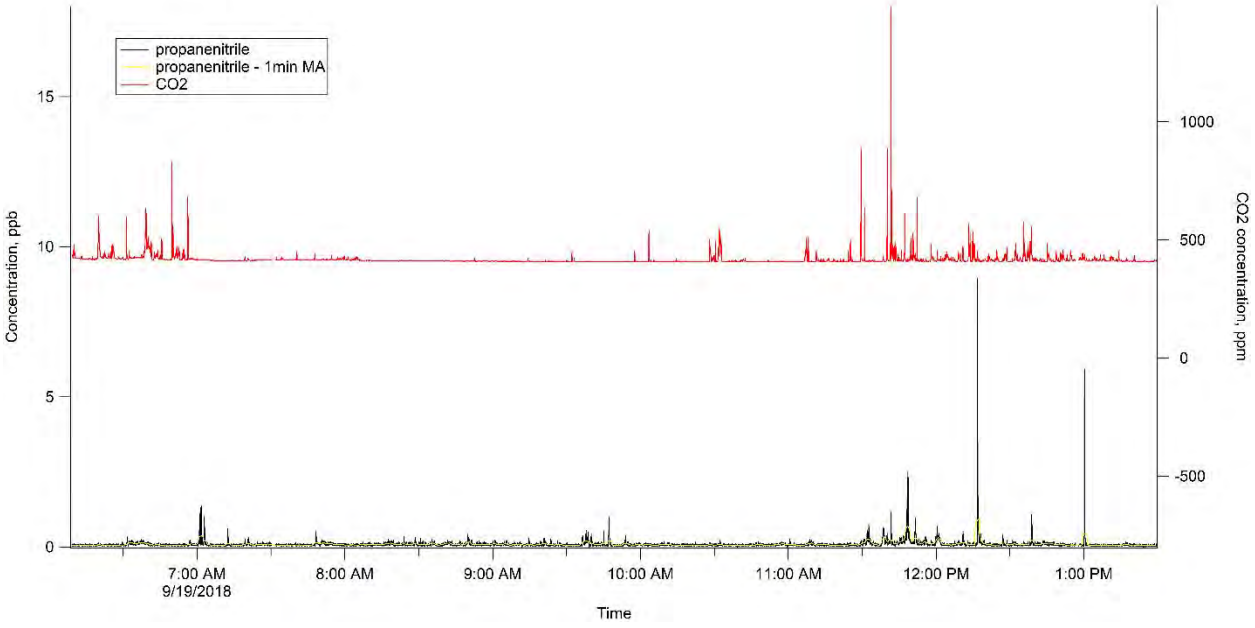

Figure 3-10. Propanenitrile.

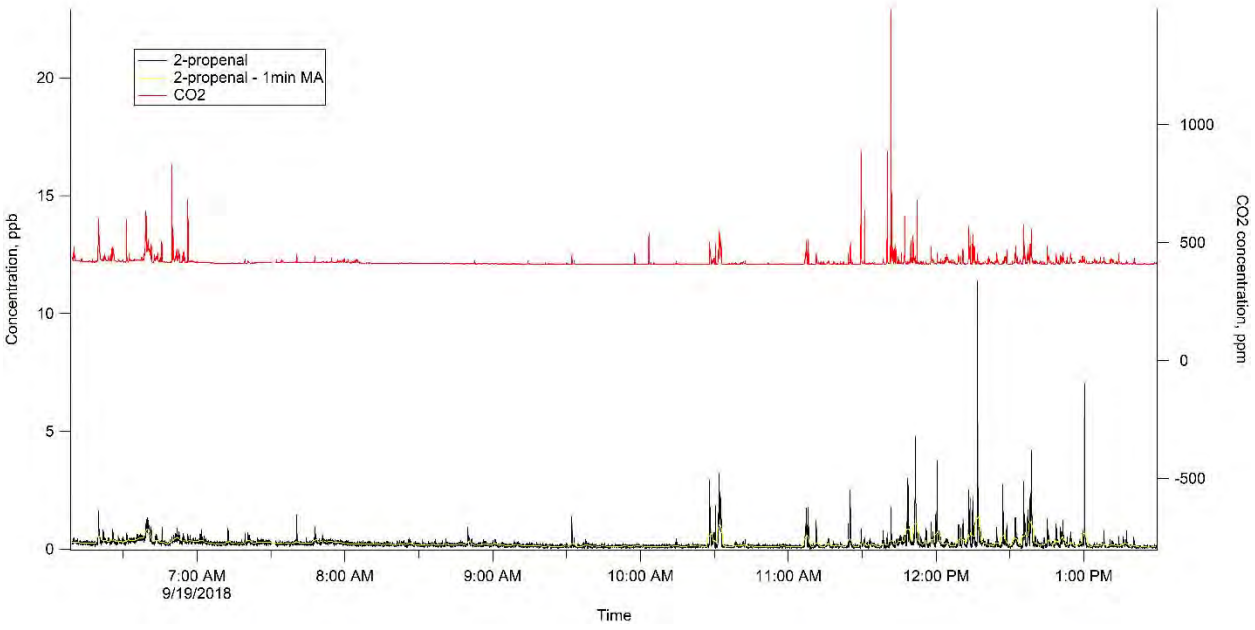

Figure 3-11. 2-propenal.

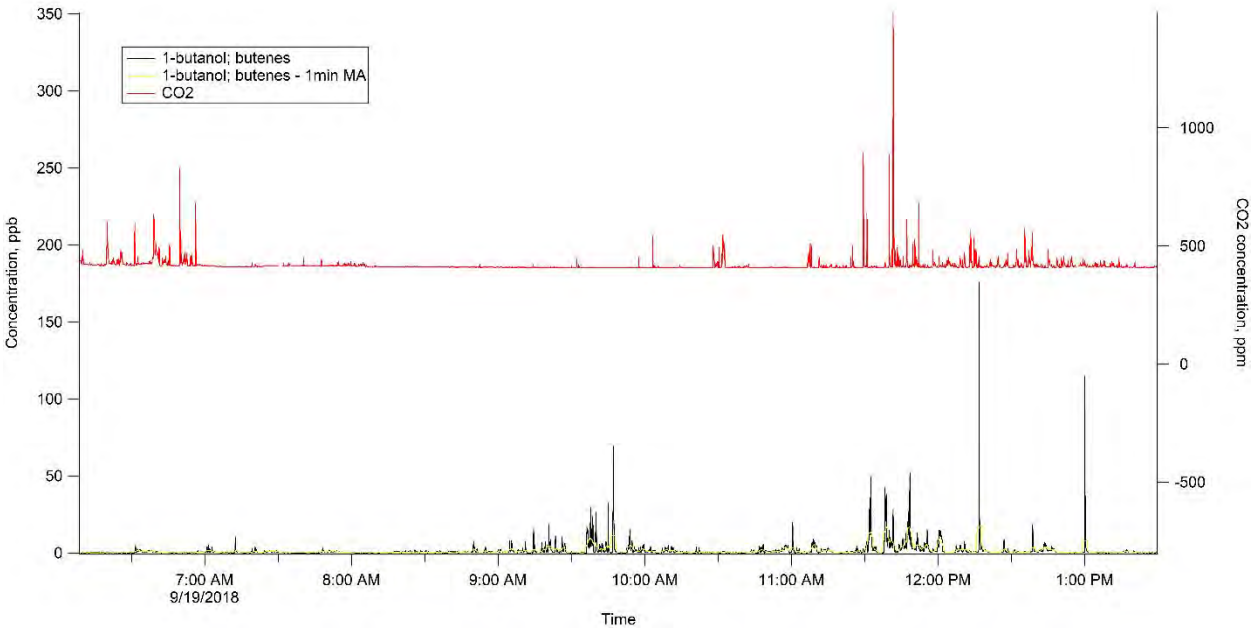

Figure 3-12. 1-butanol; Butenes.

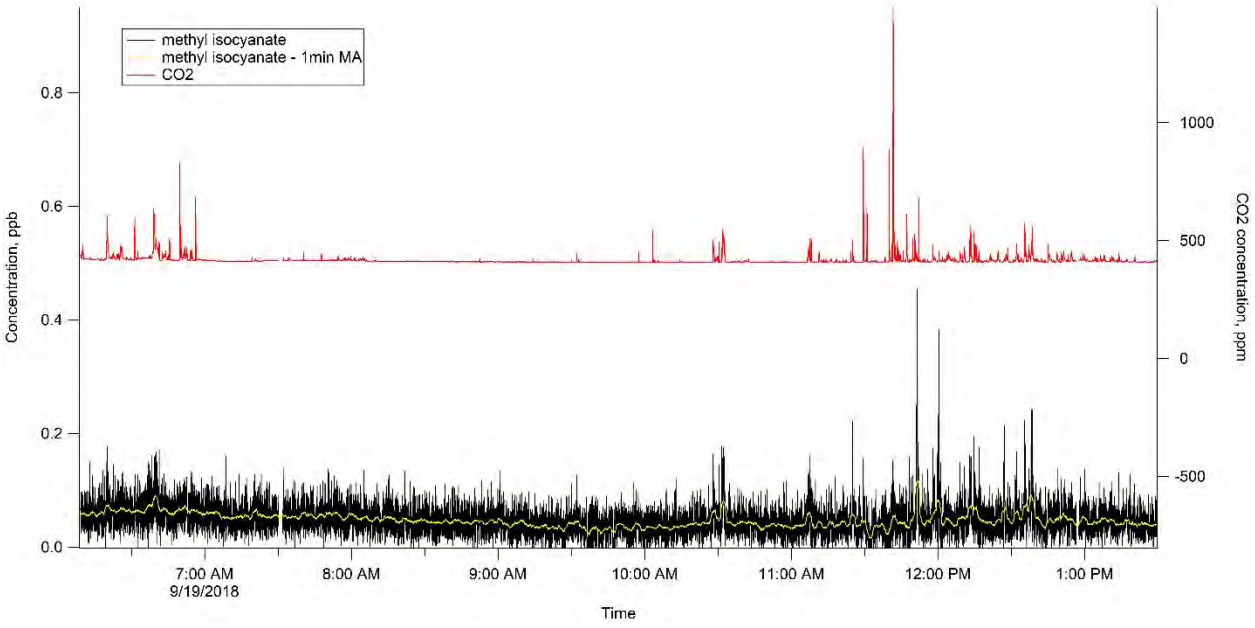

Figure 3-13. Methyl Isocyanate.

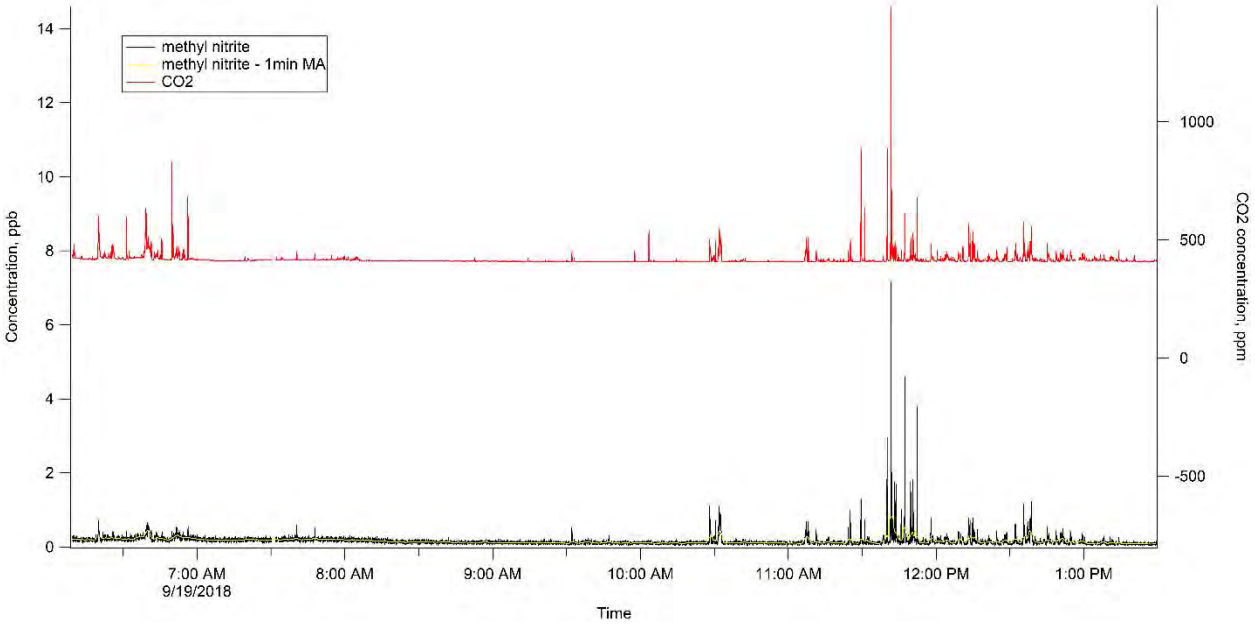

Figure 3-14. Methyl Nitrite.

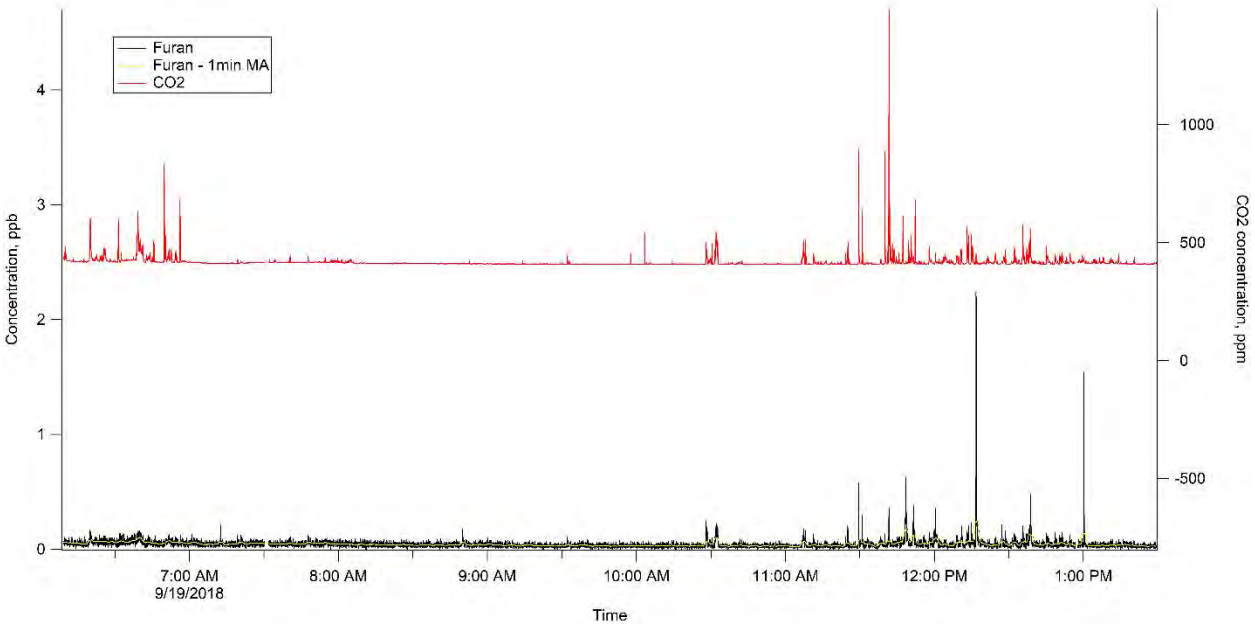

Figure 3-15. Furan.

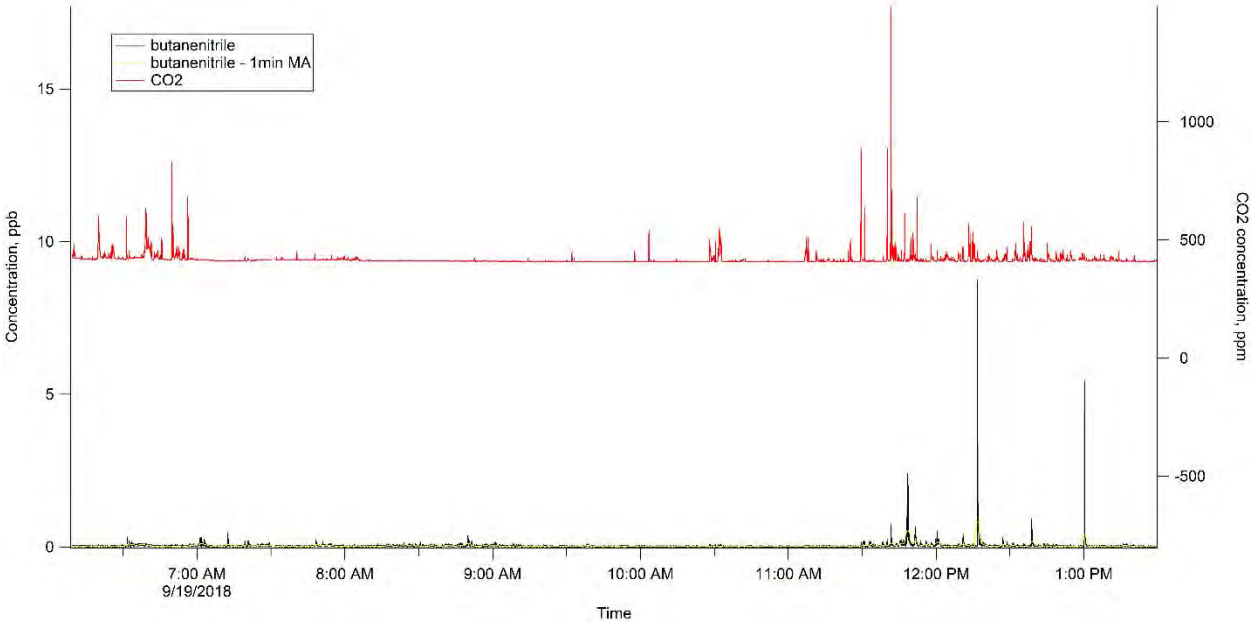

Figure 3-16. Butanenitrile.

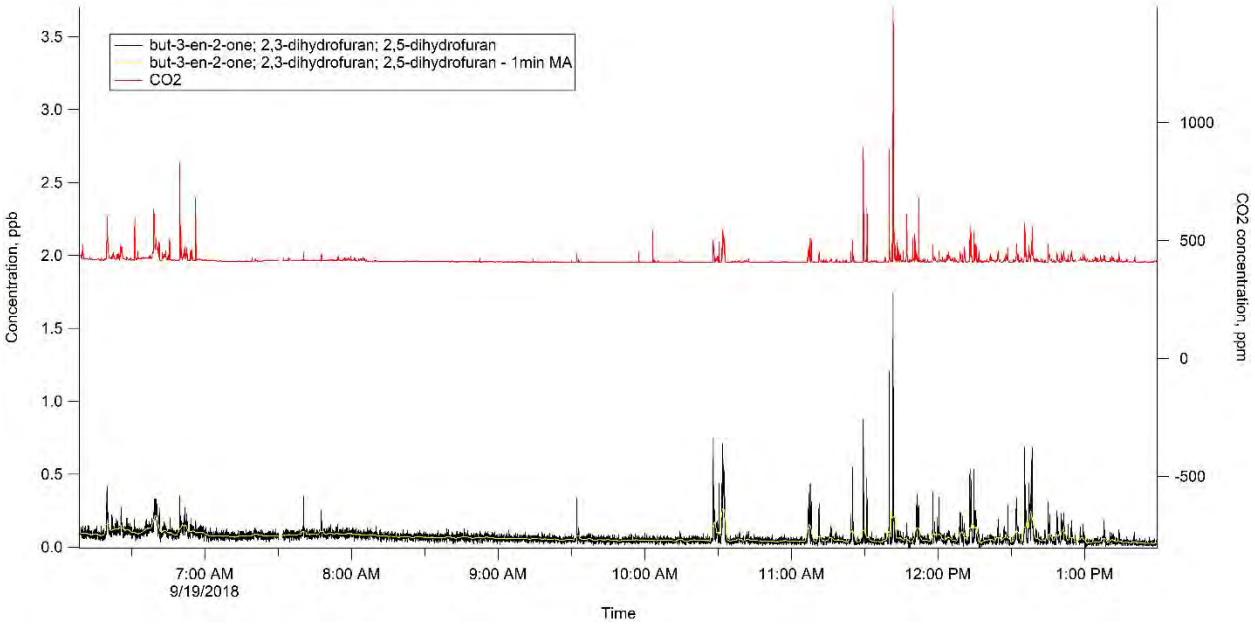

Figure 3-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

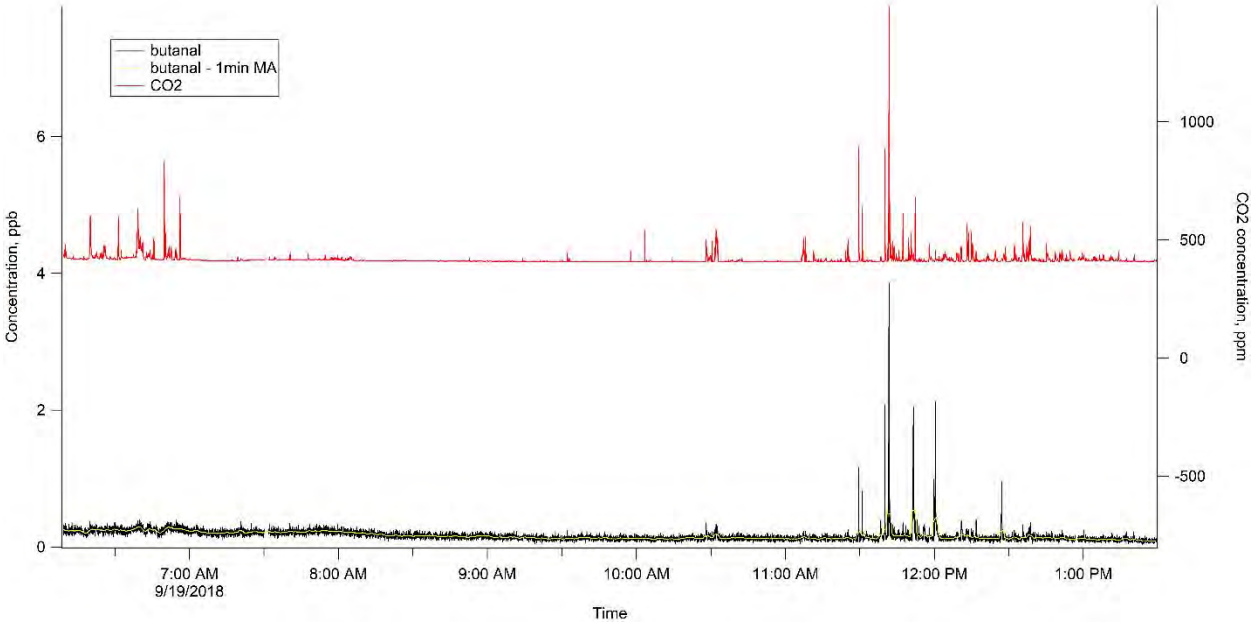

Figure 3-18. Butanal.

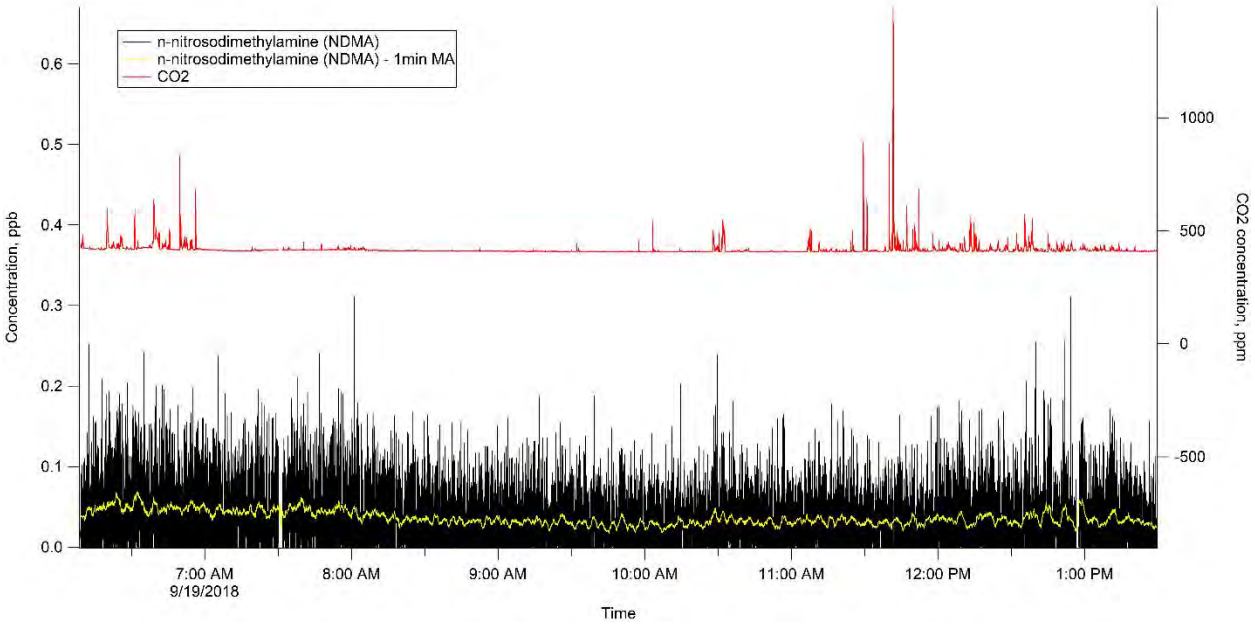

Figure 3-19. N-nitrosodimethylamine (NDMA).

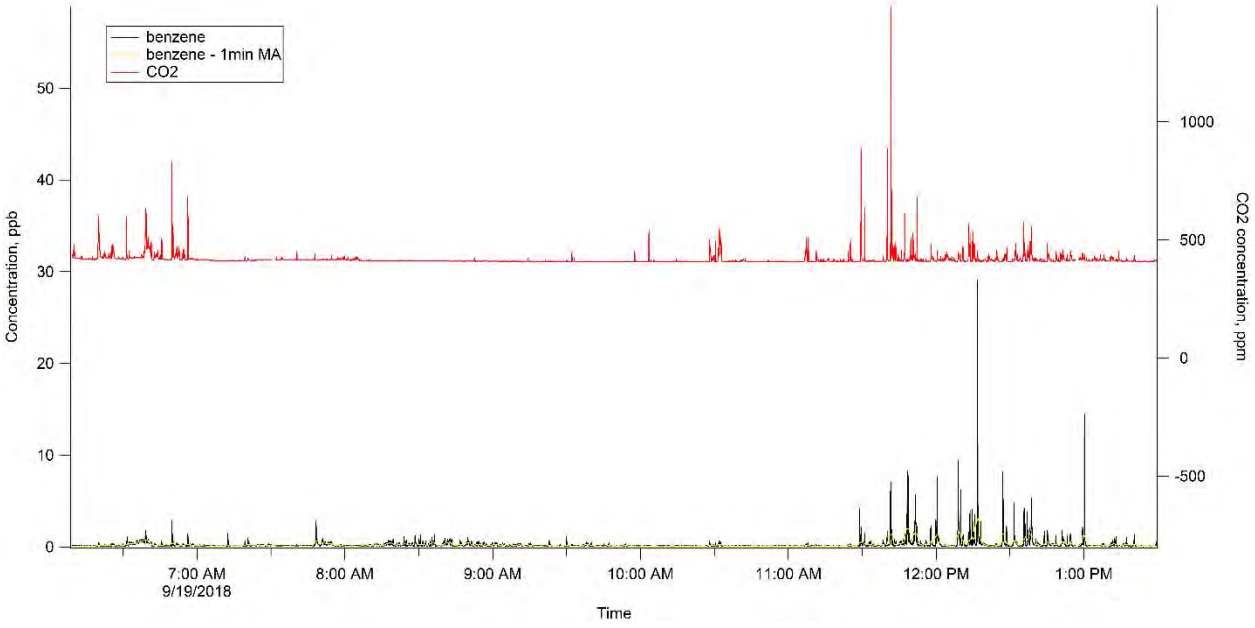

Figure 3-20. Benzene.

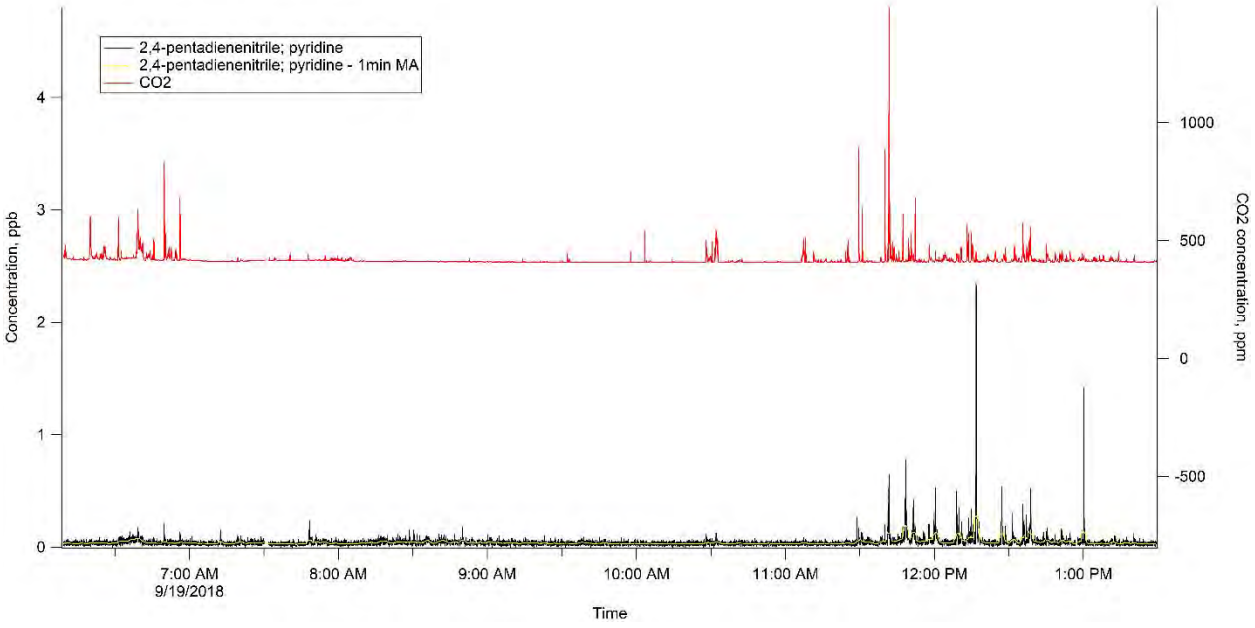

Figure 3-21. 2,4-pentadienenitrile; Pyridine.

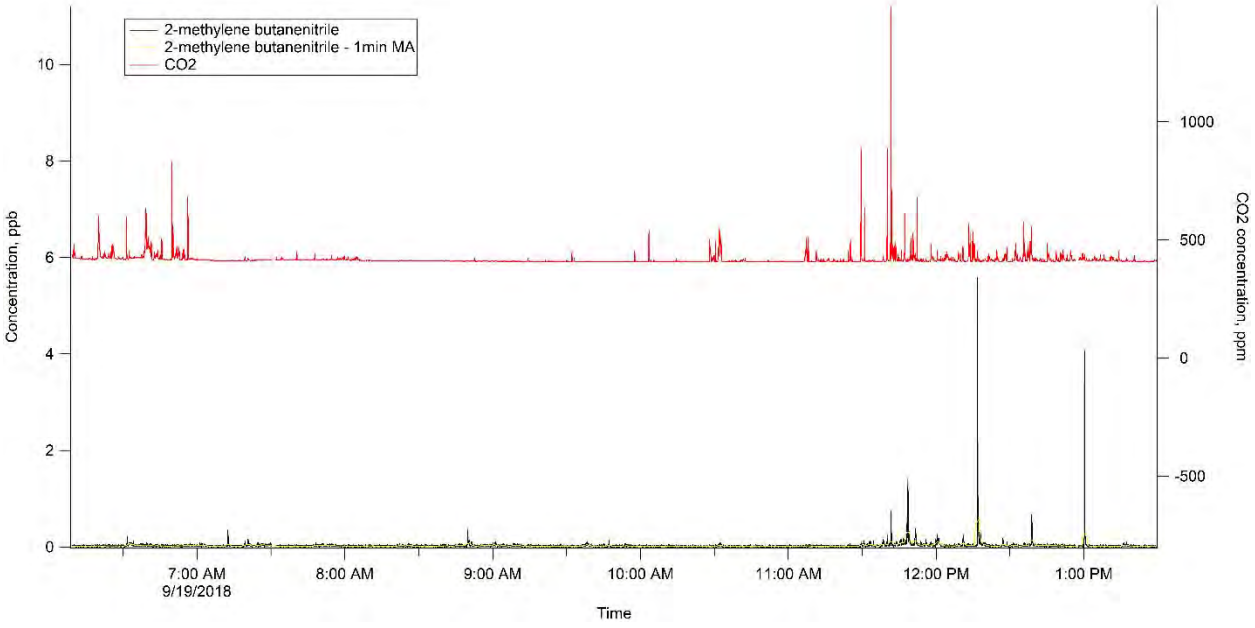

Figure 3-22. 2-methylene Butanenitrile.

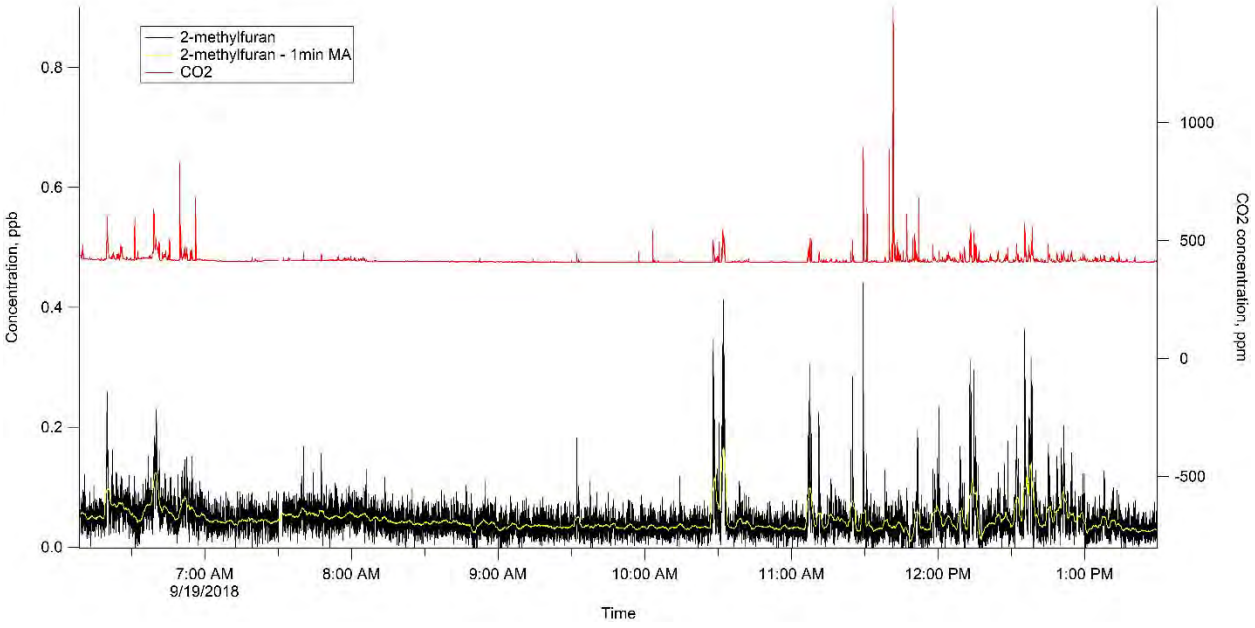

Figure 3-23. 2-methylfuran.

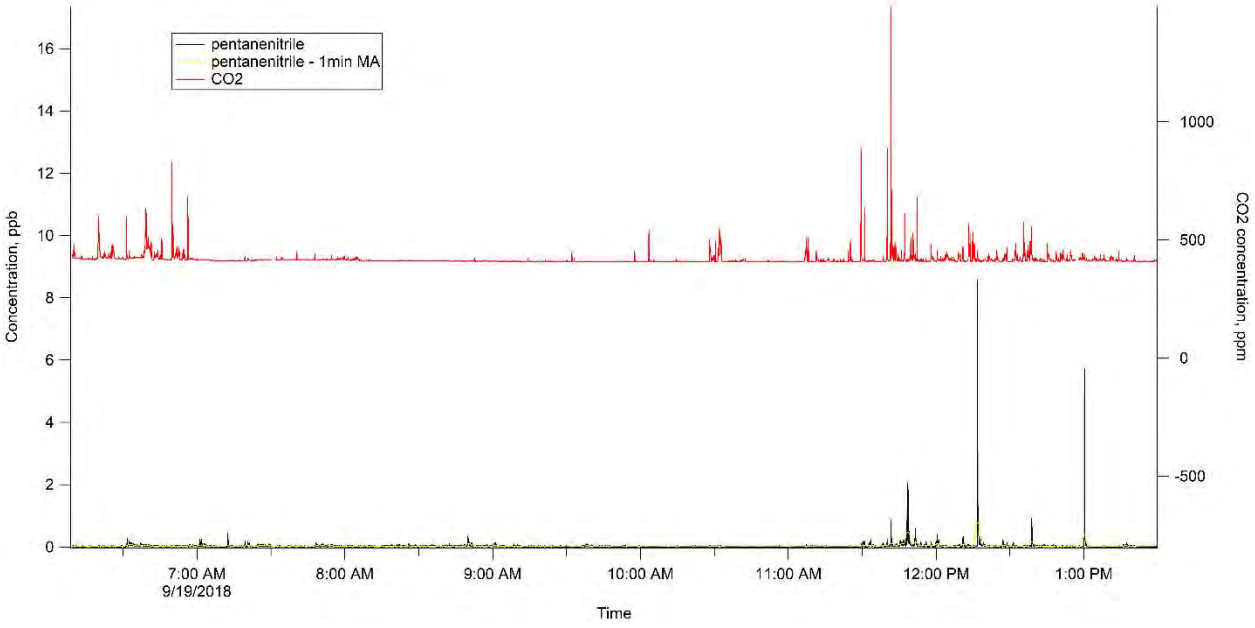

Figure 3-24. Pentanenitrile.

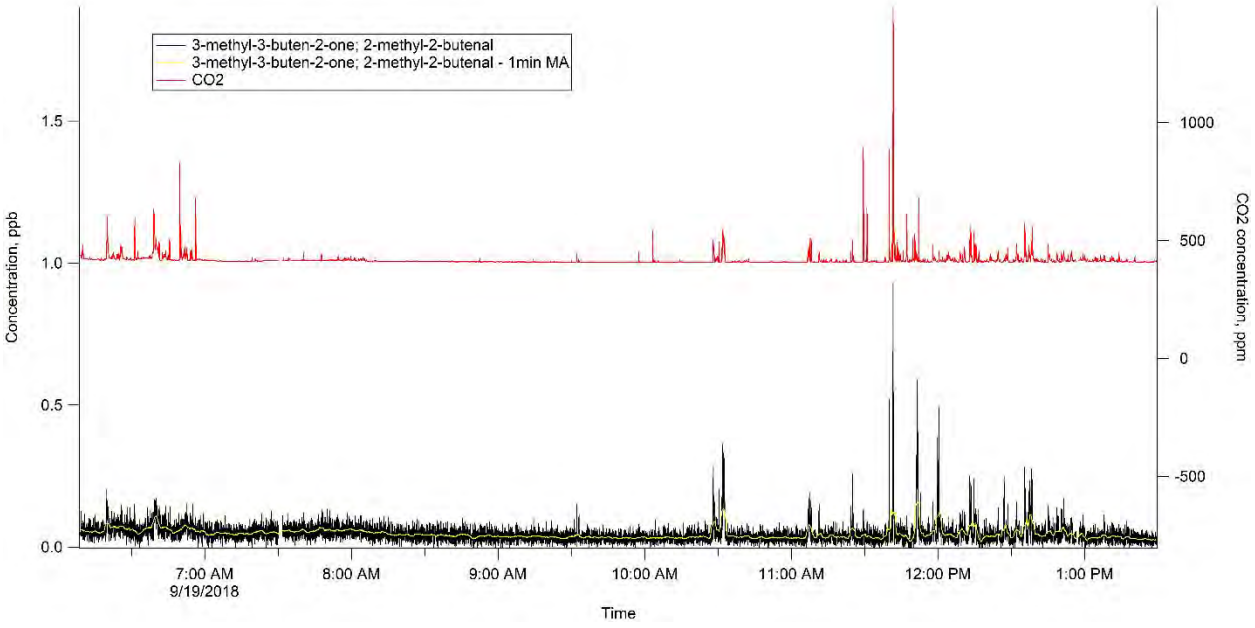

Figure 3-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

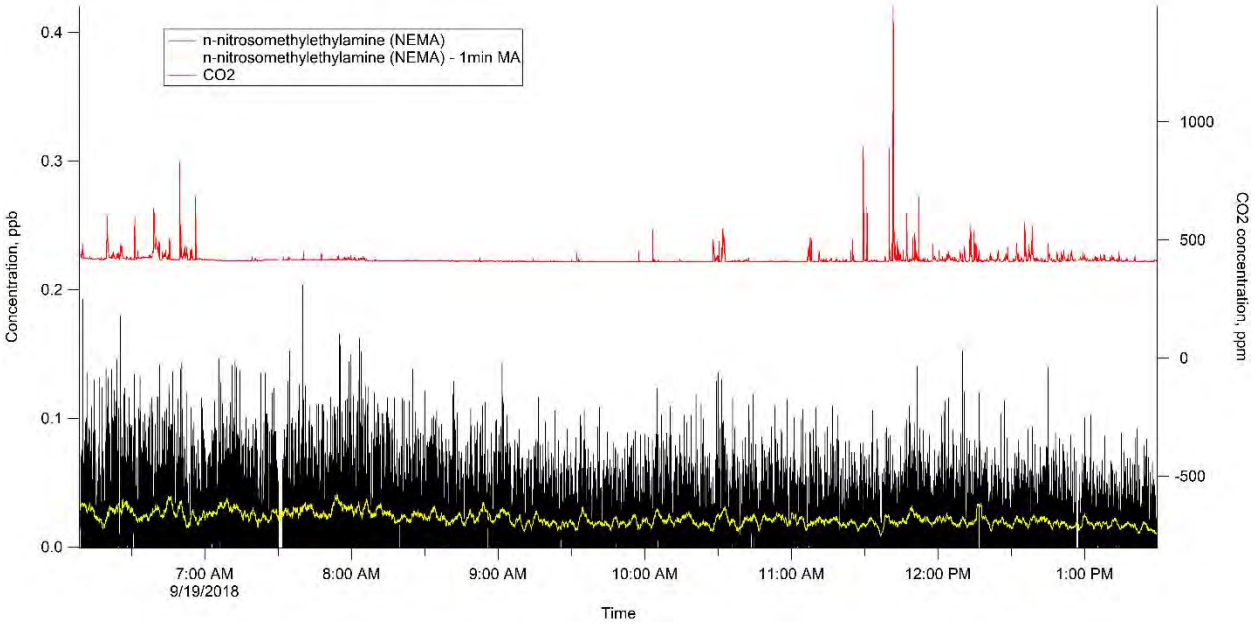

Figure 3-26. N-nitrosomethylethylamine (NEMA).

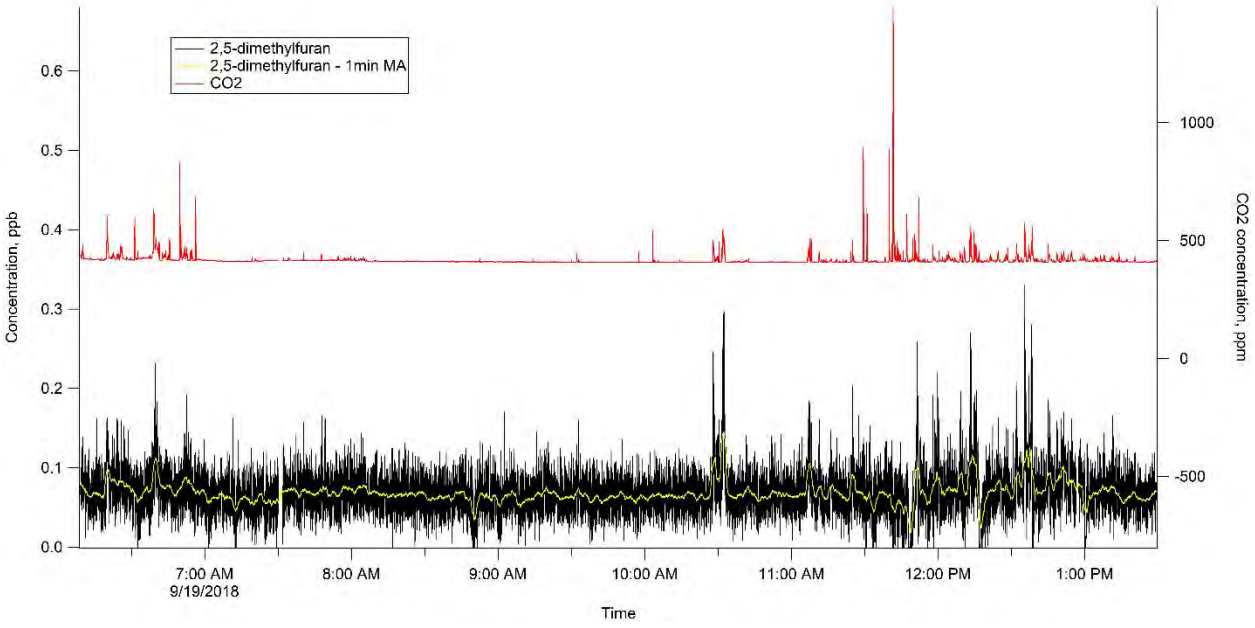

Figure 3-27. 2,5-dimethylfuran.

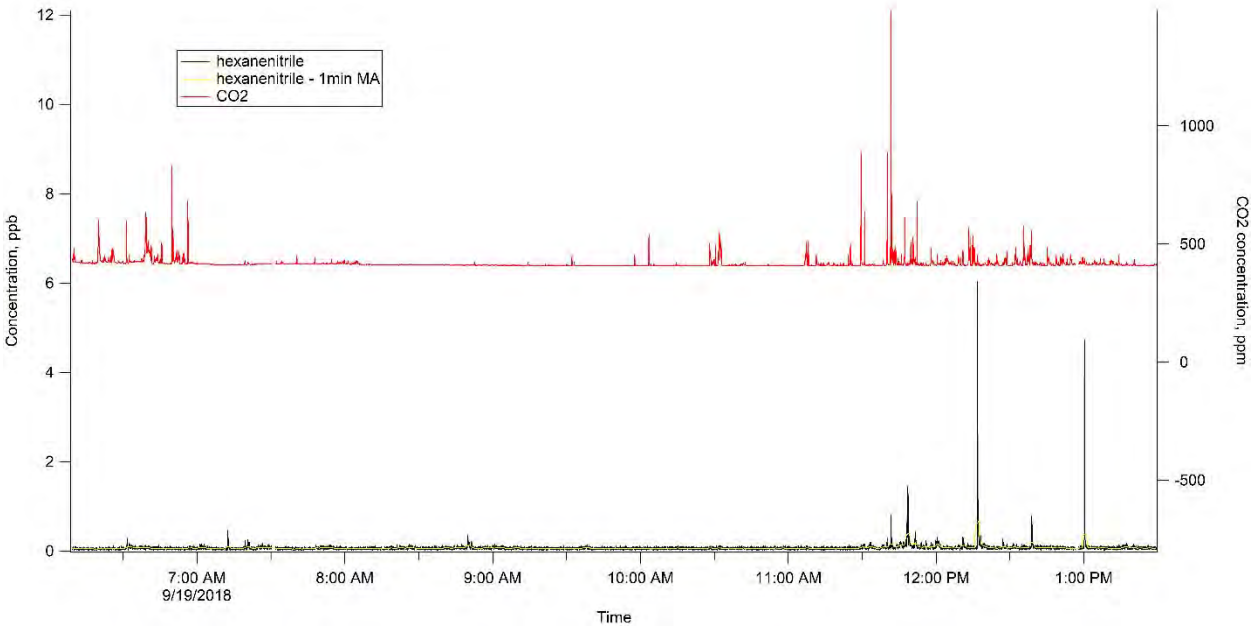

Figure 3-28. Hexanenitrile.

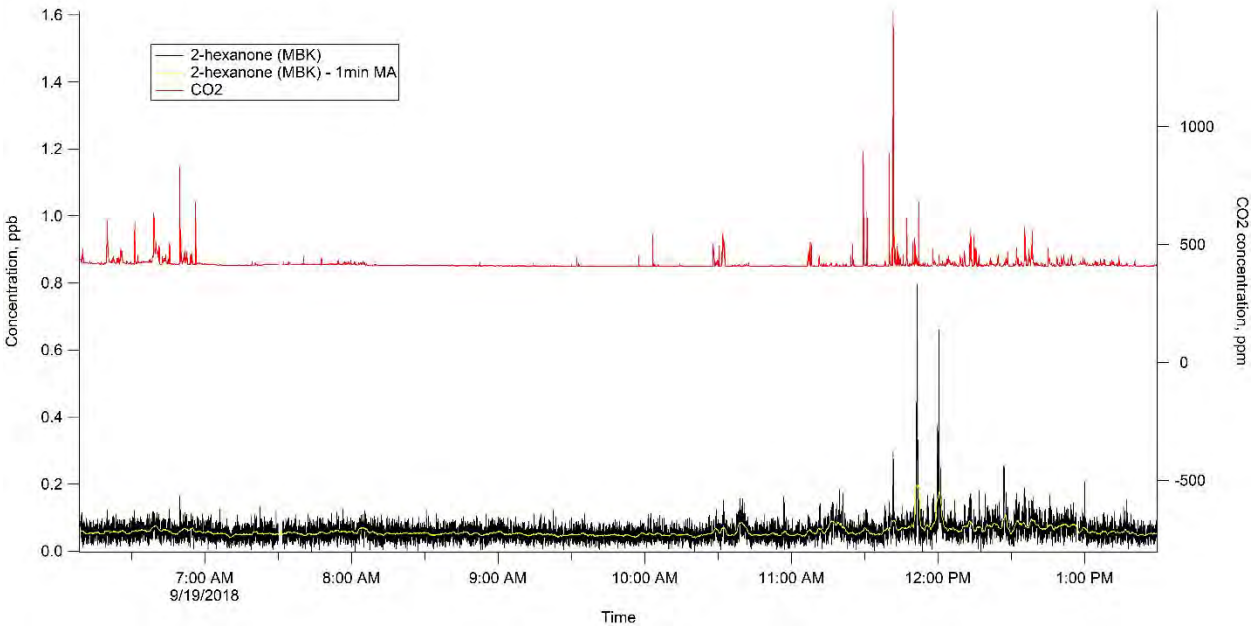

Figure 3-29. 2-hexanone (MBK).

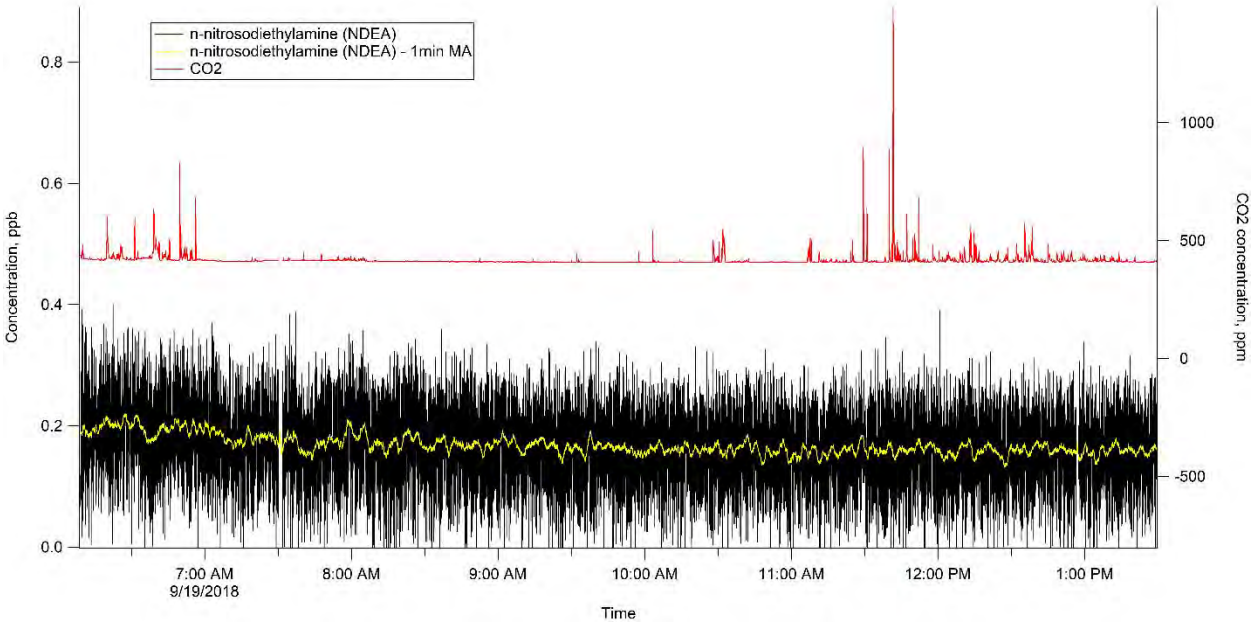

Figure 3-30. N-nitrosodiethylamine (NDEA).

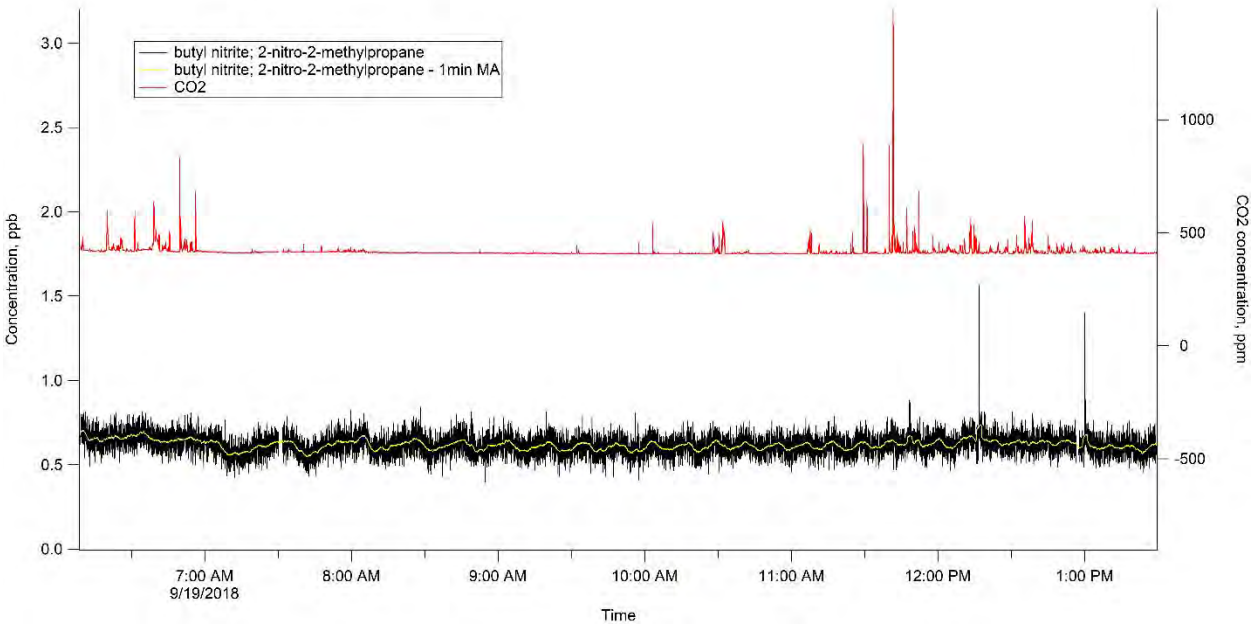

Figure 3-31. Butyl Nitrite; 2-nitro-2-methylpropane.

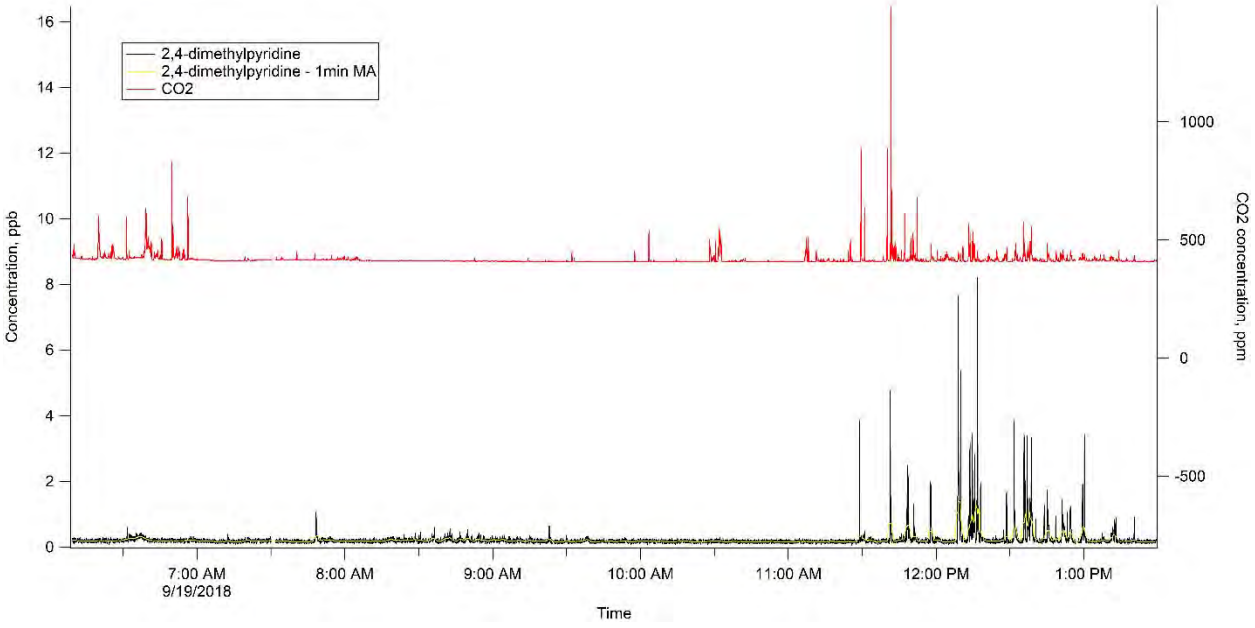

Figure 3-32. 2,4-dimethylpyridine.

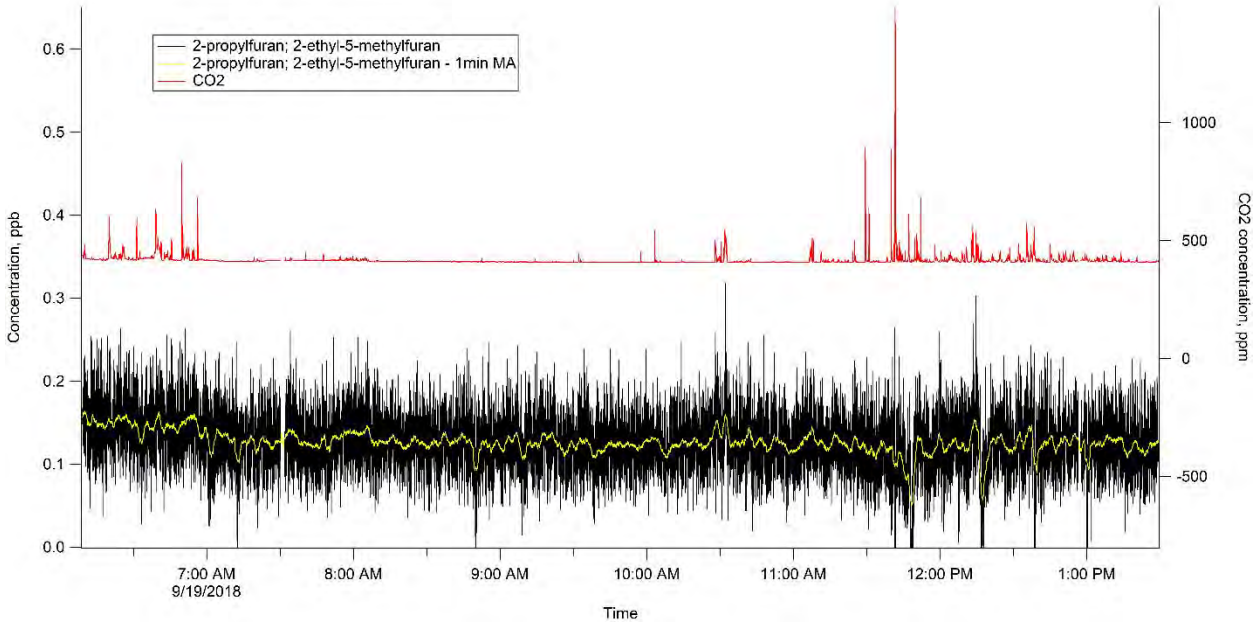

Figure 3-33. 2-propylfuran; 2-ethyl-5-methylfuran.

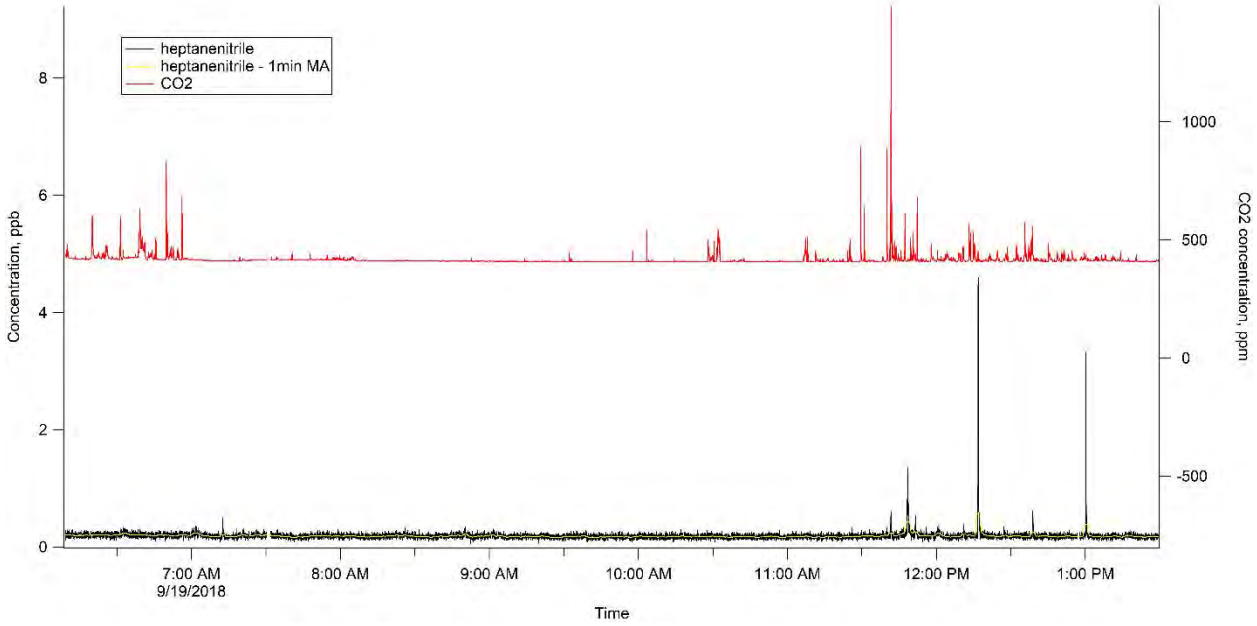

Figure 3-34. Heptanenitrile.

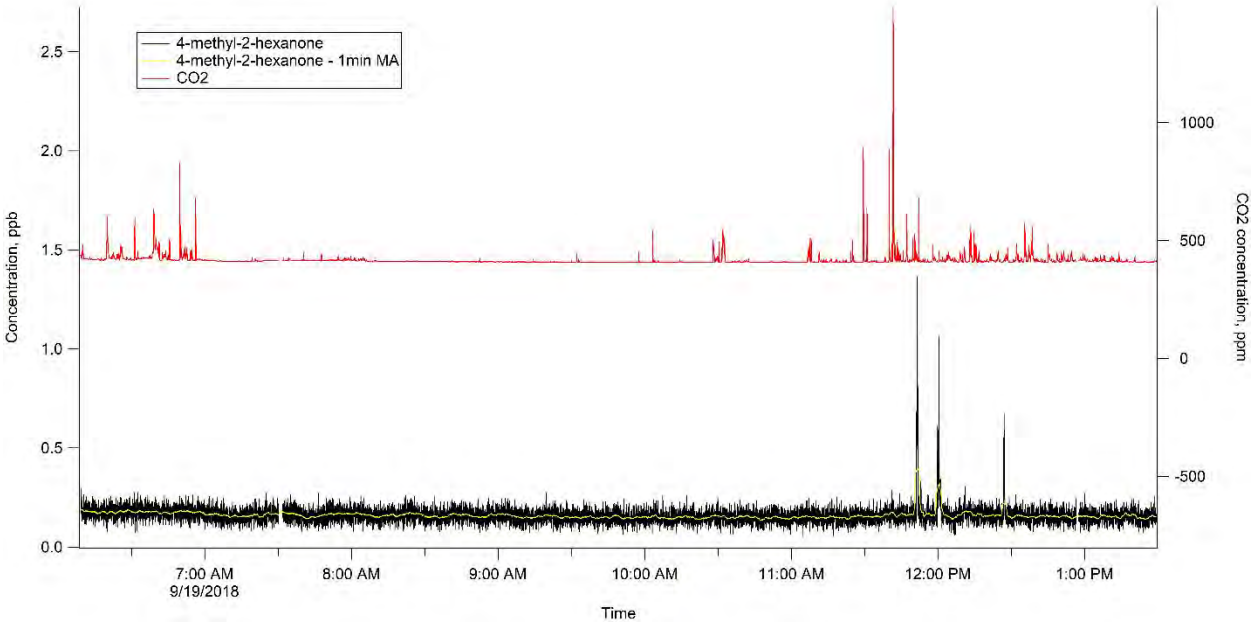

Figure 3-35. 4-methyl-2-hexanone.

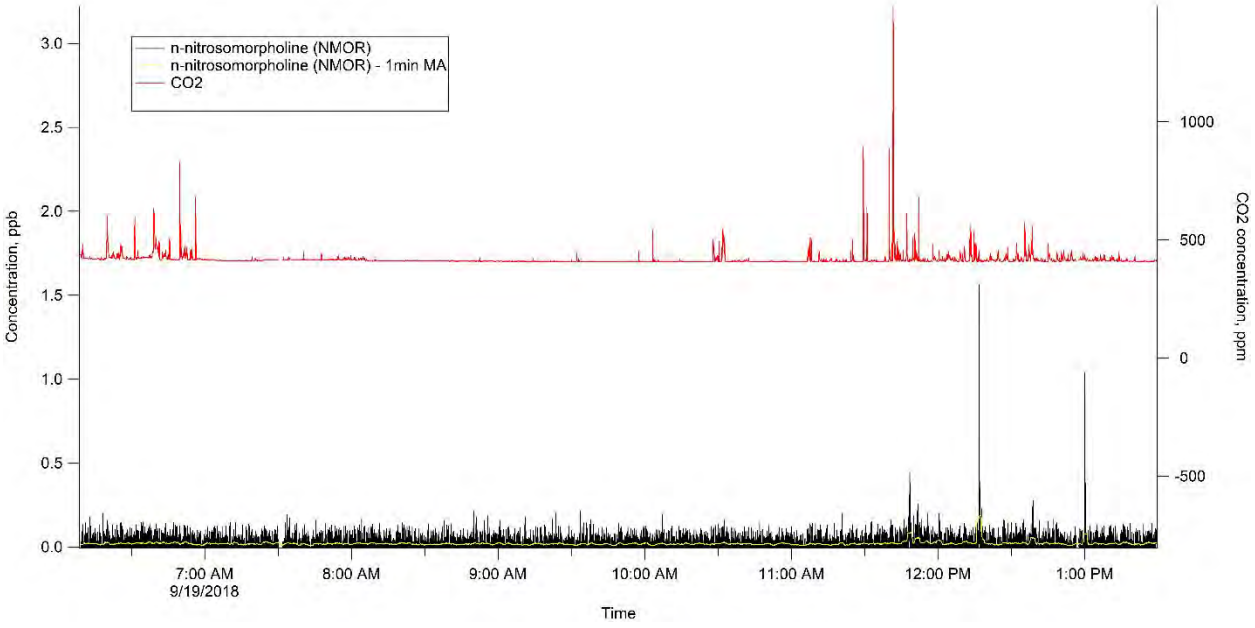

Figure 3-36. N-nitrosomorpholine (NMOR).

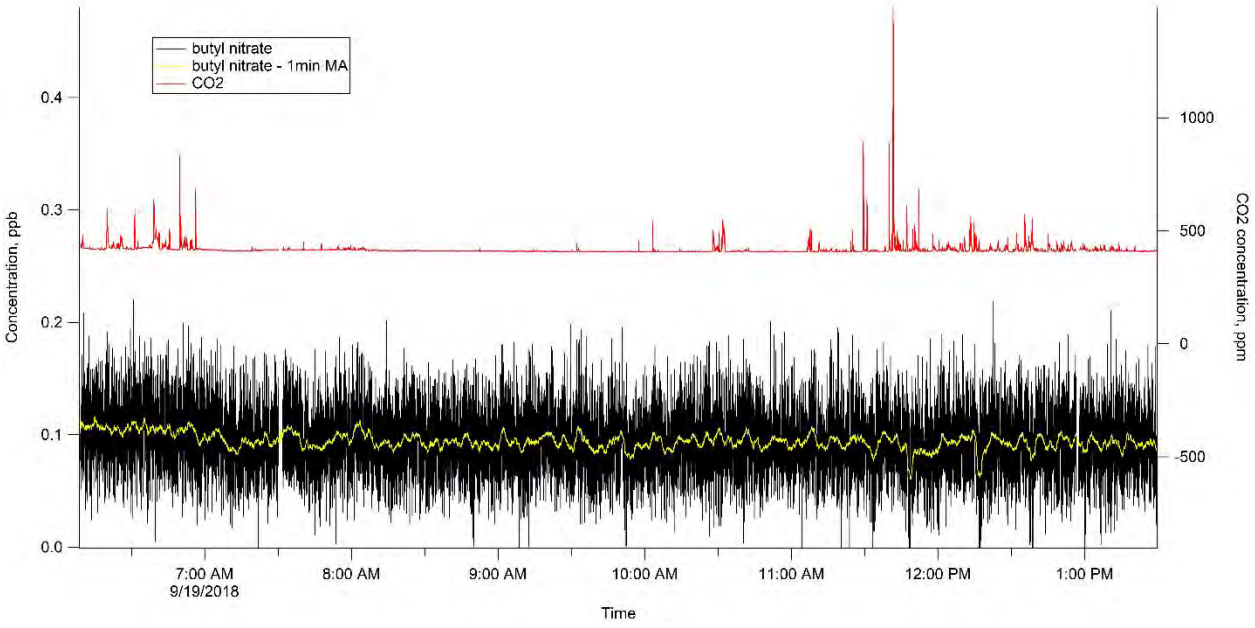

Figure 3-37. Butyl Nitrate.

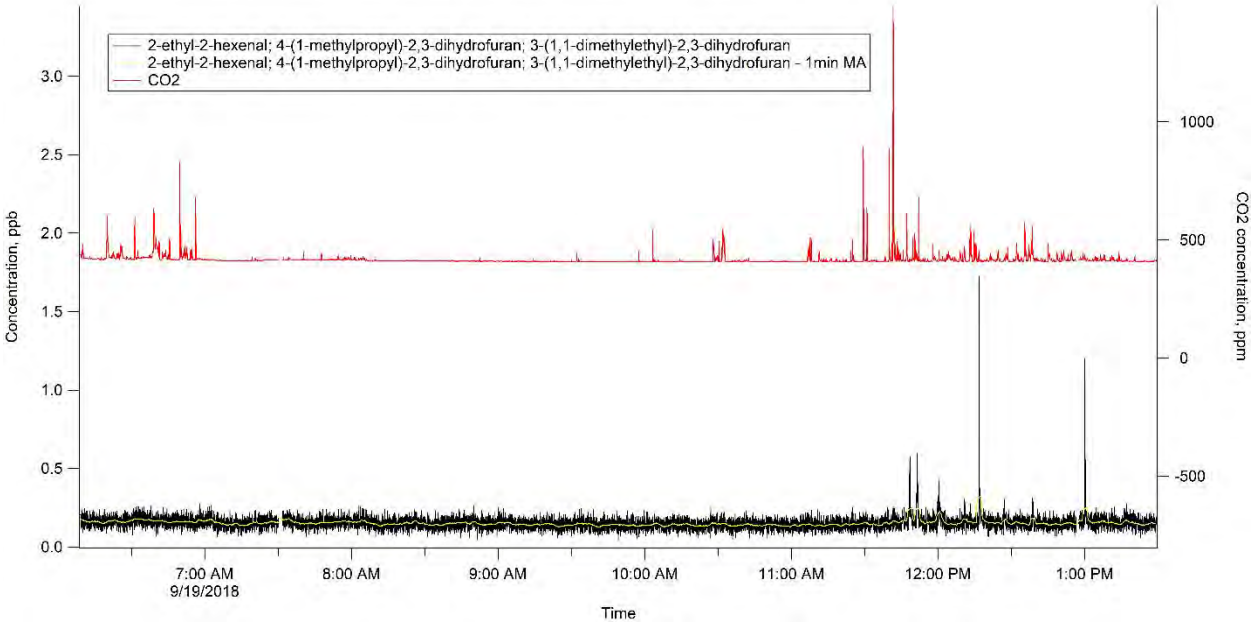

Figure 3-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

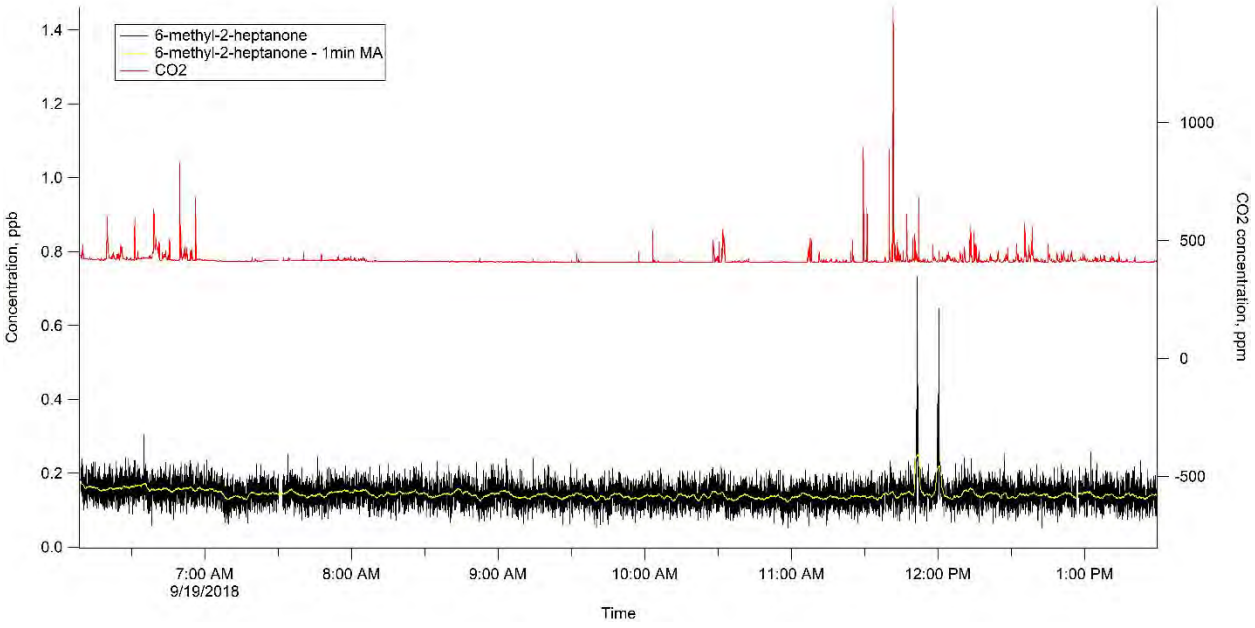

Figure 3-39. 6-methyl-2-heptanone.

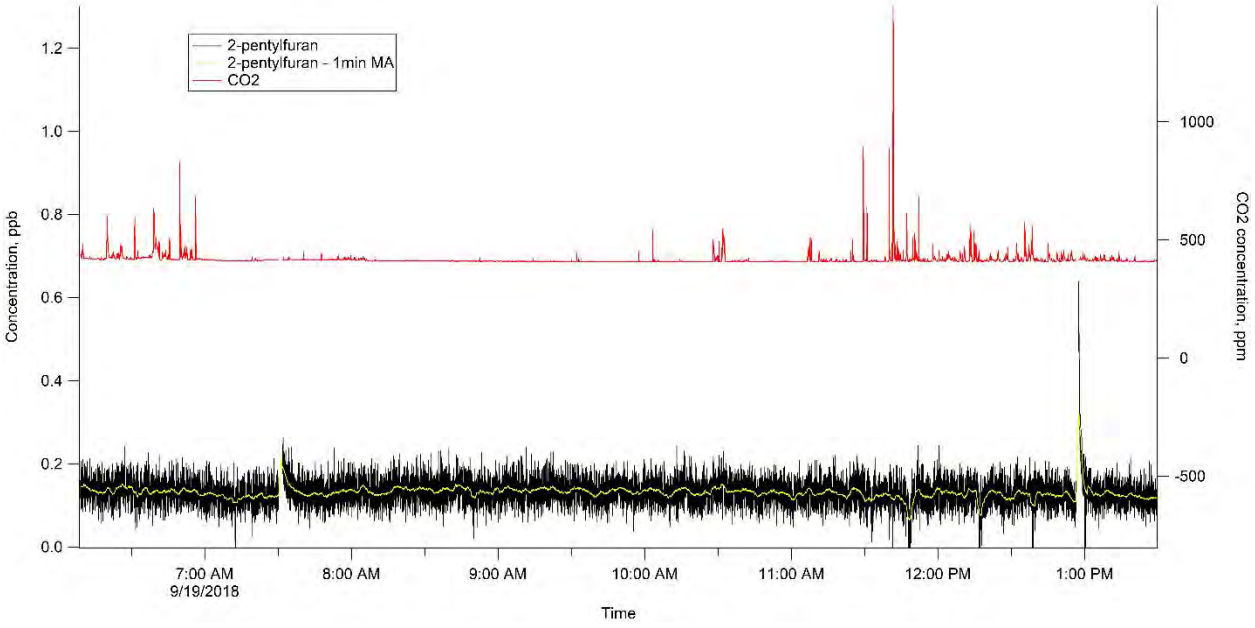

Figure 3-40. 2-pentylfuran.

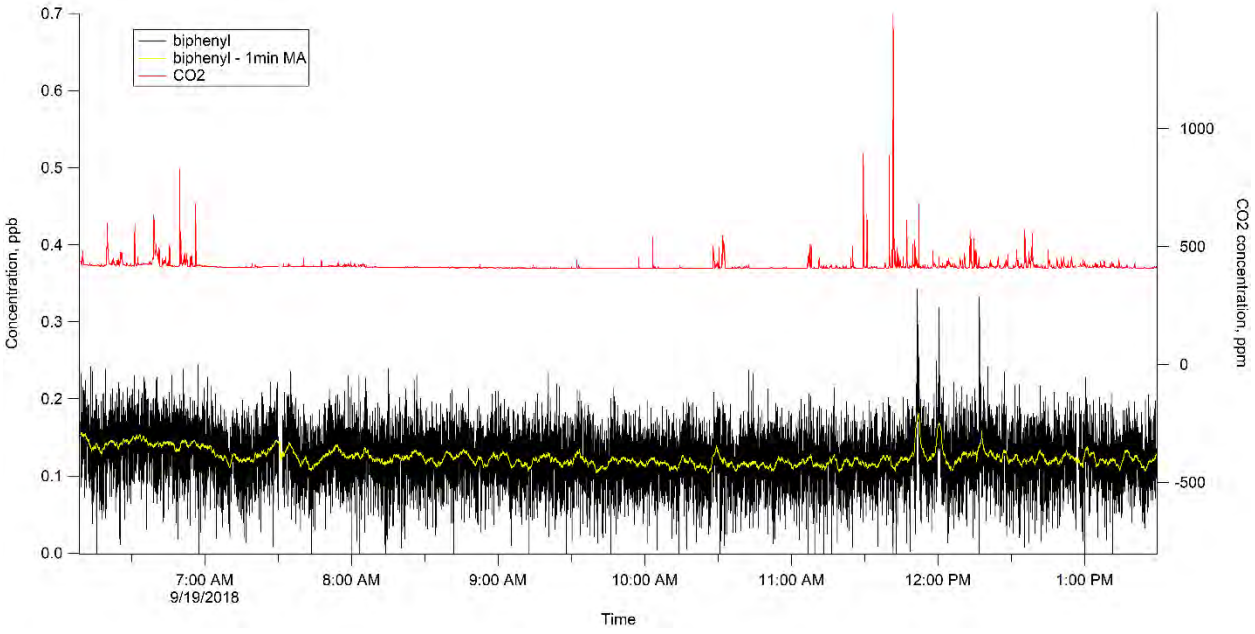

Figure 3-41. Biphenyl.

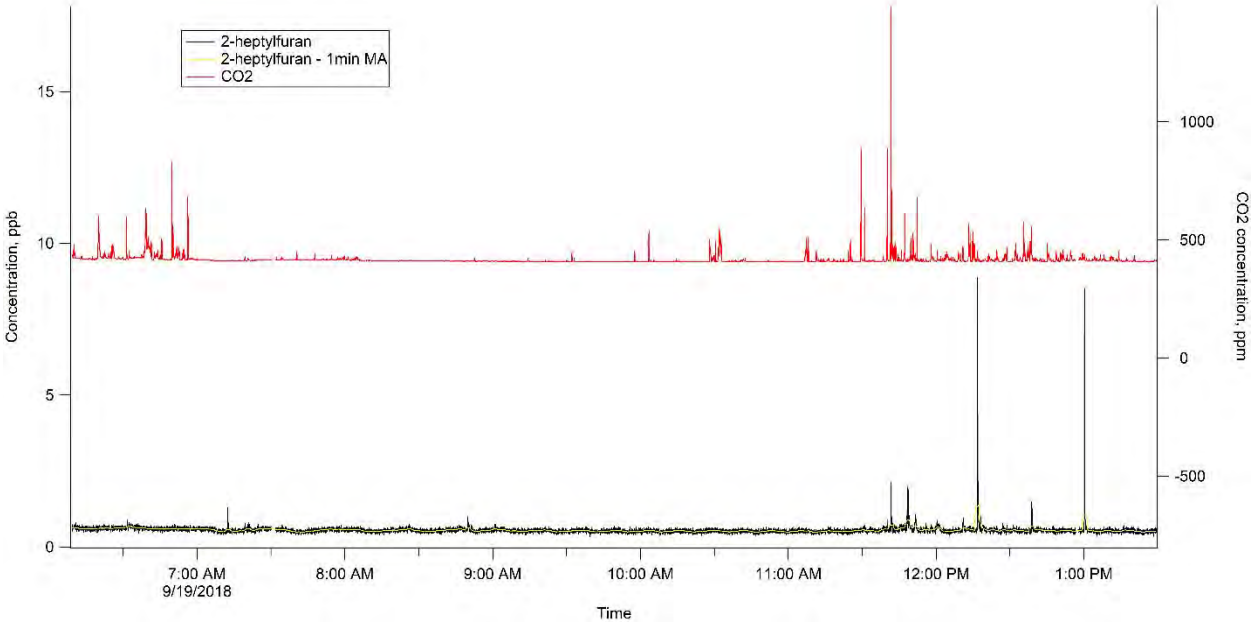

Figure 3-42. 2-heptylfuran.

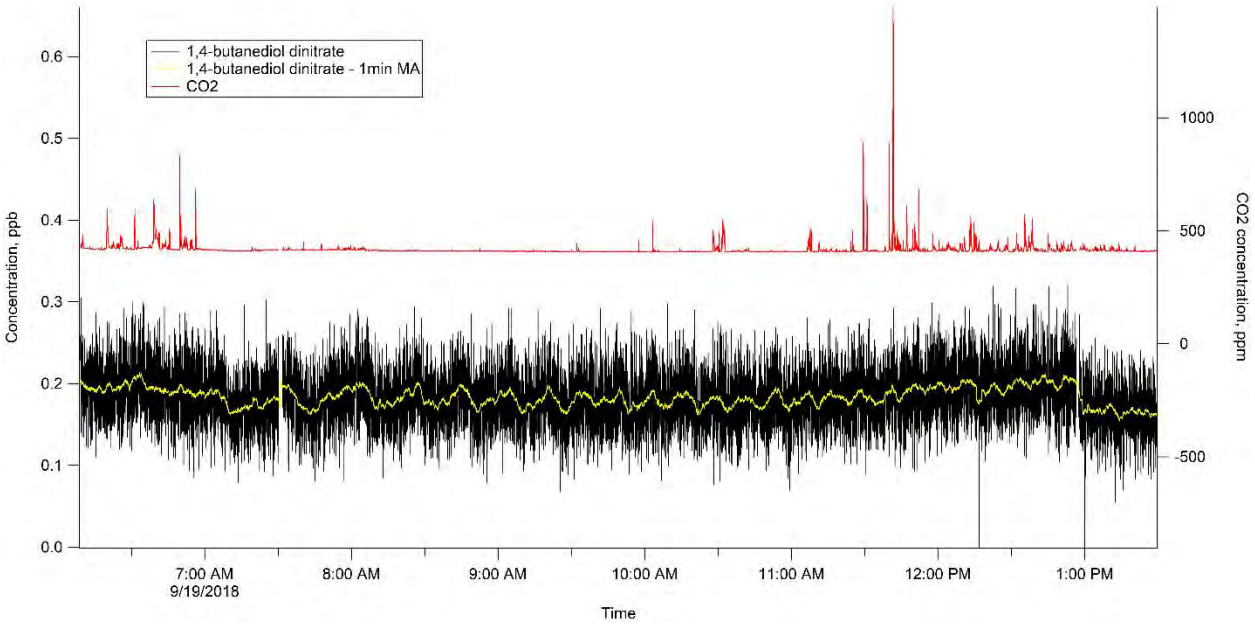

Figure 3-43. 1,4-butanediol Dinitrate.

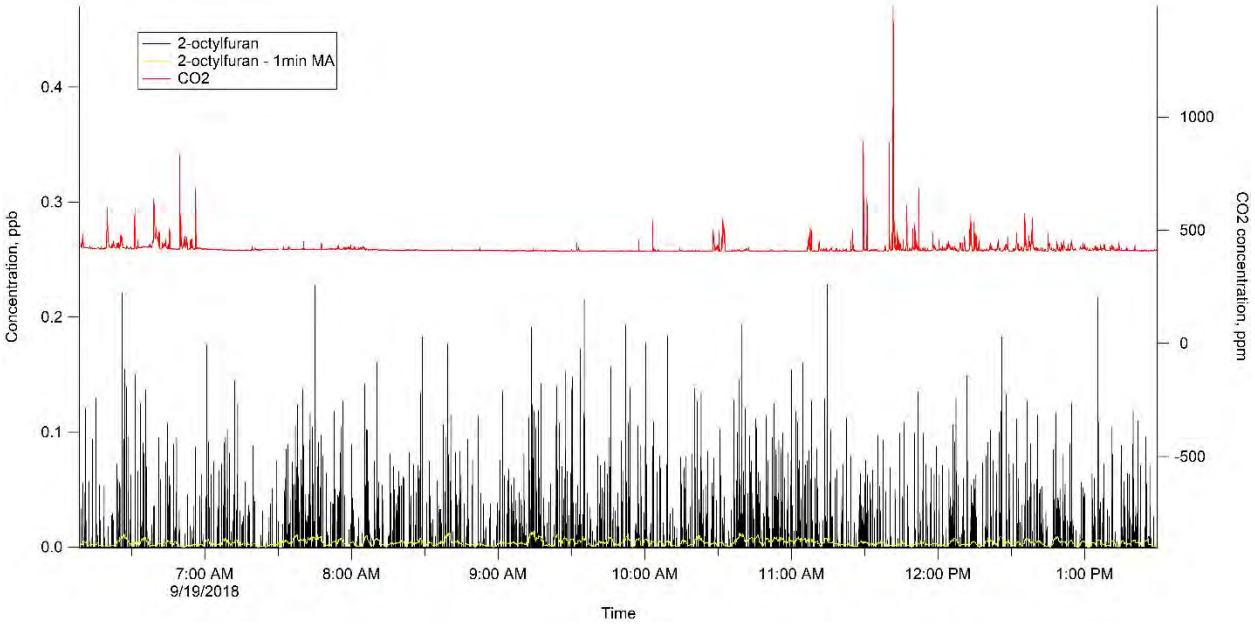

Figure 3-44. 2-octylfuran.

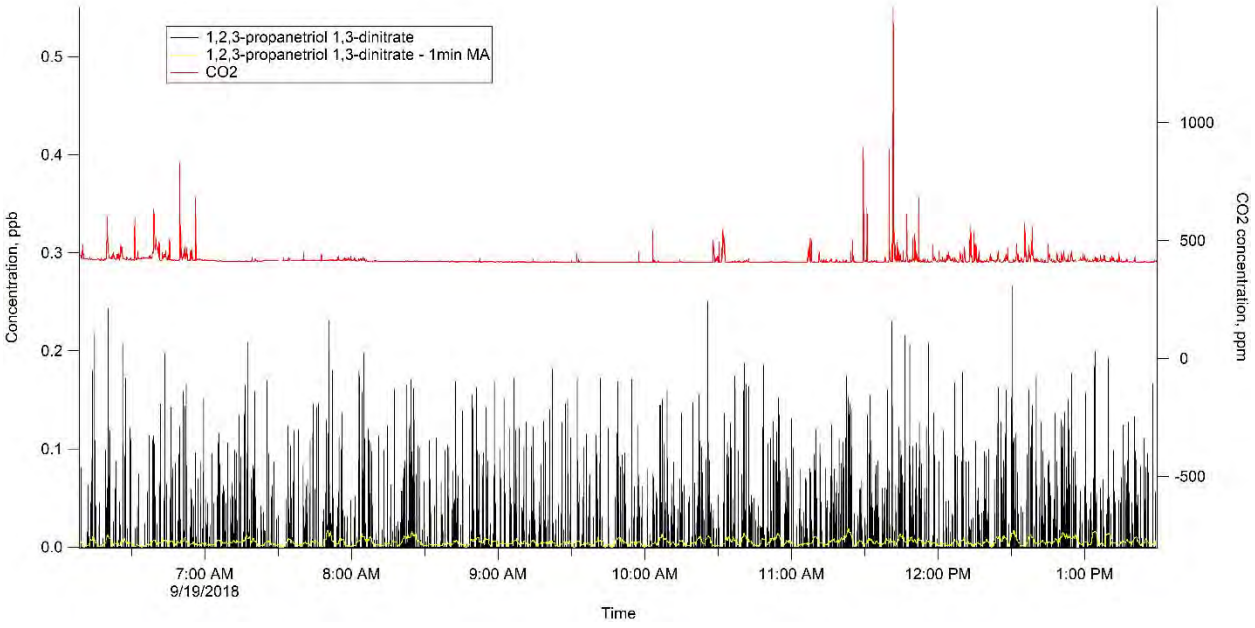

Figure 3-45. 1,2,3-propanetriol 1,3-dinitrate.

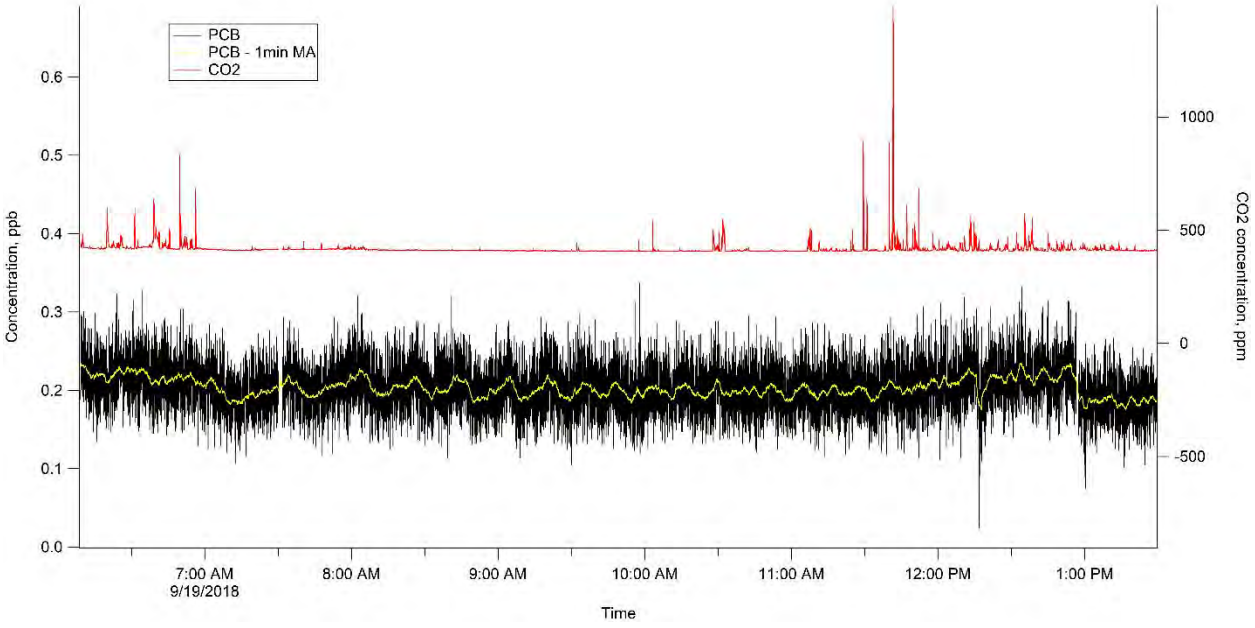

Figure 3-46. PCB.

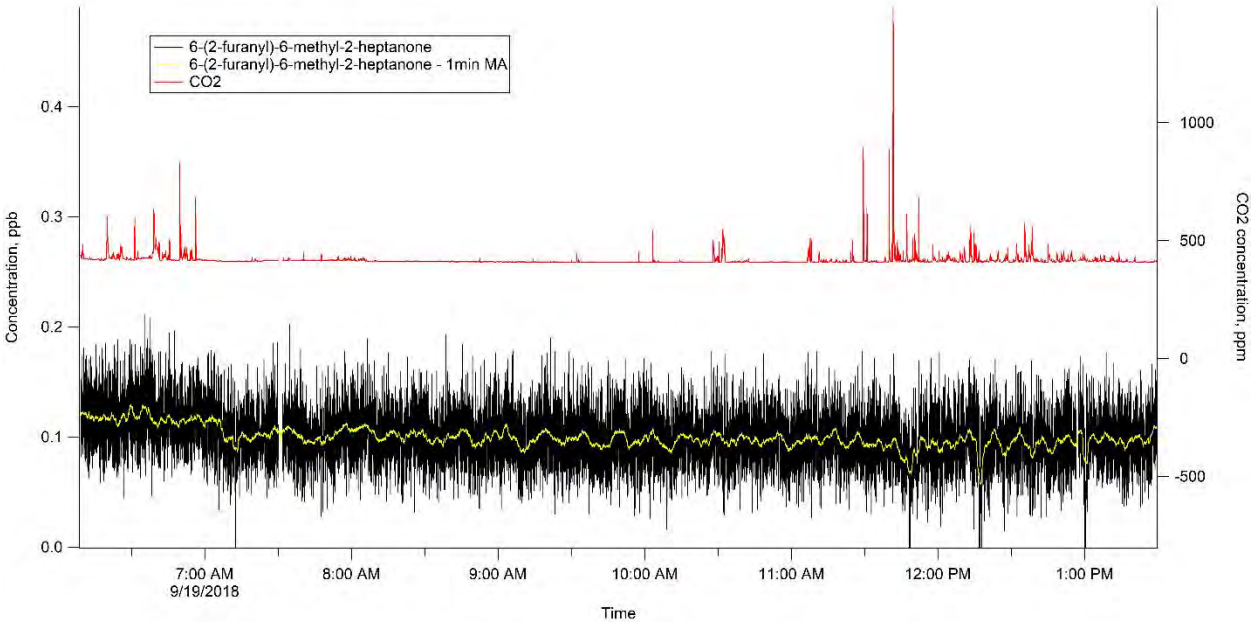

Figure 3-47. 6-(2-furanyl)-6-methyl-2-heptanone.

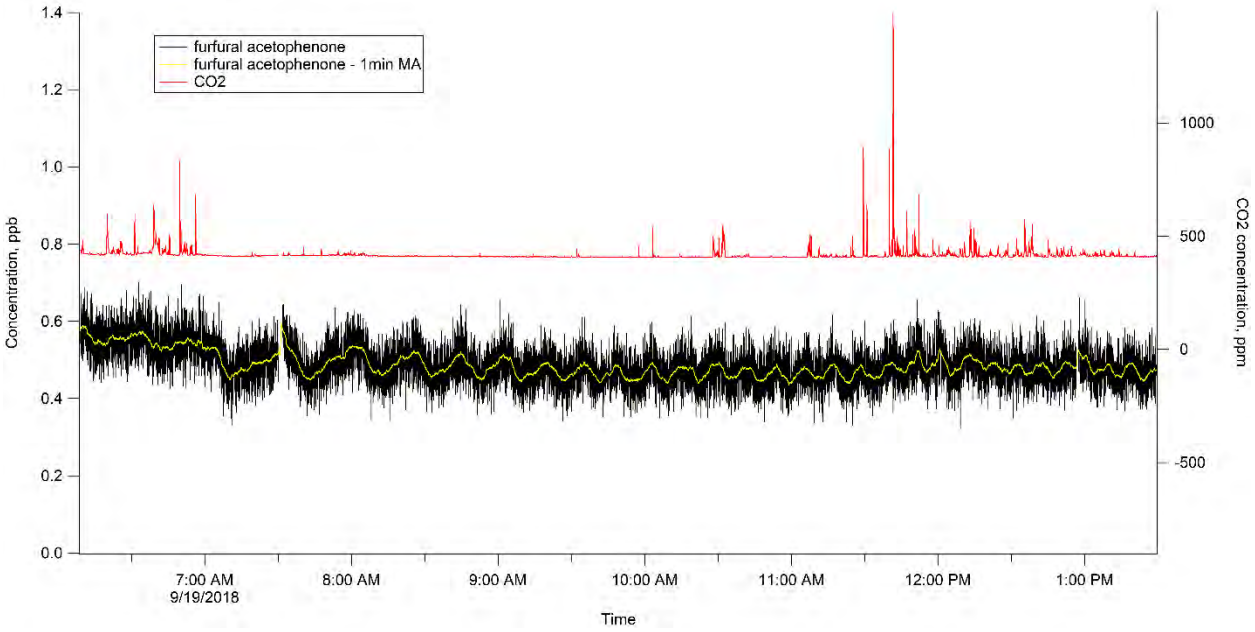

Figure 3-48. Furfural Acetophenone.

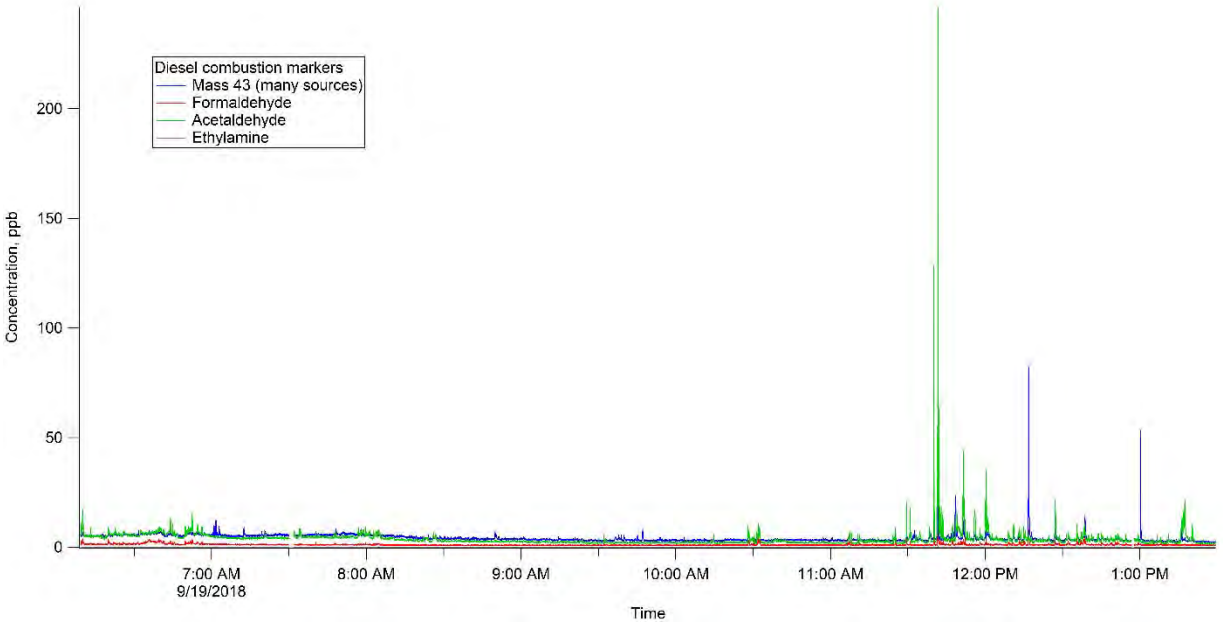

Figure 3-49. Diesel Combustion Markers.

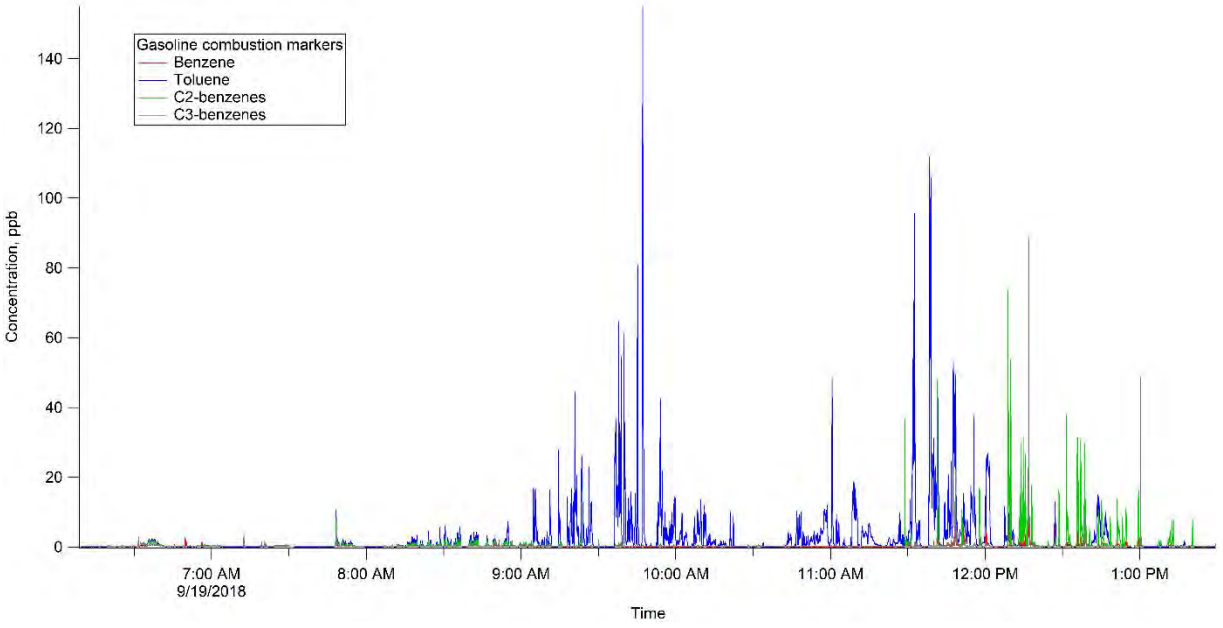

Figure 3-50. Gasoline Combustion Markers.

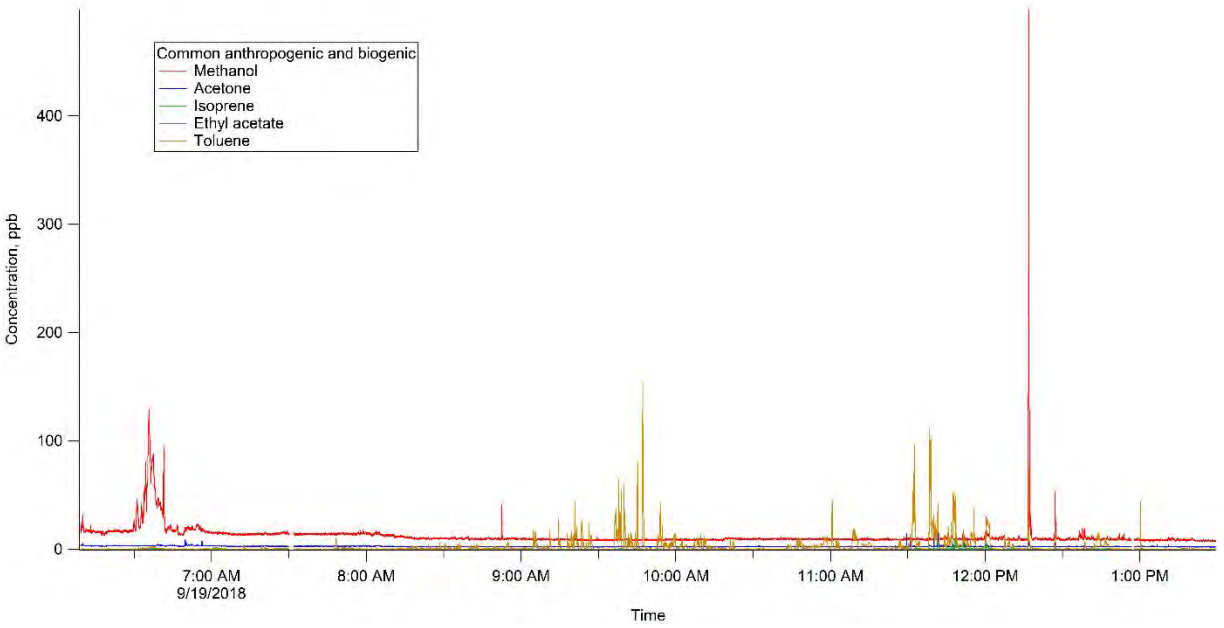

Figure 3-51. Plant and Human Markers.

4.0 SEPTEMBER 20, 2018 – SX PAVING

4.1 Quality Assessment

Data from September 20, 2018, 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.

4.2 Summary

On September 20, 2018, the ML performed general area monitoring of the Hanford Site in support of the SX Paving Project.

The ML checked in at the CSO at 05:20. A QA/QC zero-air/sensitivity check began on the CO_2 monitor, the Picarro ammonia analyzer, and the PTR-MS prior to arrival at 04:42. The ML staff began mobile monitoring of SX Farm at 05:38. At 06:18, the ML staff began sorbent sampling while located on the southwest side of the farm. For the remainder of the shift, the ML alternated between the east and west side of the farm, in an effort to remain downwind of paving activities.

The ML staff checked out with the CSO at 13:48. The ML arrived back at the TerraGraphics warehouse at 14:50.

Table 4-1. Mobile Laboratory Sampling Mode Throughout the Monitoring Period.

Time	Location	Sampling Mode
05:38 - 06:30	SX Farm (SW side of farm)	Mobile Area Sampling
06:30 - 08:00	SX Farm (East side of farm)	Mobile Area Sampling
08:00 - 08:28	SX Farm (West side of farm)	Mobile Area Sampling
08:28 - 09:40	SX Farm (East entrance of farm)	Mobile Area Sampling
09:40 - 13:30	SX Farm (East side of farm)	Mobile Area Sampling

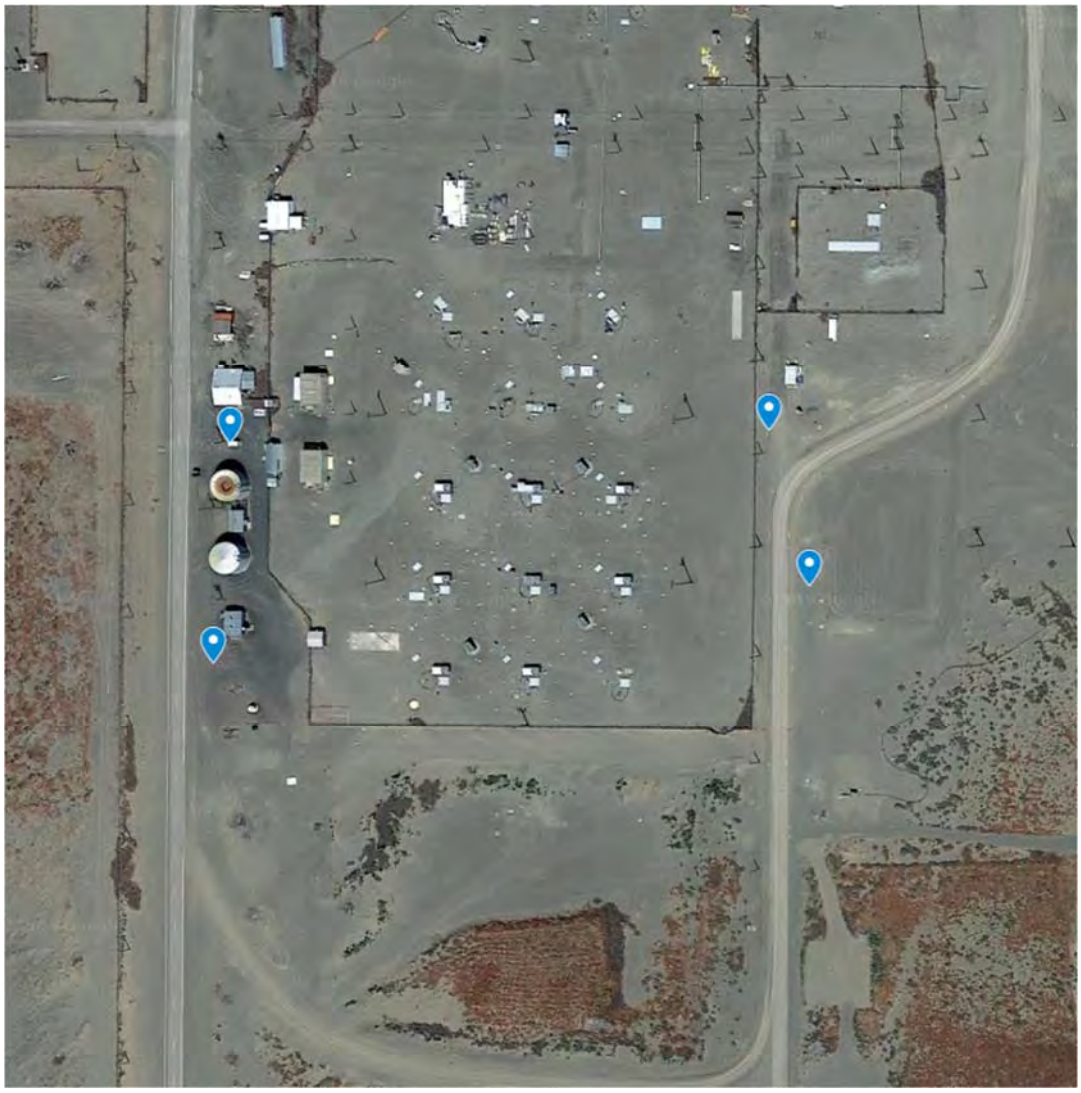

Figure 4-1. Mobile Laboratory Location for the Duration of the Monitoring Period.

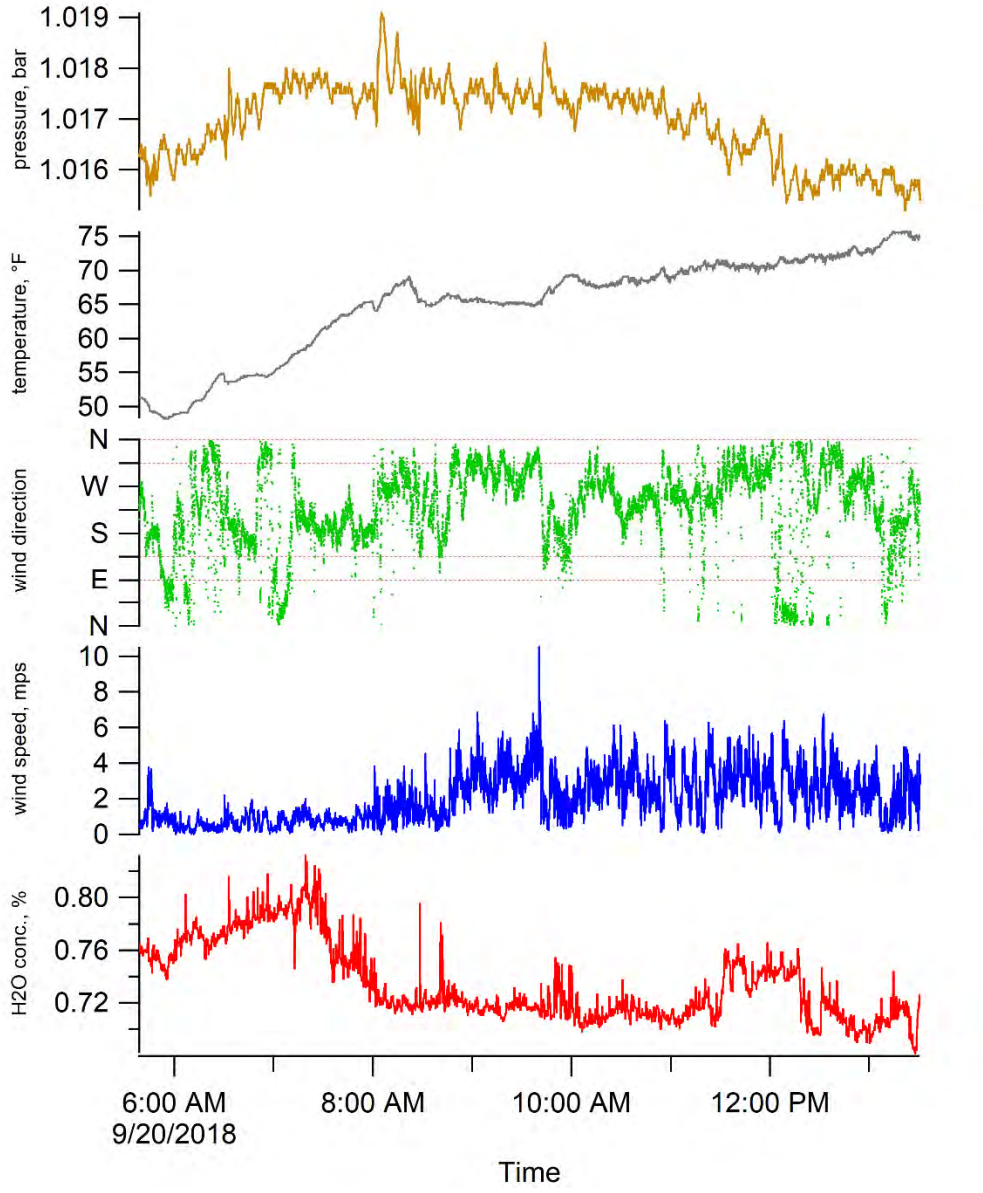

Figure 4-2. Weather Data for the Duration of the Monitoring Period.

4.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

Table 4-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 20, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	4.146	1.313	31.677	10.424	3.631
2	formaldehyde	300	0.751	0.251	33.379	8.603	0.692
3	methanol	200000	7.191	4.333	60.251	131.019	5.437
4	acetonitrile	20000	0.164	0.037	22.508	1.116	0.161
5	acetaldehyde	25000	2.373	2.555	107.658	162.334	1.516
6	ethylamine	5000	0.027	0.015	55.739	0.227	0.024
7	1,3-butadiene	1000	0.233	0.538	230.628	7.910	0.042
8	propanenitrile	6000	0.078	0.099	127.873	5.183	0.060
9	2-propenal	100	0.169	0.290	171.905	18.830	0.114
10	1-butanol + butenes	20000	1.331	4.169	313.204	161.280	0.288
11	methyl isocyanate	20	0.039	0.027	69.360	1.080	0.036
12	methyl nitrite	100	0.113	0.082	72.295	1.204	0.080
13	furan	1	0.038	0.031	80.185	0.521	0.028
14	butanenitrile	8000	0.031	0.036	118.471	0.525	0.021
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	100, 1, 1	0.050	0.045	89.715	N/A*	N/A*
16	butanal	25000	0.126	0.094	74.584	2.630	0.088
17	NDMA**	0.3	0.028	0.037	130.621	0.506	0.015
18	benzene	500	0.132	0.170	128.596	4.852	0.085
19	2,4-pentadienenitrile + pyridine	300, 1000	0.031	0.022	71.241	0.753	0.028
20	2-methylene butanenitrile	30	0.025	0.026	103.868	0.347	0.019
21	2-methylfuran	1	0.035	0.032	91.647	0.429	0.024
22	pentanenitrile	6000	0.023	0.033	140.022	0.473	0.015
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.041	0.033	82.015	0.676	0.030
24	NEMA**	0.3	0.016	0.021	133.472	0.178	0.007
25	2,5-dimethylfuran	1	0.050	0.037	73.825	0.888	0.049
26	hexanenitrile	6000	0.050	0.035	71.093	0.374	0.047
27	2-hexanone (MBK)	5000	0.061	0.044	71.749	0.488	0.049
28	NDEA**	0.1	0.154	0.076	49.169	0.416	0.149
29	butyl nitrite + 2-nitro-2-methylpropane	100, 30	0.570	0.210	36.879	10.864	0.573
30	2,4-dimethylpyridine	500	0.171	0.081	47.016	3.857	0.162
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.118	0.042	35.721	0.287	0.116

Table 4-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 20, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.175	0.044	25.227	0.420	0.172
33	4-methyl-2-hexanone	500	0.148	0.040	27.002	0.357	0.145
34	NMOR**	0.6	0.019	0.031	161.941	0.216	0.000
35	butyl nitrate	2500	0.089	0.032	35.746	0.263	0.088
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.141	0.038	26.672	0.324	0.139
37	6-methyl-2-heptanone	8000	0.135	0.035	25.964	0.308	0.133
38	2-pentylfuran	1	0.115	0.036	31.357	0.255	0.113
39	biphenyl	200	0.118	0.040	33.763	0.285	0.116
40	2-heptylfuran	1	0.521	0.111	21.325	1.498	0.526
41	1,4-butanediol dinitrate	50	0.165	0.171	103.344	10.610	0.160
42	2-octylfuran	1	0.003	0.015	452.234	0.219	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.004	0.027	605.478	1.043	0.000
44	PCB	1000	0.185	0.165	89.395	9.973	0.181
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.097	0.031	31.802	0.251	0.096
46	furfural acetophenone	1	0.460	0.096	20.799	1.418	0.467

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.726 ppb and the median value was 0.031 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 studies [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., 2017].

The following figures display a selection of COPC signals, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 20, 2018.

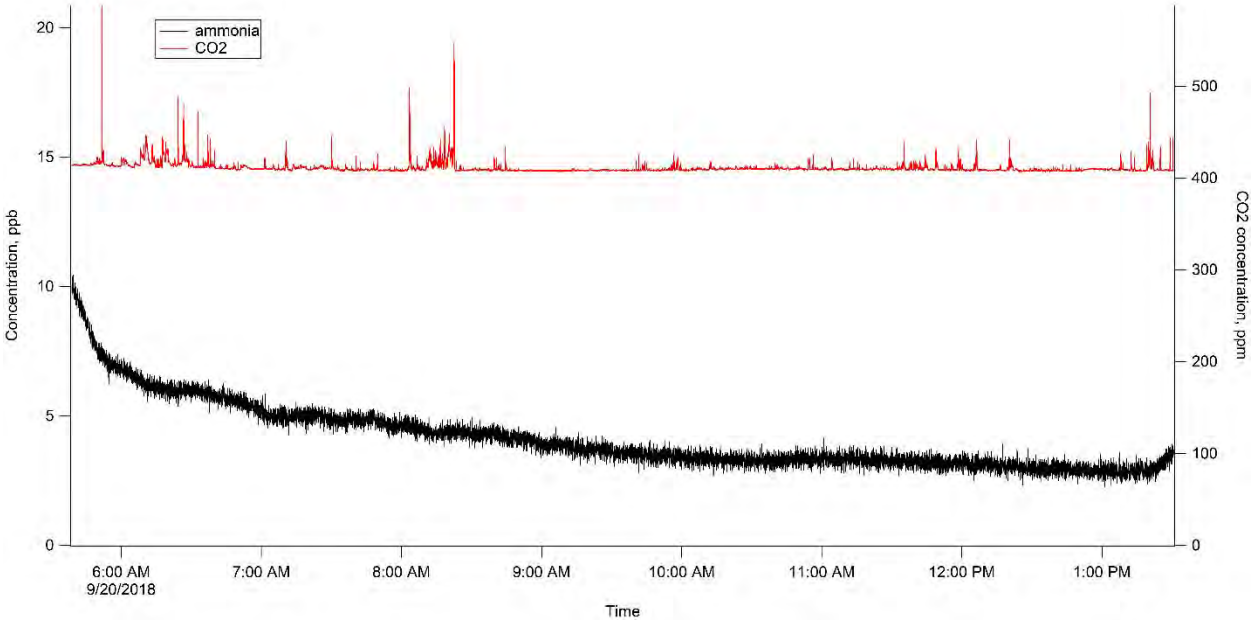

Figure 4-3. Ammonia.

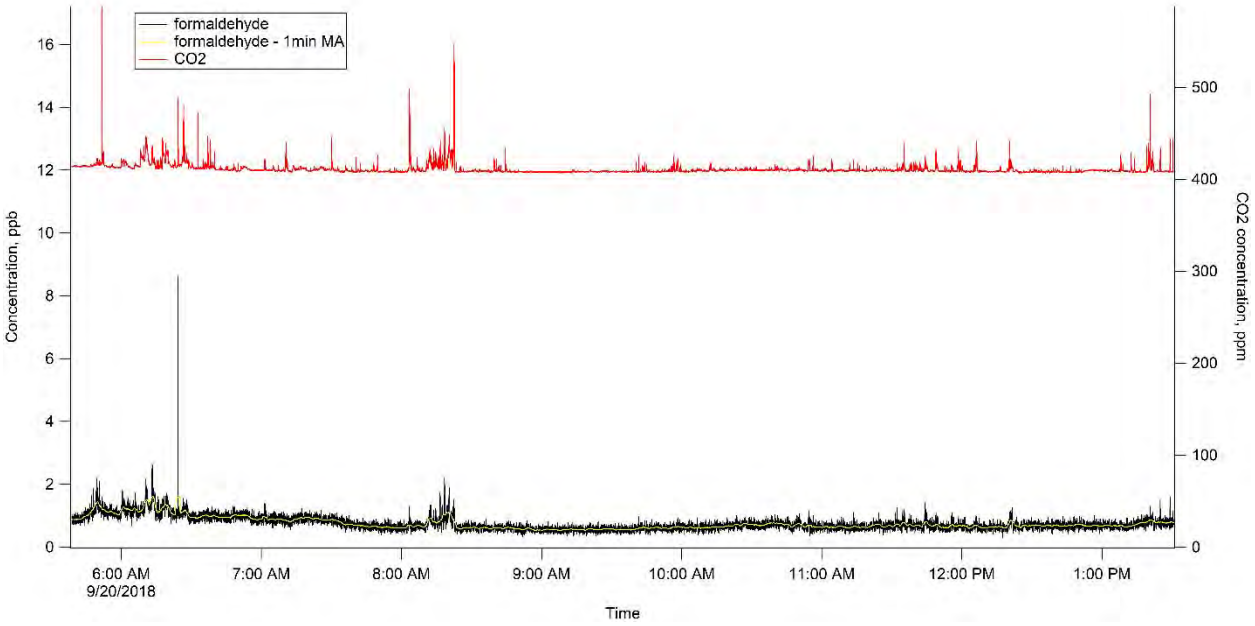

Figure 4-4. Formaldehyde.

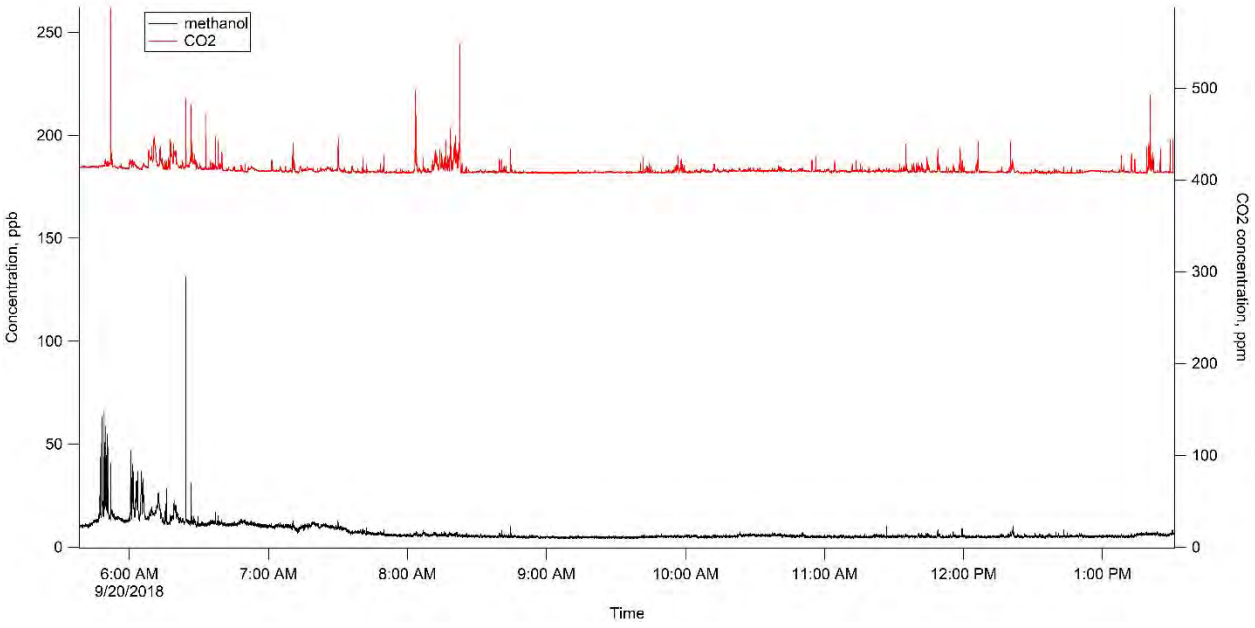

Figure 4-5. Methanol.

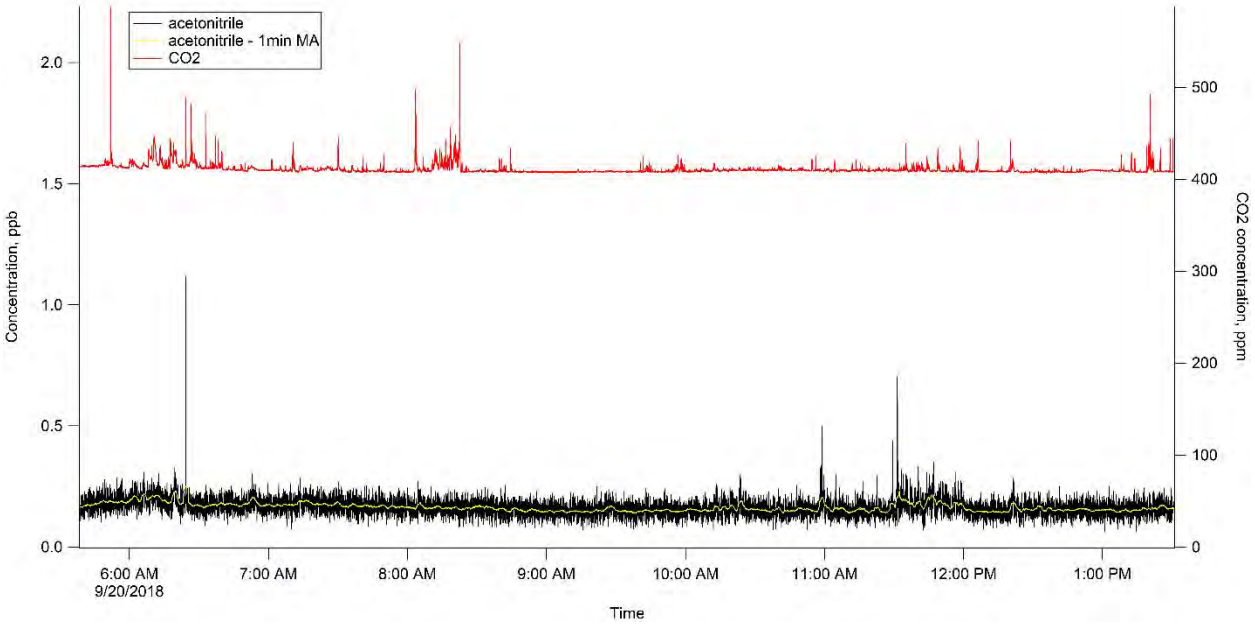

Figure 4-6. Acetonitrile.

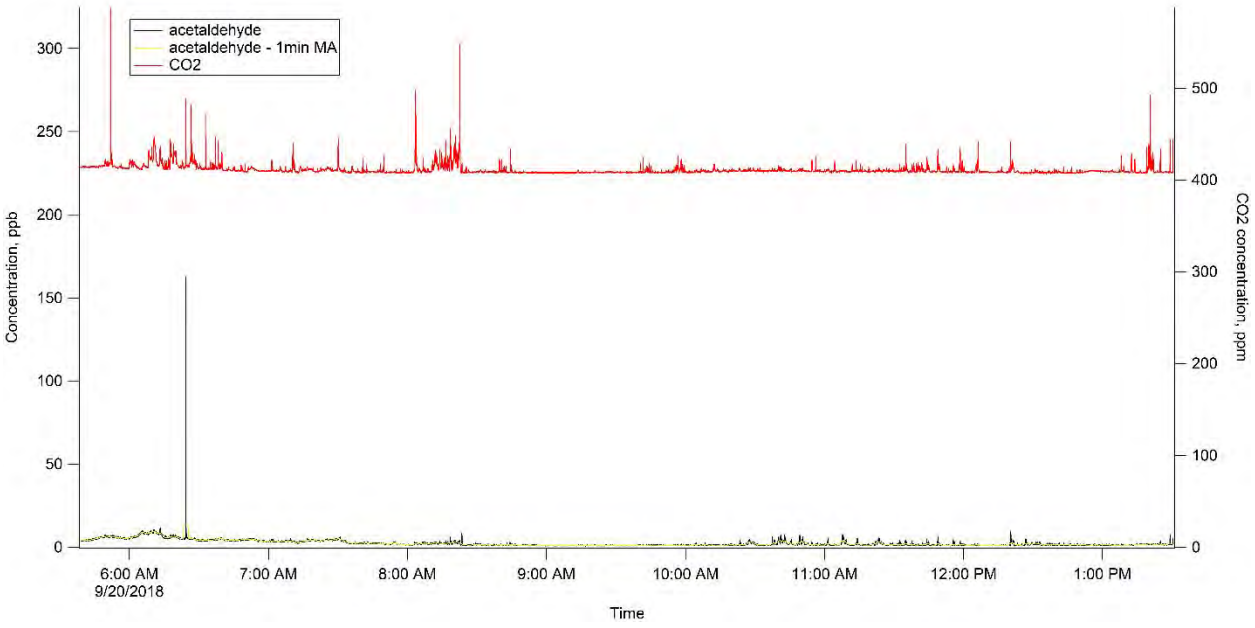

Figure 4-7. Acetaldehyde.

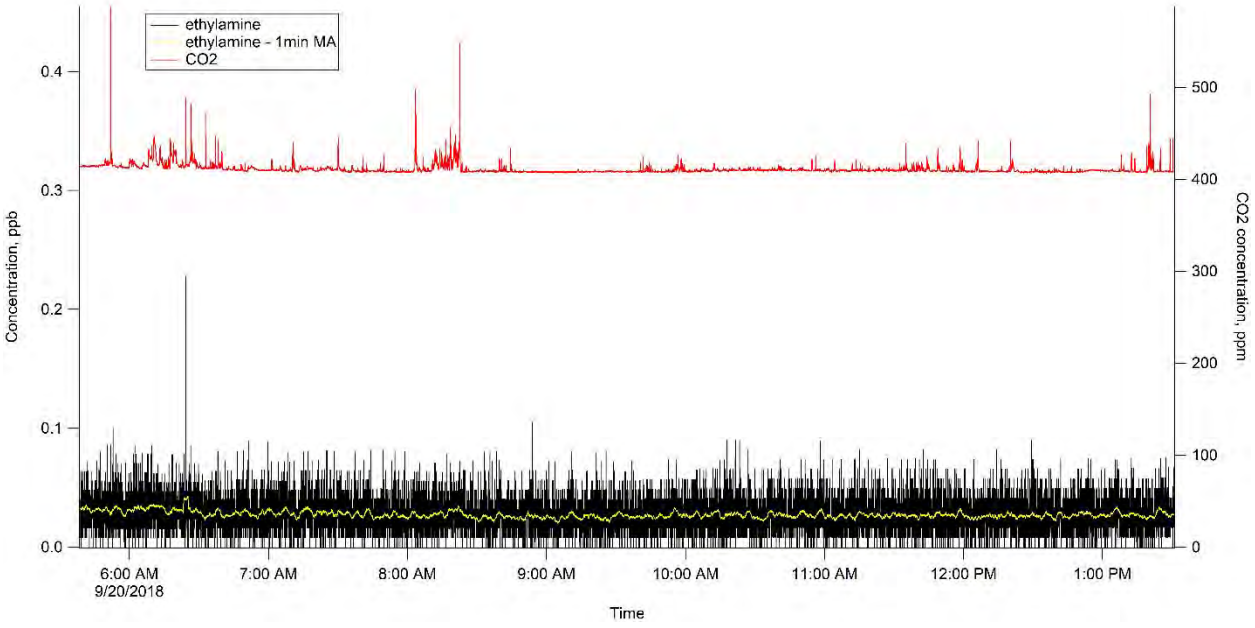

Figure 4-8. Ethylamine.

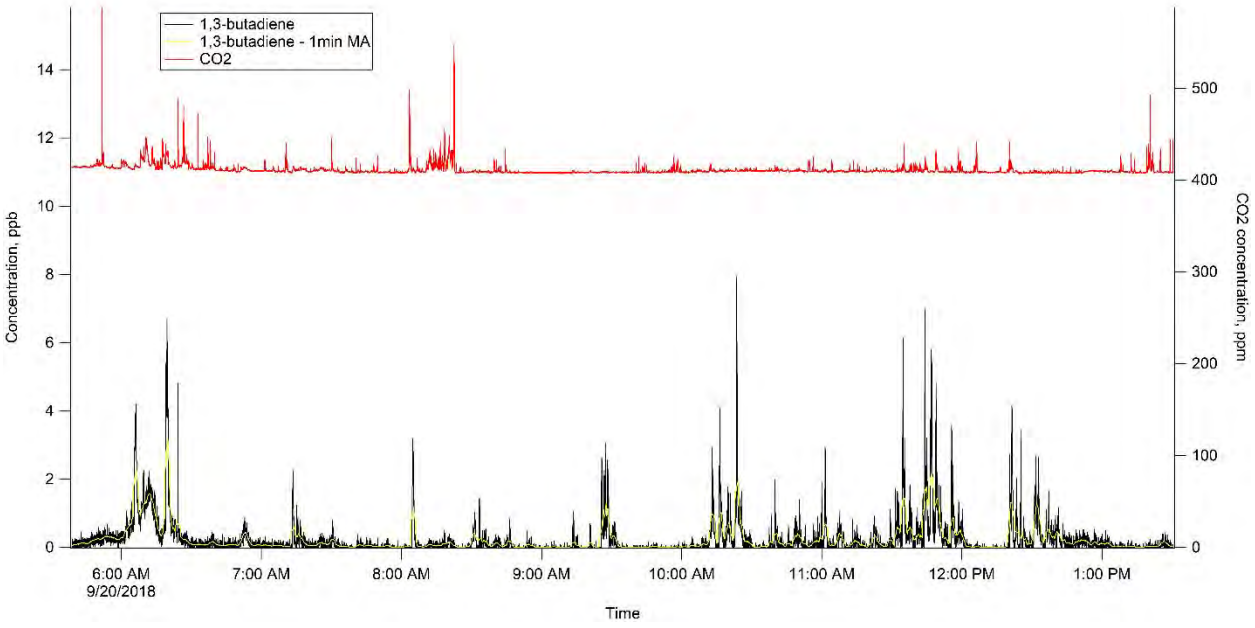

Figure 4-9. 1,3-butadiene.

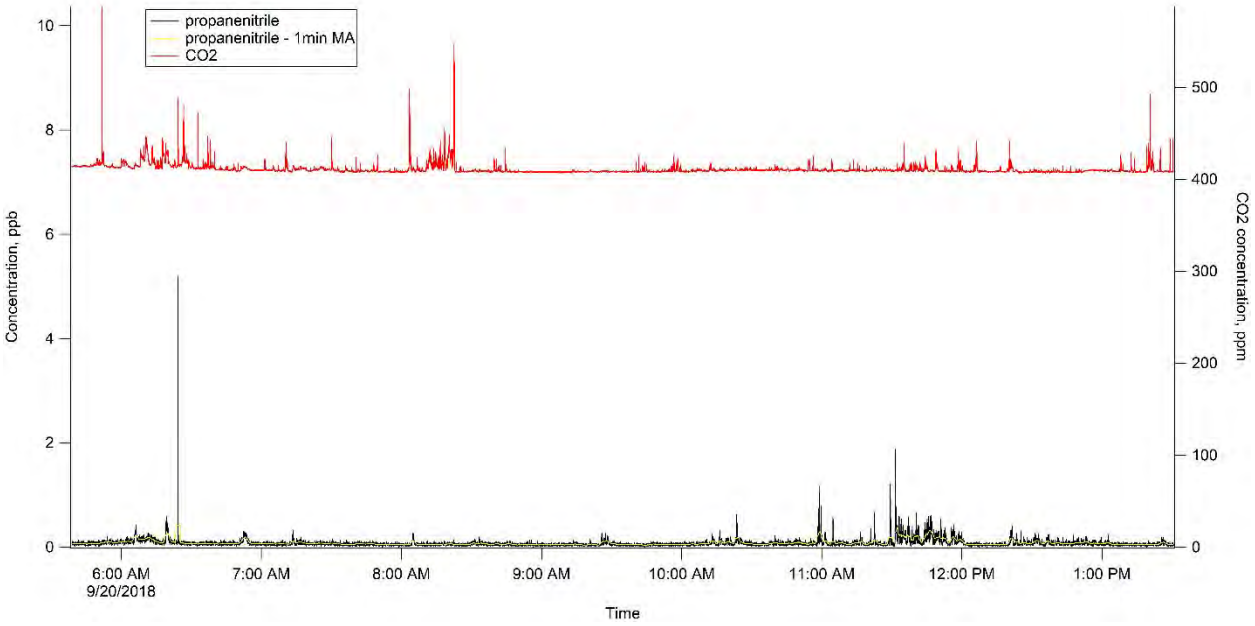

Figure 4-10. Propanenitrile.

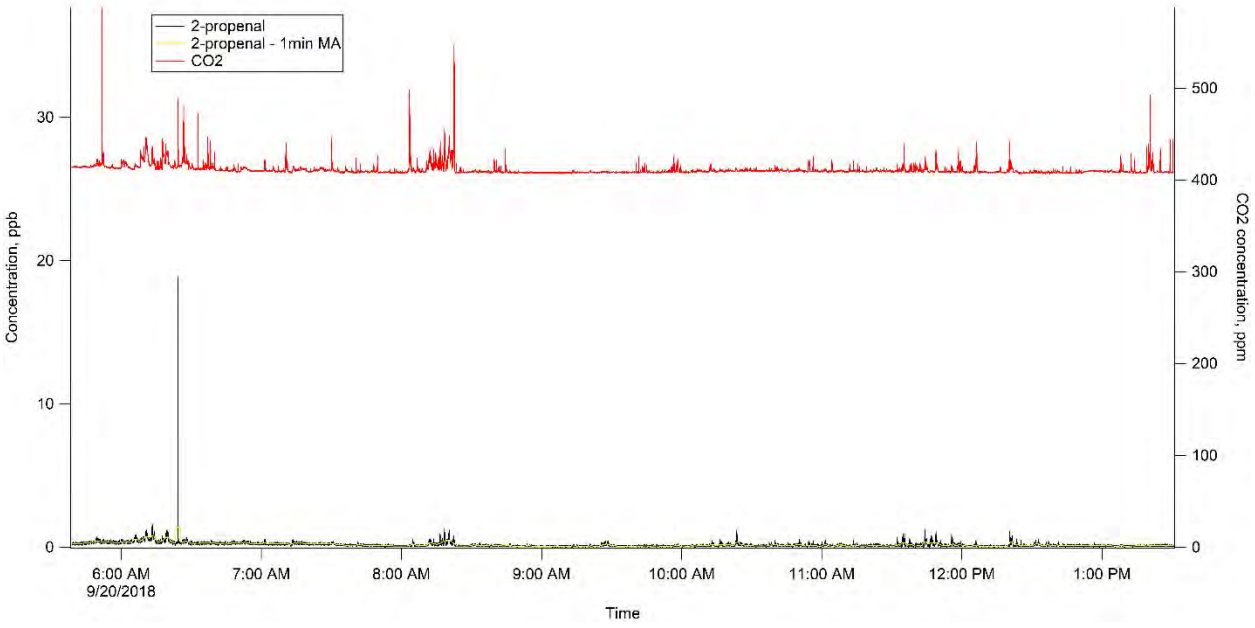

Figure 4-11. 2-propenal.

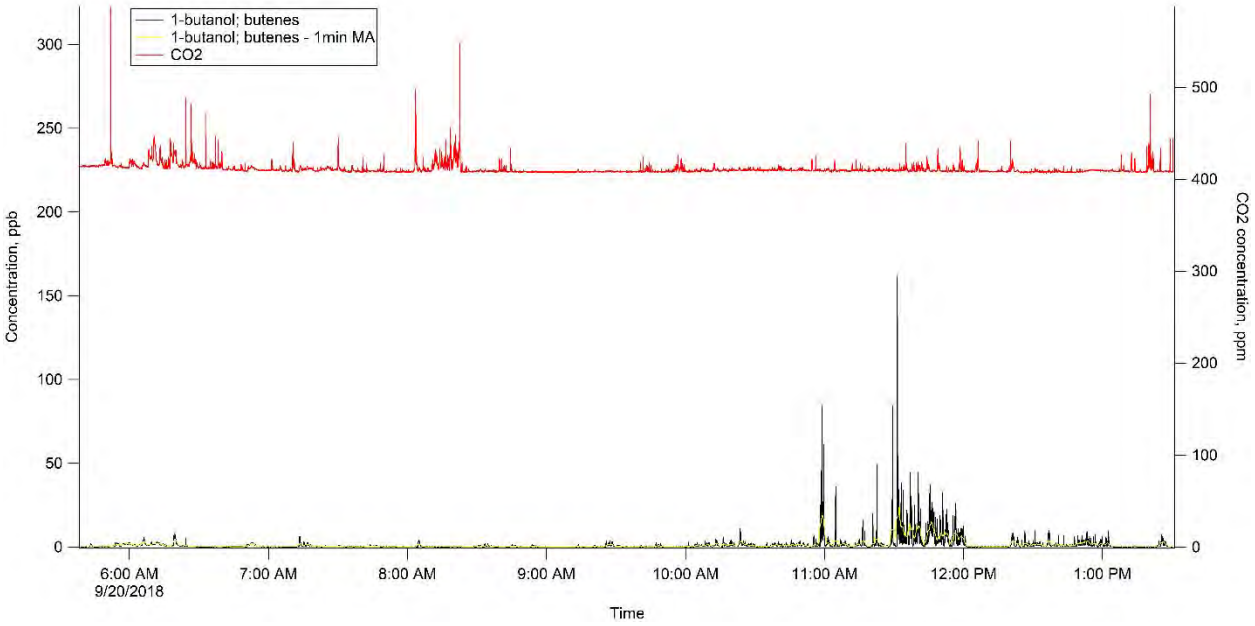

Figure 4-12. 1-butanol; Butenes.

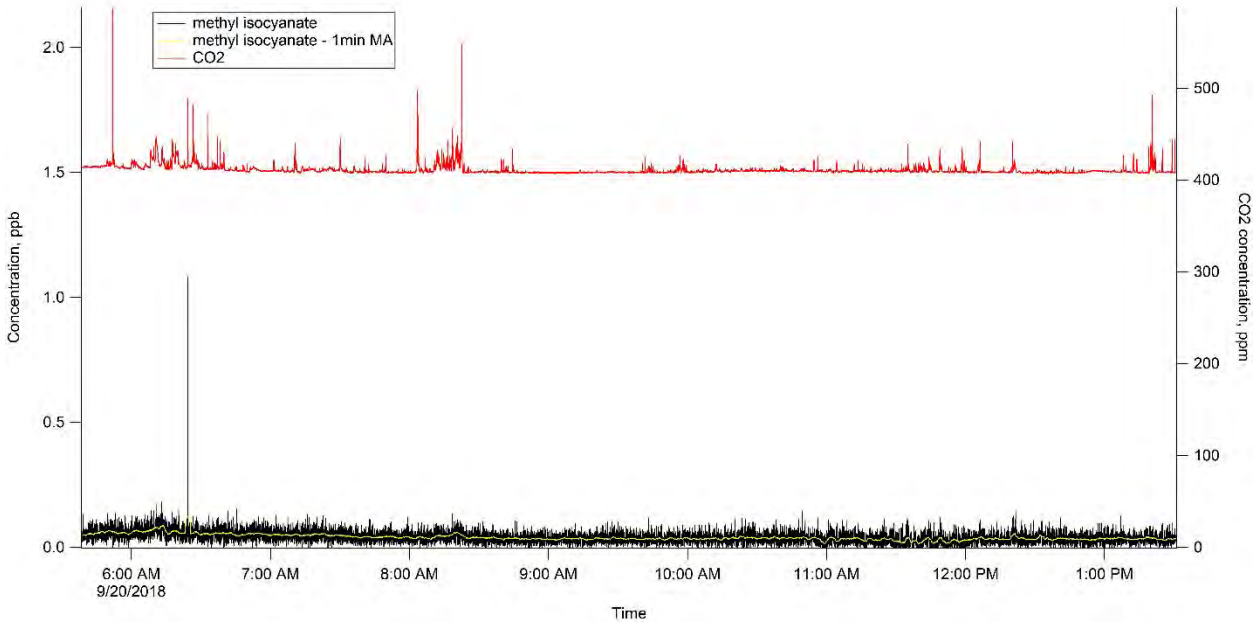

Figure 4-13. Methyl Isocyanate.

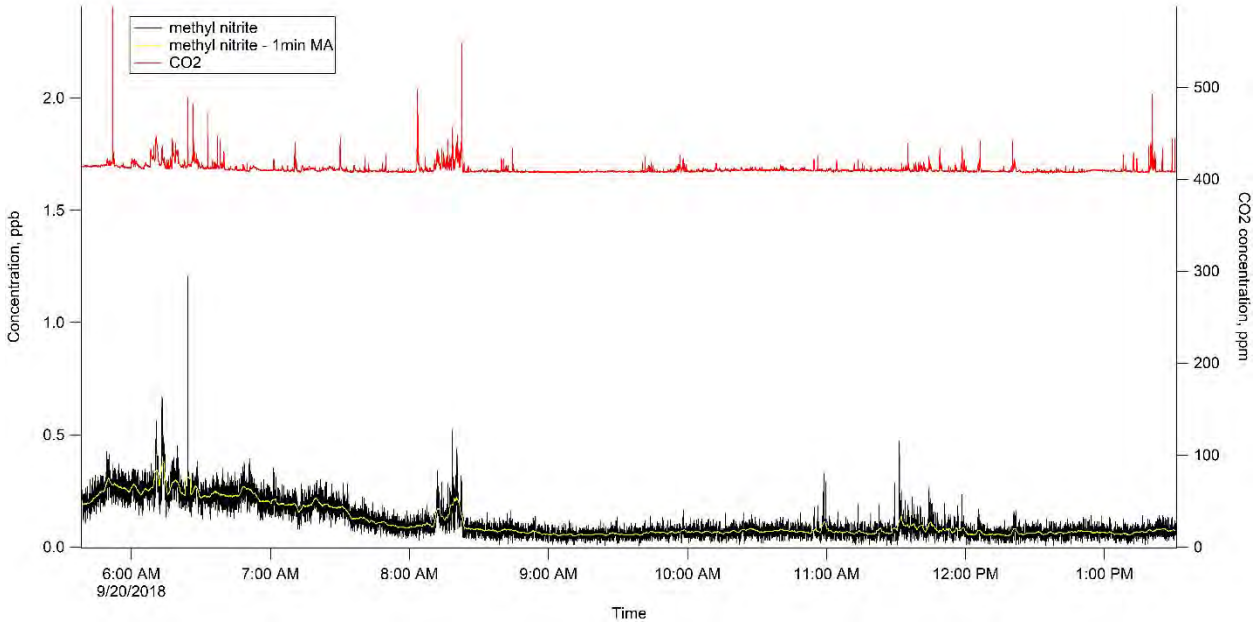

Figure 4-14. Methyl Nitrite.

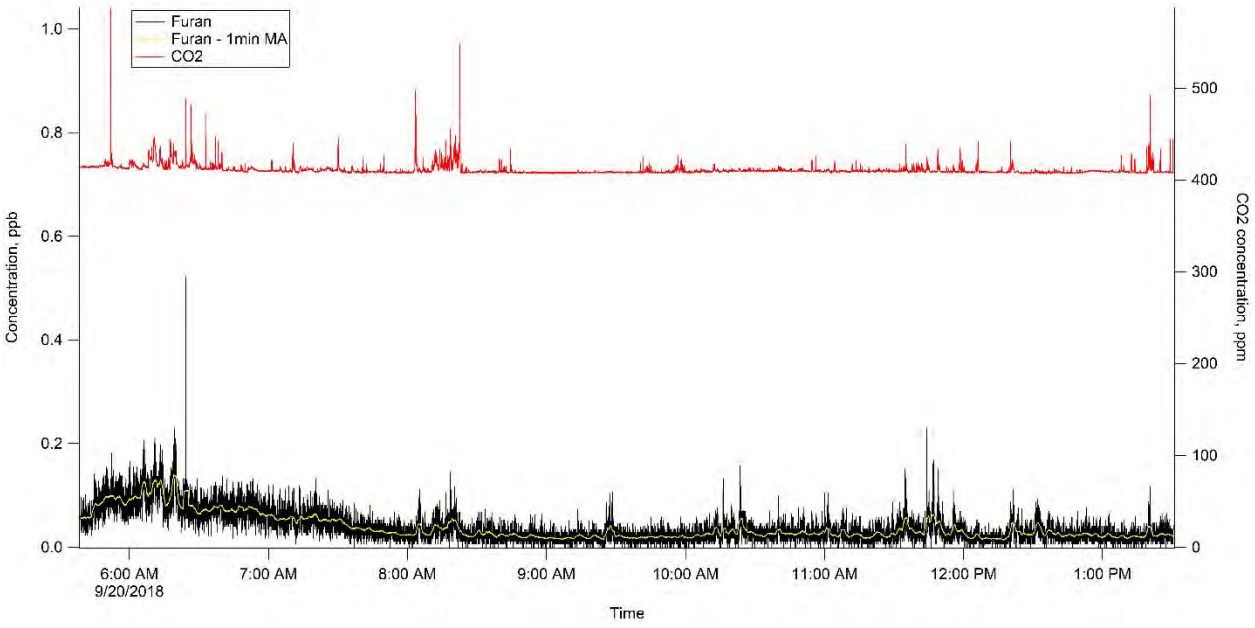

Figure 4-15. Furan.

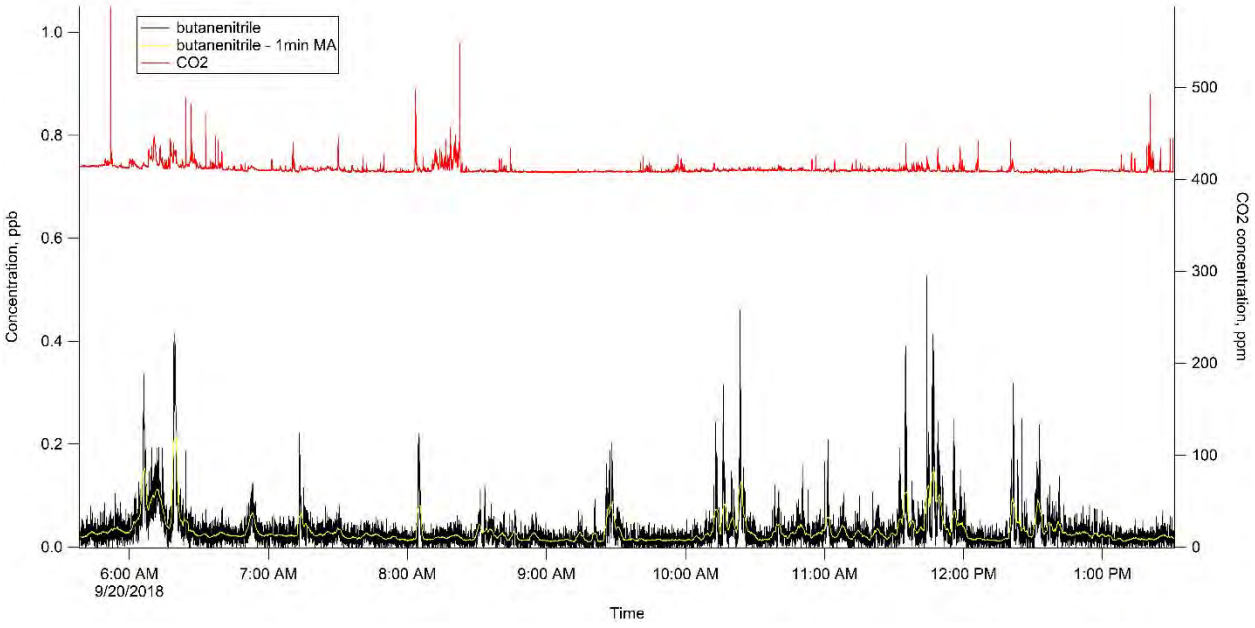

Figure 4-16. Butanenitrile.

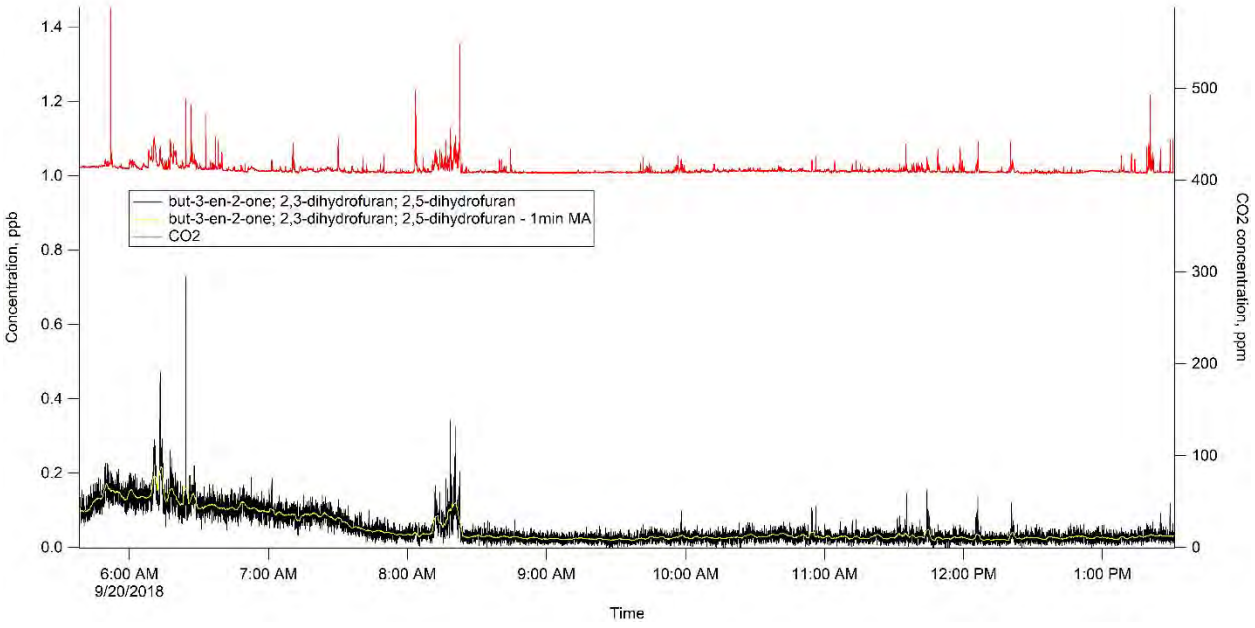

Figure 4-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

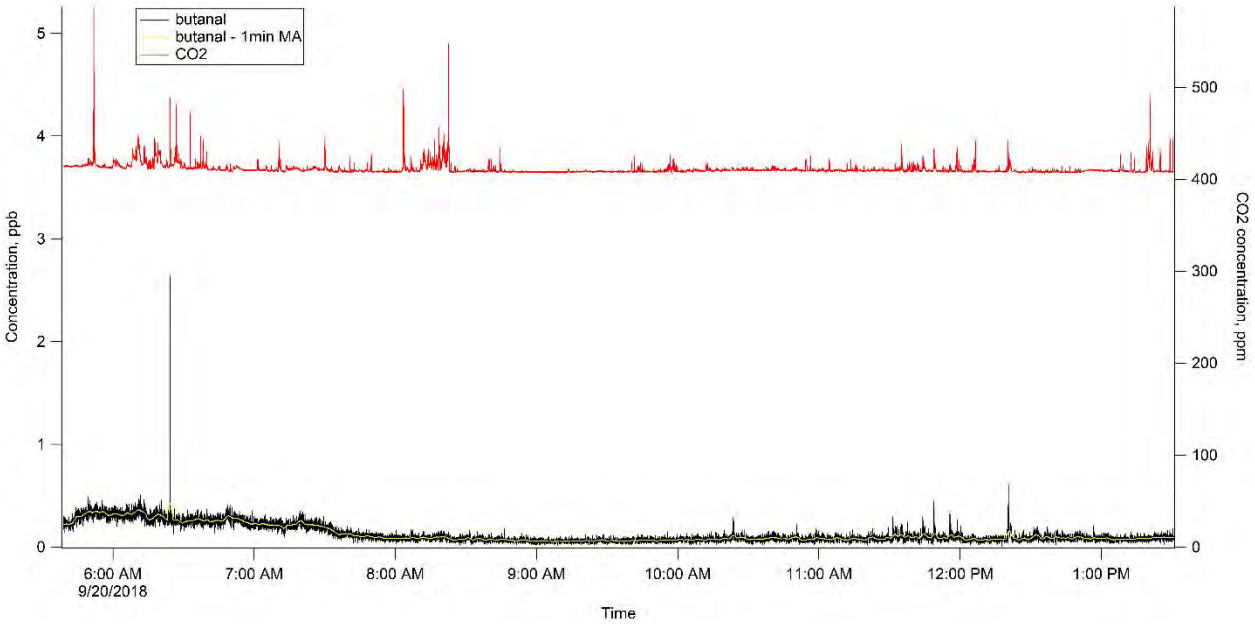

Figure 4-18. Butanal.

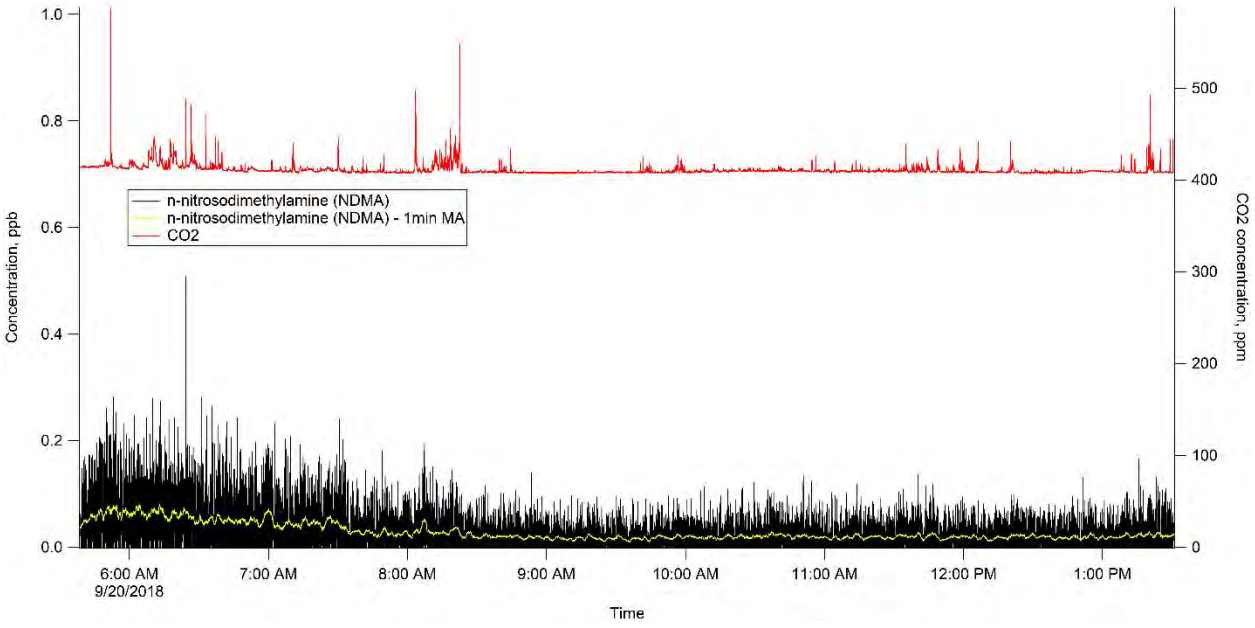

Figure 4-19. N-nitrosodimethylamine (NDMA).

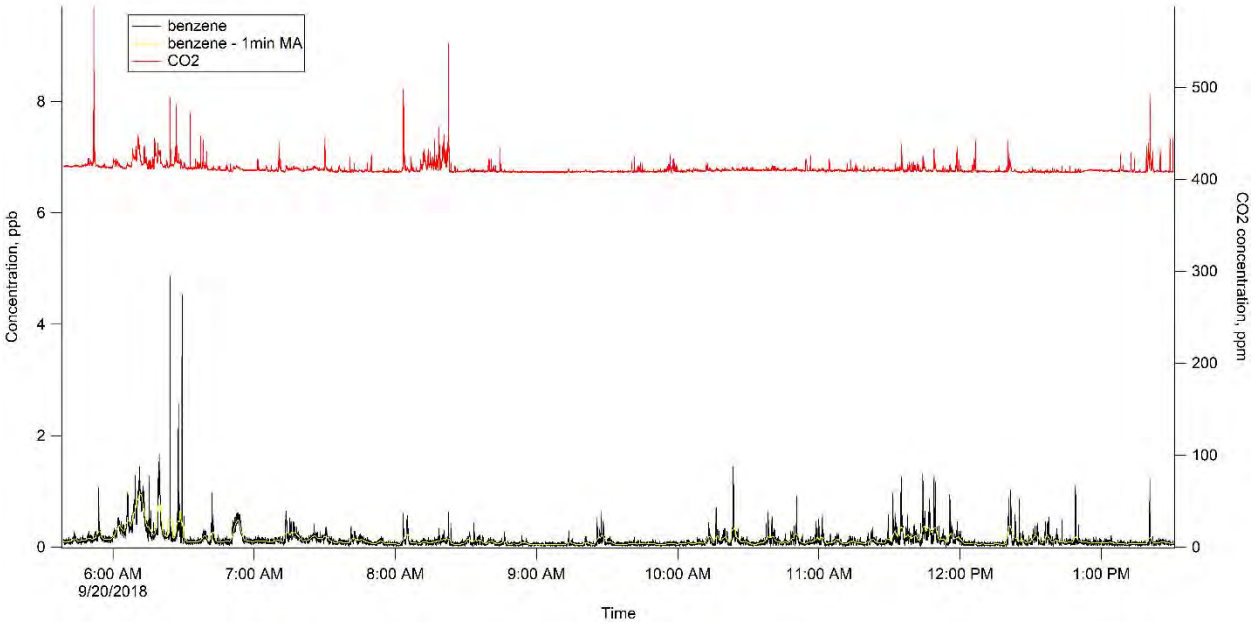

Figure 4-20. Benzene.

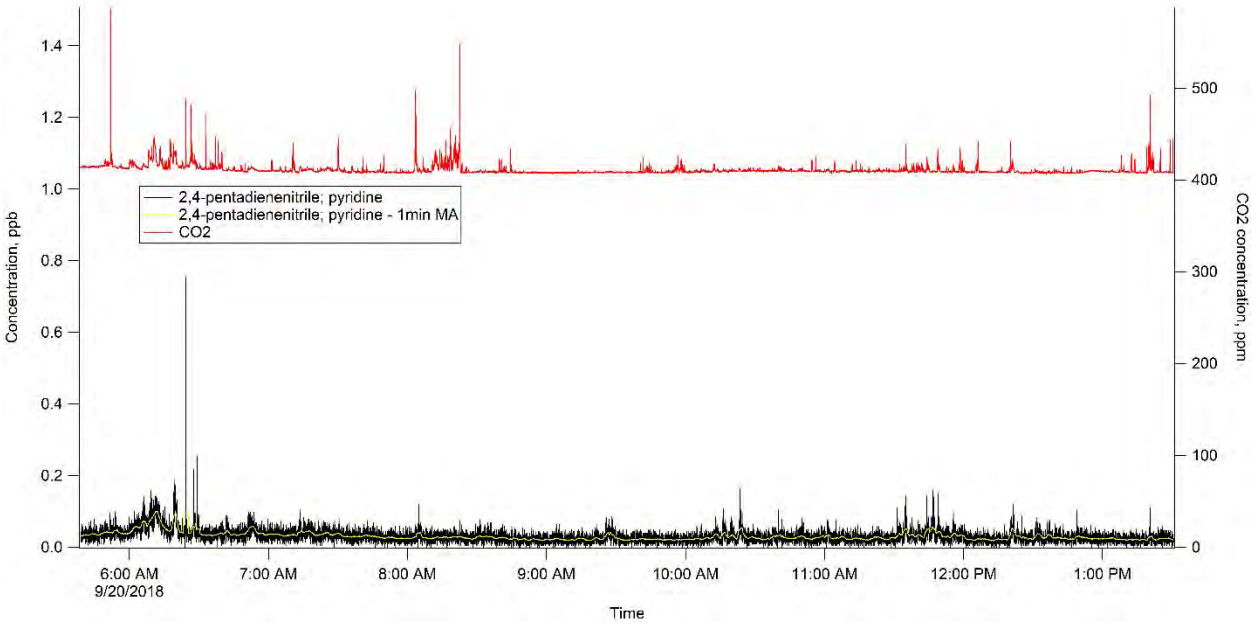

Figure 4-21. 2,4-pentadienenitrile; Pyridine.

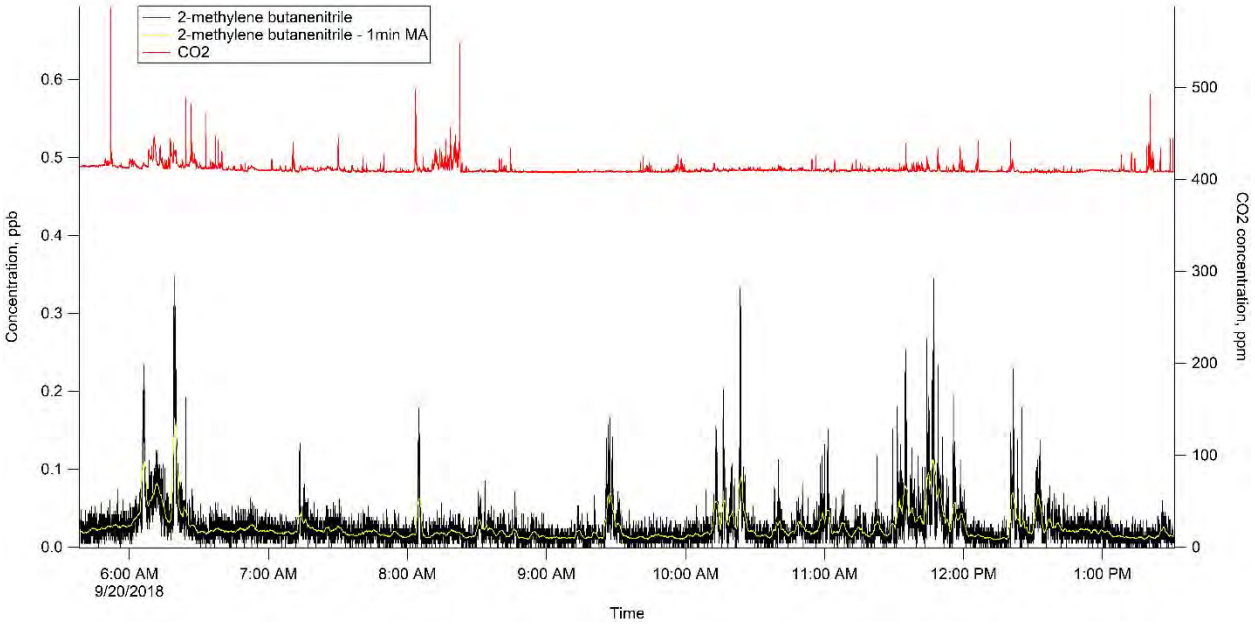

Figure 4-22. 2-methylene Butanenitrile.

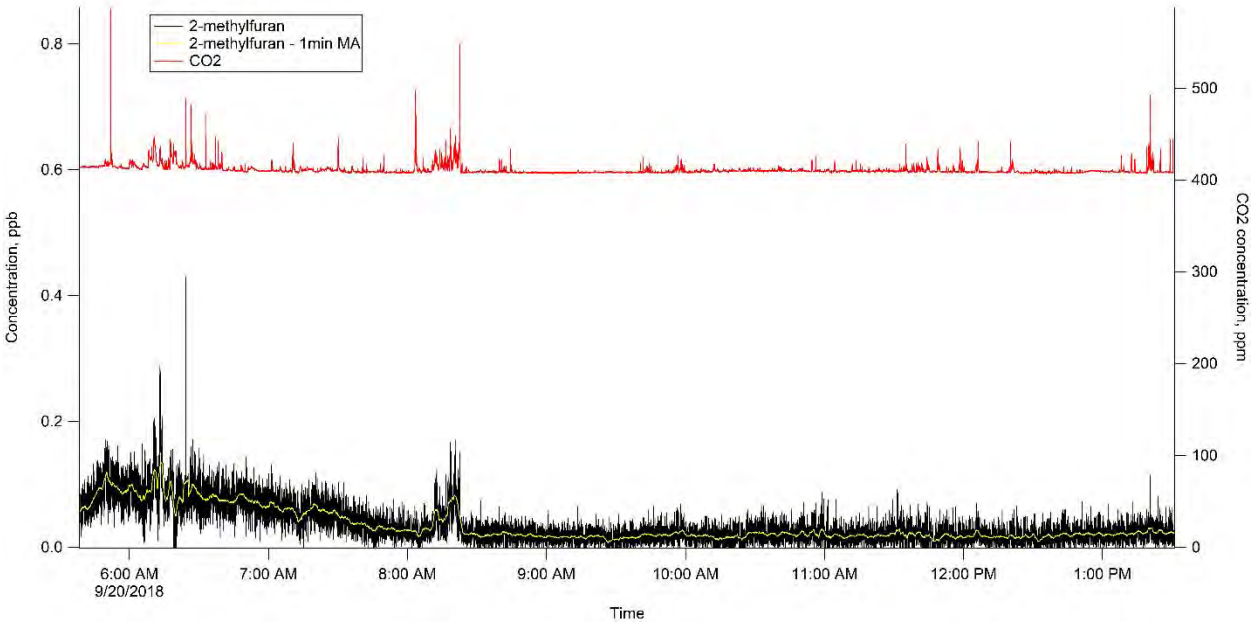

Figure 4-23. 2-methylfuran.

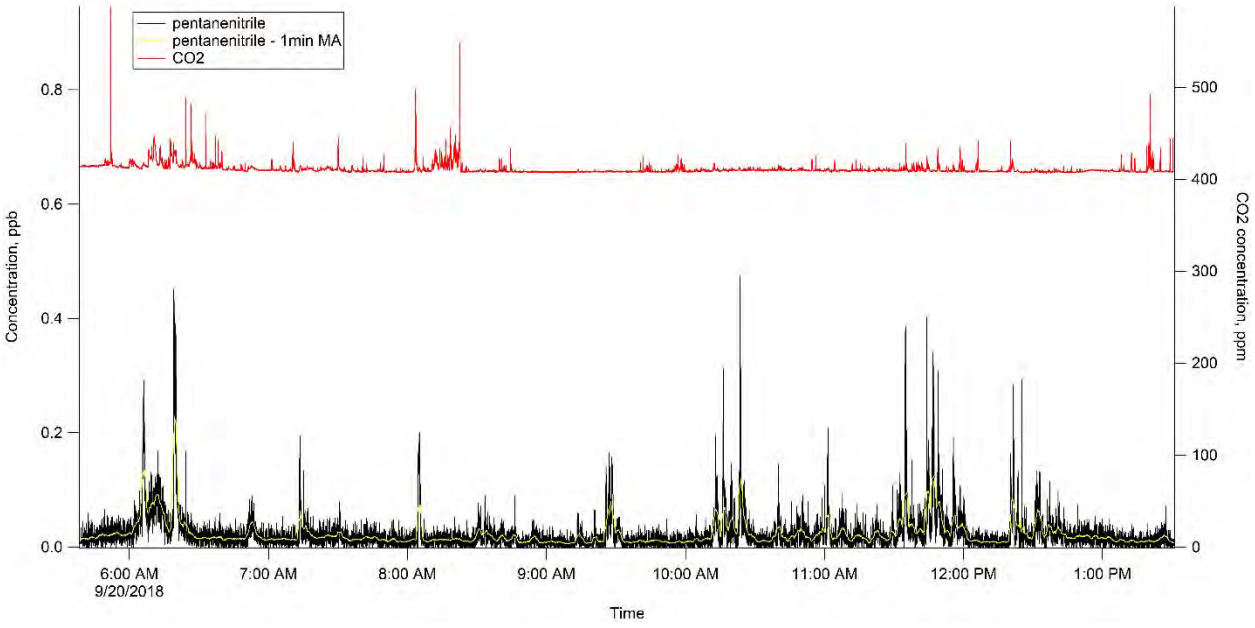

Figure 4-24. Pentanenitrile.

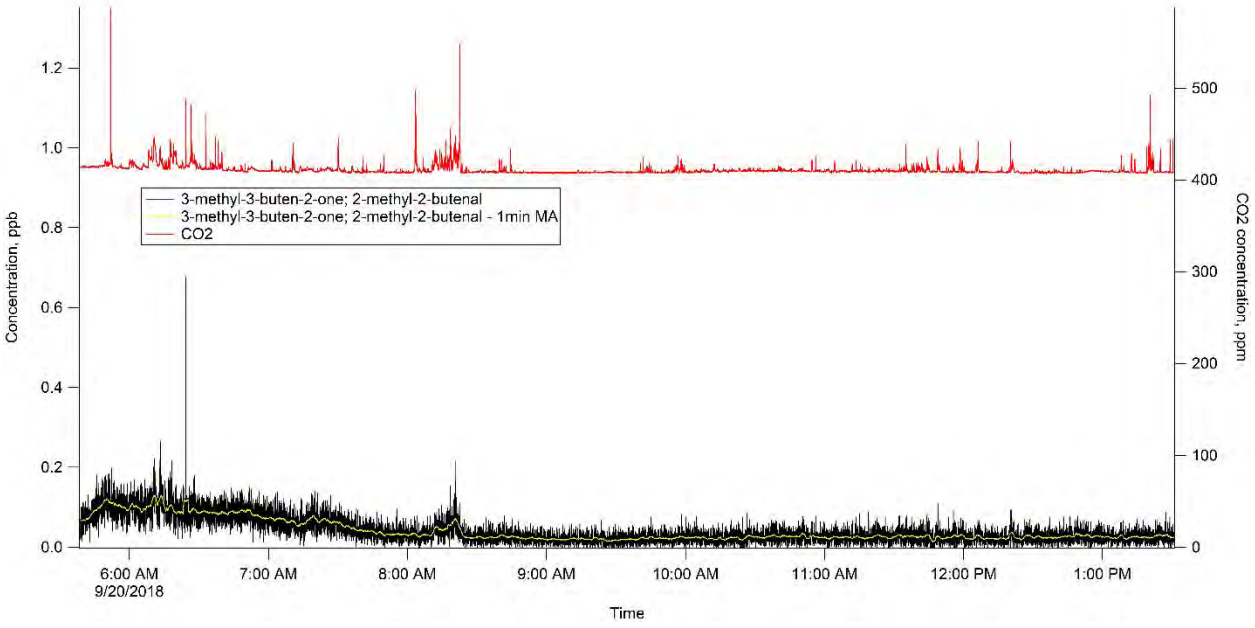

Figure 4-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

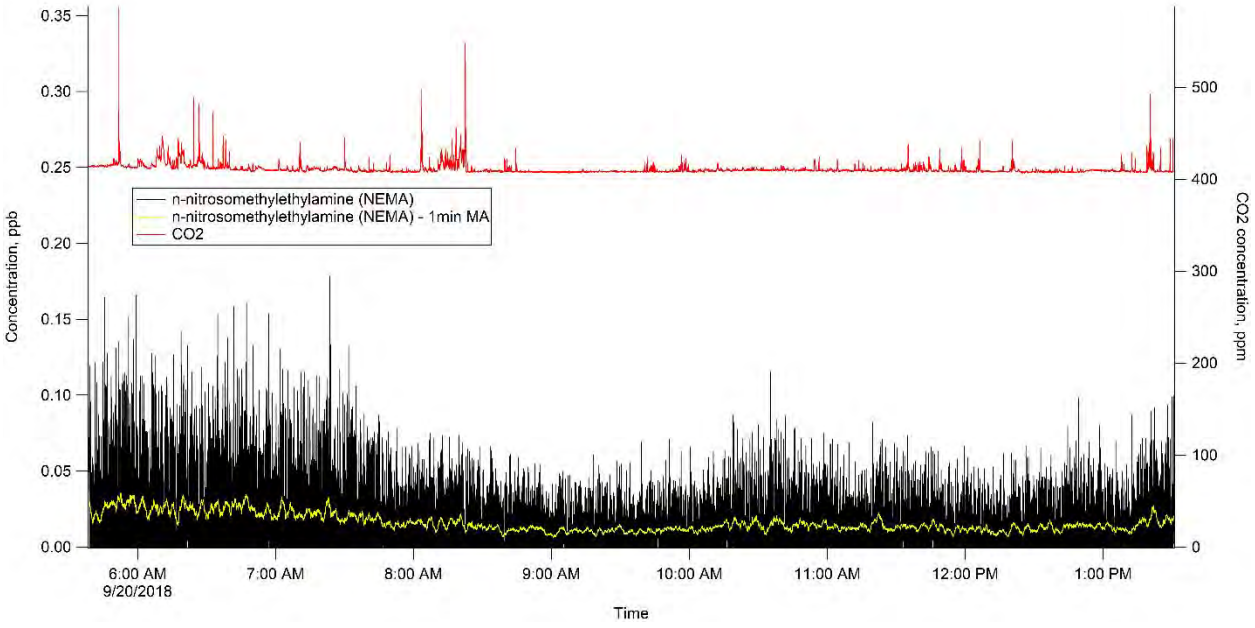

Figure 4-26. N-nitrosomethylethylamine (NEMA).

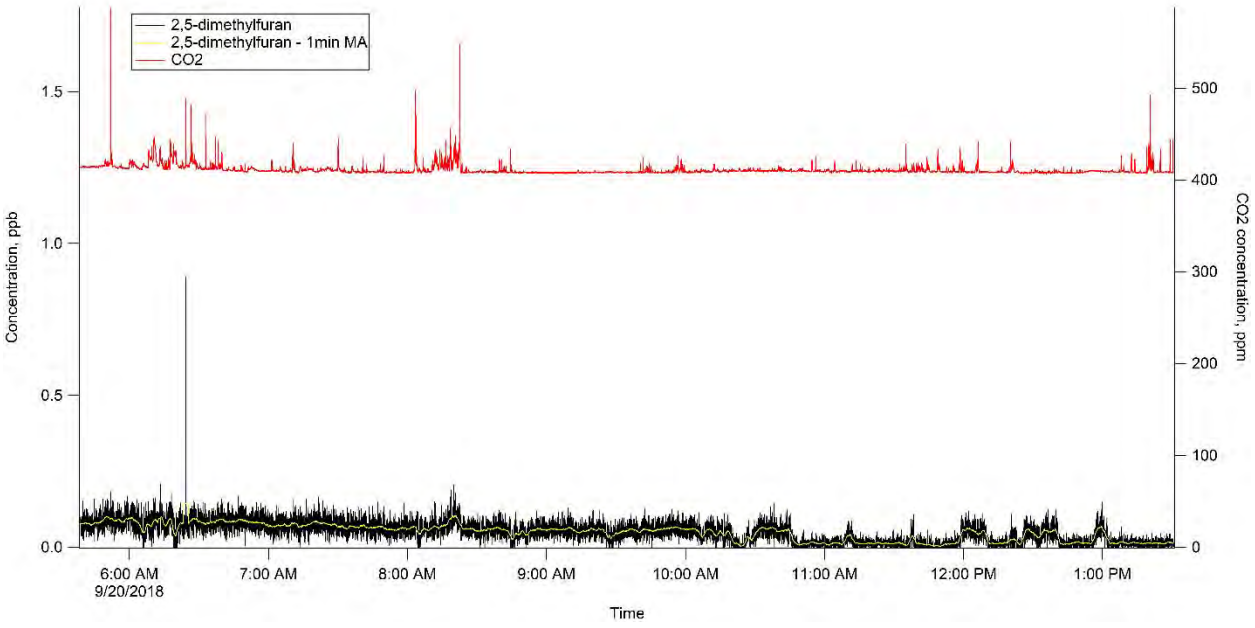

Figure 4-27. 2,5-dimethylfuran.

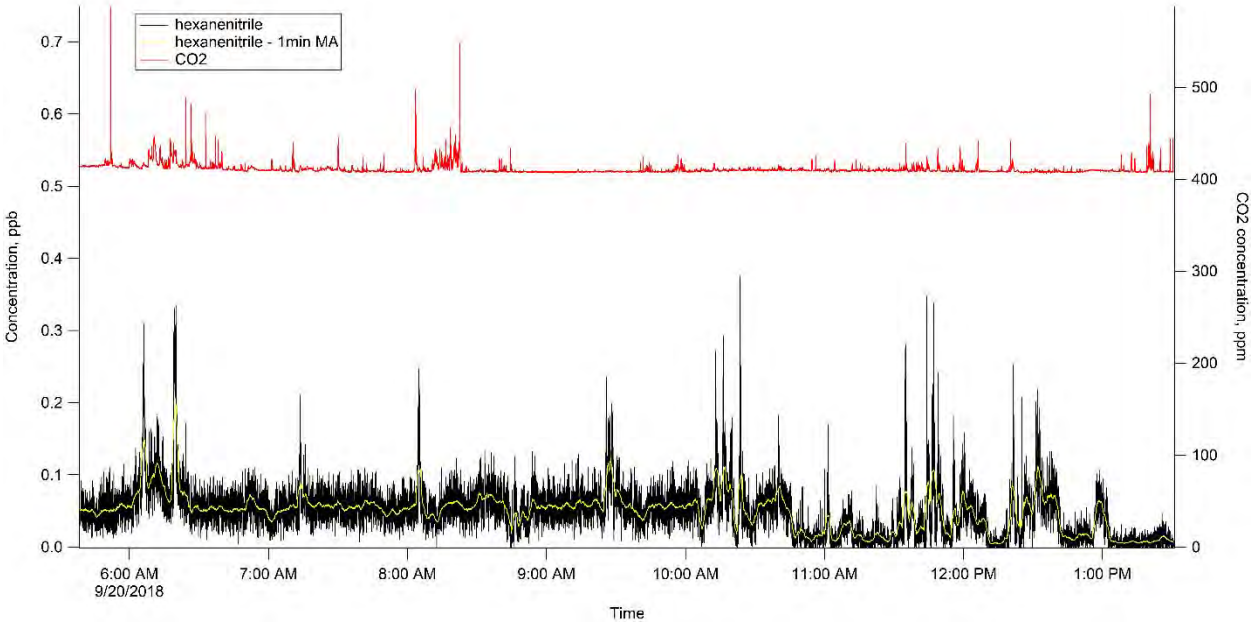

Figure 4-28. Hexanenitrile.

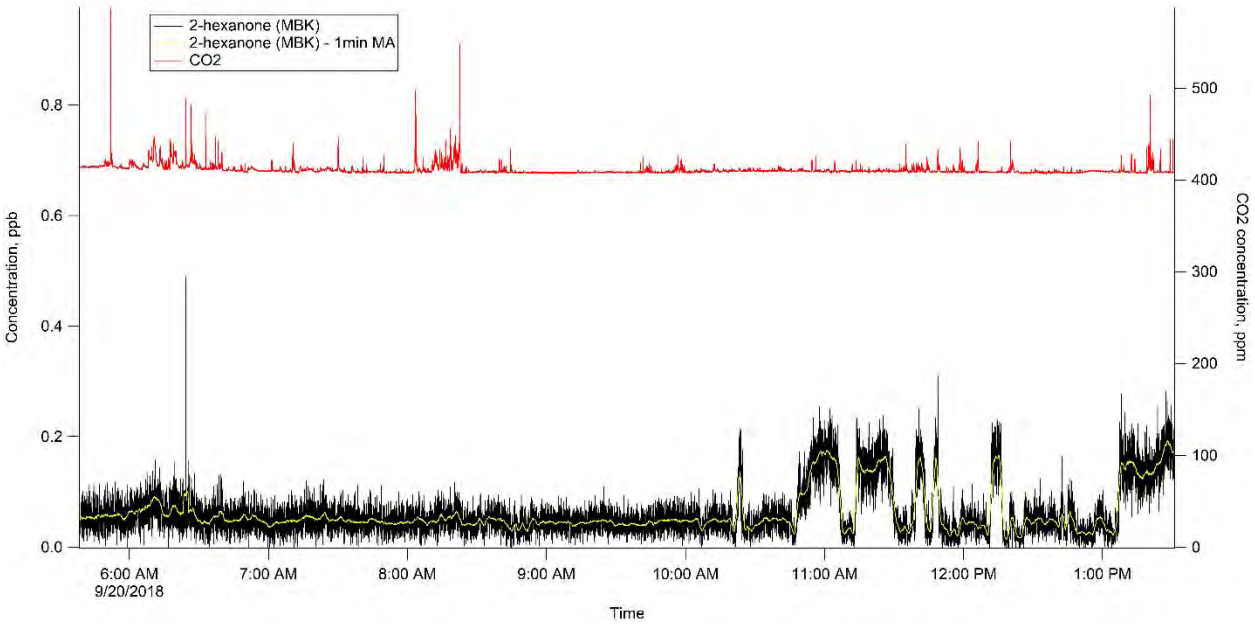

Figure 4-29. 2-hexanone (MBK).

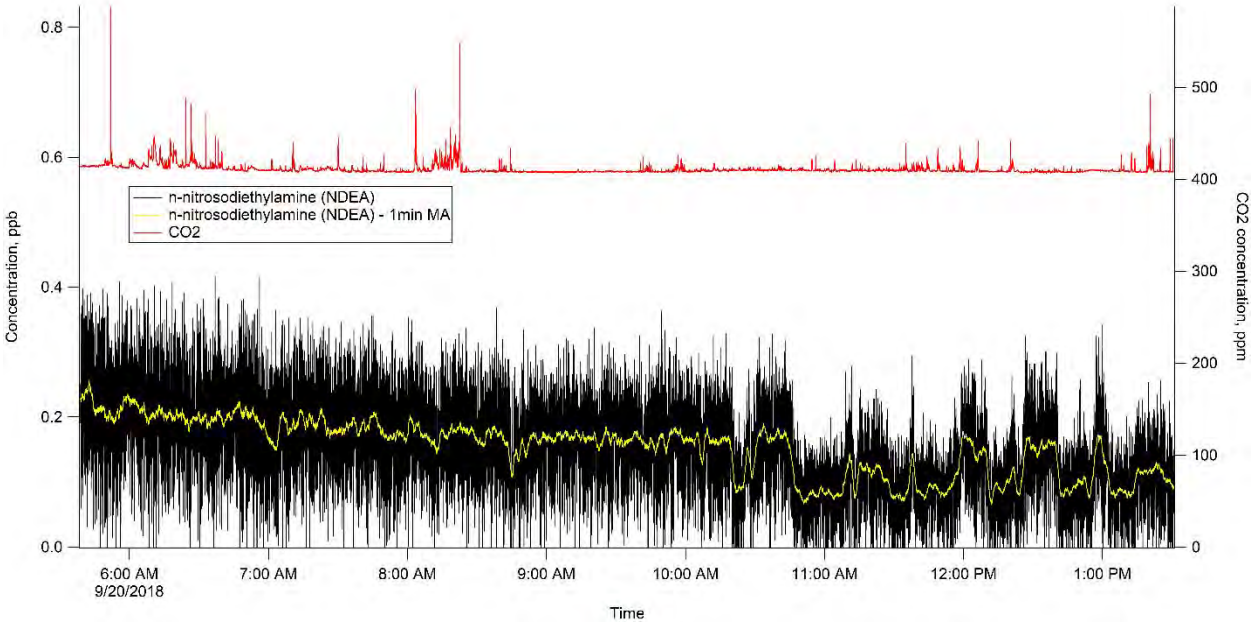

Figure 4-30. N-nitrosodiethylamine (NDEA).

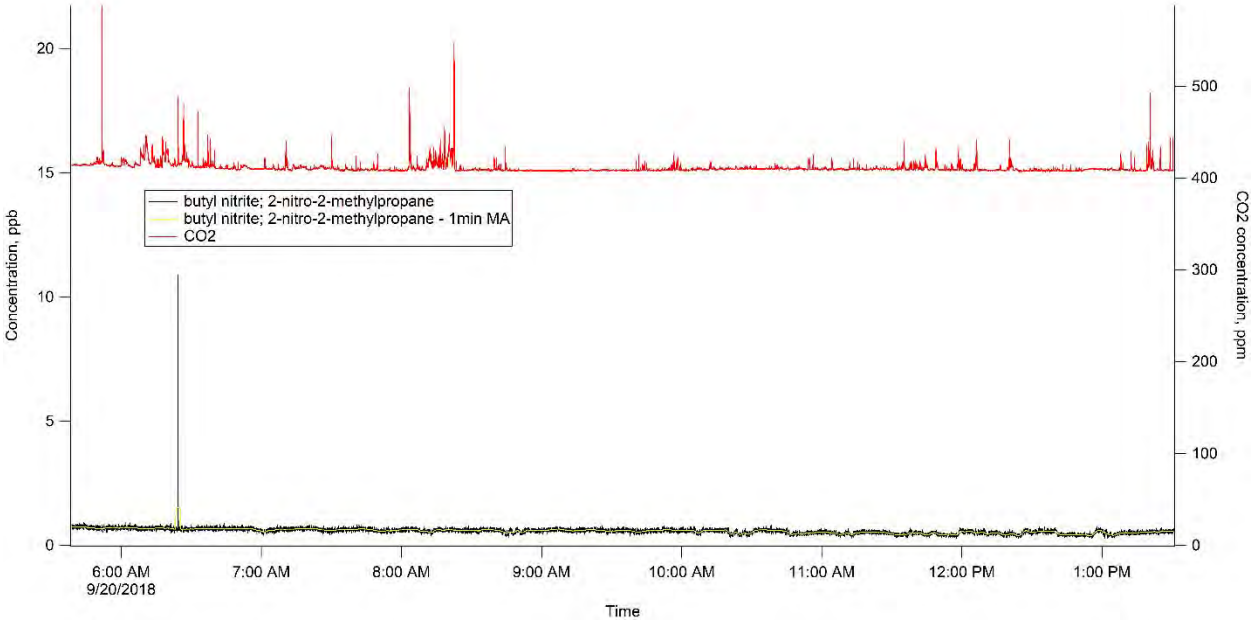

Figure 4-31. Butyl nitrite; 2-nitro-2-methylpropane.

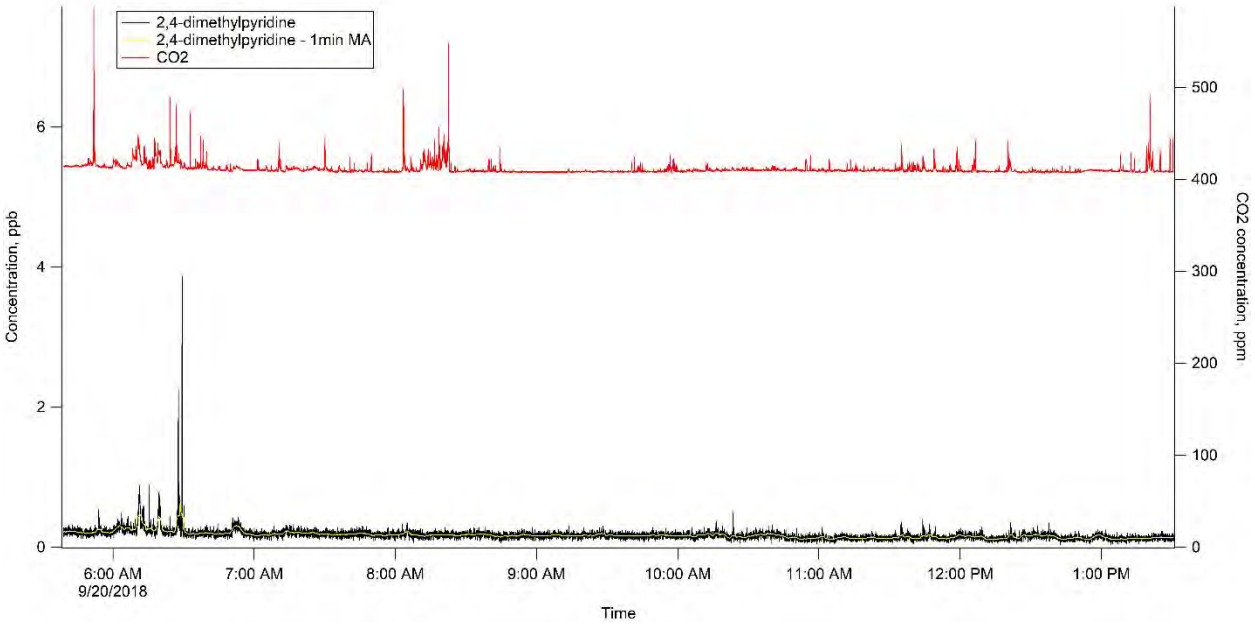

Figure 4-32. 2,4-dimethylpyridine.

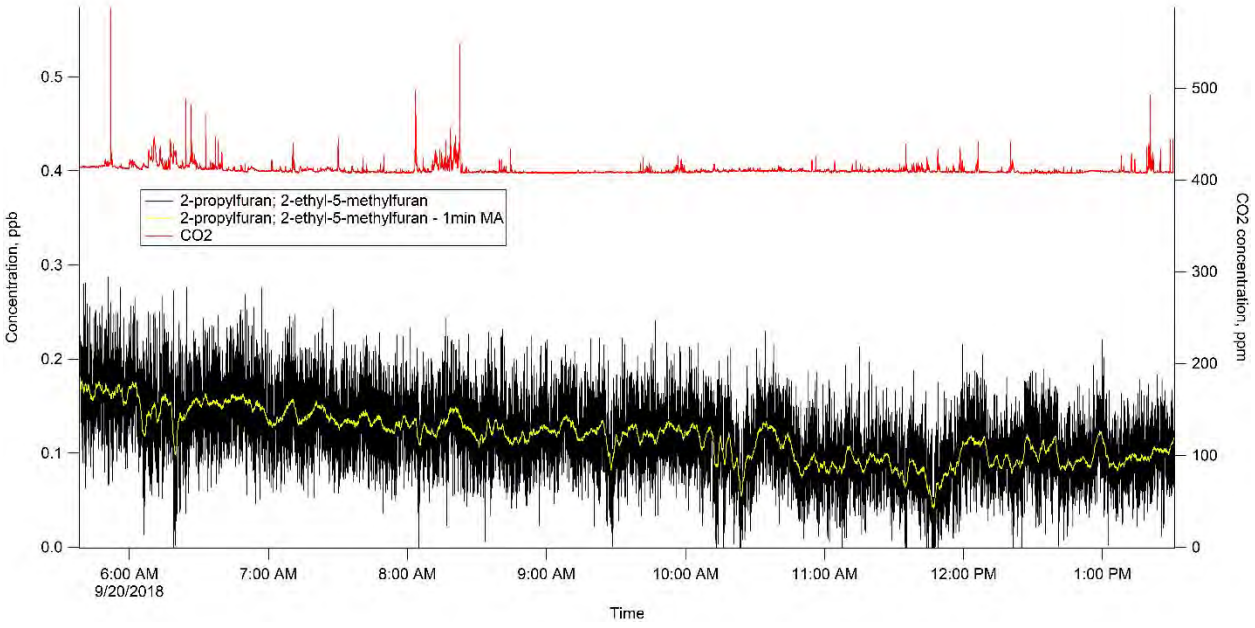

Figure 4-33. 2-propylfuran; 2-ethyl-5-methylfuran.

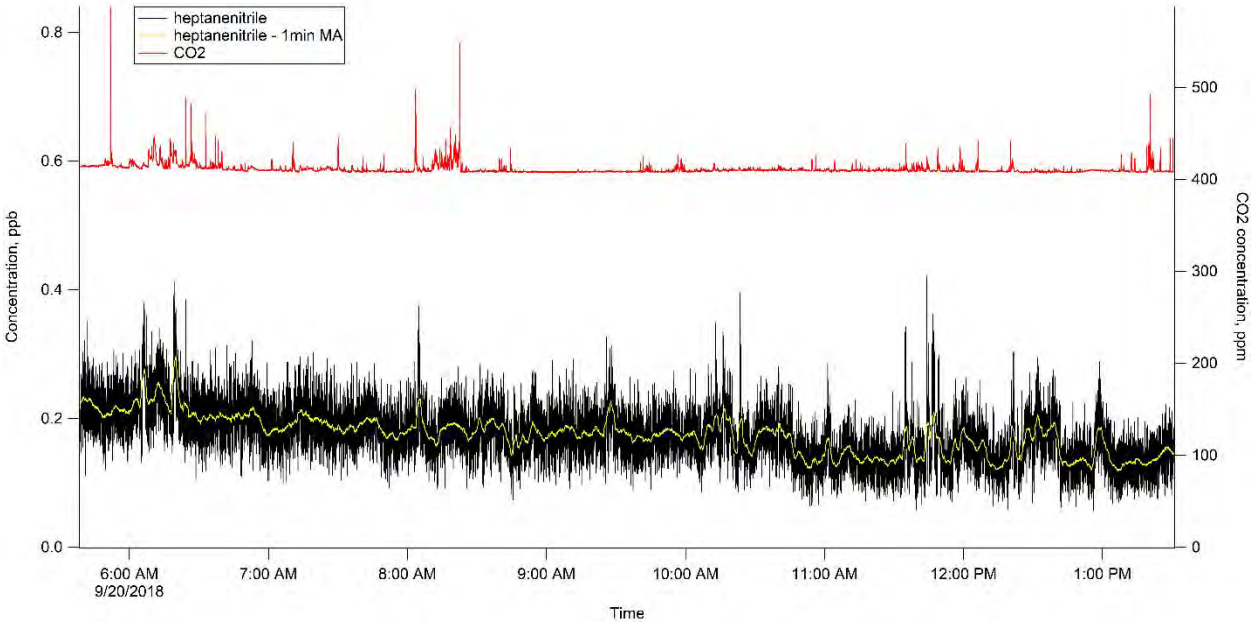

Figure 4-34. Heptanenitrile.

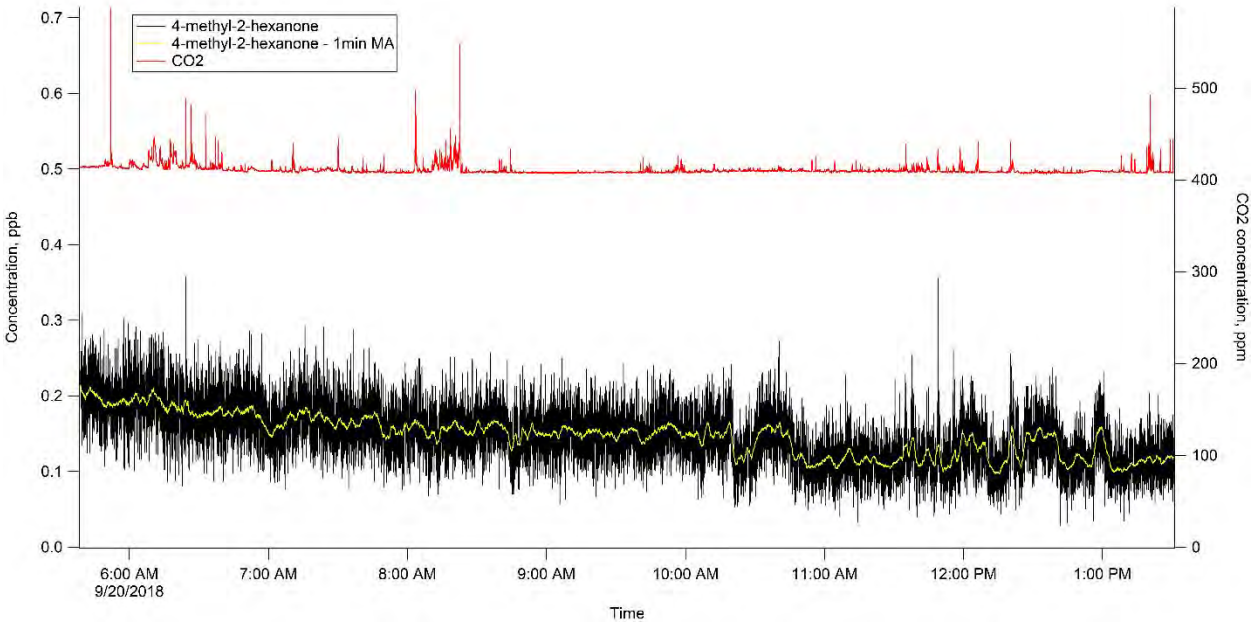

Figure 4-35. 4-methyl-2-hexanone.

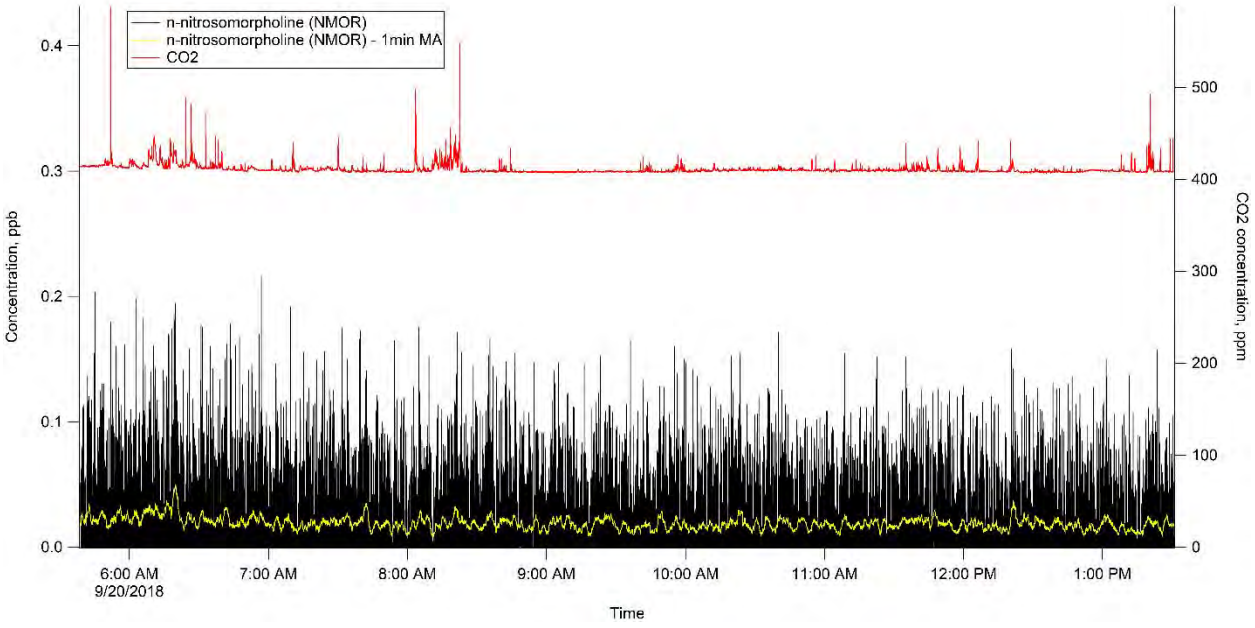

Figure 4-36. N-nitrosomorpholine (NMOR).

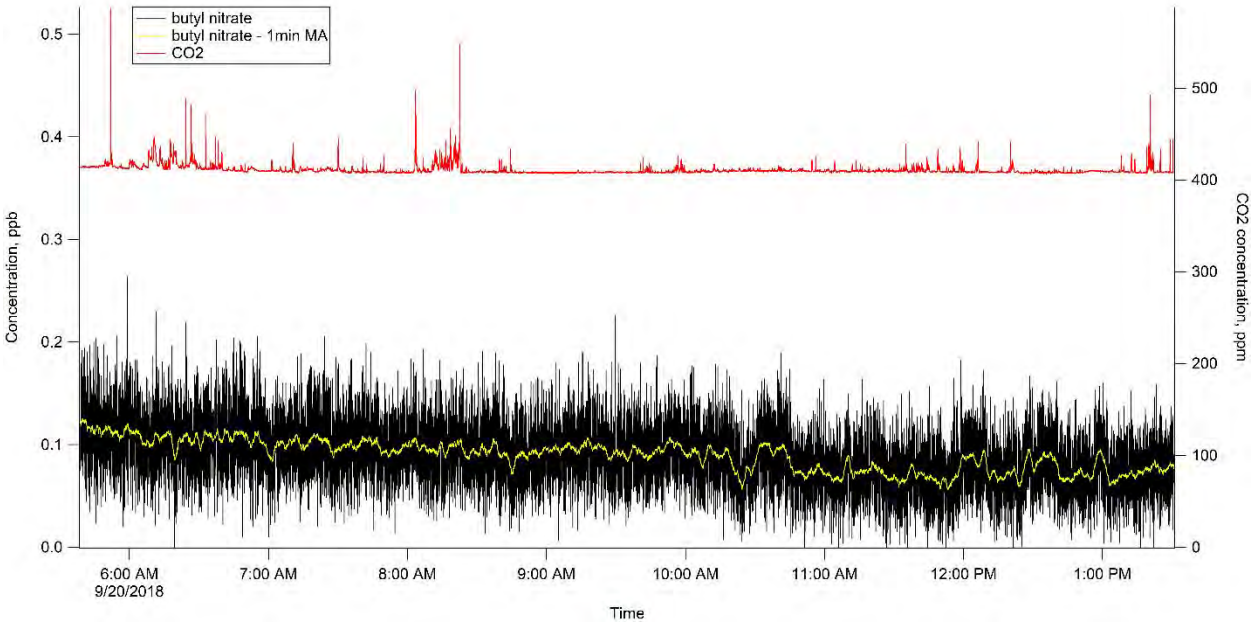

Figure 4-37. Butyl Nitrate.

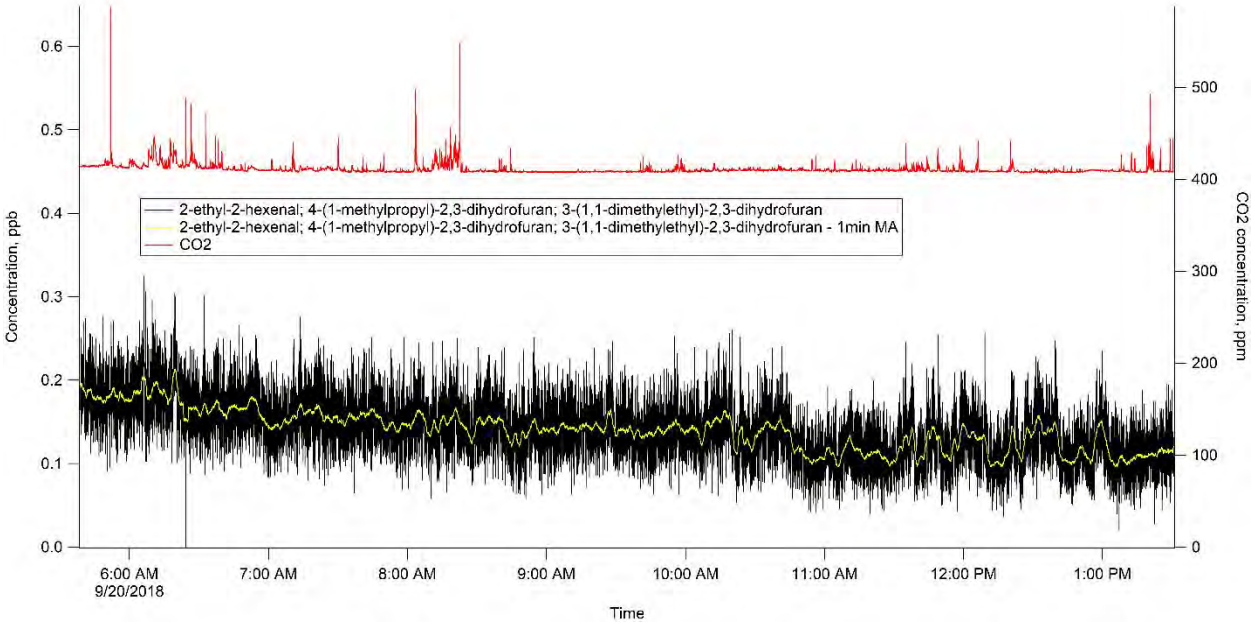

Figure 4-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

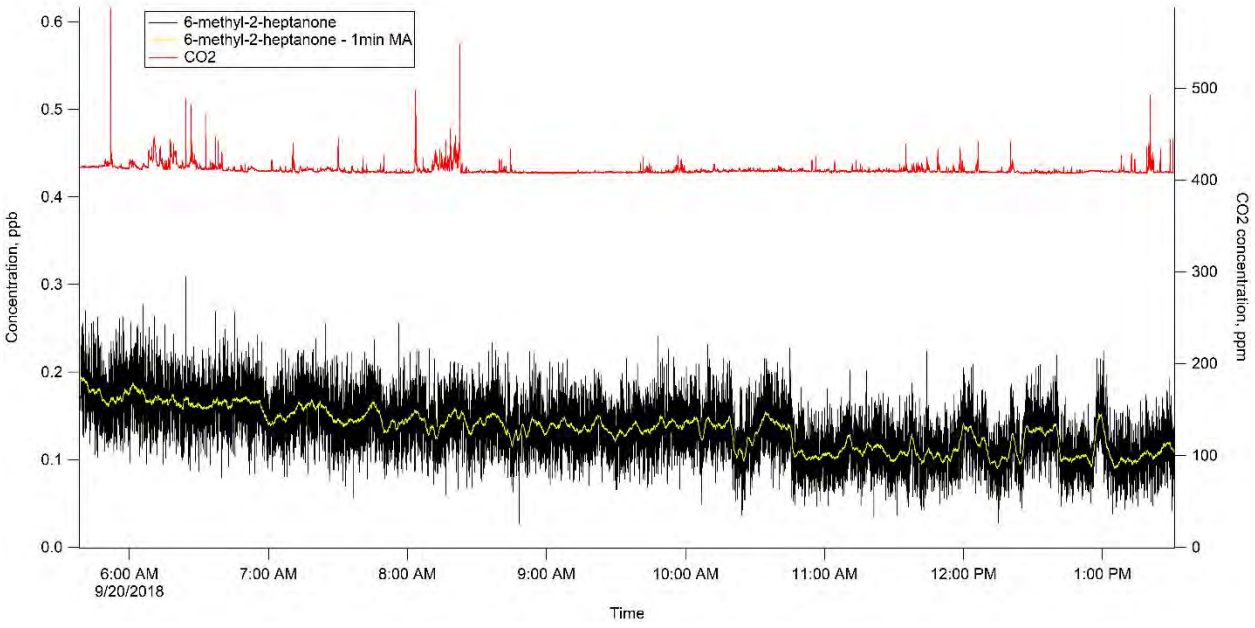

Figure 4-39. 6-methyl-2-heptanone.

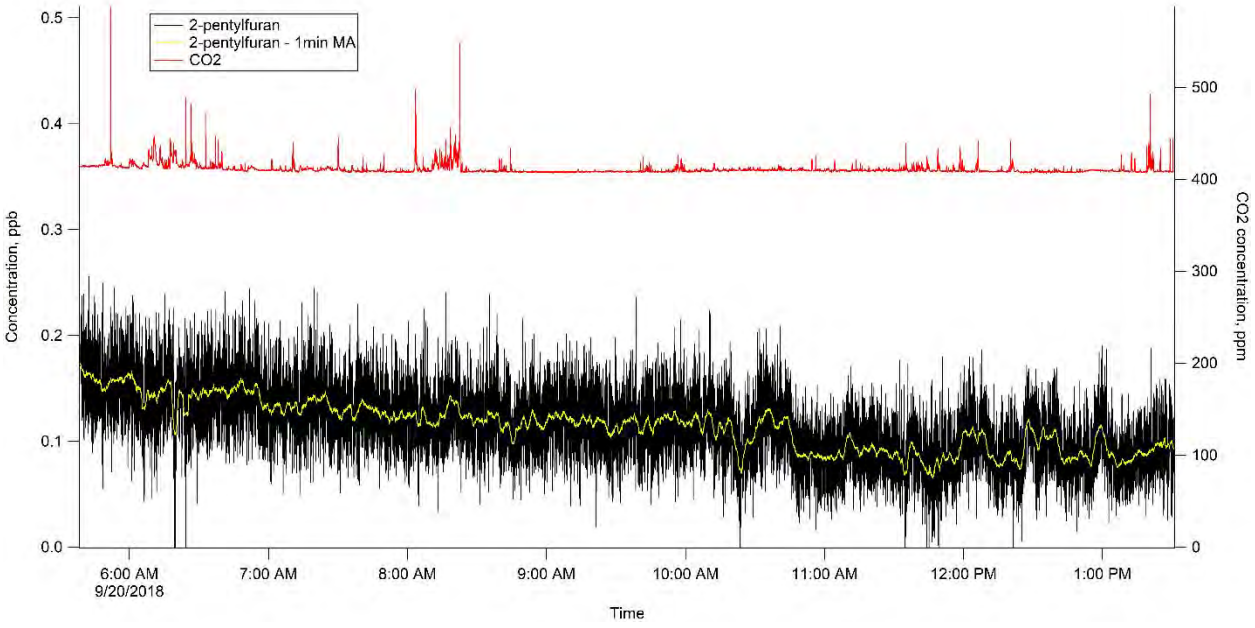

Figure 4-40. 2-pentylfuran.

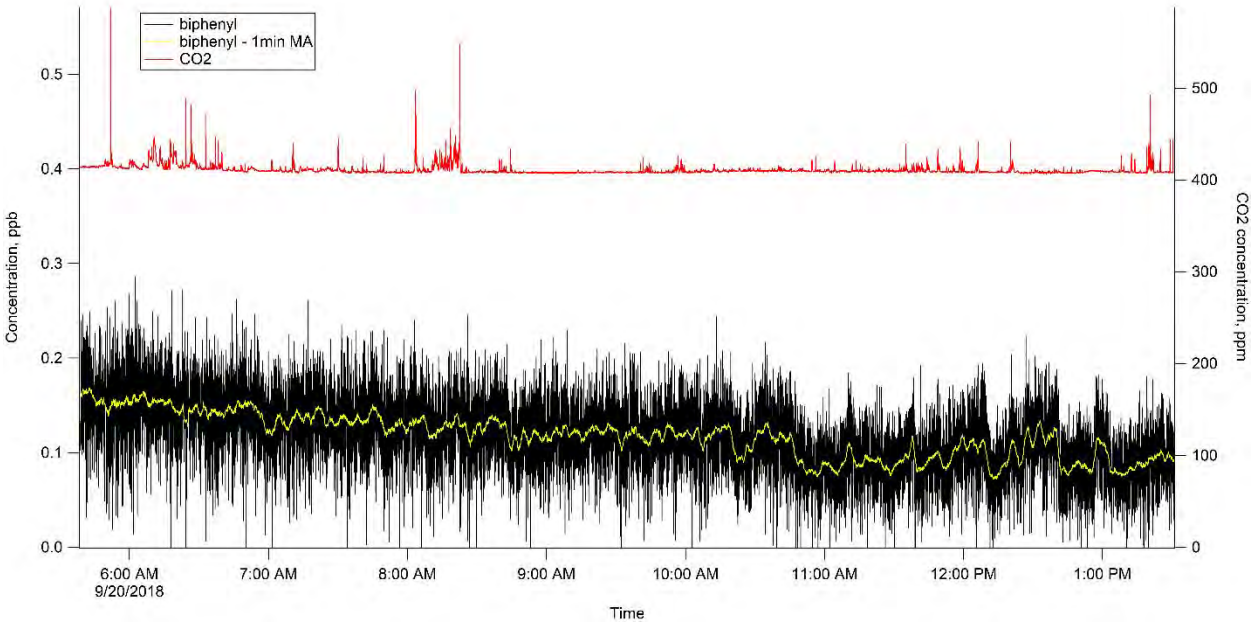

Figure 4-41. Biphenyl.

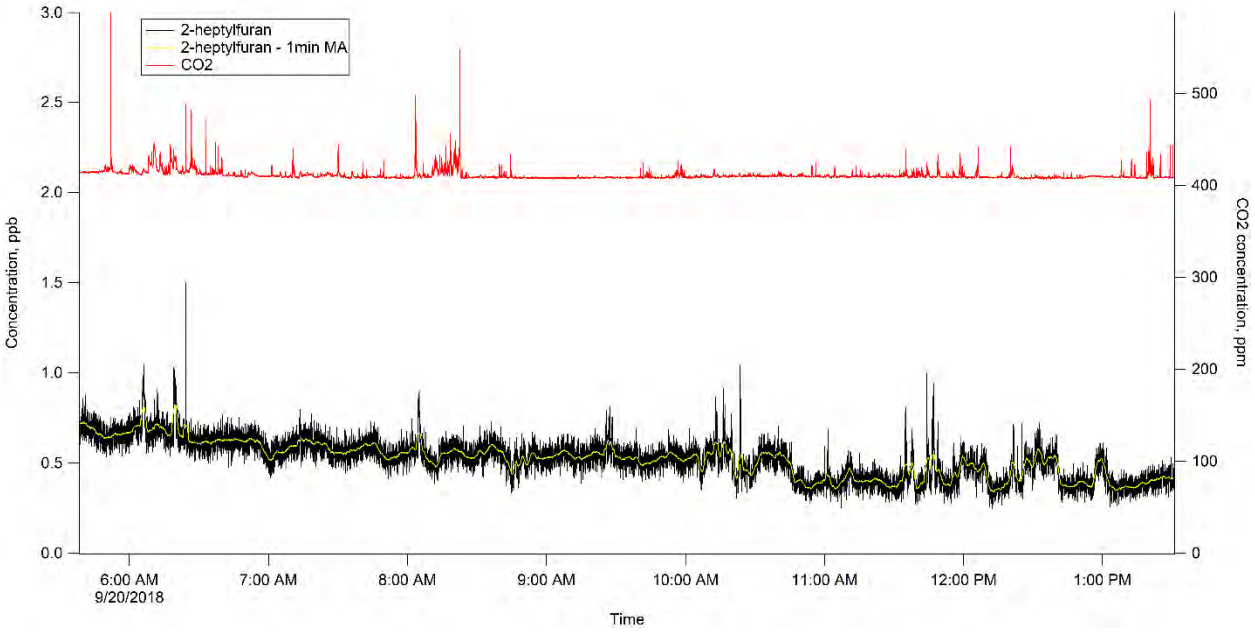

Figure 4-42. 2-heptylfuran.

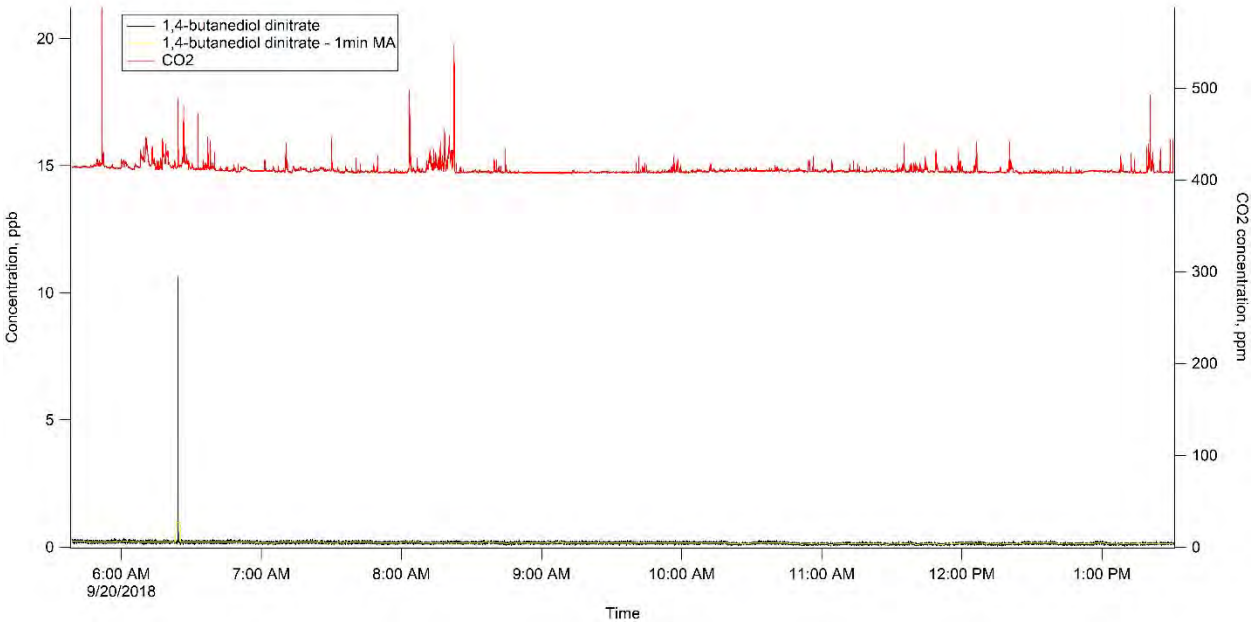

Figure 4-43. 1,4-butanediol Dinitrate.

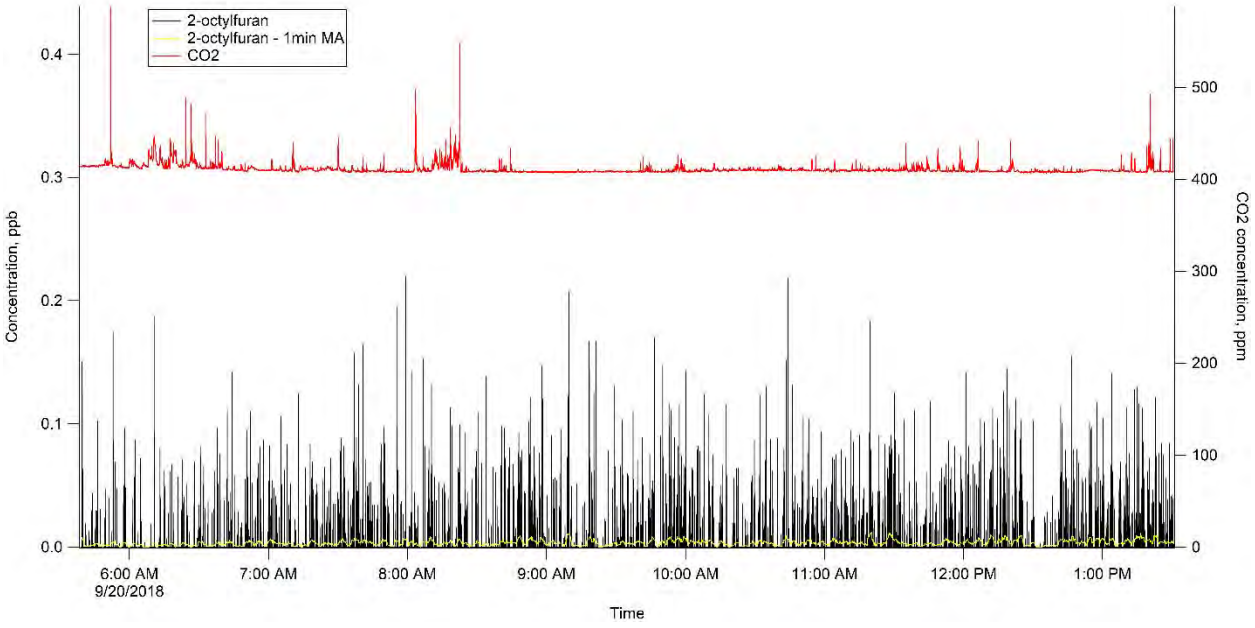

Figure 4-44. 2-octylfuran.

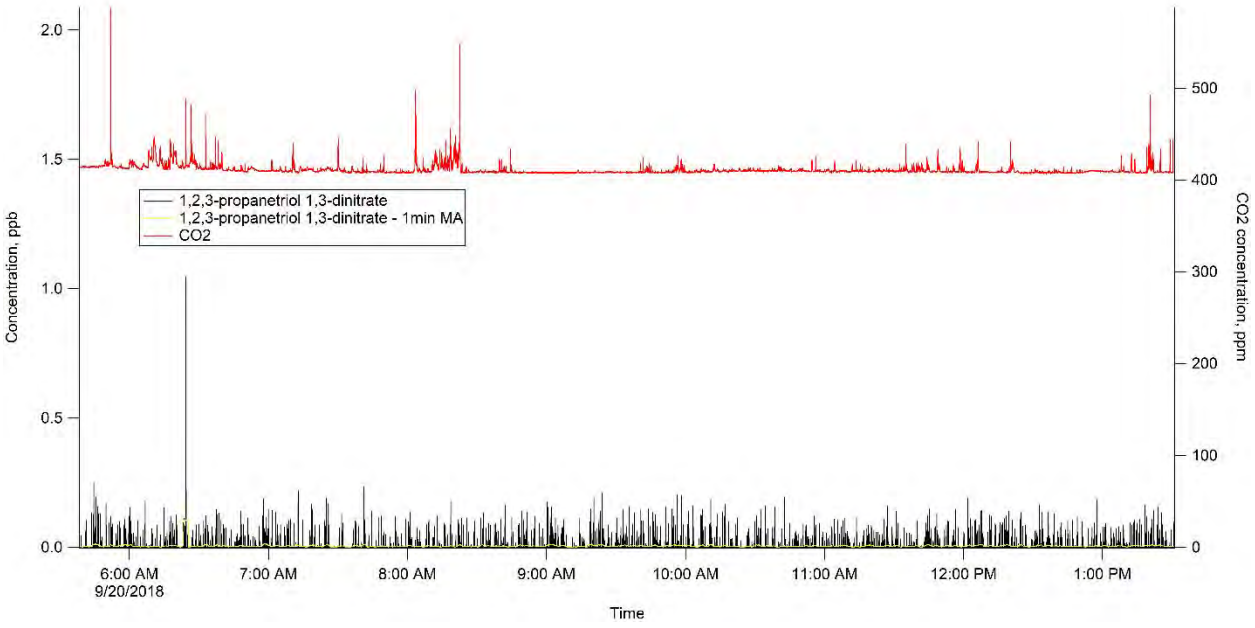

Figure 4-45. 1,2,3-propanetriol 1,3-dinitrate.

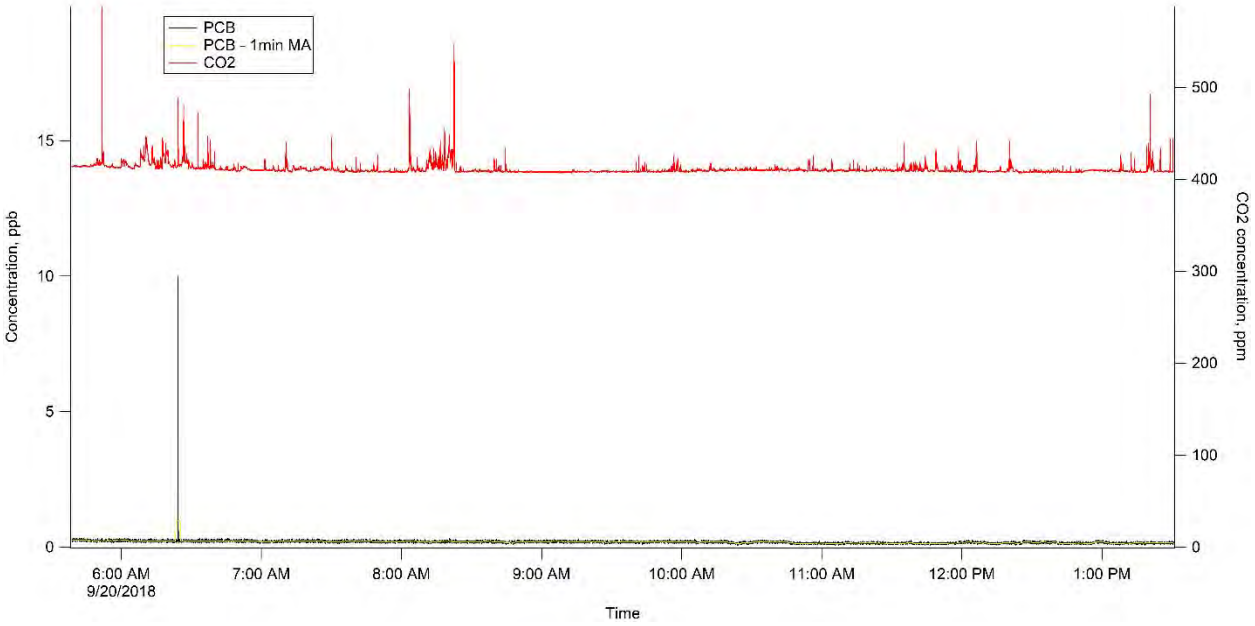

Figure 4-46. PCB.

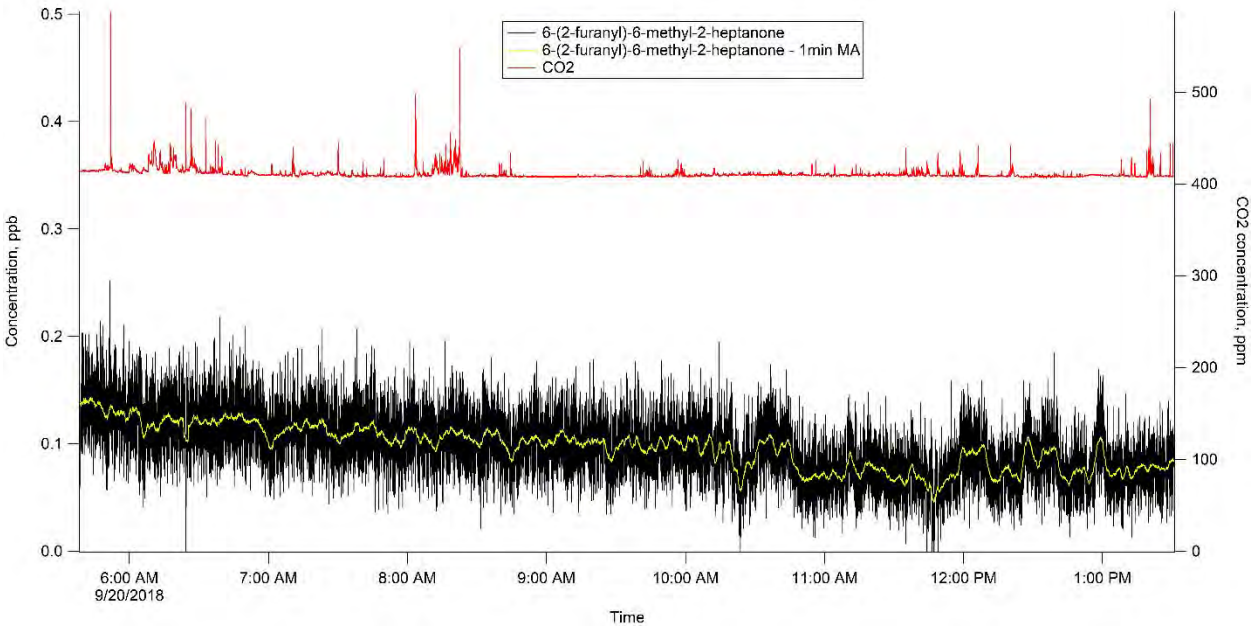

Figure 4-47. 6-(2-furanyl)-6-methyl-2-heptanone.

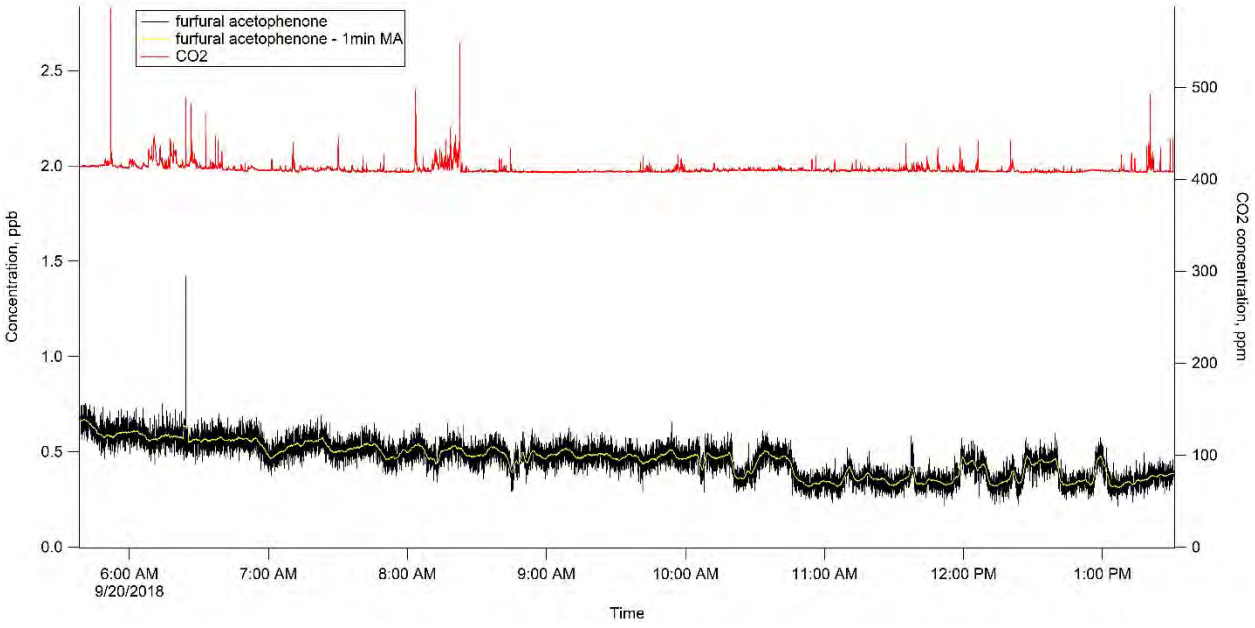

Figure 4-48. Furfural Acetophenone.

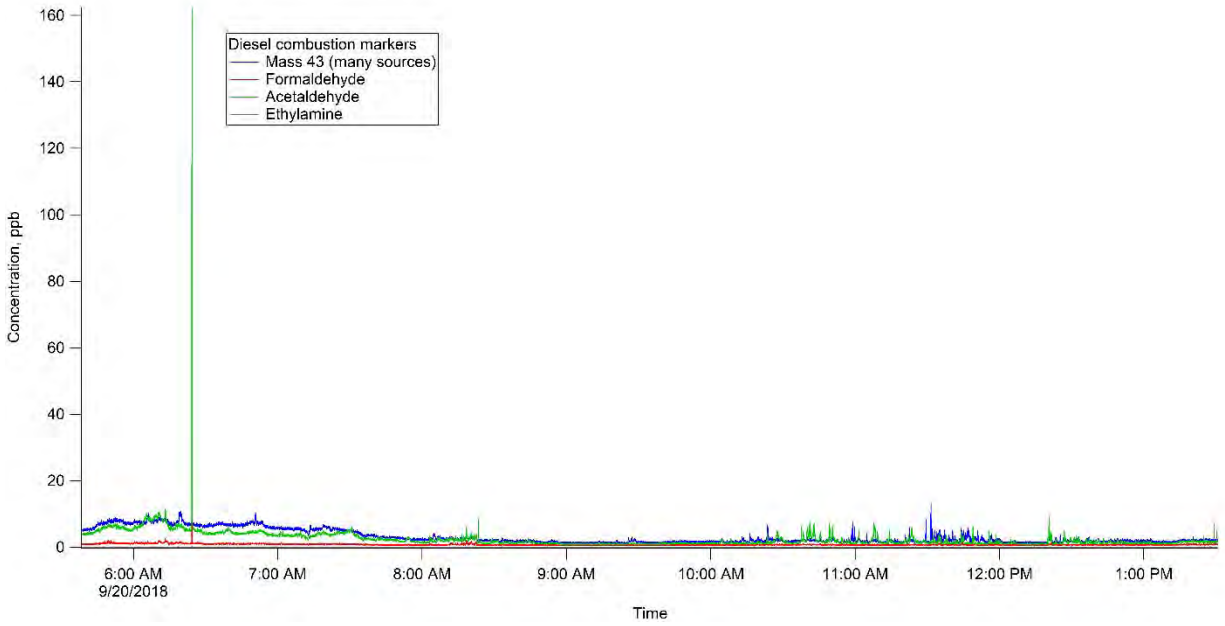

Figure 4-49. Diesel Combustion Markers.

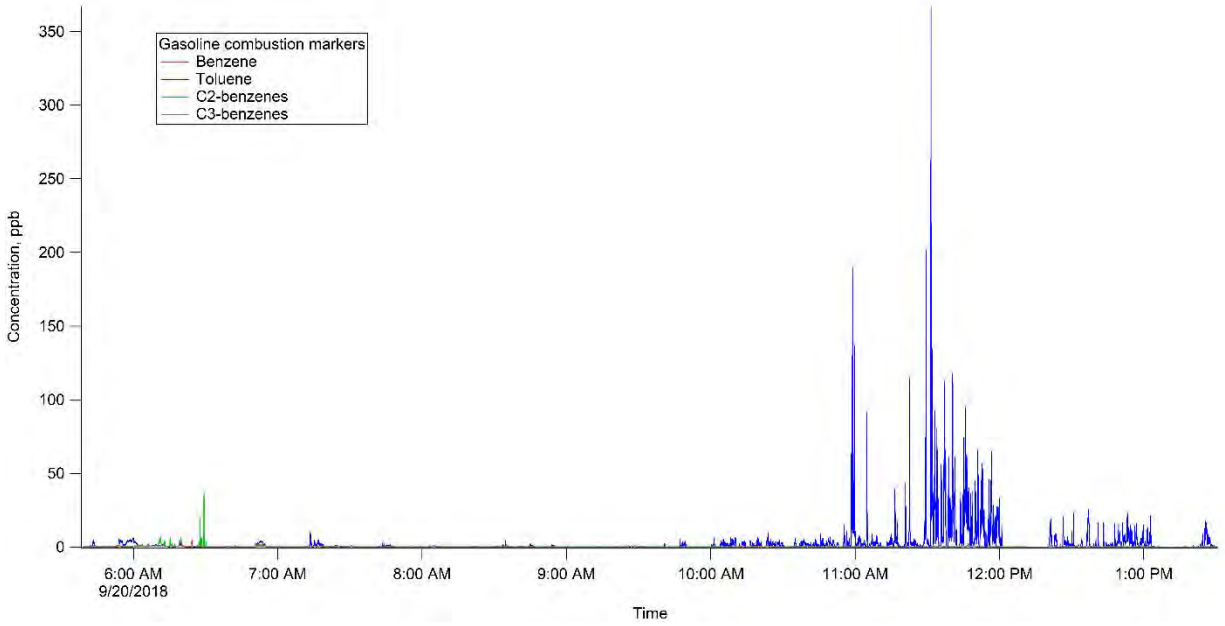

Figure 4-50. Gasoline Combustion Markers.

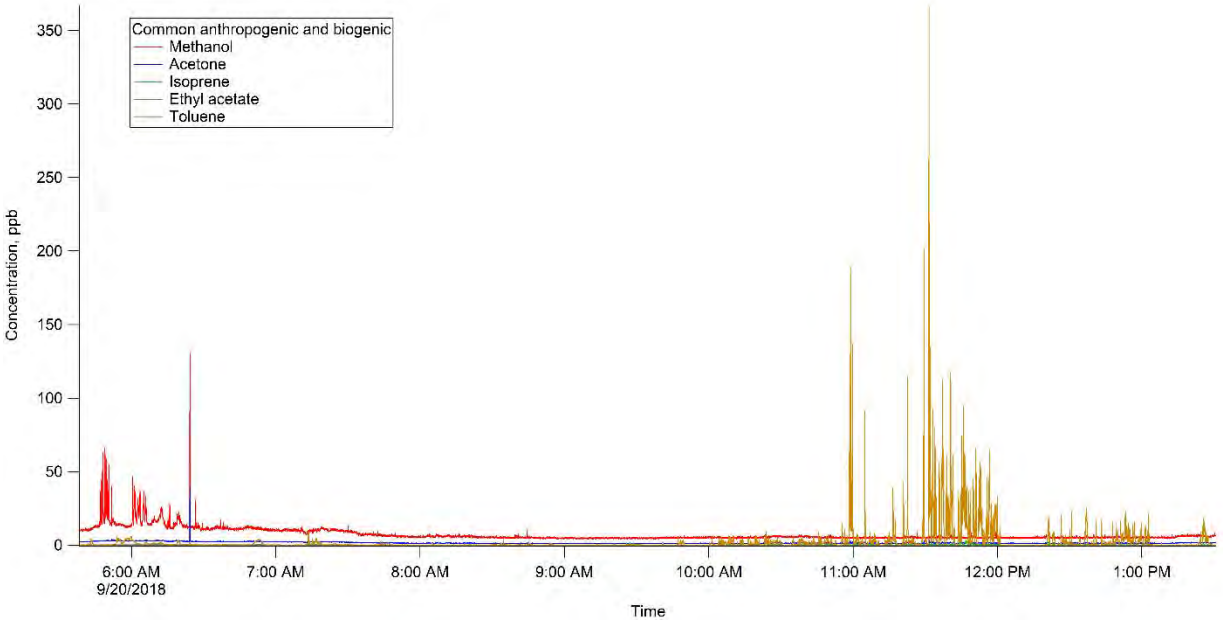

Figure 4-51. Plant and Human Markers.

5.0 SEPTEMBER 21, 2018 – SX PAVING

5.1 Quality Assessment

Data from September 21, 2018, 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

On September 21, 2018, the ML performed general area monitoring of the Hanford Site in support of the SX Paving Project.

The ML arrived on site and checked in at the CSO at 05:25. A QA/QC zero-air/sensitivity check began at 04:10 on the CO_2 monitor and PTR-MS prior to arrival. The ML began mobile monitoring of SX Farm at 05:42. The ML parked at the southeast corner of the farm at 05:52 and remained there until 09:30 when the ML staff relocated to the west side of the farm, tracking the wind.

The ML staff checked out with the CSO at 13:50. During transport back to the TerraGraphics warehouse, the QA/QC zero-air/sensitivity check of the Picarro ammonia analyzer was initiated at 14:04.

Table 5-1. Mobile Laboratory Sampling Mode Throughout the Monitoring Period.

Time	Location	Sampling Mode
05:42 - 09:30	SX Farm (SE corner of farm)	Mobile Area Monitoring
09:30 - 13:25	SX Farm (West side of farm)	Mobile Area Monitoring

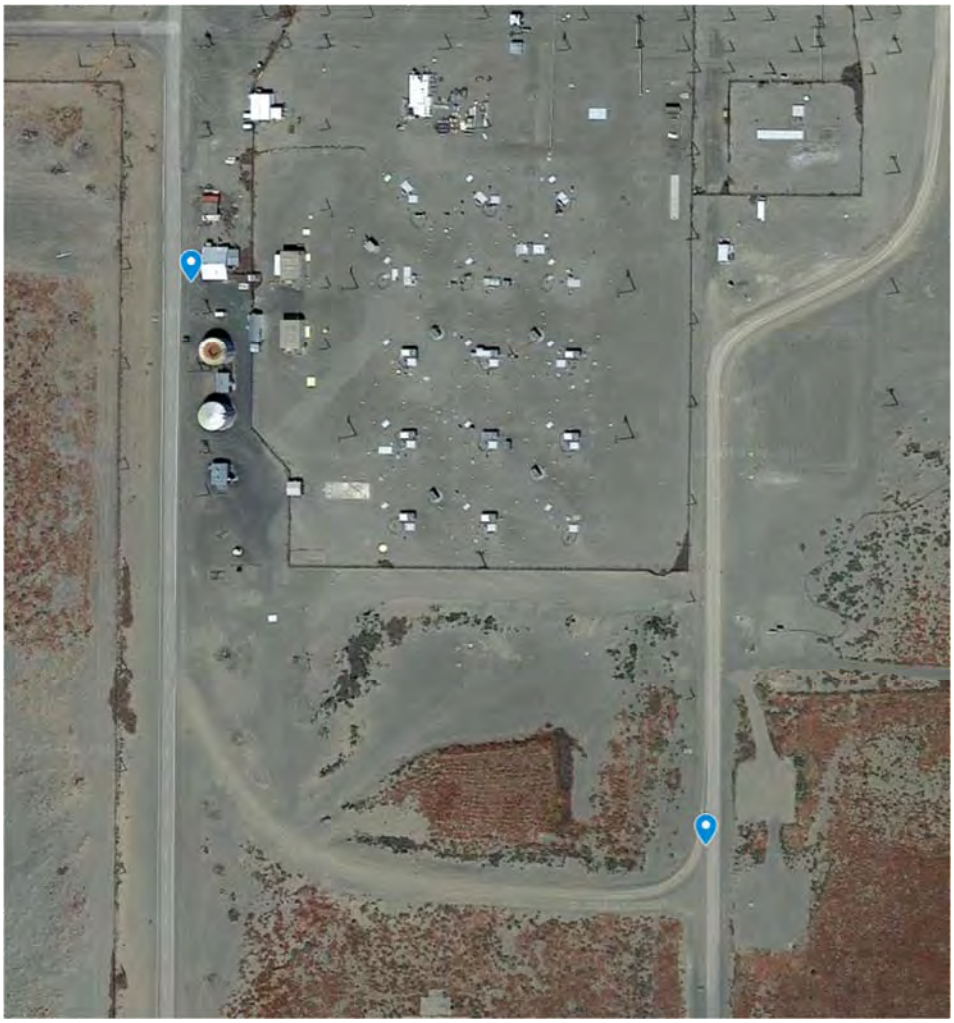

Figure 5-1. Mobile Laboratory Location for the Duration of the Monitoring Period.

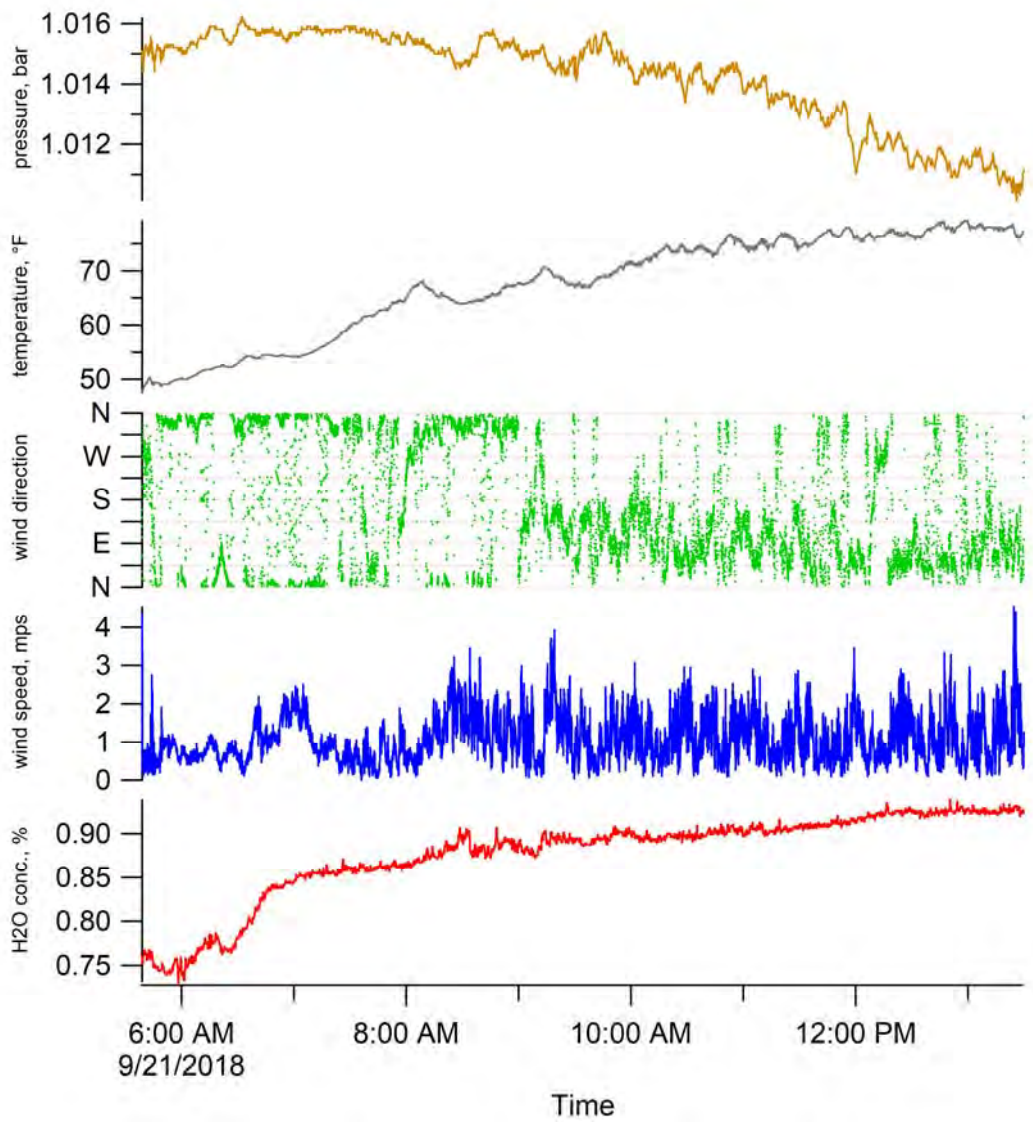

Figure 5-2. Weather Data for the Duration of the Monitoring Period.

5.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

Table 5-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 21, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	6.003	0.840	13.988	8.618	5.666
2	formaldehyde	300	0.977	0.190	19.461	4.706	0.957
3	methanol	200000	11.405	2.390	20.953	38.026	10.438
4	acetonitrile	20000	0.171	0.031	18.130	0.510	0.169
5	acetaldehyde	25000	3.646	1.214	33.305	26.909	3.374
6	ethylamine	5000	0.029	0.015	52.522	0.105	0.024
7	1,3-butadiene	1000	0.136	0.594	436.259	17.725	0.000
8	propanenitrile	6000	0.070	0.047	67.662	1.314	0.065
9	2-propenal	100	0.237	0.135	57.203	2.474	0.216
10	1-butanol + butenes	20000	0.410	0.798	194.722	23.751	0.217
11	methyl isocyanate	20	0.070	0.028	39.414	0.214	0.068
12	methyl nitrite	100	0.182	0.099	54.706	3.009	0.165
13	furan	1	0.041	0.022	55.114	0.430	0.039
14	butanenitrile	8000	0.029	0.042	144.349	1.306	0.023
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	100, 1, 1	0.079	0.039	49.525	N/A*	N/A*
16	butanal	25000	0.190	0.061	32.016	0.620	0.175
17	NDMA**	0.3	0.042	0.044	104.231	0.303	0.031
18	benzene	500	0.116	0.135	116.645	3.780	0.091
19	2,4-pentadienenitrile; pyridine	300, 1000	0.032	0.017	53.191	0.424	0.029
20	2-methylene butanenitrile	30	0.022	0.027	120.044	0.793	0.018
21	2-methylfuran	1	0.045	0.024	52.676	0.210	0.041
22	pentanenitrile	6000	0.021	0.037	177.957	1.190	0.015
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.054	0.026	48.674	0.203	0.049
24	NEMA**	0.3	0.025	0.032	126.498	0.206	0.011
25	2,5-dimethylfuran	1	0.076	0.025	33.520	0.197	0.075
26	hexanenitrile	6000	0.068	0.037	53.704	1.129	0.064
27	2-hexanone (MBK)	5000	0.058	0.021	36.181	0.195	0.056
28	NDEA**	0.1	0.177	0.071	40.375	0.453	0.178
29	butyl nitrite + 2-nitro-2-methylpropane	100, 30	0.647	0.067	10.322	0.947	0.647
30	2,4-dimethylpyridine	500	0.185	0.046	24.955	1.214	0.181
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.136	0.038	27.601	0.288	0.135

Table 5-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 21, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.194	0.039	20.164	0.786	0.191
33	4-methyl-2-hexanone	500	0.169	0.034	19.956	0.322	0.167
34	NMOR**	0.6	0.019	0.032	163.613	0.212	0.000
35	butyl nitrate	2500	0.102	0.032	31.041	0.230	0.101
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.158	0.033	21.061	0.406	0.156
37	6-methyl-2-heptanone	8000	0.154	0.030	19.491	0.285	0.152
38	2-pentylfuran	1	0.133	0.032	23.739	0.275	0.132
39	biphenyl	200	0.132	0.036	27.624	0.294	0.132
40	2-heptylfuran	1	0.588	0.074	12.562	1.641	0.581
41	1,4-butanediol dinitrate	50	0.187	0.036	19.359	0.349	0.185
42	2-octylfuran	1	0.003	0.014	508.702	0.216	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.005	0.021	459.852	0.292	0.000
44	PCB	1000	0.211	0.034	16.027	0.347	0.209
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.112	0.027	24.522	0.252	0.111
46	furfural acetophenone	1	0.528	0.062	11.753	0.844	0.523

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.457 ppb and the median value was 0.069 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 studies [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., 2017].

The following figures display a selection of COPC signals, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 21, 2018.

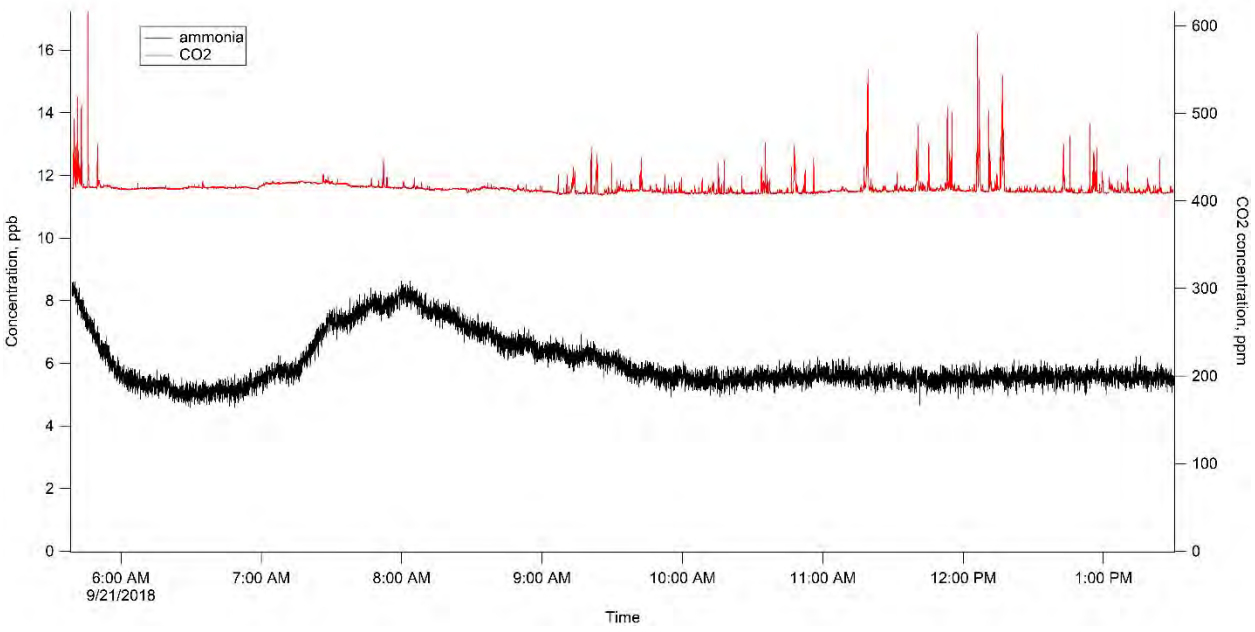

Figure 5-3. Ammonia.

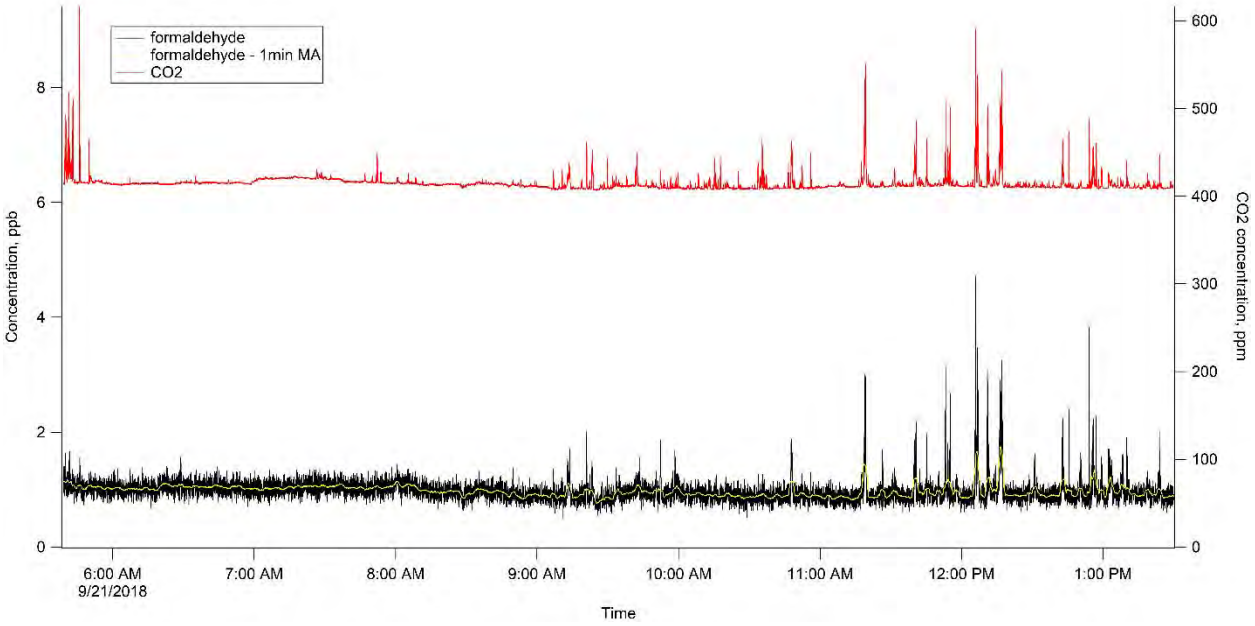

Figure 5-4. Formaldehyde.

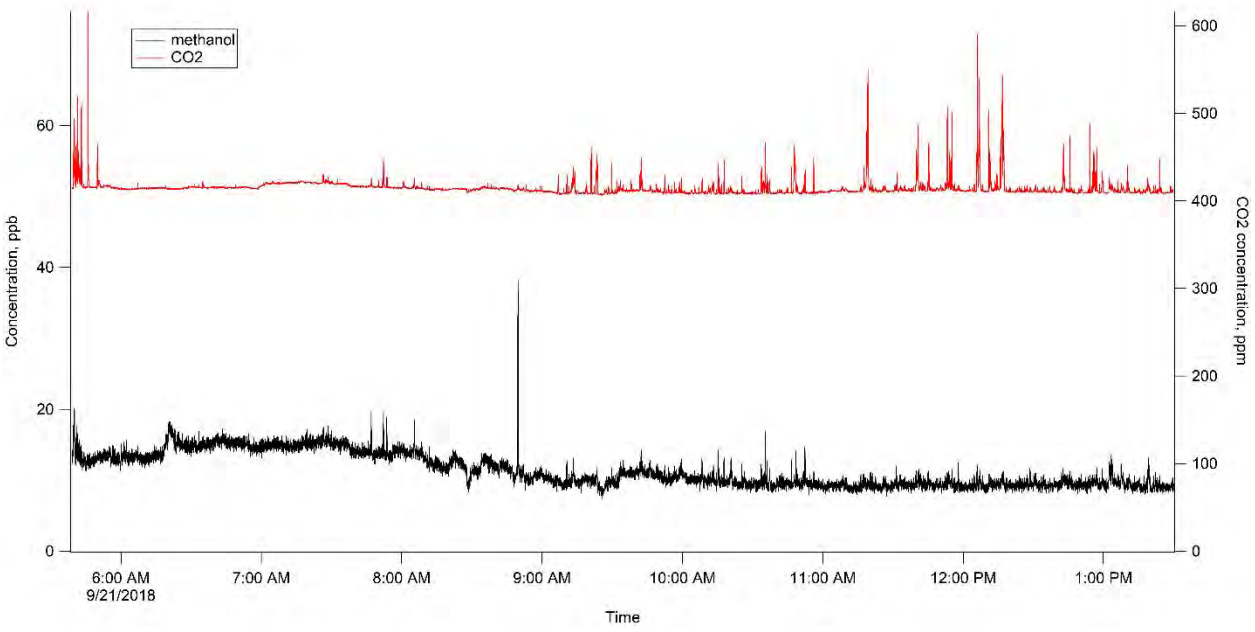

Figure 5-5. Methanol.

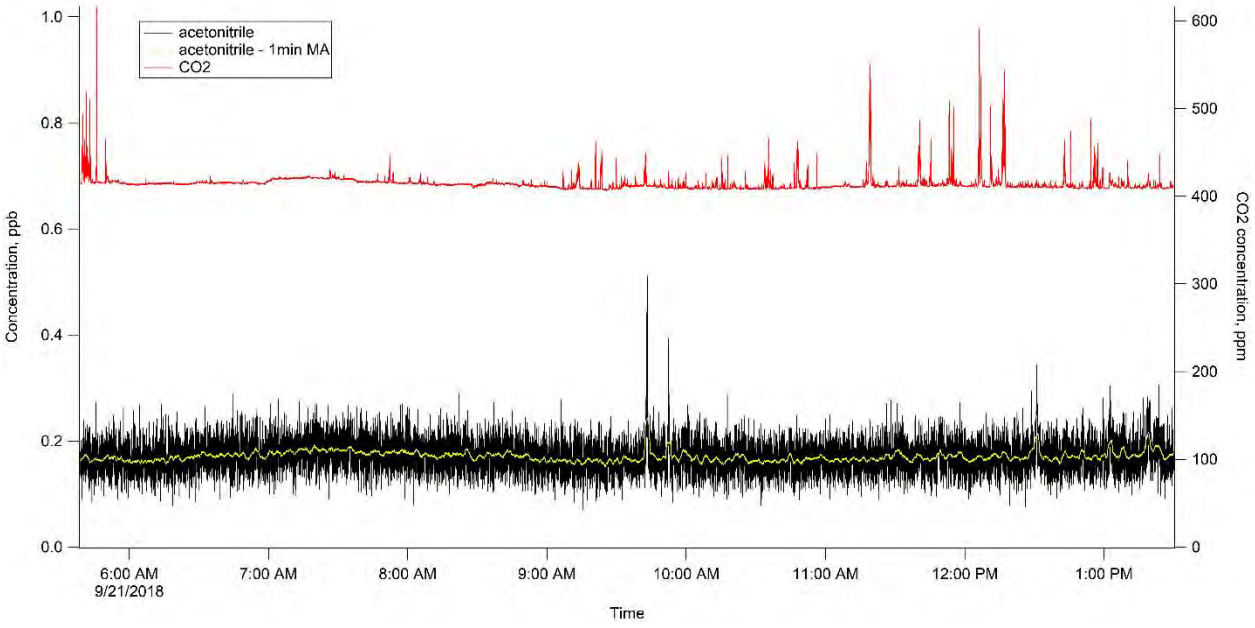

Figure 5-6. Acetonitrile.

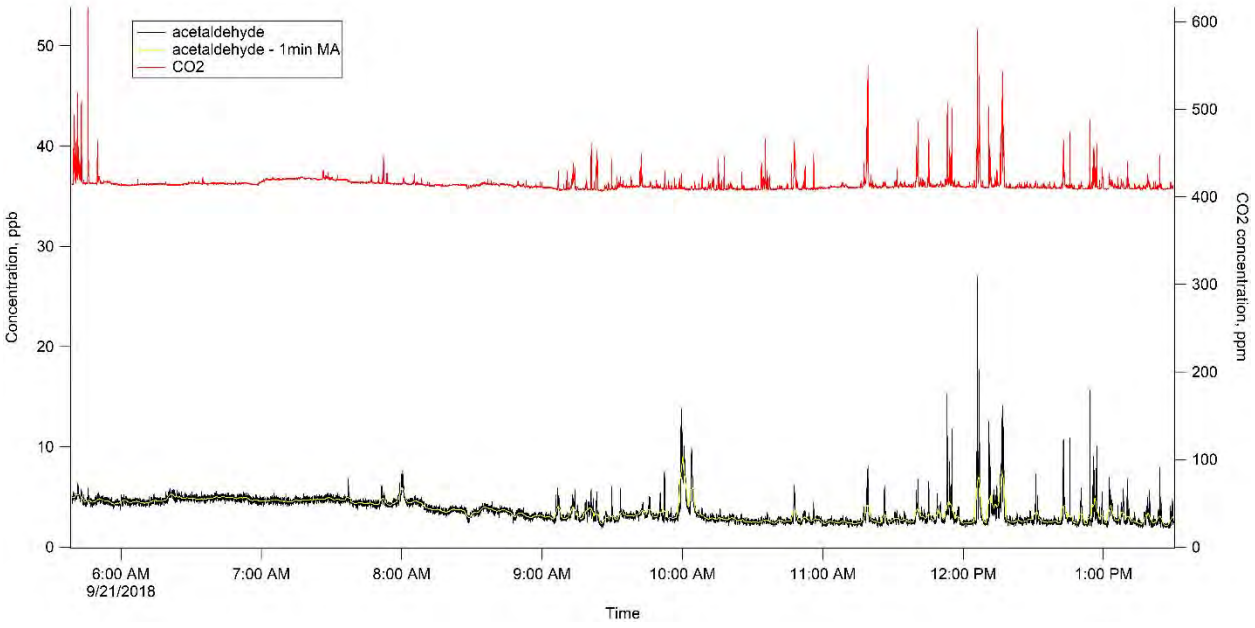

Figure 5-7. Acetaldehyde.

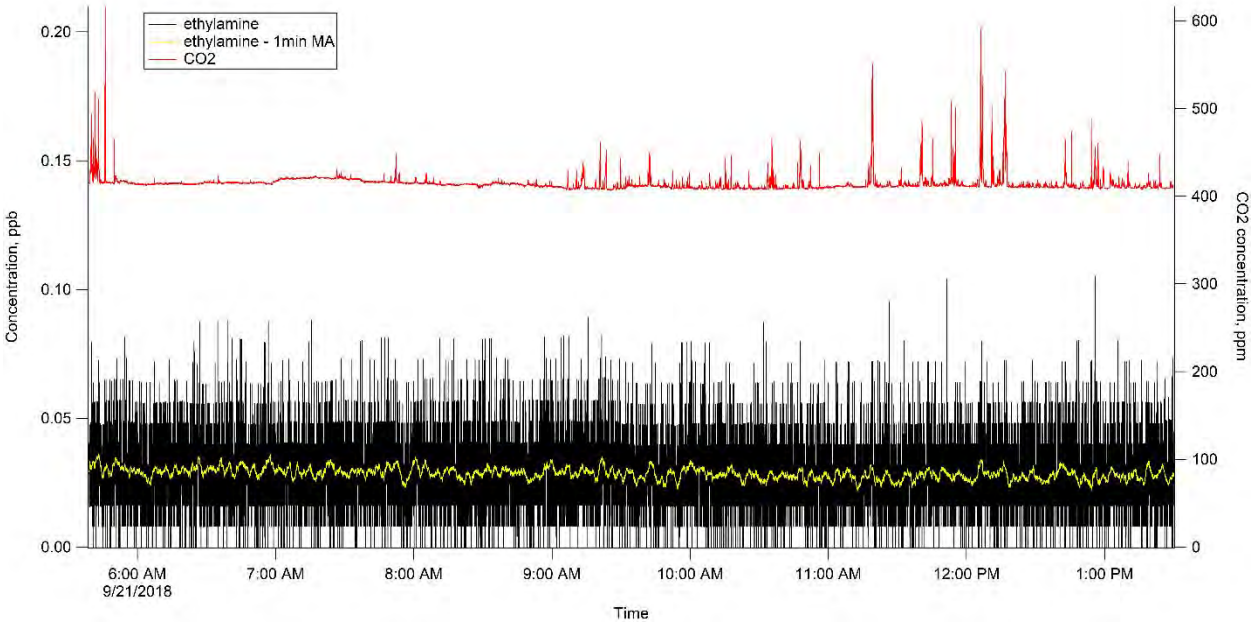

Figure 5-8. Ethylamine.

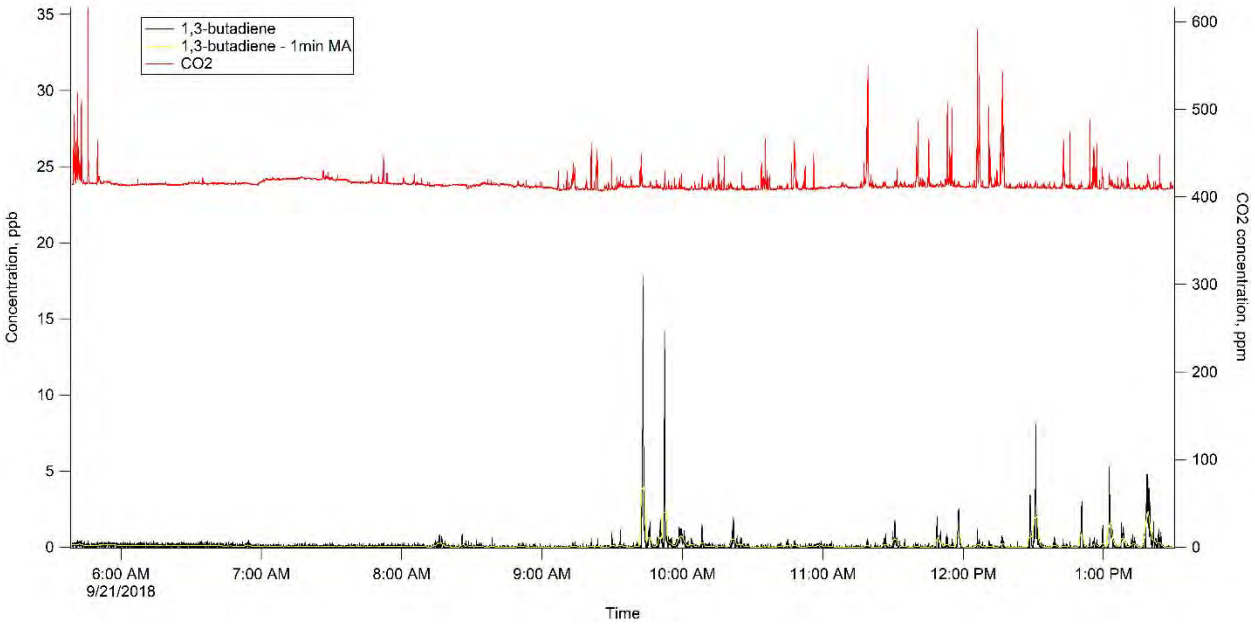

Figure 5-9. 1,3-butadiene.

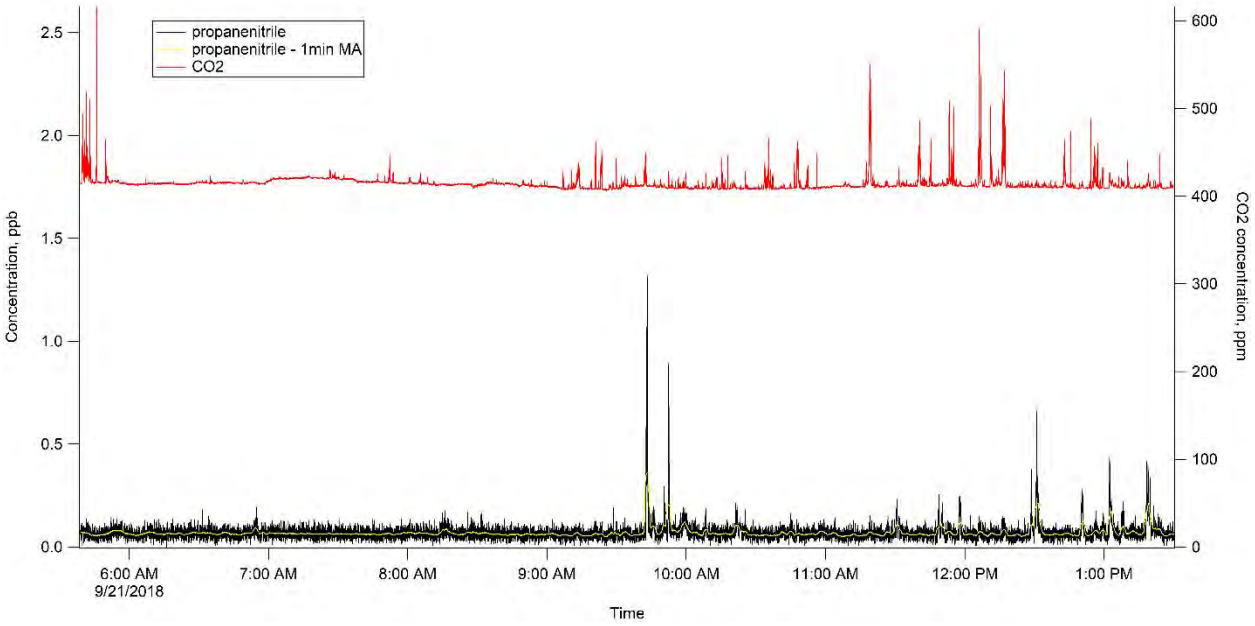

Figure 5-10. Propanenitrile.

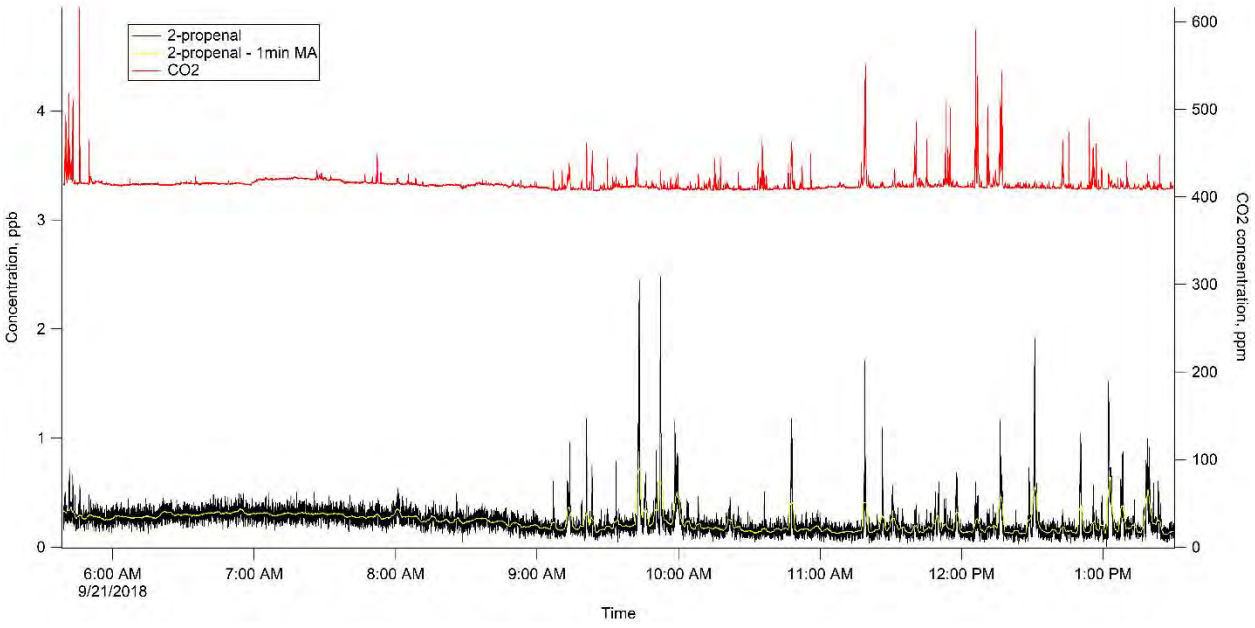

Figure 5-11. 2-propenal.

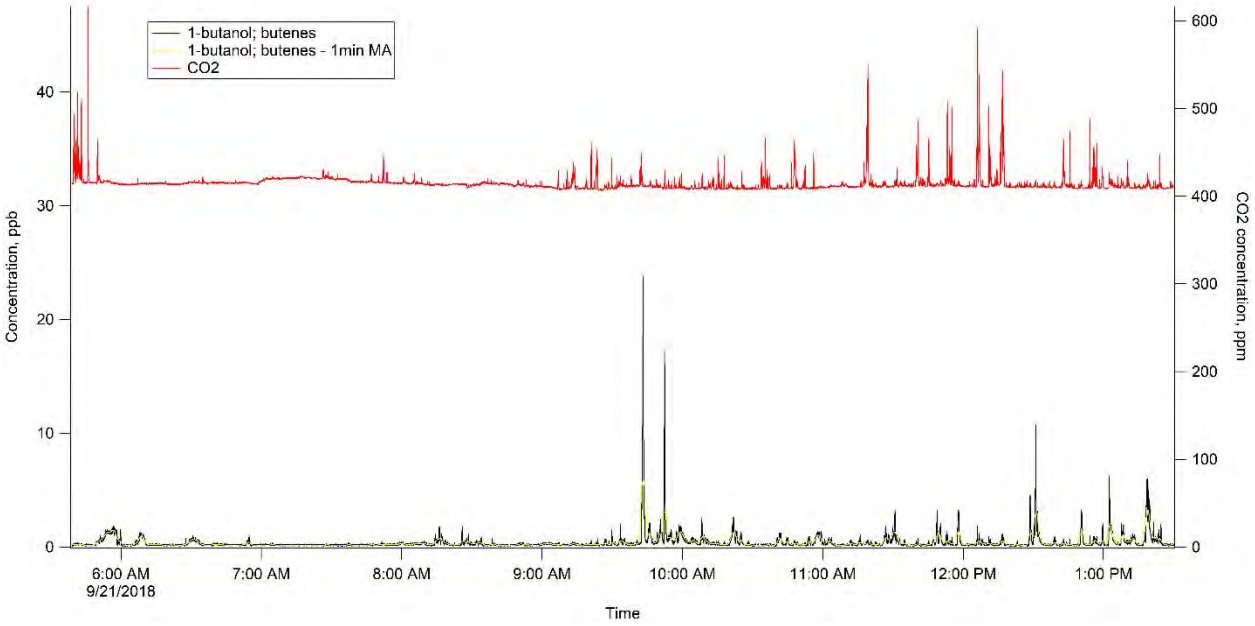

Figure 5-12. 1-butanol; Butenes.

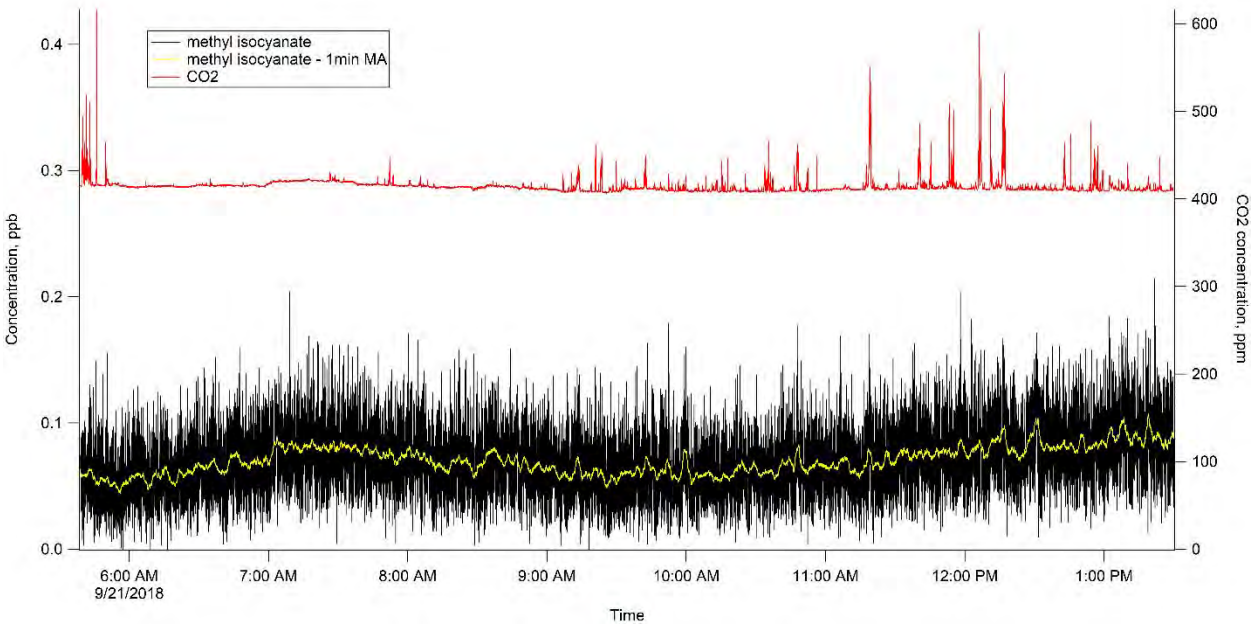

Figure 5-13. Methyl Isocyanate.

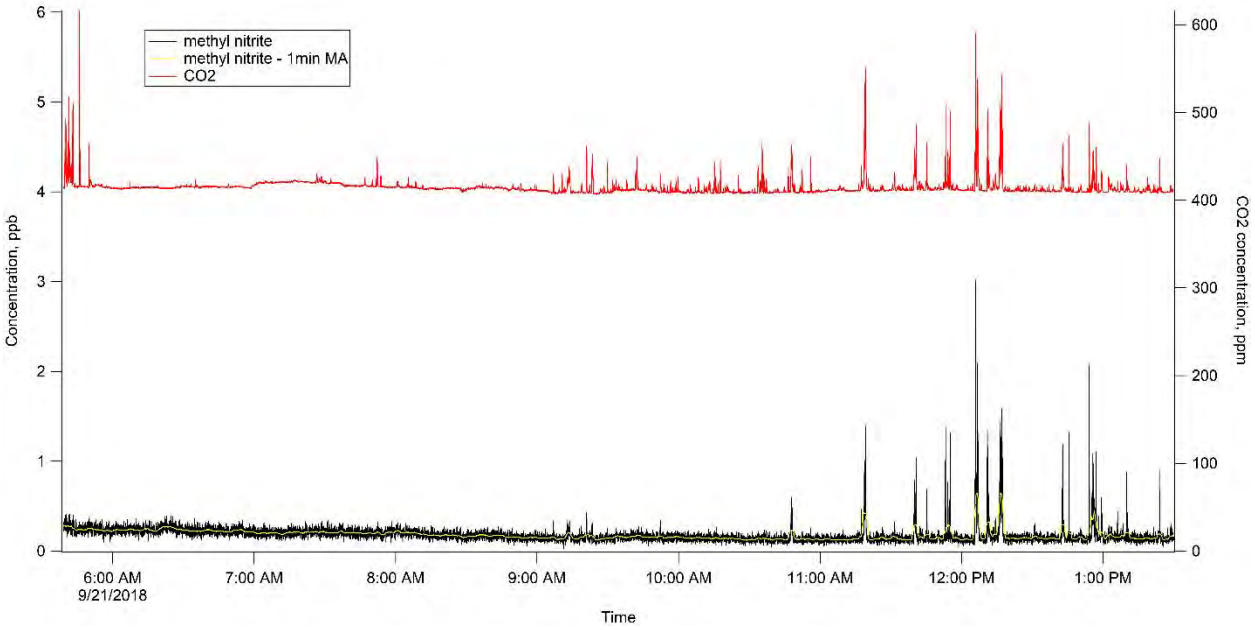

Figure 5-14. Methyl Nitrite.

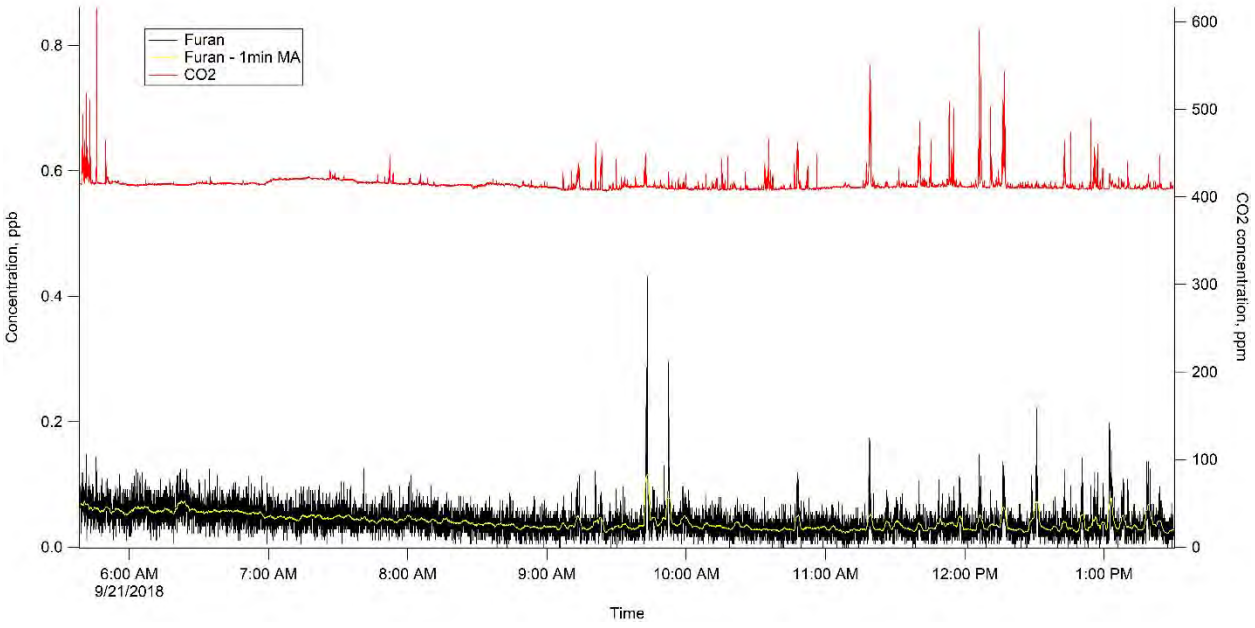

Figure 5-15. Furan.

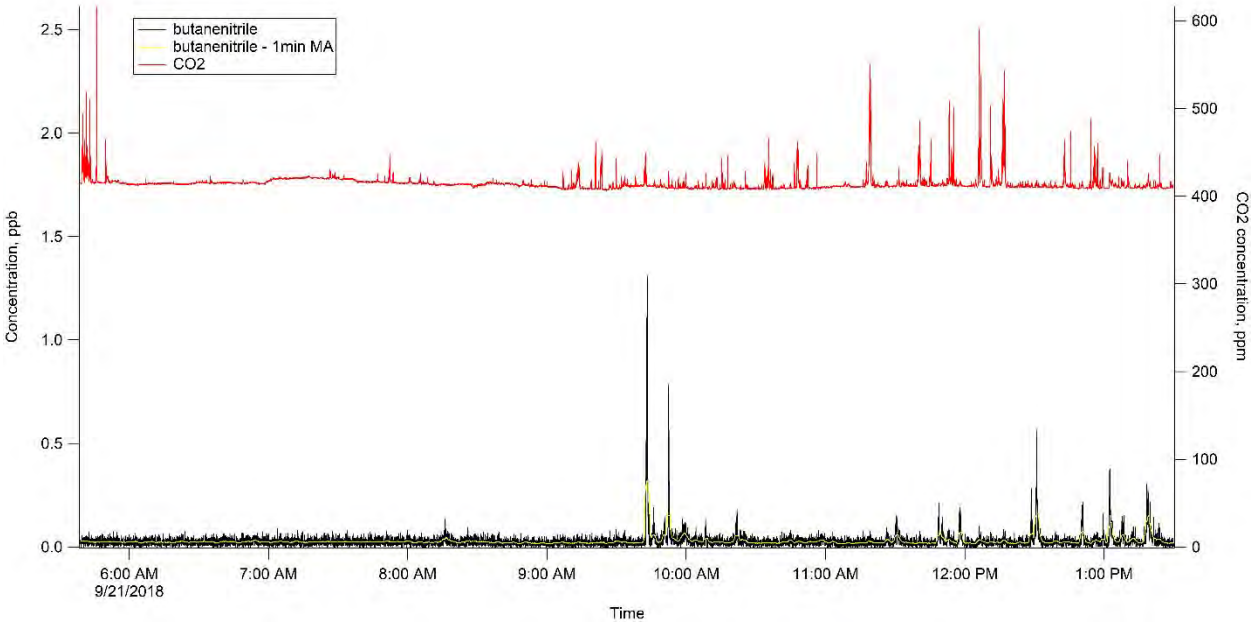

Figure 5-16. Butanenitrile.

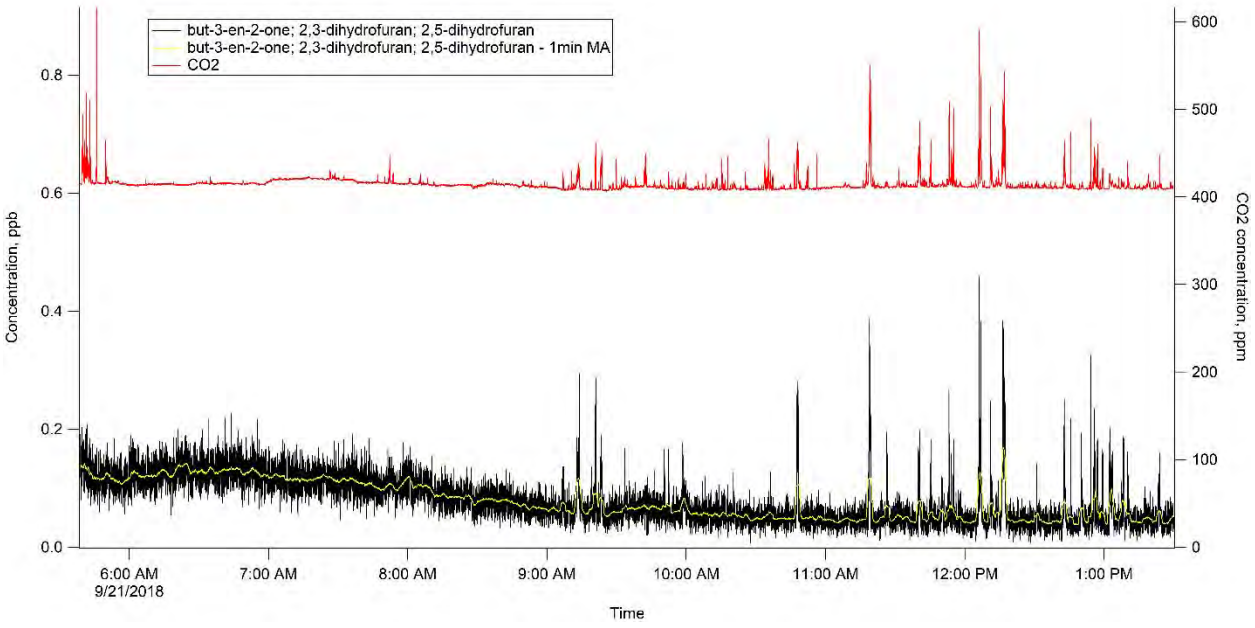

Figure 5-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

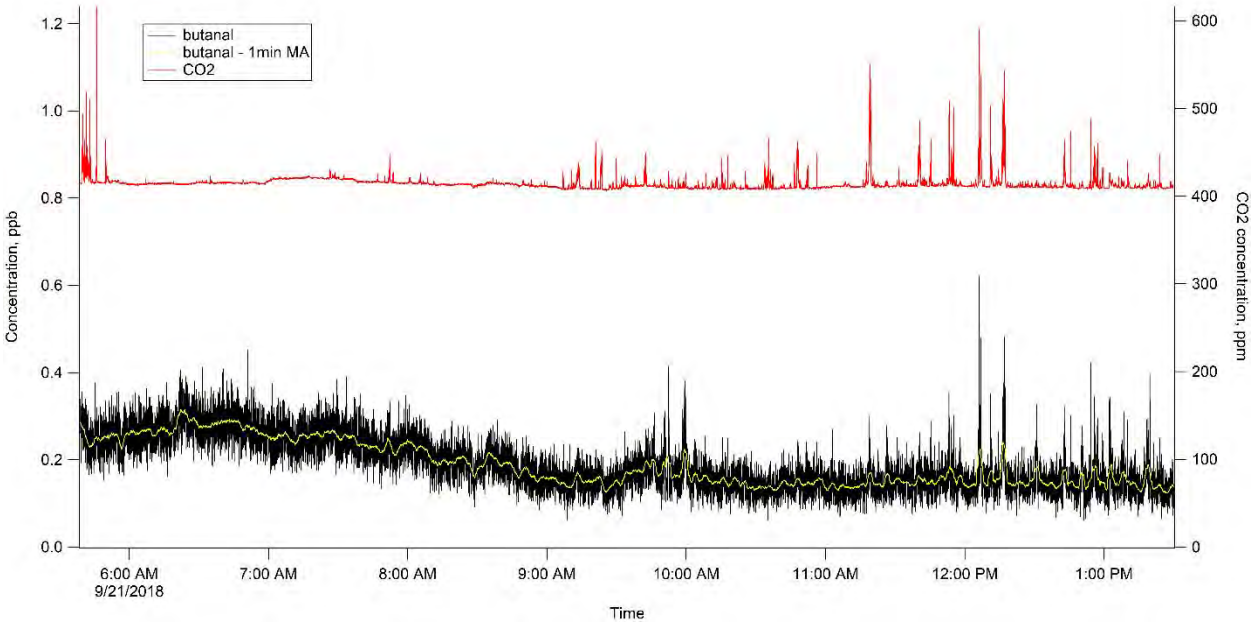

Figure 5-18. Butanal.

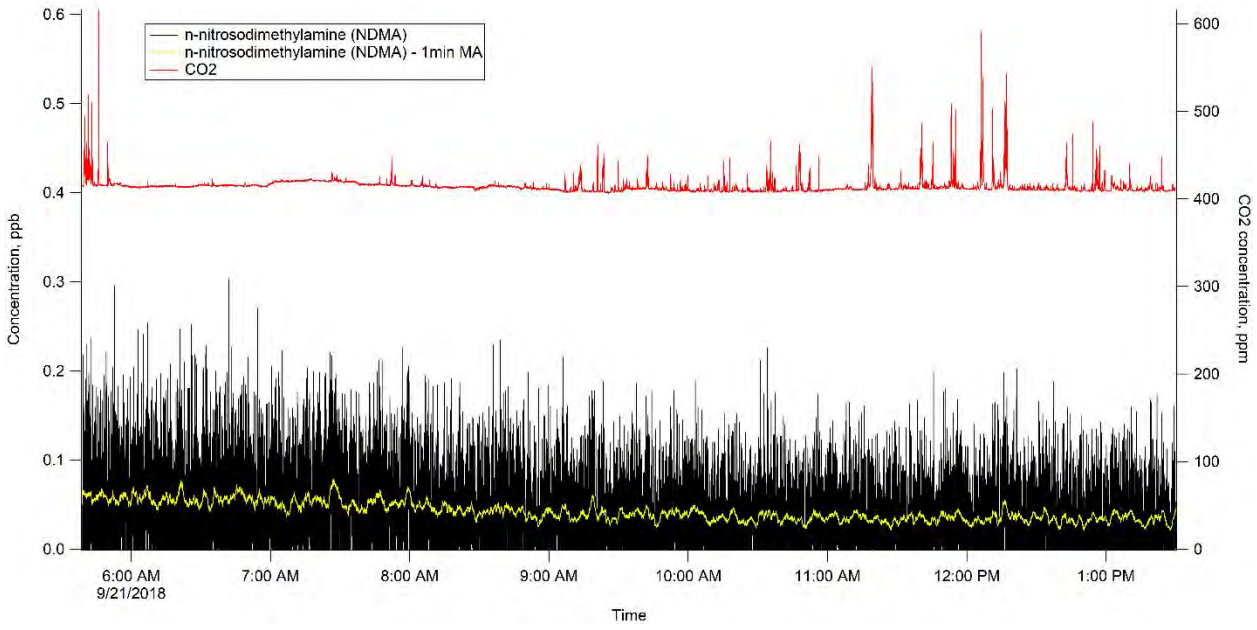

Figure 5-19. N-nitrosodimethylamine (NDMA).

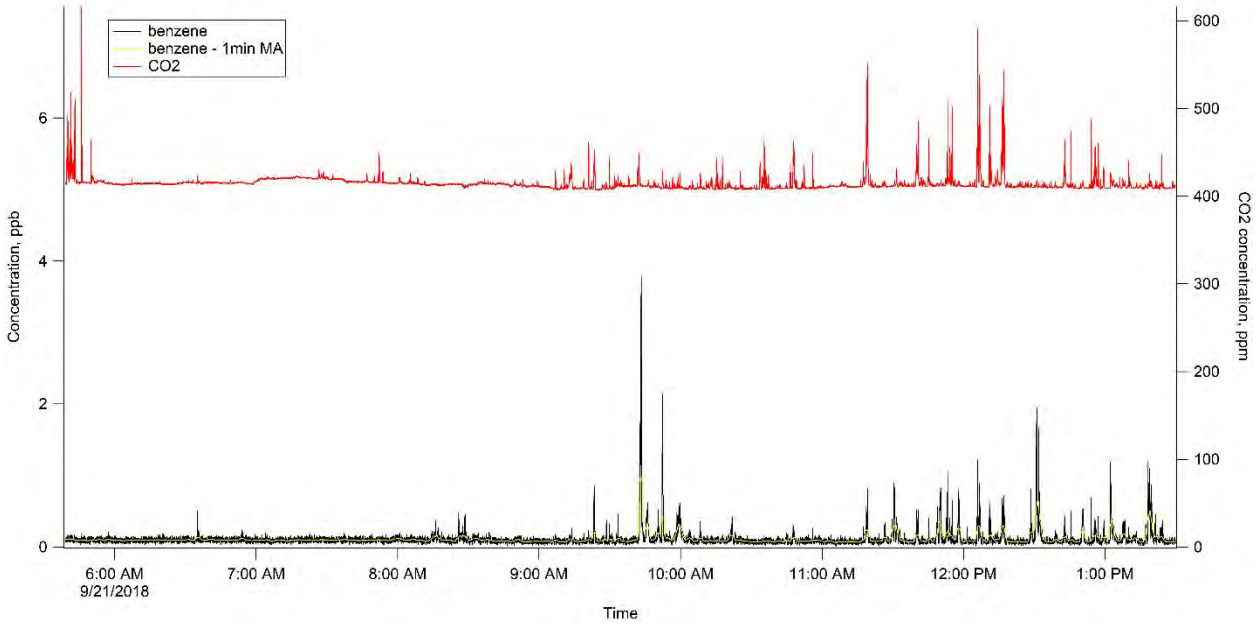

Figure 5-20. Benzene.

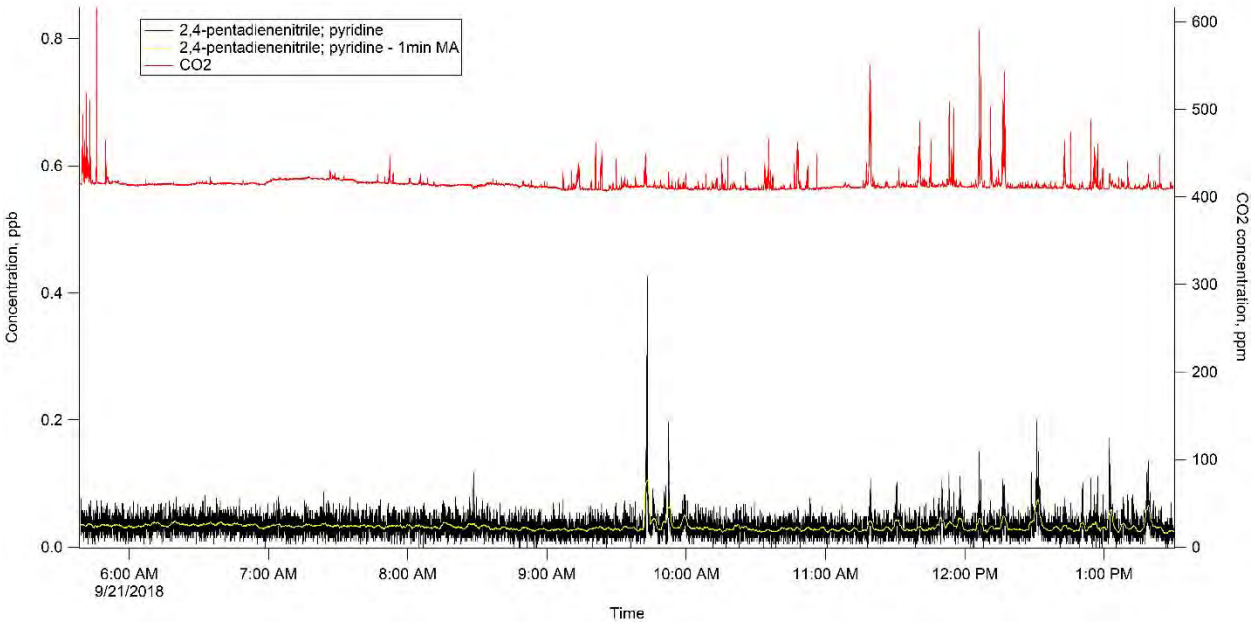

Figure 5-21. 2,4-pentadienenitrile; Pyridine.

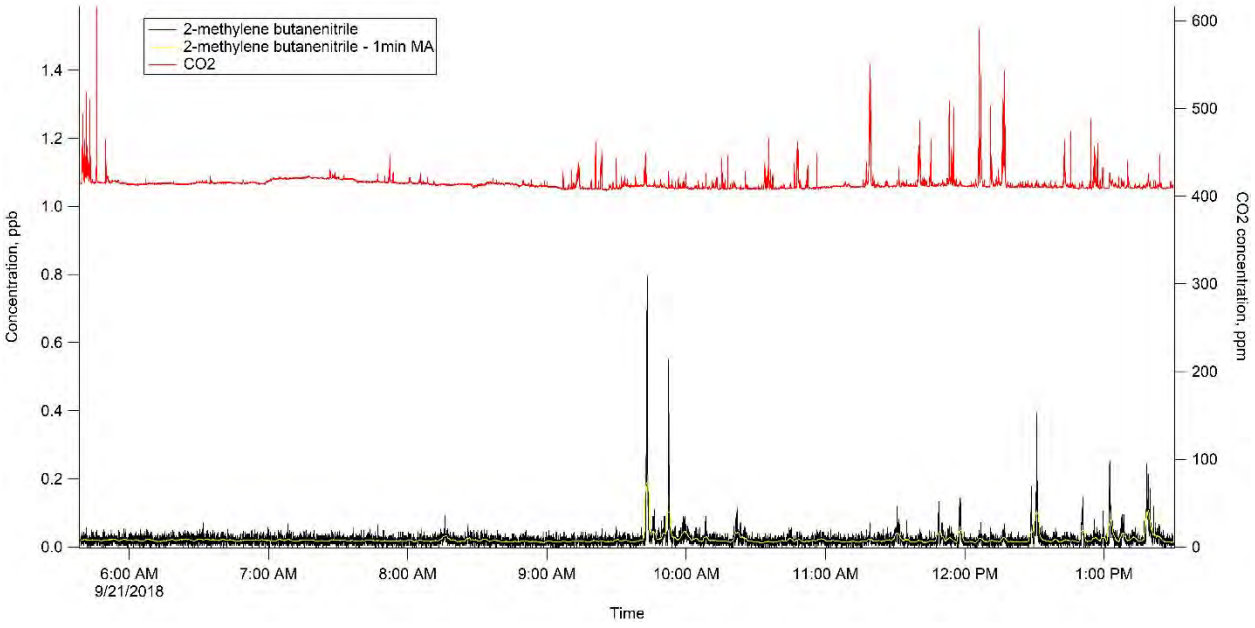

Figure 5-22. 2-methylene Butanenitrile.

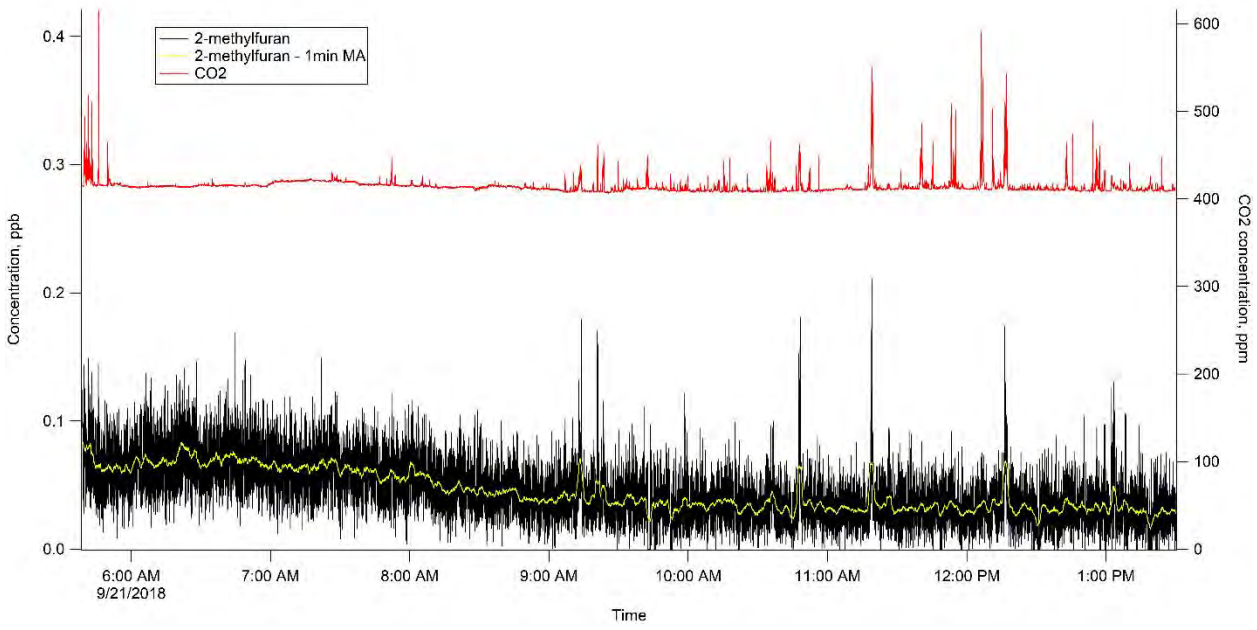

Figure 5-23. 2-methylfuran.

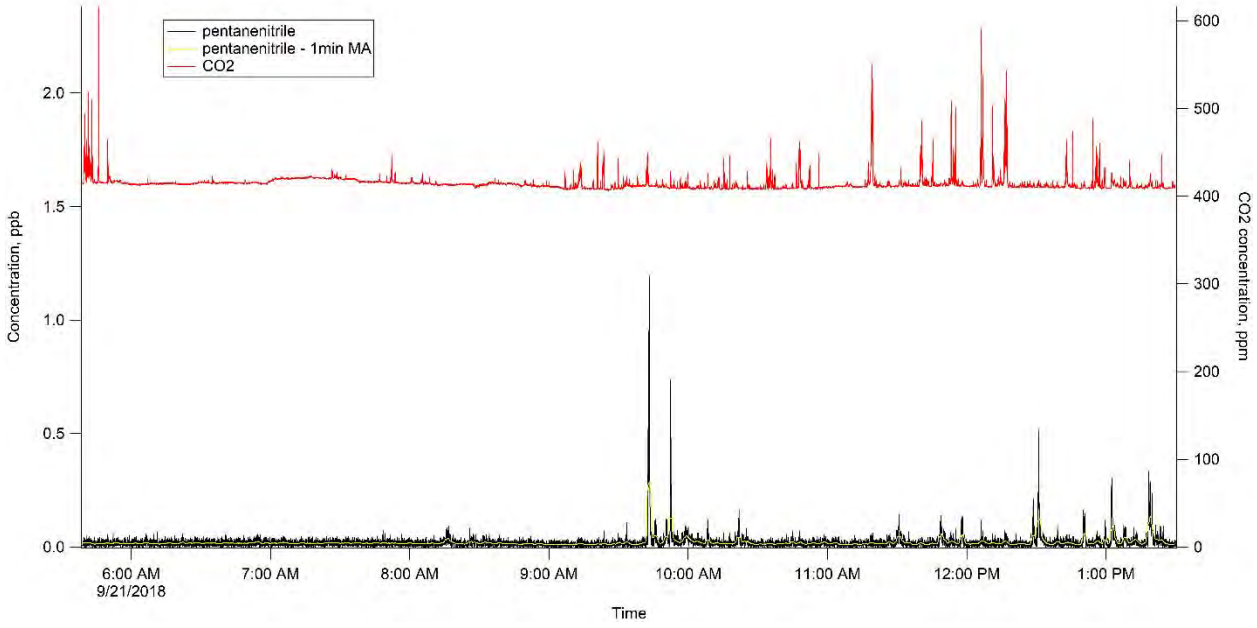

Figure 5-24. Pentanenitrile.

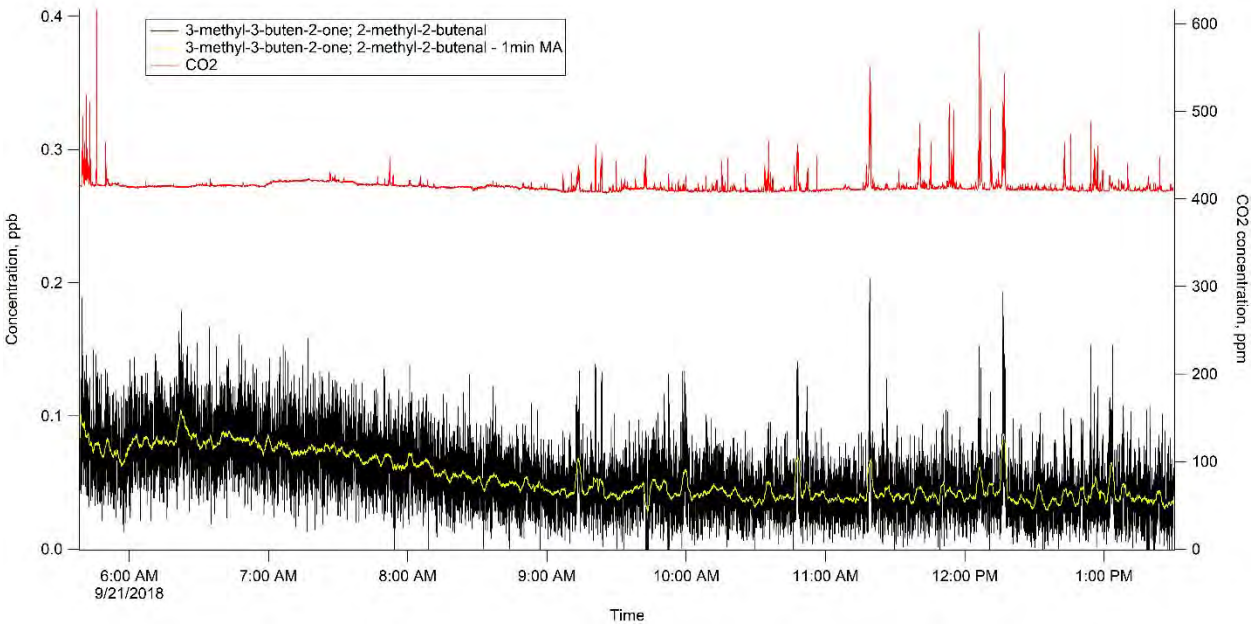

Figure 5-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

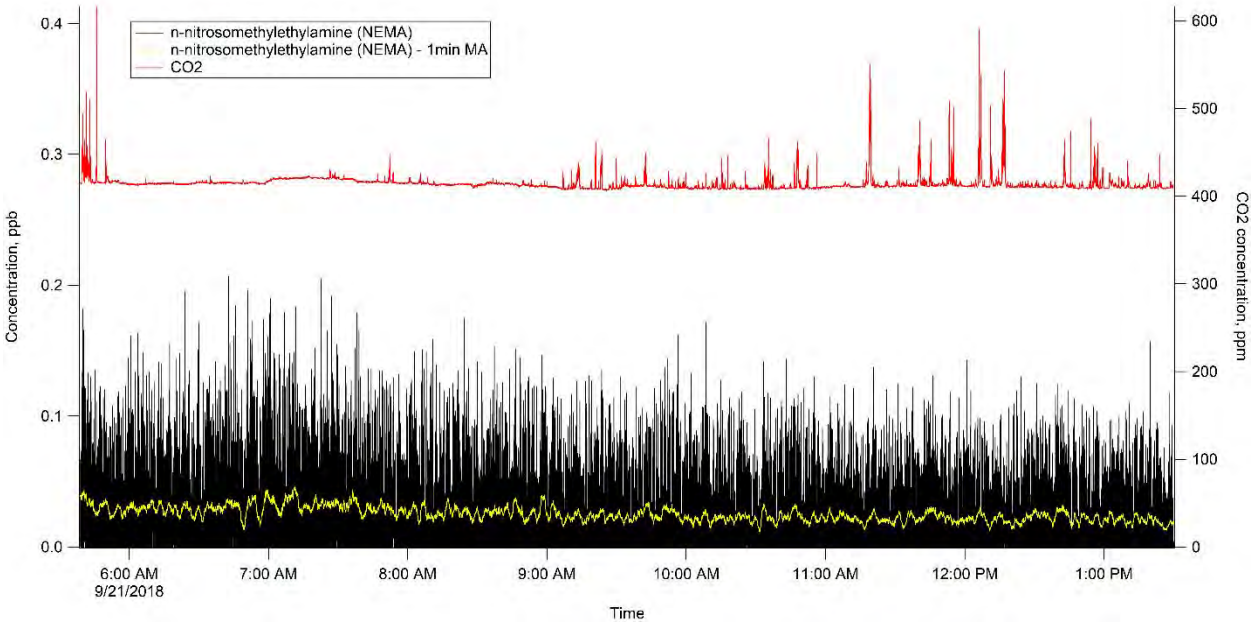

Figure 5-26. N-nitrosomethylethylamine (NEMA).

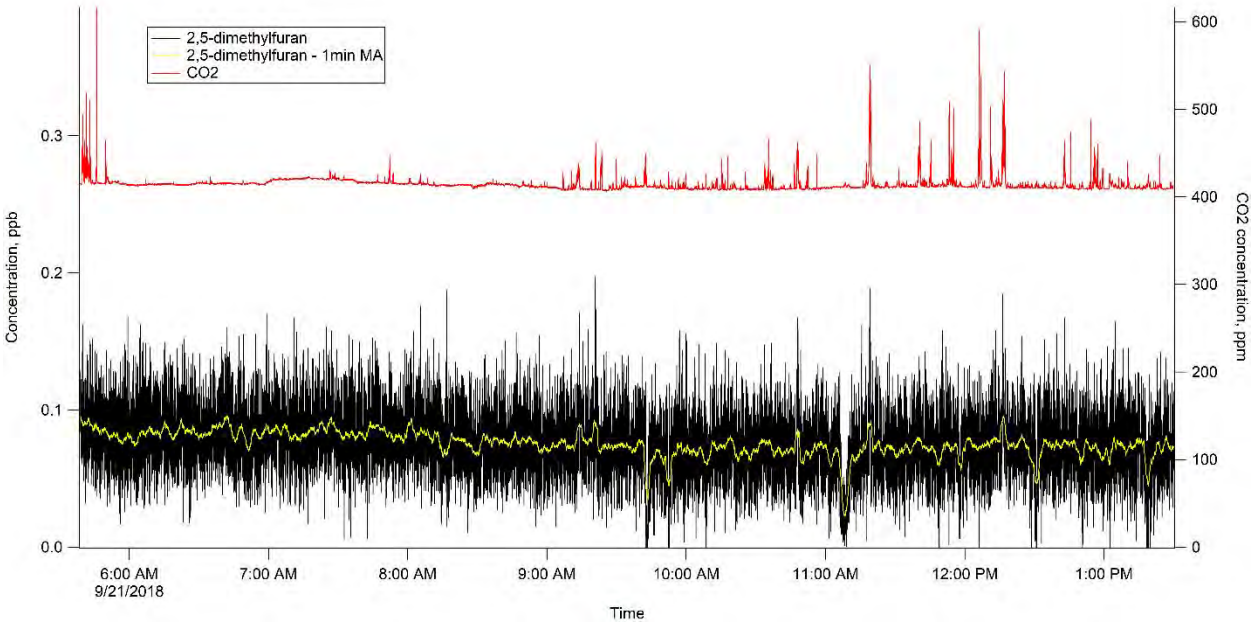

Figure 5-27. 2,5-dimethylfuran.

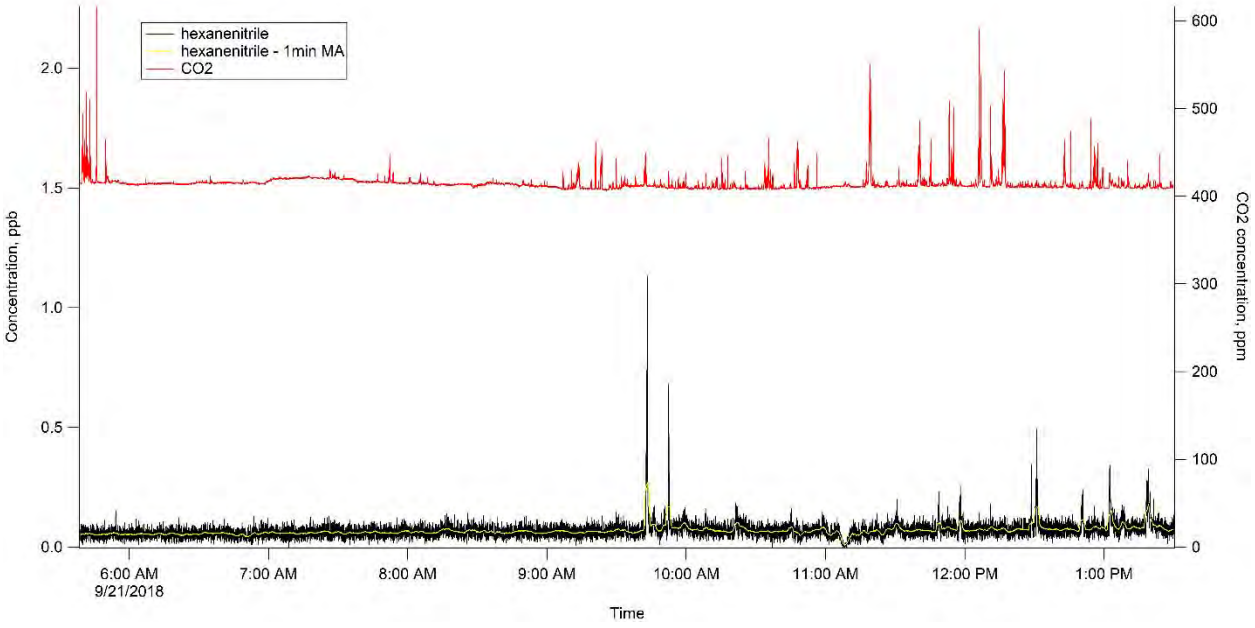

Figure 5-28. Hexanenitrile.

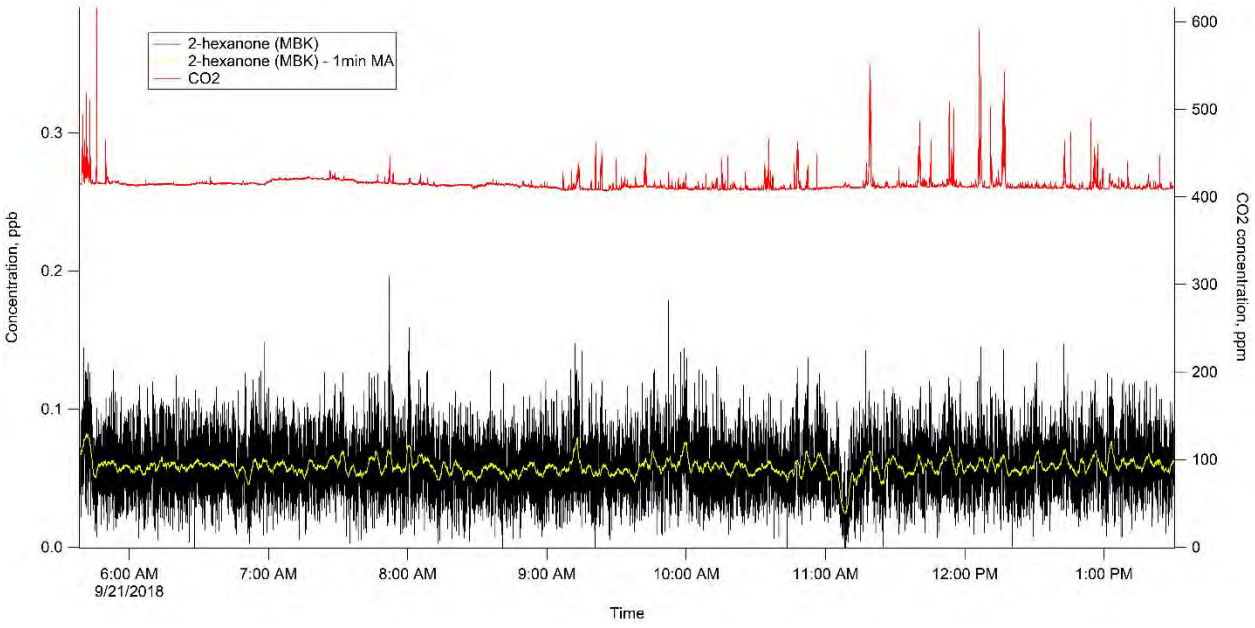

Figure 5-29. 2-hexanone (MBK).

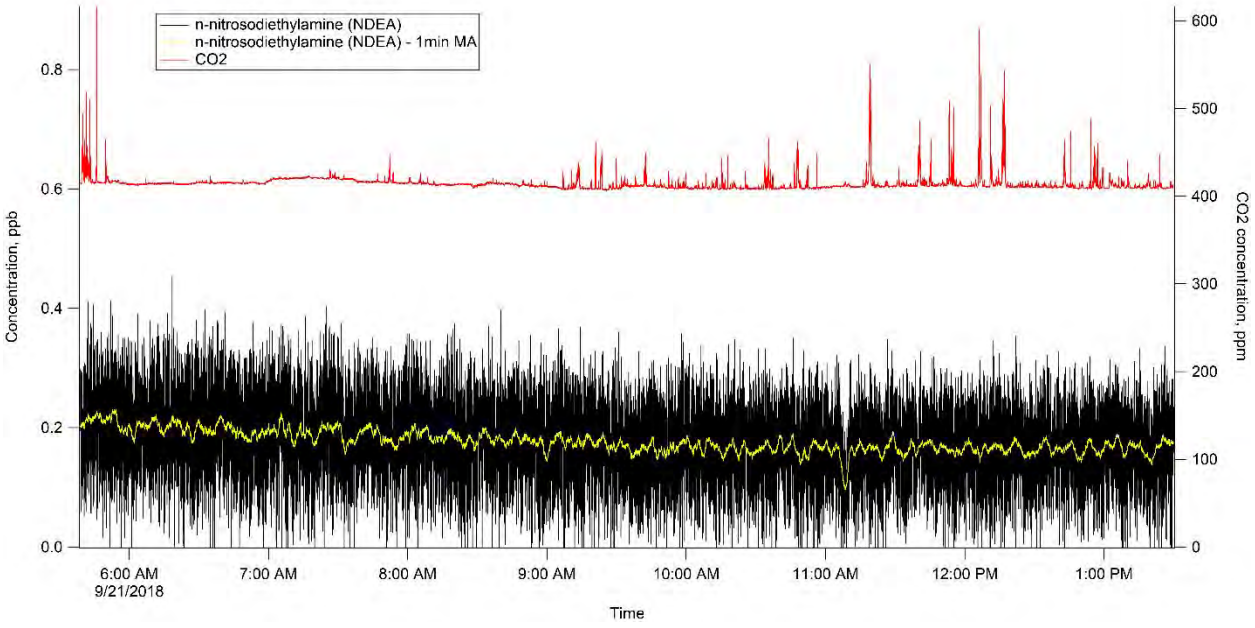

Figure 5-30. N-nitrosodiethylamine (NDEA).

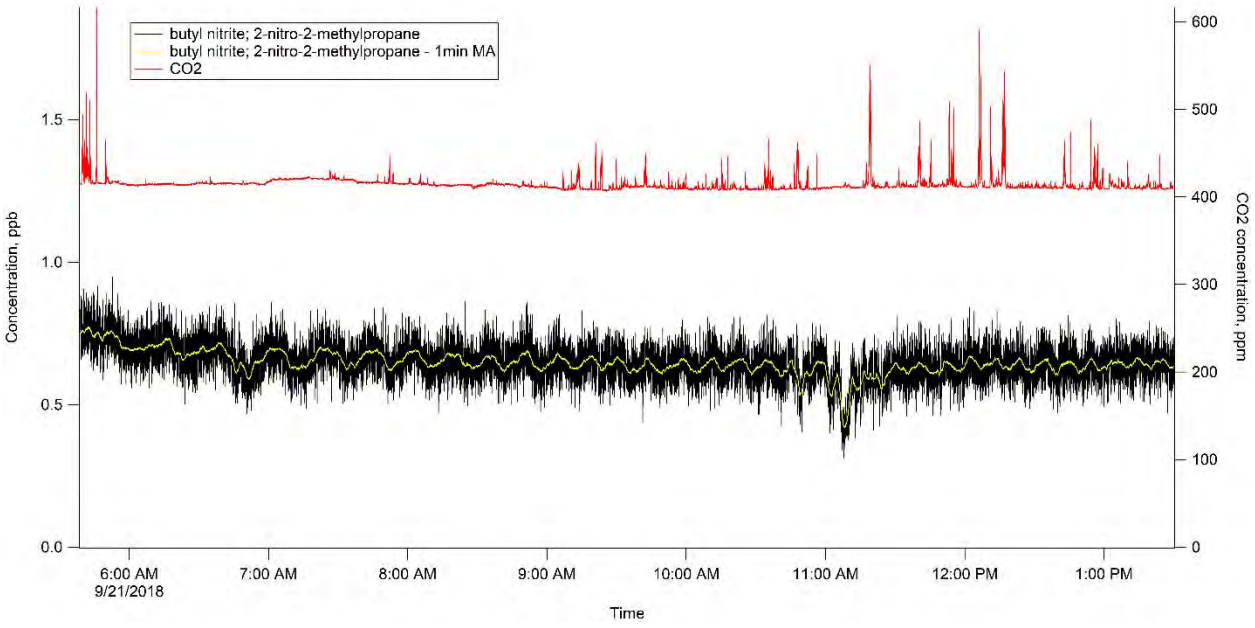

Figure 5-31. Butyl Nitrite; 2-nitro-2-methylpropane.

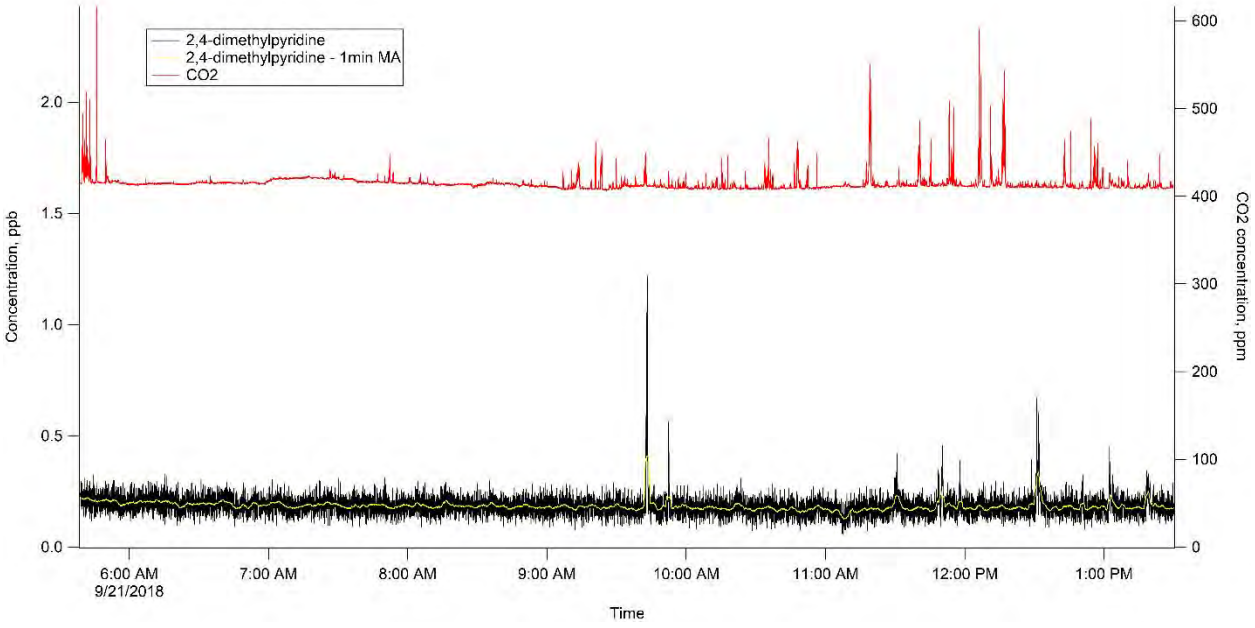

Figure 5-32. 2,4-dimethylpyridine.

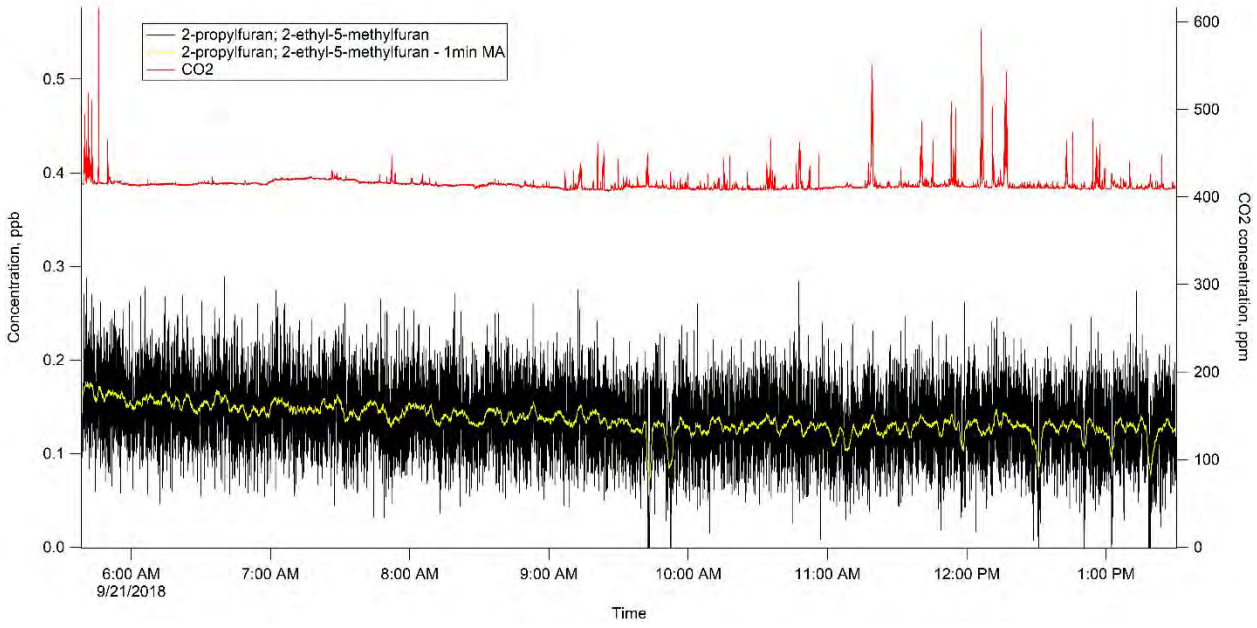

Figure 5-33. 2-propylfuran; 2-ethyl-5-methylfuran.

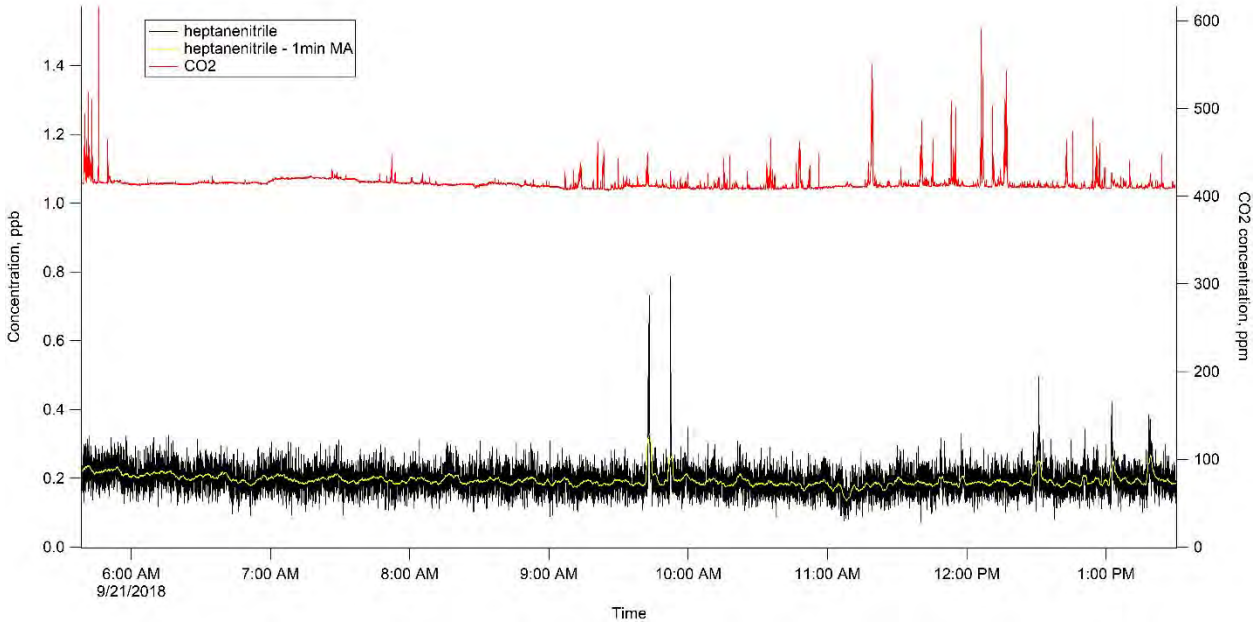

Figure 5-34. Heptanenitrile.

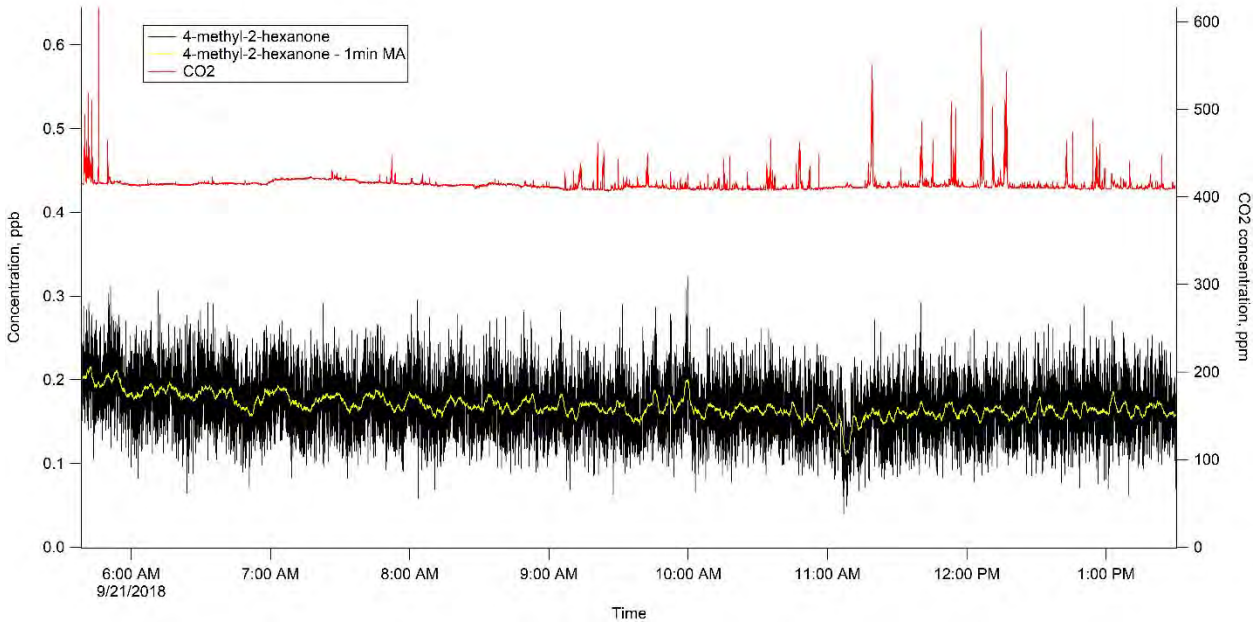

Figure 5-35. 4-methyl-2-hexanone.

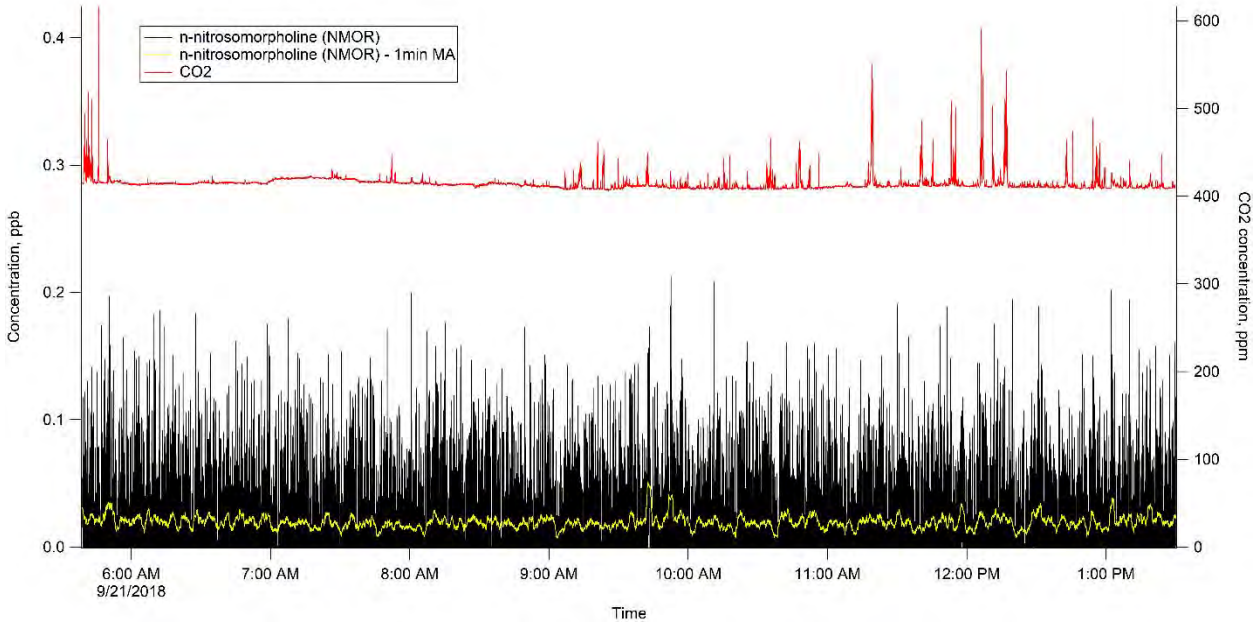

Figure 5-36. N-nitrosomorpholine (NMOR).

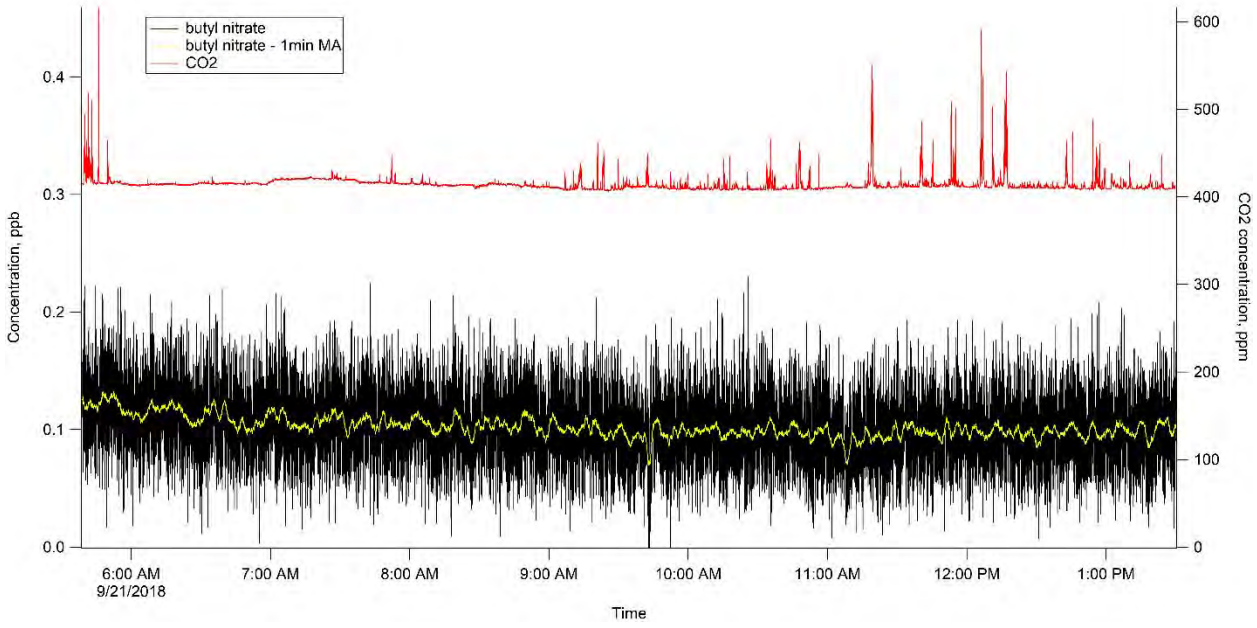

Figure 5-37. Butyl Nitrate.

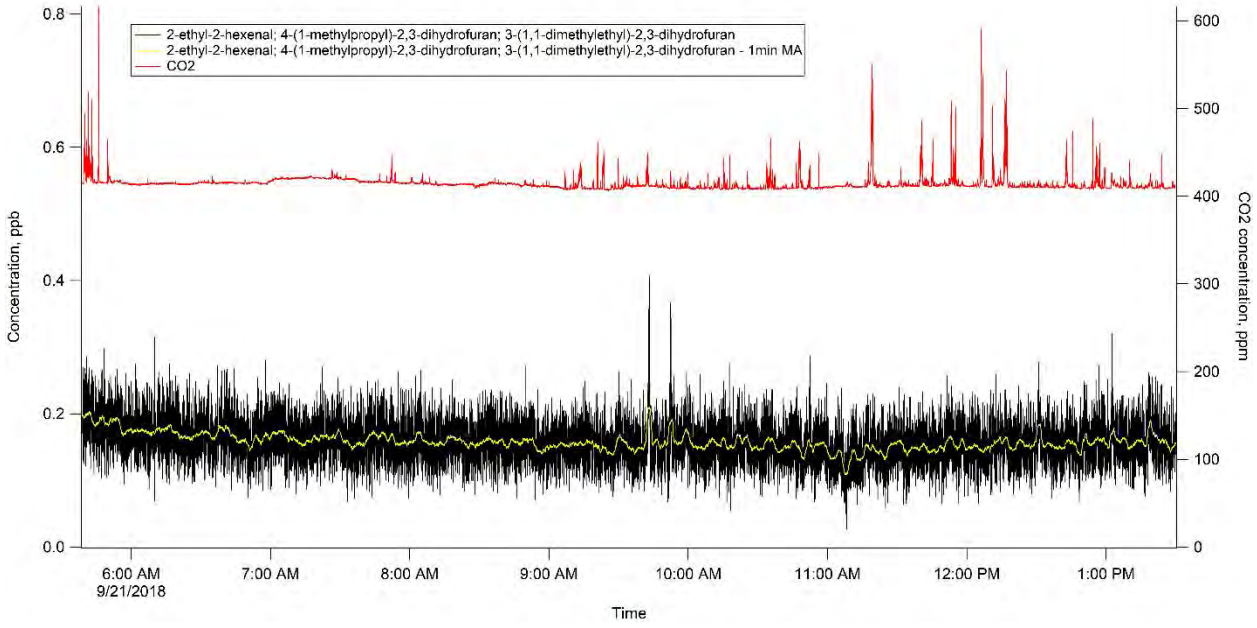

Figure 5-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

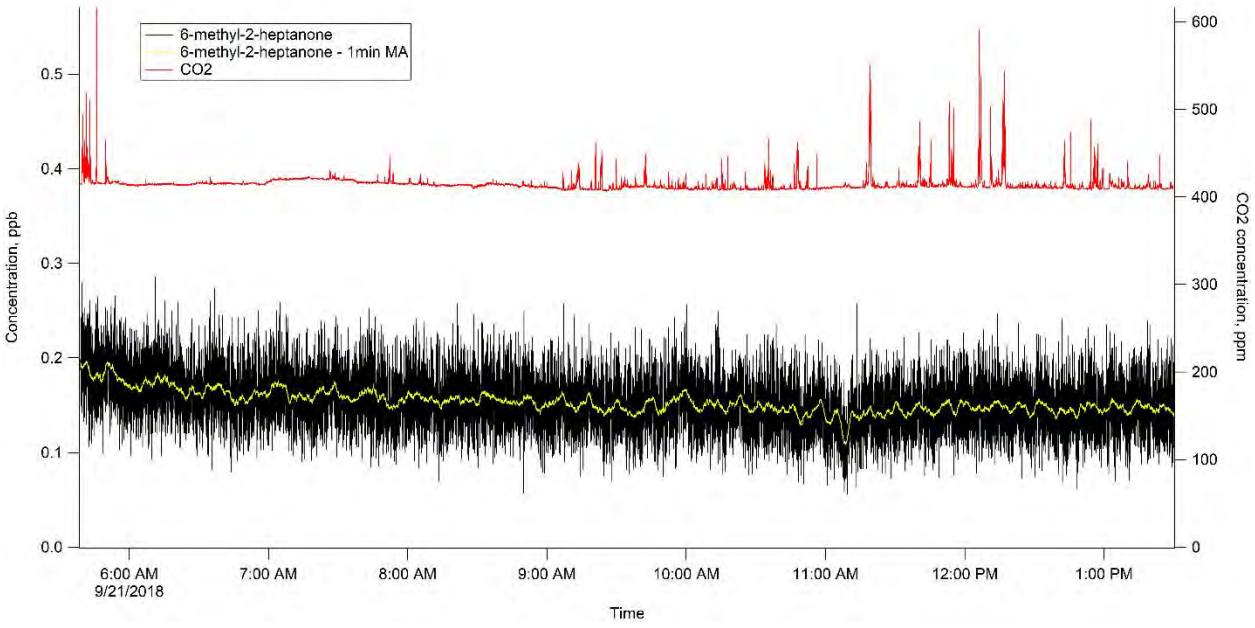

Figure 5-39. 6-methyl-2-heptanone.

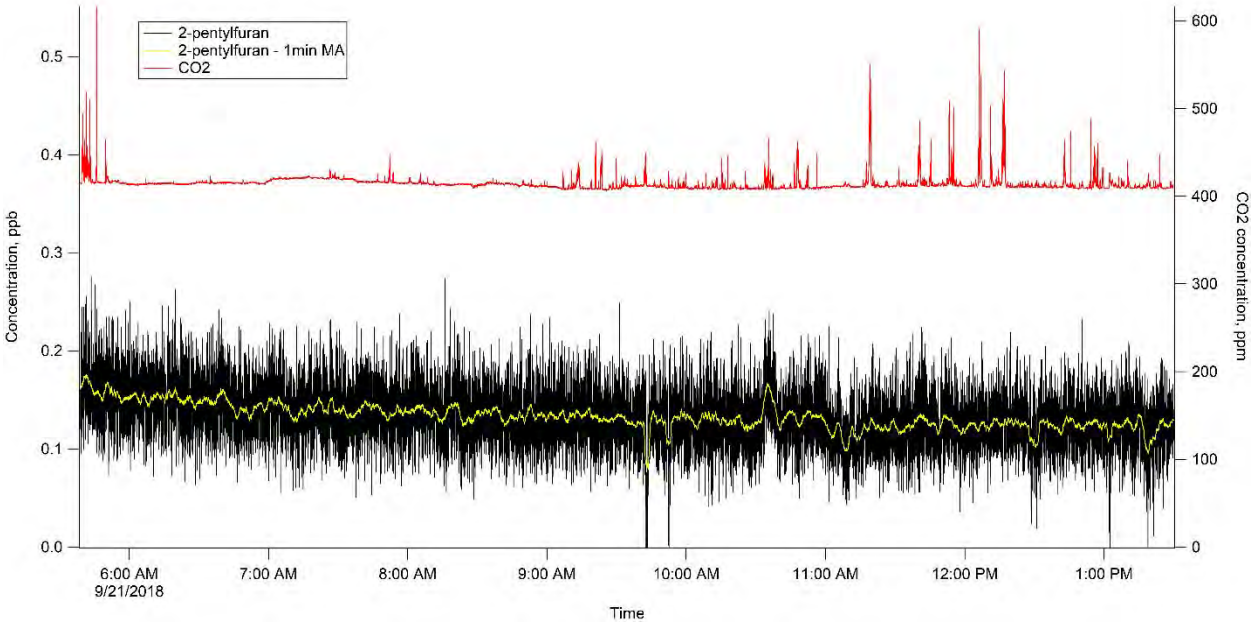

Figure 5-40. 2-pentylfuran.

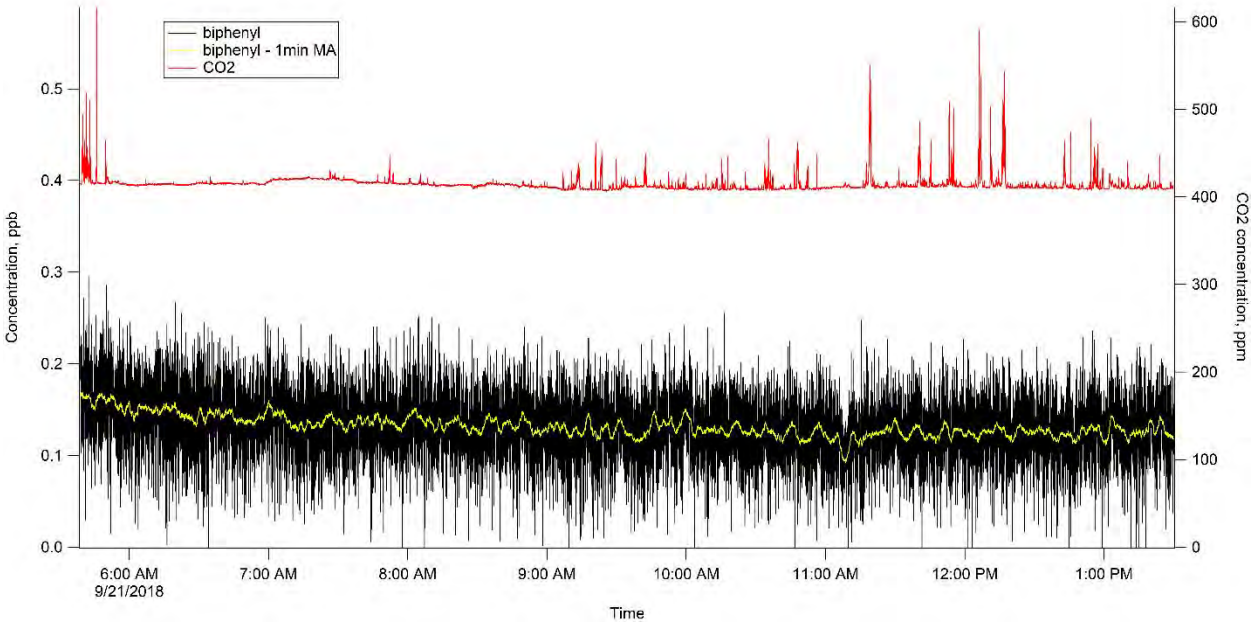

Figure 5-41. Biphenyl.

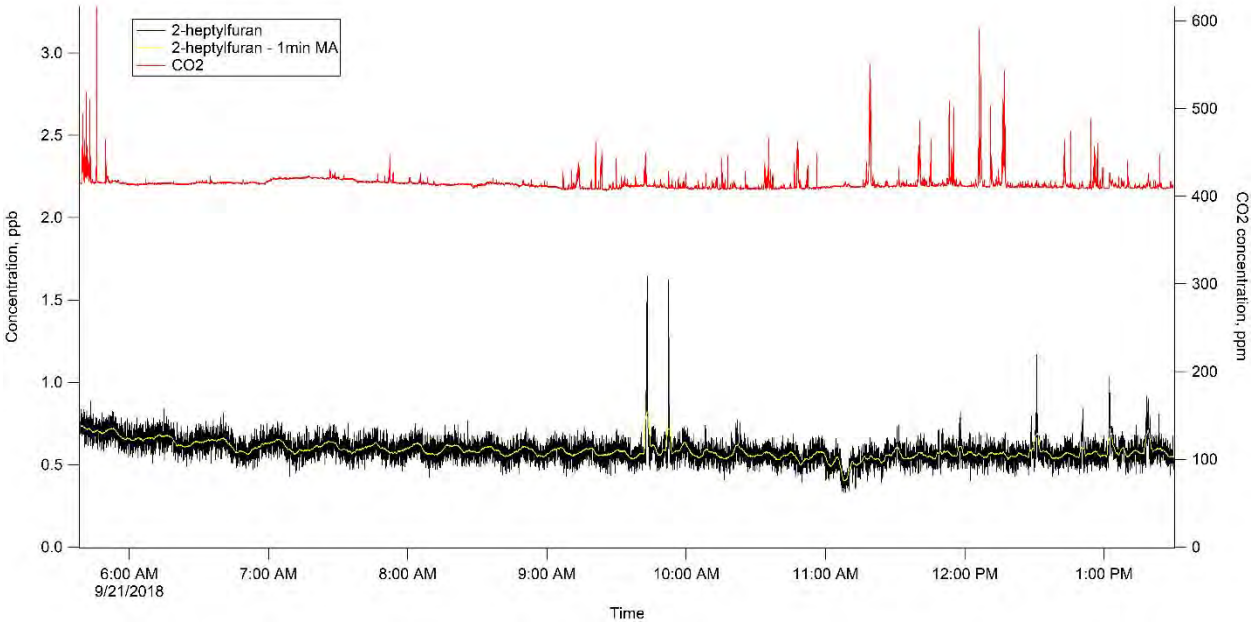

Figure 5-42. 2-heptylfuran.

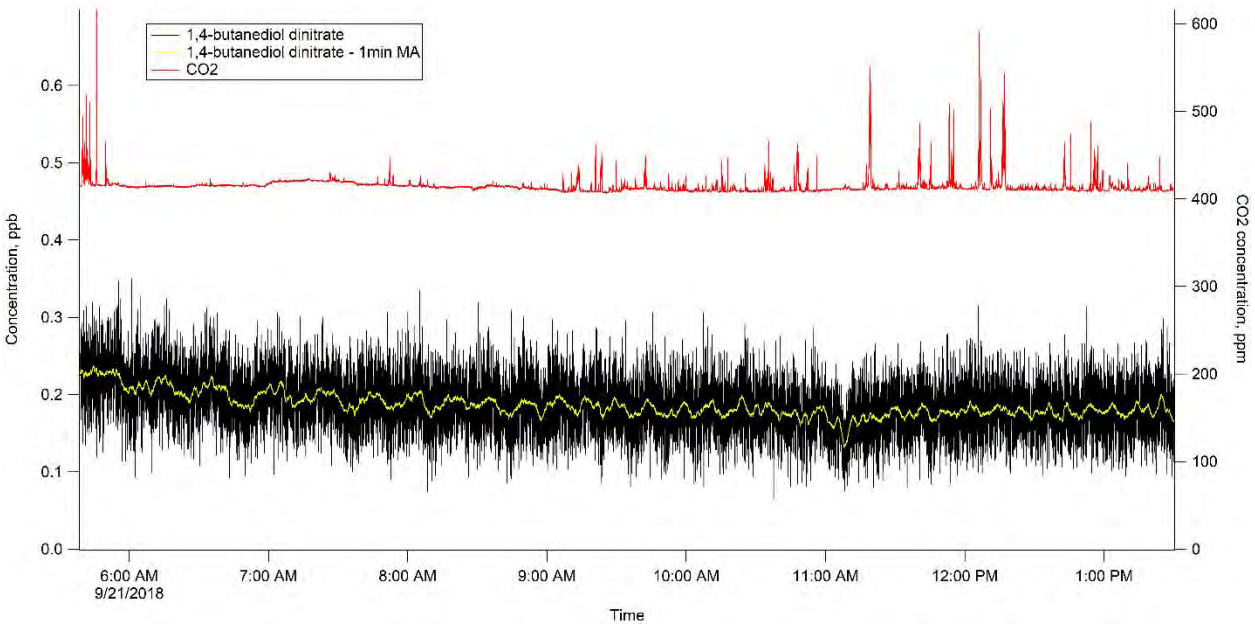

Figure 5-43. 1,4-butanediol Dinitrate.

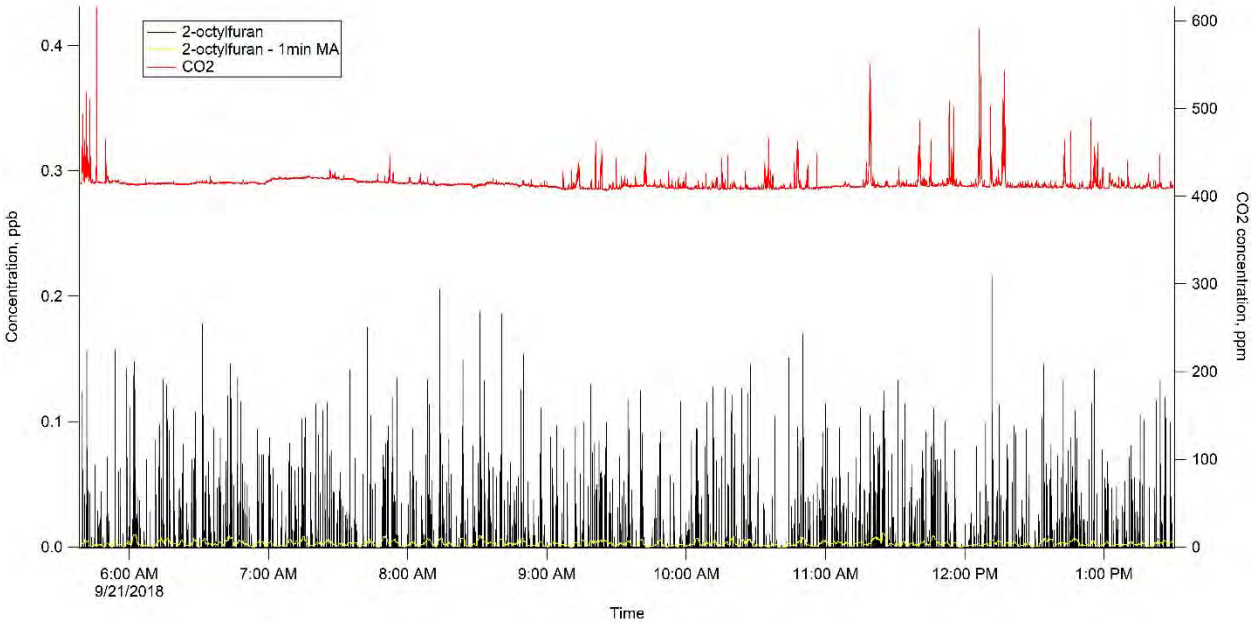

Figure 5-44. 2-octylfuran.

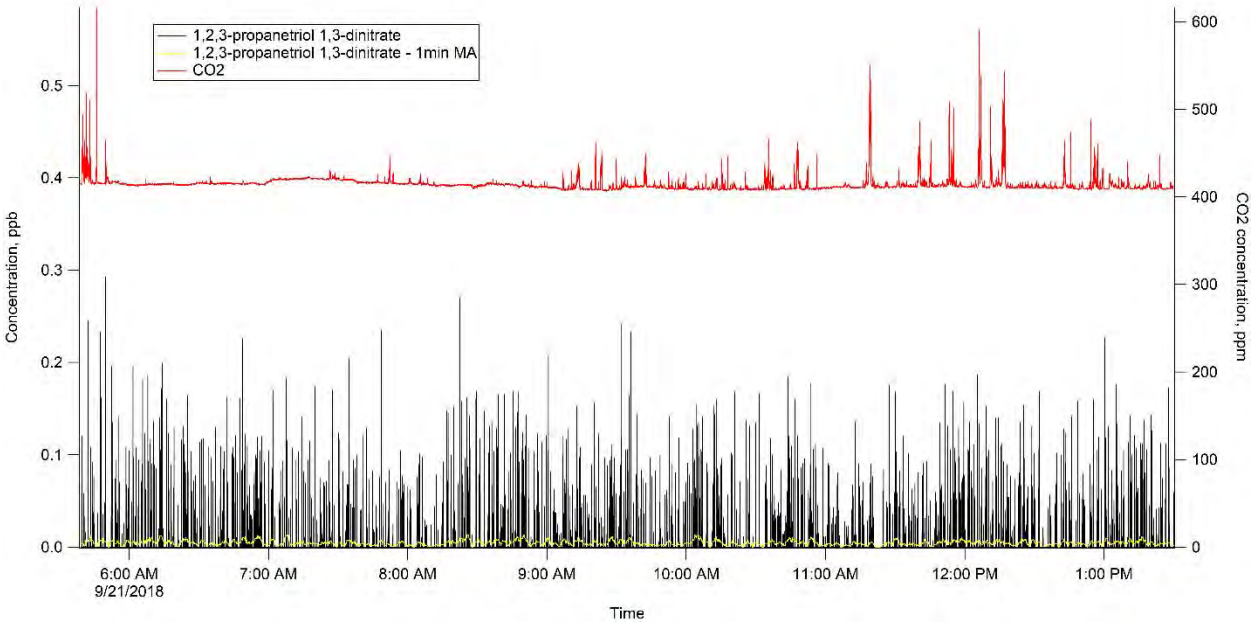

Figure 5-45. 1,2,3-propanetriol 1,3-dinitrate.

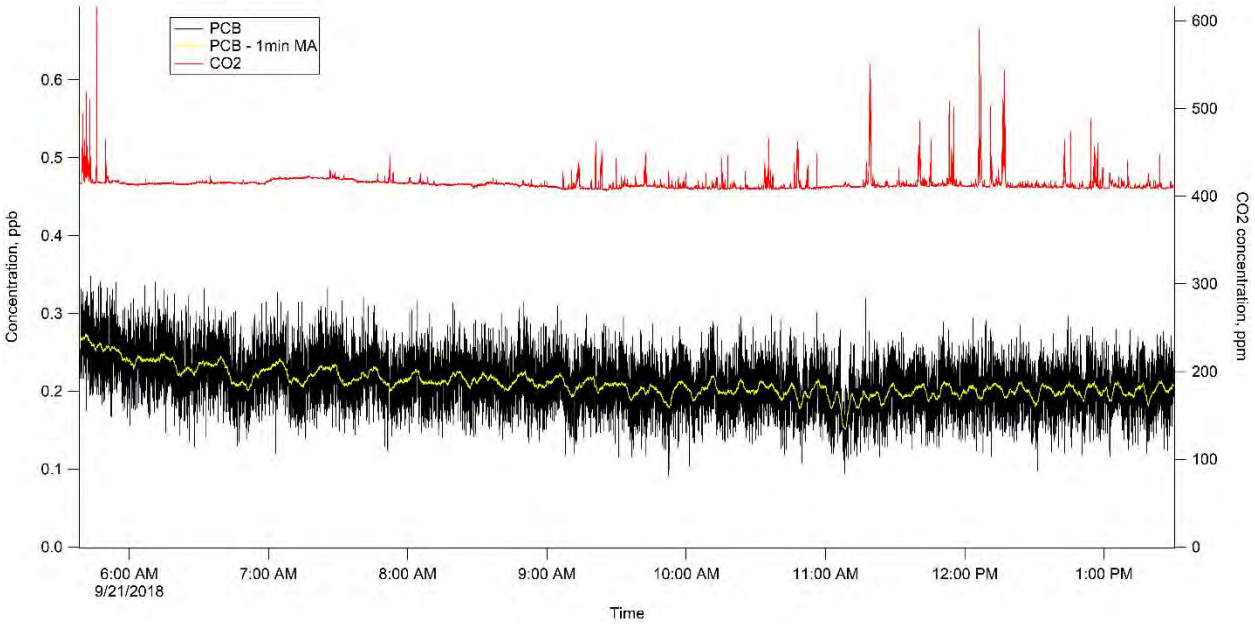

Figure 5-46. PCB.

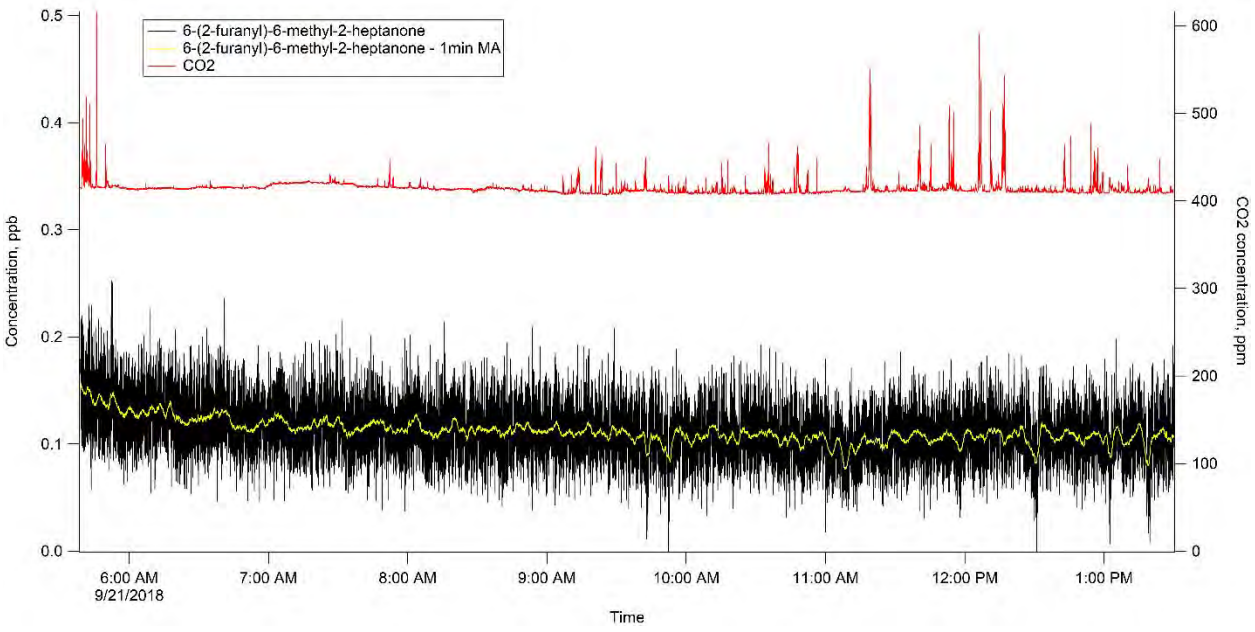

Figure 5-47. 6-(2-furanyl)-6-methyl-2-heptanone.

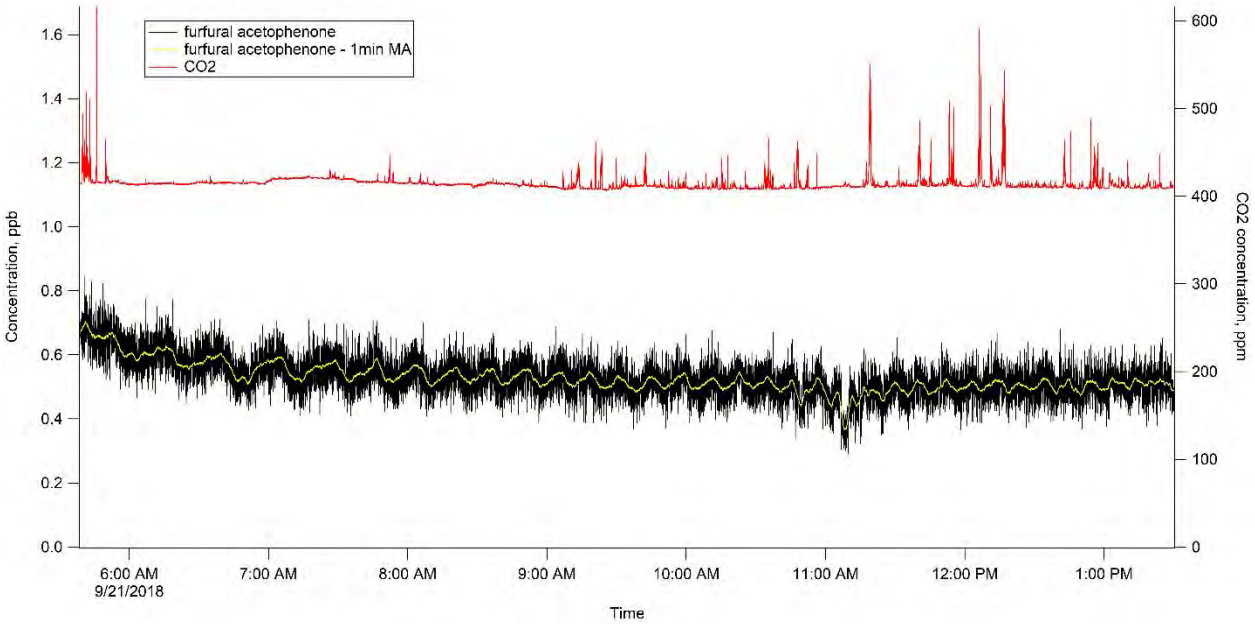

Figure 5-48. Furfural Acetophenone.

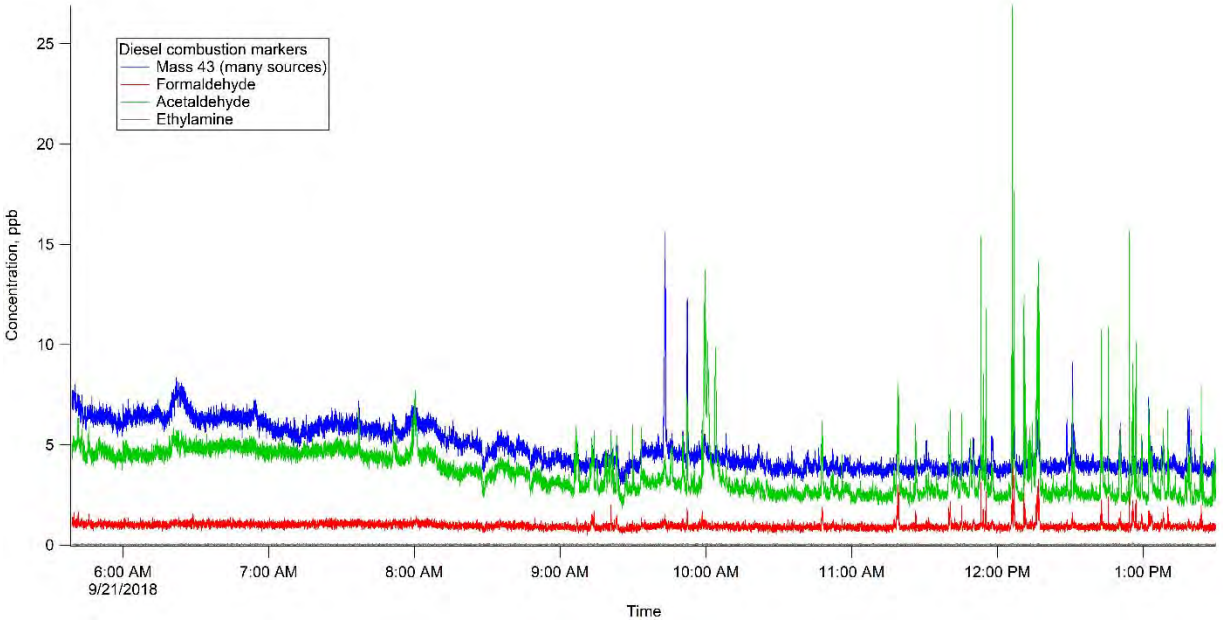

Figure 5-49. Diesel Combustion Markers.

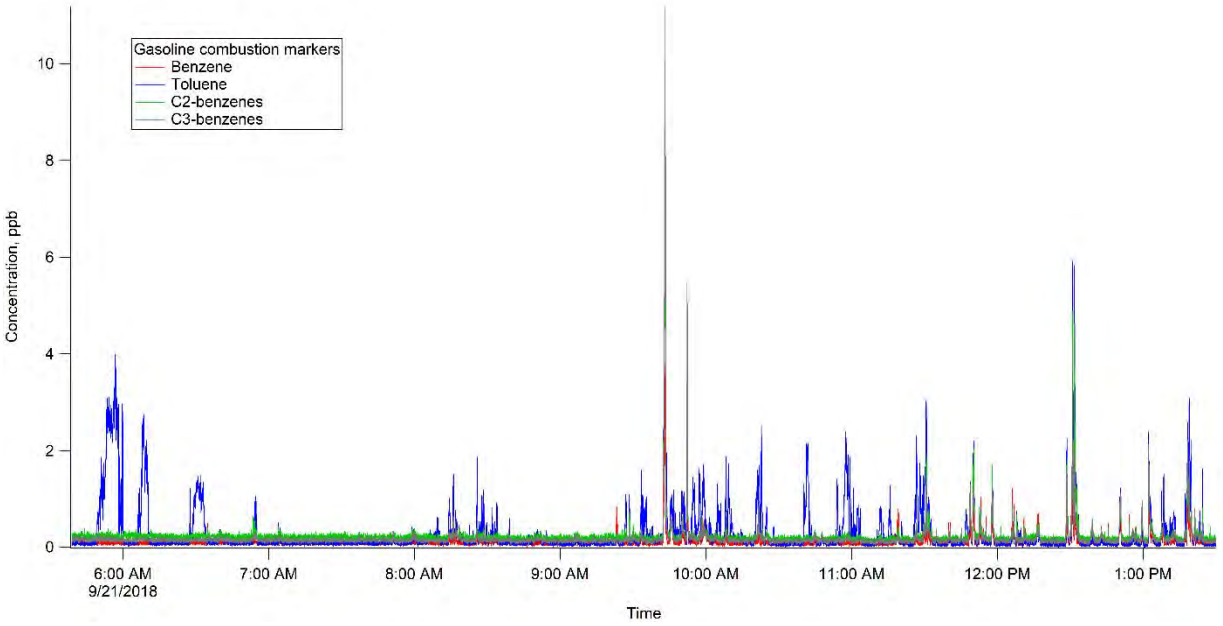

Figure 5-50. Gasoline Combustion Markers.

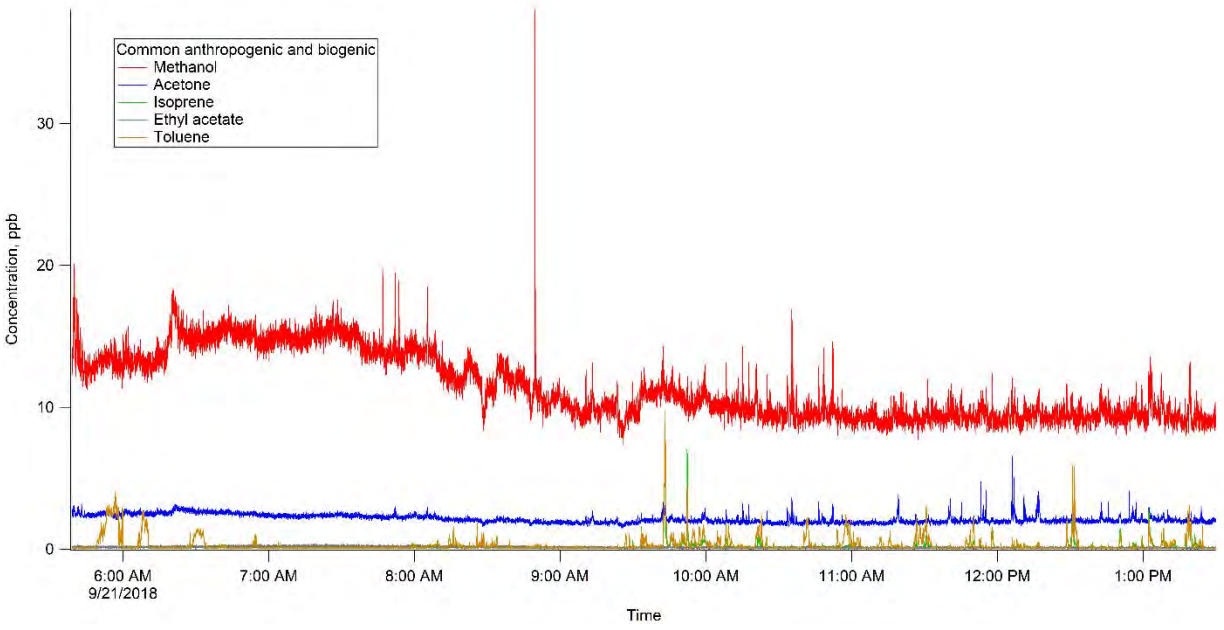

Figure 5-51. Plant and Human Markers.

6.0 SEPTEMBER 22, 2018 – SX PAVING

6.1 Quality Assessment

Data from September 22, 2018, 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

On September 22, 2018, the ML performed general area monitoring of the Hanford Site in support of the SX Paving Project.

The ML staff checked in at the CSO at 06:14. Prior to arrival, the QA/QC zero-air/sensitivity checks on the CO_2 monitor and PTR-MS began at 04:26. The ML staff began mobile monitoring of SX Farms at 06:35. At 09:09, an AOP-008 was announced due to high winds (greater than 20 mph). At 09:17, the ML staff called Mr. George Weeks to inform him of the AOP and receive instruction. The ML staff were directed to continue monitoring with appropriate personal protective equipment (PPE), which in the case of high winds, is protective eye wear.

At 13:42, the ML staff checked out with the CSO. The QA/QC zero-air/sensitivity check of the Picarro ammonia analyzer was initiated at 13:43. The ML returned to the TerraGraphics warehouse at 14:45.

Table 6-1. Mobile Laboratory Sampling Mode Throughout the Monitoring Period.

Time	Location	Sampling Mode
06:35 - 12:12	SX Farm (East side of farm)	Mobile Area Monitoring
12:12 - 13:24	SX Farm (NE side of farm)	Mobile Area Monitoring

Figure 6-1. Mobile Laboratory Location for the Duration of the Monitoring Period.

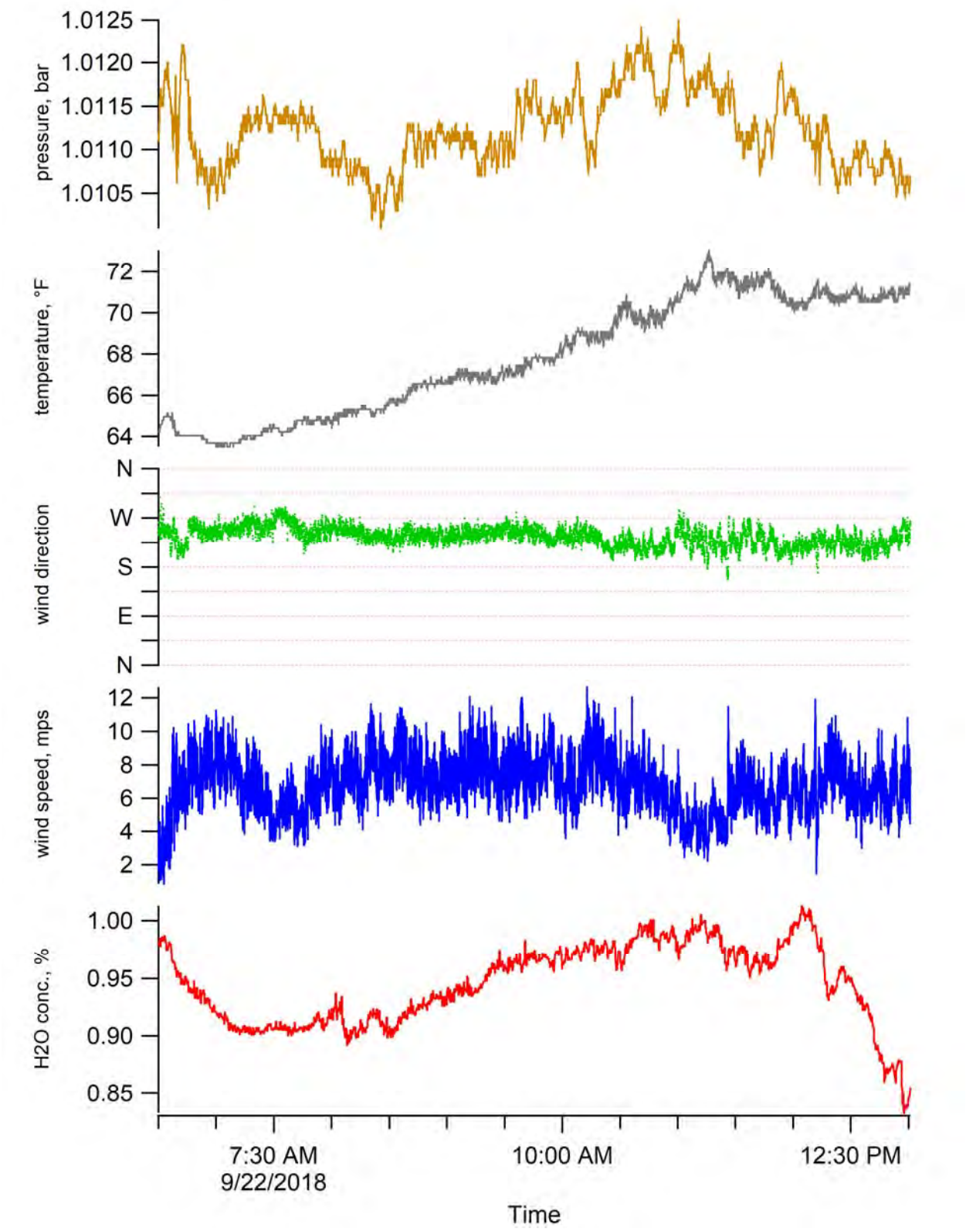

Figure 6-2. Weather Data for the Duration of the Monitoring Period.

6.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

Table 6-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 22, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	ammonia	25000	5.978	1.046	17.491	9.964	5.950
2	formaldehyde	300	0.576	0.140	24.283	2.301	0.551
3	methanol	200000	6.025	3.460	57.419	136.714	5.403
4	acetonitrile	20000	0.199	0.061	30.870	1.257	0.187
5	acetaldehyde	25000	2.079	1.223	58.845	19.177	1.719
6	ethylamine	5000	0.026	0.015	56.626	0.096	0.024
7	1,3-butadiene	1000	1.518	2.888	190.324	61.933	0.435
8	propanenitrile	6000	0.160	0.189	117.791	4.208	0.101
9	2-propenal	100	0.336	0.397	118.188	7.027	0.184
10	1-butanol; butenes	20000	2.354	3.527	149.839	77.479	1.176
11	methyl isocyanate	20	0.043	0.026	60.442	0.309	0.039
12	methyl nitrite	100	0.089	0.039	43.620	0.564	0.083
13	furan	1	0.054	0.054	100.289	1.060	0.039
14	butanenitrile	8000	0.113	0.178	156.878	4.089	0.054
15	but-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran	100, 1, 1	0.034	0.024	70.991	N/A*	N/A*
16	butanal	25000	0.096	0.049	50.674	0.606	0.083
17	NDMA**	0.3	0.022	0.026	116.774	0.161	0.013
18	benzene	500	0.320	0.482	150.641	10.893	0.143
19	2,4-pentadienenitrile; pyridine	300, 1000	0.048	0.049	101.254	1.113	0.034
20	2-methylene butanenitrile	30	0.080	0.120	150.296	2.517	0.038
21	2-methylfuran	1	0.017	0.019	113.544	0.240	0.013
22	pentanenitrile	6000	0.095	0.166	175.120	4.045	0.039
23	3-methyl-3-buten-2-one; 2-methyl-2-butenal	20, 30	0.025	0.020	76.998	0.210	0.023

Table 6-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of September 22, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
24	NEMA**	0.3	0.018	0.022	123.030	0.158	0.009
25	2,5-dimethylfuran	1	0.046	0.032	69.504	0.230	0.047
26	hexanenitrile	6000	0.137	0.137	100.152	3.004	0.095
27	2-hexanone (MBK)	5000	0.060	0.023	38.536	0.249	0.057
28	NDEA**	0.1	0.177	0.068	38.314	0.405	0.179
29	butyl nitrite; 2-nitro-2-methylpropane	30	100, 30	0.071	11.251	1.088	0.625
30	2,4-dimethylpyridine	500	0.224	0.116	51.964	3.097	0.200
31	2-propylfuran; 2-ethyl-5-methylfuran	1	0.103	0.052	51.054	0.298	0.107
32	heptanenitrile	6000	0.241	0.104	43.150	2.213	0.216
33	4-methyl-2-hexanone	500	0.176	0.041	23.557	0.510	0.171
34	NMOR**	0.6	0.026	0.040	154.079	0.456	0.000
35	butyl nitrate	2500	0.094	0.034	36.442	0.252	0.093
36	2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.178	0.053	29.706	0.990	0.169
37	6-methyl-2-heptanone	8000	0.152	0.032	20.768	0.315	0.150
38	2-pentylfuran	1	0.112	0.041	36.164	0.288	0.114
39	biphenyl	200	0.136	0.037	26.953	0.313	0.135
40	2-heptylfuran	1	0.685	0.227	33.124	4.878	0.622
41	1,4-butanediol dinitrate	50	0.184	0.037	20.223	0.386	0.181
42	2-octylfuran	1	0.002	0.011	641.346	0.186	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.004	0.018	498.187	0.248	0.000
44	PCB	1000	0.196	0.038	19.522	0.428	0.193
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.102	0.033	32.618	0.264	0.102
46	furfural acetophenone	1	0.534	0.068	12.659	0.925	0.526

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.387 ppb and the median value was 0.030 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 studies [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., 2017].

The following figures display a selection of COPC signals, overlaid with the same signal smoothed using a one-minute moving average, and CO_2, for the monitoring period of September 22, 2018.

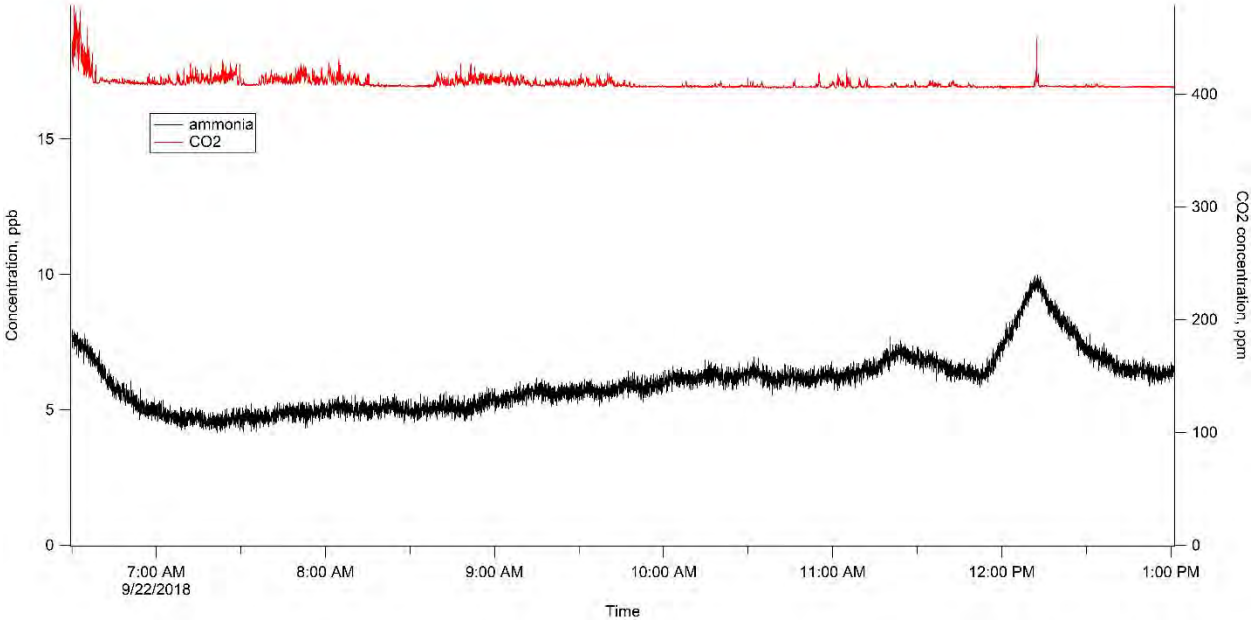

Figure 6-3. Ammonia.

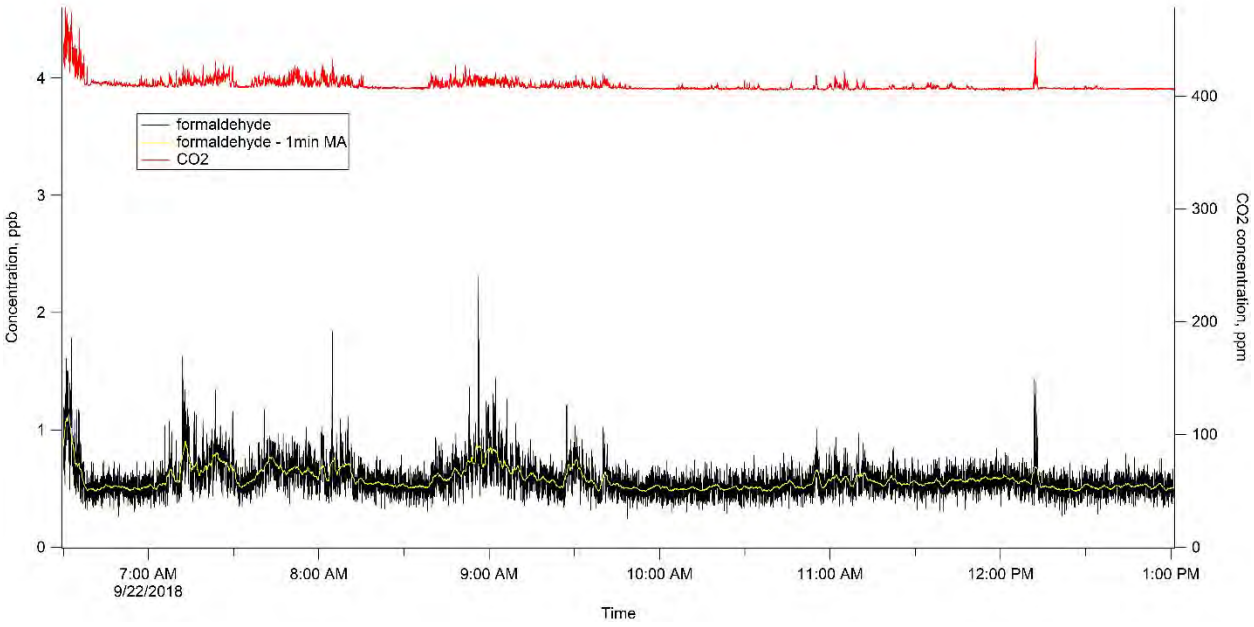

Figure 6-4. Formaldehyde.

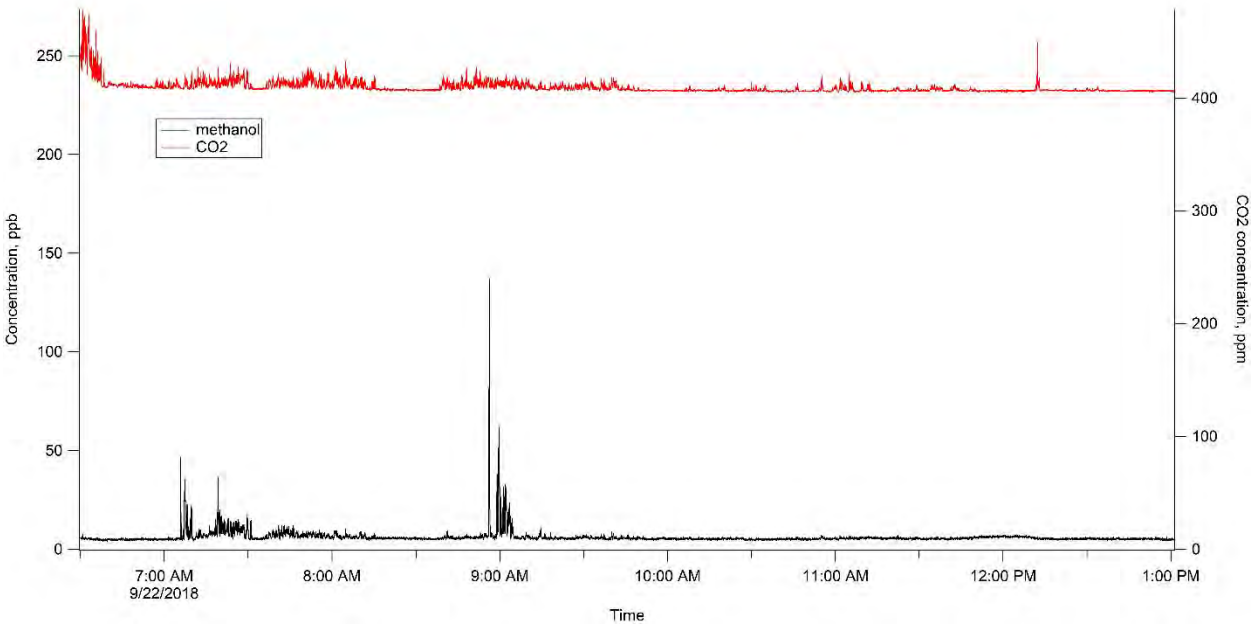

Figure 6-5. Methanol.

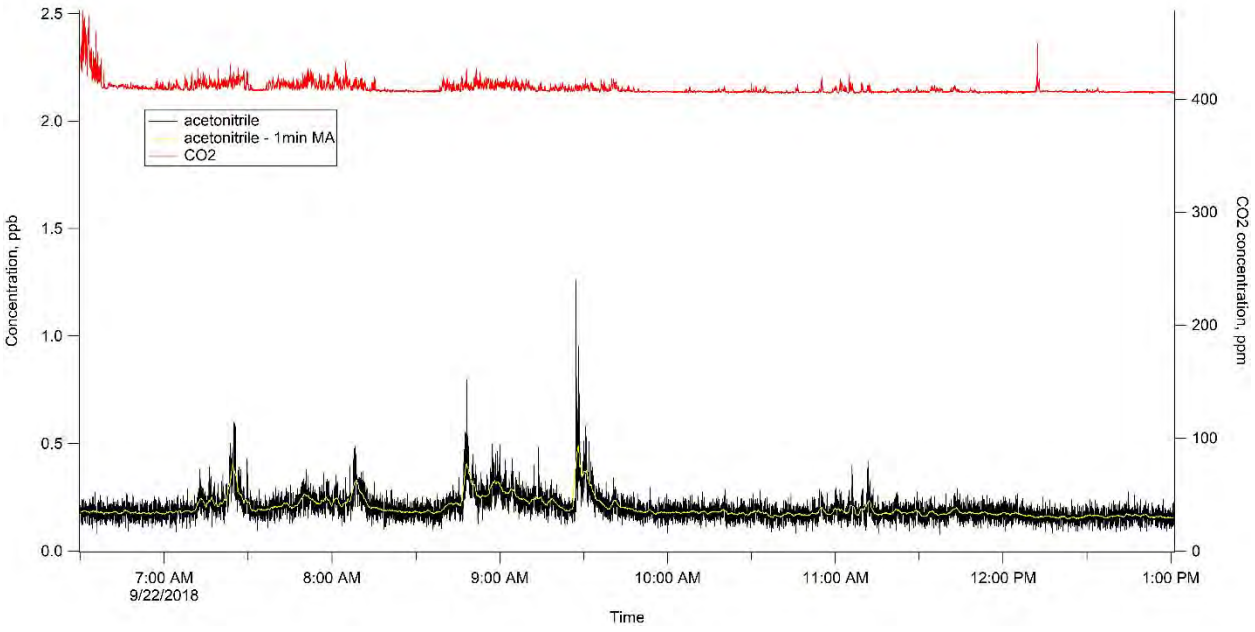

Figure 6-6. Acetonitrile.

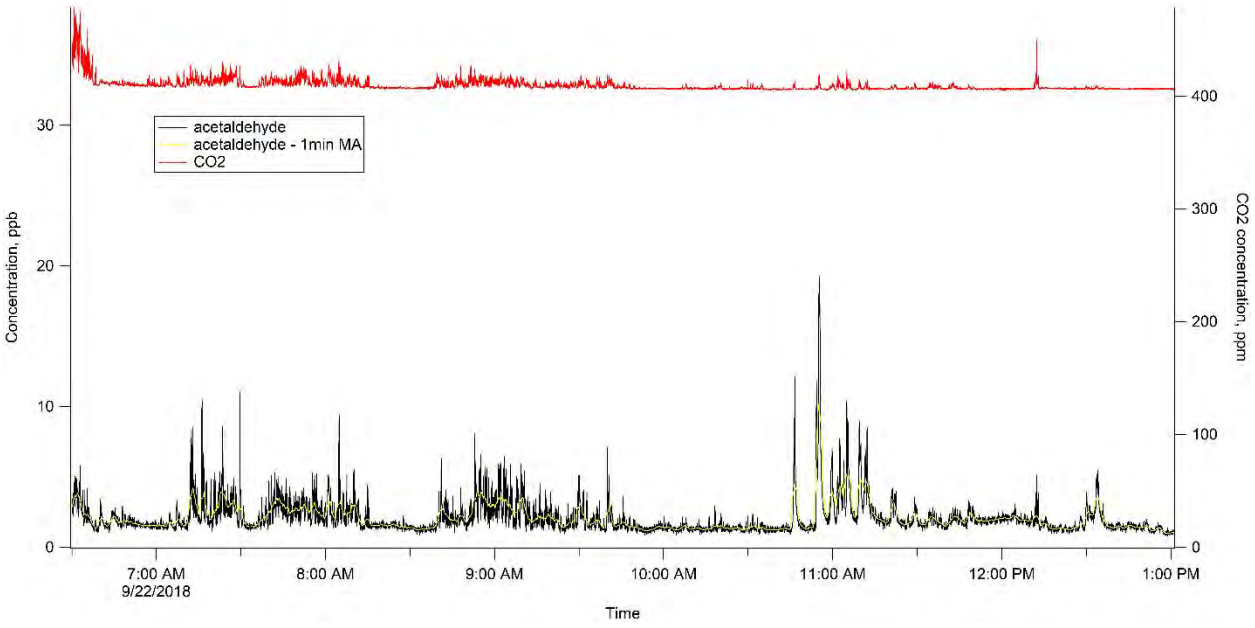

Figure 6-7. Acetaldehyde.

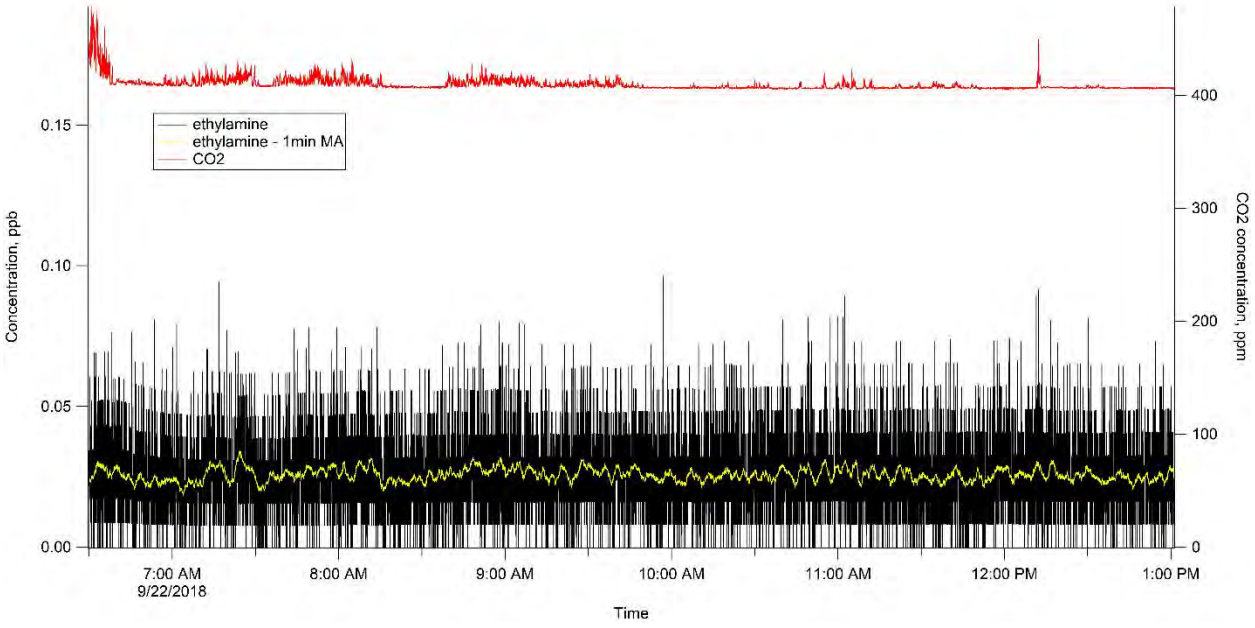

Figure 6-8. Ethylamine.

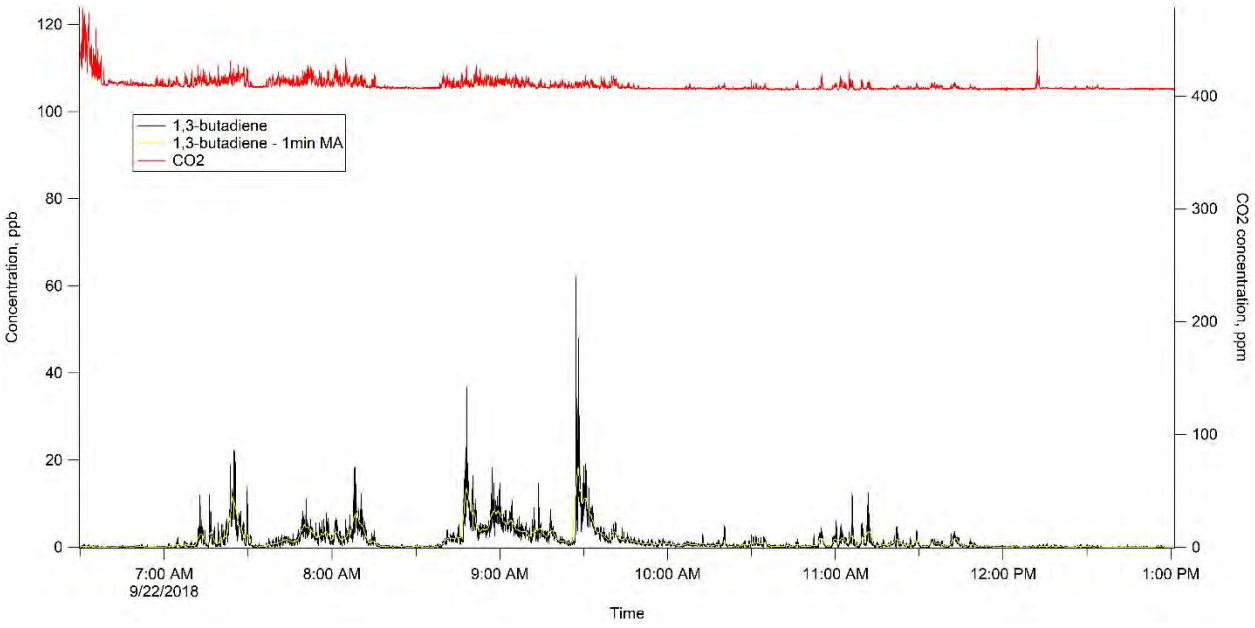

Figure 6-9. 1,3-butadiene.

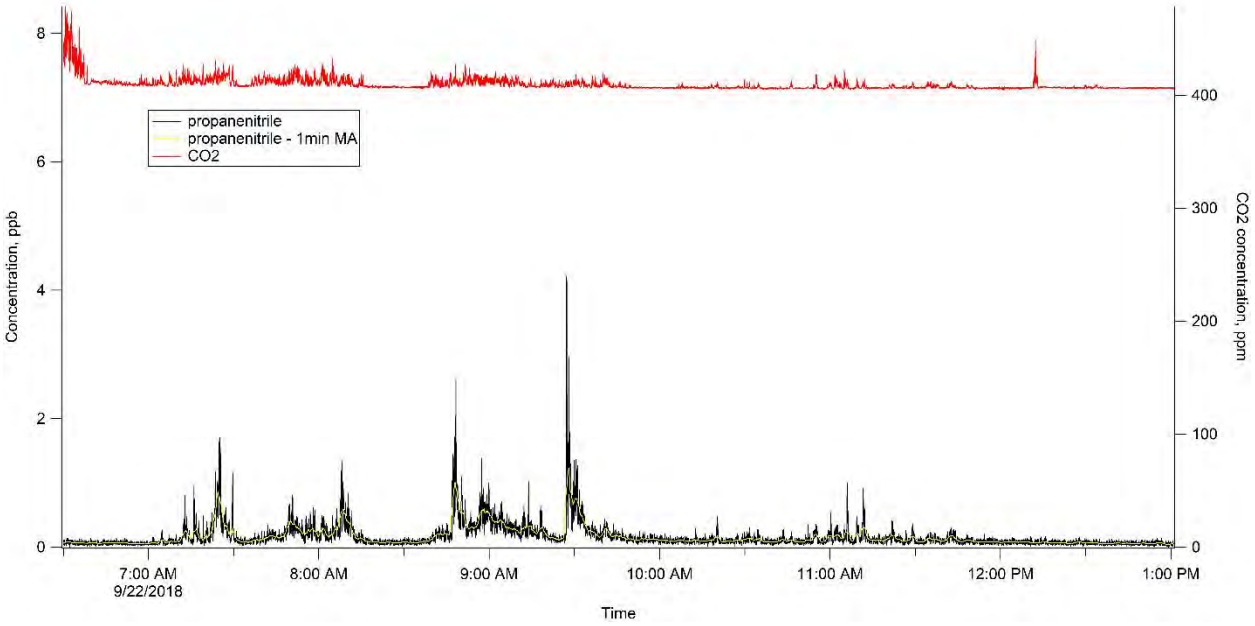

Figure 6-10. Propanenitrile.

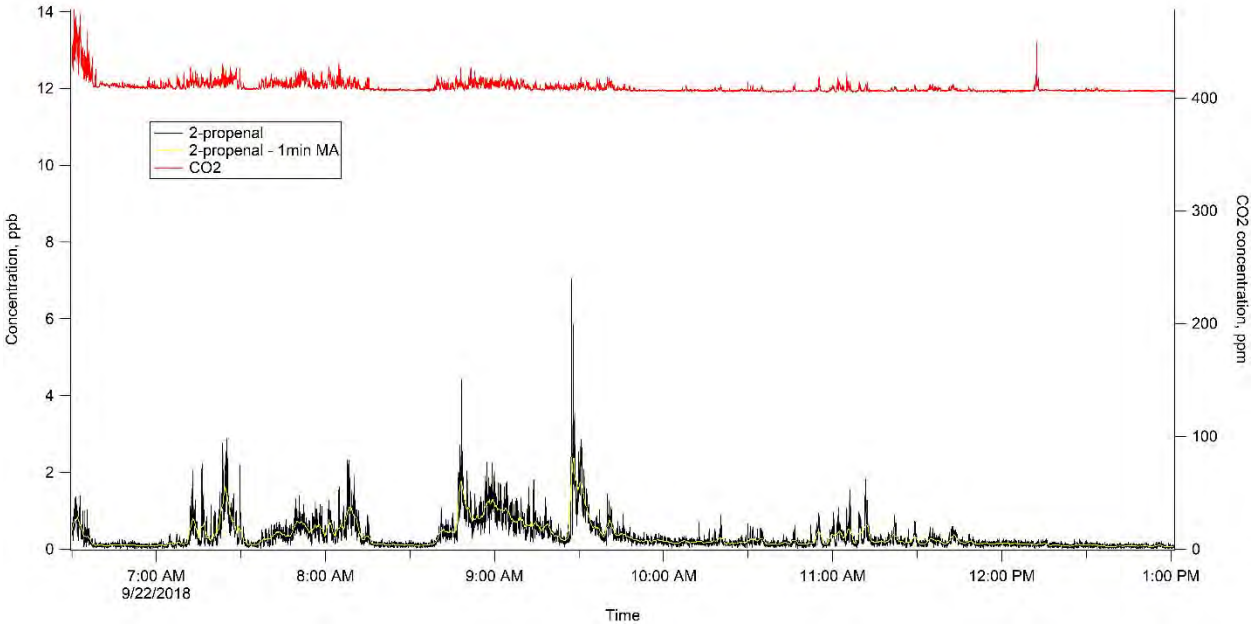

Figure 6-11. 2-propenal.

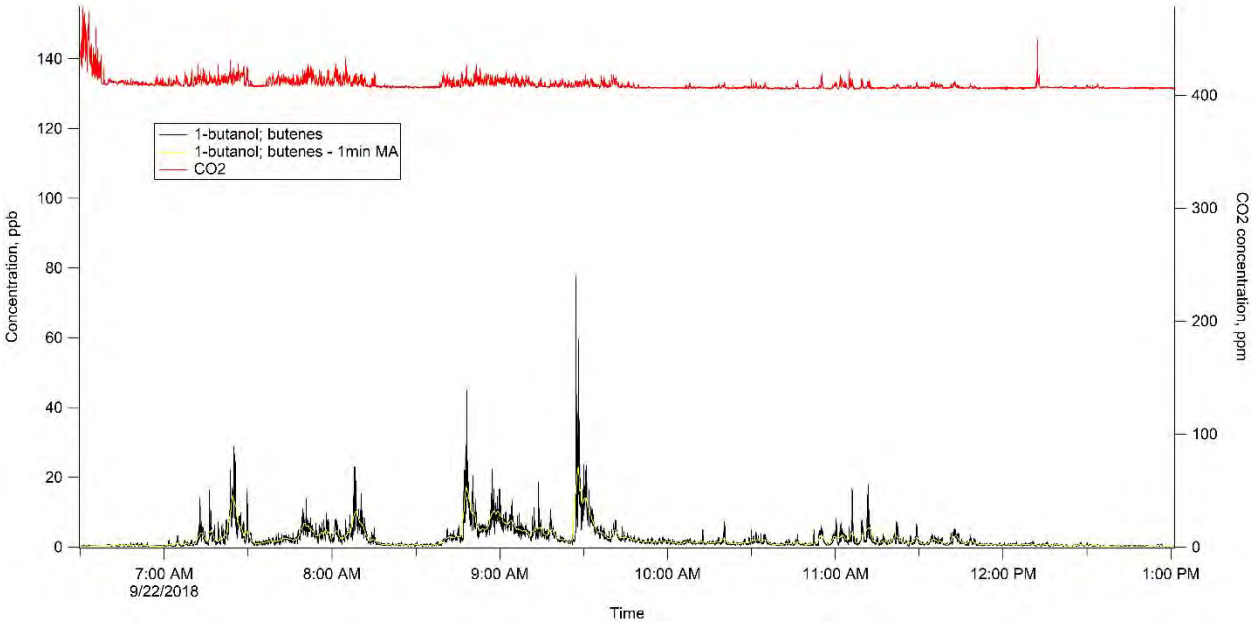

Figure 6-12. 1-butanol; Butenes.

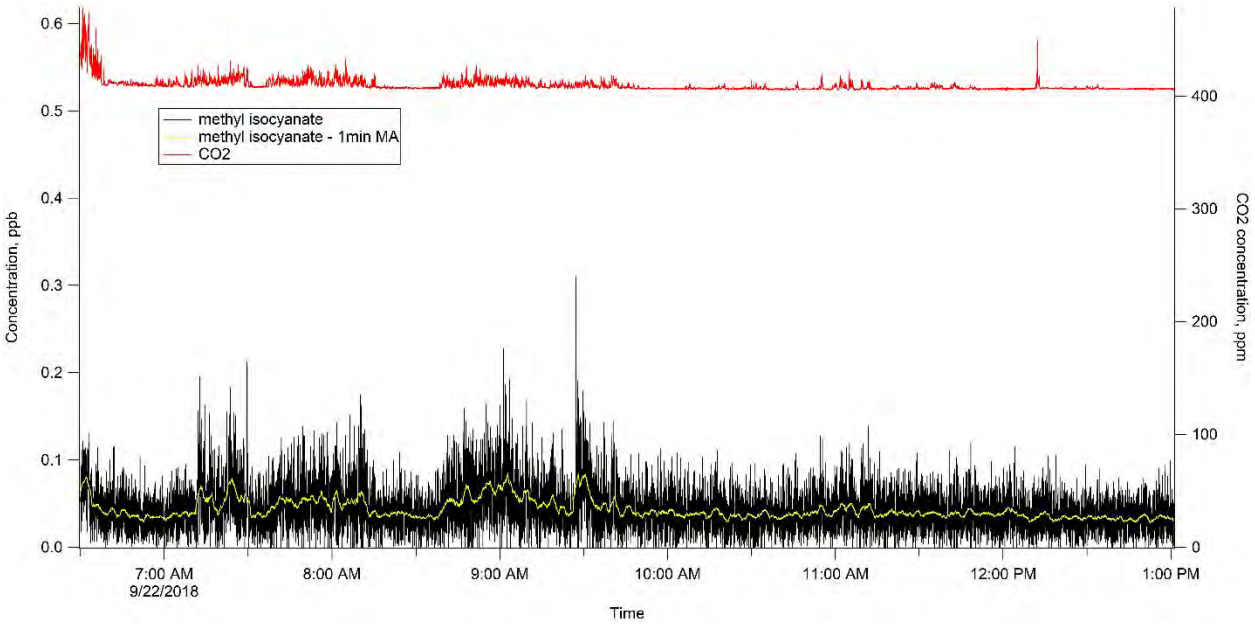

Figure 6-13. Methyl Isocyanate.

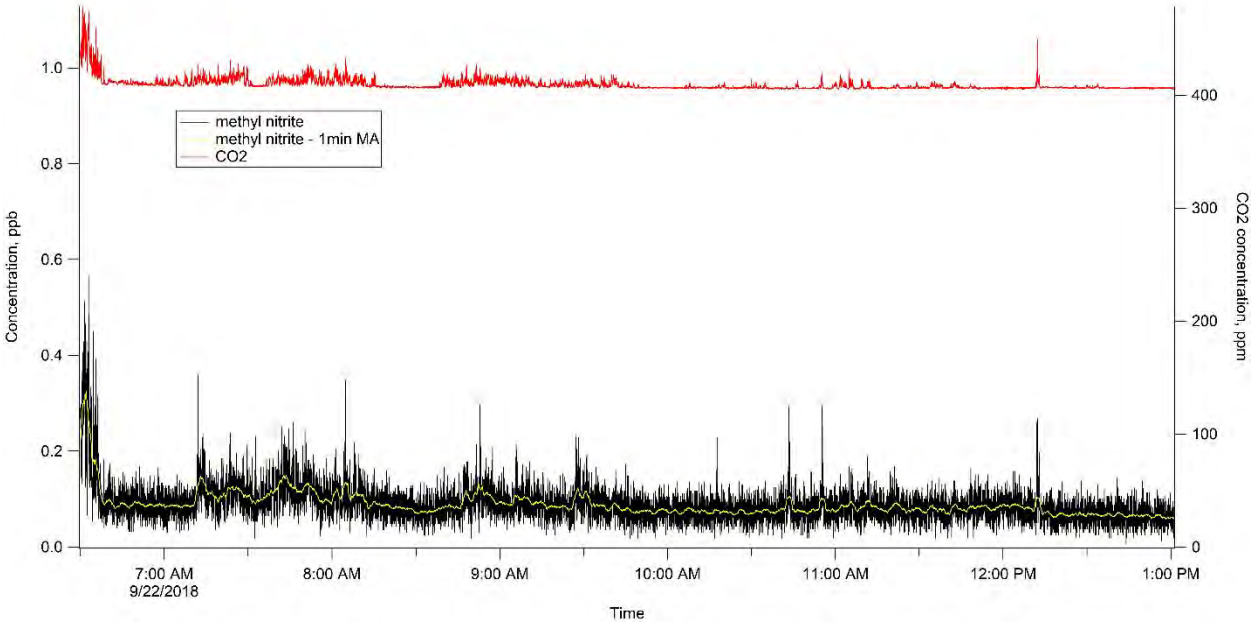

Figure 6-14. Methyl Nitrite.

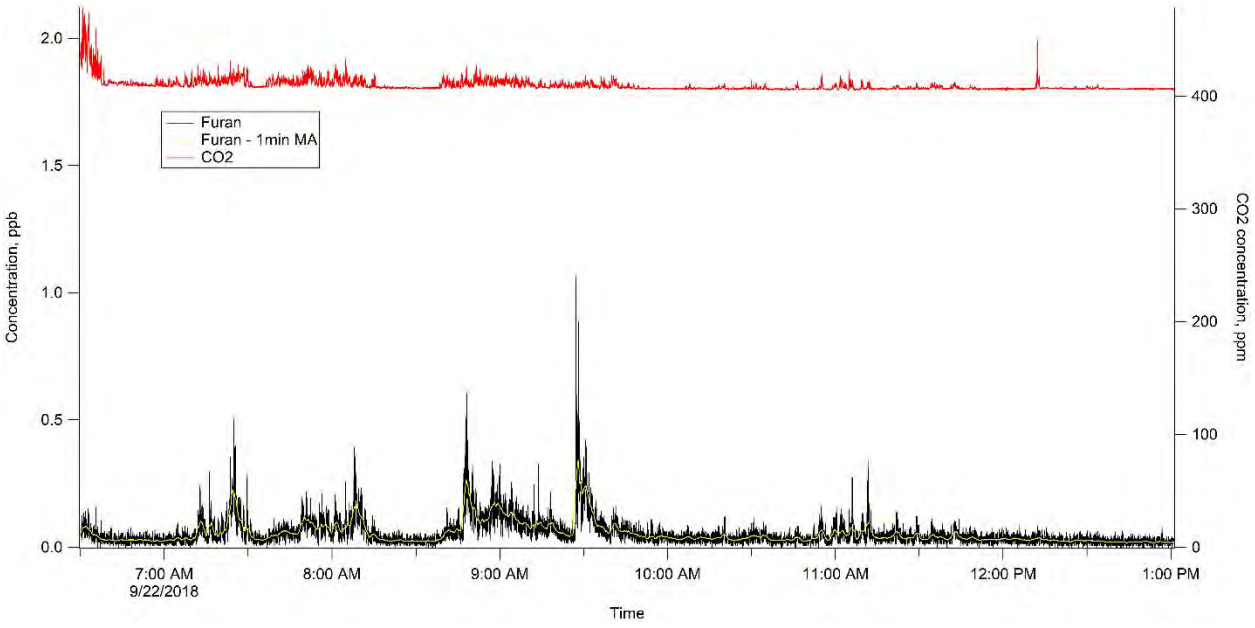

Figure 6-15. Furan.

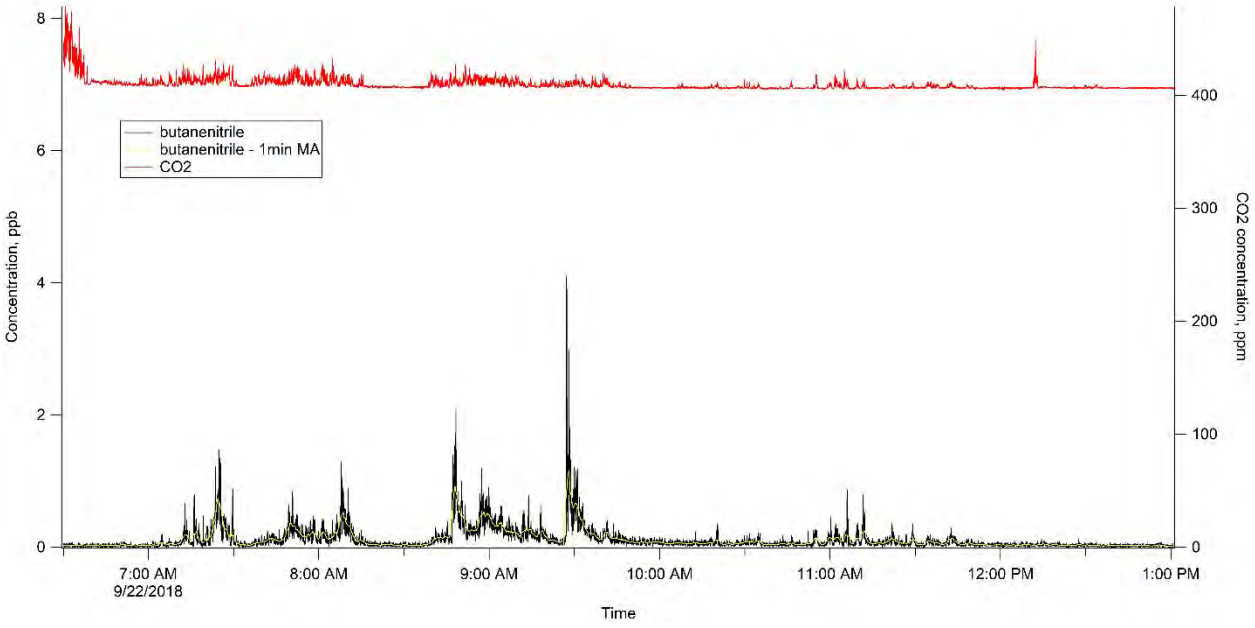

Figure 6-16. Butanenitrile.

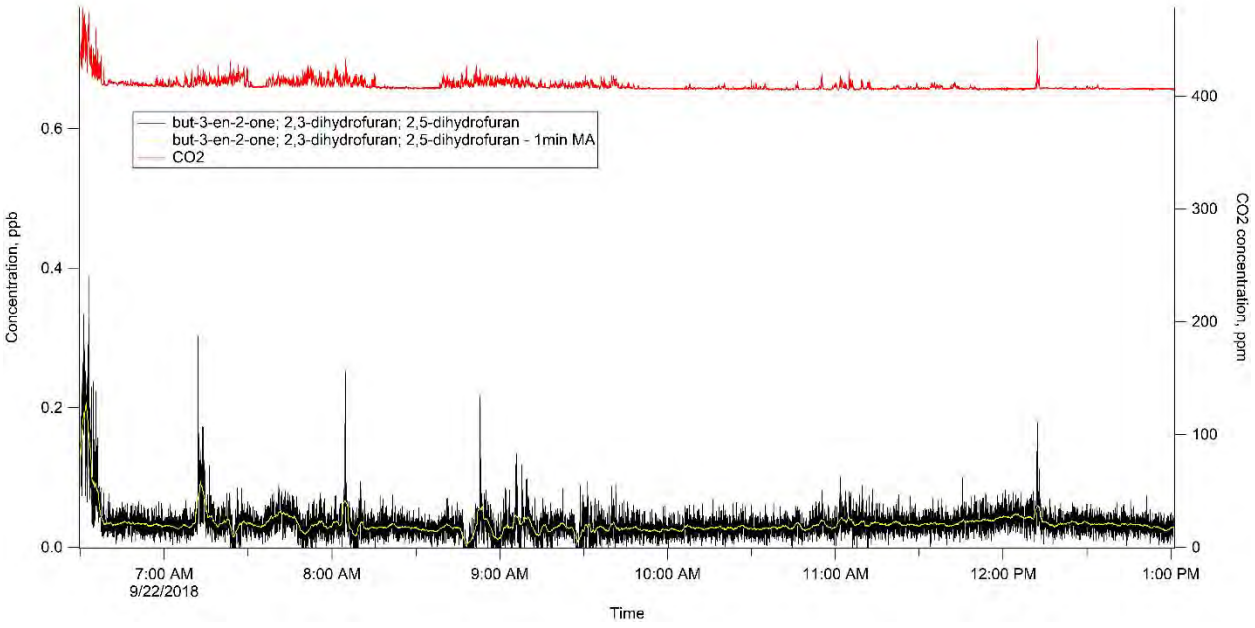

Figure 6-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

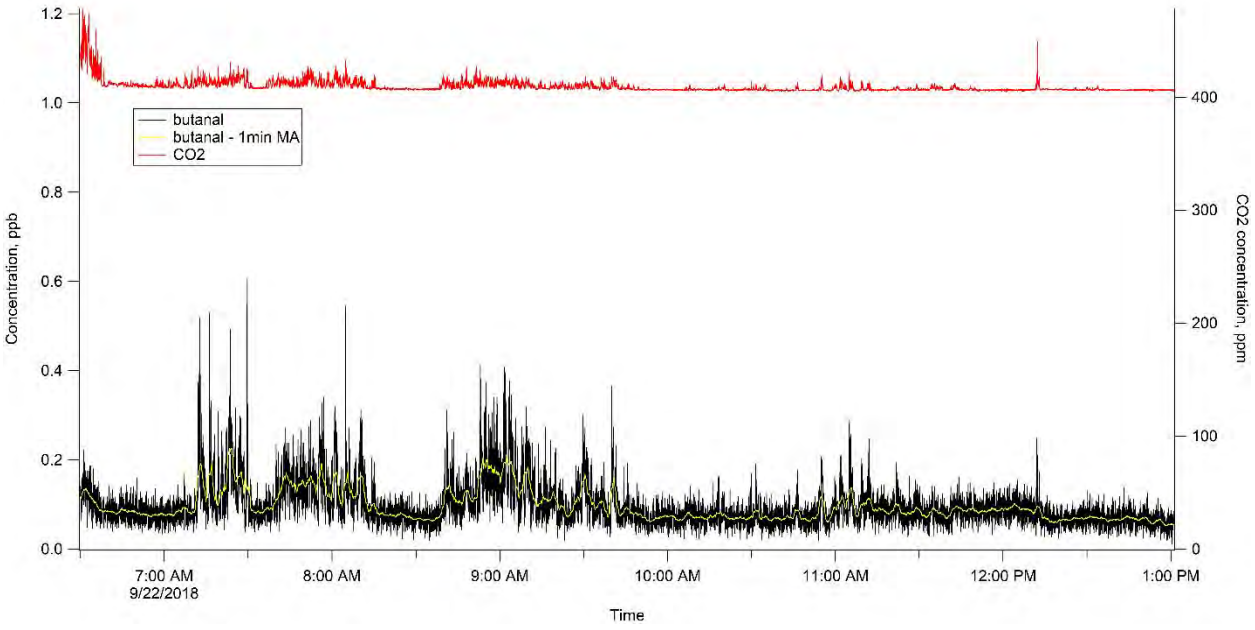

Figure 6-18. Butanal.

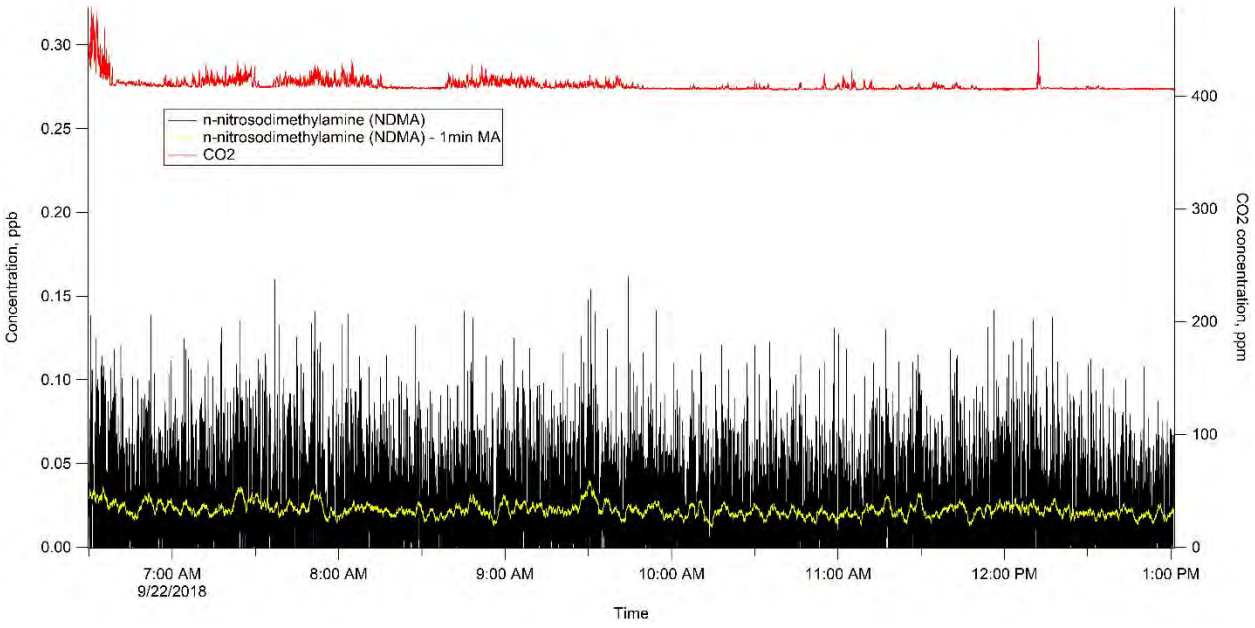

Figure 6-19. N-nitrosodimethylamine (NDMA).

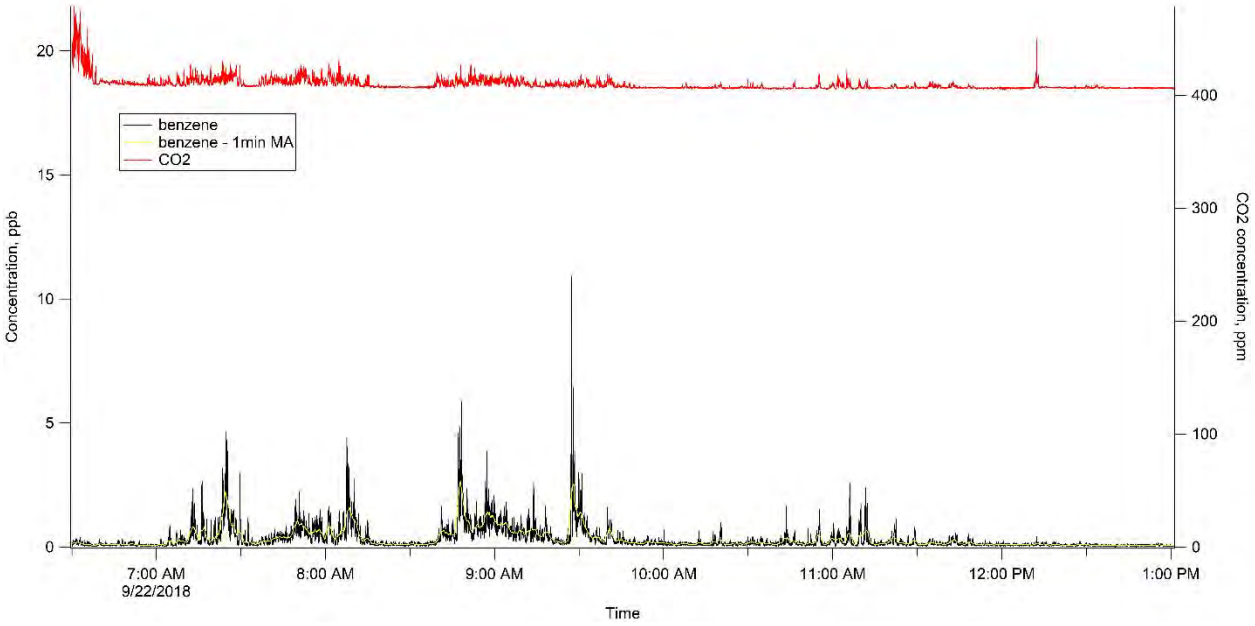

Figure 6-20. Benzene.

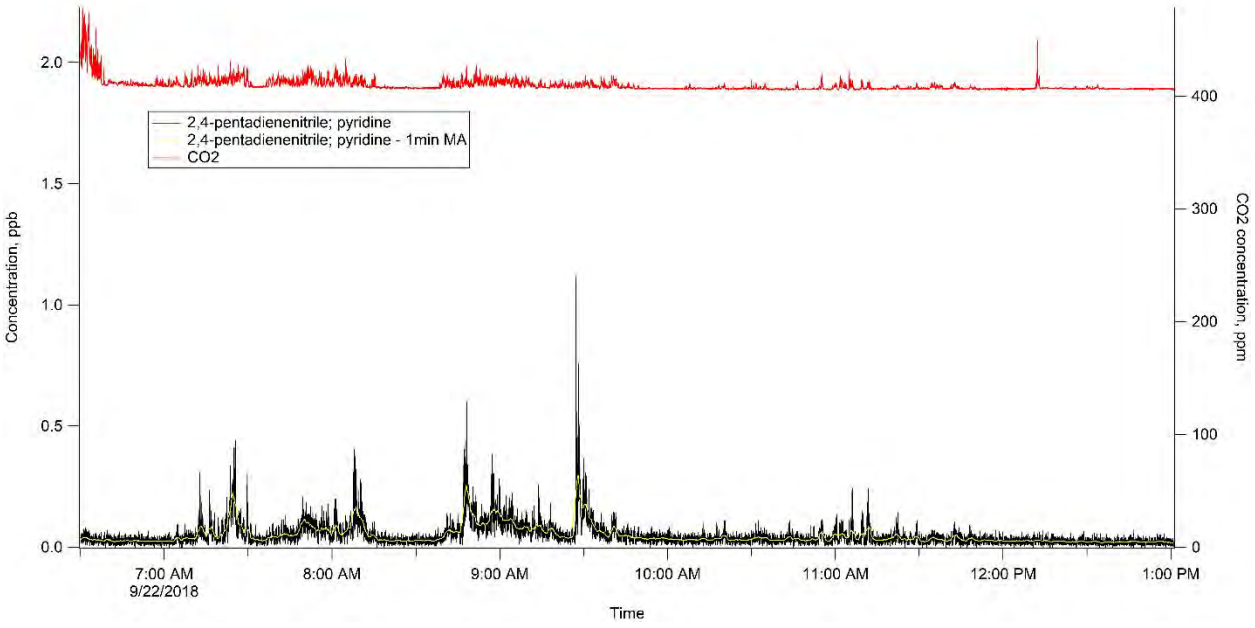

Figure 6-21. 2,4-pentadienenitrile; Pyridine.

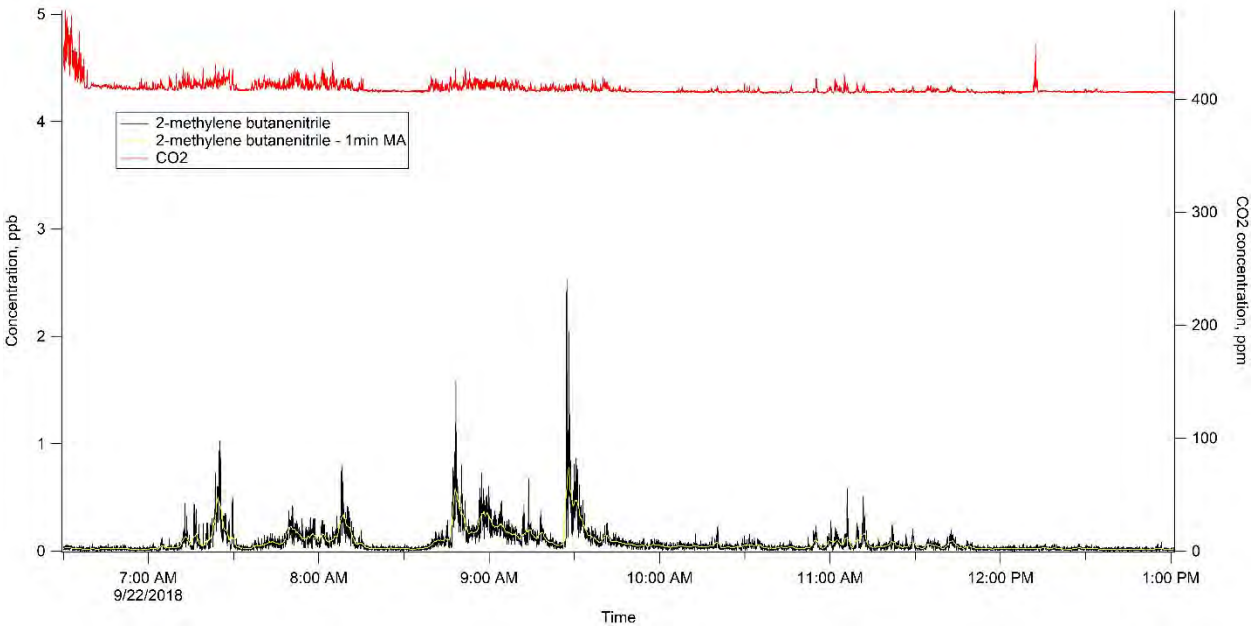

Figure 6-22. 2-methylene Butanenitrile.

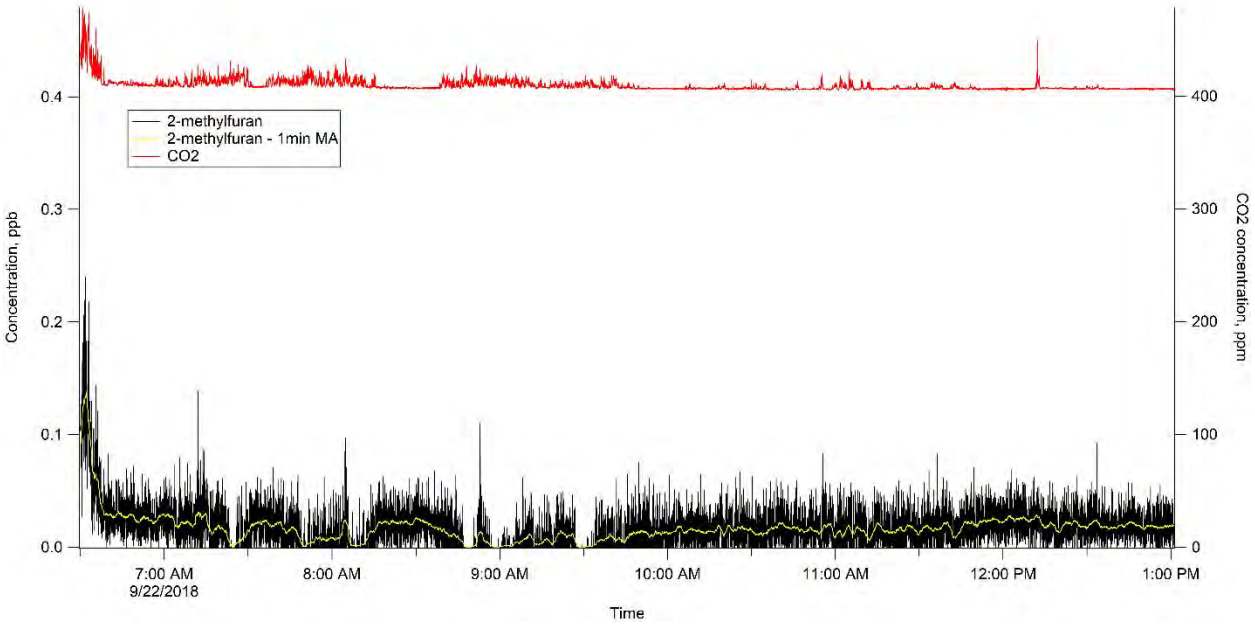

Figure 6-23. 2-methylfuran.

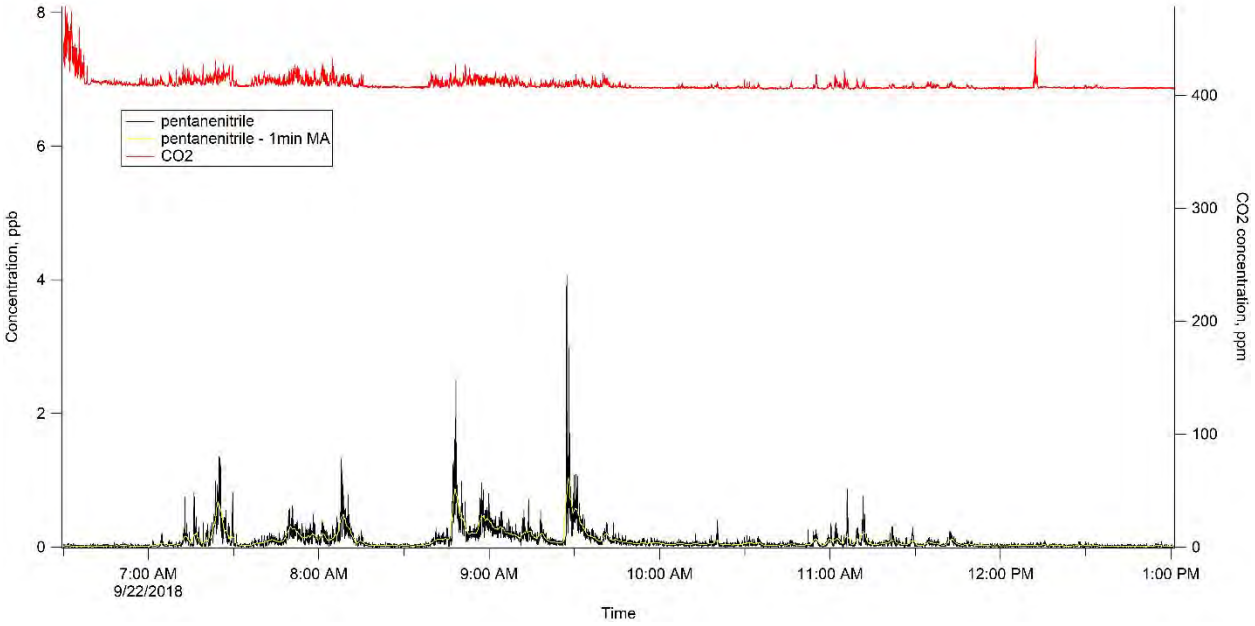

Figure 6-24. Pentanenitrile.

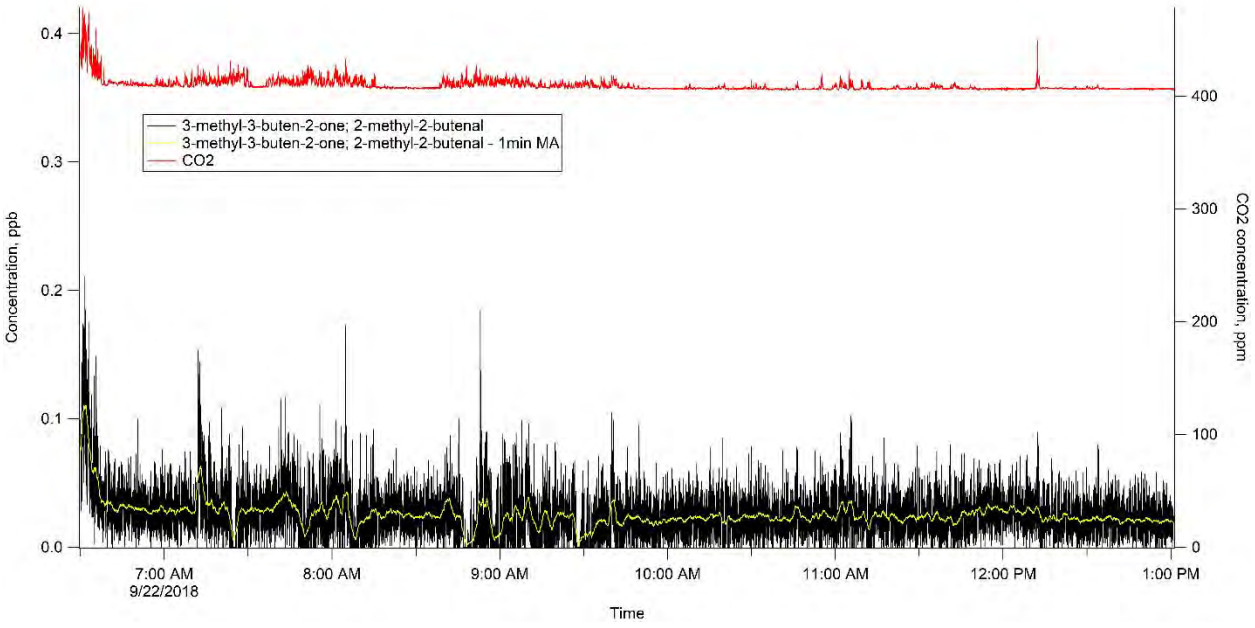

Figure 6-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

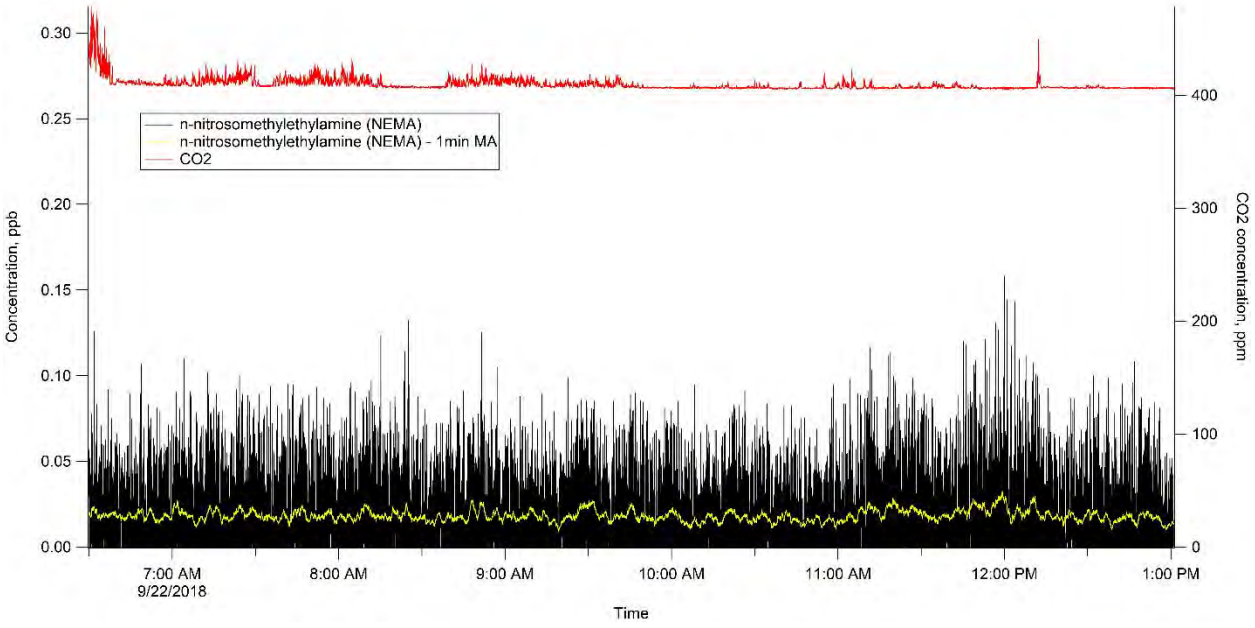

Figure 6-26. N-nitrosomethylethylamine (NEMA).

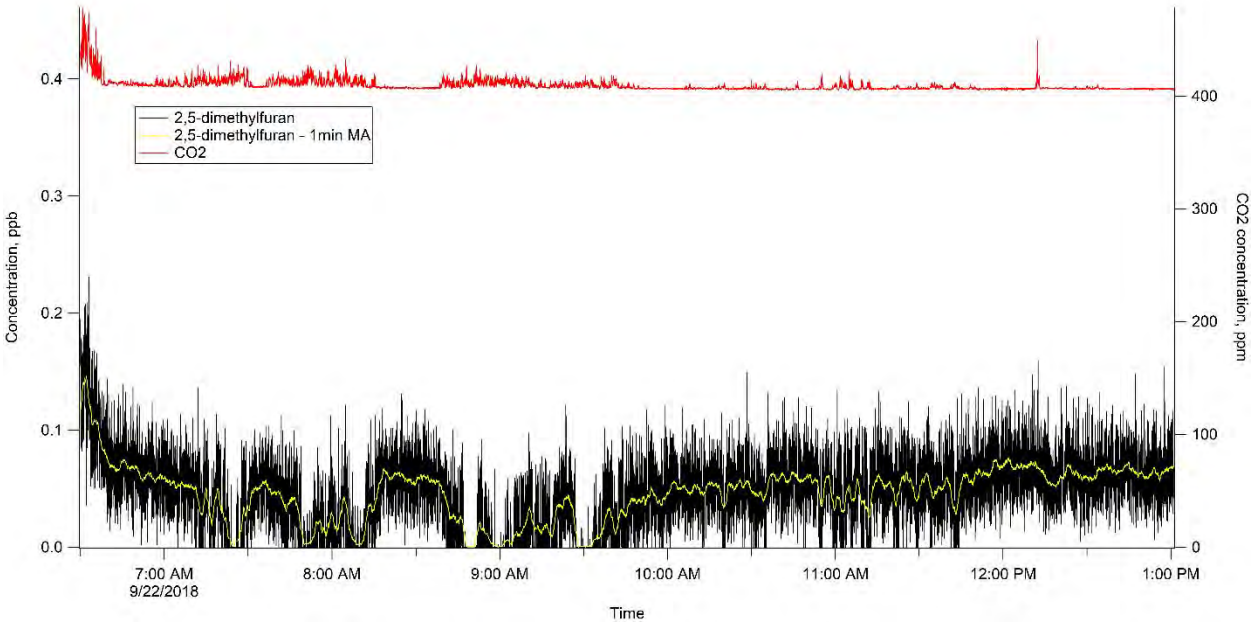

Figure 6-27. 2,5-dimethylfuran.

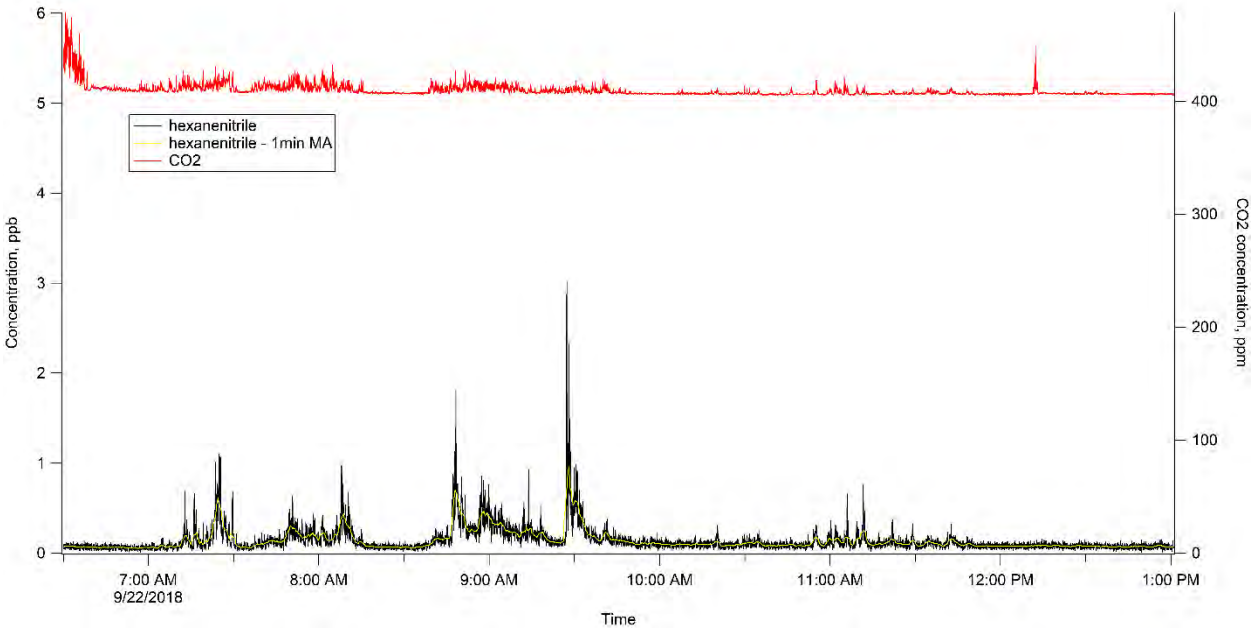

Figure 6-28. Hexanenitrile.

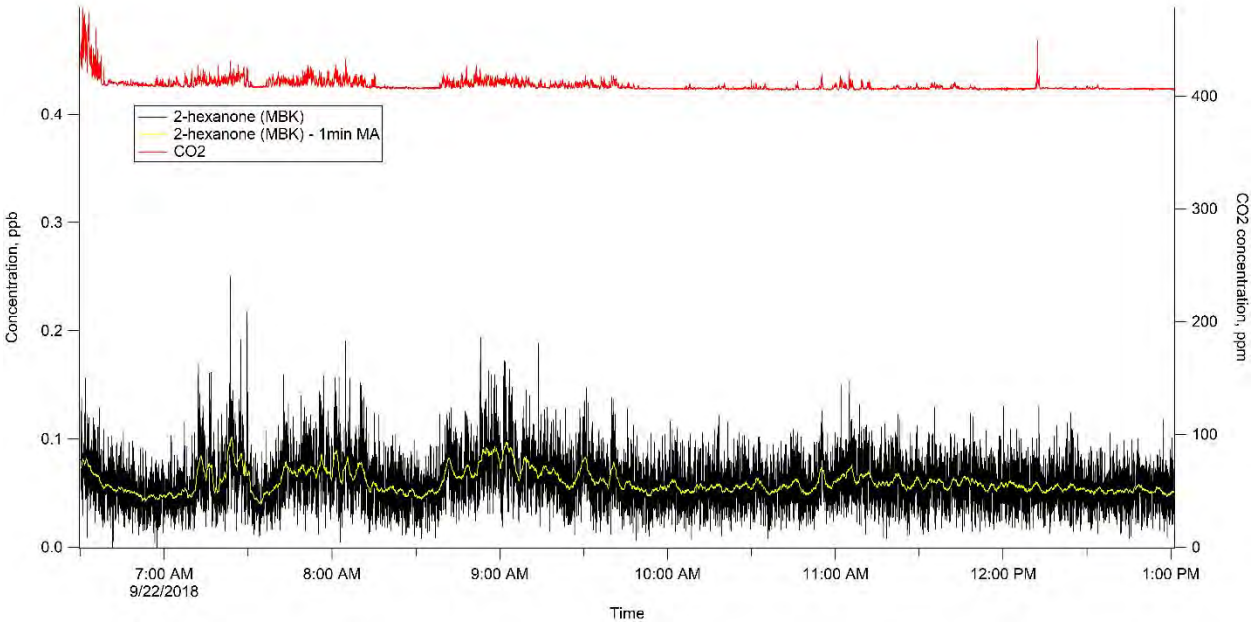

Figure 6-29. 2-hexanone (MBK).

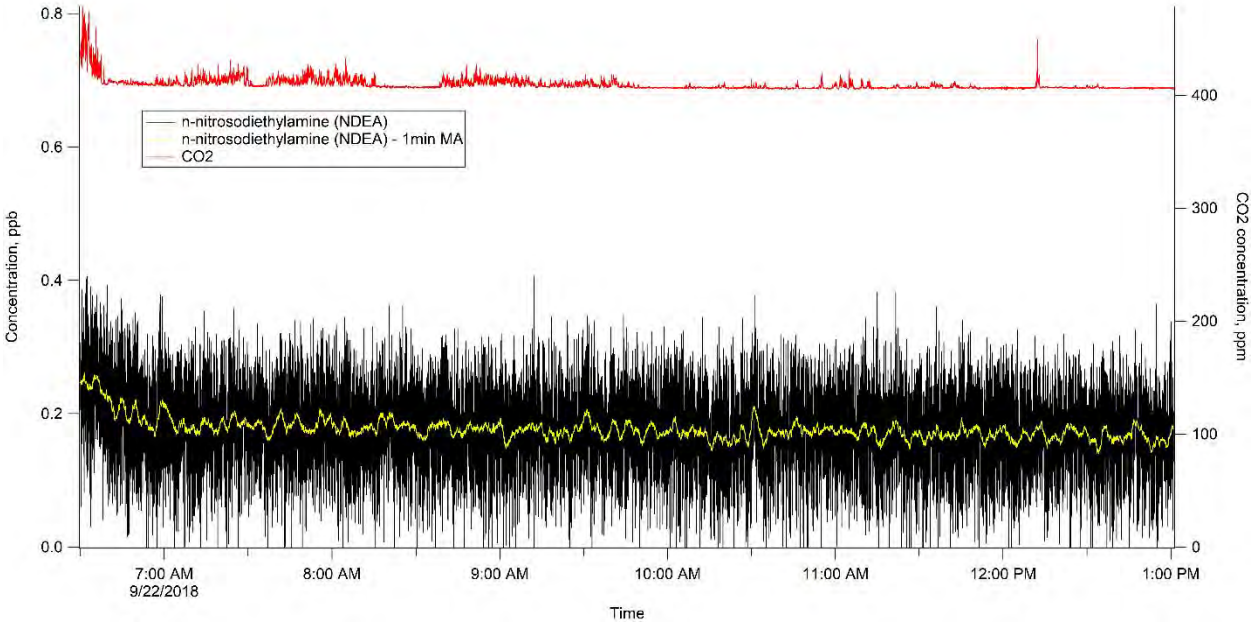

Figure 6-30. N-nitrosodiethylamine (NDEA).

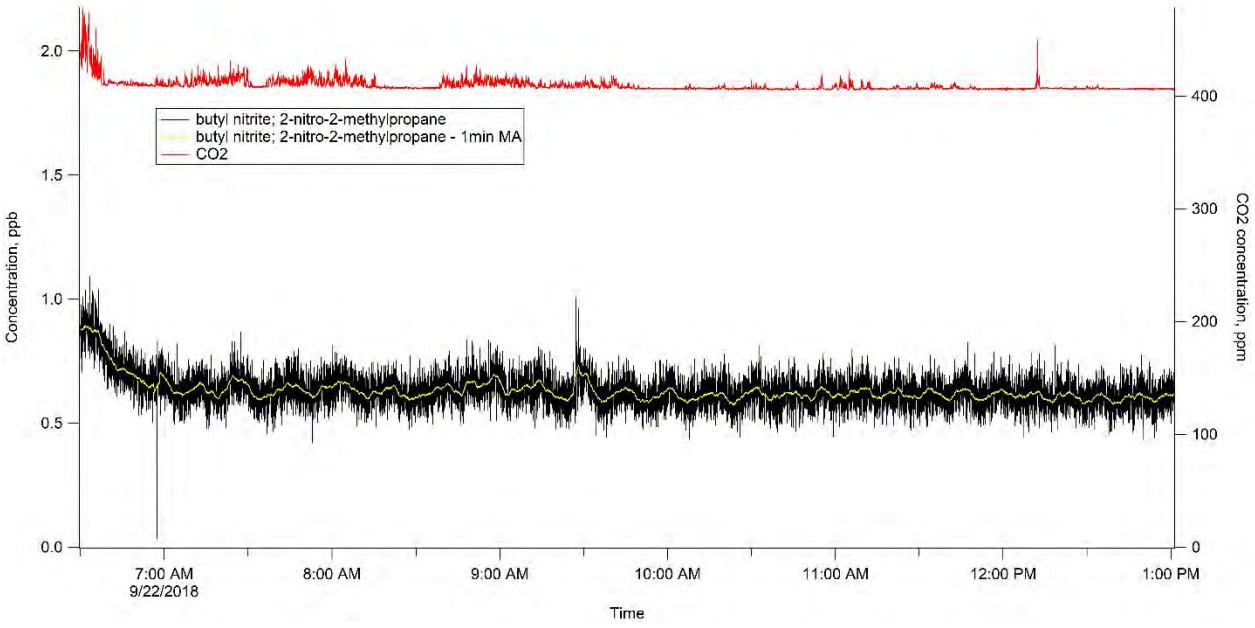

Figure 6-31. Butyl Nitrite; 2-nitro-2-methylpropane.

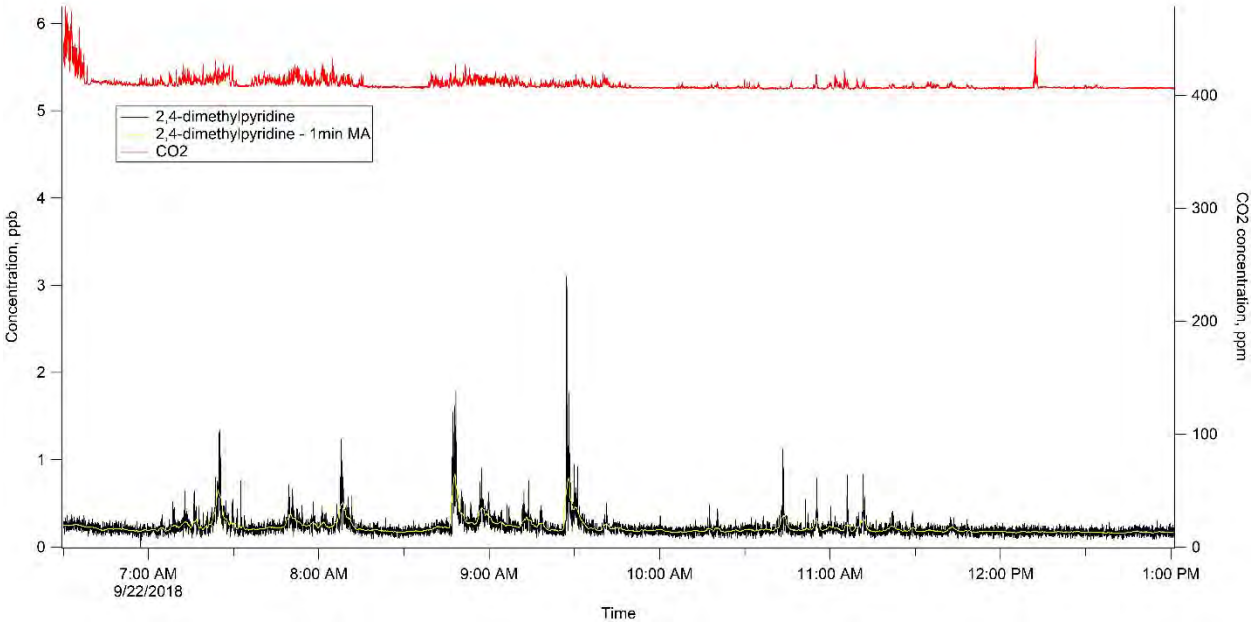

Figure 6-32. 2,4-dimethylpyridine.

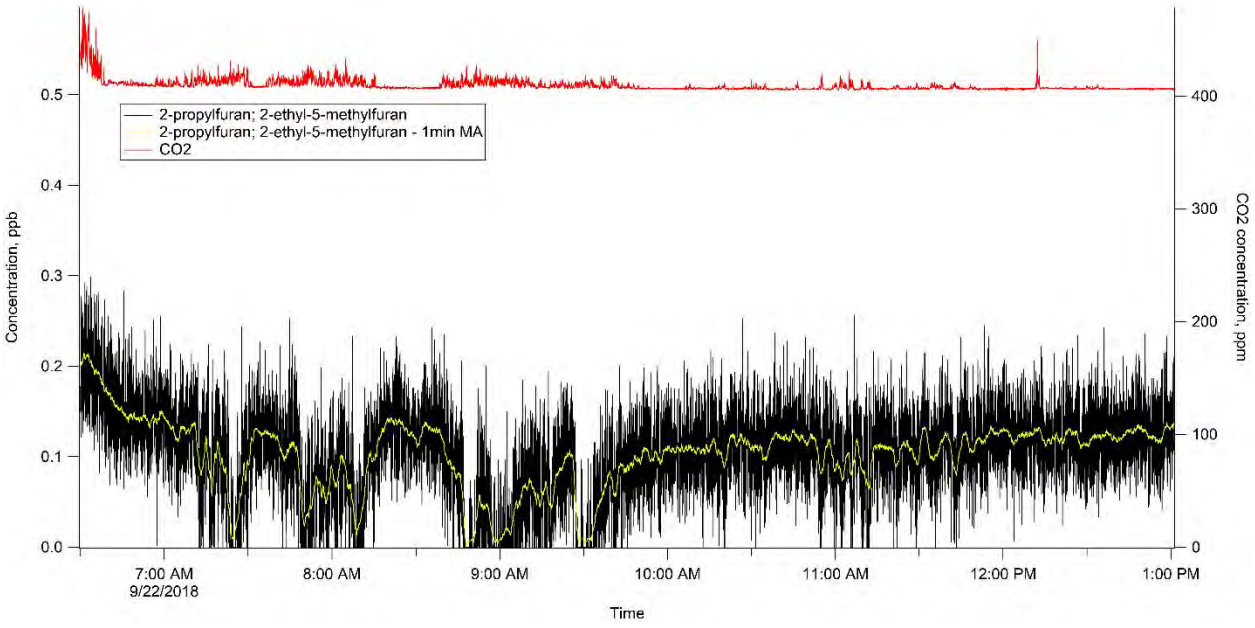

Figure 6-33. 2-propylfuran; 2-ethyl-5-methylfuran.

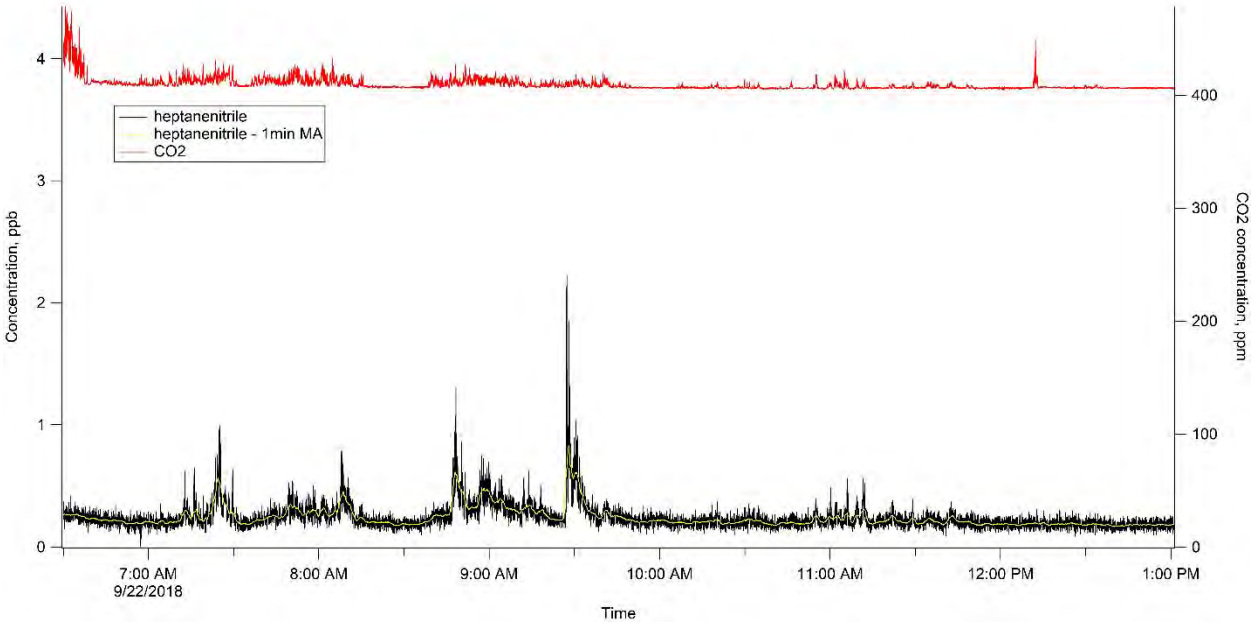

Figure 6-34. Heptanenitrile.

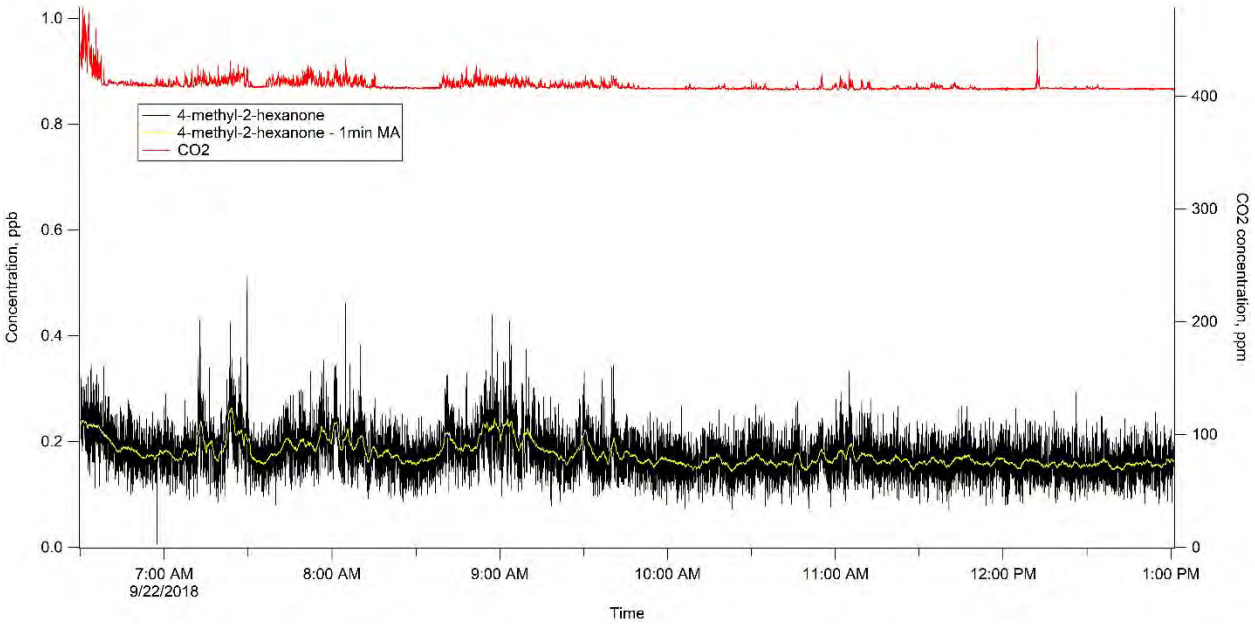

Figure 6-35. 4-methyl-2-hexanone.

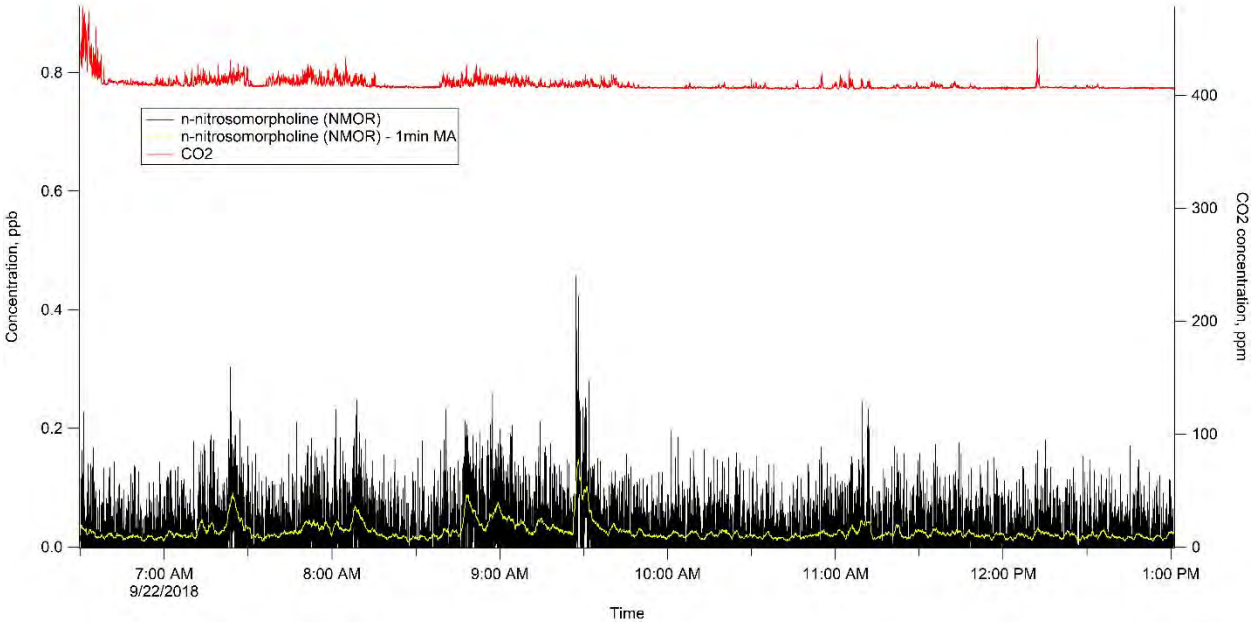

Figure 6-36. N-nitrosomorpholine (NMOR).

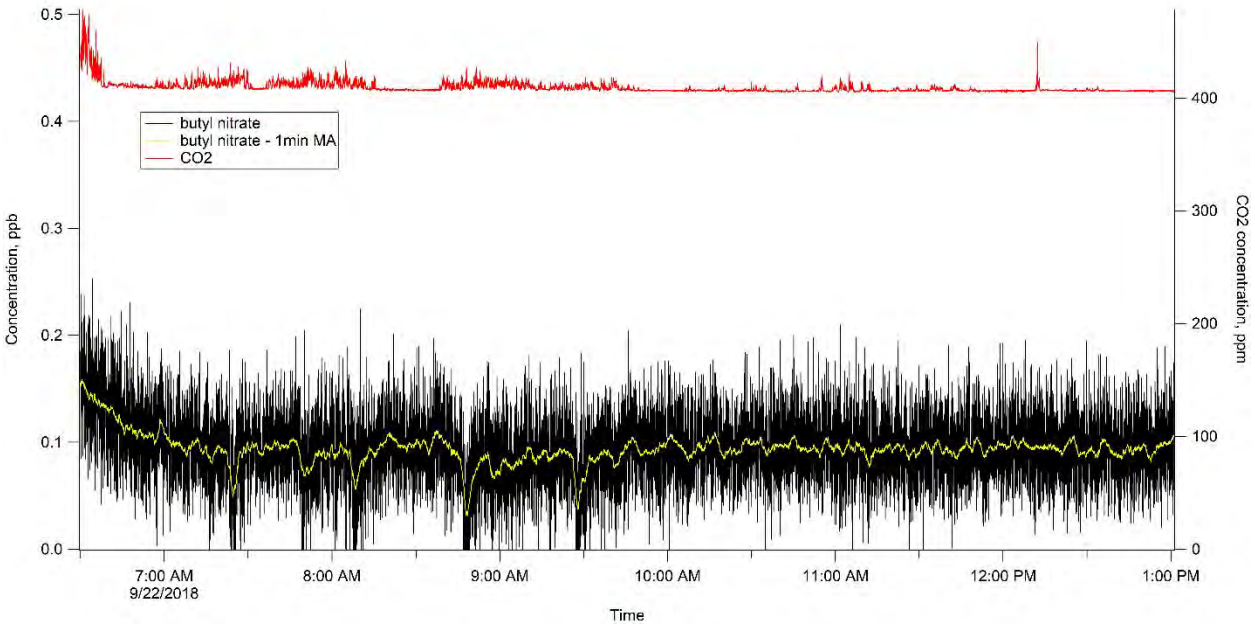

Figure 6-37. Butyl Nitrate.

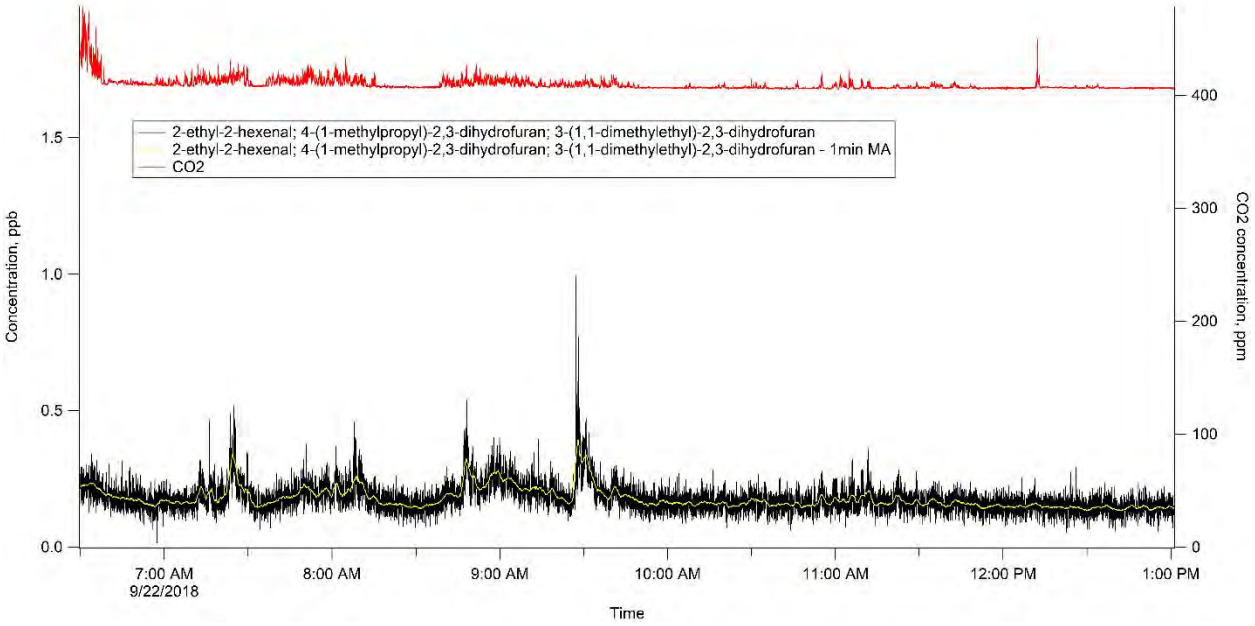

Figure 6-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

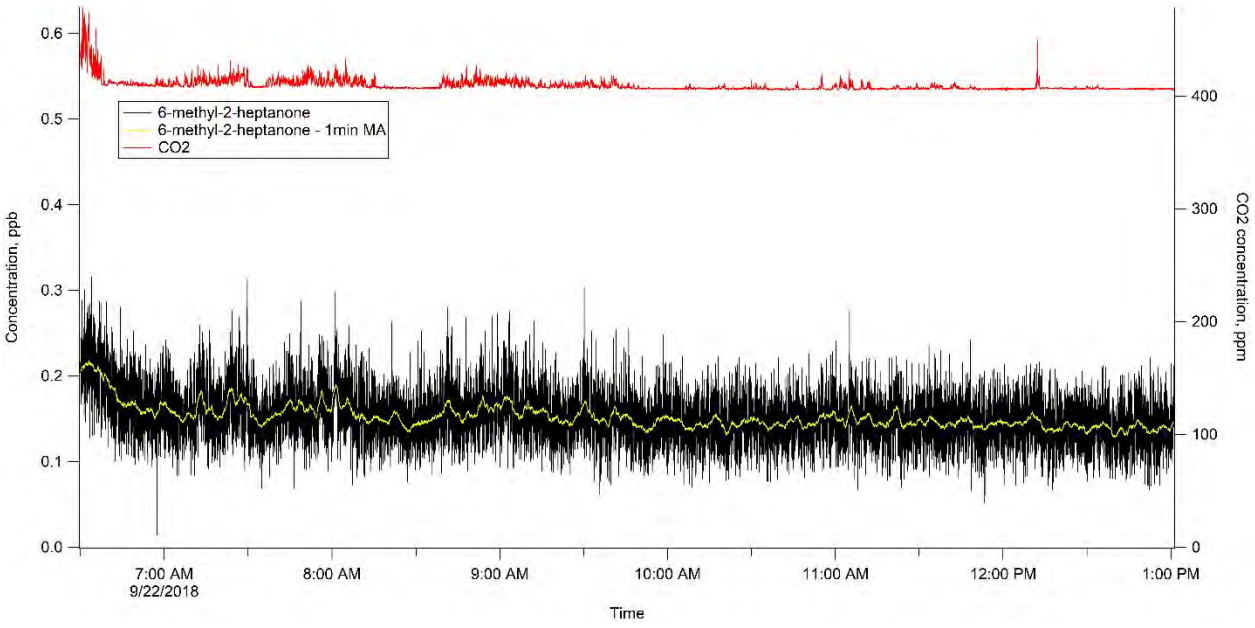

Figure 6-39. 6-methyl-2-heptanone.

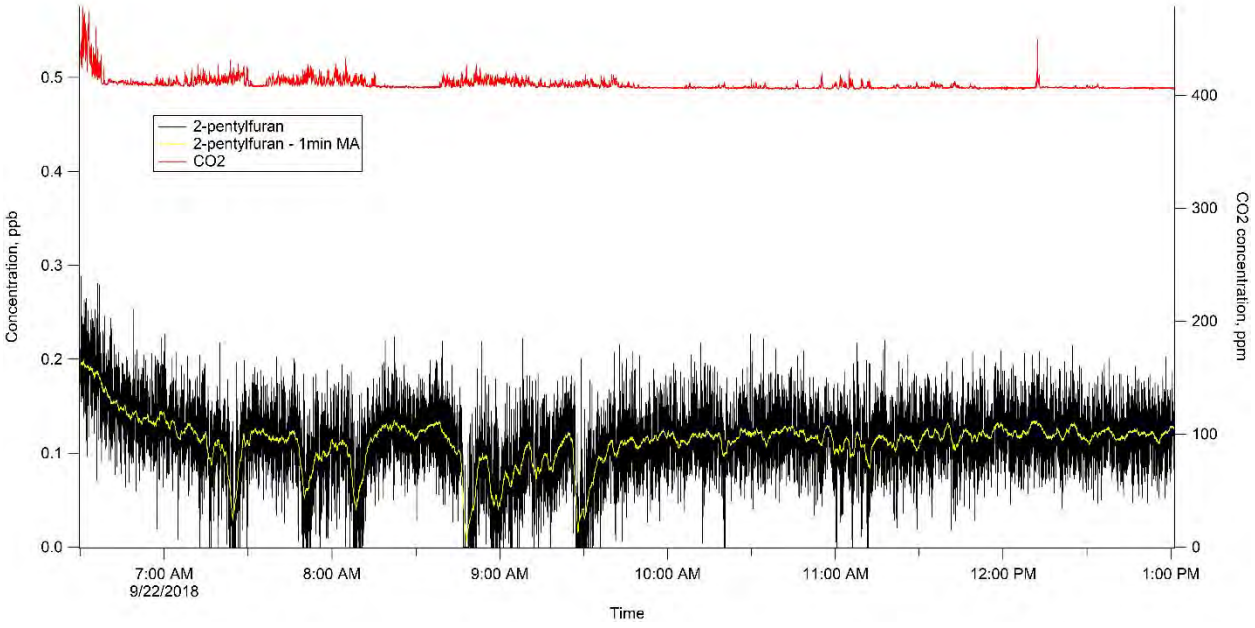

Figure 6-40. 2-pentylfuran.

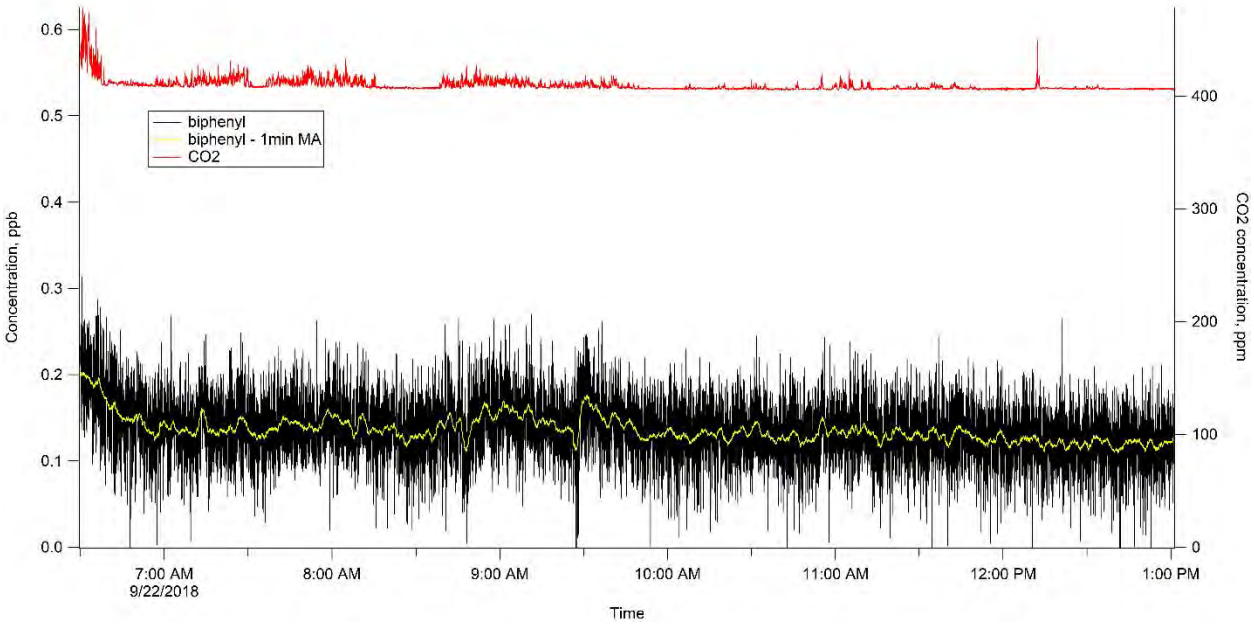

Figure 6-41. Biphenyl.

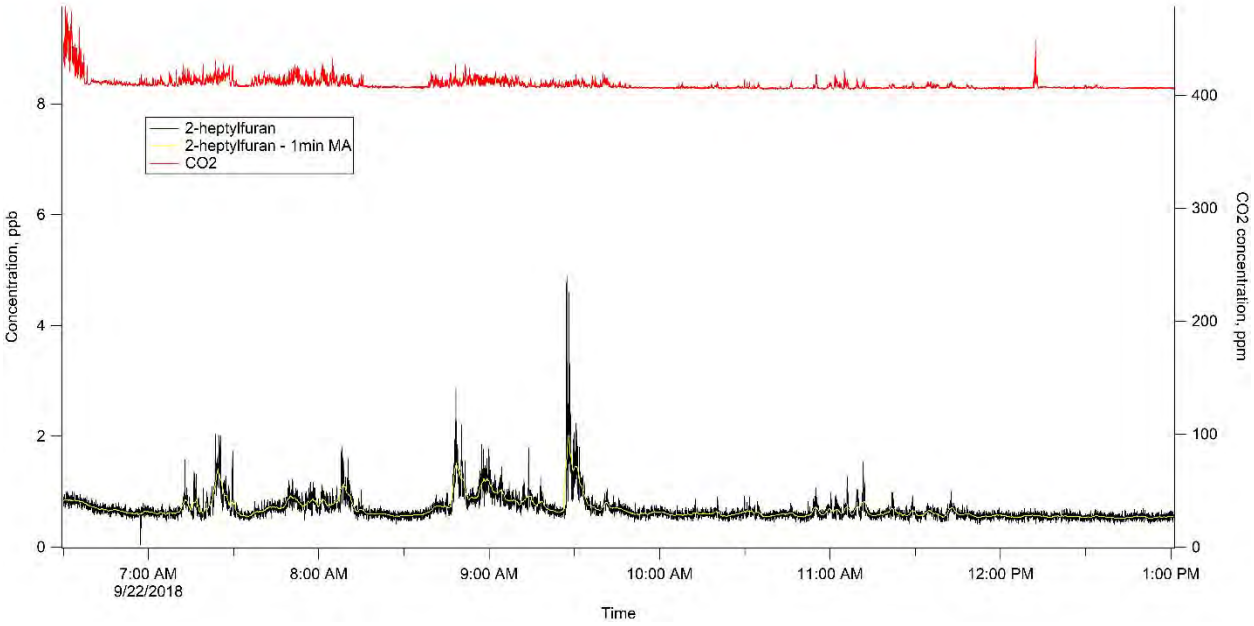

Figure 6-42. 2-heptylfuran.

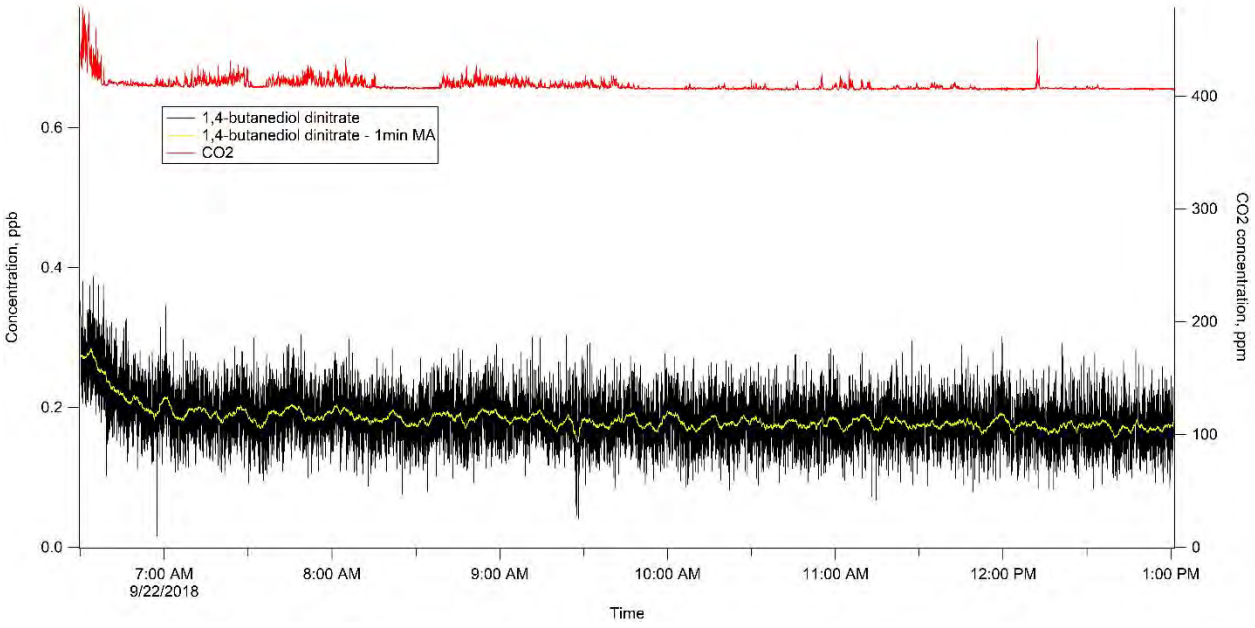

Figure 6-43. 1,4-butanediol Dinitrate.

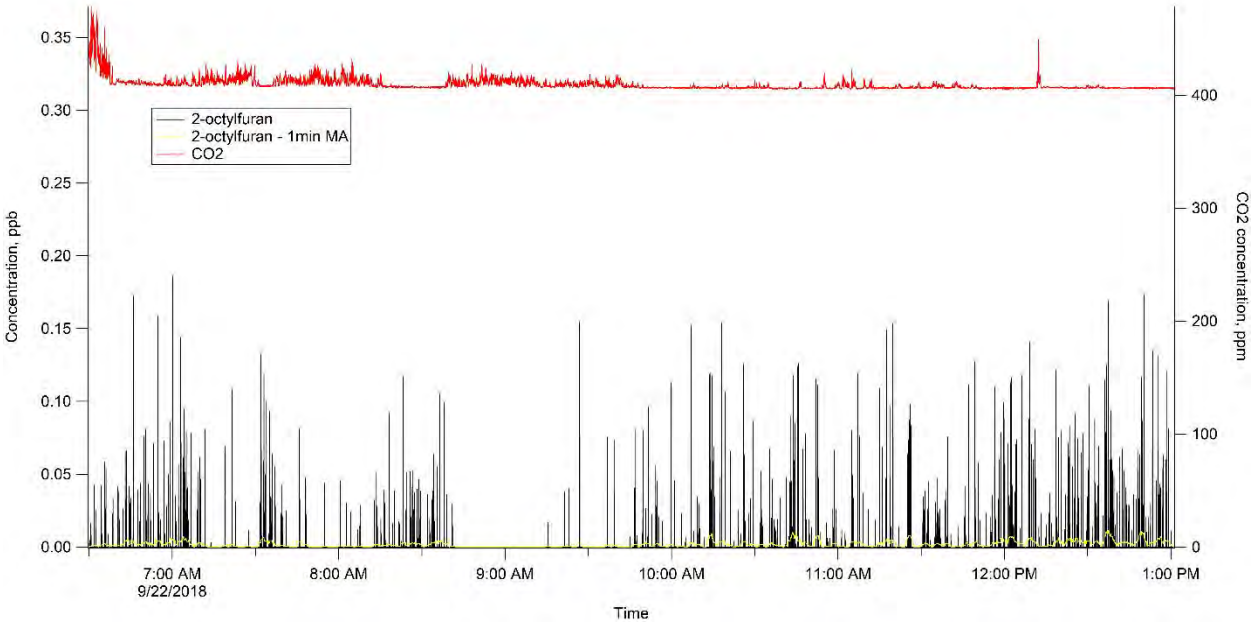

Figure 6-44. 2-octylfuran.

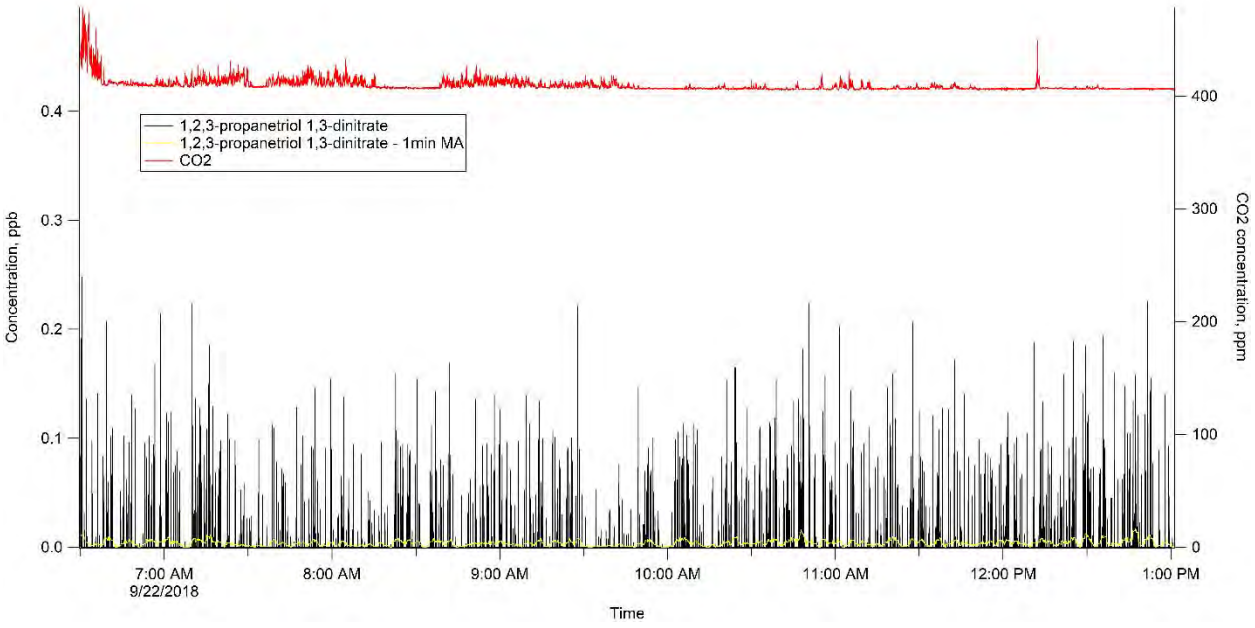

Figure 6-45. 1,2,3-propanetriol 1,3-dinitrate.

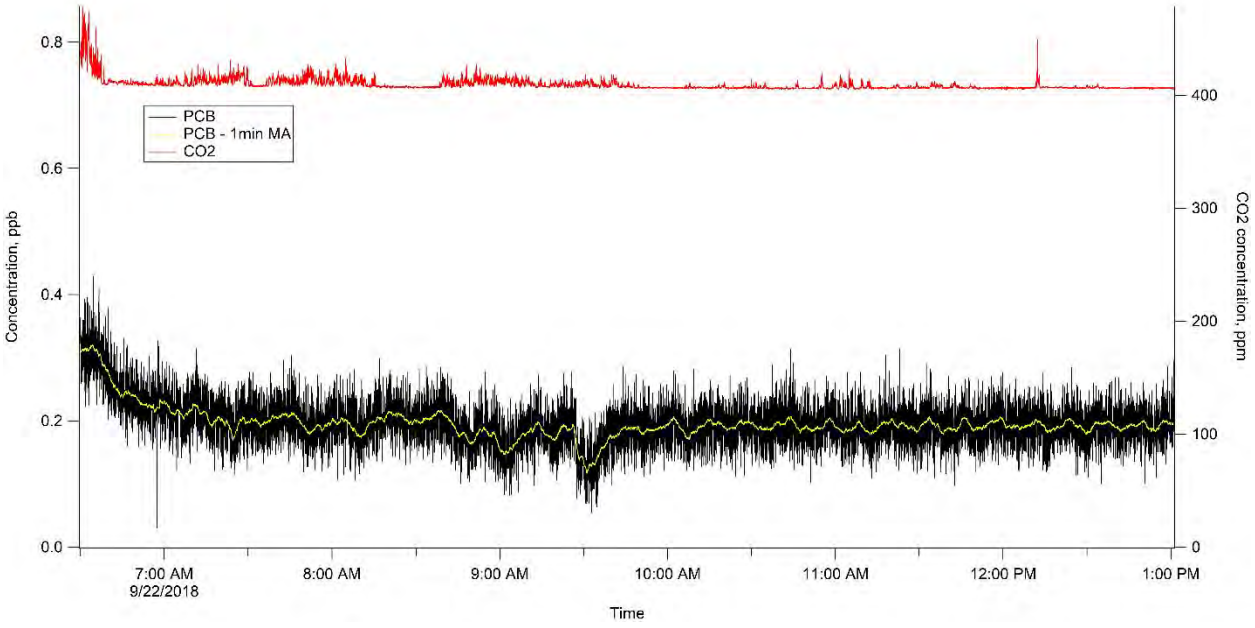

Figure 6-46. PCB.

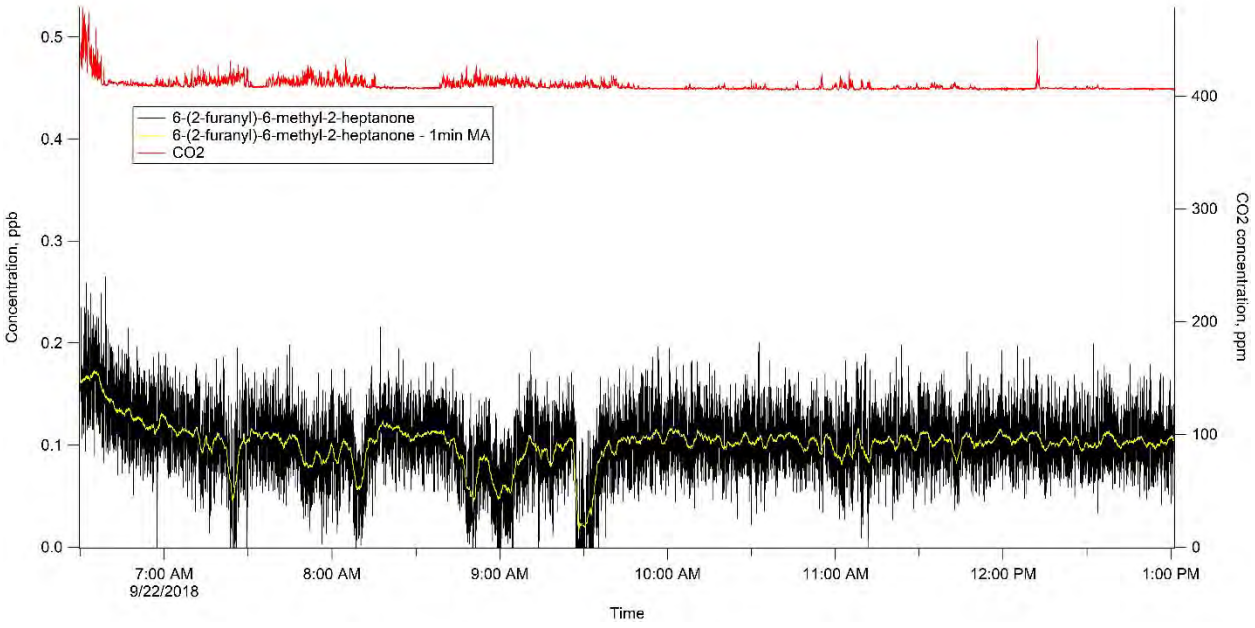

Figure 6-47. 6-(2-furanyl)-6-methyl-2-heptanone.

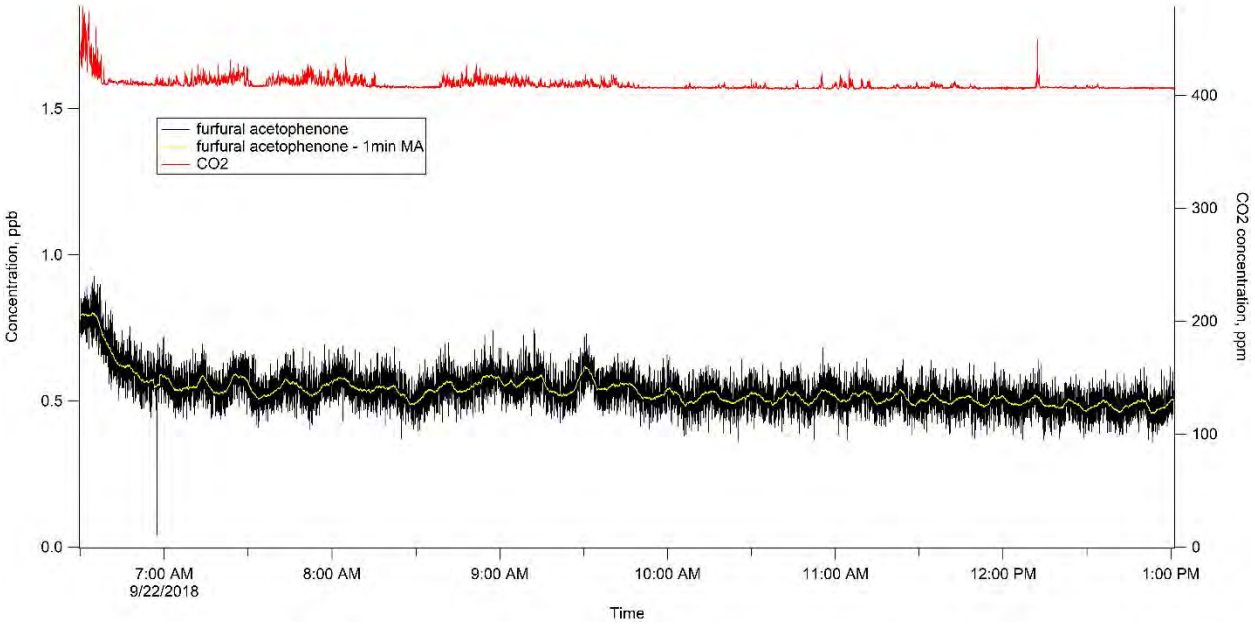

Figure 6-48. Furfural Acetophenone.

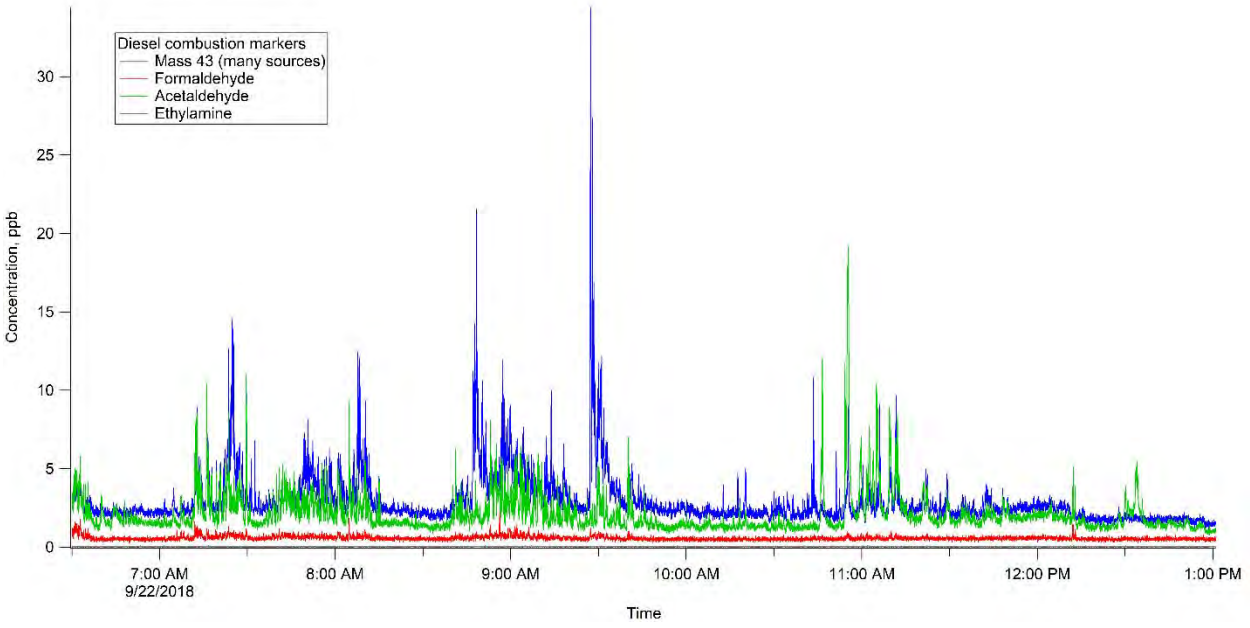

Figure 6-49. Diesel Combustion Markers.

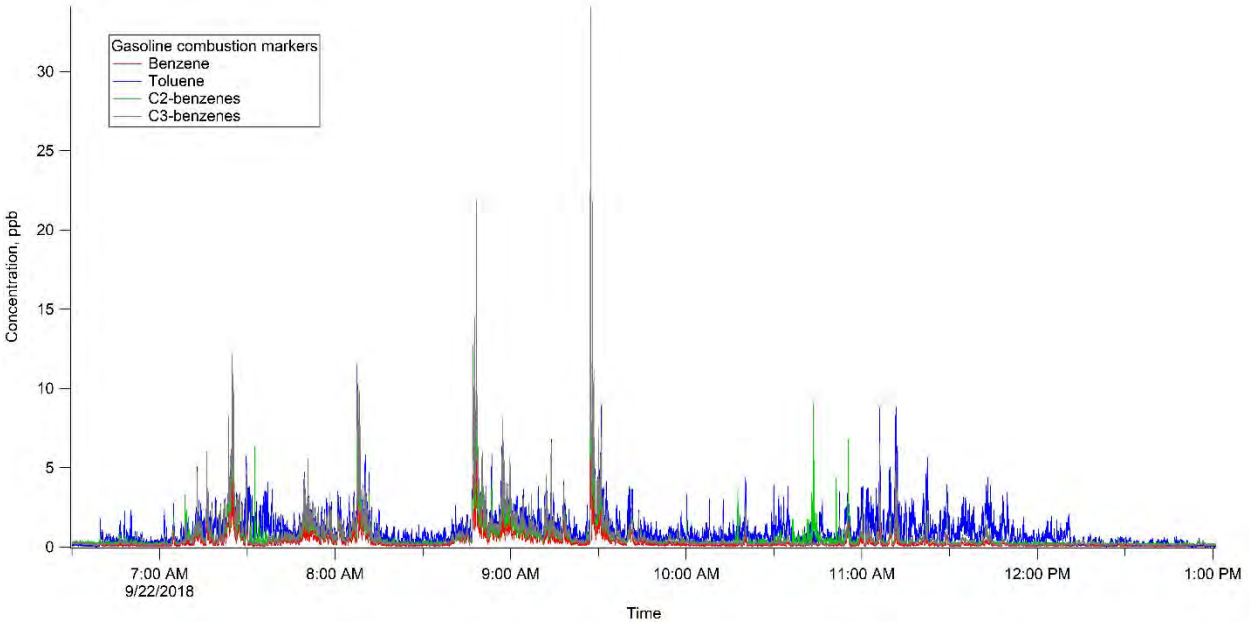

Figure 6-50. Gasoline Combustion Markers.

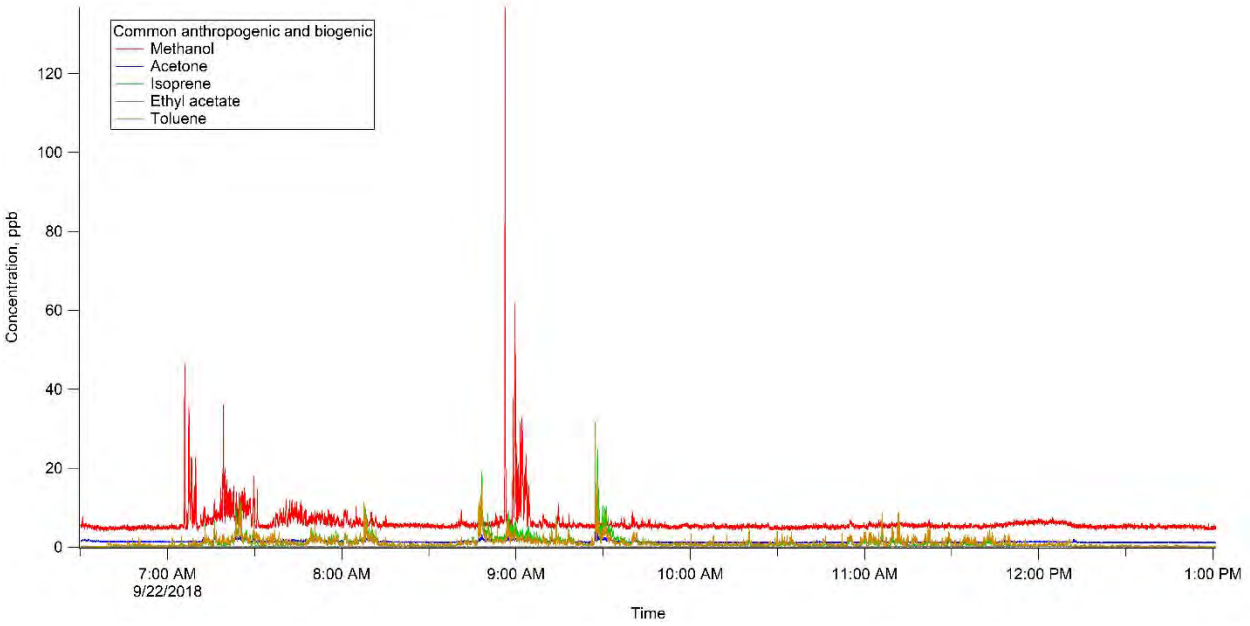

Figure 6-51. Plant and Human Markers.

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