SPECIAL COMMUNICATION – TERRAGRAPHICS MOBILE LABORATORY MONITORING FOR APRIL 16, 2019

Report No. 53005-81-RPT-047
Revision 0

September 2019

Prepared for:

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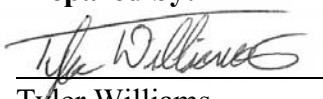

Date: 09/19/2019

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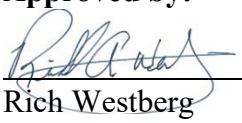
Matthew Erickson, Ph.D.

Approved by:



Date: 09/19/2019

Rich Westberg

Record of Revision

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

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Acronyms

AOP	Abnormal Operating Procedure
COPC	Chemical of Potential Concern
ML	Mobile Laboratory
MDL	Method Detection Limit
NDEA	N-nitrosodiethylamine
NDMA	N-nitrosodimethylamine
NMOR	N-nitrosomorpholine
OEL	Occupational Exposure Limit
RL	Reporting Limit
PCB	Polychlorinated Biphenyl
PST	Pacific Standard Time
PTR-TOF	Proton Transfer Reaction – Time of Flight
PTR-MS	Proton Transfer Reaction – Mass Spectrometer
SME	Subject Matter Expert

Executive Summary

On April 16, 2019, the TerraGraphics Mobile Laboratory was deployed to perform area monitoring around the 200 East area of the Hanford Site. The overall objective was to monitor and report on a wide range of compounds, primarily chemicals of potential concern and odor-causing compounds. The Abnormal Operating Procedure (AOP)-015 event occurred aas t approximately 11:54 Pacific Standard Time near AX Farm. During this time, the Mobile Laboratory was parked to the north of C Farm. No significant responses of chemicals of potential concern or odor compounds were observed around the initial time of the AOP-015 event with chemicals of potential concern remaining below occupational exposure limits or at typical background levels.

The Mobile Laboratory operators were notified of the AOP-015 by the Central Shift Office announcement at 11:54 Pacific Standard Time, and immediately moved to position the Mobile Laboratory downwind of the site of the incident. They then proceeded to contact the ML Subject Matter Expert and the Washington River Protection Solutions, LLC Project Manager for further instruction. By 11:59, Pacific Standard Time, the Mobile Laboratory had repositioned to the west side of AY Farm. At 12:03, PST the Mobile Laboratory operators were instructed to report to the Central Shift Office for briefing. By 12:18, Pacific Standard Time, the Mobile Laboratory operators had repositioned to the east side of AX Farm near the change trailer, per the request of Mr. Gavin Lindsey from Washington River Protection Solutions, LLC Production Operations Safety and Health. The Mobile Laboratory remained in this position, sampling from the mast inlet, until 13:32 Pacific Standard Time, at which time an exit from the AOP-015 was announced. A 35’ heated inlet line was available for use at this time but was unable to reach the target area due to infeasibility with positioning closer to the source of the event. For this reason, the Mobile Laboratory remained sampling from the mast for the duration of monitoring.

Small spikes of a few chemicals of potential concern (furan, but-3-en-2-one+2,3-dihydrofuran+2,5-dihydrofuran, 2-methylfuran, 2,5-dimethylfuran) and a few odor compounds (diethyl sulfide+2-methylpropane-2-thiol, 1-pentanethiol+2,2-dimethylpropane-1-thiol) were observed post announcement, but no chemicals of potential concern were observed to exceed their occupational exposure limits. In most cases the signal spikes observed did not exceed the Mobile Laboratory Proton Transfer Reaction – Mass Spectrometer’s method detection limits. The Mobile Laboratory data for chemicals of potential concern during the time period of the AOP-015 event do not support that the event was triggered by the presence of tank vapors. In addition, no odor-causing signals previously identified through source characterization work with septic sources were observed to exceed Proton Transfer Reaction – Mass Spectrometer method detection limits during this time. As such, there is no conclusive evidence to suggest that the AOP-015 event was caused by typical odor-causing compounds, such as methyl mercaptan or hydrogen sulfide. It is notable that the Mobile Laboratory was sampling approximately 100 to 200 feet to the east of the work activity and the Mobile Laboratory’s meteorological data from that time period indicated low to moderate winds prevailing from the south or southeast, and thus transport and prevailing weather patterns affected the ability to detect tank waste plumes at the Mobile Laboratory location for the majority of sampling.

1.0 APRIL 16, 2019 – AREA MONITORING

1.1 Quality Assessment

Data from April 16, 2019, were assessed using Procedure 17124-DOE-HS-102, "Mobile Laboratory Data Processing – Analysis." A Data Acceptance 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

Table 1-1. Mobile Laboratory Location By Time.

Time	Marker on Map	Location
11:59 – 12:03 PST	1	West of AY Farm
12:03 – 12:18 PST	Off Map	Central Shift Office
12:18 – 13:32 PST	2	East of AX Farm

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

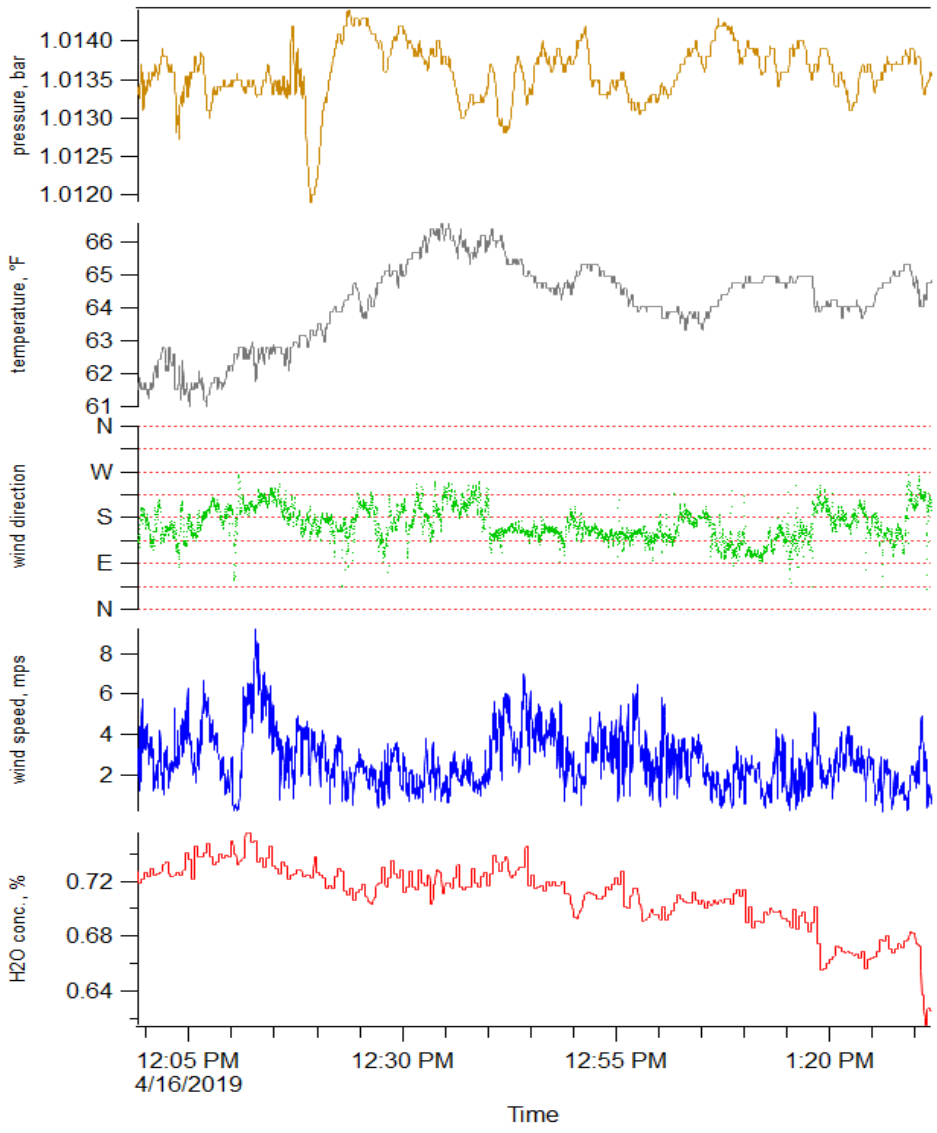

Figure 1-2. Weather Data for the Duration of Monitoring Period.

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®[1] CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

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

1.4 Chemicals of Potential Concern

Table 1-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 16, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel. St. Dev. %	Max (ppb)	Median (ppb)
1	Ammonia	25000	0.01	8.083	0.480	5.940	9.097	8.156
2	Formaldehyde	300	1.302	<1.302	0.123	20.734	1.542	<1.302
3	Methanol	200000	1.839	4.663†	0.334	7.167	6.437	4.656†
4	Acetonitrile	20000	0.07	0.096†	0.028	29.215	0.284	0.094†
5	Acetaldehyde	25000	2.07	<2.07	0.267	19.385	5.114	<2.07
6	Ethylamine	5000	0.055	<0.055	0.018	73.891	0.131	<0.055
7	1,3-butadiene	1000	0.122	0.262†	0.078	29.632	0.666	0.255†
8	Propanenitrile	6000	0.121	<0.121	0.022	50.933	0.235	<0.121
9	2-propenal	100	0.314	<0.314	0.036	55.952	0.497	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	0.035	56.650	0.754	<0.149
11	methyl isocyanate	20	0.061	<0.061	0.022	62.068	0.136	<0.061
12	methyl nitrite	100	0.117	<0.117	0.034	42.588	0.371	<0.117
13	Furan	1	0.053	<0.053	0.015	64.496	0.135	<0.053
14	Butanenitrile	8000	0.04	<0.04	0.014	77.793	0.104	<0.04
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	100, 1, 1	0.034	<0.034	0.015	66.837	N/A*	N/A*
16	Butanal	25000	0.063	0.094†	0.037	39.867	0.681	0.089†
17	NDMA**	0.3	0.02	0.062	0.040	65.482	0.239	0.059
18	Benzene	500	0.23	<0.23	0.052	42.351	1.291	<0.23
19	2,4-pentadienenitrile + pyridine	300, 1000	0.084	<0.084	0.018	48.368	0.140	<0.084
20	2-methylene butanenitrile	30	0.05	<0.05	0.010	80.896	0.057	<0.05
21	2-methylfuran	1	0.046	<0.046	0.015	73.615	0.117	<0.046
22	Pentanenitrile	6000	0.029	<0.029	0.011	85.792	0.078	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	0.015	73.376	0.122	<0.048
24	NEMA**	0.3	0.027	<0.027	0.021	81.511	0.128	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	0.013	90.306	0.091	<0.035
26	Hexanenitrile	6000	0.029	<0.029	0.010	94.969	0.065	<0.029
27	2-hexanone (MBK)	5000	0.03	<0.03	0.011	81.413	0.066	<0.03
28	NDEA**	0.1	0.023	<0.023	0.012	116.851	0.072	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 30	0.106	<0.106	0.014	52.502	0.101	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	0.009	106.244	0.086	<0.031

Table 1-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 16, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel. St. Dev. %	Max (ppb)	Median (ppb)
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	0.010	108.749	0.063	<0.035
32	Heptanenitrile	6000	0.029	<0.029	0.009	96.594	0.051	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	0.010	86.391	0.067	<0.032
34	NMOR**	0.6	0.017	<0.017	0.008	170.101	0.063	<0.017
35	butyl nitrate	2500	0.019	<0.019	0.008	121.872	0.057	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100,1, 1	0.032	<0.032	0.009	88.807	0.068	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	0.009	88.166	0.063	<0.028
38	2-pentylfuran	1	0.029	<0.029	0.009	100.607	0.053	<0.029
39	Biphenyl	200	0.031	<0.031	0.009	132.481	0.081	<0.031
40	2-heptylfuran	1	0.136	<0.136	0.015	42.043	0.096	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	0.010	87.455	0.076	<0.184
42	2-octylfuran	1	0.013	<0.013	0.008	210.080	0.069	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	0.005	361.020	0.045	<0.132
44	PCB	1000	0.139	<0.139	0.010	72.338	0.065	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	0.008	100.331	0.058	<0.025
46	furfural acetophenone	1	0.119	<0.119	0.015	43.129	0.095	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.265 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 the 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, Inc., 2017].							
<	COPC Average/Median Below the MDL.							
†	COPC Average/Median Between the RL and the MDL.							
	COPC Average/Median >100% of the OEL.							
	COPC Average/Median 50-100% of the OEL.							
	COPC Average/Median 10-50% of the OEL.							

Figure 1-3 through Figure 1-48 display 46 chemical of potential concern (COPC) signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period April 16, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's occupational exposure limit (OEL), a blue horizontal line representing the COPC's OEL, a horizontal purple line representing the reporting limit (RL), and a pink horizontal line representing the method detection limit (MDL) are shown.

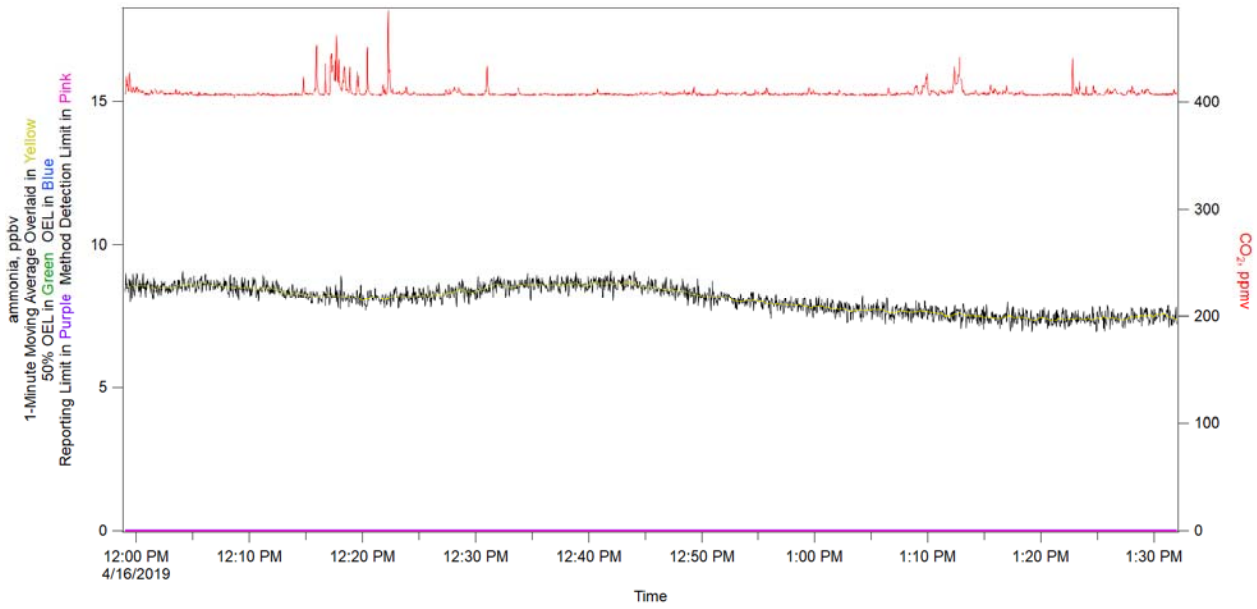

Figure 1-3. Ammonia.

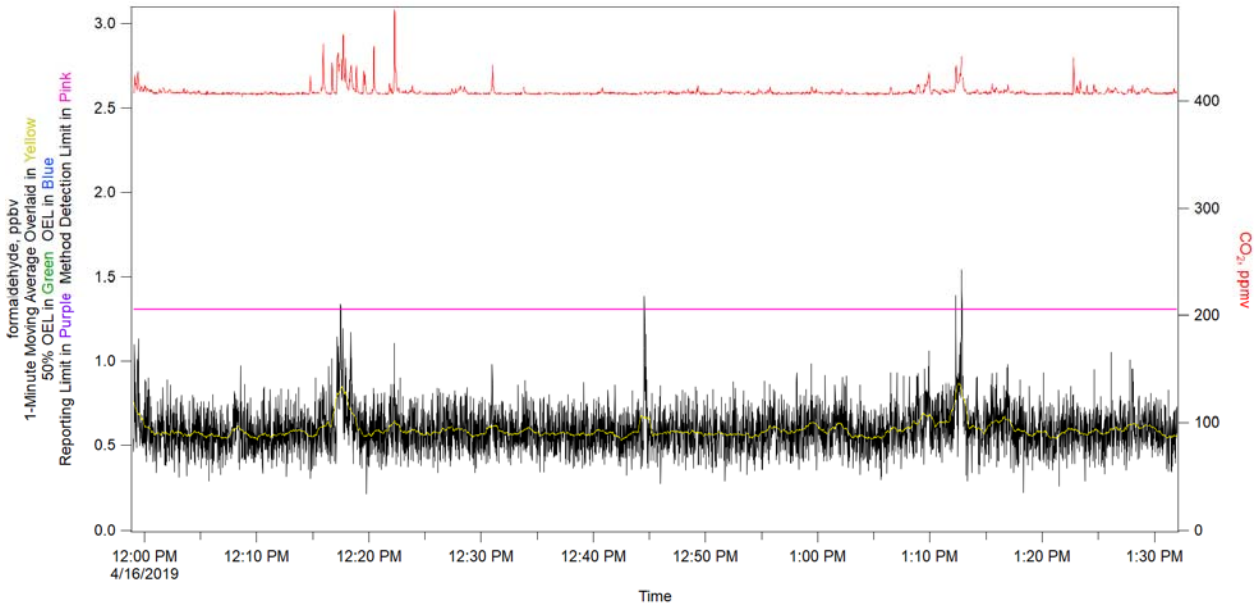

Figure 1-4. Formaldehyde.

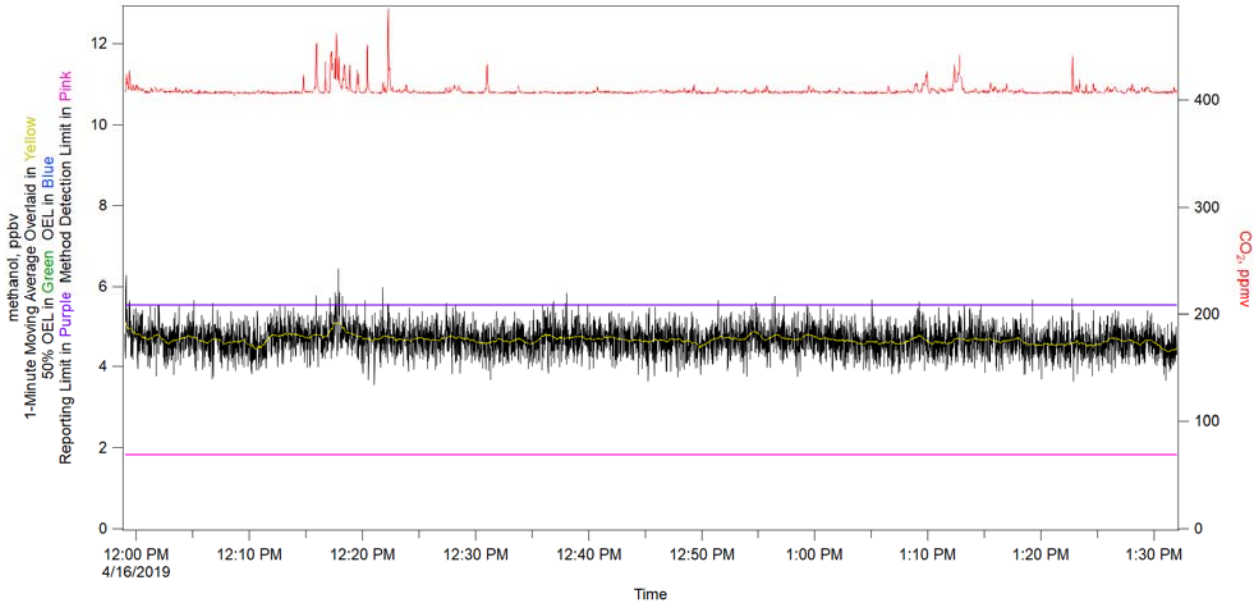

Figure 1-5. Methanol.

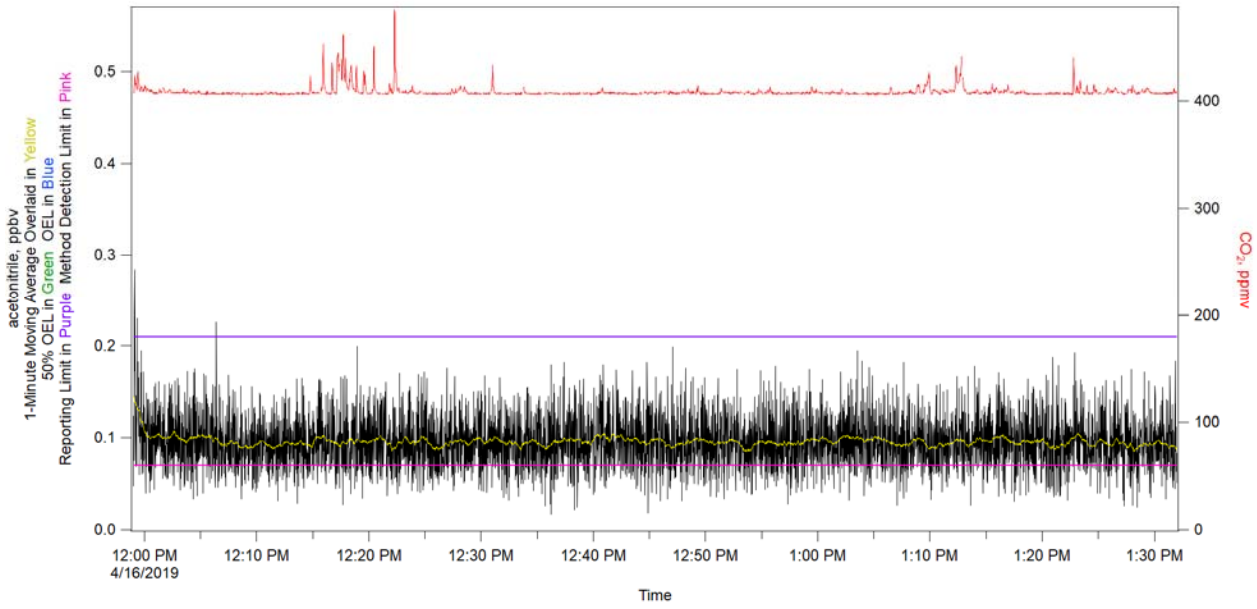

Figure 1-6. Acetonitrile.

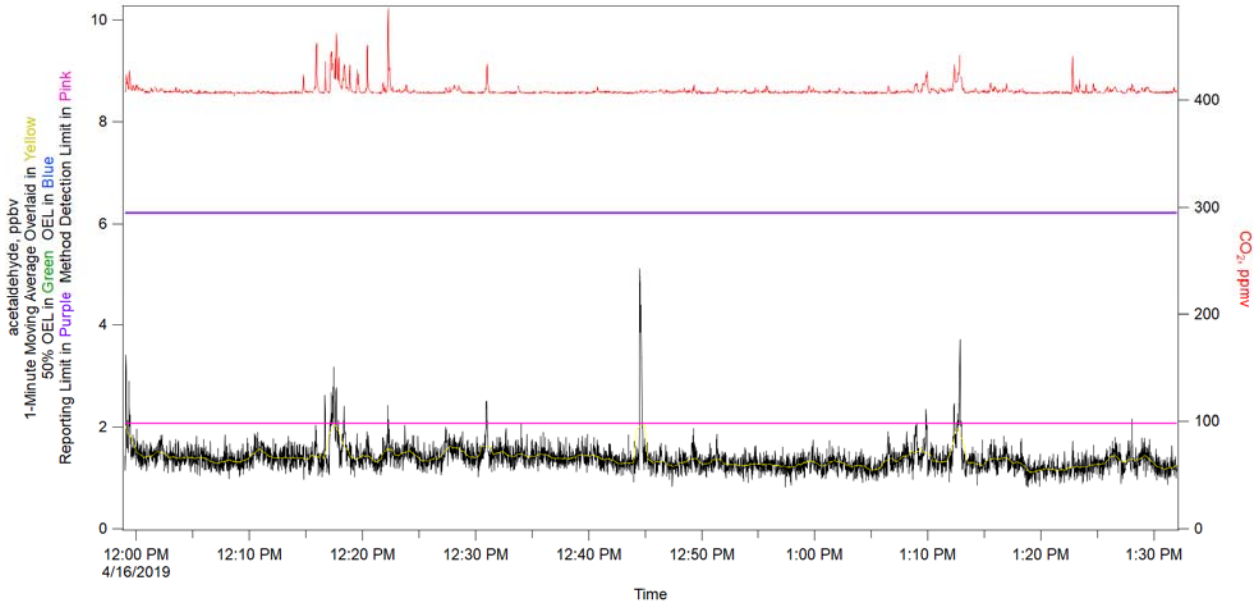

Figure 1-7. Acetaldehyde.

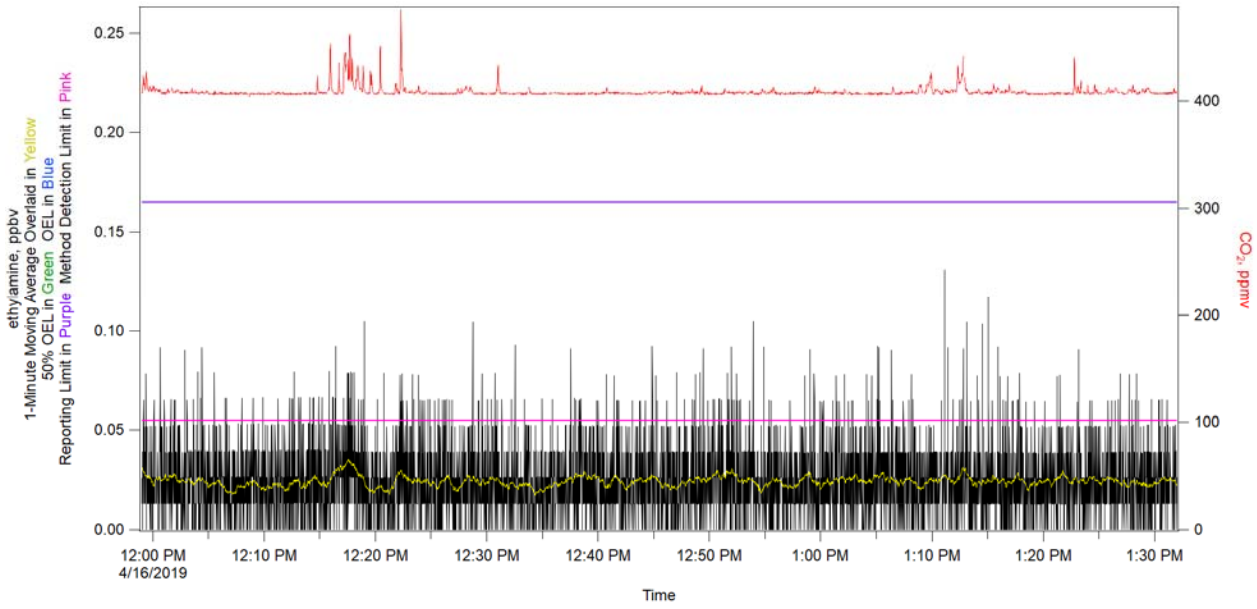

Figure 1-8. Ethylamine.

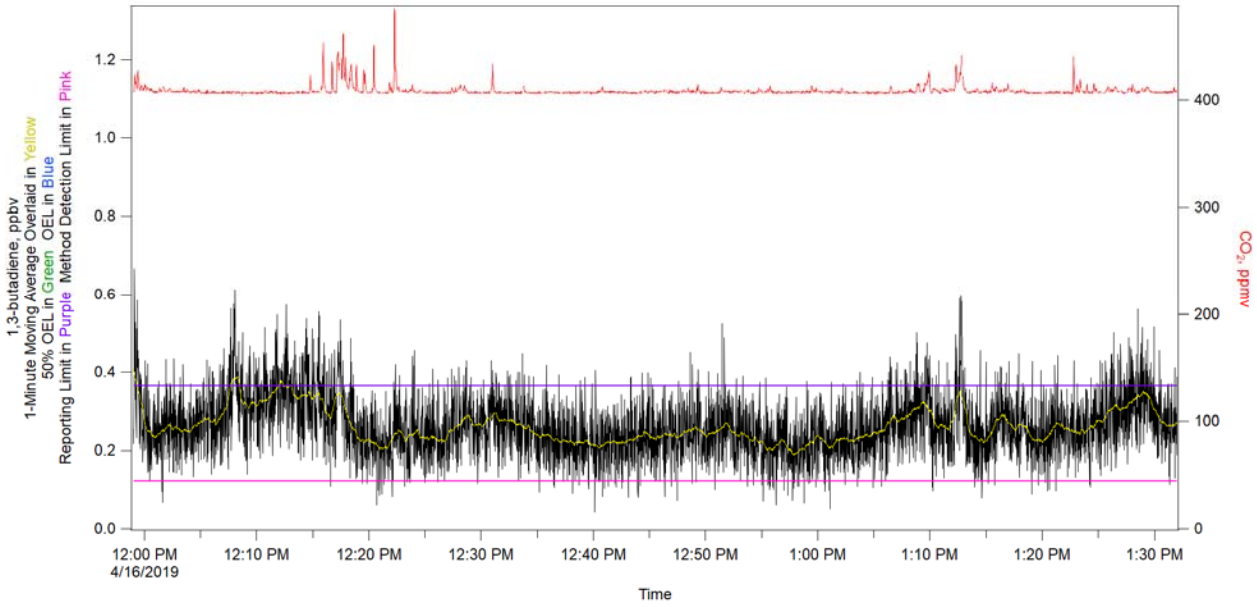

Figure 1-9. 1,3-butadiene.

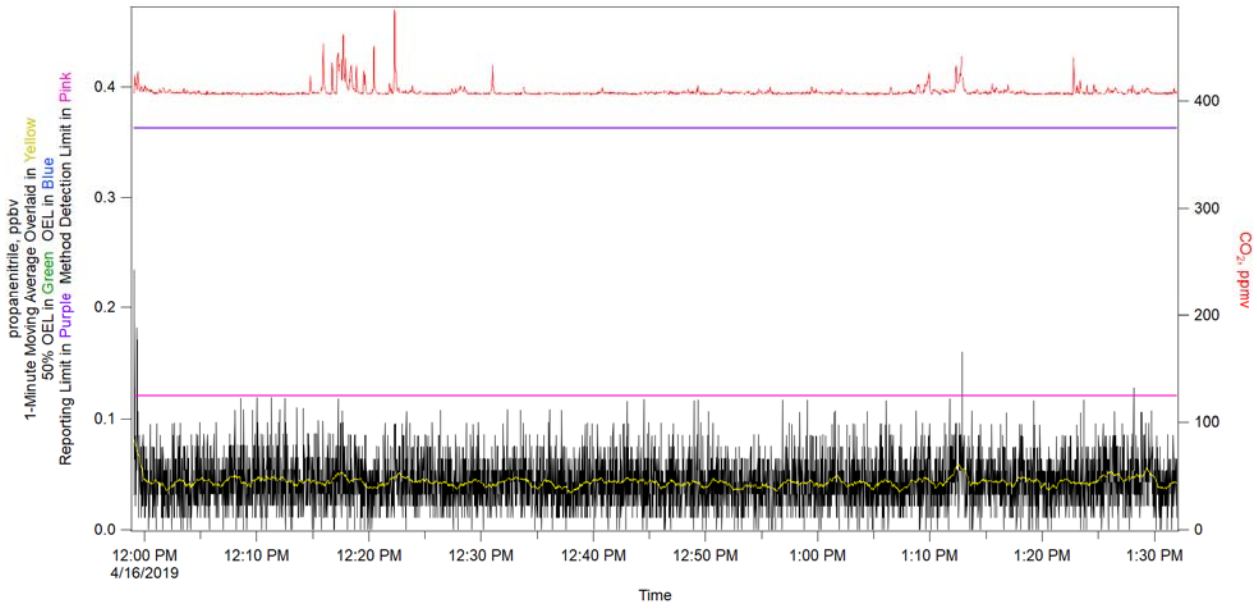

Figure 1-10. Propanenitrile.

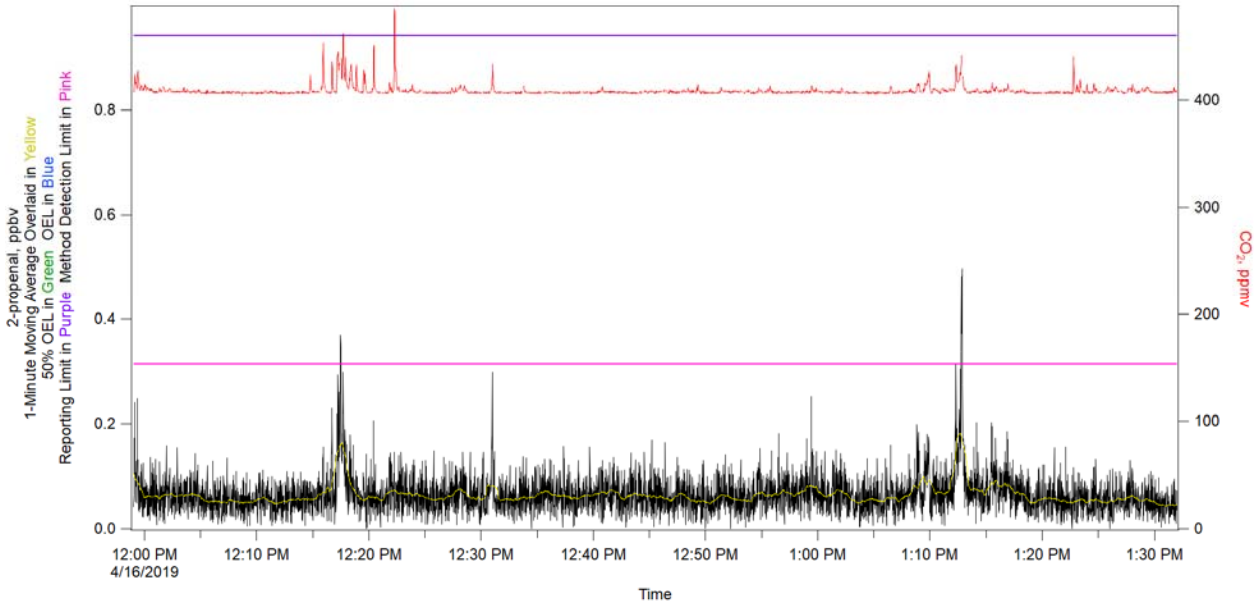

Figure 1-11. 2-propenal.

Figure 1-12. 1-butanol; Butenes.

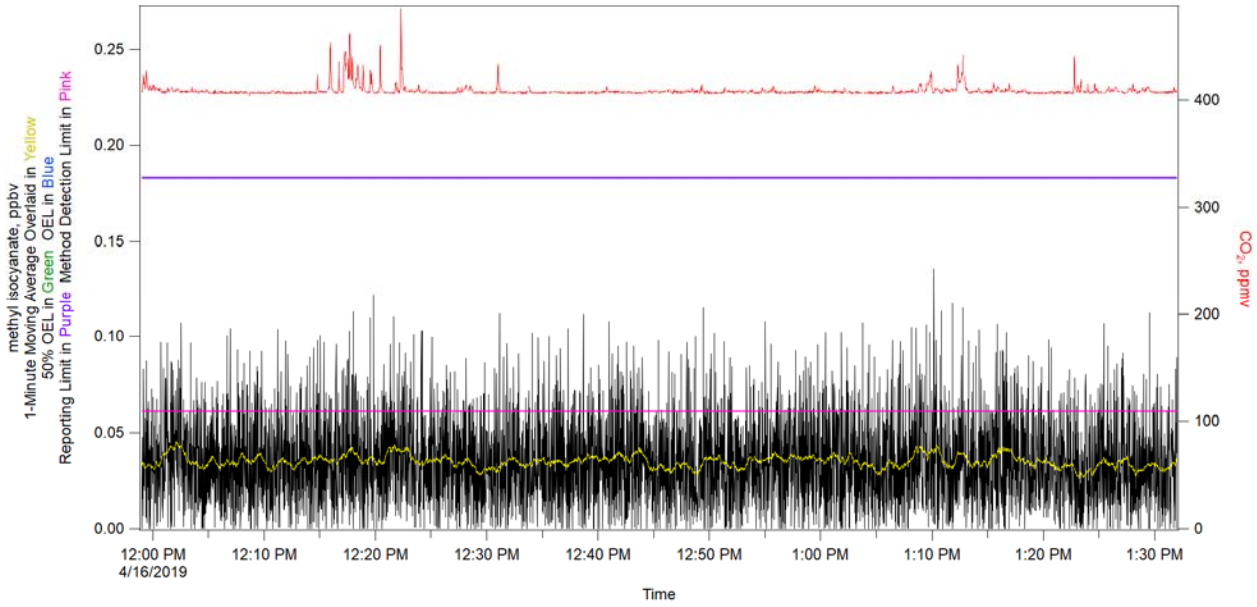

Figure 1-13. Methyl Isocyanate.

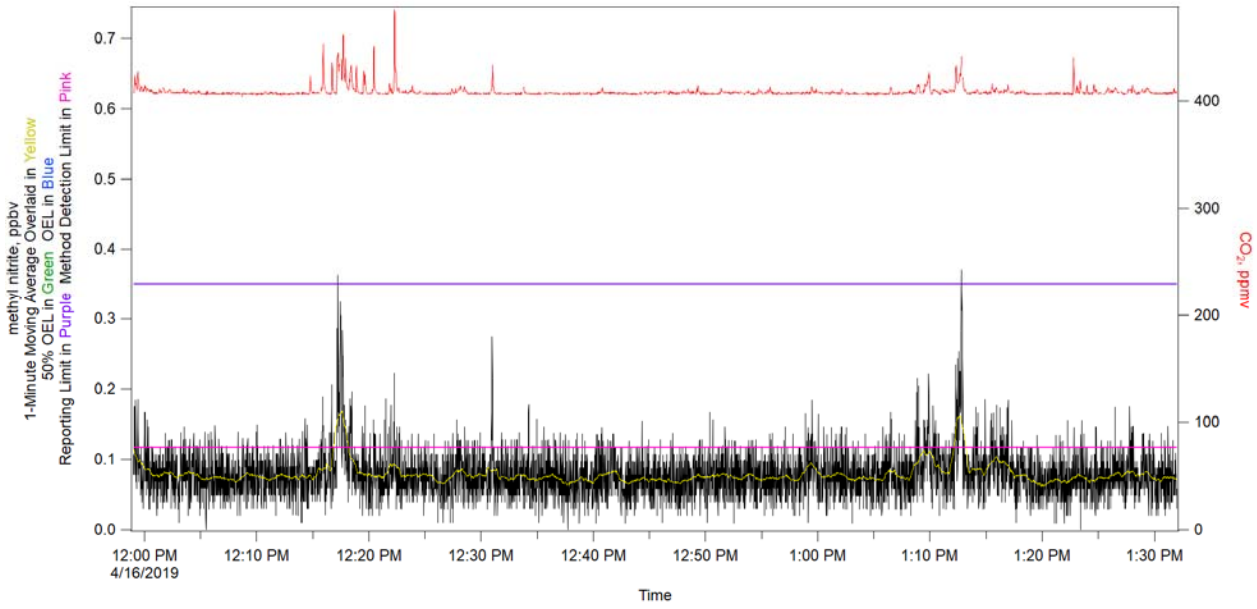

Figure 1-14. Methyl Nitrite.

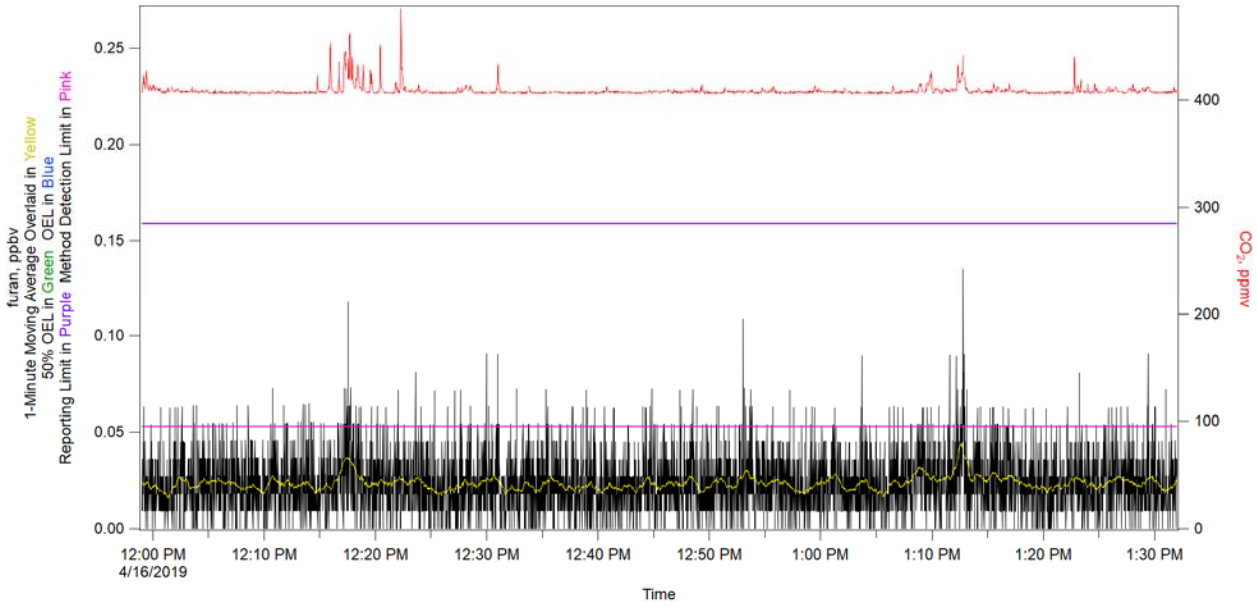

Figure 1-15. Furan.

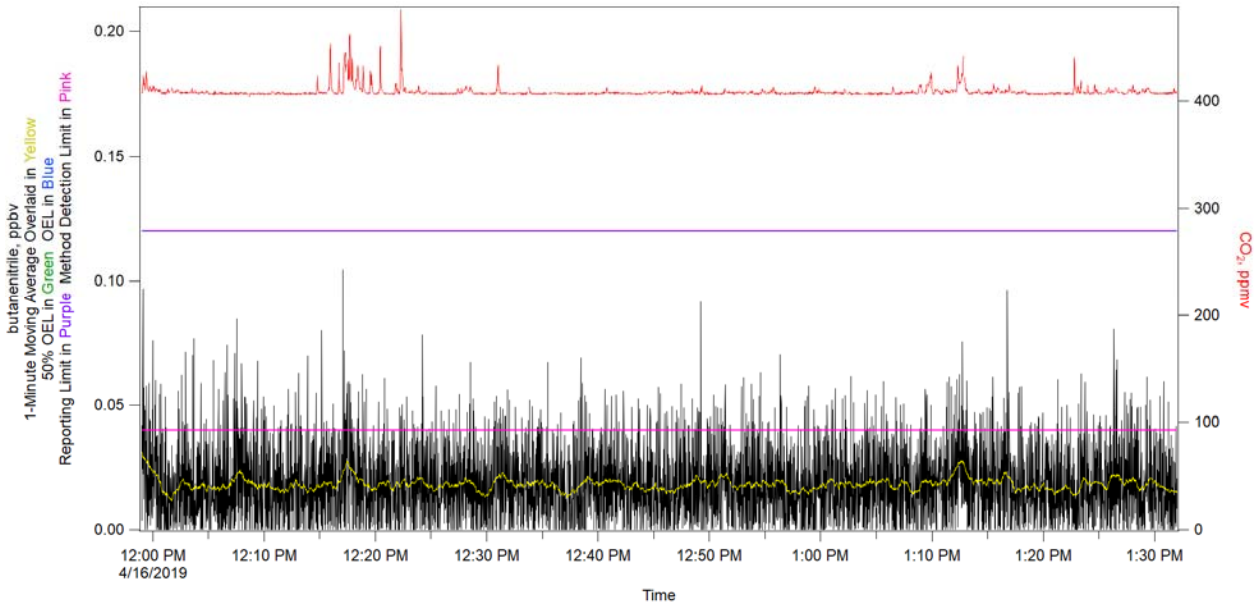

Figure 1-16. Butanenitrile.

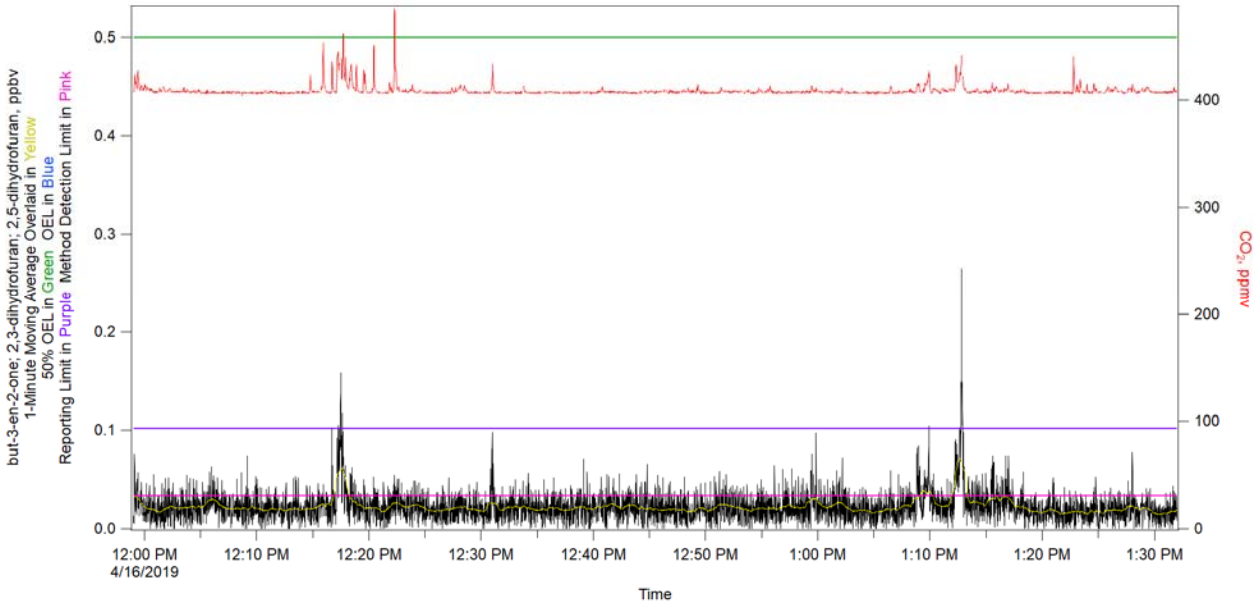

Figure 1-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

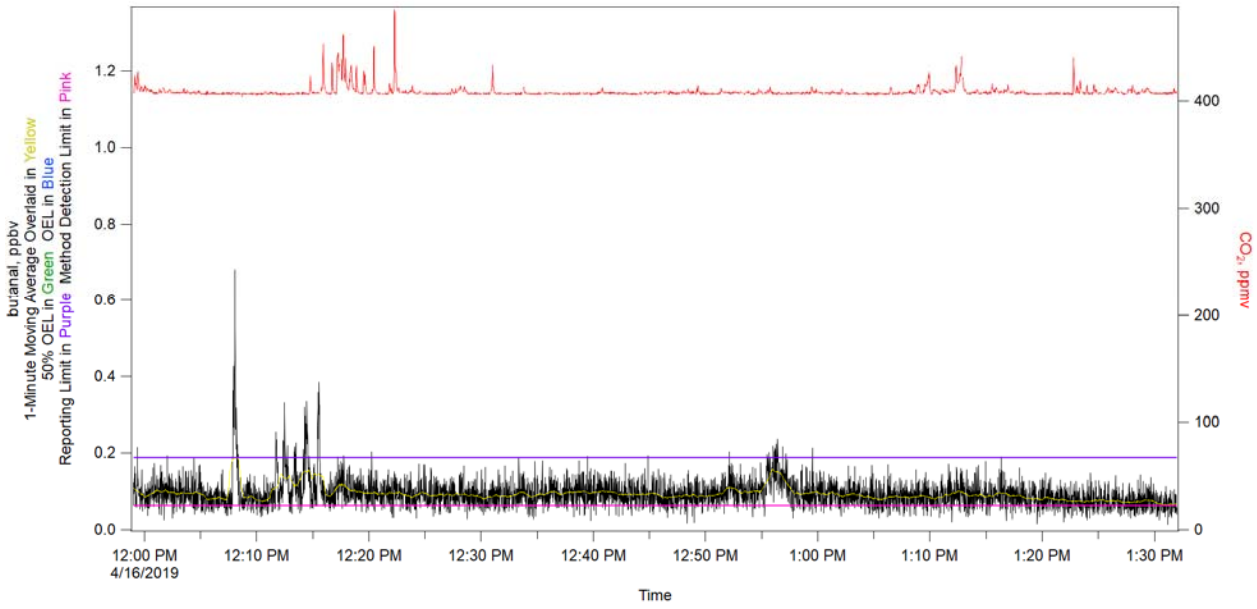

Figure 1-18. Butanal.

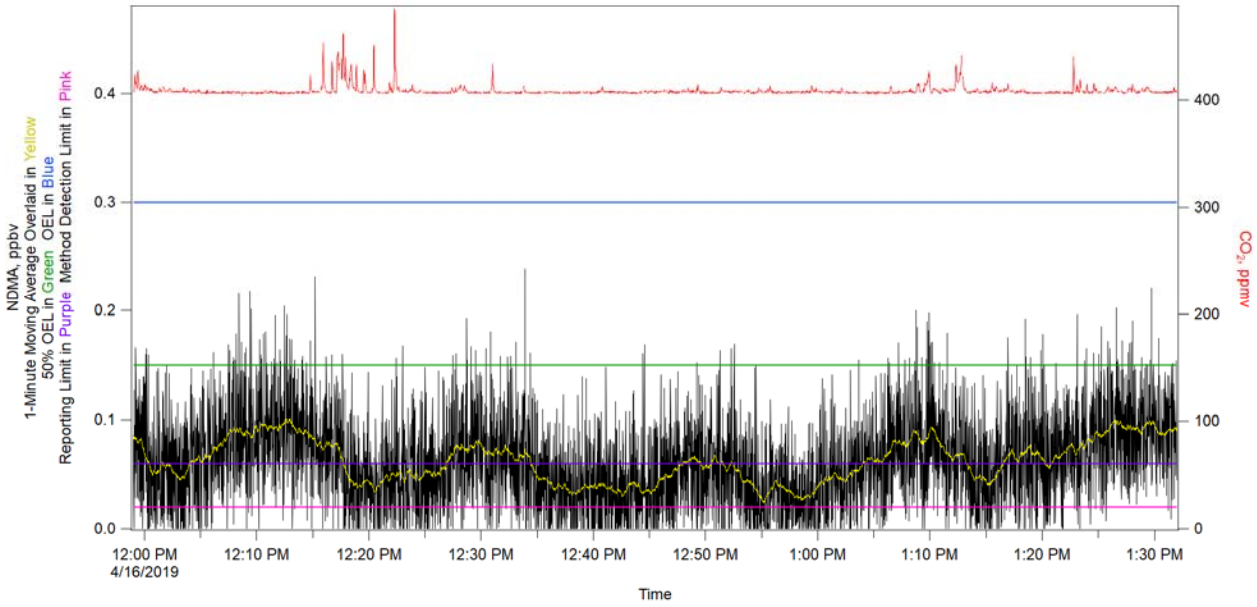

Figure 1-19. N-nitrosodimethylamine (NDMA).

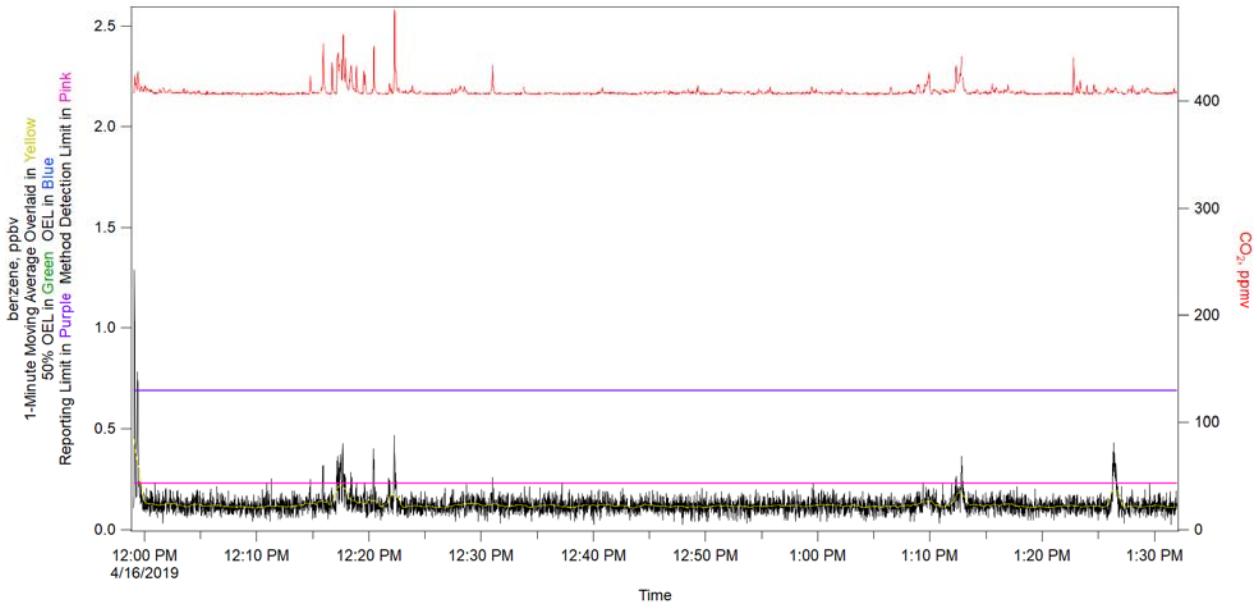

Figure 1-20. Benzene.

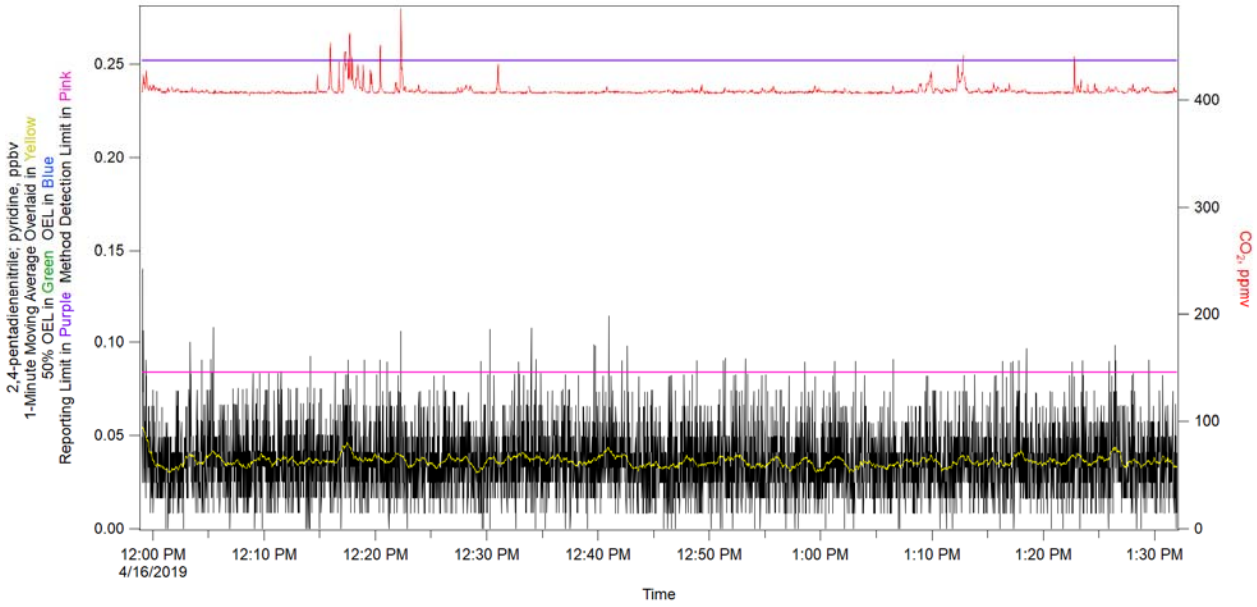

Figure 1-21. 2,4-pentadienenitrile; Pyridine.

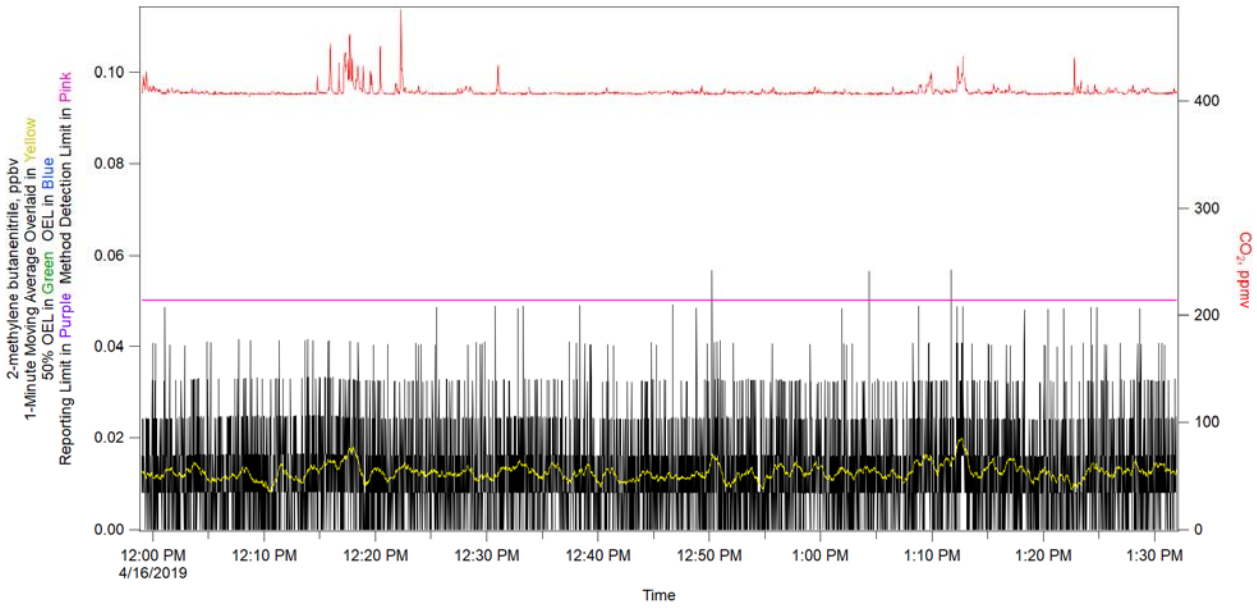

Figure 1-22. 2-methylene Butanenitrile.

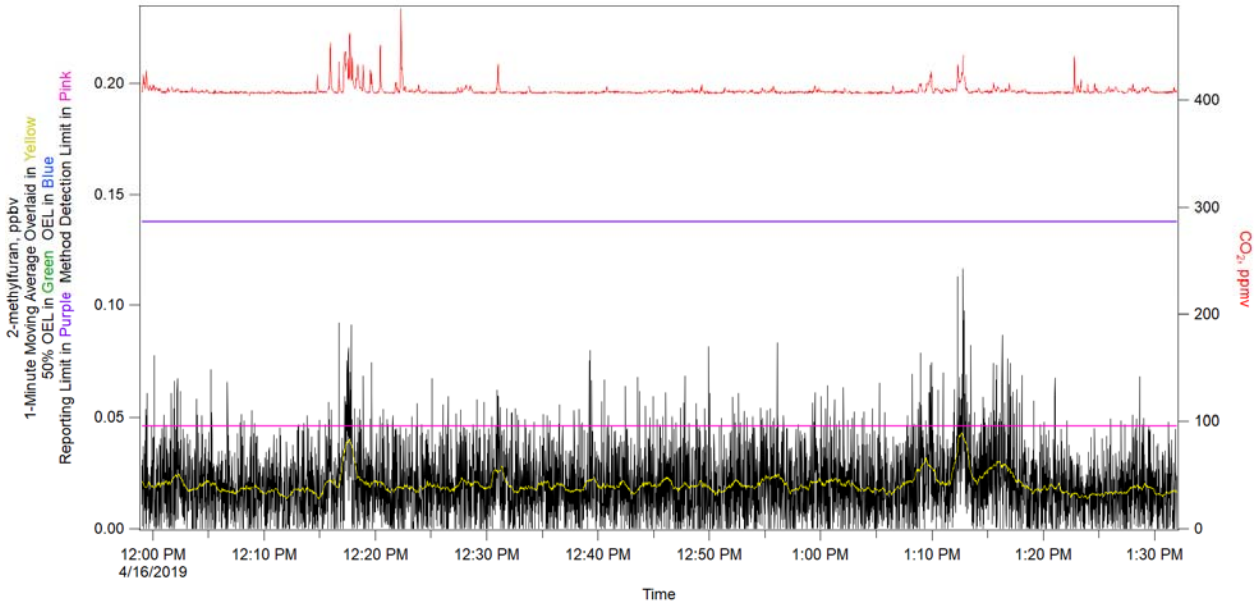

Figure 1-23. 2-methylfuran.

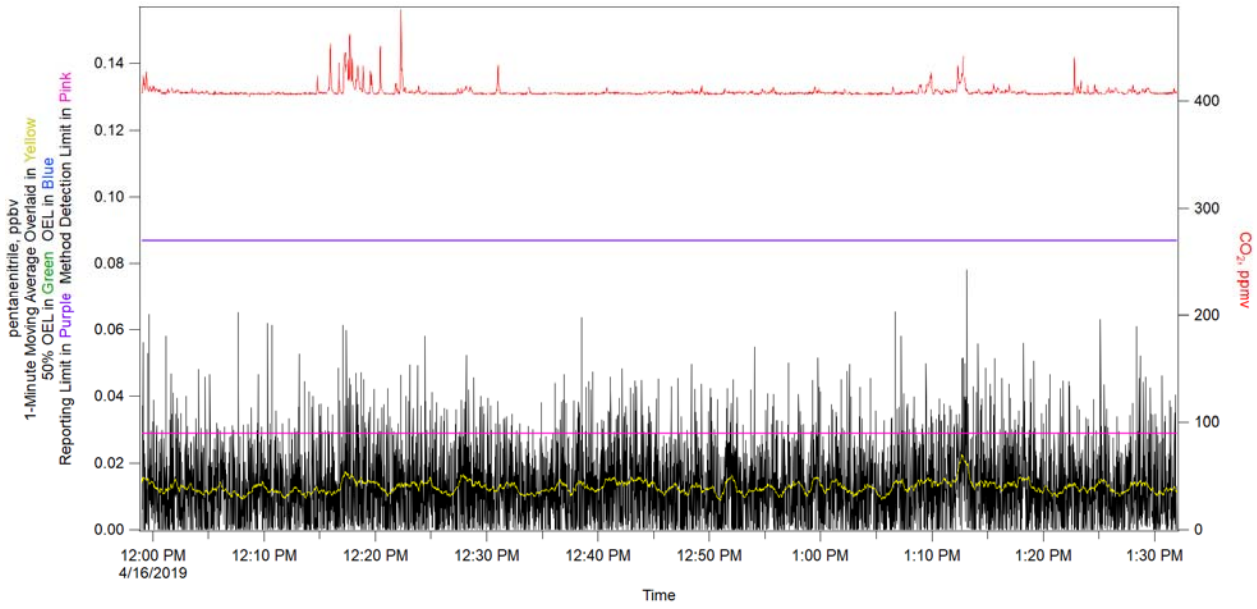

Figure 1-24. Pentanenitrile.

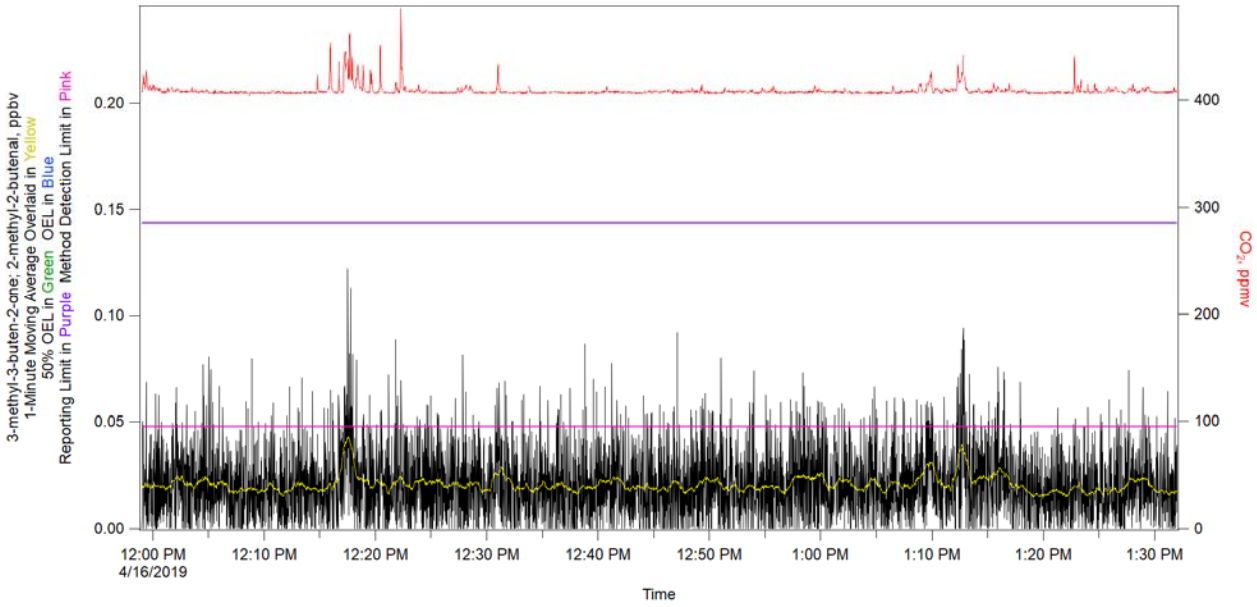

Figure 1-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

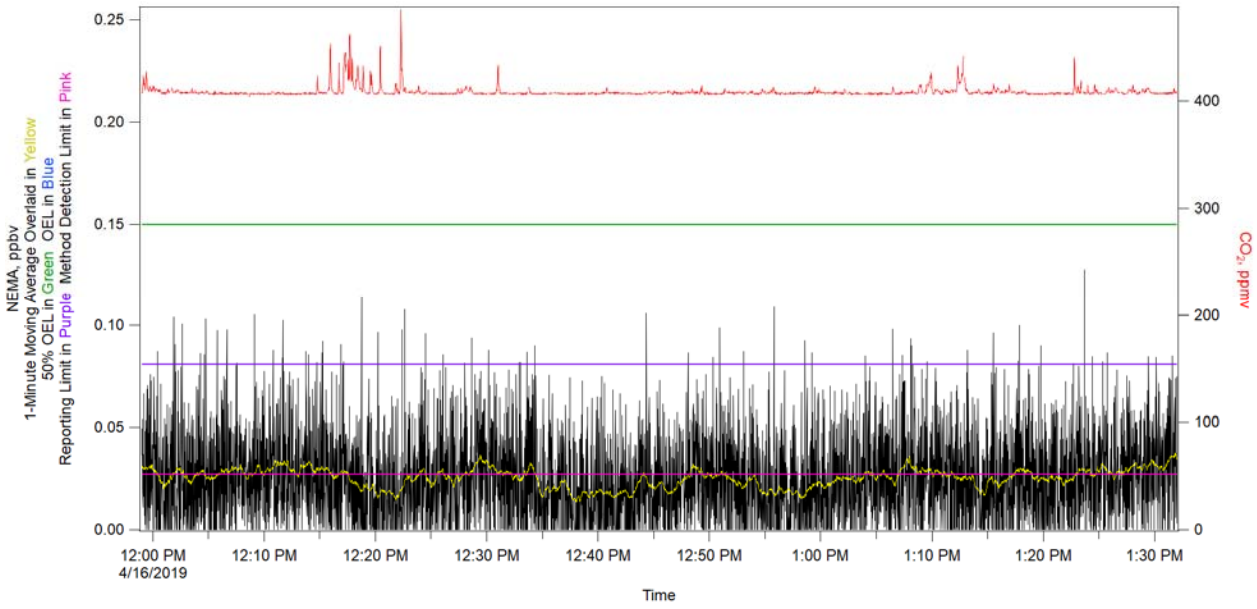

Figure 1-26. N-nitrosomethylethylamine (NEMA).

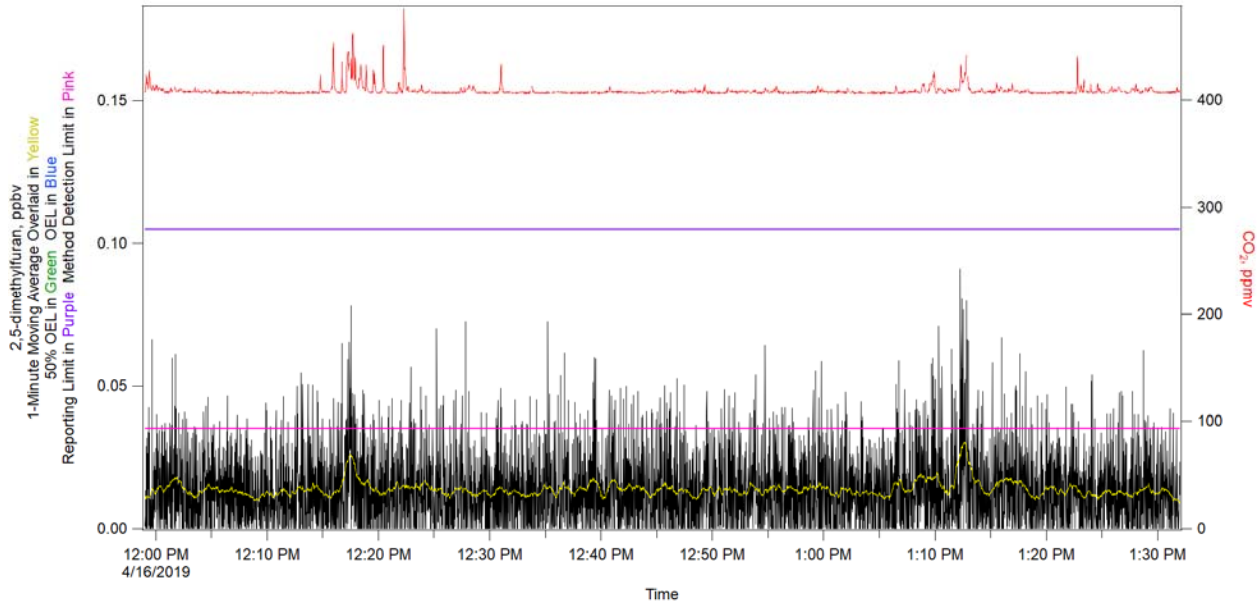

Figure 1-27. 2,5-dimethylfuran.

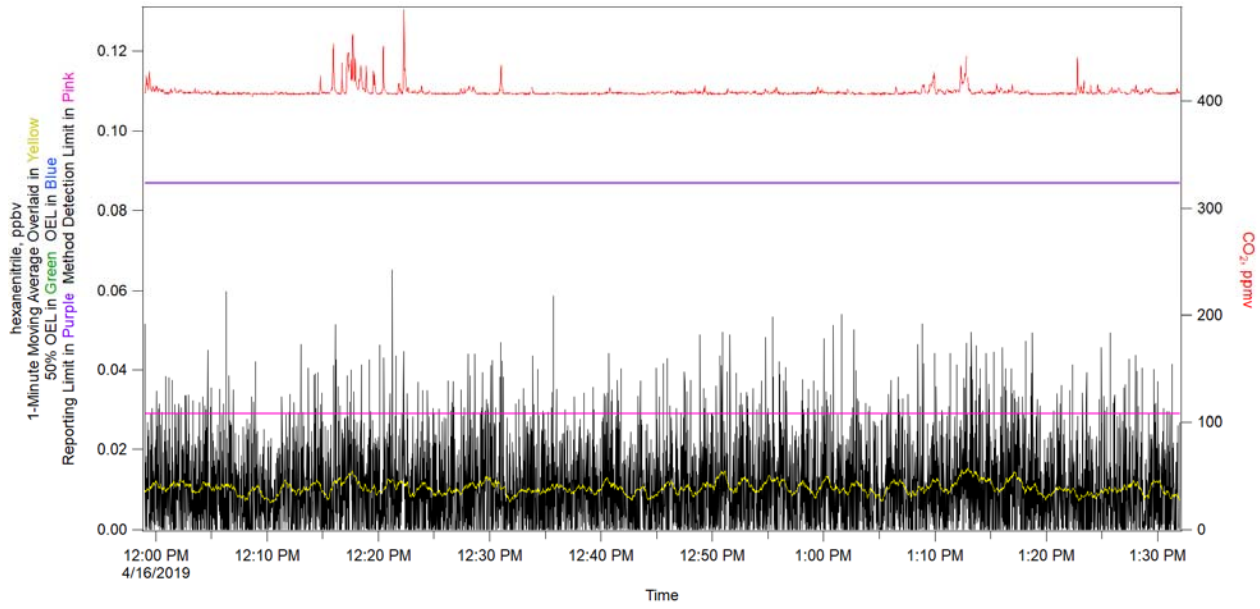

Figure 1-28. Hexanenitrile.

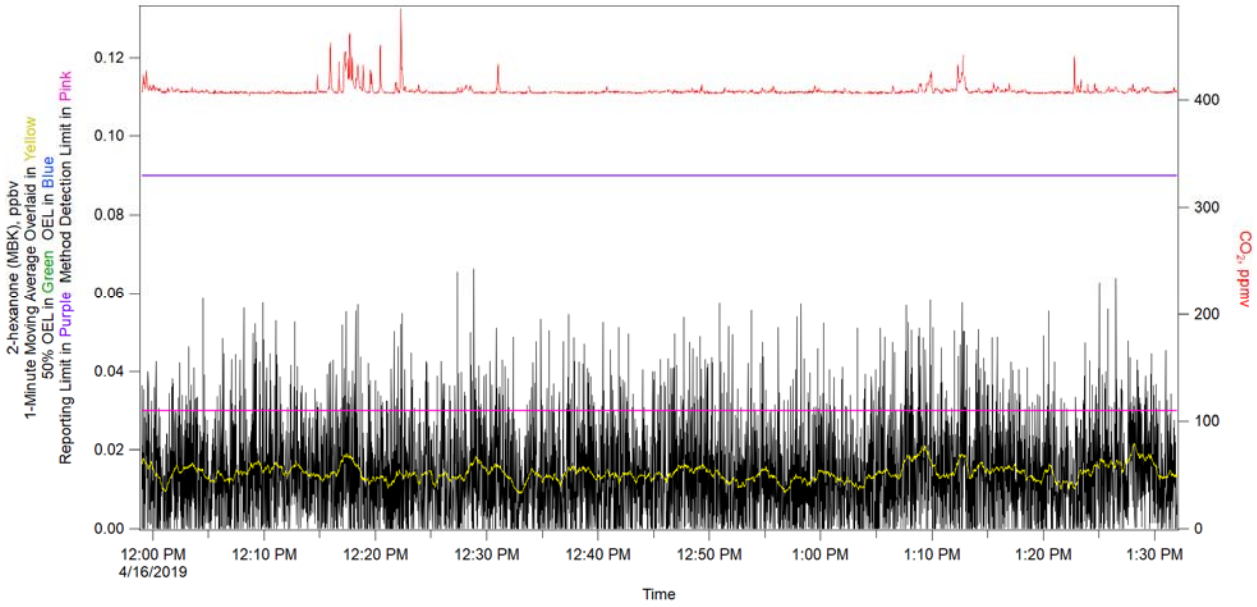

Figure 1-29. 2-hexanone (MBK).

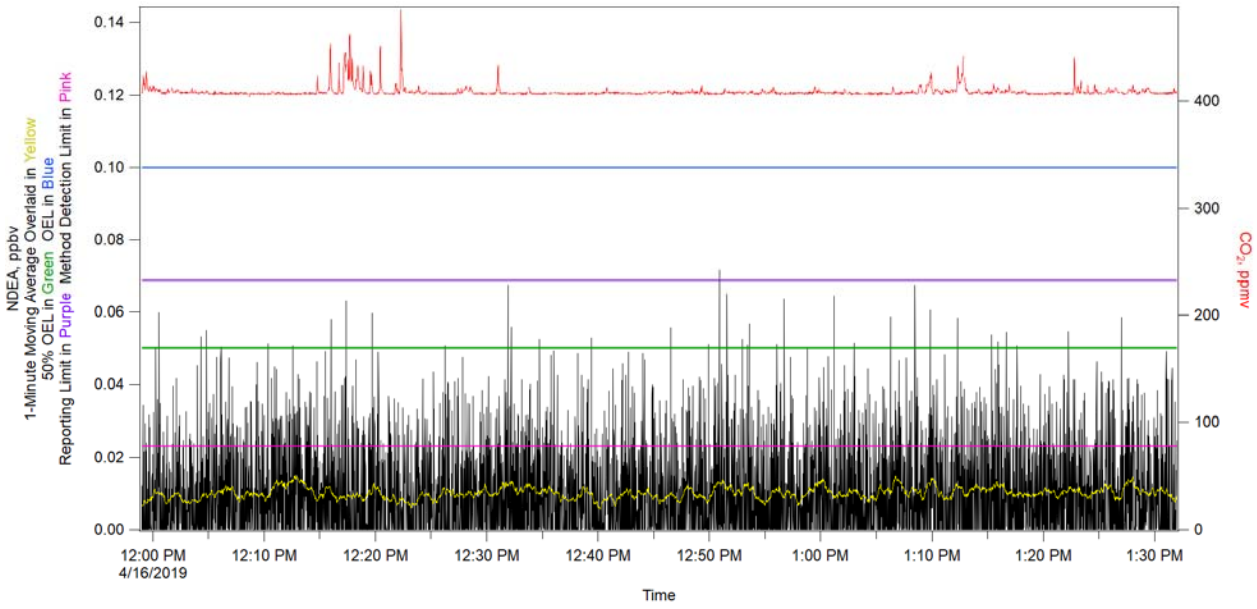

Figure 1-30. N-nitrosodiethylamine (NDEA).

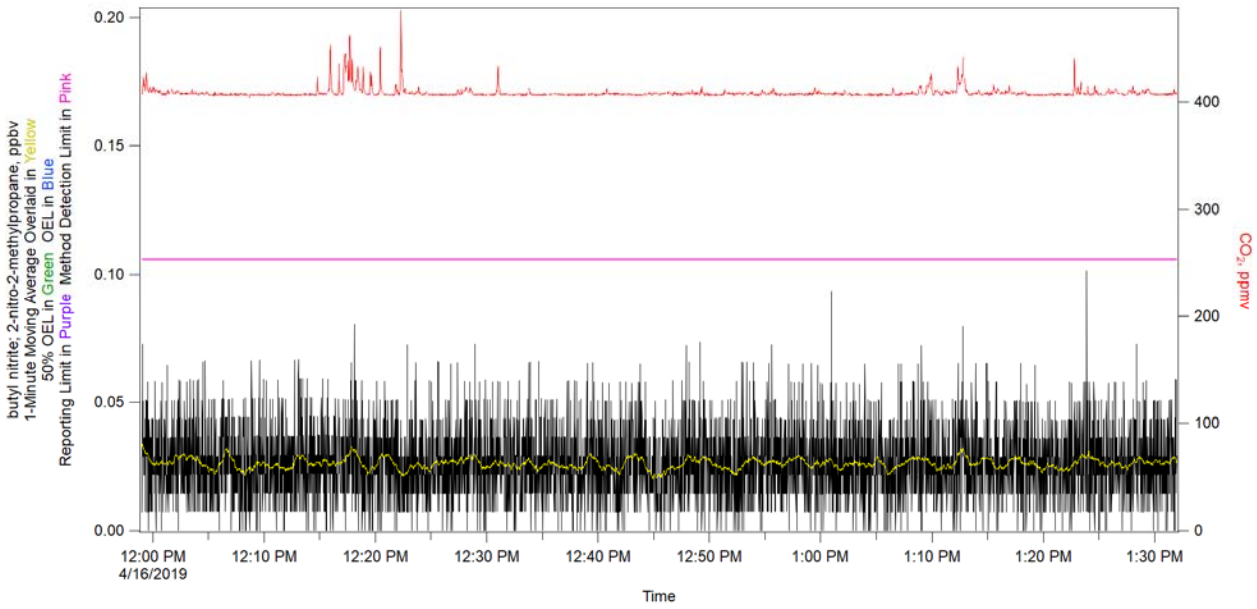

Figure 1-31. Butyl Nitrite; 2-nitro-2-methylpropane.

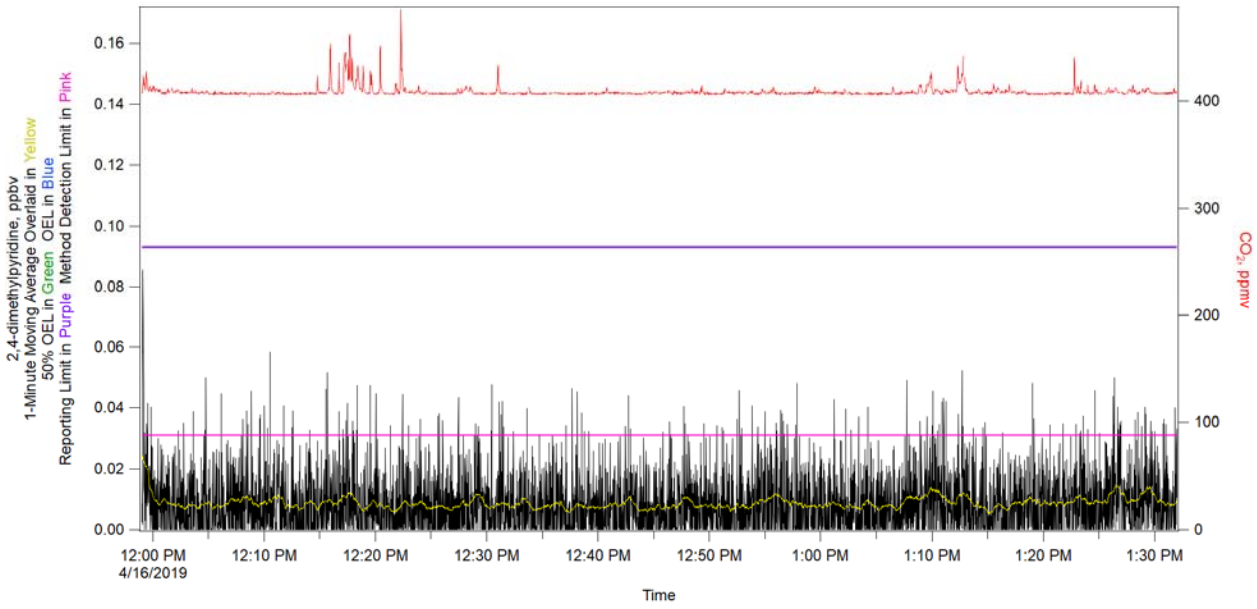

Figure 1-32. 2,4-dimethylpyridine.

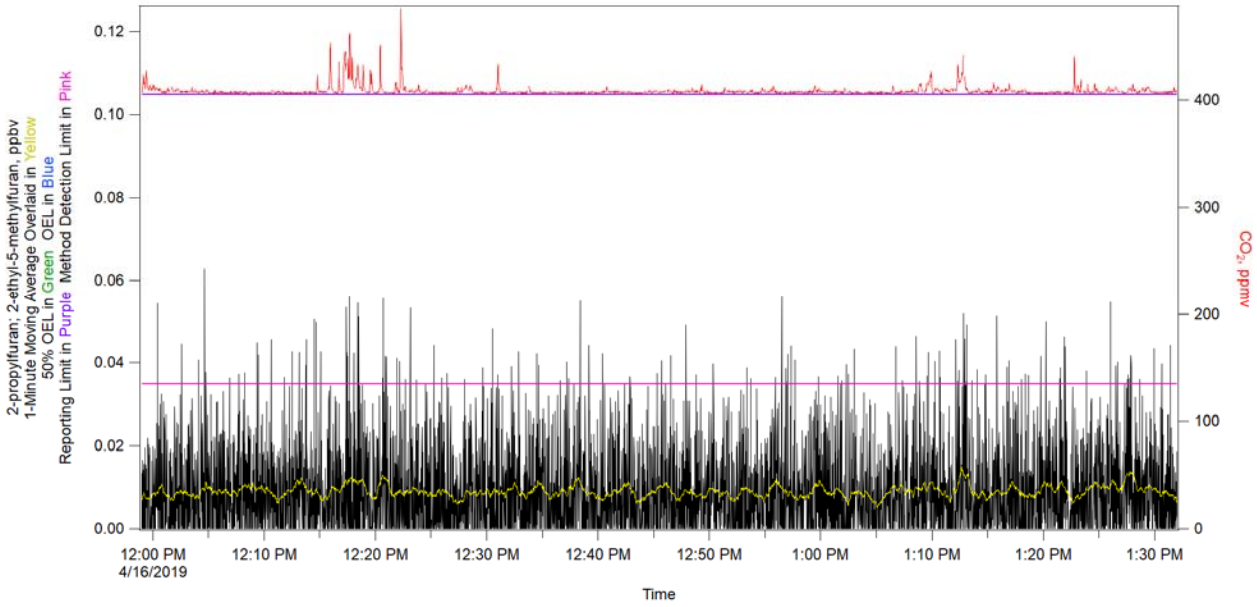

Figure 1-33. 2-propylfuran; 2-ethyl-5-methylfuran.

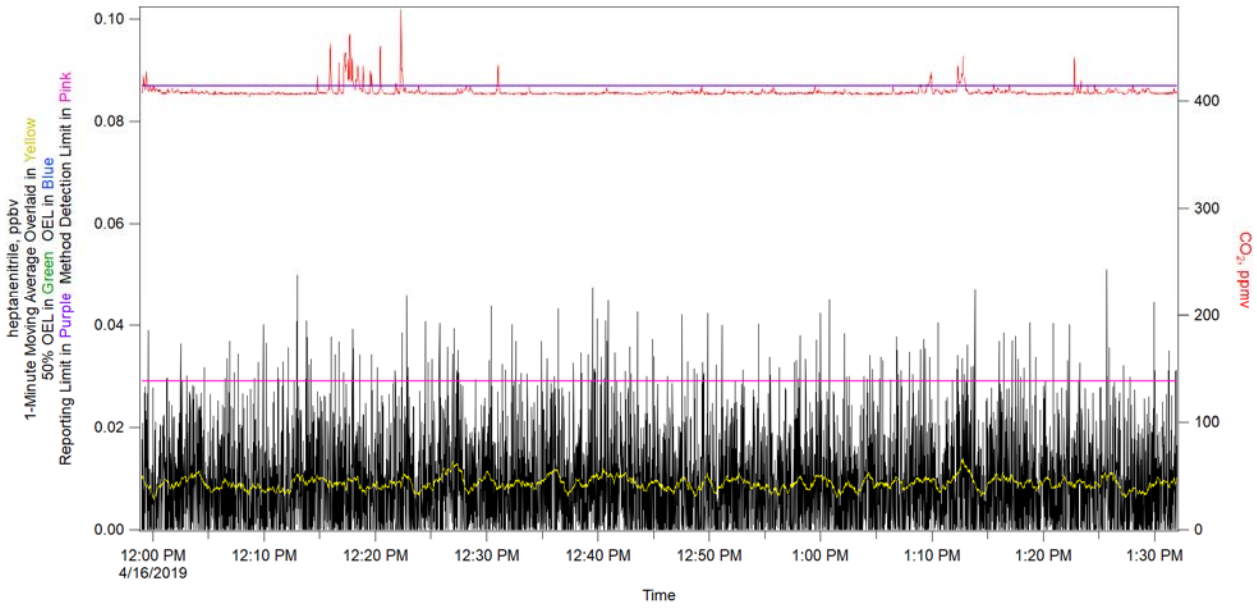

Figure 1-34. Heptanenitrile.

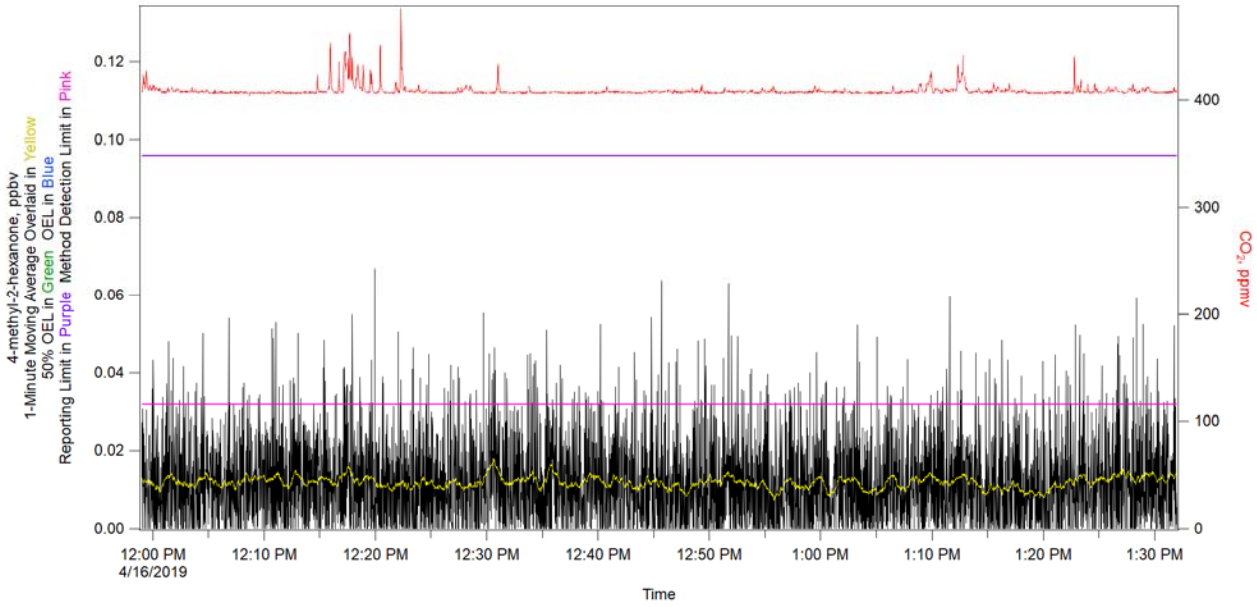

Figure 1-35. 4-methyl-2-hexanone.

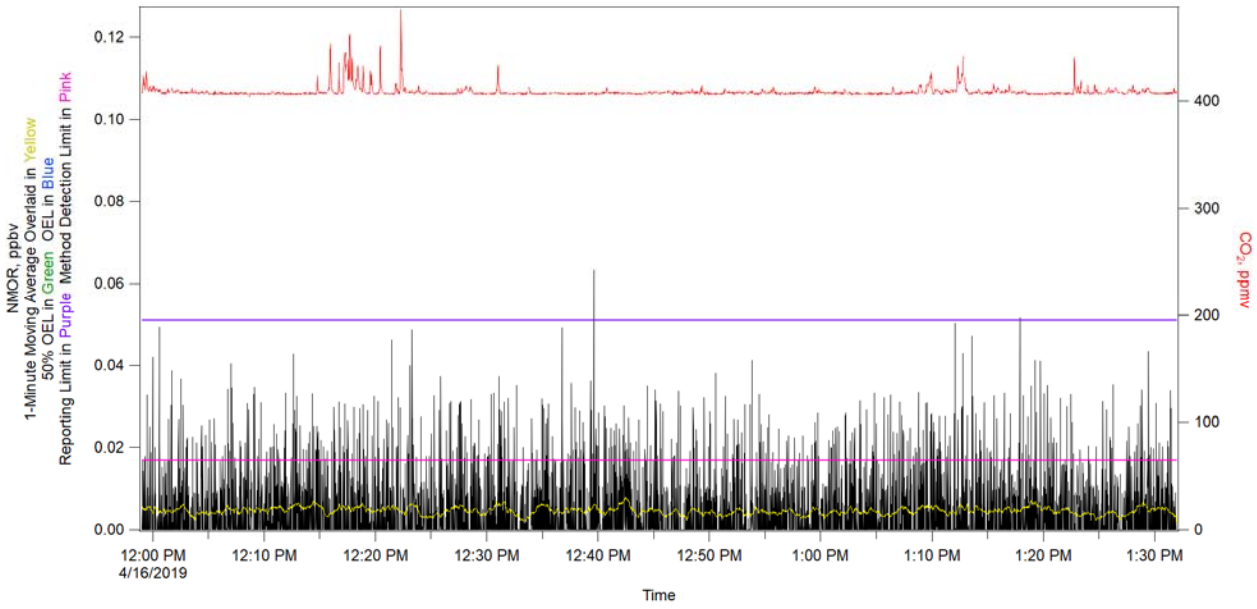

Figure 1-36. N-nitrosomorpholine (NMOR).

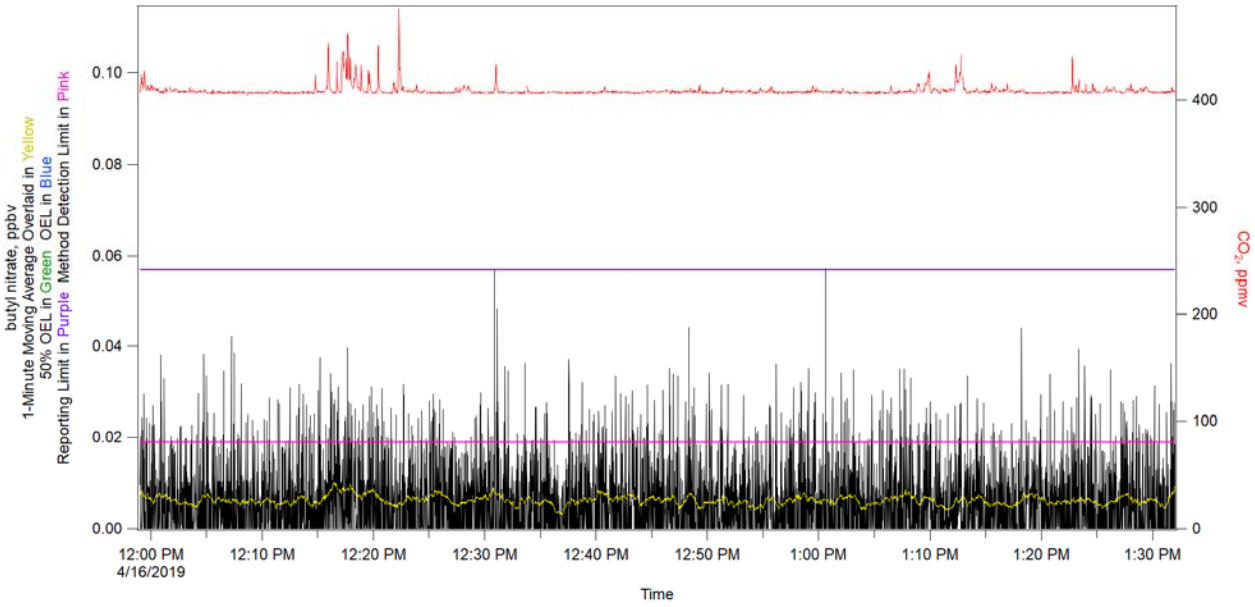

Figure 1-37. Butyl Nitrate.

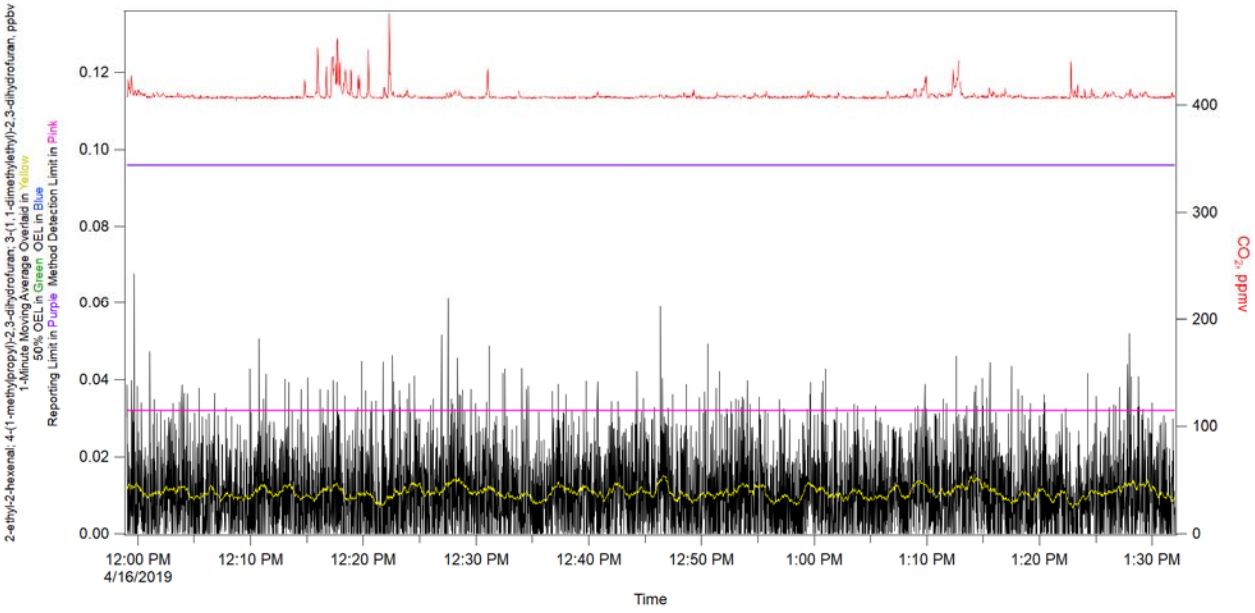

Figure 1-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

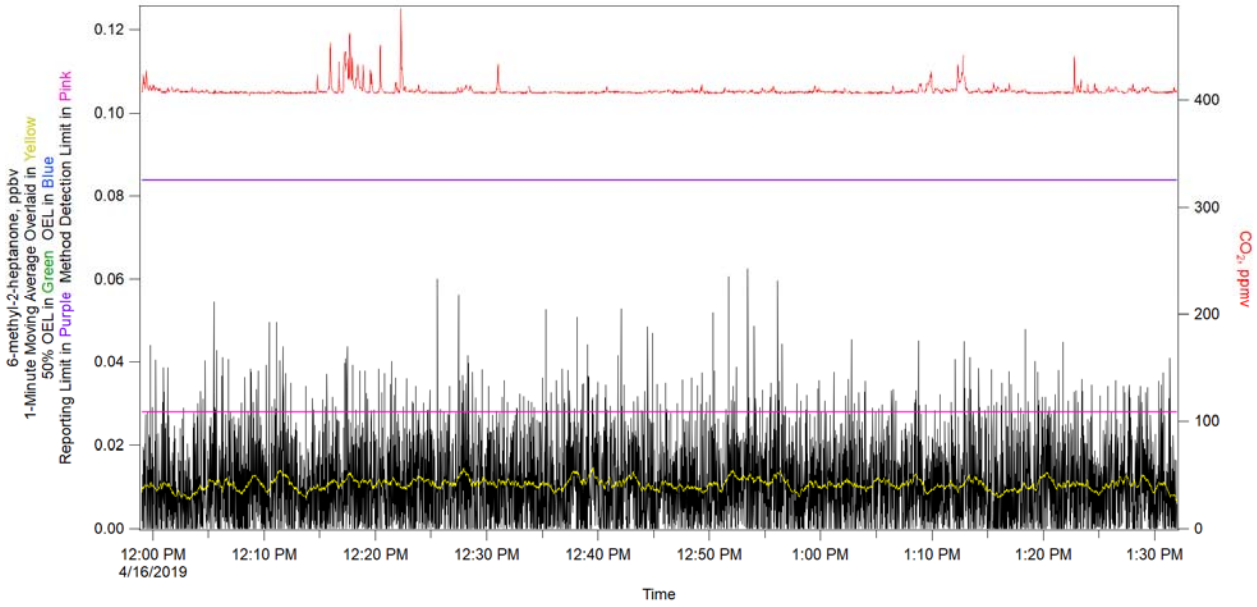

Figure 1-39. 6-methyl-2-heptanone.

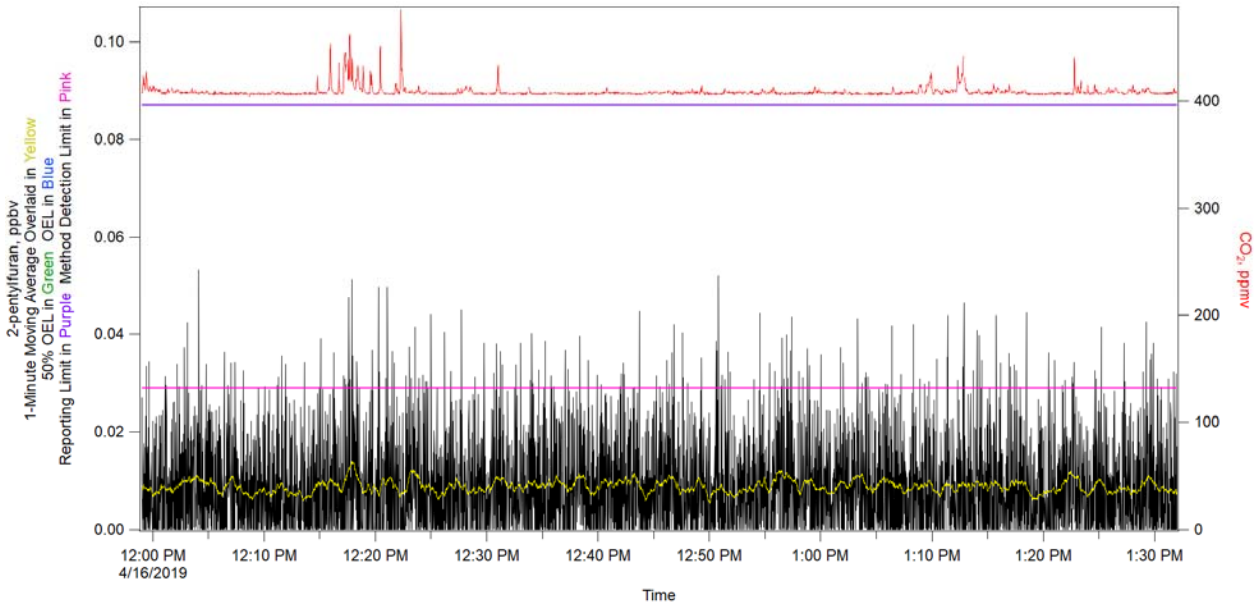

Figure 1-40. 2-pentylfuran.

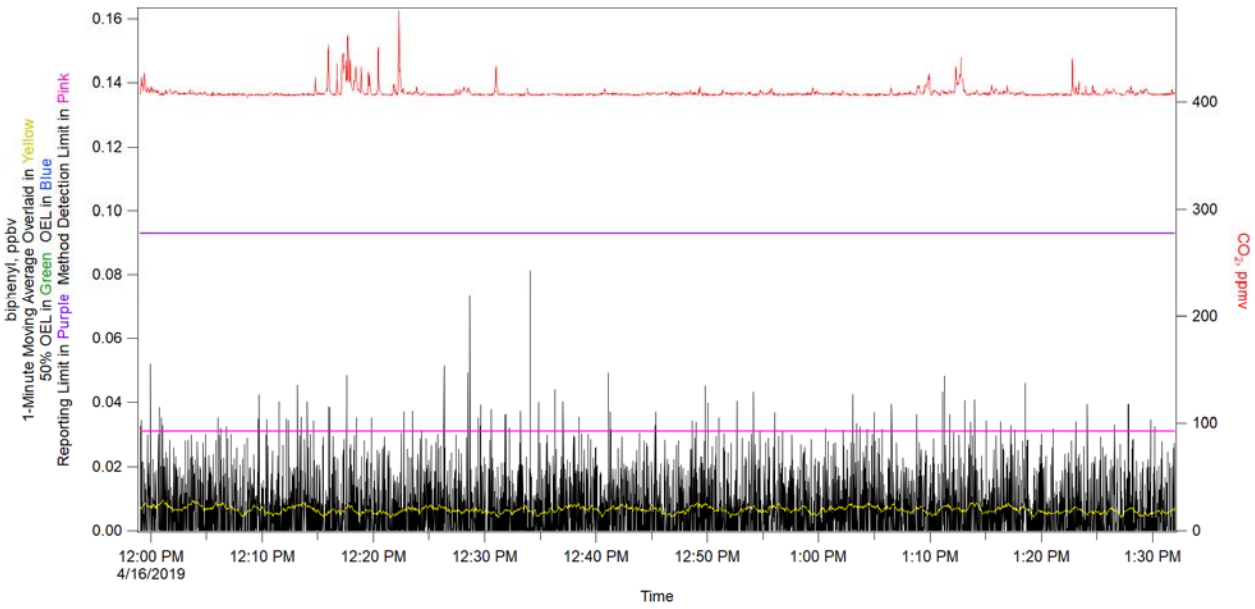

Figure 1-41. Biphenyl.

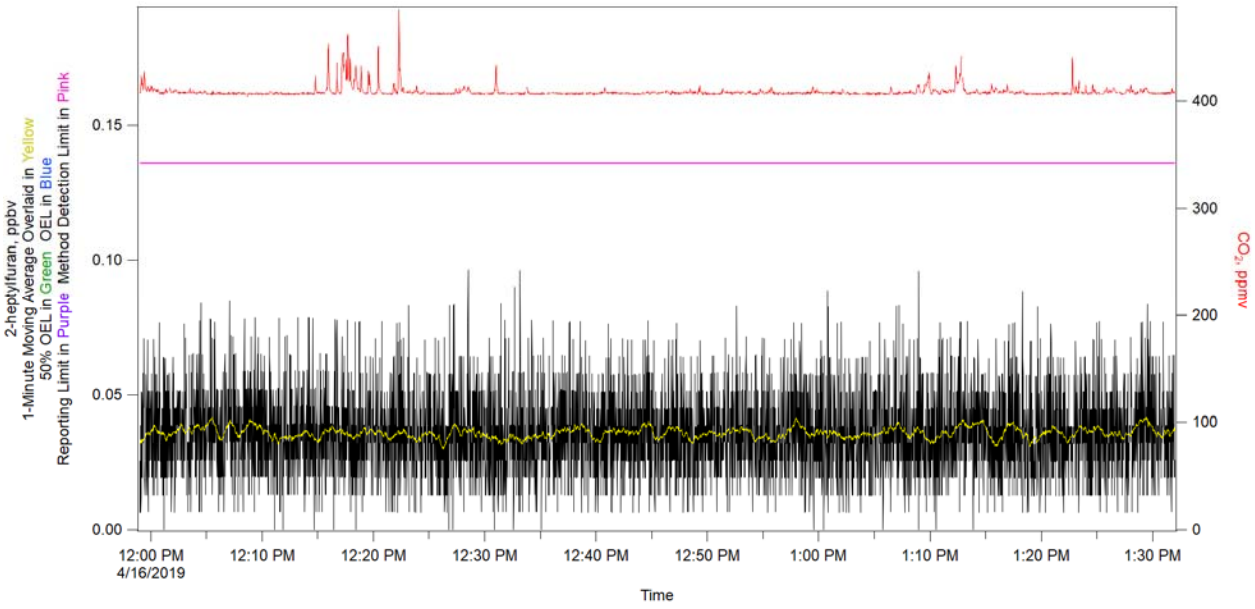

Figure 1-42. 2-heptylfuran.

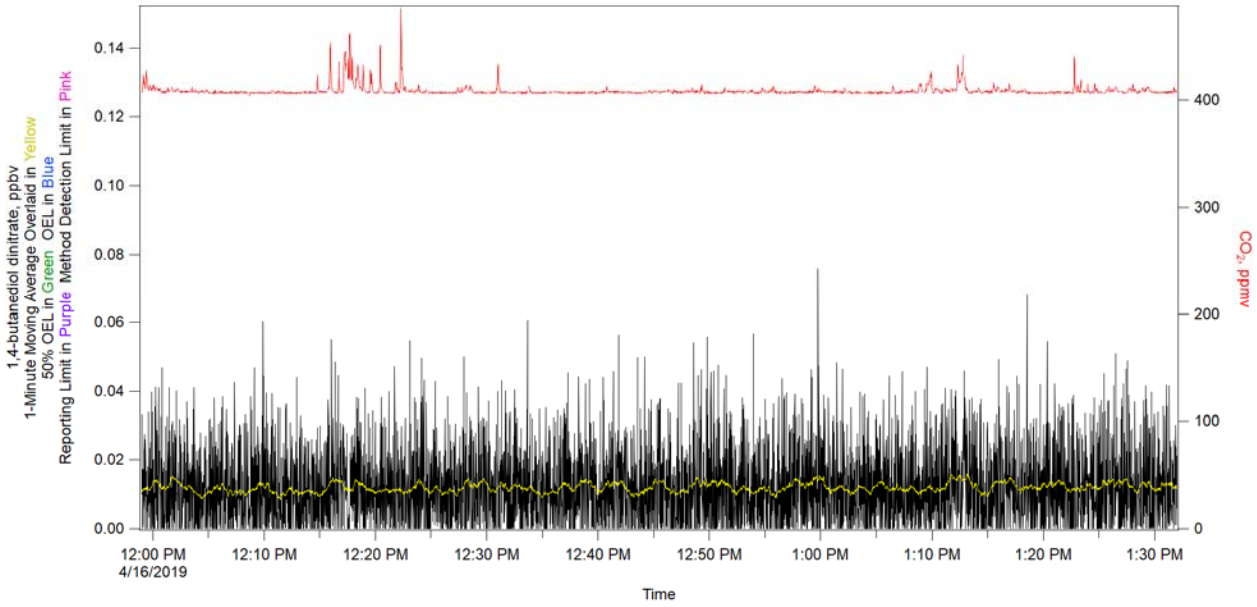

Figure 1-43. 1,4-butanediol Dinitrate.

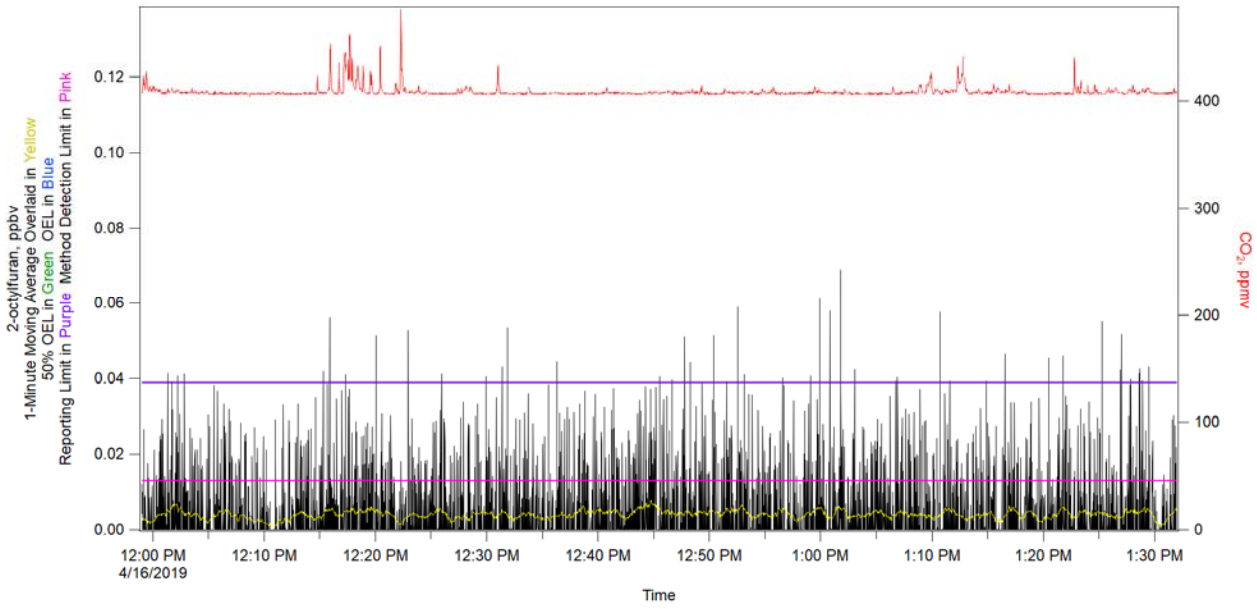

Figure 1-44. 2-octylfuran.

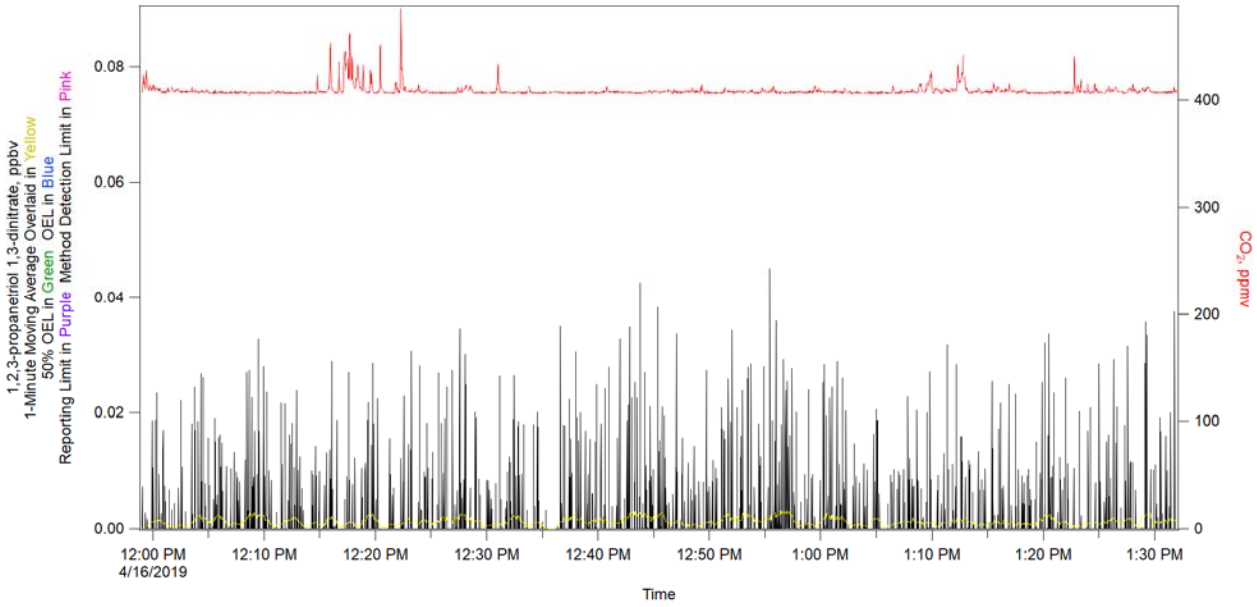

Figure 1-45. 1,2,3-propanetriol 1,3-dinitrate.

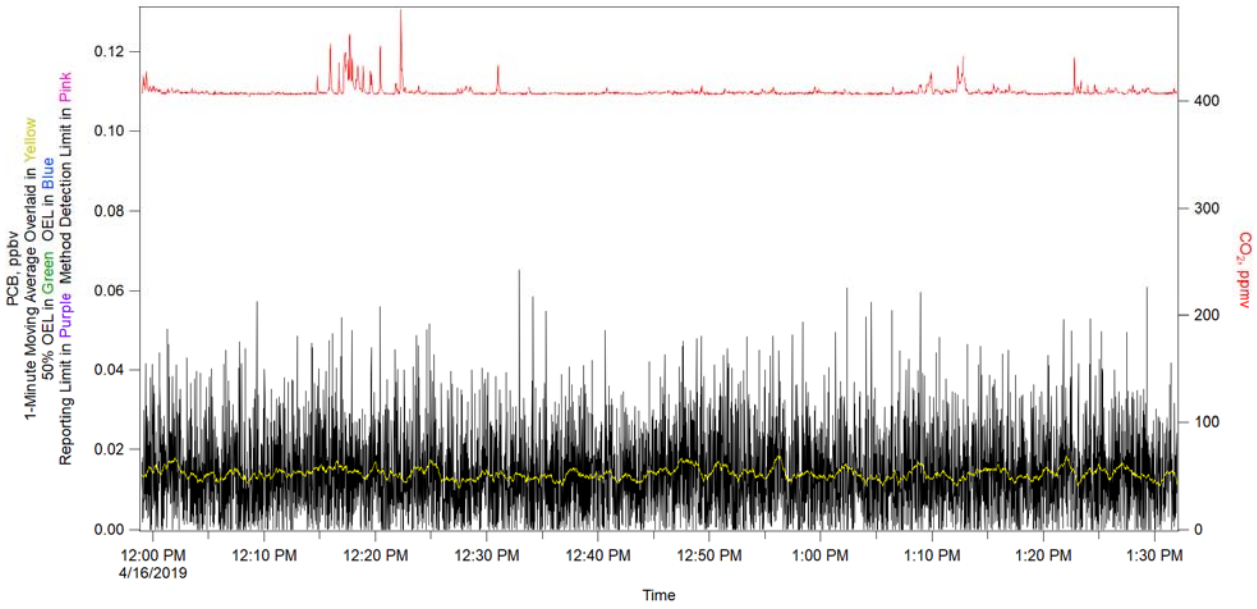

Figure 1-46. Polychlorinated Biphenyl (PCB).

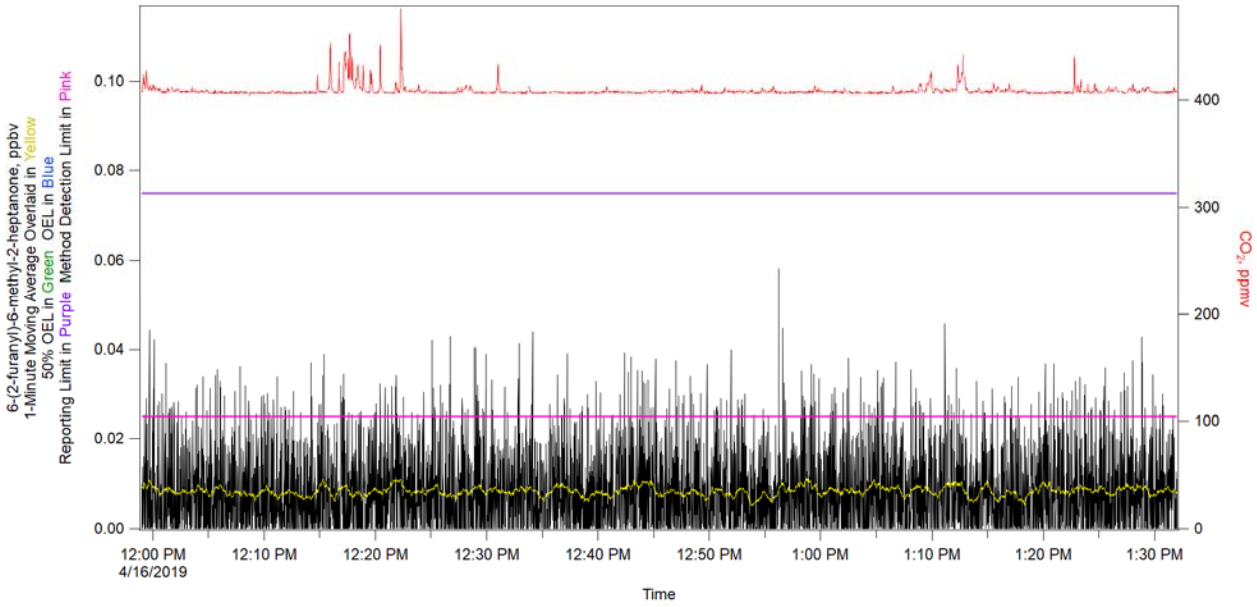

Figure 1-47. 6-(2-furanyl)-6-methyl-2-heptanone.

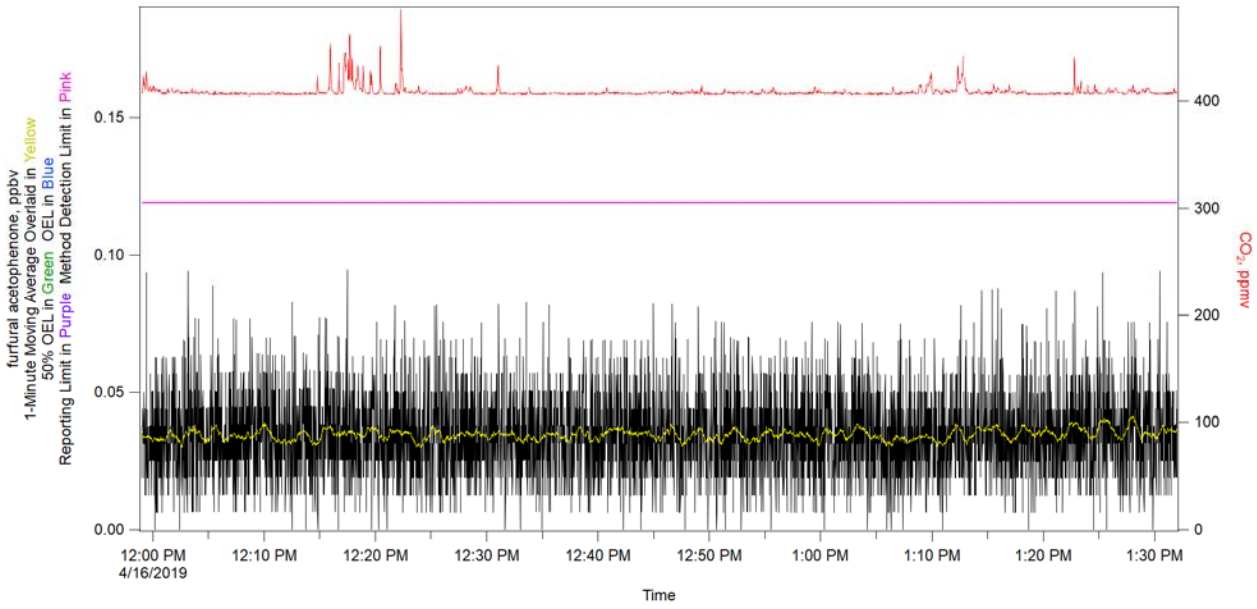

Figure 1-48. Furfural Acetophenone.

1.5 Odor Compounds

Table 1-3. Odor Statistical Information for the Monitoring Period of April 16, 2019.

Odor #	Odor Name	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel. St. Dev. (ppb)	Max (ppb)	Median (ppb)
1	methyl mercaptan	0.137	<0.137	0.029	41.338	0.197	<0.137
2	dimethylsulfide; ethanethiol	0.107	<0.107	0.026	34.178	0.181	<0.107
3	allyl mercaptan	0.177	<0.177	0.009	148.963	0.074	<0.177
4	1-propanethiol; isopropyl mercaptan	0.469	<0.469	0.020	84.067	0.120	<0.469
5	2-butene-1-thiol	0.18	<0.18	0.013	129.465	0.091	<0.18
6	diethyl sulfide; 2-methylpropane-2-thiol	0.529	<0.529	0.027	39.236	0.224	<0.529
7	thiopropanal sulfuroxide	0.046	<0.046	0.008	157.161	0.060	<0.046
8	dimethyl disulfide	0.186	<0.186	0.009	115.998	0.058	<0.186
9	1-pentanethiol; 2,2-dimethylpropane-1-thiol	0.048	<0.048	0.015	129.109	0.139	<0.048
10	benzenethiol	0.019	<0.019	0.007	190.958	0.049	<0.019
11	diallyl sulfide	0.034	<0.034	0.010	159.764	0.072	<0.034
12	methyl propyl disulfide	0.022	<0.022	0.006	217.681	0.051	<0.022
13	methylbenzenethiol	0.103	<0.103	0.009	121.901	0.068	<0.103
14	dimethyl trisulfide	0.022	<0.022	0.009	92.382	0.059	<0.022
15	(1-oxoethyl) thiophene	0.276	<0.276	0.009	126.263	0.066	<0.276
16	(1-oxopropyl) thiophene	0.028	<0.028	0.009	126.053	0.063	<0.028
17	dipropyl disulfide	0.018	<0.018	0.008	116.118	0.053	<0.018
18	methyl propyl trisulfide	0.047	<0.047	0.008	145.391	0.048	<0.047
19	dimethyl tetrasulfide	0.027	<0.027	0.007	102.090	0.045	<0.027
20	dipropyl trisulfide	0.132	<0.132	0.008	184.004	0.057	<0.132
21	diphenyl sulfide	0.014	<0.014	0.010	144.024	0.059	<0.014
<	COPC Average/Median Below the MDL.						
†	COPC Average/Median Between the RL and the MDL.						

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 April 16, 2019. If within range of the plot's left axis, a horizontal purple line representing the RL, and a pink horizontal line representing the MDL are shown.

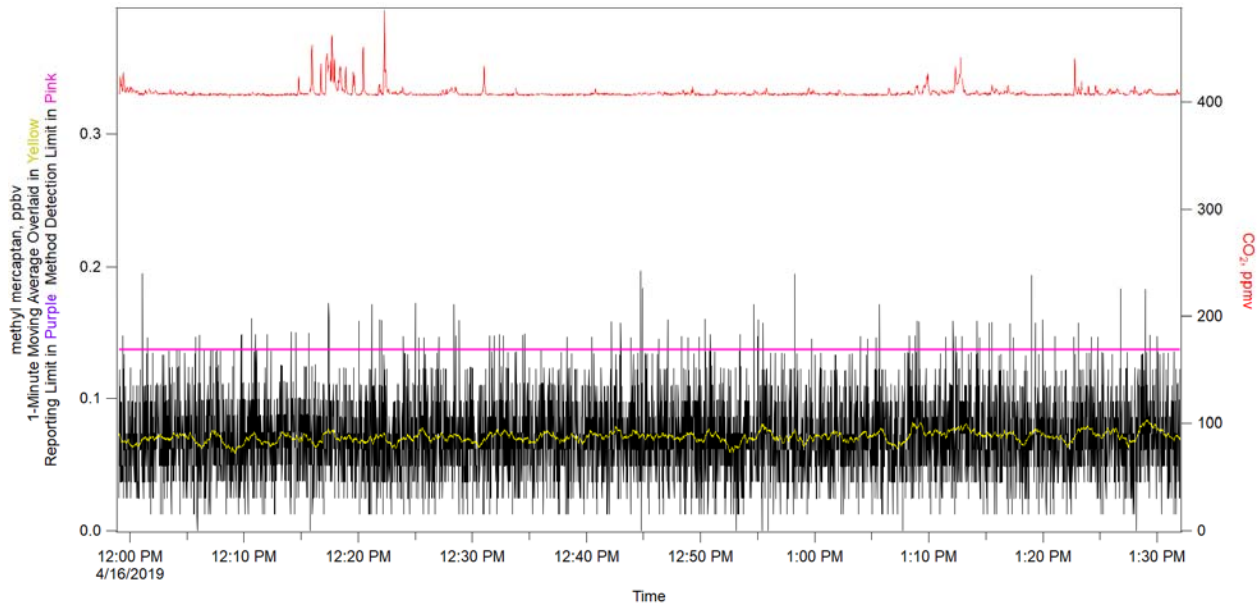

Figure 1-49. Methyl Mercaptan.

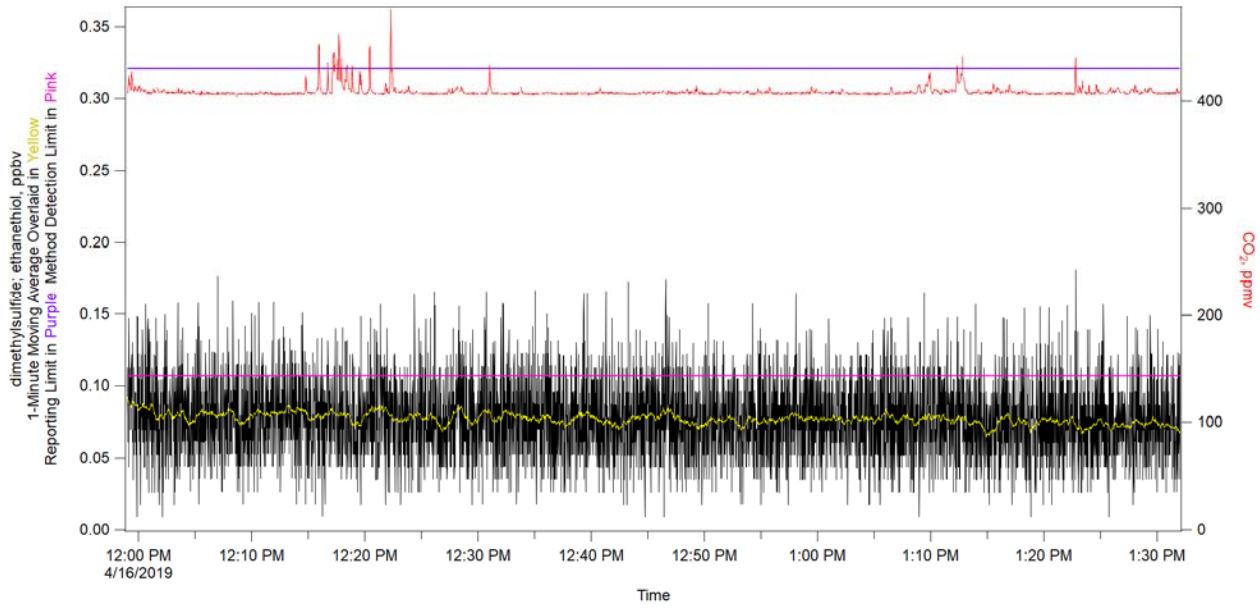

Figure 1-50. Dimethyl Sulfide; Ethanethiol.

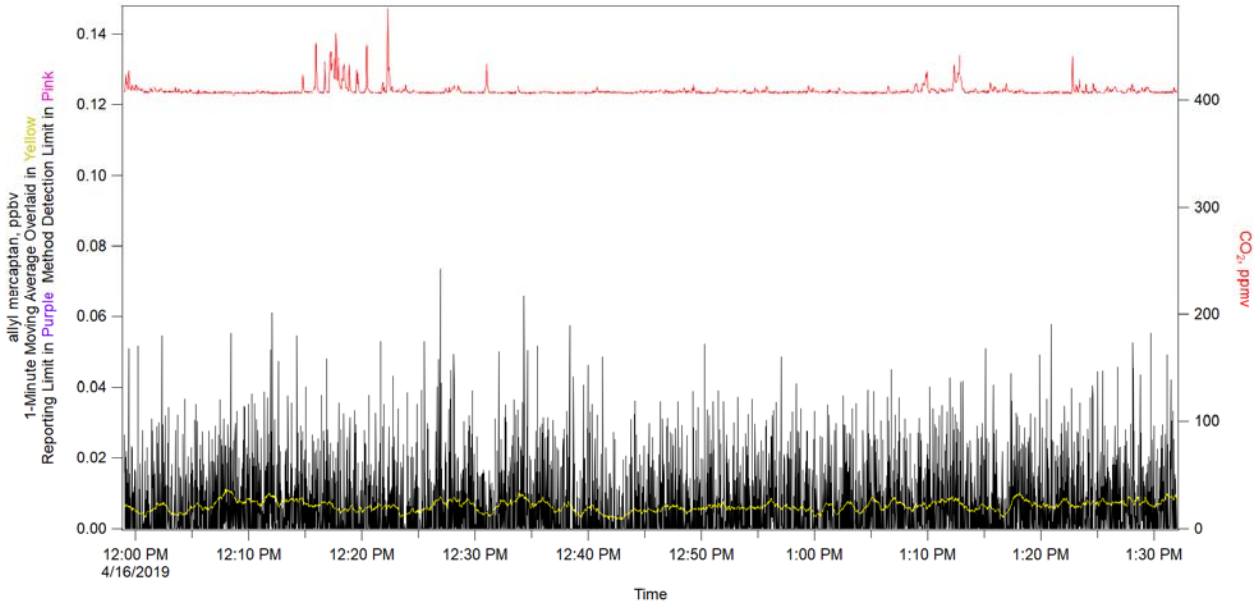

Figure 1-51. Allyl Mercaptan.

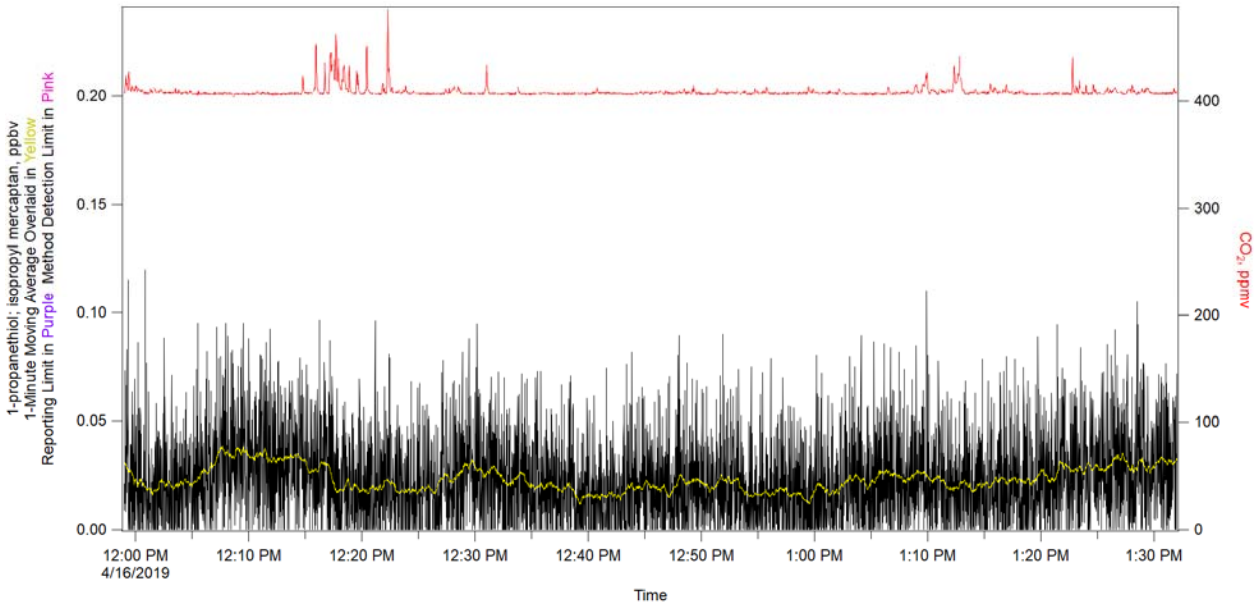

Figure 1-52. 1-propanethiol; Isopropyl Mercaptan.

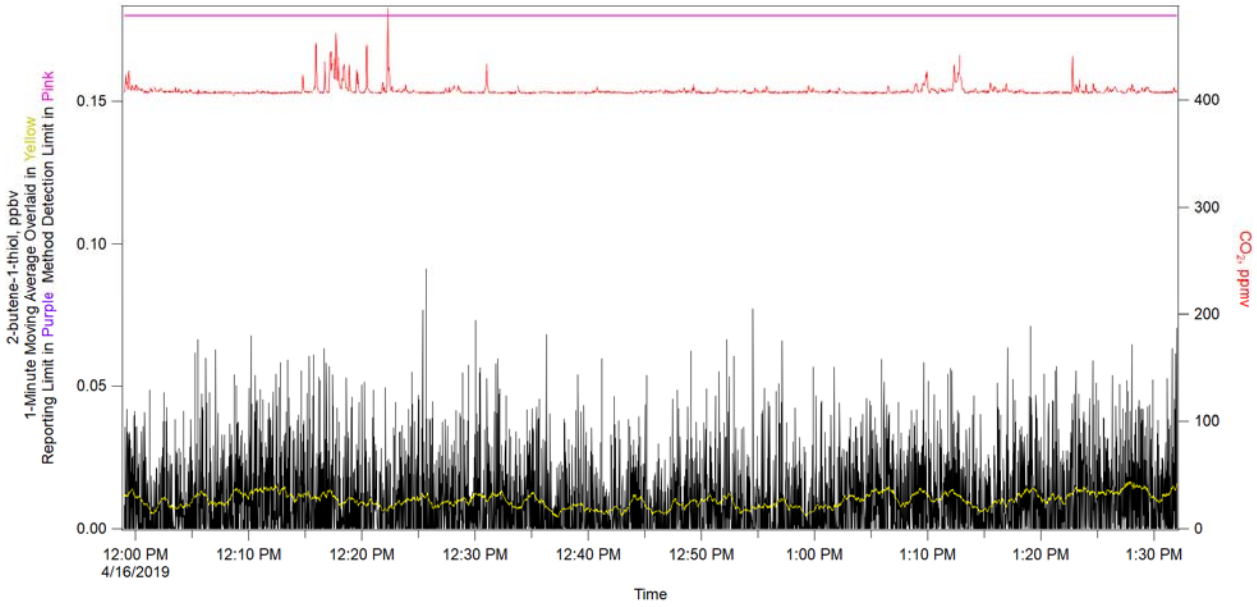

Figure 1-53. 2-butene-1-thiol.

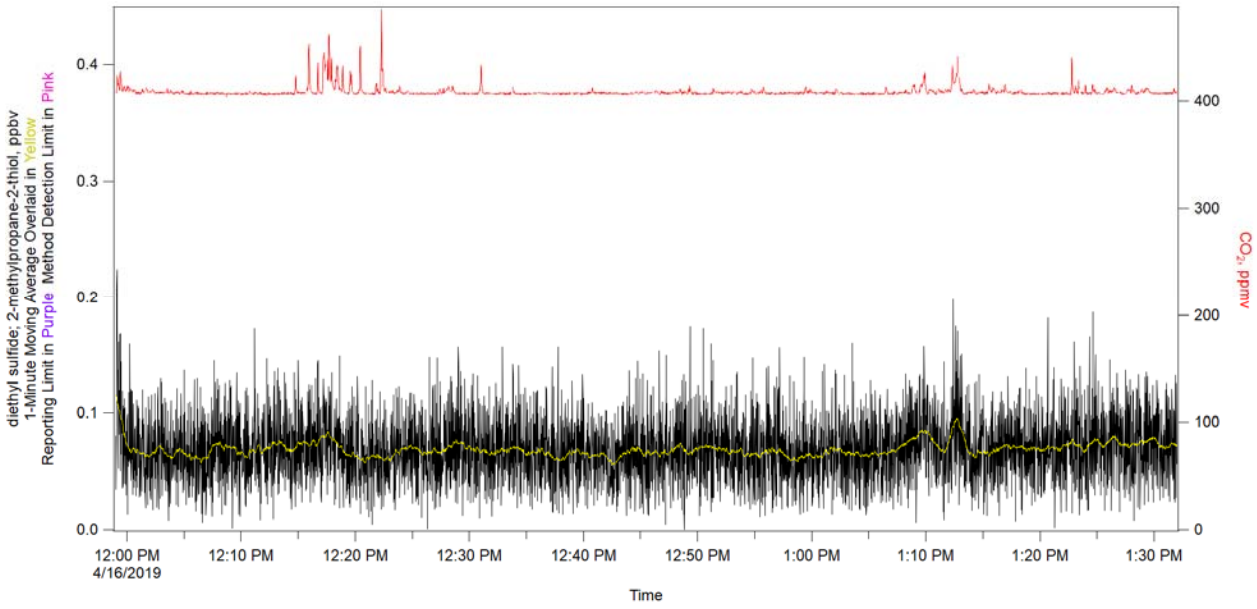

Figure 1-54. Diethyl Sulfide; 2-methylpropane-2-thiol.

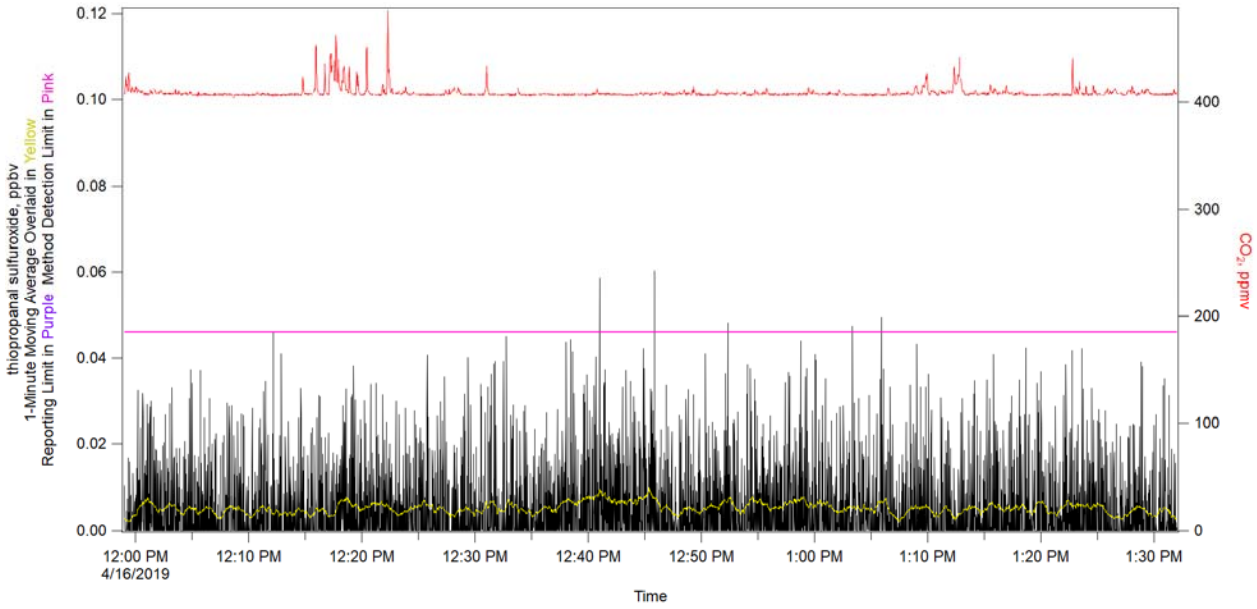

Figure 1-55. Thiopropanal Sulfuroxide.

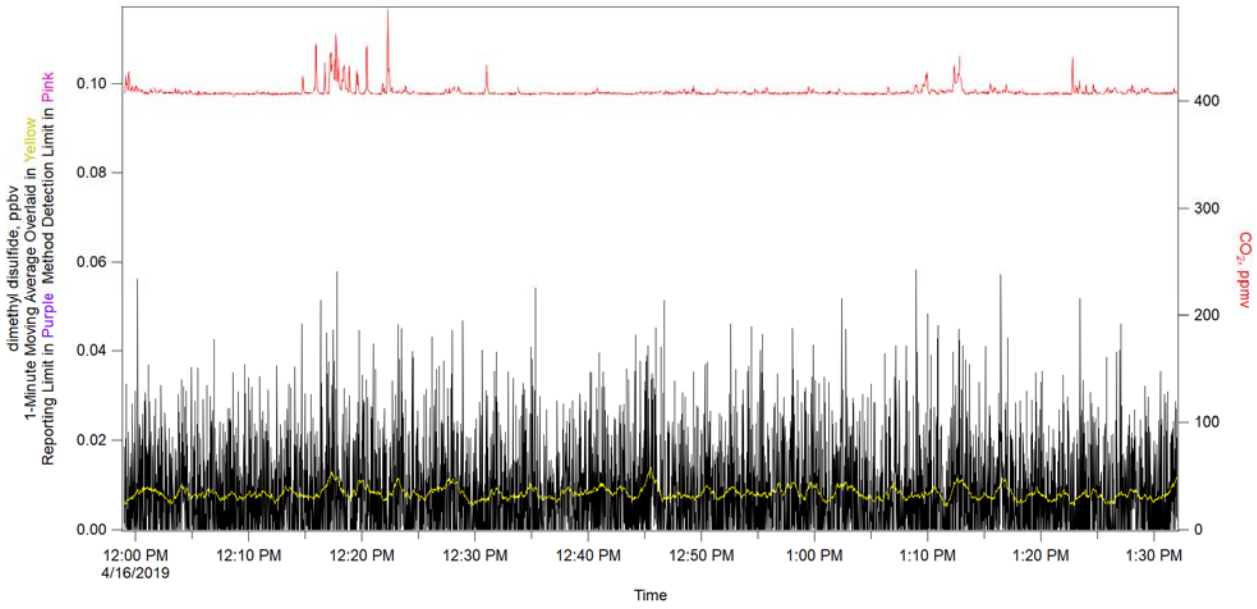

Figure 1-56. Dimethyl Disulfide.

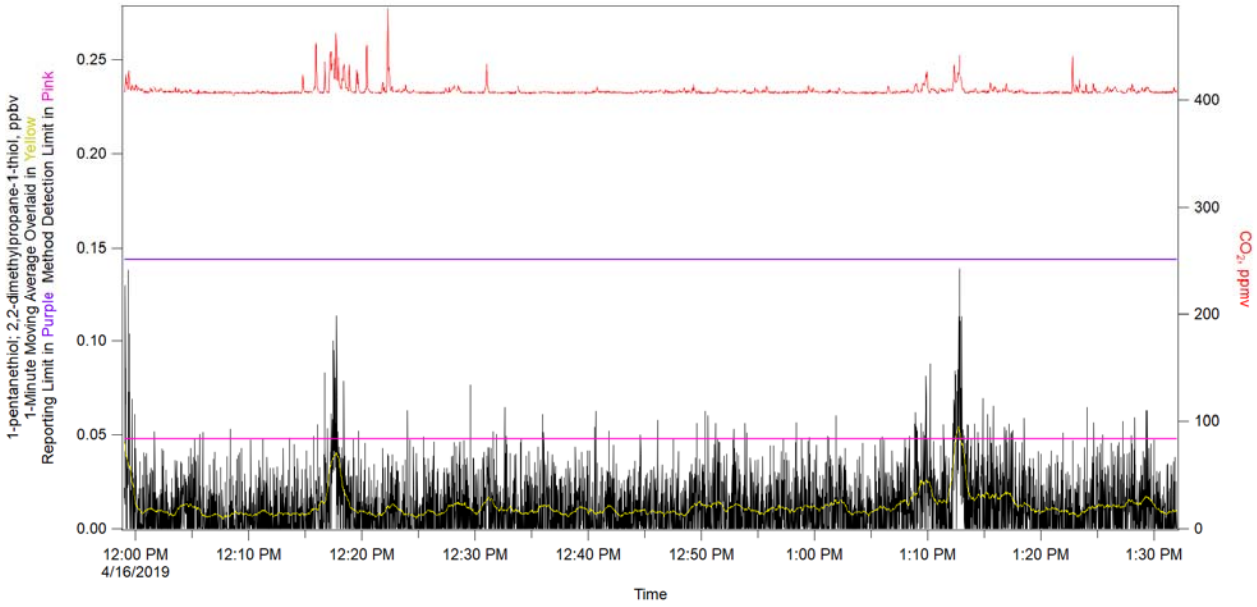

Figure 1-57. 1-pentanethiol; 2,2-dimethylpropane-1-thiol.

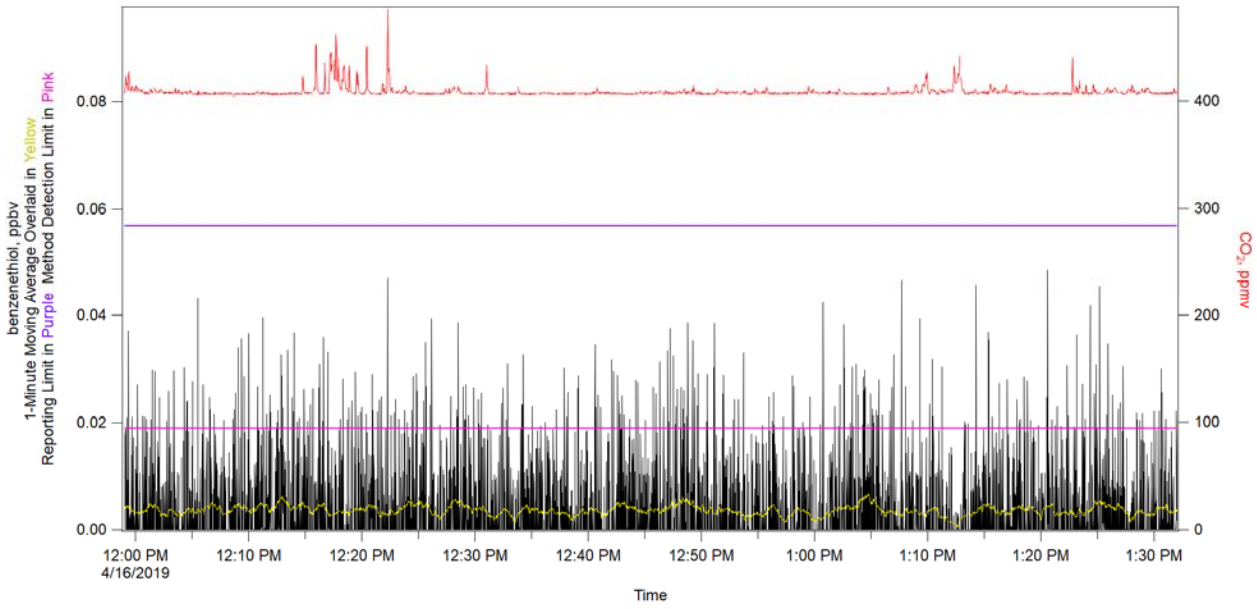

Figure 1-58. Benzenethiol.

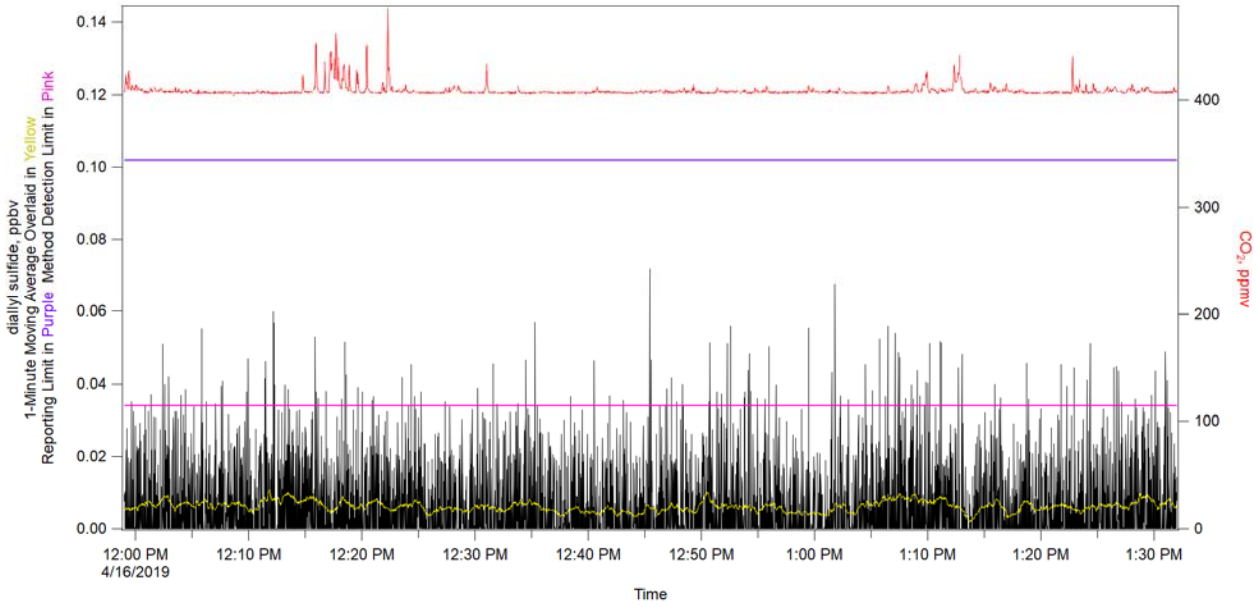

Figure 1-59. Diallyl Sulfide.

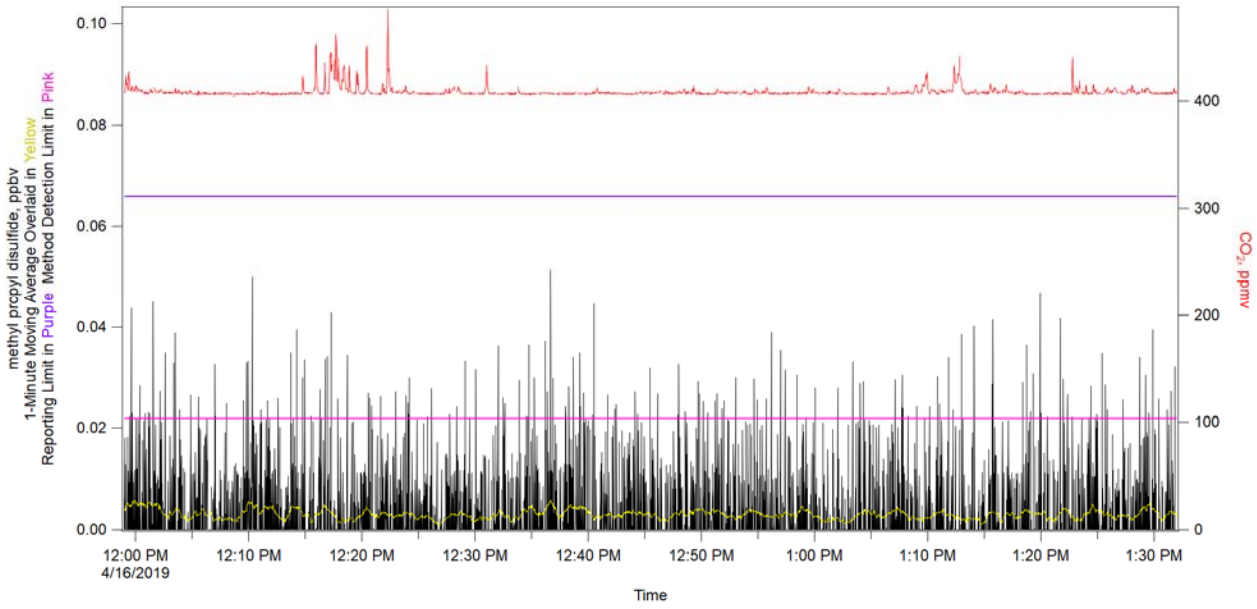

Figure 1-60. Methyl Propyl Disulfide.

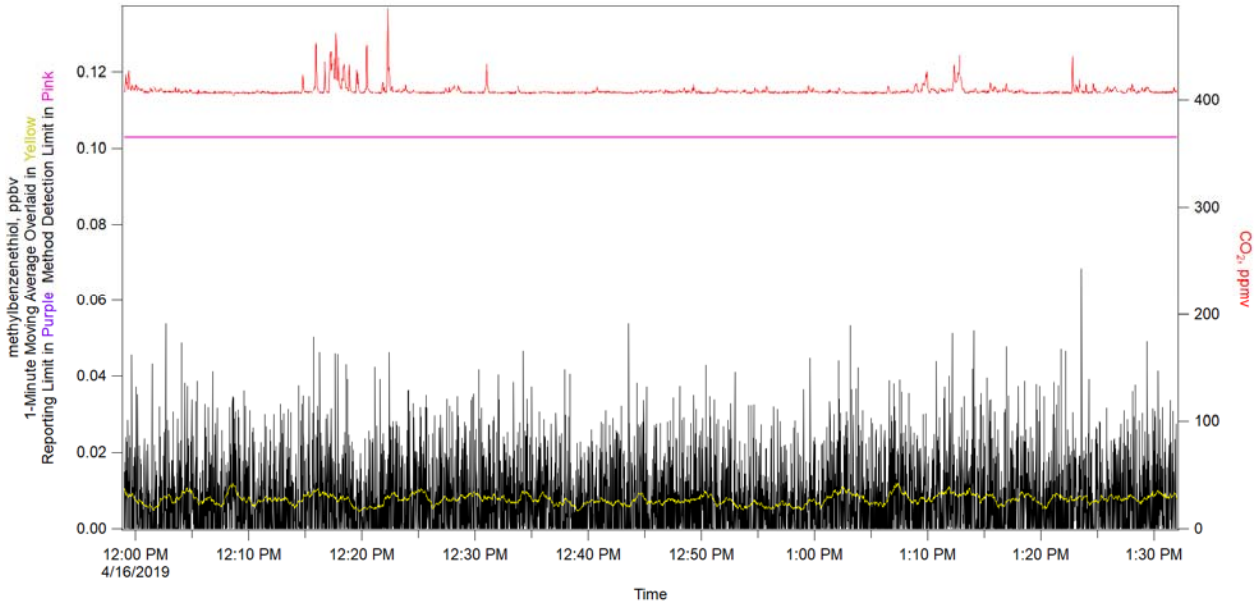

Figure 1-61. Methylbenzenethiol.

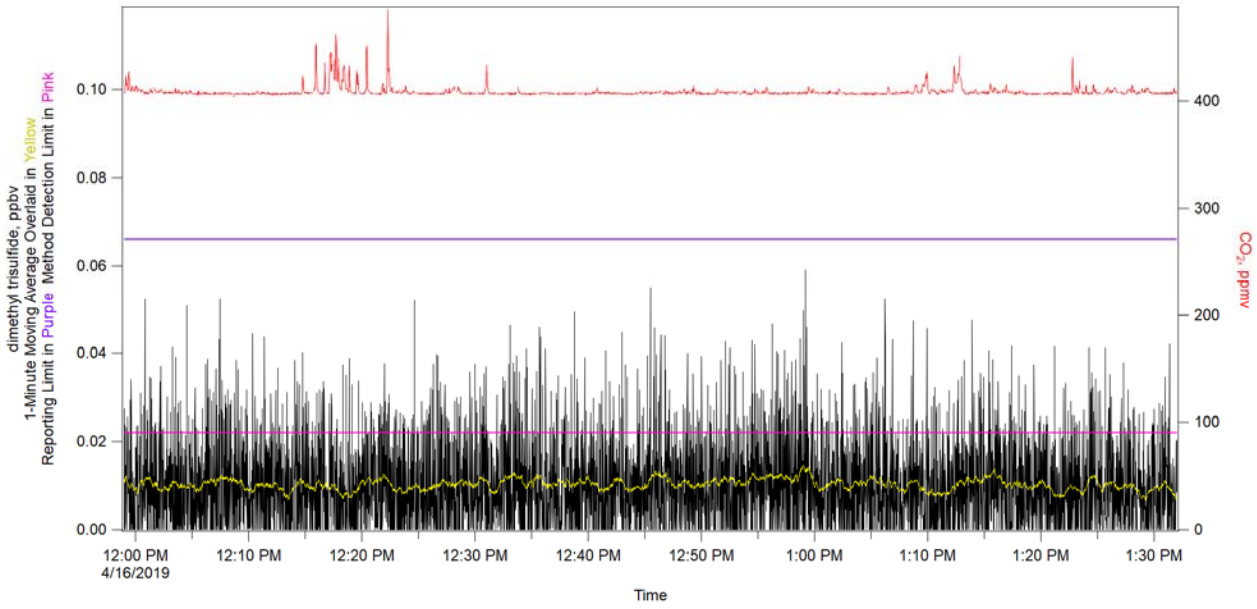

Figure 1-62. Dimethyl Trisulfide.

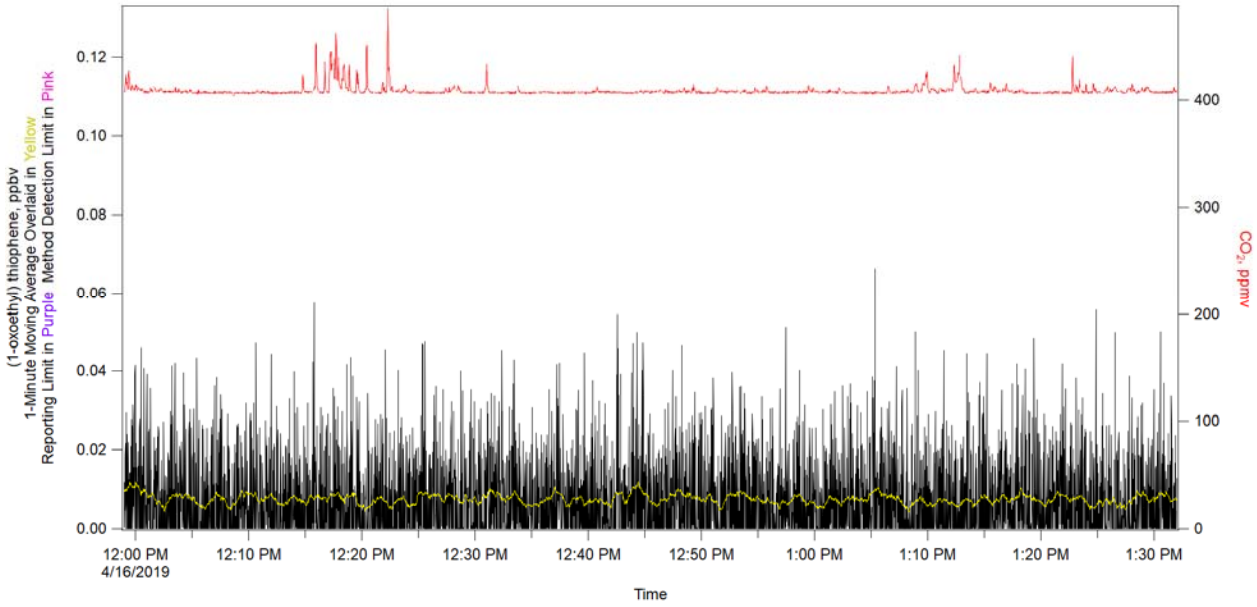

Figure 1-63. (1-oxoethyl) Thiophene.

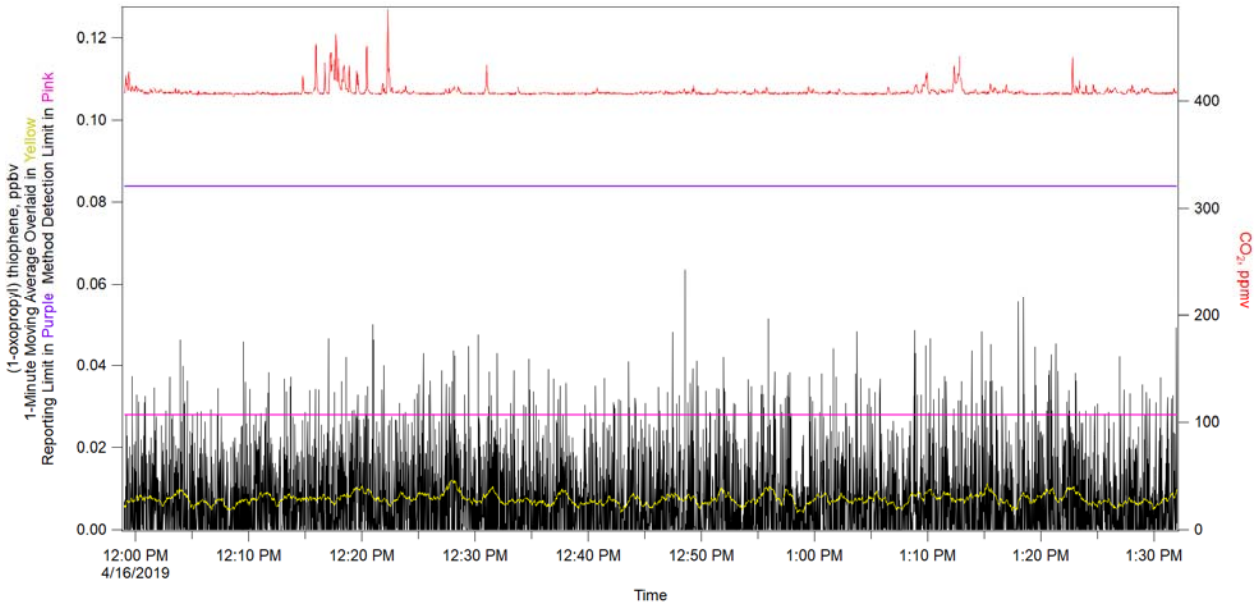

Figure 1-64. (1-oxopropyl) Thiophene.

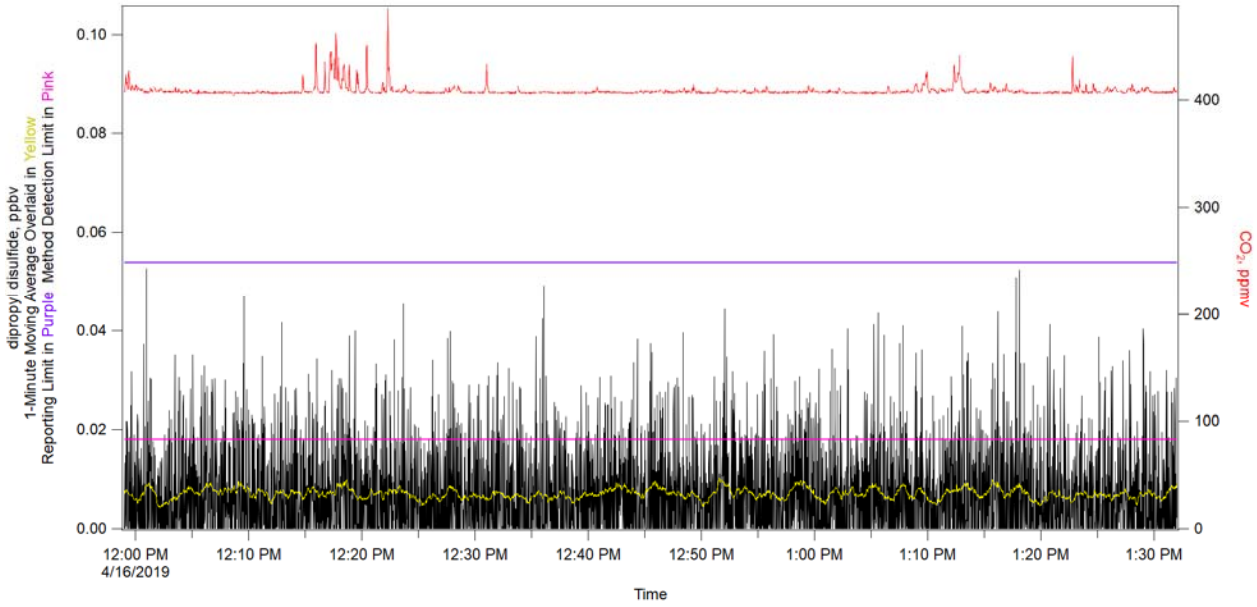

Figure 1-65. Dipropyl Disulfide.

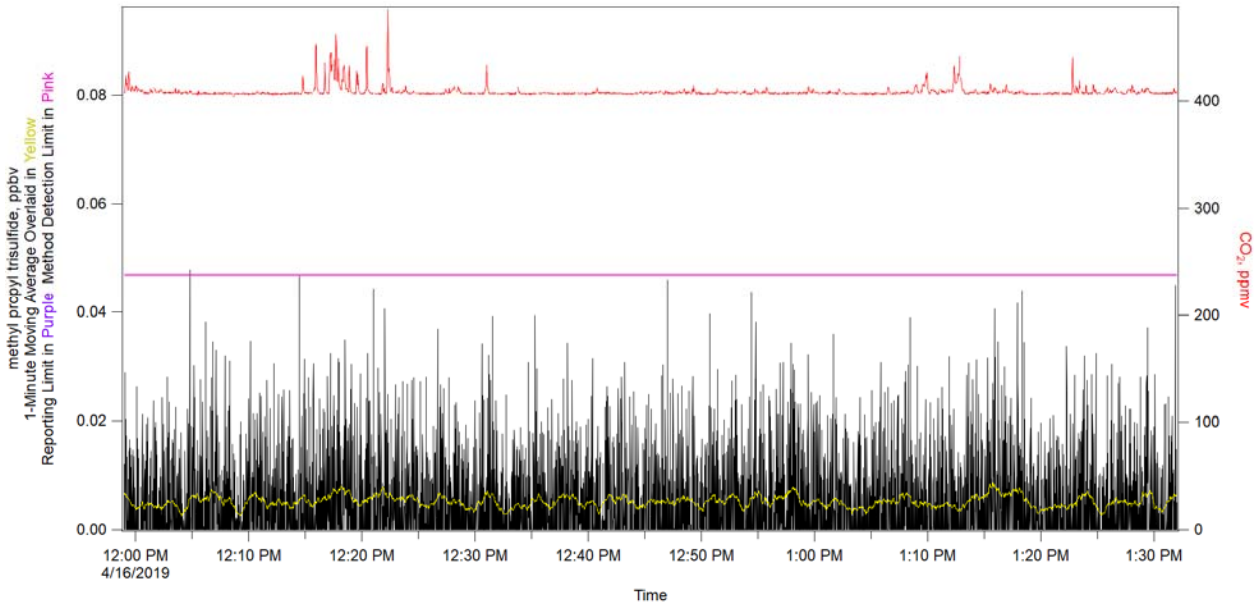

Figure 1-66. Methyl Propyl Trisulfide.

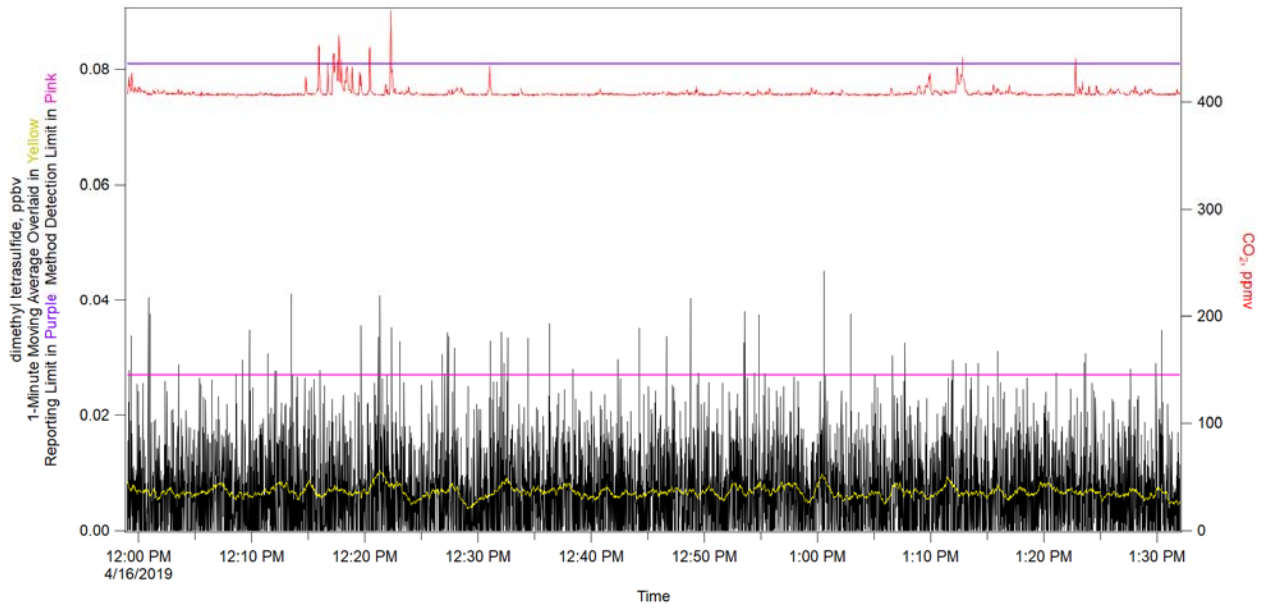

Figure 1-67. Dimethyl Tetrasulfide.

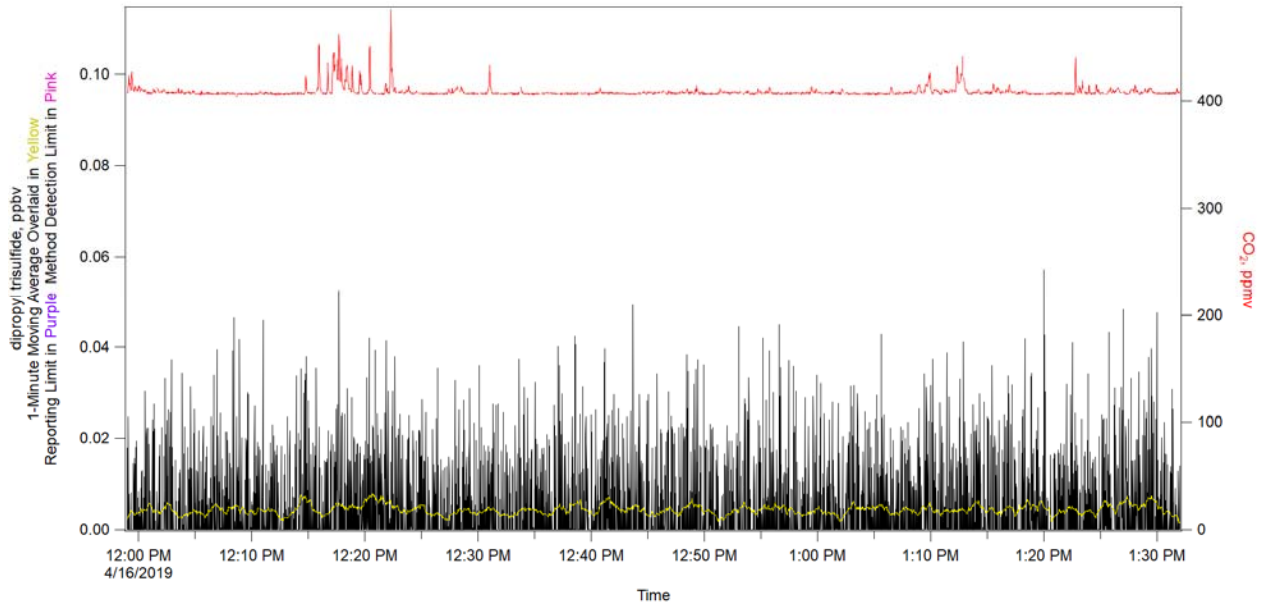

Figure 1-68. Dipropyl Trisulfide.

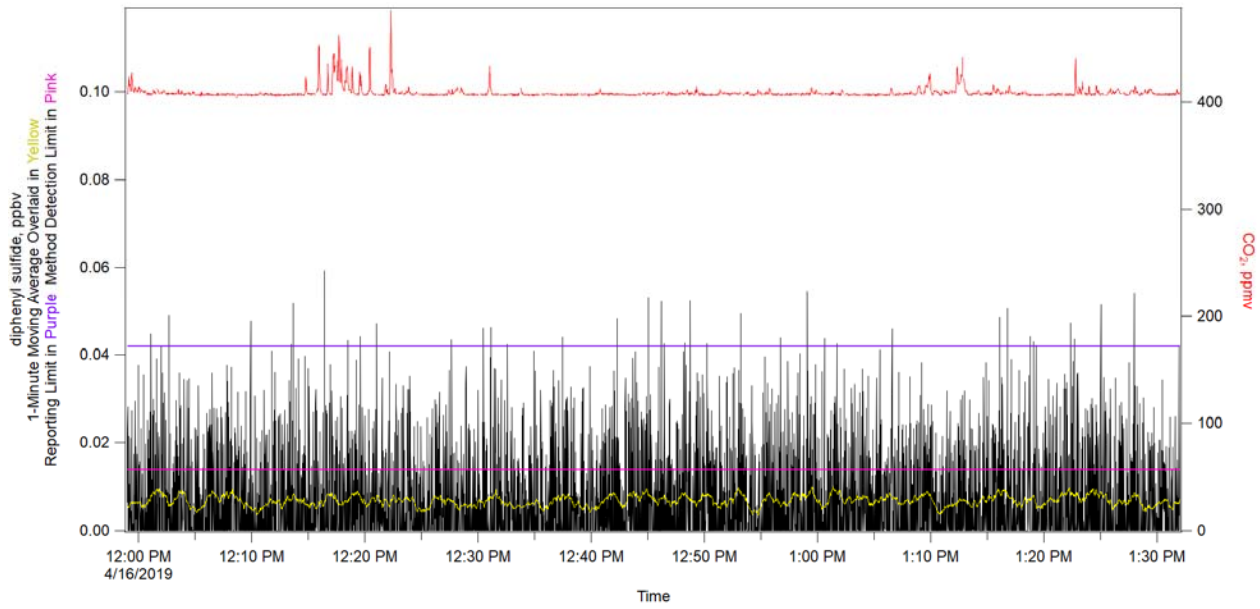

Figure 1-69. Diphenyl Sulfide.

Preliminary Analysis and Discussion

A cursory visual examination was made of each time trace of concentration of all COPCs and identified potential odor compounds from the Proton Transfer Reaction – Mass Spectrometer (PTR-MS). This included NH_3 from the Picarro for all data acquired on April 16, 2019, with focus on the period from 12:00 to 13:30, identified in the logbook as the period sampling occurred during the Abnormal Operating Procedure (AOP)-015 event. No signals were observed for any COPC during that period with a few compounds exhibiting very small signals < 10% of OEL. Similarly, no signals were observed for any odor compounds with the exception of a very small peak at m/z 91 at the exact mass identified as diethyl sulfide; 2-methylpropane-2-thiol. This peak appears to be coincident with CO_2, several of the furans (all well below 10% OEL) and diesel combustion markers as shown in Figure 1-70 below. The conclusion, therefore, is that these signals were from a diesel generator, vehicle, or other source rather than an AOP-015 itself.

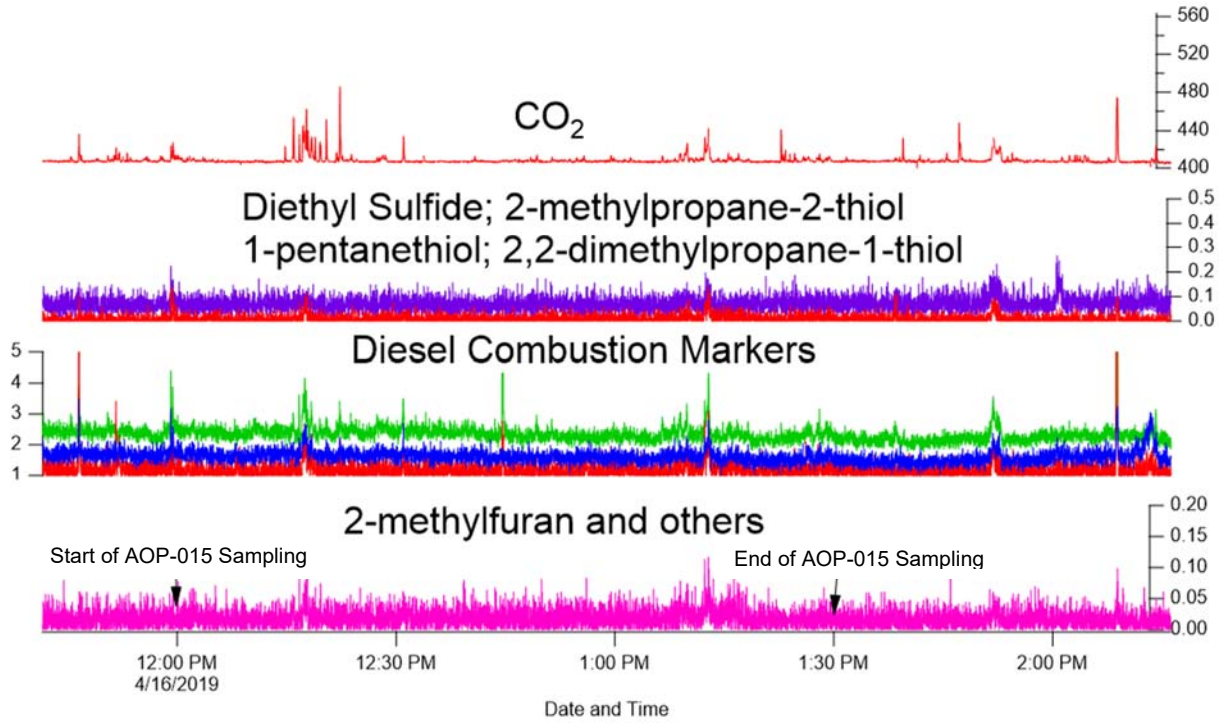

Figure 1-70. CO_2 and other Diesel Markers Coincident with Observed Signals During AOP-015 Sample Period.

These data combined with other positive signals for various compounds observed during transit to and from the AOP-015 location demonstrate that all instrumentation in the Mobile Laboratory (ML) was functioning properly and sensitive to levels of 100 ppt or lower. Discussion with ML operators confirmed statements in the logbook that the remote sampling tube was not long enough to reach the suspected source of odor emissions and therefore never deployed. These conversations further revealed that the ML was parked to the east of the source while winds were predominantly from the south, further reducing the effective sensitivity of instruments aboard the ML. Table 1-4 and Table 1-5 summarize the observations by the Subject Matter Expert (SME).

Table 1-4. Chemical of Potential Concern and Subject Matter Expert Observations. (2 Sheets)

#	COPC Name	m/z (amu)	OEL (ppb)	Observation(s)
1	ammonia	18	25000	No activity during specified period; spike observed at 7:22 as logged
2	formaldehyde	31	300	Brief spikes ~ .6 ppb during specified period <10% OEL
3	methanol	33	200000	No activity during specified period
4	acetonitrile	42	20000	No activity during specified period
5	acetaldehyde	45	25000	Brief spikes ~ 3.5 ppb during specified period <10% OEL
6	ethylamine	46	5000	Observation - no activity during specified period
7	1,3-butadiene	55	1000	Observation - no activity during specified period
8	propanenitrile	56	6000	Observation - no activity during specified period
9	2-propenal	57 (a)	100	Brief spikes ~ .4 ppb during specified period <10% OEL
10	1-butanol + butenes	57 (b)	20000	Brief spikes ~ .2 ppb during specified period <10% OEL
11	methyl isocyanate	58	20	Observation - no activity during specified period
12	methyl nitrite	62	100	Brief spikes ~ .3 ppb during specified period <10% OEL
13	furan	69	1	Observation - small peak ~ .04 ppb <10% OEL coincident w/CO_2
14	butanenitrile	70	8000	Observation - no activity during specified period
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	71	100, 1, 1	Observation - small peak ~ .04 ppb <10% OEL coincident w/CO_2
16	butanal	73	25000	Brief spikes ~ .2-.6 ppb during specified period <10% OEL
17	NDMA	75	0.3	Observation - no activity during specified period
18	benzene	79	500	Brief spikes ~ .25 ppb during specified period <10% OEL
19	2,4-pentadienenitrile + pyridine	80	300, 1000	No activity during specified period
20	2-methylene butanenitrile	82	30	No activity during specified period
21	2-methylfuran	83	1	Small peak ~ .04 ppb <10% OEL coincident w/CO_2
22	pentanenitrile	84	6000	No activity during specified period
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	85	20, 30	No activity during specified period
24	NEMA	89	0.3	No activity during specified period
25	2,5-dimethylfuran	97	1	Small peak ~ .04 ppb <10% OEL
26	hexanenitrile	98	6000	No activity during specified period
27	2-hexanone (MBK)	101	5000	No activity during specified period
28	NDEA	103	0.1	No activity during specified period
29	butyl nitrite + 2-nitro-2-methylpropane	104	100, 30	No activity during specified period
30	2,4-dimethylpyridine	108	500	No activity during specified period
31	2-propylfuran + 2-ethyl-5-methylfuran	111	1	No activity during specified period

Table 1-4. Chemical of Potential Concern and Subject Matter Expert Observations. (2 Sheets)

#	COPC Name	m/z (amu)	OEL (ppb)	Observation(s)
32	heptanenitrile	112	6000	No activity during specified period
33	4-methyl-2-hexanone	115	500	No activity during specified period
34	NMOR	117	0.6	No activity during specified period
35	butyl nitrate	120	2500	No activity during specified period
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran+ 3-(1,1-dimethylethyl)-2,3-dihydrofuran	127	100, 1, 1	No activity during specified period
37	6-methyl-2-heptanone	129	8000	No activity during specified period
38	2-pentylfuran	139	1	No activity during specified period
39	biphenyl	155	200	No activity during specified period
40	2-heptylfuran	167	1	No activity during specified period
41	1,4-butanediol dinitrate	181 (a)	50	No activity during specified period
42	2-octylfuran	181 (b)	1	No activity during specified period
43	1,2,3-propanetriol 1,3-dinitrate	183	50	No activity during specified period
44	PCB	189	1000	No activity during specified period
45	6-(2-furanyl)-6-methyl-2-heptanone	195	1	No activity during specified period
46	furfural acetophenone	199	1	No activity during specified period

Table 1-5. Odor Compounds and Subject Matter Expert Observations.

#	Odor Name	m/z (amu)	Observations
1	methyl mercaptan	49	No activity during specified period
2	dimethyl sulfide; ethanethiol	63	No activity during specified period
3	allyl mercaptan	75	No activity during specified period
4	1-propanethiol; Isopropyl mercaptan	77	No activity during specified period
5	2-butene-1-thiol	89	No activity during specified period
6	Diethyl Sulfide; 2-methylpropane-2-thiol	91 (a)	Small peak ~ .05 ppb during period, before, after, coincident w/CO_2
7	thiopropanal sulfuroxide	91 (b)	No activity during specified period
8	dimethyl disulfide	95	No activity during specified period
9	1-pentanethiol; 2,2-dimethylpropane-1-thiol	105	Small peak during specified period, before, after, coincident w/CO_2
10	benzenethiol	111	No activity during specified period
11	diallyl sulfide	115	No activity during specified period
12	methyl propyl disulfide	123	No activity during specified period
13	methylbenzenethiol	125	No activity during specified period
14	dimethyl trisulfide	127 (a)	No activity during specified period
15	(1-oxoethyl) thiophene	127 (b)	No activity during specified period
16	(1-oxopropyl) thiophene	141	No activity during specified period
17	dipropyl disulfide	151	No activity during specified period
18	methyl propyl trisulfide	155	No activity during specified period
19	dimethyl tetrasulfide	159	No activity during specified period
20	dipropyl trisulfide	183	No activity during specified period
21	diphenyl sulfide	187	No activity during specified period

Further analysis was performed when the ML SME visually inspected the prominent m/z values in the spectrum at the time of the AOP-015 to determine which additional masses were exhibiting a response during this period. The highest signals occurred at nominal m/z 43, m/z 46, acetaldehyde, and ethanol. Figure 1-71 below shows a time series plot of the instrument response at those signals throughout the course of the AOP-015 monitoring period.

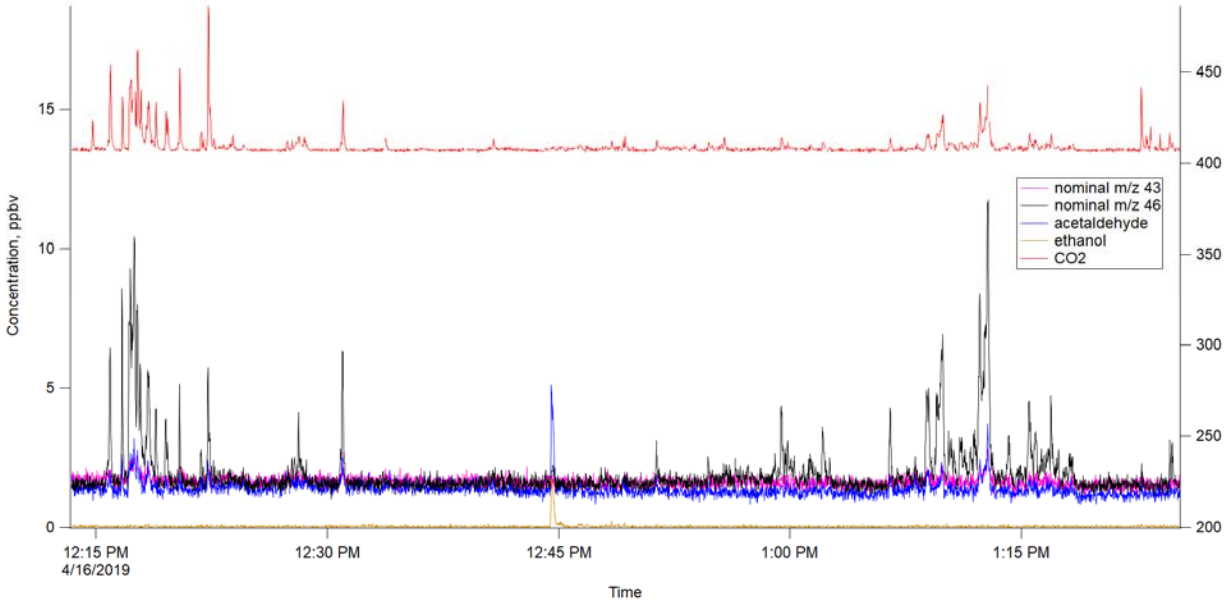

Figure 1-71. Time Series Plot of Additional Key Species Observed During AOP-015 Monitoring Period.

Most of the behavior exhibited in the plot above is well-correlated with CO_2; however, ethanol and acetaldehyde both exhibit similar signal spikes at around 12:45 PST that do not seem to correspond to a similar rise in CO_2. Ethanol does not seem to correspond to any other signal increases during this time window except the spike at 12:45 PST. Previous analyses have indicated that nominal m/z 43 and acetaldehyde are typical signals observed when sampling vehicle exhaust. Nominal m/z 46 has not previously been identified to correspond to any particular source signature but has been noted to be apparent in monitoring activities where heavy machinery was in use in the vicinity. This information, combined with a strong and prominent correlation with CO_2, indicates that this signal is likely related to work activity in the area. It should be noted that no odor-causing signals previously identified through source characterization work with septic sources were observed to exceed PTR-MS MDLs during this time. As such, there is no conclusive evidence to suggest that the AOP-015 event was caused by typical odor-causing compounds, such as methyl mercaptan or hydrogen sulfide.

2.0 REFERENCES

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