WEEKLY REPORT FOR WEEK 49
(JULY 7, 2019 – JULY 13, 2019)

Report No. 53005-81-RPT-068

September 2019

Prepared for:

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Record of Revision

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

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Figures

Tables

Acronyms and Abbreviations

A/C	Air Conditioning
ALC	Air Lift Circulator
COPC	Chemical of Potential Concern
CSM	Central Shift Manager
MBK	2-hexanone
MDL	Method Detection Limit
ML	Mobile Laboratory
NDEA	N-nitrosodiethylamine
NDMA	N-nitrosodimethylamine
NEMA	N-nitrosomethylethylamine
NMOR	N-nitrosomorpholine
OEL	Occupational Exposure Limit
PTR-MS	Proton Transfer Reaction – Mass Spectrometer
PTR-TOF	Proton Transfer Reaction – Time-of-Flight
QA	Quality Assurance
QC	Quality Control
RL	Reporting Limit
SME	Subject Matter Expert

1.0 INTRODUCTION

During the week of July 7, 2019, to July 13, 2019, the Mobile Laboratory (ML) performed testing and area monitoring. The data team continued processing data collected from the previous week. The reporting team worked towards the completion of weekly reports for Weeks 43 through 47 and monthly reports for Months 7, 8 and 9.

2.0 JULY 8, 2019 – TESTING

2.1 Quality Assessment

Data from July 8, 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.

2.2 Summary

The ML Operators arrived at the TerraGraphics warehouse at 09:45 to install a new ammonia regulator onto the ammonia gas standard (ID: THBJ-14-50-3). At 10:00, Operators called the Quality Assurance (QA) Manager and Project Manager for guidance regarding problems with incompatible threads on the regulator. The QA Manager and ML Operators took the CGA-240 regulator to OXARC®[1] for examination. OXARC's Operational Manager explained the Airgas®[2] 705 valve on the gas cylinder was flawed; the regulator was not. Airgas was then contacted to see if they were able to offer a resolution to the defective cylinder valve threading. During the time spent troubleshooting the ammonia issues, a revision of 66409-RPT-004, *Mobile Laboratory Operational Procedure*, was worked on, incorporating usage of the small ammonia bottle on hand. By the end of the workday, the ML was prepared for Tuesday deployment pending Mr. George Weeks' approval.

[1] OXARC is a registered trademark of Oxarc, Inc., Spokane, Washington.
[2] Airgas is a registered trademark of Airgas, Inc., Radnor, Pennsylvania.

3.0 JULY 9, 2019 - TESTING

3.1 Quality Assessment

Data from July 9, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Acceptance Checklist was completed. The data were accepted by TerraGraphics with the following comments.

3.2 Summary

On July 9, 2019, Operators arrived at the warehouse and prepared the ML for deployment to the Hanford Site. Operators completed all instrument checks and performed manual spans. Operators were directed to wait for approval before deploying. While waiting for further direction on deployment, ML Operators capitalized on this downtime by reviewing outstanding weekly and monthly reports. Once finished adding content to reports, Operators began work within DAQFactory®[3]; specifically learning about coding and how to make channels for the different instruments.

[3] DAQFactory is a registered trademark of AzeoTech, Inc., Ashland, Oregon.

4.0 JULY 10, 2019 – MOBILE LABORATORY MODIFICATIONS

4.1 Quality Assessment

Data from July 10, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Acceptance Checklist was completed. The data were accepted by TerraGraphics with the following comments.

4.2 Summary

On July 10, 2019, ML Operators arrived at the TerraGraphics warehouse at 05:10 to prepare the ML for deployment to the Hanford Site. The QA/Quality Control (QC) zero-air/span checks were performed on the LI-COR®[4] CO_2 monitor, the Picarro NH_3 analyzer, and the Proton Transfer Reaction – Mass Spectrometer (PTR-MS) beginning at 05:39. While completing instrument checks, Operators encountered a problem with the small NH_3 cylinder. During the PTR-MS span check, the Operators noticed the PTR-MS was not performing well. Upon notifying the Subject Matter Expert (SME), he noticed that the voltages on the PTR-MS were set incorrectly. The zero-air and span check air flow were adjusted to be set to 2 volts each. Beginning at 11:30, the remainder of the day was spent on coding DAQFactory communications to the Teledyne®[5] N_2O instrument.

[4] LI-COR is a registered trademark of LI-COR, Inc., Lincoln, Nebraska.
[5] Teledyne is a registered trademark of Teledyne Technologies, Inc., Thousand Oaks, California.

5.0 JULY 11, 2019 – TESTING

5.1 Quality Assessment

Data from July 11, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Acceptance Checklist was completed. The data were accepted by TerraGraphics with the following comments.

5.2 Summary

On July 11, 2019, the ML Operators arrived at the TerraGraphics warehouse at 07:15. While waiting for the arrival of a new small NH_3 cylinder, Operators continued working on communications between DAQFactory and the N_2O instrument. At 13:00, Operators attempted to update the Teledyne T320 software, but the Teledyne software would not recognize or connect to the USB drive.

6.0 JULY 12, 2019 – TESTING

6.1 Quality Assessment

Data from July 12, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Acceptance Checklist was completed. The data were accepted by TerraGraphics with the following comments.

6.2 Summary

On July 12, 2019, Operators arrived at the TerraGraphics warehouse at 07:10 to perform PTR-MS testing. Operators began a software upgrade on the N_2O monitors at 07:27. At 07:50, Operators initiated a zero-air and span check on the PTR-MS. Operators began a long zero-air check on the PTR-MS at 08:39 which will be used to establish a respectable background baseline through processing of this testing data. The long zero was completed at 10:07. The N_2O instrument was not effectively communicating with the DAQFactory software, so DAQFactory was restarted. At 10:20, a new PTR-MS file was initiated to capture overflow of the ML sampling system with zero air. This test will help develop a better understanding of the sampling system. The inlet overflow test was completed at 13:00. Operators swapped the zero-air cylinder in the ML for a new, full cylinder. For the remainder of the day, the SME tested the new NH_3 standard and ran a multipoint calibration on the Picarro to ensure that the new cylinder will work properly.

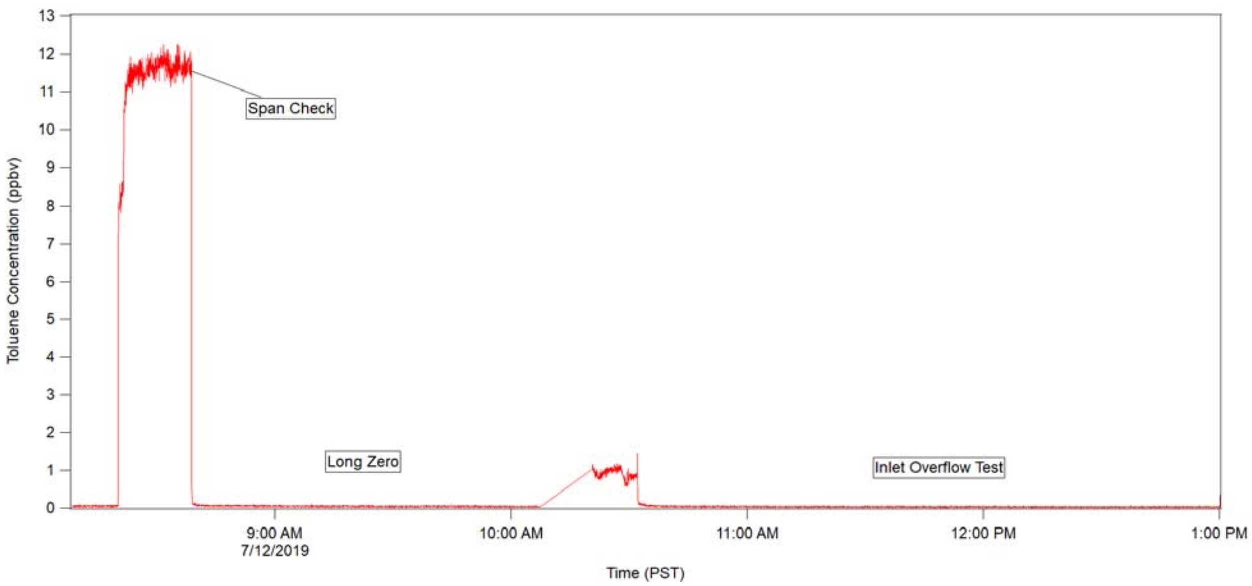

Figure 6-1. Proton Transfer Reaction – Mass Spectrometer Testing; Span Check, Long Zero, and Inlet Overflow on Toluene.

7.0 JULY 13, 2019 – AIR LIFT CIRCULATOR MONITORING

7.1 Quality Assessment

Data from July 13, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Acceptance Checklist was completed. The data were accepted by TerraGraphics with the following comments.

7.2 Summary

On July 13, 2019, the ML Operators arrived at the TerraGraphics warehouse at 12:48 to prepare the ML for deployment to the Hanford Site in support of Air Lift Circulator (ALC) operations within the double-shell tank of AW-102. The QA/QC zero-air/span was performed on the LI-COR CO_2 monitor, the Picarro NH_3 analyzer, and the PTR-MS beginning at 13:15. The ML arrived on the Hanford Site and checked in with the Central Shift Manager (CSM) at 14:47. Operators attended an ALC pre-job meeting at 14:47. The meeting concluded at 15:07. To identify where the ML should be positioned for monitoring, Operators logged into APGEMS-TF at 15:11. APGEMS-TF models atmospheric conditions and assists with targeting the area(s) of highest probable vapor concentrations. The ALC began at 16:07 and the ML was parked east of 241-AW. The ML was relocated approximately 50 yards south of previous location at 17:22. The ALC ended at 20:35 and Operators initiated the end of the day PTR-MS zero-air/span checks at 21:38. After checking out with the CSM, the ML left the Hanford Site at 21:41. The ML arrived back to the TerraGraphics warehouse at 22:32.

Table 7-1. Mobile Laboratory Summary of Events.

Time	Activity	Observed
15:42	ALC monitoring east of 241-AW	Car exhaust
16:40	ALC monitoring east of 241-AW	Car exhaust
18:02	ALC monitoring south of 241-AW	Car exhaust

Table 7-1 illustrates the times and locations on July 13, 2019, where the ML Operators noted a potential source, or a peak of interest was observed. When the ML Operators noted a car driving by at 15:42 PST, the rise in signal was seen for gasoline and diesel combustion markers (Figures 7-49 and 7-50) as well as toluene (seen in Figure 7-53) and benzene which could be a result of fragmentation. The signal seen at 16:40 PST, when the ML Operators noted another car driving by, is similar to the signal seen at 15:42 at a lower concentration. At 18:02 PST, when another car is noted driving past the ML, there are no raised signals of interest which could be a result of the wind shifting at 17:30 PST.

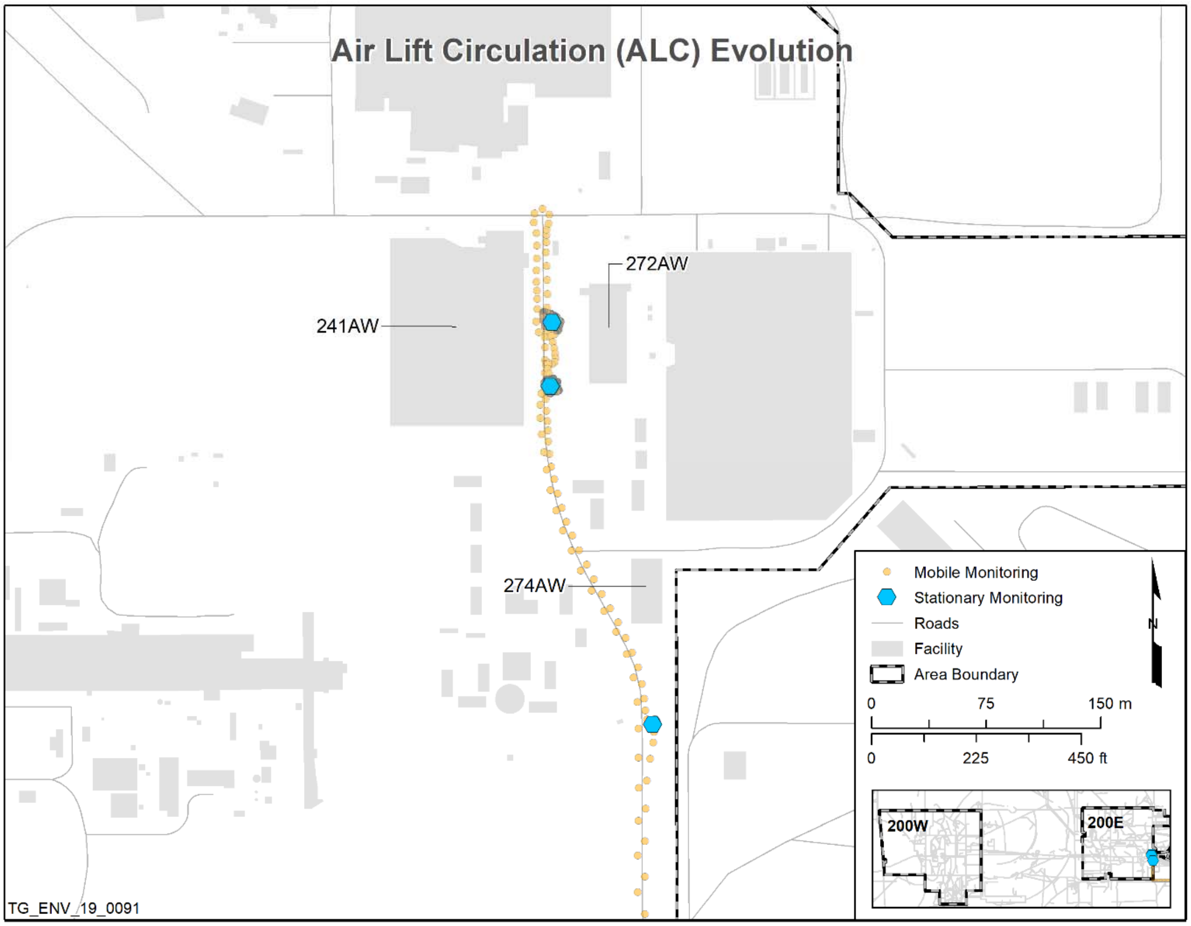

Figure 7-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.

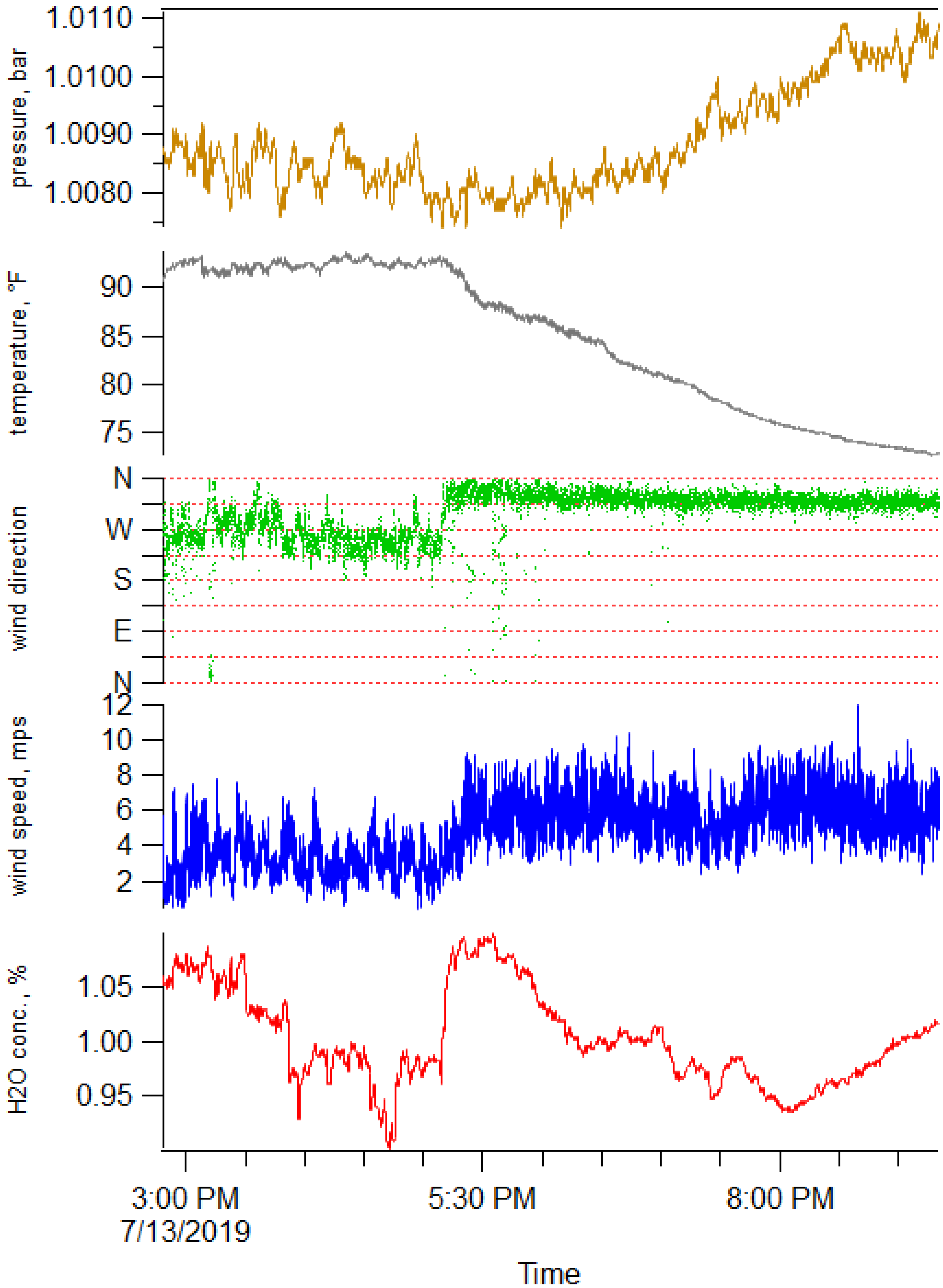

Figure 7-2. Weather Data for the Duration of the Monitoring Period.

Figure 7-2 illustrates the meteorological summary for the monitoring period on July 13, 2019. The temperature for the afternoon stayed steady near 93°F until about 5:30 PST when the temperature slowly decreased back down to the high seventies. The pressure began to slowly increase as temperature decreased, and wind speed increased as wind direction shifted from the west to the north. Humidity remained low for the monitoring period.

7.3 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
- Airmar®[6] Weather Station.

Confirmatory air samples were not collected during this period.

7.4 Area Monitoring

The ML operators performed area monitoring from approximately 14:47 to 21:38. The table below displays the chemical of potential concern (COPC) statistical results during that monitoring period.

[6] Airmar is a registered trademark of Airmar Technology Corporation, Milford, New Hampshire.

Table 7-2. Chemical of Potential Concern Statistical Information for the Source Characterization Monitoring Period of July 13, 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	6.225	9.63†	2.361	24.516	15.212	9.341†
2	formaldehyde	300	0.141	<0.141	0.140	102.914	0.473	<0.141
3	methanol	200000	0.379	8.751	1.754	20.040	28.732	8.076
4	acetonitrile	20000	0.044	0.321	0.061	18.953	0.897	0.319
5	acetaldehyde	25000	0.220	1.637	0.508	31.009	3.818	1.535
6	ethylamine	5000	0.021	<0.021	0.015	238.871	0.084	<0.021
7	1,3-butadiene	1000	0.917	3.389	0.995	29.369	6.601	3.513
8	propanenitrile	6000	0.043	0.105†	0.036	34.807	0.265	0.104†
9	2-propenal	100	0.069	0.072†	0.083	114.679	0.529	0.068†
10	1-butanol + butenes	20000	0.050	<0.050	0.113	2169.130	3.324	<0.05
11	methyl isocyanate	20	0.025	<0.025	0.023	156.390	0.149	<0.025
12	methyl nitrite	100	0.030	0.071†	0.031	43.308	0.212	0.069†
13	furan	1	0.021	<0.021	0.016	191.864	0.077	<0.021
14	butanenitrile	8000	0.013	<0.013	0.013	1964.030	0.066	<0.013
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.017	0.080	0.022	27.381	0.181	0.079
16	butanal	25000	0.022	0.093	0.026	27.966	0.242	0.092
17	NDMA**	0.3	0.015	<0.015	0.018	192.828	0.107	<0.015
18	benzene	500	0.066	<0.066	0.050	116.675	1.439	<0.066
19	2,4-pentadienenitrile + pyridine	300, 1000	0.018	<0.018	0.011	774.433	0.100	<0.018
20	2-methylene butanenitrile	300	0.008	<0.008	0.006	9773.850	0.031	<0.008
21	2-methylfuran	1	0.016	0.021†	0.015	73.856	0.083	0.02†
22	pentanenitrile	6000	0.008	<0.008	0.006	1707.790	0.034	<0.008
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.016	<0.016	0.013	90.238	0.073	<0.016
24	NEMA**	0.3	0.010	<0.01	0.007	241.956	0.048	<0.01
25	2,5-dimethylfuran	1	0.013	<0.013	0.011	107.982	0.061	<0.013
26	hexanenitrile	6000	0.006	<0.006	0.004	112.977	0.027	<0.006
27	2-hexanone (MBK)	5000	0.010	<0.01	0.008	137.479	0.062	<0.01
28	NDEA**	0.1	0.011	<0.011	0.003	5375.660	0.021	<0.011
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.006	<0.006	0.005	620.435	0.029	<0.006

Table 7-2. Chemical of Potential Concern Statistical Information for the Source Characterization Monitoring Period of July 13, 2019. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
30	2,4-dimethylpyridine	500	0.008	<0.008	0.005	232.782	0.125	<0.008
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.010	<0.01	0.007	218.505	0.037	<0.01
32	heptanenitrile	6000	0.004	<0.004	0.002	1062.860	0.013	<0.004
33	4-methyl-2-hexanone	500	0.008	<0.008	0.006	1503.910	0.028	<0.008
34	NMOR**	0.6	0.009	<0.009	0.006	524.638	0.089	<0.009
35	butyl nitrate	2500	0.004	<0.004	0.002	1511.810	0.013	<0.004
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.007	<0.007	0.005	278.513	0.042	<0.007
37	6-methyl-2-heptanone	8000	0.006	<0.006	0.005	140.284	0.031	<0.006
38	2-pentylfuran	1	0.006	0.011†	0.007	65.757	0.043	0.01†
39	biphenyl	200	0.008	<0.008	0.006	141.315	0.033	<0.008
40	2-heptylfuran	1	0.007	<0.007	0.004	41.452	0.008	<0.007
41	1,4-butanediol dinitrate	50	0.005	<0.005	0.002	151.186	0.009	<0.005
42	2-octylfuran	1	0.004	<0.004	0.002	1162.440	0.014	<0.004
43	1,2,3-propanetriol 1,3-dinitrate	50	0.002	<0.002	0.001	395.225	0.011	<0.002
44	PCB	1000	0.006	<0.006	0.002	45.924	0.006	<0.006
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.003	<0.003	0.002	230.156	0.015	<0.003
46	furfural acetophenone	1	0.006	<0.006	0.003	1482.500	0.019	<0.006
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.354 ppb and the median value was 0.062 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers.							
**	Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.].							
<	COPC Averages below the MDL.							
†	COPC Averages between the RL and the MDL.							
(red)	COPC Averages >100% of the OEL.							
(orange)	COPC Averages 50-100% of the OEL.							
(yellow)	COPC Averages 10-50% of the OEL.							

Figure 7-3 through Figure 7-48 display 46 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 of July 13, 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 7-3 through Figure 7-53 display the monitoring period, and the data shown were edited from the entire data, eliminating the daily span checks performed as well as any traveling done off the Hanford Site. Figure 7-4 through Figure 7-53 have been baseline subtracted to correct for the baseline signal response observed while the PTR-MS is sampling zero-air. Species with low or negligible amounts in ambient background can appear below zero (See Figures 7-21, 7-36, 7-43, 7-46, and 7-48) but it has negligible effect on the PTR-MS to accurately detect species above the reporting limit and OEL. Figure 7-3 displays the signal for ammonia for the monitoring period with a slight decay in concentration from the start of monitoring as the sample line equilibrates from the daily ammonia span check. Figure 7-9 displays the signal for 1,3-butadiene and the scalloping denoted by the plot is influenced by the increased humidity in the PTR-MS which has been identified to interfere with signal at this mass.

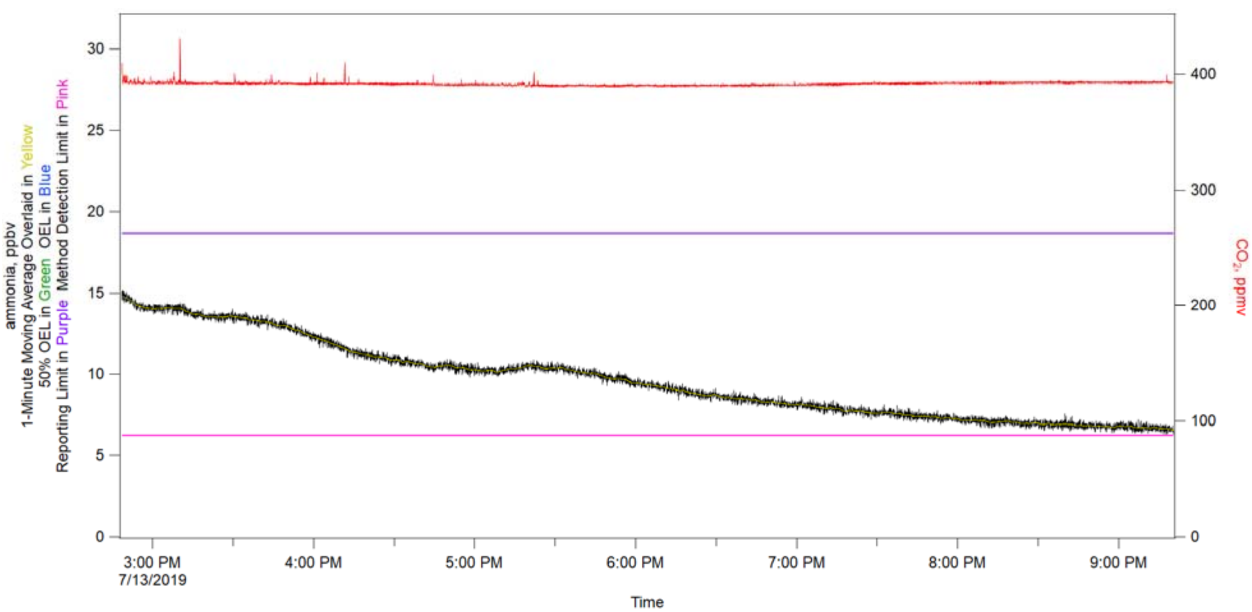

Figure 7-3. Ammonia.

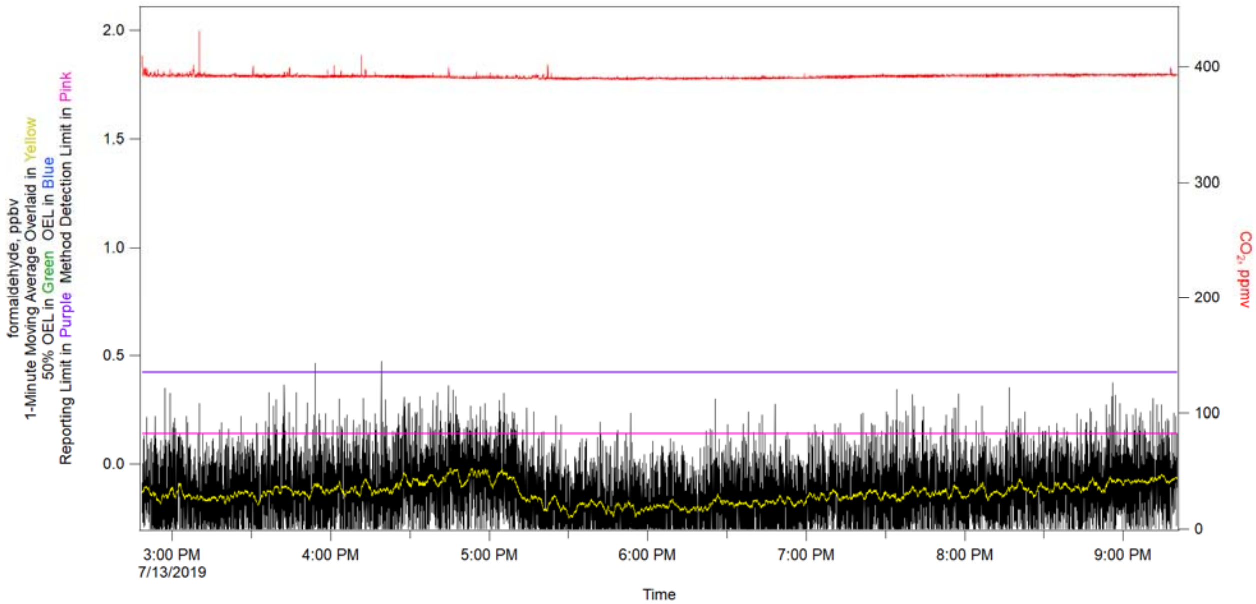

Figure 7-4. Formaldehyde.

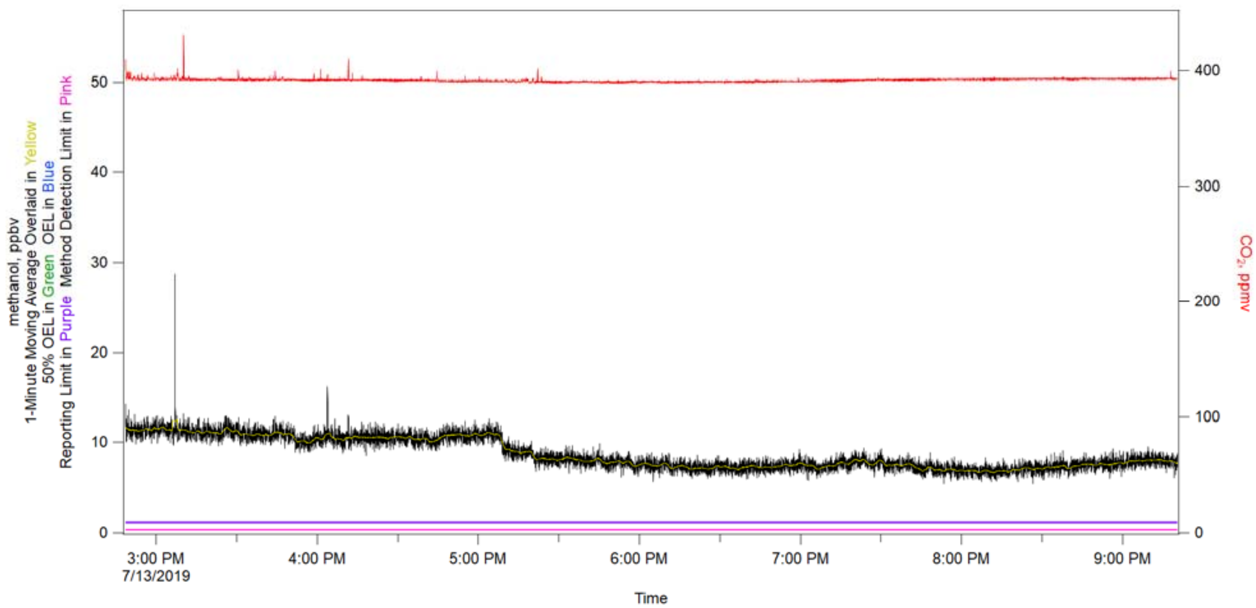

Figure 7-5. Methanol.

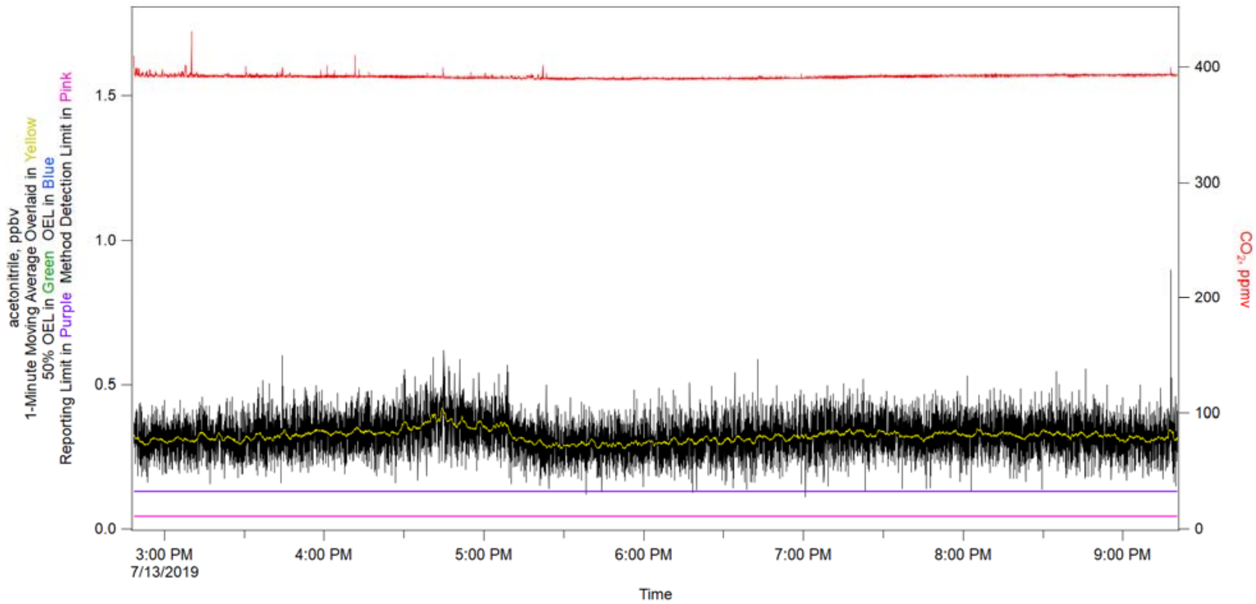

Figure 7-6. Acetonitrile.

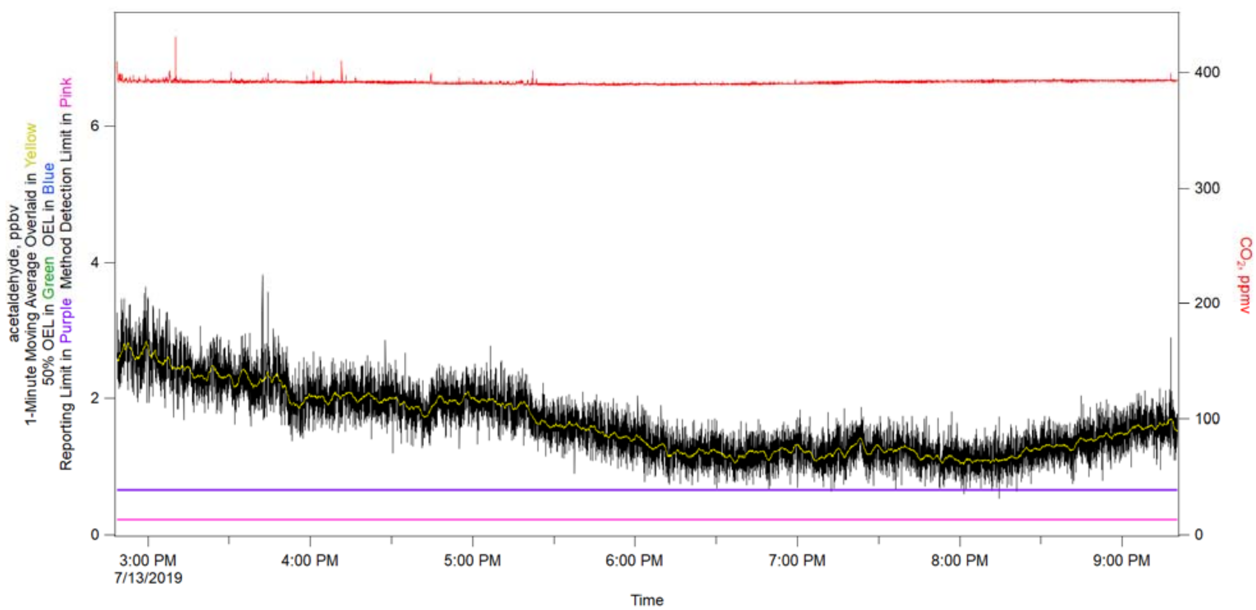

Figure 7-7. Acetaldehyde.

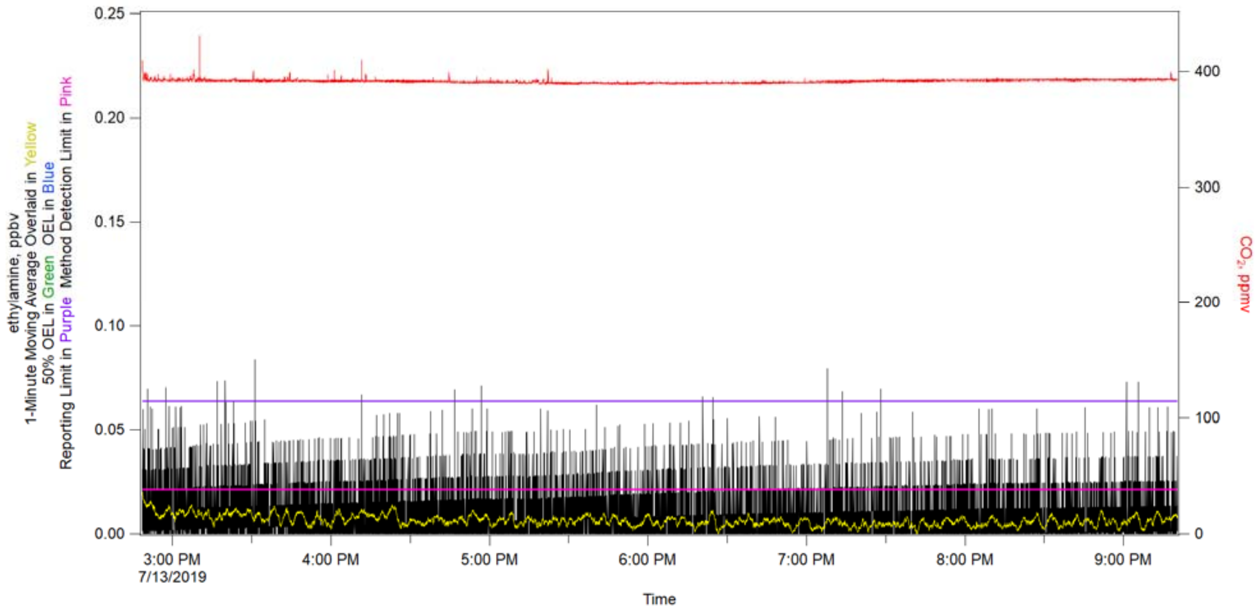

Figure 7-8. Ethylamine.

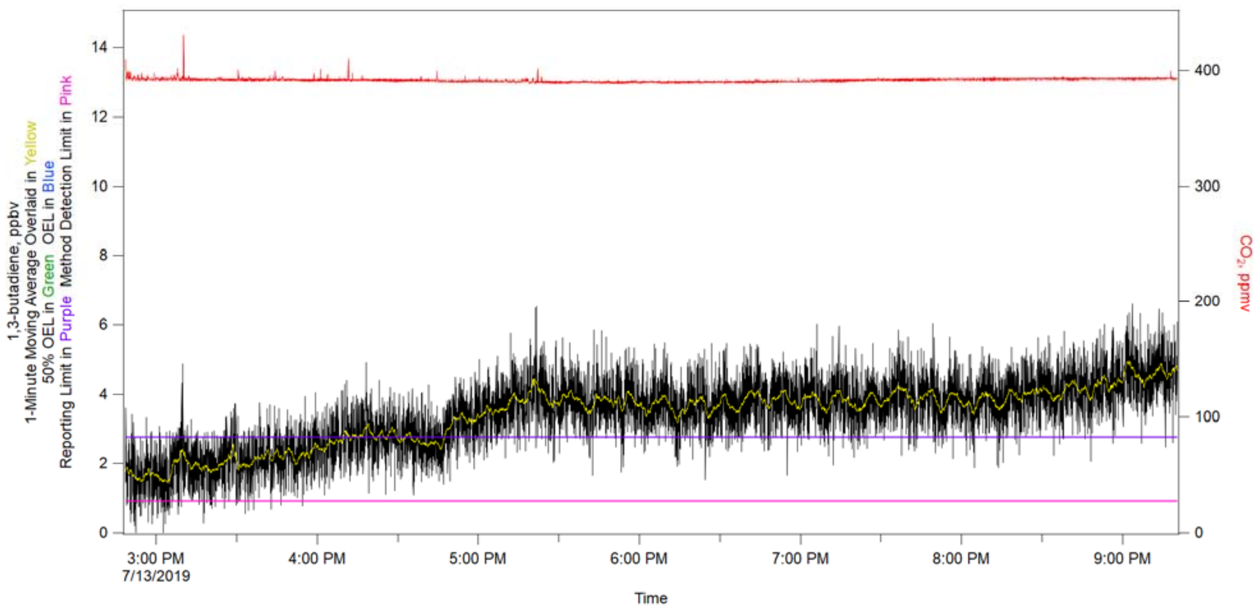

Figure 7-9. 1,3-butadiene.

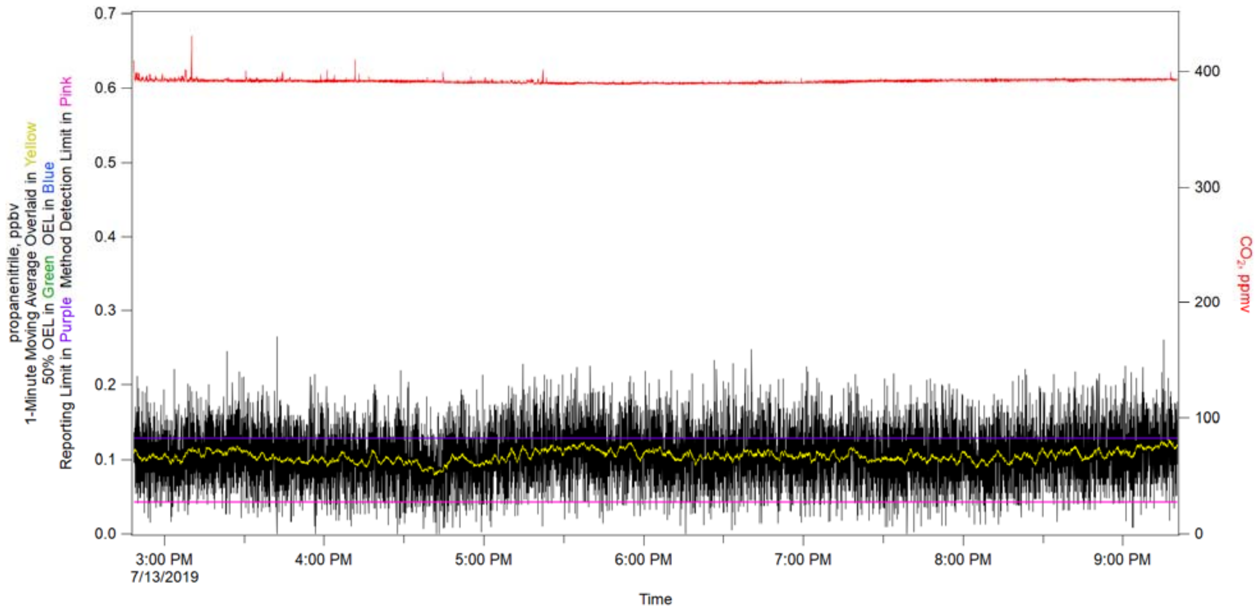

Figure 7-10. Propanenitrile.

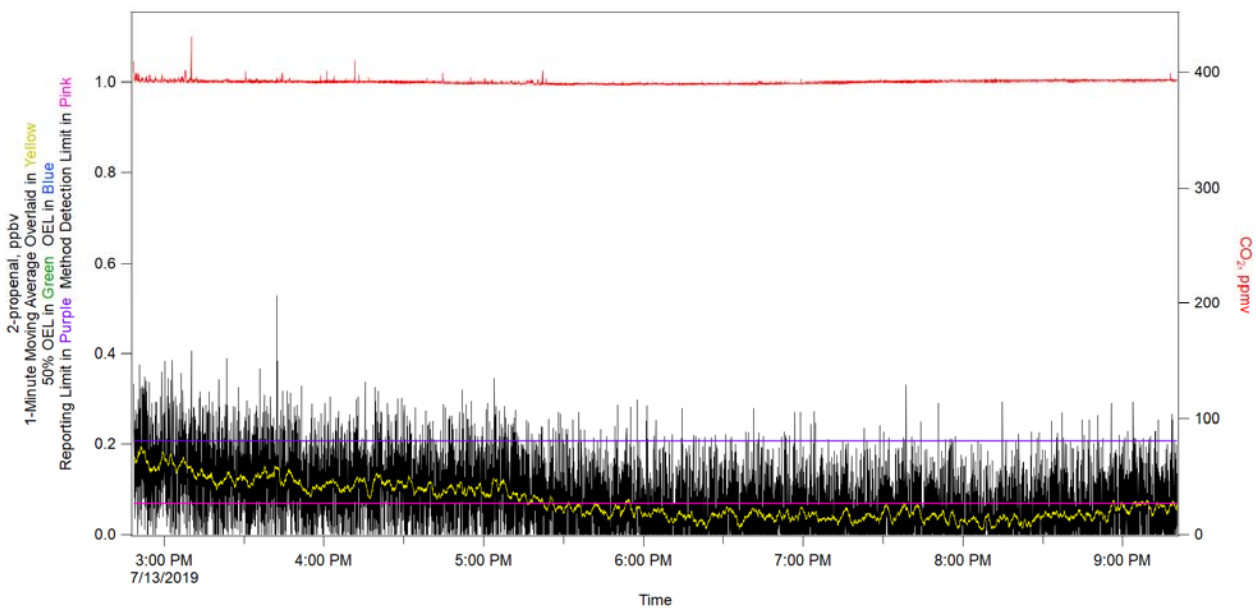

Figure 7-11. 2-propenal.

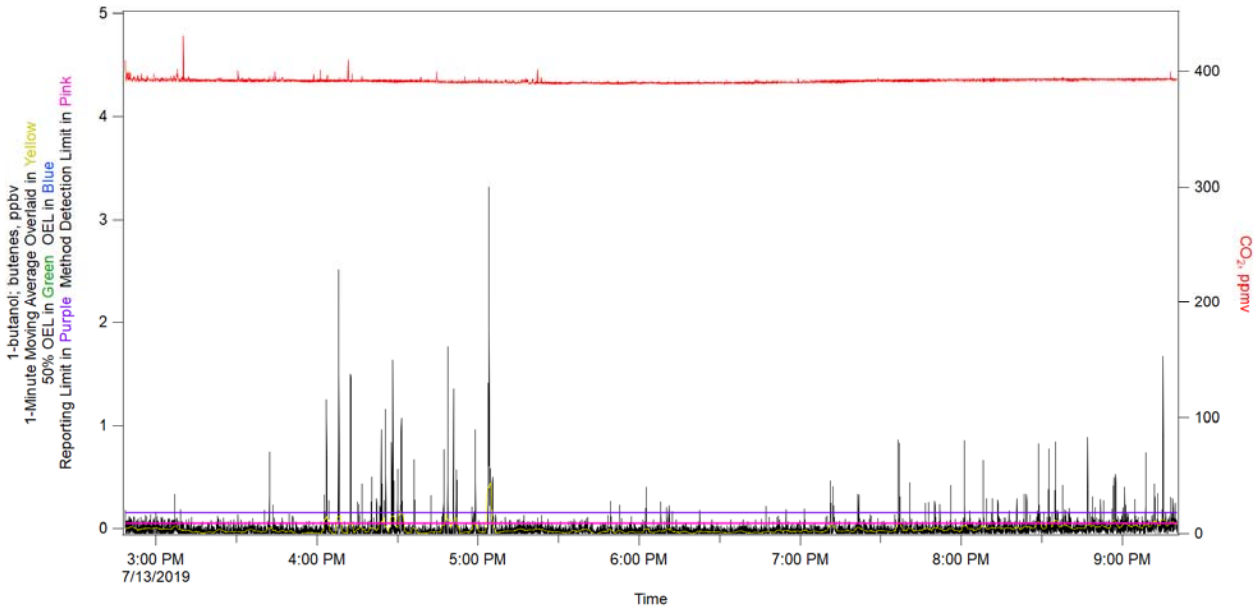

Figure 7-12. 1-butanol; Butenes.

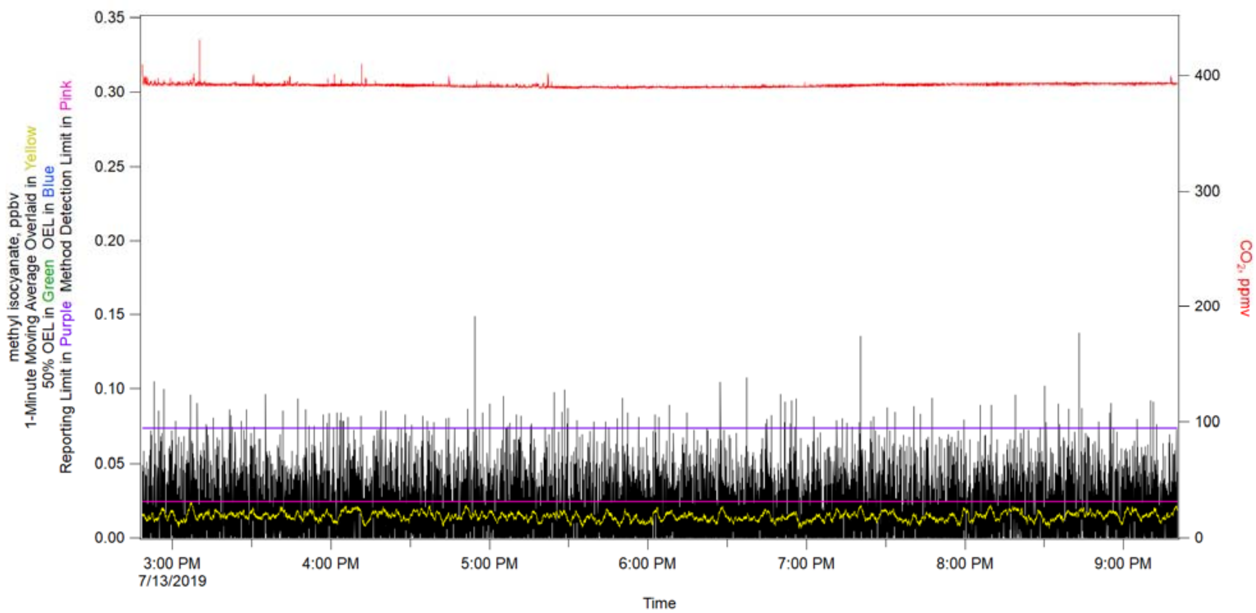

Figure 7-13. Methyl Isocyanate.

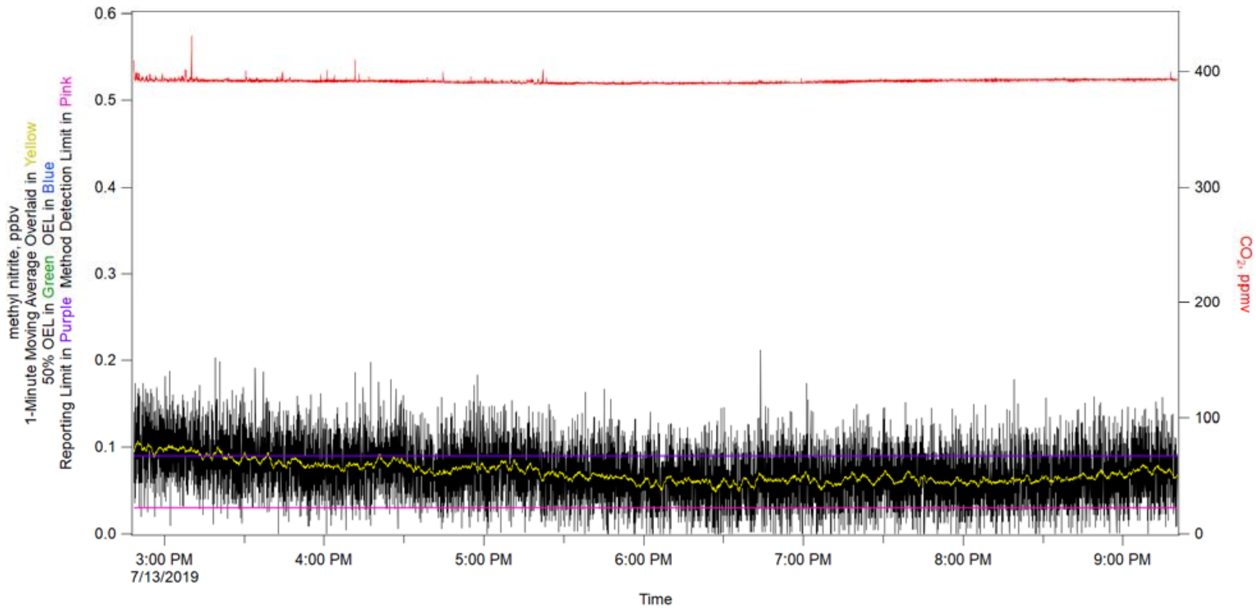

Figure 7-14. Methyl Nitrite.

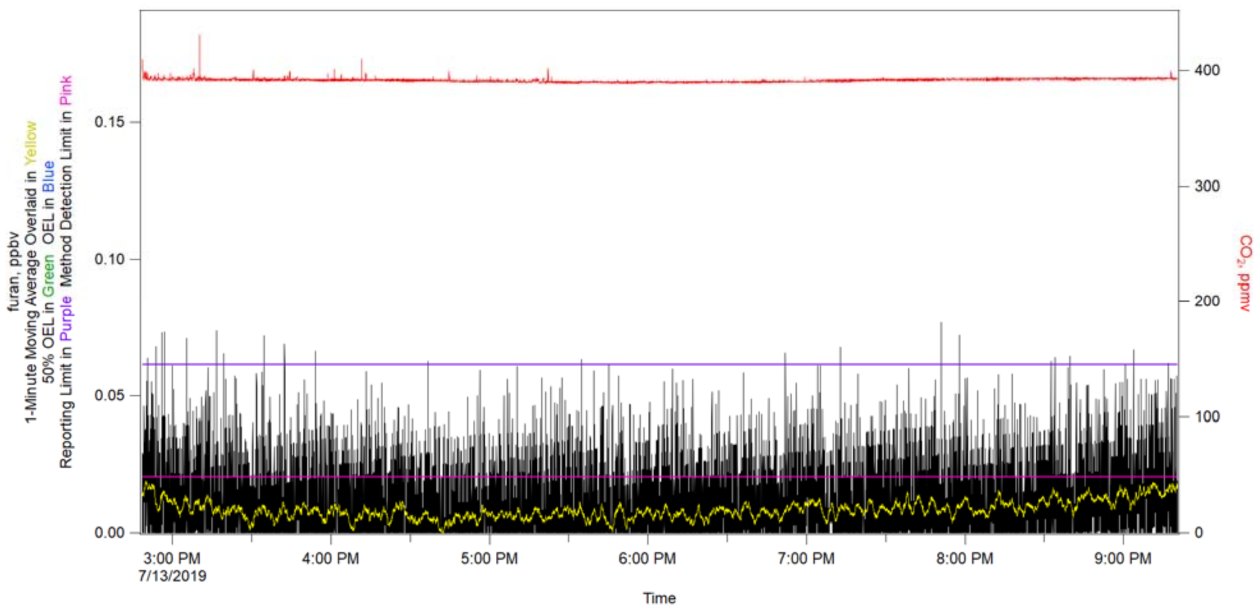

Figure 7-15. Furan.

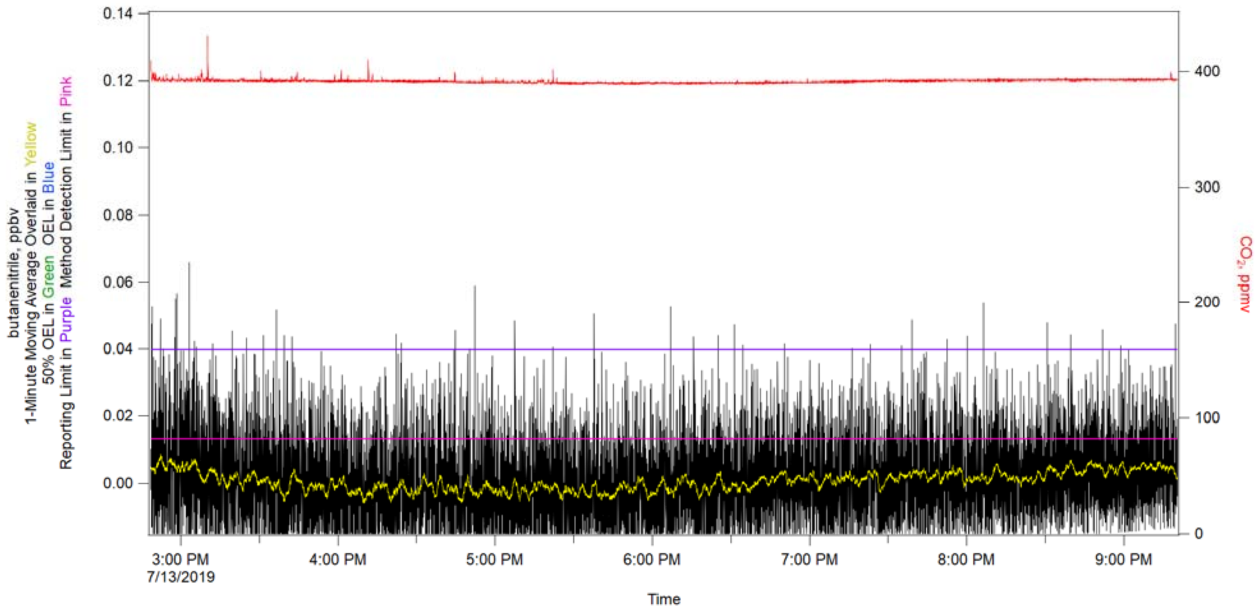

Figure 7-16. Butanenitrile.

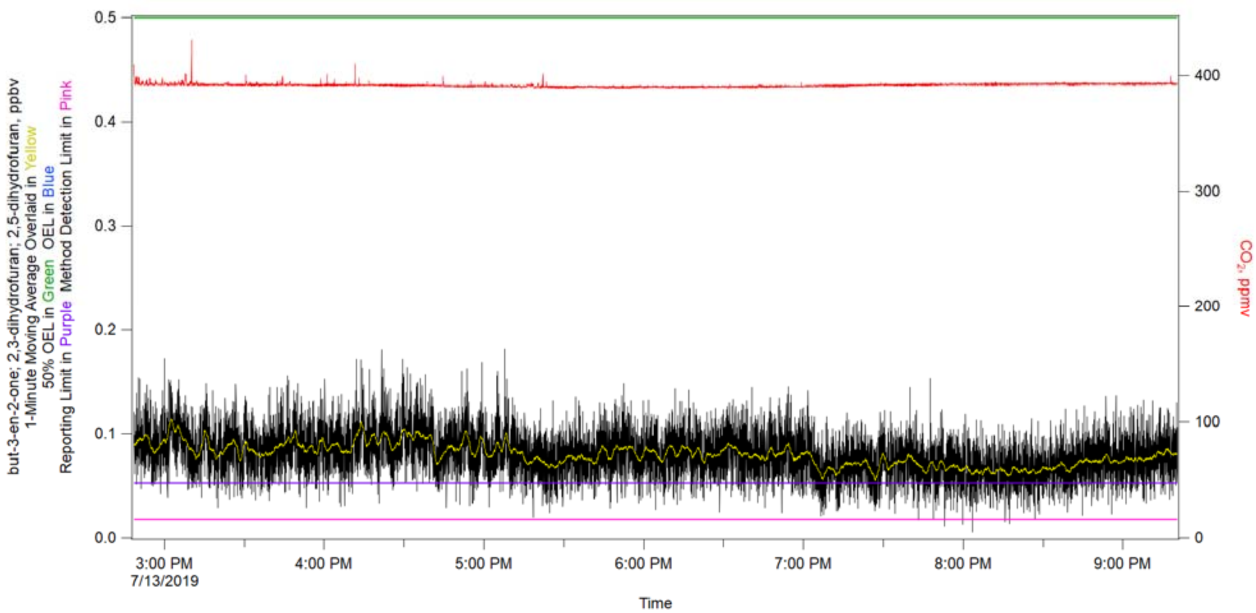

Figure 7-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

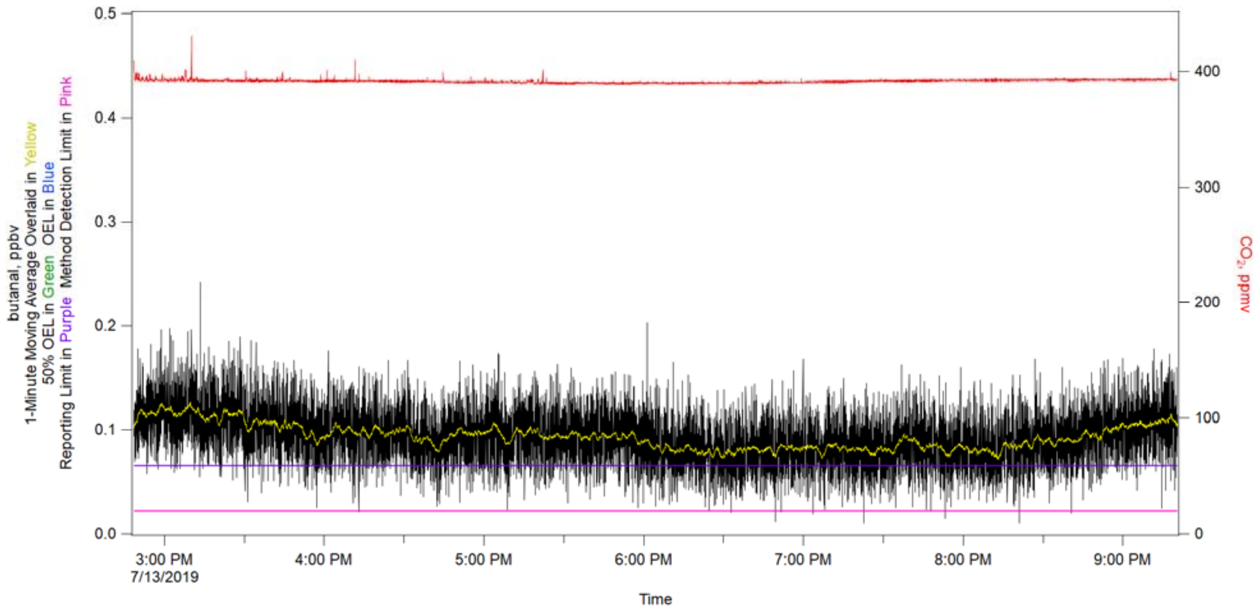

Figure 7-18. Butanal.

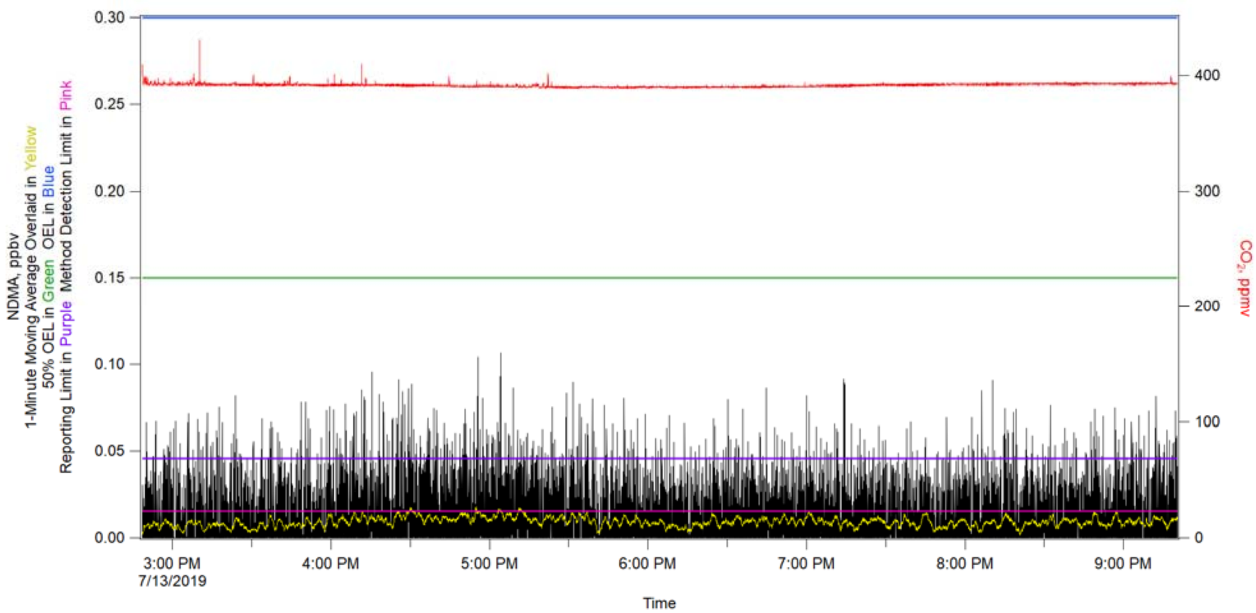

Figure 7-19. N-nitrosodimethylamine (NDMA).

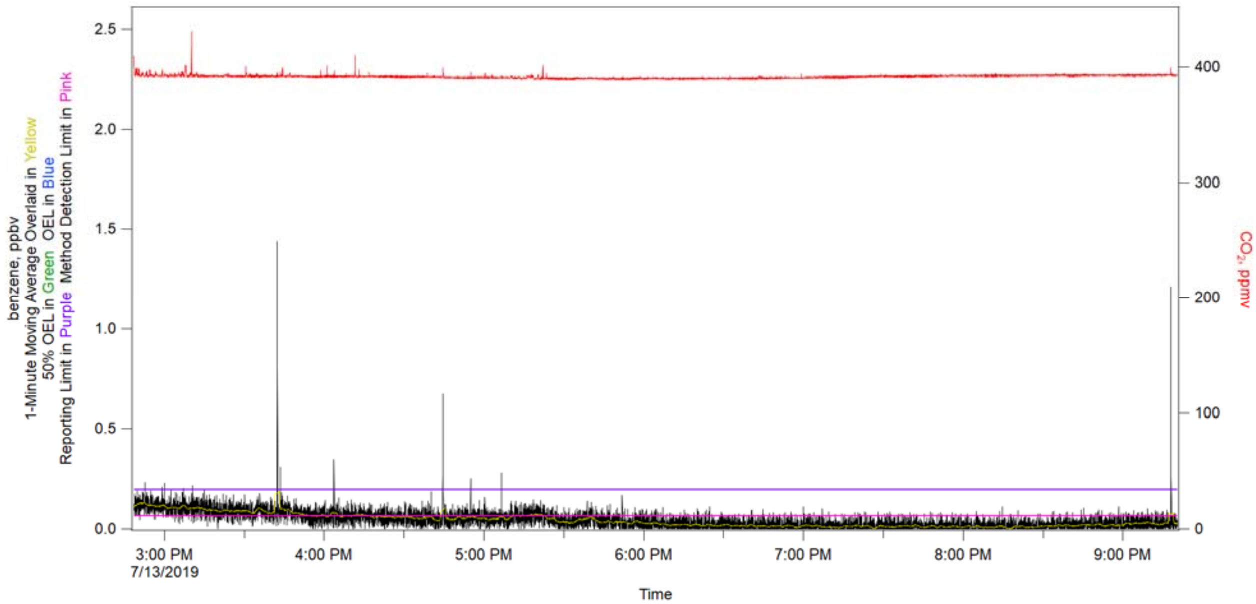

Figure 7-20. Benzene.

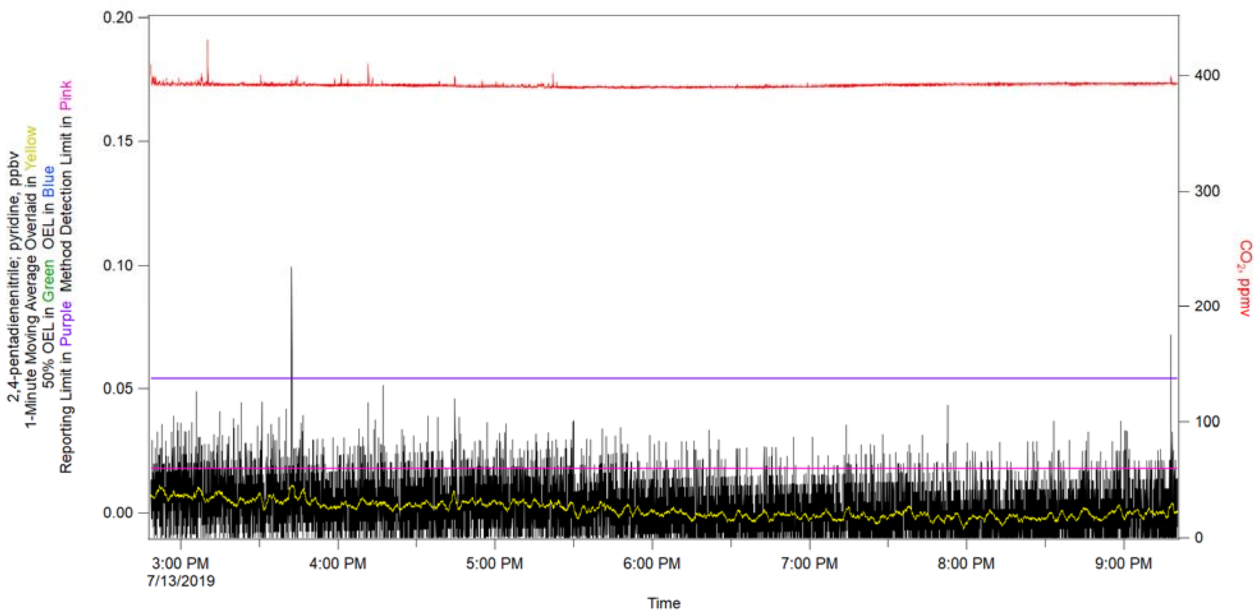

Figure 7-21. 2,4-pentadienenitrile; Pyridine.

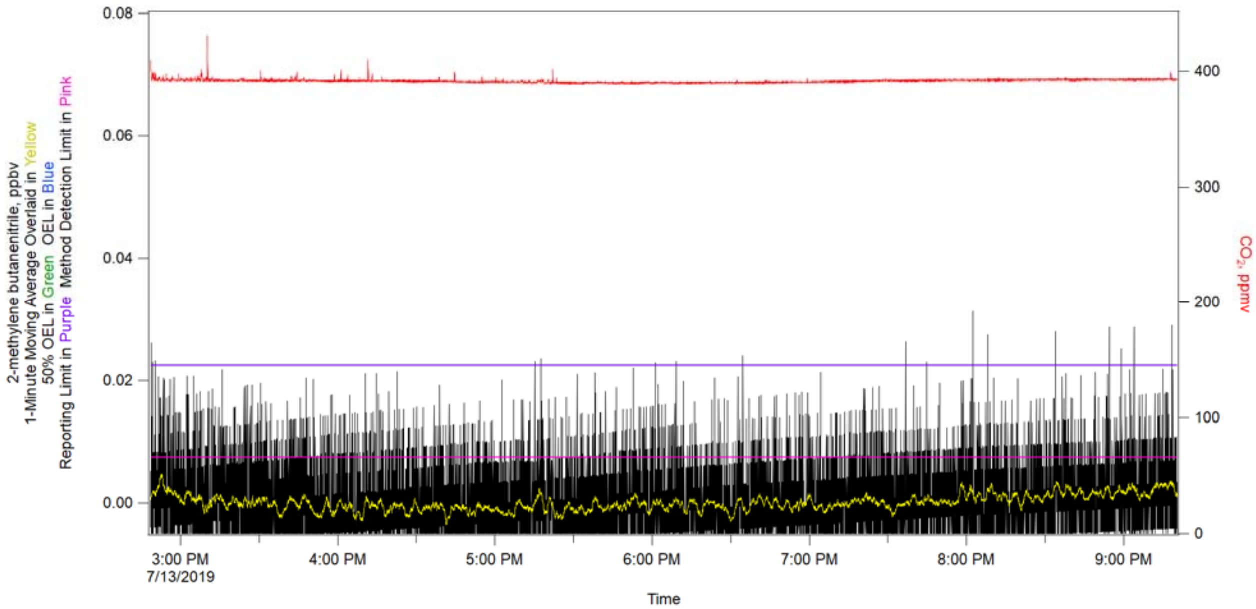

Figure 7-22. 2-methylene Butanenitrile.

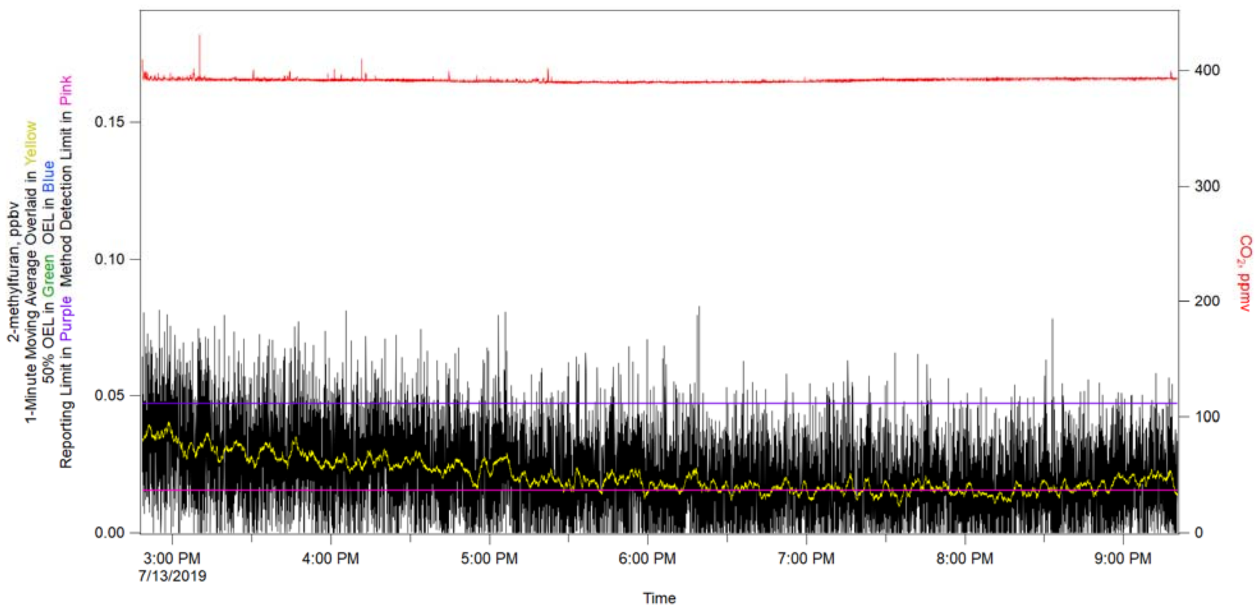

Figure 7-23. 2-methylfuran.

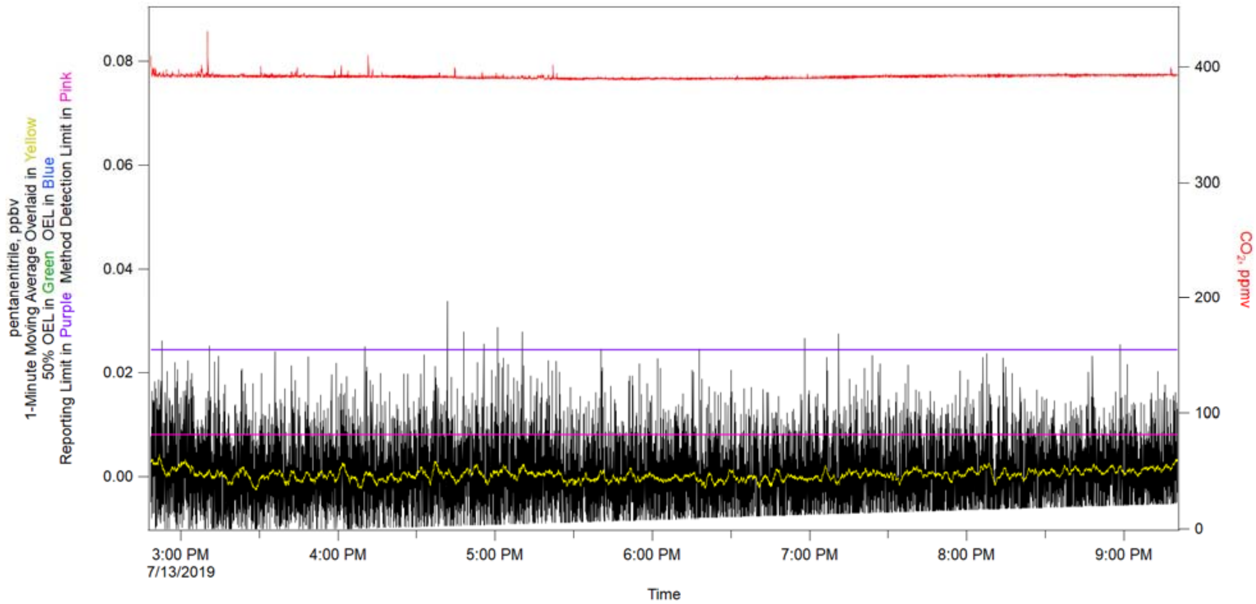

Figure 7-24. Pentanenitrile.

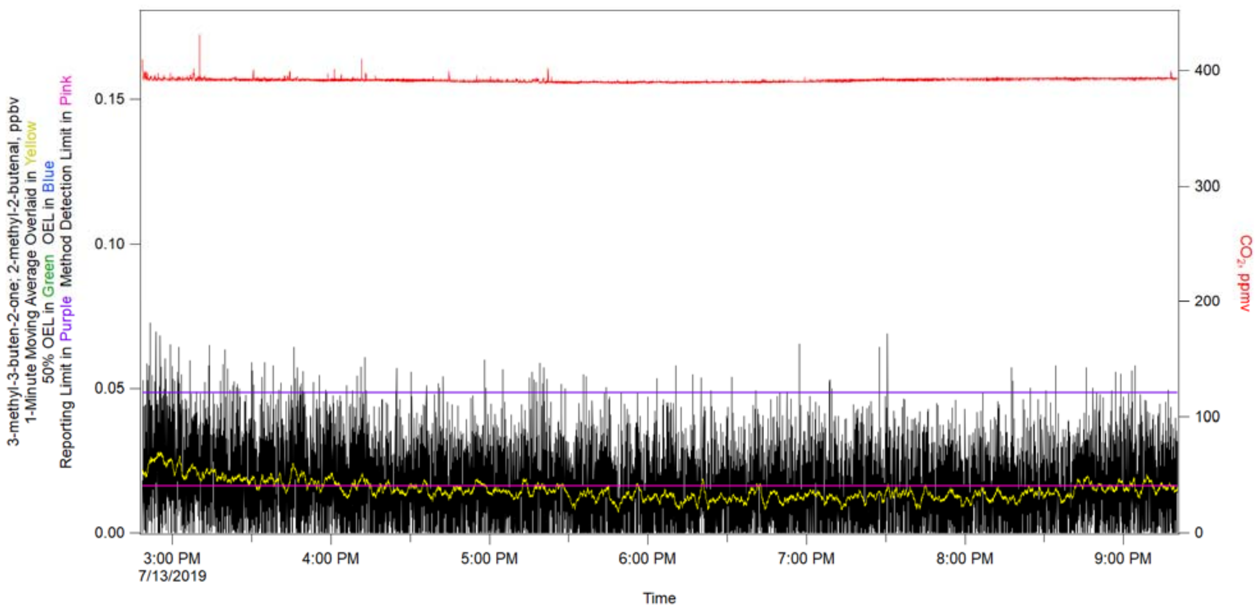

Figure 7-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

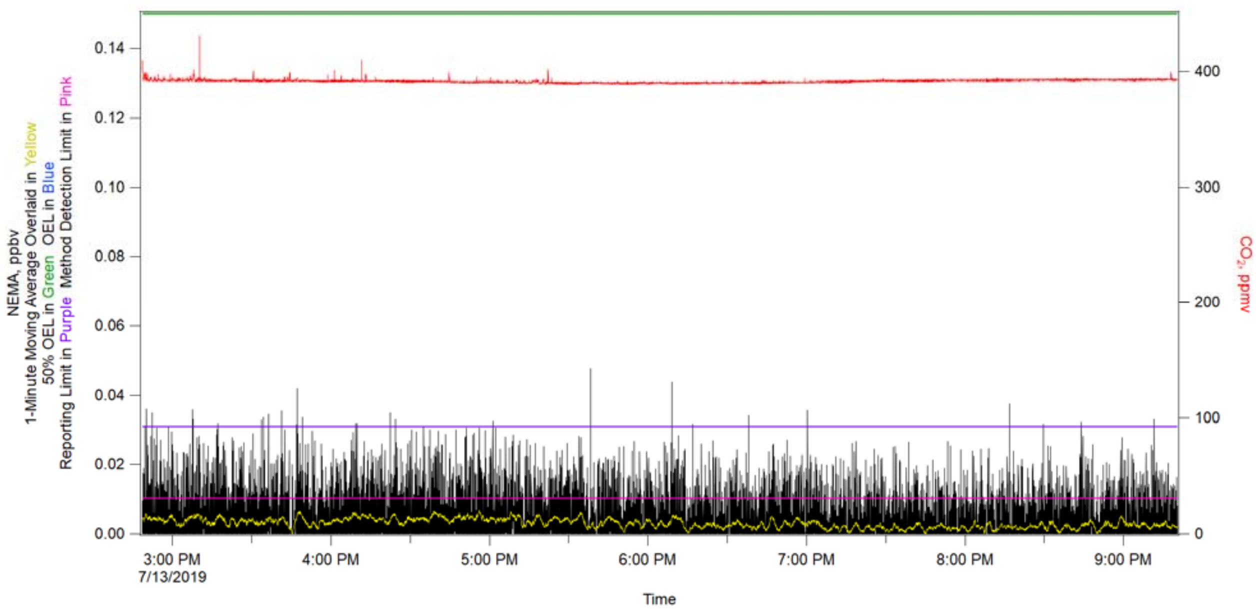

Figure 7-26. N-nitrosomethylethylamine (NEMA).

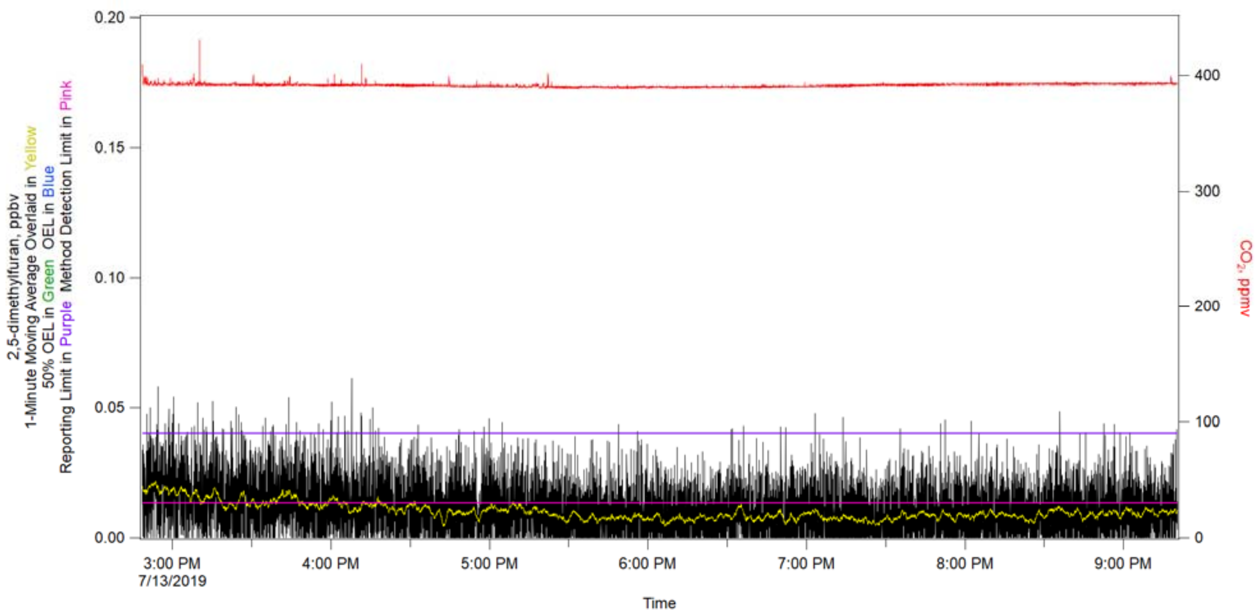

Figure 7-27. 2,5-dimethylfuran.

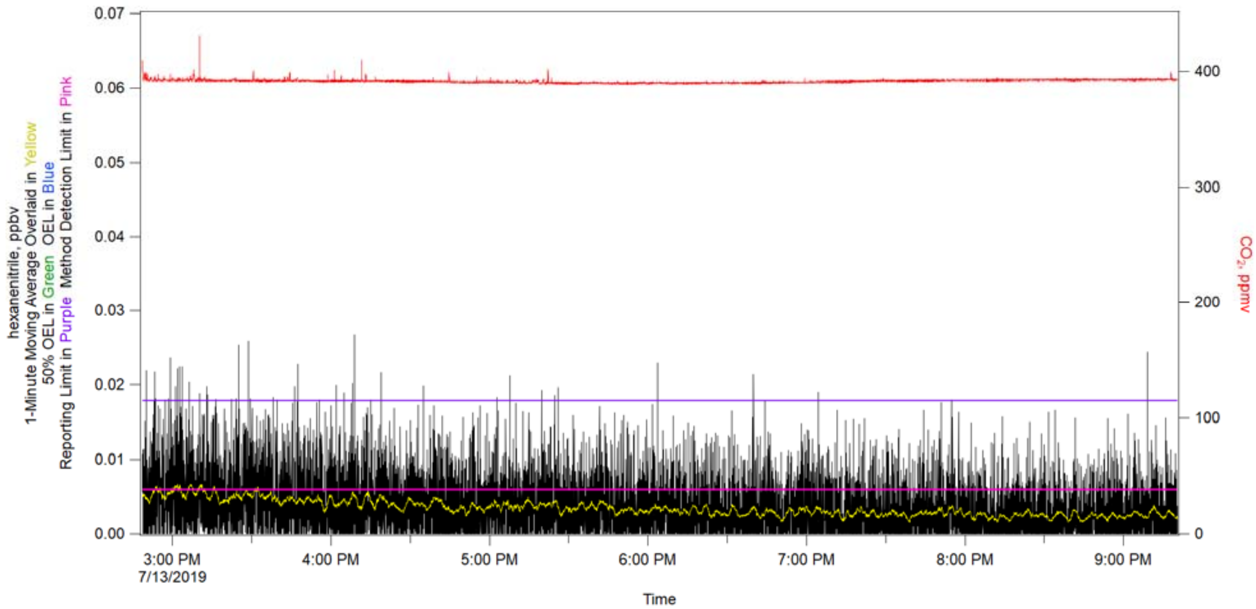

Figure 7-28. Hexanenitrile.

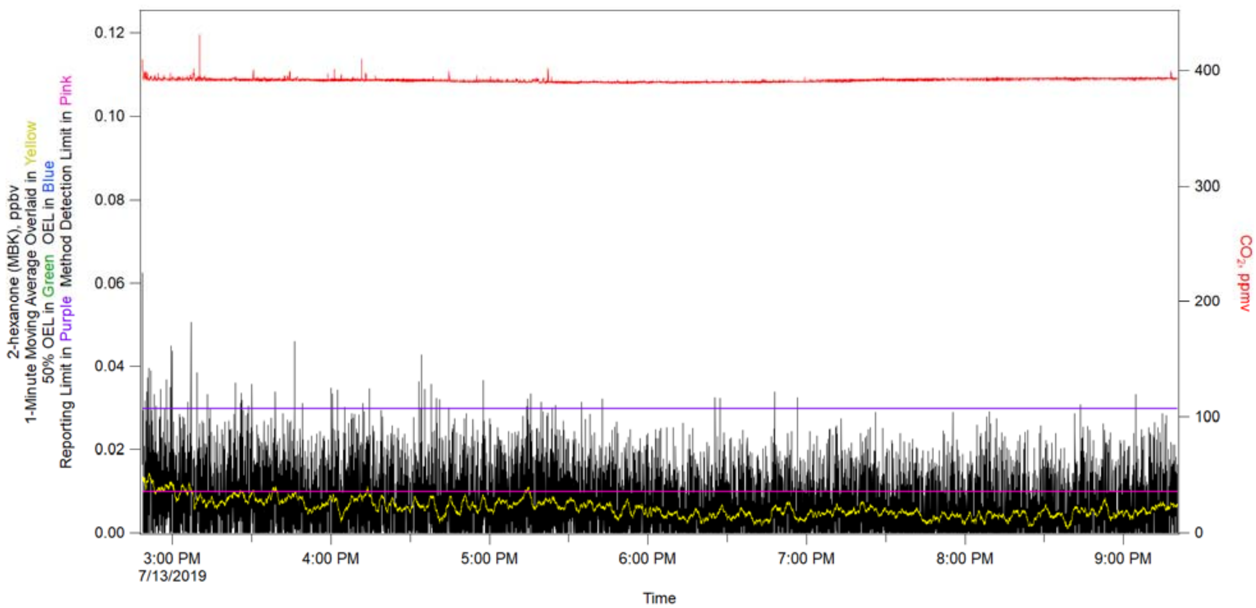

Figure 7-29. 2-hexanone (MBK).

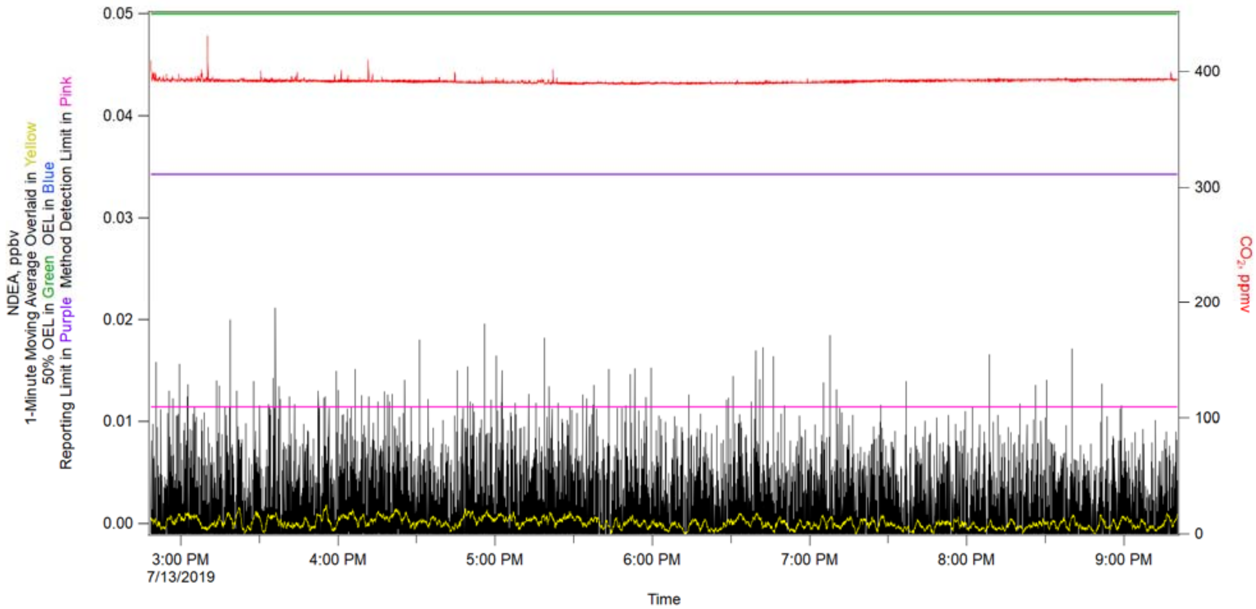

Figure 7-30. N-nitrosodiethylamine (NDEA).

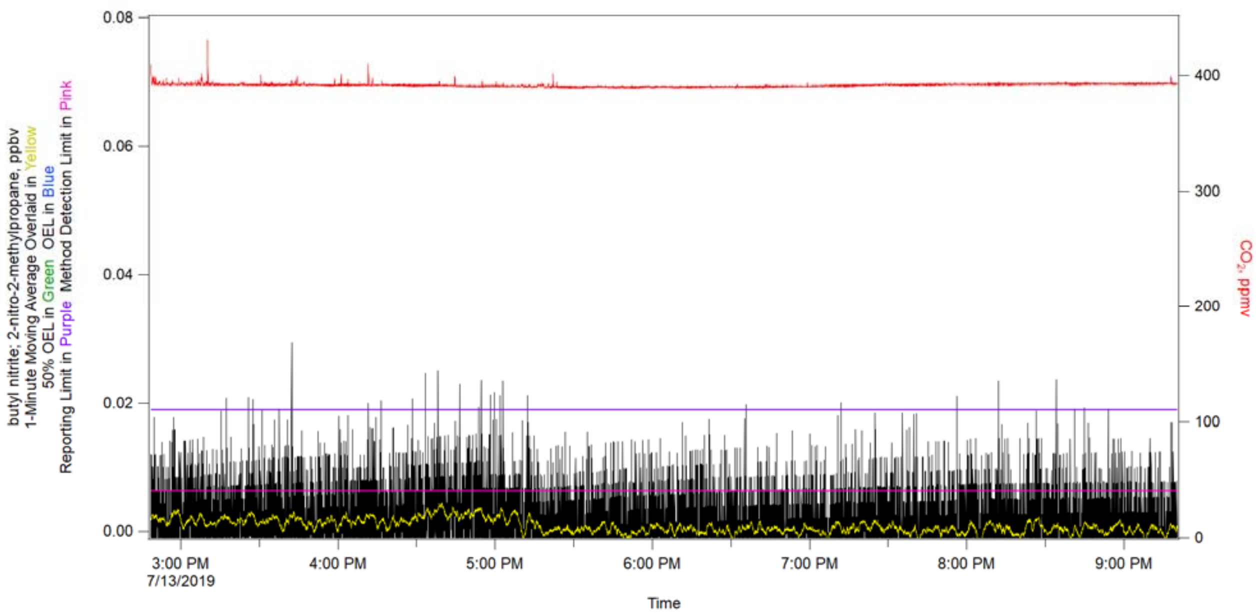

Figure 7-31. Butyl Nitrite; 2-nitro-2-methylpropane.

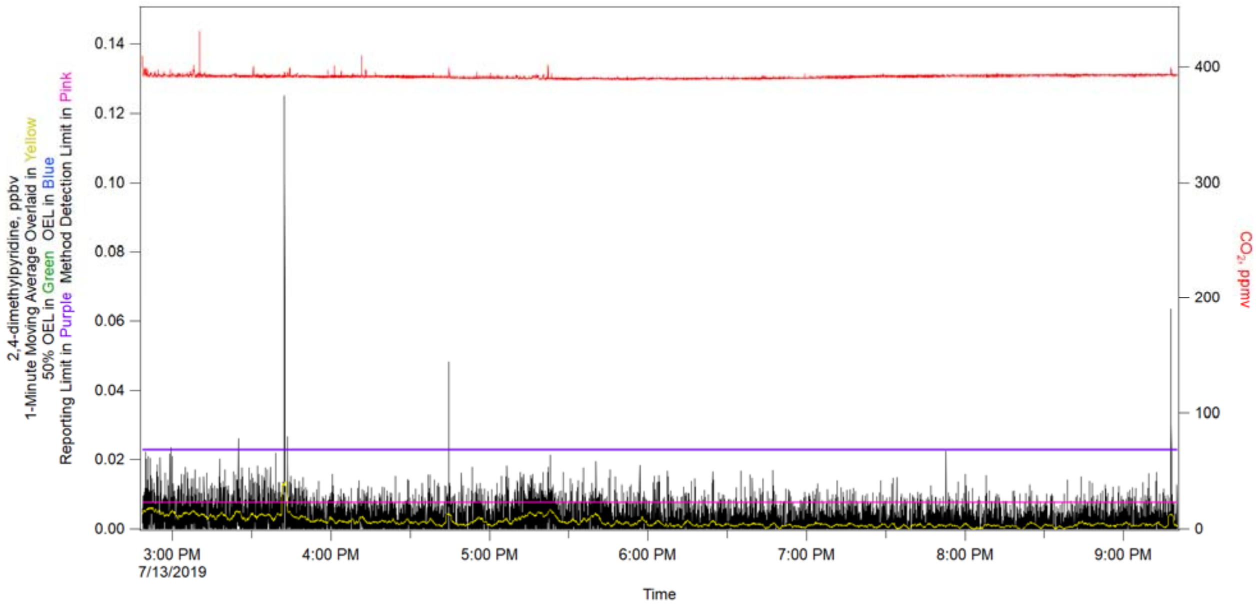

Figure 7-32. 2,4-dimethylpyridine.

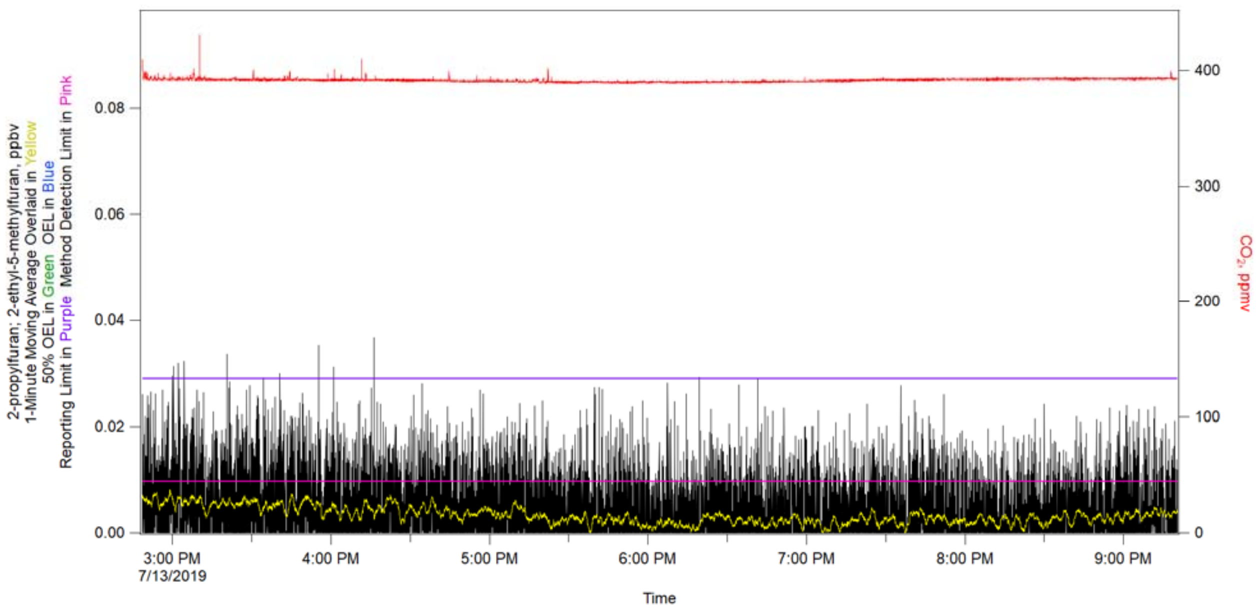

Figure 7-33. 2-propylfuran; 2-ethyl-5-methylfuran.

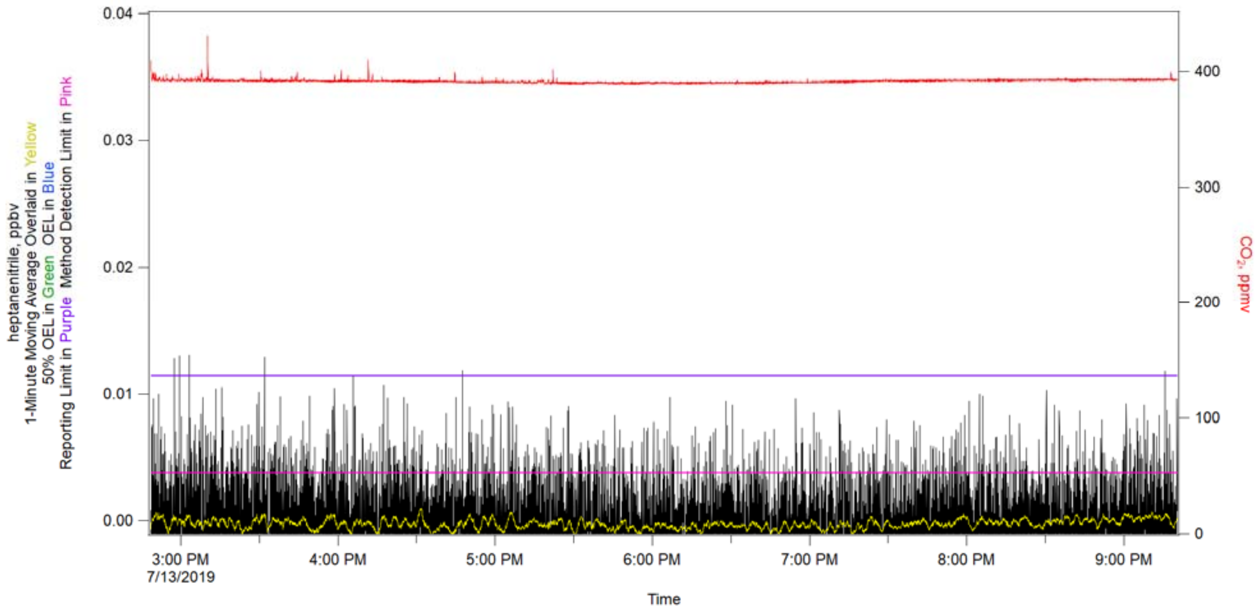

Figure 7-34. Heptanenitrile.

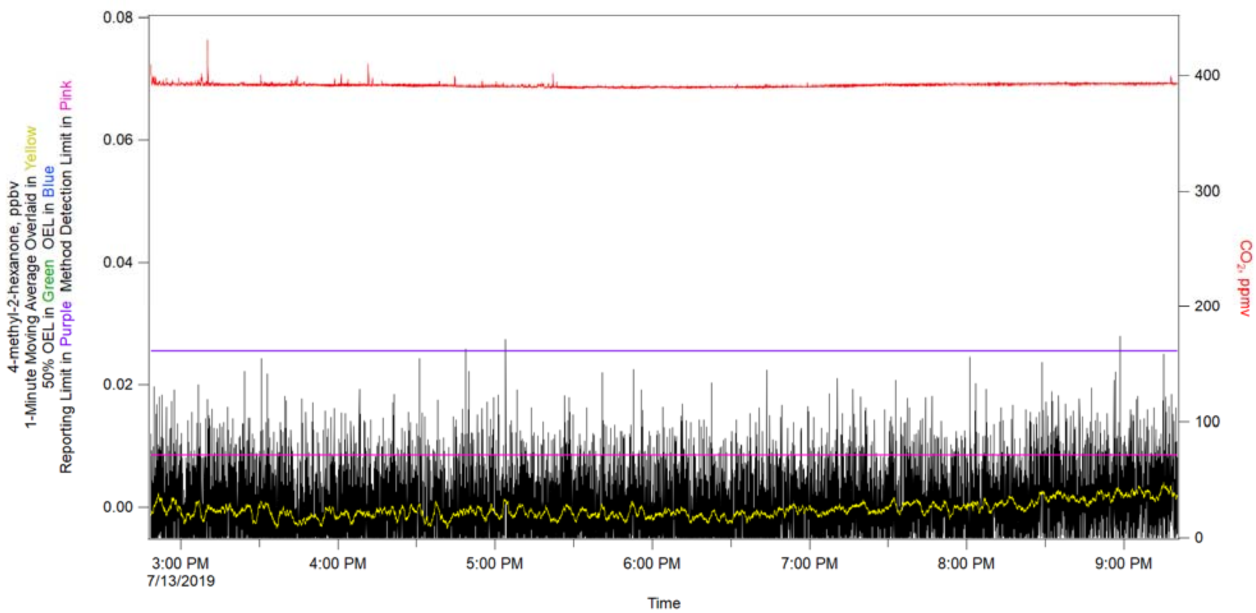

Figure 7-35. 4-methyl-2-hexanone.

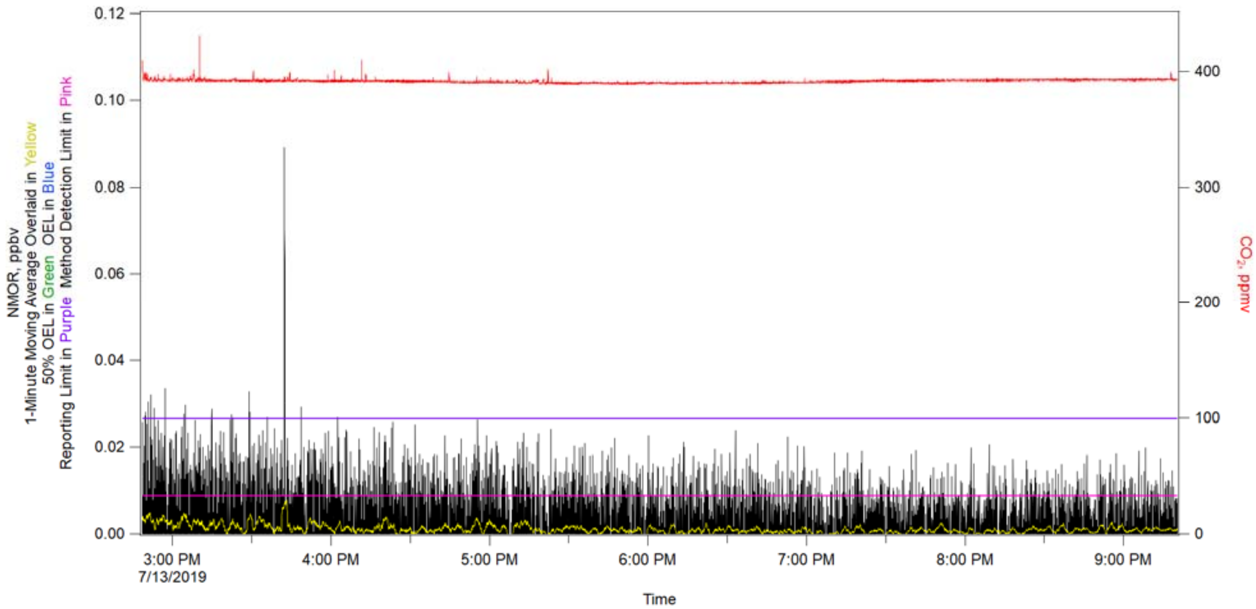

Figure 7-36. N-nitrosomorpholine (NMOR).

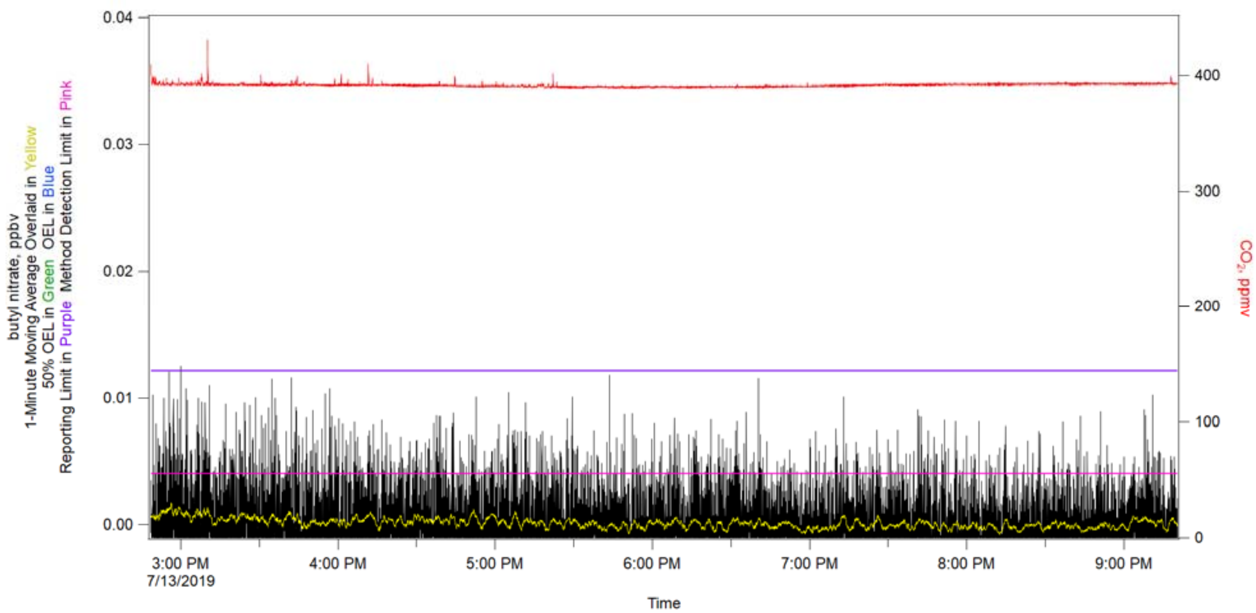

Figure 7-37. Butyl Nitrate.

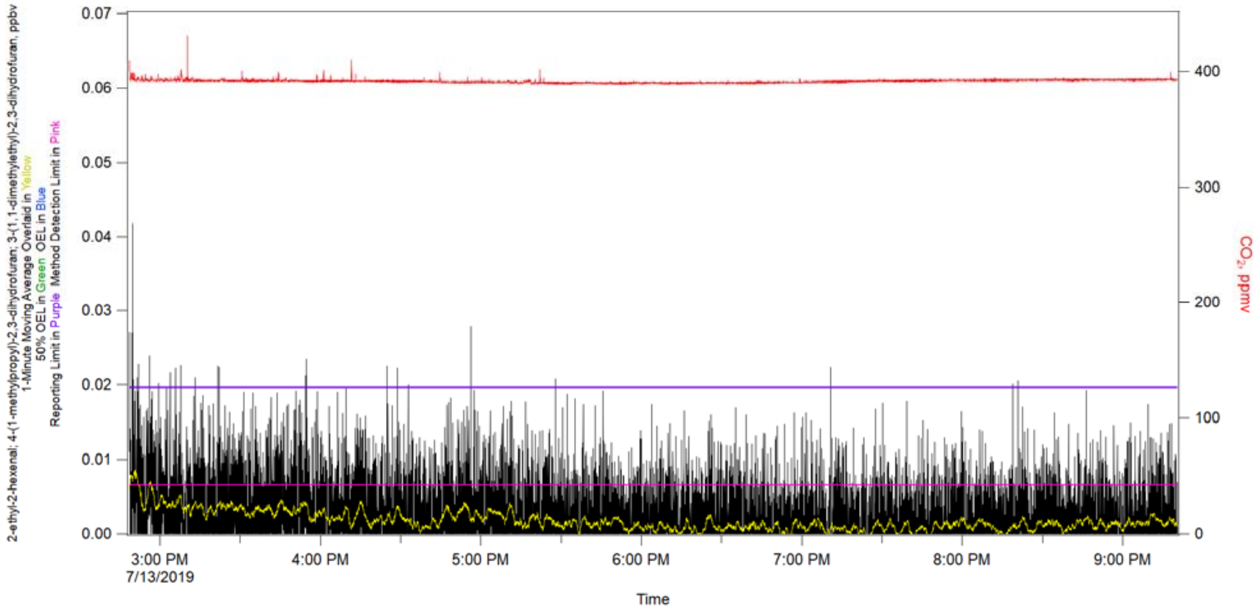

Figure 7-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

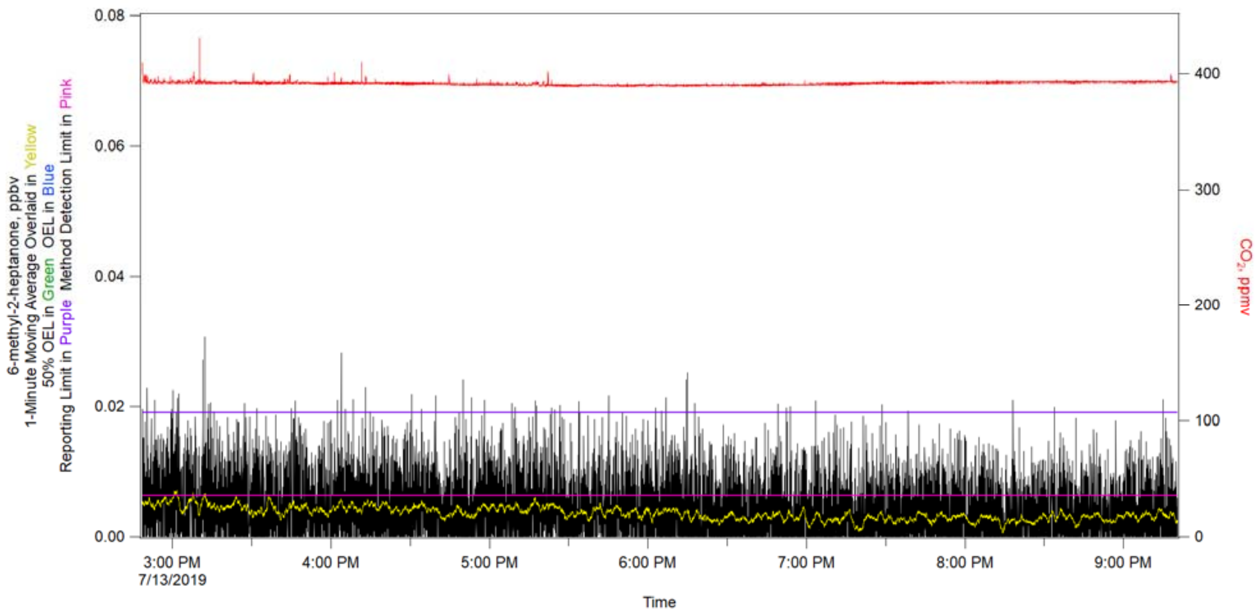

Figure 7-39. 6-methyl-2-heptanone.

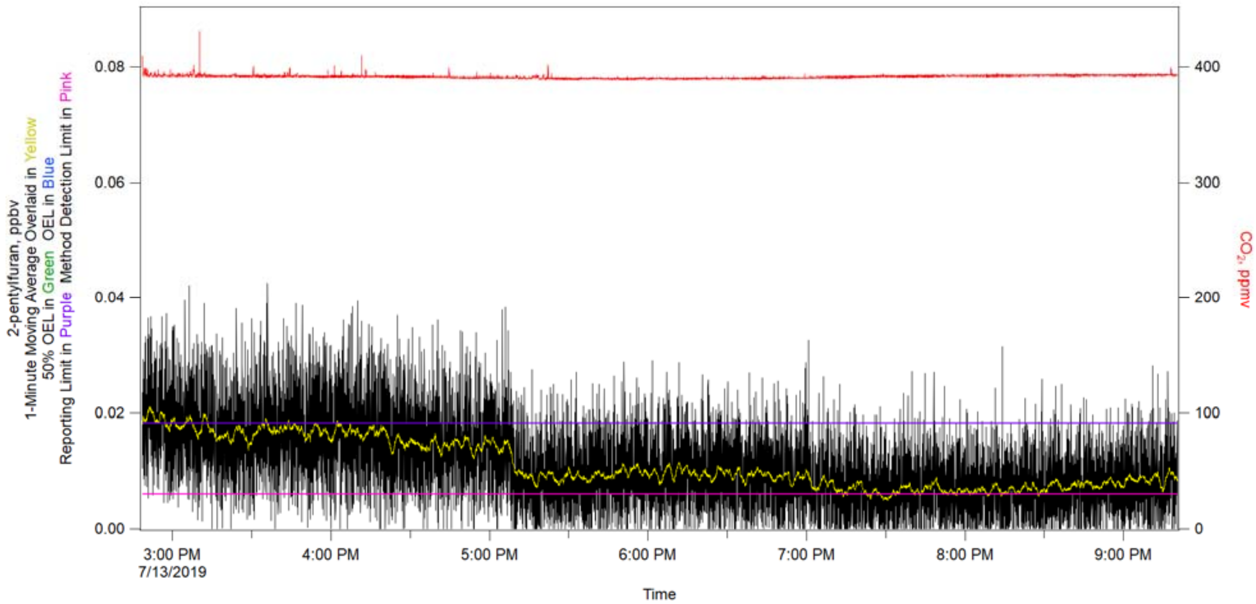

Figure 7-40. 2-pentylfuran.

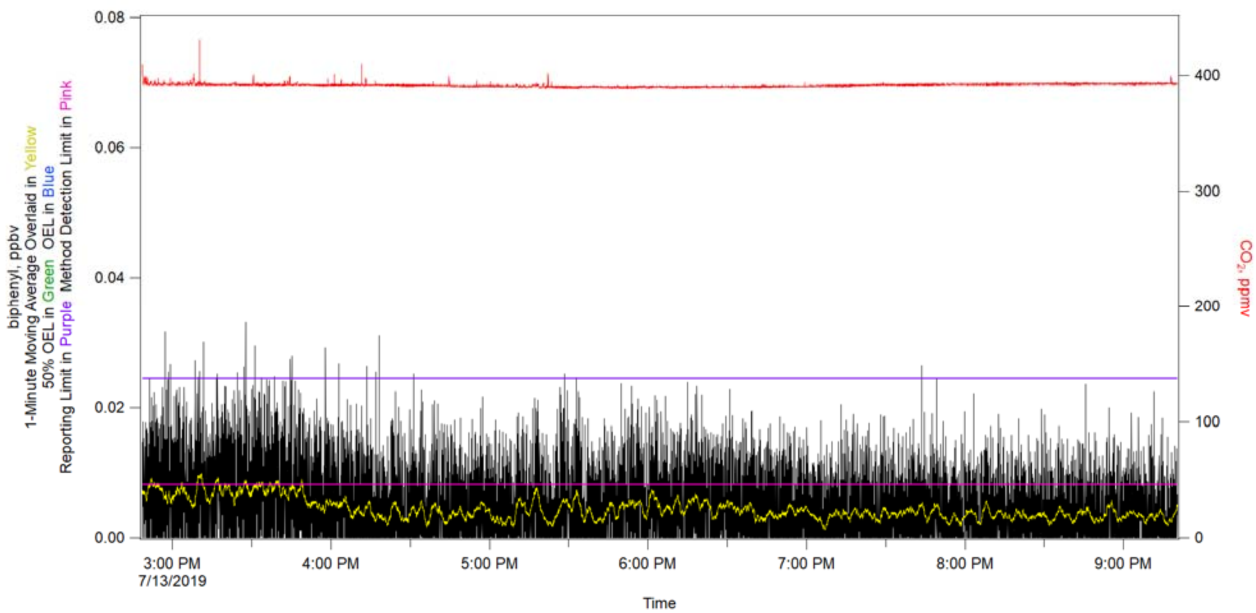

Figure 7-41. Biphenyl.

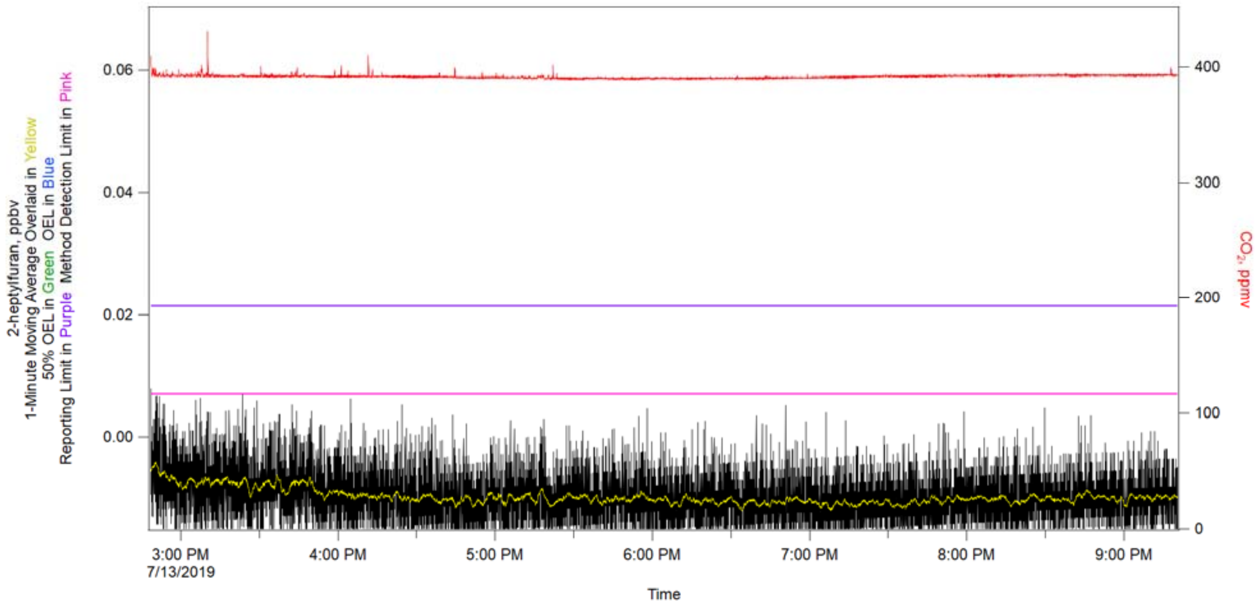

Figure 7-42. 2-heptylfuran.

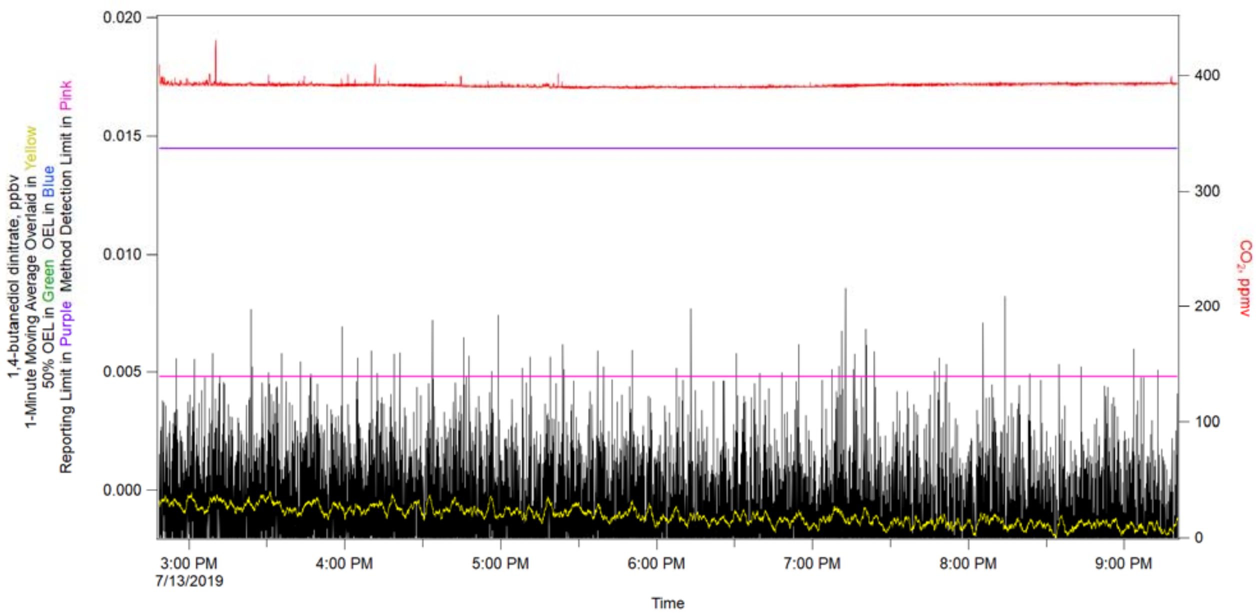

Figure 7-43. 1,4-butanediol Dinitrate.

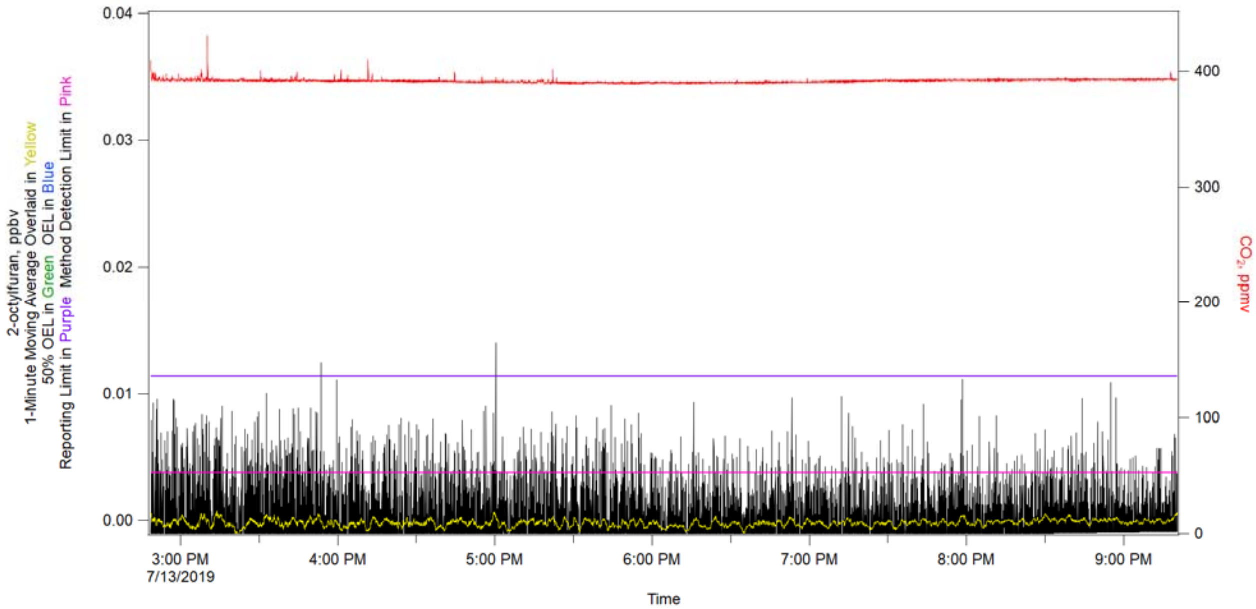

Figure 7-44. 2-octylfuran.

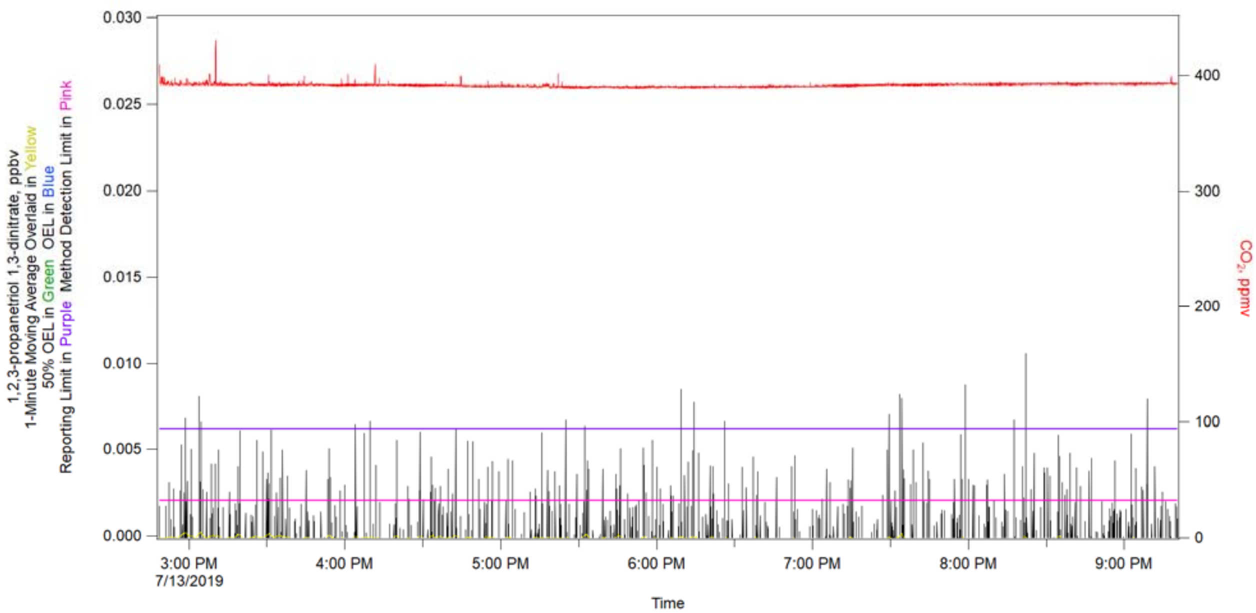

Figure 7-45. 1,2,3-propanetriol 1,3-dinitrate.

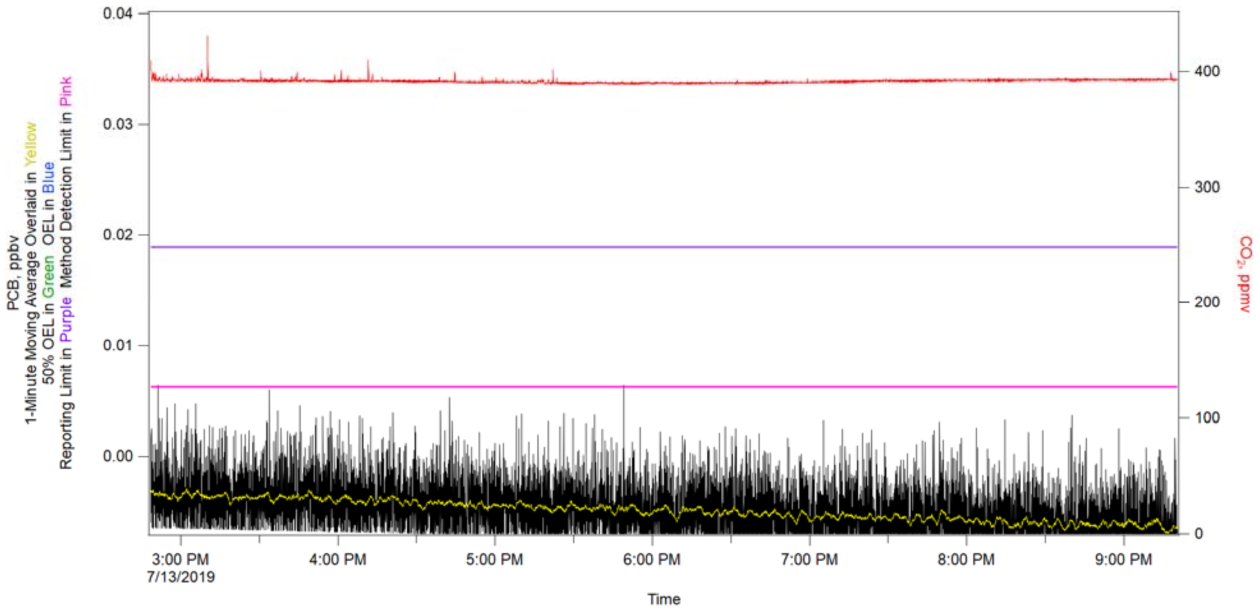

Figure 7-46. PCB.

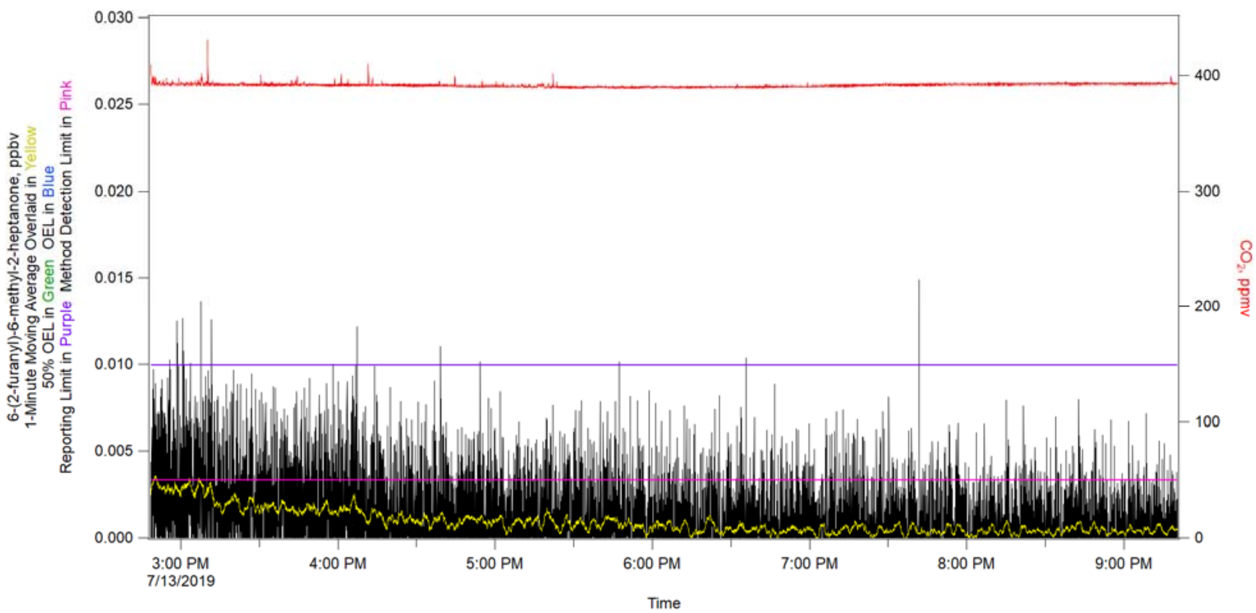

Figure 7-47. 6-(2-furanyl)-6-methyl-2-heptanone.

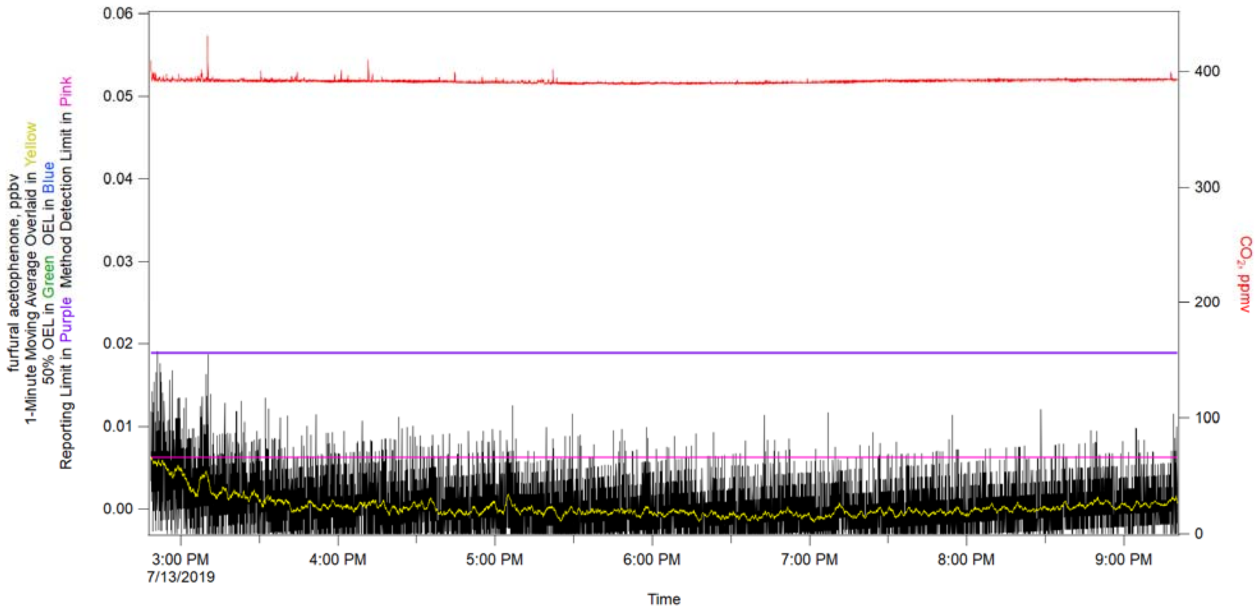

Figure 7-48. Furfural Acetophenone.

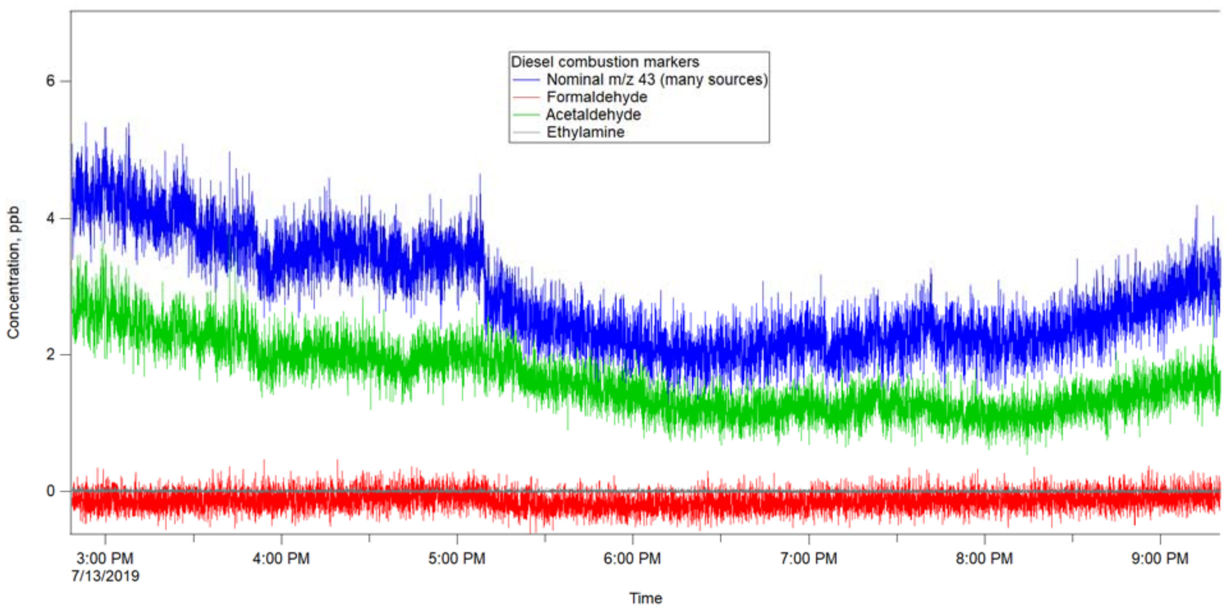

Figure 7-49. Diesel Combustion Markers.

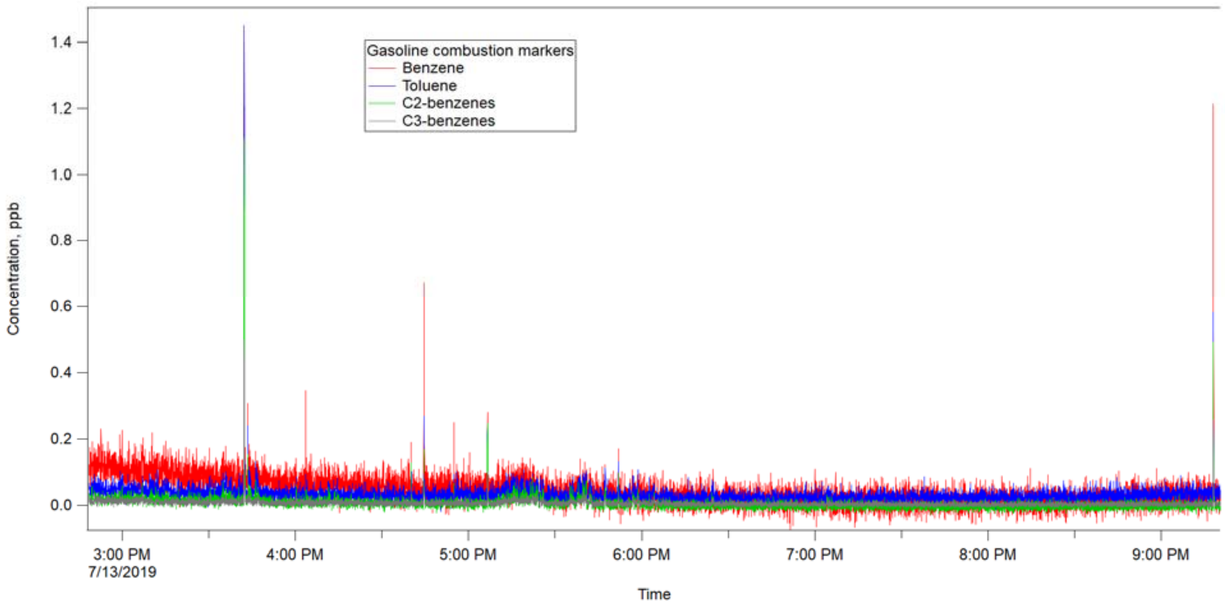

Figure 7-50. Gasoline Combustion Markers.

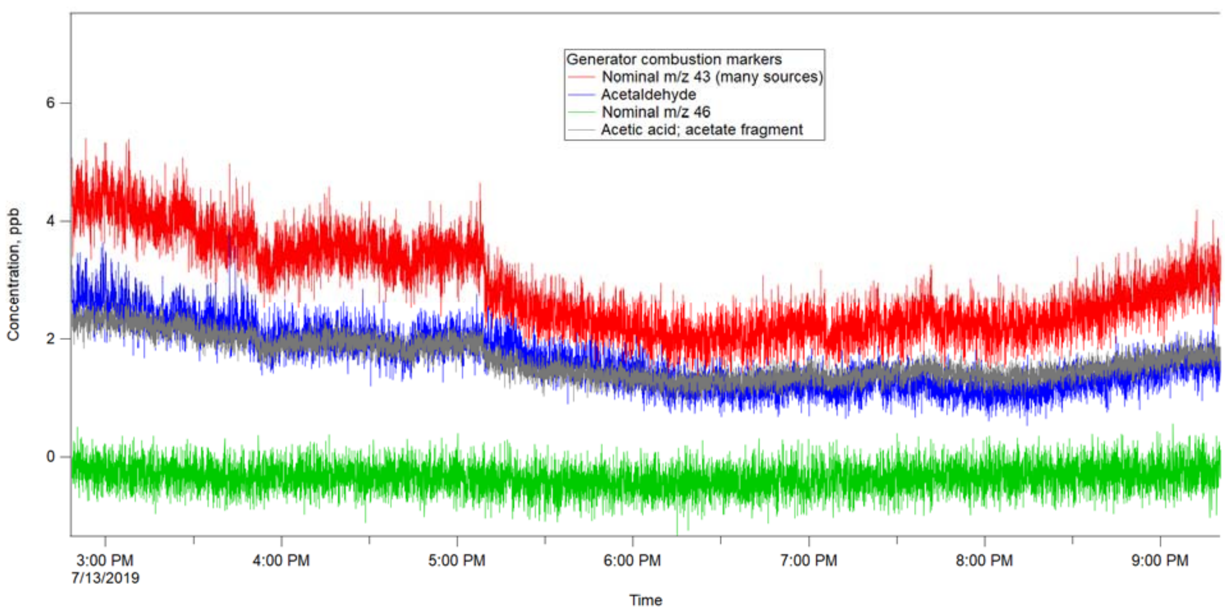

Figure 7-51. Generator Combustion Markers.

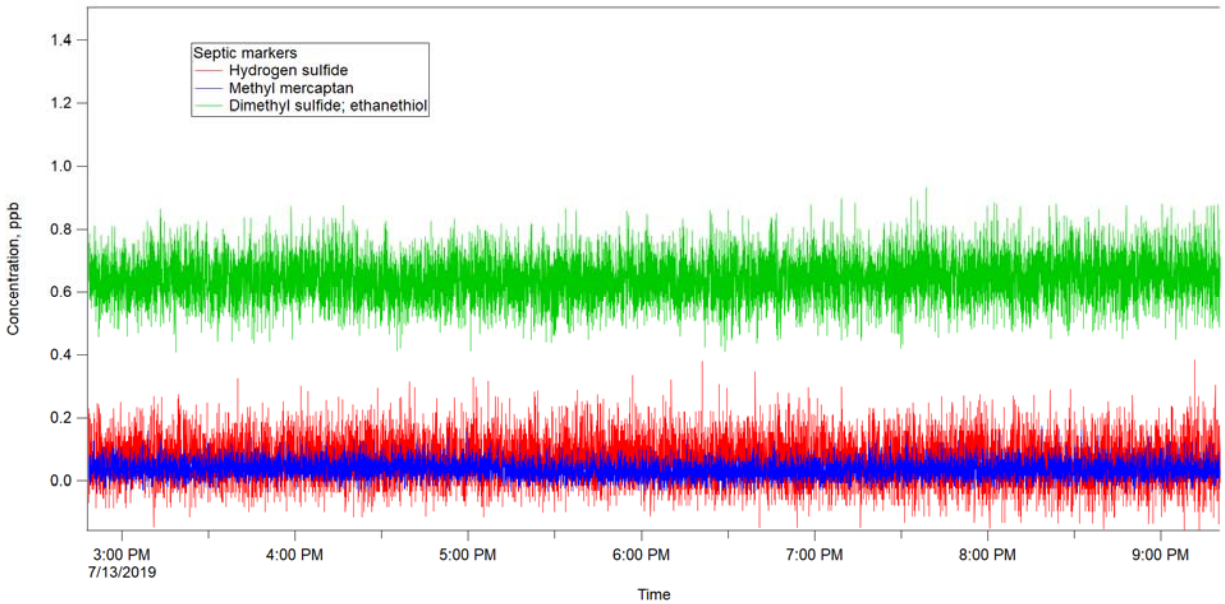

Figure 7-52. Septic Markers.

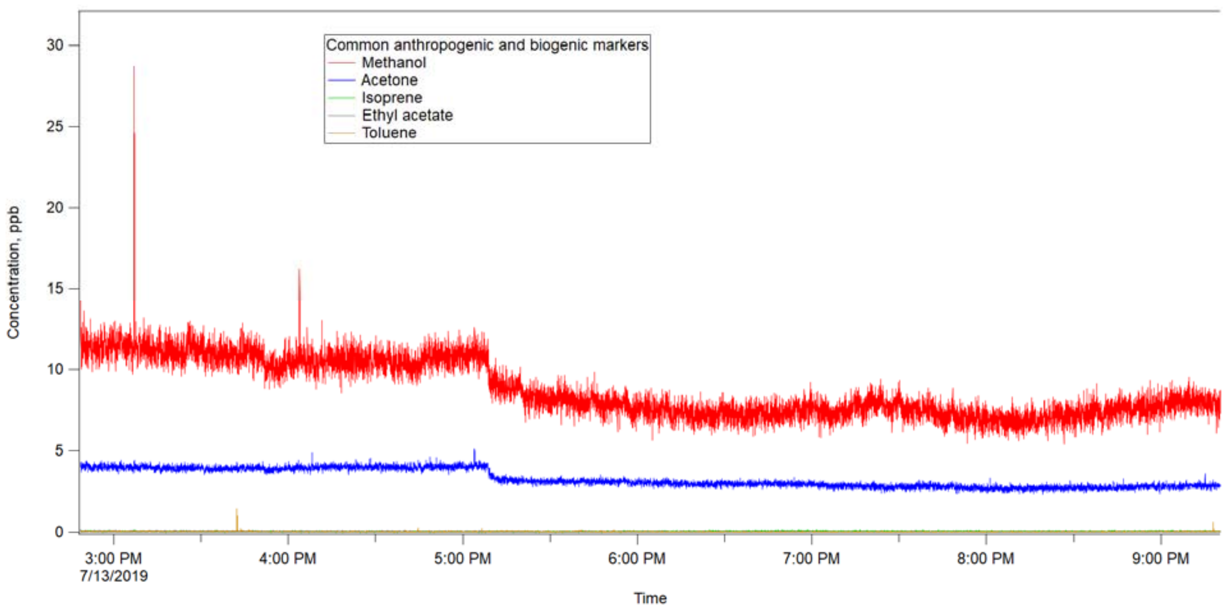

Figure 7-53. Plant and Human Markers.

8.0 DATA PROCESSING AND REPORTING

During the week of July 7, 2019, to July 14, 2019, the data processing team continued processing data from the previous week and current week. The reporting team worked towards the completion of reports for Week 43 through Week 47, and Month 7 through Month 10. The draft reports 53005-81-RPT-060, *Weekly Report for Week 42 (May 19, 2019 – May 25, 2019)* and 53005-81-RPT-061, *Weekly Report for Week 43 (May 26, 2019 – June 1, 2019)* were submitted.

9.0 REFERENCES

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