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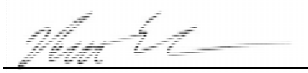

Date: 09/20/2019

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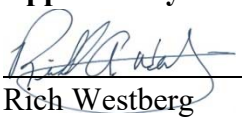

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Acronyms

AOP	Abnormal Operating Procedure
COPC	Chemical of Potential Concern
CSO	Central Shift Office
ML	Mobile Laboratory
NDMA	N-nitrosodimethylamine
NEMA	N-nitrosomethylethylamine
NMOR	N-nitrosomorpholine
OEL	Occupational Exposure Limit
PTR-MS	Proton Transfer Reaction – Mass Spectrometer
QA	Quality Assurance
QC	Quality Control
WRPS	Washington River Protection Solutions, LLC

1.0 OCTOBER 15, 2018 – OCTOBER 16, 2018 – STUDY SITE #1

1.1 Quality Assessment

Data from October 15, 2018, were assessed using Procedure 17124-DOE-HS102, "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

The Mobile Laboratory (ML) personnel performed background sampling using the ML from October 15, 2018, to October 16, 2018 at Study Site 1. Site 1 is located on the plateau northwest of the 200W Tank Farm operations. This site was chosen as an upwind site from the central Hanford Plateau. The ML arrived at Site 1 at 06:59 on October 15, 2018. The quality assurance/quality control (QA/QC) zero-air/sensitivity checks were performed on the LI-COR®[1] CO_2 monitor, the Picarro NH_3 analyzer, and the Proton Transfer Reactor – Mass Spectrometer (PTR-MS) beginning at 07:07. The data file names were confirmed and NO^+ data collection mode began at 07:58. At 09:05, ML staff switched into routine H_3O^+ data collection mode. Collection of confirmatory sorbent samples began at 09:10. The ML staff departed the monitoring site at 11:35 and checked out with the Central Shift Office (CSO).

The ML staff returned to Site 1 at 06:15 on October 16, 2018. At 06:20, confirmatory sorbent samples were disconnected from the sampling station. The ML staff moved to Site 2 at 07:08.

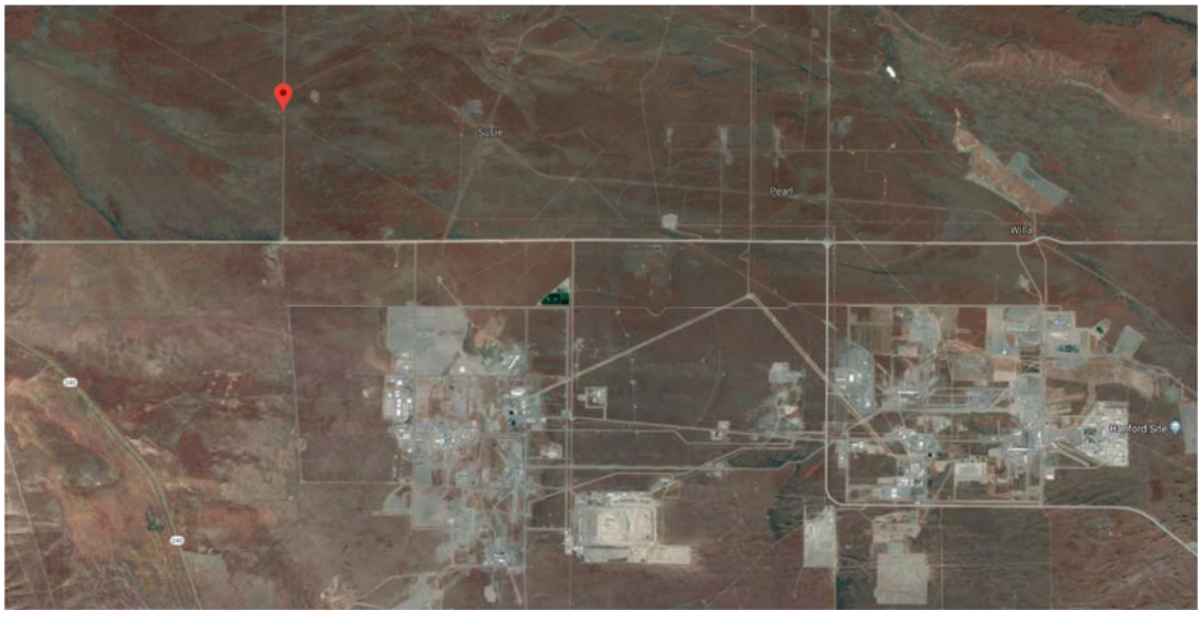

Figure 1-1. Mobile Laboratory Site #1 for the Duration of the Monitoring Period.

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

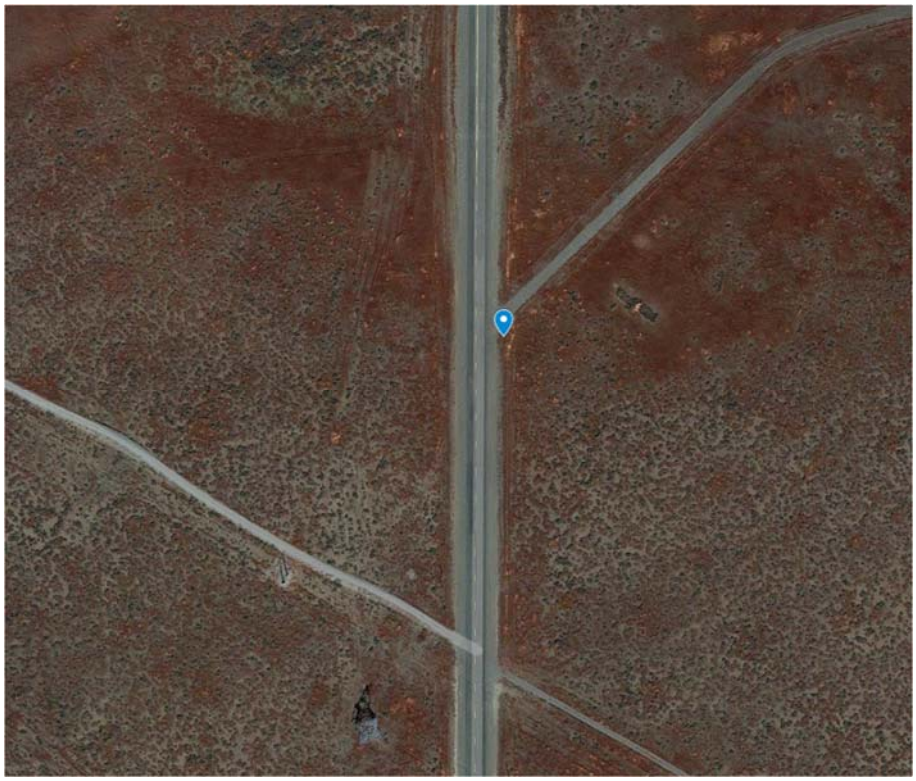

Figure 1-2. Location of the Mobile Laboratory for the Duration of the Monitoring Period.

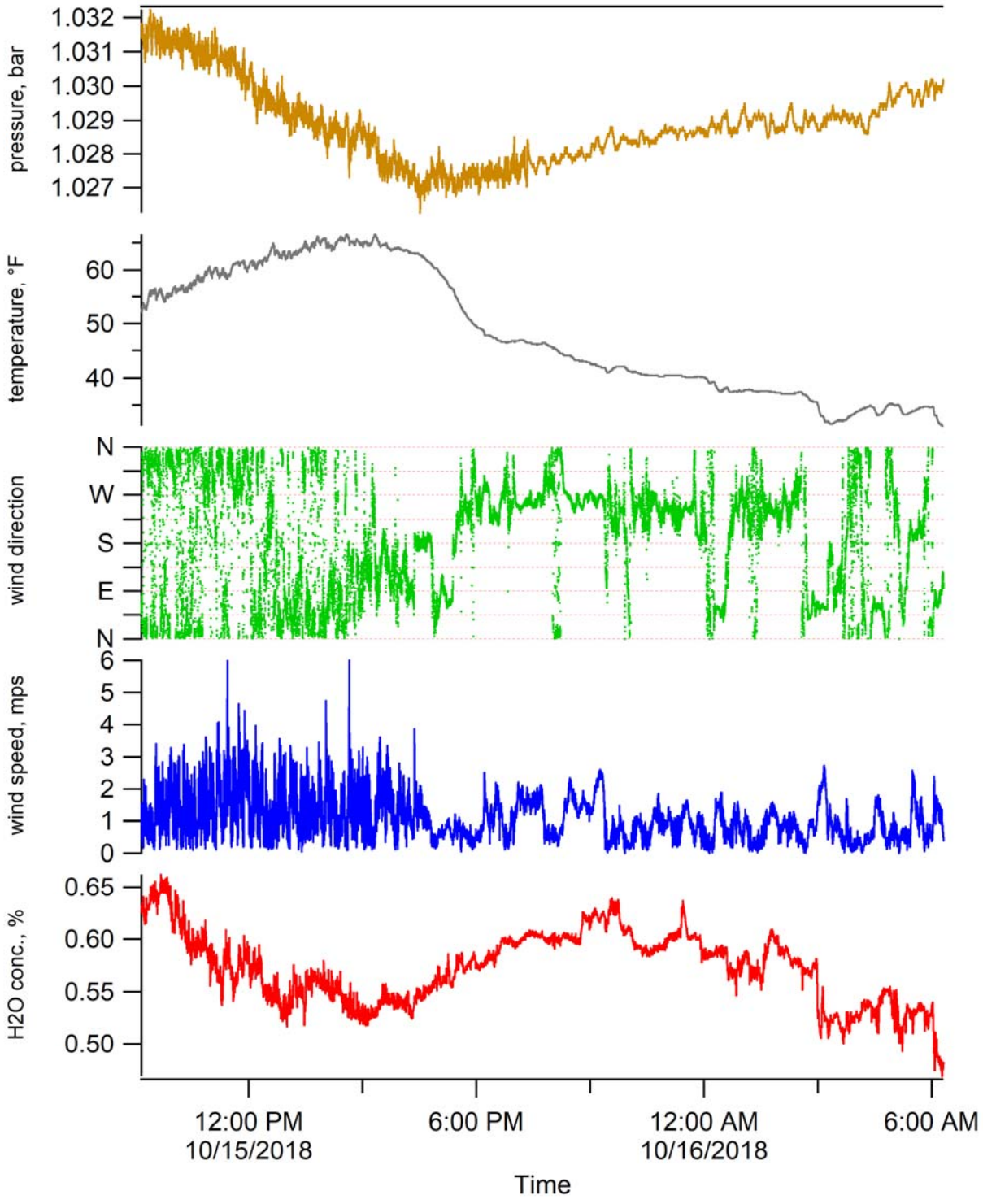

Figure 1-3. Weather Data.

1.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

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

Confirmatory air samples were collected as follows:

Table 1-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
1	10/15/18	Thermosorb®[2]/N	EL33210	09:10	12:10	180
1	10/15/18	Carbotrap®[3]-300	A052450	09:10	15:10	360
1	10/15/18	LpDNPH	181015-A	09:10	12:10	180

Table 1-2 displays the statistical information for the monitoring period of October 15, 2018, to October 16, 2018. By definition, the occupational exposure limit (OEL) is an 8-hour, time-weighted average that establishes a limit for personnel exposures to hazardous chemicals. It is the exposure level to which a person may be exposed for 8 hours/day, 40 hours/week for 40 years and have no expectation of adverse health effects. In this study, area vapor concentration measurements were made to better understand the hazardous vapor exposures that workers may receive. These measurements are only compared to OEL concentrations to give them context. It is neither accurate nor appropriate to interpret these short duration measurements (2 seconds) as worker exposure levels. Since the OEL is defined as a time-weighted average, it is more appropriate to compare them to daily average vapor concentrations. Short duration excursions above the OEL concentration are not significant.

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

Table 1-2. Statistical Information for the Monitoring Period of October 15, 2018 – October 16, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	Ammonia	25000	5.056	2.671	52.818	14.203	4.133
2	formaldehyde	300	1.343	0.295	21.970	6.519	1.316
3	Methanol	200000	8.347	2.110	25.283	17.979	7.561
4	acetonitrile	20000	18.155	10.450	57.560	128.336	17.633
5	acetaldehyde	25000	4.652	1.687	36.265	16.107	4.144
6	ethylamine	5000	0.025	0.011	45.060	0.109	0.023
7	1,3-butadiene	1000	0.157	0.079	50.692	1.468	0.144
8	propanenitrile	6000	0.045	0.015	33.763	0.187	0.043
9	2-propenal	100	0.163	0.138	84.371	3.276	0.135
10	1-butanol + butenes	20000	0.106	0.043	41.068	0.778	0.099
11	methyl isocyanate	20	0.099	0.035	35.042	0.340	0.097
12	methyl nitrite	100	0.094	0.065	69.798	1.618	0.082
13	furan	1	0.034	0.022	66.719	0.302	0.028
14	butanenitrile	8000	0.015	0.008	56.004	0.100	0.013
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.056	0.040	71.810	N/A*	N/A*
16	butanal	25000	0.170	0.046	26.821	0.514	0.162
17	NDMA**	0.3	0.051	0.051	99.348	0.307	0.035
18	benzene	500	0.144	0.062	43.162	1.740	0.125
19	2,4-pentadienenitrile + pyridine	300, 1000	0.033	0.011	33.021	0.144	0.031
20	2-methylene butanenitrile	300	0.015	0.008	55.969	0.093	0.013
21	2-methylfuran	1	0.032	0.022	68.179	0.352	0.028
22	pentanenitrile	6000	0.010	0.006	60.267	0.060	0.009
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.036	0.019	54.606	0.290	0.032
24	NEMA**	0.3	0.011	0.013	118.205	0.102	0.006
25	2,5-dimethylfuran	1	0.022	0.015	71.430	0.240	0.018
26	hexanenitrile	6000	0.005	0.004	87.074	0.058	0.004
27	2-hexanone (MBK)	5000	0.017	0.009	53.552	0.071	0.016
28	NDEA**	0.1	0.007	0.007	107.420	0.047	0.004
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.061	0.016	26.398	0.127	0.060
30	2,4-dimethylpyridine	500	0.033	0.024	73.111	0.145	0.024

Table 1-2. Statistical Information for the Monitoring Period of October 15, 2018 – October 16, 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	0.053	0.017	32.508	0.151	0.052
32	heptanenitrile	6000	0.056	0.017	30.063	0.127	0.056
33	4-methyl-2-hexanone	500	0.057	0.017	29.687	0.137	0.057
34	NMOR**	0.6	0.008	0.013	161.774	0.102	0.000
35	butyl nitrate	2500	0.033	0.014	42.282	0.106	0.032
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.050	0.015	30.131	0.138	0.050
37	6-methyl-2-heptanone	8000	0.051	0.014	28.529	0.112	0.050
38	2-pentylfuran	1	0.048	0.014	29.386	0.122	0.047
39	Biphenyl	200	0.038	0.015	40.306	0.100	0.038
40	2-heptylfuran	1	0.213	0.046	21.418	0.373	0.218
41	1,4-butanediol dinitrate	50	0.070	0.019	27.669	0.159	0.070
42	2-octylfuran	1	0.002	0.008	375.776	0.114	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.002	0.009	437.146	0.113	0.000
44	PCB	1000	0.085	0.020	23.605	0.152	0.086
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.042	0.014	32.443	0.097	0.042
46	furfural acetophenone	1	0.201	0.043	21.324	0.324	0.205

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.767 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].

The following figures display a selection of 16 chemical of potential concern (COPC) signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period October 15, 2018, to October 16, 2018. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

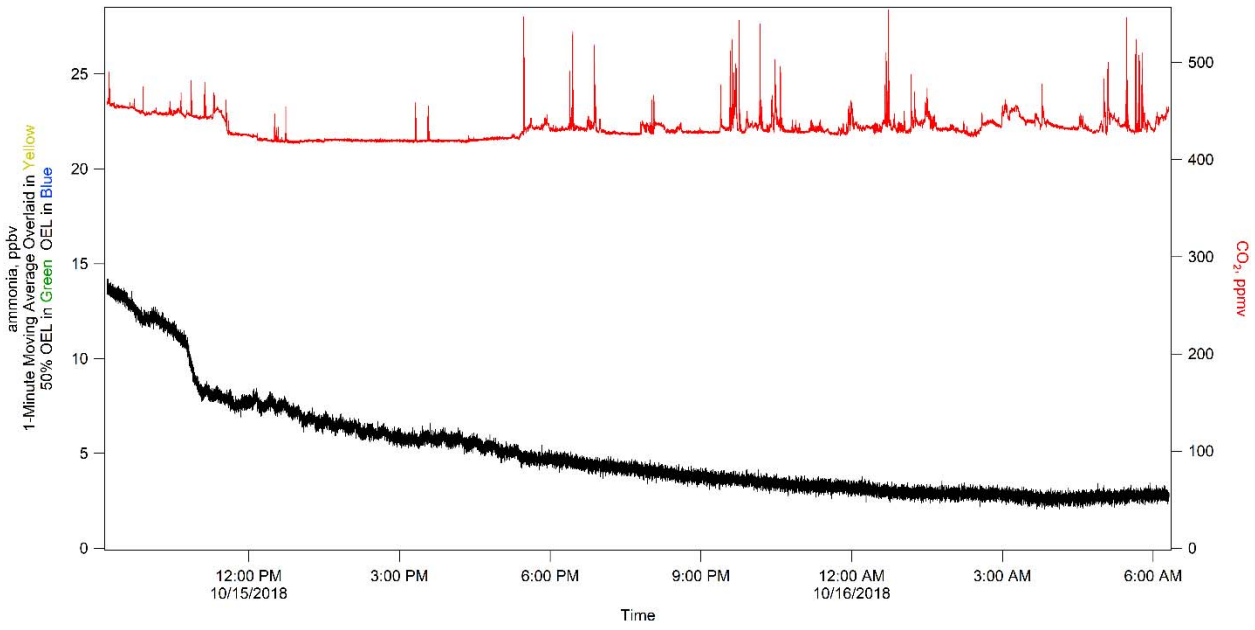

Figure 1-4. Ammonia.

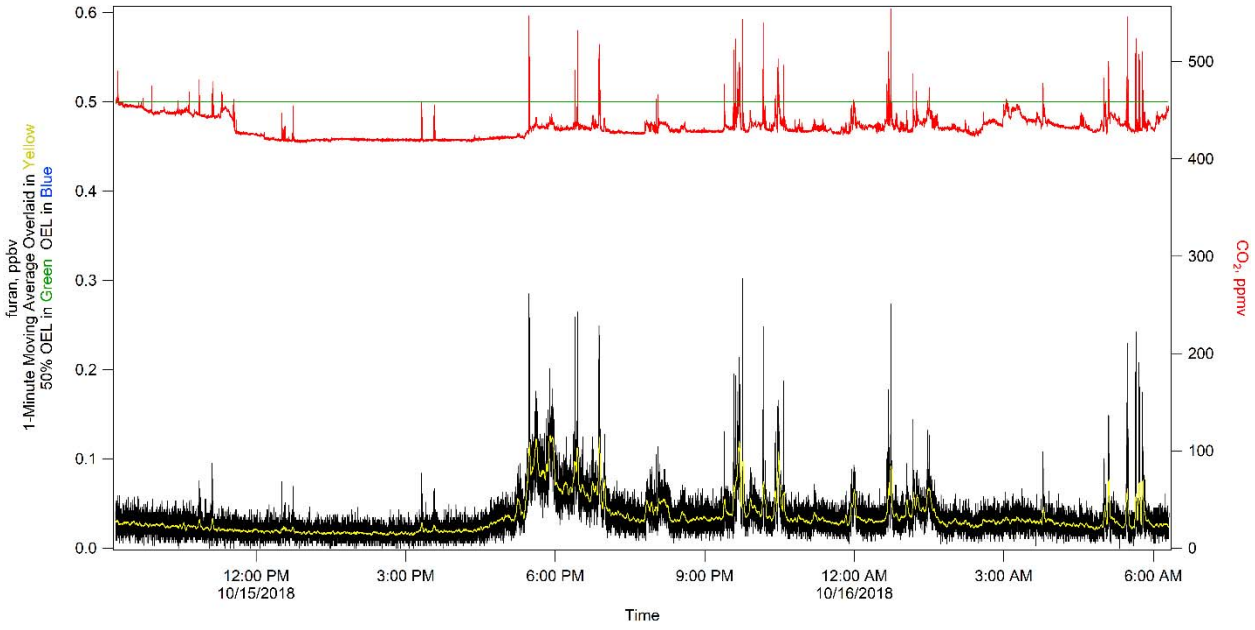

Figure 1-5. Furan.

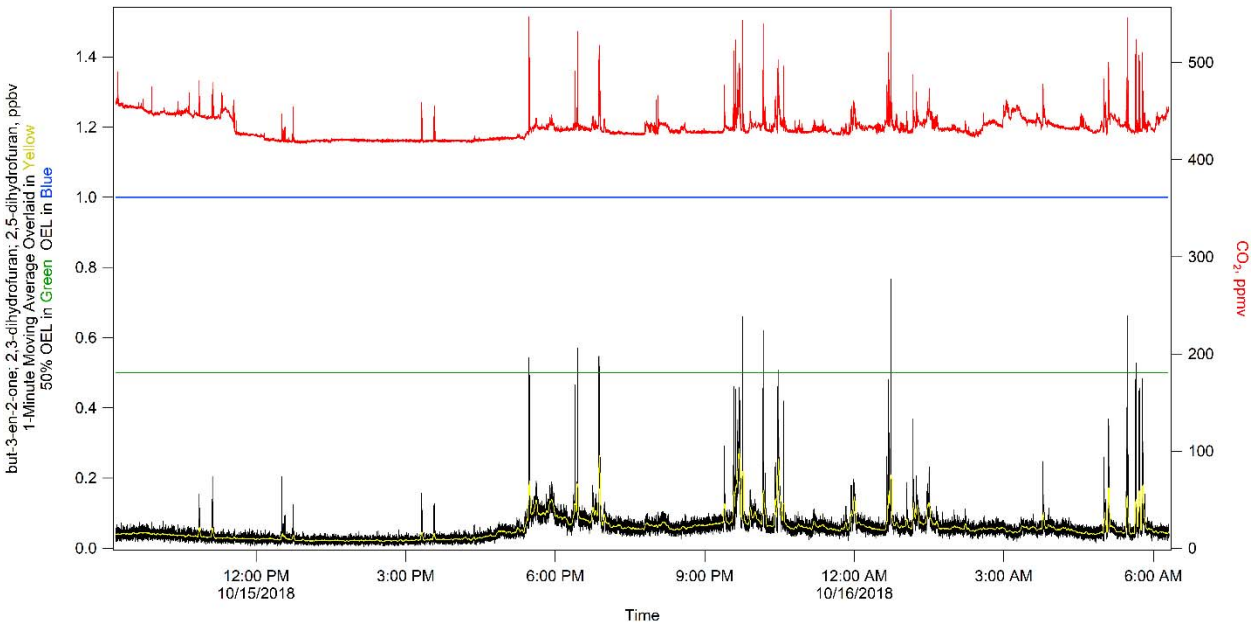

Figure 1-6. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

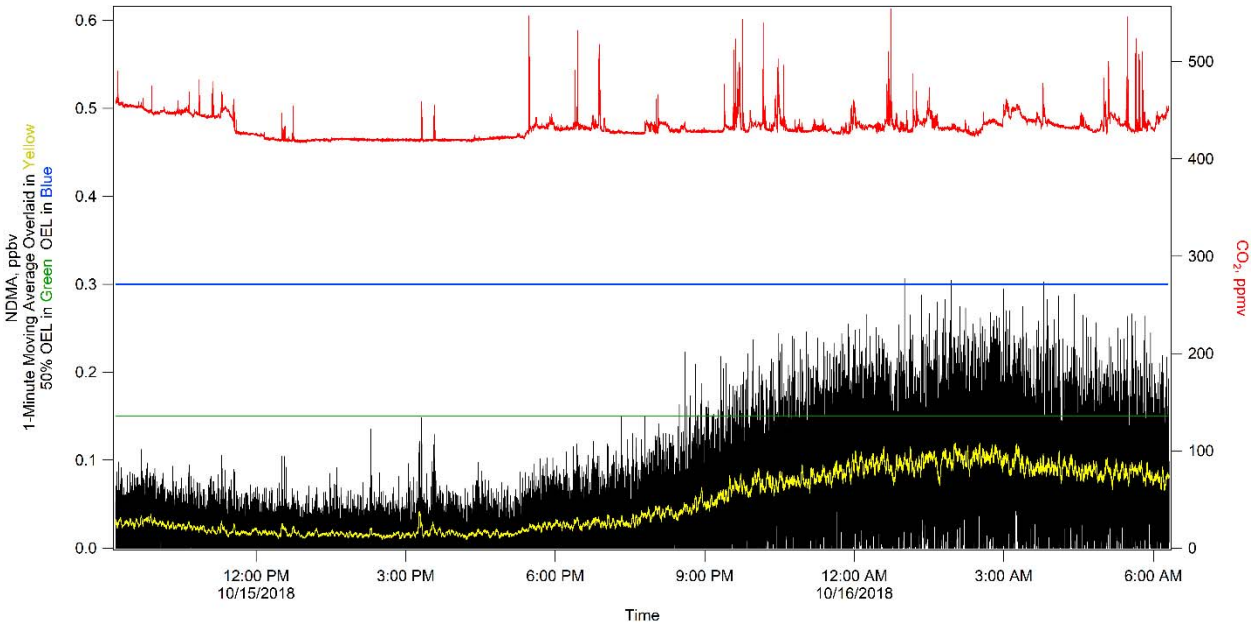

Figure 1-7. N-nitrosodimethylamine (NDMA).

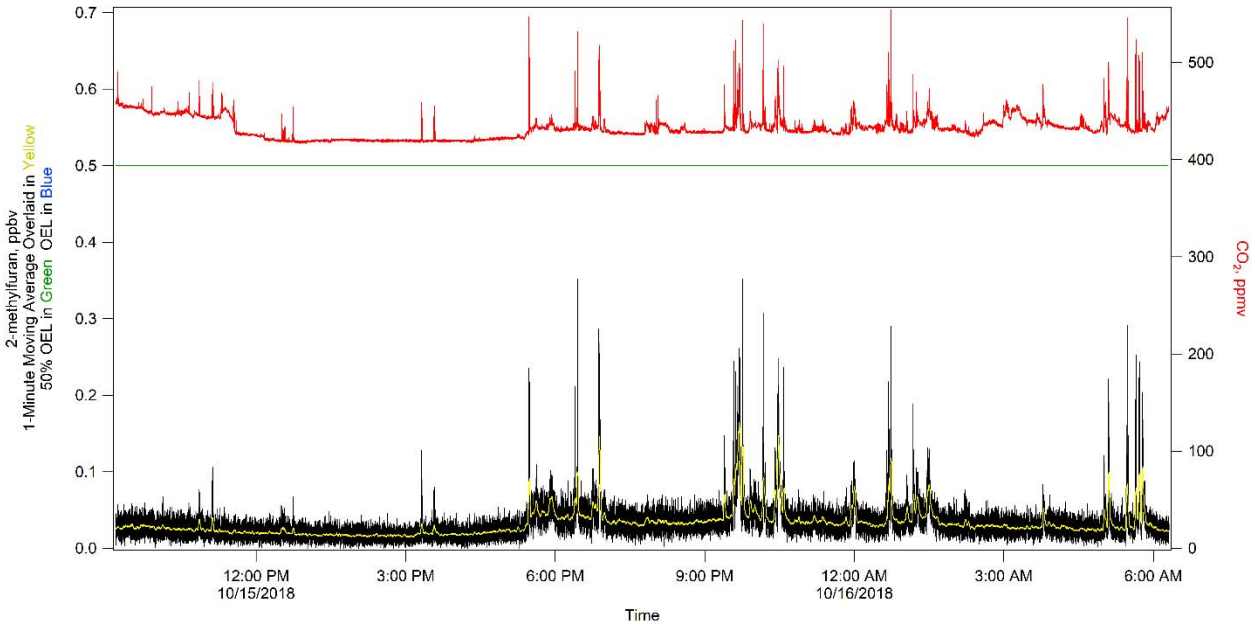

Figure 1-8. 2-methylfuran.

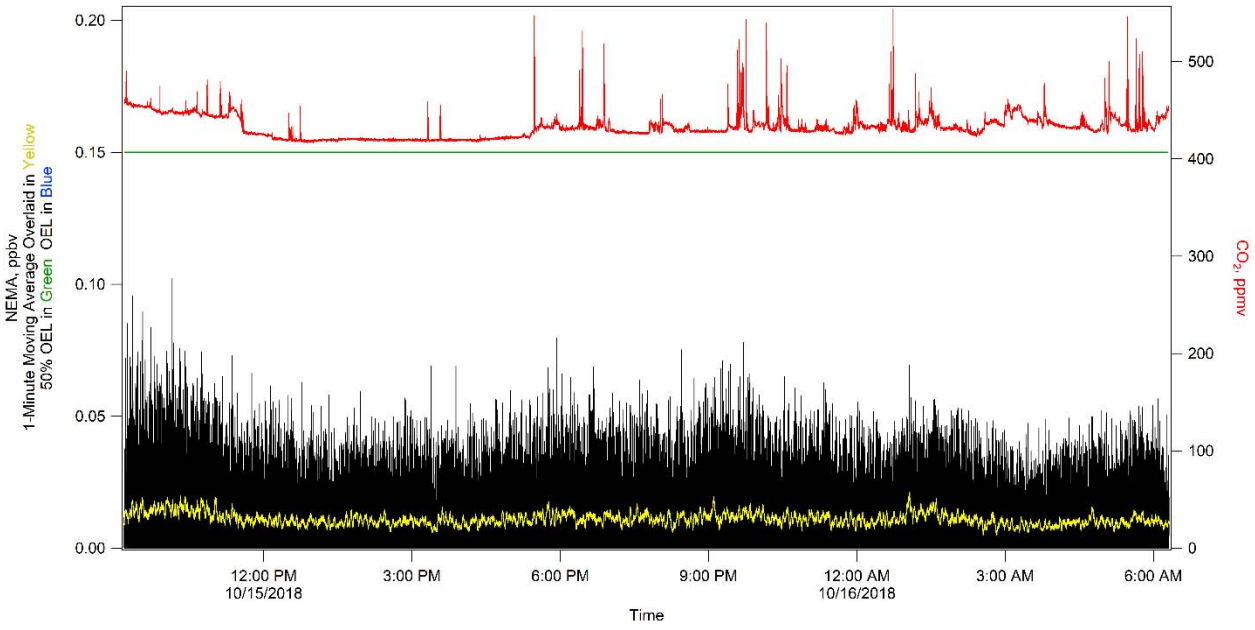

Figure 1-9. N-nitrosomethylethylamine (NEMA).

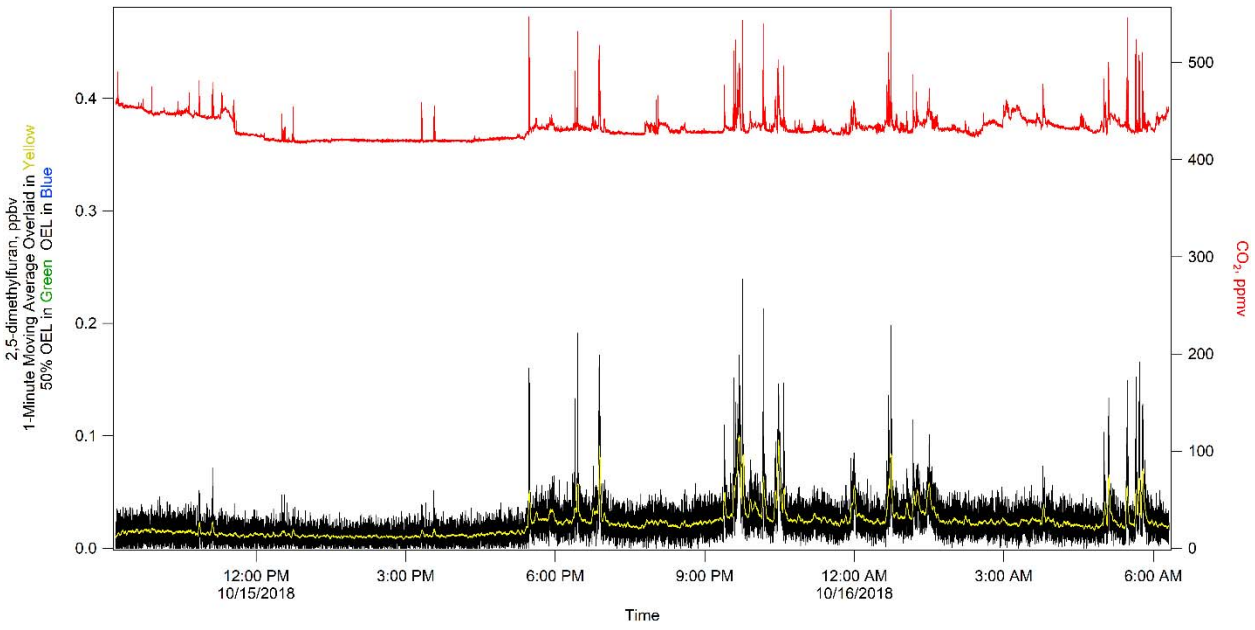

Figure 1-10. 2,5-dimethylfuran.

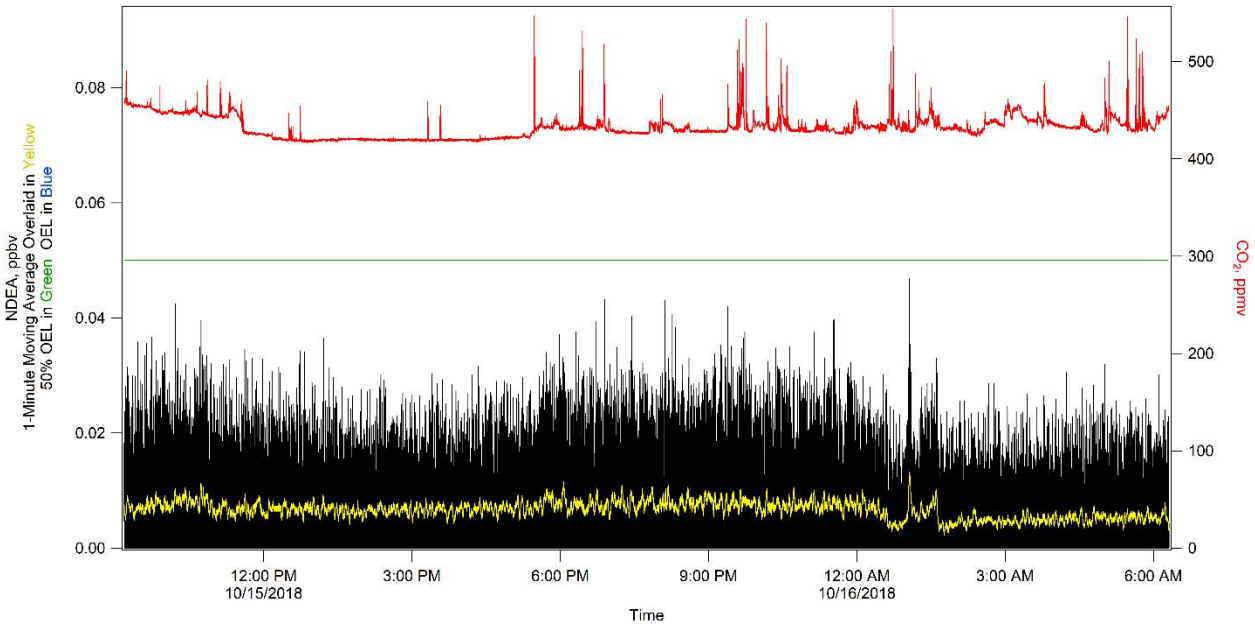

Figure 1-11. N-nitrosodiethylamine (NDEA).

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

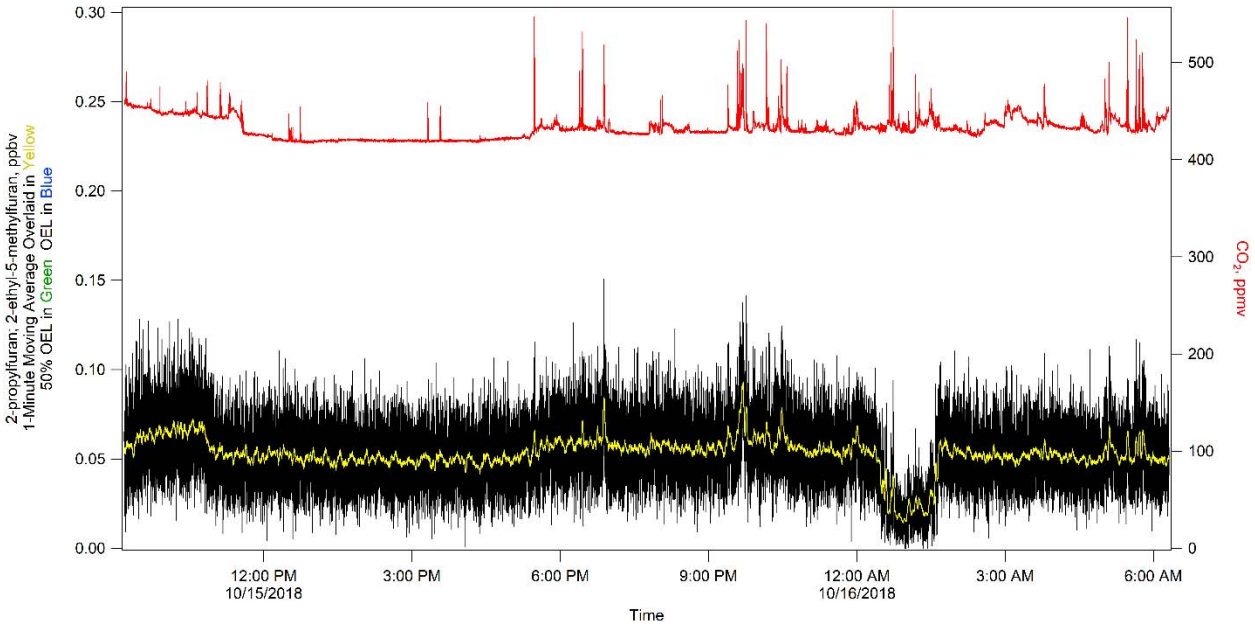

Figure 1-12. 2-propylfuran + 2-ethyl-5-methylfuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

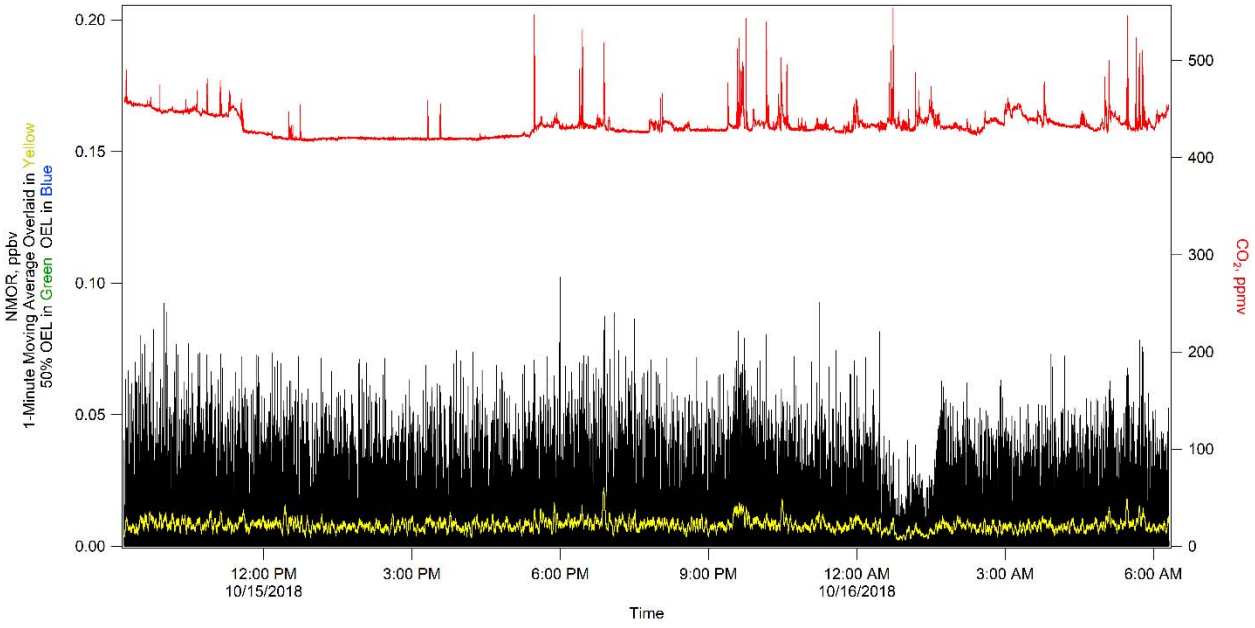

Figure 1-13. N-nitrosomorpholine (NMOR).

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

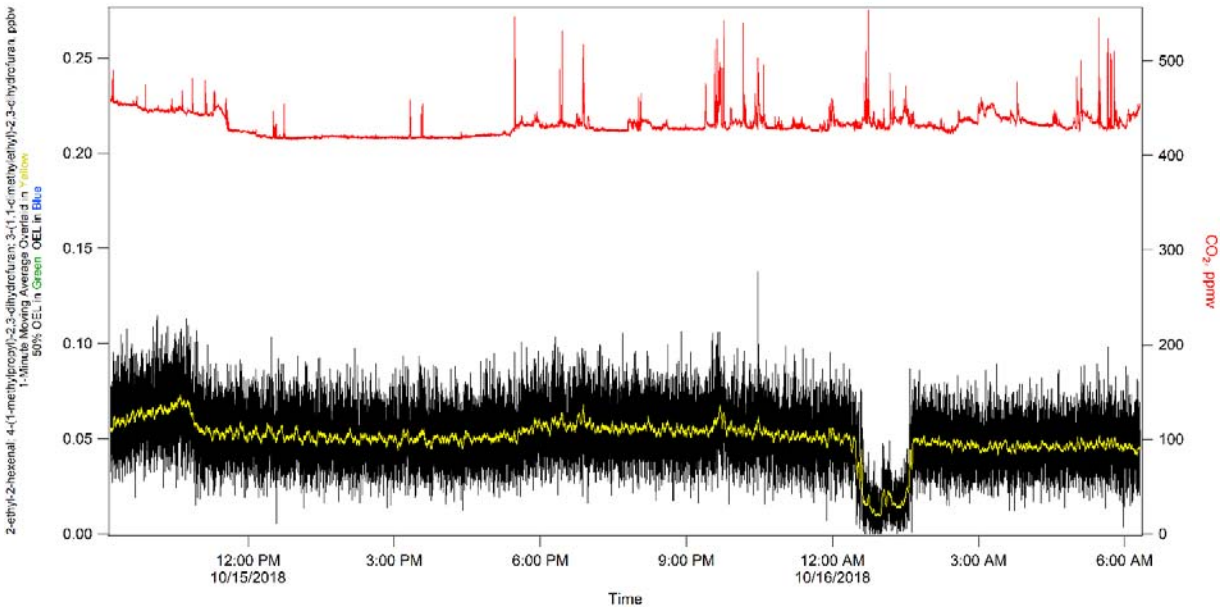

Figure 1-14. 2-ethyl-2-hexanal;4-(1-methylpropyl);2,3-dihydrofuran; 3-1(1,1-dimethylethyl)-2,3-dihydrofuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

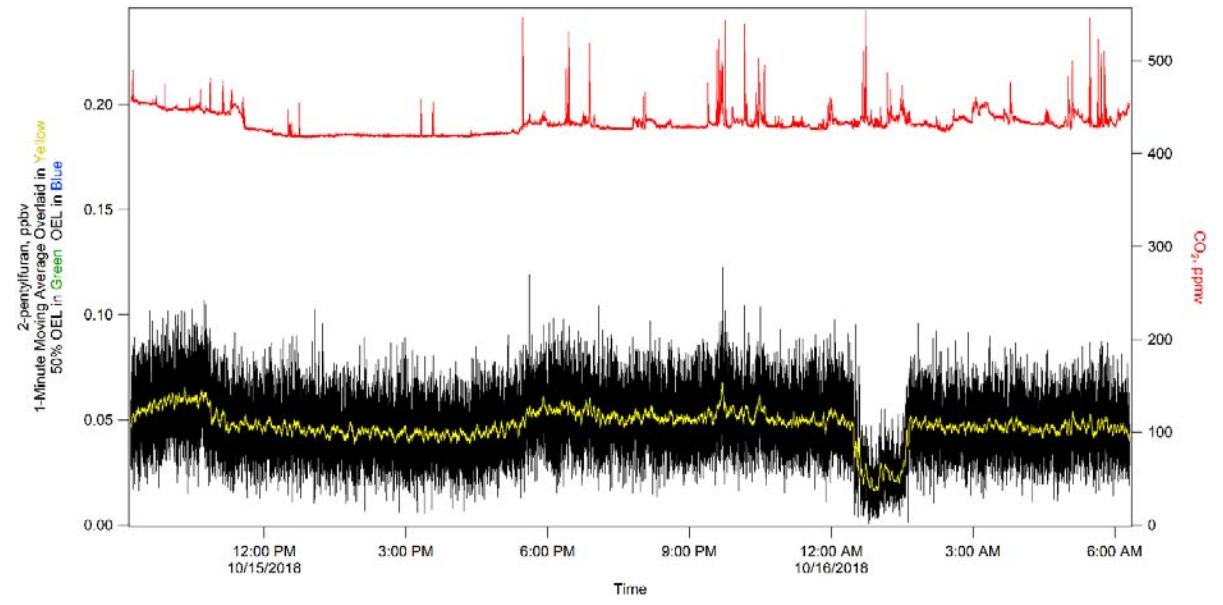

Figure 1-15. 2-pentylfuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

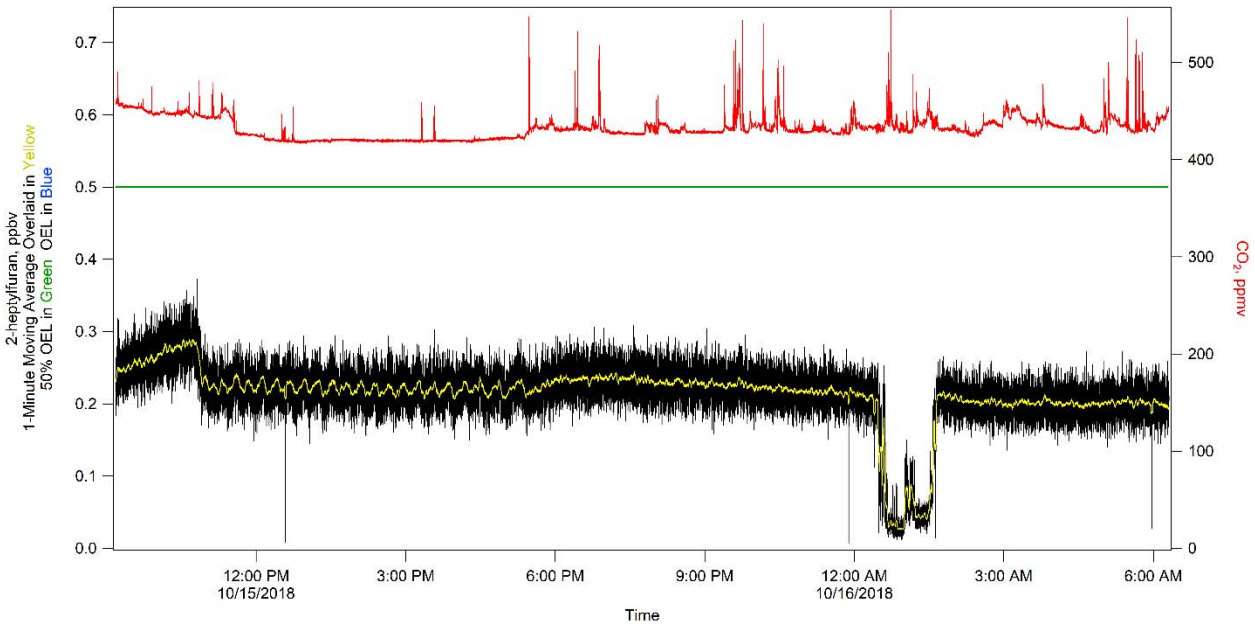

Figure 1-16. 2-heptylfuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

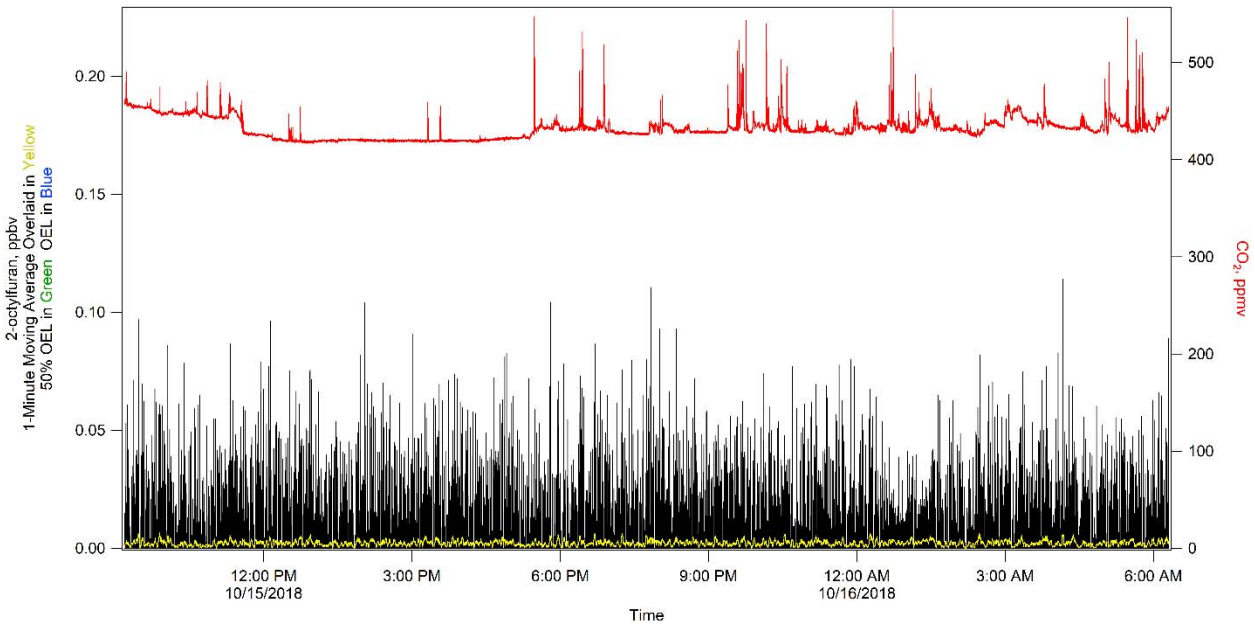

Figure 1-17. 2-octylfuran.

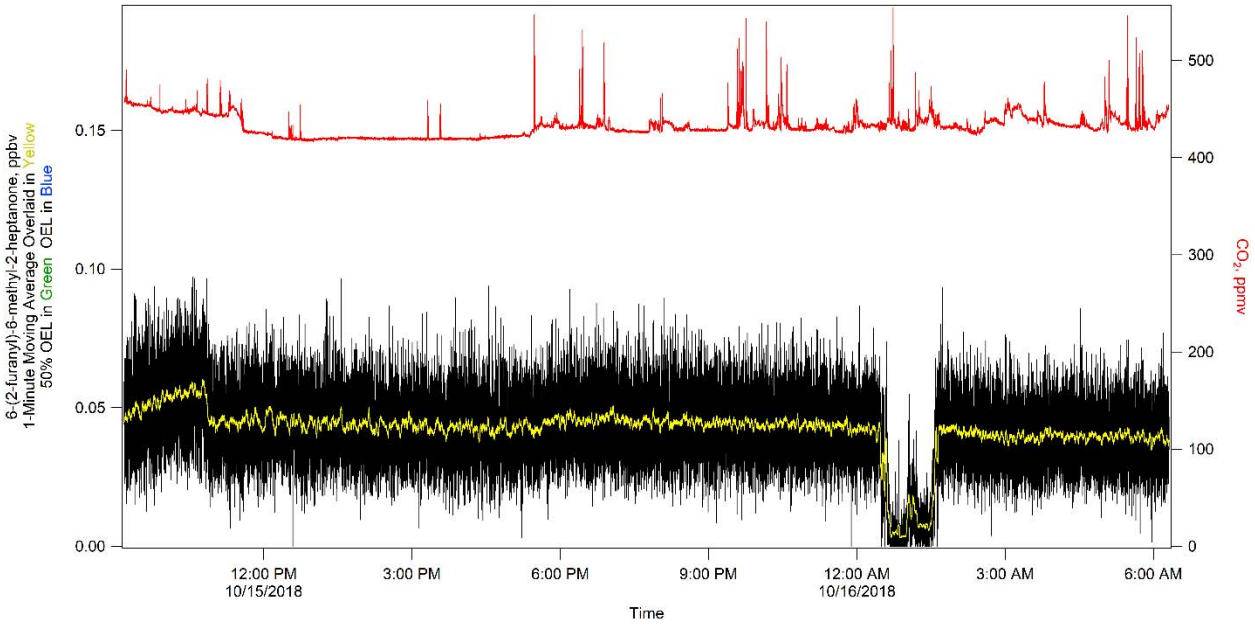

Figure 1-18. 6-(2-furanyl)-6-methyl-2-heptanone.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

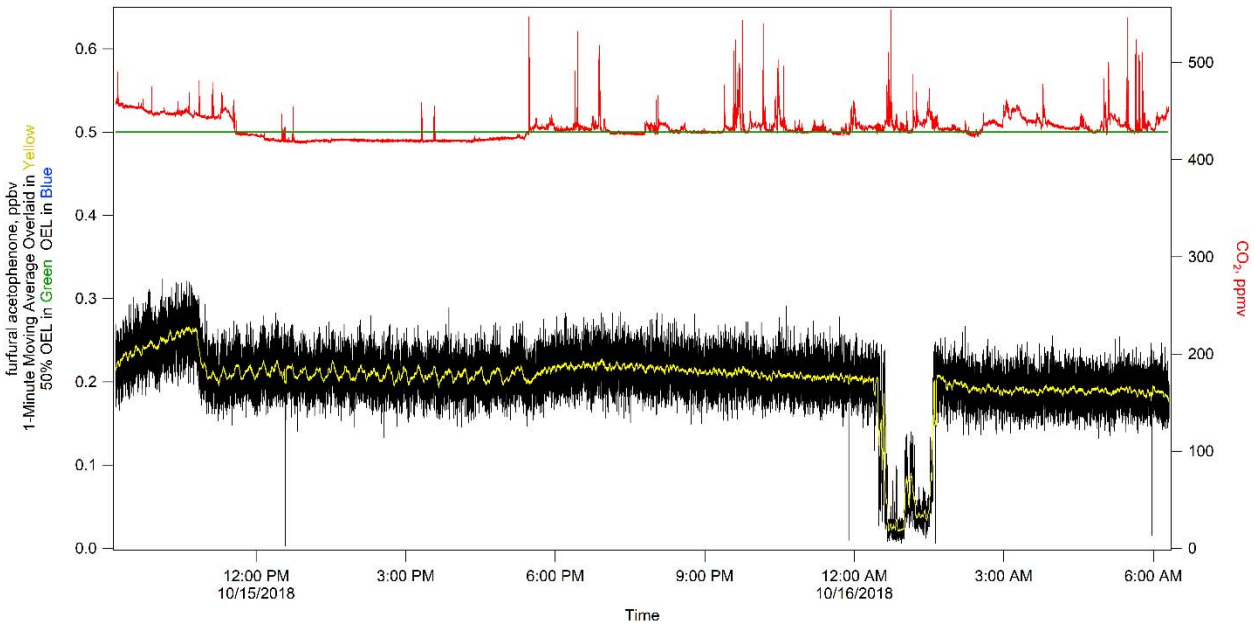

Figure 1-19. Furfural Acetophenone.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

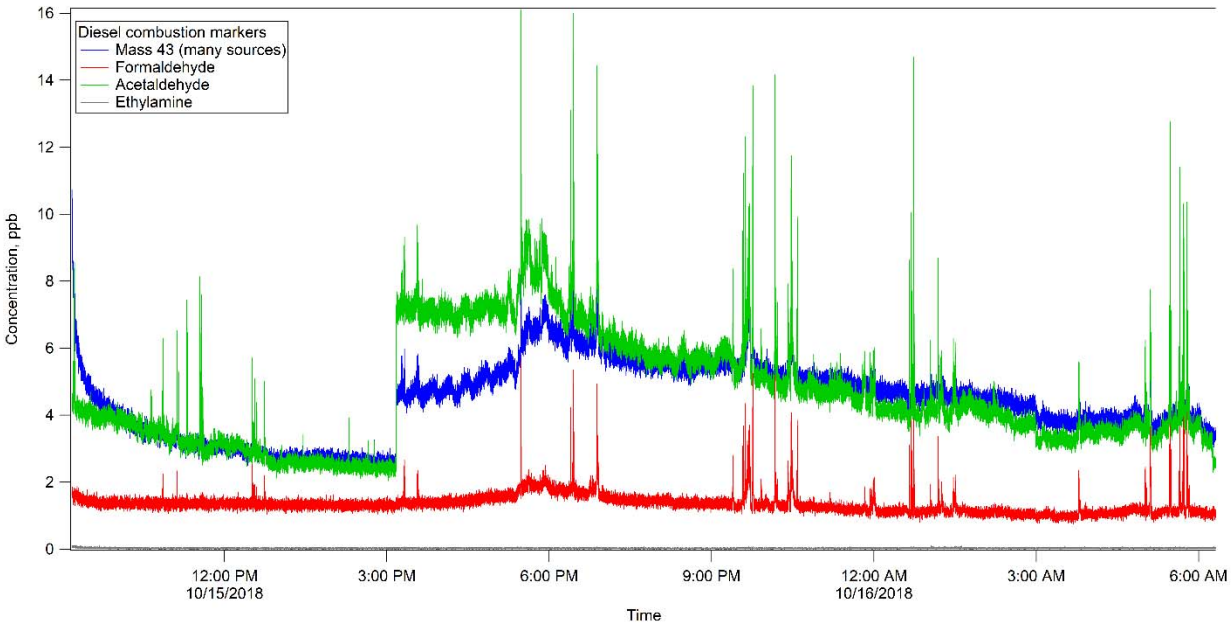

Figure 1-20. Diesel Combustion Markers.

The observed trends/changes in concentration are due to unoptimized tuning resulting in high instrument background. See DR18-008 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

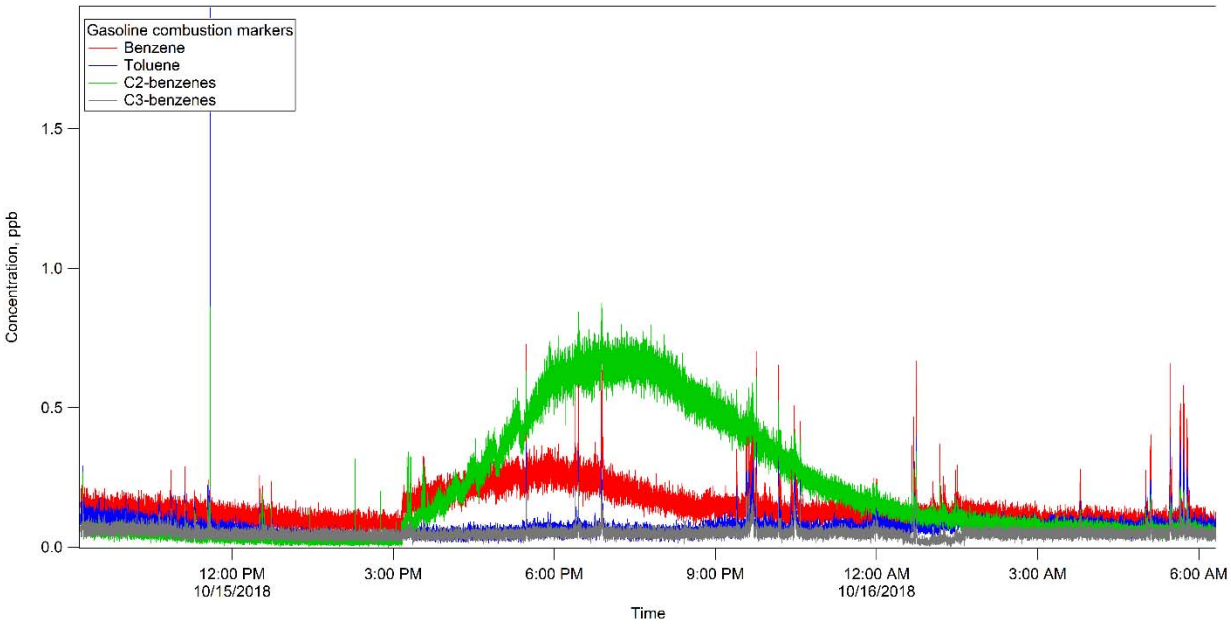

Figure 1-21. Gasoline Combustion Markers.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

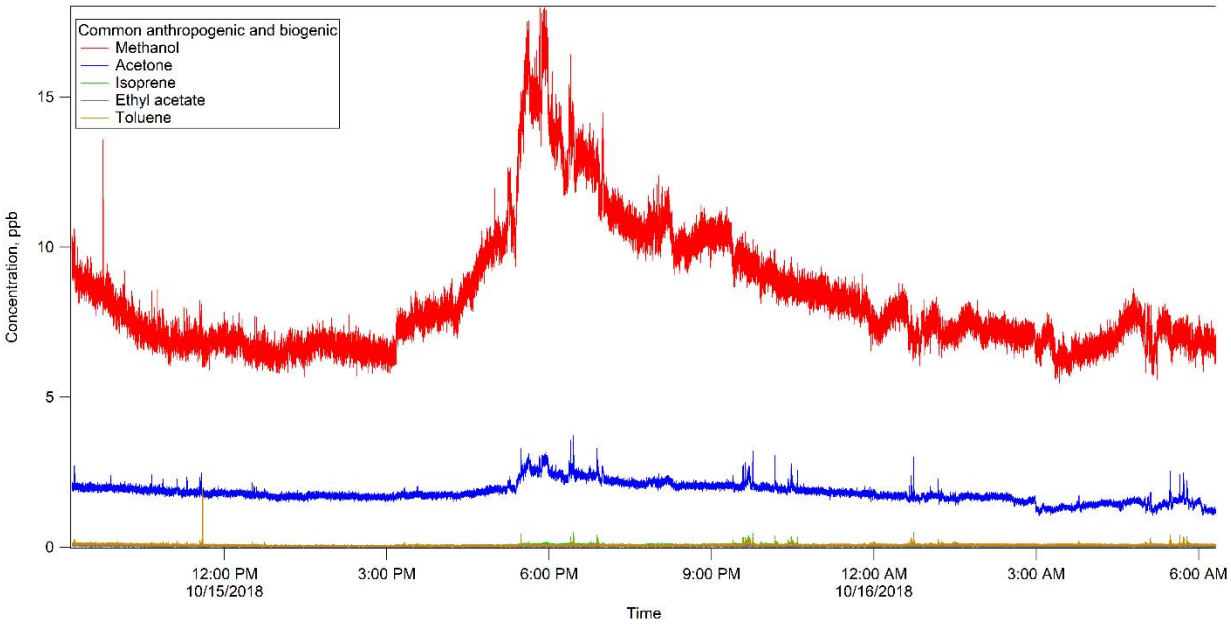

Figure 1-22. Plant and Human Markers.

2.0 OCTOBER 16, 2018 – OCTOBER 17, 2018 – STUDY SITE #2

2.1 Quality Assessment

Data from October 16, 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.

2.2 Summary

The ML personnel performed background sampling using the ML from October 16, 2018, to October 17, 2018 at Study Site 2. Site 2 is located near the southern end of the 200W tank farms. The ML arrived at Site 2 at 07:08 on October 16, 2018. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, Picarro NH_3 analyzer, and the PTR-MS beginning at 06:42, prior to Site 2 arrival. The data file names were confirmed and NO^+ data collection mode began at 07:27. At 08:31, ML staff ended NO^+ data collection mode and transitioned into routine H_3O data collection mode. The collection of confirmatory samples began at 08:46. The ML staff departed the monitoring site at 11:57 and checked out with the CSO.

The ML staff returned to Site 2 at 06:05 on October 17, 2018. At 06:06, confirmatory sorbent samples were disconnected from the sampling station. The field notes indicate the ML stopped for fuel at 06:55. The ML moved to Site 3 by 07:20.

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

Figure 2-2. The Location of the Mobile Laboratory for the Duration of the Monitoring Period.

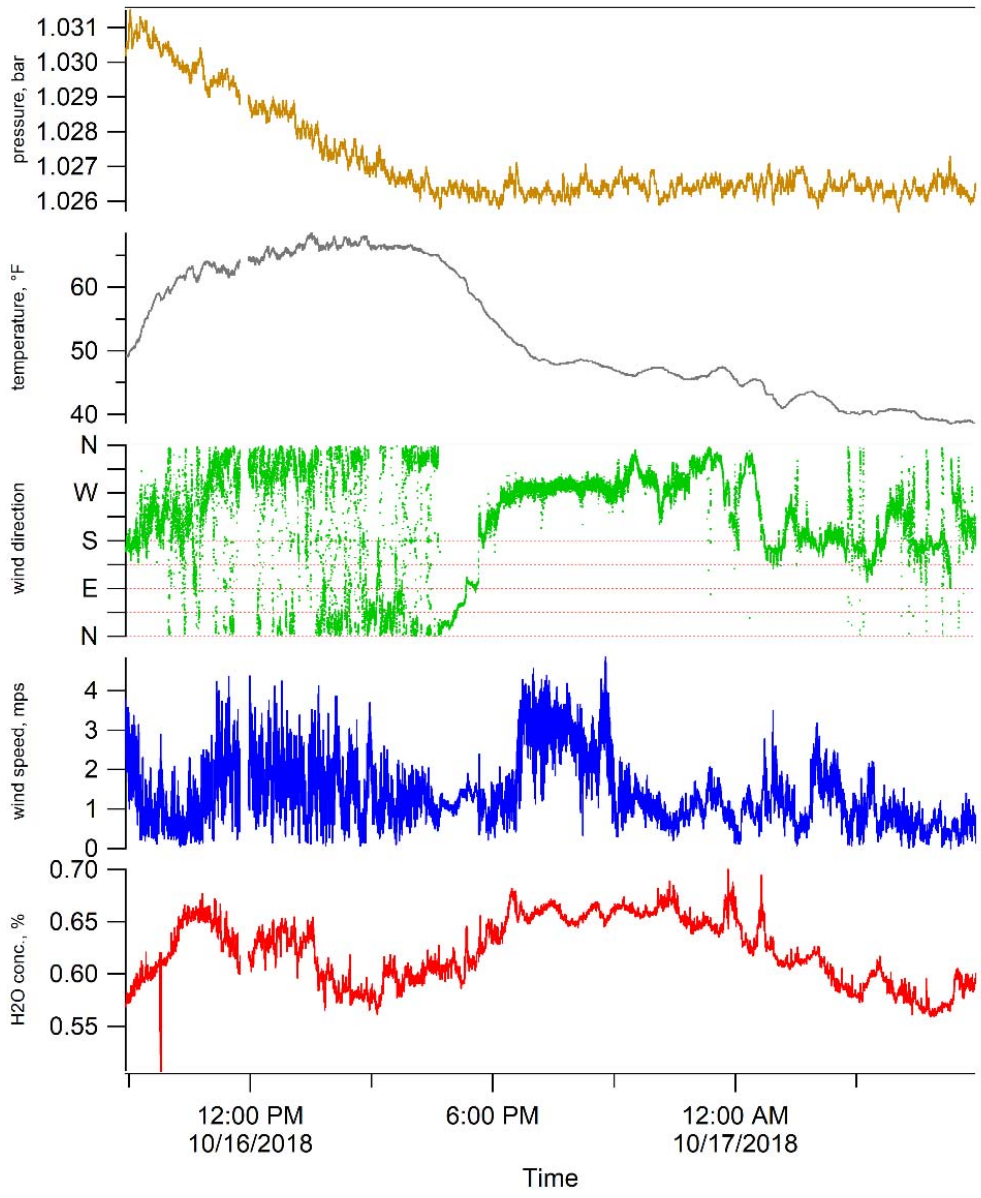

Figure 2-3. Weather Data.

2.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

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

Confirmatory air samples were collected as follows:

Table 2-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
2	10/16/18	Thermosorb/N	EL33219	08:46	11:46	180
2	10/16/18	Carbotrap-300	A060174	11:55	17:55	360
2	10/16/18	LpDNPH	181016-A	08:46	11:46	180

Table 2-2 displays the statistical information for the monitoring period of October 16, 2018, to October 17, 2018. By definition, the OEL is an 8-hour, time-weighted average that establishes a limit for personnel exposures to hazardous chemicals. It is the exposure level to which a person may be exposed for 8 hours/day, 40 hours/week for 40 years and have no expectation of adverse health effects. In this study, area vapor concentration measurements were made to better understand the hazardous vapor exposures that workers may receive. These measurements are only compared to OEL concentrations to give them context. It is neither accurate nor appropriate to interpret these short duration measurements (2 seconds) as worker exposure levels. Since the OEL is defined as a time-weighted average, it is more appropriate to compare them to daily average vapor concentrations. Short duration excursions above the OEL concentration are not significant.

Table 2-2. Statistical Information for the Monitoring Period of October 16, 2018 – October 17, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	Ammonia	25000	6.628	2.693	40.620	15.107	5.398
2	formaldehyde	300	1.354	0.343	25.355	9.569	1.295
3	Methanol	200000	8.660	1.385	15.992	15.657	8.312
4	acetonitrile	20000	2.134	6.468	303.062	105.245	0.964
5	acetaldehyde	25000	2.759	0.936	33.907	22.550	2.578
6	ethylamine	5000	0.022	0.010	45.498	0.092	0.020
7	1,3-butadiene	1000	0.154	0.108	70.192	2.595	0.139
8	propanenitrile	6000	0.041	0.015	37.001	0.313	0.040
9	2-propenal	100	0.172	0.223	129.285	6.006	0.133
10	1-butanol + butenes	20000	0.093	0.064	69.071	2.117	0.082
11	methyl isocyanate	20	0.077	0.026	33.814	0.467	0.074
12	methyl nitrite	100	0.112	0.105	93.688	2.855	0.095
13	furan	1	0.028	0.022	78.524	0.539	0.024
14	butanenitrile	8000	0.014	0.009	61.071	0.148	0.013
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.049	0.055	111.518	N/A*	N/A*
16	butanal	25000	0.174	0.038	21.582	0.647	0.170
17	NDMA**	0.3	0.020	0.019	94.975	0.163	0.016
18	benzene	500	0.115	0.055	47.432	2.324	0.108
19	2,4-pentadienenitrile + pyridine	300, 1000	0.031	0.010	32.948	0.181	0.031
20	2-methylene butanenitrile	300	0.014	0.009	60.338	0.138	0.013
21	2-methylfuran	1	0.033	0.031	93.830	0.707	0.028
22	pentanenitrile	6000	0.010	0.006	64.289	0.096	0.008
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.035	0.024	69.485	0.569	0.031
24	NEMA**	0.3	0.012	0.014	118.811	0.100	0.006
25	2,5-dimethylfuran	1	0.020	0.020	97.173	0.472	0.017
26	hexanenitrile	6000	0.004	0.004	92.054	0.046	0.003
27	2-hexanone (MBK)	5000	0.015	0.008	54.777	0.086	0.014
28	NDEA**	0.1	0.007	0.007	110.212	0.049	0.004
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.063	0.018	28.573	0.136	0.063
30	2,4-dimethylpyridine	500	0.015	0.008	53.709	0.149	0.014

Table 2-2. Statistical Information for the Monitoring Period of October 16, 2018 – October 17, 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	0.055	0.020	36.259	0.218	0.055
32	heptanenitrile	6000	0.060	0.019	31.088	0.133	0.061
33	4-methyl-2-hexanone	500	0.060	0.019	31.335	0.128	0.061
34	NMOR**	0.6	0.008	0.014	160.674	0.144	0.000
35	butyl nitrate	2500	0.034	0.015	43.326	0.098	0.034
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.052	0.017	32.290	0.122	0.053
37	6-methyl-2-heptanone	8000	0.052	0.016	30.316	0.123	0.053
38	2-pentylfuran	1	0.050	0.015	30.358	0.130	0.050
39	Biphenyl	200	0.039	0.016	41.503	0.102	0.040
40	2-heptylfuran	1	0.218	0.056	25.655	0.333	0.231
41	1,4-butanediol dinitrate	50	0.071	0.021	29.697	0.144	0.072
42	2-octylfuran	1	0.002	0.008	388.328	0.131	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.002	0.009	432.035	0.116	0.000
44	PCB	1000	0.086	0.022	25.287	0.165	0.089
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.043	0.015	34.039	0.112	0.044
46	furfural acetophenone	1	0.205	0.049	24.013	0.312	0.215

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 1.410 ppb and the median value was 0.039 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 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period October 16, 2018, to October 17, 2018. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

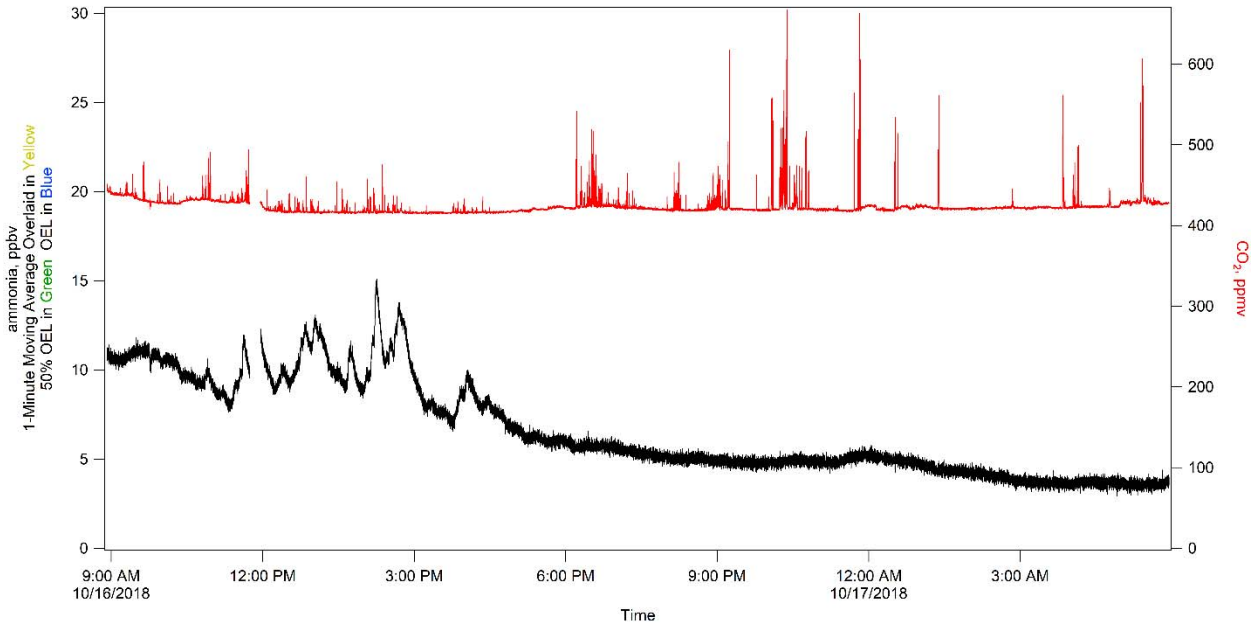

Figure 2-4. Ammonia.

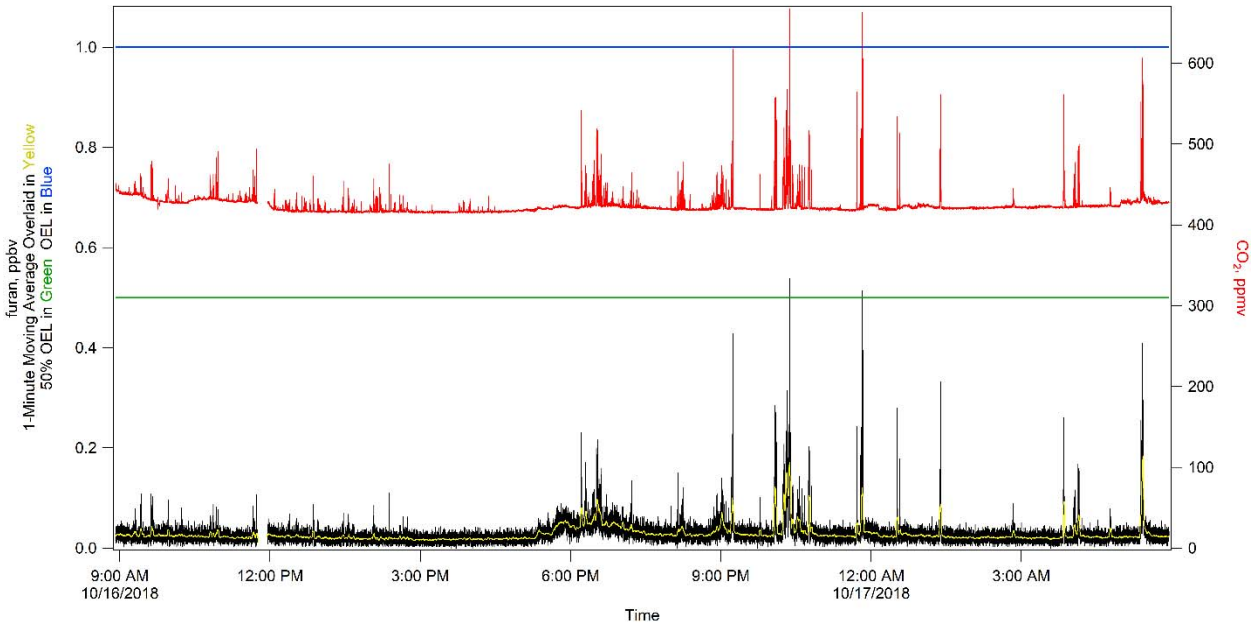

Figure 2-5. Furan.

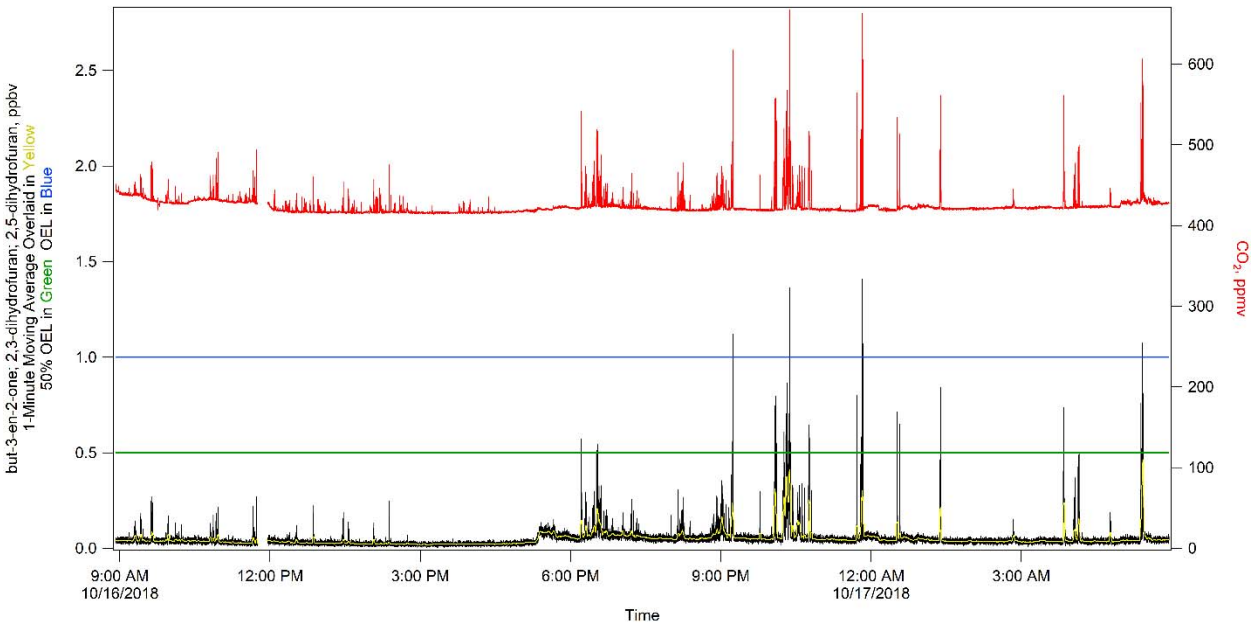

Figure 2-6. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

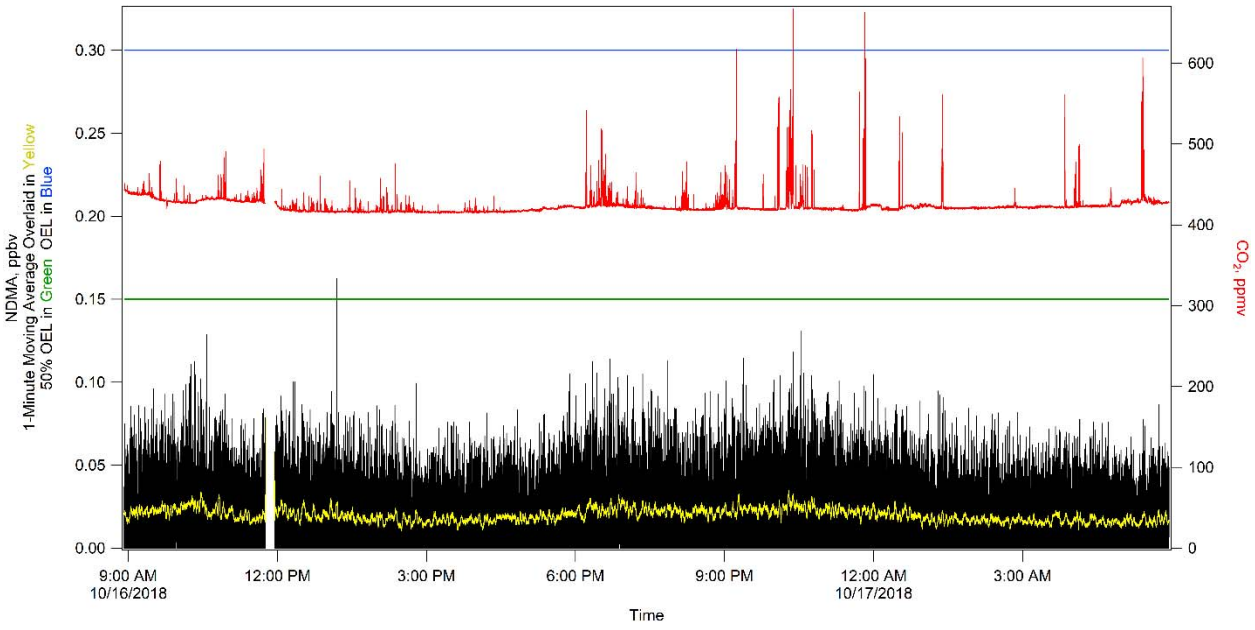

Figure 2-7. N-nitrosodimethylamine (NDMA).

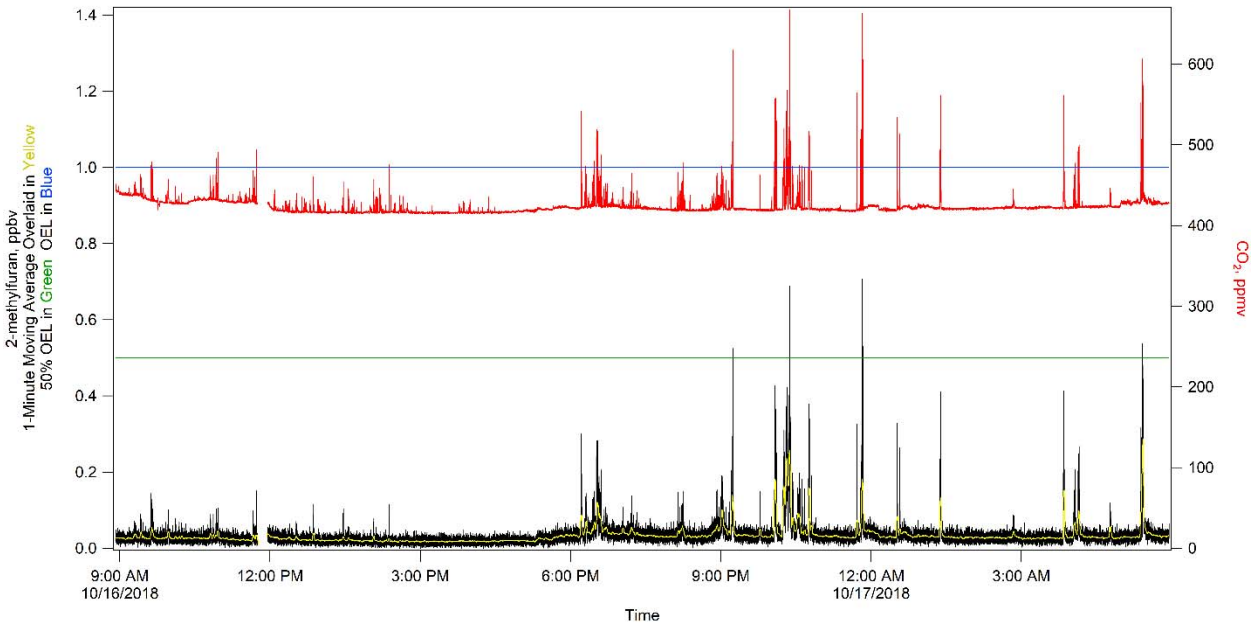

Figure 2-8. 2-methylfuran.

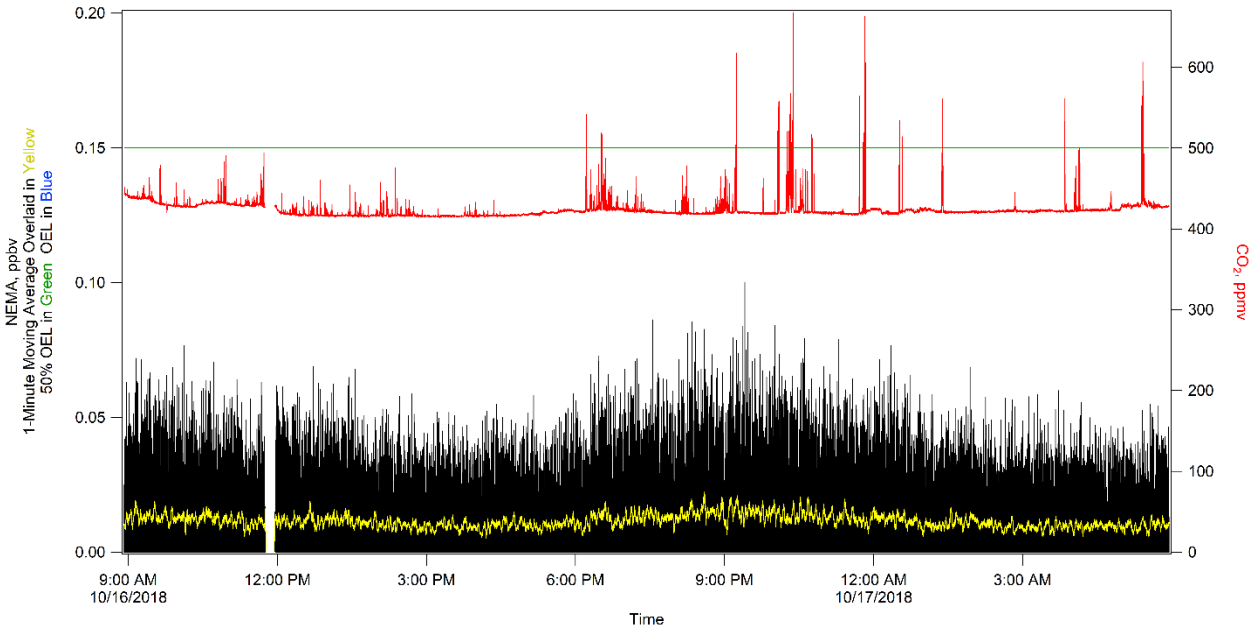

Figure 2-9. N-nitrosomethylethylamine (NMEA).

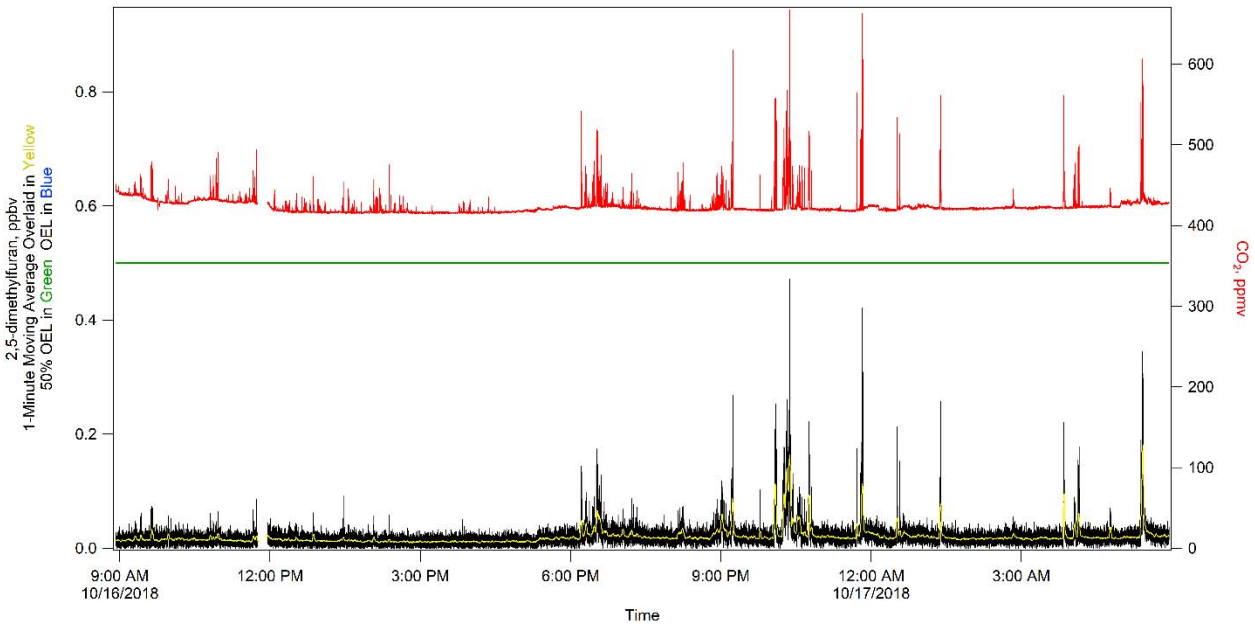

Figure 2-10. 2,5-dimethylfuran.

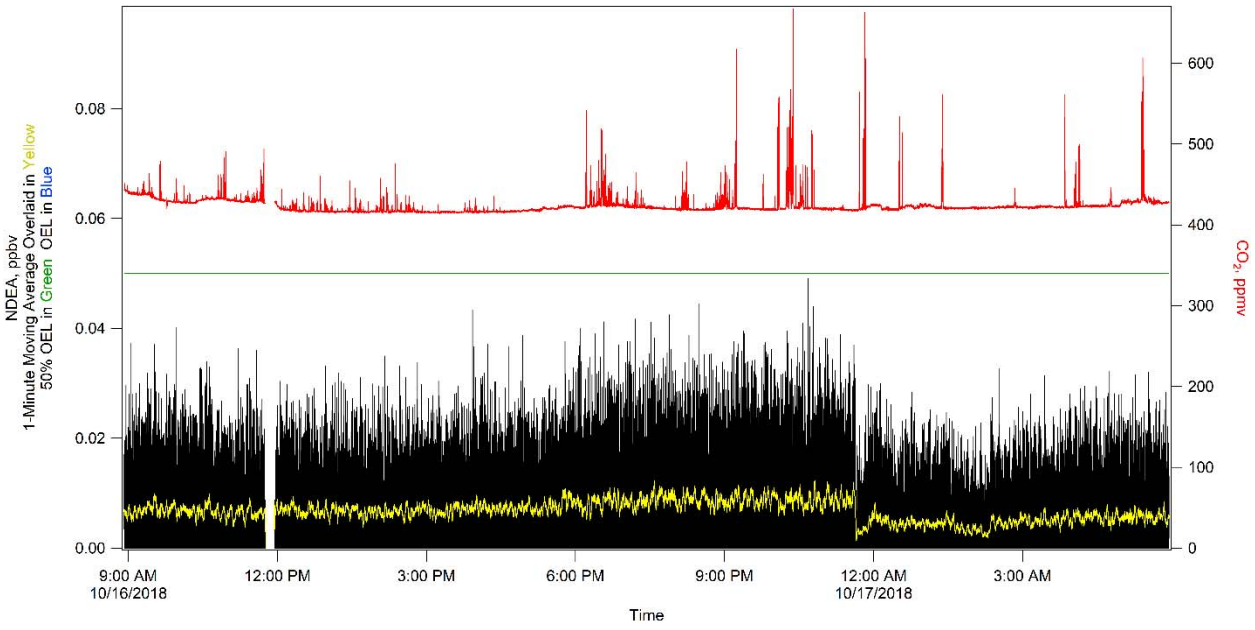

Figure 2-11. N-nitrosodiethylamine (NDEA).

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

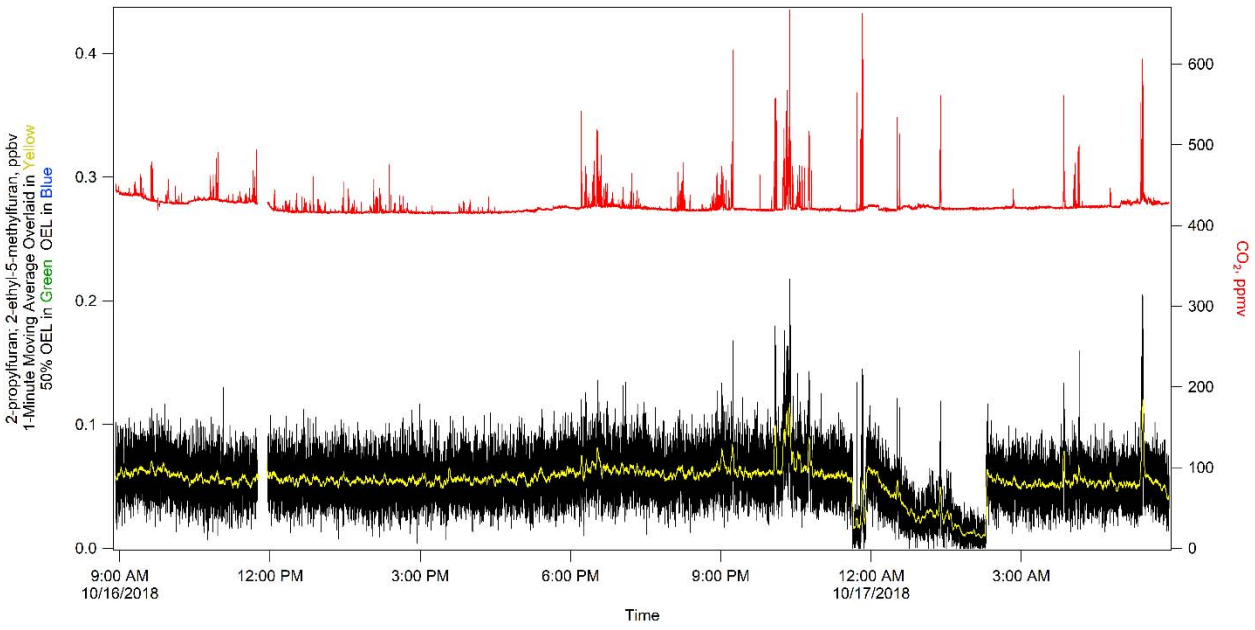

Figure 2-12. 2-propylfuran + 2-ethyl-5-methylfuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

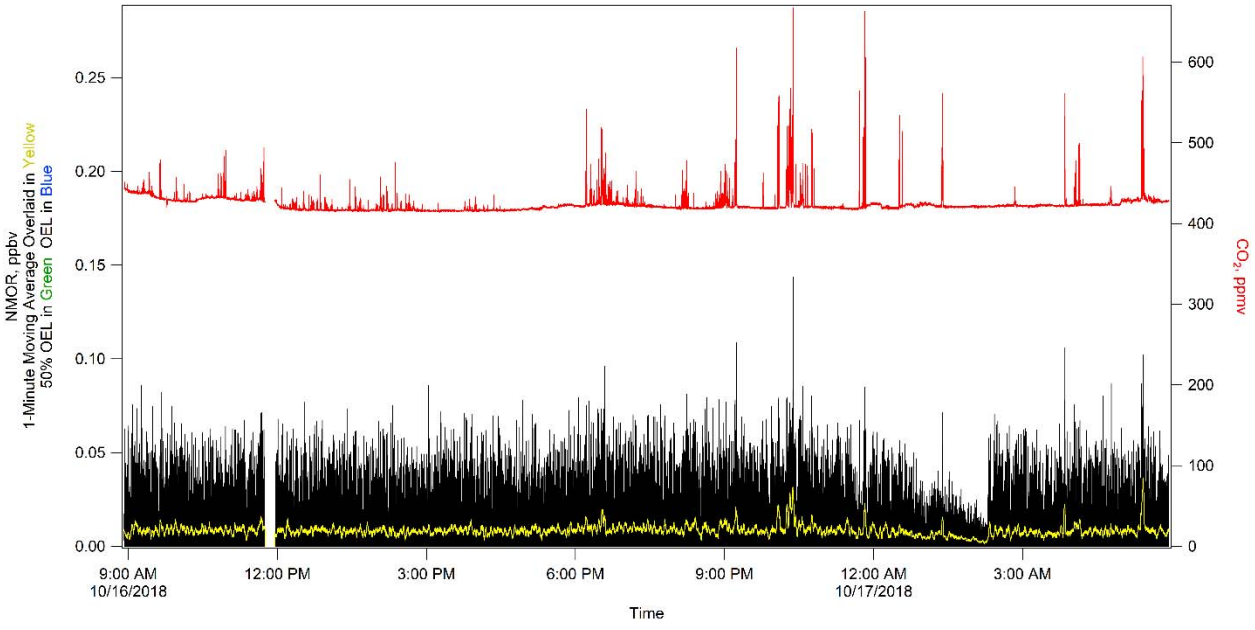

Figure 2-13. N-nitrosomorpholine (NMOR).

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

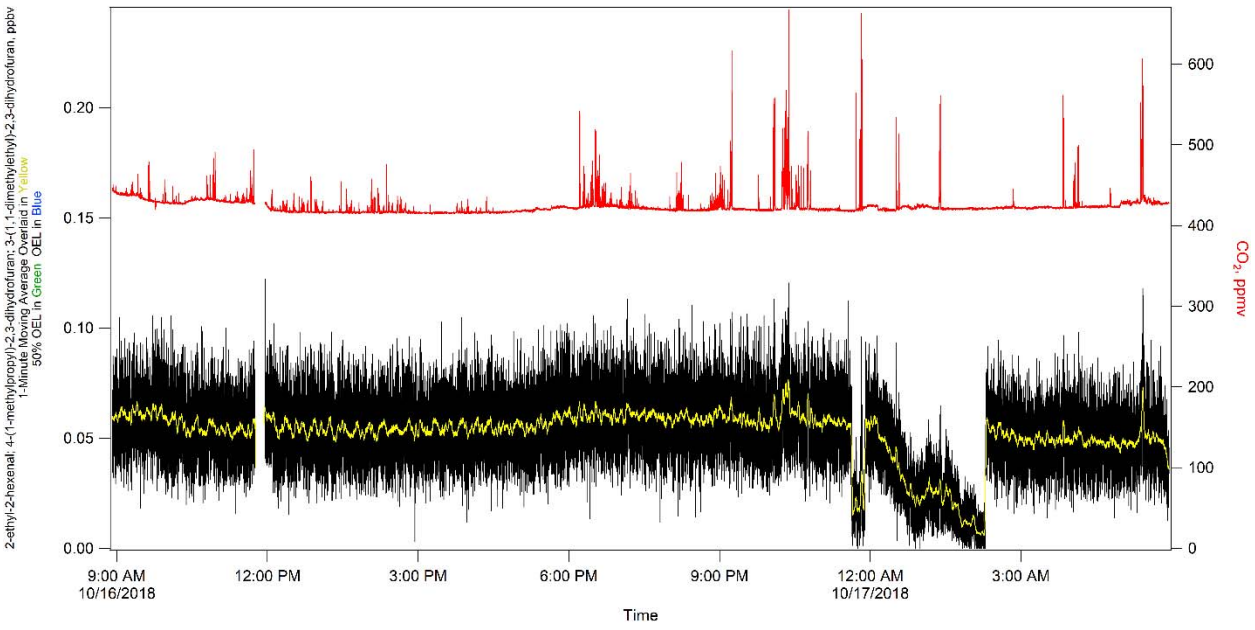

Figure 2-14. 2-ethyl-2-hexanal;4-(1-methylpropyl);2,3-dihydrofuran; 3-1(1,1-dimethylethyl)-2,3-dihydrofuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

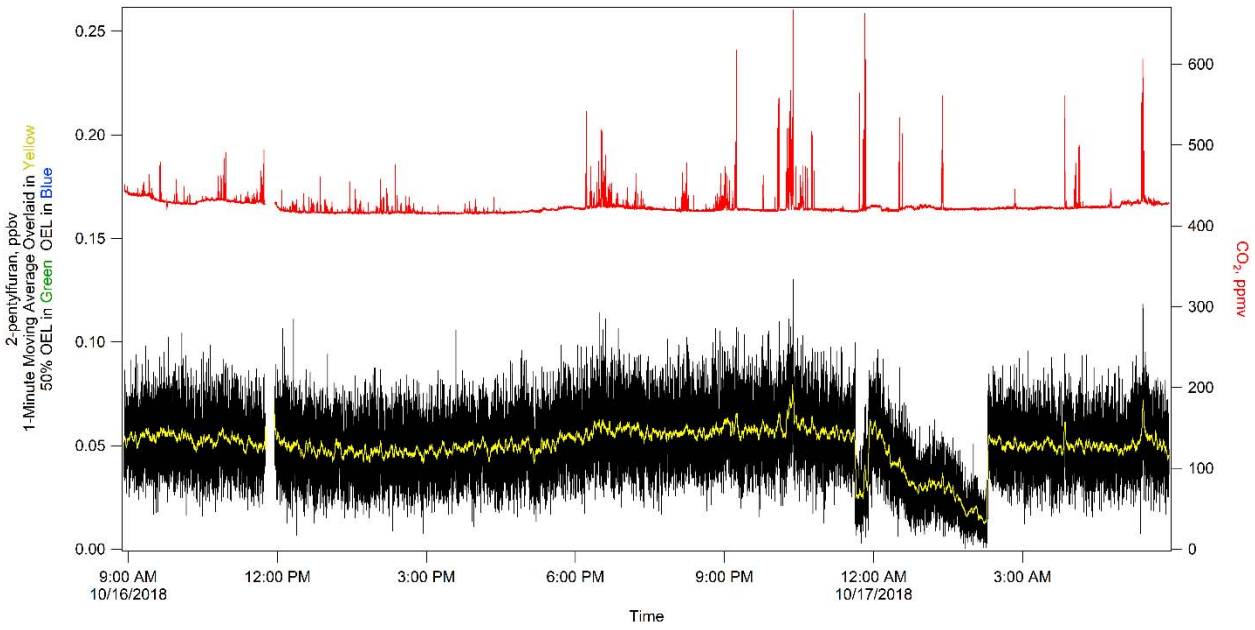

Figure 2-15. 2-pentylfuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

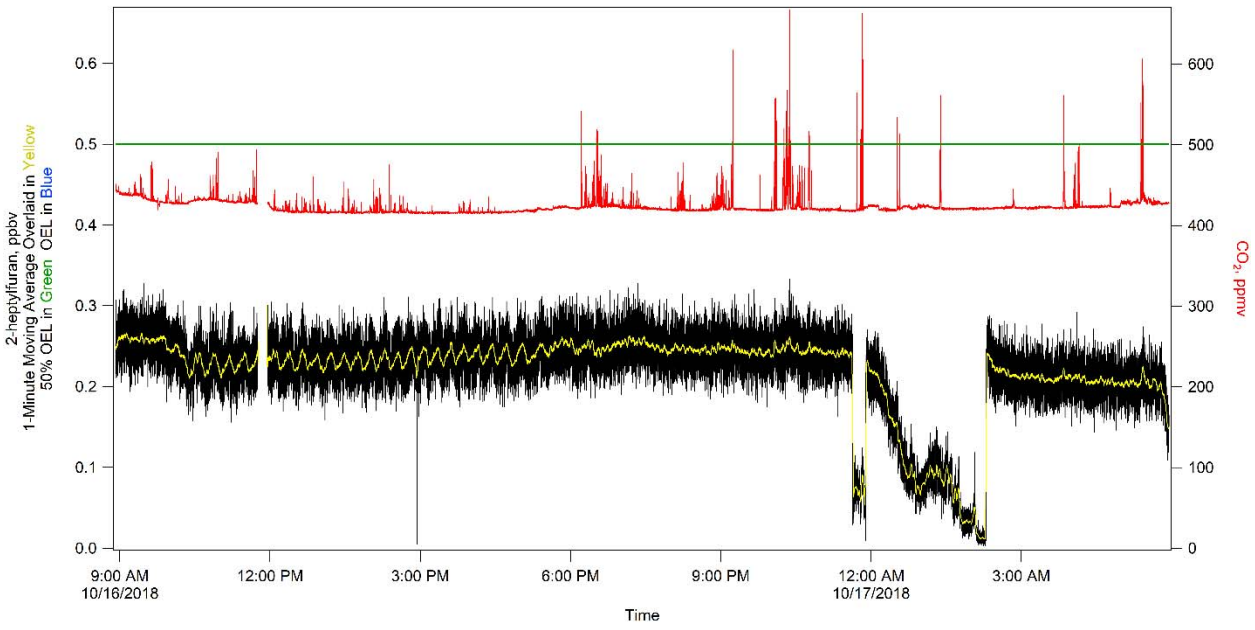

Figure 2-16. 2-heptylfuran.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

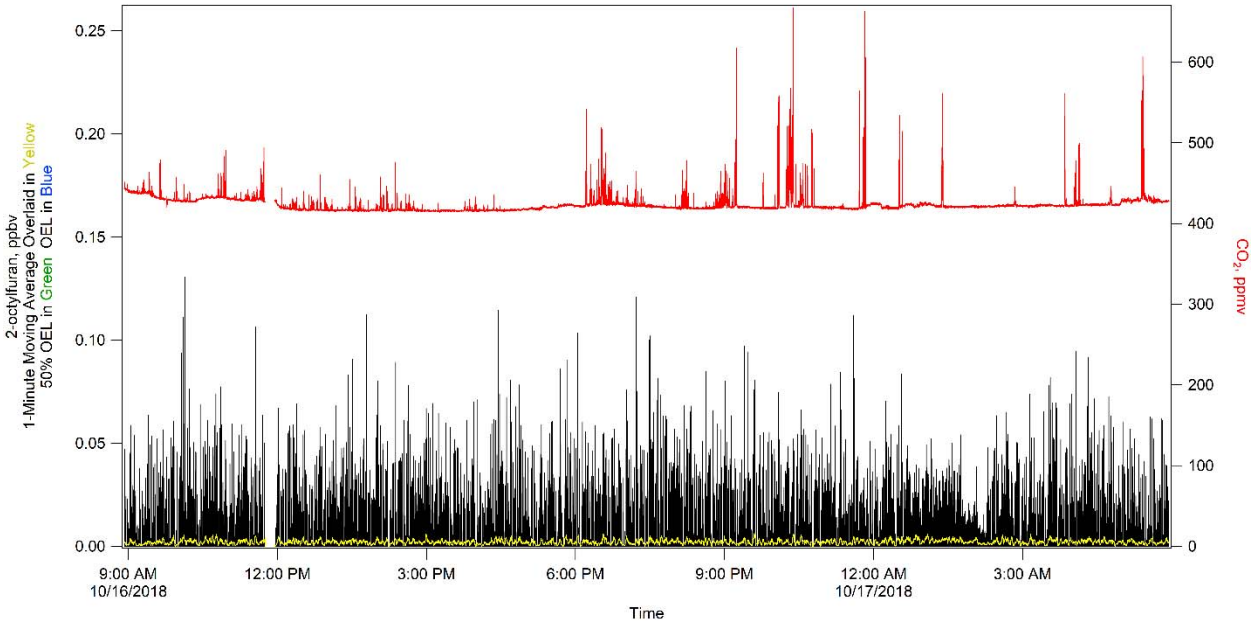

Figure 2-17. 2-octylfuran.

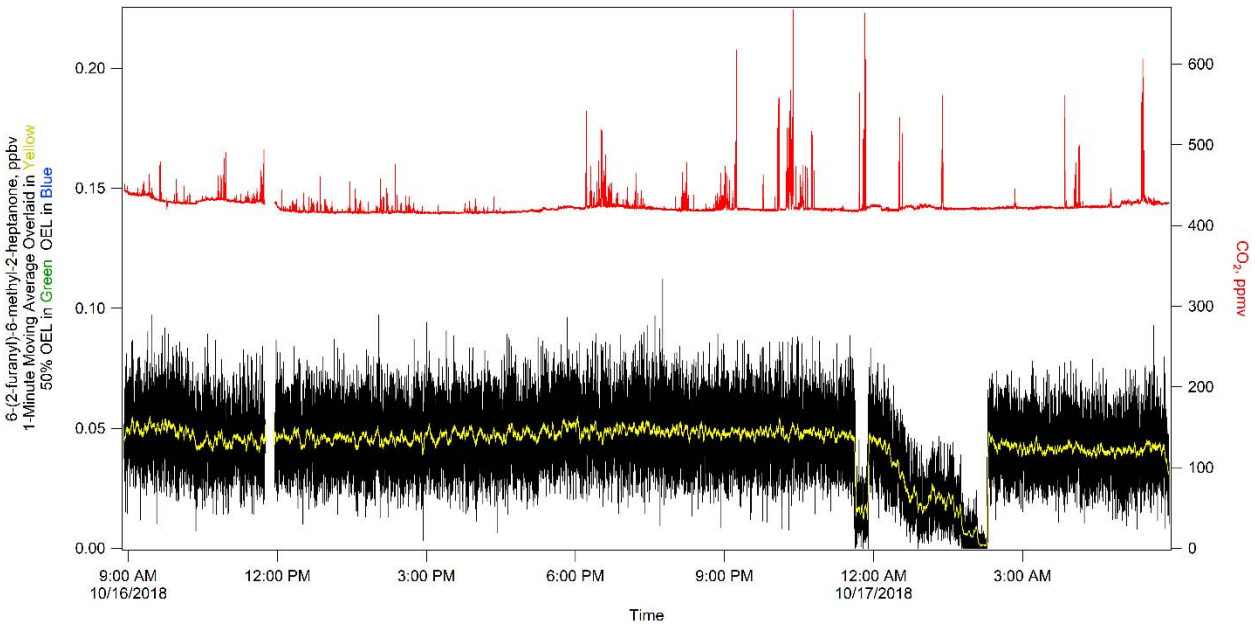

Figure 2-18. 6-(2-furanyl)-6-methyl-2-heptanone.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

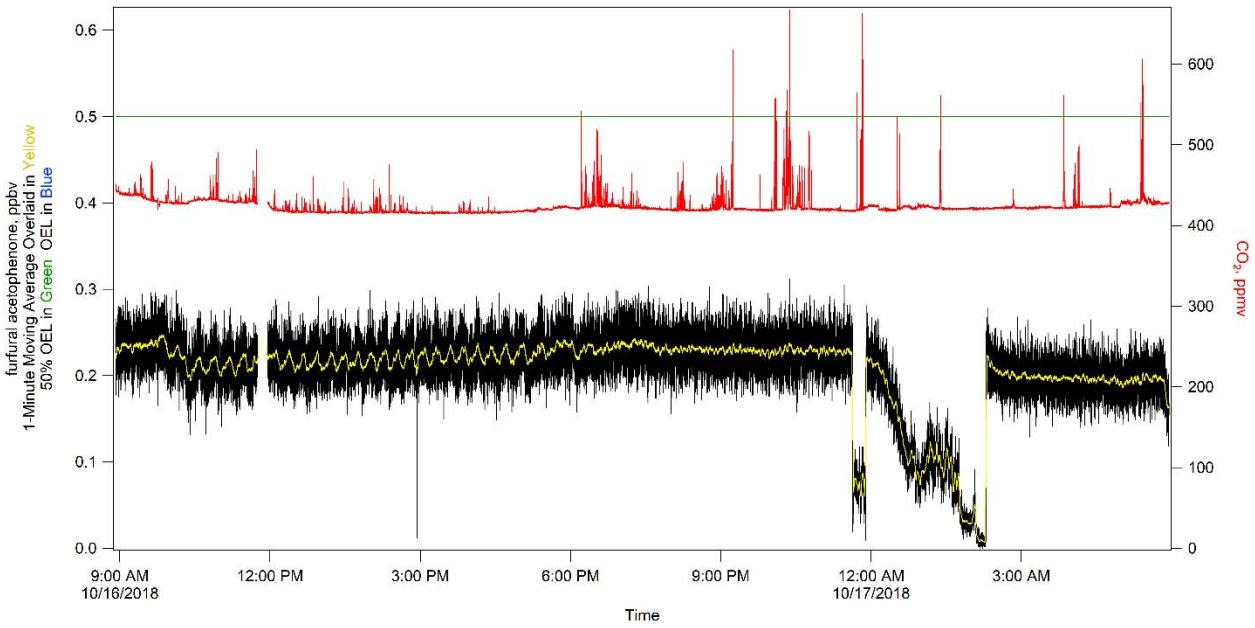

Figure 2-19. Furfural Acetophenone.

The observed abrupt changes in average concentration are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This phenomenon will be described in detail in a future monthly summary report.

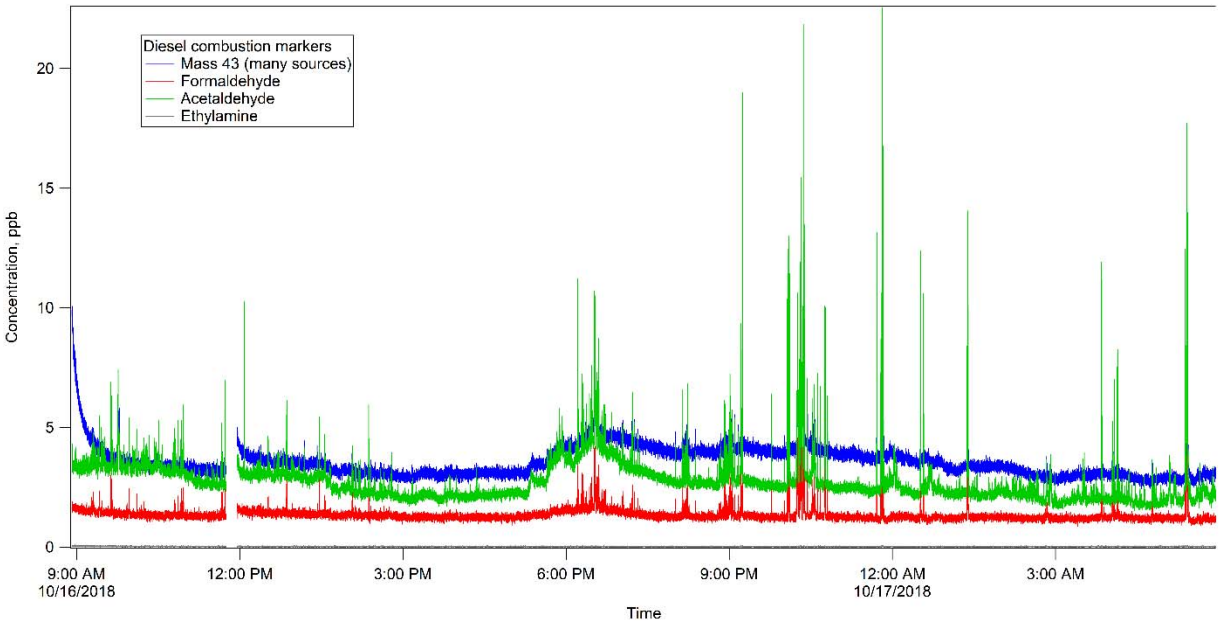

Figure 2-20. Diesel Combustion Markers.

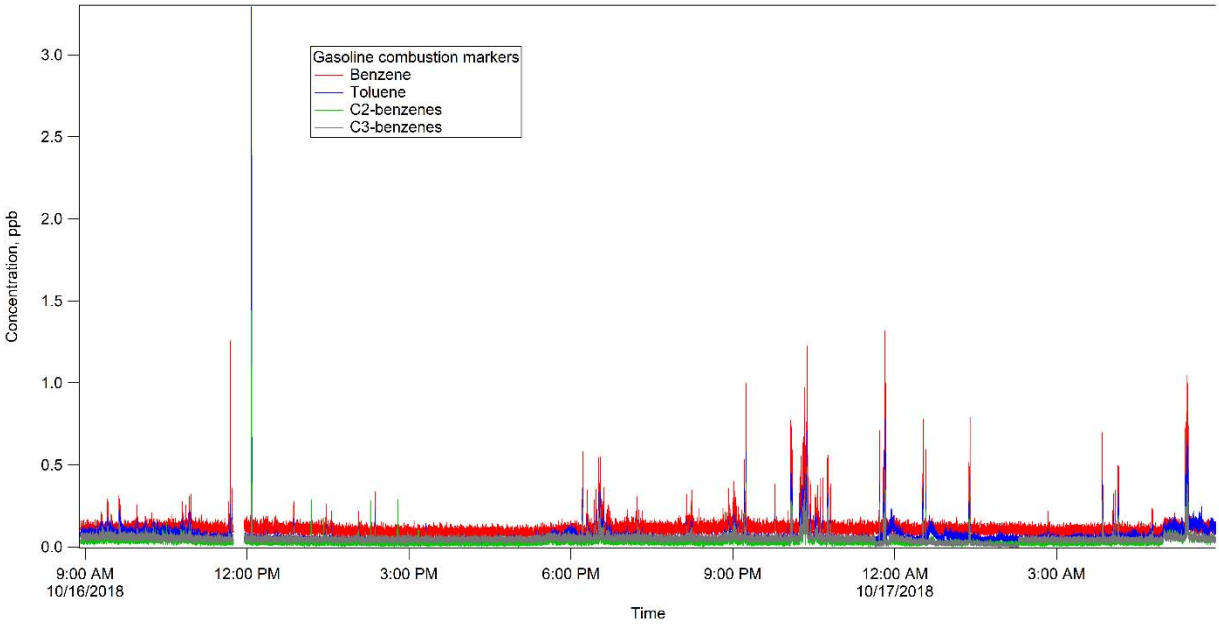

Figure 2-21. Gasoline Combustion Markers.

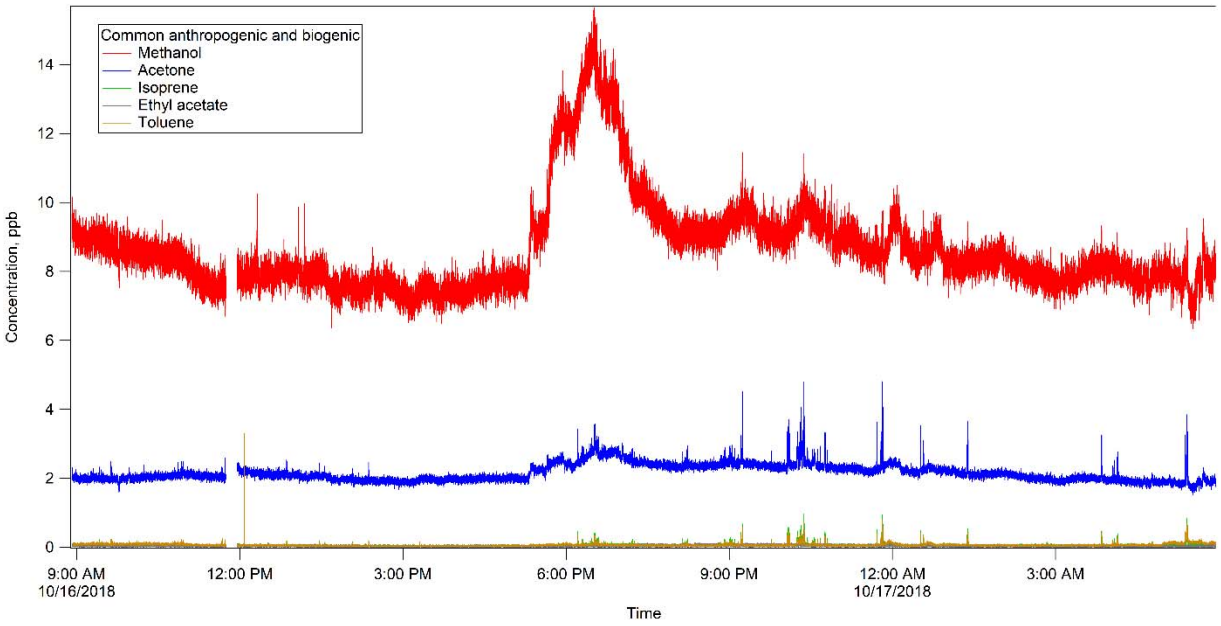

Figure 2-22. Plant and Human Markers.

3.0 OCTOBER 17, 2018 – OCTOBER 18, 2018 – STUDY SITE #3

3.1 Quality Assessment

Data from October 17, 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. TerraGraphics Quality Assurance Manager conducted a surveillance of the ML beginning at 10:05.

3.2 Summary

The ML personnel performed background sampling using the ML from October 17, 2018, to October 18, 2018 at Study Site 3. Site 3 is located near the corner of 4th and Buffalo just to the west of the 242-A Evaporator. This site historically has seen the occurrence of several Abnormal Operating Procedure (AOP)-015 events (reports of unusual odors). The ML arrived at Site 3 at 07:20 on October 17, 2018. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, Picarro NH_3 analyzer, and the PTR-MS beginning at 07:24. The data file names were confirmed and NO^+ data collection mode began at 07:48. At 08:54, ML staff transitioned from NO^+ mode to H_3O^+ data collection mode. Confirmatory sorbent samples started at 08:57. The ML staff departed the monitoring site at 12:10 and checked out with the CSO.

The ML staff returned to Site 3 at 06:05 on October 18, 2018, and disconnected confirmatory sorbent samples from the sampling station. The ML moved to Site 4 by 06:44.

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

Figure 3-2. Location of the Mobile Laboratory for the Duration Monitoring Period.

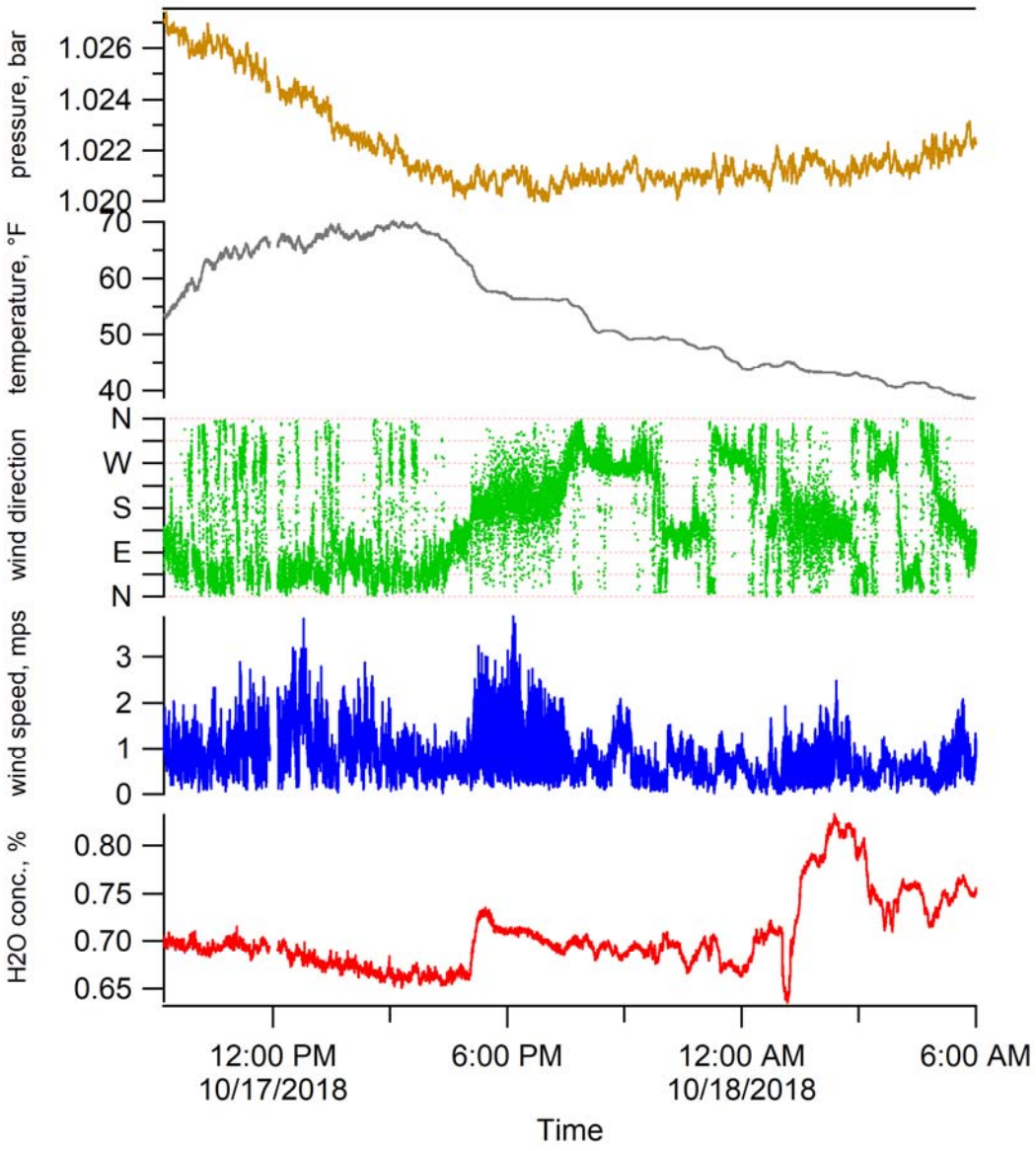

Figure 3-3. Weather Data.

3.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

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

Confirmatory air samples were collected as follows:

Table 3-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
3	10/17/18	Thermosorb/N	El33202	08:57	11:57	180
3	10/17/18	Carbotrap-300	A052357	12:06	18:06	360
3	10/17/18	LpDNPH	181017_A_Site3	08:57	11:57	180

Table 3-2 displays the statistical information for the monitoring period of October 17, 2018, to October 18, 2018. By definition, the OEL is an 8-hour, time-weighted average that establishes a limit for personnel exposures to hazardous chemicals. It is the exposure level to which a person may be exposed for 8 hours/day, 40 hours/week for 40 years and have no expectation of adverse health effects. In this study, area vapor concentration measurements were made to better understand the hazardous vapor exposures that workers may receive. These measurements are only compared to OEL concentrations to give them context. It is neither accurate nor appropriate to interpret these short duration measurements (2 seconds) as worker exposure levels. Since the OEL is defined as a time-weighted average, it is more appropriate to compare them to daily average vapor concentrations. Short duration excursions above the OEL concentration are not significant.

Table 3-2. Statistical Information for the Monitoring Period of October 17, 2018 – October 18, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	Ammonia	25000	8.978	4.470	49.783	23.031	6.606
2	formaldehyde	300	1.461	0.157	10.725	3.620	1.451
3	Methanol	200000	10.121	1.598	15.792	20.580	9.971
4	acetonitrile	20000	3.972	5.683	143.079	50.193	2.372
5	acetaldehyde	25000	3.973	1.133	28.519	17.614	3.577
6	ethylamine	5000	0.023	0.010	43.745	0.087	0.021
7	1,3-butadiene	1000	0.219	0.105	48.030	1.225	0.192
8	propanenitrile	6000	0.061	0.027	43.864	0.706	0.054
9	2-propenal	100	0.227	0.122	53.621	1.886	0.186
10	1-butanol + butenes	20000	0.174	0.123	70.782	3.248	0.126
11	methyl isocyanate	20	0.130	0.059	45.301	0.362	0.112
12	methyl nitrite	100	0.123	0.036	29.114	0.860	0.116
13	furan	1	0.035	0.016	44.241	0.182	0.032
14	butanenitrile	8000	0.022	0.014	62.883	0.347	0.018
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.066	0.033	50.022	N/A*	N/A*
16	butanal	25000	0.269	0.082	30.428	0.573	0.241
17	NDMA**	0.3	0.036	0.032	88.171	0.207	0.030
18	benzene	500	0.214	0.100	46.687	3.068	0.175
19	2,4-pentadienenitrile + pyridine	300, 1000	0.046	0.016	33.973	0.207	0.043
20	2-methylene butanenitrile	300	0.018	0.011	60.255	0.089	0.015
21	2-methylfuran	1	0.045	0.021	47.463	0.234	0.040
22	pentanenitrile	6000	0.014	0.008	59.601	0.147	0.012
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.049	0.023	47.136	0.208	0.043
24	NEMA**	0.3	0.015	0.018	121.080	0.145	0.009
25	2,5-dimethylfuran	1	0.028	0.017	60.571	0.155	0.023
26	hexanenitrile	6000	0.006	0.004	79.697	0.049	0.004
27	2-hexanone (MBK)	5000	0.021	0.012	55.218	0.089	0.019
28	NDEA**	0.1	0.004	0.006	143.698	0.046	0.000
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.044	0.022	48.894	0.122	0.039
30	2,4-dimethylpyridine	500	0.020	0.016	79.420	0.738	0.016

Table 3-2. Statistical Information for the Monitoring Period of October 17, 2018 – October 18, 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	0.042	0.028	65.539	0.178	0.043
32	heptanenitrile	6000	0.031	0.026	83.145	0.122	0.021
33	4-methyl-2-hexanone	500	0.037	0.025	66.454	0.118	0.033
34	NMOR**	0.6	0.007	0.011	154.769	0.103	0.000
35	butyl nitrate	2500	0.019	0.016	88.271	0.090	0.013
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.033	0.021	64.814	0.105	0.030
37	6-methyl-2-heptanone	8000	0.033	0.021	65.419	0.107	0.029
38	2-pentylfuran	1	0.039	0.019	48.956	0.106	0.039
39	Biphenyl	200	0.024	0.018	75.598	0.097	0.021
40	2-heptylfuran	1	0.121	0.086	71.420	0.308	0.088
41	1,4-butanediol dinitrate	50	0.041	0.029	71.631	0.131	0.034
42	2-octylfuran	1	0.002	0.007	311.737	0.110	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.002	0.007	421.408	0.100	0.000
44	PCB	1000	0.051	0.033	63.464	0.137	0.044
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.024	0.019	79.883	0.091	0.020
46	furfural acetophenone	1	0.116	0.082	70.784	0.302	0.093

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.429 ppb and the median value was 0.057 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 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period October 17, 2018, to October 18, 2018. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

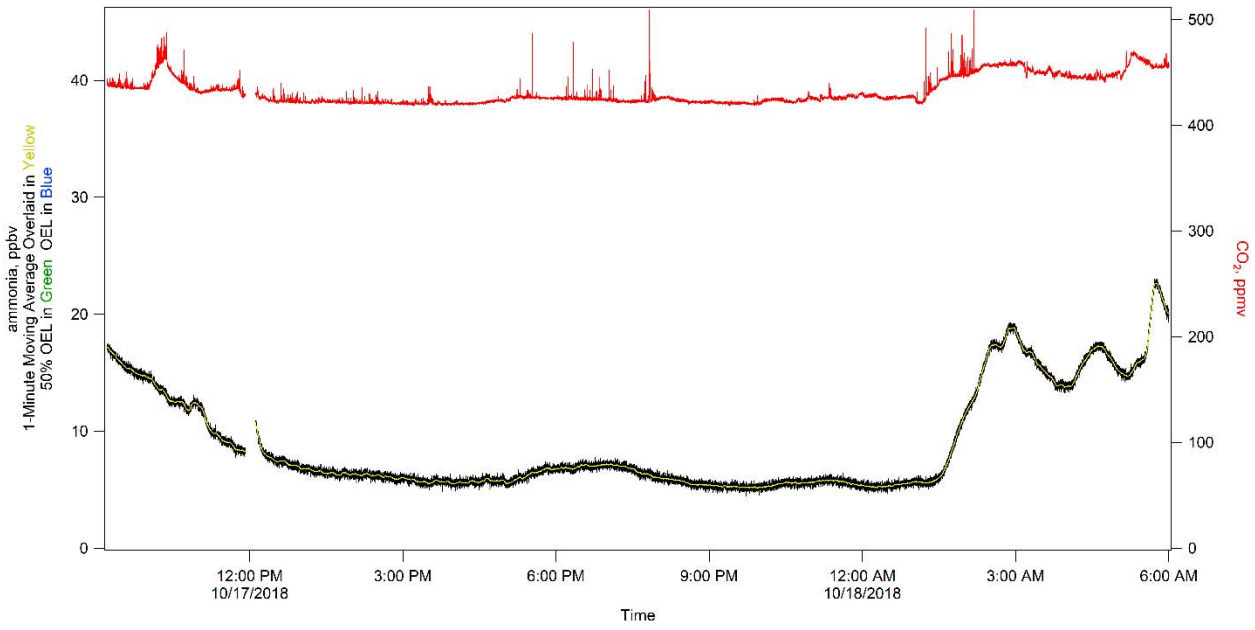

Figure 3-4. Ammonia.

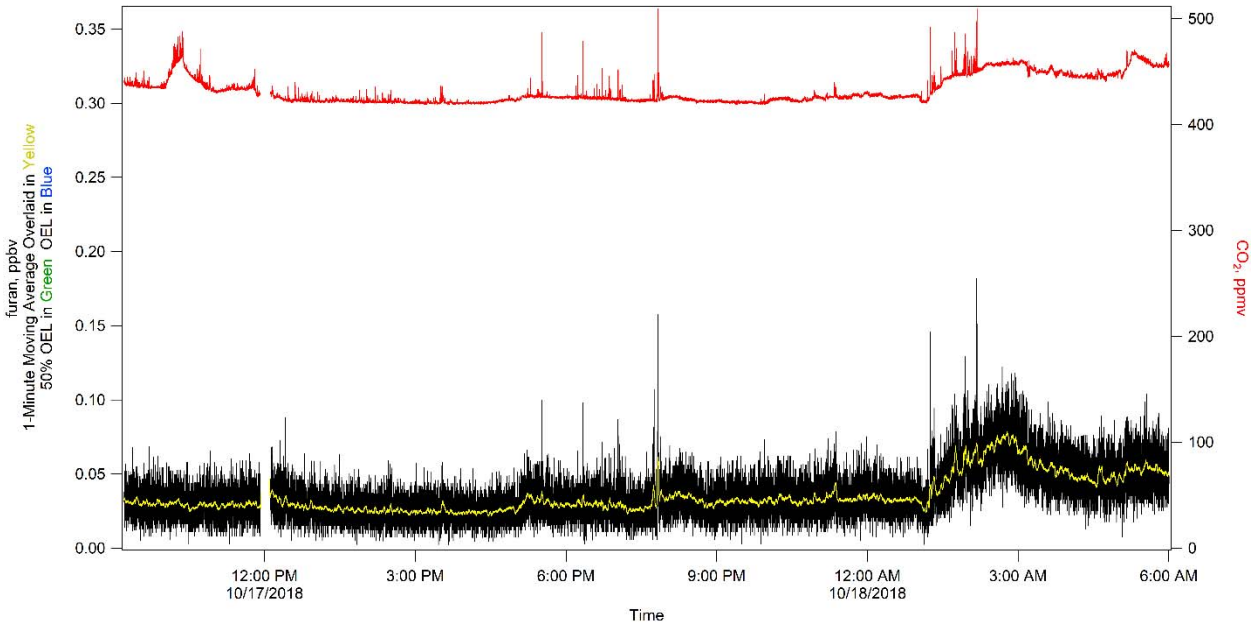

Figure 3-5. Furan.

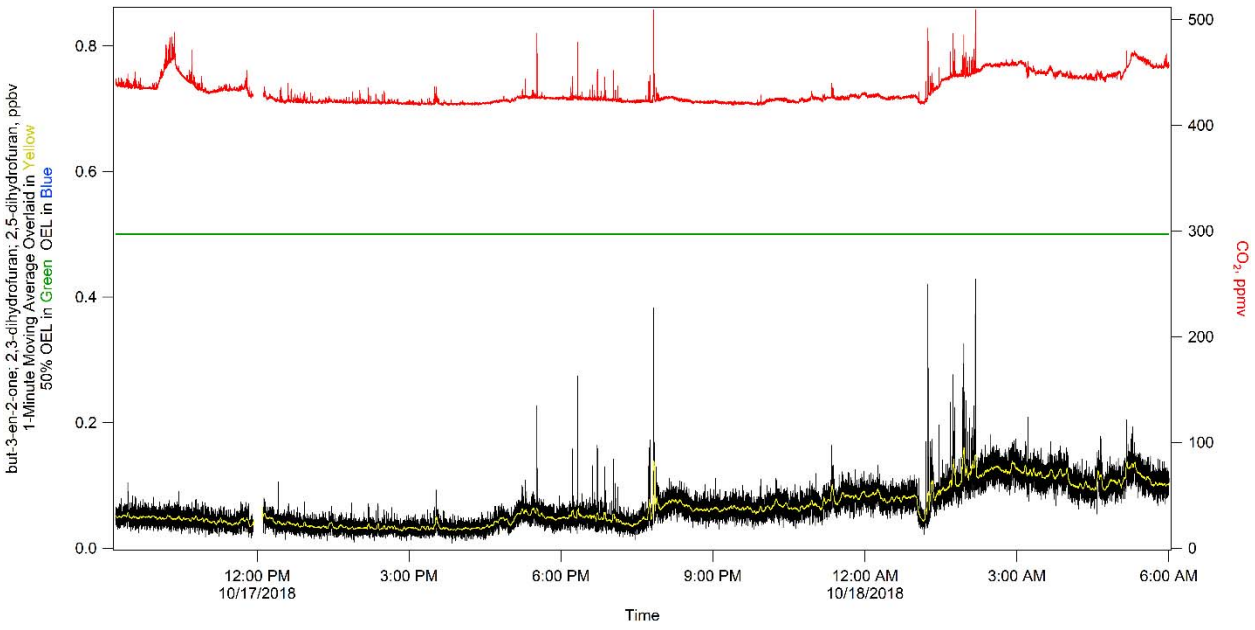

Figure 3-6. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

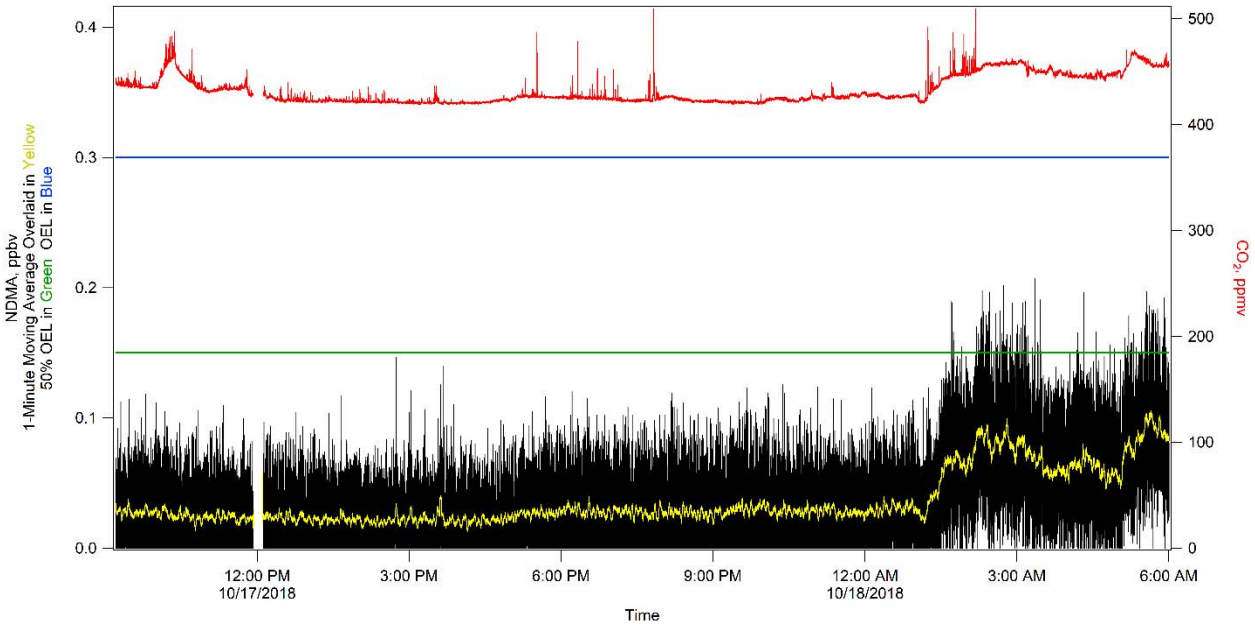

Figure 3-7. N-nitrosodimethylamine (NDMA).

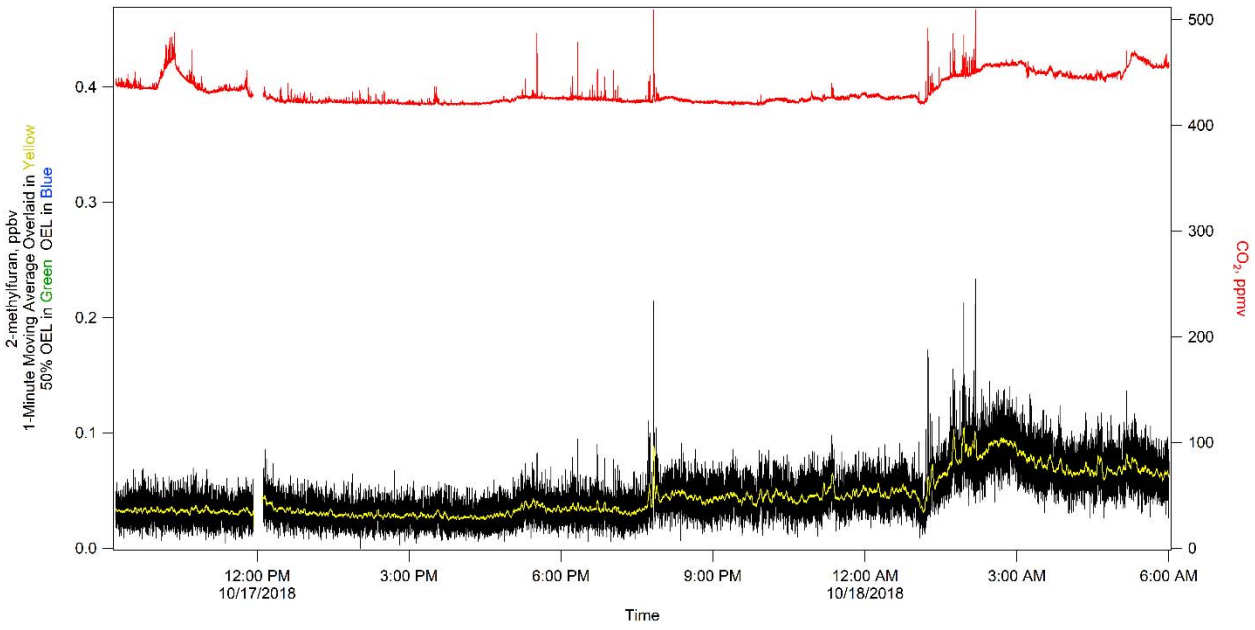

Figure 3-8. 2-methylfuran.

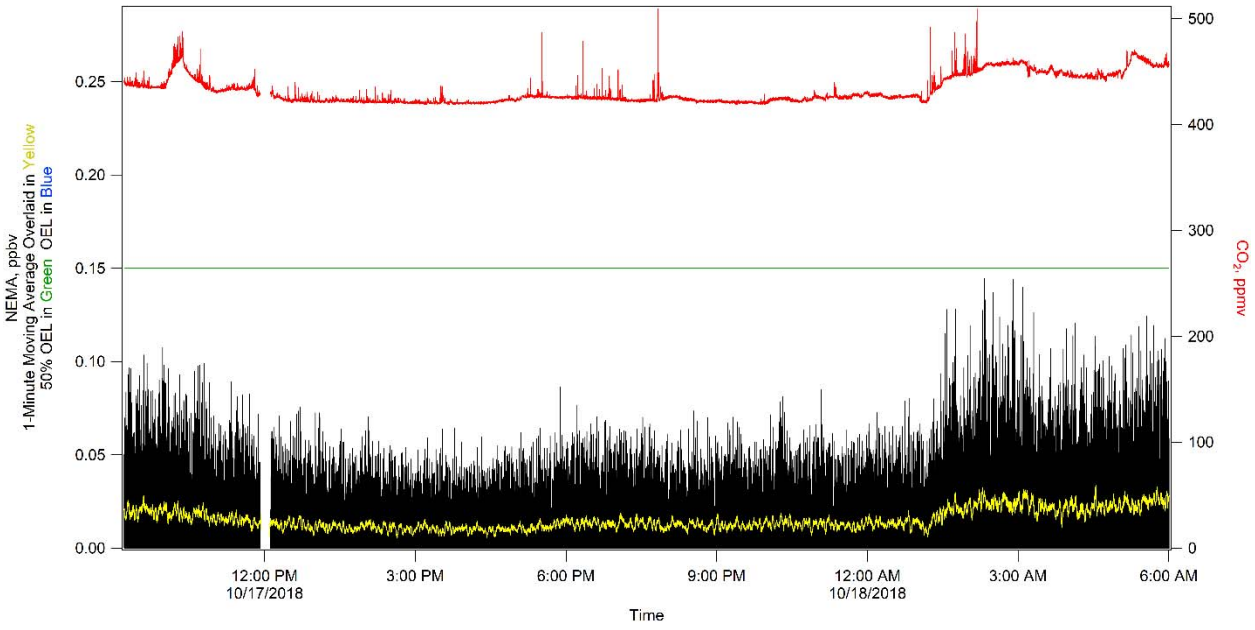

Figure 3-9. N-nitrosomethylethylamine (NEMA).

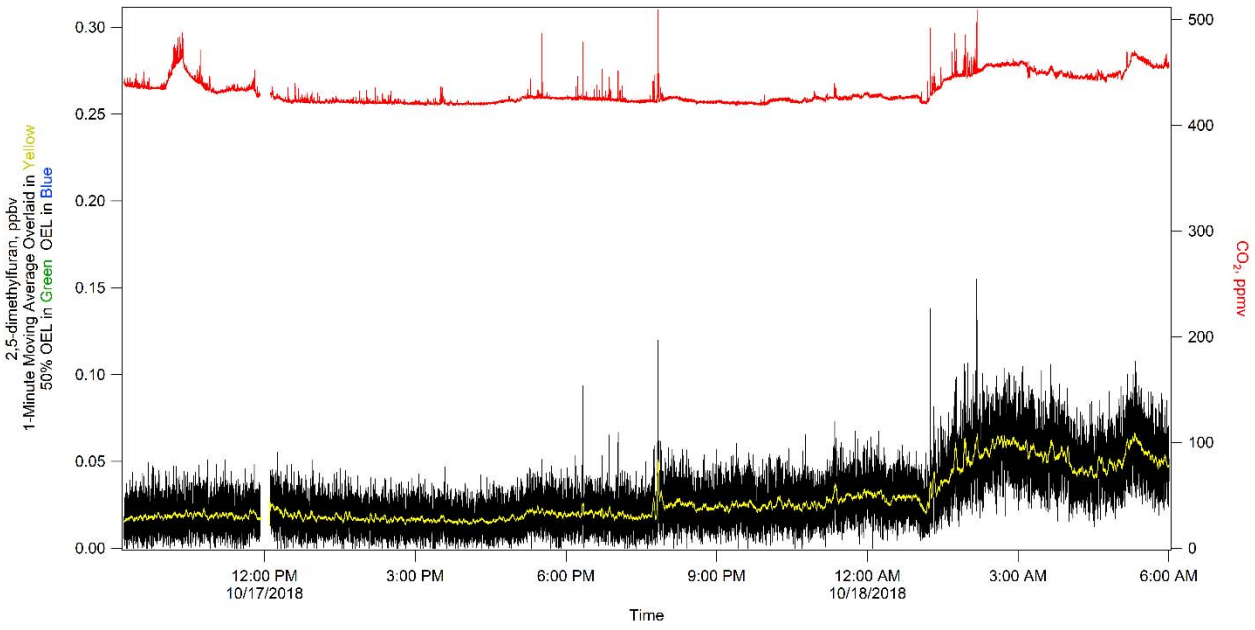

Figure 3-10. 2,5-dimethylfuran.

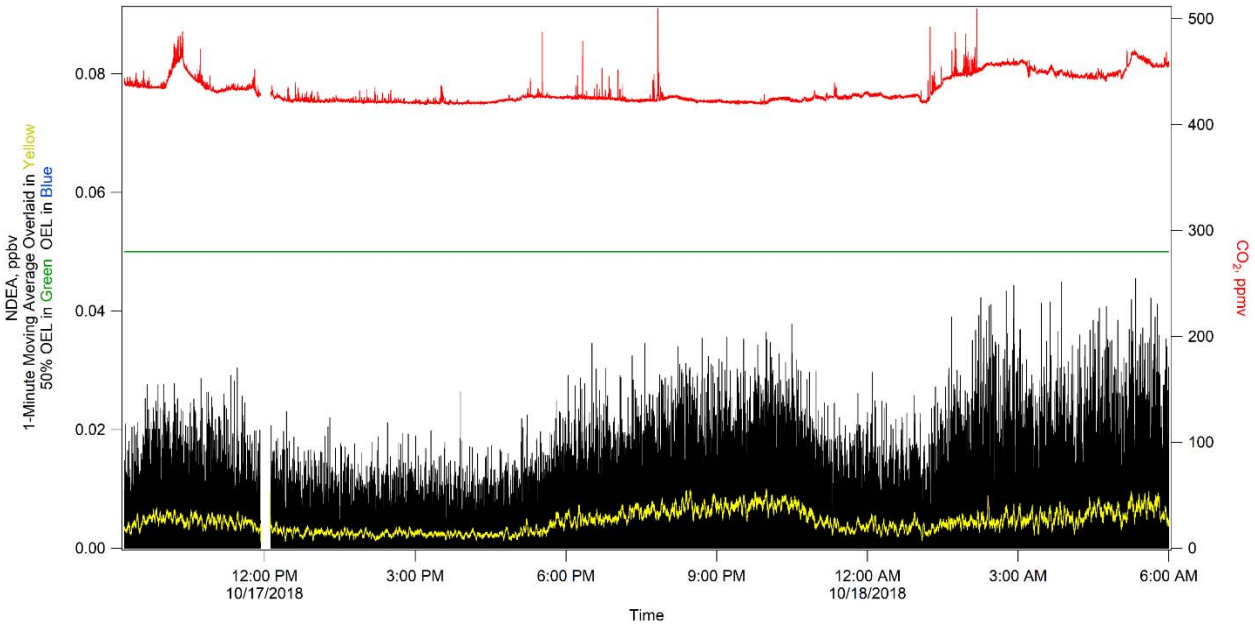

Figure 3-11. N-nitrosodiethylamine (NDEA).

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

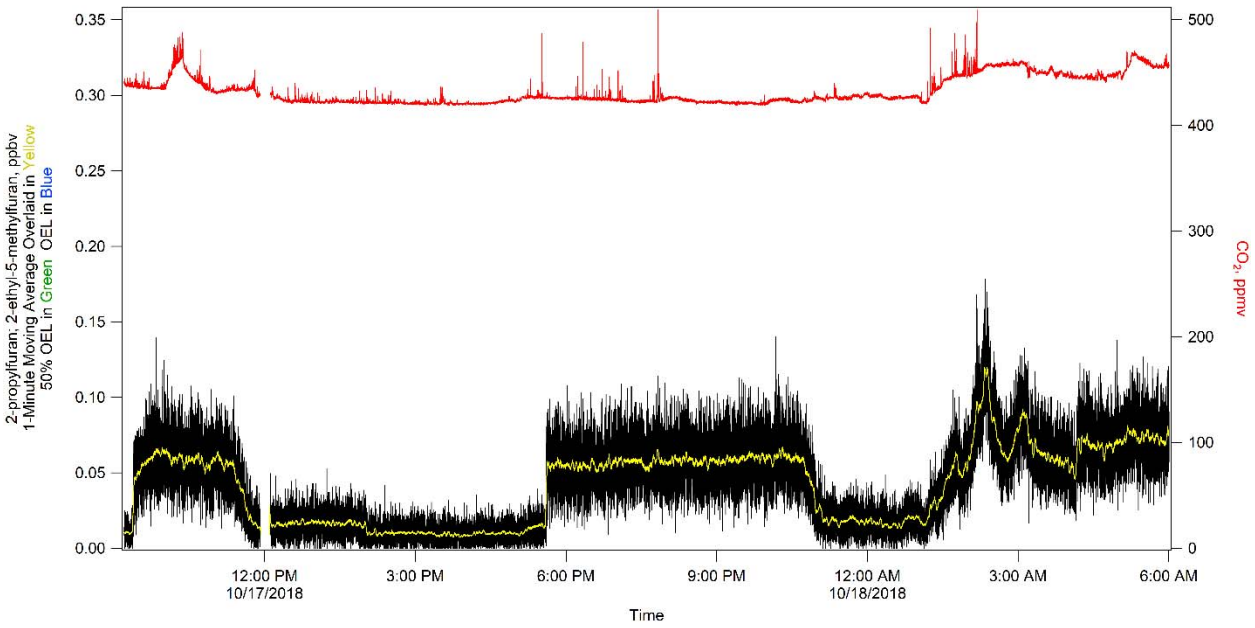

Figure 3-12. 2-propylfuran + 2-ethyl-5-methylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

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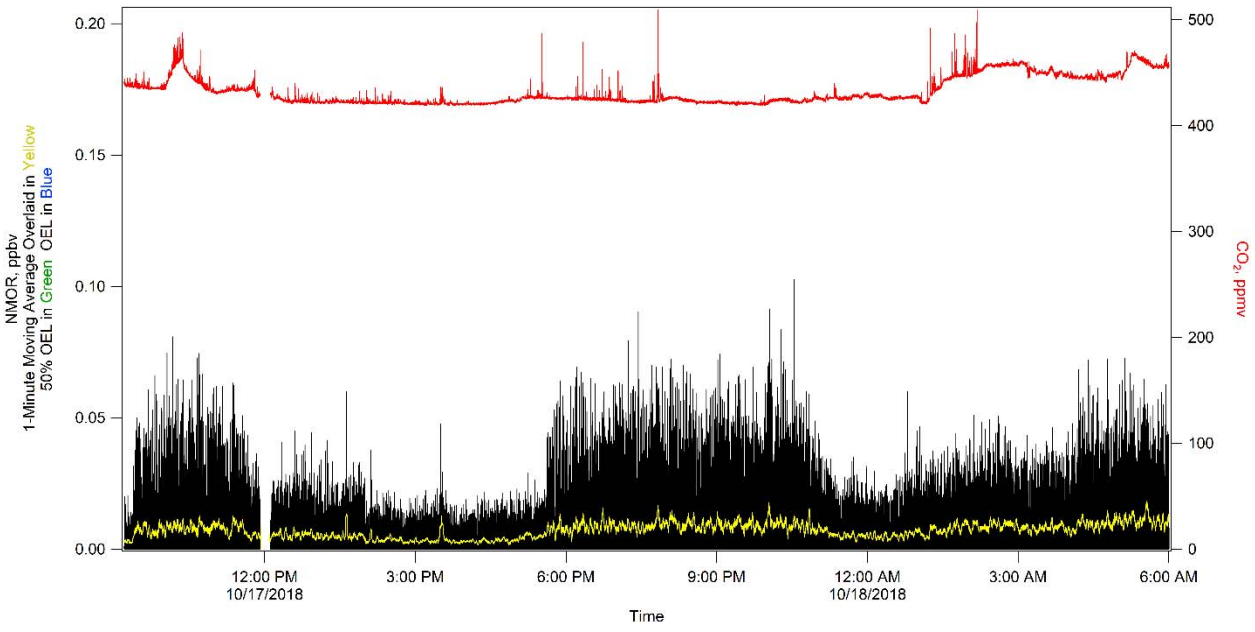

Figure 3-13. N-nitrosomorpholine (NMOR).

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

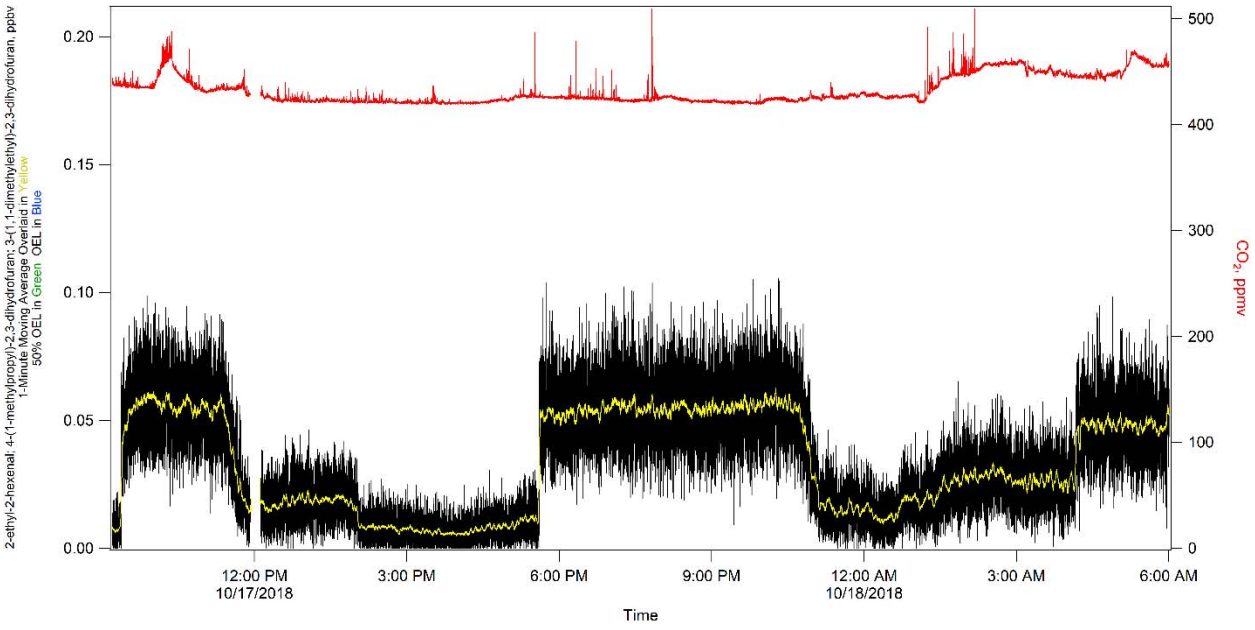

Figure 3-14. 2-ethyl-2-hexanal;4-(1-methylpropyl);2,3-dihydrofuran; 3-1(1,1-dimethylethyl)-2,3-dihydrofuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

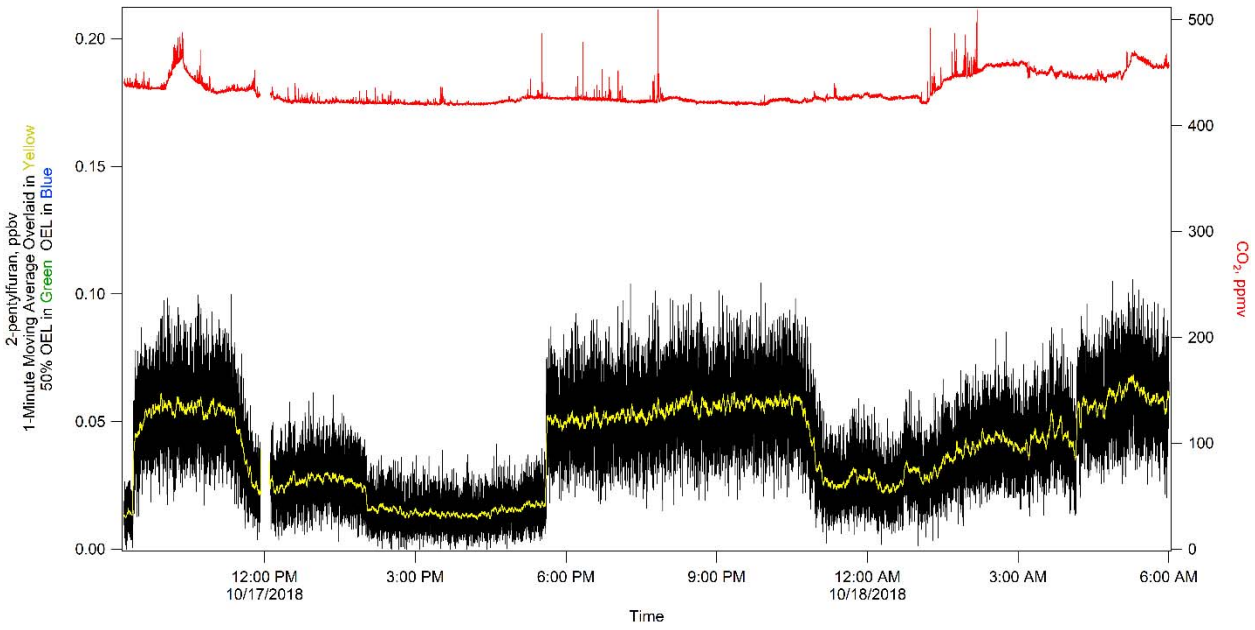

Figure 3-15. 2-pentylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

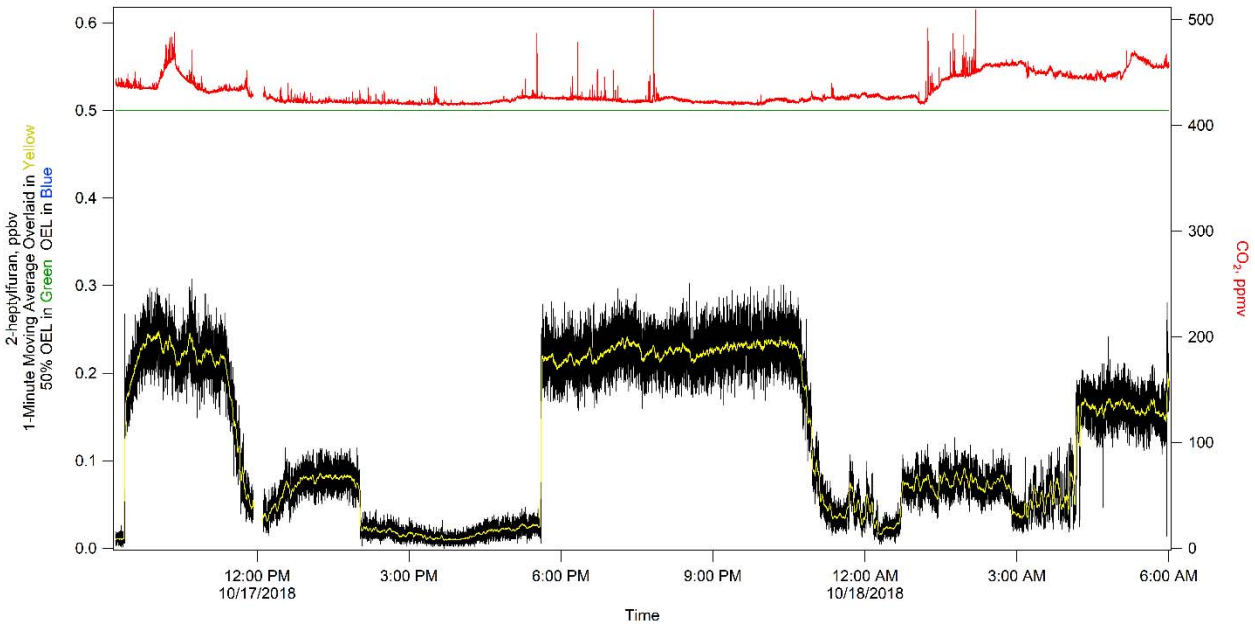

Figure 3-16. 2-heptylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

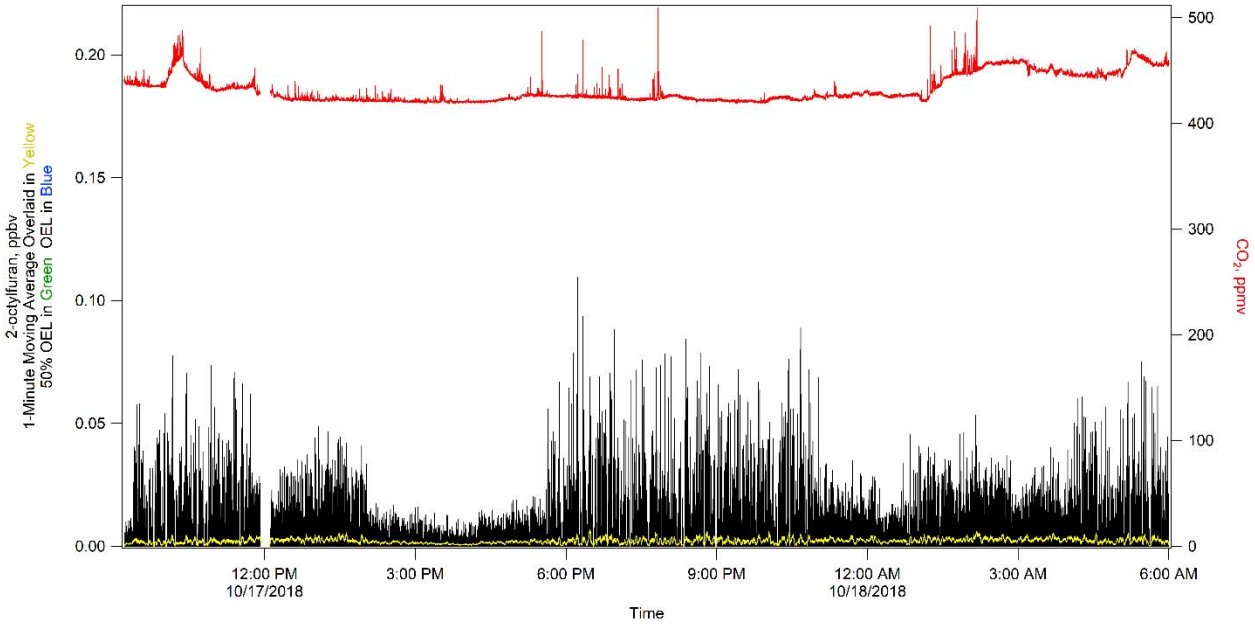

Figure 3-17. 2-octylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

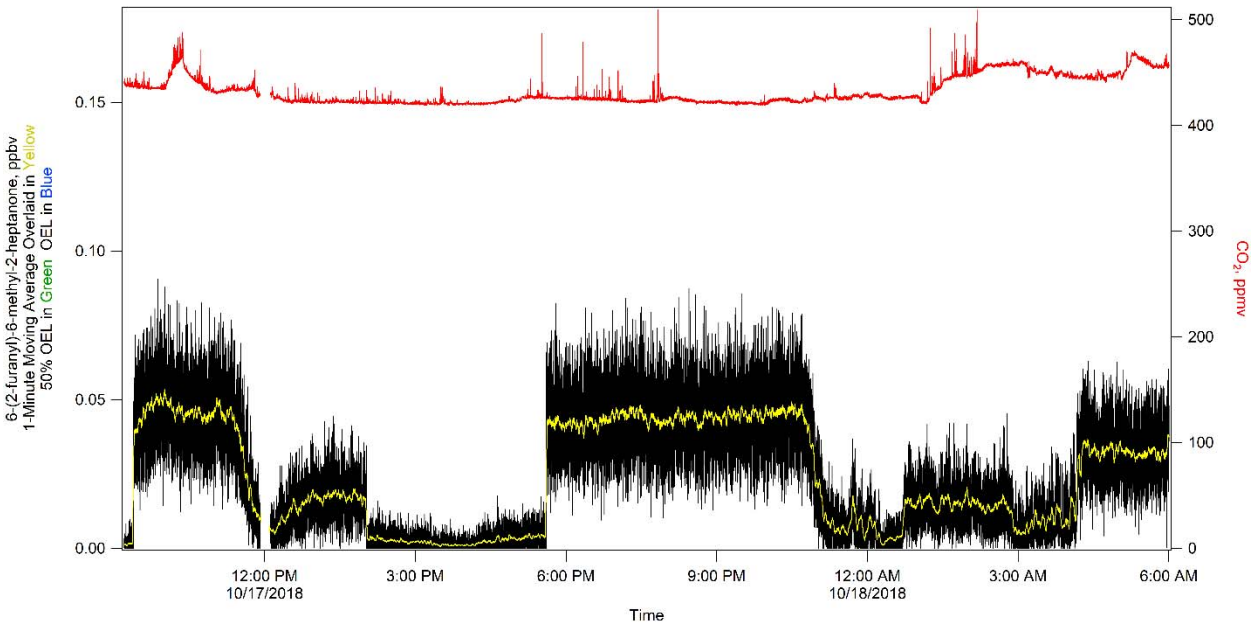

Figure 3-18. 6-(2-furanyl)-6-methyl-2-heptanone.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

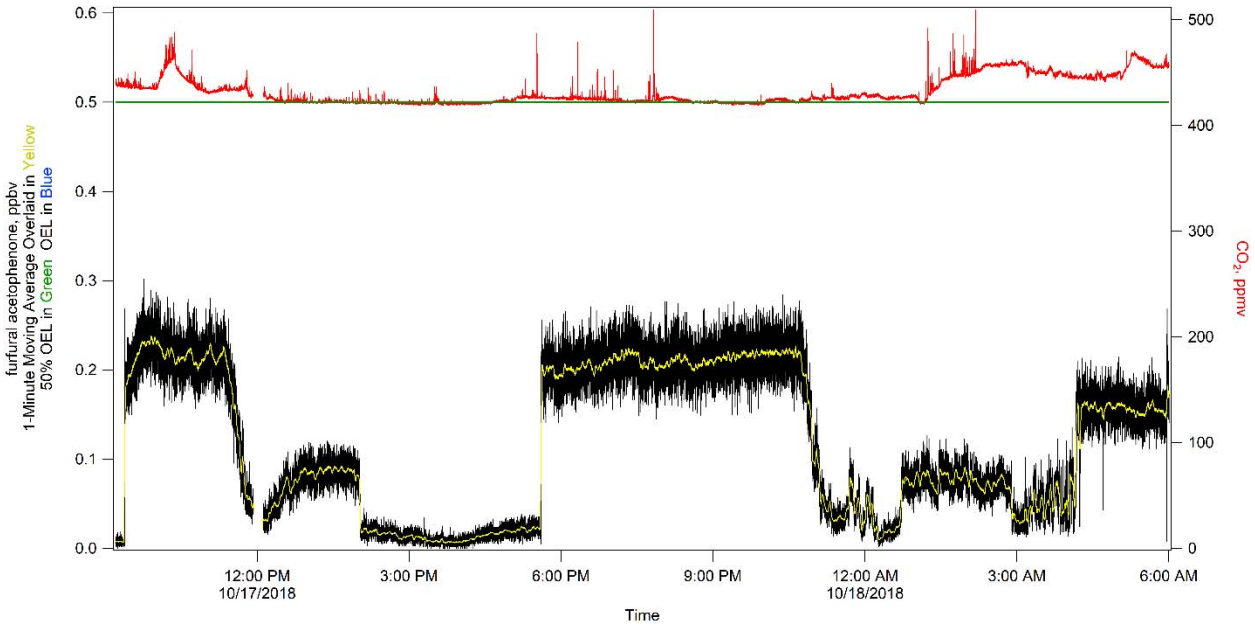

Figure 3-19. Furfural Acetophenone.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

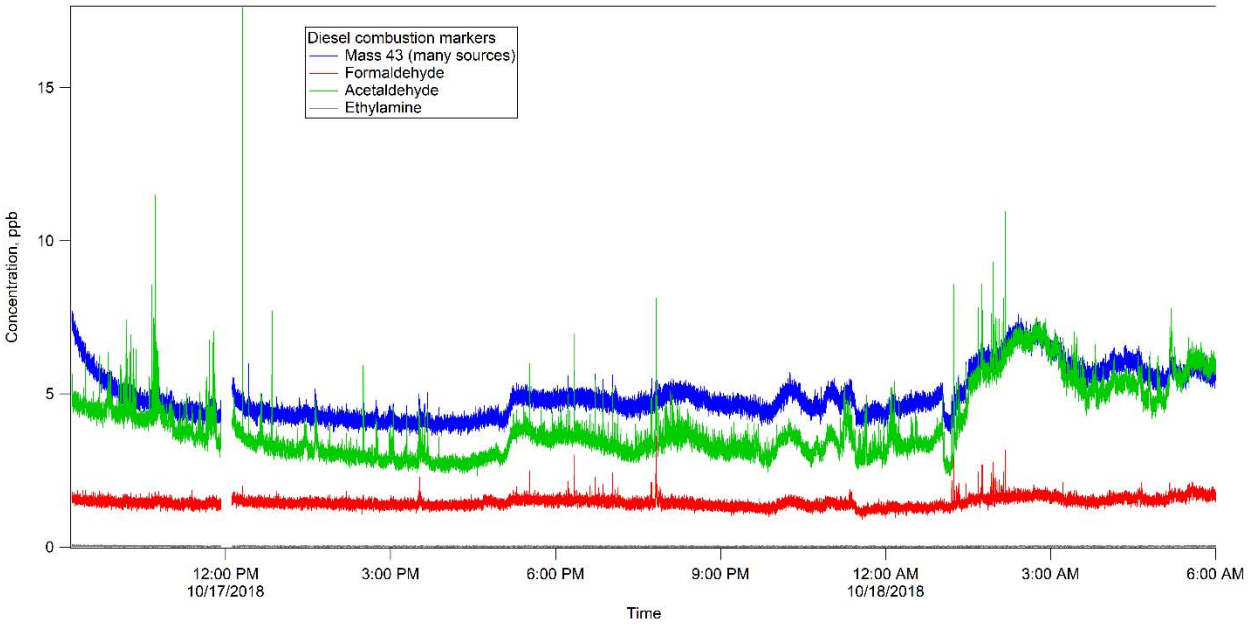

Figure 3-20. Diesel Combustion Markers.

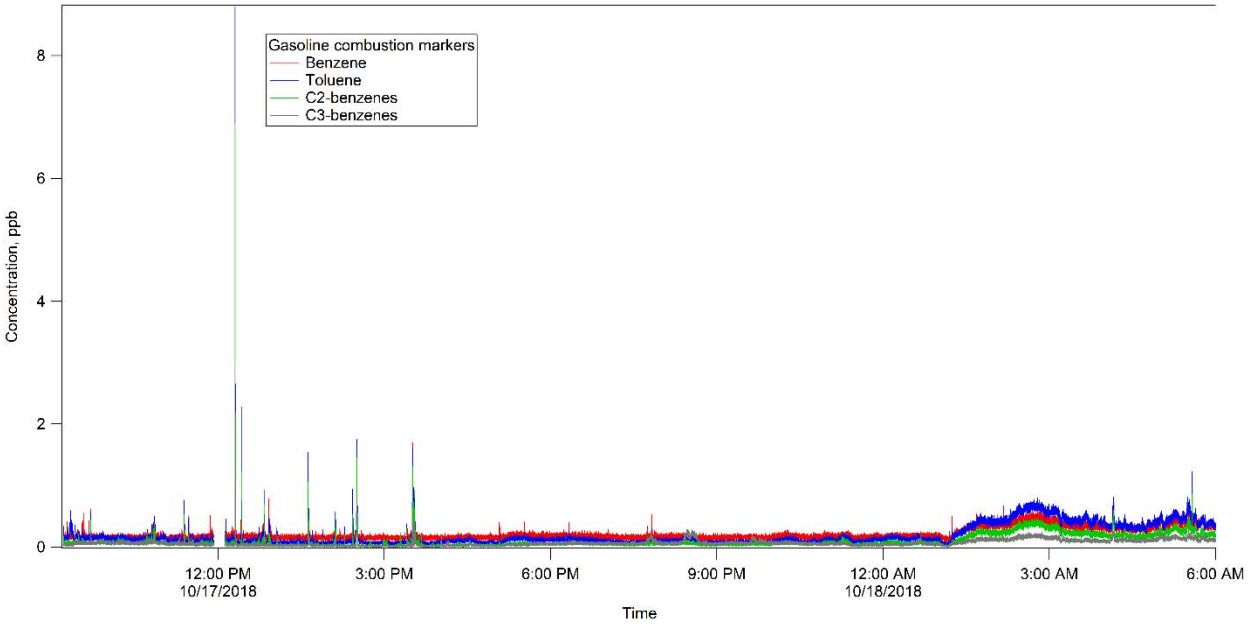

Figure 3-21. Gasoline Combustion Markers.

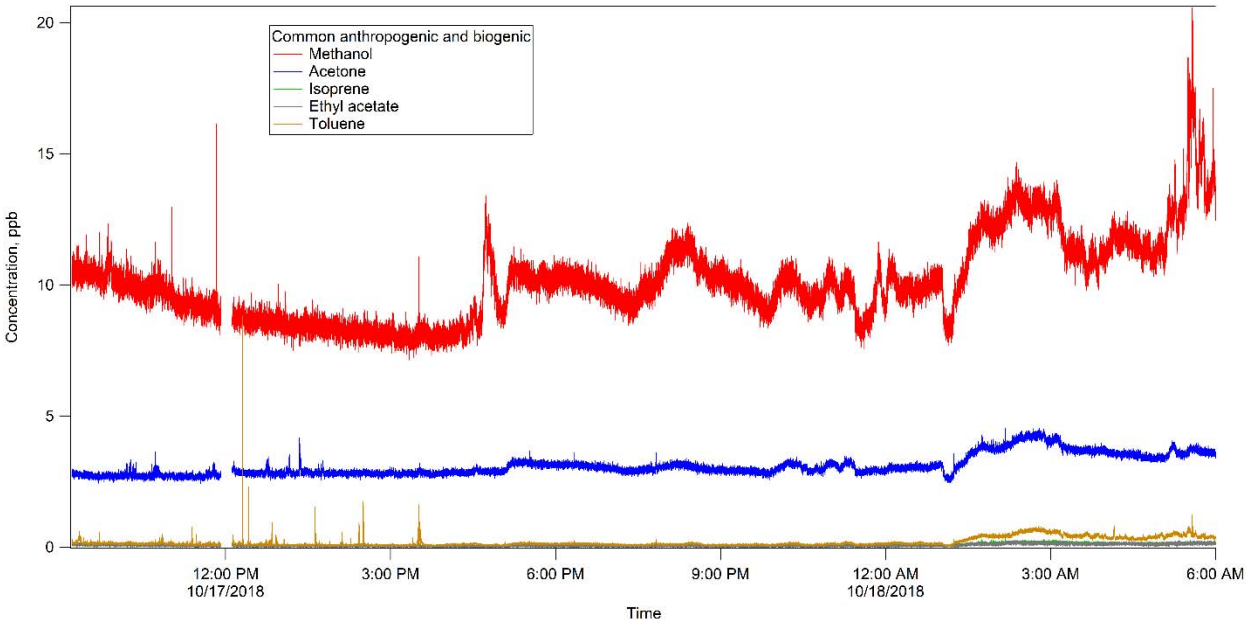

Figure 3-22. Plant and Human Markers.

4.0 OCTOBER 18, 2018 – OCTOBER 19, 2018 – STUDY SITE #4

4.1 Quality Assessment

Data from October 18, 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. DR18-008, "Deficiency Report," was initiated to adequately document the high peak forming at mass 42 when switching from H_3O and NO^+ modes on the PTR. See Appendix A for the full Deficiency Report. This instance will be discussed in detail in a subsequent monthly summary report.

4.2 Summary

The ML personnel performed background sampling using the ML from October 18, 2018, to October 19, 2018, at Study Site 4. Site 4 is located downwind of the AN Tank Farm. The ML arrived at Site 4 at 06:44 on October 18, 2018. The QA/QC zero-air/sensitivity checks were initiated on the LI-COR CO_2 monitor, Picarro NH_3 analyzer, and the PTR-MS beginning at 06:29, prior to Site 4 arrival. The data file names were confirmed and NO^+ data collection mode began at 07:27. At 08:51, ML staff ended NO^+ data collection mode and transitioned into routine H_3O^+ data collection mode. Collection of confirmatory samples began at 08:55. The ML staff were informed by the senior scientist to move closer and downwind from AN Farm at 09:55. By 10:03, the ML staff were monitoring at the suggested location. The ML staff departed the monitoring site after 12:06 and checked out with the CSO.

The ML staff returned to Site 4 at 05:51 on October 19, 2018. At 06:39, the senior scientist saw a high signal at mass 42 and noted a potential sampling issue with the PTR. The PTR-MS vendor was informed and a deficiency report was issued, DR18-008. See Appendix A for the full Deficiency Report. The ML moved to Site 5 by 09:20.

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

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

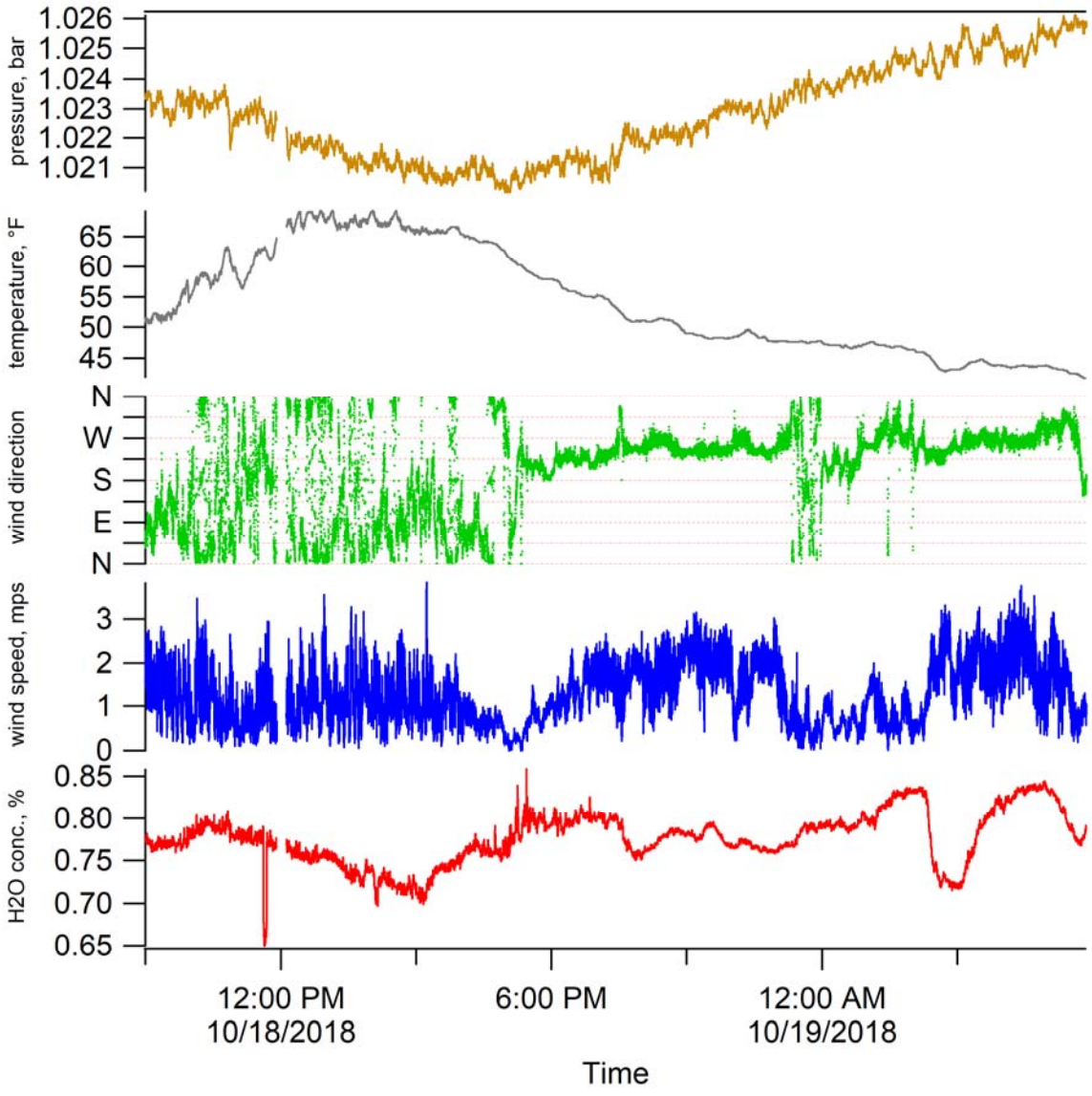

Figure 4-3. Weather Data.

4.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

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

Confirmatory air samples were collected as follows:

Table 4-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
4	10/18/18	Thermosorb/N	EL33214	08:55	11:55	180
4	10/18/18	Carbotrap-300	A052433	12:04	18:04	360
4	10/18/18	LpDNPH	181018_Site4	08:55	11:55	180

Table 4-2 displays the statistical information for the monitoring period of October 18, 2018, to October 19, 2018. By definition, the OEL is an 8-hour, time-weighted average that establishes a limit for personnel exposures to hazardous chemicals. It is the exposure level to which a person may be exposed for 8 hours/day, 40 hours/week for 40 years and have no expectation of adverse health effects. In this study, area vapor concentration measurements were made to better understand the hazardous vapor exposures that workers may receive. These measurements are only compared to OEL concentrations to give them context. It is neither accurate nor appropriate to interpret these short duration measurements (2 seconds) as worker exposure levels. Since the OEL is defined as a time-weighted average, it is more appropriate to compare them to daily average vapor concentrations. Short duration excursions above the OEL concentration are not significant.

Table 4-2. Statistical Information for the Monitoring Period of October 18, 2018 – October 19, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	Ammonia	25000	11.881	4.103	34.532	24.648	9.541
2	formaldehyde	300	1.389	0.191	13.766	4.331	1.387
3	Methanol	200000	10.612	1.711	16.128	54.623	10.255
4	acetonitrile	20000	4.428	6.551	147.925	124.642	2.794
5	acetaldehyde	25000	4.099	0.732	17.852	17.985	3.957
6	ethylamine	5000	0.023	0.011	46.213	0.092	0.022
7	1,3-butadiene	1000	0.214	0.072	33.560	1.634	0.209
8	propanenitrile	6000	0.056	0.018	31.422	0.413	0.054
9	2-propenal	100	0.202	0.096	47.291	2.821	0.190
10	1-butanol + butenes	20000	0.138	0.075	54.599	2.897	0.129
11	methyl isocyanate	20	0.249	0.063	25.397	0.577	0.247
12	methyl nitrite	100	0.132	0.041	31.243	1.229	0.127
13	furan	1	0.032	0.013	39.941	0.314	0.031
14	butanenitrile	8000	0.019	0.009	47.535	0.131	0.018
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.059	0.027	45.316	N/A*	N/A*
16	butanal	25000	0.308	0.049	15.951	0.662	0.301
17	NDMA**	0.3	0.042	0.029	68.654	0.184	0.040
18	benzene	500	0.183	0.091	49.540	4.544	0.173
19	2,4-pentadienenitrile + pyridine	300, 1000	0.047	0.013	27.437	0.371	0.045
20	2-methylene butanenitrile	300	0.016	0.007	44.736	0.070	0.014
21	2-methylfuran	1	0.042	0.017	40.965	0.318	0.040
22	pentanenitrile	6000	0.013	0.007	50.780	0.067	0.012
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	0.016	33.709	0.323	0.046
24	NEMA**	0.3	0.018	0.020	110.202	0.123	0.012
25	2,5-dimethylfuran	1	0.027	0.013	47.562	0.223	0.025
26	hexanenitrile	6000	0.005	0.004	78.415	0.033	0.004
27	2-hexanone (MBK)	5000	0.019	0.009	47.225	0.066	0.018
28	NDEA**	0.1	0.008	0.009	109.348	0.058	0.005
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.085	0.023	27.301	0.164	0.087
30	2,4-dimethylpyridine	500	0.026	0.016	59.094	0.452	0.023
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.061	0.018	29.234	0.148	0.061

Table 4-2. Statistical Information for the Monitoring Period of October 18, 2018 – October 19, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.065	0.016	24.233	0.127	0.065
33	4-methyl-2-hexanone	500	0.065	0.017	25.858	0.137	0.065
34	NMOR**	0.6	0.009	0.014	157.066	0.101	0.000
35	butyl nitrate	2500	0.037	0.014	38.631	0.103	0.036
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.058	0.015	26.491	0.128	0.058
37	6-methyl-2-heptanone	8000	0.058	0.014	24.902	0.122	0.058
38	2-pentylfuran	1	0.057	0.015	26.362	0.119	0.056
39	Biphenyl	200	0.044	0.016	36.202	0.107	0.044
40	2-heptylfuran	1	0.230	0.044	19.251	0.347	0.238
41	1,4-butanediol dinitrate	50	0.075	0.018	24.800	0.154	0.075
42	2-octylfuran	1	0.002	0.008	398.179	0.150	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.002	0.009	443.257	0.119	0.000
44	PCB	1000	0.090	0.018	20.379	0.158	0.091
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.046	0.013	28.676	0.099	0.046
46	furfural acetophenone	1	0.218	0.038	17.310	0.341	0.223

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.688 ppb and the median value was 0.057 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 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period October 18, 2018, to October 19, 2018. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

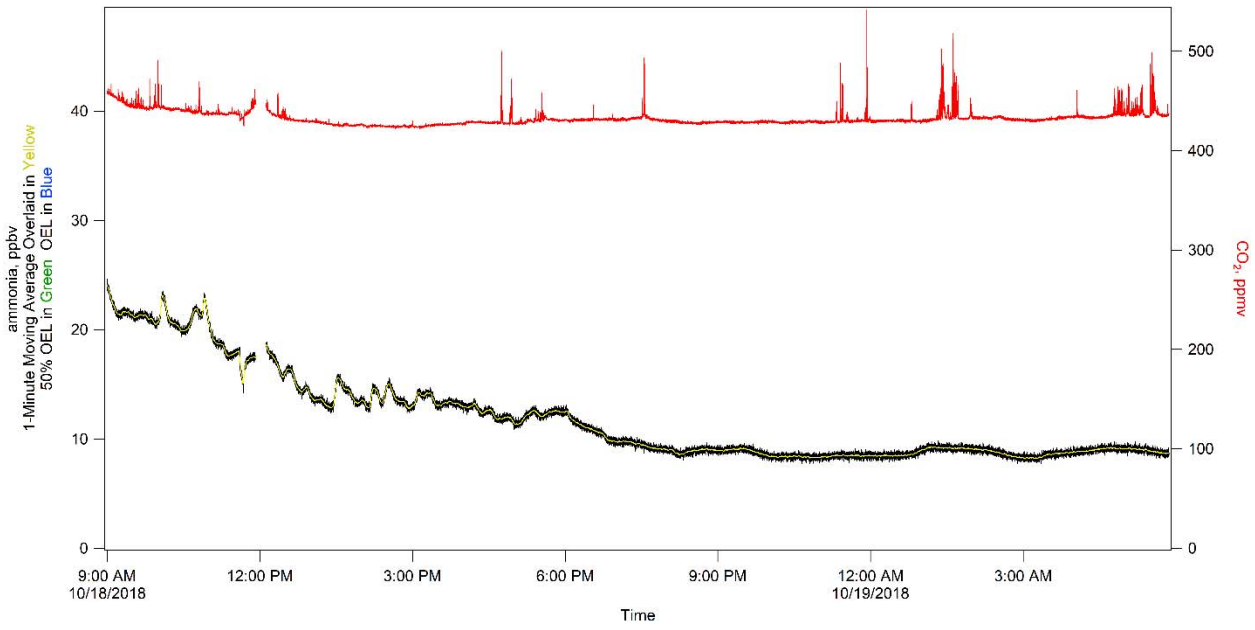

Figure 4-4. Ammonia.

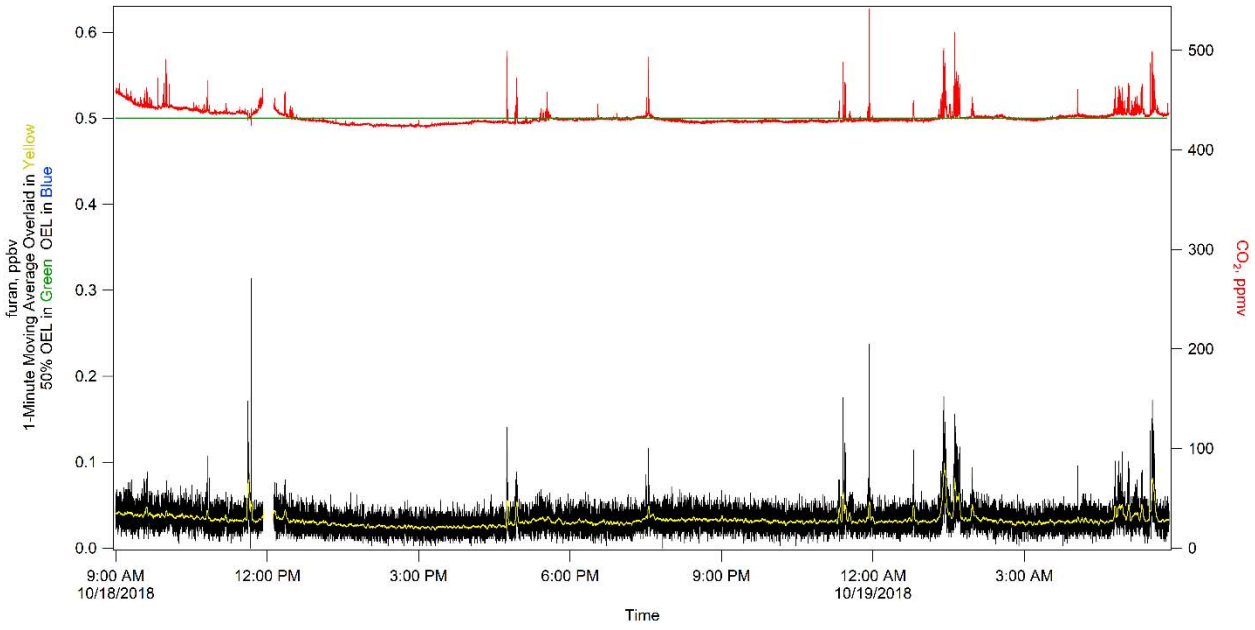

Figure 4-5. Furan.

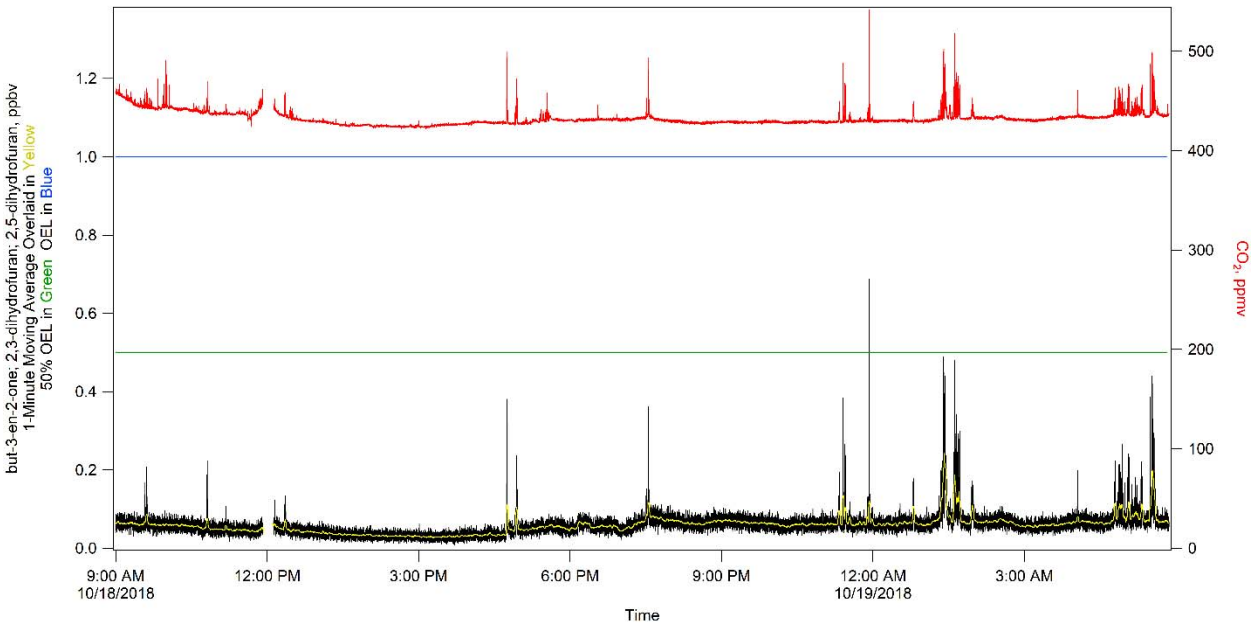

Figure 4-6. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

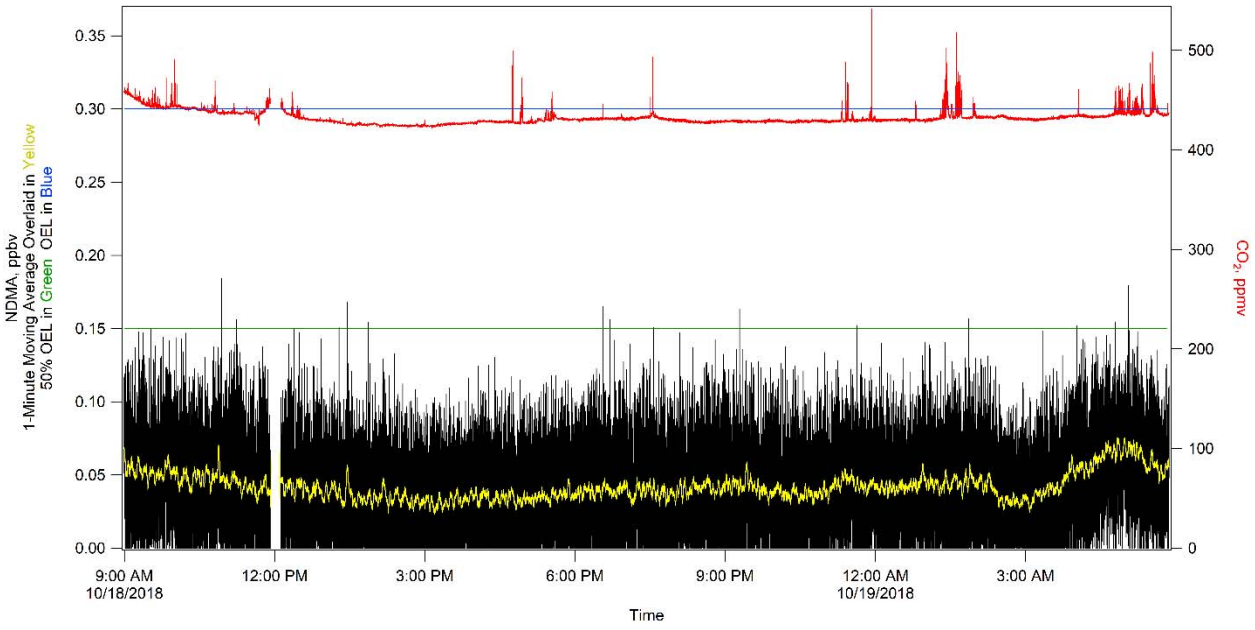

Figure 4-7. N-nitrosodimethylamine (NDMA).

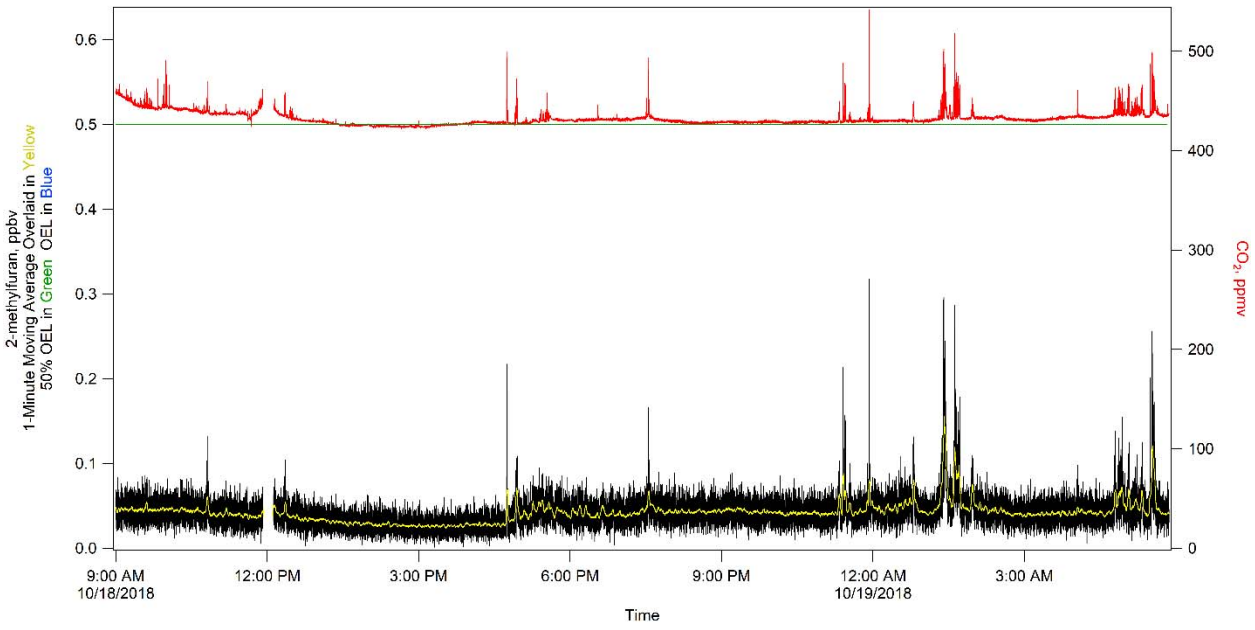

Figure 4-8. 2-methylfuran.

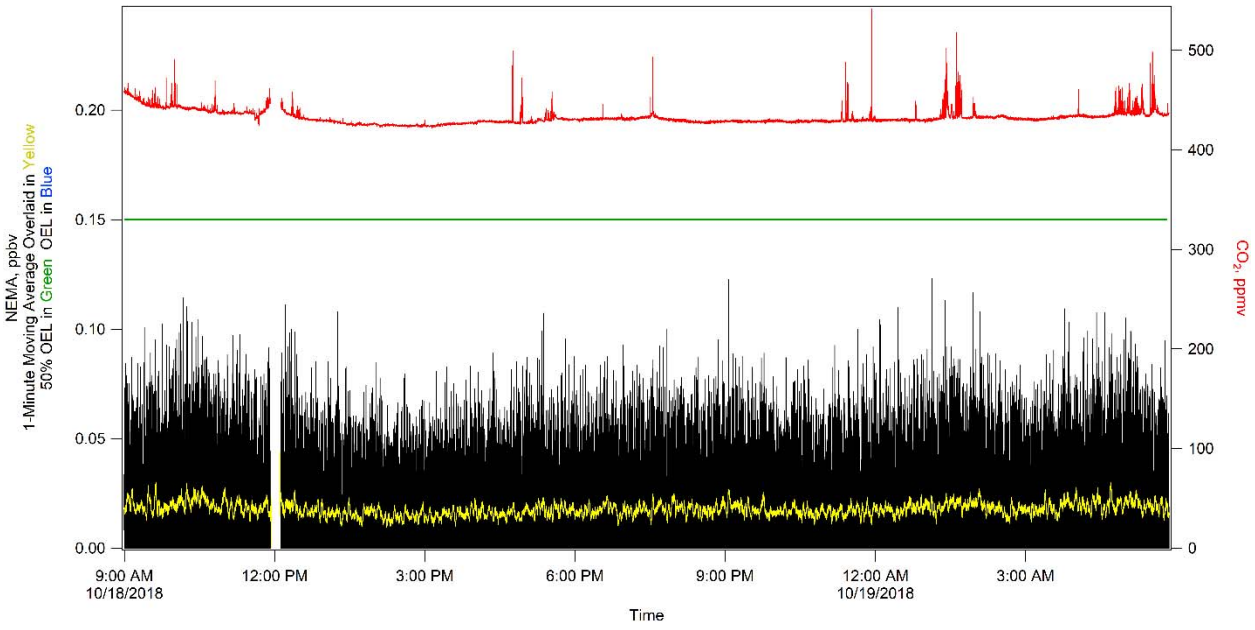

Figure 4-9. N-nitrosomethylethylamine (NEMA).

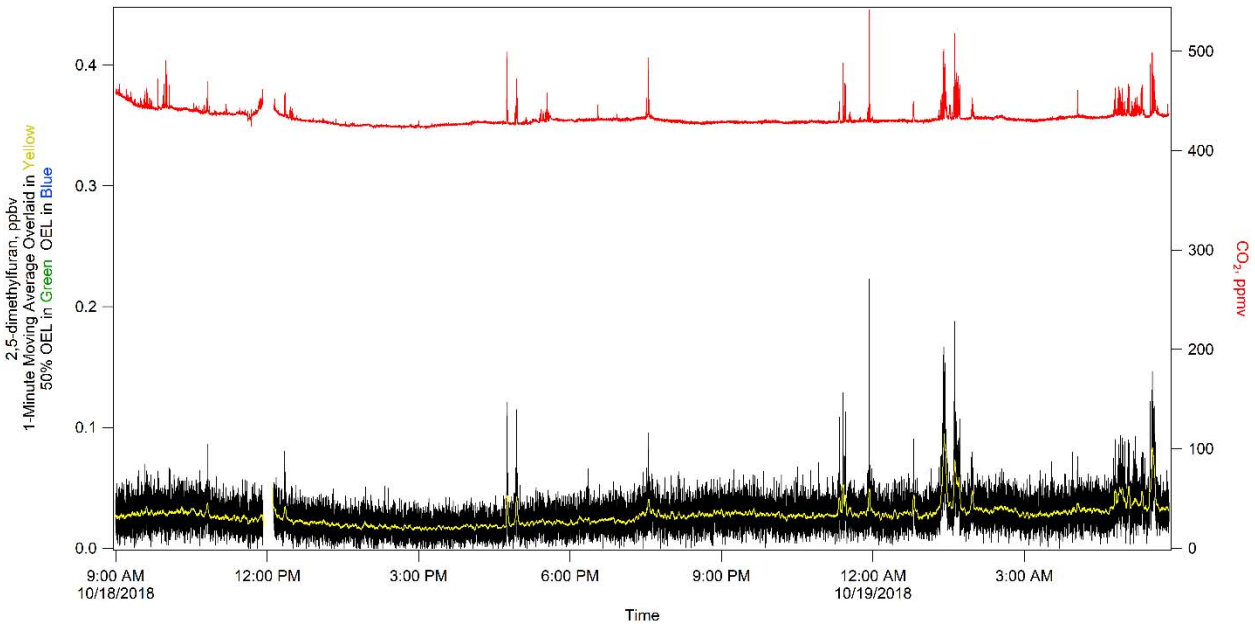

Figure 4-10. 2,5-dimethylfuran.

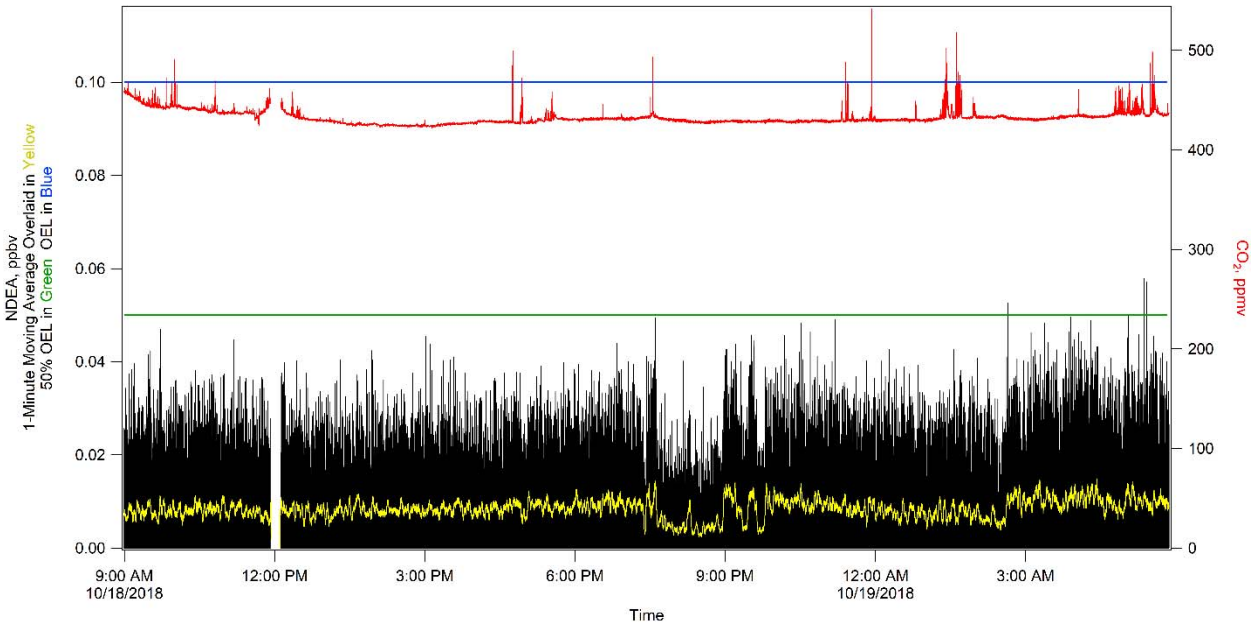

Figure 4-11. N-nitrosodiethylamine (NDEA).

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

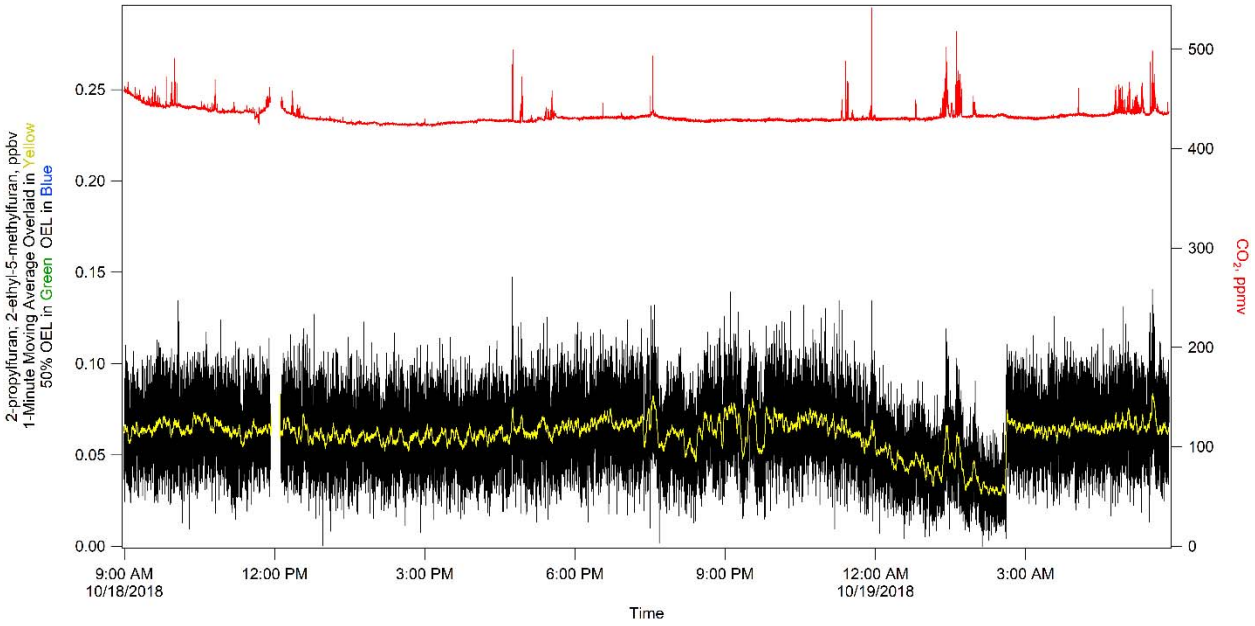

Figure 4-12. 2-propylfuran + 2-ethyl-5-methylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

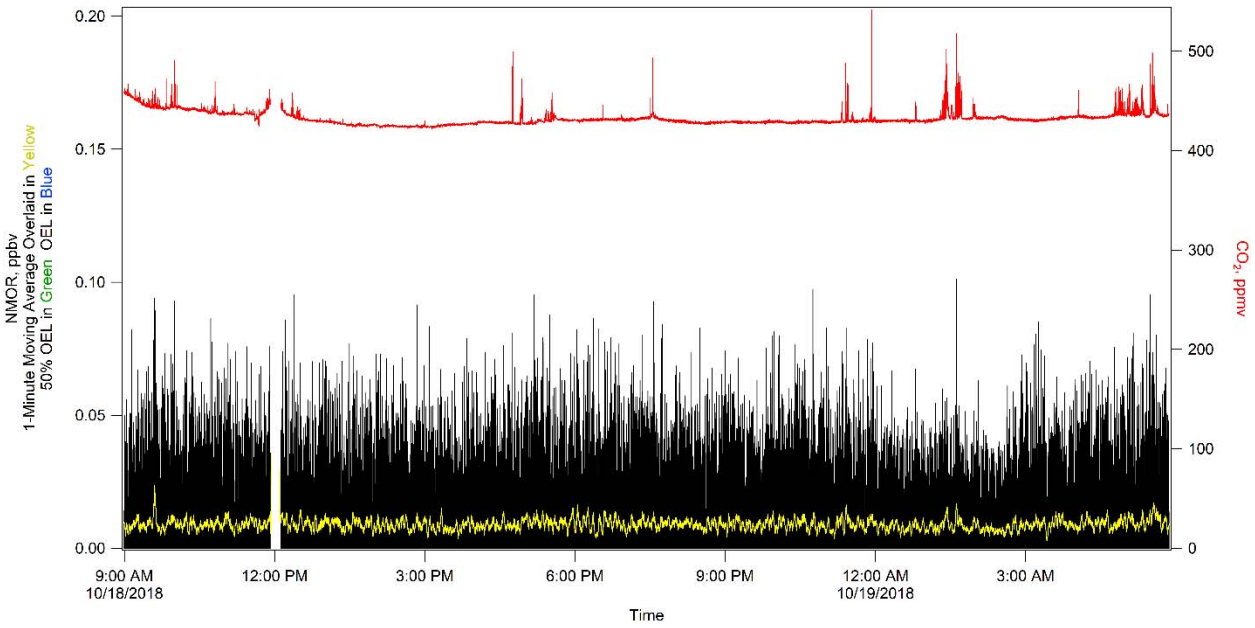

Figure 4-13. N-nitrosomorpholine (NMOR).

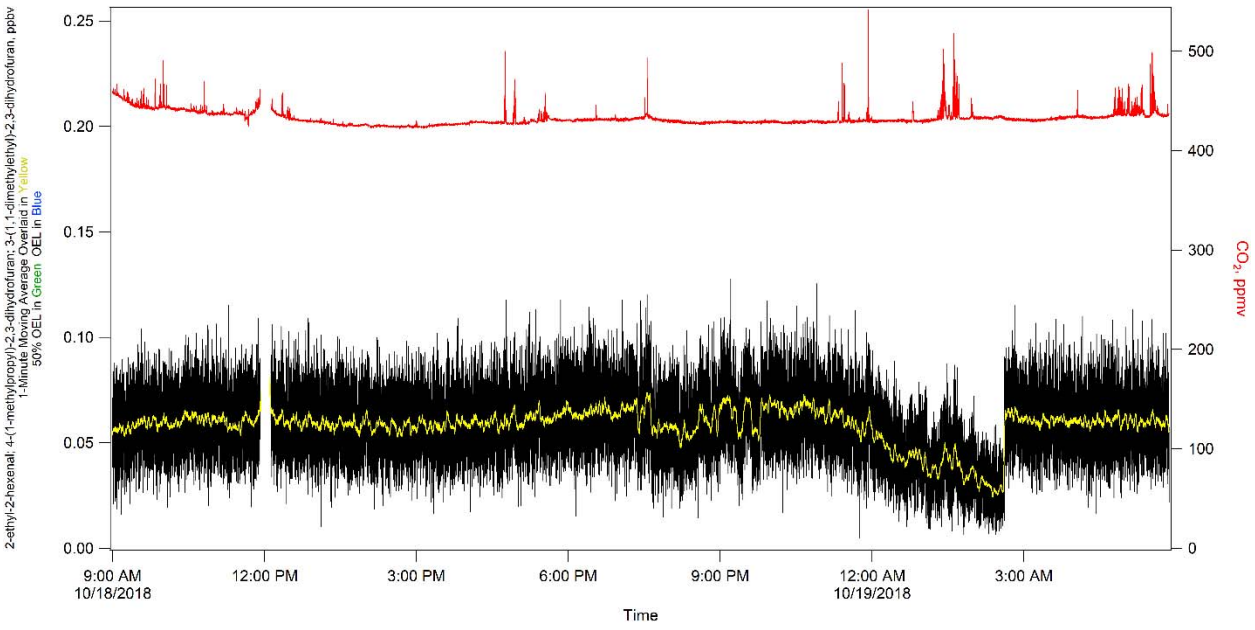

Figure 4-14. 2-ethyl-2-hexanal;4-(1-methylpropyl);2,3-dihydrofuran; 3-1(1,1-dimethylethyl)-2,3-dihydrofuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

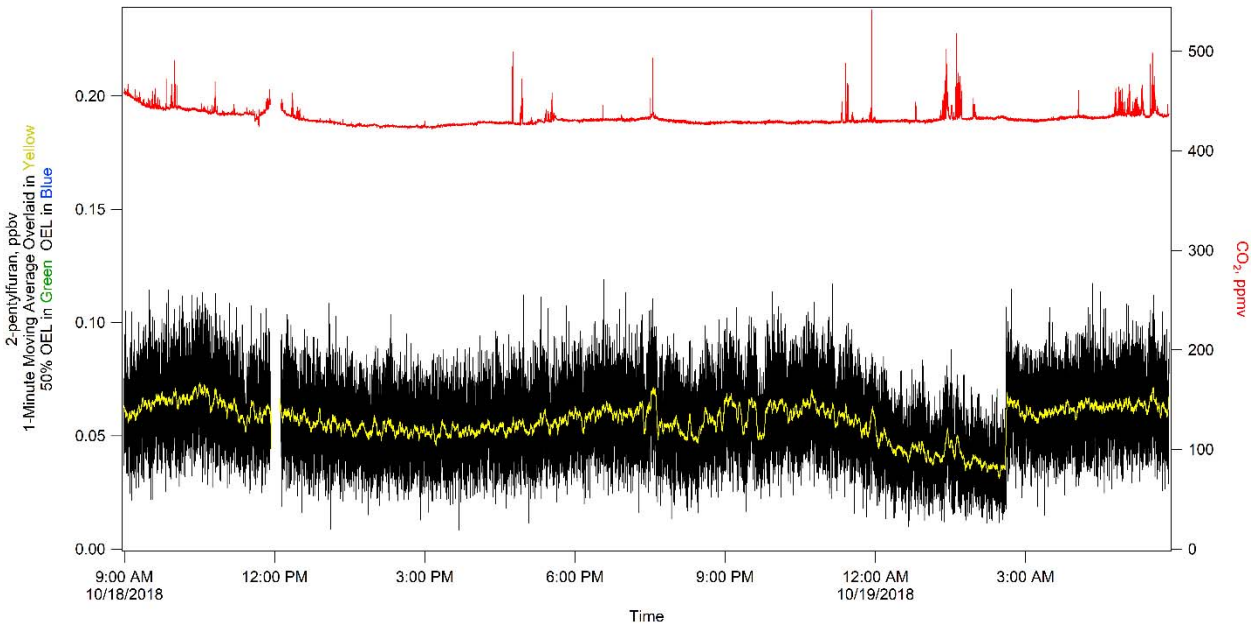

Figure 4-15. 2-pentylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

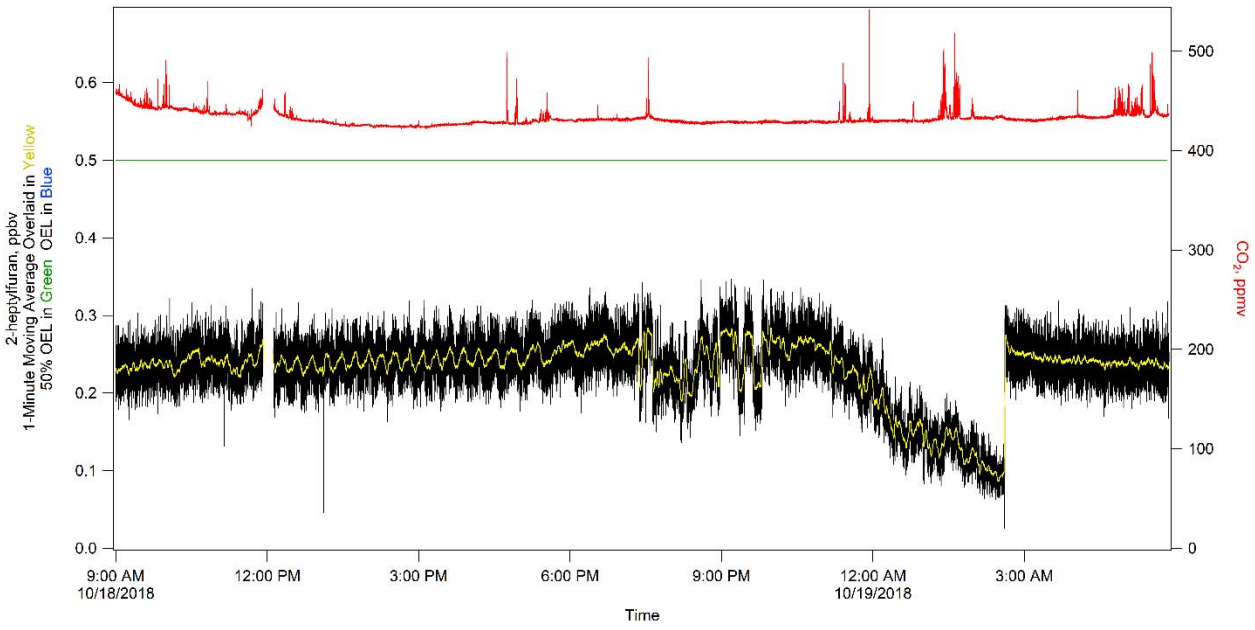

Figure 4-16. 2-heptylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

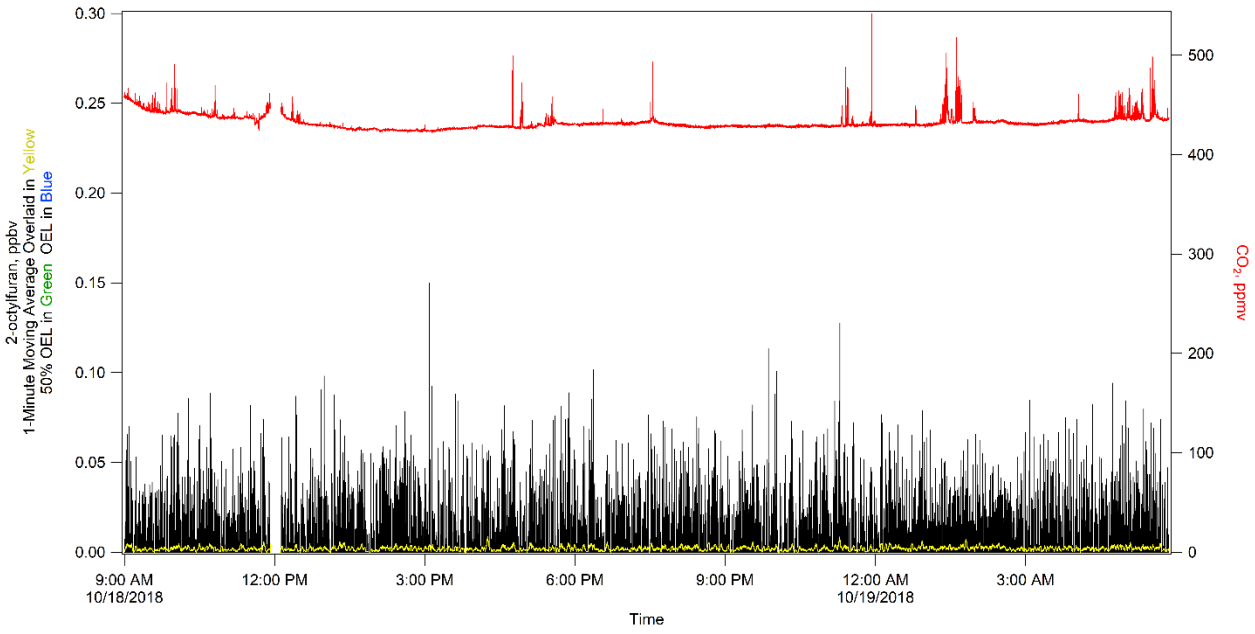

Figure 4-17. 2-octylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

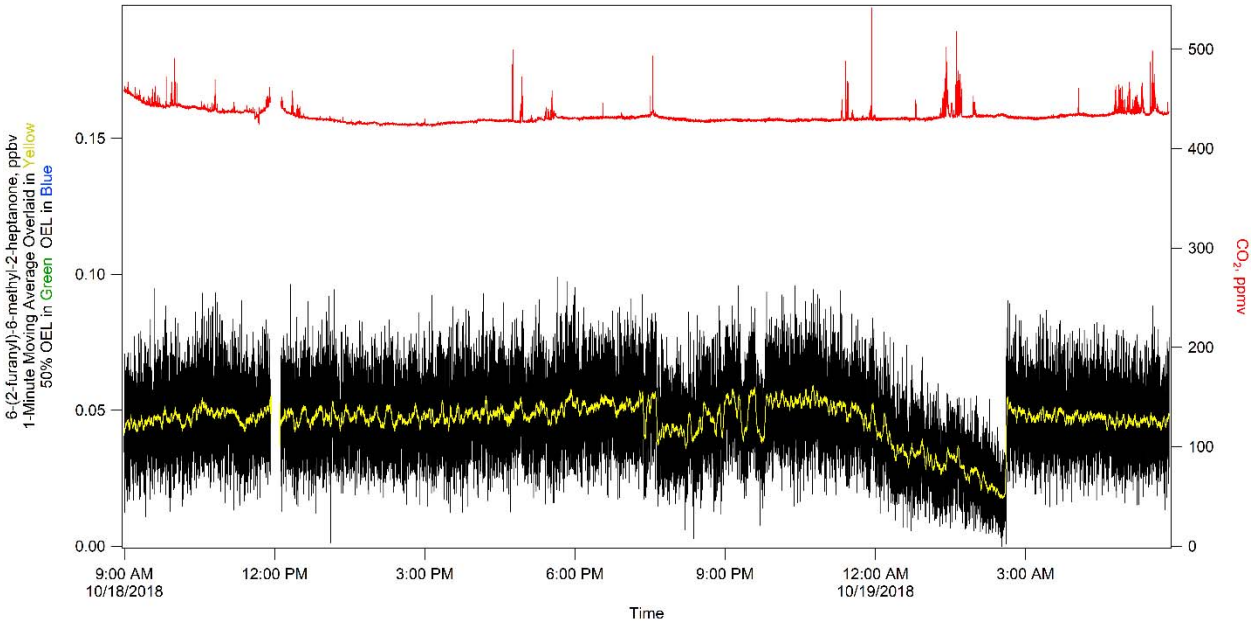

Figure 4-18. 6-(2-furanyl)-6-methyl-2-heptanone.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

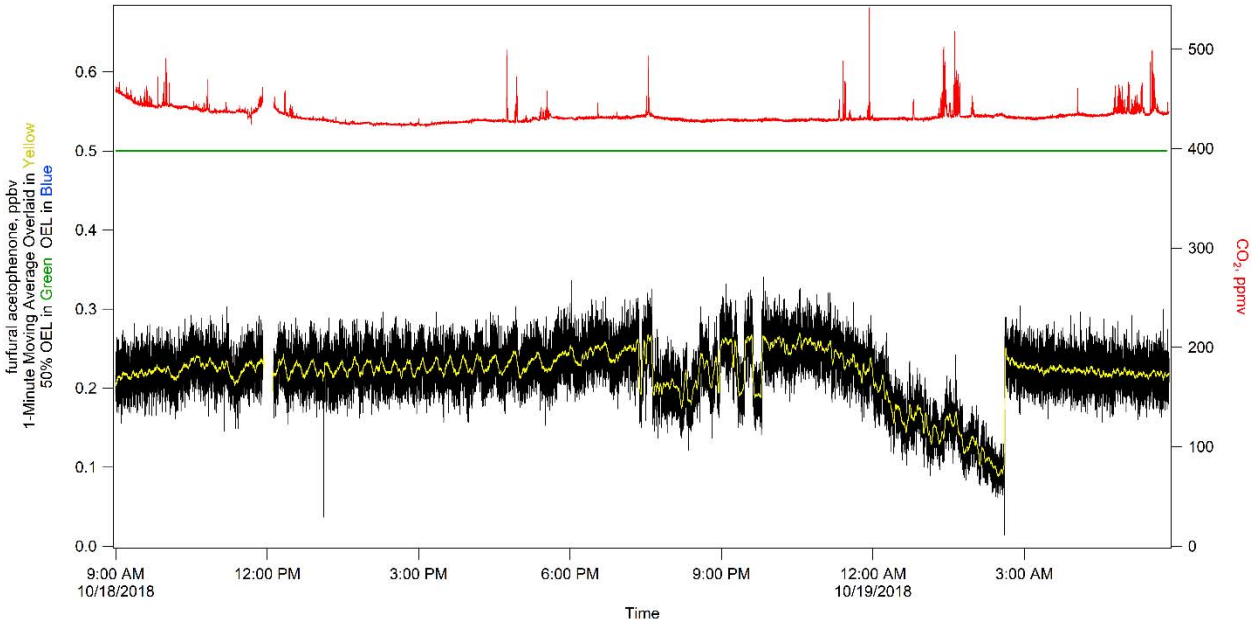

Figure 4-19. Furfural Acetophenone.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

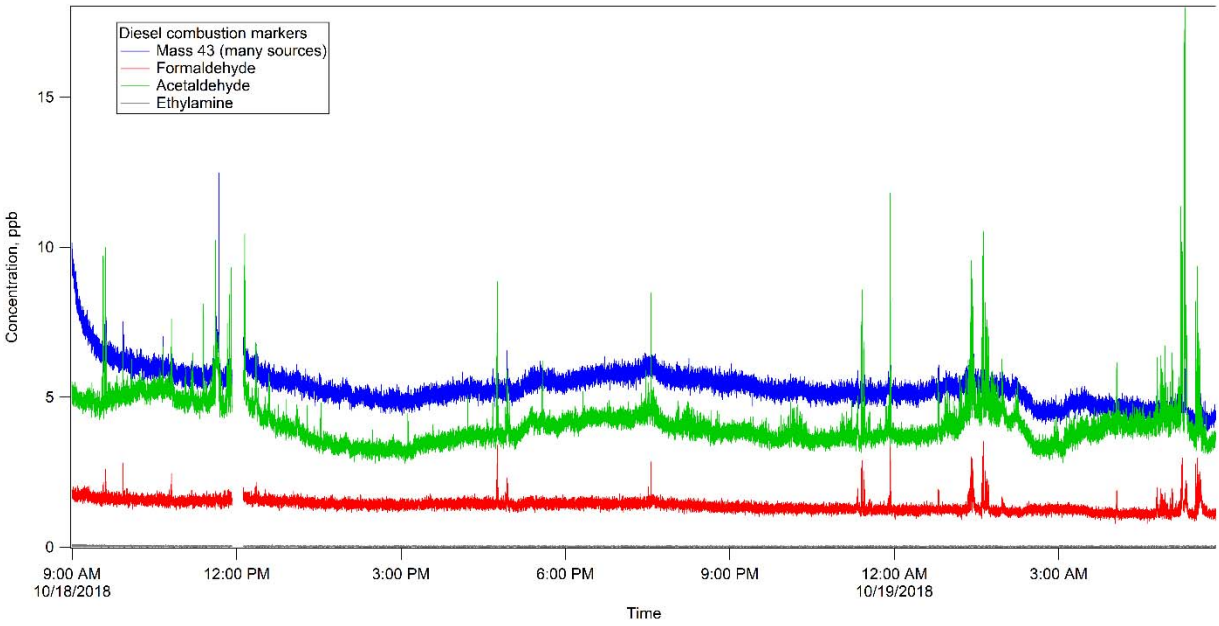

Figure 4-20. Diesel Combustion Markers.

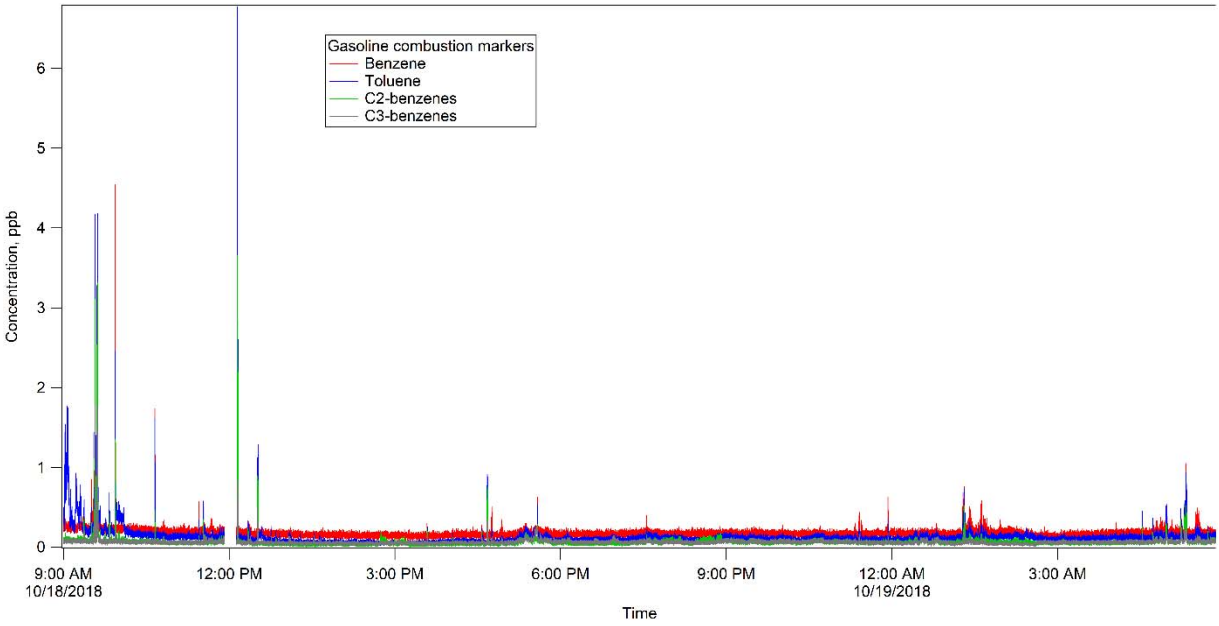

Figure 4-21. Gasoline Combustion Markers.

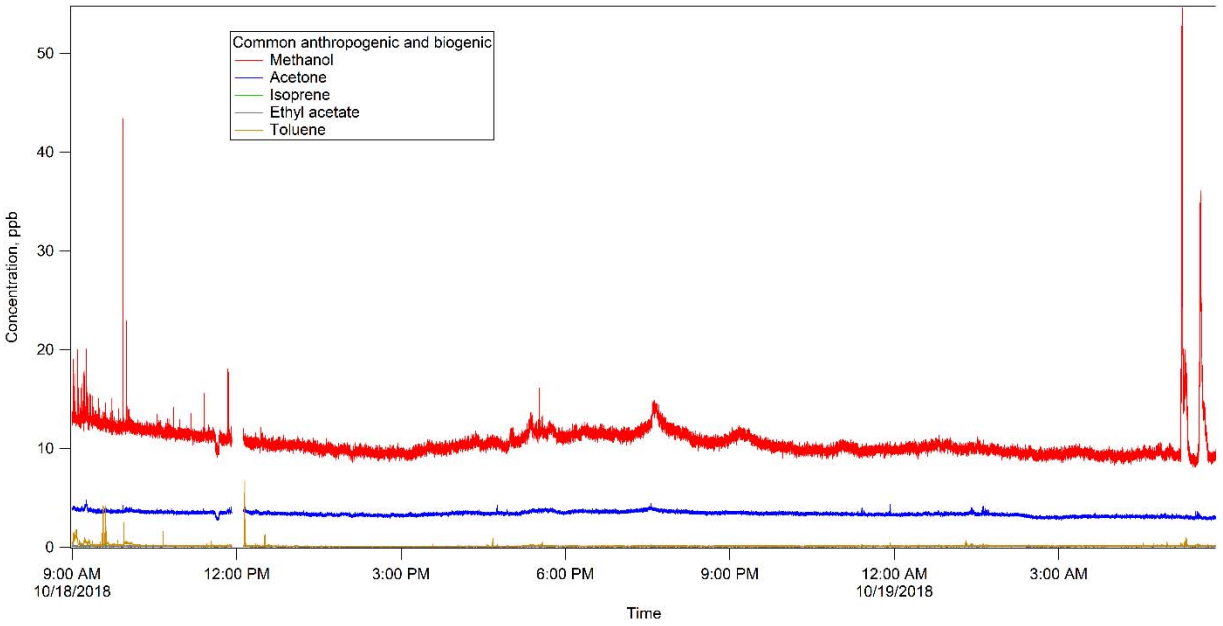

Figure 4-22. Plant and Human Markers.

5.0 OCTOBER 19, 2018 – OCTOBER 20, 2018 – STUDY SITE #5

5.1 Quality Assessment

Data from October 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. Report No. 66409- RPT-004 was adequately documented and all checks passed the acceptance limits.

5.2 Summary

The ML personnel performed background sampling using the ML from October 19, 2018, to October 20, 2018, at Study Site 5. Site 5 is located southeast of the Waste Treatment Facility. This site was chosen as it may provide data related to stack emission dispersion downwind of the tank farm ventilation and as a baseline point for future reference once the Waste Treatment Facility begins operation. The ML arrived at Site 5 at 09:20 on October 19, 2018. The QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, Picarro NH_3 analyzer, and the PTR-MS beginning at 09:29. The data file names were confirmed and routine H_3O+ data collection mode began at 09:38. Collection of confirmatory samples did not occur. The ML staff departed the monitoring site at 10:57 and checked out with the CSO.

The ML staff returned to Site 5 at 05:57 on October 20, 2018. The ML moved to Site 6 by 07:52.

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

Figure 5-2. Location of the Mobile Laboratory for the Duration Monitoring Period.

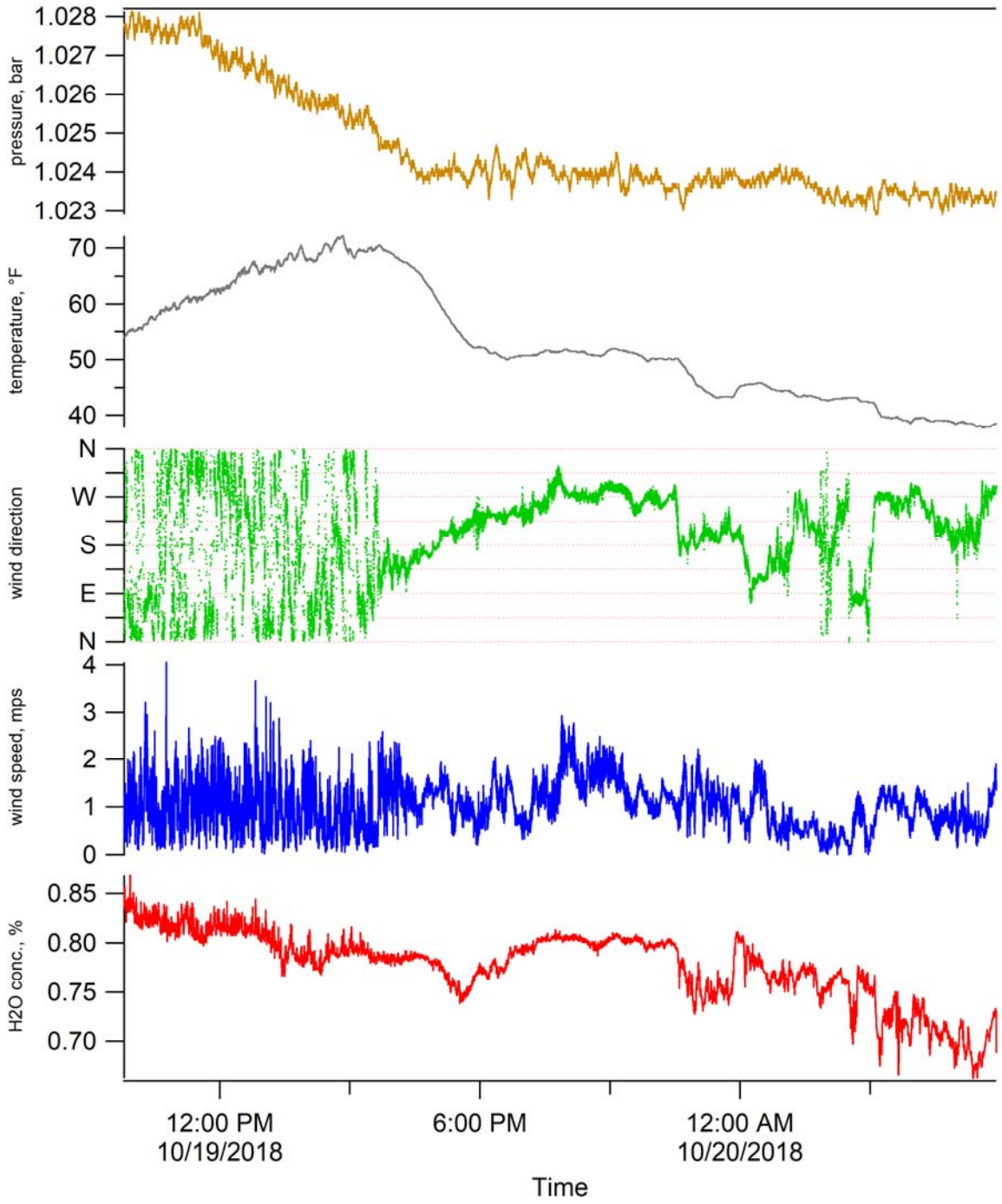

Figure 5-3. Weather Data.

5.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

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

No confirmatory air samples were collected on this day.

Table 5-1 displays the statistical information for the monitoring period of October 19, 2018, to October 20, 2018. By definition, the OEL is an 8-hour, time-weighted average that establishes a limit for personnel exposures to hazardous chemicals. It is the exposure level to which a person may be exposed for 8 hours/day, 40 hours/week for 40 years and have no expectation of adverse health effects. In this study, area vapor concentration measurements were made to better understand the hazardous vapor exposures that workers may receive. These measurements are only compared to OEL concentrations to give them context. It is neither accurate nor appropriate to interpret these short duration measurements (2 seconds) as worker exposure levels. Since the OEL is defined as a time-weighted average, it is more appropriate to compare them to daily average vapor concentrations. Short duration excursions above the OEL concentration are not significant.

Table 5-1. Statistical Information for the Monitoring Period of October 19, 2018 – October 20, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	Ammonia	25000	11.039	2.887	26.153	26.756	9.854
2	formaldehyde	300	1.360	0.316	23.237	27.280	1.339
3	Methanol	200000	10.650	7.989	75.014	923.333	10.318
4	acetonitrile	20000	6.112	3.694	60.436	23.613	4.867
5	acetaldehyde	25000	3.708	0.709	19.109	18.171	3.568
6	ethylamine	5000	0.021	0.009	42.739	0.071	0.020
7	1,3-butadiene	1000	0.242	0.084	34.593	2.022	0.233
8	propanenitrile	6000	0.055	0.017	31.571	0.524	0.053
9	2-propenal	100	0.213	0.144	67.656	4.604	0.192
10	1-butanol + butenes	20000	0.137	0.074	54.439	3.490	0.123
11	methyl isocyanate	20	0.286	0.074	25.804	0.565	0.268
12	methyl nitrite	100	0.139	0.064	45.930	2.103	0.130
13	furan	1	0.038	0.017	44.174	0.398	0.036
14	butanenitrile	8000	0.021	0.010	46.777	0.226	0.019
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.083	0.047	56.196	N/A*	N/A*
16	butanal	25000	0.294	0.065	22.285	2.291	0.287
17	NDMA**	0.3	0.040	0.028	70.238	0.194	0.038
18	benzene	500	0.165	0.087	52.978	4.220	0.149
19	2,4-pentadienenitrile + pyridine	300, 1000	0.044	0.012	27.866	0.305	0.043
20	2-methylene butanenitrile	300	0.019	0.010	53.756	0.099	0.016
21	2-methylfuran	1	0.047	0.023	48.501	0.602	0.044
22	pentanenitrile	6000	0.014	0.007	47.870	0.114	0.013
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.051	0.020	39.015	0.437	0.049
24	NEMA**	0.3	0.017	0.019	111.171	0.121	0.011
25	2,5-dimethylfuran	1	0.032	0.018	55.391	0.390	0.029
26	hexanenitrile	6000	0.005	0.004	78.736	0.045	0.004
27	2-hexanone (MBK)	5000	0.019	0.009	48.307	0.079	0.018
28	NDEA**	0.1	0.008	0.009	118.029	0.059	0.004
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.086	0.031	35.871	0.192	0.093
30	2,4-dimethylpyridine	500	0.027	0.015	55.635	0.678	0.025
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.053	0.022	41.599	0.189	0.052

Table 5-1. Statistical Information for the Monitoring Period of October 19, 2018 – October 20, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.051	0.026	52.064	0.135	0.054
33	4-methyl-2-hexanone	500	0.052	0.026	49.553	0.453	0.053
34	NMOR**	0.6	0.008	0.013	156.897	0.254	0.000
35	butyl nitrate	2500	0.029	0.018	61.543	0.107	0.028
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.052	0.024	46.473	0.133	0.054
37	6-methyl-2-heptanone	8000	0.049	0.022	46.014	0.131	0.051
38	2-pentylfuran	1	0.049	0.018	36.774	0.128	0.047
39	Biphenyl	200	0.035	0.021	58.081	0.109	0.036
40	2-heptylfuran	1	0.183	0.086	47.056	0.359	0.201
41	1,4-butanediol dinitrate	50	0.061	0.030	49.480	0.149	0.066
42	2-octylfuran	1	0.002	0.007	348.350	0.098	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.002	0.008	438.533	0.111	0.000
44	PCB	1000	0.075	0.034	45.611	0.175	0.083
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.038	0.020	53.961	0.105	0.040
46	furfural acetophenone	1	0.178	0.083	46.781	0.330	0.207

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 1.049 ppb and the median value was 0.074 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 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period October 19, 2018, to October 20, 2018. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

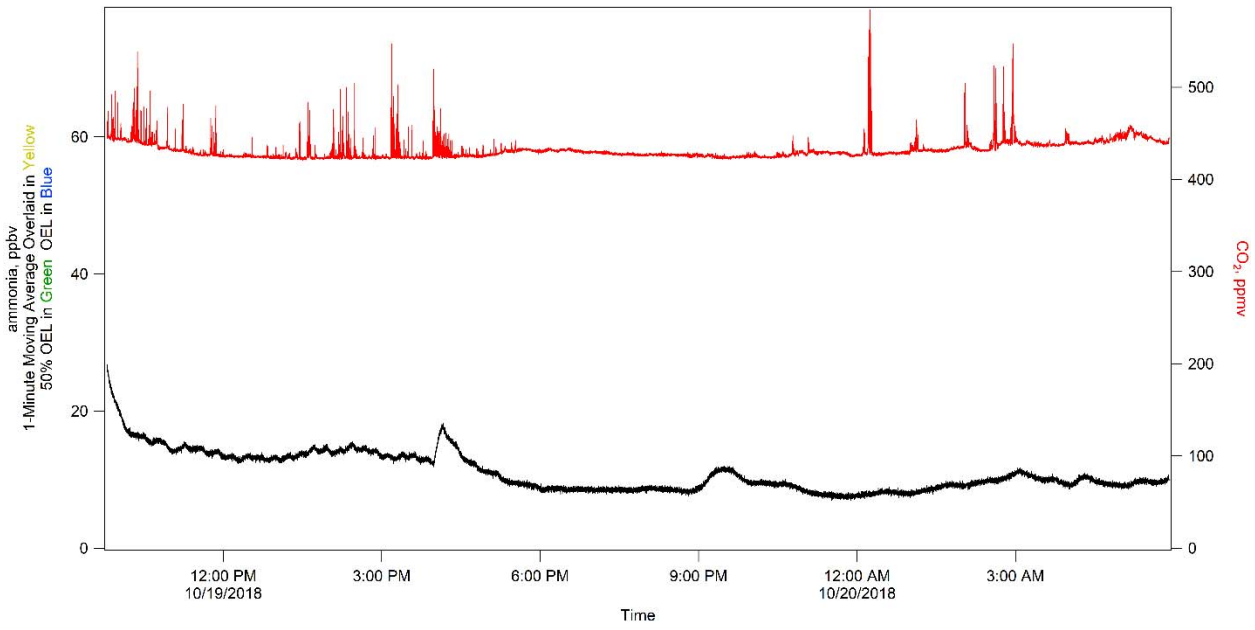

Figure 5-4. Ammonia.

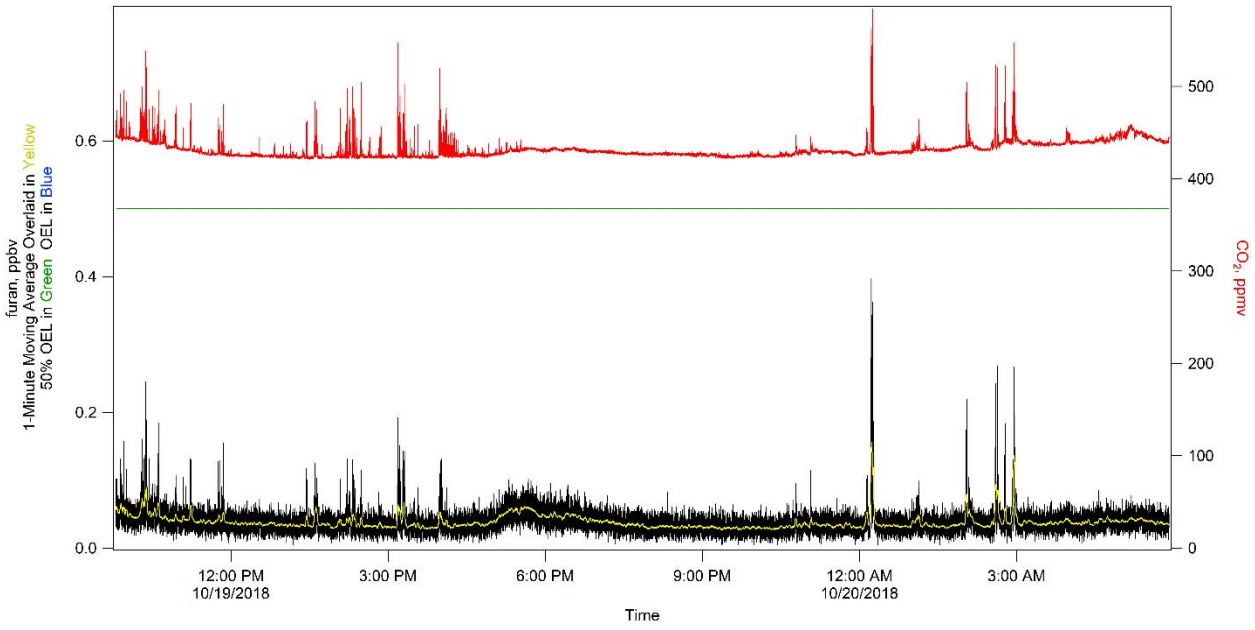

Figure 5-5. Furan.

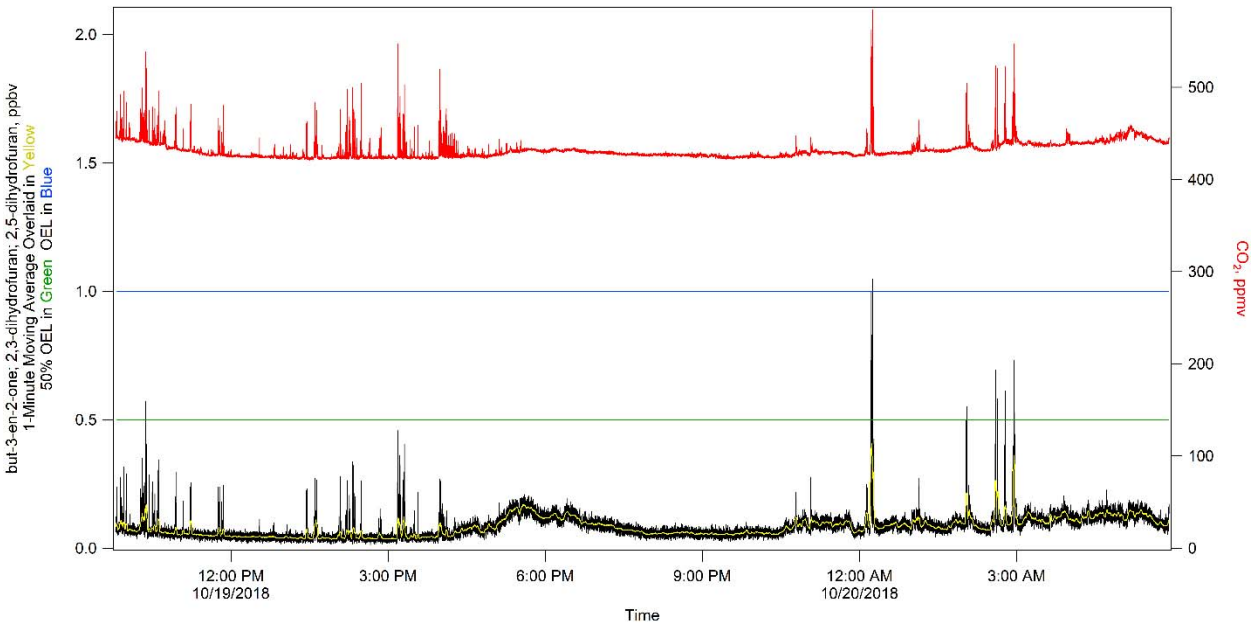

Figure 5-6. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

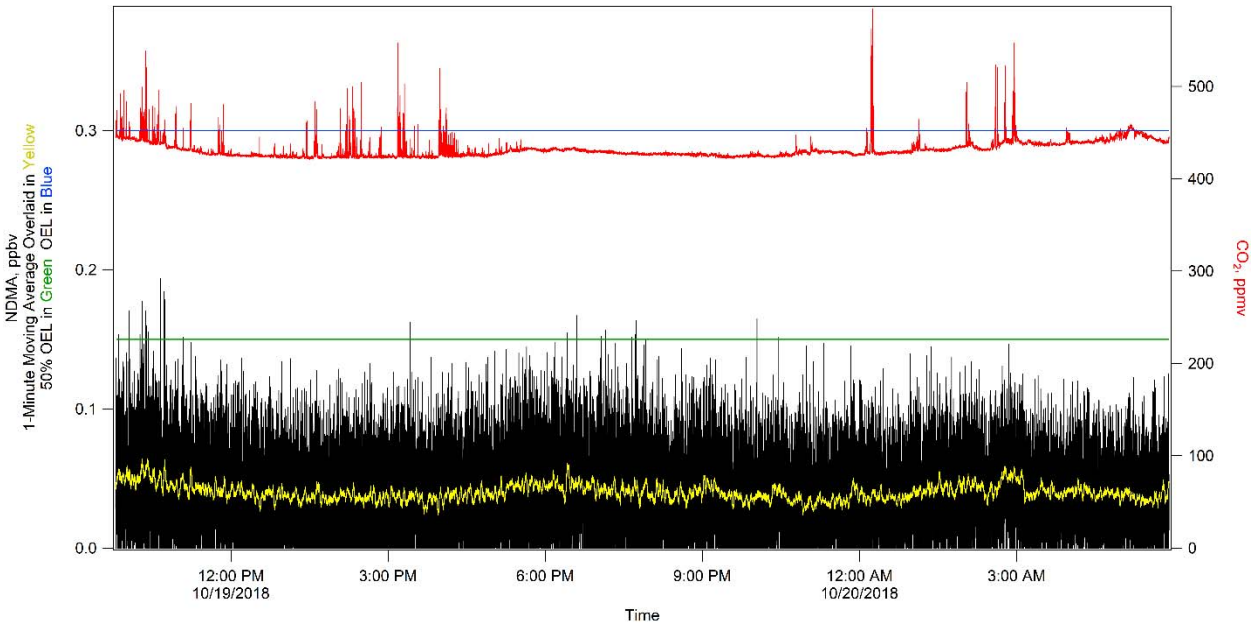

Figure 5-7. N-nitrosodimethylamine (NDMA).

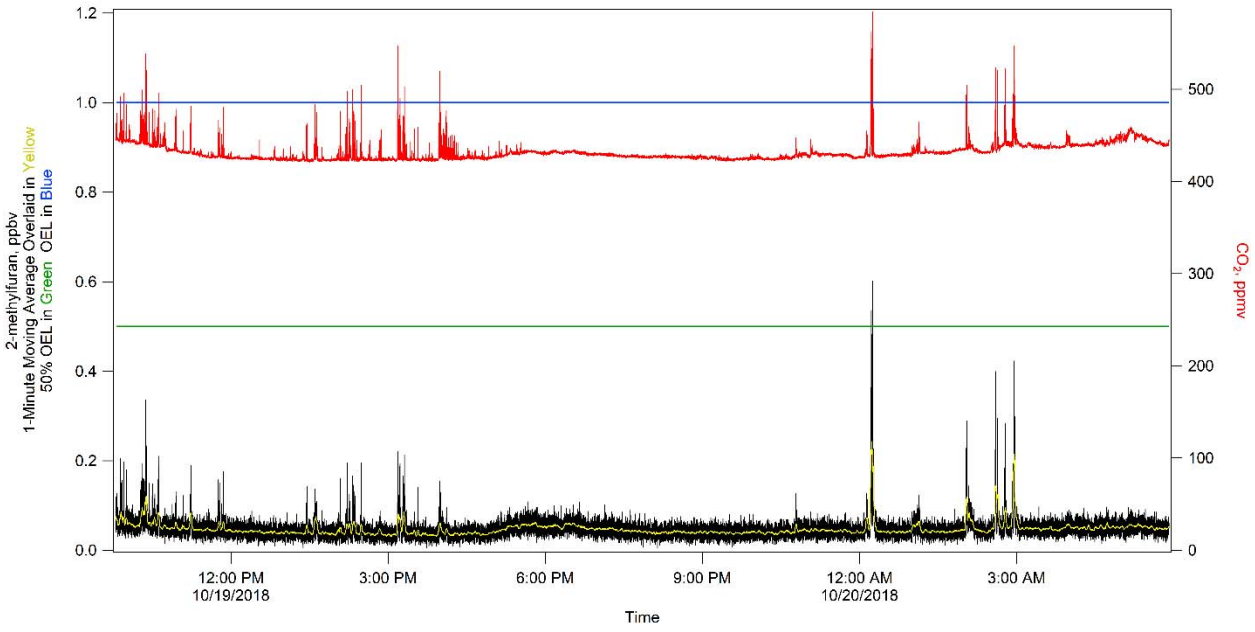

Figure 5-8. 2-methylfuran.

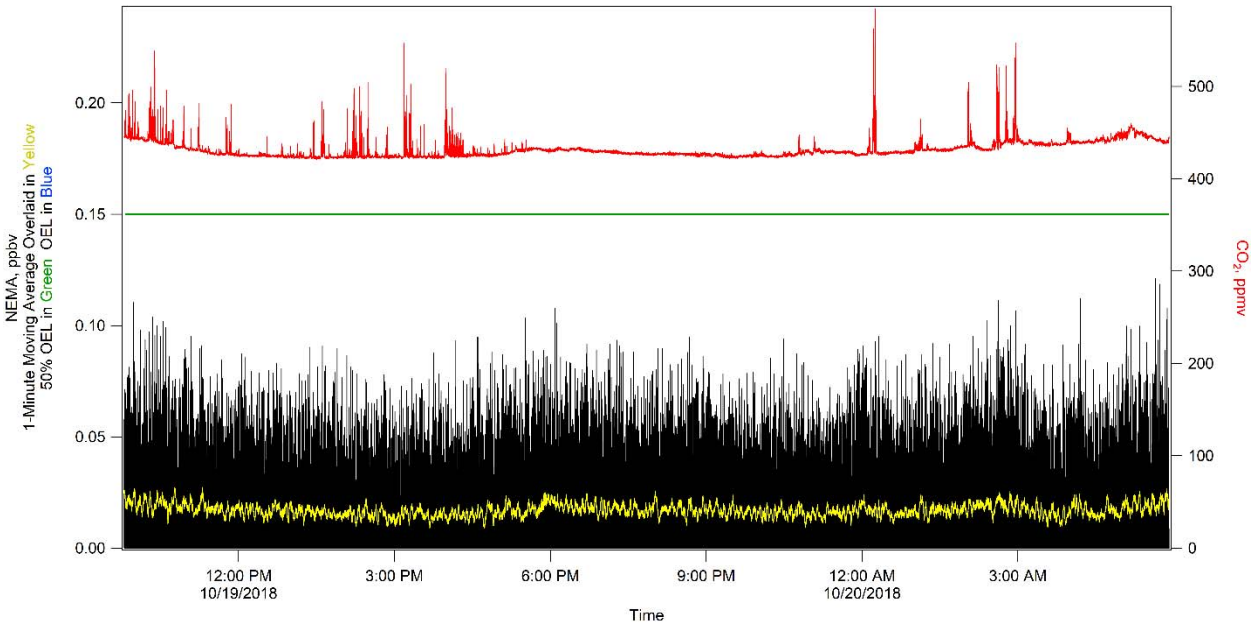

Figure 5-9. N-nitrosomethylethylamine (NEMA).

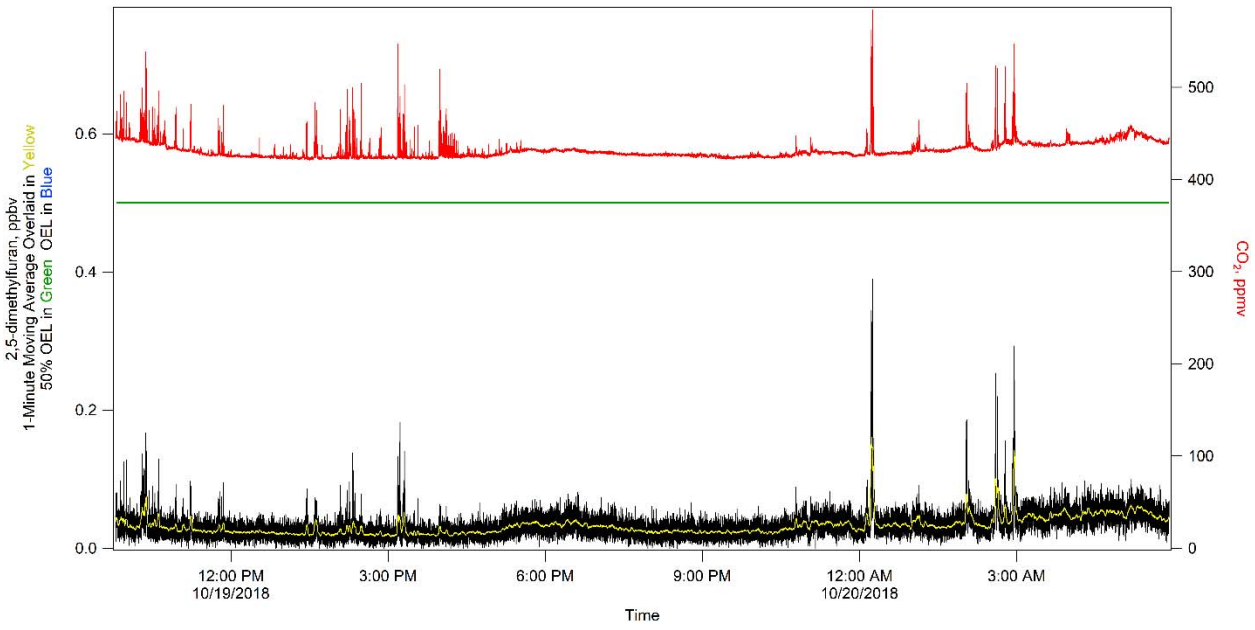

Figure 5-10. 2,5-dimethylfuran.

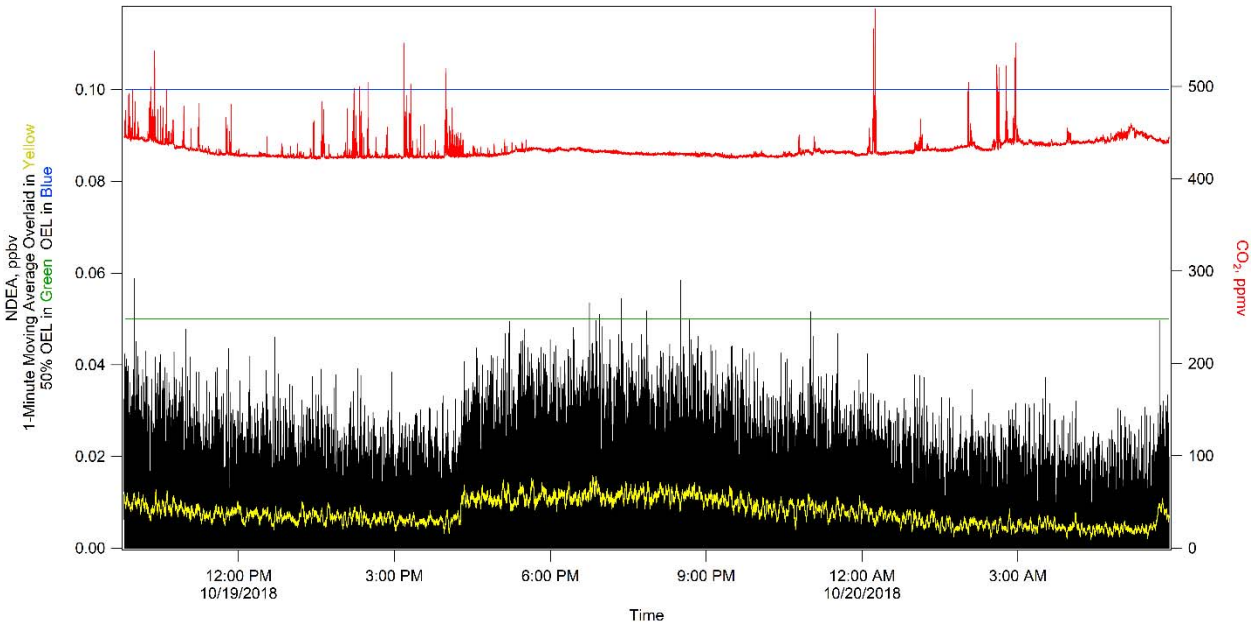

Figure 5-11. N-nitrosodiethylamine (NDEA).

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

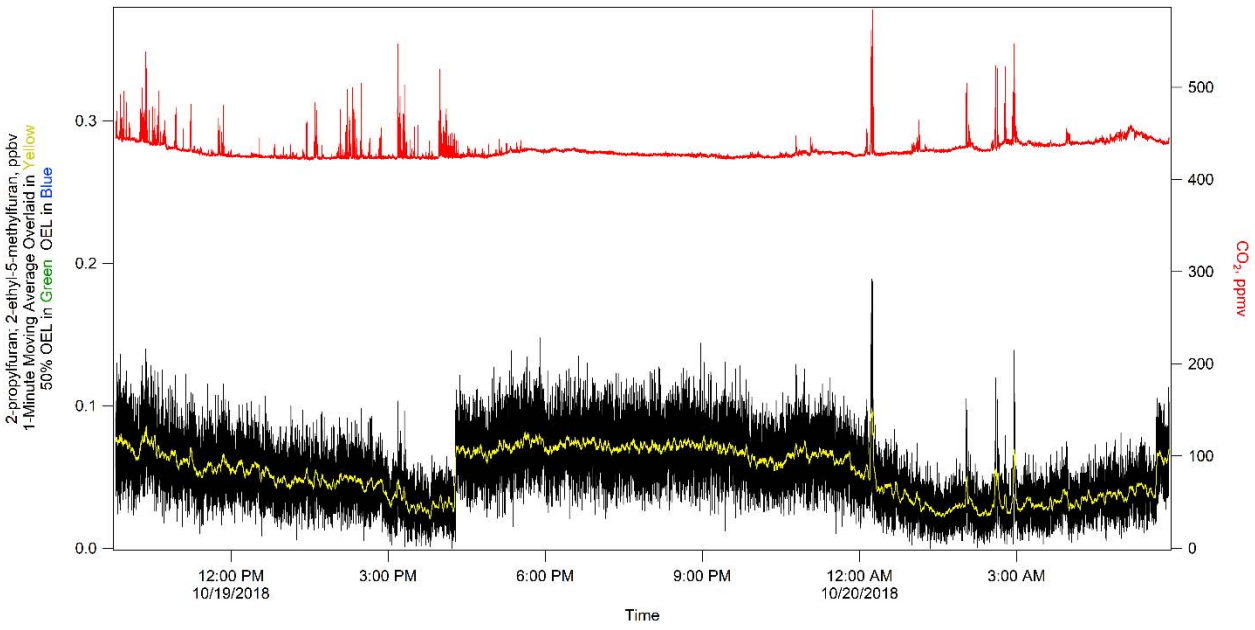

Figure 5-12. 2-propylfuran + 2-ethyl-5-methylfuran.
The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

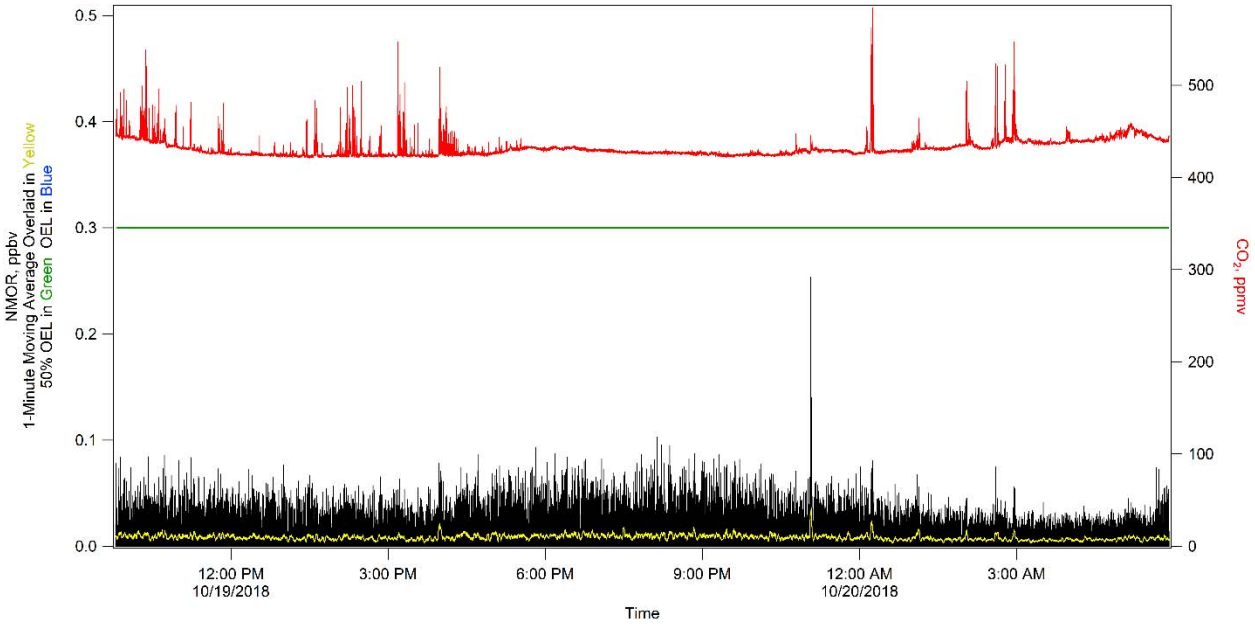

Figure 5-13. N-nitrosomorpholine (NMOR).
The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

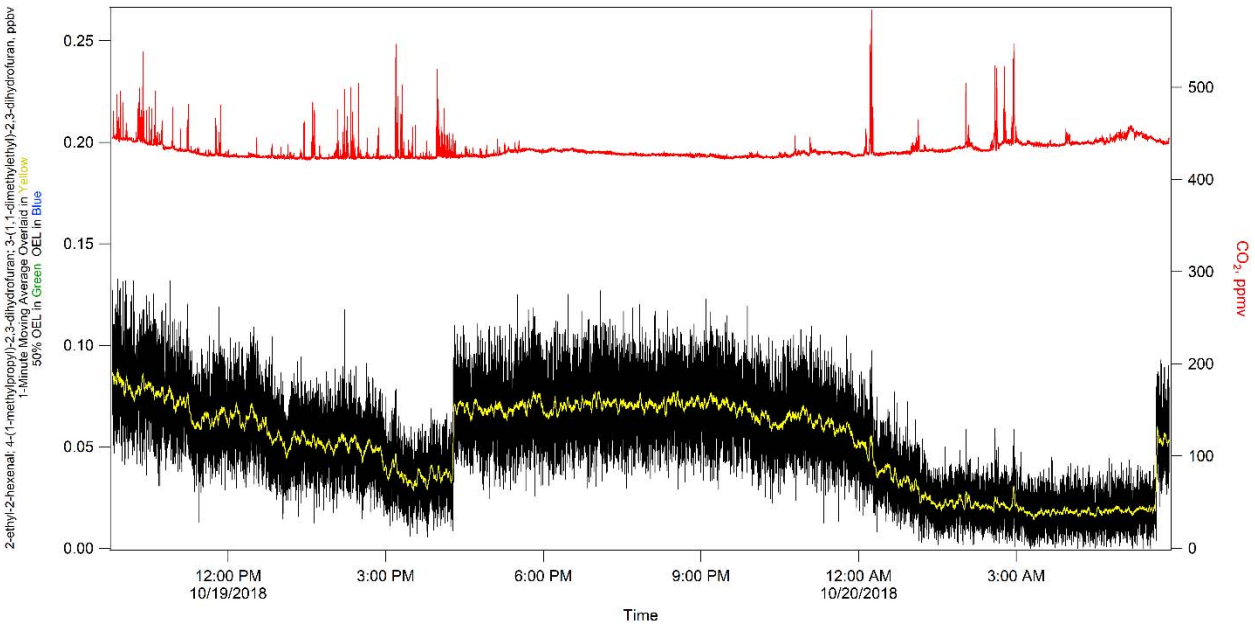

Figure 5-14. 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1-1-dimethylethyl)-2,3-dihydrofuran + 2-ethyl-2-hexenal.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

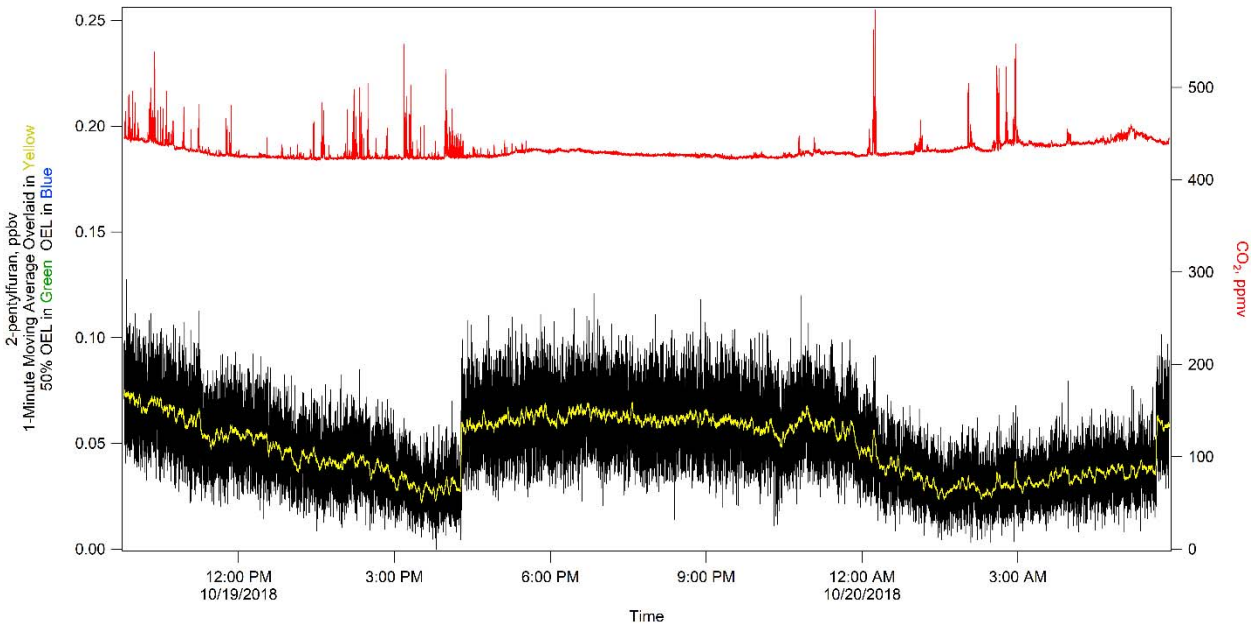

Figure 5-15. 2-pentylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

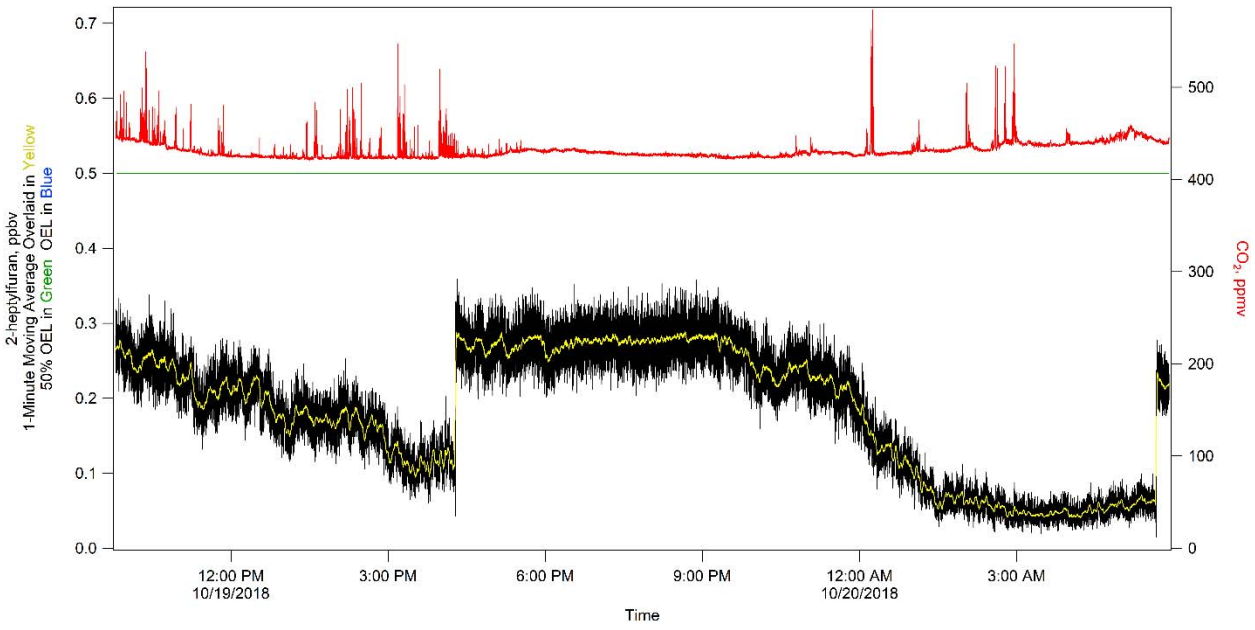

Figure 5-16. 2-heptylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

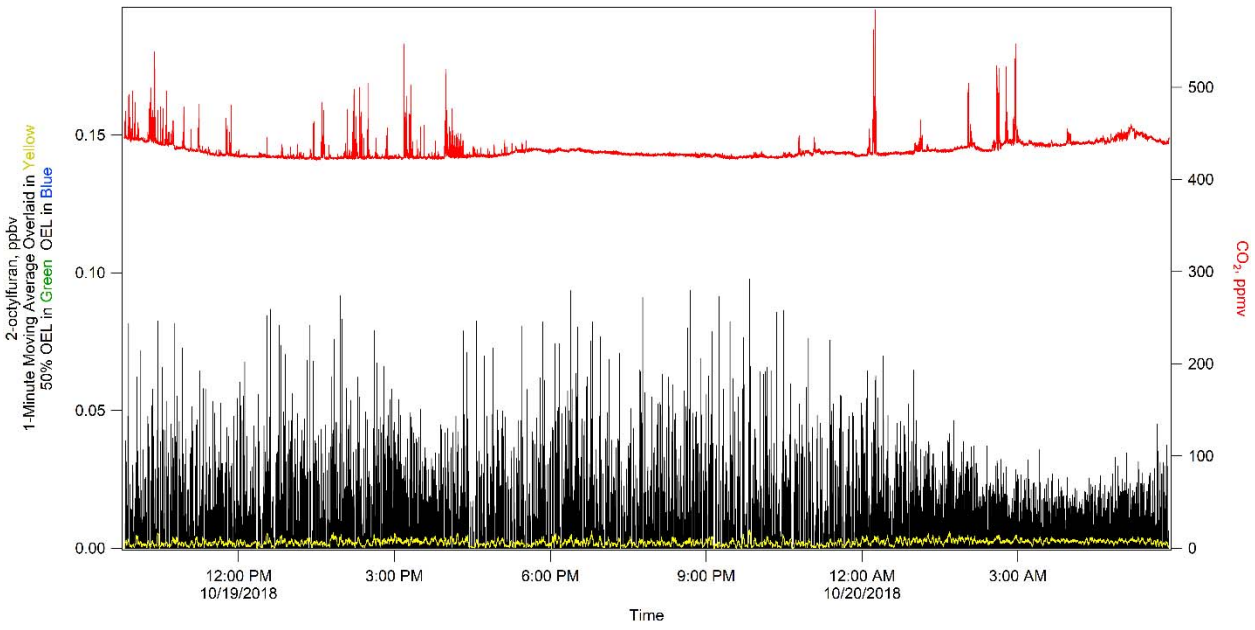

Figure 5-17. 2-octylfuran.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

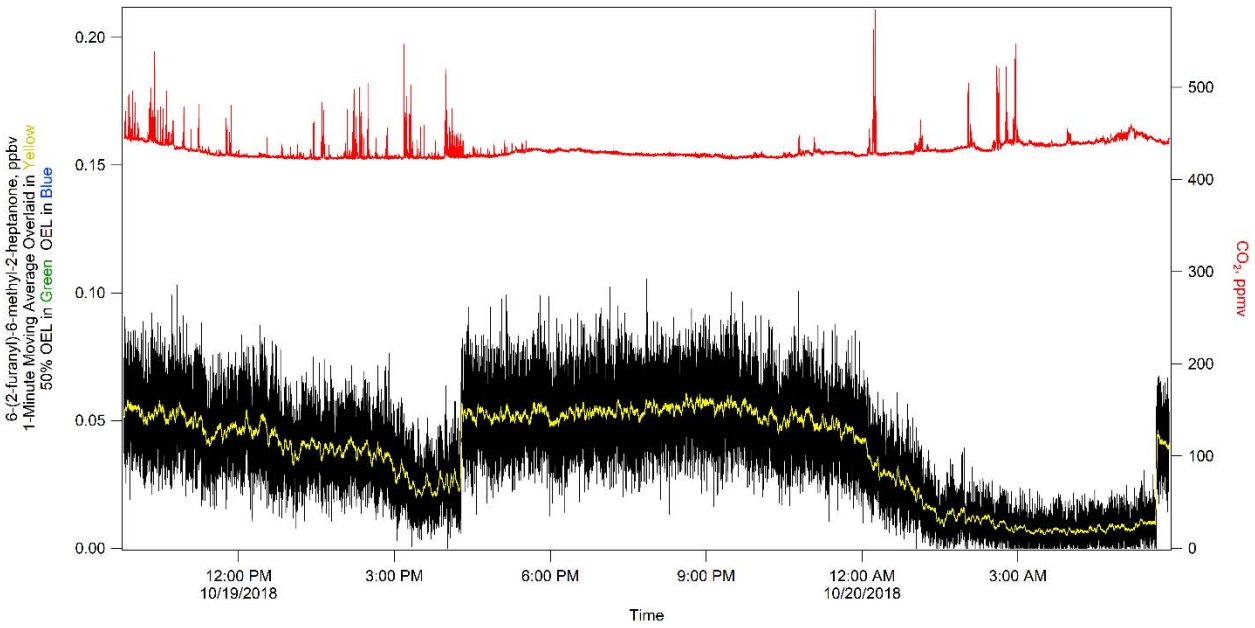

Figure 5-18. 6-(2-furanyl)-6-methyl-2-heptanone.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

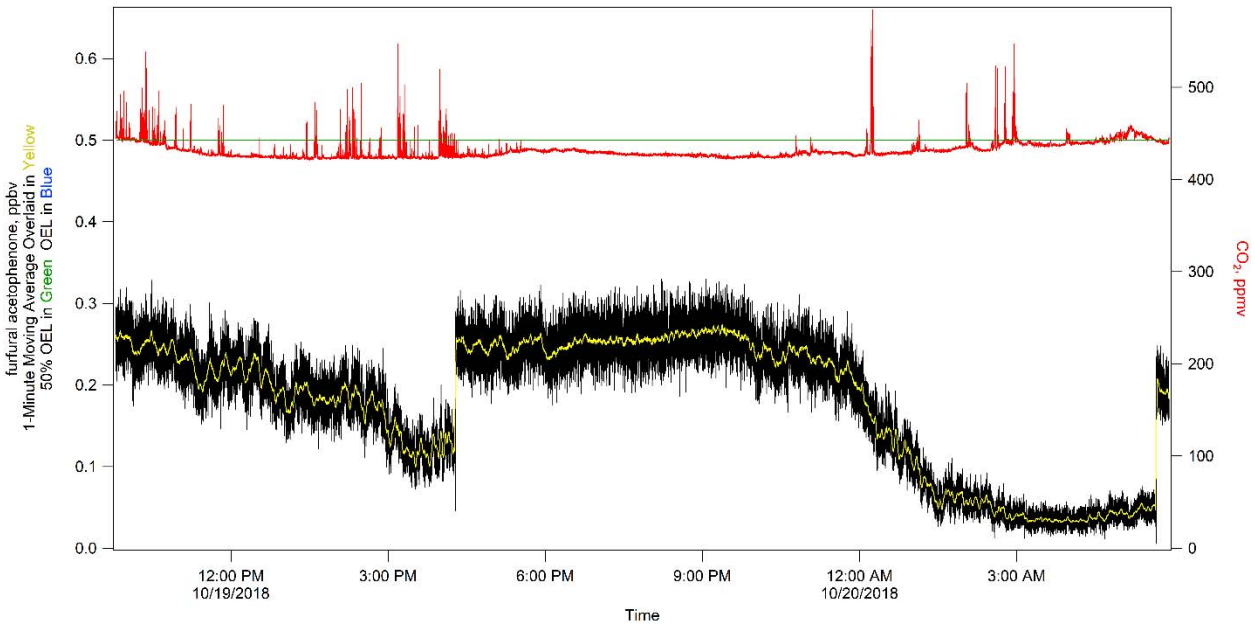

Figure 5-19. Furfural Acetophenone.

The observed abrupt changes in average concentrations are due to lack of optimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

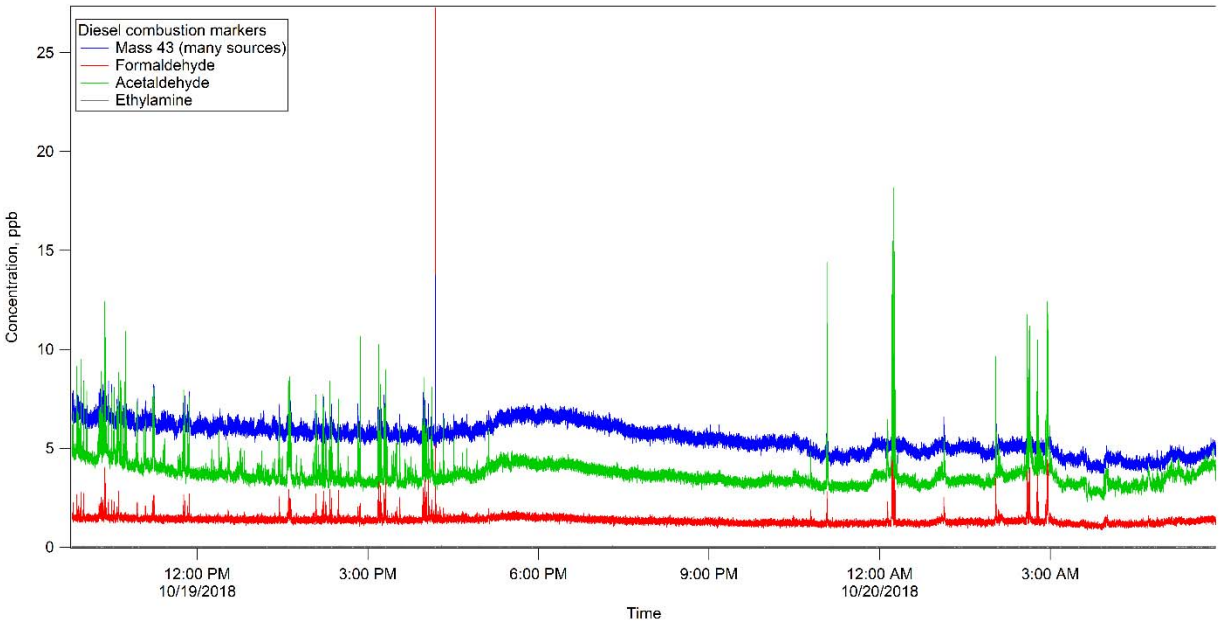

Figure 5-20. Diesel Combustion Markers.

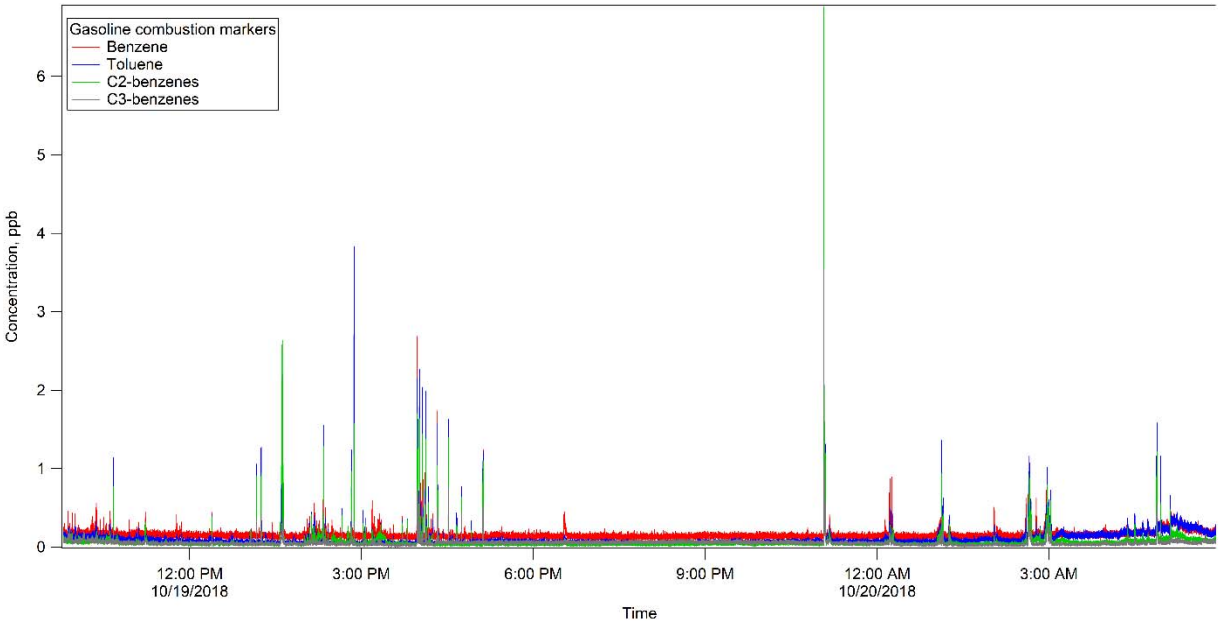

Figure 5-21. Gasoline Combustion Markers.

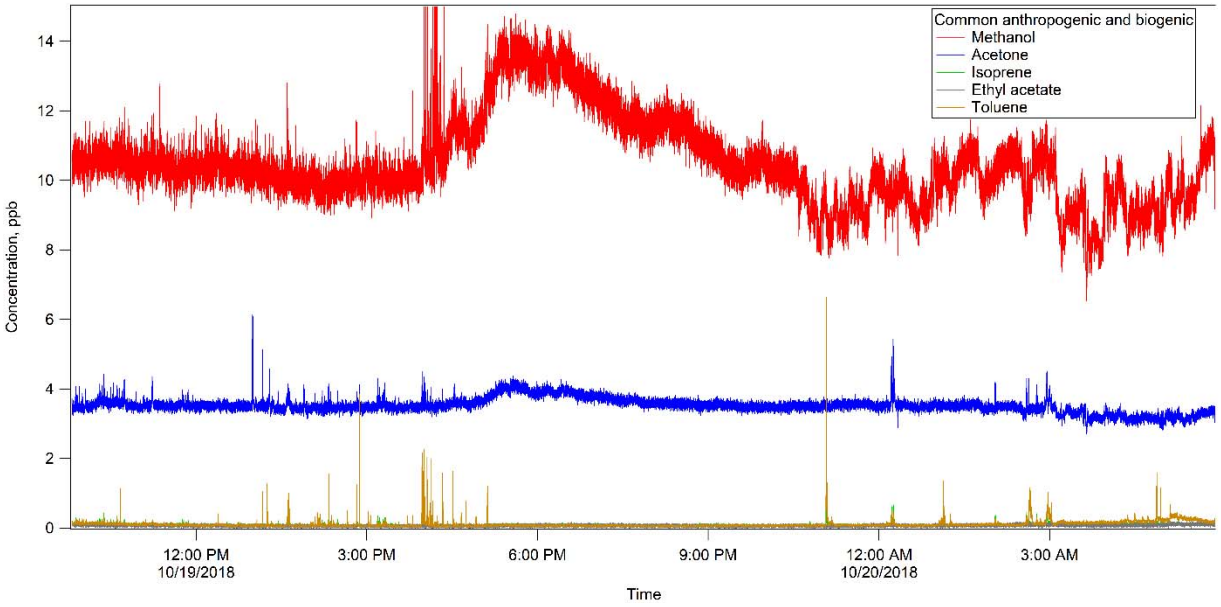

Figure 5-22. Plant and Human Markers.

At approximately 16:00 on October 19, 2018,, the ML observed methanol peaks that exceed the scale shown in this plot, to a maximum of 923 ppbv. The scale was zoomed in to not lose detail for species in lower abundance.

6.0 OCTOBER 20, 2018 – OCTOBER 21, 2018 – STUDY SITE #6

6.1 Quality Assessment

Data from October 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.

6.2 Summary

The ML personnel performed background sampling using the ML from October 20, 2018, to October 21, 2018, at Study Site 6. Site 6 is located near the intersection of US Highway 395 and Clearwater Avenue in Kennewick, WA. This site was chosen as a representative of commercial and heavy-traffic emissions as it includes heavy traffic patterns of mixed vehicle types and light commercial activity including a variety of eating establishments. The ML arrived at Site 6 at 07:52 on October 20, 2018. The initial QA/QC zero-air/sensitivity checks were performed on the LI-COR CO_2 monitor, Picarro NH_3 analyzer, and the PTR-MS beginning at 06:28, prior to Site 6 arrival. The data file names were confirmed and routine H_3O^+ data collection mode began at 08:04. Collection of confirmatory samples began at 08:12. The ML personnel refueled the generator diesel tank with a diesel can from 09:30 to 10:00. The ML staff departed the monitoring site after 10:00.

The ML staff returned to Site 6 at 04:53 on October 21, 2018. At 05:05, confirmatory sorbent samples were disconnected from the sampling station. The ML moved to Site 1 by 07:17.

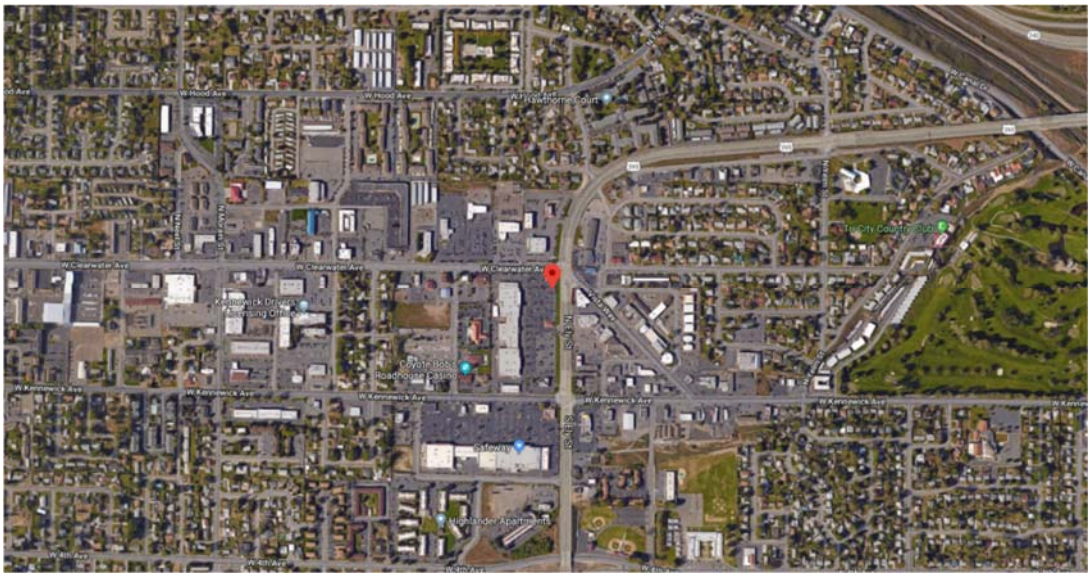

Figure 6-1. Mobile Laboratory Site #6 for the Duration of the Monitoring Period.

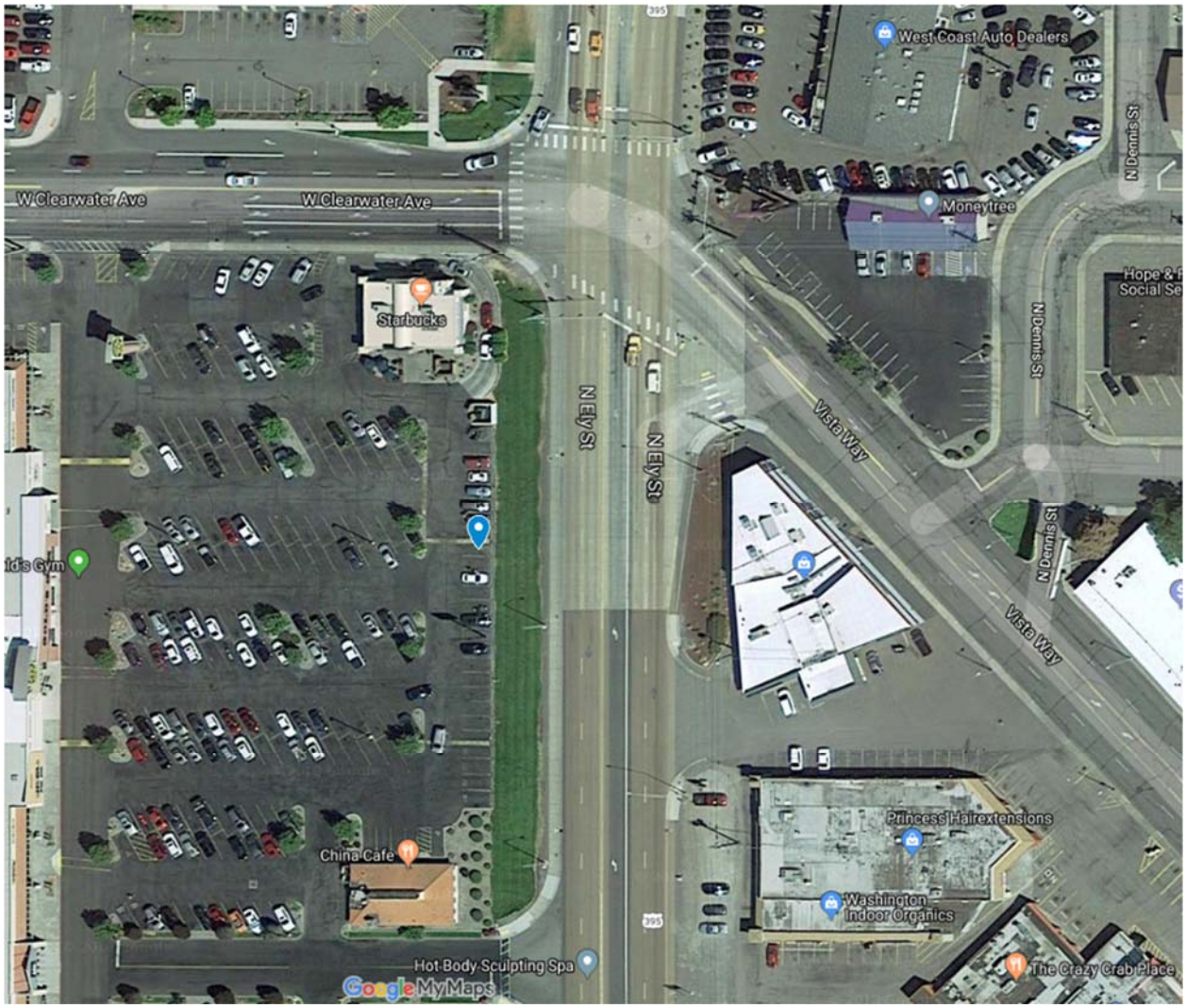

Figure 6-2. Location of the Mobile Laboratory for the Duration of the Monitoring Period.

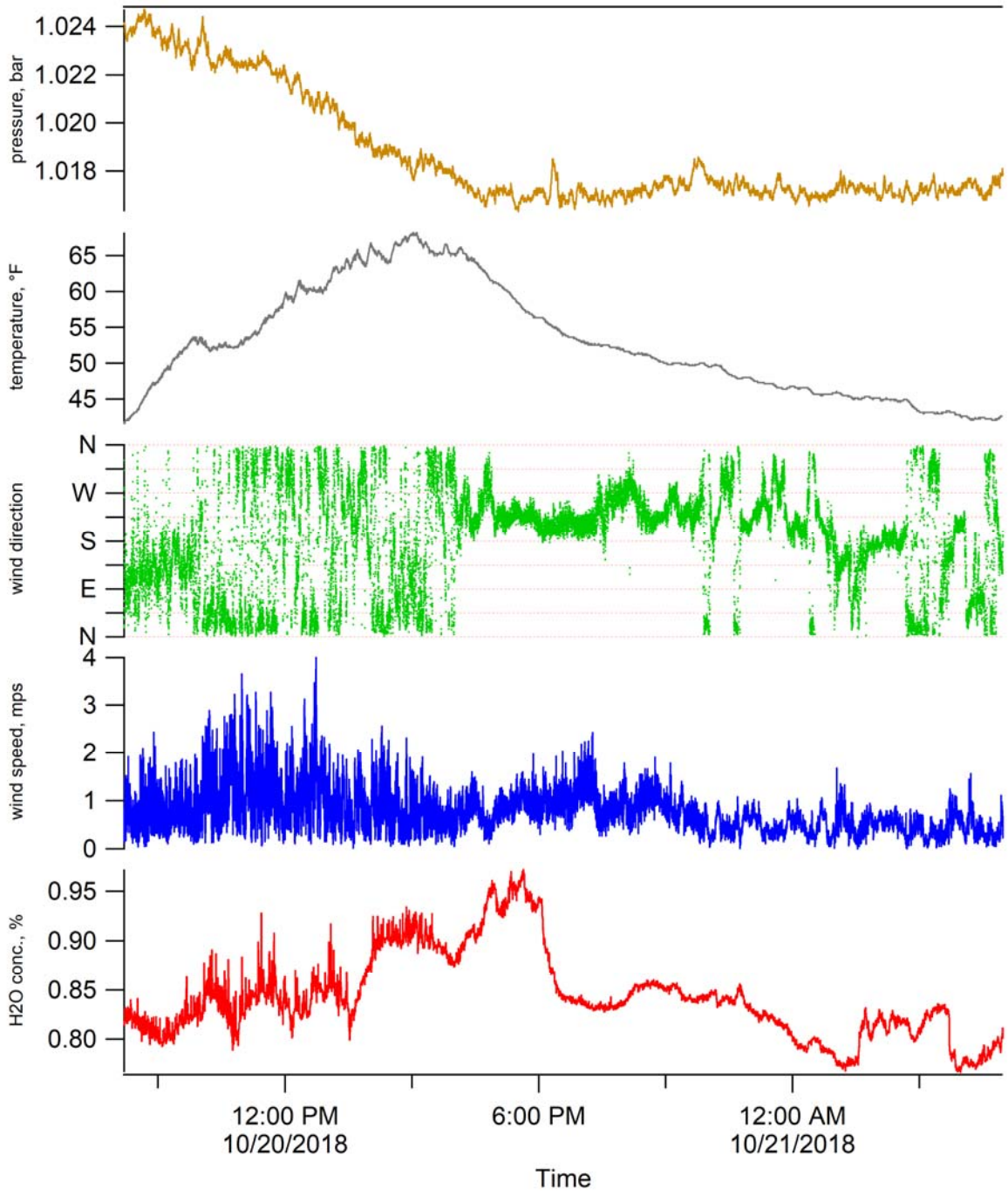

Figure 6-3. Weather Data.

6.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

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

Confirmatory air samples were collected as follows:

Table 6-1. Alternative Media Samples Taken.

Site	Date	Sample Type	ID	Start	Stop	Sample Time (min)
6	10/20/18	Thermosorb/N	EL33218	08:12	11:12	180
6	10/20/18	Carbotrap-300	A060178	08:12	13:12	360
6	10/20/18	Thermosorb/N	EL33200	08:12	11:12	180
6	10/20/18	Carbotrap-300	A052457	08:12	13:12	360
6	10/20/18	Thermosorb/N	EL33208	08:15	08:15	Blank
6	10/20/18	Carbotrap-300	A060081	08:15	08:15	Blank

Table 6-2 displays the statistical information for the monitoring period of October 20, 2018, to October 21, 2018. By definition, the OEL is an 8-hour, time-weighted average that establishes a limit for personnel exposures to hazardous chemicals. It is the exposure level to which a person may be exposed for 8 hours/day, 40 hours/week for 40 years and have no expectation of adverse health effects. In this study, area vapor concentration measurements were made to better understand the hazardous vapor exposures that workers may receive. These measurements are only compared to OEL concentrations to give them context. It is neither accurate nor appropriate to interpret these short duration measurements (2 seconds) as worker exposure levels. Since the OEL is defined as a time-weighted average, it is more appropriate to compare them to daily average vapor concentrations. Short duration excursions above the OEL concentration are not significant.

Table 6-2. Statistical Information for the Monitoring Period of October 20, 2018 – October 21, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	Ammonia	25000	25.120	7.209	28.697	50.305	23.068
2	formaldehyde	300	1.838	0.285	15.504	6.343	1.817
3	Methanol	200000	14.701	2.606	17.725	209.486	14.137
4	acetonitrile	20000	1.737	0.830	47.780	3.243	2.108
5	acetaldehyde	25000	10.104	2.918	28.881	53.721	9.956
6	ethylamine	5000	0.026	0.011	41.239	0.101	0.024
7	1,3-butadiene	1000	0.515	0.202	39.209	5.719	0.508
8	propanenitrile	6000	0.134	0.079	58.594	3.327	0.126
9	2-propenal	100	0.476	0.174	36.468	4.052	0.462
10	1-butanol + butenes	20000	0.574	0.401	69.876	14.418	0.539
11	methyl isocyanate	20	0.330	0.057	17.372	0.551	0.330
12	methyl nitrite	100	0.218	0.066	30.190	1.753	0.210
13	furan	1	0.101	0.051	50.867	0.405	0.094
14	butanenitrile	8000	0.053	0.035	65.326	1.345	0.049
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.107	0.040	37.067	N/A*	N/A*
16	butanal	25000	0.440	0.085	19.240	0.942	0.432
17	NDMA**	0.3	0.092	0.057	61.496	0.511	0.084
18	benzene	500	0.590	0.406	68.821	12.013	0.560
19	2,4-pentadienenitrile + pyridine	300, 1000	0.086	0.037	42.938	0.854	0.082
20	2-methylene butanenitrile	300	0.038	0.020	53.145	0.135	0.034
21	2-methylfuran	1	0.111	0.056	50.724	0.528	0.101
22	pentanenitrile	6000	0.027	0.015	56.214	0.493	0.024
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.090	0.031	34.850	0.447	0.088
24	NEMA**	0.3	0.029	0.029	100.389	0.191	0.022
25	2,5-dimethylfuran	1	0.063	0.031	48.814	0.303	0.059
26	hexanenitrile	6000	0.011	0.008	74.018	0.181	0.009
27	2-hexanone (MBK)	5000	0.040	0.022	55.573	0.424	0.037
28	NDEA**	0.1	0.009	0.012	133.473	0.075	0.002
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.092	0.028	30.044	0.218	0.096
30	2,4-dimethylpyridine	500	0.081	0.069	85.917	2.819	0.073
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.071	0.024	33.373	0.203	0.069

Table 6-2. Statistical Information for the Monitoring Period of October 20, 2018 – October 21, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
32	heptanenitrile	6000	0.054	0.026	48.553	0.166	0.060
33	4-methyl-2-hexanone	500	0.064	0.027	42.153	0.694	0.065
34	NMOR**	0.6	0.016	0.020	125.765	0.288	0.008
35	butyl nitrate	2500	0.030	0.019	62.098	0.113	0.029
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.059	0.022	37.885	0.137	0.061
37	6-methyl-2-heptanone	8000	0.054	0.021	39.524	0.134	0.057
38	2-pentylfuran	1	0.058	0.021	35.232	0.144	0.057
39	Biphenyl	200	0.039	0.020	51.293	0.110	0.040
40	2-heptylfuran	1	0.187	0.084	44.908	0.351	0.226
41	1,4-butanediol dinitrate	50	0.059	0.029	48.207	0.142	0.065
42	2-octylfuran	1	0.002	0.008	330.550	0.127	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.002	0.009	420.147	0.120	0.000
44	PCB	1000	0.073	0.032	43.235	0.155	0.082
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.037	0.019	52.248	0.101	0.040
46	furfural acetophenone	1	0.176	0.079	44.609	0.329	0.210

* The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.971 ppb and the median value was 0.105 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 16 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and CO_2, for the monitoring period October 20, 2018, to October 21, 2018. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL and a blue horizontal line representing the COPC's OEL are shown.

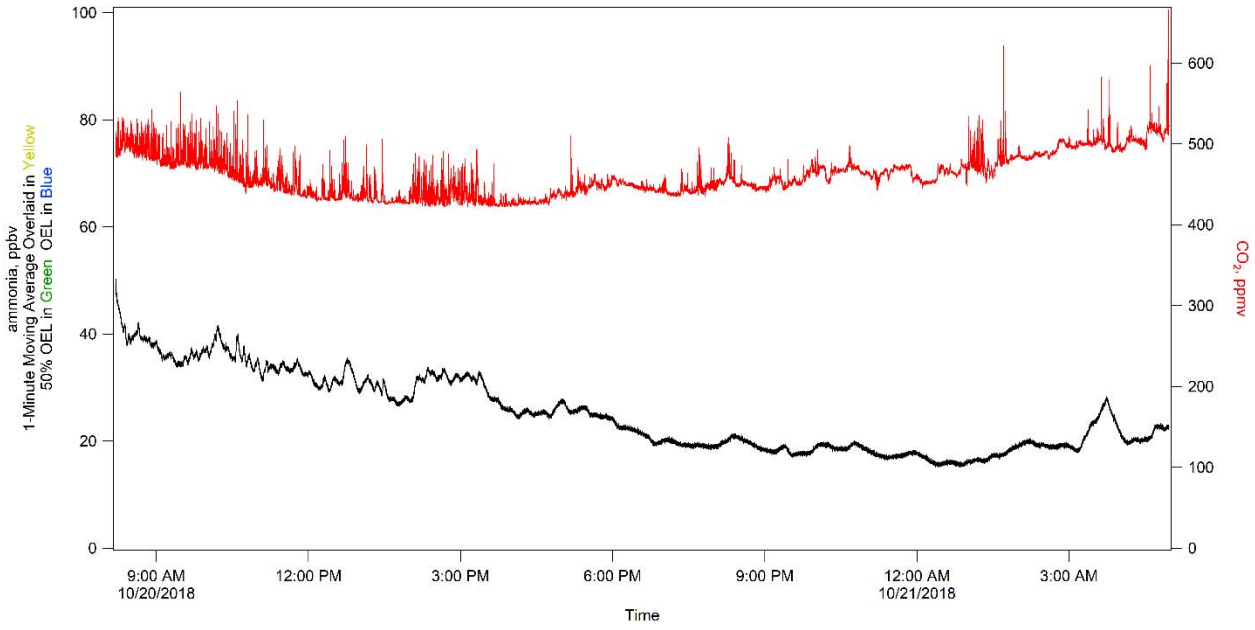

Figure 6-4. Ammonia.

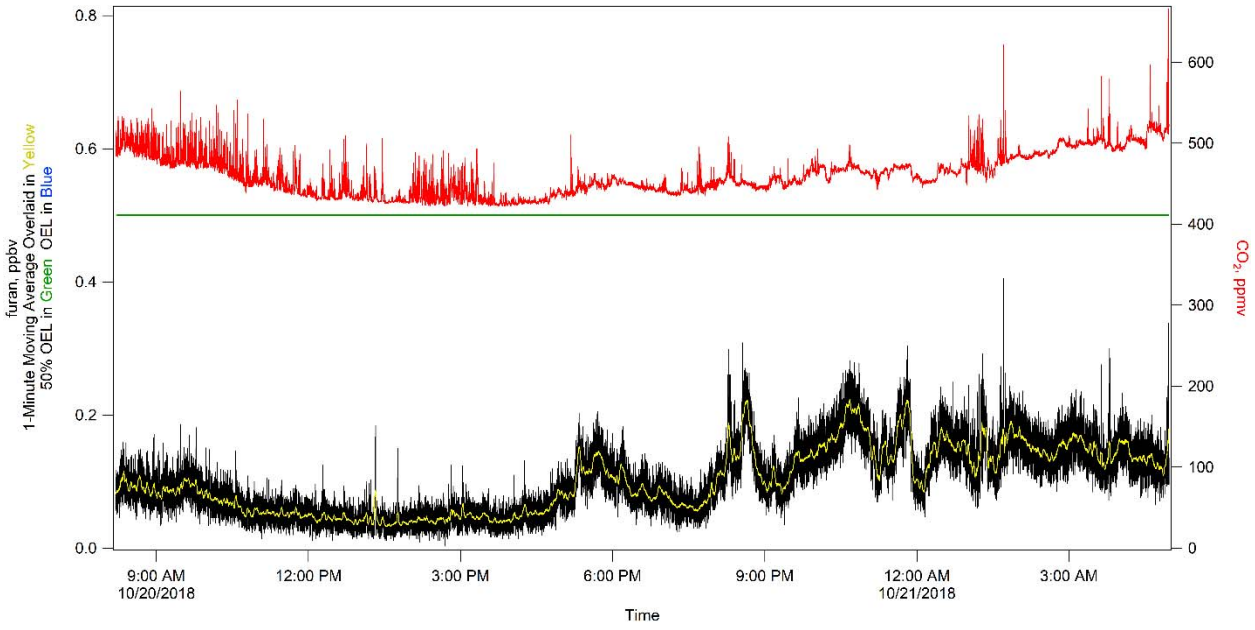

Figure 6-5. Furan.

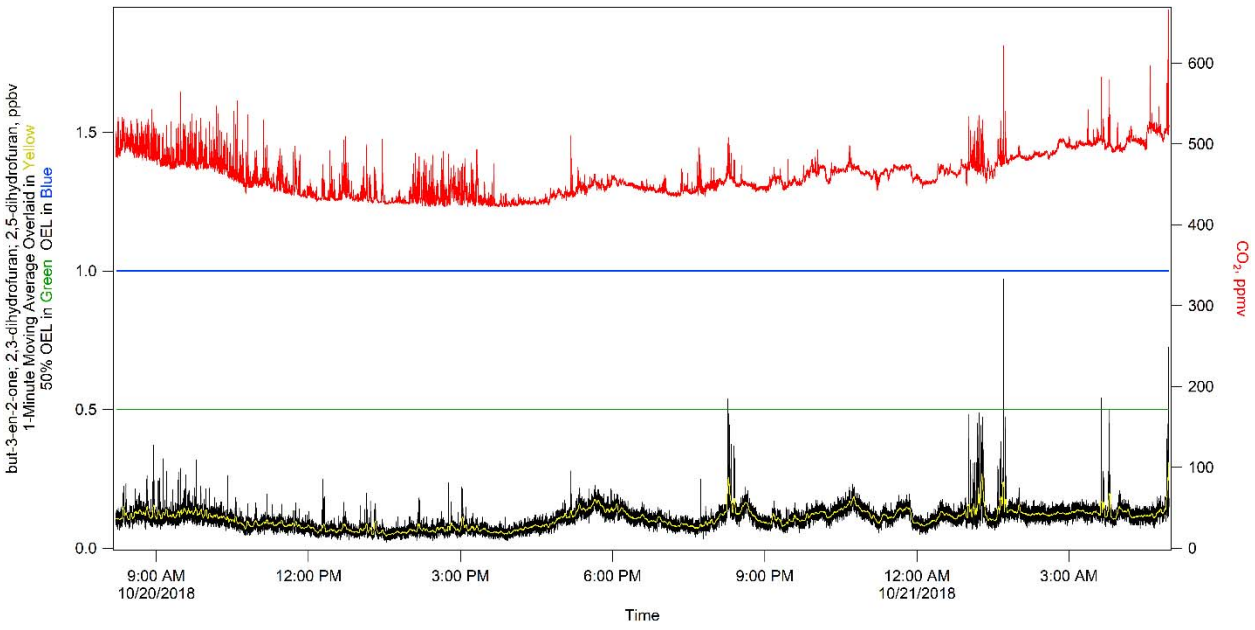

Figure 6-6. but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran.

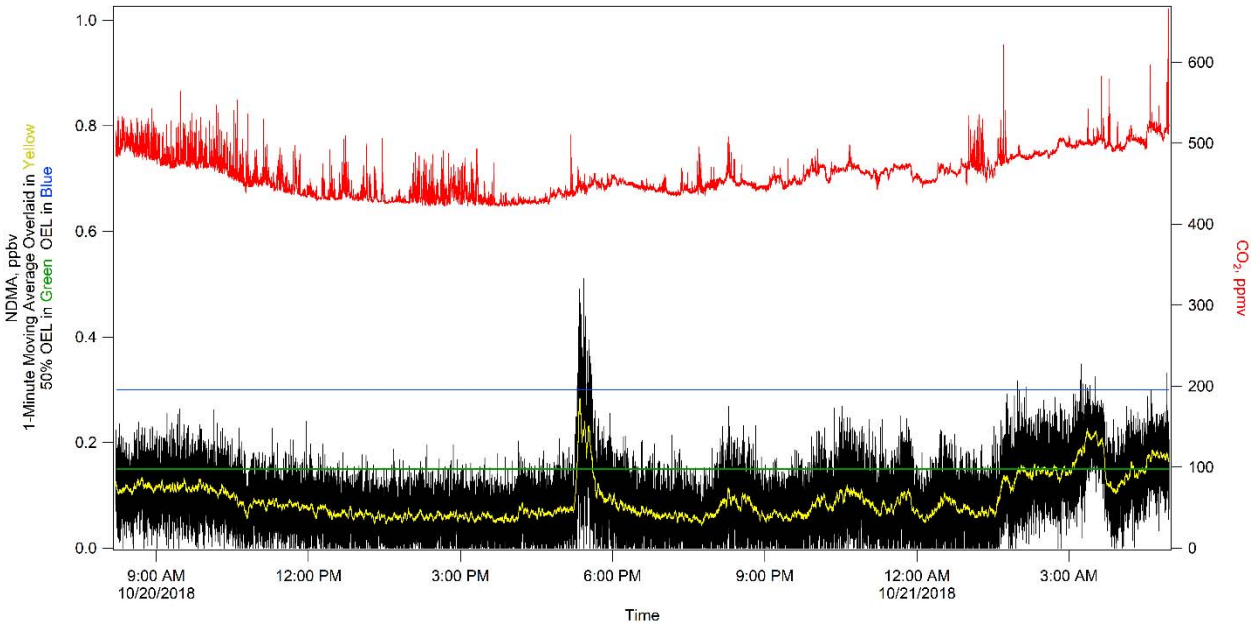

Figure 6-7. N-nitrosodimethylamine (NDMA).

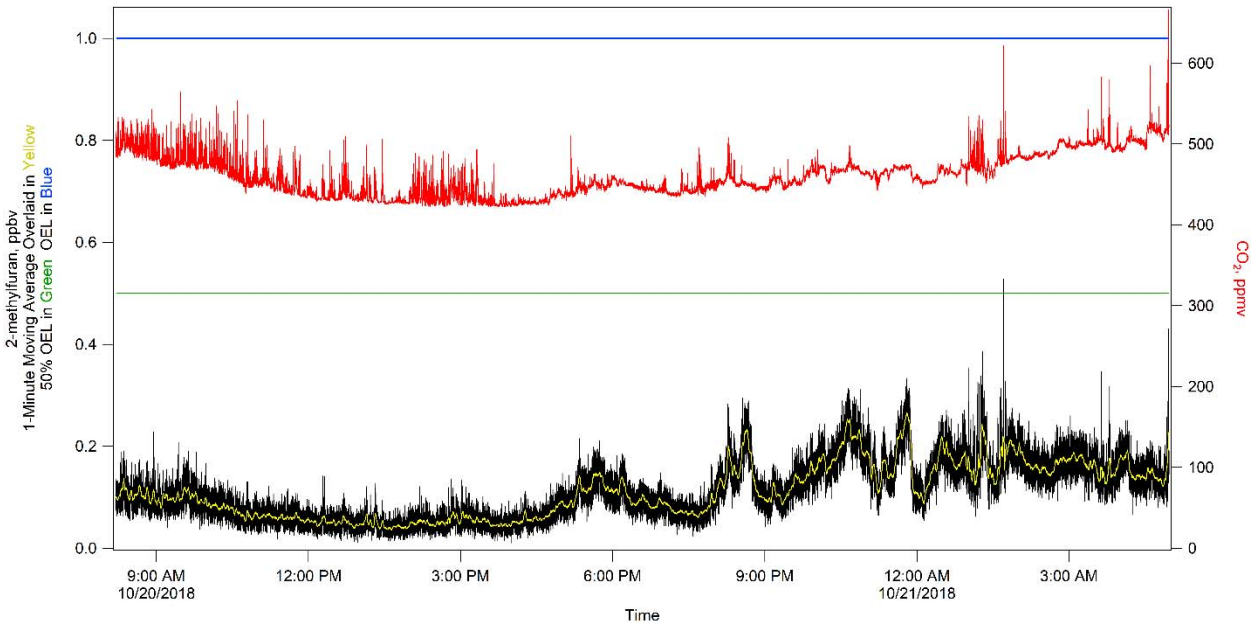

Figure 6-8. 2-methylfuran.

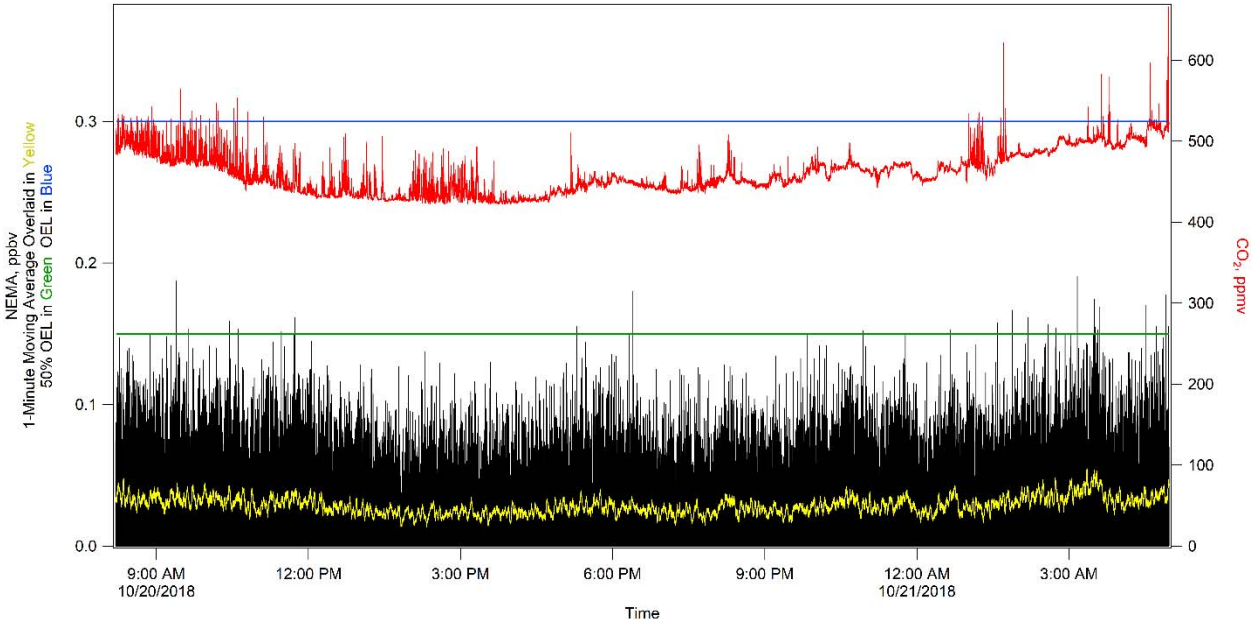

Figure 6-9. N-nitrosomethylethylamine (NEMA).

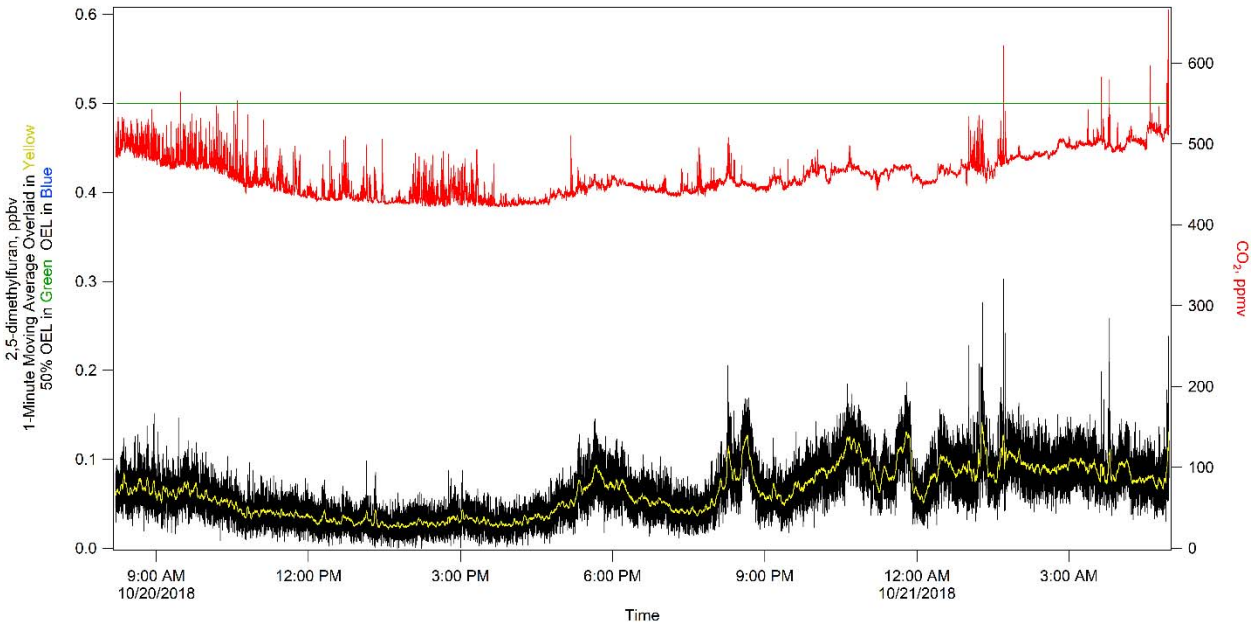

Figure 6-10. 2,5-dimethylfuran.

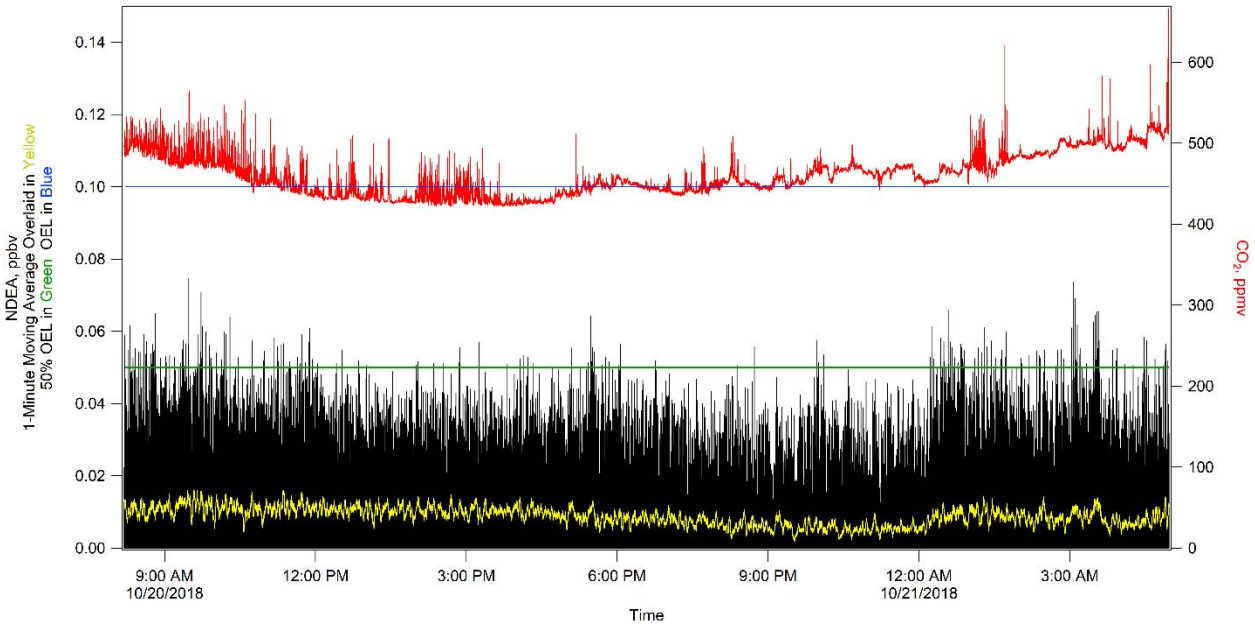

Figure 6-11. N-nitrosodiethylamine (NDEA).

The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

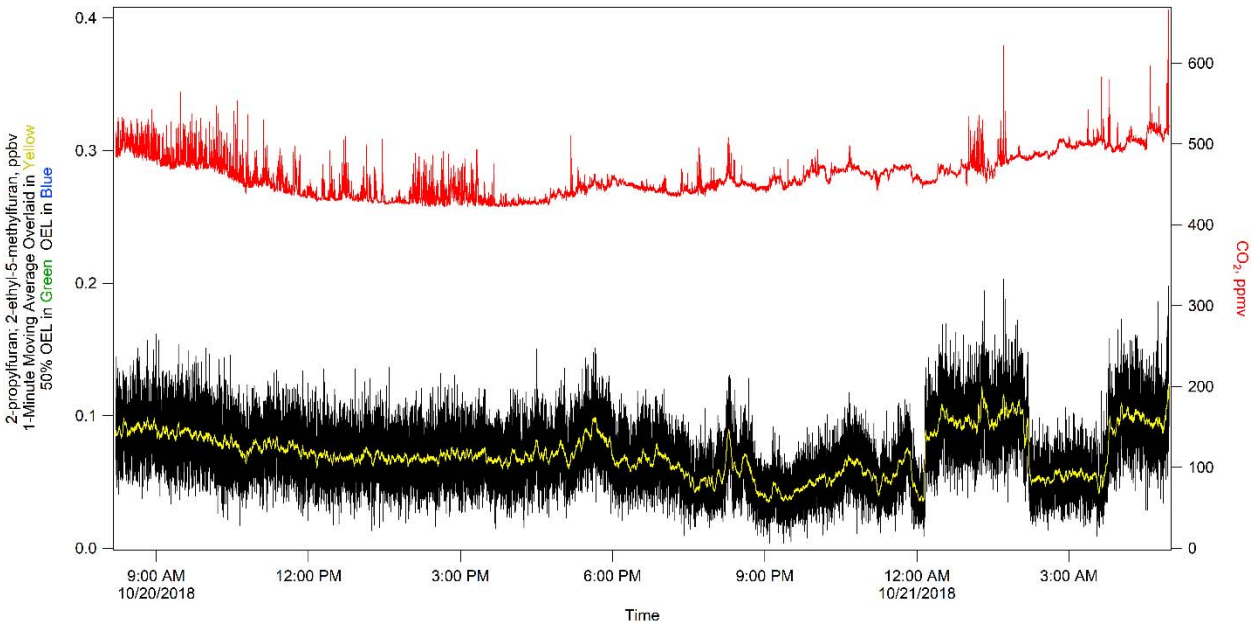

Figure 6-12. 2-propylfuran + 2-ethyl-5-methylfuran.
The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

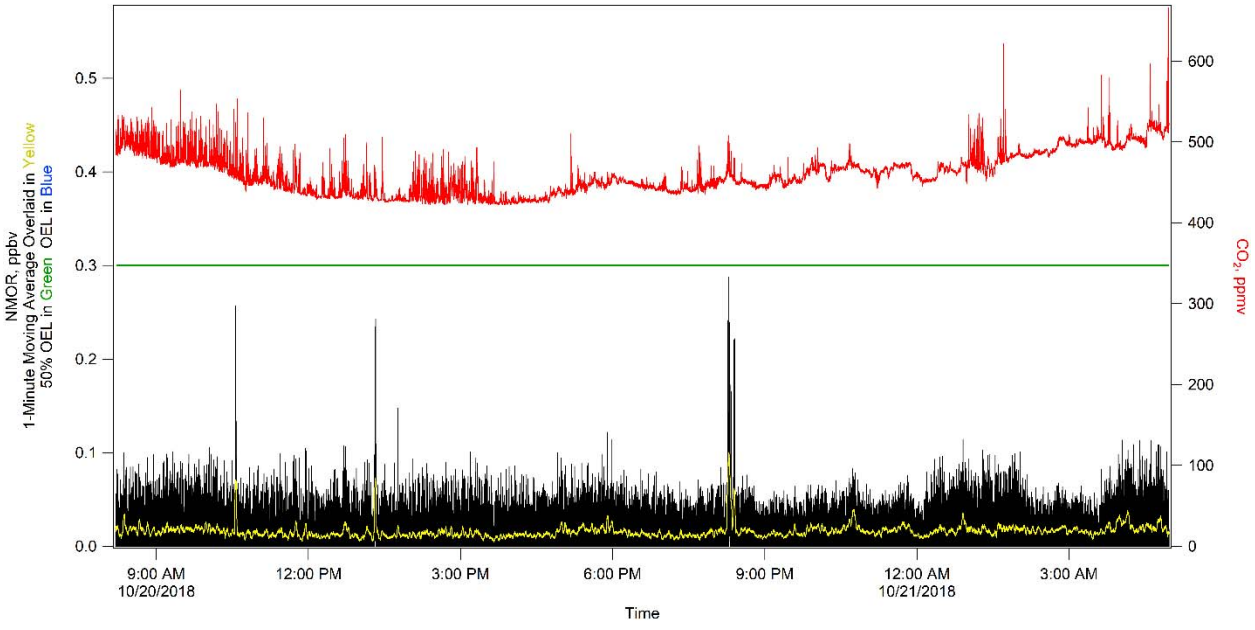

Figure 6-13. N-nitrosomorpholine (NMOR).
The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

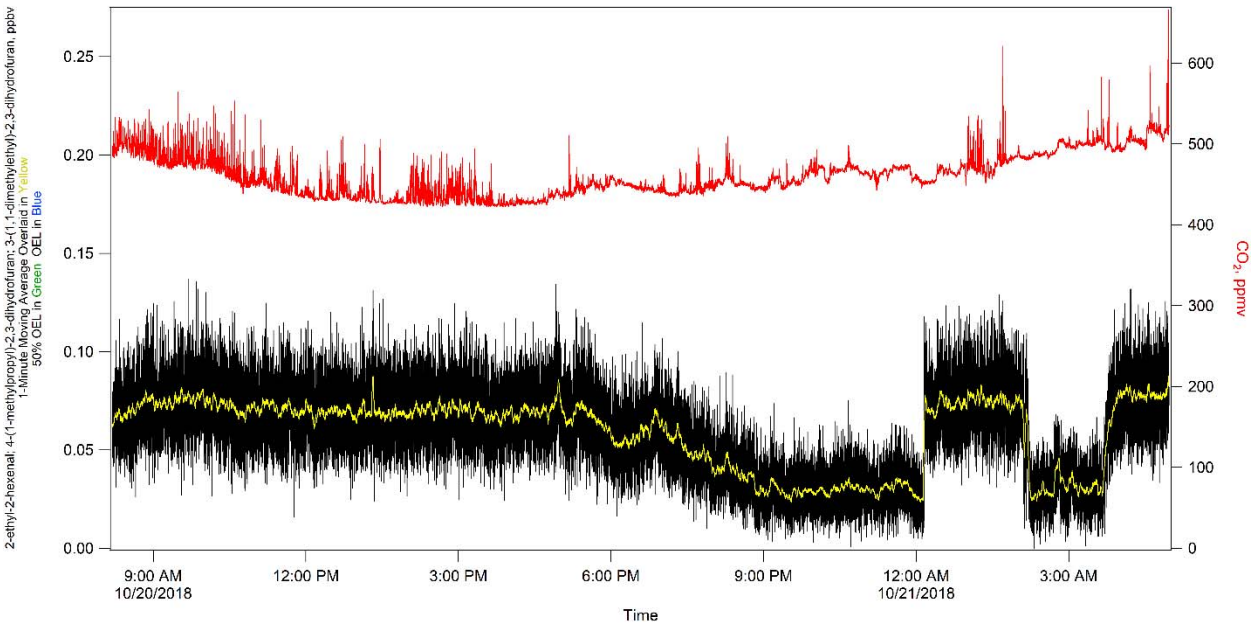

Figure 6-14. 2-ethyl-2-hexanal;4-(1-methylpropyl);2,3-dihydrofuran; 3-1(1,1-dimethylethyl)-2,3-dihydrofuran.

The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

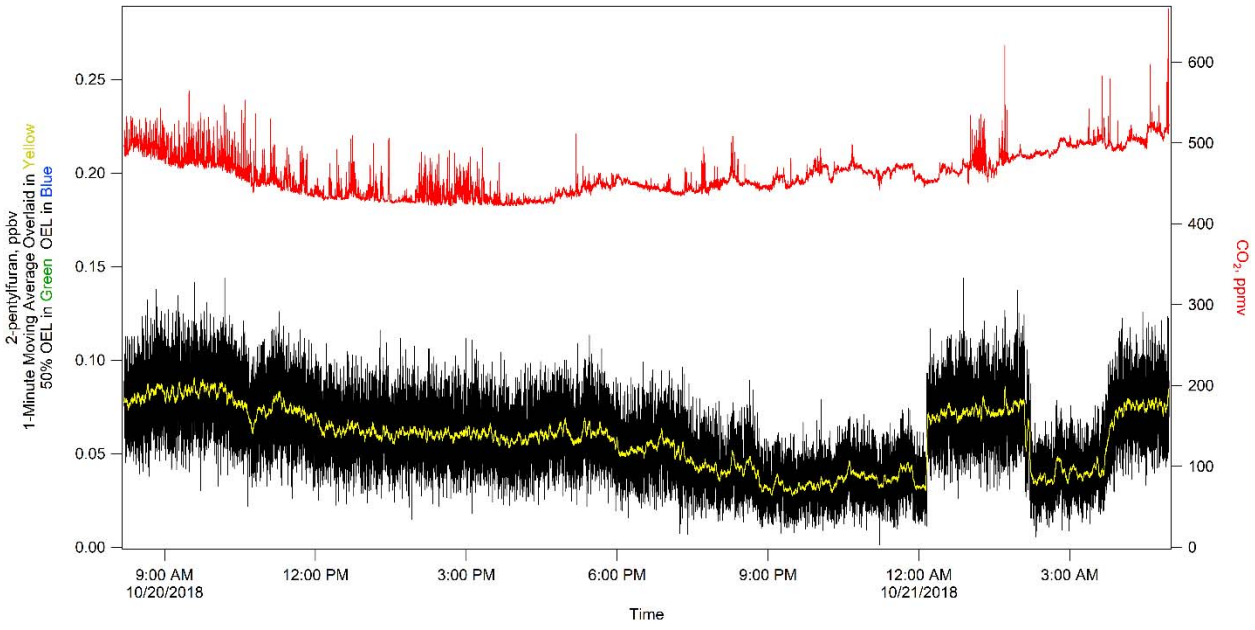

Figure 6-15. 2-pentylfuran.

The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

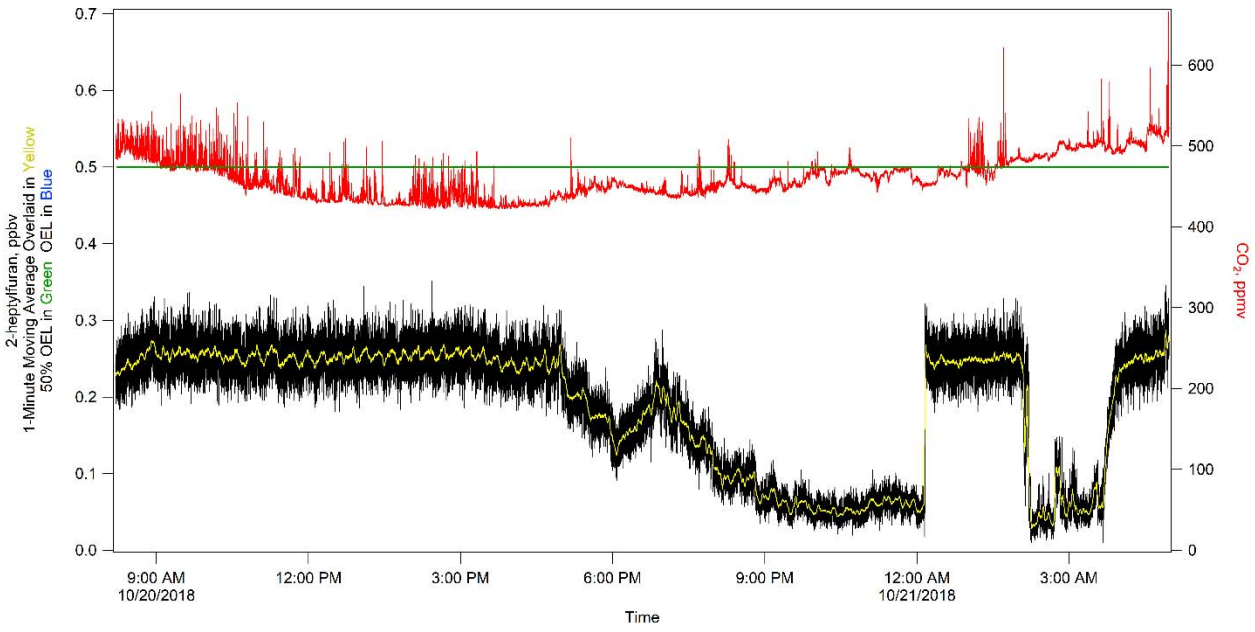

Figure 6-16. 2-heptylfuran.

The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

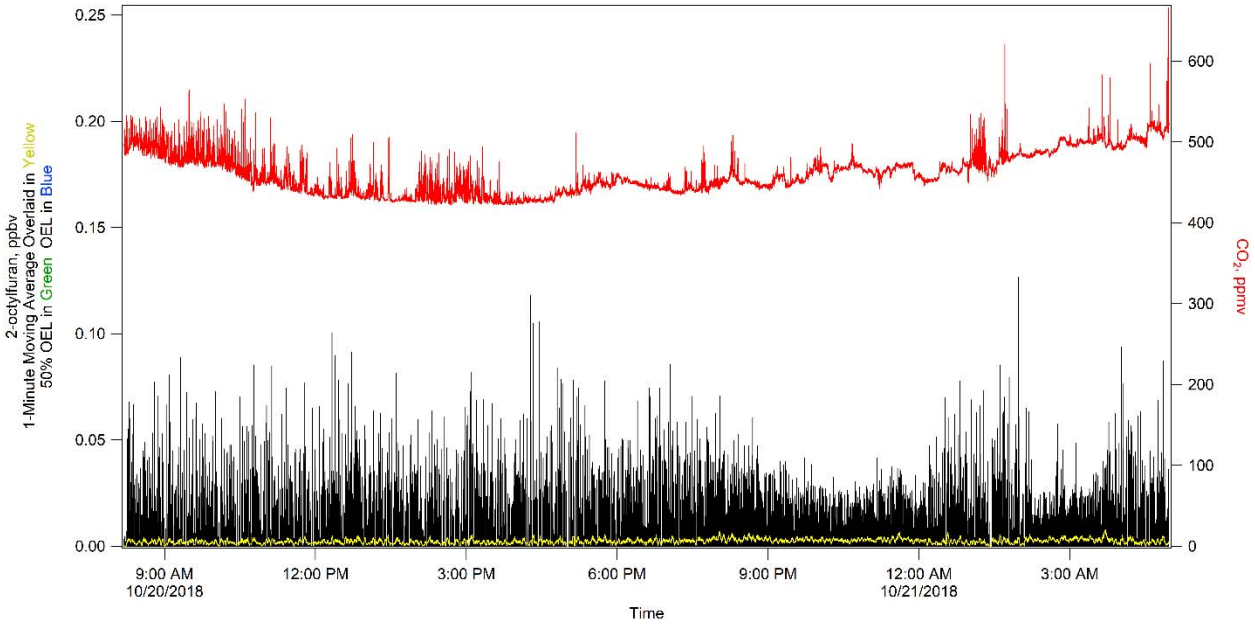

Figure 6-17. 2-octylfuran.

The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

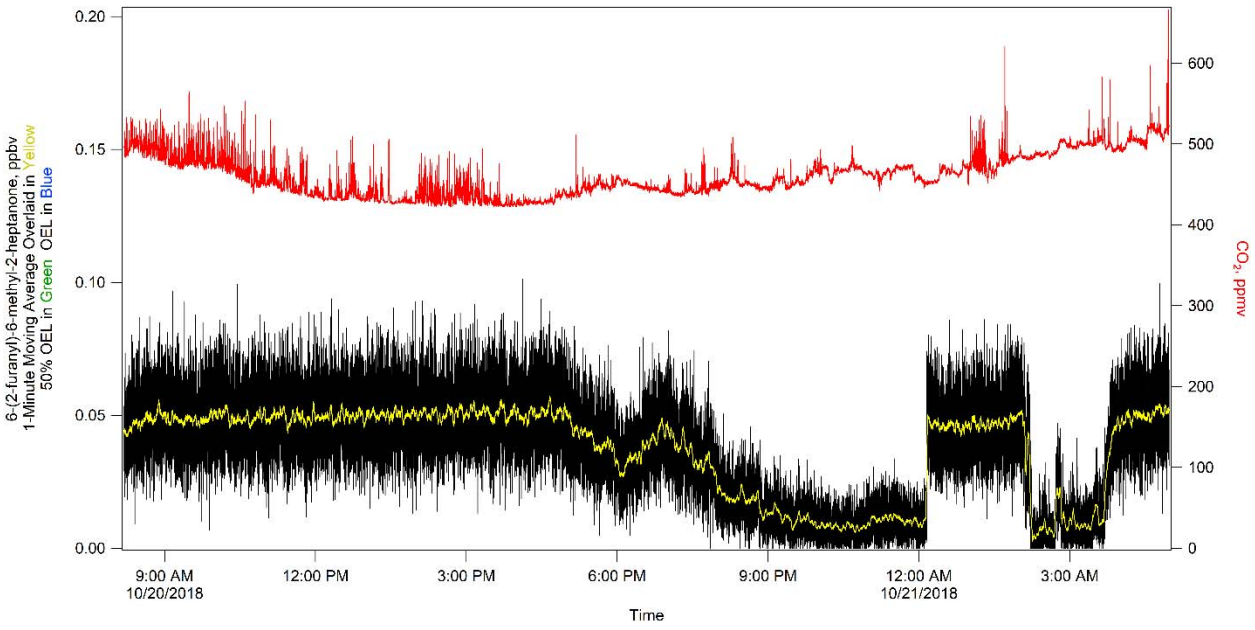

Figure 6-18. 6-(2-furanyl)-6-methyl-2-heptanone.

The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

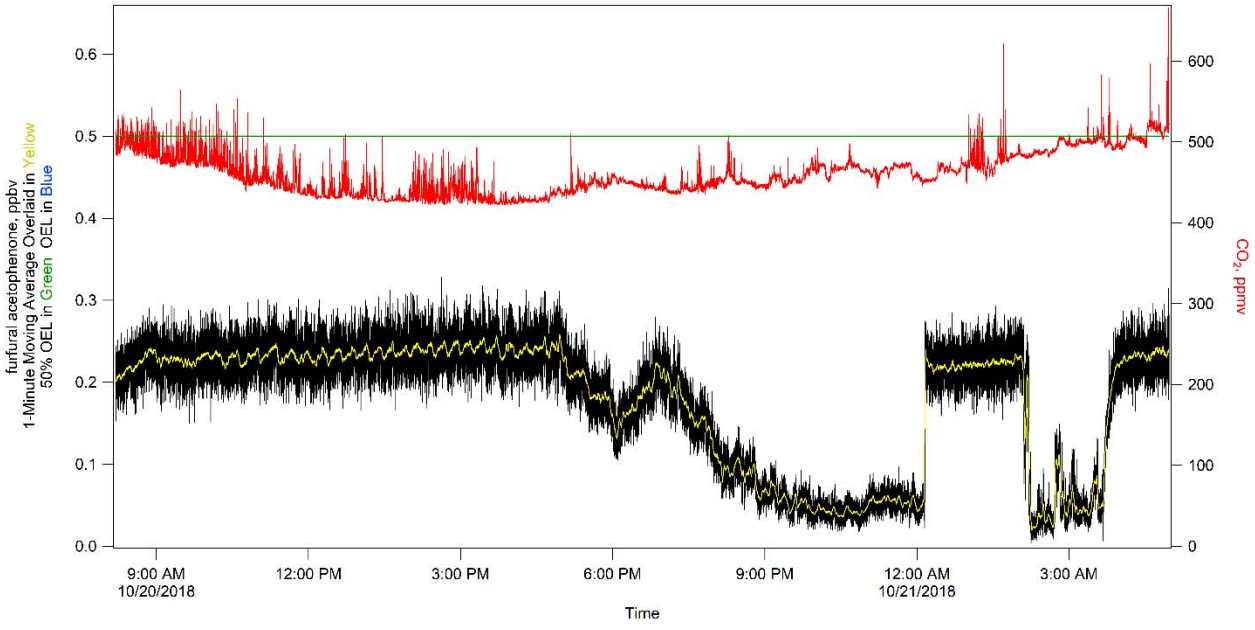

Figure 6-19. Furfural Acetophenone.

The observed abrupt changes in average concentrations are due to unoptimized tuning resulting in higher than normal instrument background. See DR18-009 in Appendix A for further explanation. This behavior will be described in further detail in the monthly report.

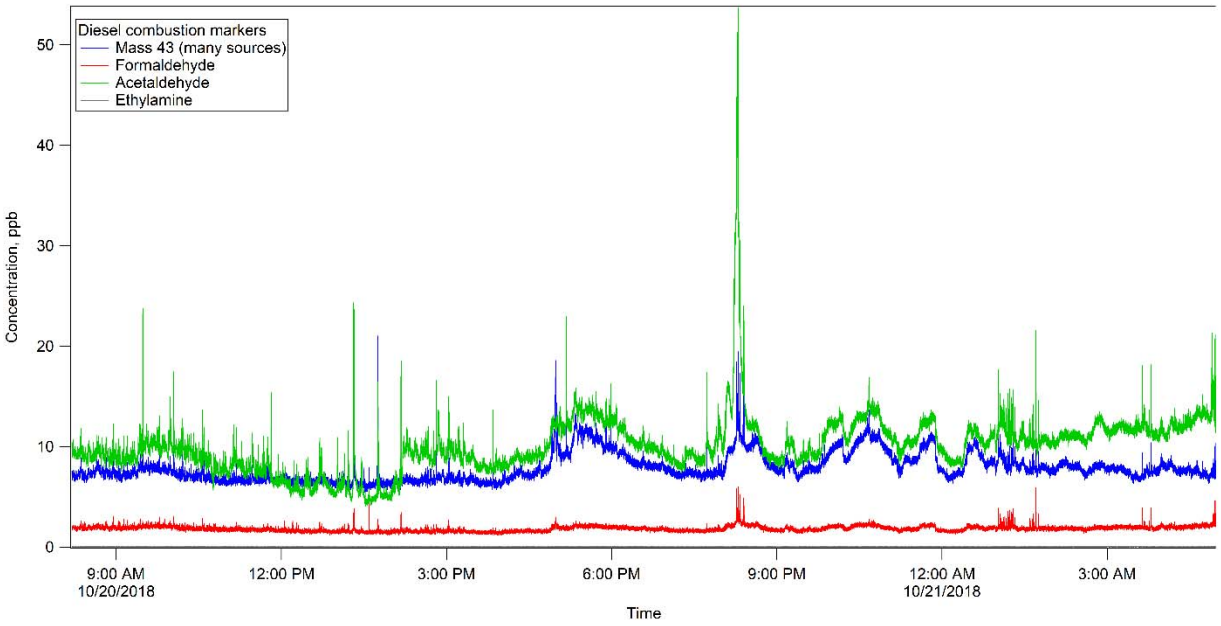

Figure 6-20. Diesel Combustion Markers.

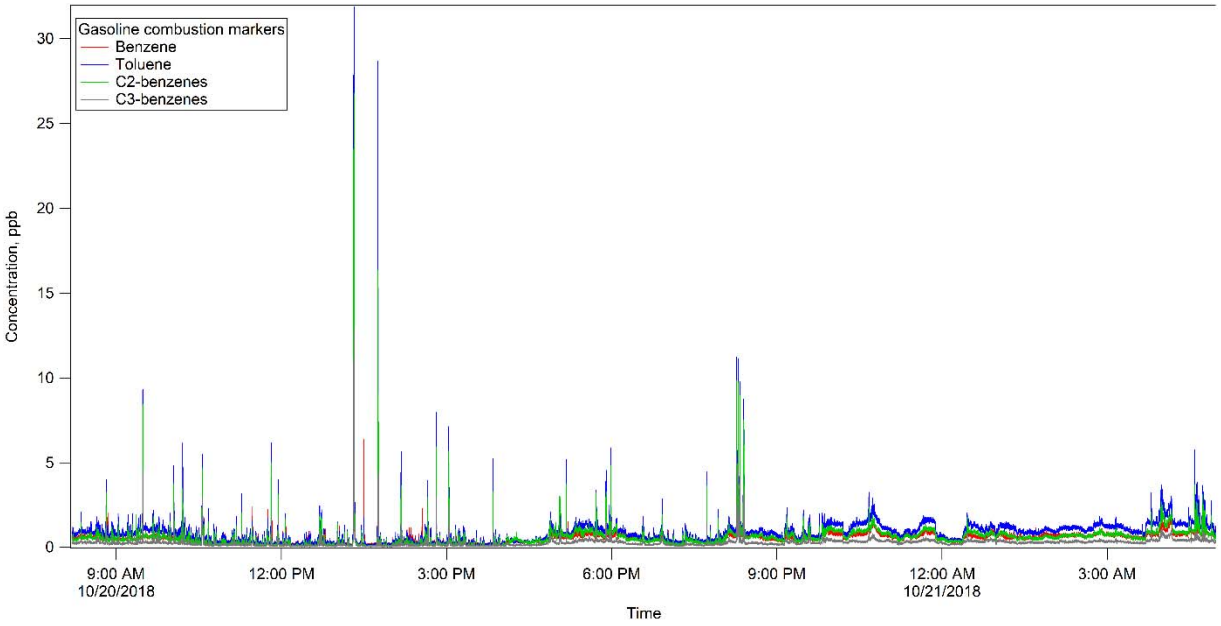

Figure 6-21. Gasoline Combustion Markers.

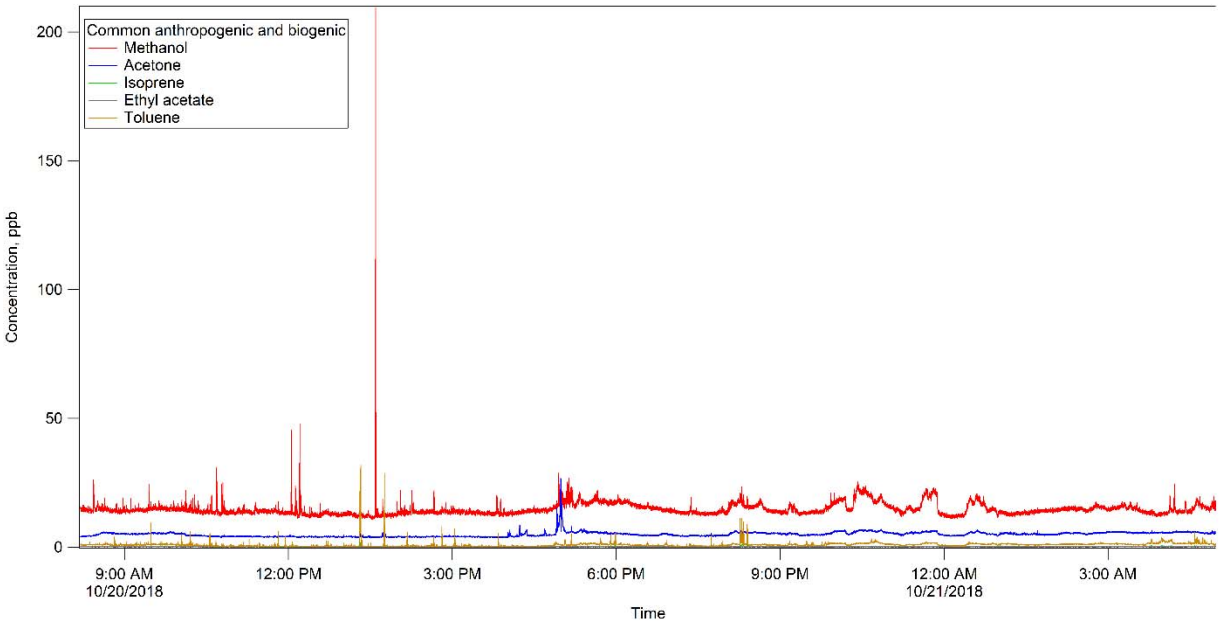

Figure 6-22. Plant and Human Markers.

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Appendix removed - Pages 110 to 116.