



## Atmospheric Analysis & Consulting, Inc.

Client : Aircraft Environment Solutions  
 Client Project Name : Aircraft Environment Solutions  
 Client Project No. : NA  
 AAC Project No. : 230962 Rev 2  
 Reporting Date : 12/08/2023

On May 23, 2023, Atmospheric Analysis & Consulting, Inc. received twenty-two (22) DNPH impregnated silica gel cartridges for Carbonyls analysis by EPA Method TO-11A. Upon receipt the samples were assigned unique Laboratory ID numbers as follows:

Client Sample ID	AAC Sample ID	Client Sample ID	AAC Sample ID
Shipping Blank	230962-44598	MJ-II 315 C – 5ppmW – Ozone In	230962-44609
Field Blank	230962-44599	MJ-II 315 C – 5ppmW – Ozone Out	230962-44610
Baseline – 200 C – Pack Exit	230962-44600	MJ-II 315 C – 5ppmW – Ambient	230962-44611
Baseline – 200 C – Ozone In	230962-44601	Field Blank	230962-44612
Baseline – 200 C – Ozone Out	230962-44602	Baseline – 300 C – Ozone In	230962-44613
Baseline – 200 C – Ambient	230962-44603	Baseline – 300 C – Ozone Out	230962-44614
Baseline – 300 C – Pack Exit	230962-44604	Baseline – 300 C – Coalescer	230962-44615
Baseline – 300 C – Ozone In	230962-44605	2197 – 300 C – Ozone In	230962-44616
Baseline – 300 C – Ozone Out	230962-44606	2197 – 300 C – Ozone Out	230962-44617
Baseline – 300 C – Ambient	230962-44607	2197 – 300 C – Ambient	230962-44618
MJ-II 315 C – 5ppmW – Pack Exit	230962-44608	Skydrol – 220 C – APU – Ozone In	230962-44619

**This analysis is accredited under the laboratory's ISO/IEC 17025:2017 accreditation issued by the ANSI National Accreditation Board. Refer to certificate and scope of accreditation AT-1908.** Test results apply to sample(s) as received. For detailed information pertaining to specific EPA, NCASI, ASTM and SCAQMD accreditations (Methods & Analytes), please visit our website at [www.aaclab.com](http://www.aaclab.com).

I certify that this data is technically accurate, complete, and in compliance with the terms and conditions of the contract. These samples were received at a temperature of 15.6°C, which is above the method recommended temperature of 4.0°C. No other problems were encountered during the analysis of these samples.

The Technical Director or his/her designee, as verified by the following signature, has authorized release of the data contained in this report. If you have any questions or require further explanation of data results, please contact the undersigned.

*Sucha Parmar, Ph.D.*

Dr. Sucha Parmar, PhD  
Technical Director

*Amended Report 230962 Rev 2 supersedes Amended Report 230962 Rev 1 and Original Report 230962. The amended reports were issued on 06/28/2023 and 12/08/2023, respectively. Per client request, a second set of results was provided, correcting for field blank results: 44599 was used to correct 44600-44611 and 44612 was used to correct 44613-44619. The Client Sample IDs were also corrected.*

**LABORATORY ANALYSIS REPORT**  
**Analysis of Carbonyls by EPA Method TO-11A**

Client : Aircraft Environment Solutions  
 Client Project Name : Aircraft Environment Solutions  
 AAC Project No. : 230962 Rev 2  
 Analyst : CH  
 Units : ppbv, ug/Sample

Sampling Date (s) : 05/16/2023  
 Receiving Date : 05/23/2023  
 Analysis Date : 05/31/2023  
 Reporting Date : 12/08/2023

Client ID	AAC Sample ID	Formaldehyde	Acetaldehyde	Acrolein	Acetone	Propionaldehyde	Crotonaldehyde	Methacrolein	MEK & Butyraldehyde	Benzaldehyde	Valeraldehyde	m-Tolualdehyde	Hexaldehyde
Shipping Blank	230962-44598	0.022	0.012	ND	0.291	0.005	ND	ND	0.007	0.008	ND	ND	ND
	SRL (ug/Sample)	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
	Qualifier	J	J			J			J	J			
Field Blank	230962-44599	0.020	0.003	ND	0.117	ND	ND	ND	ND	0.005	0.029	ND	ND
	SRL (ug/Sample)	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
	Qualifier	J	J							J	J		
Baseline – 200 C – Pack Exit	230962-44600	6.65	2.45	ND	4.19	0.787	ND	0.205	0.725	0.109	0.738	ND	ND
	SRL (ppbv)	1.44	0.983	0.772	0.745	0.745	0.617	0.617	0.600	0.408	0.502	0.360	0.432
	Qualifier							J		J			
Baseline – 200 C – Ozone In	230962-44601	5.03	1.05	ND	3.84	0.302	ND	0.083	0.376	0.033	0.612	ND	ND
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier					J		J	J	J			
Baseline – 200 C – Ozone Out	230962-44602	11.0	2.74	ND	3.18	0.561	ND	0.076	0.728	0.039	0.578	ND	ND
	SRL (ppbv)	1.06	0.720	0.565	0.546	0.546	0.452	0.452	0.440	0.299	0.368	0.264	0.316
	Qualifier							J		J			
Baseline – 200 C – Ambient	230962-44603	2.88	0.620	ND	2.73	0.301	1.29	ND	0.341	0.039	0.562	ND	ND
	SRL (ppbv)	1.07	0.731	0.574	0.554	0.554	0.459	0.459	0.446	0.303	0.374	0.268	0.321
	Qualifier		J			J			J	J			
Baseline – 300 C – Pack Exit	230962-44604	21.9	11.3	0.309	4.15	2.70	4.49	0.640	3.44	0.082	1.45	ND	0.315
	SRL (ppbv)	1.44	0.983	0.772	0.745	0.745	0.617	0.617	0.600	0.408	0.502	0.360	0.432
	Qualifier			J						J			J
Baseline – 300 C – Ozone In	230962-44605	7.20	2.41	0.083	3.54	1.02	0.311	0.180	1.13	0.080	0.926	ND	0.189
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier			J			J	J		J			J
Baseline – 300 C – Ozone Out	230962-44606	27.4	12.7	0.597	5.50	1.92	0.675	0.418	3.35	0.068	1.51	ND	0.338
	SRL (ppbv)	1.06	0.720	0.565	0.546	0.546	0.452	0.452	0.440	0.299	0.368	0.264	0.316
	Qualifier							J		J			
Baseline – 300 C – Ambient	230962-44607	2.91	1.51	ND	3.48	0.696	2.32	0.474	1.35	0.102	0.934	ND	0.235
	SRL (ppbv)	1.07	0.731	0.574	0.554	0.554	0.459	0.459	0.446	0.303	0.374	0.268	0.321
	Qualifier									J			J
MJ-II 315 C – 5ppmW – Pack Exit	230962-44608	72.5	28.9	0.571	ND	11.0	5.05	ND	7.85	0.075	6.02	ND	3.04
	SRL (ppbv)	1.44	0.983	0.772	0.745	0.745	0.617	0.617	0.600	0.408	0.502	0.360	0.432
	Qualifier			J						J			

ND - Compound was analyzed for, but was not detected at or above the SDL.

J - Analyte was detected between the SRL and the SDL.

**LABORATORY ANALYSIS REPORT**  
**Analysis of Carbonyls by EPA Method TO-11A**

Client : Aircraft Environment Solutions  
 Client Project Name : Aircraft Environment Solutions  
 AAC Project No. : 230962 Rev 2  
 Analyst : CH  
 Units : ppbv, ug/Sample

Sampling Date (s) : 05/16-18/2023  
 Receiving Date : 05/23/2023  
 Analysis Date : 05/31/2023  
 Reporting Date : 12/08/2023

Client ID	AAC Sample ID	Formaldehyde	Acetaldehyde	Acrolein	Acetone	Propionaldehyde	Crotonaldehyde	Methacrolein	MEK & Butyraldehyde	Benzaldehyde	Valeraldehyde	m-Tolualdehyde	Hexaldehyde
MJ-II 315 C – 5ppmW – Ozone In	230962-44609	14.3	7.56	ND	1.84	3.73	3.00	ND	2.64	0.103	3.11	ND	0.695
	SRL (ppbv)	1.04	0.712	0.560	0.540	0.540	0.448	0.448	0.435	0.296	0.364	0.261	0.313
	Qualifier									J			
MJ-II 315 C – 5ppmW – Ozone Out	230962-44610	58.1	40.0	1.03	5.03	10.6	1.66	1.76	14.8	0.168	3.91	ND	3.34
	SRL (ppbv)	1.04	0.712	0.560	0.540	0.540	0.448	0.448	0.435	0.296	0.364	0.261	0.313
	Qualifier									J			
MJ-II 315 C – 5ppmW – Ambient	230962-44611	4.25	1.64	ND	1.82	1.47	4.38	1.08	0.793	0.184	0.772	0.546	0.282
	SRL (ppbv)	1.08	0.734	0.577	0.557	0.557	0.462	0.462	0.449	0.305	0.376	0.269	0.323
	Qualifier									J			J
Field Blank	230962-44612	0.020	0.011	ND	0.203	0.005	ND	ND	ND	ND	0.026	ND	ND
	SRL (ug/Sample)	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
	Qualifier	J	J			J					J		
Baseline – 300 C – Ozone In	230962-44613	6.87	2.14	0.092	3.74	0.528	0.140	0.063	0.458	0.053	0.792	ND	0.147
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier			J		J	J	J		J			J
Baseline – 300 C – Ozone Out	230962-44614	33.8	9.61	0.463	2.50	1.57	0.746	0.305	2.44	0.037	1.62	0.481	0.320
	SRL (ppbv)	1.03	0.705	0.554	0.535	0.535	0.443	0.443	0.431	0.293	0.361	0.259	0.310
	Qualifier			J				J		J			
Baseline – 300 C – Coalescer	230962-44615	1.38	0.422	ND	1.97	0.211	ND	0.075	0.297	0.071	0.374	ND	0.109
	SRL (ppbv)	1.06	0.723	0.568	0.548	0.548	0.454	0.454	0.442	0.300	0.370	0.265	0.318
	Qualifier		J			J		J	J	J			J
2197 – 300 C – Ozone In	230962-44616	8.40	2.54	0.164	4.07	0.793	0.275	0.108	1.12	0.055	ND	ND	0.227
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier			J			J	J		J			J
2197 – 300 C – Ozone Out	230962-44617	97.8	28.0	1.94	4.39	10.6	0.711	1.04	12.7	ND	3.61	1.18	3.27
	SRL (ppbv)	1.04	0.712	0.560	0.540	0.540	0.448	0.448	0.435	0.296	0.364	0.261	0.313
	Qualifier												
2197 – 300 C – Ambient	230962-44618	1.41	0.509	ND	3.35	0.212	ND	0.062	0.274	0.094	0.859	ND	0.165
	SRL (ppbv)	1.07	0.727	0.571	0.551	0.551	0.457	0.457	0.444	0.302	0.372	0.266	0.320
	Qualifier		J			J		J	J	J			J
Skydrol – 220 C – APU – Ozone In	230962-44619	3.89	1.74	ND	4.28	2.14	ND	0.103	2.41	0.034	0.803	ND	0.207
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier							J		J			J

ND - Compound was analyzed for, but was not detected at or above the SDL.

J - Analyte was detected between the SRL and the SDL.

**LABORATORY ANALYSIS REPORT**  
**Analysis of Carbonyls by EPA Method TO-11A**

Client : Aircraft Environment Solutions  
 Client Project Name : Aircraft Environment Solutions  
 AAC Project No. : 230962 Rev 2  
 Analyst : CH  
 Units : ppbv, ug/Sample

Sampling Date (s) : 05/16/2023  
 Receiving Date : 05/23/2023  
 Analysis Date : 05/31/2023  
 Reporting Date : 12/08/2023

*Field Blank Corrected Values*

Client ID	AAC Sample ID	Formaldehyde	Acetaldehyde	Acrolein	Acetone	Propionaldehyde	Crotonaldehyde	Methacrolein	MEK & Butyraldehyde	Benzaldehyde	Valeraldehyde	m-Tolualdehyde	Hexaldehyde
Shipping Blank	230962-44598	0.022	0.012	ND	0.291	0.005	ND	ND	0.007	0.008	ND	ND	ND
	SRL (ug/Sample)	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
	Qualifier	J	J			J			J	J			
Field Blank	230962-44599	0.020	0.003	ND	0.117	ND	ND	ND	ND	0.005	0.029	ND	ND
	SRL (ug/Sample)	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
	Qualifier	J	J							J	J		
Baseline – 200 C – Pack Exit	230962-44600	5.91	2.37	ND	1.93	0.745	ND	0.207	0.756	0.055	0.354	ND	ND
	SRL (ppbv)	1.44	0.983	0.772	0.745	0.745	0.617	0.617	0.600	0.408	0.502	0.360	0.432
	Qualifier							J		J	J		
Baseline – 200 C – Ozone In	230962-44601	4.49	1.00	ND	2.18	0.271	ND	0.085	0.399	ND	0.332	ND	ND
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier					J		J	J		J		
Baseline – 200 C – Ozone Out	230962-44602	10.5	2.69	ND	1.52	0.530	ND	0.078	0.751	ND	0.297	ND	ND
	SRL (ppbv)	1.06	0.720	0.565	0.546	0.546	0.452	0.452	0.440	0.299	0.368	0.264	0.316
	Qualifier					J		J			J		
Baseline – 200 C – Ambient	230962-44603	2.34	0.564	ND	1.04	0.270	1.29	ND	0.364	ND	0.276	ND	ND
	SRL (ppbv)	1.07	0.731	0.574	0.554	0.554	0.459	0.459	0.446	0.303	0.374	0.268	0.321
	Qualifier		J			J			J		J		
Baseline – 300 C – Pack Exit	230962-44604	21.2	11.2	0.309	1.88	2.66	4.49	0.642	3.47	ND	1.07	ND	0.315
	SRL (ppbv)	1.44	0.983	0.772	0.745	0.745	0.617	0.617	0.600	0.408	0.502	0.360	0.432
	Qualifier			J									J
Baseline – 300 C – Ozone In	230962-44605	6.67	2.36	0.083	1.89	0.99	0.311	0.182	1.15	0.040	0.646	ND	0.189
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier			J			J	J		J			J
Baseline – 300 C – Ozone Out	230962-44606	26.9	12.7	0.597	3.84	1.89	0.675	0.420	3.37	0.029	1.23	ND	0.338
	SRL (ppbv)	1.06	0.720	0.565	0.546	0.546	0.452	0.452	0.440	0.299	0.368	0.264	0.316
	Qualifier							J		J			
Baseline – 300 C – Ambient	230962-44607	2.37	1.46	ND	1.80	0.665	2.32	0.476	1.38	0.062	0.649	ND	0.235
	SRL (ppbv)	1.07	0.731	0.574	0.554	0.554	0.459	0.459	0.446	0.303	0.374	0.268	0.321
	Qualifier									J			J
MJ-II 315 C – 5ppmW – Pack Exit	230962-44608	71.7	28.9	0.571	ND	11.0	5.05	ND	7.88	ND	5.64	ND	3.04
	SRL (ppbv)	1.44	0.983	0.772	0.745	0.745	0.617	0.617	0.600	0.408	0.502	0.360	0.432
	Qualifier			J									

ND - Compound was analyzed for, but was not detected at or above the SDL.

J - Analyte was detected between the SRL and the SDL.

**LABORATORY ANALYSIS REPORT**  
**Analysis of Carbonyls by EPA Method TO-11A**

Client : Aircraft Environment Solutions  
 Client Project Name : Aircraft Environment Solutions  
 AAC Project No. : 230962 Rev 2  
 Analyst : CH  
 Units : ppbv, ug/Sample

Sampling Date (s) : 05/16-18/2023  
 Receiving Date : 05/23/2023  
 Analysis Date : 05/31/2023  
 Reporting Date : 12/08/2023

*Field Blank Corrected Values*

Client ID	AAC Sample ID	Formaldehyde	Acetaldehyde	Acrolein	Acetone	Propionaldehyde	Crotonaldehyde	Methacrolein	MEK & Butyraldehyde	Benzaldehyde	Valeraldehyde	m-Tolualdehyde	Hexaldehyde
MJ-II 315 C – 5ppmW – Ozone In	230962-44609	13.8	7.50	ND	0.19	3.70	3.00	ND	2.66	0.064	2.83	ND	0.695
	SRL (ppbv)	1.04	0.712	0.560	0.540	0.540	0.448	0.448	0.435	0.296	0.364	0.261	0.313
	Qualifier				J					J			
MJ-II 315 C – 5ppmW – Ozone Out	230962-44610	57.6	40.0	1.03	3.39	10.5	1.66	1.76	14.9	0.129	3.63	ND	3.34
	SRL (ppbv)	1.04	0.712	0.560	0.540	0.540	0.448	0.448	0.435	0.296	0.364	0.261	0.313
	Qualifier									J			
MJ-II 315 C – 5ppmW – Ambient	230962-44611	3.70	1.59	ND	0.12	1.44	4.38	1.09	0.816	0.144	0.485	0.546	0.282
	SRL (ppbv)	1.08	0.734	0.577	0.557	0.557	0.462	0.462	0.449	0.305	0.376	0.269	0.323
	Qualifier				J					J			J
Field Blank	230962-44612	0.020	0.011	ND	0.203	0.005	ND	ND	ND	ND	0.026	ND	ND
	SRL (ug/Sample)	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
	Qualifier	J	J			J					J		
Baseline – 300 C – Ozone In	230962-44613	6.33	1.93	0.092	0.87	0.458	0.140	0.068	0.465	0.038	0.549	ND	0.147
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier			J		J	J	J		J			J
Baseline – 300 C – Ozone Out	230962-44614	33.3	9.41	0.463	ND	1.51	0.746	0.310	2.44	ND	1.38	0.481	0.320
	SRL (ppbv)	1.03	0.705	0.554	0.535	0.535	0.443	0.443	0.431	0.293	0.361	0.259	0.310
	Qualifier			J				J					
Baseline – 300 C – Coalescer	230962-44615	0.83	0.214	ND	ND	0.140	ND	0.080	0.304	0.055	0.129	ND	0.109
	SRL (ppbv)	1.06	0.723	0.568	0.548	0.548	0.454	0.454	0.442	0.300	0.370	0.265	0.318
	Qualifier	J	J			J		J	J	J	J		J
2197 – 300 C – Ozone In	230962-44616	7.85	2.33	0.164	1.20	0.723	0.275	0.113	1.13	0.039	ND	ND	0.227
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier			J			J	J		J			J
2197 – 300 C – Ozone Out	230962-44617	97.3	27.8	1.94	1.53	10.5	0.711	1.05	12.7	ND	3.36	1.18	3.27
	SRL (ppbv)	1.04	0.712	0.560	0.540	0.540	0.448	0.448	0.435	0.296	0.364	0.261	0.313
	Qualifier												
2197 – 300 C – Ambient	230962-44618	0.86	0.299	ND	0.43	0.141	ND	0.068	0.281	0.078	0.613	ND	0.165
	SRL (ppbv)	1.07	0.727	0.571	0.551	0.551	0.457	0.457	0.444	0.302	0.372	0.266	0.320
	Qualifier	J	J		J	J		J	J	J			J
Skydrol – 220 C – APU – Ozone In	230962-44619	3.35	1.54	ND	1.41	2.07	ND	0.108	2.42	ND	0.559	ND	0.207
	SRL (ppbv)	1.05	0.716	0.563	0.543	0.543	0.450	0.450	0.437	0.297	0.366	0.262	0.315
	Qualifier							J					J

ND - Compound was analyzed for, but was not detected at or above the SDL.

J - Analyte was detected between the SRL and the SDL.

### Quality Control/Quality Assurance Report

EPA TO-11A

Duplicate Analysis

Analysis Date : 05/31-06/01/2023

Instrument ID : HPLC 1200

Analyst : CH

Analyte	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
Sample ID 230962-44598												
Sample Concentration (ug/mL)	0.036	0.034	ND	0.261	<SRL	ND	<SRL	0.031	<SRL	ND	ND	ND
Duplicate Sample Concentration (ug/mL)	0.036	0.033	ND	0.262	<SRL	ND	<SRL	0.031	<SRL	ND	ND	ND
RPD**	1.1	1.5	NA	0.6	NA	NA	NA	0.3	NA	NA	NA	NA
Sample ID 230962-44600												
Sample Concentration (ug/mL)	0.136	0.088	ND	0.212	0.029	ND	<SRL	0.056	<SRL	0.037	ND	ND
Duplicate Sample Concentration (ug/mL)	0.138	0.088	ND	0.213	0.025	ND	<SRL	0.065	<SRL	0.039	ND	ND
RPD**	0.9	0.1	NA	0.4	12.9	NA	NA	14.2	NA	6.3	NA	NA
Sample ID 230962-44607												
Sample Concentration (ug/mL)	0.089	0.077	ND	0.229	0.034	0.127	0.029	0.102	<SRL	0.063	ND	<SRL
Duplicate Sample Concentration (ug/mL)	0.091	0.080	ND	0.226	0.032	0.140	0.034	0.097	<SRL	0.059	ND	<SRL
RPD**	1.8	2.9	NA	1.2	6.7	9.8	16.7	5.3	NA	5.8	NA	NA
Sample ID 230962-44615												
Sample Concentration (ug/mL)	0.054	0.040	ND	0.162	<SRL	ND	<SRL	0.043	<SRL	0.025	ND	<SRL
Duplicate Sample Concentration (ug/mL)	0.054	0.041	ND	0.161	<SRL	ND	<SRL	0.045	<SRL	0.026	ND	<SRL
RPD**	0.7	1.5	NA	0.2	NA	NA	NA	5.5	NA	4.3	NA	NA
Sample ID 230962-44617												
Sample Concentration (ug/mL)	2.362	1.01	0.087	0.275	0.494	0.040	0.062	0.753	ND	0.248	0.113	0.261
Duplicate Sample Concentration (ug/mL)	2.355	1.01	0.082	0.270	0.486	0.041	0.060	0.753	ND	0.282	0.123	0.263
RPD**	0.3	0.1	5.1	1.8	1.6	3.0	2.0	0.0	NA	12.9	9.2	0.6
Sample ID 231008-44905												
Sample Concentration (ug/mL)	0.031	<SRL	ND	0.065	<SRL	ND	<SRL	0.026	<SRL	ND	ND	ND
Duplicate Sample Concentration (ug/mL)	0.031	<SRL	ND	0.064	<SRL	ND	<SRL	0.026	<SRL	ND	ND	ND
RPD**	1.6	NA	NA	0.8	NA	NA	NA	3.5	NA	NA	NA	NA

ND = Not Detected

NA=Not Applicable

\*\* Must be <20%

### Quality Control/Quality Assurance Report

EPA TO-11A

HPLC Calibration Verification of the 01/17/2023 Calibration

Analysis Date : 05/31-06/01/2023  
Analyst : CH

Instrument ID : HPLC 1200

#### Opening CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.42	2.44	2.48	2.40	2.43	2.44	2.45	4.85	2.44	2.44	2.44	2.44
Accuracy (%)*	96.8	97.6	99.2	96.0	97.2	97.6	98.0	97.0	97.6	97.6	97.6	97.6

#### Continuing CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.44	2.44	2.48	2.41	2.44	2.45	2.46	4.86	2.45	2.44	2.45	2.44
Accuracy (%)*	97.6	97.6	99.2	96.4	97.6	98.0	98.4	97.2	98.0	97.6	98.0	97.6

#### Continuing CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.52	2.54	2.59	2.50	2.53	2.55	2.55	5.06	2.54	2.54	2.54	2.54
Accuracy (%)*	101	102	104	100	101	102	102	101	102	102	102	102

#### Continuing CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.53	2.54	2.56	2.54	2.52	2.54	2.53	5.10	2.53	2.54	2.54	2.54
Accuracy (%)*	101	102	102	102	101	102	101	102	101	102	102	102

#### Continuing CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.42	2.43	2.47	2.40	2.43	2.44	2.45	4.85	2.44	2.43	2.45	2.43
Accuracy (%)*	96.8	97.2	98.8	96.0	97.2	97.6	98.0	97.0	97.6	97.2	98.0	97.2

#### Continuing CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.68	2.67	2.72	2.64	2.66	2.68	2.70	5.31	2.69	2.67	2.69	2.67
Accuracy (%)*	107	107	109	106	106	107	108	106	108	107	108	107

#### Continuing CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.65	2.64	2.68	2.61	2.64	2.65	2.65	5.26	2.64	2.64	2.65	2.64
Accuracy (%)*	106	106	107	104	106	106	106	105	106	106	106	106

#### Closing CCV

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
2.50	2.66	2.65	2.69	2.58	2.66	2.67	2.66	5.28	2.63	2.65	2.66	2.65
Accuracy (%)*	106	106	108	103	106	107	106	106	105	106	106	106

#### Second Source

Standard Concentration (ug/mL)	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
5.00	4.98	4.94	5.01	4.92	5.01	4.97	5.04	9.86	4.82	4.95	4.97	4.95
Accuracy (%)**	99.6	98.8	100	98.4	100	99.4	101	98.6	96.4	99.0	99.4	99.0

### Quality Control/Quality Assurance Report

EPA TO-11A

Laboratory Control Spike Analysis

Analysis Date : 05/31-06/01/2023

Analyst : CH

Instrument ID : HPLC 1200

#### Laboratory Control Spike 1

Analyte	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
Sample Concentration (ug/mL)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spike Concentration (ug/mL)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00
Spiked Sample Concentration (ug/mL)	0.864	0.849	0.897	0.801	0.858	0.885	0.967	1.61	0.879	0.867	0.876	0.866
Duplicate Spiked Sample Concentration (ug/mL)	0.884	0.869	0.917	0.820	0.875	0.911	0.991	1.64	0.901	0.887	0.899	0.884
Spike Recovery (%)*	86.4	84.9	89.7	80.1	85.8	88.5	96.7	80.5	87.9	86.7	87.6	86.6
Duplicate Spike Recovery (%)*	88.4	86.9	91.7	82.0	87.5	91.1	99.1	82.0	90.1	88.7	89.9	88.4
RPD**	2.3	2.3	2.2	2.3	2.0	2.9	2.5	1.8	2.5	2.3	2.6	2.1

#### Laboratory Control Spike 2

Analyte	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
Sample Concentration (ug/mL)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spike Concentration (ug/mL)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00
Spiked Sample Concentration (ug/mL)	0.870	0.854	0.895	0.790	0.864	0.882	0.991	1.57	0.875	0.869	0.878	0.869
Duplicate Spiked Sample Concentration (ug/mL)	0.870	0.854	0.894	0.789	0.863	0.883	0.992	1.56	0.875	0.872	0.882	0.868
Spike Recovery (%)*	87.0	85.4	89.5	79.0	86.4	88.2	99.1	78.3	87.5	86.9	87.8	86.9
Duplicate Spike Recovery (%)*	87.0	85.4	89.4	78.9	86.3	88.3	99.2	78.2	87.5	87.2	88.2	86.8
RPD**	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.1	0.0	0.3	0.5	0.2

\*Must be 100 ± 30%

\*\* Must be ≤ 25%

### Quality Control/Quality Assurance Report

EPA TO-11A

Matrix Spike Analysis

Analysis Date : 05/31-06/01/2023

Analyst : CH

Instrument ID : HPLC 1200

Sample ID 230962-44599

Analyte	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
Sample Concentration (ug/mL)	0.02	0.01	0.000	0.07	0.002	0.000	0.002	0.012	0.005	0.010	0.000	0.000
Spike Concentration (ug/mL)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	2.50	1.25	1.25	1.25	1.25
Spiked Sample Concentration (ug/mL)	1.26	1.24	1.27	1.30	1.23	1.25	1.33	2.39	1.25	1.24	1.25	1.23
Duplicate Spiked Sample Concentration (ug/mL)	1.25	1.23	1.26	1.30	1.22	1.24	1.32	2.37	1.24	1.23	1.24	1.23
Spike Recovery (%)*	99.5	98.1	102	98.1	98.2	100	106	95.1	99.6	98.4	100	98.4
Duplicate Spike Recovery (%)*	98.7	97.3	101	98.1	97.4	99.2	105	94.3	98.8	97.6	99.2	98.4
RPD**	0.8	0.8	0.8	0.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.0

Sample ID 230962-44616

Analyte	Formaldehyde (ug/mL)	Acetaldehyde (ug/mL)	Acrolein (ug/mL)	Acetone (ug/mL)	Propionaldehyde (ug/mL)	Crotonaldehyde (ug/mL)	Methacrolein (ug/mL)	MEK & Butyraldehyde (ug/mL)	Benzaldehyde (ug/mL)	Valeraldehyde (ug/mL)	m-Tolualdehyde (ug/mL)	Hexaldehyde (ug/mL)
Sample Concentration (ug/mL)	0.11	0.06	0.004	0.13	0.019	0.008	0.005	0.045	0.006	0.000	0.000	0.009
Spike Concentration (ug/mL)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	2.50	1.25	1.25	1.25	1.25
Spiked Sample Concentration (ug/mL)	1.32	1.26	1.24	1.32	1.21	1.22	1.37	2.24	1.22	1.25	1.24	1.22
Duplicate Spiked Sample Concentration (ug/mL)	1.35	1.29	1.27	1.35	1.24	1.25	1.40	2.29	1.24	1.27	1.26	1.24
Spike Recovery (%)*	96.8	96.2	98.9	95.2	95.2	97.0	109	87.8	97.1	100	99.2	96.9
Duplicate Spike Recovery (%)*	99.2	98.6	101	97.6	97.6	99.4	112	89.8	98.7	102	101	98.5
RPD**	2.2	2.4	2.4	2.2	2.4	2.4	2.2	2.2	1.6	1.6	1.6	1.6

\*Must be 100± 25%

\*\* Must be ≤ 25%

### Quality Control/Quality Assurance Report

#### EPA TO-11A

#### System and Method Blank Analysis

Analysis Date : 05/31-06/01/2023  
Analyst : CH

Instrument ID : HPLC 1200

<i>Analyte</i>	<i>Formaldehyde (ug/mL)</i>	<i>Acetaldehyde (ug/mL)</i>	<i>Acrolein (ug/mL)</i>	<i>Acetone (ug/mL)</i>	<i>Propionaldehyde (ug/mL)</i>	<i>Crotonaldehyde (ug/mL)</i>	<i>Methacrolein (ug/mL)</i>	<i>MEK &amp; Butyraldehyde (ug/mL)</i>	<i>Benzaldehyde (ug/mL)</i>	<i>Valeraldehyde (ug/mL)</i>	<i>m-Tolualdehyde (ug/mL)</i>	<i>Hexaldehyde (ug/mL)</i>
Opening Acetonitrile Blank	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Method Blank 05/30/2023	<RL	0.026	<RL	0.072	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Continuing Acetonitrile Blank	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Closing Acetonitrile Blank	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL
Reporting Limit	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.050	0.025	0.025	0.025	0.025

RL= Reporting Limit

<RL=less than the Reporting Limit



# CHAIN OF CUSTODY AND ANALYSIS REQUEST – Chain of Custody is a LEGAL DOCUMENT. Complete all relevant fields.

Atmospheric Analysis and Consulting · Phone: 805-650-1642 · Email: <a href="mailto:info@aaclab.com">info@aaclab.com</a> · 2225 Sperry Ave, Ventura, CA 93003		AAC Project No.: 230962	
Client/Company Name Richard Fox/Kansas State University		Project Name Test at the FAA Research Technical Center, May 2023	
Project Manager Name: Richard Fox		Project Number: AAC number 230962, Revision 2	
Turnaround Time <input type="checkbox"/> Rush 24 h <input type="checkbox"/> Same Day <input type="checkbox"/> Rush 48 h <input type="checkbox"/> 5 Days <input type="checkbox"/> Rush 72 h <input checked="" type="checkbox"/> Normal		Sampler Name Print: Richard Fox Signature:	
Client Sample Name		Sample ID	Sampling Date
Shipping Blank		1	May 16 2023
Field Blank		2	May 16 2023
Baseline – 200 C – <b>Pack Exit</b>		3	May 16 2023
Baseline – 200 C – Ozone In		4	May 16 2023
Baseline – 200 C – Ozone Out		5	May 16 2023
Baseline – 200 C – <b>Ambient</b>		6	May 16 2023
Baseline – 300 C – <b>Pack Exit</b>		3b	May 16 2023
Baseline – 300 C – Ozone In		4b	May 16 2023
Baseline – 300 C – Ozone Out		5b	May 16 2023
Baseline – 300 C – <b>Ambient</b>		6b	May 16 2023
M-I-I 315 C - 5ppmW - <b>Pack Exit</b>		7	May 16 2023
M-I-I 315 C - 5ppmW - Ozone In		8	May 16 2023
M-I-I 315 C - 5ppmW - Ozone Out		9	May 16 2023
M-I-I 315 C - 5ppmW - <b>Ambient</b>		10	May 16 2023
Client Notes/Special Instructions: This Chain of Custody form is submitted to correct sample location identification in the Client Sample ID/Description. KSU requests that AAC laboratories include the revised Chain of custody form and correct the final report, and also provide an EDD file with the corrected sample locations. Changes to the COC are bolded and in red text.		TO-11A DNPH Cartridge	
Relinquished By Print: Richard Fox Signature: <i>Richard Fox</i>		Analysis Requested EPA TO-11	
Date 12/7/2023 Time 15:00		AAC Laboratory Sample Number	
Received By Print: Signature:		Dr. Richard Fox - Aircraft Environment Solutions Inc. 1565 E. Verde Blvd, Queen Creek, AZ 85140 Phone: (602) 359-7868 e-mail: <a href="mailto:richardfox@acenvinc.com">richardfox@acenvinc.com</a>	
EDD? Yes <input type="checkbox"/> No <input type="checkbox"/>		Send Invoice To (Name/Email/Address) Please See Purchase Order 2023-04-03-FAA-1 Dated April 3, 2023 PO Number 2023-04-03-FAA-1	
Date Time		LAB USE ONLY	
LAB USE ONLY		Sample Received via: <input type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> Courier <input type="checkbox"/> Other	
Notes:		Temperature °C Thermometer ID Initials Returned Eqmt Total cans: _____ Unused cans: _____ Flow Controllers:	



# CHAIN OF CUSTODY AND ANALYSIS REQUEST - Chain of Custody is a LEGAL DOCUMENT. Complete all relevant fields.

Atmospheric Analysis and Consulting · Phone: 805-650-1642 · Email: info@aacalab.com · 2225 Sperry Ave, Ventura, CA 93003				AAC Project No.: 230962						
Client/Company Name Richard Fox/Kansas State University Project Manager Name: Richard Fox		Project Name Test at the FAA Research Technical Center, May 2023 Project Number: AAC number 230962, Revision 2		Send Report To (Name/Email/Address) richardfox@acenvinc.com						
Turnaround Time <input type="checkbox"/> Rush 24 h <input type="checkbox"/> Same Day <input type="checkbox"/> Rush 48 h <input type="checkbox"/> 5 Days <input type="checkbox"/> Rush 72 h <input checked="" type="checkbox"/> Normal		Sampler Name Print: Richard Fox Signature:		Dr. Richard Fox - Aircraft Environment Solutions Inc. 1565 E. Verde Blvd, Queen Creek, AZ 85140 Phone: (602) 359-7868 e-mail: richardfox@acenvinc.com						
Client Sample Name		Sample ID	Sampling Date	Sample g Time	Volume Sampled	TO-11A DNPH Cartridge	AAC Laboratory Sample Number	Lab ID	Sample Received via: <input type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> Courier <input type="checkbox"/> Other	LAB USE ONLY
Field Blank	11	May 17 2023	N/A	N/A	N/A	✓	44612			Temperature _____ °C Thermometer ID _____ Initials _____ Returned Eqmt _____ Total cans: _____ Unused cans: _____ Flow Controllers: _____
Baseline - 300 C - Ozone In	12	May 17 2023	15 min	29.85 L	✓	44613				
Baseline - 300 C - Ozone Out	13	May 17 2023	15 min	30.3 L	✓	44614				
Baseline - 300 C - Codescer	14	May 17 2023	15 min	29.55 L	✓	44615				
2197 - 300 C - Ozone In	15	May 17 2023	15 min	29.85 L	✓	44616				
2197 - 300 C - Ozone Out	16	May 17 2023	15 min	30 L	✓	44617				LAB USE ONLY
2197 - 300 C - Ambient	17	May 17 2023	15 min	29.4 L	✓	44618				
Skydrol -220 C-APU - Ozone	18	May 18 2023	15 min	29.85 L	✓	44619				
Client Notes/Special Instructions: This Chain of Custody form is submitted to correct sample location identification in the Client Sample ID/Description. KSU requests that AAC laboratories include the revised Chain of custody form and correct the final report, and also provide an EDD file with the corrected sample locations. Changes to the COC are bolded and in red text.						EDD? X Yes <input type="checkbox"/> No	LAB USE ONLY Notes:			
Relinquished By Print: Richard Fox Signature: Richard Fox		Date 12/7/2023 Time 15:00	Received By Print: Signature:		Date Time					