GAMMIE AIR
MONITORING, LLC

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VIA EMAIL (PDF)

8 January 2025

Mr. Sree Mullapudi
Ypsilanti Community Utilities Authority
2777 State Street
Ypsilanti, MI 48198

Re: CEMS 4th Quarter 2024 RATA Report
GamAir Project No.: 825-2410

Dear Mr. Mullapudi,

We have the following to report on the annual relative accuracy test audit (RATA) performed on your continuous emissions monitoring system (CEMS) during 10 December 2024.

Relative Accuracy Test Audit Summary
Continuous Emissions Monitoring System
Ypsilanti Community Utilities Authority (YCUA)
Ypsilanti, Michigan
Fourth Quarter 2024
10 December 2024

Analyzer (EGLE standard)	CEMS Relative Accuracy	Relative Accuracy Specification	EGLE RATA Compliance
Oxygen (NA)	0.01% Absolute Difference	≤1% Absolute Difference	Yes
Carbon Monoxide (64 ppm at 7% O_2)	1.42% of the standard 0.91% Absolute Difference	≤10% RA or ≤5% of the standard	Yes
Sulfur Dioxide (15 ppm at 7% O_2 <5 ppm difference)	15.66% RA 9.27% of the standard	≤20% RA ≤10% of the standard	Yes

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Results from this audit meet the EGLE CEMS RATA requirements for O_2, CO, and SO_2 as specified above; specially referencing Title 40, CFR, Part 60, Appendix B, Spec. 2. CO met the relative accuracy specification of less than 5 percent of the standard. Appendix D has all YCUA process data showing compliance of running at or above 50 percent minimum feed rate. Attached to this report are all other pertinent support documentation and field data sheets.

Thank you,

Gammie Air Monitoring, LLC

Judd F. Gammie
Program Manager
cmd: 825-2410 CEMS RATA report

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Appendix A

Summary of Results

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CEMS RATA Summary

YCUA

Peformance Specifications 3 & 4A

FBI Exhaust Stack

December 10, 2024

Run No.	Use Run	Time		Reference Method					YCUA CEMS			DIFFERENCE		
		Start	Stop	O_2 %vd	CO ppmvd	SO_2 ppmvd	CO @ 7% O_2 ppmvd	SO_2 @ 7% O_2 ppmvd	O_2 %vd	CO @ 7% O_2 ppmvd	SO_2 @ 7% O_2 ppmvd	O_2 %vd	CO @ 7% O_2 ppmvd	SO_2 @ 7% O_2 ppmvd
1	N	0950	1011	8.08	2.69	10.62	2.92	11.51	8.01	3.9	13.1	0.07	-0.98	-1.59
2	N	1027	1048	8.47	2.29	4.43	2.56	4.95	8.53	3.3	6.3	-0.06	-0.74	-1.35
3	Y	1100	1121	7.96	2.17	7.35	2.33	7.90	7.96	3.2	8.7	0.00	-0.87	-0.80
4	Y	1132	1153	6.95	5	6.87	4.98	6.85	6.99	5.4	8.3	-0.04	-0.42	-1.45
5	Y	1210	1231	6.50	10.97	9.57	10.59	9.24	6.33	11.4	10.6	0.17	-0.81	-1.36
6	Y	1245	1306	6.49	8.21	10.13	7.92	9.77	6.49	7.6	10.6	0.00	0.32	-0.83
7	Y	1320	1341	5.89	14.48	11.16	13.41	10.33	6.02	12.4	10.7	-0.13	1.01	-0.37
8	Y	1353	1414	7.12	3.52	8.28	3.55	8.35	7.15	4.5	9.4	-0.03	-0.95	-1.05
9	Y	1428	1449	7.12	5.31	9.05	5.36	9.13	7.18	5.5	10.2	-0.06	-0.14	-1.07
10	Y	1459	1520	6.69	5.56	9.66	5.44	9.45	6.71	6.2	11.0	-0.02	-0.76	-1.55
11														
12														
13														
14														
15														
16														
			Averages	6.84	6.90	9.01	6.70	8.88	6.85	7.03	9.94	ABS 0.01	0.33	1.06

CO Standard (ppm at 7% O_2)

64

SO_2 Standard (ppm at 7% O_2)

15

Relative Accuracy Specifications

CO ≤ 10% RM or ≤ 5% of the Standard

SO_2 ≤ 20% RM or ≤ 10% of the Standard

O_2 ≤20% RM or

O_2 ≤1.0% Absolute Difference

	O_2 %vd	CO @ 7% O_2 ppmvd	SO_2 @ 7% O_2 ppmvd
Standard Deviation (sd) =	0.09	0.69	0.39
Confidence Coefficient (CC) =	0.07	0.58	0.33
RA $_{\text{average RM value}}$ (%) =	1.24	13.53	15.66
RA $_{\text{\% of standard}}$ (%) =	-	1.42	9.27
RA $_{\text{ABS diff + CC}}$ (ppm) =	-	0.91	-
TEST RESULT	**PASS**	**PASS**	**PASS**

Standard Deviation:

$$sd = \left[\frac{\sum_{i=1}^{n} di^{2} - \frac{\left(\sum_{i=1}^{n} di \right)}{n}}{n - 1} \right]^{1/2}$$

(or) $$sd = \sqrt{\frac{\Sigma X^{2} - n \overline{X}^{2}}{n - 1}}$$

$|\bar{d}|$ = absolute mean of differences (RM-CEM)

$|CC|$ = absolute value of the confidence coefficient

$\overline{RM}$ = absolute mean of RM values

Confidence Coefficient (CC):

$$CC = t_{0.975} \frac{Sd}{\sqrt{n}}$$

Relative Accuracy (RA) :

$$\frac{\left[|\bar{d}| + |CC| \right]}{\overline{RM}} \times 100$$

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Appendix B

Reference Method CEMS Data

YCUA
FBI Exhaust Stack
Response Time
Ypsilanti, MI
10-Dec-2024

Heat Line Length:
200'
Sample Pump Flow:
8 liters per minute

Parameter:
Oxygen - O_2
Bias Span Value (%):
11.02 %vd

Scale	Expected Value	95 Pecent of Expected Value	Monitor Response Time (seconds)
upscale	11.0	10.5	45
downscale	0.0	0.6	47
		Response Time	47
		2 X Response Time	**94**

Parameter:
Carbon Monoxide - CO
Bias Span Value:
49.76 ppmvd

Scale	Expected Value	95 Pecent of Expected Value	Monitor Response Time (seconds)
upscale	49.8	47.3	96
downscale	0.0	2.5	95
		Response Time	96
		2 X Response Time	**192**

Parameter:
Sulfur Dioxide - SO_2
Bias Span Value:
11.07 ppmvd

Scale	Expected Value	95 Pecent of Expected Value	Monitor Response Time (seconds)
upscale	11.1	10.5	145
downscale	0.0	0.6	144
		Response Time	145
		2 X Response Time	**290**

Stratification Test Results and Acceptance Criteria

Firm Name: YCUA **Fuel:** Municipal Waste
Date: 12/10/2024 **Time:** 0815-0836
Location: FBI Exhaust Stack **Pollutant:** CO

Minimum Sample Duration Per Point:
192 seconds

Traverse Point	Time	CO %vd	Absolute Difference From Mean
1	0822	2.33	0.02
2	0829	2.34	0.01
3	0836	2.38	0.03
	Mean	**2.35**	

1) If the concentration at each traverse point differs from the mean concentration for all traverse points by no more than: (a) ±5% of the mean concentration; or (b) ±0.5ppm (whichever is less restrictive) the gas stream is considered unstratified and you may collect samples from a single point that most closely matches the measured line.

2) If the 5% or 0.5 ppm criteria is not met but the concentration at each traverse point differs from the mean concentration for all traverse points by no more than ±10% of the mean; or ±1.0 ppm (whichever is less restrictive), the gas stream is considered minimally stratified and you may collect samples from three points, spaced 16.7, 50.0, and 83.3% of the measured line.

3) If the gas stream is found to be stratified, locate 12 points for the test in accordance with Table 1-1 or Table 1-2 of EPA Method 1.

4) The alternative acceptance criterion for 3-point sampling will be ± 0.5 percent CO_2 or O_2 and the alternative acceptance criterion for single point sampling will be ± 0.3 percent CO_2 or O_2.

EPA Method 3A, Section 8.1 or EPA Method 7E, Section 8.1.2

Log Averages	O2 (%vd) Stack	CO (ppmvd) Stack	SO2 (ppmvd) Stack
10Dec2024 - 08:16:42	10.25	2.37	8.68
10Dec2024 - 08:17:42	10.22	2.36	9.63
10Dec2024 - 08:18:42	10.2	2.32	10.31
10Dec2024 - 08:19:42	10.21	2.27	10.28
10Dec2024 - 08:20:42	10.22	2.3	8.99
10Dec2024 - 08:21:42	10.28	2.24	7.56
10Dec2024 - 08:22:42	10.25	2.44	6.13
10Dec2024 - 08:23:42	10.02	2.36	5.89
10Dec2024 - 08:24:42	9.93	2.27	5.97
10Dec2024 - 08:25:42	9.93	2.27	5.97
10Dec2024 - 08:26:42	10.03	2.33	5.97
10Dec2024 - 08:27:42	10.02	2.33	5.96
10Dec2024 - 08:28:42	9.91	2.38	5.98
10Dec2024 - 08:29:42	9.37	2.46	7.99
10Dec2024 - 08:30:42	9.55	2.56	9.8
10Dec2024 - 08:31:42	10.42	2.43	8.25
10Dec2024 - 08:32:42	10.7	2.39	7.6
10Dec2024 - 08:33:42	10.59	2.35	7.4
10Dec2024 - 08:34:42	10.32	2.26	6.78
10Dec2024 - 08:35:42	10.08	2.2	6.88
10Dec2024 - 08:36:42	9.82	2.45	7.55

CEMS Stratification Sample Traverse Location

Firm Name:	YCUA	
Location:	FBI Exhaust Stack	
Stack Diameter:	41.5	inches
Length of Port Nipple:	10	inches

Circular Twelve Point Traverse			
Traverse Point Number	Fraction of Stack Diameter	Distance From Inside Wall (inches)	Distance Including Nipple Length (inches)
1	0.021	0.9	10.9
2	0.067	2.8	12.8
3	0.118	4.9	14.9
4	0.177	7.3	17.3
5	0.25	10.4	20.4
6	0.356	14.8	24.8
7	0.644	26.7	36.7
8	0.75	31.1	41.1
9	0.823	34.2	44.2
10	0.882	36.6	46.6
11	0.933	38.7	48.7
12	0.979	40.6	50.6

Three Point Traverse			
Traverse Point Number	Fraction of Stack Diameter	Distance From Inside Wall (inches)	Distance Including Nipple Length (inches)
1	0.167	6.9	16.9
2	0.50	20.8	30.8
3	0.833	34.6	44.6

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:13	Stack	Stack	Stack
Zero Response	0.18	0.34	0.56
Zero Bias (%)	0.81	0.34	1.15
Span Concentration	11.02	25.13	25.58
Span Response	11.02	23.83	25.53
Span Bias (%)	-0.19	-1.04	0.22

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 10:22:15	Stack	Stack	Stack
Zero Response	0.19	-0.36	1.2
Zero Bias (%)	0.86	-0.36	2.42
Zero Drift (%)	0.05	-0.7	1.27
Span Concentration	11.02	25.13	25.58
Span Response	10.67	24.08	24.51
Span Bias (%)	-1.86	-0.79	-1.81
Span Drift (%)	-1.88	0.25	-2

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	8.08	2.69	10.62

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 09:51:15	5.52	4.1	7.26
10Dec2024 - 09:52:15	6.86	5.66	8.17
10Dec2024 - 09:53:15	8.76	1.94	8.32
10Dec2024 - 09:54:15	8.77	2.02	8.77
10Dec2024 - 09:55:15	8.7	1.58	9.13
10Dec2024 - 09:56:15	8.45	1.69	9.88
10Dec2024 - 09:57:15	7.95	1.92	11.41
10Dec2024 - 09:58:15	7.49	2.91	14.11
10Dec2024 - 09:59:15	7.57	3.03	15.42
10Dec2024 - 10:00:15	8.41	2.84	14.18
10Dec2024 - 10:01:15	8.42	2.16	11.11
10Dec2024 - 10:02:15	8.42	2.32	7.57
10Dec2024 - 10:03:15	8.17	2.35	5.59
10Dec2024 - 10:04:15	8.04	2.2	4.51
10Dec2024 - 10:05:15	7.98	3.28	4.31
10Dec2024 - 10:06:15	8.28	2.13	6.98
10Dec2024 - 10:07:15	8.42	2.19	10.32
10Dec2024 - 10:08:15	8.42	1.89	13.91
10Dec2024 - 10:09:15	8.52	2.44	17.51
10Dec2024 - 10:10:15	8.12	2.11	19.28
10Dec2024 - 10:11:15	6.77	2.91	21.07
Average	8	2.56	10.9

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 10:22:15	Stack	Stack	Stack
Zero Response	0.19	-0.36	1.2
Zero Bias (%)	0.86	-0.36	2.42
Span Concentration	11.02	25.13	25.58
Span Response	10.67	24.08	24.51
Span Bias (%)	-1.86	-0.79	-1.81

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 10:58:06	Stack	Stack	Stack
Zero Response	0.07	-0.24	1.21
Zero Bias (%)	0.29	-0.24	2.44
Zero Drift (%)	-0.57	0.12	0.02
Span Concentration	11.02	25.13	25.58
Span Response	10.63	24.43	24.6
Span Bias (%)	-2.05	-0.44	-1.63
Span Drift (%)	-0.19	0.35	0.18

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	8.47	2.29	4.43

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 10:28:01	7.32	1.97	3.8
10Dec2024 - 10:29:01	7.18	2.35	3.61
10Dec2024 - 10:30:01	7.26	1.92	4.05
10Dec2024 - 10:31:01	7.48	2.75	4.63
10Dec2024 - 10:32:01	7.55	1.74	4.95
10Dec2024 - 10:33:01	7.68	2.56	5.33
10Dec2024 - 10:34:01	8.36	1.63	5.44
10Dec2024 - 10:35:01	8.62	1.85	5.47
10Dec2024 - 10:36:01	8.66	1.67	5.4
10Dec2024 - 10:37:01	8.87	1.66	5.26
10Dec2024 - 10:38:01	8.97	1.72	5.01
10Dec2024 - 10:39:01	8.83	1.71	4.97
10Dec2024 - 10:40:01	8.87	2.19	5
10Dec2024 - 10:41:01	8.57	1.55	4.9
10Dec2024 - 10:42:01	8.21	2.1	4.95
10Dec2024 - 10:43:01	8.2	1.6	4.98
10Dec2024 - 10:44:01	8.08	2.1	5.38
10Dec2024 - 10:45:01	8.52	1.75	5.68
10Dec2024 - 10:46:01	8.75	1.82	6.31
10Dec2024 - 10:47:01	8.28	2.06	7.22
10Dec2024 - 10:48:01	8.36	1.97	7.9
Average	8.22	1.94	5.25

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 10:58:06	Stack	Stack	Stack
Zero Response	0.07	-0.24	1.21
Zero Bias (%)	0.29	-0.24	2.44
Span Concentration	11.02	25.13	25.58
Span Response	10.63	24.43	24.6
Span Bias (%)	-2.05	-0.44	-1.63

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 11:29:39	Stack	Stack	Stack
Zero Response	0.09	0.14	1.58
Zero Bias (%)	0.38	0.14	3.18
Zero Drift (%)	0.1	0.38	0.73
Span Concentration	11.02	25.13	25.58
Span Response	10.68	24.13	24.23
Span Bias (%)	-1.81	-0.74	-2.36
Span Drift (%)	0.24	-0.3	-0.73

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	7.96	2.17	7.35

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 11:01:00	8.83	1.79	8.21
10Dec2024 - 11:02:00	8.65	1.53	7.43
10Dec2024 - 11:03:00	8.42	1.72	7.36
10Dec2024 - 11:04:00	8.21	1.9	7.42
10Dec2024 - 11:05:00	8.03	1.74	7.82
10Dec2024 - 11:06:00	7.35	2.61	9.17
10Dec2024 - 11:07:00	7.86	1.99	9.17
10Dec2024 - 11:08:00	7.54	2.21	8.66
10Dec2024 - 11:09:00	7.14	2.23	8.31
10Dec2024 - 11:10:00	7.14	2.52	8.34
10Dec2024 - 11:11:00	7.51	2	7.79
10Dec2024 - 11:12:00	7.64	1.87	7.39
10Dec2024 - 11:13:00	7.69	1.84	7.03
10Dec2024 - 11:14:00	7.59	1.55	7
10Dec2024 - 11:15:00	7.49	2.12	7.22
10Dec2024 - 11:16:00	7.15	1.76	7.64
10Dec2024 - 11:17:00	7.09	2.72	8.41
10Dec2024 - 11:18:00	7.17	2.01	8.66
10Dec2024 - 11:19:00	7.34	3.28	8.72
10Dec2024 - 11:20:00	7.81	1.82	8.37
10Dec2024 - 11:21:00	8.48	1.77	8.15
Average	7.72	2.05	8.01

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 11:29:39	Stack	Stack	Stack
Zero Response	0.09	0.14	1.58
Zero Bias (%)	0.38	0.14	3.18
Span Concentration	11.02	25.13	25.58
Span Response	10.68	24.13	24.23
Span Bias (%)	-1.81	-0.74	-2.36

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 12:08:11	Stack	Stack	Stack
Zero Response	-0.18	0.37	2.37
Zero Bias (%)	-0.91	0.37	4.75
Zero Drift (%)	-1.28	0.23	1.57
Span Concentration	11.02	25.13	25.58
Span Response	10.54	24.23	22.98
Span Bias (%)	-2.48	-0.64	-4.85
Span Drift (%)	-0.67	0.1	-2.45

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	6.95	5	6.87

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 11:33:00	6.34	11.27	5.79
10Dec2024 - 11:34:00	6.36	4.59	5.76
10Dec2024 - 11:35:00	6.44	6.38	5.63
10Dec2024 - 11:36:00	6.42	4	5.36
10Dec2024 - 11:37:00	6.58	3.84	5.88
10Dec2024 - 11:38:00	6.54	3.78	6.7
10Dec2024 - 11:39:00	6.43	3.77	7.43
10Dec2024 - 11:40:00	6.42	5.24	7.81
10Dec2024 - 11:41:00	6.4	3.97	8.19
10Dec2024 - 11:42:00	6.29	5.54	8.84
10Dec2024 - 11:43:00	6.22	7.79	9.34
10Dec2024 - 11:44:00	6.25	5.93	9.72
10Dec2024 - 11:45:00	6.25	7.39	9.86
10Dec2024 - 11:46:00	6.43	5.04	9.56
10Dec2024 - 11:47:00	6.57	5.44	9.14
10Dec2024 - 11:48:00	6.6	2.71	8.67
10Dec2024 - 11:49:00	6.75	2.69	8.48
10Dec2024 - 11:50:00	7.27	4.94	7.99
10Dec2024 - 11:51:00	7.88	6.06	7.73
10Dec2024 - 11:52:00	7.91	2.67	7.67
10Dec2024 - 11:53:00	7.68	2.32	7.76
Average	6.67	5.02	7.78

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 12:08:11	Stack	Stack	Stack
Zero Response	-0.18	0.37	2.37
Zero Bias (%)	-0.91	0.37	4.75
Span Concentration	11.02	25.13	25.58
Span Response	10.54	24.23	22.98
Span Bias (%)	-2.48	-0.64	-4.85

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 12:41:51	Stack	Stack	Stack
Zero Response	0.07	-0.37	1.89
Zero Bias (%)	0.29	-0.37	3.79
Zero Drift (%)	1.19	-0.74	-0.95
Span Concentration	11.02	25.13	25.58
Span Response	10.4	24.09	24.46
Span Bias (%)	-3.15	-0.78	-1.91
Span Drift (%)	-0.67	-0.14	2.9

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	6.5	10.97	9.57

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 12:11:13	6.28	15.13	7.56
10Dec2024 - 12:12:13	6.23	7.38	8.55
10Dec2024 - 12:13:13	6.34	13.02	9.23
10Dec2024 - 12:14:13	6.45	5.04	9.15
10Dec2024 - 12:15:13	6.44	7.11	9.21
10Dec2024 - 12:16:13	6.44	4.4	9.18
10Dec2024 - 12:17:13	6.32	6.33	9.39
10Dec2024 - 12:18:13	6.28	10.52	9.78
10Dec2024 - 12:19:13	6.11	7.21	10.04
10Dec2024 - 12:20:13	6.01	12.75	10.57
10Dec2024 - 12:21:13	5.98	16.81	10.75
10Dec2024 - 12:22:13	5.9	9.7	11.12
10Dec2024 - 12:23:13	5.89	22	11.18
10Dec2024 - 12:24:13	5.71	13.26	11.89
10Dec2024 - 12:25:13	5.66	19.43	12.34
10Dec2024 - 12:26:13	5.97	7.27	11.8
10Dec2024 - 12:27:13	6.1	8.7	11.27
10Dec2024 - 12:28:13	6.25	7.73	10.79
10Dec2024 - 12:29:13	6.47	6.23	10.29
10Dec2024 - 12:30:13	6.3	8.66	9.97
10Dec2024 - 12:31:13	6	12.88	10.34
Average	6.15	10.55	10.21

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 12:41:51	Stack	Stack	Stack
Zero Response	0.07	-0.37	1.89
Zero Bias (%)	0.29	-0.37	3.79
Span Concentration	11.02	25.13	25.58
Span Response	10.4	24.09	24.46
Span Bias (%)	-3.15	-0.78	-1.91

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 13:17:32	Stack	Stack	Stack
Zero Response	-0.05	-0.35	2.03
Zero Bias (%)	-0.29	-0.35	4.07
Zero Drift (%)	-0.57	0.02	0.28
Span Concentration	11.02	25.13	25.58
Span Response	10.64	24.36	23.43
Span Bias (%)	-2	-0.51	-3.95
Span Drift (%)	1.15	0.27	-2.02

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	6.49	8.21	10.13

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 12:46:00	5.76	15.53	11.13
10Dec2024 - 12:47:00	5.92	10.13	11.4
10Dec2024 - 12:48:00	6.18	11.06	10.96
10Dec2024 - 12:49:00	6.34	4.84	10.36
10Dec2024 - 12:50:00	6.32	6.6	10.18
10Dec2024 - 12:51:00	6.16	10.87	10.23
10Dec2024 - 12:52:00	6.05	13.71	10.85
10Dec2024 - 12:53:00	6.01	13.27	11.01
10Dec2024 - 12:54:00	6.18	10.8	10.96
10Dec2024 - 12:55:00	6.41	6.06	10.4
10Dec2024 - 12:56:00	6.6	3.52	9.76
10Dec2024 - 12:57:00	6.65	2.93	9.32
10Dec2024 - 12:58:00	6.47	3.2	9.1
10Dec2024 - 12:59:00	6.25	6.79	9.86
10Dec2024 - 13:00:00	5.96	7.6	10.62
10Dec2024 - 13:01:00	6	6.37	11.36
10Dec2024 - 13:02:00	6.16	4.16	11.25
10Dec2024 - 13:03:00	6.1	3.41	11.26
10Dec2024 - 13:04:00	6.01	7.83	11.62
10Dec2024 - 13:05:00	6.19	5.03	11.4
10Dec2024 - 13:06:00	6.41	7.26	11.06
Average	6.2	7.67	10.67

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 13:17:32	Stack	Stack	Stack
Zero Response	-0.05	-0.35	2.03
Zero Bias (%)	-0.29	-0.35	4.07
Span Concentration	11.02	25.13	25.58
Span Response	10.64	24.36	23.43
Span Bias (%)	-2	-0.51	-3.95

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 13:50:14	Stack	Stack	Stack
Zero Response	0.17	-0.47	1.89
Zero Bias (%)	0.78	-0.47	3.79
Zero Drift (%)	1.05	-0.12	-0.28
Span Concentration	11.02	25.13	25.58
Span Response	10.66	24.04	23.76
Span Bias (%)	-1.91	-0.83	-3.3
Span Drift (%)	0.1	-0.32	0.65

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	5.89	14.48	11.16

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 13:21:00	5.46	14.68	12.6
10Dec2024 - 13:22:00	5.3	16.32	12.75
10Dec2024 - 13:23:00	5.25	34.37	12.67
10Dec2024 - 13:24:00	5.31	9.46	12.74
10Dec2024 - 13:25:00	5.53	15.32	12.41
10Dec2024 - 13:26:00	5.59	8.48	11.68
10Dec2024 - 13:27:00	5.2	15.87	12.2
10Dec2024 - 13:28:00	4.54	86.66	13.23
10Dec2024 - 13:29:00	4.36	21.24	14.56
10Dec2024 - 13:30:00	4.75	23.42	14.35
10Dec2024 - 13:31:00	4.84	8.08	13.58
10Dec2024 - 13:32:00	4.98	8.32	13.38
10Dec2024 - 13:33:00	5.67	2.63	11.83
10Dec2024 - 13:34:00	6.44	2.6	10.42
10Dec2024 - 13:35:00	6.84	2.96	9.11
10Dec2024 - 13:36:00	6.99	3.03	8.46
10Dec2024 - 13:37:00	6.93	3.2	8.21
10Dec2024 - 13:38:00	6.67	2.92	8.37
10Dec2024 - 13:39:00	6.6	2.82	8.59
10Dec2024 - 13:40:00	6.55	2.27	8.8
10Dec2024 - 13:41:00	6.36	4.45	9.43
Average	5.72	13.77	11.4

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 13:50:14	Stack	Stack	Stack
Zero Response	0.17	-0.47	1.89
Zero Bias (%)	0.76	-0.47	3.79
Span Concentration	11.02	25.13	25.58
Span Response	10.66	24.04	23.76
Span Bias (%)	-1.91	-0.83	-3.3

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 14:27:36	Stack	Stack	Stack
Zero Response	-0.03	0.74	1.88
Zero Bias (%)	-0.19	0.74	3.77
Zero Drift (%)	-0.95	1.22	-0.02
Span Concentration	11.02	25.13	25.58
Span Response	10.58	24.15	23.77
Span Bias (%)	-2.29	-0.72	-3.28
Span Drift (%)	-0.38	0.11	0.02

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	7.12	3.52	8.28

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 13:54:06	6.86	3.05	8.64
10Dec2024 - 13:55:06	6.77	4.94	9.17
10Dec2024 - 13:56:06	6.77	5.11	9.27
10Dec2024 - 13:57:06	6.98	4.95	9.12
10Dec2024 - 13:58:06	7.27	3.18	8.67
10Dec2024 - 13:59:06	7.38	2.46	8.36
10Dec2024 - 14:00:06	7.35	3.36	8.13
10Dec2024 - 14:01:06	7.38	2.02	7.94
10Dec2024 - 14:02:06	7.25	2.89	7.93
10Dec2024 - 14:03:06	6.96	2.58	8.4
10Dec2024 - 14:04:06	6.59	3.5	9.31
10Dec2024 - 14:05:06	6.56	2.89	9.72
10Dec2024 - 14:06:06	6.88	2.37	9.51
10Dec2024 - 14:07:06	6.93	2.13	9.14
10Dec2024 - 14:08:06	6.82	2.39	9.06
10Dec2024 - 14:09:06	6.69	5.4	9.26
10Dec2024 - 14:10:06	6.75	3.12	9.15
10Dec2024 - 14:11:06	6.66	4.28	9.42
10Dec2024 - 14:12:06	6.57	3.97	9.33
10Dec2024 - 14:13:06	6.62	4.03	9.37
10Dec2024 - 14:14:06	6.67	4.7	9.42
Average	6.89	3.49	8.97

Cylinder Gas	O2 (%vd) Stack	CO (ppmvd) Stack	SO2 (ppmvd) Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 14:27:36	Stack	Stack	Stack
Zero Response	-0.03	0.74	1.88
Zero Bias (%)	-0.19	0.74	3.77
Span Concentration	11.02	25.13	25.58
Span Response	10.58	24.15	23.77
Span Bias (%)	-2.29	-0.72	-3.28

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 14:58:13	Stack	Stack	Stack
Zero Response	0.02	-0.33	1.89
Zero Bias (%)	0.05	-0.33	3.79
Zero Drift (%)	0.24	-1.07	0.02
Span Concentration	11.02	25.13	25.58
Span Response	10.65	24.5	24.11
Span Bias (%)	-1.96	-0.37	-2.6
Span Drift (%)	0.34	0.35	0.67

Results	O2 (%vd) Stack	CO (ppmvd) Stack	SO2 (ppmvd) Stack
Corrected Averages	7.12	5.31	9.05

Log Averages	O2 (%vd) Stack	CO (ppmvd) Stack	SO2 (ppmvd) Stack
10Dec2024 - 14:29:00	6.08	18.63	10.27
10Dec2024 - 14:30:00	6.17	9.82	10.8
10Dec2024 - 14:31:00	6.36	11.66	10.98
10Dec2024 - 14:32:00	6.26	6.78	10.94
10Dec2024 - 14:33:00	6.28	7.16	11.21
10Dec2024 - 14:34:00	6.4	9.37	10.89
10Dec2024 - 14:35:00	6.75	6.93	10.68
10Dec2024 - 14:36:00	6.88	4.81	10.18
10Dec2024 - 14:37:00	7.08	2.82	9.67
10Dec2024 - 14:38:00	7.16	3.29	9.3
10Dec2024 - 14:39:00	7.33	2.11	8.89
10Dec2024 - 14:40:00	7.44	2.15	8.43
10Dec2024 - 14:41:00	7.57	2.25	7.97
10Dec2024 - 14:42:00	7.54	2.69	8.02
10Dec2024 - 14:43:00	7.13	2.66	8.48
10Dec2024 - 14:44:00	6.75	2.12	9.17
10Dec2024 - 14:45:00	6.57	3.56	9.88
10Dec2024 - 14:46:00	6.78	2.8	9.83
10Dec2024 - 14:47:00	7.07	5.07	9.64
10Dec2024 - 14:48:00	7.22	2.32	9.2
10Dec2024 - 14:49:00	7.22	2.25	9.08
Average	6.86	5.3	9.69

Cylinder Gas	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Zero ID	SG9127184	SG9127184	SG9127184
Zero Expiration	1/27/2031	1/27/2031	1/27/2031
Low ID		CC710088	
Low Expiration		11/7/2030	
Low Concentration		25.13	
Mid ID	ALM028397	CC122603	CC426960
Mid Expiration	3/5/2036	12/23/2035	6/22/2029
Mid Concentration	11.02	49.72	25.58
High ID	CC17990	XC031050B	CC343257
High Expiration	7/14/2033	4/16/2031	11/23/2034
High Concentration	20.97	99.57	50.36

Calibration Error	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 08:12:10	Stack	Stack	Stack
Zero Response	0.01	0	-0.02
Zero Error (%)	0.05	0	-0.04
Low Response	0	24.87	0
Low Error (%)	0	-0.26	-49.9
Mid Response	11.06	49.29	25.42
Mid Error (%)	0.2	-0.43	-0.31
High Response	20.85	99.98	50.99
High Error (%)	-0.57	0.41	1.25

Initial Bias	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 14:58:13	Stack	Stack	Stack
Zero Response	0.02	-0.33	1.89
Zero Bias (%)	0.05	-0.33	3.79
Span Concentration	11.02	25.13	25.58
Span Response	10.65	24.5	24.11
Span Bias (%)	-1.96	-0.37	-2.6

Final Bias & Drift	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
10Dec2024 - 15:44:13	Stack	Stack	Stack
Zero Response	0.08	0.22	1.91
Zero Bias (%)	0.33	0.22	3.83
Zero Drift (%)	0.29	0.55	0.04
Span Concentration	11.02	25.13	25.58
Span Response	10.66	24.53	24.06
Span Bias (%)	-1.91	-0.34	-2.7
Span Drift (%)	0.05	0.03	-0.1

Results	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
Corrected Averages	6.69	5.56	9.66

Log Averages	O2 (%vd)	CO (ppmvd)	SO2 (ppmvd)
	Stack	Stack	Stack
10Dec2024 - 15:00:00	6.6	5.56	8.7
10Dec2024 - 15:01:00	6.69	4.24	9.15
10Dec2024 - 15:02:00	6.66	3.04	9.47
10Dec2024 - 15:03:00	6.78	4.13	9.6
10Dec2024 - 15:04:00	6.97	2.49	9.43
10Dec2024 - 15:05:00	7.02	3	9.3
10Dec2024 - 15:06:00	6.8	4.49	9.41
10Dec2024 - 15:07:00	6.62	3.82	9.82
10Dec2024 - 15:08:00	6.57	4.54	10.07
10Dec2024 - 15:09:00	6.71	3.69	10.03
10Dec2024 - 15:10:00	6.64	3.91	10.02
10Dec2024 - 15:11:00	6.46	4.12	10.2
10Dec2024 - 15:12:00	6.23	6.86	10.7
10Dec2024 - 15:13:00	6.11	11.66	11.03
10Dec2024 - 15:14:00	6.18	13.22	11.64
10Dec2024 - 15:15:00	6.29	8.06	11.5
10Dec2024 - 15:16:00	6.26	5.87	11.52
10Dec2024 - 15:17:00	6.2	7.78	11.4
10Dec2024 - 15:18:00	6.19	3.77	11.17
10Dec2024 - 15:19:00	6.16	5.08	11.05
10Dec2024 - 15:20:00	6.26	3.65	10.75
Average	6.49	5.38	10.28