



November 3, 2020

Gillian Walshe-Langford, Ph.D.
Air Monitoring Program
Metro Public Health Department
2500 Charlotte Avenue
Nashville, Tennessee 37209
Reference: Third Quarter 2020 TDEC / Performance Audits

Dear Dr. Walshe-Langford:

This report contains the results of performance audits conducted by personnel from Tennessee's Air Quality Assurance Program on September 8, 2020, September 9, 2020, September 10, 2020, and September 15, 2020. The audits were performed on various instruments at multiple monitoring locations throughout Metropolitan Davidson County air monitoring network, including gaseous analyzers for O₃, SO₂, NO₂, CO, and particle samplers for PM 10 and PM 2.5. The sites audited include Near Road, East Health Center, Percy Priest Dam, and Lockeland School.

During the third quarter Quality Assurance Performance Audits (QAPA), Tennessee Air Quality Assurance personnel audited Percy Priest and East Health Center ozone analyzers with a level three standard (Teledyne 750U multi-gas calibrator) to determine the accuracy of the analyzer. For non-ozone gas audits, certified gas concentrations were delivered from the Teledyne 750U's verified mass flow controllers to determine the accuracy of SO₂, NO₂ and CO analyzers. Times were verified by www.time.gov, and temperatures were verified using a transfer standard (Streamline Pro). The flow rate of each low volume particle sampler was checked against a specified design flow rate and a transfer standard (Streamline Pro). All TDEC QA equipment is verified against a certified standard to ensure its accuracy. These audits were conducted to ensure that each air monitor within the Metropolitan Davidson County network was operating within accepted criteria established by federal regulations and guidance documents. Acceptable limits of these performance audits are published in 40 Code of Federal Regulations (CFR) Part 58 and QA Handbook Volume II, which establish federal standards for Quality Assurance and Quality Control practices for ambient air monitoring. These acceptable limits should be considered in conjunction with your last approved Quality Assurance Plan.


Results from the third quarter, 2020 QAPAs, demonstrate that the Davidson County air monitoring network was operating within acceptable limits of federal regulations and quality assurance guidelines. All QAPA results were noted in the instrument log books and summarized in the following pages of this report.

If we can be of any further assistance or should there be questions regarding this audit, please email me at Ben.Hartsfield@tn.gov or call (615) 532-0597.

Sincerely,

A handwritten signature in blue ink that reads "Ben Hartsfield".

Ben Hartsfield
Environmental Consultant 1
Quality Assurance Section

Reviewed by Michelle Oakes 
Michelle Oakes (Nov 3, 2020 09:52 CST)

cc: A. Pratt, APC; M. Oakes, APC; R. Brawner, APC; G. Walshe-Langford, Davidson County

*Air Pollution Control Division
Quality Assurance Performance Audit*

Site: Near Road CO
 Audit Quarter: 3Q 2020
 AQS #: 47-037-0040
 Auditor: Ben Hartsfield
 Date of Audit: 9/8/2020

Instrument Model: Teledyne T300 Serial Number: 1360 Data Logger Model: ESC 8832 Data Logger Serial Number: A4689K			<u>Audit Equipment:</u> Teledyne T750U SN 71 Teledyne 751H SN 183 Praxair FA02370 CO 201.7 PPM 6/26/2022 Streamline Pro SN 150306 www.time.gov			
<u>Measured Parameter</u> sccm/LPM	<u>Audit Value</u> ppm	<u>Monitor Response</u> ppm	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>	
0cc/5L	0	-0.218		<±0.41 ppm	Zero	
180cc/10L	3.566	3.305	-7.3%	<±15.1%	5	
90cc/10L	1.799	1.707	-5.1%	<±15.1%	4	
30cc/10L	0.603	0.577	-4.3%	<±15.1%	3	
0cc/10L	0	-0.190		<±0.41 ppm	Zero	
Data Logger Time	10:54:10	10:54:08	00:00:02	<±00:01:00*		
Data Logger Temperature	26.5	27.7	1.2	<±2.1°C		

Site: Near Road NO₂
 Audit Quarter: 3Q 2020
 AQS #: 47-037-0040
 Auditor: Ben Hartsfield
 Date of Audit: 09/08/2020

Instrument Model: Thermo 42i TL NO₂ Serial Number: 1324658812 Data Logger Model: ESC 8832 Data Logger Serial Number: A4689K			<u>Audit Equipment:</u> Teledyne T750U SN 71 Teledyne 751H SN 183 Praxair FA02370 NO/NO _x 10.99 PPM 6/26/2022 Streamline Pro SN 150306 www.time.gov			
<u>Measured Parameter</u> sccm/LPM	<u>Audit Value</u> ppb	<u>Monitor Response</u> ppb	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>	
0cc/10L	0	0	0.0	<±3.1 ppb	Zero	
1350mv-150cc/10L	112	105	-6.3%	<±15.1%	7	
1100mv-50cc/10L	72	66	-8.3%	<±15.1%	6	
970mv-30cc/10L	50	46	-8.0%	<±15.1%	5	
0cc/10L	0	0	0.0	<±3.1 ppb	Zero	

Site: Near Road NO_x
Audit Quarter: 3Q 2020
AQS #: 47-037-0040
Auditor: Ben Hartsfield
Date of Audit: 09/08/2020

Instrument Model: Thermo 42i NO_x Serial Number: 1324658812 Data Logger Model: ESC 8832 Data Logger Serial Number: A4689K		Audit Equipment: Teledyne T750U SN 71 Teledyne 751H SN 183 Praxair FA02370 NO/NO _x 10.99 PPM 6/26/2022 Streamline Pro SN 060504 www.time.gov			
<u>Measured Parameter sccm/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>
0cc/10L	0	0	0.0	<±3.1 ppb	Zero
150cc/10L	162	156	-3.7%	<±15.1%	
100cc/10L	108	103	-4.6%	<±15.1%	
60cc/10L	65	62	-4.6%	<±15.1%	
20cc/10L	21	20	-4.8%	<±15.1%	
0cc/10L	0	0	0.0	<±3.1 ppb	Zero

Site: Near Road NO
Audit Quarter: 3Q 2020
AQS #: 47-037-0040
Auditor: Ben Hartsfield
Date of Audit: 09/08/2020

Instrument Model: Thermo 42i NO Serial Number: 1324658812 Data Logger Model: ESC 8832 Data Logger Serial Number: A4689K		Audit Equipment: Teledyne T750U SN 71 Teledyne 751H SN 183 Praxair FA02370 NO/NO _x 10.99 PPM 6/26/2022 Streamline Pro SN 150306 www.time.gov			
<u>Measured Parameter sccm/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>
0cc/10L	0	0	0.0	<±3.1 ppb	Zero
150cc/10L	162	156	-3.7%	<±15.1%	
100cc/10L	108	103	-4.6%	<±15.1%	
60cc/10L	65	62	-4.6%	<±15.1%	
20cc/10L	21	20	-4.8%	<±15.1%	
0cc/10L	0	0	0.0	<±3.1 ppb	Zero

Converter Efficiency: 97.8%

Site: Near Road SO₂
Audit Quarter: 3Q 2020
AQS #: 47-037-0040
Auditor: Ben Hartsfield
Date of Audit: 09/08/2020

Instrument Model: Thermo 43i SO₂ Serial Number: 1182890005 Data Logger Model: ESC 8832 Data Logger Serial Number: A4689K			Audit Equipment: Teledyne T750U SN 71 Teledyne 751H SN 183 Praxair FA02370 SO ₂ 13.16 PPM 6/26/2022 Streamline Pro SN 150306 www.time.gov			
<u>Measured Parameter sccm/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>	
0cc/10L	0	0	0	0.1	Zero	
150cc/10L	194	194	0.0%	<±15.1%	8	
100cc/10L	130	132	1.5%	<±15.1%	7	
60cc/10L	78	79	1.3%	<±15.1%	6	
20cc/10L	26	26	0.0%	<±15.1%	5	
10cc/10L	13	13	0.0%	<±15.1%	4	
0cc/10L	0	0	0.0	0.1	Zero	
Data Logger Time	10:54:10	10:54:08	00:00:02	<±00:01:00*		
Data Logger Temperature	26.5	27.7	1.2	<±2.1°C		

Audit Notes:

1. The monitors audited showed satisfactory correlation with our audit standard.
2. The results were noted in the instrument logbooks and listed in this report.
3. *The data logger acceptable range of <±00:01:00 is a State recommendation.

Recommendation:

1. None.

Site: Near Road
Audit Quarter: 3Q 2020
AQS #: 47-037-0040
Auditor: Ben Hartsfield
Date of Audit: 09/08/2020

Instrument Model: BAM Serial Number: W21428		<u>Audit Equipment:</u> Streamline Pro SN C150306 www.time.gov		
<u>Measured Parameter</u>	<u>Audit Value</u>	<u>Monitor Response</u>	<u>Difference</u>	<u>Acceptable Range</u>
Sample Flow: LPM	16.52	16.7	1.1%	+/-4.1% (5.1%)
Barometric Pressure: mmHg	748.9	747	-1.9	+/-10.1 mmHg
Ambient Temperature: °C	29.9	29.7	-0.2°C	+/-2.1°C
External Leak Check:	AF:0.9	AL: 0.9		≤25 mmHg
Monitor Time:	10:45:30	10:45:12	-0:00:18	+/-00:05:00

Audit Notes:

1. The monitors audited showed satisfactory correlation with our audit standard.
2. The results were noted in the instrument logbooks and listed in this report.
3. *The data logger time acceptable range of <±00:01:00 is a State recommendation.

Recommendations: None.

Any questions concerning the audits, or any comments made in connection with the audits may be addressed to me at (615) 532-0597 or at Ben.Hartsfield@tn.gov.

Sincerely,



Ben Hartsfield
 Environmental Consultant 1
 Quality Assurance Program

*Air Pollution Control Division
Quality Assurance Performance Audit*

Site: Percy Priest Dam Ozone
Audit Quarter: 3Q 2020
AQS #: 47-037-0026
Auditor: Ben Hartsfield
Date of Audit: 09/10/2020

Instrument Model: Thermo 49i O3 Serial Number: 1322458652 Data Logger Model: ESC 8832		<u>Audit Equipment:</u> Teledyne T750U SN 153 Teledyne 751H SN 183 Streamline Pro C150306 www.time.gov			
<u>Measured Parameter O3 ppb/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>
0ppb/5L	0	0	0	<±3.1 ppb	Zero
85ppb/5L	85	84	-1.2%	<±15.1%	5
65ppb/5L	65	64	-1.5%	<±15.1%	4
35ppb/5L	35	34	-2.9%	<±15.1%	3
15ppb/5L	15	14	-6.7%	<±1.5 ppb or <±15.1%, whichever is less stringent	2
0ppb/5L	0	0	-0	<±3.1 ppb	Zero
Data Logger Time	08:40:30	08:40:00	00:00:30	+/-00:01:00*	
Data Logger Temperature	25.6	26.0	0.4	±2.1 °C	

Audit Notes:

1. The monitor audited showed satisfactory correlation with our audit standard.
2. The results were noted in the instrument log books and listed in this report.
3. *The data logger acceptable range of <±00:01:00 is a State recommendation.

Recommendations: None.

Any questions concerning the audits or any comments made in connection with the audits may be addressed to me at (615) 687-7048 or at Ben.Hartsfield@tn.gov.

Sincerely,



Ben Hartsfield
 Environmental Consultant 1
 Quality Assurance Program

*Air Pollution Control Division
Quality Assurance Performance Audit*

Site: East Health Center NO₂
Audit Quarter: 3Q 2020
AQS #: 47-037-0011
Auditor: Ben Hartsfield
Date of Audit: 09/15/2020

Instrument Model: Thermo 42i NO₂ Serial Number: 1105247201 Data Logger Model: ESC 8832 Data Logger Serial Number: A4721K			<u>Audit Equipment:</u> Teledyne T750U SN 153 Teledyne 751H SN 183 Praxair FA02370 NO/NO _x 10.99 PPM 6/26/2022 Streamline Pro SN 150306 www.time.gov			
<u>Measured Parameter sccm/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>	
0cc/10L	0	0	0.0	<±3.1 ppb	Zero	
1400mv-150cc/10L	121	119	-1.7%	<±15.1%	7	
1150mv-100cc/10L	81	79	-2.5%	<±15.1%	6	
970mv-60cc/10L	50	50	0.0%	<±15.1%	5	
0cc/10L	0	0	0.0	<±3.1 ppb	Zero	

Site: East Health Center NO_x
Audit Quarter: 3Q 2020
AQS #: 47-037-0011
Auditor: Ben Hartsfield
Date of Audit: 09/15/2020

Instrument Model: Thermo 42i NO_x Serial Number: 110547201 Data Logger Model: ESC 8832 Data Logger Serial Number: A4721K			<u>Audit Equipment:</u> Teledyne T750U SN 153 Teledyne 751H SN 183 Praxair FA02370 NO/NO _x 10.99 PPM 6/26/2022 Streamline Pro SN 060504 www.time.gov			
<u>Measured Parameter sccm/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>	
0cc/10L	0	1	0.0	<±3.1 ppb	Zero	
150cc/10L	162	167	3.1%	<±15.1%		
100cc/10L	108	112	3.7%	<±15.1%		
60cc/10L	65	67	3.1%	<±15.1%		
20cc/11L	21	22	4.8%	<±15.1%		
0cc/10L	0	0	0.0	<±3.1 ppb	Zero	

Site: East Health Center NO
 Audit Quarter: 3Q 2020
 AQS #: 47-037-0011
 Auditor: Ben Hartsfield
 Date of Audit: 09/15/2020

Instrument Model: Thermo 42i NO Serial Number: 1105247201 Data Logger Model: ESC 8832 Data Logger Serial Number: A4721K		<u>Audit Equipment:</u> Teledyne T750U SN 153 Teledyne 751H SN 183 Praxair FA02370 NO/NO _x 10.99 PPM 6/26/2022 Streamline Pro SN 150306 www.time.gov			
<u>Measured Parameter sccm/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>
0cc/10L	0	0	0.0	<±3.1 ppb	Zero
150cc/10L	162	167	3.1%	<±15.1%	
100cc/10L	108	112	3.7%	<±15.1%	
60cc/10L	65	67	3.1%	<±15.1%	
20cc/10L	21	22	4.8%	<±15.1%	
0cc/10L	0	-1	0.0	<±3.1 ppb	Zero

Converter Efficiency: 97.6%

Audit Notes:

1. The monitor audited showed satisfactory correlation with our audit standard.

Site: East Health Center O3
Audit Quarter: 3Q 2020
AQS #: 47-037-0011
Auditor: Ben Hartsfield
Date of Audit: 09/09/2020

Instrument Model: Thermo 49i O3 Serial Number: CM09130037 Data Logger Model: ESC 8832 Data Logger Serial Number: A4721K			Audit Equipment: Teledyne T750U SN 153 Teledyne 751H SN 183 Praxair FA02370 CO 201.7 PPM 6/26/2022 Streamline Pro SN 150306 www.time.gov			
<u>Measured Parameter sccm/LPM</u>	<u>Audit Value ppb</u>	<u>Monitor Response ppb</u>	<u>Difference</u>	<u>Acceptable Range</u>	<u>Level *</u>	
0ppb/5L	0	-1	-1	0.1	Zero	
85ppb/5L	85	81	-4.7%	<±15.1%	8	
65ppb/5L	65	61	-6.2%	<±15.1%	7	
35ppb/5L	35	33	-5.7%	<±15.1%	6	
15ppb/5L	15	14	-6.7%	<±15.1%	5	
0ppb/5L	0	0	0.0	0.1	Zero	
Data Logger Time	10:55:30	10:55:00	00:00:30	<±00:01:00		
Data Logger Temperature	23.7	24.1	0.4	<±2.1°C		

Audit Notes:

1. The monitor audited showed satisfactory correlation with our audit standard
2. Data Logger acceptable range of <+ 00:01:00 is a state recommendation.

Recommendation:

1. State recommendations are to keep data loggers accurate to within one minute. Please follow your SOP regarding acceptable time range.

Any questions concerning the audits or any comments made in connection with the audits may be addressed to me at (615) 687-7048 or at Ben.Hartsfield@tn.gov.

Sincerely,



Ben Hartsfield
 Environmental Consultant 1
 Quality Assurance Program

Site: Lockeland
Audit Quarter: 3Q 2020
AQS #: 47-037-0023
Auditor: Ben Hartsfield
Date of Audit: 09/09/2020

Instrument Model: T640 Serial Number: 1405A231091503		<u>Audit Equipment:</u> Streamline Pro SN C150306 www.time.gov		
<u>Measured Parameter</u>	<u>Audit Value</u>	<u>Monitor Response</u>	<u>Difference</u>	<u>Acceptable Range</u>
Sample Flow: LPM	5.03	5.05	0.4%	+/-4.1% (5.1%)
Bypass Flow: LPM	11.56	11.68	1.0%	+/-4.1% (5.1%)
Total Flow: LPM	16.59	16.60	0.1%	+/-4.1% (5.1%)
Barometric Pressure: mmHg	752.2	750.4	-1.8	+/-10.1 mmHg
Ambient Temperature: °C	31.9	30.9	-0.76	+/-2.1°C
Monitor Time:	10:08:00	10:08:52	00:00:52	+/-00:05:00
Leak Check Main:	0.1			
Leak Check Bypass	0.1			

Site: Lockeland
Audit Quarter: 3Q 2020
AQS #: 47-037-0023 POC1
Auditor: Ben Hartsfield
Date of Audit: 09/09/2020

Instrument Model: BAM POC 1 Serial Number: W21431		<u>Audit Equipment:</u> Streamline Pro SN C150306 www.time.gov		
<u>Measured Parameter</u>	<u>Audit Value</u>	<u>Monitor Response</u>	<u>Difference</u>	<u>Acceptable Range</u>
Sample Flow: LPM	16.42	16.7	1.7%	+/-4.1% (5.1%)
Barometric Pressure: mmHg	752.2	751	-1.2	+/-10.1 mmHg
Ambient Temperature: °C	30.1	29.8	-0.3	+/-2.1°C
External Leak Check: As Found mmHg		0.5		≤25 mmHg
External Leak Check: As Left mmHg		0.5		≤25 mmHg
Monitor Time:	09:41:18	09:41:00	-0:00:18	+/-00:05:00

Site: Lockeland
Audit Quarter: 3Q 2020
AQS #: 47-037-0023 POC 2
Auditor: Ben Hartsfield
Date of Audit: 09/09/2020

Instrument Model: 2025i PM2.5 Serial Number: 2025I202241204		Audit Equipment: Streamline Pro SN C150306 www.time.gov		
<u>Measured Parameter</u>	<u>Audit Value</u>	<u>Monitor Response</u>	<u>Difference</u>	<u>Acceptable Range</u>
Sample Flow: LPM	16.48	16.67	1.2	+/-4.1% (5.1%)
Barometric Pressure: mmHg	752.9	752	-0.9	+/-10.1 mmHg
Ambient Temperature: °C	32.9	31.8	-1.1°C	+/-2.1°C
Filter Temperature: °C	33.6	32.2	-1.4°C	+/-2.1°C
External Leak Check: As Found mmHg		5		≤25 mmHg
External Leak Check: As Left mmHg		4		≤25 mmHg
Monitor Time:	09:55:34	09:55:00	-0:00:34	+/-00:05:00

Audit Notes:

1. The monitors audited showed satisfactory correlation with our audit standard.
2. The results were noted in the instrument log books and listed in this report.

Recommendations: None.

Any questions concerning the audits or any comments made in connection with the audits may be addressed to me at (615) 687-7048 or at Ben.Hartsfield@tn.gov.

Sincerely,



Ben Hartsfield
 Environmental Consultant 1
 Quality Assurance Program