

# **QUALITY ASSURANCE AUDIT REPORT**

## **North Texas Commission Ambient Air and Meteorological Monitoring**

**Prepared for:**

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## EXECUTIVE SUMMARY

On November 12<sup>th</sup> – 15<sup>th</sup>, 2018, an audit team from the AECOM ambient air group in Austin, Texas conducted performance and technical system audits of the North Texas Commission (NTC) ambient air monitoring network. The audits provide an independent assessment of the monitoring program.

The monitoring program at NTC consists of continuous gas chromatographs (GC), volatile organic compound (VOC) canister collection systems, and meteorological sensors including wind speed, wind direction, and temperature.

The performance audit results indicate acceptable responses for measurement systems with the exceptions summarized below.

The wind direction sensors were found to be outside the total maximum error specification of  $\pm 5^\circ$  at three sites: Everman, Bowie, and Dish. These wind direction sensors were realigned and found to be within the audit objective. Following realignment, there is no further field action required.

The wind speed sensor bearings were outside of the audit guidance of 0.3 g-cm for the torque test at Elm Fork, Rhome, and Flower Mound. These issues were resolved by installing new bearings on the wind speed sensors at Elm Fork and Rhome and replacing the wind speed sensor at Flower Mound.

Out of the 48 compounds being analyzed, seven compounds (ethylene, acetylene, isoprene, 2-methylhexane, styrene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, 1,2,3-trimethylbenzene, and n-undecane) were found to be outside of the audit objective of 70% - 130% recovery at several sites. In addition, the Rushing, Kennedale and Mansfield sites had the following GC compound recoveries outside of the audit specification:

Locations	Compounds
Rushing	2,3-dimethylpentane
Kennedale	Propylene
Mansfield	M&P-xylene, 1,2,4-trimethylbenzene, and n-undecane

These network GC audit results are comparable historically to other AECOM auto-GC audits. No problems were identified in the quality control procedures at any of these sites that would indicate a persistent measurement error. The GC audit results are contained in table ES-2.

Technical systems audit results demonstrate satisfactory operational procedures for collecting valid data.

A performance evaluation (PE) sample is prepared by the AECOM QA group on a quarterly basis and submitted to the VOC laboratory for analysis. This performance evaluation sample contained known (spiked) concentrations of the target VOCs. A review of the sample recoveries for the spiked target VOCs shows that six of the compounds were not within the range of expected values (70-130%). All six of those compounds were below the acceptable sample recovery, with the exception of ethane:

- 1,2,4-trimethylbenzene (61.1%),
- 1,3,5-trimethylbenzene (65.3%),
- 1-hexene (63.6%),
- 4-ethyltoluene (62.7%),
- ethane (180.1%),
- o-xylene (68.5%),

Over the past year, the PE sample recoveries have been lower than expected for heavier, non-halogenated VOCs. 1-hexene has also historically been a problematic compound for VOC work and typically has lower recoveries. AECOM QA staff and the sampling lab have been working together to investigate the low recoveries of these compounds. The percent recovery for ethene and other C2 compounds can be challenging for lower concentrations due to the lab's level of quantification limit being higher than the theoretical input. AECOM QA staff shared the performance evaluation results with the VOC laboratory, and no other corrective action was taken. We will continue to evaluate these compounds in our PE samples and work with the lab to resolve these discrepancies. GD Air's most recent performance evaluation canister results for the fourth quarter of 2018 are contained below in Table ES-1.

In the review of the November/December canister data, AECOM's data validation tools indicated some suspect results. In working with GDAir, it was determined that their dilution cylinder that had recently changed had trace contamination of several compounds on the VOC target list. The contamination resulted in a number of 99<sup>th</sup> percentile results (i.e., compounds affected had concentrations as high or higher than most all previously reported). Consideration was given to selectively flagging affected compounds or invalidating whole samples known to be impacted. Selectively flagging compounds may have led to uncertain usability of unaffected results in those samples and as such it was determined prudent to invalidate the whole sample. The invalidated samples were collected between November 17, 2018 and December 16, 2018. Going forward, GDAir will analyze new gas standards prior to placing them into service to ensure contaminants are not present in their working standards. We anticipate that any sample anomalies such as contamination will continue to be detected by AECOM's rigorous validation protocols.

**Table ES-1. Results of Performance Standard for Off-Site Analytical Lab**

<b>Compound Name</b>	<b>CAS Number</b>	<b>Concentration (ppb-v)</b>	<b>Concentration Results (ppb-v)</b>	<b>Percent Recovery</b>
1,1,1-Trichloroethane	71-55-6	3.1	2.7	85.5%
1,1,2,2-Tetrachloroethane	79-34-5	3.2	2.4	75.5%
1,1,2-Trichloroethane	79-00-5	3.2	2.6	82.5%
1,1-Dichloroethane	75-34-3	3.1	2.6	84.8%
1,1-Dichloroethene	75-35-4	3.2	2.7	84.7%
1,2,4-Trimethylbenzene	95-63-6	3.0	1.9	61.1%
1,2-Dibromoethane	106-93-4	3.2	2.5	79.0%
1,2-Dichloroethane	107-06-2	3.1	2.7	86.2%
1,2-Dichloropropane	78-87-5	3.2	2.9	91.1%
1,3,5-Trimethylbenzene	108-67-8	3.0	2.0	65.3%
1,3-Butadiene	106-99-0	6.2	5.5	88.8%
1-Butene	106-98-9	3.2	2.7	84.1%
1-Hexene	592-41-6	2.9	1.9	63.6%
1-Pentene	109-67-1	3.2	2.7	85.4%
2,2,4-Trimethylpentane	540-84-1	3.1	2.7	85.2%
4-Ethyltoluene (p-Ethyltoluene)	622-96-8	3.0	1.9	62.7%
Benzene	71-43-2	3.2	2.7	85.5%
Bromomethane	74-83-9	3.0	2.7	90.7%
c-1,3-Dichloropropene	10061-01-5	3.1	3.0	95.2%
Carbon tetrachloride	56-23-5	3.1	2.6	83.9%
Chlorobenzene	108-90-7	3.2	2.5	77.0%
Chloroform	67-66-3	3.1	2.7	88.0%
Chloromethane (Methyl Chloride)	74-87-3	3.1	3.4	107.3%
Cyclohexane	110-82-7	3.2	2.6	82.0%
Dichlorodifluoromethane (Freon-12)	75-71-8	3.0	2.7	88.4%
Ethane	74-84-0	3.3	6.0	180.1%
Ethene	74-85-1	3.3	3.7	110.5%
Ethylbenzene	100-41-4	3.2	2.3	72.9%
Methylene Chloride (Dichloromethane)	75-09-2	3.0	2.8	90.8%
m-Xylene & p-Xylene	106-42-3+108-38-3	6.1	4.5	72.9%
n-Butane	106-97-8	3.2	2.8	87.4%
n-Heptane	142-82-5	3.1	2.5	79.1%
n-Hexane	110-54-3	9.3	7.4	79.7%
n-Pentane	109-66-0	3.1	2.7	86.5%
o-Xylene	95-47-6	3.2	2.2	68.5%
Propane	74-98-6	3.1	3.2	102.8%
Propylene	115-07-1	6.4	5.6	87.9%
Styrene	100-42-5	3.1	2.2	70.8%
t-1,3-Dichloropropene	10061-02-6	3.1	2.3	73.0%
Tetrachloroethene	127-18-4	3.2	2.3	73.6%
Toluene	108-88-3	3.2	2.5	78.3%
Trichloroethene	79-01-6	3.2	2.8	88.3%
Trichlorofluoromethane (Freon-11)	75-69-4	3.2	2.7	82.5%
Vinyl Chloride	75-01-4	3.1	2.9	93.9%

**Table ES-2. Audit Standard Results for all Network GCs**

Compound Name	CAS Number	Audit Concentration (ppb-c)	Benbrook	Decatur	Dish	Eagle Mountain Lake
			Percent Recovery	Percent Recovery	Percent Recovery	Percent Recovery
Ethane	74-84-0	59.4	99.9%	98.8%	87.7%	91.3%
Ethylene	74-85-1	18.0	87.6%	83.2%	57.8%	73.3%
Propane	74-98-6	11.7	89.6%	88.7%	89.9%	87.1%
Propylene	115-07-1	11.7	71.8%	75.7%	73.1%	73.4%
Iso-Butane	75-28-5	15.3	115.1%	106.3%	103.5%	107.5%
N-Butane	106-97-8	15.6	115.1%	108.2%	101.7%	109.3%
Acetylene	74-86-2	7.6	72.3%	67.5%	55.3%	73.5%
Trans-2-Butene	624-64-6	15.0	116.3%	108.9%	104.6%	107.5%
1-Butene	106-98-9	15.3	110.9%	103.9%	100.8%	106.0%
Cis-2-Butene	590-18-1	15.6	117.2%	107.7%	102.9%	110.4%
Cyclopentane	287-92-3	18.9	116.5%	106.6%	100.7%	110.1%
Iso-Pentane	78-78-4	19.3	116.3%	106.8%	104.6%	112.0%
N-Pentane	109-66-0	19.5	117.4%	105.5%	102.6%	110.2%
1,3-Butadiene	106-99-0	14.8	105.1%	93.4%	98.1%	99.4%
Trans-2-Pentene	646-04-8	19.5	112.2%	88.4%	97.6%	100.5%
1-Pentene	109-67-1	19.5	103.1%	76.1%	91.3%	91.2%
Cis-2-Pentene	627-20-3	18.1	99.7%	71.4%	86.6%	87.5%
2,2-Dimethylbutane	75-83-2	23.1	112.2%	89.1%	96.8%	99.4%
2-Methylpentane	107-83-5	22.5	114.6%	99.7%	99.8%	102.3%
Isoprene	78-79-5	19.5	84.3%	66.4%	76.0%	78.3%
n-Hexane	110-54-3	23.3	110.0%	90.6%	86.7%	87.1%
Methylcyclopentane	108-87-2	23.3	92.6%	77.4%	83.8%	79.6%
2,4-Dimethylpentane	108-08-7	27.2	105.7%	99.3%	94.9%	103.9%
Benzene	71-43-2	23.3	97.2%	87.9%	84.5%	82.8%
Cyclohexane	110-82-7	23.3	105.6%	96.6%	90.5%	93.1%
2-Methylhexane	591-76-4	27.2	86.2%	68.0%	78.1%	71.5%
2,3-Dimethylpentane	565-59-3	26.3	116.2%	114.5%	100.9%	110.0%
3-Methylhexane	589-34-4	27.2	101.2%	95.2%	88.3%	95.8%
2,2,4-Trimethylpentane	540-84-1	31.1	95.1%	90.7%	88.9%	86.4%
n-Heptane	142-82-5	27.2	96.1%	88.6%	90.2%	85.0%
Methylcyclohexane	108-87-2	27.0	96.9%	87.3%	91.5%	89.0%
2,3,4-Trimethylpentane	565-75-3	31.1	95.2%	85.2%	89.2%	87.6%
Toluene	108-88-3	27.0	92.0%	85.9%	89.2%	90.6%
2-Methylheptane	592-27-8	30.8	92.5%	80.7%	87.9%	87.0%
3-Methylheptane	589-81-1	31.1	92.9%	83.6%	88.7%	90.5%
n-Octane	111-65-9	31.1	92.2%	86.2%	88.6%	88.3%
Ethylbenzene	100-41-4	31.1	83.0%	76.4%	81.2%	76.4%
M&P-Xylene	108-38-3	61.6	80.1%	74.9%	79.4%	75.4%
Styrene	100-42-5	30.6	73.6%	71.4%	71.8%	69.4%
O-Xylene	95-47-6	30.6	87.4%	85.0%	79.6%	83.3%
N-Nonane	111-84-2	34.0	92.0%	84.4%	87.0%	87.3%
Isopropylbenzene	98-82-8	33.4	83.8%	74.0%	81.1%	78.9%
n-Propylbenzene	103-65-1	32.8	81.5%	73.2%	81.9%	78.5%
1,3,5-Trimethylbenzene	108-67-8	34.0	69.2%	71.6%	74.4%	73.6%
1,2,4-Trimethylbenzene	95-63-6	34.7	80.1%	77.0%	79.8%	77.4%
n-Decane	124-18-5	34.3	90.6%	82.5%	93.8%	89.2%
1,2,3-Trimethylbenzene	526-73-8	34.4	68.2%	58.7%	68.2%	66.2%
n-Undecane	1120-21-4	41.6	73.3%	72.7%	70.4%	71.9%

<sup>a</sup> Compound order based on elution time.

**Table ES-2. (continued) Audit Standard Results for all Network GCs**

Compound Name	CAS Number	Audit Concentration (ppb-c)	Elm Fork	Everman	Flower Mound	Godley
			Percent Recovery	Percent Recovery	Percent Recovery	Percent Recovery
Ethane	74-84-0	59.4	96.7%	79.4%	89.3%	93.6%
Ethylene	74-85-1	18.0	83.7%	62.8%	66.5%	74.8%
Propane	74-98-6	11.7	90.9%	88.8%	90.8%	88.9%
Propylene	115-07-1	11.7	77.6%	73.6%	71.5%	74.0%
Iso-Butane	75-28-5	15.3	103.9%	109.0%	101.8%	108.9%
N-Butane	106-97-8	15.6	106.1%	111.4%	101.3%	109.1%
Acetylene	74-86-2	7.6	79.3%	74.7%	82.8%	73.9%
Trans-2-Butene	624-64-6	15.0	107.1%	110.2%	103.2%	108.8%
1-Butene	106-98-9	15.3	103.3%	110.8%	100.6%	105.3%
Cis-2-Butene	590-18-1	15.6	107.3%	111.6%	103.2%	109.7%
Cyclopentane	287-92-3	18.9	104.9%	111.4%	101.3%	107.8%
Iso-Pentane	78-78-4	19.3	106.9%	112.9%	102.4%	109.9%
N-Pentane	109-66-0	19.5	106.1%	111.8%	102.1%	109.6%
1,3-Butadiene	106-99-0	14.8	104.5%	107.9%	87.7%	106.2%
Trans-2-Pentene	646-04-8	19.5	102.9%	105.8%	93.6%	105.5%
1-Pentene	109-67-1	19.5	93.0%	105.8%	82.7%	100.2%
Cis-2-Pentene	627-20-3	18.1	92.7%	88.3%	82.7%	100.2%
2,2-Dimethylbutane	75-83-2	23.1	104.9%	111.1%	95.7%	107.6%
2-Methylpentane	107-83-5	22.5	106.1%	111.4%	99.1%	106.8%
Isoprene	78-79-5	19.5	68.9%	80.3%	72.4%	86.7%
n-Hexane	110-54-3	23.3	90.8%	76.2%	98.1%	99.2%
Methylcyclopentane	108-87-2	23.3	83.9%	81.8%	82.2%	76.7%
2,4-Dimethylpentane	108-08-7	27.2	92.4%	100.6%	99.3%	99.8%
Benzene	71-43-2	23.3	88.6%	82.9%	82.0%	82.7%
Cyclohexane	110-82-7	23.3	94.5%	98.2%	91.3%	91.2%
2-Methylhexane	591-76-4	27.2	78.9%	66.7%	76.5%	66.7%
2,3-Dimethylpentane	565-59-3	26.3	103.9%	115.9%	104.2%	105.9%
3-Methylhexane	589-34-4	27.2	91.7%	89.6%	91.8%	85.1%
2,2,4-Trimethylpentane	540-84-1	31.1	88.7%	89.1%	89.7%	83.9%
n-Heptane	142-82-5	27.2	88.1%	85.1%	89.8%	83.3%
Methylcyclohexane	108-87-2	27.0	88.6%	92.2%	91.7%	86.9%
2,3,4-Trimethylpentane	565-75-3	31.1	89.0%	90.0%	90.7%	84.0%
Toluene	108-88-3	27.0	85.6%	88.0%	85.2%	80.8%
2-Methylheptane	592-27-8	30.8	87.1%	90.7%	89.4%	79.7%
3-Methylheptane	589-81-1	31.1	88.1%	93.6%	90.1%	81.2%
n-Octane	111-65-9	31.1	88.2%	88.6%	89.6%	81.3%
Ethylbenzene	100-41-4	31.1	80.1%	81.6%	79.4%	76.4%
M&P-Xylene	108-38-3	61.6	78.4%	79.4%	77.5%	74.3%
Styrene	100-42-5	30.6	70.9%	65.6%	67.3%	65.1%
O-Xylene	95-47-6	30.6	83.6%	89.9%	77.2%	81.8%
N-Nonane	111-84-2	34.0	87.6%	90.7%	86.1%	82.5%
Isopropylbenzene	98-82-8	33.4	80.8%	84.3%	79.2%	77.9%
n-Propylbenzene	103-65-1	32.8	79.7%	81.4%	79.1%	76.0%
1,3,5-Trimethylbenzene	108-67-8	34.0	74.9%	84.2%	70.2%	77.1%
1,2,4-Trimethylbenzene	95-63-6	34.7	78.3%	81.3%	73.8%	76.2%
n-Decane	124-18-5	34.3	88.3%	92.0%	89.4%	83.5%
1,2,3-Trimethylbenzene	526-73-8	34.4	68.2%	69.7%	63.1%	65.4%
n-Undecane	1120-21-4	41.6	72.0%	75.3%	71.7%	66.6%

<sup>a</sup> Compound order based on elution time.

**Table ES-2. (continued) Audit Standard Results for all Network GCs**

Compound Name	CAS Number	Audit Concentration (ppb-c)	Kennedale	Mansfield	Rhyme	Rushing	UTA
			Percent Recovery	Percent Recovery	Percent Recovery	Percent Recovery	Percent Recovery
Ethane	74-84-0	59.4	91.0%	88.1%	97.6%	104.9%	86.9%
Ethylene	74-85-1	18.0	83.2%	74.7%	81.6%	89.0%	76.8%
Propane	74-98-6	11.7	83.3%	83.4%	94.1%	102.4%	82.8%
Propylene	115-07-1	11.7	68.5%	71.4%	70.5%	78.5%	76.4%
Iso-Butane	75-28-5	15.3	102.6%	103.9%	107.0%	115.6%	103.9%
N-Butane	106-97-8	15.6	104.7%	106.3%	112.2%	117.9%	103.9%
Acetylene	74-86-2	7.6	68.1%	69.8%	70.3%	62.1%	61.8%
Trans-2-Butene	624-64-6	15.0	103.6%	104.6%	115.5%	114.2%	103.9%
1-Butene	106-98-9	15.3	100.2%	102.1%	105.3%	112.4%	100.1%
Cis-2-Butene	590-18-1	15.6	104.8%	105.4%	108.0%	114.6%	103.0%
Cyclopentane	287-92-3	18.9	104.4%	105.0%	108.5%	114.3%	102.7%
Iso-Pentane	78-78-4	19.3	104.6%	106.8%	110.2%	115.8%	104.5%
N-Pentane	109-66-0	19.5	104.9%	105.6%	108.2%	113.9%	103.1%
1,3-Butadiene	106-99-0	14.8	95.4%	103.7%	97.4%	106.9%	100.4%
Trans-2-Pentene	646-04-8	19.5	99.3%	103.4%	105.0%	100.1%	101.2%
1-Pentene	109-67-1	19.5	93.7%	101.8%	96.5%	93.8%	97.7%
Cis-2-Pentene	627-20-3	18.1	93.6%	98.4%	98.6%	94.5%	95.2%
2,2-Dimethylbutane	75-83-2	23.1	101.4%	104.5%	107.5%	109.7%	101.7%
2-Methylpentane	107-83-5	22.5	102.4%	103.1%	104.9%	113.7%	100.2%
Isoprene	78-79-5	19.5	81.8%	85.4%	80.6%	80.6%	81.3%
n-Hexane	110-54-3	23.3	88.8%	85.0%	98.5%	103.4%	88.8%
Methylcyclopentane	108-87-2	23.3	79.0%	81.6%	85.9%	88.5%	86.4%
2,4-Dimethylpentane	108-08-7	27.2	99.0%	85.1%	98.4%	109.7%	90.0%
Benzene	71-43-2	23.3	84.4%	77.5%	85.4%	83.8%	83.9%
Cyclohexane	110-82-7	23.3	95.0%	85.5%	98.5%	115.2%	90.7%
2-Methylhexane	591-76-4	27.2	70.8%	76.2%	79.3%	64.2%	80.6%
2,3-Dimethylpentane	565-59-3	26.3	104.9%	88.8%	103.8%	138.6%	92.0%
3-Methylhexane	589-34-4	27.2	90.9%	83.1%	98.3%	110.2%	86.1%
2,2,4-Trimethylpentane	540-84-1	31.1	83.3%	80.1%	88.3%	101.0%	85.4%
n-Heptane	142-82-5	27.2	83.3%	81.1%	82.8%	88.0%	86.3%
Methylcyclohexane	108-87-2	27.0	87.9%	82.4%	90.2%	102.0%	86.4%
2,3,4-Trimethylpentane	565-75-3	31.1	82.8%	80.8%	89.8%	98.3%	84.6%
Toluene	108-88-3	27.0	79.5%	79.3%	82.4%	82.1%	82.5%
2-Methylheptane	592-27-8	30.8	77.7%	78.0%	84.9%	92.4%	82.1%
3-Methylheptane	589-81-1	31.1	79.8%	78.5%	81.4%	91.8%	82.2%
n-Octane	111-65-9	31.1	81.6%	77.4%	85.2%	96.3%	80.9%
Ethylbenzene	100-41-4	31.1	73.7%	72.9%	77.6%	84.8%	77.0%
M&P-Xylene	108-38-3	61.6	72.7%	69.9%	75.2%	92.6%	74.2%
Styrene	100-42-5	30.6	59.7%	63.0%	64.5%	60.5%	65.9%
O-Xylene	95-47-6	30.6	82.9%	74.0%	83.3%	113.4%	79.1%
N-Nonane	111-84-2	34.0	85.2%	77.2%	88.1%	102.6%	82.7%
Isopropylbenzene	98-82-8	33.4	76.5%	74.1%	80.8%	94.8%	80.6%
n-Propylbenzene	103-65-1	32.8	72.9%	71.8%	79.9%	87.1%	79.1%
1,3,5-Trimethylbenzene	108-67-8	34.0	74.8%	67.9%	81.3%	98.3%	76.0%
1,2,4-Trimethylbenzene	95-63-6	34.7	70.3%	68.9%	80.6%	81.4%	75.8%
n-Decane	124-18-5	34.3	83.1%	79.1%	95.3%	93.7%	87.1%
1,2,3-Trimethylbenzene	526-73-8	34.4	61.6%	60.2%	66.9%	79.0%	70.5%
n-Undecane	1120-21-4	41.6	70.9%	63.9%	75.7%	83.0%	78.4%

<sup>a</sup> Compound order based on elution time.