

Analysis of Volatile Organic Compounds Using USEPA Method 524.3

Eclipse 4760 Purge and Trap and the 4100 Autosampler

Introduction

Although analysis of VOCs by purge and trap is considered a mature technique, advances in methodology and refinement of instrumentation are still being developed. This application note presents suggested operating conditions for the 4760 purge and trap and the 4100 autosampler.

Methodology

A multi-point calibration from 0.5 to 40 ppb was run using the conditions listed below.



Purge-and-Trap	Eclipse 4760 P&T Sample Concentrator
Trap	#10 trap; Tenax® / Silica gel / CMS
Purge Gas	Zero grade Helium at 40 mL/min
Purge Time	11 min
Sparge Mount Temperature	45 °C
Sample Temperature (purge)	45 °C
Sample Temperature (bake)	45 °C
Desorb Time	0.5 min
Bake Time	4 min
Ol #10 Trap Temperature	Ambient during purge 180 °C during desorb pre-heat 190 °C during desorb 210 °C during bake
Water Management	120 °C during purge Ambient during desorb 240 °C during bake
Transfer Line Temperature	140 °C
Six-port Valve Temperature	140 °C

Autosampler	4100 Water/Soil Sample Processor
System Gas	Zero grade nitrogen
Purge Gas	Zero grade helium
LV20 Pressure	8.0 psi
Loop-based Time Settings	Default
Rinse Water	80 °C
Soil Sample Transfer	150 °C
Soil Oven	150 °C
Soil Lift Station	45 °C

4100 Sample Processor Methods			
Sample Type	Waters Only	Soils Only	Blanks Only
Vial Cap Color	Blue	Yellow	Green
Needle Rinses	1	1	0
SAM A (µL)	5	5	5
SAM B (µL)	0	0	0
SAM C (µL)	0	0	0
SAM D (µL)	0	0	0
Purge Time (min)	11.0	11.0	11.0
Desorb Time (min)	0.5	0.5	0.5
P&T Rinses	2	1	0
Rinse Water	Hot	Hot	Hot
Water Stir Time (min)	0.0		
Water Settle Time (sec)	0		
Soil Add Water to Vial (#loops)		* 1 x 5 mL	
Soil Pre-Heat Stir		Yes	
Soil Pre-Heat/Purge Temp (°C)		45.0	
Soil Stir During Purge		Yes	

* Suggested initial volume in vial should be 5 mL and final volume 10 mL.

Gas Chromatograph	Agilent 7890A
Column	Restek Rtx-VMS 30 meter, 0.25 mm ID, 1.4 μ mdf
Carrier Gas	Zero grade helium
Inlet Temperature	250 °C
Inlet Liner	Agilent Ultra Inert, 1 mm straight taper
Column Flow Rate	0.8 mL/min
Split Ratio	50:1
Oven Program	Hold at 40 °C for 2 min 12 °C/minute to 170 °C 40 °C/minute to 220 °C Hold at 220 °C for 2 min Total GC Run is 16.1 min
Mass Spectrometer	Agilent 5975C
Mode	Scan 35 - 300 amu
Scans/Second	5.19
Solvent Delay	1.70 min
Transfer Line Temperature	250 °C
Source Temperature	300 °C
Quadrupole Temperature	200 °C
Draw Out Plate	6 mm

Results

See Table 1.

Table 1. Calibration Data

Analyte	Compound	Avg RF	% RSD	Detection Limit Std (ppb)	Detected (ppb)
1	1,4-difluorobenzene	N/A	N/A	N/A	N/A
2	chlorodifluoromethane	0.313	13.13	0.15	0.16
3	chlorodifluorobenzene	0.410	7.65	0.15	0.16
4	chloromethane	0.393	6.58	0.15	0.13
5	1,3 - butadiene	0.411	8.45	0.15	0.16
6	bromomethane	0.336	10.60	0.15	0.14
7	chloroethane	0.370	8.47	0.15	0.23
8	trichlorofluoromethane	0.630	8.42	0.15	0.16
9	ethyl ether	0.175	8.57	0.15	0.16
10	1,1-dichloroethene	0.319	7.34	0.15	0.14
11	carbon disulfide	1.047	8.04	0.15	0.17
12	methyl iodide	0.624	9.00	0.15	0.15
13	allyl chloride	0.151	10.76	0.15	0.15
14	methylene chloride	0.422	16.05	0.15	0.98

Analyte	Compound	Avg RF	% RSD	Detection Limit Std (ppb)	Detected (ppb)
15	trans-1,2-dichloroethene	0.334	9.43	0.15	0.11
16	methyl acetate	0.321	9.45	0.15	0.11
17	methyl tertbutyl ether d3	0.880	10.61	20	19.68
18	methyl tert-butyl ether	0.902	10.16	0.15	0.16
19	tert-Butyl alcohol	0.801	11.88	0.15	0.17
20	di-isopropyl ether	0.902	11.09	0.15	0.13
21	1,1-dichloroethane	0.644	7.11	0.15	0.16
22	tert-Butyl ether	0.801	11.88	0.15	0.17
23	cis-1,2-dichloroethene	0.338	6.37	0.15	0.17
24	bromochloromethane	0.198	8.15	0.15	0.16
25	chloroform	0.670	8.64	0.15	0.14
27	carbon tetrachloride	0.542	8.69	0.15	0.14
28	tetrahydrofuran	0.044	11.73	0.15	0.16
29	1,1,1-trichloroethane	0.585	6.91	0.15	0.14
31	1,1-dichloropropene	0.400	10.52	0.15	0.14
32	1-chlorobutane	0.559	9.84	0.15	0.14
33	benzene	1.850	5.42	0.15	0.17
34	tert-amyl methyl ether	0.652	13.70	0.15	0.15
36	1,2-dichloroethane	0.562	5.43	0.15	0.12
37	trichloroethene	0.368	3.94	0.15	0.17
38	tert-amyl ethyl ether	0.602	7.23	0.15	0.14
39	dibromomethane	0.250	8.42	0.15	0.19
40	bromodichloromethane	0.470	6.21	0.15	0.18
41	1,2-dichloropropane	0.323	9.18	0.15	0.17
42	cis-1,3-dichloropropene	0.430	4.23	0.15	0.16
43	chlorobenzene-d5 (IS)	N/A	N/A	N/A	N/A
44	toluene	0.752	7.49	0.15	0.17

Analyte	Compound	Avg RF	% RSD	Detection Limit Std (ppb)	Detected (ppb)
45	tetrachloroethene	0.474	10.82	0.15	0.12
46	trans-1,3-dichloropropene	0.488	8.07	0.15	0.15
47	ethyl methacrylate	0.350	14.85	0.15	0.14
48	1,1,2-trichloroethane	0.307	2.05	0.15	0.17
49	chlorodibromomethane	0.454	9.78	0.15	0.14
50	1,3-dichloropropane	0.510	8.75	0.15	0.15
51	1,2-dibromoethane	0.393	8.00	0.15	0.15
52	chlorobenzene	1.027	2.14	0.15	0.17
53	ethylbenzene	1.502	8.00	0.15	0.15
54	1,1,1,2-tetrachloroethane	0.374	2.94	0.15	0.14
55	m,p-xylenes	0.569	15.84	0.30	0.26
56	o-xylene	0.465	17.90	0.15	0.13
57	styrene	0.824	R=0.999	0.15	0.13
58	bromoform	0.336	7.82	0.15	0.15
59	isopropylbenzene	1.21	19.84	0.15	0.13
60	1,4-dichlorobenzene-d4 (IS)	N/A	N/A	N/A	N/A
61	4-bromofluorobenzene (SS)	0.946	2.49	20.0	20.83
62	bromobenzene	0.924	6.31	0.15	0.20
63	n-propylbenzene	3.304	4.60	0.15	0.17
64	1,1,1,2-tetrachloroethane	0.989	11.88	0.15	0.17
65	2-chlorotoluene	2.049	5.62	0.15	0.17
66	1,3,5-trimethylbenzene	2.177	15.75	0.15	0.12
67	1,2,3-trichloropropane	0.865	7.47	0.15	0.17
68	4-chlorotoluene	1.984	8.15	0.15	0.15
69	tert-butylbenzene	1.988	8.76	0.15	0.14
70	1,2,4-trimethylbenzene	2.044	19.08	0.15	0.13
71	sec-butylbenzene	2.611	15.32	0.15	0.13
72	p-isopropyltoluene	2.061	R=0.999	0.15	0.10
73	1,3-dichlorobenzene	1.509	2.43	0.15	0.18
74	1,4-dichlorobenzene	1.573	5.17	0.15	0.21
75	n-butylbenzene	1.989	10.80	0.15	0.15

Analyte	Compound	Avg RF	% RSD	Detection Limit Std (ppb)	Detected (ppb)
76	hexachloroethene	0.347	9.12	0.15	0.14
77	1,2-dichlorobenzene	1.468	5.78	0.15	0.19
78	1,2-dichlorobenzene-d4 (ss)	1.011	3.19	20	21.59
79	1,2-Dibromo-3-chloropropane	0.210	15.62	0.15	0.18
80	hexachlorobutadiene	0.554	11.16	0.15	0.22
81	1,2,4-trichlorobenzene	0.695	5.04	0.15	0.20
82	naphthalene	1.744	8.72	0.15	0.16
83	1,2,3-trichlorobenzene	0.695	5.04	0.15	0.20

Initial Demonstration of Proficiency

2014.s 30-Jun-16	10 ppb (true concentration)							Precision	Accuracy
	VOA032	VOA033	VOA034	VOA035	VOA036	VOA037	VOA038		
	IDC 1	IDC 2	IDC 3	IDC 4	IDC 5	IDC 6	IDC 7		
								<= 20 %	+ - 20%
1,4-Difluorobenzene	20	20	20	20	20	20	20	0.00	100.00
Dichlorodifluoromethane	7.14	8.22	7.71	7.91	8.76	8.68	8.71	7.49	81.61
Chlorodifluoromethane	7.43	8.78	8.16	8.2	9.8	9.43	9.94	10.70	88.20
Chloromethane	8.45	8.73	8.37	8.46	10.01	9.52	10.14	8.50	90.97
Vinyl chloride	8.2	8.03	8.04	8.36	9.95	9.82	10.35	11.43	89.64
1,3-Butadiene	7.92	7.68	7.64	7.74	9.36	9.31	9.61	10.72	84.66
Bromomethane	8.2	7.99	8.01	8.18	9.64	9.55	10.12	10.39	88.13
Trichlorofluoromethane	8.33	8.03	7.72	7.91	9.1	9.29	9.43	8.33	85.44
Ethyl ether	8.56	8.88	8.82	8.71	10.94	10.8	11.65	13.38	97.66
1,1-Dichloroethene	8.75	8.51	8.52	8.56	9.92	10.37	10.77	10.49	93.43
Carbon disulfide	8.74	8.72	8.46	8.51	9.89	10.18	10.56	9.51	92.94
Methyl iodide	8.82	8.86	8.79	8.87	10.27	10.42	11.1	10.18	95.90
Allyl chloride	9.08	9.05	8.87	8.8	10.26	10.97	11.37	11.04	97.71
Methylene chloride	8.37	8.44	8.24	8.28	9.33	10.09	10.44	10.28	90.27
trans-1,2-Dichloroethene	8.83	8.99	8.72	8.84	10.04	10.79	11.22	10.84	96.33
Methyl acetate	9.36	9.89	9.67	9.63	11.1	12.29	12.17	11.83	105.87
Methyl tert-butyl ether-d3	18.76	19.04	18.78	19.18	21.85	22.79	24.1	10.79	103.21
Methyl tert-butyl ether	9.09	9.2	9.04	9.07	10.39	10.99	11.7	11.07	99.26
tert-Butyl alcohol	9.31	9.42	9.4	9.55	10.65	11.19	11.91	10.25	20.41
Diisopropyl ether	9.11	9.27	9.26	9.18	10.53	10.88	11.93	11.02	100.23
1,1-Dichloroethane	9.28	9.28	9.05	9.07	10.38	10.68	11.29	9.20	98.61
tert-Butyl ethyl ether	9.31	9.42	9.4	9.55	10.65	11.19	11.91	10.25	102.04
cis-1,2-Dichloroethene	9.29	9.14	9.12	9.09	10.19	10.65	10.7	7.64	97.40
Bromochloromethane	9.24	9.3	9.49	9.24	8.78	10.35	10.76	7.30	95.94
Chloroform	9.45	9.35	9.11	9.01	8.81	10.24	10.75	7.41	95.31
Carbon tetrachloride	9.39	9.13	8.85	8.8	8.9	10.07	10.19	6.23	93.33
Tetrahydrofuran	8.86	10.11	10.12	10.21	11	13.15	12.1	13.27	107.93
1,1,1-Trichloroethane	8.92	8.81	8.5	8.61	8.33	9.73	9.9	6.80	89.71
1,1-Dichloropropene	9.11	9.18	9.1	9.24	8.84	10.45	11.09	8.85	95.73
1-Chlorobutane	9.56	9.72	9.51	9.35	8.89	10.66	11.13	7.97	98.31
Benzene	9.73	9.81	9.73	9.84	9.07	11.11	11.09	7.57	100.54
tert-Amyl methyl ether	9.97	10.16	10.15	10.07	9.97	11.67	10.86	6.11	104.07
1,2-Dichloroethane	9.78	9.73	9.64	9.4	8.66	11.13	9.11	7.98	96.36
Trichloroethene	9.51	9.88	9.64	9.64	9.44	9.81	9.65	1.60	96.53
tert-Amyl ethyl ether	9.74	9.83	9.8	9.77	9.75	9.27	9.98	2.26	97.34
Dibromomethane	9.8	9.79	9.77	9.46	8.97	9.09	9.61	3.62	94.99
1,2-Dichloropropane	9.6	9.54	9.78	9.45	8.79	8.95	9.41	3.83	93.60
Bromodichloromethane	9.98	9.75	9.71	9.55	9.07	8.94	9.61	3.95	95.16
cis-1,3-Dichloropropene	9.36	9.61	9.49	9.59	11.23	9.41	9.57	6.75	97.51
Chlorobenzene-d5	20	20	20	20	20	20	20	0.00	100.00
Toluene	9.69	9.62	9.64	9.87	12.04	9.95	8.54	10.60	99.07
Tetrachloroethene	11.54	11.83	11.79	12.43	11.44	11.97	9.57	7.94	115.10
trans-1,3-Dichloropropane	9.81	9.85	9.74	9.94	9.65	10.11	8.37	6.00	96.39
1,1,2-Trichloroethane	9.99	9.98	10.1	10.2	9.79	9.85	8.32	6.61	97.47
Ethyl methacrylate	9.98	10.09	10.28	10.75	10.2	10.58	9.23	4.83	101.59
Chlorodibromomethane	9.75	9.78	9.62	9.61	9.46	9.6	8.06	6.43	94.11
1,3-Dichloropropane	9.71	9.62	9.55	9.88	9.29	9.66	8.11	6.35	94.03
1,2-Dibromoethane	9.58	9.66	9.33	9.57	9.47	9.65	7.97	6.50	93.19
Chlorobenzene	10	9.88	9.78	9.85	9.54	9.81	9.9	1.46	98.23
Ethylbenzene	10.1	10.08	9.88	10.13	9.94	10.13	10.14	1.03	100.57
1,1,1,2-Tetrachloroethene	10.06	9.55	9.81	9.56	9.49	9.67	9.63	2.03	96.81
m,p-Xylenes	21.51	21.29	21.22	21.53	21.25	21.87	21.19	1.14	107.04
o-Xylene	10.63	10.64	10.22	11	10.96	11.15	9.49	5.41	105.84
Styrene	11.05	10.8	10.91	11	11.17	11.42	9.84	4.61	108.84
Bromoform	10.06	10.41	10.08	10.14	10.41	10.2	8.66	6.06	99.94
Isopropylbenzene	10.6	10.83	10.64	10.93	10.96	11.17	9.46	5.28	106.56
1,4-Dichlorobenzene-d4	20	20	20	20	20	20	20	0.00	100.00
4-Bromofluorobenzene	20.07	19.15	19.48	20.18	19.49	16.97	19.61	5.59	96.39
Bromobenzene	9.53	9.01	9.02	9.38	9.32	8.11	9.15	5.14	90.74

Initial Demonstration of Proficiency (continued)

	VOA032	VOA033	VOA034	VOA035	VOA036	VOA037	VOA038	Precision	Accuracy
	IDC 1	IDC 2	IDC 3	IDC 4	IDC 5	IDC 6	IDC 7	% RSD ≤ 20 %	% Recovery ± 20%
n-Propylbenzene	9.93	9.62	9.53	9.92	9.59	8.4	9.53	5.43	95.03
1,1,2,2-Tetrachloroethane	8.88	8.82	8.86	8.6	8.66	7.32	8.71	6.46	85.50
2-Chlorotoluene	10.67	9.29	9.4	9.63	9.47	8.59	10.34	7.17	96.27
1,3,5-Trimethylbenzene	10.76	10.37	10.54	10.65	10.59	9.17	10.51	5.23	103.70
1,2,3-Trichloropropane	9.86	9.33	9.41	9.5	9.06	7.87	9.17	6.85	91.71
4-Chlorotoluene	10.19	9.93	9.91	10.04	11.21	8.65	10.1	7.47	100.04
tert-Butylbenzene	9.49	9.16	9.18	9.37	9.53	8.11	9.6	5.56	92.06
1,2,4-Trimethylbenzene	11.1	10.67	10.9	11.02	11.1	9.56	10.92	5.08	107.53
sec-Butylbenzene	10.74	10.49	10.4	10.46	10.46	9.17	10.57	5.06	103.27
p-Isopropyltoluene	8.56	8.45	8.53	8.69	8.65	8.91	8.55	1.74	86.20
1,3-Dichlorobenzene	9.78	9.73	9.64	9.8	9.57	9.71	9.58	0.95	96.87
1,4-Dichlorobenzene	9.7	9.43	9.29	9.51	9.18	9.5	9.36	1.79	94.24
n-Butylbenzene	9.78	9.68	9.58	9.9	9.85	10.45	9.95	2.83	98.84
Hexachloroethane	9.47	9.17	9.52	9.28	9.57	9.38	9.32	1.51	93.87
1,2-Dichlorobenzene-d4	19.96	19.46	19.48	19.64	19.76	19.76	19.67	0.88	98.38
1,2-Dichlorobenzene	9.83	9.55	9.46	9.44	9.42	9.61	9.33	1.72	95.20
1,2-Dibromo-3-chloropropane	9.09	9.36	9.46	8.93	8.84	8.52	9.51	4.01	91.01
Hexachlorobutadiene	8.77	8.96	8.94	8.38	9.05	7.94	8.72	4.54	86.80
1,2,4-Trichlorobenzene	9.75	9.83	10.78	9.66	10.16	9.56	10.3	4.33	100.06
Naphthalene	9.99	10.55	11.27	10.57	10.89	10.28	11.02	4.14	106.53
1,2,3-Trichlorobenzene	9.75	9.83	10.78	9.66	10.16	9.56	10.3	4.33	100.06

Calibration Acceptance Data

	VOA014.D		VOA015.D		VOA016.D		VOA017.D		VOA018.D		VOA019.D		VOA020.D	
	30-Jun-16		VSTD001		VSTD002		VSTD005		VSTD010		VSTD020		VSTD040	
	5ML		5ML		5ML		5ML		5ML		5ML		5ML	
[Results Signal 1]	5ML 0.5PPB	0.5PPB	5ML 1PPB	5ML 1PPB	5ML 2PPB	5ML 2PPB	5ML 5PPB	5ML 5PPB	10PPB 524	10PPB 524	20PPB 524	20PPB 524	40PPB 524	40PPB 524
	524 STD	524 STD	524 STD	524 STD	524 STD	524 STD	524 STD	524 STD	STD	STD	STD	STD	STD	STD
1,4-Difluorobenzene	5	100%	5	100%	5	100%	5	100%	5	100%	5	100%	5	100%
Dichlorodifluoromethane	0.55	110%	0.96	96%	2.03	102%	5.07	101%	10.08	101%	21.4	107%	36.76	92%
Chlorodifluoromethane	0.5	100%	0.98	98%	1.95	98%	4.75	95%	11	110%	21.68	108%	35.19	88%
Chloromethane	0.53	106%	0.99	99%	1.97	99%	4.7	94%	10.72	107%	21.16	106%	35.95	90%
Vinyl chloride	0.51	102%	1	100%	1.94	97%	4	80%	11.14	111%	21.79	109%	36.53	91%
1,3-Butadiene	0.53	106%	1.01	101%	1.82	91%	0.44	9%	11.06	111%	21.77	109%	36.99	92%
Bromomethane	0.58	116%	0.99	99%	1.87	94%	4.57	91%	10.99	110%	20.69	103%	35.44	89%
Trichlorofluoromethane	0.51	102%	0.92	92%	1.95	98%	4.45	89%	11.17	112%	22.06	110%	35.9	90%
Ethyl ether	0.48	96%	1.01	101%	1.85	93%	4.82	96%	11.09	111%	22.44	112%	39.03	98%
1,1-Dichloroethene	0.48	96%	1	100%	1.91	96%	4.55	91%	11.07	111%	21.91	110%	36.72	92%
Carbon disulfide	0.51	102%	0.96	96%	1.87	94%	4.79	96%	10.94	109%	22.38	112%	36.84	92%
Methyl iodide	0.46	92%	0.98	98%	1.88	94%	4.72	94%	11.07	111%	22.95	115%	38.9	97%
Allyl chloride	0.49	98%	0.89	89%	1.78	89%	4.71	94%	11.2	112%	23.29	116%	40.64	102%
Methylene chloride	1.32	264%	1.66	166%	2.49	125%	4.73	95%	10.23	102%	19.53	98%	31.94	80%
trans-1,2-Dichloroethene*	0.51	102%	1	100%	1.95	98%	4.79	96%	11	110%	22.45	112%	34.28	86%
Methyl acetate	0.45	90%	1.04	104%	2.07	104%	4.59	92%	10.54	105%	22.27	111%	33.59	84%
Methyl tert-butyl ether-d3	19.42	97%	19.2	96%	19	95%	18.79	94%	22.78	114%	23.19	116%	17.62	88%
Methyl tert-butyl ether	0.5	100%	1	100%	1.93	97%	4.63	93%	11.2	112%	22.67	113%	33.93	85%
tert-Butyl alcohol	0.51	102%	0.91	91%	1.77	18%	4.51	18%	10.96	22%	24.19	24%	39.06	20%
Diisopropyl ether	0.48	96%	0.87	87%	1.79	90%	4.7	94%	11.15	112%	22.98	115%	42.88	107%
1,1-Dichloroethane	0.48	96%	1.01	101%	1.95	98%	4.89	98%	10.81	108%	22.06	110%	35.92	90%
tert-Butyl ethyl ether	0.46	92%	0.91	91%	1.77	89%	4.51	90%	10.96	110%	24.19	121%	39.06	98%
cis-1,2-Dichloroethene	0.51	102%	1	100%	1.89	95%	4.81	96%	10.49	105%	21.76	109%	36.44	91%
Bromochloromethane	0.52	104%	1	100%	1.93	97%	4.89	98%	11.25	113%	20.73	104%	34.35	86%
Chloroform	0.52	104%	1.03	103%	1.95	98%	4.82	96%	11.09	111%	20.84	104%	33.48	84%
Carbon tetrachloride	0.54	108%	1.08	108%	1.94	97%	4.93	99%	11.31	113%	20.45	102%	34.6	87%
Tetrahydrofuran	0.49	98%	0.94	94%	1.9	95%	4.66	93%	11.95	120%	21.55	108%	41.15	103%
1,1,1-Trichloroethane	0.5	100%	1.06	106%	1.84	92%	4.68	94%	10.79	108%	21.38	107%	37.5	94%
1,1-Dichloropropene	0.45	90%	0.93	93%	1.81	91%	4.66	93%	10.82	108%	22.08	110%	45.79	114%
1-Chlorobutane	0.44	88%	0.93	93%	1.84	92%	4.79	96%	10.82	108%	21.52	108%	45.75	114%
Benzene	0.46	92%	1	100%	2.01	101%	5.01	100%	9.73	97%	20.17	101%	43.98	110%
tert-Amyl methyl ether	0.42	84%	0.89	89%	1.85	93%	4.87	97%	10.16	102%	22.21	111%	49.61	124%
1,2-Dichloroethane	0.51	102%	1.08	108%	2.05	103%	5.03	101%	9.25	93%	18.62	93%	40.72	102%
Trichloroethene	0.48	96%	1.08	108%	2.04	102%	4.97	99%	9.79	98%	19.99	100%	38.73	97%
tert-Amyl ethyl ether	0.49	98%	0.99	99%	1.85	93%	4.87	97%	9.63	96%	20.58	103%	45.94	115%
Dibromomethane	0.55	110%	1.1	110%	2.04	102%	4.88	98%	9.7	97%	19.4	97%	34.45	86%
1,2-Dichloropropane	0.56	112%	1.1	110%	2.08	104%	4.92	98%	9.49	95%	18.62	93%	34.94	87%
Bromodichloromethane	0.53	106%	1.07	107%	2.01	101%	5.08	102%	9.81	98%	19.53	98%	35.49	89%
cis-1,3-Dichloropropene	0.53	106%	1.05	105%	1.88	94%	4.89	98%	9.98	100%	20.33	102%	38.75	97%

Calibration Acceptance Data (continued)

	VOA014.D		VOA015.D		VOA016.D		VOA017.D		VOA018.D		VOA019.D		VOA020.D	
	30-Jun-16		VSTD001		VSTD002		VSTD005		VSTD010		VSTD020		VSTD040	
	5ML		5ML		5ML		5ML		5ML		5ML		5ML	
	5ML 0.5PPB	0.5PPB	5ML 1PPB	5ML 1PPB	5ML 2PPB	5ML 2PPB	5ML 5PPB	5ML 5PPB	10PPB 524	10PPB 524	20PPB 524	20PPB 524	40PPB 524	40PPB 524
[Results Signal 1]	524 STD	524 STD	524 STD	524 STD	524 STD	524 STD	524 STD	524 STD	STD	STD	STD	STD	STD	STD
Chlorobenzene-d5	20	100%	20	100%	20	100%	20	100%	20	100%	20	100%	20	100%
Toluene	0.5	100%	0.95	95%	1.79	90%	4.77	95%	10.19	102%	21.72	109%	43.97	110%
Tetrachloroethene	0.41	82%	1.01	101%	1.99	100%	4.57	91%	10.62	106%	22.71	114%	43.02	108%
trans-1,3-Dichloropropane	0.46	92%	0.95	95%	1.81	91%	4.96	99%	10.22	102%	21.71	109%	44.78	112%
1,1,2-Trichloroethane	0.48	96%	1.01	101%	2.04	102%	5.02	100%	9.98	100%	20.41	102%	39.49	99%
Ethyl methacrylate	0.46	92%	0.86	86%	1.75	88%	4.52	90%	10.65	107%	23.03	115%	49.27	123%
Chlorodibromomethane	0.44	88%	0.97	97%	1.96	98%	4.83	97%	12.01	120%	20.29	101%	39.6	99%
1,3-Dichloropropane	0.49	98%	0.97	97%	1.87	94%	4.79	96%	11.95	120%	19.64	98%	39.43	99%
1,2-Dibromoethane	0.48	96%	0.99	99%	1.91	96%	4.88	98%	11.8	118%	19.4	97%	38.84	97%
Chlorobenzene	0.5	100%	1.02	102%	1.93	97%	4.97	99%	10.2	102%	20.28	101%	39.15	98%
Ethylbenzene	0.45	90%	0.98	98%	1.83	92%	4.87	97%	10.28	103%	21.97	110%	44.05	110%
1,1,1,2-Tetrachloroethene	0.51	102%	1.05	105%	2.02	101%	5.05	101%	9.63	96%	19.79	99%	38.63	97%
m,p-Xylenes	0.83	83%	1.62	81%	3.57	89%	10.14	101%	22.25	111%	47.33	118%	92.97	116%
o-Xylene	0.39	78%	0.85	85%	1.7	85%	5.01	100%	11.05	111%	23.59	118%	49.66	124%
Styrene	0.41	82%	0.76	76%	1.55	78%	5.06	101%	11.3	113%	25	125%	50.52	126%
Bromoform	0.43	86%	1	100%	1.91	96%	4.89	98%	10.5	105%	21.08	105%	43.23	108%
Isopropylbenzene	0.4	80%	0.79	79%	1.69	85%	4.97	99%	11.31	113%	24.35	122%	49.84	125%
1,4-Dichlorobenzene-d4	20	100%	20	100%	20	100%	20	100%	20	100%	20	100%	20	100%
4-Bromofluorobenzene	20.73	104%	20.53	103%	20.11	101%	20.01	100%	19.41	97%	19.66	98%	19.55	98%
Bromobenzene	0.55	110%	1.05	105%	2.06	103%	4.97	99%	9.34	93%	19.44	97%	36.97	92%
n-Propylbenzene	0.48	96%	0.96	96%	1.94	97%	4.05	81%	10.03	100%	21.47	107%	42.03	105%
1,1,2,2-Tetrachloroethane	0.59	118%	1.09	109%	2.16	108%	4.93	99%	9.13	91%	17.9	90%	34.35	86%
2-Chlorotoluene	0.49	98%	0.93	93%	1.88	94%	5.3	106%	10.72	107%	20.61	103%	39.91	100%
1,3,5-Trimethylbenzene	0.41	82%	0.84	84%	1.73	87%	5.17	103%	11.08	111%	23.55	118%	46.45	116%
1,2,3-Trichloropropane	0.56	112%	1.07	107%	2.06	103%	4.95	99%	9.44	94%	19.07	95%	36.59	91%
4-Chlorotoluene	0.45	90%	0.93	93%	1.83	92%	5.18	104%	10.37	104%	22.08	110%	42.86	107%
tert-Butylbenzene	0.49	98%	0.89	89%	1.77	89%	5.1	102%	10.38	104%	21.95	110%	43.76	109%
1,2,4-Trichlorobenzene	0.39	78%	0.82	82%	1.66	83%	4.96	99%	11.38	114%	24.4	122%	48.46	121%
sec-Butylbenzene	0.4	80%	0.83	83%	1.82	91%	5.19	104%	11.01	110%	23.4	117%	46.1	115%
p-Isopropyltoluene	0.31	62%	0.65	65%	1.34	67%	4.01	80%	9.28	93%	19.95	100%	40.38	101%
1,3-Dichlorobenzene	0.51	102%	1.04	104%	1.99	100%	4.98	100%	9.89	99%	19.99	100%	38.44	96%
1,4-Dichlorobenzene	0.53	106%	1.08	108%	1.98	99%	5.02	100%	9.69	97%	19.58	98%	37.09	93%
n-Butylbenzene	0.44	88%	0.92	92%	1.7	85%	4.86	97%	10.7	107%	22.6	113%	45.17	113%
Hexachloroethane	0.53	106%	1.11	111%	2.12	106%	5.16	103%	9.67	97%	18.65	93%	33.75	84%
1,2-Dichlorobenzene-d4	20.93	105%	20.46	102%	20.41	102%	19.7	99%	19.93	100%	19.46	97%	19.1	96%
1,2-Dichlorobenzene	0.53	106%	1.07	107%	2.06	103%	5	100%	9.84	98%	19.12	96%	36.24	91%
1,2-Dibromo-3-chloropropane	0.63	126%	1.17	117%	2.02	101%	4.55	91%	9	90%	17.67	88%	34.71	87%
Hexachlorobutadiene	0.61	122%	1.05	105%	2.03	102%	4.82	96%	9.74	97%	18.53	93%	34.3	86%
1,2,4-Trichlorobenzene	0.53	106%	0.99	99%	1.97	99%	4.71	94%	10.7	107%	19.92	100%	38.11	95%
Naphthalene	0.5	100%	0.91	91%	1.8	90%	4.69	94%	10.6	106%	21.74	109%	44.38	111%
1,2,3-Trichlorobenzene	0.53	106%	0.99	99%	1.97	99%	4.71	94%	10.7	107%	19.92	100%	38.11	95%