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CONTENT

1 INTRODUCTION

In November 2008 the Finnish Environment Institute (SYKE) carried out the proficiency test for the analysis of oil hydrocarbons and volatile organic compounds (VOC) in water and soil. The test was carried out in accordance with the international guidelines, ISO/IEC Guide 43 1 [1], ILAC Requirements [2], ISO 13528 [3] and IUPAC Recommendations [4]. The SYKE laboratory has been accredited by the Finnish Accreditation Service as a proficiency testing provider (PT01, www.mikes.fi).

2 ORGANIZING OF THE PROFICIENCY TEST

2.1 Responsibilities

Organizing laboratory:
Finnish Environment Institute (SYKE), Laboratory
Hakuninmaantie 6, 00430 Helsinki, Finland
Phone: +358 20 610 123
Fax: +358 9 495 913

Subcontractors:

Pirkanmaa Regional Environment Centre: Homogenisation and subsampling of soil
Ramboll Analytics Oy: Testing of oil hydrocarbons in water samples.

The responsibilities in organizing the proficiency test were as follows:

Kaija Korhonen, coordinator
Pirjo Sainio, analytical expert (Oil hydrocarbons)
Jari Nuutinen, analytical expert (VOC)
Anne Markkanen, technical assistent
Helena Tanttu, technical assistant
Markku Ilmakunnas, layout of the report

2.2 Participants

In total, 24 laboratories (Appendix 1) from Estonia, Finland, Latvia, Norway and Sweden participated in this proficiency test. Most laboratories analysed oil hydrocarbons in water and 15 laboratories analysed oil hydrocarbons in soil. VOC compounds or at least some of VOC compounds in water and/ or soil were analysed by 14 laboratories. The accredited method used 12 laboratories for oil hydrocarbon analysis in water and 11 for oil hydrocarbon analysis in soil, 9 laboratories for VOC analysis in water and 7 laboratories for VOC analysis in soil. The organizing laboratory (SYKE) has the code 1 in the result tables.

2.3 Samples and their delivery

The preparation of the samples is presented in Appendix 2.

The artificial samples (A1O and A1V) as well as the addition oil solution L1 for the water sample G2O were commercial standard solutions diluted to the final concentration.

The soil sample taken on an oil contaminated site close to Tampere was dried at room temperature and diluted with uncontaminated soil. Both the contaminated and uncontaminated soil samples were mixed thoroughly and sieved . The fractions of 0.25–0.5 mm were taken to mixing. The mixed soil sample was distributed in sub samples using a rotary sample divider equipped with vibratory sample feeder.

The samples were delivered 18 November 2008. They were requested to be analysed and reported at the latest 3 December 2008.

The samples and the requested measurands were as follows:

Sample code	**Measurand**	**Date of analysis**
A1O	Concentration of oil hydrocarbons (C10–C40) in hexane, mg/ml	Before 28 Nov. 2008
G2O	Concentration of oil hydrocarbons (C10–C40) in groundwater, mg/l	Before 28 Nov. 2008
S3O	Concentration of oil hydrocarbons (C10–C40) in soil, mg/kg	Before 28 Nov. 2008
A1V	VOC compounds in methanol, µg/ml	Before 28 Nov. 2008
G2V	VOC in groundwater, µg/l	19–20 Nov. 2008
S3V	VOC in soil, mg/kg	Before 28 Nov. 2008

2.4 Homogeneity and stability studies

Homogeneity of the sample S3O was tested by analysing oil hydrocarbons as duplicate determinations from seven sub samples (Appendix 3). According to the homogeneity test results the samples S3O were considered to be homogenous.

Homogeneities of the sample G2V and the sample of S3V were tested by analysing tetrachloroethene, 1,2-dichlorobenzene, o-xylene and MTBE as duplicate determinations from seven sub samples (Appendix 3). Both samples were considered to be homogenous.

The stabilities of the samples A1O, A1V, L1 and S3V were checked during the sample transport to the participants. The sample vials were weighed at SYKE before the delivering and reweighed at the participating laboratory after the receiving. The differences of these two measurements should be < 0.5 %. In one case the lost of the sample A1V was over the limit and a new sample was sent to the laboratory.

The stability test was carried out for the groundwater sample G2V. Some of the samples were stored at the room temperature and the others in cool over night. The samples were analysed 20 November (Appendix 4). Because no significant loss of analytes was obtained the samples could be regarded stable.

Stability test was carried out also for the artificial sample A1V and the soil sample S3V (Appendix 4). According to the test the increased temperature did not cause significant chance in the sample S3V. The test results of the sample A1V were inconsistent. The losses of the samples A1V during the transport were less than 0.5 % whereas according to the stability test some analytes could change over the limit. However, when the samples were stored at different temperatures the measured results were within the

daily variation of the method and as well as the variation between the bottles. In addition, in every case the temperature of the received samples were lower than the test temperature. So, the conclusion was that the samples could be regarded stable.

2.5 Comments sent by the participants

Appendix 5 contains the comments sent by the participants. One laboratory sent a comment that the coordinator should give more detailed instruction how to handle soil samples preserved with methanol. It is not allowed that the provider gives analytical guidelines during the test, but in the letter should be express more clearly that the initial data of the sample given in the sample letter are available for calculation.

2.6 Processing of the data

2.6.1 Testing of outliers and normality of the data

Before the statistical treatment, the data was tested according to the Kolmogorov-Smirnov normality test and the possible extreme values were rejected as the outliers according to the Hampel test. Also before the robust calculation some outliers were rejected in case that the results deviated from the robust mean over 50 %.

2.6.2 Assigned value

The assigned values and their uncertainties are presented in Appendix 6. The calculated concentrations were used as the assigned values for most measurands in the artificial and soil samples. The uncertainty given is the expanded combined uncertainty based on the combination of uncertainties associated with individual operations involved in the preparation of the sample. The main individual resource of the uncertainty was the uncertainty of the concentration in the stock solution.

The robust means of the reported results were used as the assigned value for the measurands in the water samples and for some measurands in soil. However, the indicative assigned value was used instead of the assigned value when the uncertainty of the assigned value was higher than 20 % (ETBE, DIPE). The uncertainty of the assigned value was calculated using the robust standard deviation of the reported results as follows:

$$U\% = \frac{100 \times \left(\frac{2 \times 1.25 \times s_{rob}}{\sqrt{n}} \right)}{AV}$$

where:

AV = the assigned value
U% = the expanded uncertainty of the assigned value
s_{rob} = the robust standard deviation
n = the number of the results

The uncertainty of the calculated assigned value for oil hydrocarbons in the artificial sample A1O was 3.2 % and the uncertainties of the calculated assigned values for VOCs in the artificial sample A1V was less than 1 %. When the robust mean of the results reported by the participants was used as the assigned value the uncertainties of the assigned values varied from 3.3 % to 16 %.

Only the assigned values for o-xylene in the sample G2V changed a little (4.63 µg/l → 4.57 µg/l) from the value reported in the preliminary results. However, the variation had no significant effect on the performance of the laboratories.

2.6.3 Target value for total deviation and z score

The performance evaluation was carried out by using the z scores (Appendix 9). The target value for the total deviation used for calculation of the z scores was estimated on basis of the type of the sample, the concentration of the analyte, the results of homogeneity testing and the uncertainties of the assigned values. z scores were interpreted as follows:

$\lvert z \rvert \leq 2$	satisfactory results
$2 < \lvert z \rvert < 3$	questionable results
$\lvert z \rvert \geq 3$	unsatisfactory results

The calculated z scores of each participant are presented in Appendix 7.

The reliability of the assigned value was tested according the criterion $u/s_t \leq 0.3$, where u is the standard uncertainty (U/2) of the assigned value and s_t the target value (target value for total deviation/2). The criterion was not fulfilled in every case, which indicated that the following assigned values had high uncertainty:

- A1V: TAME
- G2V: benzene, chlorobenzene, CCl_4, $CHCl_3$, ethylbenzene, MTBE, TCE e m+p-xylene
- S3O: oil hydrocarbons

However, the ratio u/s_t was always < 0.7 if the result was evaluated (DIPE, ETBE, see 3.1).

The reliability of the target value for total deviation and the same time the reliability of the corresponding z score were estimated by comparing the target value (s_t) with the robust standard deviation of the reported results (s_{rob}). Due to low number of the results the criterion $s_{rob} < s_t$ was not fulfilled in most cases, which weakened the evaluation of performance.

3 RESULTS AND CONCLUSIONS

3.1 Results

The results and the performance of each laboratory are presented in Appendix 7 and the summary of the results in Table 1. The reported results and their uncertainties are presented graphically in Appendix 8.

Table 1. Summary of the proficiency test 8/2008.

Analyte	Sample	Unit	Ass. val.	Mean	Mean rob.	Md	SD rob	SD rob, %	Num. of labs	2*Targ SD%	Accepted z-val%
Min-oil-GC	A1O	mg/ml	3,02	2.99	2.95	2.93	0.27	9.2	19	20	84
	G2O	mg/l	0,319	0.31	0.32	0.32	0.052	16,2	22	30	82
	S3O	mg/kg	317	315.57	317.42	320.00	59.13	18,6	15	30	79
VOC-111TCEa	A1V	µg/ml	0,426	0,45	0.45	0.45	0.098	21,6	13	20	67
VOC-1122TeCEa	A1V	µg/ml	0,426	0.36	0.39	0.40	0.071	18.1	8	20	75
VOC-11DCEa	A1V	µg/ml	0,426	0.43	0.44	0.44	0.051	11,7	11	20	82
VOC-11DCEe	A1V	µg/ml	0,426	0.47	0.50	0.47	0.17	34,4	11	20	45
VOC-124TCB	A1V	µg/ml	0,77	0.83	0.80	0.82	0.15	18,7	8	20	75
	G2V	µg/l	4,24	4.07	4.24	4.19	0.29	6,9	8	25	88
	S3V	mg/kg	1,91	1.82	2.05	2.05	0.55	26,7	8	30	75
VOC-12DCB	A1V	µg/ml	0,789	0.72	0.79	0.78	0.17	21,5	7	20	67
	G2V	µg/l	3,21	3.23	3.21	3.17	0.12	3,8	8	25	88
	S3V	mg/kg	1,96	2.25	2.04	2.03	0.36	17.5	8	30	63
VOC-12DCEa	A1V	µg/ml	0,426	0.42	0.41	0.42	0.051	12,3	12	20	67
	G2V	µg/l	6,3	6.21	6.30	6.30	0.54	8.6	12	25	92
	S3V	mg/kg	1,06	0.98	0.98	0.99	0.19	18,8	11	30	82
VOC-Benzene	A1V	µg/ml	1,78	1.86	1.86	1.85	0.12	6,5	14	20	79
	G2V	µg/l	8,37	8.44	8.37	8.30	1.15	13,7	14	25	93
	S3V	mg/kg	4,42	4.58	4.65	4.64	0.94	20,2	14	30	79
VOC-c12DCEe	A1V	µg/ml	1,79	1.81	1.82	1.80	0.14	7,6	12	10	83
	G2V	µg/l	10,6	10.64	10.76	10.69	0.85	7.9	12	25	100
	S3V	mg/kg	4,45	4.43	4.47	4.67	0.85	19	11	30	82
VOC-CB	G2V	µg/l	5,2	5.19	5.20	5.09	0.83	15,9	12	25	92
VOC-CCl4	A1V	µg/ml	0,426	0.48	0.47	0.48	0.090	19,2	14	20	69
	G2V	µg/l	5,12	4.88	5.12	5.17	0.84	16,5	14	25	77
	S3V	mg/kg	1,06	1.13	1.09	1.07	0.18	16,8	12	30	73
VOC-CHBr3	A1V	µg/ml	0,426	0.45	0.44	0.45	0.032	7.2	10	25	90
VOC-CHCl3	A1V	µg/ml	0,426	0.45	0.44	0.45	0.062	13,9	14	20	85
	G2V	µg/l	5,89	5.91	5.89	6.07	0.85	14,5	14	25	92
	S3V	mg/kg	1,06	0.96	1.03	1.04	0.26	24,8	12	30	82
VOC-DIPE	A1V	µg/ml	1,5	1.27	1.20	1.14	0.26	21,4	3		
	G2V	µg/l	6,13	6.13	6.13	6.30	0.80	13.1	3		
	S3V	mg/kg	3,73	3.14	2.82	2.77	0.30	10,7	3		
VOC-Et.benzene	A1V	µg/ml	1,75	1.84	1.80	1.82	0.30	16,7	14	20	64
	G2V	µg/l	6,41	6.56	6.41	6.56	0.98	15,3	14	25	86
	S3V	mg/kg	4,36	4.83	4.43	4.60	0.90	20,4	14	30	79
VOC-ETBE	A1V	µg/ml	2,86	2.67	3.10	3.12	1.38	44,7	5		
	G2V	µg/l	5,51	5.55	5.51	5.06	2.33	42,3	5		
	S3V	mg/kg	7,1	6.49	6.49	7.73	2.05	31,6	5		
VOC-m/p-Xylene	A1V	µg/ml	5,02	4.93	4.54	4.75	1.17	25,7	14	20	57
	G2V	µg/l	10,75	10.35	10.75	10.70	2.22	20,6	14	25	79
	S3V	mg/kg	12,48	11.70	12.08	12.57	2.48	20,5	14	30	71
VOC-MTBE	A1V	µg/ml	4,12	4.34	4.56	4.35	0.86	18,8	10	20	50
	G2V	µg/l	16,14	16.10	16.14	16.25	2.52	15,6	10	25	70
	S3V	mg/kg	10,23	10.71	11.25	10.80	1.23	11	10	30	80
VOC-o-Xylene	A1V	µg/ml	1,52	1.65	1.58	1.60	0.20	12,4	14	20	71
	G2V	µg/l	4,57	4.63	4.57	4.47	0.37	8	14	25	85
	S3V	mg/kg	3,78	3.80	3.91	4.01	0.52	13,2	14	30	79
VOC-Styrene	A1V	µg/ml	1,89	1.83	1.82	1.79	0.39	21,1	9	20	56
VOC-t12DCEe	A1V	µg/ml	0,426	0.46	0.45	0.45	0.076	16,8	11	20	73
VOC-TAME	A1V	µg/ml	3,42	3.45	3.42	3.38	0.54	15,8	10	20	60
	G2V	µg/l	12,2	11.76	12.15	12.25	1.13	9,3	10	25	70
	S3V	mg/kg	8,26	7.85	8.26	8.12	0.74	9	10	30	80
VOC-TCEe	A1V	µg/ml	1,94	1.79	1.80	1.80	0.37	20,5	14	20	71
	G2V	µg/l	5,32	5.51	5.32	5.65	1.08	20,2	14	25	85
	S3V	mg/kg	4,84	4.55	4.63	4.67	0.89	19,2	12	30	75
VOC-TeTCEe	A1V	µg/ml	3,87	3.79	3.84	3.79	0.70	18,2	14	20	71
	G2V	µg/l	9,99	10.28	9.99	9.80	1.70	17	14	25	79
	S3V	mg/kg	9,63	9.39	9.41	9.61	2.01	21,3	12	30	83
VOC-Toluene	A1V	µg/ml	3,55	3.76	3.71	3.71	0.32	8.6	14	20	79
	G2V	µg/l	9,31	9.39	9.31	9.20	1.00	10,7	14	25	100
	S3V	mg/kg	8,83	8.95	9.23	9.32	1.32	14,3	14	30	79
VOC-VIN	A1V	µg/ml	0,426	0.47	0.51	0.51	0.16	32,4	9	20	44

where

Ass. val. the assigned value
Mean the mean value
Mean rob the robust mean
Md the median value
SD % the standard deviation as percent
SD rob the robust standard deviation
SD rob % the robust standard deviation as percents
Num of Labs the number of the participants
2*Targ. SD% the target value for total deviation at the 95% confidence interval
Accepted z-val% the satisfactory z values: the results (%), where $|z| \leq 2$.

Table 2. Results of the replicate determinations (ANOVA statistics) PT 8/2008.

Analyte	Sample	Unit	Ass. val.	Mean	Md	sw	sb	st	sw %	sb %	st %	2*Targ SD %	Num of labs	Accepted. z-val %
Min-oil-GC	A1O	mg/ml	3,02	2,99	2,93	0,103	0,253	0,273	3,5	8,5	9,1	20	19	84
	S3O	mg/kg	317	315	340	18,5	65,2	67,8	5,9	21	22	30	14	79
VOC-111TCEa	A1V	µg/ml	0,426	0,448	0,453	0,0216	0,0919	0,0944	4,8	20	21	20	12	67
VOC-1122TeCEa	A1V	µg/ml	0,426	0,365	0,4	0,0163	0,105	0,106	4,5	29	29	20	8	75
VOC-11DCEa	A1V	µg/ml	0,426	0,426	0,425	0,0193	0,0517	0,0552	4,5	12	13	20	11	82
VOC-11DCEe	A1V	µg/ml	0,426	0,475	0,42	0,0426	0,14	0,147	9	30	31	20	11	45
VOC-124TCB	A1V	µg/ml	0,77	0,834	0,82	0,0446	0,198	0,203	5,3	24	24	20	8	75
	G2V	µg/l	4,24	4,06	4,19	0,215	0,568	0,607	5,3	14	15	25	8	88
	S3V	mg/kg	1,91	1,82	2,04	0,112	0,632	0,642	6,1	35	35	30	8	75
VOC-12DCB	A1V	µg/ml	0,789	0,716	0,772	0,0187	0,176	0,177	2,6	25	25	20	6	67
	G2V	µg/l	3,21	3,23	3,21	0,113	0,176	0,209	3,5	5,4	6,4	25	8	88
	S3V	mg/kg	1,96	2,15	2,03	0,0594	1,29	1,29	2,8	60	60	30	8	62
VOC-12DCEa	A1V	µg/ml	0,426	0,424	0,42	0,0331	0,077	0,0838	7,8	18	20	20	12	67
	G2V	µg/l	6,3	6,2	6,3	0,26	0,781	0,823	4,2	13	13	25	12	92
	S3V	mg/kg	1,06	0,984	0,988	0,0402	0,12	0,127	4,1	12	13	30	11	82
VOC-Benzene	A1V	µg/ml	1,78	1,86	1,85	0,0338	0,103	0,108	1,8	5,5	5,8	20	14	79
	G2V	µg/l	8,37	8,44	8,3	0,303	1,16	1,2	3,6	14	14	25	14	93
	S3V	mg/kg	4,42	4,68	4,64	0,262	0,726	0,772	5,6	16	17	30	14	79
VOC-c12DCEe	A1V	µg/ml	1,79	1,81	1,8	0,0406	0,206	0,21	2,2	11	12	10	12	83
	G2V	µg/l	10,8	10,6	10,9	0,433	0,956	1,05	4,1	9	9,9	25	12	100
	S3V	mg/kg	4,45	4,43	4,67	0,168	0,636	0,658	3,8	14	15	30	11	82
VOC-CB	G2V	µg/l	5,2	5,16	5,09	0,129	0,749	0,76	2,5	15	15	25	12	92
VOC-CCl4	A1V	µg/ml	0,426	0,477	0,477	0,0227	0,119	0,121	4,8	25	25	20	13	69
	G2V	µg/l	5,12	4,88	5,09	0,223	1,17	1,19	4,6	24	24	25	13	77
	S3V	mg/kg	1,06	1,13	1,07	0,053	0,207	0,214	4,7	18	19	30	11	73
VOC-CHBr3	A1V	µg/ml	0,426	0,446	0,448	0,0247	0,0607	0,0656	5,5	14	15	25	10	90
VOC-CHCl3	A1V	µg/ml	0,426	0,446	0,45	0,0436	0,0427	0,0611	9,8	9,6	14	20	13	85
	G2V	µg/l	5,89	5,89	6,07	0,244	0,804	0,84	4,1	14	14	25	13	92
	S3V	mg/kg	1,06	0,962	1,02	0,0471	0,269	0,273	4,9	28	28	30	11	82
VOC-DIPE	A1V	µg/ml	1,5	1,27	1,14	0,0254	0,348	0,349	2	27	28		3	
	G2V	µg/l	6,13	6,13	6,3	0,183	0,7	0,724	3	11	12		3	
	S3V	mg/kg	3,73	3,14	2,77	0,0746	0,816	0,819	2,4	26	26		3	
VOC-Et.benzene	A1V	µg/ml	1,75	1,84	1,85	0,12	0,194	0,228	6,5	11	12	20	14	64
	G2V	µg/l	6,41	6,49	6,61	0,302	0,968	1,01	4,7	15	16	25	14	86
	S3V	mg/kg	4,36	4,75	4,6	0,175	2,32	2,33	3,7	49	49	30	14	79
VOC-ETBE	A1V	µg/ml	2,86	2,87	2,75	0,0624	0,976	0,978	2,3	37	37		5	
	G2V	µg/l	5,51	5,55	5,06	0,25	2,12	2,14	4,5	38	38		5	
	S3V	mg/kg	7,1	6,49	6,57	0,273	1,8	1,82	4,2	28	28		5	
VOC-m/p-Xylene	A1V	µg/ml	5,02	4,93	5,05	0,297	0,535	0,612	6	11	12	20	14	57
	G2V	µg/l	10,8	10,3	10,7	0,846	2,75	2,88	8,2	27	28	25	14	79
	S3V	mg/kg	12,5	11,9	12,6	0,397	2,44	2,48	3,3	21	21	30	14	71
VOC-MTBE	A1V	µg/ml	4,12	4,34	4,3	0,121	1	1,01	2,8	23	23	20	10	50
	G2V	µg/l	16,1	16,1	16,3	0,618	2,91	2,96	3,8	18	18	25	10	70
	S3V	mg/kg	10,2	10,7	10,7	0,624	1,78	1,89	5,8	17	18	30	10	80
VOC-o-Xylene	A1V	µg/ml	1,52	1,65	1,61	0,0698	0,209	0,22	4,2	13	13	20	14	71
	G2V	µg/l	4,57	4,6	4,56	0,184	0,613	0,64	4	13	14	25	13	85
	S3V	mg/kg	3,78	3,85	4,01	0,145	0,525	0,544	3,8	14	14	30	14	79
VOC-Styrene	A1V	µg/ml	1,89	1,83	1,79	0,0592	0,567	0,57	3,2	31	31	20	9	56
VOC-t12DCEe	A1V	µg/ml	0,426	0,462	0,451	0,0172	0,107	0,108	3,7	23	23	20	11	73
VOC-TAME	A1V	µg/ml	3,42	3,45	3,38	0,16	0,372	0,405	4,7	11	12	20	10	80
	G2V	µg/l	12,2	11,8	12,3	0,389	1,59	1,63	3,3	13	14	25	10	70
	S3V	mg/kg	8,26	7,85	8	0,427	1,26	1,33	5,4	16	17	30	10	80
VOC-TCEe	A1V	µg/ml	1,94	1,79	1,8	0,0636	0,449	0,454	3,5	25	25	20	14	71
	G2V	µg/l	5,32	5,54	5,65	0,201	1,43	1,44	3,6	26	26	25	13	85
	S3V	mg/kg	4,84	4,55	4,67	0,182	0,828	0,848	4	18	19	30	12	75
VOC-TeTCEe	A1V	µg/ml	3,87	3,79	3,79	0,171	0,657	0,679	4,5	17	18	20	14	71
	G2V	µg/l	9,99	10,2	9,8	0,359	2,03	2,06	3,5	20	20	25	14	79
	S3V	mg/kg	9,63	9,39	9,71	0,527	1,36	1,46	5,6	14	16	30	12	83
VOC-Toluene	A1V	µg/ml	3,55	3,76	3,76	0,0831	0,205	0,221	2,2	5,5	5,9	20	14	79
	G2V	µg/l	9,31	9,36	9,2	0,285	1,1	1,13	3	12	12	25	14	100
	S3V	mg/kg	8,83	9,11	9,34	0,452	1,34	1,41	5	15	16	30	14	79
VOC-VIN	A1V	µg/ml	0,426	0,471	0,495	0,021	0,161	0,163	4,5	34	35	20	9	44

Ass. val. - assigned value, Md - median, sw - repeatability standard error, sb - standard error between laboratories, st - reproducibility standard error

The variation of oil hydrocarbon results (robust standard deviation) from the synthetic sample A1O was 9.2 %, from the ground water samples 16.2 % and from the soil samples 18.6 %. The deviations of the results in this test were less than in the previous respective proficiency test SYKE 2/2006 [11] where the deviations varied from 7.2 % to 35 %.

The deviations in the results of aromatic compounds varied from 6.5 % to 25.7 % and in the results of chlorinated compounds from 3.8 % to 34.4 %. The high deviation of the results from the synthetic sample indicated possible calibration problems in the determination of 1,1-dichloroethene and vinylchloride. As well, there seemed to be some problems in the determination of ETBE because the deviations of the results of all samples were high (31.6–44.7 %). The deviations of the results of other oxygenates were between 9 and 21.4 %.

The participants were requested to report the analytical replicate results. The results of the replicate determinations (ANOVA statistics) are presented in Table 2. The repeatability (within-laboratory standard deviation, s_w) in this proficiency test varied from 3.5 % to 5.9 % in the determination of oil hydrocarbons, from 2 % to 5.8 % in the determination of oxygenates, from 1.8 % to 8.2 % in the determination of aromatics and 1.8 % to 9.8 % in the determination of chlorinated hydrocarbons. Respectively the reproducibility (between-laboratory standard deviation, s_b) varied in oil analysis from 8.5 % to 21 %, in oxygenate analysis from 11 % to 38 %, in the analysis of aromatics from 5.5 % to 49 % and in analysis of chlorinated compounds from 5.4 % to 60 %. The ratio s_b/s_w, the robustness of the methods, was mainly higher than 3 and in several cases even higher than 5. The ratio s_b/s_w should be between 2×3 for robust methods. Explanations to terms used in the result tables are given in Appendix 9.

3.2 Analytical methods

The analytical methods used by the participants are presented in Appendix 10.1.

Oil hydrocarbons in water
Most laboratories determined oil hydrocarbons in water using the method that based on the standard EN ISO 9322-2 [5]. The water sample was extracted with hexane, pentane or heptane. Polar substances were removed by clean-up on Florisil and the purified aliquot was analysed by GC/FID. One laboratory used the standard method ISO 11423-2 [6] and two laboratories the IR method based on the withdrawn standard SFS 3010. Before the method comparison the results were coded by coordinator as follows:

- Method 1: based on EN ISO 9322-2, extraction by stirring
- Method 2: based on EN ISO 9322-2, extraction by shaking
- Method 3: based on ISO 11423-2
- Method 4: based on withdrawn SFS 3010
- Method 5: unspecified extraction technique or in house method

Based on method comparison no significant difference could be obtained between the methods (Appendix 10.2).

Oil hydrocarbons in soil
Most laboratories used the method based on the standard ISO 16703 [7]. Soil sample was extracted with acetone/hexane, hexane or heptanes. The extract was purified on Florisil column and the aliquot was analysed using GC/FID.
Before the method comparison the results were coded by coordinator as follows:

- Method 1: based on ISO 16703, extraction by shaking
- Method 2: based on ISO 16703, extraction by sonication

- Method 3: Nordtest TR 329
- Method 3: unspecified in house method

Based on method comparison no significant difference could be obtained between the methods (Appendix 10.2).

VOC compounds in water

VOC compound were determined using the methods based on several standards [8–12]. Before the method comparison the results were coded by coordinator as follows:

- Method 1: headspace or purge and trap + GC/MS or MS
- Method 2: headspace + GC/PID
- Method 2: liquid/liquid extraction + GC/ECD
- Method 3: unspecified technique

No significant difference could be obtained between the methods (Appendix 10.2).

VOC compounds in soil

Before method comparison the results were coded by coordinator as follows:

- Method 1: extraction with methanol (preservation solvent)
- Method 2: methanol changed to other solvent
- Method 3: unspecified solvent

No significant difference could be obtained between the methods (Appendix 10.2).

3.3 Uncertainties of the results

Most laboratories reported the expanded uncertainties with their results (Appendix 8). The reported uncertainties varied especially in the analysis of water samples (Table 3). Most laboratories estimated uncertainties using the data of validation and internal quality control (Meth 3). Estimation method did not explain the high variation between uncertainties. All reported uncertainties of 1,2-dichlorobetzene measurement in the groundwater (G2V) were estimated by using Method 3 giving range 9–100 % (Appendix 11). It is evident that harmonization in the estimation of uncertainties should be necessary.

Table 3. The ranges of the reported uncertainties in the analysis of water and soil samples

Compounds	**Uncertainties in water analysis, %**	**Uncertainties in soil analysis, %**
Oil hydrocarbons	3.2-42	9-40
Oxygenates	10-100	15-55
Aromatics	7-100	10-55
Chlorinated compounds	10-100	10-55

4 EVALUATION OF PERFORMANCE

The evaluation of the participants based on z scores which were calculated using the estimated target values for the total deviation. The estimation of the target value based on the type of sample, the concentration of the analyte in the sample, the results of homogeneity and stability tests and uncertainty of the assigned value.

The calculated z scores are presented with the results of each participant (Appendix 7) and the summary of z scores is presented in Appendix 12.

Accepting the deviations of 10–20 % from the assigned values for artificial samples 84 % of the oil hydrocarbon results, 65 % of the oxygenate results (MTBE and TAME), 65 % of the results of aromatic compounds and 72 % of the results of chlorinated compounds were satisfactory.

Consequently, when in the analysis of groundwater samples the deviations of 25–30 % from the assigned values were accepted 82 % of the oil hydrocarbon results, 78 % of the oxygenate results, 89 % of the results of aromatic compounds and 88 % of the results of chlorinated hydrocarbon were satisfactory.

Accepting the deviations of 30 % from the assigned values for the soil samples 79 % of the oil hydrocarbon results, 80 % of the oxygenate results and 74 % of the results both aromatic and chlorinated compounds were satisfactory.

In total, 77 % of the total data in this proficiency test were satisfactory. About the half of the participants used accredited methods and 75 % of their results were satisfactory. SYKE arranged a respective proficiency test in 2006 [13] and then the satisfactory results were 74 %.

5 SUMMARY

The Finnish Environment Institute carried out the proficiency test for the analysis of oil hydrocarbons and volatile organic compounds (VOC) in water and soil in November 2008. In total, 24 laboratories participated in the proficiency test. One artificial sample, one groundwater sample and one soil sample were delivered to the laboratories and depending on the sample type 15–22 laboratories analyzed oil hydrocarbons and 3–14 laboratories VOC compounds.

The calculated concentrations or the robust mean of the results reported by the participant were used as the assigned values for measurands. The uncertainties of the calculated assigned values were mainly less than 1 % except for oil hydrocarbons it was 3.2 %. Respectively the uncertainties of the consensus assigned values (the robust mean) were from 3.3 % to 16 %.

The evaluation of the performance of the participants was carried out using z score. Due to the low number of the participants DIPE and ETBE results could not be evaluated. In total, 77 % of the total data in this proficiency test were satisfactory when the deviations of 10–30 % from the assigned values were accepted. About the half of the participants used accredited methods and 75 % of their results were satisfactory.

6 YHTEENVETO

Suomen ympäristökeskus järjesti pätevyyskokeen öljyhiilivetyjen ja haihtuvien orgaanisten yhdisteiden määrityksistä vesi- ja maanäytteistä marraskuussa 2008. Vesi- ja maanäytteiden lisäksi osallistujille toimitettiin synteettinen näyte. Pätevyyskokeeseen osallistui yhteensä 24 laboratorioita, joista näytteestä riippuen 15–22 laboratoriota analysoi öljyhiilivedyt ja 3–14 laboratoriota VOC-yhdisteet.

Mittaussuureen vertailuarvona käytettiin laskennallista pitoisuutta (teoreettinen arvo) tai osallistujien raportoimien tulosten keskiarvoa (sopimusarvo). Synteettisen öljyhiilivetynäytteen A1O pitoisuus oli 3.02 mg/ml ja sen laajennettu epävarmuus oli 3,2 % (95 %:n luottamusväli). VOC-yhdisteiden teoreettisten vertailuarvojen laajennetut epävarmuudet olivat alle 1 %. Yhdisteestä ja raportoitujen tulosten hajonnasta riippuen vertailuarvon laajennettu epävarmuus oli 3,3–16 %, kun vertailuarvona käytettiin sopimusarvoa.

Tuloksia arvioitiin z-arvon avulla, joka laskettiin etukäteen asetetun hajonnan tavoitearvon avulla. Tavoitehajontaa asetettaessa otettiin huomioon mittaussuureen pitoisuus, vertailuarvon mittausepävarmuus sekä näytteen homogeenisuustestin tulokset. Vähäisestä osallistujamäärästä johtuen DIPE- ja ETBE-tuloksia ei voitu arvioida.

Synteettisten näytteiden tuloksissa sallittiin 10–20 %:n poikkeama vertailuarvosta. Tällöin öljyhiilivetytuloksista hyväksyttäviä oli 84 %, öljyn lisäaineiden tuloksista (MTBE ja TAME) 65 %, aromaattisten yhdisteiden tuloksista 67 % ja kloorattujen hiilivetyjen tuloksista 72 %.

Vesinäytteiden tuloksissa sallittiin 25–30 %:n poikkeama vertailuarvosta, jolloin öljyhiilivetytuloksista oli hyväksyttäviä 82 %, öljyn lisäainetuloksista 78 %, aromaattisten yhdisteiden tuloksista 89 % ja kloorattujen hiilivetyjen tuloksista 88 %.

Maanäytteen tulosten sallittiin poiketa vertailuarvosta 30 %, jolloin hyväksyttäviä öljyhiilivetytuloksia oli 79 %, öljyn lisäaineiden tuloksia 80 % ja sekä aromaattisten hiilivetyjen että kloorattujen hiilivetyjen tuloksia 77 %.

Tässä pätevyyskokeessa koko aineistossa hyväksyttäviä tuloksia oli yhteensä 77 %. Noin puolet laboratorioista käytti akkreditoituja määritysmenetelmiä ja näistä tuloksista hyväksyttäviä oli 75 %. SYKE järjesti vastaavan pätevyyskokeen v. 2006, jolloin koko aineistossa hyväksyttäviä tuloksia oli 74 %.

7 REFERENCES

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5 EN ISO 9377-2:2000. Water quality – Determination of hydrocarbon oil index. Part2: Method using solvent extraction and gas chromatography.

6 ISO 11423-2:1997, Water quality - Determination of benzene and some derivatives - Part 2: Method using extraction and gas chromatography

7 ISO 16703:2004 Soil quality - Determination of content of hydrocarbon in the range C10 to C40 by gas chromatograph.

8 ISO 22155:2005. Soil quality – Gas chromatographic quantitative determination of volatile aromatic and halogenated hydrocarbons and selected ethers – Static headspace method.

9 ISO 10301:1997, Water quality – Determination of highly volatile halogenated hydrocarbons – Gas chromatographic methods

10 ISO 11423-1:1997, Water quality - Determination of benzene and some derivatives - Part 1: Head-space gas chromatographic method

11 ISO 15009:2002. Soil quality – Gas chromatographic determination of the content of volatile aromatic hydrocarbons, naphthalene and volatile halogenated hydrocarbons – Purge-and-trap method with thermal desorption.

12 ISO 15680:2003. Water quality – Gas-chromatographic determination of number of monocyclic aromatic hydrocarbons, naphthalene and several chlorinated compounds using purge and trap and thermal desorption.

13 Mäkinen, I., Sainio, P. and Nuutinen, J.. 2006. SYKE Proficiency test 2/2006 – Volatile organic compounds and mineral oils from water and polluted soil. Reports of Finnish Environment Institute 10/2006. Helsinki.

APPENDIX 1 PARTICIPANTS IN THE PROFICIENCY TEST 8/2008

AnalyCen AS, Moss, Norway
Borealis Polymers Oy, Laboratoriopalvelut, Analyyttinen ryhmä, Kulloo, Finland
Ekokem Oy Ab, Riihimäki, Finland
Estonian Environmental Research Center, Tallinn, Estonia
Eurofins Environment Sweden AB, Lidköping, Sweden
Eurofins Norge As, Drammen, Norway
Eurofins Scientific Finland Oy, Tampere, Finland
Finnish Environment Institute, SYKE, Helsinki, Finland
Golder Associates Oy, Helsinki, Finland
Jyväskylän yliopisto, ympäristön tutkimuskeskus, Jyväskylä, Finland
Karlshamn Kraft AB, Karlshamn, Sweden
Laboratoriet SSAB Tunnplåt AB, Borlänge, Sweden
Lapin Vesitutkimus Oy, Rovaniemi, Finland
NabLabs Ympäristöanalytiikka Oy, Oulu, Finland
Neste Oil Oyj, analytiikan laboratorio/Vesilaboratorio, Porvoo, Finland
Novalab Oy, Karkkila, Finland
Outokumpu Tornio Works, Tornio, Finland
Pirkanmaan ympäristökeskus, Tampere, Finland
Ramboll Analytics Oy, Lahti, Finland
Rautaruukki Oyj, Ruukki Metals, Kehitysosasto, Prosessilaboratorio, Hämeenlinna, Finland
Rautaruukki Oyj, Ruukki Metals, Raahe, Finland
SGS Inspection Services Oy, Hamina, Finland
SIA “Vides Audits”, Riika, Latvia
Tavastlab, Hämeenlinna, Finland

APPENDIX 2 PREPARATION OF THE SAMPLES

Oil hydrocarbons (C10–C40)

Sample A1O

Solutions	Preparation
Diesel oil + Lubricating oil (BAM K008+BAM-K009)	300.40 mg oil in 99.5 ml of hexane => 3.02 mg/ml

The vial A1O (1.5 ml) was sent to the participant.

Sample G2O; L1 (the standard mixture for analysis of the water sample G2O)

Solutions	Preparation
I Diesel oil (BAM-K008)	3000.50 mg oil in 45.3 ml of hexan => 60.87 mg/ml
II Lubricating oil (BAM KS-K009)	3003.60 mg oil in 55.5 ml of hexane => 54.08 mg/ml
L1	2.0 ml I + 4.0 ml II into 100 ml of isopropanol => 3.396 mg/ml
G2O	100 µl of L1 into 1 litre of water => 0.340 mg/l

The vial L1 (1.5 ml) was sent to the participant. The final water sample GO2 was prepared at the participating laboratory by adding 100 µl of the solution L1 into the 1 l of the water sample G2O.

Sample S3O

The sample was taken on an oil contaminated site close to Tampere. The sample was dried at room temperature and diluted with uncontaminated dried soil. The mixed sample was sieved and 0.25–0.5 mm fraction was taken to mixing. The sample was mixed by a mechanized sample mixer and distributed into sub samples of ca. 50 g using a rotary sample divider equipped with vibratory sample feeder.

APPENDIX 2 PREPARATION OF THE SAMPLES (continues)

Volatile organics

Step 1 Individual stock solutions were prepared by weighting methanol (10 ml) and 0.08–0.18 g of the pure compound into a vial. The concentrations of the analytes in the individual stock solutions are presented in the column B (table below). In addition the commercial standard solution QTM Volatile Halocarbons Mix (Supelco, uncertainty +/- 0.5%) was used (column C).

Step 2 The addition solution 1 for the samples A1V and S3V was prepared by weighting different amounts (0.3–1.2 g) of the individual stock solutions and 0.8 g of the stock solution QTM mix (column D).

Step 3 The addition solution 2 for the sample G2V was prepared by weighting different amounts of the individual stock solutions (column B) and the stock solution QTM mix into methanol (column C) into methanol (column E).

Step 4 The sample A1V sample was prepared by diluting 1,54 g of the addition solution 1 with 74.82 g of methanol (column F).

Step 5 The sample G2V was prepared by diluting the addition solution 2 with methanol and the dilution was added into the ground water (30 l) (column G).

Step 6 The sample S3V was prepared by adding 4 ml of water and 1 ml of the addition solution 1 into the 20 g of dried soil. The sample S3V was preserved with 20 ml methanol (column H).

Concentrations of oxygenates and aromatic organics in the samples A1V, G2V and S3V

Compound, **Producer, purity**	Column B **Individual stock solution, mg/ml**	Column C **Stock solution mix, QTM**	Column D **Addition solution 1, mg/ml**	Column E **Addition solution 2, mg/ml**	Column F **A1V µg/ml**	Column G **G2V µg/l**	Column H **S3V mg/kg**
ETBE Fluka > 97 %	13.771	-	0.142	0.502	2.858	4.90	7.10
DIPE Fluka 99,7 %	14.078	-	0,075	0,748	1.500	7.30	3.73
MTBE Sigma Aldrich 99,8 %	12.961	-	0.205	1.641	4.115	16.0	10.23
TAME Aldrich ≥ 97 %	12.798	-	0.133	1.082	2.684	10.6	6.67
Benzene Fluka 99.9 %	16.963	-	0.088	1.000	1.779	9.76	4.42
Ethylbenzene Fluka > 99,5 %	17.160	-	0.087	0.852	1.754	8.31	4.36
Styrene Alrich > 99 %	17.934	-	0.094	-	1.886	-	4.69
Toluene Fluka 99.9 %	17.107	-	0.177	1.137	3.552	11.1	8.83
o-Xylene Fluka 99.5 %	17.336	-	0.076	0.569	1.520	5.55	3.78
m-Xylene Fluka 99.5 %	17.026	-	0.250	1.463	5.018	14.3	12.48

APPENDIX 2 PREPARATION OF THE SAMPLES (continues)

Concentrations of halogenated hydrocarbons in the samples A1V, G2V and S3V

Compound, **Producer, purity**	Column B **Individual stock solution, mg/ml**	Column C **Stock solution QTM**	Column D **Addition solution 1, mg/ml**	Column E **Addition solution 2, mg/ml**	Column F **A1V**	Column G **G2V**	Column H **S3V**
Bromoform Supelco	-	2.001	0.0212	-	0.426	-	
Carbontetra-chloride Supelco	-	2.000	0.0212	-	0.426	6.77	1.06
Chlorobenzene Fluka, 99,7 %	11.07	-	-	0,645	-	6.30	-
Chloroform Supelco	-	2.000	0.0212	-	0.426	6.77	1.06
1.2-Dichloro-benzene Fluka, 99,9 %	8.635	-	0.0390	0.352	0.789	3.43	1.96
1,1-Dichloroethane Supelco	-	2.002	0.0212	-	0.426	-	-
1,2-Dichloroethane QTM	-	2.000	0.0212	-	0.426	6.77	1.06
1,1-Dichloroethene Supelco	-	2.001	0.0212	-	0.426	-	-
cis-1,2-Dichloroethene Fluka, < 97 % Supelco	14.991	2.000	0.0680	0.691	1.789	13.5	4.45
trans-1,2-Dichloroethene Supelco	-	2.002	0.0212	-	0.426	6.78	-
1,2,4-Trichlorobenzene Fluka, 99,5 %	8.094	-	0.0380	0.479	0.770	4.67	1.91
1,1,1-Trichloroethane Supelco	-	2.000	0.0212	-	0.426	-	-
Trichloroethene Fluka, > 99.9 % Supelco	14.07	2.001	0.0970	-	1.945	6.78	4.84
1,1,2,2-Tetrachloroethane Supelco	-	2.002	0.0212	-	0.426	-	-
Tetrachloroethene Fluka, > 99.9 % Supelco	16.186	1.998	0.0192	0.656	3.873	13.2	9.63
Vinylchloride Supelco	-	2.000	0.0212	-	0.426	-	-

APPENDIX 3 TESTING OF HOMOGENEITY

The homogeneity of the samples G2V, S3V and S3O were tested by analysing seven sub samples.

Analyte/sample	Conc.	s_t%	s_t	s_a	s_a/s_t	Was s_a/s_t <0.5?	s_{bb}	s_{bb}^2	c	Was s_{bb}^2<c?
Oil hydrocarbons/S3O	293 mg/kg	15	44	7.4	0.17	yes	2.71	7.3	419	yes
MTBE/G2V	17.2 µg/l	12.5	2.15	7.4	0.13	yes	0.35	0.12	0.94	yes
MTBE/S3V	10.1 mg/kg	15	1.52	0.29	0.21	yes	0.25	0.06	0.54	yes
o-Xylene/G2V	5.5 µg/l	12.5	0.69	0.31	0.09	yes	0.20	0.04	0.09	yes
o-Xylene/S3V	4.0 mg/kg	15	0.60	0.06	0.11	yes	0.05	>0.01	0.07	yes
1,2-Dichlorobenzene/G2V	3.6 µg/l	12.5	0.45	0.07	0.06	yes	0.09	>0.01	0.04	yes
1,2-Dichlorobenzene/S3V	2.1 mg/kg	15	0.31	0.03	0.11	yes	0.02	>0.01	0.02	yes
Tetrachloroethene/G2V	12.6 µg/l	12.5	1.56	0.03	0.13	yes	0.49	0.24	0.50	yes
Tetrachloroethene/S3V	10.3 mg/kg	15	1.55	0.20	0.26	yes	0.28	0.08	0.63	yes

Conc. = Concentration
s_t = target deviation, total target deviation/2
s_t% = target deviation as percent, total target deviation/2
s_a = analytical deviation, mean standard deviation of results in a sub sample
s_{bb} = between-sample deviation, standard deviation of results between sub samples
$c = F1 \bullet s_{all}^2 + F2 \bullet s_a^2$
where:

$s_{all}^2 = (0.3 s_t)^2$
F1 = 2.01 when the number of sub samples is 7
F2 = 1.25 when the number of sub samples is 7

In each case $s_a/s_t < 0.5$ and $s_{bb}^2 < c$.

Conclusion: The samples were considered homogenous.

APPENDIX 4. TESTING OF STABILITY

The samples were distributed 18 November 2008 and they were asked to analyse as follows:

- volatile organics in water (G2V) 19– 20 November 2008
- volatile organics in the samples A1V and S3V before 28 November 2008
- oil hydrocarbons in all samples before 28 November 2008

Oil hydrocarbons

Sample	Date	Result mg/ml	Calculated con-centration
A1O	23 Oct. 2008	3.06 mg/ml	3.02
	20 Nov. 2008	3.11mg/ml	
G2O	5 Nov. 2008	0.32 mg/l	0.34
	20 Nov. 2008	0.31 mg/ml	
S3O	8 Oct. 2008	293 mg/kg	
	26 Nov. 2008	297 mg/kg	

Volatile organics, sample A1V

Analyte/ µg/ml	Assigned value	18 Nov	Test at 20 degrees	Test at 4 degrees	D	$0,3*s_t$	Was $\|D\| < 0,3*s_t$
ETBE	2.860	2.257	2.519	2.403	-0.116	0.086	no
DIPE	1.500	1.067	1.202	1.141	-0.061	0.045	no
MTBE	4.120	4.198	4.453	4.295	-0.158	0.124	no
TAME	3.420	3.097	3.359	3.247	-0.112	0.103	no
Benzene	1.780	1.895	1.979	1.918	-0.061	0.053	no
Ethylbentzene	1.750	1.907	1.953	1.913	-0.040	0.053	yes
Styrene	1.890	1.996	2.061	2.026	-0.035	0.057	yes
Toluene	3.550	3.797	3.895	3.794	-0.101	0.107	yes
m/p-Xylene	5.020	5.088	5.238	5.119	-0.119	0.151	yes
o-Xylene	1.520	1.660	1.703	1.665	-0.038	0.046	yes
Bromoform	0.426	0.494	0.454	0.448	-0.007	0.013	yes
Carbontetrachloride	0.426	0.479	0.488	0.467	-0.020	0.013	no
Chloroform	0.426	0.455	0.476	0.454	-0.022	0.013	no
1,2-Dichlorobenzene	0.789	0.907	0.937	0.892	-0.045	0.024	no
1,1-Dichloroethane	0.426	0.456	0.473	0.457	-0.016	0.013	no
1,2-Dichloroethane	0.426	0.459	0.463	0.448	-0.015	0.013	no
1,1-Dichloroethene	0.426	0.500	0.517	0.524	0.007	0.013	yes
cis-1,2-Dichloroethene	1.790	1.917	2.022	1.936	-0.086	0.054	yes
trans-1,2-Dichloroethene	0.426	0.432	0.467	0.454	-0.013	0.013	no
1,2,4-Trichlorobenzene	0.770	0.940	0.937	0.925	-0.012	0.023	yes
1,1,1-Trichloroethane	0.426	0.460	0.465	0.452	-0.013	0.013	yes
Trichloroethene	1.940	1.968	2.086	2.018	-0.068	0.058	no
1,1,2,2-Tetrachloroethane	0.426	0.470	0.456	0.437	-0.018	0.013	no
Tetrachloroethene	3.870	4.093	4.098	4.004	-0.094	0.116	yes
Vinylchloride	0.426	0.546	0.548	0.495	-0.053	0.013	no

The stability test samples were analysed 20 November 2008. All results in the samples stored at the temperature 20 degrees were higher than stored at the 4 degrees. However, when the samples were stored at different temperatures the measured results were within the daily variation of the method and as well as the variation between the bottles. In addition, during the transport the losses of samples A1V were lower than 0.5 %.
Conclusion: The samples were considered homogenous.

Volatile organics, sample G2V

Analyte/ µg/l	Assigned value	18 Nov.	Test at 20 degrees	Test at 4 degrees	D	$0,3*s_t$	Was $\|D\| < 0,3*s_t$
ETBE	5.51	4.23	4.10	4.01	-0.09	0.25	yes
DIPE	6.13	5.63	5.52	5.37	-0.15	0.28	yes
MTBE	16.14	17.76	17.06	16.57	-0.50	0.73	yes
TAME	12.20	13.46	13.09	12.69	-0.40	0.55	yes
Benzene	8.37	10.36	9.68	8.85	-0.83	0.38	no
Ethylbentzene	6.41	7.95	7.32	6.77	-0.55	0.29	no
Toluene	9.31	11.32	10.61	9.80	-0.80	0.42	no
m/p-Xylene	10.75	15.60	14.98	14.16	-0.82	0.48	no
o-Xylene	4.57	5.51	5.17	4.84	-0.33	0.21	no
Carbontetrachloride	5.12	6.86	6.13	5.47	-0.65	0.23	no
Chloroform	5.89	7.18	6.78	6.34	-0.44	0.27	no
1,2-Dichlorobenzene	3.21	3.60	3.46	3.26	-0.21	0.14	no
1,2-Dichloroethane	6.30	7.53	7.17	6.69	-0.47	0.28	no
cis-1,2-Dichloroethene	10.80	13.48	12.46	11.73	-0.73	0.49	no
1,2,4-Trichlorobenzene	4.24	4.66	4.46	4.20	-0.26	0.19	no
Trichloroethene	5.32	7.12	6.36	5.81	-0.55	0.24	no
Tetrachloroethene	9.99	12.18	11.38	10.29	-1.08	0.45	no

The stability test samples were analysed 20 November 2008. All results in the samples stored at the temperature 20 degrees were higher than stored at the 4 degrees. However, it is not obvious that any significant water evaporation has occurred during transport.

Conclusion: Any significant loss of analytes has not occurred during transport.

Organic volatiles, sample S3V

Analyte/ mg/kg	Assigned value	18 Nov.	Test at 20 degrees	Test at 4 degrees	D	$0,3*s_t$	Was $\|D\| < 0,3*s_t$
ETBE	7.10	5.48	5.891	5.700	-0.19	0.32	yes
DIPE	3.73	2.59	2.696	2.594	-0.10	0.17	yes
MTBE	10.23	10.45	10.806	10.494	-0.31	0.46	yes
TAME	8.26	7.62	8.009	7.737	-0.27	0.37	yes
Benzene	4.42	4.54	4.726	4.635	-0.09	0.20	yes
Ethylbentzene	4.36	4.47	4.675	4.676	0.00	0.20	yes
Toluene	8.83	9.12	9.531	9.588	0.06	0.40	yes
o-Xylene	3.78	3.95	4.075	4.068	-0.01	0.17	yes
m/p-Xylene	12.48	12.08	12.657	12.754	0.10	0.56	yes
Carbontetrachloride	1.06	1.12	1.064	1.028	-0.04	0.05	yes
Chloroform	1.06	1.08	0.864	0.846	-0.02	0.05	yes
1,2-Dichlorobenzene	1.06	2.07	2.021	2.011	-0.01	0.05	yes
1,2-Dichloroethane	1.06	1.12	0.951	0.933	-0.02	0.05	yes
cis-1,2-Dichloroethene	4.45	4.56	4.791	4.721	-0.07	0.20	yes
1,2,4-Trichlorobenzene	1.91	2.07	2.107	2.069	-0.04	0.09	yes
Trichloroethene	4.84	4.71	5.047	5.011	-0.04	0.22	yes
Tetrachloroethene	9.63	9.56	9.892	10.255	0.36	0.43	yes

The stability test samples were analysed 27 November 2008.

s_t = the target value

D = the difference of the result at the temperatures 4 degrees and 20 degrees

Conclusion: Soil samples were considered stabile.

APPENDIX 5 COMMENTS SENT BY THE PARTICIPANTS

Lab	Comment	Action/SYKE
8	Laboratory wondered whether methanol and water phase should be poured out before weighing the solid sample.	The weigh of the sample and all other information for calculation of the results had been given in the sample letter. It is not allowed that the provider gives analytical guidelines during the test, but in the letter should be express more clearly that the initial data of the sample given in the sample letter are available for calculation.
24	In the calculation of the results for the sample S3V we included 4 ml of water and 21 ml of MeOH (altogether 25 ml). During our analytical method 1,1,2,2-tetrachloroethane in the sample A1V mainly decomposes into TCE_e.	

APPENDIX 6 ASSIGNED VALUES AND THEIR UNCERTAINTIES

Oil hydrocarbons, oxygenates and aromatic hydrocarbons:

Analyte	Sample	Assigned value	Unit	Estimation of assigned value	Uncertainty ($U = 2\ u_c$) %
Mineral oils	A1O	3.02	mg/ml	Calculated	3.2
	G2O	0.319	mg/l	Robust mean	8.7
	S3O	317	mg/kg	Robust mean	12
ETBE	*A1V*	*2.86*	*µg/ml*	*Calculated*	-
	G2V	*5.51*	*µg/l*	*Robust mean*	-
	S3V	*7.1*	*mg/kg*	*Robust mean*	-
DIPE	*A1V*	*1.5*	*µg/ml*	*Calculated*	-
	G2V	*6.13*	*µg/l*	*Robust mean*	-
	S3V	*3.73*	*mg/kg*	*Robust mean*	-
MTBE	A1V	4.12	µg/ml	Calculated	<1
	G2V	16.14	µg/l	Robust mean	12
	S3V	10.23	mg/kg	Calculated	<1
TAME	A1V	3.42	µg/ml	Robust mean	16
	G2V	12.2	µg/l	Robust mean	7.4
	S3V	8.26	mg/kg	Robust mean	8.9
Benzene	A1V	1.78	µg/ml	Calculated	<1
	G2V	8.37	µg/l	Robust mean	9.2
	S3V	4.42	mg/kg	Calculated	<1
Ethylbenzene	A1V	1.75	µg/ml	Calculated	<1
	G2V	6.41	µg/l	Robust mean	<10
	S3V	4.36	mg/kg	Calculated	<1
Styrene	S2	1.89	µg/ml	Calculated	<1
Toluene	A1V	3.55	µg/ml	Calculated	<1
	G2V	9.31	µg/l	Robust mean	7.2
	S3V	8.83	mg/kg	Calculated	<1
m/p-Xylene	A1V	5.02	µg/ml	Calculated	<1
	G2V	10.75	µg/l	Robust mean	14
	S3V	12.48	mg/kg	Calculated	<1
o-Xylene	A1V	1.52	µg/ml	Calculated	<1
	G2V	4.57	µg/l	Robust mean	5.5
	S3V	3.78	mg/kg	Calculated	<1

APPENDIX 6 ASSIGNED VALUES AND THEIR UNCERTAINTIES (continues)

Halogenated hydrocarbons

Analyte	Sample	Assigned value	Unit	Estimation of assigned value	Uncertainty ($U = 2\ u_c$) %
Bromoform	A1V	0.426	µg/ml	Calculated	<1
Carbontetrachloride	A1V	0.426	µg/ml	Calculated	<1
	G2V	5.12	µg/l	Robust mean	11
	S3V	1.06	mg/kg	Calculated	<1
Chlorobenzene	G1O	5,20	µg/ml	Robust mean	12
Chloroform	A1V	0.426	µg/ml	Calculated	<1
	G2V	5.89	µg/l	Robust mean	9.6
	S3V	1.06	mg/kg	Calculated	<1
1,2-Dichlorobenzene	A1O	0,789	µg/ml	Calculated	<1
	G2V	3,21	µg/l	Robust mean	3,3
	S3V	1,96	mg/kg	Calculated	<1
1,1- Dichloroethane	A1O	0.426	µg/ml	Calculated	<1
1,2-Dichloroethane	A1V	0.426	µg/ml	Calculated	<1
	G2V	6.30	µg/l	Robust mean	6.2
	S3V	1.06	mg/kg	Calculated	<1
1,1- Dichloroethene	A1O	0.426	µg/ml	Calculated	<1
cis-1,2-Dichloroethene	A1V	1.79	µg/ml	Calculated	<1
	G2V	10.76	µg/l	Robust mean	5.7
	S3V	4.45	mg/kg	Calculated	<1
trans-1,2-Dichloroethene	A1O	0.426	µg/ml	Calculated	<1
1,2,4-Trichlorobenzene	A1V	0.77	µg/ml	Calculated	<1
	G2V	4.24	µg/l	Robust mean	6.0
	S3V	1.91	mg/kg	Calculated	<1
1,1,1-Trichloroethane	A1O	0.426	µg/ml	Calculated	<1
Trichloroethene	A1V	1.94	µg/ml	Calculated	<1
	G2V	5.32	µg/l	Robust mean	14
	S3V	4.83	mg/kg	Calculated	<1
1,1,2,2-Tetrachloroethane	A1O	0.426	µg/ml	Calculated	<1
Tetrachloroethene	A1V	3.87	µg/ml	Calculated	<1
	G2V	9.99	µg/l	Robust mean	11
	S3V	9.63	mg/kg	Calculated	<1
Vinylchloride	A1O	0.426	µg/ml	Calculated	<1

Indicative assigned values printed in Italics.

The uncertainty of the assigned value was estimated on the basis of the sample preparation, if the assigned value was calculated. Otherwise

$$U\% = 100*(2*1{,}25*s_{rob}/\sqrt{n})/AV$$

where:

s_{rob} = the robust standard deviation
n = the number of the results
AV = the assigned value

LIITE 7.

Appendix 7. Results of each laboratory

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 1																
Min-oil-GC	mg/ml	A1O		0,285	yes	3,02	20	3,11	2,93	2,99	0,269	9	17	2	0	19
	mg/kg	S3O		-0,415	yes	317	30	297	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		0,609	yes	0,426	20	0,452	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		0,378	yes	0,426	20	0,442	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEa	µg/ml	A1V		0,729	yes	0,426	20	0,457	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		1,770	yes	0,426	20	0,501	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		2,020	yes	0,77	20	0,925	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		-0,075	yes	4,24	25	4,2	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		0,553	yes	1,91	30	2,07	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCB	µg/ml	A1V		1,310	yes	0,789	20	0,893	0,772	0,716	0,167	23,2	4	2	1	7
	µg/l	G2V		0,121	yes	3,21	25	3,26	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		0,173	yes	1,96	30	2,01	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		0,507	yes	0,426	20	0,448	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		0,497	yes	6,3	25	6,69	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-0,797	yes	1,06	30	0,933	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		0,775	yes	1,78	20	1,92	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		0,457	yes	8,37	25	8,85	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		0,324	yes	4,42	30	4,63	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		1,640	yes	1,79	10	1,94	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		0,687	yes	10,8	25	11,7	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		0,406	yes	4,45	30	4,72	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		0,529	yes	5,2	25	5,54	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		0,972	yes	0,426	20	0,467	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		0,551	yes	5,12	25	5,47	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		-0,201	yes	1,06	30	1,03	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		0,405	yes	0,426	25	0,448	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		0,660	yes	0,426	20	0,454	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		0,608	yes	5,89	25	6,34	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		-1,350	yes	1,06	30	0,846	1,02	0,962	0,263	27,3	9	2	1	12
VOC-DIPE	µg/ml	A1V			yes	1,5		1,14	1,14	1,27	0,313	24,6	3	0	0	3
	µg/l	G2V			yes	6,13		5,37	6,3	6,13	0,633	10,3	3	0	0	3
	mg/kg	S3V			yes	3,73		2,59	2,77	3,14	0,7	22,2	3	0	0	3
VOC-Et.	µg/ml	A1V		0,931	yes	1,75	20	1,91	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		0,450	yes	6,41	25	6,77	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		0,483	yes	4,36	30	4,68	4,6	4,75	2,26	47,6	14	0	0	14
VOC-ETBE	µg/ml	A1V			yes	2,86		2,4	2,75	2,67	0,905	33,8	4	1	0	5
	µg/l	G2V			yes	5,51		4,01	5,06	5,55	1,98	35,6	5	0	0	5
	mg/kg	S3V			yes	7,1		5,7	6,57	6,49	1,64	25,2	4	1	0	5
VOC-m/p-	µg/ml	A1V		0,198	yes	5,02	20	5,12	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		2,540	yes	10,8	25	14,2	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		0,146	yes	12,5	30	12,8	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		0,426	yes	4,12	20	4,3	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		0,211	yes	16,1	25	16,6	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		0,172	yes	10,2	30	10,5	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		0,954	yes	1,52	20	1,67	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		0,464	yes	4,57	25	4,84	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		0,507	yes	3,78	30	4,07	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		0,720	yes	1,89	20	2,03	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		0,654	yes	0,426	20	0,454	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		-0,506	yes	3,42	20	3,25	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		0,324	yes	12,2	25	12,7	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		-0,422	yes	8,26	30	7,74	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		0,403	yes	1,94	20	2,02	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		0,735	yes	5,32	25	5,81	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		0,236	yes	4,84	30	5,01	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		0,347	yes	3,87	20	4	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		0,148	yes	9,99	25	10,2	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		0,432	yes	9,63	30	10,3	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		0,687	yes	3,55	20	3,79	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		0,422	yes	9,31	25	9,8	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		0,572	yes	8,83	30	9,59	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		1,630	yes	0,426	20	0,495	0,495	0,471	0,157	33,3	8	1	0	9

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 2																
Min-oil-GC	mg/ml	A1O		-1,030	yes	3,02	20	2,71	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		1,480	yes	0,319	30	0,390	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		-3,020	yes	317	30	173	340	315	65,9	20,9	12	2	1	15
VOC-CCl4	µg/ml	A1V		1,920	yes	0,426	20	0,508	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		-4,890	yes	5,12	25	1,99	5,09	4,88	1,16	23,6	11	2	1	14
VOC-CHCl3	µg/ml	A1V		-4,510	H	0,426	20	0,234	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		-0,797	yes	5,89	25	5,3	6,07	5,89	0,82	13,9	12	1	1	14
VOC-TCEe	µg/ml	A1V		-5,540	yes	1,94	20	0,865	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		-1,220	yes	5,32	25	4,51	5,65	5,54	1,4	25,2	12	1	1	14
VOC-TeTCEe	µg/ml	A1V		-6,540	H	3,87	20	1,34	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		-0,214	yes	9,99	25	9,72	9,8	10,2	2,01	19,7	14	0	0	14
Laboratory 3																
Min-oil-GC	mg/l	G2O		8,690	H	0,319	30	0,735	0,31	0,309	0,0499	16,1	20	2	0	22
VOC-111TCEa	µg/ml	A1V		-0,024	yes	0,426	20	0,425	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-11DCEa	µg/ml	A1V		1,970	yes	0,426	20	0,51	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		2,320	yes	0,426	20	0,525	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		0,649	yes	0,77	20	0,82	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		0,371	yes	4,24	25	4,44	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		-4,870	yes	1,91	30	0,515	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCB	µg/l	G2V		0,224	yes	3,21	25	3,3	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		-4,440	yes	1,96	30	0,655	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		-0,102	yes	6,3	25	6,22	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-4,560	H	1,06	30	0,335	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		0,365	yes	1,78	20	1,85	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		-0,599	yes	8,37	25	7,74	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		-4,540	H	4,42	30	1,41	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		0,000	yes	1,79	10	1,79	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		-0,252	yes	10,8	25	10,5	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		-4,510	H	4,45	30	1,44	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		0,077	yes	5,2	25	5,25	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		0,211	yes	0,426	20	0,435	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		-0,161	yes	5,12	25	5,02	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		-5,060	H	1,06	30	0,255	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		0,357	yes	0,426	25	0,445	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		0,563	yes	0,426	20	0,45	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		-0,548	yes	5,89	25	5,49	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		-4,590	yes	1,06	30	0,33	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		2,540	yes	1,75	20	2,2	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		0,237	yes	6,41	25	6,6	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		-3,790	yes	4,36	30	1,88	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		1,780	yes	5,02	20	5,92	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		0,434	yes	10,8	25	11,3	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		-4,300	H	12,5	30	4,43	12,6	11,9	2,4	20,2	12	2	0	14
VOC-o-Xylene	µg/ml	A1V		2,400	yes	1,52	20	1,89	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		0,286	yes	4,57	25	4,73	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		-3,630	H	3,78	30	1,72	4,01	3,85	0,528	13,7	12	2	0	14
VOC-TCEe	µg/ml	A1V		-1,340	yes	1,94	20	1,68	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		-1,450	yes	5,32	25	4,35	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		-5,040	H	4,84	30	1,18	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		0,543	yes	3,87	20	4,08	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		-0,246	yes	9,99	25	9,68	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		-4,640	H	9,63	30	2,92	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		1,150	yes	3,55	20	3,96	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		-0,324	yes	9,31	25	8,93	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		-4,470	H	8,83	30	2,92	9,34	9,11	1,37	15,0	12	2	0	14

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 4																
Min-oil-GC	mg/ml	A1O		-0,652	yes	3,02	20	2,82	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		0,021	yes	0,319	30	0,3200	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		-0,657	yes	317	30	286	340	315	65,9	20,9	12	2	1	15
VOC-Benzene	µg/ml	A1V		3,790	H	1,78	20	2,46	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		0,306	yes	8,37	25	8,69	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		1,600	yes	4,42	30	5,48	4,64	4,68	0,75	16,0	12	2	0	14
VOC-Et.	µg/ml	A1V		-5,750	H	1,75	20	0,744	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		0,262	yes	6,41	25	6,62	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		0,804	yes	4,36	30	4,89	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		-4,480	H	5,02	20	2,77	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		0,546	yes	10,8	25	11,5	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		1,010	yes	12,5	30	14,4	12,6	11,9	2,4	20,2	12	2	0	14
VOC-o-Xylene	µg/ml	A1V		-4,640	H	1,52	20	0,815	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		-0,087	yes	4,57	25	4,52	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		0,484	yes	3,78	30	4,05	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Toluene	µg/ml	A1V		-5,270	H	3,55	20	1,68	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		0,032	yes	9,31	25	9,35	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		1,230	yes	8,83	30	10,5	9,34	9,11	1,37	15,0	12	2	0	14
Laboratory 5																
Min-oil-GC	mg/ml	A1O		-1,090	yes	3,02	20	2,69	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		1,270	yes	0,319	30	0,38	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		1,120	yes	317	30	370	340	315	65,9	20,9	12	2	1	15
Laboratory 6																
Min-oil-GC	mg/ml	A1O		1,210	yes	3,02	20	3,38	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		1,070	yes	0,319	30	0,37	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		-0,252	yes	317	30	305	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		-3,810	yes	0,426	20	0,264	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		-5,460	yes	0,426	20	0,194	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEa	µg/ml	A1V		-2,570	yes	0,426	20	0,317	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		-4,540	yes	0,426	20	0,233	0,42	0,475	0,143	30,1	10	1	0	11
VOC-12DCB	µg/ml	A1V		-4,610	yes	0,789	20	0,425	0,772	0,716	0,167	23,2	4	2	1	7
	µg/l	G2V		-3,020	H	3,21	25	2	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		-2,130	yes	1,96	30	1,33	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		-3,290	yes	0,426	20	0,286	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		-2,290	yes	6,3	25	4,5	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-1,260	yes	1,06	30	0,86	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		-3,100	H	1,78	20	1,23	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		-1,440	yes	8,37	25	6,87	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		-0,999	yes	4,42	30	3,76	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		-5,180	yes	1,79	10	1,33	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		-1,700	yes	10,8	25	8,5	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		-1,260	yes	4,45	30	3,61	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		-2,210	yes	5,2	25	3,77	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		-3,910	yes	0,426	20	0,26	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		-1,330	yes	5,12	25	4,27	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		-0,597	yes	1,06	30	0,965	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		-0,892	yes	0,426	25	0,379	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		-1,440	yes	0,426	20	0,364	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		-0,892	yes	5,89	25	5,23	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		-1,370	yes	1,06	30	0,843	1,02	0,962	0,263	27,3	9	2	1	12
VOC-DIPE	µg/ml	A1V			yes	1,5		1	1,14	1,27	0,313	24,6	3	0	0	3
	µg/l	G2V			yes	6,13		6,23	6,3	6,13	0,633	10,3	3	0	0	3
	mg/kg	S3V			yes	3,73		2,75	2,77	3,14	0,7	22,2	3	0	0	3
VOC-Et.	µg/ml	A1V		-6,930	H	1,75	20	0,537	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		-3,960	H	6,41	25	3,23	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		-1,210	yes	4,36	30	3,57	4,6	4,75	2,26	47,6	14	0	0	14
VOC-ETBE	µg/ml	A1V			yes	2,86		1,45	2,75	2,67	0,905	33,8	4	1	0	5
	µg/l	G2V			yes	5,51		3,43	5,06	5,55	1,98	35,6	5	0	0	5
	mg/kg	S3V			yes	7,1		4,31	6,57	6,49	1,64	25,2	4	1	0	5
VOC-m/p-	µg/ml	A1V		-6,820	H	5,02	20	1,6	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		-4,160	yes	10,8	25	5,17	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		-1,340	yes	12,5	30	9,97	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		-4,750	yes	4,12	20	2,17	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		-2,510	yes	16,1	25	11,1	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		-2,560	yes	10,2	30	6,3	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		-7,010	H	1,52	20	0,455	1,61	1,65	0,216	13,0	12	2	0	14

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	µg/l	G2V		-4,620	H	4,57	25	1,93	4,56	4,6	0,623	13,5	11	2	1	14
Laboratory 6																
VOC-o-Xylene	mg/kg	S3V		-1,660	yes	3,78	30	2,84	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		-5,920	yes	1,89	20	0,771	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		-3,600	yes	0,426	20	0,273	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		-6,000	H	3,42	20	1,37	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		-2,990	H	12,2	25	7,63	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		-2,920	yes	8,26	30	4,64	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		-3,390	yes	1,94	20	1,28	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		-1,730	yes	5,32	25	4,17	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		-1,230	yes	4,84	30	3,94	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		-4,200	yes	3,87	20	2,24	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		-1,510	yes	9,99	25	8,1	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		-1,360	yes	9,63	30	7,67	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		-3,490	H	3,55	20	2,31	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		-1,700	yes	9,31	25	7,33	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		-1,600	yes	8,83	30	6,71	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		-5,800	yes	0,426	20	0,179	0,495	0,471	0,157	33,3	8	1	0	9
Laboratory 7																
Min-oil-GC	mg/ml	A1O		0,662	yes	3,02	20	3,22	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-0,188	yes	0,319	30	0,31	0,31	0,309	0,0499	16,1	20	2	0	22
Laboratory 8																
Min-oil-GC	mg/l	G2O		-2,070	yes	0,319	30	0,22	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		-4,300	H	317	30	113	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		2,680	yes	0,426	20	0,54	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-11DCEa	µg/ml	A1V		1,030	yes	0,426	20	0,47	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		18,100	H	0,426	20	1,2	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		0,130	yes	0,77	20	0,78	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		0,245	yes	4,24	25	4,37	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		-0,428	yes	1,91	30	1,79	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCB	µg/ml	A1V		-0,051	yes	0,789	20	0,785	0,772	0,716	0,167	23,2	4	2	1	7
	µg/l	G2V		0,000	yes	3,21	25	3,21	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		-0,034	yes	1,96	30	1,95	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		0,211	yes	0,426	20	0,435	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		0,108	yes	6,3	25	6,38	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-1,430	yes	1,06	30	0,833	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		1,210	yes	1,78	20	2	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		1,170	yes	8,37	25	9,59	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		-0,305	yes	4,42	30	4,22	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		-0,335	yes	1,79	10	1,76	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		0,248	yes	10,8	25	11,1	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		-1,740	yes	4,45	30	3,29	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		1,460	yes	5,2	25	6,15	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		7,020	yes	0,426	20	0,725	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		7,820	H	5,12	25	10,1	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		3,330	yes	1,06	30	1,59	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHCl3	µg/ml	A1V		3,620	yes	0,426	20	0,58	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		1,270	yes	5,89	25	6,83	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		-1,310	yes	1,06	30	0,852	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		2,170	yes	1,75	20	2,13	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		3,020	yes	6,41	25	8,83	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		1,180	yes	4,36	30	5,13	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		-4,920	H	5,02	20	2,55	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		1,290	yes	10,8	25	12,5	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		0,327	yes	12,5	30	13,1	12,6	11,9	2,4	20,2	12	2	0	14
VOC-o-Xylene	µg/ml	A1V		1,880	yes	1,52	20	1,81	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		2,250	yes	4,57	25	5,86	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		0,864	yes	3,78	30	4,27	4,01	3,85	0,528	13,7	12	2	0	14
VOC-t12DCEe	µg/ml	A1V		5,610	yes	0,426	20	0,665	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TCEe	µg/ml	A1V		-3,270	yes	1,94	20	1,31	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		-1,650	yes	5,32	25	4,22	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		-3,030	yes	4,84	30	2,64	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		2,660	yes	3,87	20	4,9	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		3,370	yes	9,99	25	14,2	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		0,990	yes	9,63	30	11,1	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		1,610	yes	3,55	20	4,12	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		1,950	yes	9,31	25	11,6	9,2	9,36	1,11	11,8	14	0	0	14

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	S3V		-0,164	yes	8,83	30	8,61	9,34	9,11	1,37	15,0	12	2	0	14
Laboratory 9																
Min-oil-GC	mg/ml	A1O		-0,993	yes	3,02	20	2,72	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		0,405	yes	0,319	30	0,3384	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		-2,530	yes	317	30	197	340	315	65,9	20,9	12	2	1	15
VOC-Benzene	µg/ml	A1V		-0,393	yes	1,78	20	1,71	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		-1,140	yes	8,37	25	7,18	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		-3,050	yes	4,42	30	2,4	4,64	4,68	0,75	16,0	12	2	0	14
VOC-Et.	µg/ml	A1V		1,310	yes	1,75	20	1,98	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		-0,125	yes	6,41	25	6,31	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		-2,290	yes	4,36	30	2,87	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		0,249	yes	5,02	20	5,14	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		-0,190	yes	10,8	25	10,5	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		-2,480	yes	12,5	30	7,83	12,6	11,9	2,4	20,2	12	2	0	14
VOC-o-Xylene	µg/ml	A1V		0,592	yes	1,52	20	1,61	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		-0,254	yes	4,57	25	4,42	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		-2,080	yes	3,78	30	2,6	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Toluene	µg/ml	A1V		-0,127	yes	3,55	20	3,5	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		-1,040	yes	9,31	25	8,11	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		-2,630	yes	8,83	30	5,35	9,34	9,11	1,37	15,0	12	2	0	14
Laboratory 10																
Min-oil-GC	mg/ml	A1O		0,596	yes	3,02	20	3,2	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		0,021	yes	0,319	30	0,32	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		0,868	yes	317	30	358	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		1,270	yes	0,426	20	0,48	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		-0,258	yes	0,426	20	0,415	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEa	µg/ml	A1V		0,211	yes	0,426	20	0,435	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		-1,100	yes	0,77	20	0,685	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		-2,140	yes	4,24	25	3,1	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		0,593	yes	1,91	30	2,08	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCB	µg/ml	A1V		-1,130	yes	0,789	20	0,7	0,772	0,716	0,167	23,2	4	2	1	7
	µg/l	G2V		-0,714	yes	3,21	25	2,92	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		0,485	yes	1,96	30	2,1	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		3,620	yes	0,426	20	0,58	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		1,570	yes	6,3	25	7,53	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		0,975	yes	1,06	30	1,21	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		0,365	yes	1,78	20	1,85	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		0,959	yes	8,37	25	9,37	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		1,330	yes	4,42	30	5,3	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		1,680	yes	1,79	10	1,94	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		0,198	yes	10,8	25	11,1	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		0,963	yes	4,45	30	5,09	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		1,720	yes	5,2	25	6,32	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		1,500	yes	0,426	20	0,49	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		-0,010	yes	5,12	25	5,11	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		1,620	yes	1,06	30	1,32	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		1,480	yes	0,426	25	0,505	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		1,500	yes	0,426	20	0,49	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		0,521	yes	5,89	25	6,27	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		1,560	yes	1,06	30	1,31	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		0,200	yes	1,75	20	1,79	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		1,160	yes	6,41	25	7,34	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		1,200	yes	4,36	30	5,14	4,6	4,75	2,26	47,6	14	0	0	14
VOC-ETBE	µg/ml	A1V			yes	2,86		3,71	2,75	2,67	0,905	33,8	4	1	0	5
	µg/l	G2V			yes	5,51		6,59	5,06	5,55	1,98	35,6	5	0	0	5
	mg/kg	S3V			yes	7,1		8,19	6,57	6,49	1,64	25,2	4	1	0	5
VOC-m/p-	µg/ml	A1V		0,169	yes	5,02	20	5,11	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		2,000	yes	10,8	25	13,4	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		0,986	yes	12,5	30	14,3	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		2,630	yes	4,12	20	5,21	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		0,178	yes	16,1	25	16,5	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		1,200	yes	10,2	30	12,1	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		1,150	yes	1,52	20	1,69	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		1,870	yes	4,57	25	5,64	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		1,200	yes	3,78	30	4,46	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		2,670	yes	1,89	20	2,4	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		-0,141	yes	0,426	20	0,42	0,451	0,462	0,106	22,9	11	0	0	11

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
VOC-TAME	µg/ml	A1V		1,590	yes	3,42	20	3,96	3,38	3,45	0,393	11,4	8	2	0	10
Laboratory 10																
VOC-TAME	µg/l	G2V		0,634	yes	12,2	25	13,2	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		0,474	yes	8,26	30	8,85	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		1,110	yes	1,94	20	2,16	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		2,040	yes	5,32	25	6,67	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		1,140	yes	4,84	30	5,66	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		1,340	yes	3,87	20	4,39	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		3,580	yes	9,99	25	14,5	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		1,070	yes	9,63	30	11,2	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		0,211	yes	3,55	20	3,63	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		0,559	yes	9,31	25	9,96	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		1,050	yes	8,83	30	10,2	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,495	0,471	0,157	33,3	8	1	0	9
Laboratory 11																
Min-oil-GC	mg/ml	A1O		-1,080	yes	3,02	20	2,7	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		0,481	yes	0,319	30	0,342	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O			H	317	30	<55	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		0,493	yes	0,426	20	0,447	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-11DCEa	µg/ml	A1V		-0,082	yes	0,426	20	0,422	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		5,120	yes	0,426	20	0,644	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		1,160	yes	0,77	20	0,859	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		0,881	yes	4,24	25	4,71	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		1,990	yes	1,91	30	2,48	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCB	µg/ml	A1V		-0,158	yes	0,789	20	0,776	0,772	0,716	0,167	23,2	4	2	1	7
	µg/l	G2V		0,075	yes	3,21	25	3,24	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		0,629	yes	1,96	30	2,15	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		-0,974	yes	0,426	20	0,385	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		0,093	yes	6,3	25	6,37	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		0,135	yes	1,06	30	1,08	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		0,000	yes	1,78	20	1,78	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		-0,491	yes	8,37	25	7,86	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		0,336	yes	4,42	30	4,64	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		1,170	yes	1,79	10	1,9	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		0,198	yes	10,8	25	11,1	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		0,431	yes	4,45	30	4,74	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		-0,005	yes	5,2	25	5,2	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		1,470	yes	0,426	20	0,488	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		2,060	yes	5,12	25	6,44	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		0,476	yes	1,06	30	1,14	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		2,740	yes	0,426	25	0,572	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		0,223	yes	0,426	20	0,435	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		0,380	yes	5,89	25	6,17	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		-0,148	yes	1,06	30	1,04	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		0,743	yes	1,75	20	1,88	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		0,370	yes	6,41	25	6,71	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		1,170	yes	4,36	30	5,12	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		-0,558	yes	5,02	20	4,74	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		-1,380	yes	10,8	25	8,9	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		0,558	yes	12,5	30	13,5	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		-0,255	yes	4,12	20	4,01	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		-0,714	yes	16,1	25	14,7	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		1,380	yes	10,2	30	12,3	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		0,428	yes	1,52	20	1,58	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		-0,029	yes	4,57	25	4,55	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		0,899	yes	3,78	30	4,29	4,01	3,85	0,528	13,7	12	2	0	14
VOC-t12DCEe	µg/ml	A1V		0,974	yes	0,426	20	0,468	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		-0,468	yes	3,42	20	3,26	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		-0,809	yes	12,2	25	11	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		0,446	yes	8,26	30	8,81	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		0,387	yes	1,94	20	2,01	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		0,637	yes	5,32	25	5,74	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		0,010	yes	4,84	30	4,85	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		0,711	yes	3,87	20	4,14	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		0,569	yes	9,99	25	10,7	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		-0,282	yes	9,63	30	9,22	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		0,493	yes	3,55	20	3,73	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		0,106	yes	9,31	25	9,43	9,2	9,36	1,11	11,8	14	0	0	14

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	S3V		1,280	yes	8,83	30	10,5	9,34	9,11	1,37	15,0	12	2	0	14
Laboratory 11																
VOC-VIN	µg/ml	A1V		-1,270	yes	0,426	20	0,372	0,495	0,471	0,157	33,3	8	1	0	9
Laboratory 12																
Min-oil-GC	mg/ml	A1O		-0,099	yes	3,02	20	2,99	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-0,188	yes	0,319	30	0,310	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		1,030	yes	317	30	366	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		3,230	yes	0,426	20	0,564	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		0,786	yes	0,426	20	0,46	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEa	µg/ml	A1V		0,692	yes	0,426	20	0,456	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		3,900	yes	0,426	20	0,592	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		-1,180	yes	0,77	20	0,679	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		-0,252	yes	4,24	25	4,11	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		0,881	yes	1,91	30	2,16	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCEa	µg/ml	A1V		-2,020	yes	0,426	20	0,34	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		0,165	yes	6,3	25	6,43	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-1,140	yes	1,06	30	0,878	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		0,084	yes	1,78	20	1,79	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		0,634	yes	8,37	25	9,03	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		0,166	yes	4,42	30	4,53	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		1,510	yes	1,79	10	1,92	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		0,346	yes	10,8	25	11,3	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		-0,528	yes	4,45	30	4,1	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		-0,677	yes	5,2	25	4,76	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		3,560	yes	0,426	20	0,577	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		0,406	yes	5,12	25	5,38	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		0,236	yes	1,06	30	1,1	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		0,423	yes	0,426	25	0,449	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		1,080	yes	0,426	20	0,472	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		0,838	yes	5,89	25	6,51	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		0,079	yes	1,06	30	1,07	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		0,371	yes	1,75	20	1,81	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		-0,379	yes	6,41	25	6,11	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		0,826	yes	4,36	30	4,9	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		-0,070	yes	5,02	20	4,98	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		0,211	yes	10,8	25	11	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		0,345	yes	12,5	30	13,1	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		0,000	yes	4,12	20	4,12	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		-0,053	yes	16,1	25	16	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		-0,021	yes	10,2	30	10,2	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		-0,132	yes	1,52	20	1,5	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		0,000	yes	4,57	25	4,57	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		0,600	yes	3,78	30	4,12	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		-1,510	yes	1,89	20	1,6	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		1,120	yes	0,426	20	0,474	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		-1,520	yes	3,42	20	2,9	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		-0,219	yes	12,2	25	11,9	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		0,081	yes	8,26	30	8,36	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		-0,567	yes	1,94	20	1,83	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		-0,566	yes	5,32	25	4,94	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		-0,306	yes	4,84	30	4,62	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		0,904	yes	3,87	20	4,22	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		0,310	yes	9,99	25	10,4	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		0,241	yes	9,63	30	9,98	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		0,169	yes	3,55	20	3,61	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		0,839	yes	9,31	25	10,3	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		0,325	yes	8,83	30	9,26	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		2,340	yes	0,426	20	0,526	0,495	0,471	0,157	33,3	8	1	0	9

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 13																
Min-oil-GC	mg/ml	A1O		-0,232	yes	3,02	20	2,95	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-0,188	yes	0,319	30	0,31	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		0,063	yes	317	30	320	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		3,730	yes	0,426	20	0,585	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		0,469	yes	0,426	20	0,446	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEa	µg/ml	A1V		5,390	H	0,426	20	0,655	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		6,420	yes	0,426	20	0,7	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		6,490	yes	0,77	20	1,27	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		0,220	yes	4,24	25	4,36	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		14,100	H	1,91	30	5,94	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCB	µg/ml	A1V		8,190	H	0,789	20	1,44	0,772	0,716	0,167	23,2	4	2	1	7
	µg/l	G2V		0,822	yes	3,21	25	3,54	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		11,900	yes	1,96	30	5,46	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		2,960	yes	0,426	20	0,552	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		0,766	yes	6,3	25	6,9	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		3,490	H	1,06	30	1,61	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		8,850	H	1,78	20	3,35	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		2,640	yes	8,37	25	11,1	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		12,300	H	4,42	30	12,6	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		4,750	yes	1,79	10	2,21	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		0,370	yes	10,8	25	11,3	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		6,790	H	4,45	30	8,98	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		1,330	yes	5,2	25	6,07	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		5,070	yes	0,426	20	0,642	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		1,590	yes	5,12	25	6,14	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		8,620	H	1,06	30	2,43	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		0,657	yes	0,426	25	0,461	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		1,100	yes	0,426	20	0,473	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		-0,521	yes	5,89	25	5,51	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		6,050	H	1,06	30	2,02	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		6,710	H	1,75	20	2,92	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		1,450	yes	6,41	25	7,57	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		13,400	yes	4,36	30	13,1	4,6	4,75	2,26	47,6	14	0	0	14
VOC-ETBE	µg/ml	A1V			H	2,86		7,29	2,75	2,67	0,905	33,8	4	1	0	5
	µg/l	G2V			yes	5,51		8,7	5,06	5,55	1,98	35,6	5	0	0	5
	mg/kg	S3V			H	7,1		24,8	6,57	6,49	1,64	25,2	4	1	0	5
VOC-m/p-	µg/ml	A1V		4,880	H	5,02	20	7,47	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		0,806	yes	10,8	25	11,8	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		10,200	H	12,5	30	31,5	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		7,620	H	4,12	20	7,26	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		2,160	yes	16,1	25	20,5	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		11,100	H	10,2	30	27,2	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		3,980	yes	1,52	20	2,13	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		0,233	yes	4,57	25	4,7	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		6,880	H	3,78	30	7,68	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		4,600	yes	1,89	20	2,76	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		4,420	yes	0,426	20	0,615	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		7,950	H	3,42	20	6,14	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		3,320	H	12,2	25	17,3	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		11,400	H	8,26	30	22,4	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		3,760	yes	1,94	20	2,67	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		1,010	yes	5,32	25	5,99	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		8,880	H	4,84	30	11,3	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		5,840	H	3,87	20	6,13	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		1,820	yes	9,99	25	12,3	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		6,940	H	9,63	30	19,7	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		7,200	H	3,55	20	6,11	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		1,680	yes	9,31	25	11,3	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		10,500	H	8,83	30	22,7	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		7,120	yes	0,426	20	0,73	0,495	0,471	0,157	33,3	8	1	0	9
Laboratory 14																
Min-oil-GC	mg/ml	A1O		2,040	yes	3,02	20	3,63	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		0,648	yes	0,319	30	0,35	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		1,290	yes	317	30	378	340	315	65,9	20,9	12	2	1	15

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 15																
Min-oil-GC	mg/ml	A1O		-0,530	yes	3,02	20	2,86	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-0,230	yes	0,319	30	0,308	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		0,736	yes	317	30	352	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		-1,310	yes	0,426	20	0,37	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		-4,950	yes	0,426	20	0,215	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEa	µg/ml	A1V		-0,376	yes	0,426	20	0,41	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-12DCEa	µg/ml	A1V		0,446	yes	0,426	20	0,445	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		-0,923	yes	6,3	25	5,57	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-0,299	yes	1,06	30	1,01	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		0,084	yes	1,78	20	1,79	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		-0,710	yes	8,37	25	7,63	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		1,060	yes	4,42	30	5,12	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		-1,170	yes	1,79	10	1,69	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		-0,963	yes	10,8	25	9,5	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		1,070	yes	4,45	30	5,17	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		-1,110	yes	5,2	25	4,48	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		-0,141	yes	0,426	20	0,42	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		-1,670	yes	5,12	25	4,05	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		-0,016	yes	1,06	30	1,06	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		-1,620	yes	0,426	25	0,34	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		-0,845	yes	0,426	20	0,39	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		-1,640	yes	5,89	25	4,68	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		0,818	yes	1,06	30	1,19	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		-1,430	yes	1,75	20	1,5	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		-1,670	yes	6,41	25	5,07	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		-0,849	yes	4,36	30	3,81	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		-2,590	yes	5,02	20	3,72	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		-1,340	yes	10,8	25	8,94	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		-0,377	yes	12,5	30	11,8	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		-0,267	yes	4,12	20	4,01	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		-0,549	yes	16,1	25	15	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		0,290	yes	10,2	30	10,7	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		0,362	yes	1,52	20	1,58	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		-0,478	yes	4,57	25	4,3	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		0,428	yes	3,78	30	4,02	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		-2,590	yes	1,89	20	1,4	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		0,211	yes	0,426	20	0,435	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		-0,073	yes	3,42	20	3,4	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		0,022	yes	12,2	25	12,2	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		-0,387	yes	8,26	30	7,78	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		-1,130	yes	1,94	20	1,72	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		-1,440	yes	5,32	25	4,36	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		-0,251	yes	4,84	30	4,66	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		-1,120	yes	3,87	20	3,44	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		-1,430	yes	9,99	25	8,2	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		0,343	yes	9,63	30	10,1	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		0,873	yes	3,55	20	3,86	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		-0,275	yes	9,31	25	8,99	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		0,742	yes	8,83	30	9,81	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		3,730	yes	0,426	20	0,585	0,495	0,471	0,157	33,3	8	1	0	9

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 16																
VOC-111TCEa	µg/ml	A1V		-0,728	yes	0,426	20	0,395	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		-1,900	yes	0,426	20	0,345	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEa	µg/ml	A1V		-0,493	yes	0,426	20	0,405	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		-1,550	yes	0,426	20	0,36	0,42	0,475	0,143	30,1	10	1	0	11
VOC-124TCB	µg/ml	A1V		-1,560	yes	0,77	20	0,65	0,82	0,834	0,197	23,5	8	0	0	8
	µg/l	G2V		-1,820	yes	4,24	25	3,27	4,19	4,06	0,584	14,3	8	0	0	8
	mg/kg	S3V		-0,925	yes	1,91	30	1,65	2,04	1,82	0,606	33,3	7	1	0	8
VOC-12DCB	µg/ml	A1V			H	0,789	20	<0.1	0,772	0,716	0,167	23,2	4	2	1	7
	µg/l	G2V		-0,125	yes	3,21	25	3,16	3,21	3,23	0,201	6,2	7	1	0	8
	mg/kg	S3V		1,320	yes	1,96	30	2,35	2,03	2,15	1,22	57,0	8	0	0	8
VOC-12DCEa	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		-0,317	yes	6,3	25	6,05	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-0,314	yes	1,06	30	1,01	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		1,690	yes	1,78	20	2,08	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		-0,089	yes	8,37	25	8,28	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		1,200	yes	4,42	30	5,22	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		-0,503	yes	1,79	10	1,75	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		-0,444	yes	10,8	25	10,2	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		0,258	yes	4,45	30	4,62	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		-0,205	yes	5,2	25	5,07	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		-0,258	yes	0,426	20	0,415	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		-0,146	yes	5,12	25	5,03	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		0,063	yes	1,06	30	1,07	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		0,169	yes	0,426	25	0,435	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		0,211	yes	0,426	20	0,435	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		0,281	yes	5,89	25	6,1	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		0,393	yes	1,06	30	1,12	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		-0,686	yes	1,75	20	1,63	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		-1,030	yes	6,41	25	5,58	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		0,080	yes	4,36	30	4,41	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		-5,520	H	5,02	20	2,25	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		-4,500	yes	10,8	25	4,7	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		-3,360	yes	12,5	30	6,19	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		3,830	yes	4,12	20	5,7	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		-1,620	yes	16,1	25	12,9	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		0,893	yes	10,2	30	11,6	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		-1,510	yes	1,52	20	1,29	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		-1,860	yes	4,57	25	3,51	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		-0,591	yes	3,78	30	3,45	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		-0,529	yes	1,89	20	1,79	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		-1,200	yes	0,426	20	0,375	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		1,840	yes	3,42	20	4,05	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		-2,660	yes	12,2	25	8,14	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		-0,089	yes	8,26	30	8,15	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		-0,825	yes	1,94	20	1,78	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		0,627	yes	5,32	25	5,74	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		-0,885	yes	4,84	30	4,2	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		-1,190	yes	3,87	20	3,41	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		-0,438	yes	9,99	25	9,44	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		-1,770	yes	9,63	30	7,07	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		-0,197	yes	3,55	20	3,48	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		-0,899	yes	9,31	25	8,26	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		-0,128	yes	8,83	30	8,66	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		1,270	yes	0,426	20	0,48	0,495	0,471	0,157	33,3	8	1	0	9
Laboratory 17																
Min-oil-GC	mg/ml	A1O		-0,629	yes	3,02	20	2,83	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-1,230	yes	0,319	30	0,26	0,31	0,309	0,0499	16,1	20	2	0	22

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 18																
Min-oil-GC	mg/ml	A1O		-0,414	yes	3,02	20	2,89	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		0,188	yes	0,319	30	0,328	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		0,321	yes	317	30	332	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V			H	0,426	20	<1,0	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-Benzene	µg/ml	A1V		0,253	yes	1,78	20	1,82	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		0,561	yes	8,37	25	8,96	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		-0,132	yes	4,42	30	4,33	4,64	4,68	0,75	16,0	12	2	0	14
VOC-CB	µg/l	G2V		-0,010	yes	5,2	25	5,19	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V			H	0,426	20	<3,0	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V			H	5,12	25	<30	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V			H	1,06	30	<3,75	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHCl3	µg/ml	A1V			H	0,426	20	<3,0	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V			H	5,89	25	<30	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V			H	1,06	30	<3,75	1,02	0,962	0,263	27,3	9	2	1	12
VOC-Et.	µg/ml	A1V		0,229	yes	1,75	20	1,79	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		0,245	yes	6,41	25	6,61	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		-0,011	yes	4,36	30	4,35	4,6	4,75	2,26	47,6	14	0	0	14
VOC-m/p-	µg/ml	A1V		-0,239	yes	5,02	20	4,9	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		0,509	yes	10,8	25	11,4	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		-0,230	yes	12,5	30	12,1	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		1,020	yes	4,12	20	4,54	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		2,010	yes	16,1	25	20,2	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		0,420	yes	10,2	30	10,9	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		0,362	yes	1,52	20	1,57	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V			H	4,57	25	<5,0	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		0,040	yes	3,78	30	3,8	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		-0,132	yes	1,89	20	1,86	1,79	1,83	0,553	30,2	9	0	0	9
VOC-TAME	µg/ml	A1V		-0,512	yes	3,42	20	3,25	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		0,262	yes	12,2	25	12,6	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		-0,323	yes	8,26	30	7,86	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		1,680	yes	1,94	20	2,26	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V			H	5,32	25	<10	5,65	5,54	1,4	25,2	12	1	1	14
	mg/kg	S3V		0,620	yes	4,84	30	5,29	4,67	4,55	0,816	17,9	10	2	0	12
VOC-TeTCEe	µg/ml	A1V		-0,439	yes	3,87	20	3,7	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		0,382	yes	9,99	25	10,5	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		-0,410	yes	9,63	30	9,04	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		0,225	yes	3,55	20	3,63	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		-0,100	yes	9,31	25	9,19	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		-0,094	yes	8,83	30	8,71	9,34	9,11	1,37	15,0	12	2	0	14
Laboratory 19																
Min-oil-GC	mg/l	G2O		-1,860	yes	0,319	30	0,23	0,31	0,309	0,0499	16,1	20	2	0	22
Laboratory 20																
Min-oil-GC	mg/l	G2O		-2,280	yes	0,319	30	0,21	0,31	0,309	0,0499	16,1	20	2	0	22
Laboratory 21																
Min-oil-GC	mg/ml	A1O		-0,132	yes	3,02	20	2,98	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-0,920	yes	0,319	30	0,275	0,31	0,309	0,0499	16,1	20	2	0	22
Laboratory 22																
Min-oil-GC	mg/ml	A1O		47,600	H	3,02	20	17,4	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		3,640	H	0,319	30	0,493	0,31	0,309	0,0499	16,1	20	2	0	22

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
Laboratory 23																
Min-oil-GC	mg/ml	A1O		-6,360	H	3,02	20	1,1	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-0,397	yes	0,319	30	0,3	0,31	0,309	0,0499	16,1	20	2	0	22
VOC-111TCEa	µg/ml	A1V		1,740	yes	0,426	20	0,5	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,4	0,365	0,102	28,0	8	0	0	8
VOC-11DCEe	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,42	0,475	0,143	30,1	10	1	0	11
VOC-12DCEa	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		0,254	yes	6,3	25	6,5	6,3	6,2	0,802	12,9	12	0	0	12
VOC-c12DCEe	µg/ml	A1V		0,112	yes	1,79	10	1,8	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		0,642	yes	10,8	25	11,7	10,9	10,6	1,02	9,6	12	0	0	12
VOC-CCl4	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		0,750	yes	5,12	25	5,6	5,09	4,88	1,16	23,6	11	2	1	14
VOC-CHCl3	µg/ml	A1V		1,740	yes	0,426	20	0,5	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		2,280	yes	5,89	25	7,57	6,07	5,89	0,82	13,9	12	1	1	14
VOC-t12DCEe	µg/ml	A1V		1,740	yes	0,426	20	0,5	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TCEe	µg/ml	A1V		-1,750	yes	1,94	20	1,6	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		0,571	yes	5,32	25	5,7	5,65	5,54	1,4	25,2	12	1	1	14
VOC-TeTCEe	µg/ml	A1V		-1,340	yes	3,87	20	3,35	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		-1,030	yes	9,99	25	8,7	9,8	10,2	2,01	19,7	14	0	0	14
Laboratory 24																
Min-oil-GC	mg/ml	A1O		0,315	yes	3,02	20	3,12	2,93	2,99	0,269	9	17	2	0	19
	mg/l	G2O		-0,397	yes	0,319	30	0,30	0,31	0,309	0,0499	16,1	20	2	0	22
	mg/kg	S3O		1,070	yes	317	30	368	340	315	65,9	20,9	12	2	1	15
VOC-111TCEa	µg/ml	A1V		-1,550	yes	0,426	20	0,36	0,453	0,448	0,0925	20,6	11	1	1	13
VOC-11DCEa	µg/ml	A1V		-1,080	yes	0,426	20	0,38	0,425	0,426	0,0539	12,6	10	1	0	11
VOC-11DCEe	µg/ml	A1V		-0,728	yes	0,426	20	0,395	0,42	0,475	0,143	30,1	10	1	0	11
VOC-12DCEa	µg/ml	A1V		-0,141	yes	0,426	20	0,42	0,42	0,424	0,0823	19,3	12	0	0	12
	µg/l	G2V		-1,230	yes	6,3	25	5,33	6,3	6,2	0,802	12,9	12	0	0	12
	mg/kg	S3V		-0,189	yes	1,06	30	1,03	0,988	0,984	0,122	12,3	9	2	0	11
VOC-Benzene	µg/ml	A1V		0,702	yes	1,78	20	1,9	1,85	1,86	0,106	5,7	11	3	0	14
	µg/l	G2V		-1,290	yes	8,37	25	7,02	8,3	8,44	1,17	13,8	14	0	0	14
	mg/kg	S3V		1,370	yes	4,42	30	5,33	4,64	4,68	0,75	16,0	12	2	0	14
VOC-c12DCEe	µg/ml	A1V		-0,447	yes	1,79	10	1,75	1,8	1,81	0,206	11,3	12	0	0	12
	µg/l	G2V		-0,765	yes	10,8	25	9,77	10,9	10,6	1,02	9,6	12	0	0	12
	mg/kg	S3V		0,071	yes	4,45	30	4,5	4,67	4,43	0,631	14,2	9	2	0	11
VOC-CB	µg/l	G2V		-1,150	yes	5,2	25	4,45	5,09	5,16	0,739	14,3	12	0	0	12
VOC-CCl4	µg/ml	A1V		-1,310	yes	0,426	20	0,37	0,477	0,477	0,119	24,9	12	1	1	14
	µg/l	G2V		-1,580	yes	5,12	25	4,11	5,09	4,88	1,16	23,6	11	2	1	14
	mg/kg	S3V		-1,040	yes	1,06	30	0,895	1,07	1,13	0,205	18,1	8	3	1	12
VOC-CHBr3	µg/ml	A1V		-0,019	yes	0,426	25	0,425	0,448	0,446	0,0641	14,3	10	0	0	10
VOC-CHCl3	µg/ml	A1V		-1,080	yes	0,426	20	0,38	0,45	0,446	0,0604	13,5	11	2	1	14
	µg/l	G2V		-1,360	yes	5,89	25	4,89	6,07	5,89	0,82	13,9	12	1	1	14
	mg/kg	S3V		-0,283	yes	1,06	30	1,02	1,02	0,962	0,263	27,3	9	2	1	12
VOC-DIPE	µg/ml	A1V			yes	1,5		1,67	1,14	1,27	0,313	24,6	3	0	0	3
	µg/l	G2V			yes	6,13		6,78	6,3	6,13	0,633	10,3	3	0	0	3
	mg/kg	S3V			yes	3,73		4,08	2,77	3,14	0,7	22,2	3	0	0	3
VOC-Et.	µg/ml	A1V		-0,686	yes	1,75	20	1,63	1,85	1,84	0,224	12,1	11	3	0	14
	µg/l	G2V		-1,790	yes	6,41	25	4,98	6,61	6,49	0,989	15,2	13	1	0	14
	mg/kg	S3V		-0,826	yes	4,36	30	3,82	4,6	4,75	2,26	47,6	14	0	0	14
VOC-ETBE	µg/ml	A1V			yes	2,86		3,12	2,75	2,67	0,905	33,8	4	1	0	5
	µg/l	G2V			yes	5,51		5,03	5,06	5,55	1,98	35,6	5	0	0	5
	mg/kg	S3V			yes	7,1		7,74	6,57	6,49	1,64	25,2	4	1	0	5
VOC-m/p-	µg/ml	A1V		-0,637	yes	5,02	20	4,7	5,05	4,93	0,598	12,1	9	5	0	14
	µg/l	G2V		-0,970	yes	10,8	25	9,45	10,7	10,3	2,81	27,3	14	0	0	14
	mg/kg	S3V		-0,609	yes	12,5	30	11,3	12,6	11,9	2,4	20,2	12	2	0	14
VOC-MTBE	µg/ml	A1V		2,220	yes	4,12	20	5,04	4,3	4,34	0,981	22,5	9	1	0	10
	µg/l	G2V		0,676	yes	16,1	25	17,5	16,3	16,1	2,88	17,8	10	0	0	10
	mg/kg	S3V		1,010	yes	10,2	30	11,8	10,7	10,7	1,82	16,9	9	1	0	10
VOC-o-Xylene	µg/ml	A1V		-0,296	yes	1,52	20	1,48	1,61	1,65	0,216	13,0	12	2	0	14
	µg/l	G2V		-1,180	yes	4,57	25	3,89	4,56	4,6	0,623	13,5	11	2	1	14
	mg/kg	S3V		-0,265	yes	3,78	30	3,63	4,01	3,85	0,528	13,7	12	2	0	14
VOC-Styrene	µg/ml	A1V		-0,397	yes	1,89	20	1,81	1,79	1,83	0,553	30,2	9	0	0	9
VOC-t12DCEe	µg/ml	A1V		-0,610	yes	0,426	20	0,4	0,451	0,462	0,106	22,9	11	0	0	11
VOC-TAME	µg/ml	A1V		0,336	yes	3,42	20	3,54	3,38	3,45	0,393	11,4	8	2	0	10
	µg/l	G2V		0,153	yes	12,2	25	12,4	12,3	11,8	1,56	13,2	8	2	0	10
	mg/kg	S3V		0,194	yes	8,26	30	8,5	8	7,85	1,27	16,2	9	1	0	10
VOC-TCEe	µg/ml	A1V		-0,206	yes	1,94	20	1,9	1,8	1,79	0,445	24,8	14	0	0	14
	µg/l	G2V		6,150	yes	5,32	25	9,41	5,65	5,54	1,4	25,2	12	1	1	14

Outlier test failed: C - Cohcran, G1 - Grubbs(1-outlier algorithm), G2 - Grubbs(2-outliers algorithm), H - Hampel, M - manual

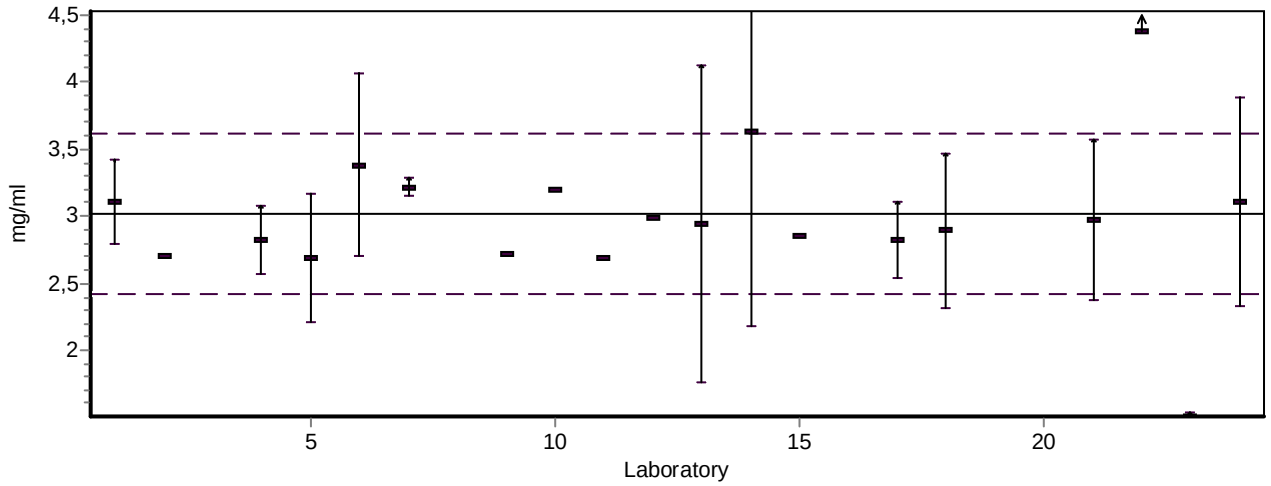
Analyte	Unit	Sample	z-Graphics -3 -2 -1 0 +1 +2 +3	Z- value	Outl test OK	Assig-ned value	2* Targ SD%	Lab's result	Md.	Mean	SD	SD%	Pas-sed	Outl. fai-led	Mis-sing	Num of labs
	mg/kg	S3V		-0,272	yes	4,84	30	4,64	4,67	4,55	0,816	17,9	10	2	0	12
Laboratory 24																
VOC-TeTCEe	µg/ml	A1V		-0,581	yes	3,87	20	3,64	3,79	3,79	0,665	17,5	12	2	0	14
	µg/l	G2V		-2,050	yes	9,99	25	7,43	9,8	10,2	2,01	19,7	14	0	0	14
	mg/kg	S3V		-0,907	yes	9,63	30	8,32	9,71	9,39	1,41	14,9	10	2	0	12
VOC-Toluene	µg/ml	A1V		1,350	yes	3,55	20	4,03	3,76	3,76	0,217	5,8	11	3	0	14
	µg/l	G2V		-0,332	yes	9,31	25	8,92	9,2	9,36	1,11	11,8	14	0	0	14
	mg/kg	S3V		0,502	yes	8,83	30	9,49	9,34	9,11	1,37	15,0	12	2	0	14
VOC-VIN	µg/ml	A1V		22,600	H	0,426	20	1,39	0,495	0,471	0,157	33,3	8	1	0	9

VOC- = VOC-1122TeCEa
VOC-Et. = VOC-Et.benzene
VOC-m/p- = VOC-m/p-Xylene

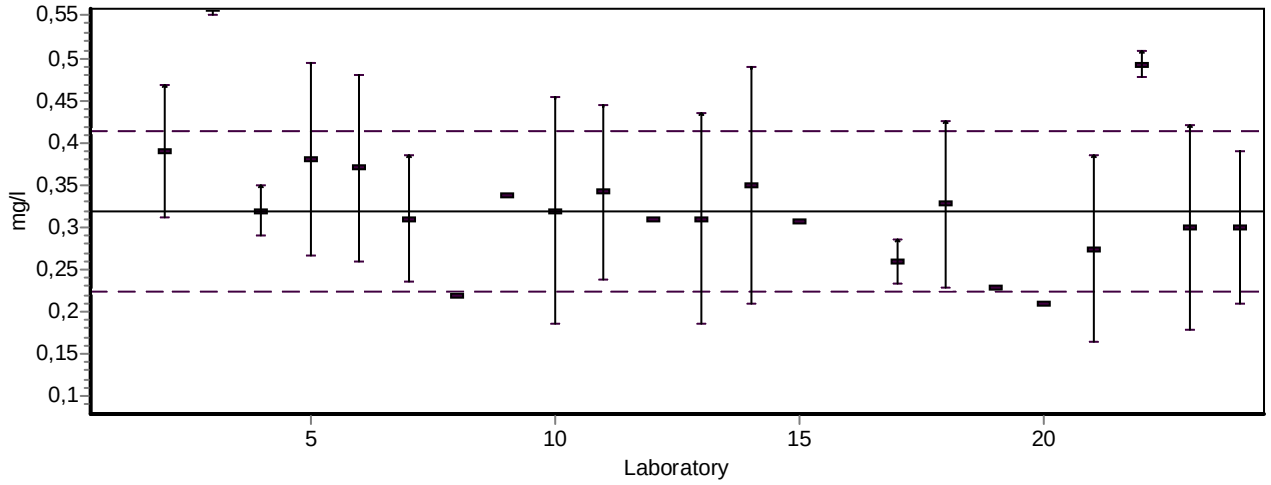
LIITE 8.

Appendix 8. Results and uncertainty estimates reported by the laboratories

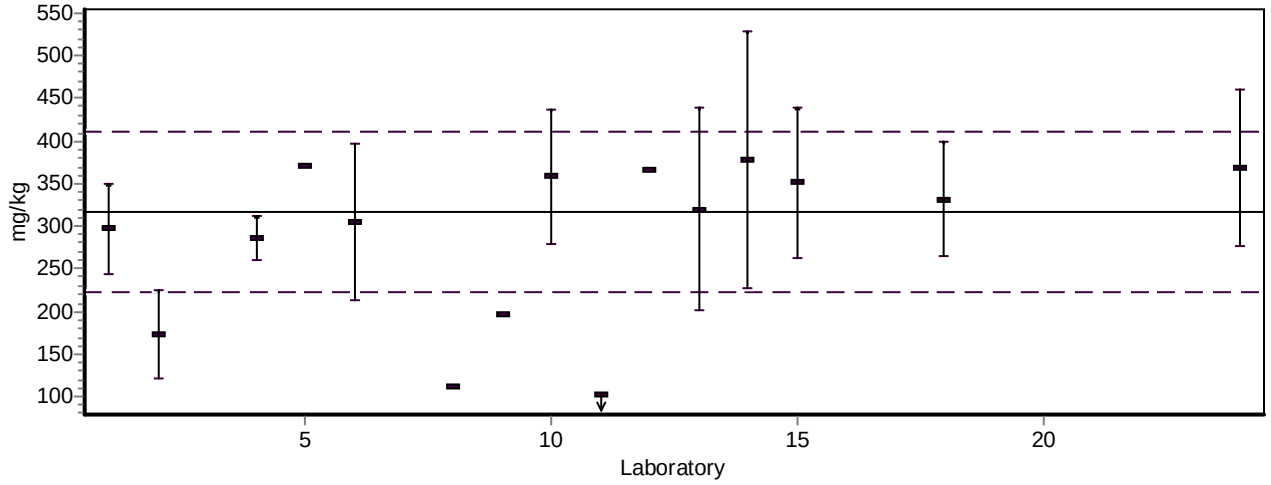
Analyytti *(Analyte)* **Min-oil-GC** Näyte *(Sample)* A1O



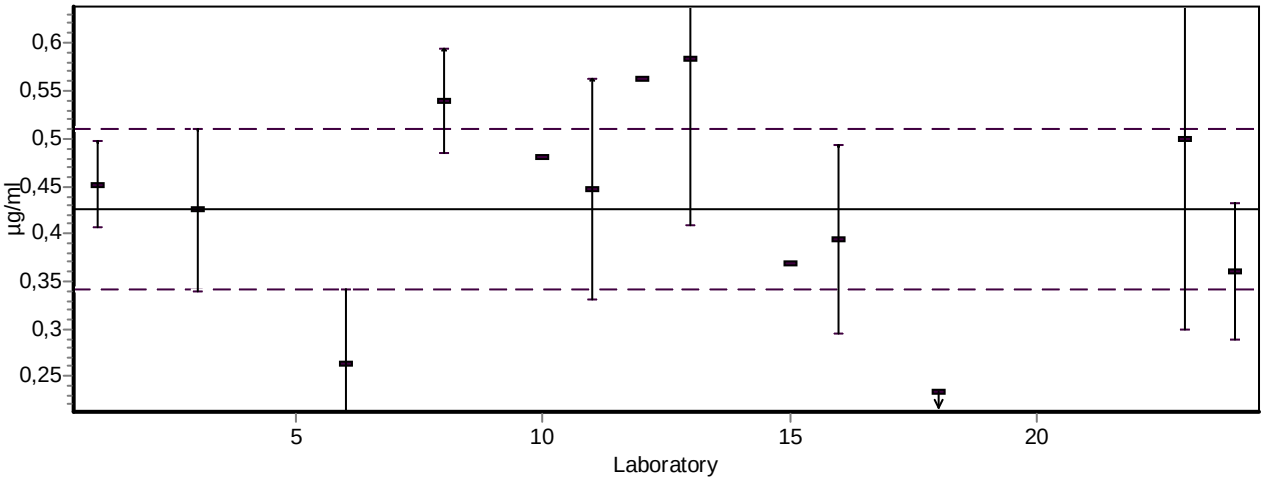
Analyytti *(Analyte)* **Min-oil-GC** Näyte *(Sample)* G2O



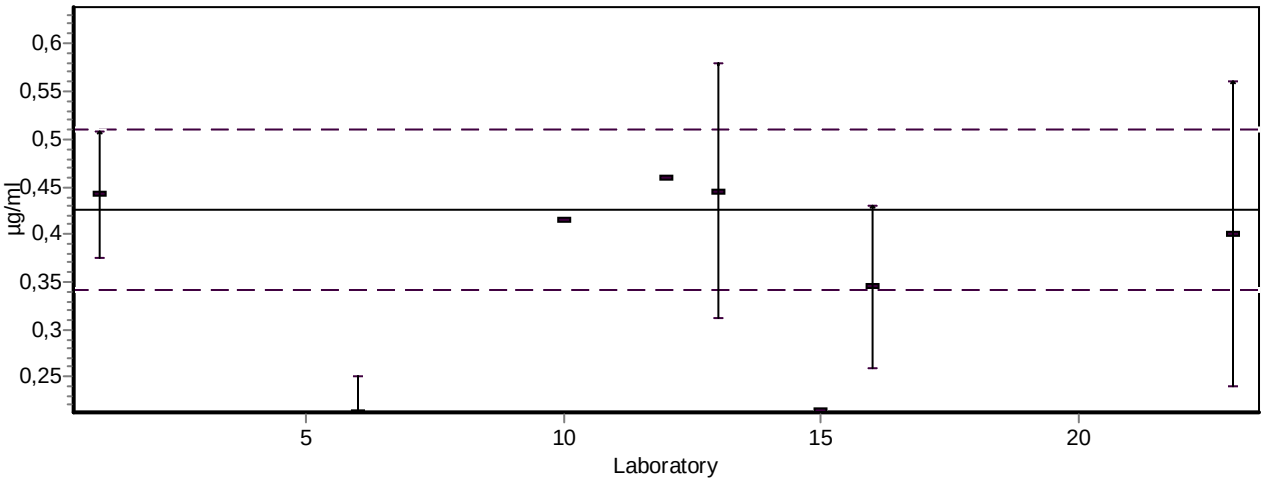
Analyytti *(Analyte)* **Min-oil-GC** Näyte *(Sample)* S3O



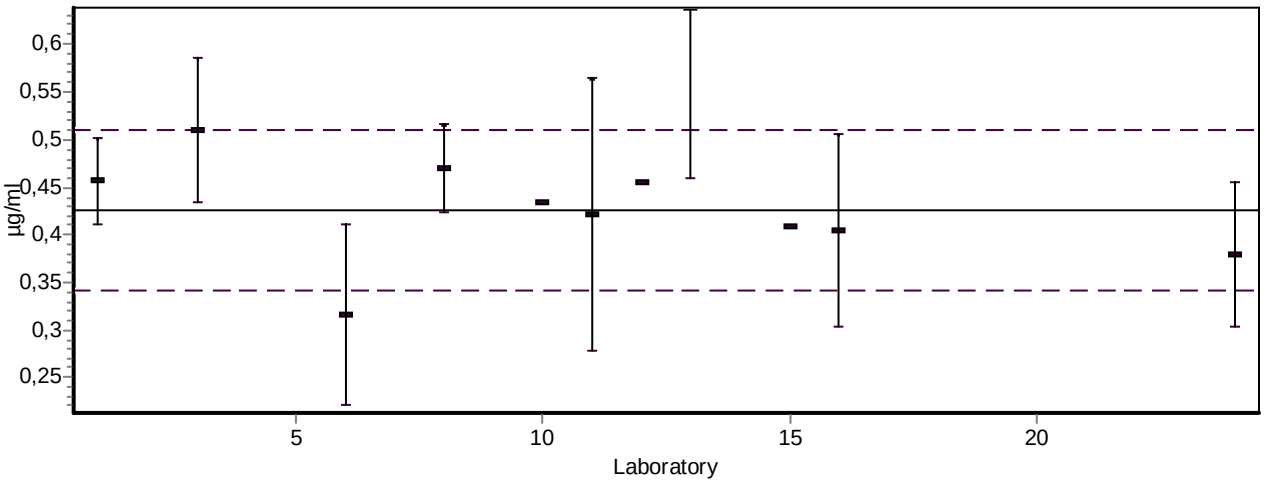
Analyytti *(Analyte)* **VOC-111TCEa** Näyte *(Sample)* A1V



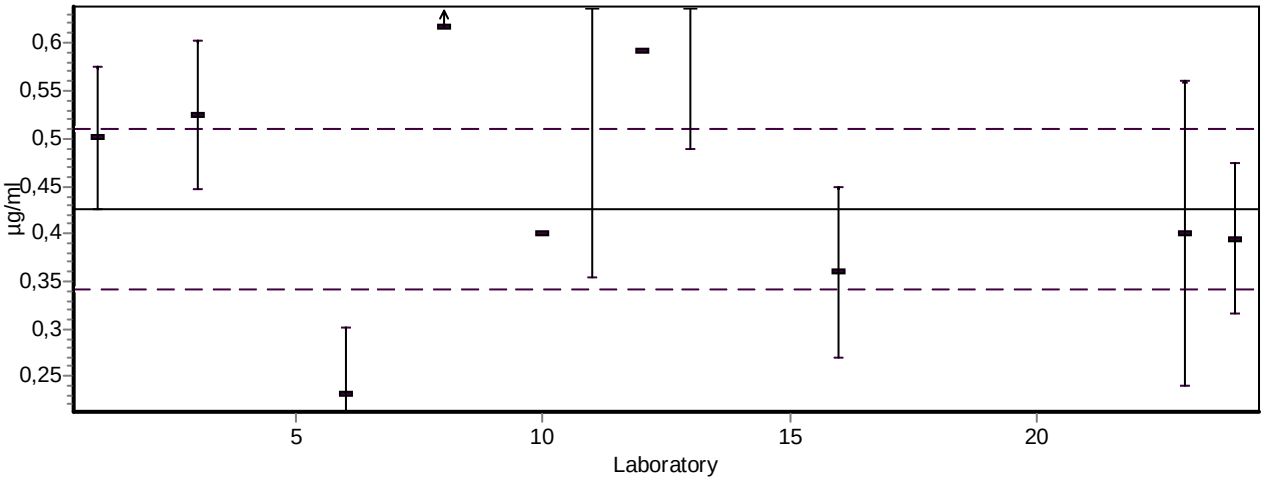
Analyytti *(Analyte)* **VOC-1122TeCEa** Näyte *(Sample)* A1V



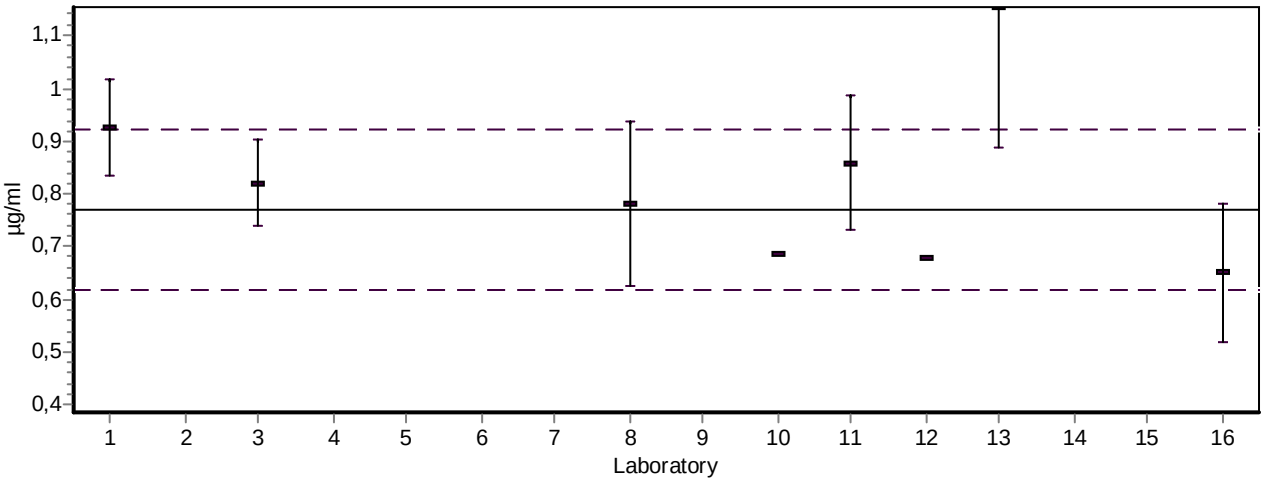
Analyytti *(Analyte)* **VOC-11DCEa** Näyte *(Sample)* A1V



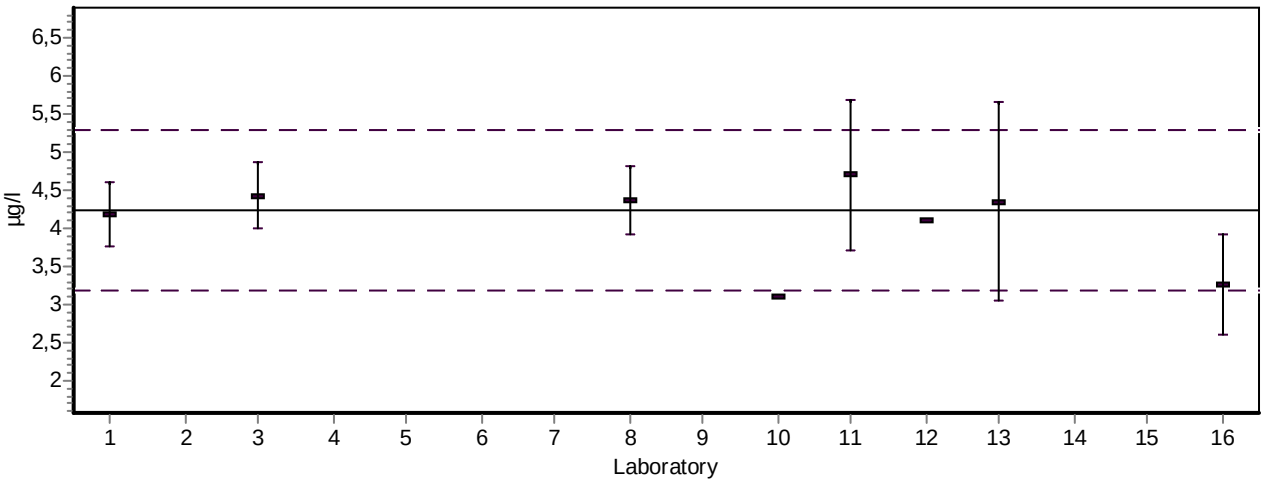
Analyytti *(Analyte)* **VOC-11DCEe** Näyte *(Sample)* A1V



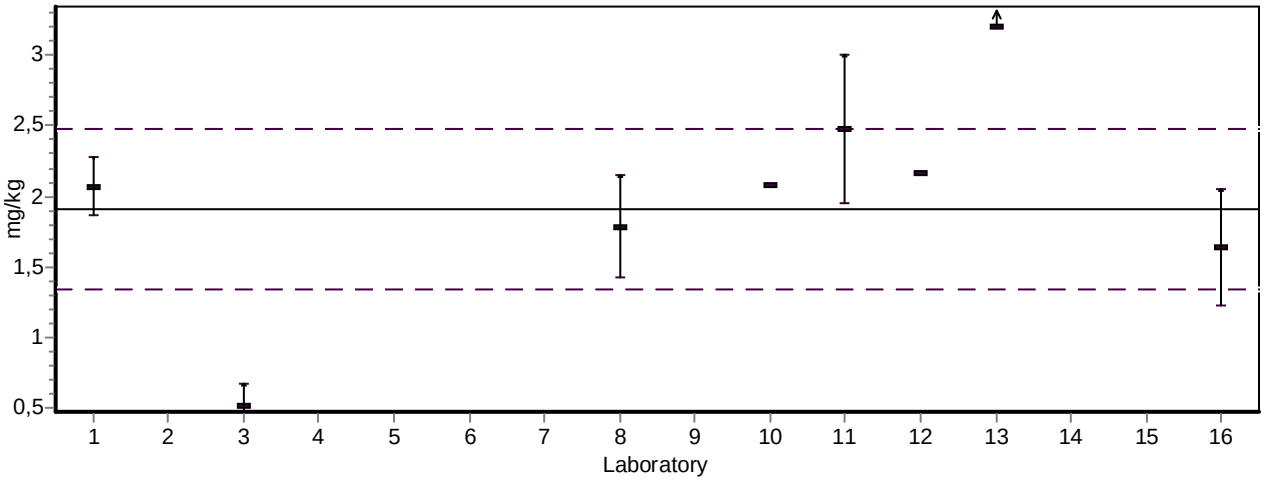
Analyytti *(Analyte)* **VOC-124TCB** Näyte *(Sample)* A1V



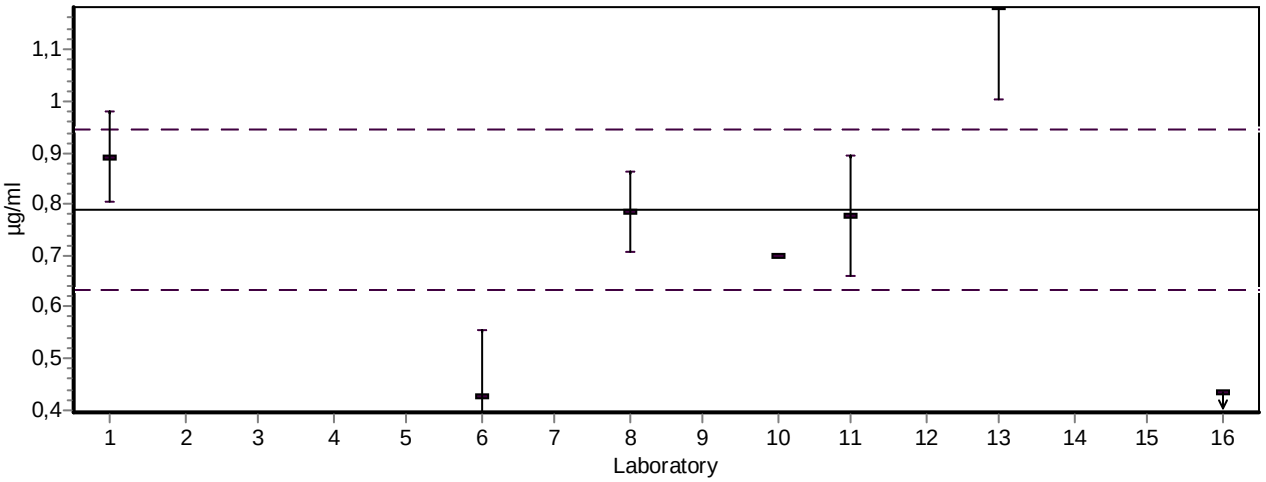
Analyytti *(Analyte)* **VOC-124TCB** Näyte *(Sample)* G2V



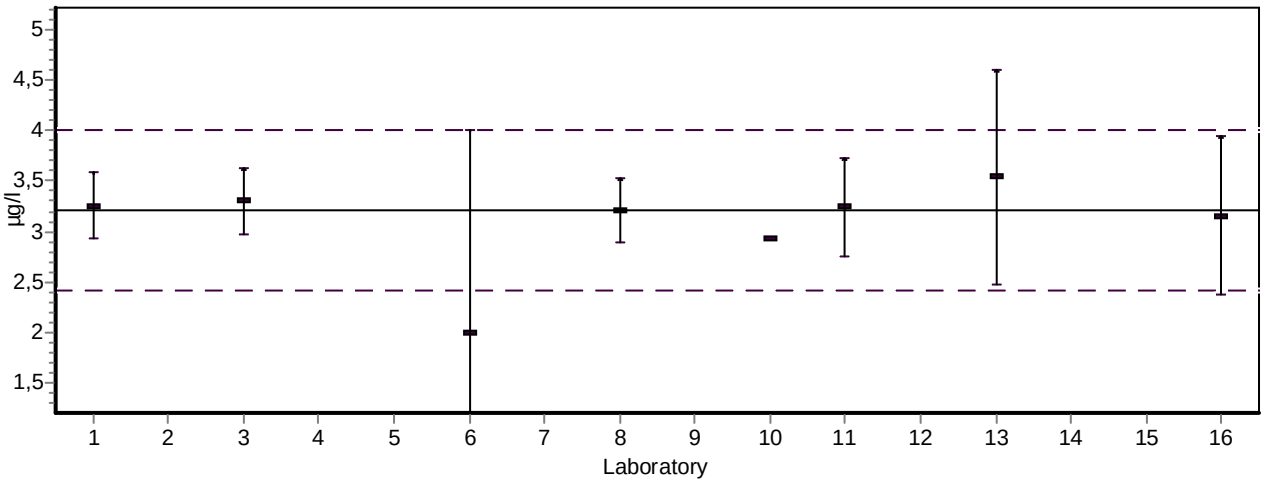
Analyytti *(Analyte)* **VOC-124TCB** Näyte *(Sample)* S3V



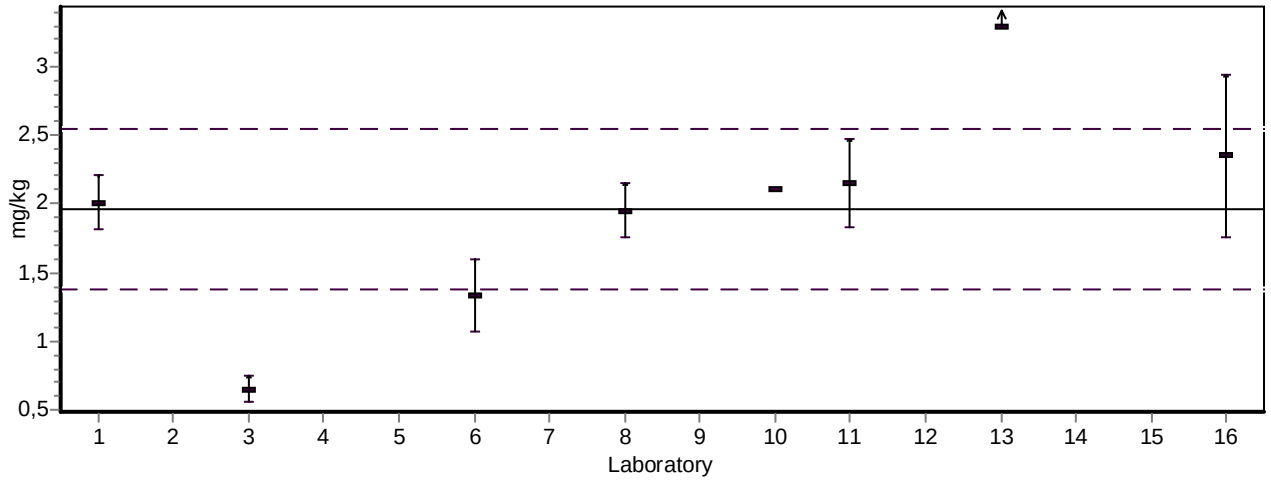
Analyytti *(Analyte)* **VOC-12DCB** Näyte *(Sample)* A1V



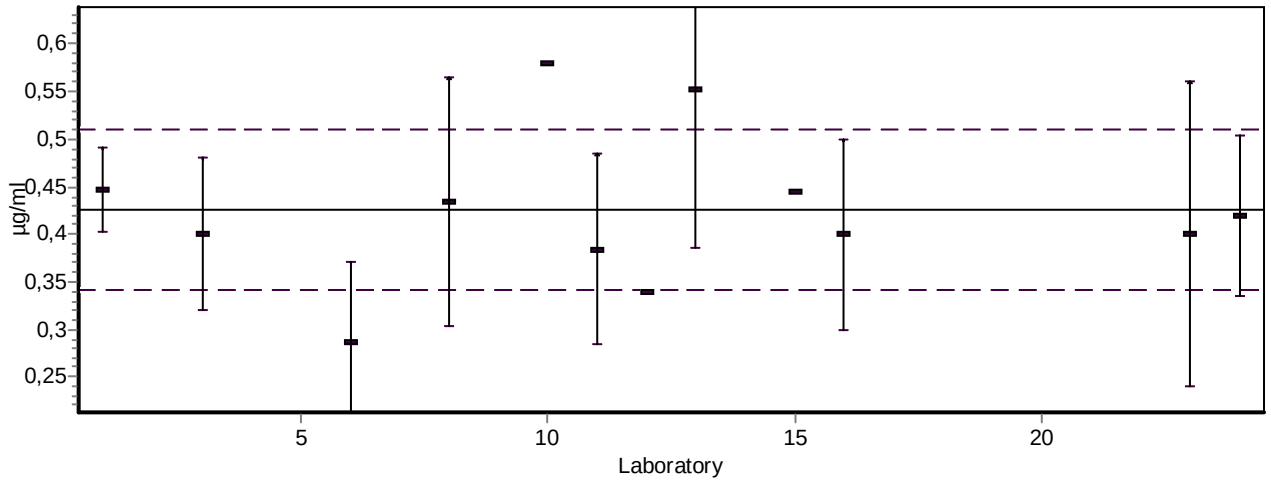
Analyytti *(Analyte)* **VOC-12DCB** Näyte *(Sample)* G2V



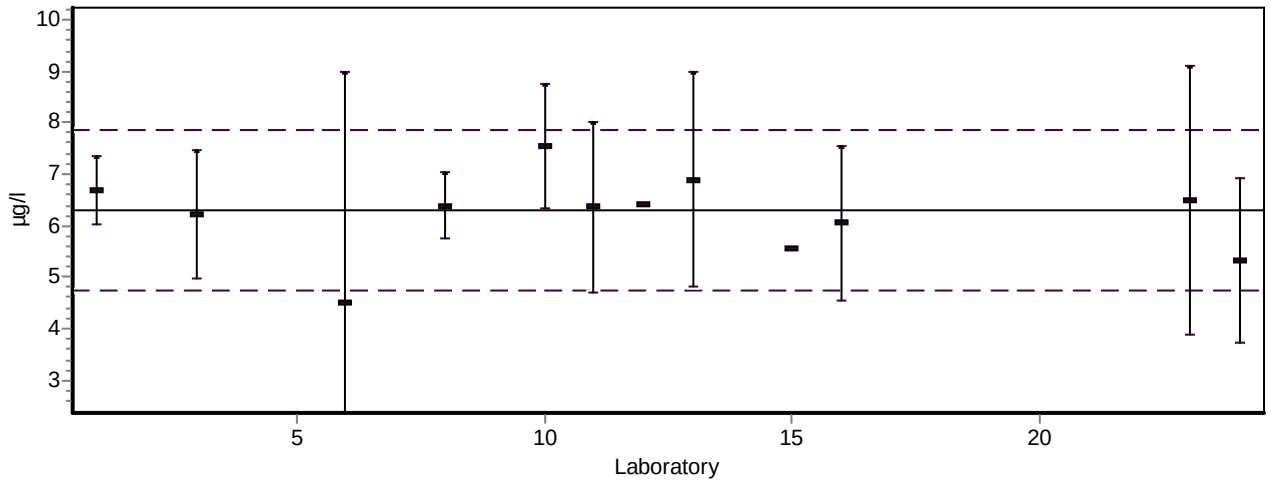
Analyytti *(Analyte)* **VOC-12DCB** Näyte *(Sample)* S3V



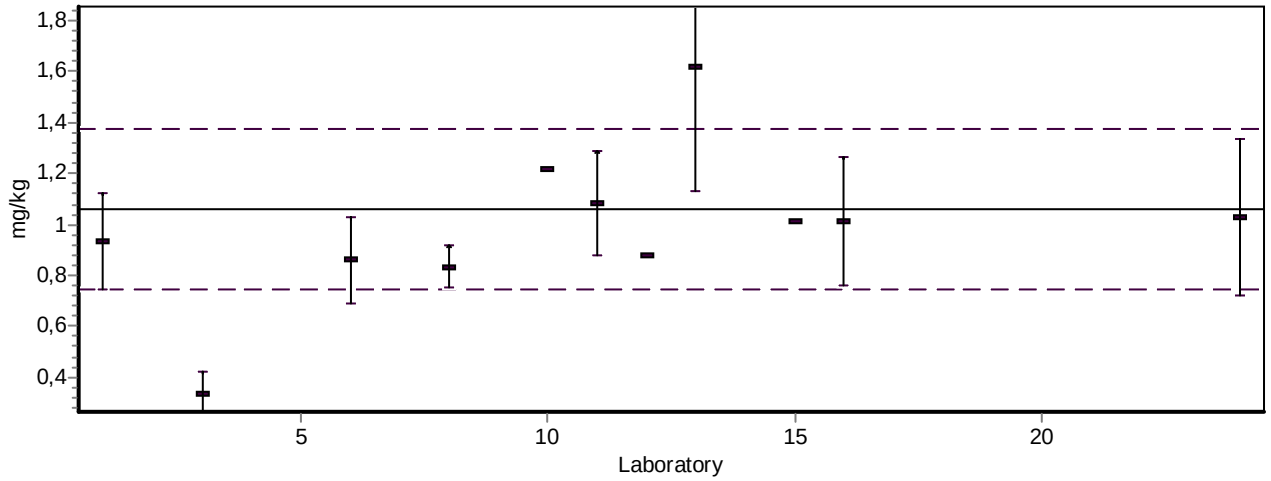
Analyytti *(Analyte)* **VOC-12DCEa** Näyte *(Sample)* A1V



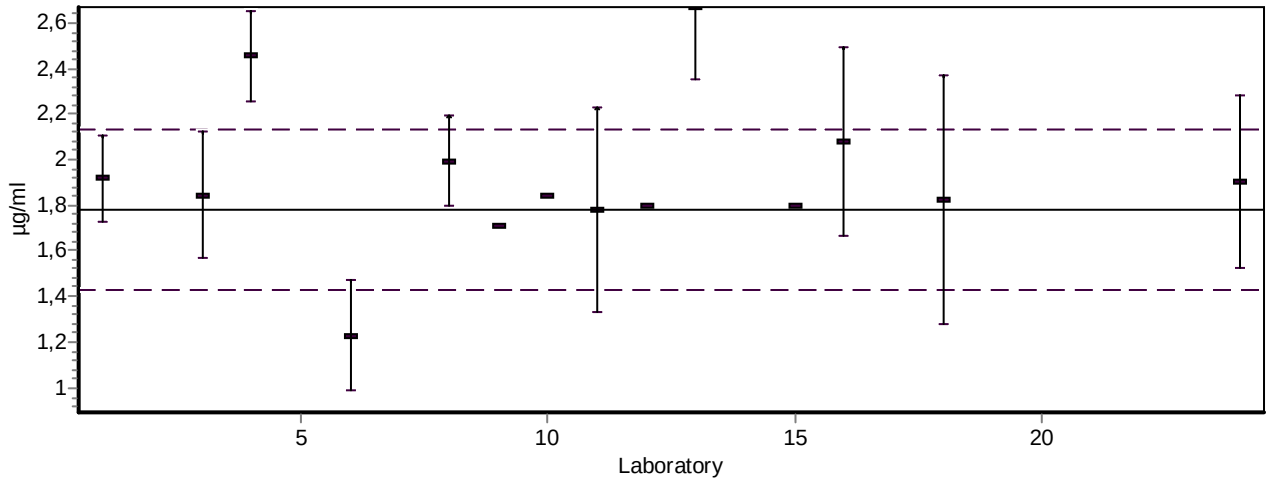
Analyytti *(Analyte)* **VOC-12DCEa** Näyte *(Sample)* G2V



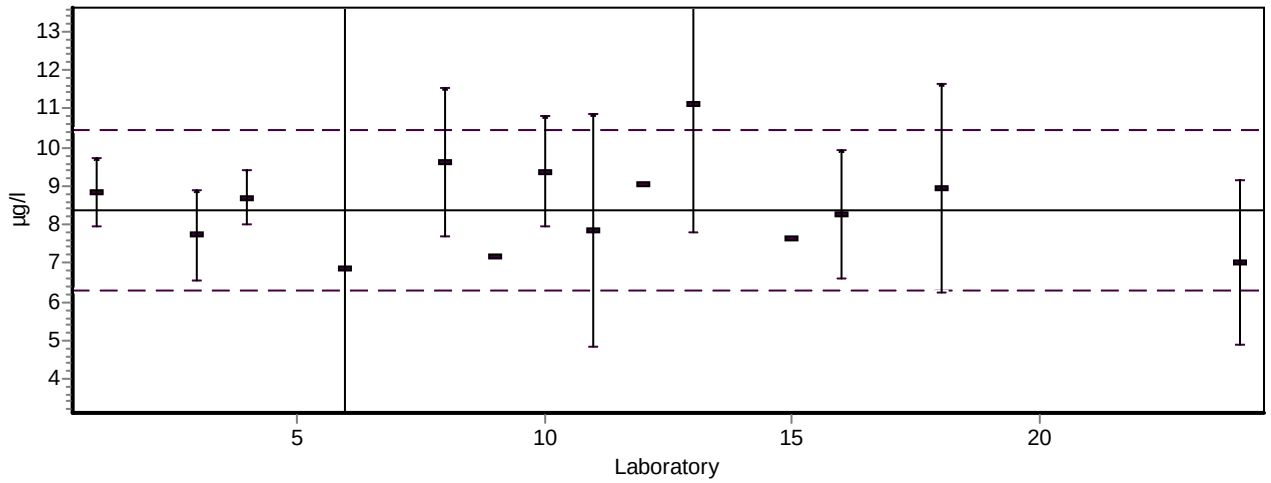
Analyytti *(Analyte)* **VOC-12DCEa** Näyte *(Sample)* S3V



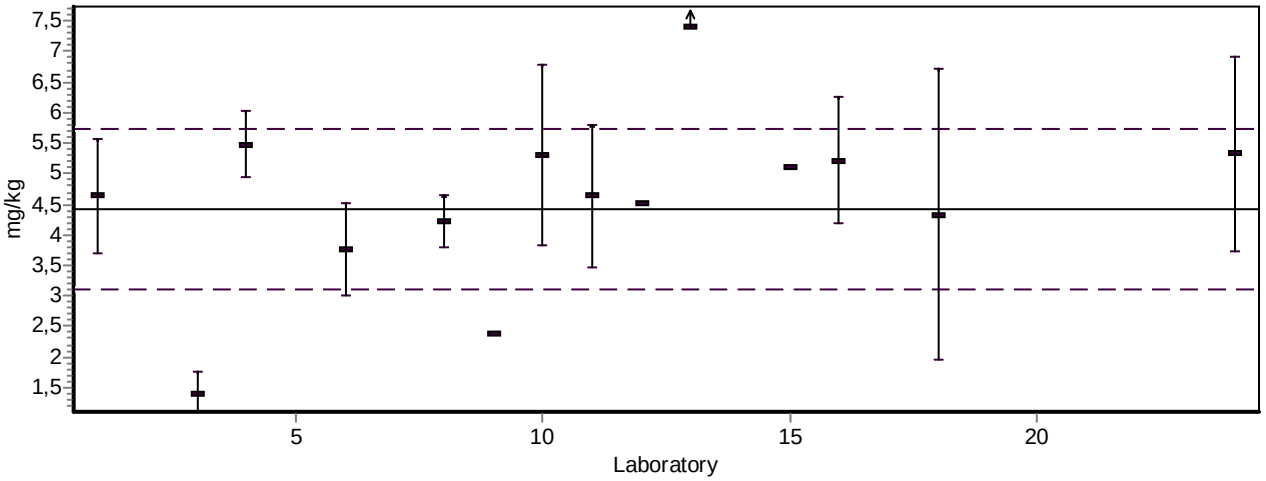
Analyytti *(Analyte)* **VOC-Benzene** Näyte *(Sample)* A1V



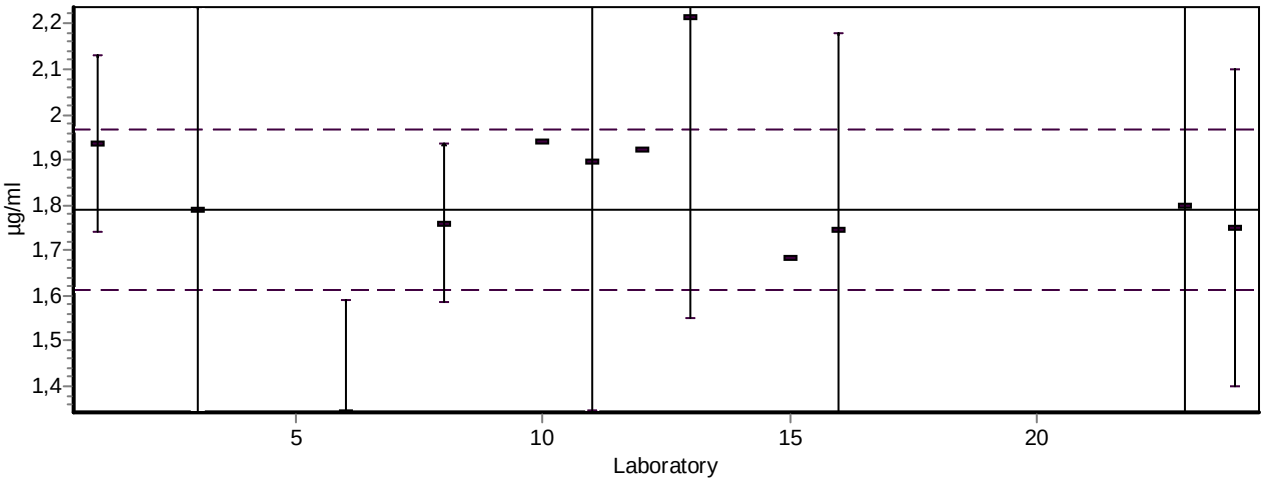
Analyytti *(Analyte)* **VOC-Benzene** Näyte *(Sample)* G2V



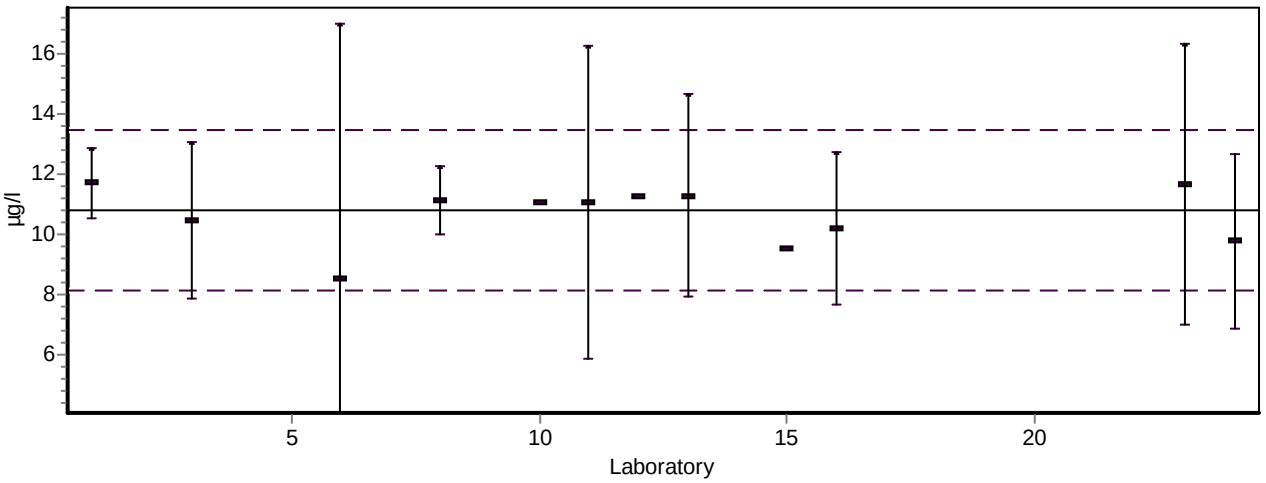
Analyytti *(Analyte)* **VOC-Benzene** Näyte *(Sample)* S3V



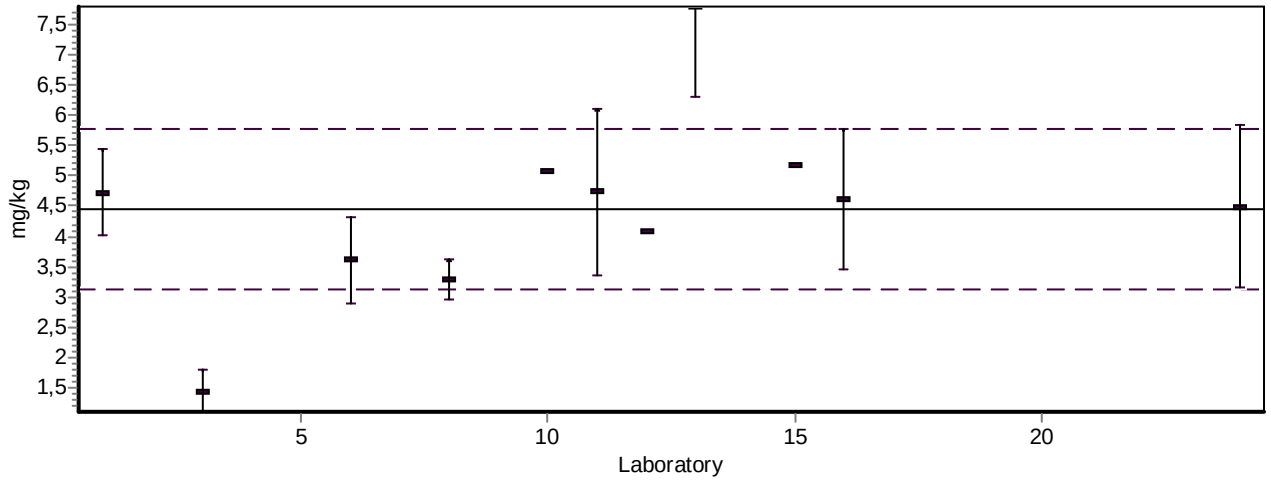
Analyytti *(Analyte)* **VOC-c12DCEe** Näyte *(Sample)* A1V



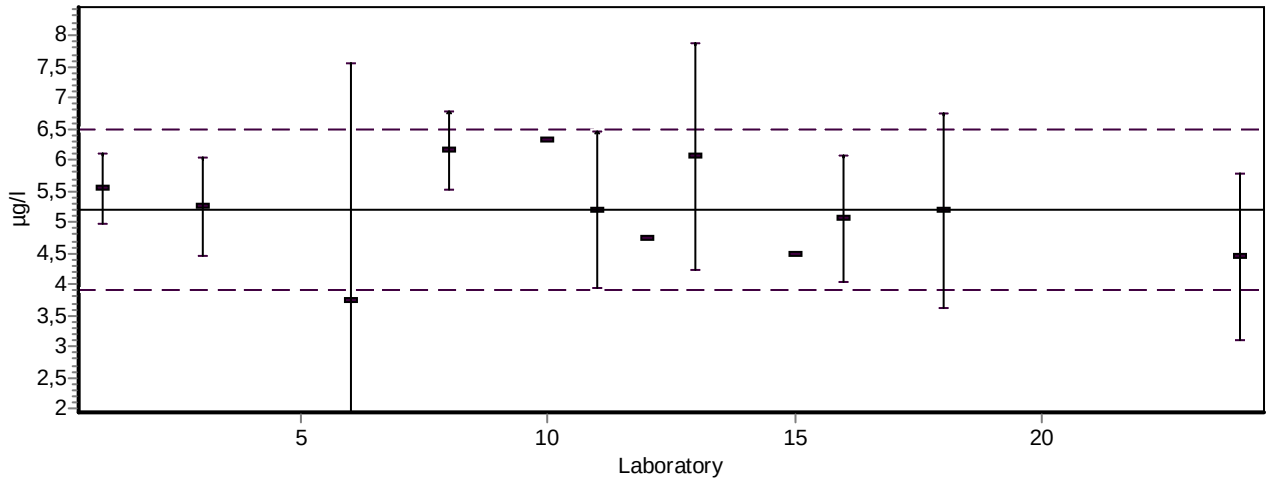
Analyytti *(Analyte)* **VOC-c12DCEe** Näyte *(Sample)* G2V



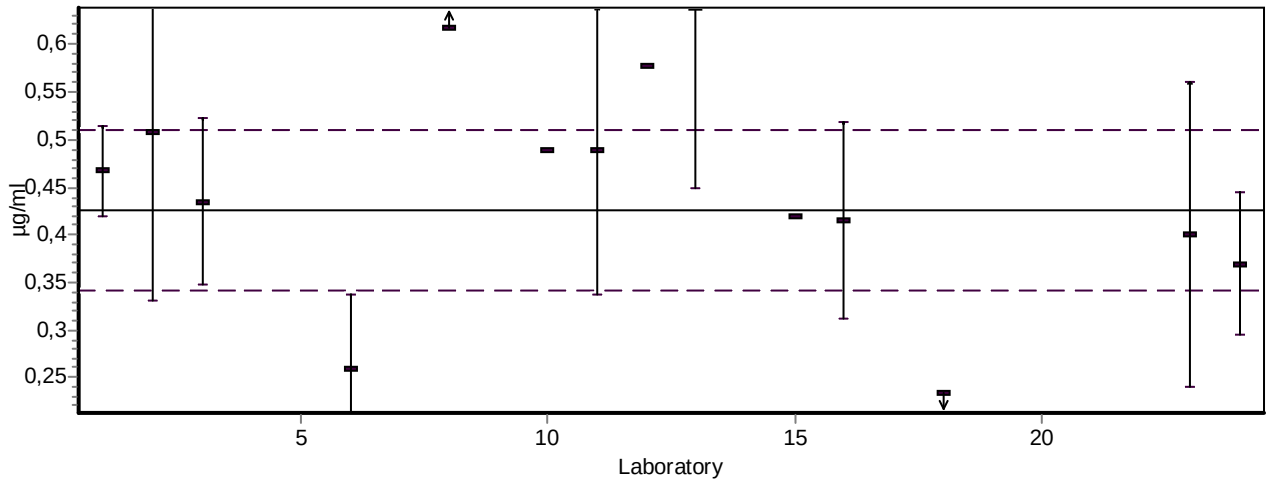
Analyytti *(Analyte)* **VOC-c12DCEe** Näyte *(Sample)* S3V



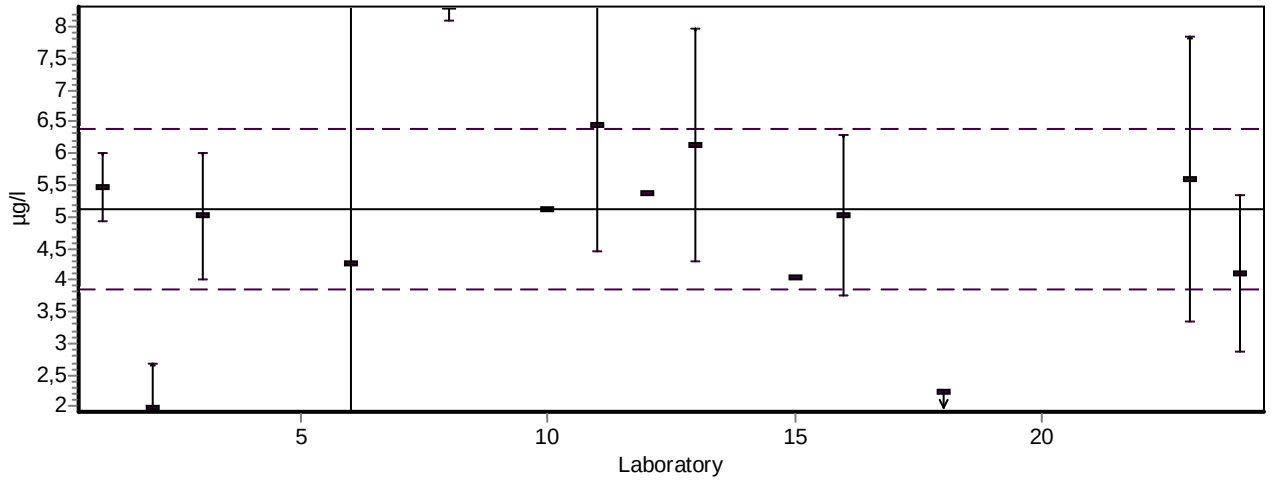
Analyytti *(Analyte)* **VOC-CB** Näyte *(Sample)* G2V



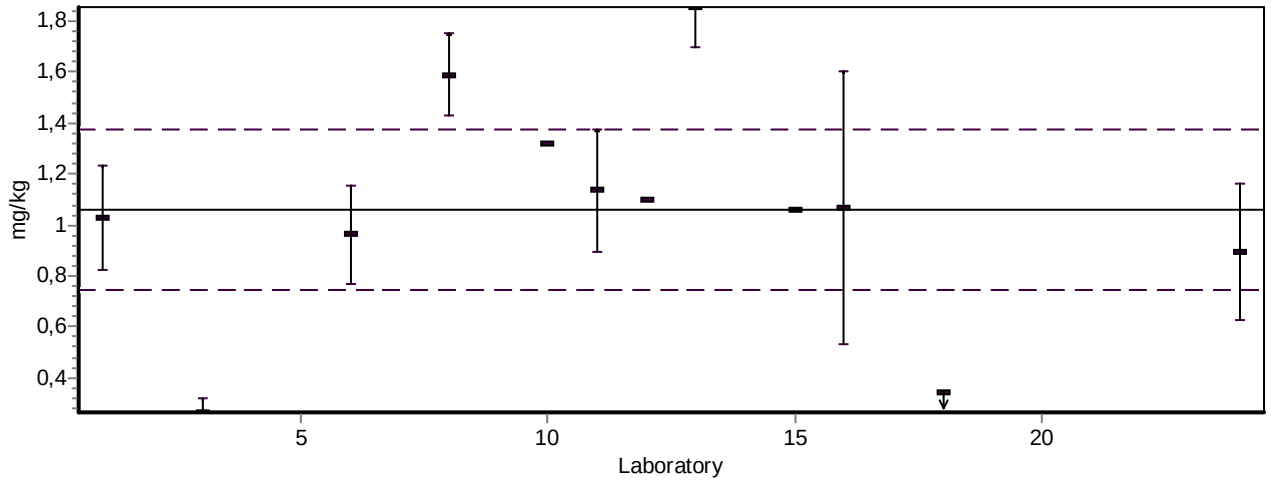
Analyytti *(Analyte)* **VOC-CCl4** Näyte *(Sample)* A1V



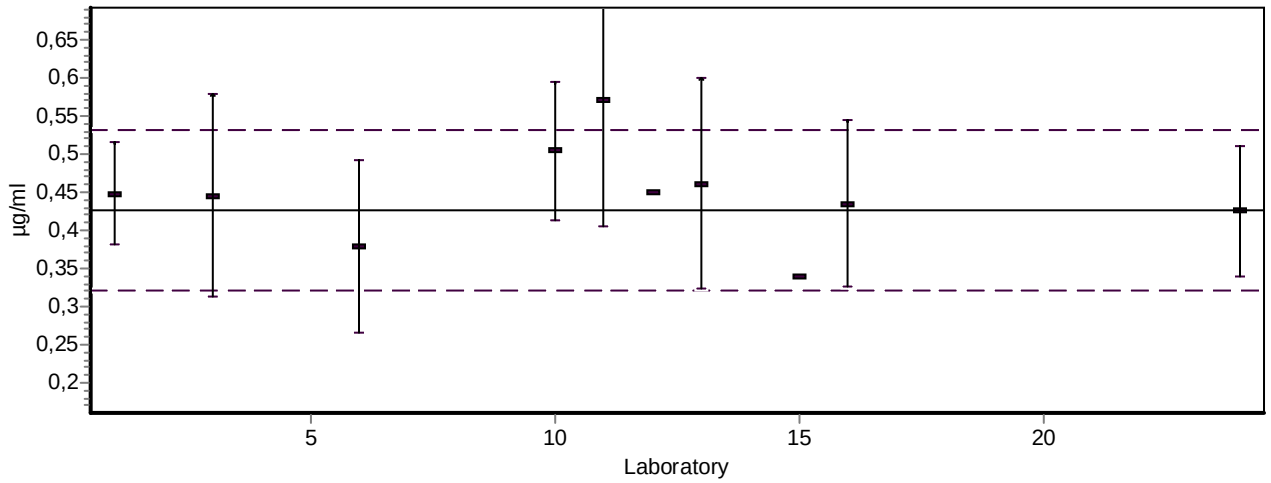
Analyytti *(Analyte)* **VOC-CCl4** Näyte *(Sample)* G2V



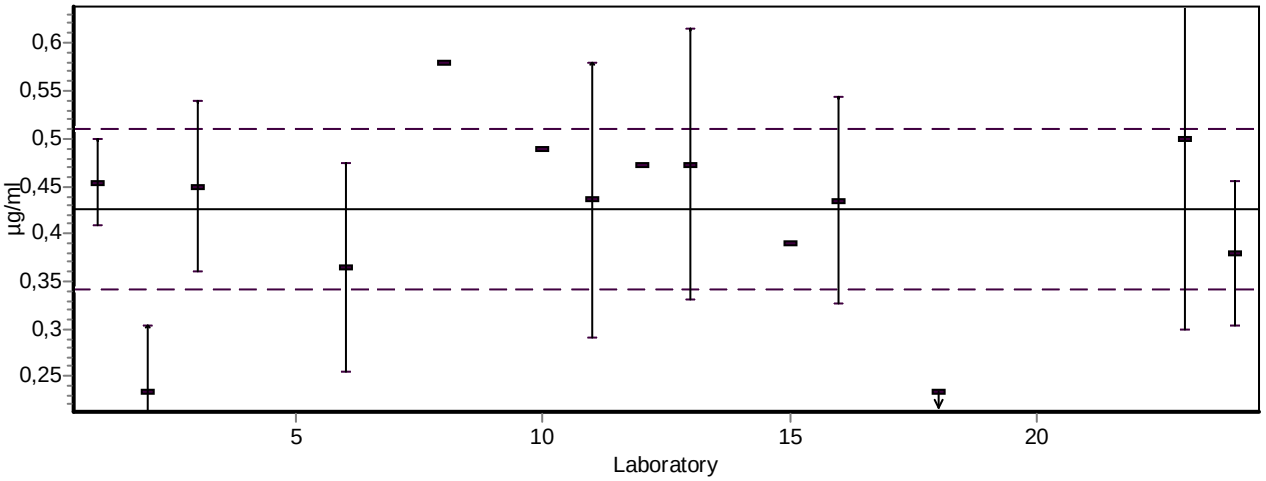
Analyytti *(Analyte)* **VOC-CCl4** Näyte *(Sample)* S3V



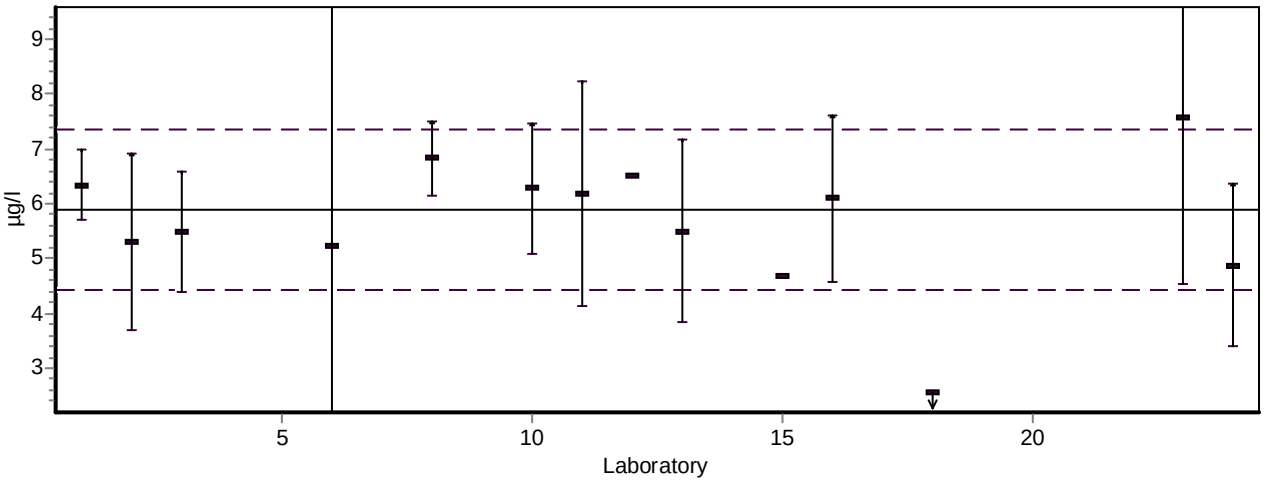
Analyytti *(Analyte)* **VOC-CHBr3** Näyte *(Sample)* A1V



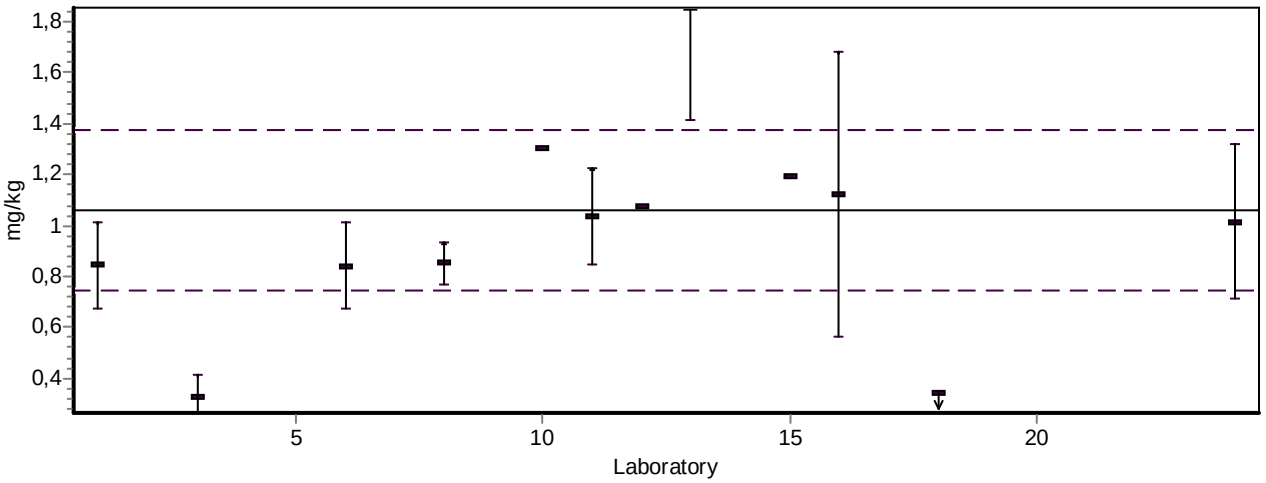
Analyytti *(Analyte)* **VOC-CHCl3** Näyte *(Sample)* A1V



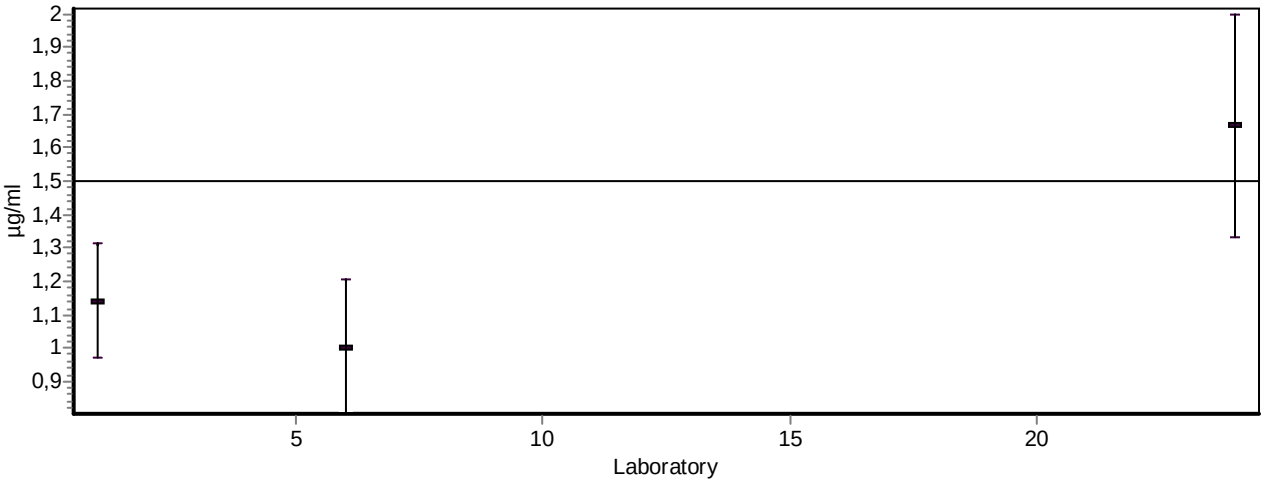
Analyytti *(Analyte)* **VOC-CHCl3** Näyte *(Sample)* G2V



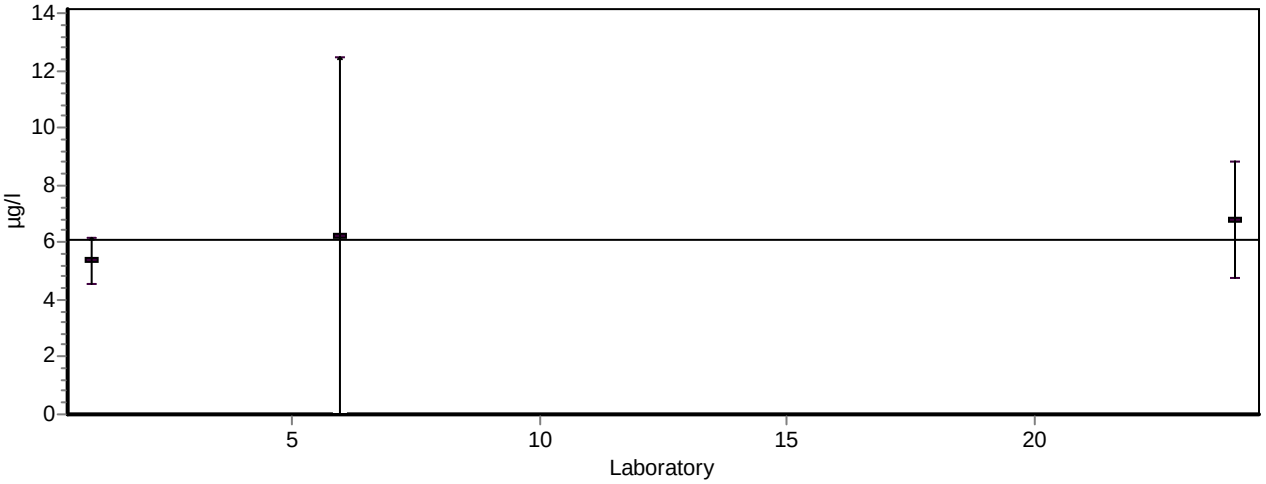
Analyytti *(Analyte)* **VOC-CHCl3** Näyte *(Sample)* S3V



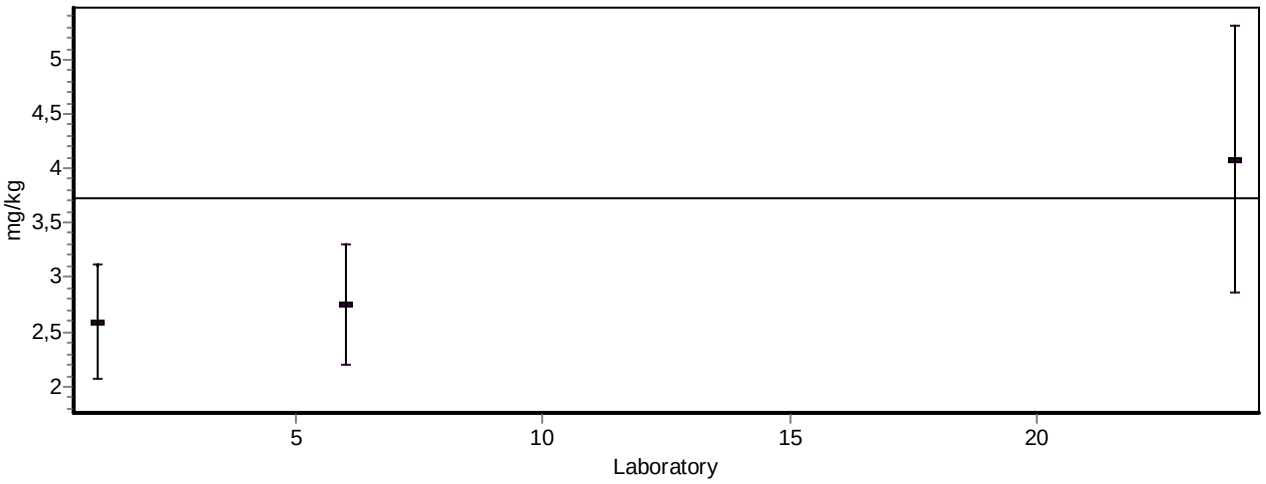
Analyytti *(Analyte)* **VOC-DIPE** Näyte *(Sample)* A1V



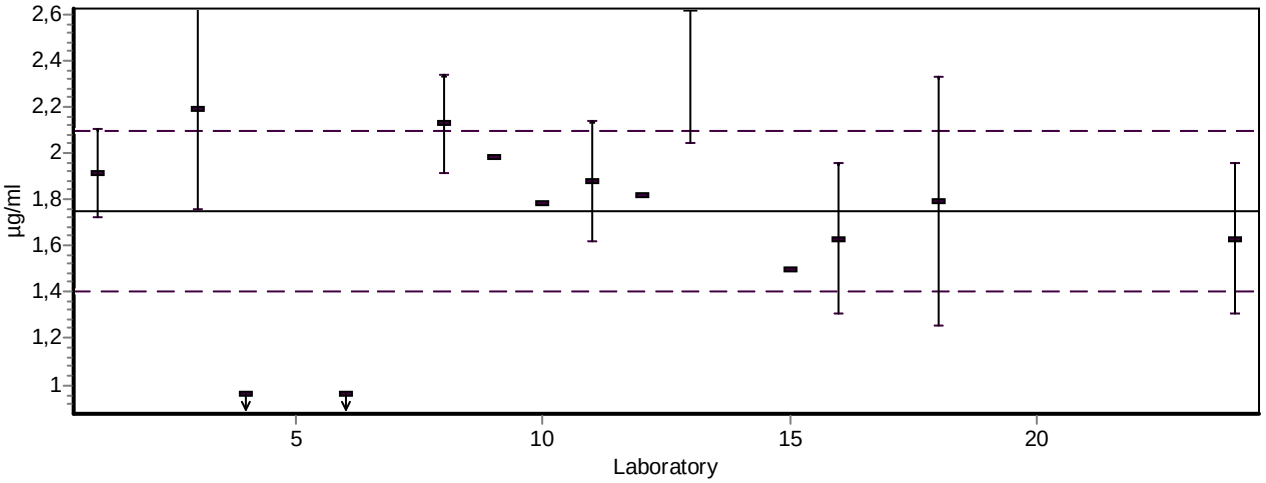
Analyytti *(Analyte)* **VOC-DIPE** Näyte *(Sample)* G2V



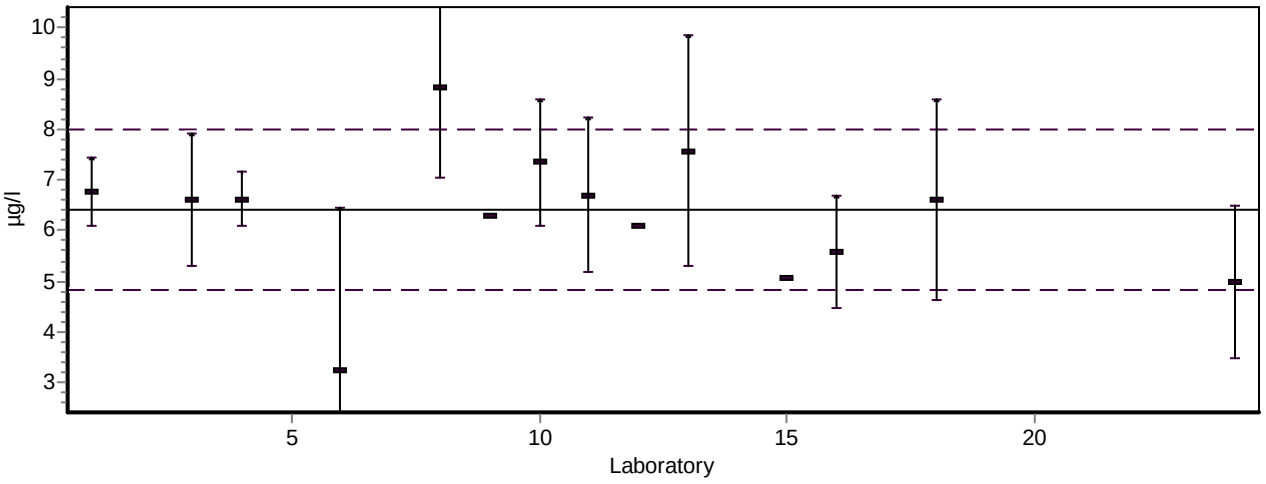
Analyytti *(Analyte)* **VOC-DIPE** Näyte *(Sample)* S3V



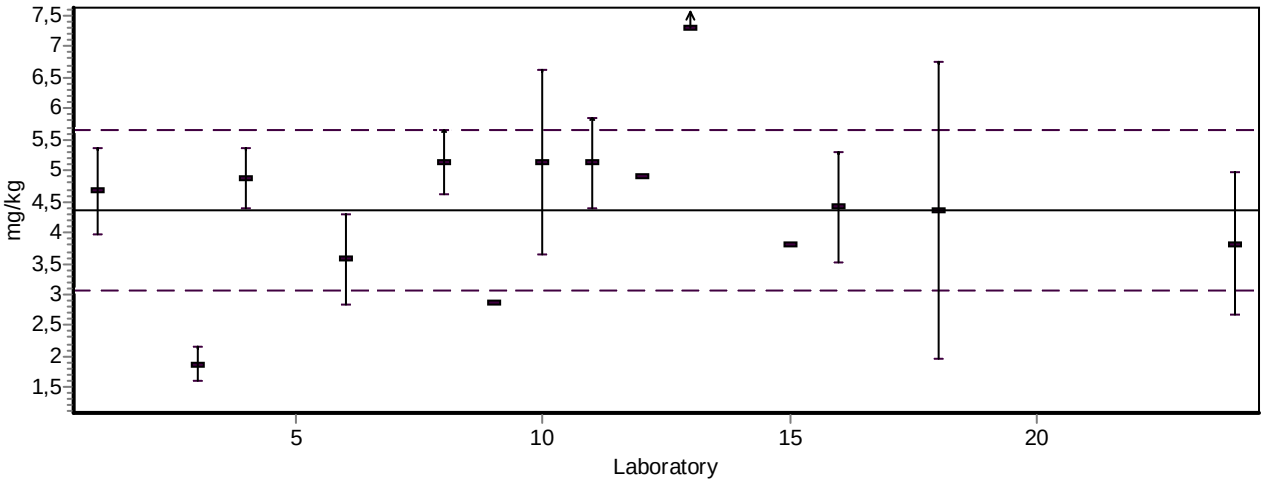
Analyytti *(Analyte)* **VOC-Et.benzene** Näyte *(Sample)* A1V



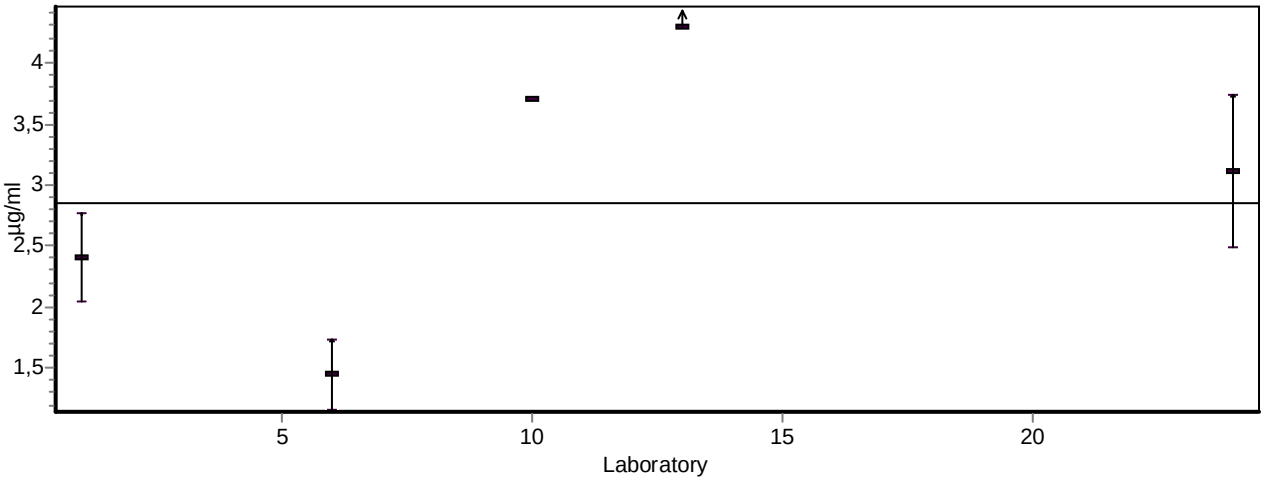
Analyytti *(Analyte)* **VOC-Et.benzene** Näyte *(Sample)* G2V



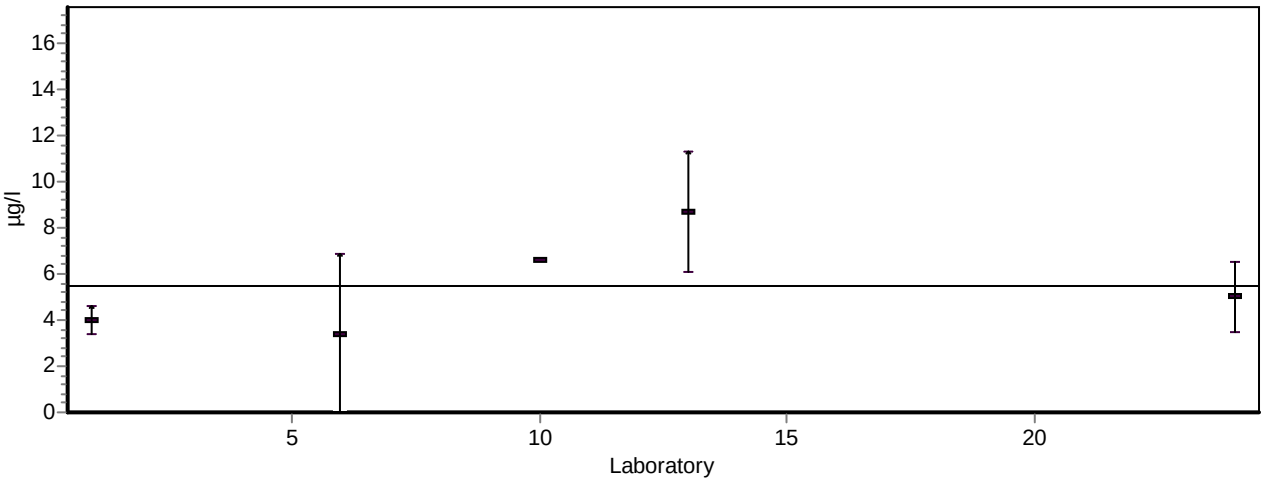
Analyytti *(Analyte)* **VOC-Et.benzene** Näyte *(Sample)* S3V



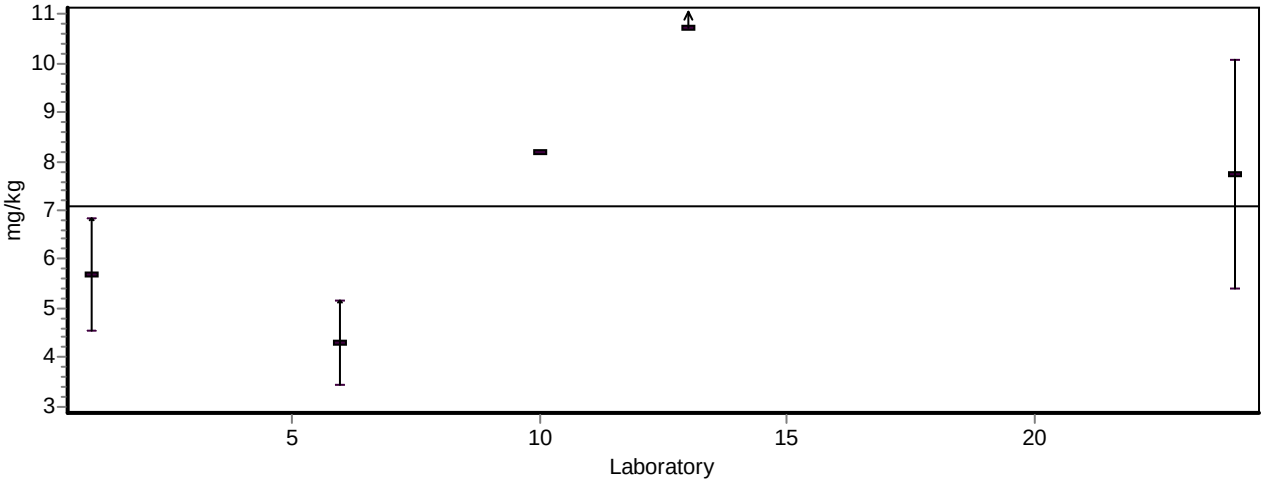
Analyytti *(Analyte)* **VOC-ETBE** Näyte *(Sample)* A1V



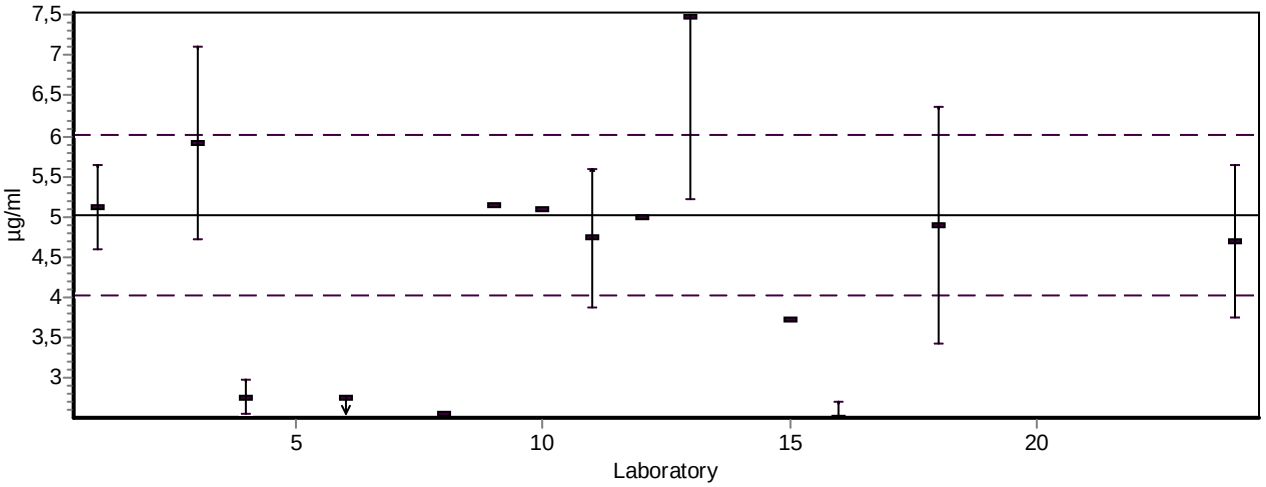
Analyytti *(Analyte)* **VOC-ETBE** Näyte *(Sample)* G2V



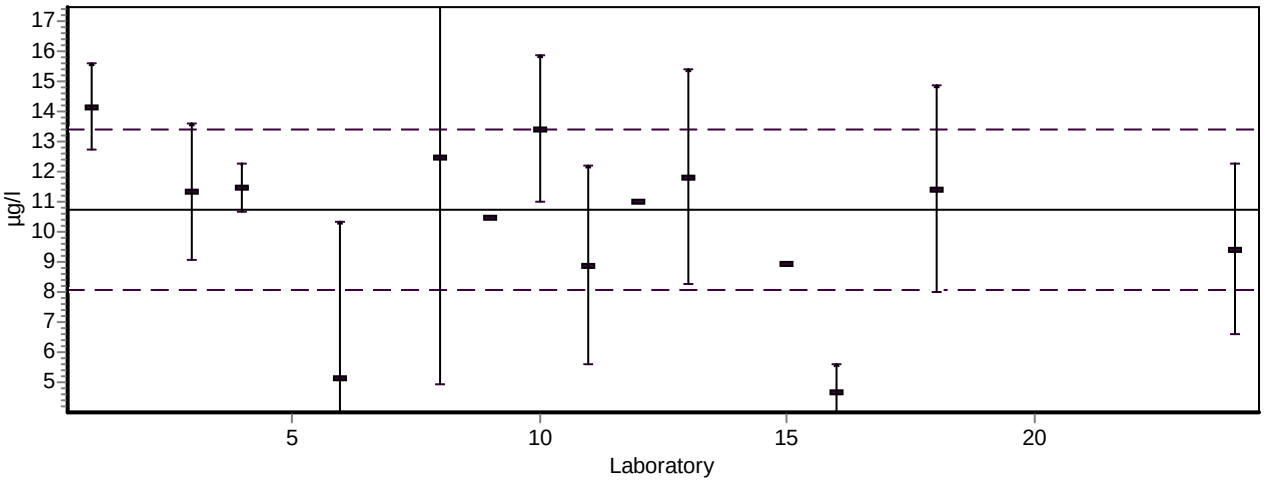
Analyytti *(Analyte)* **VOC-ETBE** Näyte *(Sample)* S3V



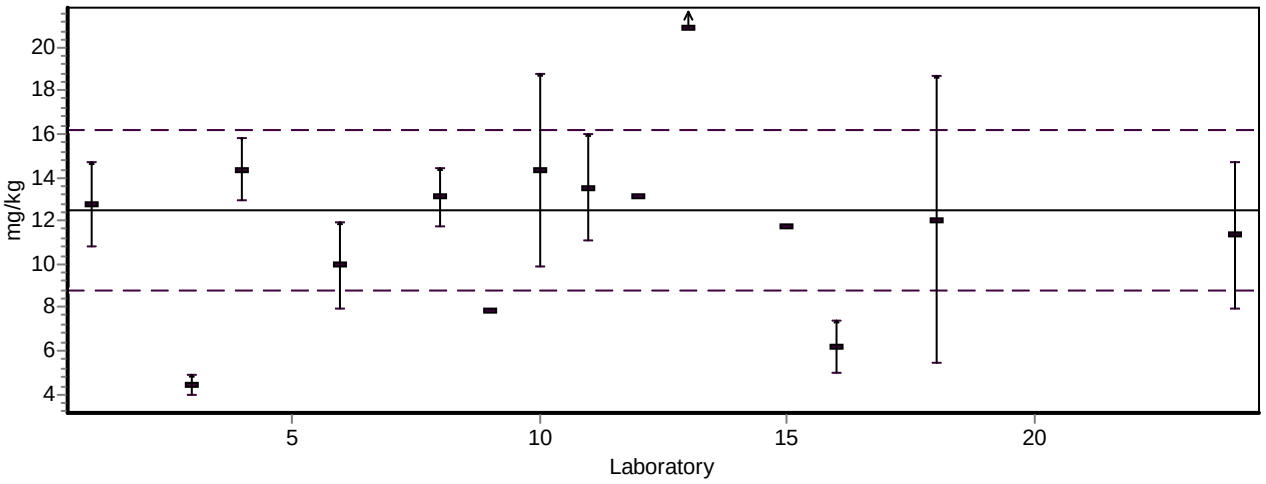
Analyytti *(Analyte)* **VOC-m/p-Xylene** Näyte *(Sample)* A1V



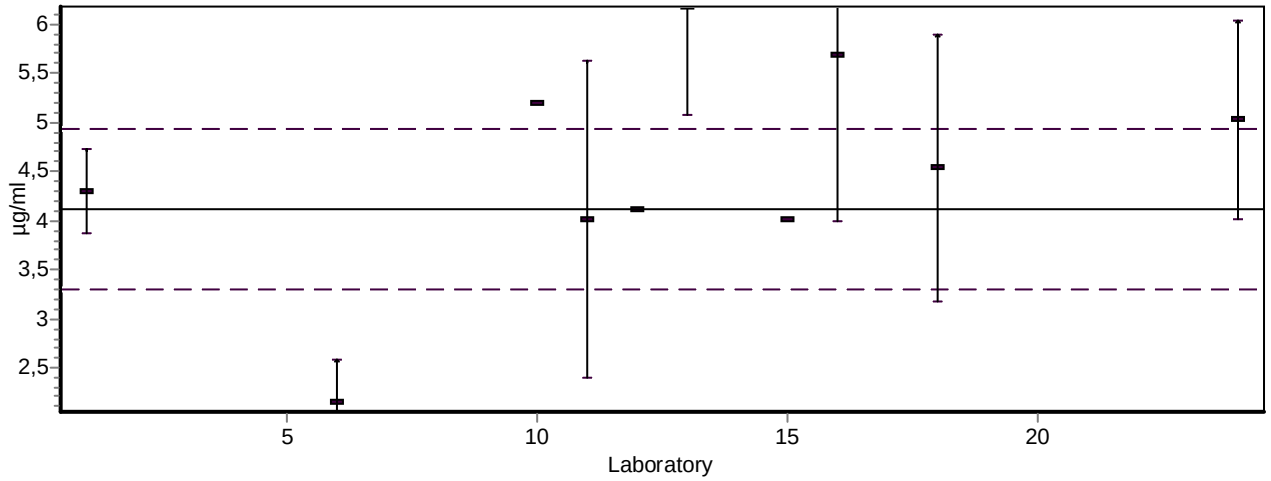
Analyytti *(Analyte)* **VOC-m/p-Xylene** Näyte *(Sample)* G2V



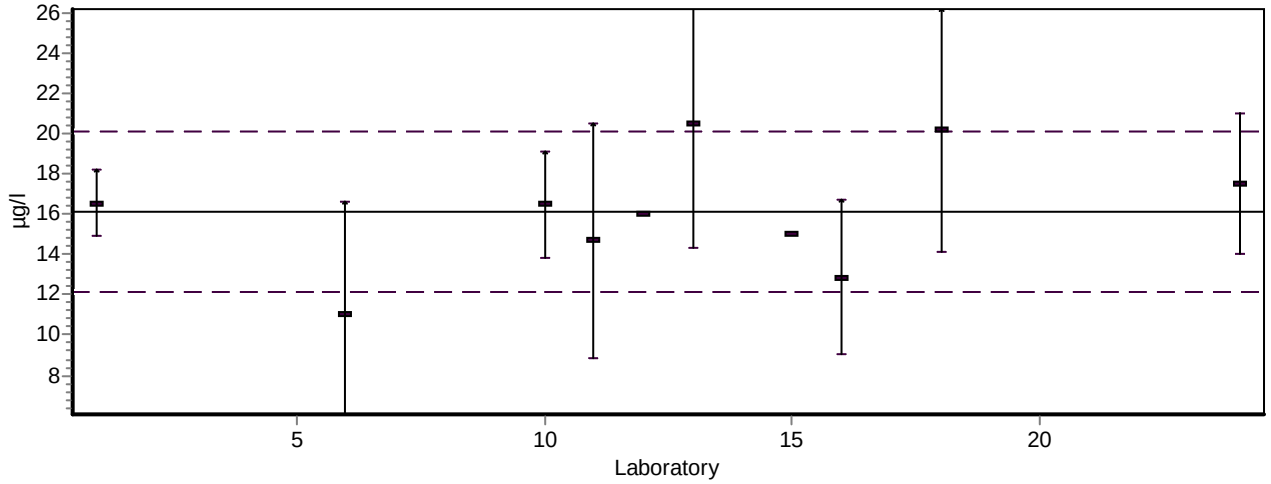
Analyytti *(Analyte)* **VOC-m/p-Xylene** Näyte *(Sample)* S3V



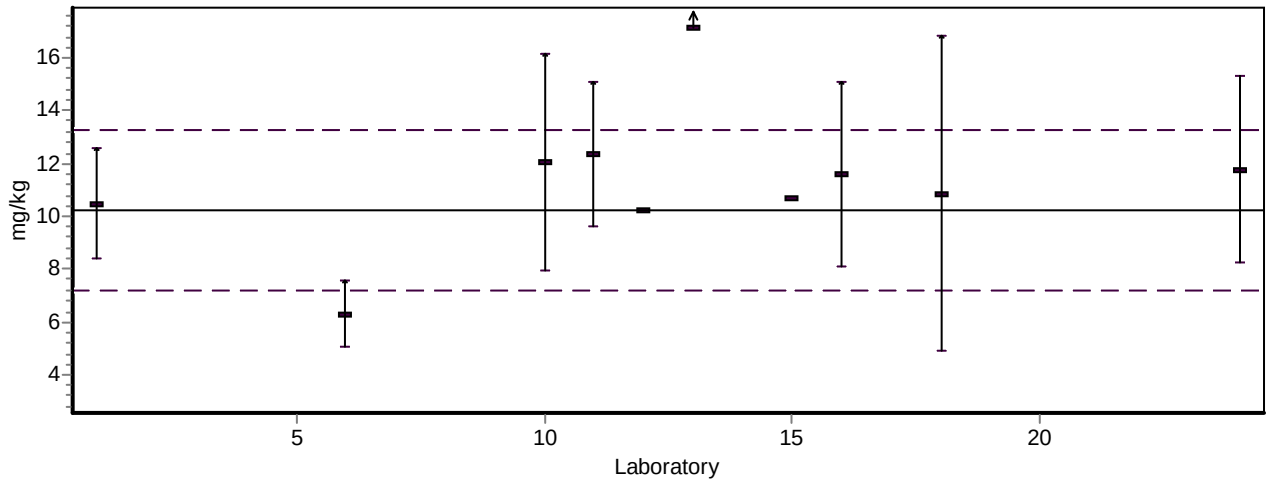
Analyytti *(Analyte)* **VOC-MTBE** Näyte *(Sample)* A1V



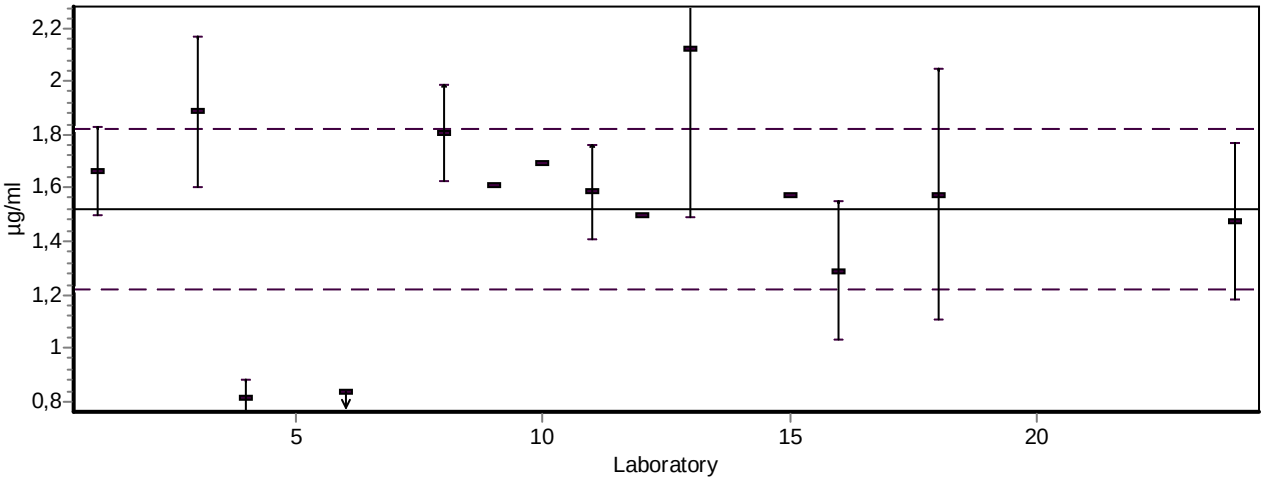
Analyytti *(Analyte)* **VOC-MTBE** Näyte *(Sample)* G2V



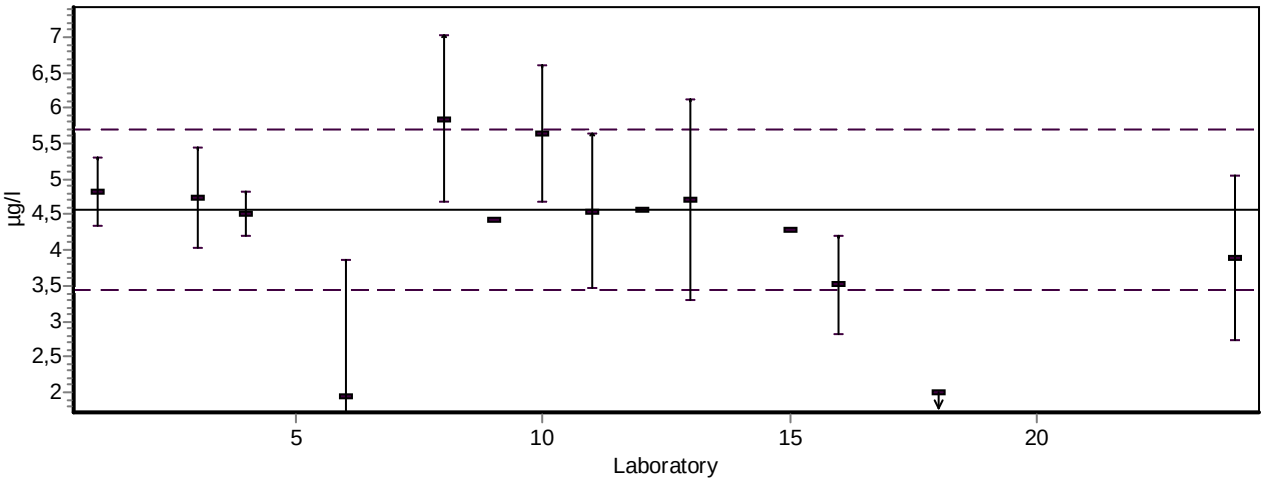
Analyytti *(Analyte)* **VOC-MTBE** Näyte *(Sample)* S3V



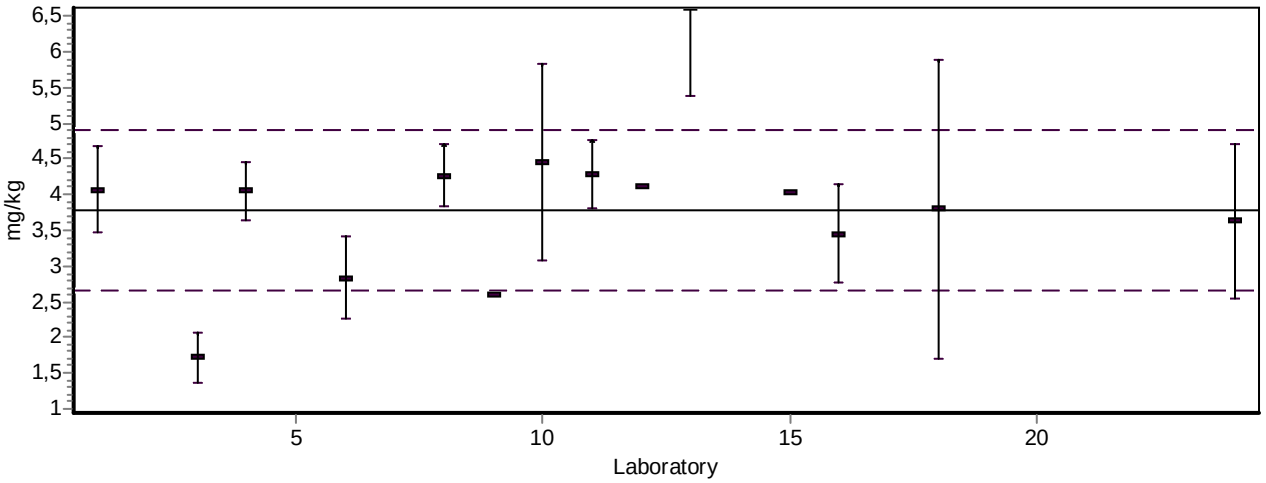
Analyytti *(Analyte)* **VOC-o-Xylene** Näyte *(Sample)* A1V



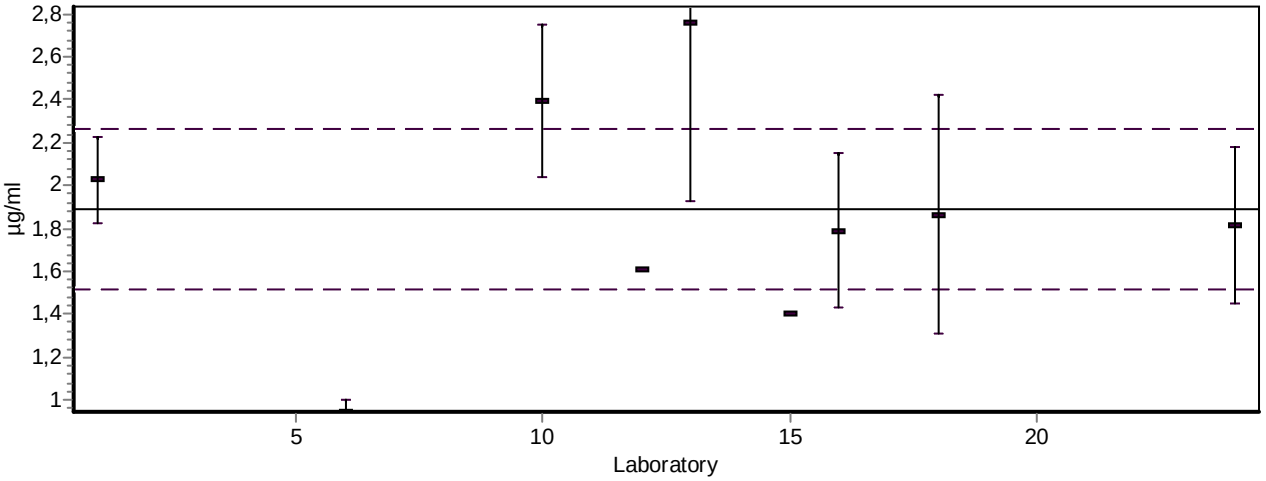
Analyytti *(Analyte)* **VOC-o-Xylene** Näyte *(Sample)* G2V



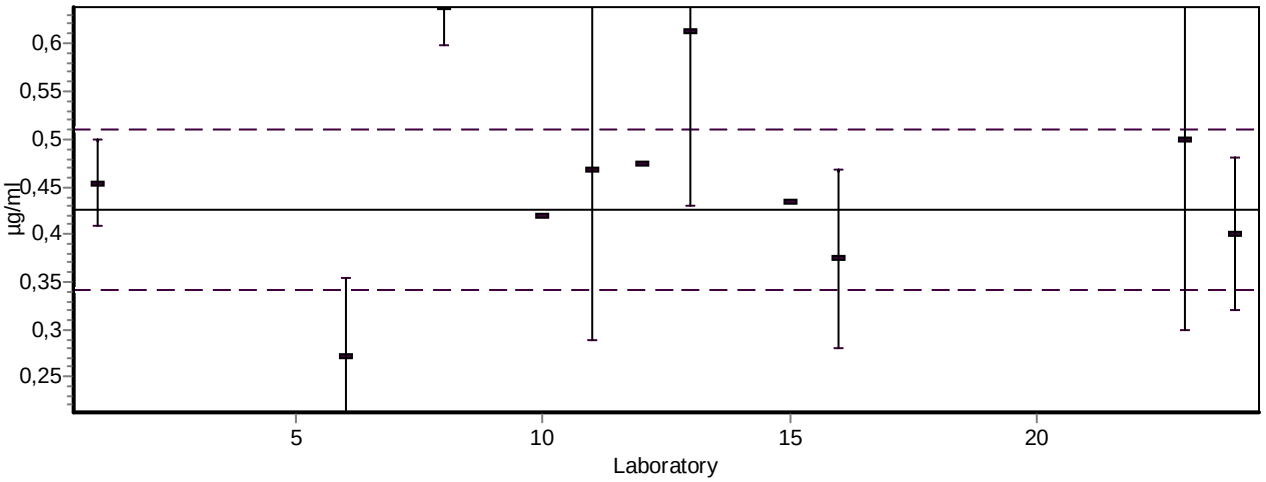
Analyytti *(Analyte)* **VOC-o-Xylene** Näyte *(Sample)* S3V



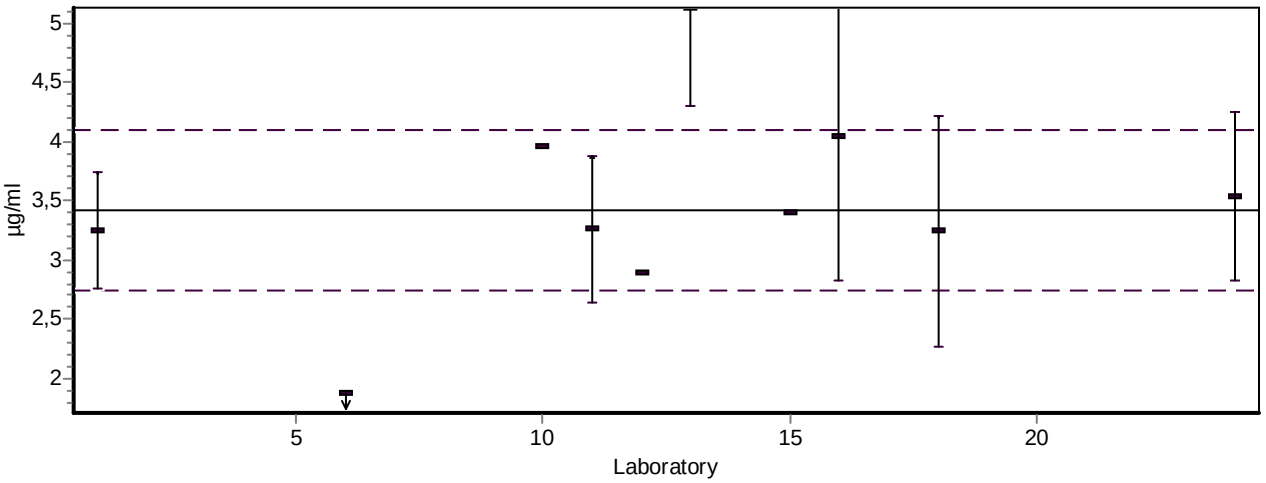
Analyytti *(Analyte)* **VOC-Styrene** Näyte *(Sample)* A1V



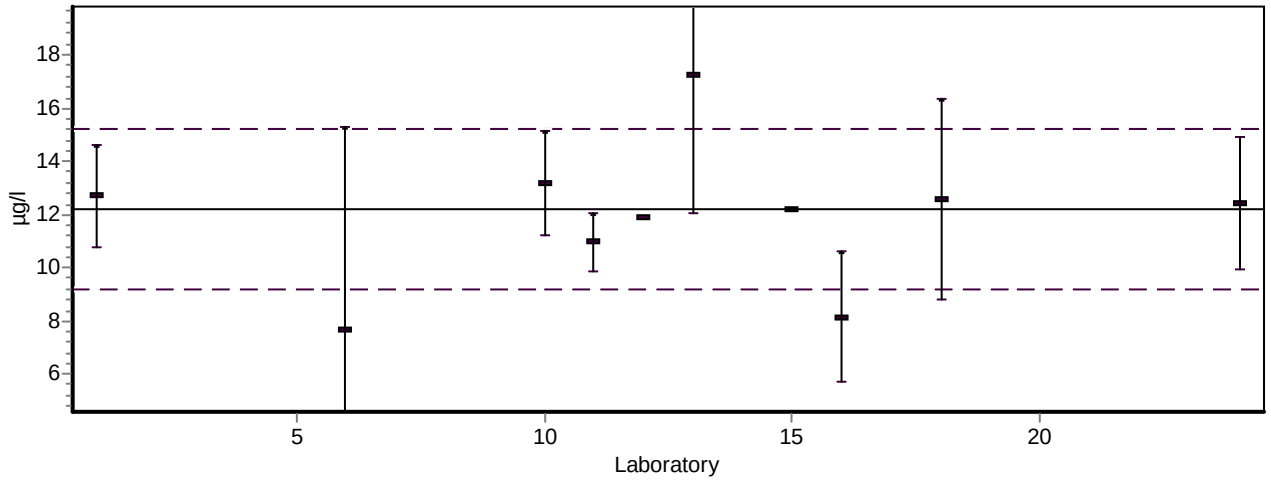
Analyytti *(Analyte)* **VOC-t12DCEe** Näyte *(Sample)* A1V



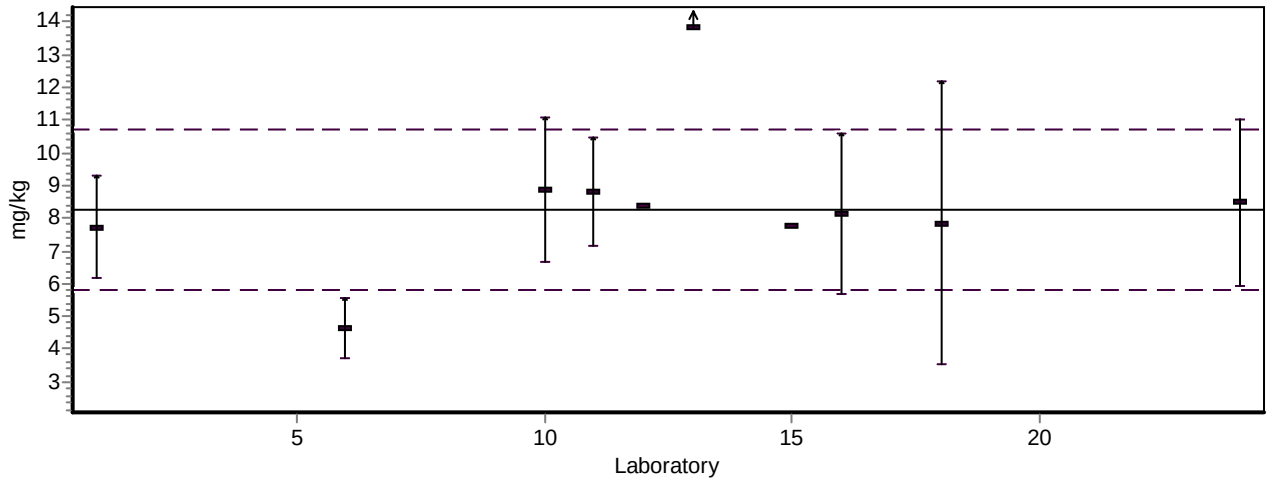
Analyytti *(Analyte)* **VOC-TAME** Näyte *(Sample)* A1V



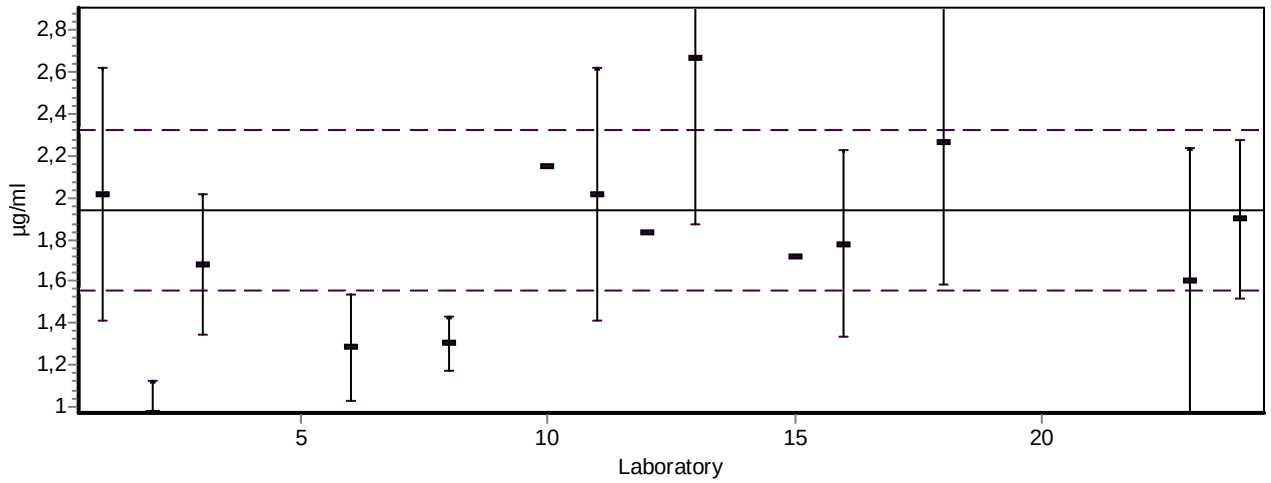
Analyytti *(Analyte)* **VOC-TAME** Näyte *(Sample)* G2V



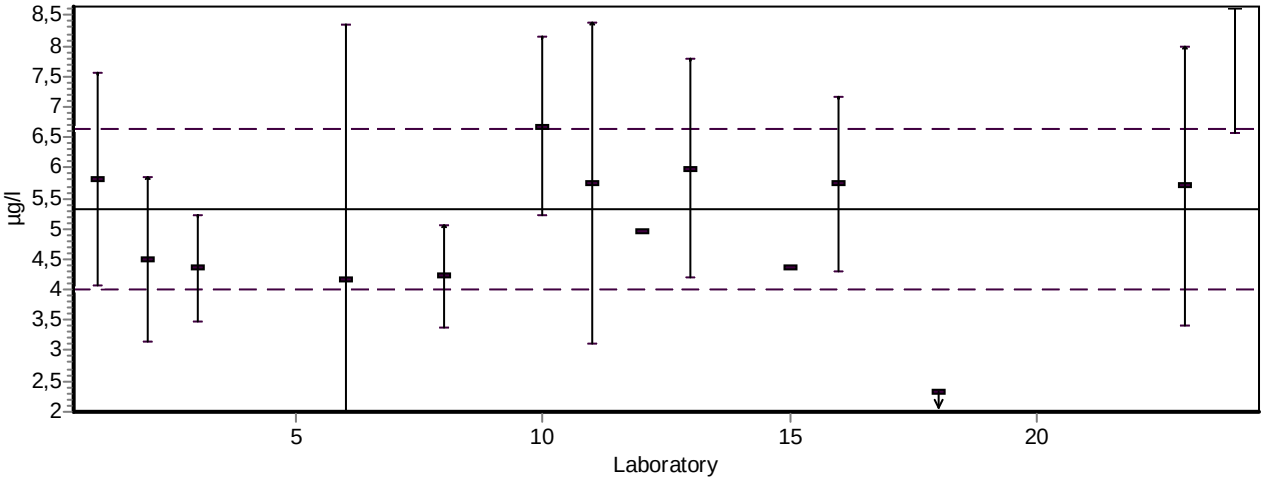
Analyytti *(Analyte)* **VOC-TAME** Näyte *(Sample)* S3V



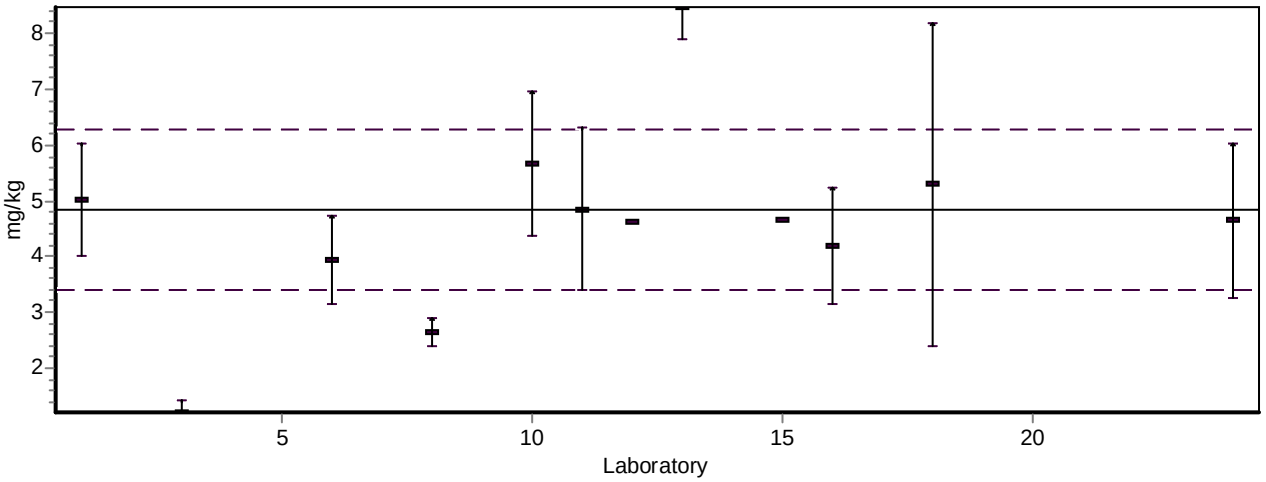
Analyytti *(Analyte)* **VOC-TCEe** Näyte *(Sample)* A1V



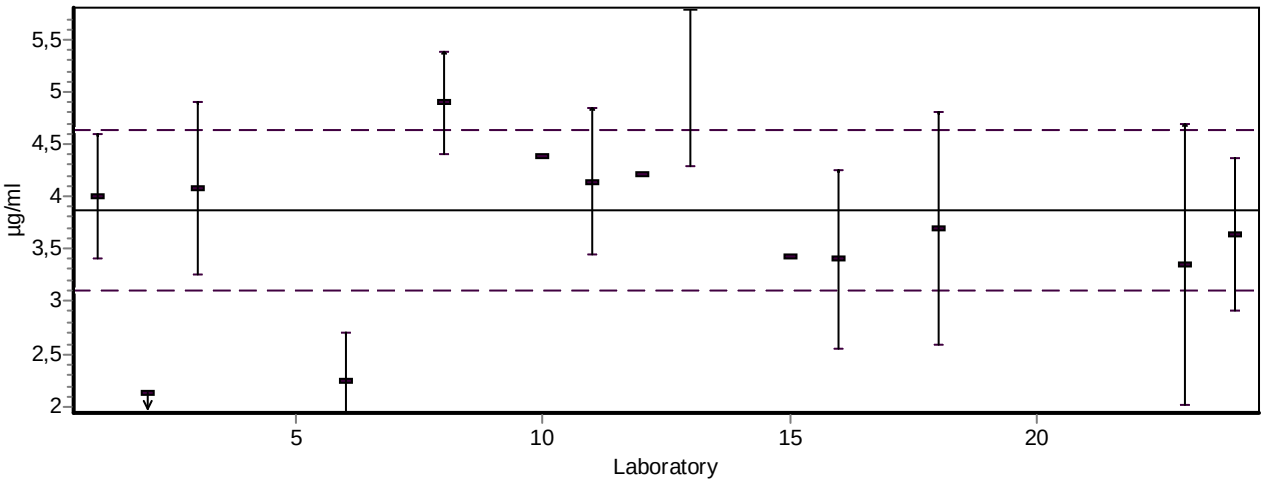
Analyytti *(Analyte)* **VOC-TCEe** Näyte *(Sample)* G2V



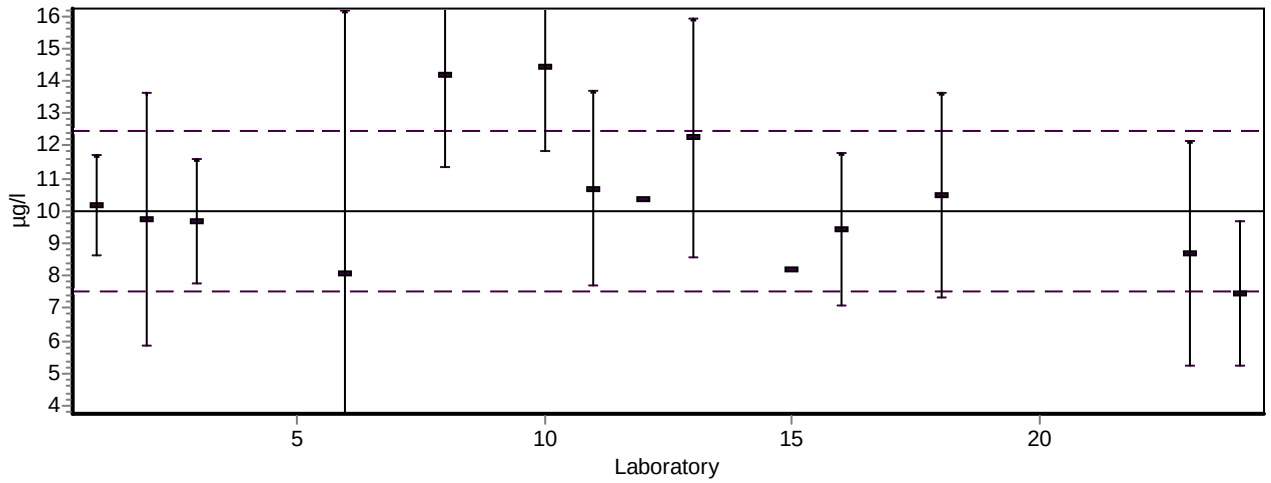
Analyytti *(Analyte)* **VOC-TCEe** Näyte *(Sample)* S3V



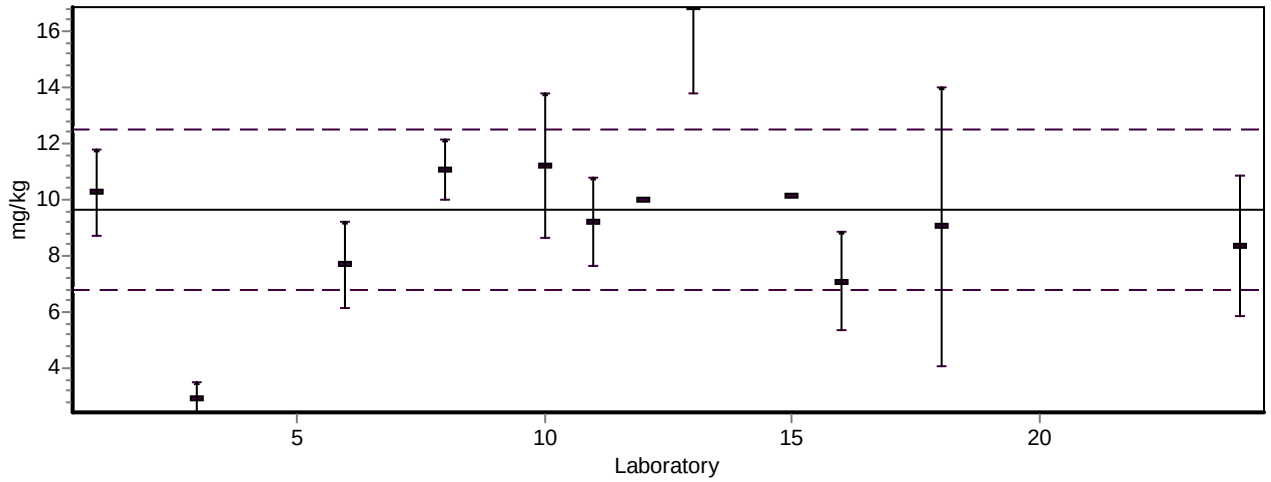
Analyytti *(Analyte)* **VOC-TeTCEe** Näyte *(Sample)* A1V



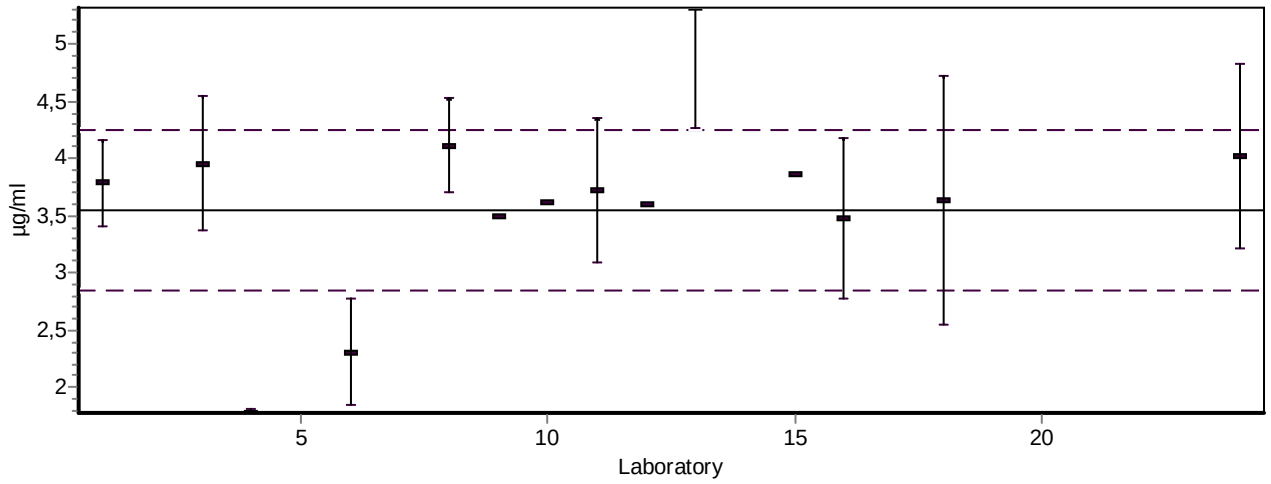
Analyytti *(Analyte)* **VOC-TeTCEe** Näyte *(Sample)* G2V



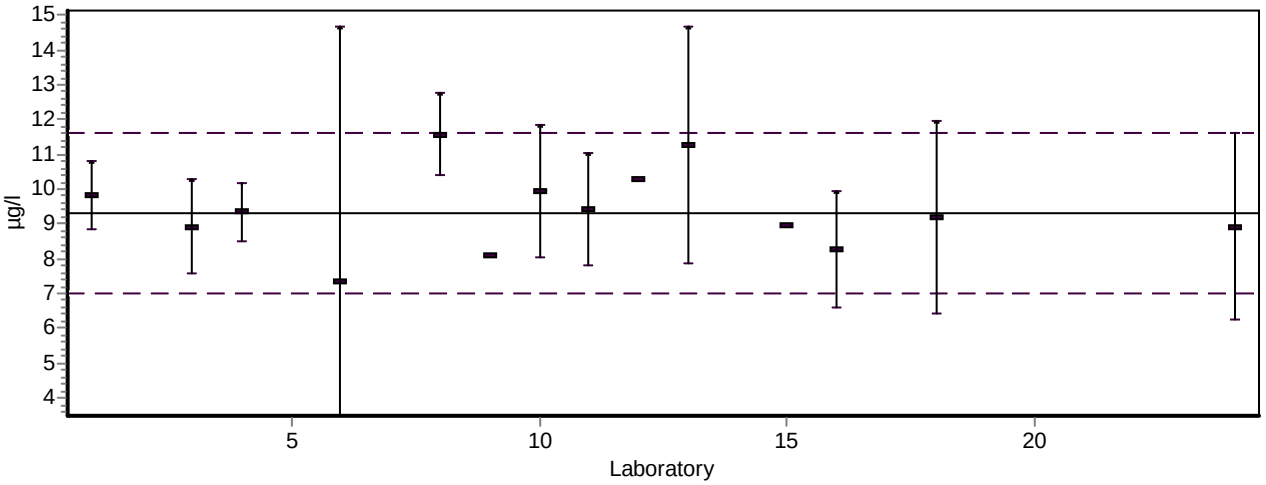
Analyytti *(Analyte)* **VOC-TeTCEe** Näyte *(Sample)* S3V



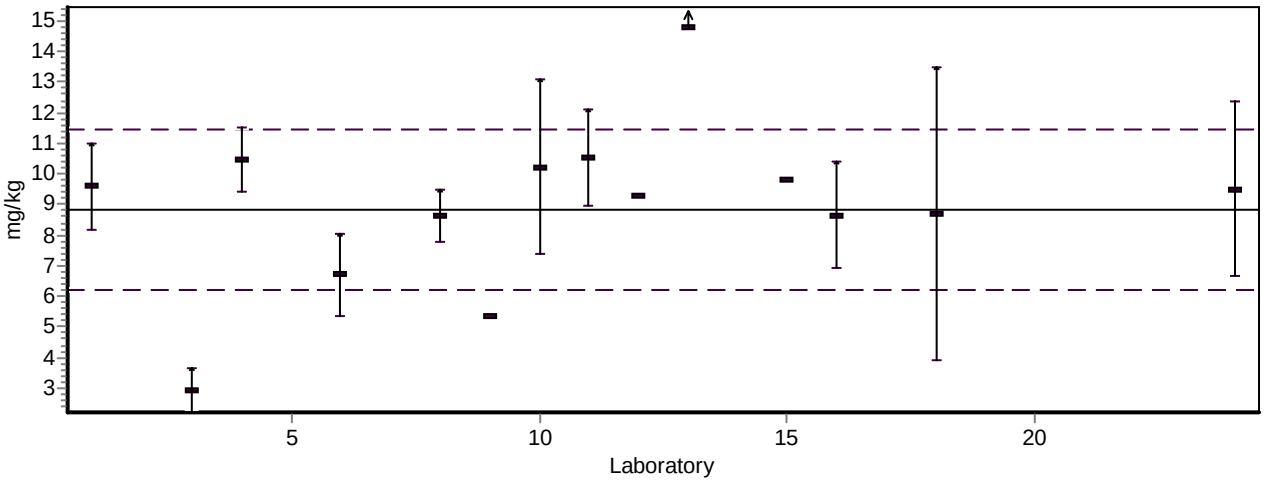
Analyytti *(Analyte)* **VOC-Toluene** Näyte *(Sample)* A1V



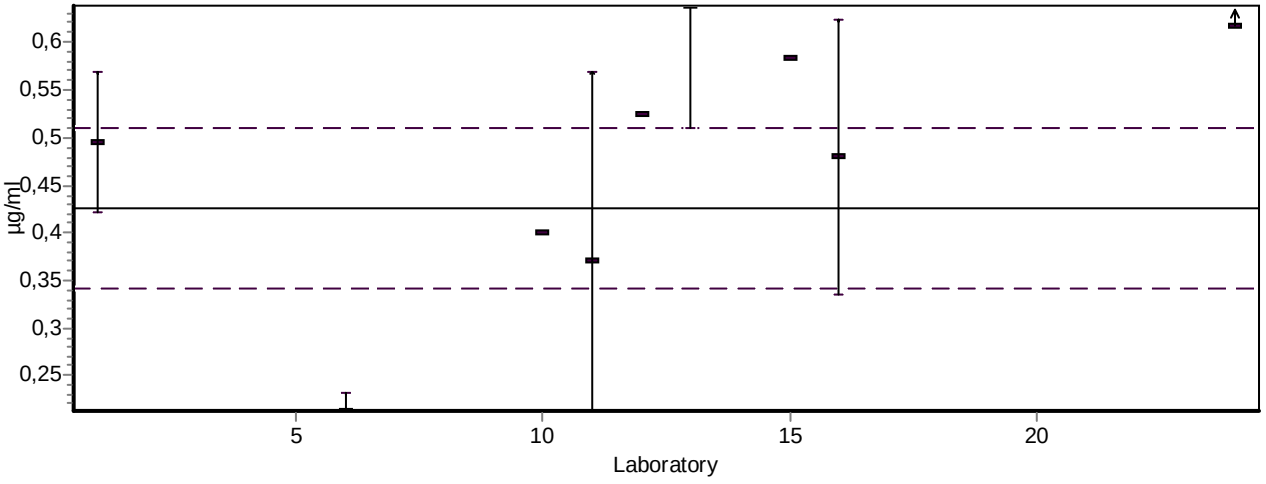
Analyytti *(Analyte)* **VOC-Toluene** Näyte *(Sample)* G2V



Analyytti *(Analyte)* **VOC-Toluene** Näyte *(Sample)* S3V



Analyytti *(Analyte)* **VOC-VIN** Näyte *(Sample)* A1V



APPENDIX 9 EXPLANATIONS FOR THE RESULT SHEETS

Results of each participant

Analyte
Unit
Sample The code of the sample
z-Graphics z score - the graphical presentation
z-value z-score, calculated as follows:
$z = (x_i - X)/s$, where
x_i = the result of the individual laboratory
X = the reference value (*the assigned value*)
s = the target value for the standard deviation (s_{target}).
Outl test OK yes - the result passed the outlier test
H = Hampel test (a test for the mean value)
In addition, in robust statistics results deviating at least 50 % from the original robust mean have been rejected.
Assigned value the reference value
2* Targ SD % the target value for total deviation (95 % confidence interval)
Lab's result the result reported by the participant (the mean value of the replicates)
Md. Median
Mean Mean
SD Standard deviation
SD% Standard deviation, %
Passed The results passed the outlier test
Missing i.e. < DL
Num of labs the total number of the participants

Summary on the z scores

A - accepted ($-2 \le z \le 2$)
p - questionable ($2 < z \le 3$), positive error, the result > X
n - questionable ($-3 \le z < -2$), negative error, the result < X
P - non- accepted ($z > 3$), positive error, the result >>> X
N - non- accepted ($z < -3$), negative error, the result <<< X (X = the reference value)

Robust analysis

The items of data is sorted into increasing order, $x_1, x_2, \ldots, x_i, \ldots, x_p$.
Initial values for x^* and s^* are calculated as:
X^* = median of x_i (i = 1 …p)
s^* = 1.483 median of $| x_i - x^* |$ (i = 1 …p)

For each x_i is calculated:
$x_i^* = x^* - \varphi$ if $x_i < x^* - \varphi$
$x_i^* = x^* + \varphi$ if $x_i > x^* + \varphi$
$x_i^* = x_i$ otherwise

The new values of x^* and s^* are calculated from:
$X^* = \sum x_i^* / p$

$$s^* = 1.134 \sqrt{\sum (x_i^* - x^*)^2 / (p-1)}$$

The robust estimates x^* and s^* can be derived by an iterative calculation, i.e. by updating the values of x^* and s^* several times, until the process convergences.

APPENDIX 10.1 ANALYTICAL METHODS

Oil hydrocarbons / Water – G2O

A. Extraction and clean-up

Lab	Extraction solvent volume	Extraction method/Time	Separation	Concentration	Clean-up	Reference
2	n-Hexane 10 ml	Stirring/30 min		Ar	Florisil	EN ISO 9377-2
3	n-Pentane 50 ml	/30 min			SPE, Florisil	EN ISO 9377-2
4	n-Hexane 50 ml	Stirring/1 h	Microseparator	Rotary evaporator	Florisil	EN ISO 9377-2
5	Hexane 50 ml	Shaking/30 min	Funnel		Florisil	EN ISO 9377-2
6	Heptane	Shaking/40 min	Centrifuging		Al_2O_3	EN ISO 9377-2
7	n-Pentane 50 ml	Shaking/30 min	Microseparator	Kudena Danish	Florisil	EN ISO 9377-2
8	Pentane	Shaking/30 min			Florisil	EN ISO 9377-2
9	Pentane 2 ml	Shaking/15 min	Centrifuging			ISO 11423-2
10	Hexane 25+25 ml	Stirring/1+ 0.5 h	Pipetting	N_2	Florisil	modif. ISO 9377-2
11	Pentane 50 ml	Shaking/40 min	Funnel	Rotary evaporator, N_2	Florisil/	modif. EN ISO 9377
12	Hexane 30 ml	Stirring/30 min	Funnel	N_2	Al_2O_3	In house method based on ISO 9377
13	Hexane	Shaking/20 min	Funnel	N_2	Florisil	EN ISO 9377-2
14	Hexane 50 ml	Stirring/30 min	Funnel	Rotary evaporator, N_2	Florisil/Na_2SO_4	modif. EN ISO 9377
15	Hexane 20 ml	Shaking/10 min	Settling		Florisil	In house method
17	Cyclohexane	Shaking/30 min		Vacuum	Florisil	In house method based on ISO 9377
18	Hexane 50 ml	Shaking/30 min	Funnel	Vacuum centrifuge	Florisil/Na_2SO_4	EN ISO 9377-2
19	Pentane 50 ml	30 min	Microseparator		Florisil	ISO 9377-2
20	Tetrachloroethylene 50 ml	Shaking/28 min	Column			In house method based on SFS 3010
21	n-Hexane 50 ml	Shaking/30 min	Microseparator	N_2	Florisil/Na_2SO_4	EN ISO 9377-2
22	Tetrachloroethylene 50 ml	Shaking/30 min	Column			Based on SFS 3010
23						EN ISO 9377-2
24	Hexane 50 ml	Stirring/30 min	Funnel		Florisil	ISO 9377-2

B. Measurement conditions

Lab	Equipment/ Detector/ Temperature	Injection tech-nique/volume	Column: l(m)/Id(mm)/ film(µm)	Oven program	Internal standard/ Calibration range
2	GC/FID, 320 °C	On-column/2 µl	30/0.25/0.25	40 °C, 5 min, 15 °C/min to 300°C, 10 min	C32/ 67–672 mg (Diesel)
3	GC/FID, 375 °C	Large inj,/50 µl	30/0.32/1.0	50 °C, 65 °C/min to 350°C	/2–100 mg/l
4	GC/FID, 330 °C	/1 µl	30/0.53/0.5	60 °C, 2 min, 30 °C/min to 3200 °C, 10 min	Diesel + motor oil 0.1–1.0 mg/ml
5	GC/FID, 325 °C	Split/20 µl	25/0.53/1.0	50–310 °C	Gasoil + lubricating oil 0.1–5.0 mg
6	GC/FID, 350 °C	Split/ 2 µl	15/0.32/0.25	60 °C, 1 min, 20 °C/min to 300 °C, 5 min	None/
7	GC/FID, 350 °C	PTV/1 µl	30/0.25/0.25	40 °C, 4 min, 10 °C/min to 80 °C, 35 °C/min to 325 °C, 9 min	None/ 0–1 mg/ml or 0,7–5 mg/ml
8	GC/FID	/50 µl	15/0.53/0.15	50 °C	None/ 0.1–5 mg/l
9	/325 °C	Spitless/2 µl	30/0.25/0.5	40–310 °C	1-Chloro-4-fluorbenzene 0.1–12.5 mg/l
10	GC/FID	Spitless/2 µl	15/0.53/0.15		None/ 0.1–4 mg/ml

APPENDIX 10.1 ANALYTICAL METHODS (continues)

Oil hydrocarbons / Water – G2O

B. Measurement conditions

Lab	Equipment/ Detector/ Temperature	Injection technique/volume	Column: l(m)/Id(mm)/ film(µm	Oven program	Internal standard Calibration range
11	GC/FID, 315 °C	Splitless/2 µl	25/0.2/0.33	35 °C, 2 min, 25 °C/min to 325°C, 23 min	Squalane/ 0–1 µg/l
12	GC/FID, 350 °C	Split/2 µl	30/0.32/0.25	40 °C, 1 min, 20 °C/min to 320°C, 23 min	None/ 0.05–4 mg/ml
13	GC/FID, 320 °C	Splitless/1 µl	15/0.32/0.1	50 °C, 2 min, 20 °C/min to 320 °C, 5–15 min	Decane+ tetracontane 0.2–1.2 g/l
14	GC/FID, 300 °C	Splitless/1 µl	30/0.32/0.25	40 °C, 10 °C/min to 290°C, 20 min	Dekane + tetracontane 0–1.2 µg/µl
15	GC/MS, 230 °C	/0.5 µl	10/0.1/0.17	50 °C, 1.25 min, 45 °C/min to 350 °C, 3.5 min	alfa-5-Androstane 250–5000 µg/l
17	GC/FID	Splitless/1 µl	15/0.53/0.15	350 °C	None/ 0.1–5 µg/l
18	GC/FID, 360 °C	On-column/ 2 µl	15/0.32/1.0	50 °C, 1 min, 20 °C/min to 320°C, 9 min	None/ 0.25–2.5 mg/ml
19	GC/FID, 340 °C	PTV/20 µl	30/0.32/0.25	35 °C, 4 min, 30 °C/min to 320°C, 4,5 min	None/ 0–1000 mg/l
20					None/ 0.1–5 mg/50 ml
21	GC/FID, 380 °C	On-column/ 1 µl	15/0.32/1.0	40 °C, 1.5 min, 40 °C/min to 200°C, 20°C/min to 300 °C, 10 °C/min to 320 °C, 7 min	C10 and C40 100–3000 mg/l
22	IR-Spectrum ONE				None/ 0.1–5 mg/50 ml
23					
24	GC/FID, 325 °C	On-column/ 2 µl	15/0.53/1.0	60 °C, 1 min, 20 °C/min to 320°C, 15 min	n-Decane + tetracontane 20–1000 mg/l

Oil hydrocarbons/Soil – S3O

A. Extraction and clean-up

Lab	Sample amount/ Extraction solvent volume	Extraction method/Time	Separation	Concentration	Clean-up	Reference
1	10 g/acetone 20 ml+ hexane 10 ml	Shaking/1 h	Centrifuging	N_2	Florisil/Na_2SO_4	ISO 16703
2	5 g/n-hexane 10 ml + acetone 20 ml	Ultrasonic/1 h	Centrifuging		Florisil	ISO 16703
4	15 g/acetone 40 ml + n-hexane 20 ml	Ultrasonic/1 h	Microseparator		Florisil	ISO 16703
5	20 g/hexane 50 ml	Shaking/1 h	Funnel		Florisil	ISO 16703
6	15–20 g/heptane 10 ml	Shaking/35 min	Centrifuging, pipetting		Al_2O_3	modif. ISO 16703
8	25 g/pentane 10 ml	Shaking/2 h			Na_2SO_4	Nordtest TR 329
9	10 g/DCM 20 ml	Shaking/2 h	Centrifuging		Na_2SO_4	
10	/acetone + hexane 15 ml (2:1)	Ultrasonic/0.5 h	Pipetting		Florisil	modif. ISO 16703
11	20 g/pentane 20 ml	Shaking/1 h	Centrifuging		Al_2O_3	In house method
12	20 g/hexane 10 ml	Shaking/40 min	Settling Centrifuging			In house method based on ISO 16703
13	20 g/hexane 10 ml	Shaking/1h	Settling Centrifuging		Florisil	ISO TR 11046, EN ISO 9377, ISO/FDIS 16703
14	/acetone 40 ml + hexane 20 ml	Shaking/1 h	Settling		Florisil/Na_2SO_4	modif. ISO 16703
15	10 g/MeOH + acetone hexane + water 50 ml	Shaking/1 h	Settling		Florisil	In house method
18	5–10 g/acetone + hexane 30 ml (2:1)	Shaking/0.5 h	Centrifuging	Vac,. centrif.	Florisil	ISO/DIS 16703
24	10 g/heptane 5 ml	Shaking/0.5 h	Pipetting		Florisil	ISO 16703

APPENDIX 10.1 ANALYTICAL METHODS (continues)

Oil hydrocarbons/Soil – S3O

B. Measurement conditions

Lab	Equipment/ Detector, Temperature	Injection technique/volume	Column: l(m)/Id(mm)/ film(µm	Oven program	Internal standard/ Calibration range
1	GC/FID, 360 °C	On column/1 µl	5/0.32/0.25	60 °C, 5 min, 30 °C/min to 330 °C, 5 min, 50 °C/min to 340 °C, 7 min	BAM-K010/ 0.05–4 mg/ml
2	GC/FID, 320 °C	On column/2 µl	30/0.25/0.25	40 °C, 5 min, 15 °C/min to 300 °C, 10 min	C40 26–520 mg/l/5
4	GC/FID, 330 °C	/1 µl	30/0.53/0.50	60 °C, 2 min, 30 °C/min to 320 °C, 10 min	Diesel + Motor oil 0.1–1.0 mg/ml
5	GC/FID, 325 °C	Split/20 µl	25/0.53/1.0	50–310 °C	Gasoil + lubricating oil 0.1–5.0 mg
6	GC/FID, 350 °C	Split/2 µl	15/0.32/0.25	60 °C, 1 min, 20 °C/min to 300 °C, 5 min	None/ 0–2000 mg/l
8	GC/FID	/2 µl	30/0.25/0.25	35 °C	Bromobenzene o-Terphenyl 0.1–10 mg/l
9	325 °C	Splitless/2 µl	30/0.25/0.5	4–310 °C	1-Chloro-4-fluorbenzene, n-Triacontane 0.1–20 mg/l
10	GC/FID	Splitless/2 µl	15/0.53/0.15		None/ 0.1–4 mg/ml
11	GC/FID	Splitless/ 2 µl	25/0.2/0.33	35 °C, 2 min, 25 °C/min to 325 °C, 23 min	None/ <10 000 mg/kg
12	GC/FID, 350 °C	Split/2 µl	30/0.32/0.25	40 °C, 1 min, 20 °C/min to 320 °C, 23 min	None/ 50–2000 mg/kg
13	GC/FID, 320 °C	Splitless/ 1 µl	15/0.32/0.25	50 °C, 5 min, 30 °C/min to 320 °C, 15 min	None/ 0–1600, mg/l
14	GC/FID, 300 °C	Splitless/ 1 µl	30/0.32/0.25	40 °C, 10 °C/min to 290 °C, 20 min	None/ 0–1.2 µg/µl
15	GC/MS, 230 °C	/0.1 µl	10/0.1/0.17	50 °C, 1.25 min, 45 °C/min to 350 °C, 3.5 min	alfa-5-Androstane 50–2500 g/kg
18	GC/FID, 360 °C	On-column/2 µl	15/0.32/1.0	50 °C, 1 min, 20 °C/min to 325 °C, 9 min	None/ 0.25–2.5 mg/ml
24	GC/FID, 325 °C	On-column/ 0.5µl	15/0.53/1.0	60 °C, 1 min, 20 °C/min to 320 °C, 15 min	n-Decane Tetracontane 100–2400 mg/l

VOC / Water – G2V

A. Extraction

Lab	Extraction solvent/volume	Extraction method/Time	Separation	Reference
1				ISO 10301, ISO 11423-1
2	Pentane/100ml	Shaking/10 min	Funnel	
3	/10 ml	Equilibration for 30 min at 65 °C		Nordic Guidelines for Chem. Analysis of contaminated soil samples
4				ISO 11423-1
6				ISO TC 190 WG 6
8	Water/10 ml			In house Method
9	Pentane/2 ml	Shaking/15 min	Centrifuging	ISO 11423-2
10				EN ISO 15680
11				In house method
12				In house method based on EPA 8260
13	/10 ml			ISO 11423-1 and -2 EN ISO 10301
15				In house method
16				ISO 11423-1, EN ISO 10301

APPENDIX 10.1 ANALYTICAL METHODS (continues)

VOC / Water – G2V

A. Extraction

Lab	Extraction solvent volume	Extraction method/Time	Separation	Reference
18				modif. ISO 11423-1
23				ISO 10301
24				ISO 22892 EPA 8260C ISO 11423-1

B. Measurement conditions

Lab	Equipment/ Detector, Temperature	Injection tech-nique/volume	Column: l(m)/Id(mm)/ film(µm	Oven program	Internal standard/ Caliration range
1	GC/MS	Headspace/ 1 ml	30/0.25/1.4	40 °C, 2 min, 14 °C/min to 90 °C, 5 min, 12 °C/min to 190 °C, 1 min, 40 °C/min to 230 °C, 1 min	a,a,a-Trifluoro-toluene, Toluene-D8/ 0.5–50 µg/l
2	GC/ECD, 350 °C	/1µl	non polar		None/ 0.1–100 µg/l
3	GC/MS	Headspace/ 1 ml	60/0.25/1.4	35 °C, 5°C/min to 220 °C	Toluene-D8/ 0.2–20 µg/l
4	GC/PID, 160 °C	Headspace/ 0.5 ml	30/0.53/1.0	40 °C, 4 min, 5 °C/min to 140 °C, 2 min	Restek/ 5–1000 µg/l
6	MS	Headspace/ 1 ml	30/0.25/0.25	40 °C, 5 min, 6 °C/min to 90 °C, 40 °C/min to 260 °C, 3 min	Toluene-D8/ 0.5–2000 µg/l
8	MS	Headspace	60/0.32/1.8	70 °C	Toluene-D8/ 0.05–1.0 µg/l
9	/325 °C	Splitless/ 2 µl	30/0.25/0.5	40–310 °C	1-Chloro-4-fluorbenzene 0.1–12.5 mg/l
10	GC/MS	Purge&Trap			Toluene-D8/
11	GC/MSD	Headspace	60/0.25/1.4	35 °C, 10 min, 5 °C/min to 220 °C, 2 min	1,2-Dichlorobenzene-D4 Toluene-D8/ < 90 µg/l
12	GC/MS	Headspace/ 1 ml	50/0.2/0.5	35 °C, 3 min, 15 °C/min to 220 °C, 30 °C/min to 300 °C, 3 min	Toluene-D8/ 2–500 µg/l
13	MS/ 200 °C	Headspace/	60/0.32/1.0	40 °C, 3 min, 7.5 °C/min to 200 °C	1,2-Dichloroethane-D4 Toluene-D8/ 1–100 µg/l
15	GC/MS, 230 °C	Headspace/ 1 ml	10/0.1/0.17	35 °C, 2 min, 50 °C/min to 250 °C, 2 mln	Toluene-D8/ 5–100 µg/l
16	GC/MS	Headspace/ 1 µl	50/0.25/0.25	38–250 °C	1,2-dichloroethane-D4 Toluene-D8 4-Bromo-fluorbenzene/ 1–16 µg/l
18	GC/FID, 260 °C, FID 300 °C	Headspace/ 1 ml	30/0.25/1.4 25/0.2/0.33	35 °C, 3 min, 5 °C/min to 100 °C, 20 °C/min to 200 °C, 4 min	None/ 3.5–15 µg
23					
24	GC/MSD, 200 °C	Headspace/ time 0.04 s	30/0.25/1.4	35 °C, 7 min, 4 °C/min to 50 °C, 10 °C/min to 100 °C, 40 °C/min to 230 °C, 3 min	Toluene-D8, Chlorobenzene-D5, Trifluoromethylbenzene 0.15–250 µg/l

VOC / Soil – S3V

A. Extraction

Lab	Extraction solvent volume	Extraction method/Time	Separation/ Time	Reference
1	MeOH 20 ml	Shaking/60 min	Settling/24 h	ISO 22155
3	1 % MeOH in water 10 ml (2 g sample)	Equilibration for 30 min at 65 °C		Nordic Guidelines for Chem. Analysis of contam. soil samples
4				ISO 22155
6	MeOH 20 ml	Shaking/40 min	Centrifuging	ISO/TC190/WG6
8	Water 10 ml			In house method
9	DCM 20 ml	Shaking/2 h	Centrifuging	
10	MeOH 21 ml	Shaking/0.5 h	Pipetting	EN ISO 22155
11	1 % MeOH or MeOH 9 ml or 20 ml	Shaking/ 0 or 0.5 h	Centrifuging	In house method
12	Pentane 20 ml	/0.5 h	Settling or centrifuging	In house method based on ISO 16703
13	MeOH	Shaking/15 min		modif. ISO/DIS 22155, modif. EPA8260B, EPA5021
15	MeOH 10 ml + 21 ml	Shaking/0.5 h	Settling	In house method
16	MeOH/21 ml	Shaking/0.5 h	Settling	ISO 22155
18		Shaking/0.5 h		
24	MeOH			ISO 22892, EPA8260C ISO 22155

B. Measurement conditions

Lab	Equipment/ Detector, Temperature	Injection technique/volume	Column: l(m)/Id(mm)/ film(µm	Oven program	Internal standard/ Calibration range
1	GC/MS	Headspace/1 ml	30/0.25/1.4	40 °C, 2 min, 14 °C/min to 90 °C, 5 min, 12 °C/min to 190 °C, 1 min, 40 °C/min to 230 °C, 1 min	a,a,a-Trifluorotoluene, Toluene-D8/ 0.5–50 µg/l
3	GC/MS	Headspace/1 ml	60/0.25/1.4	35 °C, 5°C/min to 220 °C	Toluene-D8/ 5–20 µg/l
4	GC/PID, 145 °C	Headspace/0.5 ml	30/0.53/1.0	40 °C, 4 min, 5 °C/min to 100 °C, 2 min	Restek/ 5–200 µg/sample
6	MS	/1 ml	30/0.25/0.25	40 °C, 5 min, 6 °C/min to 90 °C, 40 °C/min to 260 °C, 3 min	Toluene-D8/ 0.5–2000 µg/l
8	MS	Headspace	60/0.32/1.8	70 °C	Toluene-D8/ 0.05–1.0 µg/l
9	/325 °C	Splitless/ 2 µl	30/0.25/0.5	40–310 °C	1-Chloro-4-fluorbenzene n-Triacontane/ 0.1–20 mg/l
10	GC/MSD	Headspace			Toluene-D8
11	GC/MSD	Headspace	60/0.25/1.4	35 °C, 10 min, 5 °C/min to 220 °C, 2 min	1,2-Dichlorobenzene-D4 Toluene-D8/ < 250 µg/l
12	GC/MS	Split/1 µl	50/0.2/0.5	35 °C, 3 min, 15 °C/min to 220 °C, 30 °C/min to 300 °C, 3min	Toluene-D8/ 0.1–10 mg/kg
13	MS	Headspace	60/0.32/1.0	40 °C, 3 min, 7.5 °C/min to 200 °C, 5 mln	1,2-Dichloroethane-D4 Toluene-D8/5–100 mg/l
15	GC/MS 230 °C	Headspace/1 ml	10/0.1/0.17	35 °C, 2 min, 50 °C/min to 250 °C, 2 mln	Toluene-D8, 0.1–2 mg/kg
16	GC/MS	Headspace/1 µl	50/0.25/0.25	38–250 °C	1,2-Dichloroethane-D4 4-Bromo-fluorobenzene/ Toluene-D8/1–16 µg/l
18	GC/FID, 260 °C, FID 300 °C	Headspace/ 1 ml	30/0.25/1.4 25/0.2/0.33	35 °C, 3 min, 5 °C/min to 100 °C, 20 °C/min to 200 °C, 4 min	None/ 3.5–15 µg
24	GC/MSD, 200 °C	Headspace/ time 0.04 s	30/0.25/1.4	35 °C, 7 min, 4 °C/min to 50 °C, 10 °C/min to 100 °C, 40 °C/min to 230 °C, 3 min	Chlorobenzene-D5, Trifluoromethylbenzene Toluene-D8/0.15–250 µg/l

Appendix 10.2 Results grouped according to the methods

Oil hydrocarbons in water

- Method 1: based on EN ISO 9322-2, extraction by stirring
- Method 2: based on EN ISO 9322-2, extraction by shaking
- Method 3: based on ISO 11423-2
- Method 4: based on withdrawn SFS 3010
- Method 5: unspecified extraction technique or in house method

Oil hydrocarbons in soil

- Method 1: based on ISO 16703, extraction by shaking
- Method 2: based on ISO 16703, extraction by sonication
- Method 3: Nordtest TR 329
- Method 3: unspecified in house method

VOC compounds in water

- Method 1: headspace or purge and trap + GC/MS or MS
- Method 2: headspace + GC/PID
- Method 2: liquid/liquid extraction + GC/ECD
- Method 3: unspecified technique

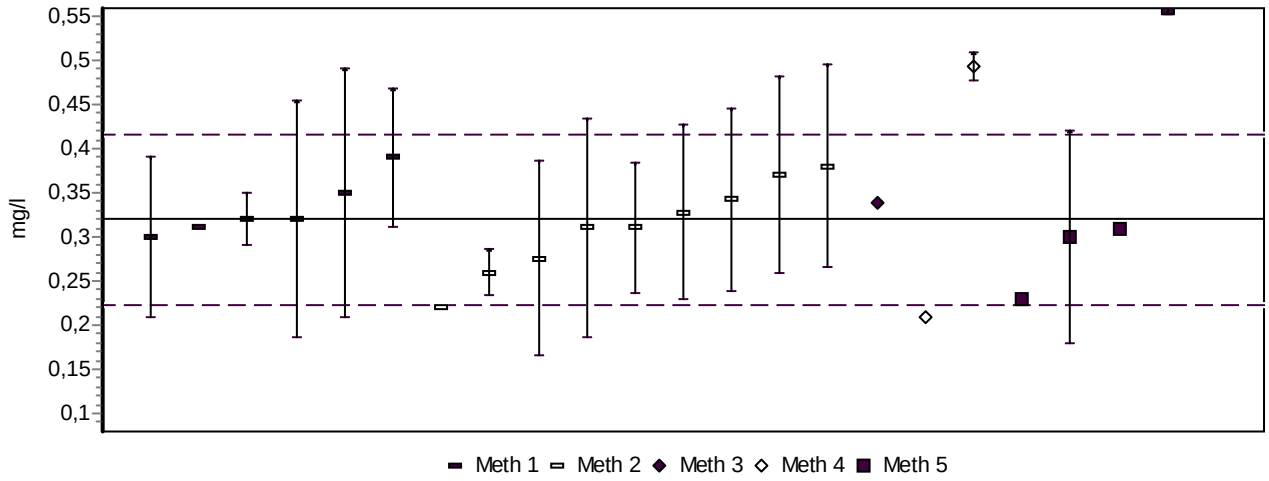
VOC compounds in soil

- Method 1: extraction with methanol
- Method 2: methanol changed to other solvent
- Method 3: unspecified extraction solvent

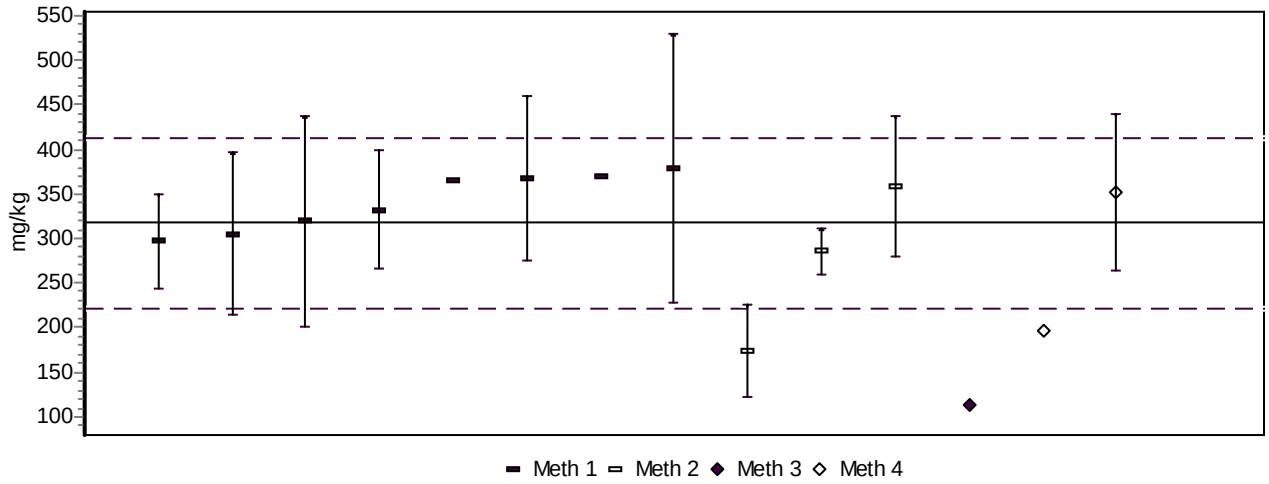
LIITE 10.2.

Appendix 10.2. Results groupped according to the methods

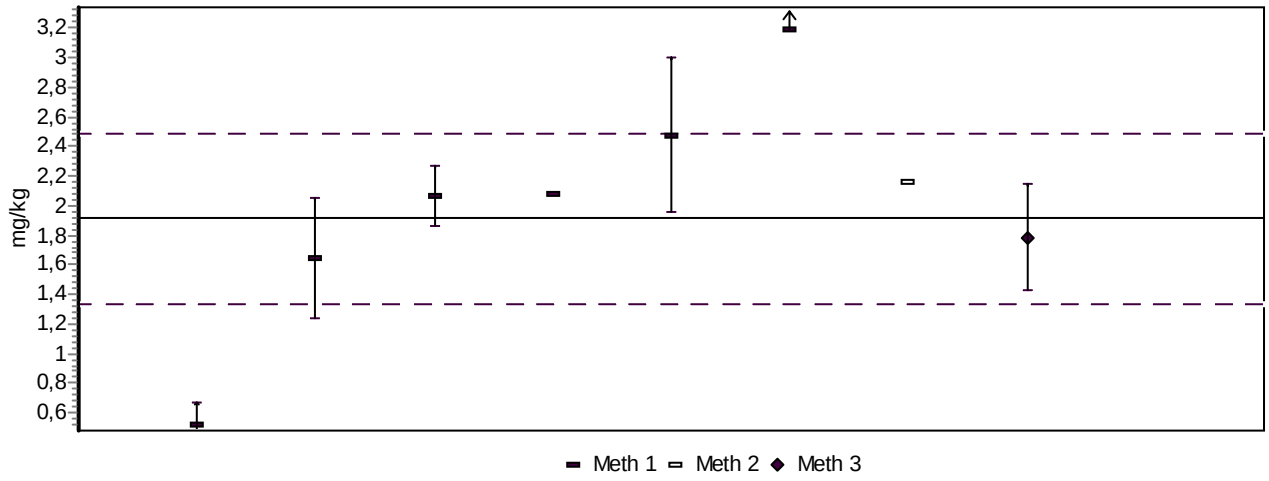
Analyytti *(Analyte)* **Min-oil-GC** Näyte *(Sample)* G2O



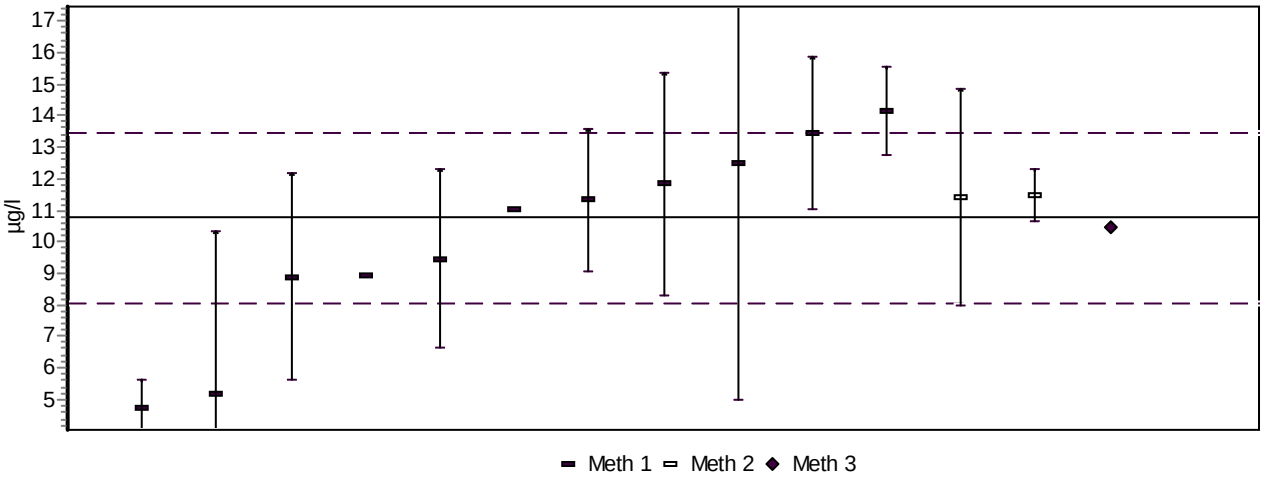
Analyytti *(Analyte)* **Min-oil-GC** Näyte *(Sample)* S3O



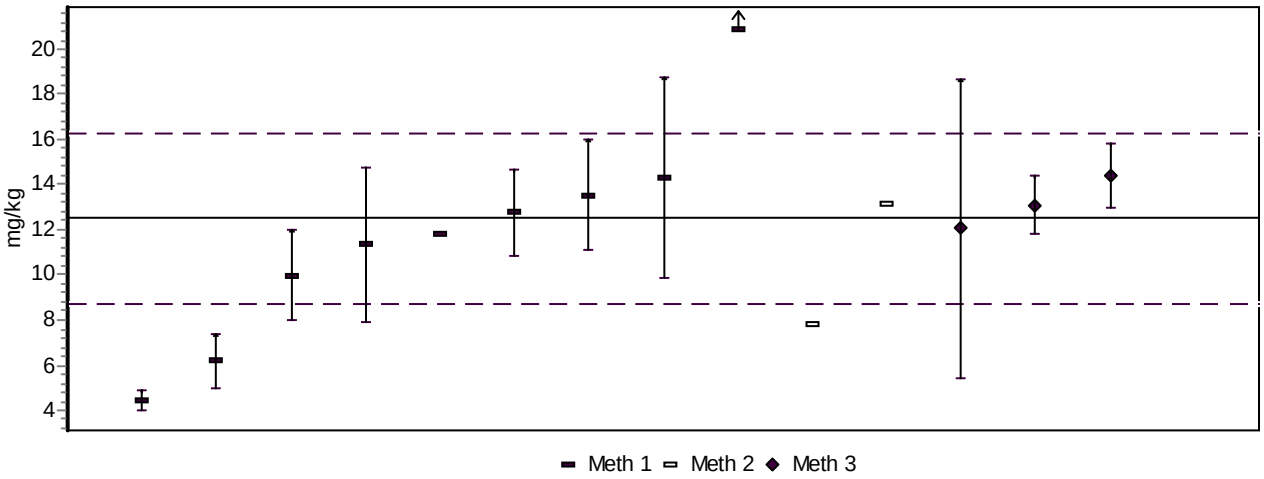
Analyytti *(Analyte)* **VOC-124TCB** Näyte *(Sample)* S3V



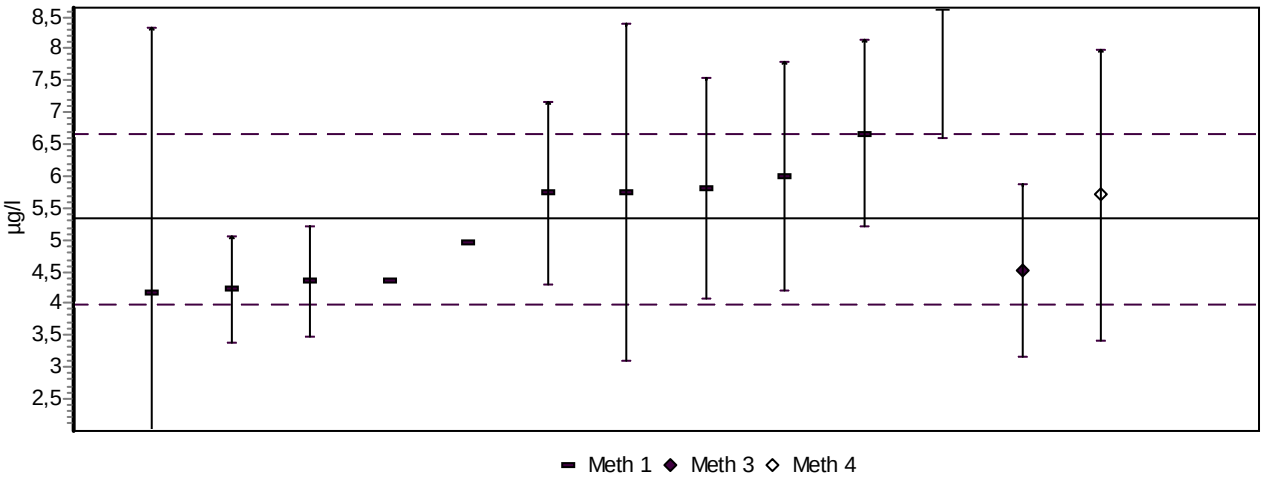
Analyytti *(Analyte)* **VOC-m/p-Xylene** Näyte *(Sample)* G2V



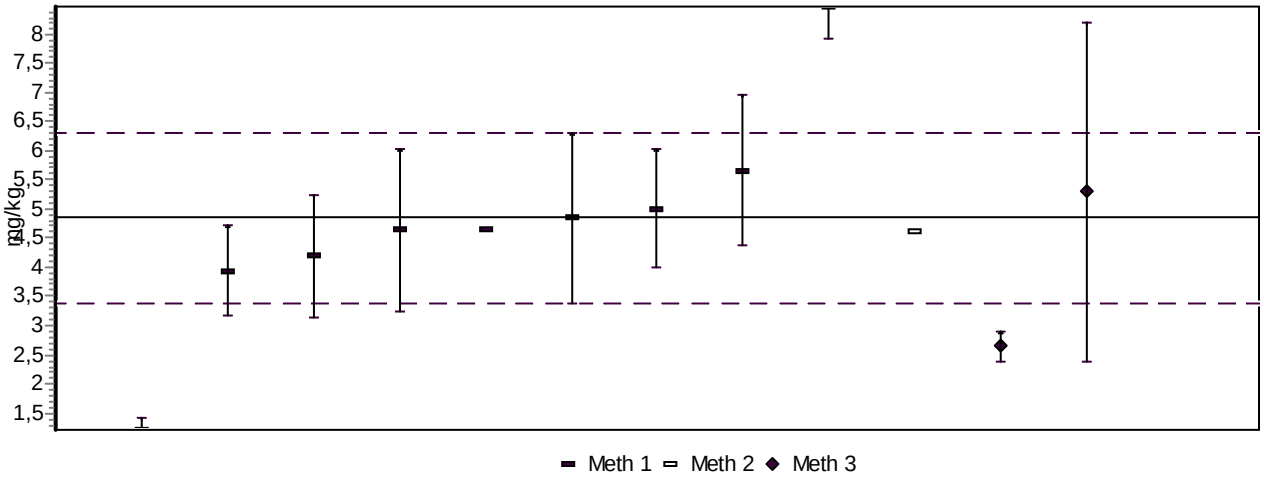
Analyytti *(Analyte)* **VOC-m/p-Xylene** Näyte *(Sample)* S3V



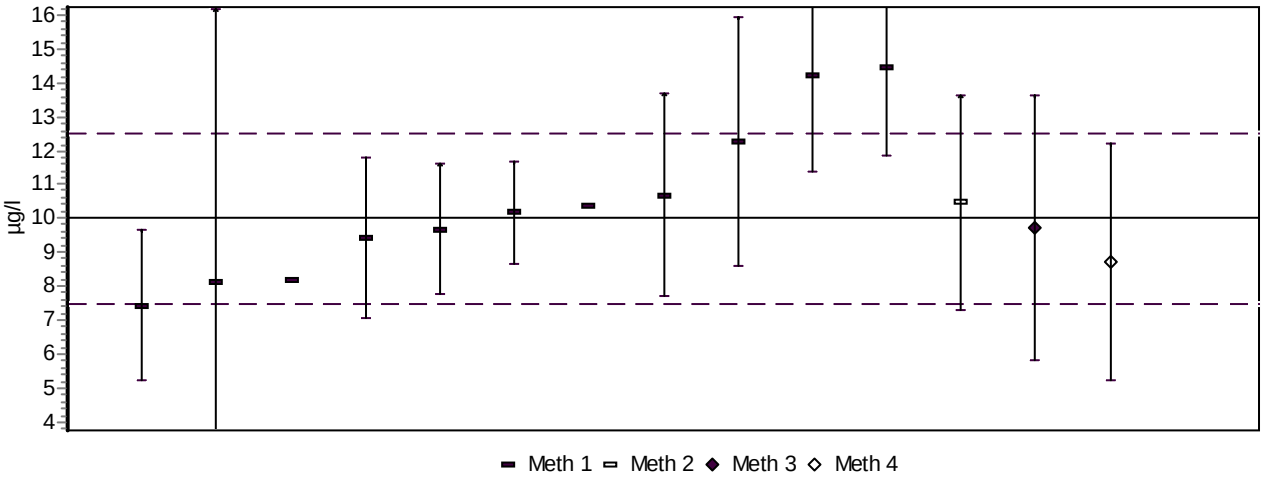
Analyytti *(Analyte)* **VOC-TCEe** Näyte *(Sample)* G2V



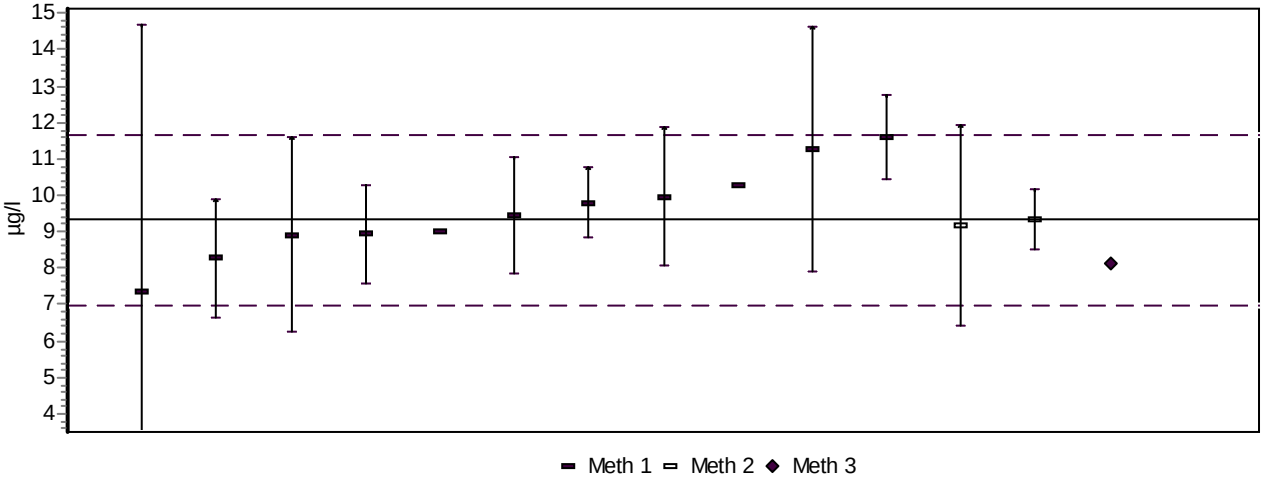
Analyytti *(Analyte)* **VOC-TCEe** Näyte *(Sample)* S3V



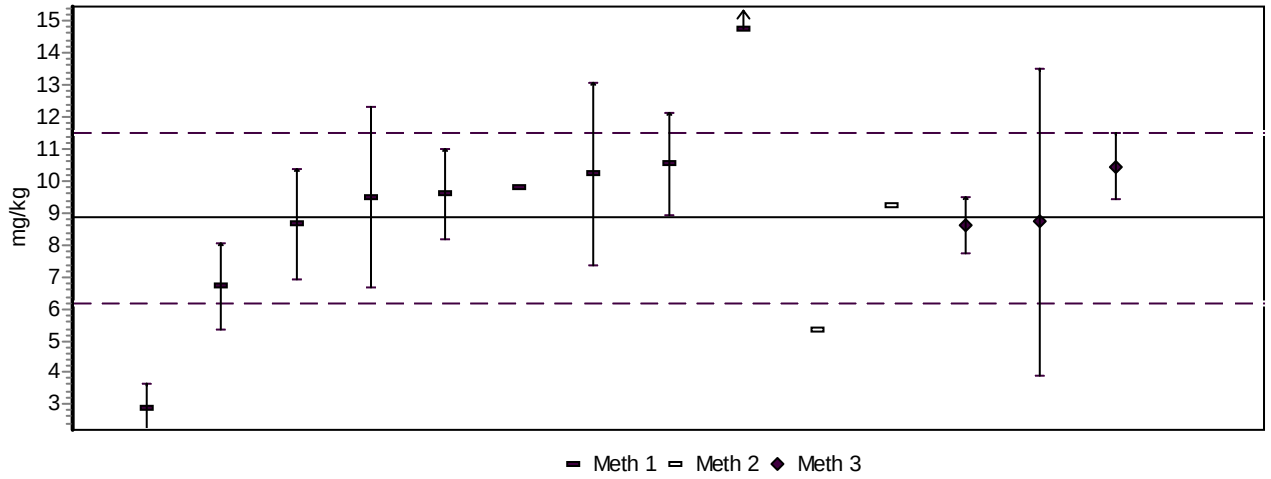
Analyytti *(Analyte)* **VOC-TeTCEe** Näyte *(Sample)* G2V



Analyytti *(Analyte)* **VOC-Toluene** Näyte *(Sample)* G2V



Analyytti *(Analyte)* **VOC-Toluene** Näyte *(Sample)* S3V



APPENDIX 11 MEASUREMENT UNCERTAINTIES REPORTED BY THE PARTICIPANTS

Uncertainties were estimated using the procedures as follows:

Meth 1	using the IQC data (X chart)
Meth 2	using the IQC data (X-chart and also R- chart or r%-chart for real samples)
Meth 3	using the data obtained in method validation and IQC, see e.g. NORDTEST TR 537[1)]
Meth 4	using the data obtained in the analysis of CRM (besides IQC data), see e.g.NORDTEST TR 537[1)]
Meth 5	using the IQC data and the results obtained in proficiency tests, see e.g. NORDTEST TR 537[1)]
Meth 6	using the "modeling approach" (GUM Guide or EURACHEM Guide Quantifying Uncertainty in Analytical Measurements [2)]
Meth 7	other procedure
Meth 8	no uncertainty estimation

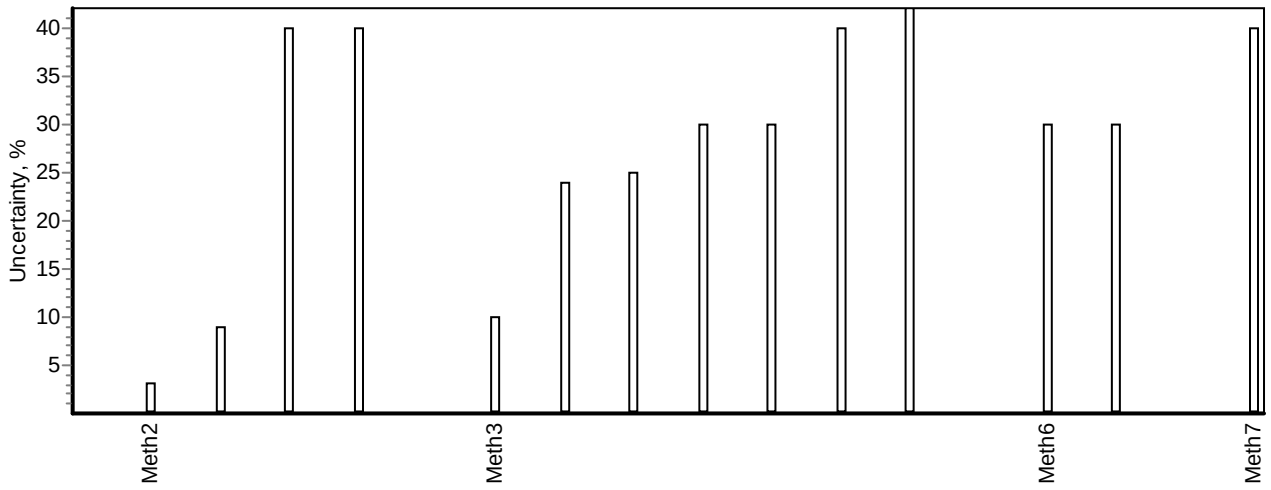
(IQC= internal quality control)

[1)] http://www.nordicinnovation.net/nordtestfiler/tec537.pdf (NORDTEST guide for estimation of measurement uncertainty)

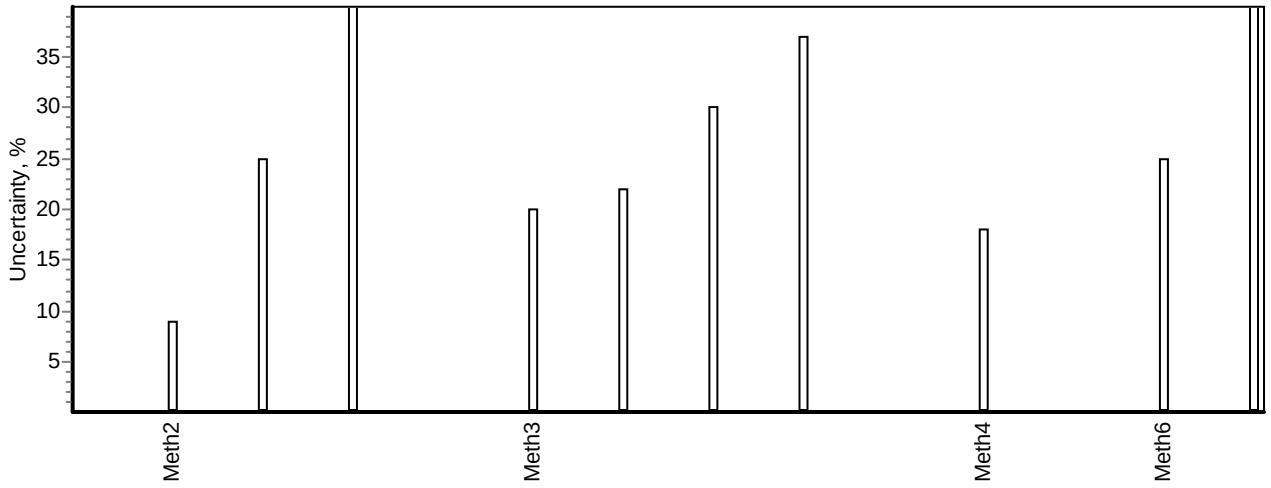
[2)] http://www.eurachem.ul.pt/guides/QUAM2000-1.pdf

LIITE 11.
Appendix 11.

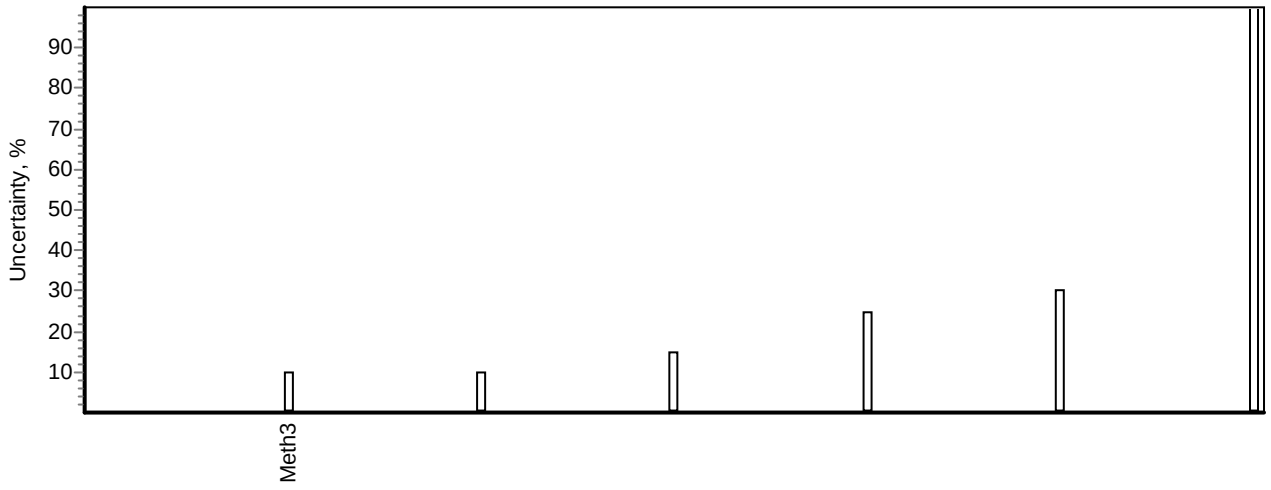
Analyytti *(Analyte)* **Min-oil-GC** Näyte *(Sample)* G2O



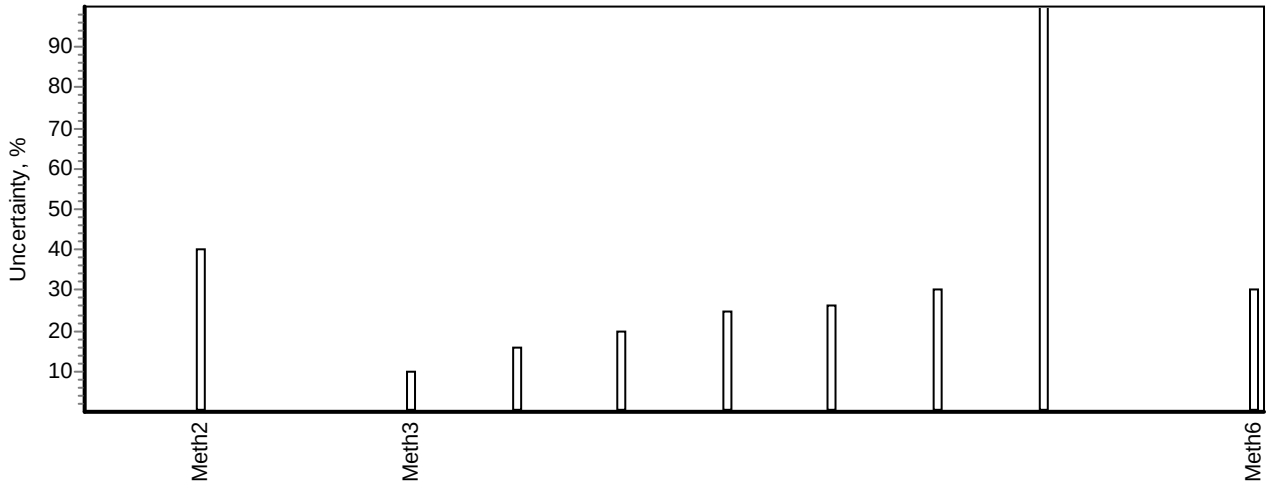
Analyytti *(Analyte)* **Min-oil-GC** Näyte *(Sample)* S3O



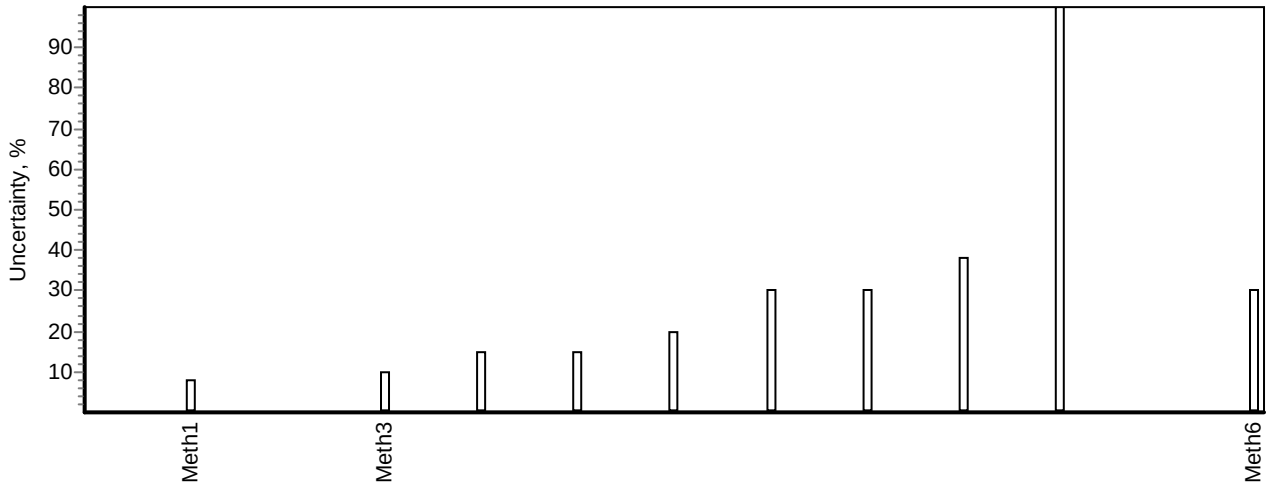
Analyytti *(Analyte)* **VOC-12DCB** Näyte *(Sample)* G2V



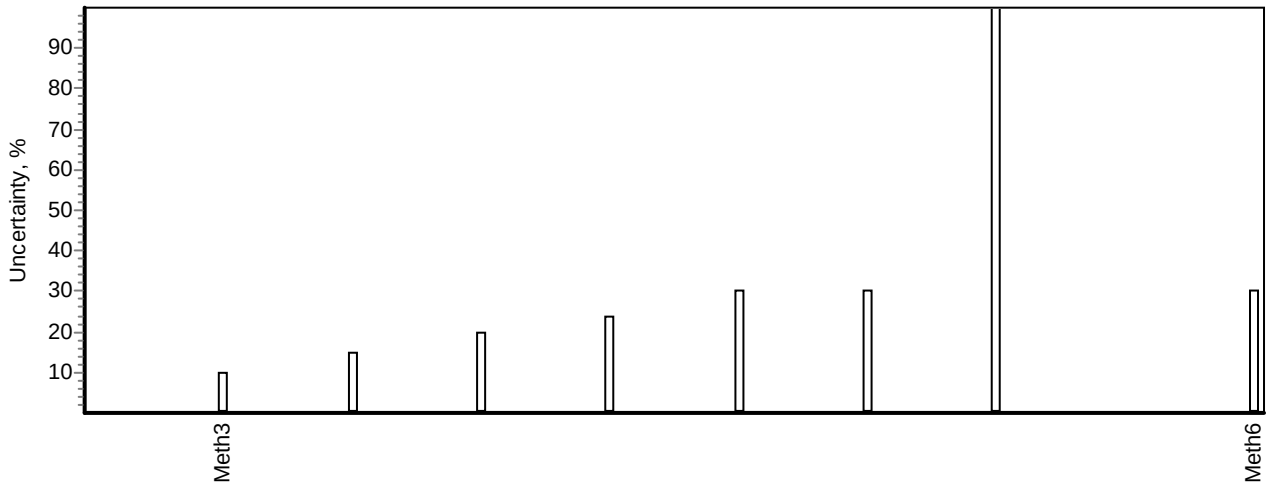
Analyytti *(Analyte)* **VOC-12DCEa** Näyte *(Sample)* G2V



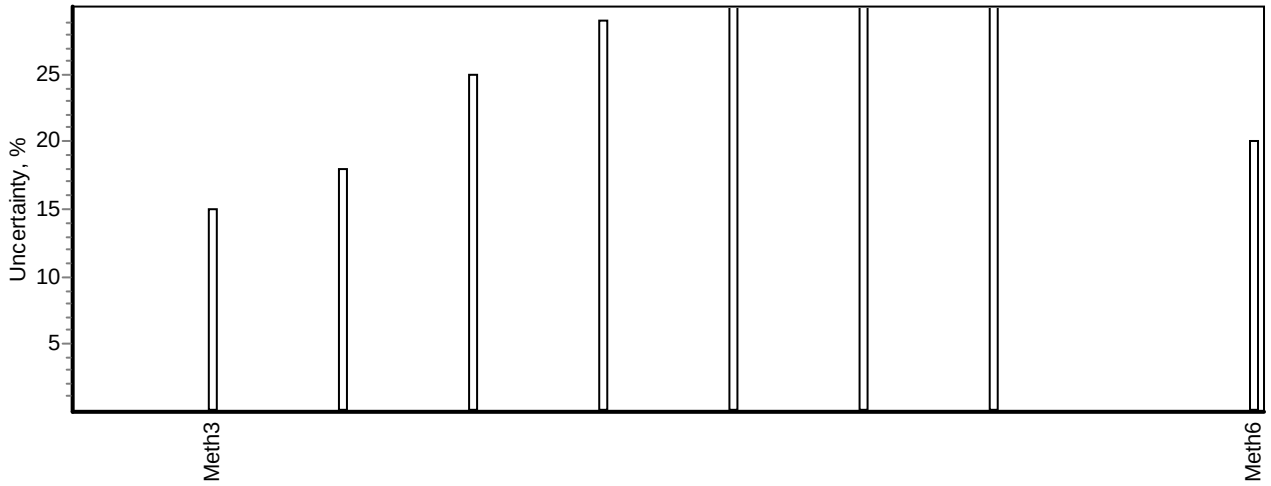
Analyytti *(Analyte)* **VOC-Benzene** Näyte *(Sample)* G2V



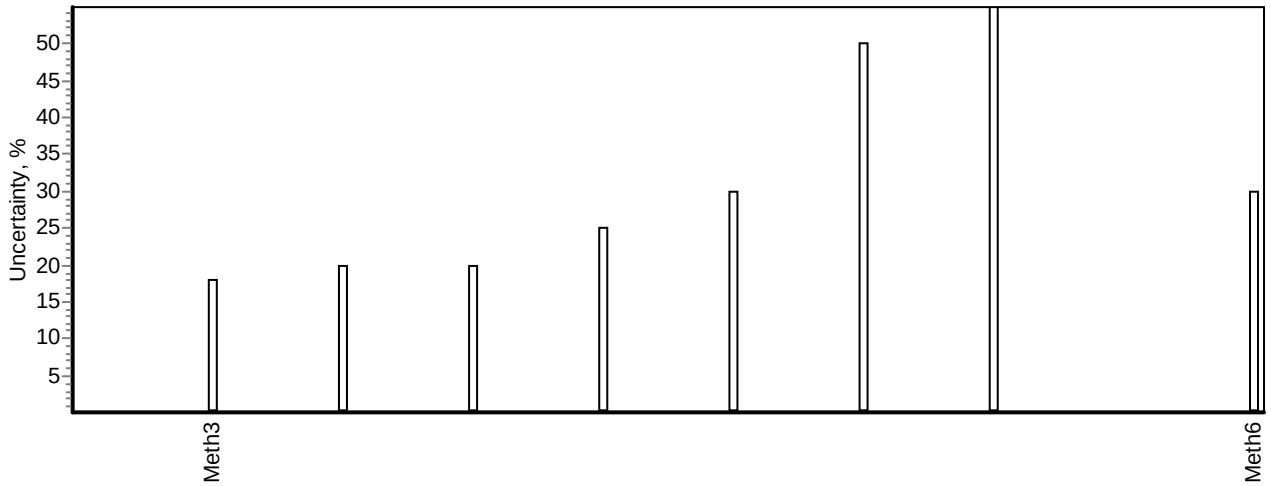
Analyytti *(Analyte)* **VOC-CB** Näyte *(Sample)* G2V



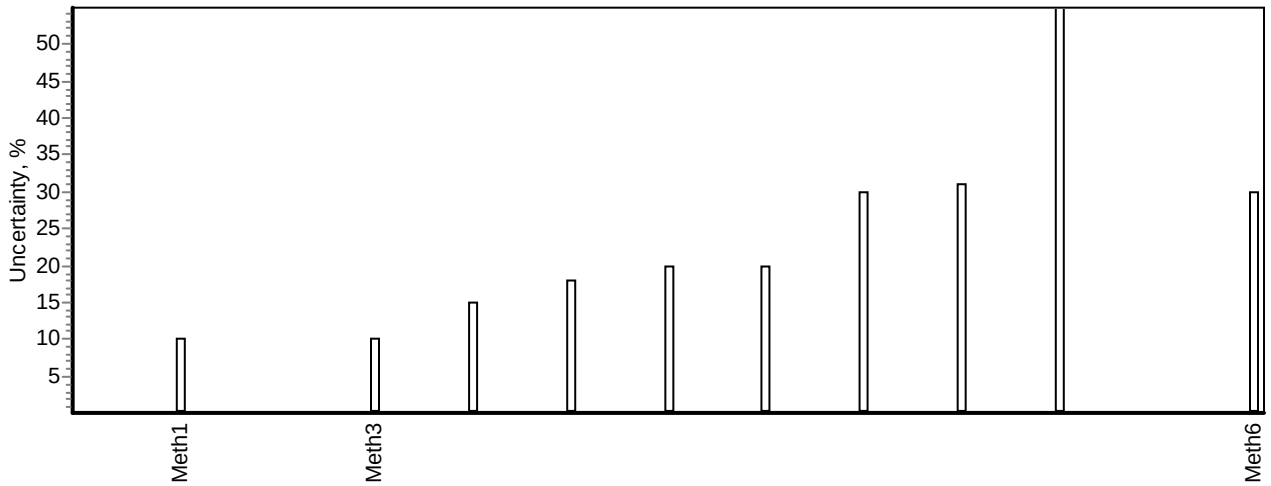
Analyytti *(Analyte)* **VOC-CHBr3** Näyte *(Sample)* A1V



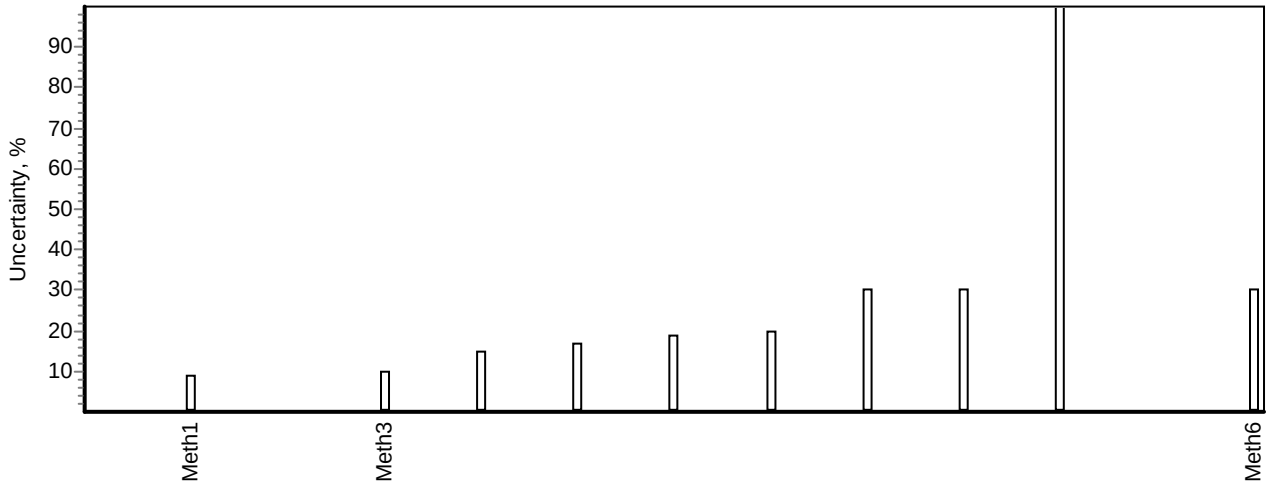
Analyytti *(Analyte)* **VOC-CHCl3** Näyte *(Sample)* S3V



Analyytti *(Analyte)* **VOC-m/p-Xylene** Näyte *(Sample)* S3V



Analyytti *(Analyte)* **VOC-Toluene** Näyte *(Sample)* G2V



LIITE 12.

Appendix 12. Summary of the z scores

Analyte	Sample\Lab	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Min-oil-GC	A1O	A	A	.	A	A	A	A	.	A	A	A	A	A	p	A	.	A	A	.	.	A	**P**	**N**
	G2O	.	A	**P**	A	A	A	A	n	A	A	A	A	A	A	A	.	A	A	A	n	A	**P**	A
	S3O	A	**N**	.	A	A	A	.	**N**	n	A	.	A	A	A	A	.	.	A	.	.	.	.	.
VOC-111TCEa	A1V	A	.	A	.	.	**N**	.	p	.	A	A	**P**	**P**	.	A	A	.	.	.	.	.	.	A
VOC-1122TeCEa	A1V	A	.	.	.	.	**N**	.	.	.	A	.	A	A	.	**N**	A	.	.	.	.	.	.	A
VOC-11DCEa	A1V	A	.	A	.	.	n	.	A	.	A	A	A	**P**	.	A	A	.	.	.	.	.	.	.
VOC-11DCEe	A1V	A	.	p	.	.	**N**	.	**P**	.	A	**P**	**P**	**P**	.	.	A	.	.	.	.	.	.	A
VOC-124TCB	A1V	p	.	A	.	.	.	.	A	.	A	A	A	**P**	.	.	A	.	.	.	.	.	.	.
	G2V	A	.	A	.	.	.	.	A	.	n	A	A	A	.	.	A	.	.	.	.	.	.	.
	S3V	A	.	**N**	.	.	.	.	A	.	A	A	A	**P**	.	.	A	.	.	.	.	.	.	.
VOC-12DCB	A1V	A	.	.	.	.	**N**	.	A	.	A	A	.	**P**	.	.	.	.	.	.	.	.	.	.
	G2V	A	.	A	.	.	**N**	.	A	.	A	A	.	A	.	.	A	.	.	.	.	.	.	.
	S3V	A	.	**N**	.	.	n	.	A	.	A	A	.	**P**	.	.	A	.	.	.	.	.	.	.
VOC-12DCEa	A1V	A	.	A	.	.	**N**	.	A	.	**P**	A	n	p	.	A	A	.	.	.	.	.	.	A
	G2V	A	.	A	.	.	n	.	A	.	A	A	A	A	.	A	A	.	.	.	.	.	.	A
	S3V	A	.	**N**	.	.	A	.	A	.	A	A	A	**P**	.	A	A	.	.	.	.	.	.	.
VOC-Benzene	A1V	A	.	A	**P**	.	**N**	.	A	A	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
	G2V	A	.	A	A	.	A	.	A	A	A	A	A	p	.	A	A	.	A	.	.	.	.	.
	S3V	A	.	**N**	A	.	A	.	A	**N**	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-c12DCEe	A1V	A	.	A	.	.	**N**	.	A	.	A	A	A	**P**	.	A	A	.	.	.	.	.	.	A
	G2V	A	.	A	.	.	A	.	A	.	A	A	A	A	.	A	A	.	.	.	.	.	.	A
	S3V	A	.	**N**	.	.	A	.	A	.	A	A	A	**P**	.	A	A	.	.	.	.	.	.	.
VOC-CB	G2V	A	.	A	.	.	n	.	A	.	A	A	A	A	.	A	A	.	A	.	.	.	.	.
VOC-CCl4	A1V	A	A	A	.	.	**N**	.	**P**	.	A	A	**P**	**P**	.	A	A	.	.	.	.	.	.	A
	G2V	A	**N**	A	.	.	A	.	**P**	.	A	p	A	A	.	A	A	.	.	.	.	.	.	A
	S3V	A	.	**N**	.	.	A	.	**P**	.	A	A	A	**P**	.	A	A	.	.	.	.	.	.	.
VOC-CHBr3	A1V	A	.	A	.	.	A	.	.	.	A	p	A	A	.	A	A	.	.	.	.	.	.	.
VOC-CHCl3	A1V	A	**N**	A	.	.	A	.	**P**	.	A	A	A	A	.	A	A	.	.	.	.	.	.	A
	G2V	A	A	A	.	.	A	.	A	.	A	A	A	A	.	A	A	.	.	.	.	.	.	p
	S3V	A	.	**N**	.	.	A	.	A	.	A	A	A	**P**	.	A	A	.	.	.	.	.	.	.
VOC-DIPE	A1V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	G2V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S3V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
VOC-Et.benzene	A1V	A	.	p	**N**	.	**N**	.	p	A	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
	G2V	A	.	A	A	.	**N**	.	**P**	A	A	A	A	A	.	A	A	.	A	.	.	.	.	.
	S3V	A	.	**N**	A	.	A	.	A	n	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-ETBE	A1V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	G2V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S3V	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
VOC-m/p-Xylene	A1V	A	.	A	**N**	.	**N**	.	**N**	A	A	A	A	**P**	.	n	**N**	.	A	.	.	.	.	.
	G2V	p	.	A	A	.	**N**	.	A	A	A	A	A	A	.	A	**N**	.	A	.	.	.	.	.
	S3V	A	.	**N**	A	.	A	.	A	n	A	A	A	**P**	.	A	**N**	.	A	.	.	.	.	.
VOC-MTBE	A1V	A	.	.	.	.	**N**	.	.	.	p	A	A	**P**	.	A	**P**	.	A	.	.	.	.	.
	G2V	A	.	.	.	.	n	.	.	.	A	A	A	p	.	A	A	.	p	.	.	.	.	.
	S3V	A	.	.	.	.	n	.	.	.	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-o-Xylene	A1V	A	.	p	**N**	.	**N**	.	A	A	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
	G2V	A	.	A	A	.	**N**	.	p	A	A	A	A	A	.	A	A	.	.	.	.	.	.	.
	S3V	A	.	**N**	A	.	A	.	A	n	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-Styrene	A1V	A	.	.	.	.	**N**	.	.	.	p	.	A	**P**	.	n	A	.	A	.	.	.	.	.
VOC-t12DCEe	A1V	A	.	.	.	.	**N**	.	**P**	.	A	A	A	**P**	.	A	A	.	.	.	.	.	.	A
VOC-TAME	A1V	A	.	.	.	.	**N**	.	.	.	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
	G2V	A	.	.	.	.	n	.	.	.	A	A	A	**P**	.	A	n	.	A	.	.	.	.	.
	S3V	A	.	.	.	.	n	.	.	.	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-TCEe	A1V	A	**N**	A	.	.	**N**	.	**N**	.	A	A	A	**P**	.	A	A	.	A	.	.	.	.	A
	G2V	A	A	A	.	.	A	.	A	.	p	A	A	A	.	A	A	.	.	.	.	.	.	A
	S3V	A	.	**N**	.	.	A	.	**N**	.	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-TeTCEe	A1V	A	**N**	A	.	.	**N**	.	p	.	A	A	A	**P**	.	A	A	.	A	.	.	.	.	A
	G2V	A	A	A	.	.	A	.	**P**	.	**P**	A	A	A	.	A	A	.	A	.	.	.	.	A
	S3V	A	.	**N**	.	.	A	.	A	.	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-Toluene	A1V	A	.	A	**N**	.	**N**	.	A	A	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
	G2V	A	.	A	A	.	A	.	A	A	A	A	A	A	.	A	A	.	A	.	.	.	.	.
	S3V	A	.	**N**	A	.	A	.	A	n	A	A	A	**P**	.	A	A	.	A	.	.	.	.	.
VOC-VIN	A1V	A	.	.	.	.	**N**	.	.	.	A	A	p	**P**	.	**P**	A	.	.	.	.	.	.	.
%		96	55	61	72	100	43	100	63	67	89	94	91	33	67	92	91	100	97	100	0	100	0	89
Accredited		yes	yes	yes	yes	yes	yes	yes	yes		yes	yes		yes	yes	yes	yes						yes	

Analyte	Sample\Lab	24	%
Min-oil-GC	A1O	A	84
	G2O	A	82
	S3O	A	79

Analyte	Sample\Lab	24	%
VOC-111TCEa	A1V	A	67
VOC-1122TeCEa	A1V	.	75
VOC-11DCEa	A1V	A	82
VOC-11DCEe	A1V	A	45
VOC-124TCB	A1V	.	75
	G2V	.	88
	S3V	.	75
VOC-12DCB	A1V	.	67
	G2V	.	88
	S3V	.	62
VOC-12DCEa	A1V	A	67
	G2V	A	92
	S3V	A	82
VOC-Benzene	A1V	A	79
	G2V	A	93
	S3V	A	79
VOC-c12DCEe	A1V	A	83
	G2V	A	100
	S3V	A	82
VOC-CB	G2V	A	92
VOC-CCl4	A1V	A	69
	G2V	A	77
	S3V	A	73
VOC-CHBr3	A1V	A	90
VOC-CHCl3	A1V	A	85
	G2V	A	92
	S3V	A	82
VOC-DIPE	A1V	.	
	G2V	.	
	S3V	.	
VOC-Et.benzene	A1V	A	64
	G2V	A	86
	S3V	A	79
VOC-ETBE	A1V	.	
	G2V	.	
	S3V	.	
VOC-m/p-Xylene	A1V	A	57
	G2V	A	79
	S3V	A	71
VOC-MTBE	A1V	p	50
	G2V	A	70
	S3V	A	80
VOC-o-Xylene	A1V	A	71
	G2V	A	85
	S3V	A	79
VOC-Styrene	A1V	A	56
VOC-t12DCEe	A1V	A	73
VOC-TAME	A1V	A	80
	G2V	A	70
	S3V	A	80
VOC-TCEe	A1V	A	71
	G2V	**P**	85
	S3V	A	75
VOC-TeTCEe	A1V	A	71
	G2V	n	79
	S3V	A	83
VOC-Toluene	A1V	A	79
	G2V	A	100
	S3V	A	79
VOC-VIN	A1V	**P**	44
%		92	
Accredited		yes	

A - accepted ($-2 \leq Z \leq 2$), p - questionable ($2 < Z \leq 3$), n - questionable ($-3 \leq Z < -2$), P - non-accepted ($Z > 3$), N - non-accepted ($Z < -3$),

%* - percentage of accepted results

Totally accepted, % In all: 77 In accredited: 75

Documentation page

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Author(s)	Kaija Korhonen, Pirjo Sainio, Jari Nuutinen, Anne Markkanen, Helena Tanttu and Markku Ilmakunnas	
Title of publication	Proficiency test SYKE 8/2008 Oil hydrocarbons and volatile organic compounds in water and soil.	
Parts of publication/ other project publications	The publication is available only on the internet: www.ymparisto.fi/julkaisut.	
Abstract	Finnish Environment Institute carried out the proficiency test for analysis of oil hydrocarbons and volatile organic carbons in November 2008. One artificial sample, one groundwater sample and one soil sample were distributed to the participants. In total, 24 laboratories participated in the proficiency test. Either the calculated concentration or the robust mean of the results reported by the participants was chosen to be the assigned value for the measurand. The performance of the participants was evaluated by using z scores. In this proficiency test 77 % of the results were satisfactory when the deviation of 10–30 % from the assigned value was accepted at the 95 % confidence level.	
Keywords	water analysis, oil hydrocarbons, VOC, volatile organic hydrocarbons, water and environmental laboratories, proficiency test, interlaboratory comparisons	
Publication series and number	Suomen ympäristökeskuksen raportteja 12/2009	
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Tekijä(t)	Kaija Korhonen, Pirjo Sainio, Jari Nuutinen, Anne Markkanen, Helena Tanttu ja Markku Ilmakunnas	
Julkaisun nimi	Proficiency Test SYKE 8/2008 Oil hydrocarbons and volatile organic compounds in water and soil	
Julkaisun osat/ muut saman projektin tuottamat julkaisut	Julkaisu on saatavana vain internetissä: www.ymparisto.fi/julkaisut	
Tiivistelmä	Suomen ympäristökeskuksen laboratorio järjesti pätevyyskokeen marraskuussa 2008 öljyhiilivetyjen ja haihtuvien orgaanisten yhdisteiden (VOC) määrittämisestä vedestä ja maasta. Pätevyyskokeeseen osallistui yhteensä 24 laboratoriota. Mittaussuureen vertailuarvona käytettiin teoreettista (laskennallista) pitoisuutta tai osallistujien tulosten robustia keskiarvoa. Tulosten arviointi tehtiin z-arvon perusteella, jolloin tuloksissa sallittiin yhdisteestä ja näytteestä riippuen 10-30 %:n poikkeama vertailuarvosta. Koko aineistossa hyväksyttäviä tuloksia oli 77 %.	
Asiasanat	vesianalyysi, AOX, pH, sähkönjohtavuus (γ_{25}), N_{NH4}, $N_{NO2+NO3}$, N_{tot}, P_{PO4}, P_{tot}, sameus, väri, vesi- ja ympäristölaboratoriot, pätevyyskoe, laboratorioiden välinen vertailumittaus	
Julkaisusarjan nimi ja numero	Suomen ympäristökeskuksen raportteja 12/2009	
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Utgivare	Finlands Miljöcentral (SYKE)	Datum Maj 2009
Författare	Kaija Korhonen, Pirjo Sainio, Jari Nuutinen, Anne Markkanen, Helena Tanttu och Markku Ilmakunnas	
Publikationens titel	Proficiency Test SYKE 8/2008 Oil hydrocarbons and volatile organic compounds in water and soil	
Publikationens delar/ andra publikationer inom samma projekt	Publikationen finns tillgänglig på internet www.ymparisto.fi/julkaisut	
Sammandrag	Under november 2008 genomförde Finlands Miljöcentral en provningsjämförelse, som omfattade bestämningen av petroleumkolväten VOC i grundvatten och jord. Proven sändes ut till 24 laboratorier. Som referensvärde av analytens koncentration användes det teoretiska värdet eller robust medelvärdet av deltagarnas resultat. Resultaten värderades med hjälp av z-värden. I jämförelsen var 77 % av alla resultaten tillfredsställande, när totalavvikelsen av 10–30 % från referensvärdet accepterades.	
Nyckelord	vattenanalyser, petroleumkolväten, VOC, provningsjämförelse, vatten- och miljölaboratorier	
Publikationsserie och nummer	Suomen ympäristökeskuksen raportteja 12/2009	
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