



# QUASIMEME

Quality assurance of information  
for marine environmental monitoring

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## Certificate of Analysis



**Sediment**

**REFERENCE MATERIAL**

**Sediment sample 28**

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## Certificate of Analysis Sediment 28

### General Information

In this report an overview is given of analytical data for this sample collected in our proficiency testing program. The consensus values are calculated using a robust statistical model. With this NDA model mean and standard deviation are calculated using all reported data when at least 4 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into two sections: Consensus Values and Indicative Values. The division is made on the reliability of the data. Consensus Values are based on at least 10 results while the relative uncertainty is smaller than 6.25%. Indicative Values are based on a relative uncertainty of maximum 35% with at least 4 and less than 10 results or a relative uncertainty higher than 6.25%.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation) and the uncertainty in the assigned value. The confidence limits (at 95 % probability) are calculated for these determinands.

The results of each determinand is expressed on dried sediment.

### Sample information

QUASIMEME reference materials cover a range of natural Marine sediment species from contaminated waters from the North Sea and/or Mediterranean. There is no spiking, mixing or other alterations of the samples. For sample preparation the sediment samples are dried at 40 oC and milled to pass a 0.5 mm sieve.

This Sediment sample 28 of Estuarine sediment from Firth of Forth, Scotland is prepared for the QUASIMEME proficiency programs. The results on which the values in this report are based were taken from the periods given in the following table.

Year.Round	Program	Sample Round Id
2023.1	MS2	QOR154MS
2020.2	MS7	QBC064MS
2020.1	MS6	QSP072MS
2019.1	MS6	QSP068MS
2018.2	MS7	QBC056MS
2018.1	MS2	QOR135MS
2017.1	MS2	QOR131MS
2017.1	MS3	QPH093MS
2017.1	MS6	QSP061MS
2017.1	MS7	QBC050MS
2015.2	MS7	QBC044MS



## Consensus Values MS2

### Method: Chlorinated organics - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
pp'-DDE	µg/kg	0.822	0.2267	27.6	41	0.860	0.1200	0.0442	0.750	-	0.893
HCB	µg/kg	18.2	6.17	33.9	49	18.7	3.72	1.10	16.4	-	20.0
PCB31	µg/kg	0.953	0.2711	28.5	45	0.950	0.1650	0.0505	0.871	-	1.03
PCB52	µg/kg	1.19	0.323	27.3	55	1.20	0.220	0.055	1.10	-	1.27
PCB101	µg/kg	2.81	0.715	25.4	55	2.90	0.470	0.120	2.62	-	3.00
PCB105	µg/kg	0.560	0.1619	28.9	38	0.563	0.0950	0.0328	0.507	-	0.613
PCB118	µg/kg	1.54	0.385	25.1	56	1.54	0.231	0.064	1.43	-	1.64
PCB138+PCB163	µg/kg	8.47	1.244	14.7	15	8.62	1.008	0.401	7.78	-	9.15
PCB153	µg/kg	6.64	1.706	25.7	57	6.59	1.070	0.282	6.19	-	7.09
PCB156	µg/kg	0.505	0.1372	27.2	37	0.536	0.0920	0.0282	0.459	-	0.550
PCB180	µg/kg	4.11	1.157	28.1	57	4.27	0.590	0.192	3.81	-	4.42
PCB138	µg/kg	5.98	1.798	30.1	50	5.97	1.345	0.318	5.47	-	6.49
PCB170	µg/kg	2.30	0.342	14.9	10	2.31	0.170	0.135	2.06	-	2.54

### Method: Carbon - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
TOC	%	3.14	0.336	10.7	36	3.15	0.250	0.070	3.02	-	3.25



## Indicative Values MS2

### Method: Chlorinated organics - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
a-HCH	µg/kg	0.0407	0.0271	66.7	22	0.0465	0.0160	0.0072	0.0287	-	0.0526
g-HCH	µg/kg	0.0667	0.0602	90.2	20	0.0707	0.0332	0.0168	0.0386	-	0.0948
Transnonachlor	µg/kg	-	-	-	4	0.0500	0.0	-	-	-	-
Dieldrin	µg/kg	0.883	0.2550	28.9	20	0.853	0.1635	0.0713	0.764	-	1.00
pp'-DDT	µg/kg	0.416	0.1525	36.7	34	0.424	0.1025	0.0327	0.362	-	0.469
pp'-DDD	µg/kg	1.37	0.461	33.6	43	1.40	0.290	0.088	1.23	-	1.52
b-HCH	µg/kg	0.0542	0.0459	84.8	22	0.0575	0.0310	0.0122	0.0339	-	0.0745
HCBd	µg/kg	-	-	-	4	0.0570	0.0	-	-	-	-
PCB28	µg/kg	1.11	0.410	36.9	17	1.17	0.183	0.124	0.900	-	1.32
Heptachlor	µg/kg	-	-	-	4	0.0889	0.0	-	-	-	-
PCB18	µg/kg	0.364	0.1866	51.2	7	0.433	0.1090	0.0882	0.197	-	0.531
PCB44	µg/kg	0.721	0.1724	23.9	7	0.720	0.0970	0.0815	0.567	-	0.875
PCB47	µg/kg	0.285	0.0401	14.0	6	0.279	0.0185	0.0205	0.245	-	0.325
PCB49	µg/kg	0.825	0.3679	44.6	7	0.882	0.1560	0.1738	0.496	-	1.15
PCB66	µg/kg	1.04	0.221	21.4	6	1.04	0.133	0.113	0.815	-	1.26
PCB110	µg/kg	2.48	0.132	5.3	6	2.47	0.060	0.067	2.35	-	2.62
PCB128	µg/kg	0.841	0.2020	24.0	9	0.887	0.1520	0.0842	0.689	-	0.994
PCB149	µg/kg	6.10	0.807	13.2	7	6.15	0.420	0.381	5.38	-	6.82
PCB183	µg/kg	1.06	0.229	21.6	8	1.11	0.110	0.101	0.874	-	1.25
PCB187	µg/kg	2.23	0.685	30.7	6	2.46	0.335	0.349	1.54	-	2.91
PCB158	µg/kg	0.663	0.1650	24.9	7	0.657	0.0990	0.0780	0.516	-	0.811
PCB141	µg/kg	1.86	0.202	10.8	7	1.87	0.090	0.095	1.68	-	2.04
PCB151	µg/kg	1.79	0.627	35.0	7	1.93	0.460	0.296	1.23	-	2.35
PCB194	µg/kg	0.534	0.1437	26.9	9	0.602	0.1280	0.0599	0.425	-	0.642

### Method: Nitrogen - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
PN	%	0.169	0.0185	11.0	9	0.171	0.0090	0.0077	0.155	-	0.183



### Consensus Values MS3

#### Method: Polycyclic aromatic hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Indeno[1,2,3-cd]pyrene	µg/kg	168	34.2	20.4	19	167	20.7	9.8	151	-	184
Pyrene	µg/kg	467	79.6	17.0	18	458	48.3	23.5	428	-	507
Fluoranthene	µg/kg	447	59.9	13.4	19	451	25.4	17.2	418	-	476
Benzo[a]anthracene	µg/kg	220	38.0	17.3	19	219	21.0	10.9	202	-	238
Benzo[a]pyrene	µg/kg	214	43.9	20.5	19	220	27.9	12.6	193	-	235
Benzo[k]fluoranthene	µg/kg	113	14.9	13.2	17	113	7.6	4.5	106	-	121

#### Method: Carbon - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
TOC	%	3.09	0.420	13.6	12	3.12	0.316	0.152	2.83	-	3.36



## Indicative Values MS3

### Method: Polycyclic aromatic hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Chrysene + Triphenylene	µg/kg	234	53.6	22.9	9	229	40.6	22.3	194	-	275
Benzo[e]pyrene	µg/kg	195	66.4	34.0	15	194	57.0	21.4	159	-	232
Phenanthrene	µg/kg	404	108.8	26.9	18	412	70.6	32.0	350	-	458
Benzo[g,h,i]perylene	µg/kg	198	53.9	27.3	20	201	33.0	15.1	172	-	223
Benzo[b]fluoranthene	µg/kg	249	62.2	25.0	18	255	44.2	18.3	218	-	280
Naphthalene	µg/kg	204	72.4	35.5	17	199	45.4	21.9	167	-	241
Dibenz[a,h]anthracene	µg/kg	37.0	10.63	28.8	19	37.5	7.35	3.05	31.8	-	42.1
Anthracene	µg/kg	114	29.2	25.6	20	111	19.4	8.2	100	-	127
Fluorene	µg/kg	55.2	18.64	33.7	17	53.0	12.90	5.65	45.7	-	64.8
Acenaphthene	µg/kg	29.3	13.50	46.0	17	27.0	5.69	4.09	22.4	-	36.2
Acenaphthylene	µg/kg	25.7	13.59	52.9	13	26.1	10.50	4.71	17.6	-	33.8
Dibenzothiophene	µg/kg	30.5	9.48	31.1	11	31.1	4.90	3.57	24.2	-	36.8
3-6-dimethylphenanthrene	µg/kg	-	-	-	5	26.9	4.9	-	-	-	-
2-methylphenanthrene	µg/kg	127	40.7	32.1	7	129	30.1	19.2	90.6	-	163
Perylene	µg/kg	107	33.9	31.7	11	100	20.0	12.8	84.4	-	129
Triphenylene	µg/kg	-	-	-	5	55.5	8.3	-	-	-	-
Chrysene	µg/kg	179	40.7	22.8	13	178	19.8	14.1	154	-	203
C1-phenanthr.+anthrac.	µg/kg	467	145.4	31.1	6	455	58.5	74.2	322	-	612
C2-phenanthr.+anthrac.	µg/kg	403	116.1	28.9	6	418	46.5	59.3	287	-	519
C3-phenanthr.+anthrac.	µg/kg	-	-	-	4	298	44.0	-	-	-	-
C1-pyrenes+fluoranthenes	µg/kg	-	-	-	5	423	157.5	-	-	-	-
C1-chrysenes	µg/kg	-	-	-	4	261	73.4	-	-	-	-



## Indicative Values MS6

### Method: Organometals - MS6

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Tributyltin (TBT)	µg Sn/kg	2.90	1.342	46.3	48	2.90	1.194	0.242	2.51	-	3.29
Dibutyltin (DBT)	µg Sn/kg	2.22	1.097	49.4	42	2.31	0.737	0.212	1.88	-	2.56
Monobutyltin (MBT)	µg Sn/kg	5.87	2.441	41.6	40	5.98	1.404	0.482	5.09	-	6.65
Triphenyltin (TPhT)	µg Sn/kg	-	-	-	4	1.00	0.5	-	-	-	-



### Consensus Values MS7

#### Method: Brominated Flame Retardants - MS7

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
BDE047	µg/kg	0.274	0.0543	19.8	49	0.281	0.0310	0.0097	0.258	- 0.290
BDE099	µg/kg	0.236	0.0399	17.0	48	0.244	0.0260	0.0072	0.224	- 0.247
BDE209	µg/kg	32.9	7.86	23.9	40	34.1	4.91	1.55	30.4	- 35.4





### Indicative Values MS7

#### Method: Brominated Flame Retardants - MS7

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
BDE028	µg/kg	0.0291	0.0136	46.9	36	0.0332	0.0088	0.0028	0.0244	- 0.0337
BDE100	µg/kg	0.0527	0.0170	32.2	36	0.0557	0.0095	0.0035	0.0469	- 0.0584
BDE153	µg/kg	0.0490	0.0220	44.9	36	0.0505	0.0125	0.0046	0.0416	- 0.0564
BDE154	µg/kg	0.0442	0.0179	40.5	38	0.0478	0.0116	0.0036	0.0384	- 0.0501
BDE183	µg/kg	0.0491	0.0330	67.2	34	0.0557	0.0178	0.0071	0.0376	- 0.0605
TBBP-A	µg/kg	-	-	-	5	0.274	0.1	-	-	-
a-HBCD	µg/kg	-	-	-	5	0.144	0.0	-	-	-
b-HBCD	µg/kg	-	-	-	5	0.0553	0.0	-	-	-
g-HBCD	µg/kg	-	-	-	5	0.477	0.2	-	-	-
BDE66	µg/kg	0.0247	0.0092	37.1	26	0.0267	0.0064	0.0023	0.0210	- 0.0284