



QUASIMEME

Quality assurance of information
for marine environmental monitoring

Certificate of Analysis



Sediment

REFERENCE MATERIAL

Sediment sample 55



Certificate of Analysis Sediment 55

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 55 of Harbor sediment from harbor of Rotterdam 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
2023.2	MS7	QBC077MS
2023.1	MS8	QPF021MS
2022.1	MS2	QOR151MS
2022.1	MS3	QPH114MS
2021.2	MS6	QSP078MS
2021.2	MS8	QPF014MS
2021.1	MS7	QBC066MS
2020.2	MS8	QPF010MS
2020.1	MS2	QOR143MS
2020.1	MS3	QPH106MS
2020.1	MS6	QSP073MS
2020.1	MS7	QBC063MS



Consensus Values MS2

Method: Chlorinated organics - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
PCB28	µg/kg	32.3	5.57	17.2	34	32.3	3.01	1.19	30.4	-	34.2
PCB31	µg/kg	32.1	6.00	18.7	22	31.7	2.86	1.60	29.5	-	34.8
PCB52	µg/kg	152	19.1	12.6	34	150	9.8	4.1	145	-	158
PCB101	µg/kg	111	18.4	16.5	34	108	11.5	3.9	105	-	118
PCB105	µg/kg	13.5	3.15	23.4	24	13.4	1.89	0.80	12.2	-	14.8
PCB118	µg/kg	47.3	5.42	11.5	35	47.9	3.68	1.14	45.4	-	49.1
PCB138+PCB163	µg/kg	40.8	6.49	15.9	15	39.4	3.80	2.09	37.2	-	44.3
PCB153	µg/kg	39.3	7.78	19.8	35	40.6	5.85	1.64	36.6	-	42.0
PCB156	µg/kg	1.89	0.432	22.8	21	1.87	0.275	0.118	1.70	-	2.09
PCB180	µg/kg	9.61	1.748	18.2	37	9.64	1.054	0.359	9.03	-	10.2
PCB138	µg/kg	29.6	6.69	22.6	29	29.5	4.35	1.55	27.1	-	32.2
PCB44	µg/kg	69.1	10.71	15.5	12	68.8	4.28	3.86	62.3	-	75.8
PCB49	µg/kg	62.8	9.01	14.3	12	63.7	3.45	3.25	57.2	-	68.5
PCB149	µg/kg	40.7	6.27	15.4	14	39.8	3.52	2.09	37.2	-	44.3
PCB183	µg/kg	2.55	0.388	15.2	10	2.61	0.214	0.153	2.27	-	2.82

Method: Carbon - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
TOC	%	3.16	0.229	7.2	22	3.15	0.121	0.061	3.06	-	3.27



Indicative Values MS2

Method: Chlorinated organics - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
a-HCH	µg/kg	0.130	0.1016	78.3	17	0.157	0.0670	0.0308	0.0777	- 0.182
g-HCH	µg/kg	0.136	0.0639	47.1	20	0.140	0.0420	0.0179	0.106	- 0.165
Dieldrin	µg/kg	0.728	0.4288	58.9	15	0.758	0.2380	0.1384	0.492	- 0.964
pp'-DDE	µg/kg	2.65	0.850	32.1	27	2.78	0.527	0.205	2.31	- 2.98
pp'-DDT	µg/kg	0.538	0.2031	37.8	20	0.603	0.1294	0.0568	0.443	- 0.632
pp'-DDD	µg/kg	1.71	0.599	35.0	28	1.82	0.368	0.142	1.48	- 1.94
HCB	µg/kg	3.22	1.041	32.3	31	3.34	0.660	0.234	2.84	- 3.60
b-HCH	µg/kg	0.210	0.1031	49.1	17	0.233	0.0590	0.0313	0.157	- 0.263
HCBd	µg/kg	0.993	0.5899	59.4	8	1.206	0.3130	0.2607	0.512	- 1.47
d-HCH	µg/kg	-	-	-	5	0.200	0.1	-	-	-
PCB18	µg/kg	6.77	2.105	31.1	9	6.71	1.216	0.877	5.19	- 8.36
PCB47	µg/kg	20.3	7.30	35.9	9	22.0	4.70	3.04	14.8	- 25.8
PCB66	µg/kg	52.8	9.14	17.3	8	53.9	6.04	4.04	45.4	- 60.3
PCB110	µg/kg	83.8	15.46	18.4	10	82.5	8.36	6.11	72.9	- 94.7
PCB128	µg/kg	4.78	0.979	20.5	12	4.76	0.559	0.353	4.17	- 5.40
PCB170	µg/kg	5.23	1.060	20.3	16	5.49	0.712	0.331	4.67	- 5.79
PCB187	µg/kg	6.41	1.566	24.4	11	6.37	0.936	0.590	5.37	- 7.45
PCB158	µg/kg	3.07	0.976	31.8	9	3.13	0.613	0.407	2.33	- 3.80
PCB141	µg/kg	5.79	1.220	21.1	9	5.83	0.984	0.508	4.87	- 6.71
PCB151	µg/kg	12.5	2.26	18.1	10	12.5	1.69	0.89	10.9	- 14.1
PCB194	µg/kg	1.38	0.316	22.9	13	1.33	0.192	0.109	1.19	- 1.57

Method: Nitrogen - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
PN	%	0.303	0.0110	3.6	6	0.301	0.0050	0.0056	0.292	- 0.314



Consensus Values MS3

Method: Polycyclic aromatic hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Benzo[e]pyrene	µg/kg	285	40.5	14.2	26	288	19.9	9.9	268	-	301
Indeno[1,2,3-cd]pyrene	µg/kg	261	48.4	18.5	40	260	26.2	9.6	246	-	277
Phenanthrene	µg/kg	362	77.5	21.4	38	359	62.2	15.7	337	-	388
Pyrene	µg/kg	445	74.6	16.8	38	448	45.5	15.1	420	-	469
Benzo[g,h,i]perylene	µg/kg	239	45.9	19.2	41	242	25.7	9.0	224	-	253
Fluoranthene	µg/kg	564	84.3	15.0	40	568	52.2	16.7	537	-	591
Benzo[a]anthracene	µg/kg	254	57.5	22.6	37	254	37.2	11.8	235	-	273
Benzo[b]fluoranthene	µg/kg	412	76.0	18.5	29	408	42.4	17.6	383	-	441
Benzo[a]pyrene	µg/kg	212	30.9	14.5	40	217	20.2	6.1	203	-	222
Naphthalene	µg/kg	215	55.4	25.8	35	212	40.0	11.7	196	-	234
Dibenz[a,h]anthracene	µg/kg	60.8	17.79	29.3	38	63.5	12.36	3.61	55.0	-	66.6
Benzo[k]fluoranthene	µg/kg	177	30.4	17.2	33	177	21.0	6.6	166	-	187
Anthracene	µg/kg	127	31.8	25.1	41	129	22.4	6.2	117	-	137
Fluorene	µg/kg	55.1	11.65	21.2	38	55.6	7.50	2.36	51.2	-	58.9
Acenaphthene	µg/kg	34.0	8.57	25.2	38	34.1	4.40	1.74	31.2	-	36.9
Dibenzothiophene	µg/kg	47.7	7.51	15.7	19	46.3	5.34	2.15	44.1	-	51.3
Perylene	µg/kg	188	36.2	19.3	20	189	21.5	10.1	171	-	205
Chrysene	µg/kg	290	71.7	24.7	28	276	47.9	16.9	262	-	318
Benzo[fluoranthenes (b+j)	µg/kg	575	59.7	10.4	11	600	56.6	22.5	536	-	615

Method: Carbon - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
TOC	%	3.17	0.294	9.3	21	3.17	0.176	0.080	3.03	-	3.30



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	349	73.1	20.9	14	338	59.5	24.4	307	-	391
Acenaphthylene	µg/kg	30.0	16.25	54.2	34	32.9	9.42	3.48	24.3	-	35.6
Benzo[a]fluorene	µg/kg	-	-	-	4	87.6	27.4	-	-	-	-
3-6-dimethylphenanthrene	µg/kg	57.5	15.05	26.2	9	60.0	10.90	6.27	46.2	-	68.9
2-methylphenanthrene	µg/kg	154	27.5	17.9	11	161	12.0	10.4	136	-	172
1-methylpyrene	µg/kg	-	-	-	5	43.6	8.5	-	-	-	-
Triphenylene	µg/kg	94.2	20.32	21.6	10	94.5	7.41	8.03	79.9	-	109
Benzo[fluoranthenes (a+b+j+k)	µg/kg	-	-	-	5	687	107.5	-	-	-	-
C1-phenanthr.+anthrac.	µg/kg	454	157.3	34.6	14	441	107.1	52.5	364	-	544
C2-phenanthr.+anthrac.	µg/kg	647	278.5	43.1	13	645	195.5	96.6	480	-	814
C3-phenanthr.+anthrac.	µg/kg	489	150.1	30.7	10	507	72.4	59.3	384	-	595
C1-pyrenes+fluoranthenes	µg/kg	416	248.8	59.8	10	405	151.8	98.3	241	-	591
C2-pyrenes+fluoranthenes	µg/kg	343	151.9	44.3	6	330	83.7	77.5	191	-	495
C1-chrysenes	µg/kg	361	108.0	30.0	9	373	76.6	45.0	279	-	442
C2-chrysenes	µg/kg	256	172.1	67.2	7	259	96.6	81.3	102	-	410
C1-benzo[fluoranthenes	µg/kg	-	-	-	4	350	62.3	-	-	-	-
C1-naphthalenes	µg/kg	315	102.7	32.6	10	306	65.6	40.6	243	-	388
C2-naphthalenes	µg/kg	438	181.3	41.4	13	365	174.4	62.9	329	-	546
C3-naphthalenes	µg/kg	387	184.0	47.5	13	410	99.7	63.8	277	-	498
C1-phenanthrenes	µg/kg	-	-	-	4	284	24.1	-	-	-	-
C1-dibenzothiophenes	µg/kg	124	35.9	28.9	9	123	17.2	15.0	97.1	-	151
C2-dibenzothiophenes	µg/kg	396	171.7	43.3	9	333	95.7	71.6	267	-	526
C3-dibenzothiophenes	µg/kg	402	217.6	54.1	7	398	118.8	102.8	208	-	597
1-methylphenanthrene	µg/kg	100	29.7	29.7	7	94.1	16.2	14.0	73.6	-	127
1-methylnaphthalene	µg/kg	99.3	32.55	32.8	12	103.3	20.85	11.74	78.8	-	120
2-methylnaphthalene	µg/kg	151	46.1	30.6	12	158	28.9	16.7	122	-	180

Method: Total petroleum hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Total petroleum hydrocarbons	mg/kg	484	46.4	9.6	7	479	25.0	21.9	443	-	526

Method: Nitrogen - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
PN	%	0.302	0.0302	10.0	8	0.301	0.0150	0.0133	0.277	-	0.327



Indicative Values MS6

Method: Organometals - MS6

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Tributyltin (TBT)	µg Sn/kg	11.9	5.06	42.4	35	13.0	2.82	1.07	10.2	-	13.7
Dibutyltin (DBT)	µg Sn/kg	7.05	2.205	31.3	31	7.47	1.260	0.495	6.24	-	7.85
Monobutyltin (MBT)	µg Sn/kg	33.7	20.83	61.9	27	37.0	15.91	5.01	25.4	-	41.9
Diphenyltin (DPHT)	µg Sn/kg	-	-	-	4	0.238	0.1	-	-	-	-
Monophenyltin (MPHT)	µg Sn/kg	-	-	-	4	1.32	1.1	-	-	-	-



Consensus Values MS7

Method: Brominated Flame Retardants - MS7

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
BDE028	µg/kg	0.262	0.0733	28.0	32	0.264	0.0453	0.0162	0.236	-	0.288
BDE047	µg/kg	1.45	0.366	25.2	34	1.44	0.204	0.078	1.32	-	1.58
BDE099	µg/kg	1.18	0.298	25.2	34	1.19	0.162	0.064	1.08	-	1.28
BDE100	µg/kg	0.317	0.0773	24.4	34	0.326	0.0400	0.0166	0.290	-	0.344
BDE209	µg/kg	60.2	11.17	18.6	29	59.6	6.50	2.59	56.0	-	64.5



Indicative Values MS7

Method: Brominated Flame Retardants - MS7

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
BDE153	µg/kg	0.281	0.0962	34.3	33	0.312	0.0450	0.0209	0.246	-	0.315
BDE154	µg/kg	0.168	0.0624	37.1	31	0.169	0.0310	0.0140	0.145	-	0.191
BDE183	µg/kg	0.225	0.0856	38.1	26	0.244	0.0460	0.0210	0.190	-	0.259
total HBCD	µg/kg	61.1	6.91	11.3	6	58.8	5.20	3.53	54.2	-	68.0
TBBP-A	µg/kg	-	-	-	4	3.00	2.4	-	-	-	-
a-HBCD	µg/kg	11.7	1.48	12.7	6	11.9	0.85	0.75	10.2	-	13.2
b-HBCD	µg/kg	4.06	0.651	16.1	6	4.00	0.461	0.332	3.40	-	4.71
g-HBCD	µg/kg	-	-	-	5	44.8	5.1	-	-	-	-
BDE66	µg/kg	0.0586	0.0233	39.8	20	0.0655	0.0140	0.0065	0.0478	-	0.0695
BDE85	µg/kg	0.0549	0.0252	46.0	21	0.0607	0.0152	0.0069	0.0435	-	0.0664



Consensus Values MS8

Method: Perfluorinated alkyl substances - MS8

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
PFOA	µg/kg	0.432	0.0731	16.9	18	0.435	0.0465	0.0215	0.396	- 0.468
PFDA	µg/kg	0.178	0.0267	15.0	16	0.178	0.0148	0.0083	0.164	- 0.192
PFUnDA	µg/kg	0.195	0.0278	14.3	15	0.191	0.0087	0.0090	0.180	- 0.210



Indicative Values MS8

Method: Perfluorinated alkyl substances - MS8

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
n-PFOS	µg/kg	1.81	0.706	39.1	15	1.80	0.306	0.228	1.42	-	2.19
PFOSA	µg/kg	0.139	0.0397	28.5	14	0.142	0.0214	0.0133	0.117	-	0.162
PFBA	µg/kg	0.0827	0.0325	39.3	9	0.0840	0.0201	0.0135	0.0582	-	0.107
PFPeA	µg/kg	-	-	-	5	0.100	0.0	-	-	-	-
PFHxA	µg/kg	0.121	0.0260	21.6	16	0.122	0.0151	0.0081	0.107	-	0.135
PFHpA	µg/kg	0.0415	0.0097	23.3	6	0.0415	0.0081	0.0049	0.0318	-	0.0511
PFNA	µg/kg	0.0495	0.0222	44.8	7	0.0570	0.0136	0.0105	0.0297	-	0.0694
PFDoA	µg/kg	0.199	0.0492	24.7	15	0.203	0.0266	0.0159	0.172	-	0.226
PFTTrDA	µg/kg	0.100	0.0307	30.7	14	0.112	0.0101	0.0103	0.0825	-	0.118
PFTeDA	µg/kg	0.0812	0.0151	18.6	9	0.0802	0.0058	0.0063	0.0698	-	0.0925
n-PFBS	µg/kg	0.0746	0.0308	41.3	13	0.0730	0.0183	0.0107	0.0561	-	0.0930
n-PFHxS	µg/kg	0.0536	0.0212	39.5	7	0.0561	0.0125	0.0100	0.0346	-	0.0725
total-PFOS	µg/kg	2.30	0.591	25.7	18	2.36	0.382	0.174	2.00	-	2.59
NMeFOSAA	µg/kg	0.401	0.1135	28.3	13	0.419	0.0853	0.0394	0.333	-	0.469
NEtFOSAA	µg/kg	1.05	0.354	33.8	13	1.12	0.258	0.123	0.835	-	1.26