



QUASIMEME

Quality assurance of information
for marine environmental monitoring

Certificate of Analysis



Sediment

REFERENCE MATERIAL

Sediment sample 1



Certificate of Analysis Sediment 1

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 1 of Open Sea 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
2018.1	MS1	QTM122MS
2016.1	MS1	QTM114MS
2015.1	MS1	QTM110MS
2014.1	MS1	QTM106MS



Consensus Values MS1

Method: Real totals - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Aluminium-RT	%	6.13	0.752	12.3	68	6.05	0.520	0.114	5.94	- 6.31
Arsenic-RT	mg/kg	14.4	1.50	10.4	67	14.4	1.00	0.23	14.05	- 14.79
Barium-RT	mg/kg	426	27.4	6.4	29	423	19.0	6.4	415	- 436
Cadmium-RT	µg/kg	1120	102	9.1	66	1120	70	16	1093	- 1143
Calcium-RT	g/kg	22.5	0.79	3.5	12	22.6	0.57	0.28	22.0	- 23.0
Chromium-RT	mg/kg	151	10.3	6.9	69	150	6.8	1.6	148.1	- 153.0
Cobalt-RT	mg/kg	17.4	0.91	5.3	25	17.3	0.61	0.23	16.98	- 17.73
Copper-RT	mg/kg	66.4	4.51	6.8	71	66.1	3.12	0.67	65.4	- 67.5
Iron-RT	%	4.00	0.242	6.1	72	4.01	0.170	0.036	3.94	- 4.05
Lead-RT	mg/kg	131	12.8	9.8	71	131	9.0	1.9	127.7	- 133.8
Lithium-RT	mg/kg	49.5	4.97	10.0	62	49.4	3.43	0.79	48.2	- 50.7
Magnesium-RT	mg/kg	9650	1261	13.1	16	9730	873	394	8990	- 10320
Manganese-RT	mg/kg	496	29.0	5.9	66	494	20.1	4.5	489	- 503
Mercury-RT	µg/kg	1100	106	9.7	55	1100	74	18	1070	- 1127
Nickel-RT	mg/kg	71.7	5.54	7.7	71	71.4	3.85	0.82	70.3	- 73.0
Phosphorus-RT	mg/kg	1170	32	2.8	18	1170	23	10	1158	- 1190
Potassium-RT	mg/kg	14000	970	6.9	15	14100	630	310	13510	- 14570
Scandium-RT	mg/kg	11.1	1.45	13.1	13	10.9	0.96	0.50	10.3	- 12.0
Sodium-RT	mg/kg	14900	1120	7.5	14	14700	800	370	14250	- 15540
Strontium-RT	mg/kg	212	20.0	9.4	19	211	14.0	5.7	203	- 222
Titanium-RT	mg/kg	4760	215	4.5	12	4740	147	78	4626	- 4897
Vanadium-RT	mg/kg	109	7.4	6.8	28	108	5.0	1.8	106.2	- 112.0
Zinc-RT	mg/kg	236	16.7	7.1	72	236	11.1	2.5	231.9	- 239.8

Method: Acid extractable (So-called totals) - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Arsenic-AE	mg/kg	13.5	1.76	13.0	77	13.5	1.20	0.25	13.1	- 13.9
Barium-AE	mg/kg	197	37.9	19.2	25	195	26.3	9.5	182	- 213
Cadmium-AE	µg/kg	1110	101	9.1	80	1110	70	14	1092	- 1137
Calcium-AE	g/kg	21.0	0.82	3.9	10	20.9	0.55	0.33	20.4	- 21.6
Chromium-AE	mg/kg	107	19.3	17.9	76	108	13.1	2.8	103	- 112
Cobalt-AE	mg/kg	13.8	1.19	8.6	31	13.9	0.80	0.27	13.3	- 14.2
Copper-AE	mg/kg	62.4	3.54	5.7	82	62.4	2.40	0.49	61.6	- 63.1
Iron-AE	%	3.55	0.248	7.0	65	3.53	0.170	0.038	3.49	- 3.62
Lead-AE	mg/kg	120	9.7	8.1	80	119	6.6	1.4	118.2	- 122.5
Lithium-AE	mg/kg	36.9	7.10	19.2	39	38.0	4.90	1.42	34.6	- 39.2



Consensus Values MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Magnesium-AE	mg/kg	9200	631	6.9	20	9260	450	176	8911	- 9499
Method: Acid extractable (So-called totals) - MS1										
(cont.)										
Manganese-AE	mg/kg	434	30.0	6.9	69	434	19.8	4.5	426	- 441
Mercury-AE	µg/kg	1090	112	10.2	84	1090	77	15	1071	- 1119
Molybdenum-AE	mg/kg	1.92	0.346	18.0	13	1.96	0.239	0.120	1.71	- 2.13
Nickel-AE	mg/kg	58.6	7.73	13.2	78	58.6	5.30	1.09	56.8	- 60.3
Phosphorus-AE	mg/kg	1110	89	8.0	15	1110	60	29	1058	- 1156
Strontium-AE	mg/kg	135	11.8	8.8	16	133	7.5	3.7	128	- 141
Uranium-AE	mg/kg	1.98	0.165	8.3	12	2.00	0.122	0.059	1.87	- 2.08
Vanadium-AE	mg/kg	68.6	13.22	19.3	38	68.2	9.19	2.68	64.2	- 72.9
Zinc-AE	mg/kg	223	11.5	5.2	79	222	7.8	1.6	220.1	- 225.2

Method: Carbon - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
TOC	%	5.24	0.446	8.5	52	5.20	0.312	0.077	5.11	- 5.36



Indicative Values MS1

Method: Real totals - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Cerium-RT	mg/kg	160	10.9	6.8	5	158	7.0	6.1	148	-	173
Cesium-RT	µg/kg	3690	571	15.5	6	3650	421	292	3120	-	4260
Molybdenum-RT	mg/kg	2.29	0.337	14.7	8	2.43	0.259	0.149	2.01	-	2.56
Rubidium-RT	mg/kg	54.0	15.68	29.0	7	51.0	10.65	7.41	40.0	-	68.1
Selenium-RT	mg/kg	1.16	0.476	41.1	5	1.05	0.350	0.266	0.611	-	1.71
Sulfur-RT	mg/kg	5480	171	3.1	7	5490	120	81	5328	-	5634
Thallium-RT	µg/kg	565	60.5	10.7	7	555	42.4	28.6	511	-	620
Uranium-RT	mg/kg	3.16	0.323	10.2	6	3.16	0.203	0.165	2.84	-	3.48

Method: Acid extractable (So-called totals) - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Aluminium-AE	%	2.92	1.362	46.6	53	2.92	0.925	0.234	2.55	-	3.30
Cesium-AE	µg/kg	2450	553	22.5	4	2480	357	346	1690	-	3220
Gallium-AE	µg/kg	11800	3280	27.9	9	10800	1990	1370	9280	-	14220
Potassium-AE	mg/kg	4200	1404	33.4	9	4330	963	585	3140	-	5260
Rubidium-AE	mg/kg	35.4	9.33	26.3	4	34.7	5.96	5.83	22.5	-	48.4
Scandium-AE	mg/kg	8.64	0.666	7.7	5	8.71	0.520	0.372	7.87	-	9.40
Selenium-AE	mg/kg	0.939	0.2864	30.5	12	0.986	0.2005	0.1033	0.759	-	1.12
Sodium-AE	mg/kg	9180	451	4.9	9	9310	320	188	8837	-	9517
Sulfur-AE	mg/kg	5610	148	2.6	7	5620	113	70	5479	-	5743
Thallium-AE	µg/kg	311	88.0	28.2	14	315	59.7	29.4	261	-	362
Titanium-AE	mg/kg	749	120.0	16.0	9	773	81.4	50.0	659	-	840

Method: Carbon - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Inorganic-Carbonate	%	0.607	0.1565	25.8	26	0.620	0.1100	0.0384	0.544	-	0.670