WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Sediment Exchange for Tests on Organic Contaminants

REFERENCE MATERIAL

SETOC sample 776

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis SETOC 776

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, the 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 8 results and a maximum relative uncertainty of 6.25%. Indicative Values are based on a maximum relative uncertainty of 35% and a minimum of 4 and maximum of 7 results, or a relative uncertainty greater than 6.25% when there are at least 8 results.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation), the uncertainty of the mean (consensus or indicative) value and the relative uncertainty.

All values, expressed on a weight basis (kg or %), are reported as oven-dried (105°C) material. Moisture is reported in the material as received.

Sample information

WEPAL reference materials are from natural sources only. There is no spiking, mixing or other alterations of the samples. For sample preparation, the SETOC samples are dried at 40°C and milled to pass a 0.5 mm sieve.

This SETOC sample 776 of Marine Sediment, from Italy, is prepared for the WEPAL proficiency programs. The sample has been used in 9 periods (or rounds). Only results from the last 5 periods are used. This way, the consensus values reflect the latest 'state of the art' analytical techniques used by the laboratories. The results on which the values in this report are based were taken from the periods given in the following table:

Year	Round	Number
2024	4	4
2024	1	3
2023	1	3
2020	1	1
2015	1	4

Consensus Values SETOC 776

Method: Polycyclic aromatic hydrocarbons

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
naphthalene	µg/kg	1910	790	41.4	141	1983	566	83.2	4.36
acenaphthylene	µg/kg	849	424	49.9	124	833	264	47.6	5.60
acenaphthene	µg/kg	2757	1008	36.6	130	2825	641	111	4.01
fluorene	µg/kg	3606	1368	37.9	129	3661	911	151	4.18
phenanthrene	µg/kg	20934	3563	17.0	145	21109	2209	370	1.77
anthracene	µg/kg	632	381	60.2	146	633	228	39.4	6.23
fluoranthene	µg/kg	7395	894	12.1	147	7420	570	92.2	1.25
pyrene	µg/kg	4720	687	14.6	129	4690	470	75.6	1.60
chrysene	µg/kg	2365	430	18.2	146	2347	295	44.5	1.88
benz(a)anthracene	µg/kg	1642	319	19.4	147	1639	216	32.9	2.01
benzo(b)fluoranthene	µg/kg	2908	596	20.5	122	2910	396	67.5	2.32
benzo(k)fluoranthene	µg/kg	1247	195	15.6	144	1253	121	20.3	1.63
benzo(a)pyrene	µg/kg	1052	197	18.7	147	1058	142	20.3	1.93
dibenz(ah)anthracene	µg/kg	439	98.0	22.3	129	432	58.0	10.8	2.46
indeno(1,2,3-cd)pyrene	µg/kg	1626	294	18.1	146	1627	189	30.4	1.87
benzo(ghi)perylene	µg/kg	1589	254	16.0	145	1602	178	26.3	1.66
EPA ∑PAH(16)	µg/kg	54398	7547	13.9	65	53660	5560	1170	2.15

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
PCB 028	µg/kg	9.76	2.55	26.1	104	9.92	1.43	0.313	3.20
PCB 052	µg/kg	16.3	3.75	22.9	117	16.7	2.28	0.433	2.65
PCB 101	µg/kg	20.3	3.92	19.3	120	20.0	2.29	0.448	2.21
PCB 105	µg/kg	7.36	0.525	7.1	27	7.30	0.290	0.126	1.72
PCB 118	µg/kg	19.4	3.04	15.7	116	19.5	1.70	0.353	1.82
PCB 128	µg/kg	4.38	0.599	13.7	18	4.40	0.359	0.176	4.02
PCB 138	µg/kg	22.1	4.77	21.6	121	22.0	3.00	0.542	2.45
PCB 149	µg/kg	17.3	2.13	12.3	9	17.3	1.40	0.887	5.13
PCB 153	µg/kg	25.1	3.78	15.1	121	24.9	2.10	0.429	1.71
PCB 156	µg/kg	2.67	0.316	11.8	22	2.67	0.166	0.084	3.16
PCB 180	µg/kg	23.2	4.27	18.4	121	23.2	2.51	0.486	2.09
PCB 077	µg/kg	1.99	0.369	18.5	17	2.02	0.230	0.112	5.62
PCB 167	µg/kg	1.31	0.215	16.4	18	1.31	0.085	0.063	4.84
PCB 189	µg/kg	0.758	0.078	10.3	10	0.785	0.033	0.031	4.06
∑PCB(7)	µg/kg	134	13.5	10.1	44	134	8.00	2.55	1.90

Consensus Values SETOC 776

Method: Organochlorine pesticides

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
hexachlorobutadiene	µg/kg	7.79	1.67	21.4	24	7.97	1.06	0.425	5.46
hexachlorobenzene	µg/kg	34.1	6.77	19.9	41	34.1	4.17	1.32	3.88

Method: Other parameters

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Mineral oil, GC	mg/kg	857	204	23.8	125	855	154	22.8	2.66
EOX	mg/kg	2.28	0.531	23.3	23	2.29	0.314	0.138	6.08
Organic carbon	g/kg	25.4	3.35	13.2	65	26.0	1.96	0.520	2.05
Inorganic carbon	g/kg	43.9	6.21	14.2	12	43.5	3.55	2.24	5.11
CN - Total	mg/kg	3.28	0.573	17.5	43	3.27	0.302	0.109	3.34

Method: Metals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	45.8	4.47	9.8	65	45.9	3.10	0.693	1.51
Cd	mg/kg	13.0	1.40	10.8	65	12.8	1.01	0.218	1.67
Cr	mg/kg	43.9	8.25	18.8	67	44.0	5.70	1.26	2.87
Cu	mg/kg	221	21.1	9.6	68	220	11.5	3.20	1.45
Hg	mg/kg	4.56	0.393	8.6	68	4.51	0.220	0.060	1.31
Ni	mg/kg	28.7	4.20	14.6	68	29.3	3.04	0.636	2.22
Pb	mg/kg	230	28.4	12.4	68	231	19.5	4.31	1.87
Zn	mg/kg	1653	121	7.3	68	1642	77.1	18.3	1.11
Ba	mg/kg	103	15.0	14.5	46	106	8.70	2.76	2.67
Co	mg/kg	16.4	2.39	14.6	51	16.5	1.70	0.419	2.55
Mo	mg/kg	1.86	0.306	16.5	37	1.86	0.210	0.063	3.39

Method: Dibenzo-P Dioxin

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
2,3,7,8 Cl4DD	ng/kg	9.63	1.77	18.4	15	9.80	1.20	0.571	5.92
1,2,3,7,8 Cl5DD	ng/kg	32.3	3.00	9.3	14	32.1	1.50	1.00	3.11
1,2,3,4,7,8 Cl6DD	ng/kg	53.4	6.57	12.3	14	52.9	3.91	2.19	4.10
1,2,3,6,7,8 Cl6DD	ng/kg	60.3	8.99	14.9	14	60.4	5.57	3.00	4.98
1,2,3,4,6,7,8 Cl7DD	ng/kg	783	146	18.7	15	779	79.0	47.2	6.03
Cl8DD	ng/kg	3552	459	12.9	15	3592	299	148	4.17

Consensus Values SETOC 776

Method: Dibenzofuran

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
1,2,3,7,8 Cl5DF	ng/kg	359	55.5	15.5	15	354	33.0	17.9	5.00
1,2,3,6,7,8 Cl6DF	ng/kg	857	125	14.6	15	878	71.4	40.4	4.71
1,2,3,4,6,7,8 Cl7DF	ng/kg	8587	780	9.1	15	8490	558	252	2.93
1,2,3,4,7,8,9 Cl7DF	ng/kg	1616	281	17.4	15	1661	161	90.6	5.60
Cl8DF	ng/kg	25359	3696	14.6	15	25481	1836	1193	4.70

Method: Experimental

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
DEHP	µg/kg	2841	267	9.4	8	2897	172	118	4.16

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
PCB 031	µg/kg	7.27	1.43	19.7	10	7.45	1.06	0.566	7.79
PCB 081	µg/kg	0.066	0.012	18.8	6	0.069	0.008	0.006	9.58
PCB 114	µg/kg	0.347	0.057	16.4	8	0.351	0.035	0.025	7.23
PCB 123	µg/kg	1.06	0.784	73.7	16	1.37	0.500	0.245	23.0
PCB 126	µg/kg	0.224	0.085	38.0	10	0.248	0.059	0.034	15.0
PCB 157	µg/kg	0.611	0.096	15.7	8	0.628	0.061	0.042	6.94
PCB 169	µg/kg	0.108	0.069	64.0	13	0.137	0.047	0.024	22.2

Method: Organochlorine pesticides

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
pentachlorobenzene	µg/kg	4.09	1.12	27.3	18	4.07	0.680	0.329	8.05
1,2,3,4 tetrachlorobenzene	µg/kg	0.624	0.272	43.5	4	0.608	0.132	0.170	27.2
1,2,4 trichlorobenzene	µg/kg	6.34	1.83	28.8	18	6.36	1.07	0.538	8.49
1,3,5 trichlorobenzene	µg/kg	14.6	4.07	27.8	18	14.6	2.56	1.20	8.19
1,2,4,5 tetrachlorobenzene	µg/kg	12.3	3.90	31.8	4	11.8	2.01	2.44	19.9
p,p`-DDT	µg/kg	1.69	0.717	42.5	22	1.87	0.411	0.191	11.3
p,p`-DDE	µg/kg	4.56	1.55	33.9	25	4.57	0.777	0.386	8.47
p,p`-DDD	µg/kg	4.59	1.67	36.4	22	4.74	0.784	0.445	9.70
o,p`-DDD	µg/kg	1.39	0.881	63.3	16	1.92	0.422	0.275	19.8

Method: Other parameters

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Mineral oil, IR	mg/kg	904	126	13.9	4	912	61.3	78.7	8.71
Particles < 2 µm	%	26.5	21.5	81.1	9	23.1	11.4	8.97	33.8
Particles < 63 µm	%	72.8	22.6	31.0	13	79.3	13.4	7.82	10.7
Particles > 63 µm	%	11.4	9.62	84.2	9	12.9	5.70	4.01	35.1
CN - Free	mg/kg	0.603	0.125	20.8	6	0.629	0.000	0.064	10.6

Method: Metals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Sb	mg/kg	1.87	0.671	35.9	6	2.03	0.302	0.343	18.3
Sn	mg/kg	13.7	2.62	19.1	7	14.2	1.73	1.24	9.03
V	mg/kg	42.6	5.76	13.5	7	44.2	2.75	2.72	6.39

Indicative Values SETOC 776

Method: Dibenzo-P Dioxin

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
1,2,3,7,8,9 Cl6DD	ng/kg	50.5	18.3	36.2	15	49.5	10.5	5.89	11.7

Method: Dibenzofuran

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
2,3,7,8 Cl4DF	ng/kg	198	46.4	23.4	15	209	31.5	15.0	7.55
2,3,4,7,8 Cl5DF	ng/kg	290	86.4	29.8	15	290	40.0	27.9	9.61
1,2,3,4,7,8 Cl6DF	ng/kg	1950	440	22.6	15	1871	259	142	7.28
1,2,3,7,8,9 Cl6DF	ng/kg	546	118	21.6	15	530	71.0	38.1	6.98
2,3,4,6,7,8 Cl6DF	ng/kg	553	180	32.5	15	583	120	58.0	10.5

Method: Experimental

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Tributyl Tin (TBT)	µg/kg	57.4	29.9	52.0	15	60.3	17.9	9.64	16.8