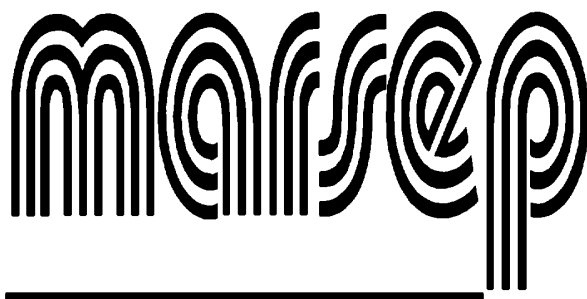




**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 282

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.

Please note: Most WEPAL-QUASIMEME reference materials are found to be stable over the long term (>10 years) for most determinand/matrix combinations. There are a few exceptions known to us as being less stable over the long term. These are organotins in sediment (MS6), ASP in shellfish (BT7), some PAHs and PCBs in sediment (SETOC) and N-NH₄ (as N) in clay soils (ISE).

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 MARSEP samples are dried at 40°C and milled to pass a 0.5 mm sieve.

This MARSEP sample 282 of Sewage sludge, from Switzerland, is prepared for the WEPAL proficiency programs. The sample has been used in 4 periods (or rounds). The results on which the values in this report are based were taken from the periods given in the following table:

Year	Round	Number
2026	1	2
2022	2	4
2021	2	3
2020	1	1

Consensus Values MARSEP 282

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ag	µg/kg	3545	524	14.8	14	3618	287	175	4.94
Al	g/kg	5.16	0.707	13.7	52	5.23	0.487	0.123	2.38
As	mg/kg	6.17	0.623	10.1	57	6.15	0.400	0.103	1.67
B	mg/kg	50.6	8.57	16.9	43	50.1	6.34	1.63	3.23
Ba	mg/kg	309	27.8	9.0	29	308	22.6	6.46	2.09
Be	µg/kg	121	24.2	19.9	19	120	12.1	6.93	5.71
Ca	g/kg	46.7	2.69	5.8	101	46.6	1.70	0.335	0.716
Cd	mg/kg	0.601	0.069	11.5	102	0.605	0.044	0.009	1.42
Co	mg/kg	3.84	0.397	10.3	86	3.81	0.275	0.053	1.39
Cr	mg/kg	36.7	3.77	10.3	103	36.6	2.28	0.465	1.27
Cu	mg/kg	325	20.4	6.3	111	325	13.0	2.42	0.744
Fe	g/kg	32.5	2.61	8.0	80	32.7	1.64	0.365	1.12
Hg	µg/kg	370	45.6	12.3	88	370	29.5	6.08	1.64
K	g/kg	2.35	0.298	12.7	115	2.36	0.210	0.035	1.48
Li	mg/kg	3.29	0.508	15.4	11	3.25	0.220	0.191	5.82
Mg	g/kg	9.97	0.613	6.1	109	9.98	0.420	0.073	0.736
Mn	mg/kg	428	28.2	6.6	78	426	17.8	3.99	0.932
Mo	mg/kg	6.69	0.631	9.4	85	6.71	0.411	0.086	1.28
Na	g/kg	0.731	0.107	14.6	62	0.729	0.064	0.017	2.31
Ni	mg/kg	34.2	3.03	8.9	105	34.2	1.88	0.370	1.08
N	g/kg	56.4	2.16	3.8	106	56.4	1.30	0.262	0.464
P	g/kg	36.9	2.37	6.4	119	36.7	1.50	0.271	0.735
Pb	mg/kg	25.7	2.67	10.4	106	26.0	1.66	0.325	1.26
Sb	µg/kg	1979	278	14.0	23	2002	168	72.4	3.66
Se	µg/kg	2098	290	13.8	25	2169	199	72.4	3.45
Sn	mg/kg	22.1	2.20	10.0	21	22.2	1.60	0.600	2.72
Sr	mg/kg	177	10.3	5.8	20	178	5.88	2.88	1.63
V	mg/kg	9.05	1.60	17.6	40	8.89	1.05	0.315	3.49
Zn	mg/kg	648	46.2	7.1	113	642	34.8	5.43	0.838
S	mg/kg	10248	1326	12.9	53	10195	837	228	2.22
TC =totalC (org+inorg)	g/kg	351	20.8	5.9	28	353	14.3	4.91	1.40
U	mg/kg	2.21	0.150	6.8	11	2.20	0.080	0.057	2.57

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	211	6.35	3.0	19	210	4.00	1.82	0.862
loss-on-ignition	%	66.8	0.624	0.9	77	66.8	0.400	0.089	0.133

Consensus Values MARSEP 282

Method: Other determinations									(cont.)
Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
residue-on-ignition	%	33.4	0.512	1.5	12	33.4	0.310	0.185	0.552
dry weight	%	89.9	0.809	0.9	41	90.0	0.450	0.158	0.176

Indicative Values MARSEP 282

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Bi	µg/kg	9417	432	4.6	4	9416	335	270	2.87
N - NH4 (as N)	mg/kg	3430	4507	131.4	8	3509	3062	1992	58.1
S - SO4 (as S)	mg/kg	10949	621	5.7	5	10731	319	347	3.17
Ti	mg/kg	59.7	53.3	89.3	12	59.6	30.5	19.2	32.2
Tl	µg/kg	65.6	12.7	19.3	12	67.6	5.79	4.58	6.98
TOC =total org.C	g/kg	330	45.8	13.9	7	334	25.8	21.6	6.57
OC = org.C	g/kg	369	53.1	14.4	5	356	32.1	29.7	8.04