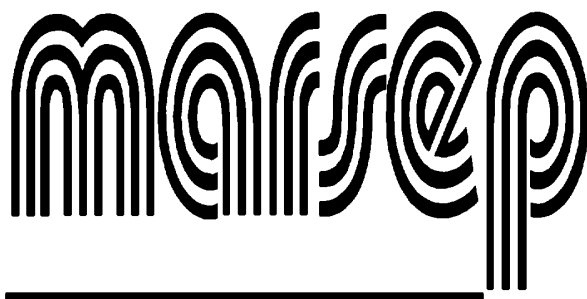




**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 289

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

This MARSEP sample 289 of Sewage sludge, from Switzerland, is prepared for the WEPAL proficiency programs. The sample has been used in 1 period (or round). The results on which the values in this report are based were taken from the period given in the following table:

Year	Round	Number
2023	2	2

Consensus Values MARSEP 289

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ca	g/kg	45.9	2.12	4.6	20	46.1	1.25	0.592	1.29
Cd	mg/kg	0.777	0.093	11.9	20	0.790	0.063	0.026	3.33
Co	mg/kg	6.62	0.450	6.8	19	6.68	0.220	0.129	1.95
Cr	mg/kg	32.7	5.19	15.9	19	32.7	3.00	1.49	4.56
Cu	mg/kg	301	16.9	5.6	21	306	14.2	4.60	1.53
Fe	g/kg	89.3	9.00	10.1	16	88.0	5.79	2.81	3.15
Hg	µg/kg	487	61.4	12.6	18	481	37.8	18.1	3.72
K	g/kg	1.77	0.395	22.3	24	1.86	0.313	0.101	5.69
Mg	g/kg	3.38	0.281	8.3	22	3.37	0.178	0.075	2.22
Mn	mg/kg	477	33.3	7.0	16	473	20.4	10.4	2.18
Mo	mg/kg	5.34	0.706	13.2	18	5.31	0.390	0.208	3.89
Na	g/kg	0.854	0.107	12.6	16	0.831	0.056	0.034	3.93
Ni	mg/kg	22.4	2.95	13.2	20	22.1	1.45	0.825	3.68
N	g/kg	39.3	1.81	4.6	19	39.2	0.952	0.520	1.32
P	g/kg	32.3	1.82	5.6	23	32.4	1.06	0.474	1.47
Pb	mg/kg	36.0	2.82	7.8	20	36.4	1.76	0.789	2.19
V	mg/kg	13.9	1.33	9.6	8	14.1	0.800	0.590	4.25
Zn	mg/kg	728	45.7	6.3	21	733	32.0	12.5	1.71
S	mg/kg	10753	1443	13.4	11	10440	926	544	5.06

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
loss-on-ignition	%	56.2	1.01	1.8	15	56.1	0.690	0.325	0.578
dry weight	%	91.7	0.922	1.0	11	91.9	0.480	0.348	0.379

Indicative Values MARSEP 289

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	5.37	1.02	19.0	13	5.40	0.598	0.354	6.59
As	mg/kg	3.19	0.873	27.3	12	3.30	0.491	0.315	9.86
B	mg/kg	13.7	5.42	39.6	6	14.6	2.87	2.77	20.2
Ba	mg/kg	324	29.8	9.2	6	328	14.8	15.2	4.69
Be	µg/kg	152	71.0	46.8	4	145	36.5	44.4	29.2
Sb	µg/kg	1904	239	12.6	5	1890	188	134	7.02
Se	µg/kg	1525	196	12.9	6	1581	121	100	6.58
Sn	mg/kg	35.8	5.08	14.2	5	35.3	3.70	2.84	7.92
Sr	mg/kg	236	22.3	9.4	4	235	14.8	13.9	5.90
TC =totalC (org+inorg)	g/kg	316	9.43	3.0	6	317	6.12	4.81	1.52
U	mg/kg	1.25	0.019	1.5	4	1.25	0.010	0.012	0.951