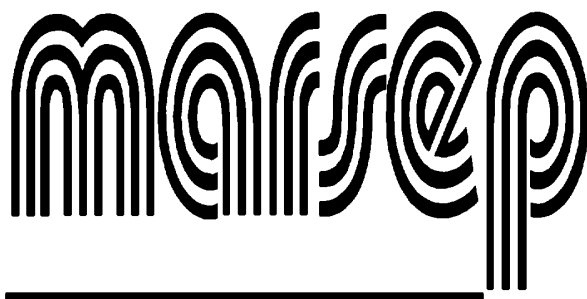




**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 291

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 291 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	3	2

Consensus Values MARSEP 291

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	4.86	0.639	13.1	10	4.82	0.265	0.253	5.20
Ca	g/kg	67.9	5.63	8.3	24	68.5	3.56	1.44	2.12
Cd	mg/kg	0.787	0.122	15.5	21	0.806	0.066	0.033	4.22
Cr	mg/kg	73.7	9.98	13.5	22	73.7	6.74	2.66	3.61
Cu	mg/kg	323	22.6	7.0	25	324	14.7	5.65	1.75
Fe	g/kg	79.7	4.80	6.0	18	79.7	2.82	1.42	1.78
Hg	µg/kg	572	98.0	17.1	21	583	44.9	26.7	4.67
Mg	g/kg	3.42	0.346	10.1	25	3.44	0.260	0.086	2.53
Mn	mg/kg	521	35.9	6.9	18	513	29.0	10.6	2.03
Mo	mg/kg	6.15	0.652	10.6	17	6.17	0.290	0.198	3.22
Ni	mg/kg	45.6	3.91	8.6	22	45.5	2.37	1.04	2.28
N	g/kg	31.3	1.52	4.9	27	31.4	0.960	0.367	1.17
P	g/kg	28.0	2.30	8.2	27	27.8	1.58	0.553	1.97
Pb	mg/kg	66.7	5.94	8.9	21	66.4	3.92	1.62	2.43
Zn	mg/kg	858	65.1	7.6	24	853	45.8	16.6	1.94
TC =totalC (org+inorg)	g/kg	275	10.6	3.9	12	277	6.65	3.83	1.39

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
loss-on-ignition	%	49.2	0.725	1.5	22	49.3	0.375	0.193	0.393
dry weight	%	93.9	0.937	1.0	13	93.9	0.470	0.325	0.346

Indicative Values MARSEP 291

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	8.30	1.63	19.6	11	8.07	0.975	0.613	7.38
B	mg/kg	17.2	4.71	27.4	10	17.1	2.32	1.86	10.8
Ba	mg/kg	476	67.8	14.3	5	487	45.3	37.9	7.97
Be	µg/kg	404	83.0	20.5	5	426	62.3	46.4	11.5
Co	mg/kg	11.5	2.64	23.0	19	11.6	1.35	0.757	6.60
K	g/kg	1.46	0.529	36.3	26	1.54	0.400	0.130	8.89
Na	g/kg	0.769	0.155	20.2	15	0.794	0.094	0.050	6.51
Sb	µg/kg	4441	887	20.0	4	4350	408	554	12.5
Se	µg/kg	1907	418	21.9	5	2038	250	234	12.3
Sn	mg/kg	26.4	0.764	2.9	5	26.5	0.260	0.427	1.62
Sr	mg/kg	269	17.7	6.6	4	271	8.20	11.1	4.11
V	mg/kg	21.6	5.17	24.0	7	20.2	4.11	2.44	11.3
S	mg/kg	7926	1416	17.9	11	7506	766	534	6.73
TOC =total org.C	g/kg	262	13.0	5.0	4	260	6.84	8.11	3.10

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	172	7.73	4.5	5	175	5.00	4.32	2.52