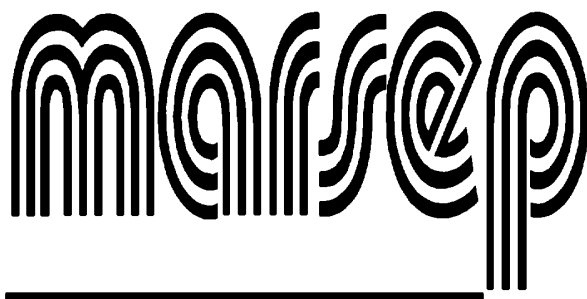




**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 286

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 286 of sewage sludge, from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been used in 3 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
2023	2	4
2021	4	2
2019	2	1

Consensus Values MARSEP 286

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ag	µg/kg	2774	250	9.0	9	2770	150	104	3.75
Al	g/kg	17.5	1.45	8.3	36	17.4	0.803	0.303	1.73
As	mg/kg	5.80	0.654	11.3	34	5.74	0.438	0.140	2.42
B	mg/kg	22.7	4.59	20.3	21	23.7	3.25	1.25	5.53
Ba	mg/kg	375	23.9	6.4	19	374	15.4	6.85	1.83
Be	µg/kg	222	17.0	7.7	11	220	10.0	6.39	2.89
Ca	g/kg	54.5	2.83	5.2	65	54.8	1.76	0.439	0.805
Cd	mg/kg	1.02	0.082	8.0	64	1.03	0.045	0.013	1.25
Co	mg/kg	5.33	0.438	8.2	59	5.35	0.290	0.071	1.34
Cr	mg/kg	50.3	5.57	11.1	64	50.6	3.15	0.870	1.73
Cu	mg/kg	344	23.8	6.9	69	343	16.0	3.58	1.04
Fe	g/kg	47.9	2.43	5.1	50	47.6	1.61	0.429	0.896
Hg	µg/kg	714	87.8	12.3	56	710	60.3	14.7	2.05
K	g/kg	2.65	0.568	21.5	71	2.62	0.400	0.084	3.19
Mg	g/kg	8.86	0.473	5.3	69	8.86	0.330	0.071	0.803
Mn	mg/kg	491	31.6	6.4	48	490	19.9	5.70	1.16
Mo	mg/kg	10.8	0.666	6.1	56	10.8	0.390	0.111	1.03
Na	g/kg	0.652	0.093	14.2	38	0.649	0.056	0.019	2.88
Ni	mg/kg	31.5	2.76	8.8	65	31.7	1.66	0.428	1.36
N	g/kg	37.9	1.40	3.7	61	38.0	0.920	0.225	0.593
P	g/kg	38.2	2.24	5.9	75	38.2	1.44	0.324	0.848
Pb	mg/kg	51.8	3.78	7.3	64	51.2	2.85	0.591	1.14
Sb	µg/kg	3163	325	10.3	15	3148	178	105	3.32
Se	µg/kg	2261	316	14.0	15	2268	188	102	4.51
Sn	mg/kg	24.3	2.52	10.4	14	24.5	1.77	0.842	3.47
Sr	mg/kg	231	15.8	6.8	8	231	5.77	6.97	3.02
V	mg/kg	15.8	1.43	9.1	25	15.9	0.880	0.357	2.26
Zn	mg/kg	890	50.3	5.6	69	895	29.0	7.56	0.850
S	mg/kg	10211	933	9.1	32	10118	549	206	2.02
TC =totalC (org+inorg)	g/kg	281	9.91	3.5	16	281	3.50	3.10	1.10

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	191	11.2	5.9	12	191	6.50	4.04	2.12
loss-on-ignition	%	52.9	1.01	1.9	54	52.7	0.539	0.171	0.324
residu-on-ignition	%	46.9	0.806	1.7	12	47.0	0.545	0.291	0.621
dry weight	%	92.2	0.835	0.9	27	92.0	0.600	0.201	0.218

Indicative Values MARSEP 286

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Cl	mg/kg	1821	162	8.9	4	1864	86.5	101	5.55
Li	mg/kg	6.21	1.55	24.9	8	6.11	0.890	0.683	11.0
N - NH ₄ (as N)	mg/kg	2939	429	14.6	4	3060	229	268	9.13
S - SO ₄ (as S)	mg/kg	10533	1958	18.6	5	10271	1134	1094	10.4
Ti	mg/kg	486	212	43.7	6	531	98.1	108	22.3
Tl	µg/kg	157	31.7	20.2	9	163	28.3	13.2	8.43
U	mg/kg	1.65	0.130	7.8	6	1.64	0.055	0.066	4.01

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
COD	g/kg	596	110	18.4	4	629	58.2	68.5	11.5