

## Sewage sludges

Code	Product	Unit
<b>New</b> ERM-CC136	<b>Sewage sludge - Extractable and total metals</b> An aged sewage sludge collected from a disused sewage works site at Heathrow in London, UK. Dried, sterilised and ground to a powder. The extractable metal content refers to metals soluble in Aqua Regia using methods based on ISO11466 (1995). Assessed values Al..... 15100 mg/kg      Fe ..... 22200 mg/kg      Ni ..... 130 mg/kg Ba ..... 633 mg/kg      K ..... 2030 mg/kg      Pb ..... 341 mg/kg Co ..... 23.2 mg/kg      Mg ..... 2820 mg/kg      Zn ..... 890 mg/kg Cr ..... 399 mg/kg      Mn ..... 544 mg/kg Cu ..... 464 mg/kg      Na ..... 397 mg/kg	25 g
LGC6181	<b>Sewage sludge - Extractable metals</b> The extractable metal content refers to metals soluble in Aqua Regia using methods based on ISO11466 (1995). Certified values Ag ..... 55 mg/kg      Cr ..... 78 mg/kg      Ni ..... 45 mg/kg As ..... 7.8 mg/kg      Fe ..... 40300 mg/kg      Pb ..... 105 mg/kg Cd ..... 5.8 mg/kg      Hg ..... 4.9 mg/kg      V ..... 20 mg/kg Cu ..... 354 mg/kg      Mn ..... 454 mg/kg      Zn ..... 1100 mg/kg	100 g
LGC6182	<b>Sewage sludge - PAHs</b> A digested sewage sludge of mixed origin was taken from a city water treatment plant immediately after discharge from a digestion tank. Assessed Values Acenaphthene..... 0.10 mg/kg      Chrysene..... 0.84 mg/kg Anthracene ..... 0.17 mg/kg      Fluoranthene..... 1.81 mg/kg Benzo(a)anthracene ..... 0.66 mg/kg      Fluorene ..... 0.19 mg/kg Benzo(b)fluoranthene ..... 0.95 mg/kg      Indeno(1,2,3cd)pyrene ..... 0.58 mg/kg Benzo(k)fluoranthene ..... 0.45 mg/kg      Naphthalene..... 0.33 mg/kg Benzo(ghi)perylene..... 0.62 mg/kg      Phenanthrene ..... 1.04 mg/kg Benzo(a)pyrene ..... 0.59 mg/kg      Pyrene..... 1.53 mg/kg Indicative values for Acenaphthylene, Dibenzo(a,h)anthracene	30 g
LGC6184	<b>Sewage sludge - PCBs</b> A digested sewage sludge of mixed origin, taken from a city water treatment plant in the Czech Republic, immediately after discharge from a digestion tank. Certified values PCB 101 ..... 37 µg/kg      PCB 118..... 17 µg/kg      PCB 153 ..... 112 µg/kg Assessed values PCB 28 ..... 28 µg/kg      PCB 149..... 63 µg/kg      PCB 187 ..... 35 µg/kg PCB 52 ..... 14 µg/kg      PCB 170..... 37 µg/kg      PCB 194 ..... 13 µg/kg PCB 138 ..... 77 µg/kg      PCB 180..... 78 µg/kg Indicative values for PCB 31, PCB 77, PCB 110	30 g
BCR-145R	<b>Sewage sludge (mixed origin) - Trace elements</b> Certified values Cd ..... 3.50 mg/kg      Hg..... 2.01 mg/kg      Pb ..... 286 mg/kg Co ..... 5.61 mg/kg      Mn ..... 156 mg/kg      Zn ..... 2122 mg/kg Cu ..... 696 mg/kg      Ni..... 247 mg/kg Indicative value for Cr <u>Aqua Regia soluble content</u> Certified values Cr ..... 307 mg/kg      Ni ..... 251 mg/kg      Zn ..... 2137 mg/kg Cu ..... 707 mg/kg      Pb ..... 282 mg/kg Indicative values for Cd, Co, Hg, Mn	40 g
BCR-146R	<b>Sewage sludge (industrial origin) - Trace elements</b> Certified values Cd..... 18.8 mg/kg      Cu..... 838 mg/kg      Ni ..... 69.7 mg/kg Co ..... 7.39 mg/kg      Hg..... 8.62 mg/kg      Pb ..... 609 mg/kg Cr ..... 196 mg/kg      Mn ..... 324 mg/kg      Zn ..... 3061 mg/kg <u>Aqua regia soluble content</u> Certified values Cd ..... 18.5 mg/kg      Cu..... 831 mg/kg      Ni ..... 65.0 mg/kg Co ..... 6.5 mg/kg      Hg..... 8.39 mg/kg      Pb ..... 583 mg/kg Cr ..... 174 mg/kg      Mn ..... 298 mg/kg      Zn ..... 3043 mg/kg	40 g
BCR-597	<b>Sewage sludge - Chromium</b> Certified value Cr ..... 203 mg/kg	40 g

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Code	Product	Unit
BCR-677	Sewage sludge - PCDD/PCDFs	40 g
	Certified values	
	2,3,7,8-TCDD ..... 1.51 pg/g	2,3,4,7,8-PeCDF ..... 16.9 pg/g
	1,2,3,7,8-PeCDD ..... 4.1 pg/g	1,2,3,4,7,8-HxCDF ..... 14.5 pg/g
	1,2,3,6,7,8-HxCDD ..... 235 pg/g	1,2,3,6,7,8-HxCDF ..... 6.1 pg/g
	1,2,3,7,8,9-HxCDD ..... 79 pg/g	1,2,3,7,8,9-HxCDF ..... 0.84 pg/g
	1,2,3,4,6,7,8-HpCDD ..... $3.5 \times 10^3$ pg/g	2,3,4,6,7,8-HxCDF ..... 5.6 pg/g
	OCDD ..... $12.7 \times 10^3$ pg/g	1,2,3,4,6,7,8-HpCDF ..... 62 pg/g
	2,3,7,8-TCDF ..... 45 pg/g	1,2,3,4,7,8,9-HpCDF ..... 6.3 pg/g
	1,2,3,7,8-PeCDF ..... 24.8 pg/g	OCDF ..... 177 pg/g
CMI-CRM7006	Sewage sludge - PCDDs and PCDFs	60 g
	Certified values	
	2,3,7,8-TeCDD ..... $4.5 \pm 0.3$ ng/kg	1,2,3,4,7,8,9-HpCDF ..... $110 \pm 17$ ng/kg
	1,2,3,7,8-PeCDD ..... $2.1 \pm 0.3$ ng/kg	OCDF ..... $1590 \pm 290$ ng/kg
	1,2,3,4,7,8-HxCDD ..... $2.6 \pm 0.5$ ng/kg	PCB 77 ..... $2380 \pm 370$ ng/kg
	1,2,3,6,7,8-HxCDD ..... $5 \pm 0.9$ ng/kg	PCB 81 ..... $108 \pm 16$ ng/kg
	1,2,3,7,8,9-HxCDD ..... $3.7 \pm 0.6$ ng/kg	PCB 126 ..... $169 \pm 32$ ng/kg
	1,2,3,4,6,7,8-HpCDD ..... $65 \pm 10$ ng/kg	PCB 169 ..... $25 \pm 4$ ng/kg
	OCDD ..... $519 \pm 74$ ng/kg	PCB 105 ..... $3430 \pm 495$ ng/kg
	2,3,7,8-TeCDF ..... $110 \pm 17$ ng/kg	PCB 114 ..... $169 \pm 36$ ng/kg
	1,2,3,7,8-PeCDF ..... $157 \pm 21$ ng/kg	PCB 118 ..... $15800 \pm 2300$ ng/kg
	2,3,4,7,8-PeCDF ..... $87 \pm 11$ ng/kg	PCB 123 ..... $121 \pm 30$ ng/kg
	1,2,3,4,7,8-HxCDF ..... $376 \pm 63$ ng/kg	PCB 156 ..... $9140 \pm 1300$ ng/kg
	1,2,3,6,7,8-HxCDF ..... $102 \pm 13$ ng/kg	PCB 157 ..... $802 \pm 130$ ng/kg
	1,2,3,7,8,9-HxCDF ..... $11 \pm 2.2$ ng/kg	PCB 167 ..... $4130 \pm 670$ ng/kg
	2,3,4,6,7,8-HxCDF ..... $19.8 \pm 2.8$ ng/kg	PCB 189 ..... $1860 \pm 260$ ng/kg
	1,2,3,4,6,7,8-HpCDF ..... $256 \pm 41$ ng/kg	
	Indicative values for metals, other PCBs, PAHs, pesticides, brominated flame retardants	
RTC-CNS312-050	Sewage sludge - PAHs, PCBs and pesticides	50 g
	The PAH 10 list of polycyclic aromatic hydrocarbons is defined according to VROM, the Dutch Ministry of Housing and Urban Planning. The reference values were determined by Dutch standard methods (NEN 5771, 5718, and 5719).	
	Reference values	
	Lot 002554	
	Acenaphthene ..... 2.99 mg/kg	PCB 118 ..... 73.6 µg/kg
	Acenaphthylene ..... 2.42 mg/kg	PCB 138 ..... 136 µg/kg
	Anthracene ..... 1.67 mg/kg	PCB 153 ..... 214 µg/kg
	Benzo(a)anthracene ..... 1.45 mg/kg	PCB 180 ..... 232 µg/kg
	Benzo(a)pyrene ..... 0.872 mg/kg	Total PCB ..... 1350 µg/kg
	Benzo(b)fluoranthene ..... 0.241 mg/kg	2,4-DDD ..... 625 µg/kg
	Benzo(g,h,i)perylene ..... 0.835 mg/kg	2,4-DDE ..... 258 µg/kg
	Benzo(k)fluoranthene ..... 0.678 mg/kg	2,4-DDT ..... 223 µg/kg
	Chrysene ..... 1.12 mg/kg	4,4-DDD ..... 809 µg/kg
	Dibenzo(a,h)anthracene ..... 0.407 mg/kg	4,4-DDE ..... 229 µg/kg
	Fluoranthene ..... 4.19 mg/kg	4,4-DDT ..... 23.5 µg/kg
	Fluorene ..... 2.01 mg/kg	Aldrin ..... 221 µg/kg
	Indeno(1,2,3-cd)pyrene ..... 0.54 mg/kg	alpha-BHC ..... 137 µg/kg
	Naphthalene ..... 2.58 mg/kg	beta-BHC ..... 111 µg/kg
	Phenanthrene ..... 0.462 mg/kg	gamma-BHC (Lindane) ..... 578 µg/kg
	Pyrene ..... 4.17 mg/kg	Dieldrin ..... 569 µg/kg
	Total PAH 10 (VROM 10) ..... 13.8 mg/kg	Endosulfan I ..... 296 µg/kg
	Total PAH16 (EPA 16) ..... 25.1 mg/kg	Endrin ..... 336 µg/kg
	PCB 28 ..... 205 µg/kg	Hexachlorobenzene ..... 689 µg/kg
	PCB 52 ..... 263 µg/kg	Heptachlor ..... 197 µg/kg
	PCB 101 ..... 257 µg/kg	Heptachlor epoxide (beta) ..... 104 µg/kg
RTC-CNS311-050	Sewage Sludge - Trace Elements	50 g
	The Reference Values were determined by Dutch standard methods (NEN 56...; 57...; 64...; and 66...; series) after total digestion using predominantly nitric/hydrochloric acid mixture (Aqua Regia) in pressurised microwave digester units. The sample is suitable for use by these, or other similar digestion and analytical procedures.	
	Reference values	
	Lot 002545	
	Ag ..... 18 mg/kg	Mn ..... 232 mg/kg
	Al ..... 13200 mg/kg	Mo ..... 10.4 mg/kg
	As ..... 3.3 mg/kg	Ni ..... 19.2 mg/kg
	Ba ..... 347 mg/kg	Pb ..... 25.4 mg/kg
	Cd ..... 1.74 mg/kg	V ..... 12 mg/kg
	Co ..... 2.97 mg/kg	Zn ..... 563 mg/kg
	Cr ..... 40.4 mg/kg	Chemical Oxygen Demand (COD) ..... 771 mg/kg
	Cu ..... 402 mg/kg	Kjeldahl – Nitrogen (KN) ..... 41.1 g/kg
	Fe ..... 22500 mg/kg	Phosphorus, Total (TP) ..... 23.1 g/kg
	Hg ..... 1.71 mg/kg	

## Sewage sludges

Code	Product	Unit
RTC-CRM018-050	<b>Sewage sludge (wet) - Metals</b> Raw sewage sludge from a publicly owned treatment works (POTW), representative of a residential area with industrial influence. The certified values were determined by USEPA SW 846 (3 <sup>rd</sup> edition) Methods 3050 and 6010, except for arsenic (7060A), mercury (7471A), selenium (7740), and thallium (7841). The sample is suitable for other 3000-series metals digestion procedures and 7000-series spectroscopic methods. Certified values Lot AG18a Ag ..... 72.1 mg/kg      Cr ..... 40.1 mg/kg      Na ..... 1000 mg/kg Al..... 22400 mg/kg      Cu..... 840 mg/kg      Ni ..... 20.4 mg/kg As..... 6.63 mg/kg      Fe ..... 9900 mg/kg      Pb ..... 126 mg/kg Ba ..... 1100 mg/kg      Hg..... 4.78 mg/kg      Se ..... 8.38 mg/kg Be ..... 0.30 mg/kg      K..... 2660 mg/kg      Sr ..... 420 mg/kg Ca ..... 49100 mg/kg      Mg ..... 4300 mg/kg      V ..... 39.2 mg/kg Cd ..... 5.57 mg/kg      Mn ..... 200 mg/kg      Zn..... 1120 mg/kg Co ..... 3.22 mg/kg      Mo ..... 10.5 mg/kg Indicative values for B, P, Si, Sb, TI, Ammonia as N, TOC, Nitrogen (total Kjeldahl), Total solids	50 g
RTC-CRM029-050	<b>Sewage sludge - Metals</b> Digested sewage sludge from a publicly owned treatment works (POTW), representative of a residential area with light industrial influence. The certified values were determined by USEPA SW 846 (3 <sup>rd</sup> edition) Methods 3050B and 6010B, except for Mercury (Method 7471). The sample is suitable for other 3000-series metals digestion procedures and 7000-series spectroscopic methods. Certified values Lot 013583 Ag ..... 70.4 mg/kg      K..... 3370 mg/kg      TI..... 44.9 mg/kg Al..... 12400 mg/kg      Li ..... 63.7 mg/kg      Ti..... 34.0 mg/kg As..... 27.4 mg/kg      Mg ..... 8280 mg/kg      V ..... 41.5 mg/kg Ba ..... 1080 mg/kg      Mn ..... 399 mg/kg      Zn..... 1400 mg/kg Be ..... 4.51 mg/kg      Mo ..... 19.1 mg/kg      Ammonia as N ..... 5450 mg/kg B ..... 186 mg/kg      Na..... 1650 mg/kg      Kjeldahl nitrogen ..... 4.07 W t% Ca ..... 48400 mg/kg      Ni..... 172 mg/kg      Nitrate ..... 11200 mg/kg Cd ..... 487 mg/kg      Pb..... 300 mg/kg      pH ..... 7.10 Co ..... 5.70 mg/kg      Sb..... 5.78 mg/kg      Phosphorus, total ..... 2.21 W t% Cr ..... 345 mg/kg      Se ..... 25.4 mg/kg      Residue, total (TS)..... 91.5 W t% Cu ..... 1100 mg/kg      Si ..... 828 mg/kg      Residue, volatile ..... 59.1 W t% Fe..... 20700 mg/kg      Sn..... 97.1 mg/kg      S ..... 13600 mg/kg Hg ..... 6.13 mg/kg      Sr..... 647 mg/kg      Total organic carbon .. 28.3 W t%	50 g
RTC-CRM031-040	<b>Sewage sludge - Metals</b> The values were determined by USEPA SW 846 (3 <sup>rd</sup> edition) Methods 3050B/3051, 6010B, 6020, and 7000 series. The pH value was determined by USEPA SW 846 (3 <sup>rd</sup> edition) Methods 9040, and 9045C. The sample is suitable for other 3000-series metals digestion procedures and 7000-series spectroscopic methods. Certified values Lot 014679 Ag ..... 100 mg/kg      Na ..... 845 mg/kg Al..... 13100 mg/kg      Ni..... 136 mg/kg As..... 217 mg/kg      Pb..... 121 mg/kg B ..... 158 mg/kg      Sb..... 107 mg/kg Ba ..... 851 mg/kg      Se..... 119 mg/kg Be ..... 155 mg/kg      Sn..... 94.0 mg/kg Ca ..... 49400 mg/kg      Sr ..... 459 mg/kg Cd ..... 212 mg/kg      Ti ..... 31.1 mg/kg Co ..... 73.4 mg/kg      Tl ..... 112 mg/kg Cr (total) ..... 243 mg/kg      V ..... 133 mg/kg Cu ..... 639 mg/kg      Zn ..... 908 mg/kg Fe..... 22400 mg/kg      Ammonia as N ..... 5380 mg/kg Hg ..... 11 mg/kg      Kjeldahl nitrogen total (TKN)..... 3.55 % K ..... 7460 mg/kg      pH ..... 7.02 Li ..... 103 mg/kg      Phosphorus total ..... 2.21 % Mg ..... 8920 mg/kg      Residue total (TS) ..... 90.6 % Mn ..... 1240 mg/kg      Residue-volatile ..... 55.5 % Mo ..... 71.4 mg/kg      Sulfur..... 13900 mg/kg	40 g

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Code	Product	Unit																																
RTC-CRM055-050	Sludge - Metals	50 g																																
	<p>The values were determined by USEPA SW 846 3050(Nitric Acid/Hot Plate), 3051(Nitric Acid/Microwave), 7000 series(AA), 6010(ICP) and Dutch standard methods (NEN 56.; 57.; 64.; and 66.; series) after total digestion using predominantly nitric/hydrochloric acid mixture (Aqua Regia) in pressurised microwave digester units. The sample is suitable for use by these, or other similar digestion and analytical procedures.</p> <p>Certified values</p> <p>Lot 015148</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Ag .....64.7 mg/kg</td> <td style="width: 50%;">Mo ..... 133 mg/kg</td> </tr> <tr> <td>Al.....14800 mg/kg</td> <td>Na..... 758 mg/kg</td> </tr> <tr> <td>As.....229 mg/kg</td> <td>Ni..... 163 mg/kg</td> </tr> <tr> <td>B .....110 mg/kg</td> <td>Pb..... 154 mg/kg</td> </tr> <tr> <td>Ba .....765 mg/kg</td> <td>Sb..... 75.3 mg/kg</td> </tr> <tr> <td>Be .....167 mg/kg</td> <td>Se..... 162 mg/kg</td> </tr> <tr> <td>Ca .....47200 mg/kg</td> <td>Sn..... 148 mg/kg</td> </tr> <tr> <td>Cd .....60.6 mg/kg</td> <td>Sr..... 445 mg/kg</td> </tr> <tr> <td>Co .....97.0 mg/kg</td> <td>Tl ..... 82.0 mg/kg</td> </tr> <tr> <td>Cr .....289 mg/kg</td> <td>V ..... 245 mg/kg</td> </tr> <tr> <td>Cu .....482 mg/kg</td> <td>Zn ..... 1240 mg/kg</td> </tr> <tr> <td>Fe.....20100 mg/kg</td> <td>pH..... 7.16</td> </tr> <tr> <td>Hg .....12.5 mg/kg</td> <td>Phosphorus (total)..... 2.14 W t%</td> </tr> <tr> <td>K .....2420 mg/kg</td> <td>Residue, total (TS) ..... 86.4 W t%</td> </tr> <tr> <td>Mn .....693 mg/kg</td> <td>Residue-volatile ..... 56.2 W t%</td> </tr> <tr> <td>Mg.....9210 mg/kg</td> <td>Sulfur..... 11500 mg/kg</td> </tr> </table>		Ag .....64.7 mg/kg	Mo ..... 133 mg/kg	Al.....14800 mg/kg	Na..... 758 mg/kg	As.....229 mg/kg	Ni..... 163 mg/kg	B .....110 mg/kg	Pb..... 154 mg/kg	Ba .....765 mg/kg	Sb..... 75.3 mg/kg	Be .....167 mg/kg	Se..... 162 mg/kg	Ca .....47200 mg/kg	Sn..... 148 mg/kg	Cd .....60.6 mg/kg	Sr..... 445 mg/kg	Co .....97.0 mg/kg	Tl ..... 82.0 mg/kg	Cr .....289 mg/kg	V ..... 245 mg/kg	Cu .....482 mg/kg	Zn ..... 1240 mg/kg	Fe.....20100 mg/kg	pH..... 7.16	Hg .....12.5 mg/kg	Phosphorus (total)..... 2.14 W t%	K .....2420 mg/kg	Residue, total (TS) ..... 86.4 W t%	Mn .....693 mg/kg	Residue-volatile ..... 56.2 W t%	Mg.....9210 mg/kg	Sulfur..... 11500 mg/kg
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NIST-2781	Domestic sludge - Metals	40 g												
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NIST-2782	Industrial sludge - Leachable and total metals	70 g												
	<p>Obtained from an industrial site in northern New Jersey, USA where pharmaceutical research is carried out.</p> <p>Certified values</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">As..... 166 mg/kg</td> <td style="width: 33%;">Hg..... 1.10 mg/kg</td> <td style="width: 33%;">Se ..... 0.44 mg/kg</td> </tr> <tr> <td>Cd ..... 4.17 mg/kg</td> <td>Mo .....10.07 mg/kg</td> <td>Zn..... 1254 mg/kg</td> </tr> <tr> <td>Cr ..... 109 mg/kg</td> <td>Ni .....154.1 mg/kg</td> <td></td> </tr> <tr> <td>Cu ..... 2594 mg/kg</td> <td>Pb .....574 mg/kg</td> <td></td> </tr> </table> <p>Indicative values for a wide range of additional elements</p>		As..... 166 mg/kg	Hg..... 1.10 mg/kg	Se ..... 0.44 mg/kg	Cd ..... 4.17 mg/kg	Mo .....10.07 mg/kg	Zn..... 1254 mg/kg	Cr ..... 109 mg/kg	Ni .....154.1 mg/kg		Cu ..... 2594 mg/kg	Pb .....574 mg/kg	
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### WEPAL sewage sludge and compost reference materials

The Wageningen Evaluating Programmes for Analytical Laboratories (WEPAL) runs international sample exchange programmes for continuous quality control of analytical data as produced by chemical laboratories. There are almost 700 laboratories who take part in one or more of WEPAL's regular ring-tests programmes.

The WEPAL sewage sludge and compost reference samples are supplied with certificates including consensus values, indicative values and values for information, based on the results of the proficiency programme. The certificates are available on request.

<b>New</b>	WEPAL-MARSEP-202	Compost - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-205	Compost - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-207	Sewage sludge - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-208	Sewage sludge - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-217	Sewage sludge - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-223	Compost - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-241	Champost - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-247	Sewage sludge - Inorganic composition (please ask for detailed information)	20 g
<b>New</b>	WEPAL-MARSEP-249	Sewage sludge - Inorganic composition (please ask for detailed information)	20 g

