▪ Certificate of Analysis ▪

Product: Metals in Soil
Catalog Number: 540
Lot No. D091-540
Certificate Issue Date: December 04, 2015
Expiration Date: September 30, 2018
Revision Number: Original

CERTIFICATION

Parameter	Total Concentration[6]	Certified Value[1]	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Aluminum	59600	8080	4.69	4130 - 12000	3200 - 13000
Antimony	246	123	2.66	1.24 - 246	24.5 - 310
Arsenic	159	145	6.61	115 - 176	102 - 198
Barium	820	209	6.00	174 - 245	154 - 265
Beryllium	104	97.3	5.60	80.4 - 114	72.5 - 122
Boron	156	126	3.20	91.8 - 160	75.7 - 177
Cadmium	95.9	87.6	4.02	72.4 - 103	64.2 - 111
Calcium	12600	5690	0.478	4610 - 6760	4180 - 7200
Chromium	178	143	6.76	114 - 171	100 - 185
Cobalt	163	154	3.20	129 - 178	114 - 193
Copper	191	173	7.09	141 - 204	130 - 215
Iron	29800	15000	3.41	7020 - 23100	5570 - 24500
Lead	175	146	8.60	119 - 173	107 - 185
Magnesium	4440	2640	2.05	2020 - 3260	1700 - 3590
Manganese	519	309	5.12	252 - 367	231 - 387
Mercury	12.5	12.3	2.68	8.80 - 15.8	6.32 - 18.3
Molybdenum	134	116	4.48	91.5 - 141	81.8 - 151
Nickel	147	129	4.17	107 - 151	94.2 - 164
Potassium	29200	2400	1.18	1720 - 3080	1450 - 3360
Selenium	193	178	2.74	140 - 216	121 - 234
Silver	33.5	31.3	8.73	23.5 - 39.1	20.4 - 42.1
Sodium	14400	869	3.90	632 - 1100	509 - 1230
Strontium	286	105	4.66	84.6 - 126	74.0 - 136

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Parameter	Total Concentration[6]	Certified Value[1]	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Thallium	156	141	2.90	112 - 171	96.4 - 186
Tin	163	144	6.19	110 - 177	85.7 - 202
Titanium	2380	316	1.28	96.1 - 535	36.1 - 626
Uranium	21.4	17.6	5.76	14.2 - 20.9	12.7 - 22.4
Vanadium	159	115	6.43	89.2 - 141	77.6 - 152
Zinc	228	194	8.08	159 - 229	135 - 253

ANALYTICAL VERIFICATION

Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number	Recovery
	mg/kg	mg/kg	%			%
Aluminum	8080	8080	82.2	151	-	-
Antimony	123	123	50.4	158	-	-
Arsenic	145	145	80.7	189	-	-
Barium	209	209	93.0	177	-	-
Beryllium	97.3	97.3	94.4	169	-	-
Boron	126	126	78.3	114	-	-
Cadmium	87.6	87.6	91.3	192	-	-
Calcium	5690	5690	89.4	135	-	-
Chromium	143	143	90.9	184	-	-
Cobalt	154	154	95.4	167	-	-
Copper	173	173	89.4	187	-	-
Iron	15000	15000	92.1	150	-	-
Lead	146	146	89.5	194	-	-
Magnesium	2640	2640	91.0	139	-	-
Manganese	309	309	94.5	167	-	-
Mercury	12.3	12.3	98.4	129	-	-
Molybdenum	116	116	87.5	162	-	-
Nickel	129	129	89.0	189	-	-

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Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number	Recovery
	mg/kg	mg/kg	%			%
Potassium	2400	2400	93.7	139	-	-
Selenium	178	178	92.1	183	-	-
Silver	31.3	31.3	90.6	171	-	-
Sodium	869	869	95.9	137	-	-
Strontium	105	105	96.5	111	-	-
Thallium	141	141	90.0	165	-	-
Tin	144	144	89.3	120	-	-
Titanium	316	316	87.5	119	-	-
Uranium	17.6	17.6	104	23	-	-
Vanadium	115	115	90.4	166	-	-
Zinc	194	194	98.9	187	-	-

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1. The **Certified Values** are equal to the mean recoveries for the parameters as determined in an interlaboratory round robin study based on all applicable digestion techniques reported in the study. The Certified Values are based on an "as received" basis, assuming 100% solids content. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

2. The **Uncertainty** is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation and internal analytical verification of the product by ERA, multiplied by a coverage factor. The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product.

3. The **QC Performance Acceptance Limits (QC PALs™)**are based on actual historical data collected in ERA's Proficiency Testing program. The QC PALs™ reflect any inherent biases in the methods used to establish the limits and closely approximate a 95% confidence interval of the performance that experienced laboratories should achieve using accepted environmental methods. Use the QC PALs™ to realistically evaluate your performance against your peers.

4. The **PT Performance Acceptance Limits (PT PALs™)** are calculated using the regression equations and fixed acceptance criteria specified in the NELAC proficiency testing requirements. Use the PT PALs™ when analyzing this QC standard alongside USEPA and NELAC compliant PT standards. Please note that many PT study acceptance limits are concentration dependent (some non-linearly) and, therefore, the acceptance limits of this QC standard and any PT standard may differ relative to their difference in concentrations.

5. The **PT Data/Traceability** data include the mean value, percent recovery and number of data points reported by the laboratories in our Proficiency Testing study compared to the Certified Values. In addition, where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. This product is traceable to the lot numbers of its starting materials. All gravimetric and volumetric measurements related to its manufacture are traceable to NIST through an unbroken chain of comparisons.
Traceability Recovery (%) = [(% recovery certified standard)/(% recovery NIST SRM)]*100
The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs.

6. The **Total Concentrations** are equal to the background concentrations in the blank soil matrix (measured using neutron activation, XRF, and total acid digestion techniques), plus the amount of each analyte spiked onto the soil. For Trace Metals, the values listed are only ""Theoretical Values"" based upon the methodologies listed.

7. For additional information on this product such as intended use, instructions for use, level of homogeneity, and safety information, please refer to the provided Instruction Sheet

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer

Tom Widera

Quality Officer

David Kilhefner

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