# ▪ Certificate of Analysis ▪

**Product:** Metals in Sewage SludG™
**Catalog Number:** 160
**Lot No.** D095-160
**Certificate Issue Date:** September 23, 2016
**Expiration Date:** April 30, 2020
**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 | 8480 | 9060 | 9.98 | 7530 - 10600 | 6580 - 11500 |
| Antimony | 201 | 179 | 25.8 | 115 - 242 | 128 - 229 |
| Arsenic | 170 | 157 | 25.9 | 116 - 199 | 134 - 187 |
| Barium | 800 | 758 | 13.5 | 540 - 976 | 601 - 915 |
| Beryllium | 136 | 128 | 25.9 | 107 - 150 | 93.4 - 163 |
| Cadmium | 84.8 | 76.0 | 26.1 | 59.0 - 93.0 | 66.3 - 93.3 |
| Calcium | 48400 | 44400 | 0.0628 | 34000 - 54800 | 32800 - 56000 |
| Chromium | 96.6 | 93.2 | 27.4 | 75.3 - 111 | 76.9 - 110 |
| Cobalt | 29.4 | 26.3 | 36.8 | 17.9 - 34.7 | 20.8 - 32.3 |
| Copper | 916 | 844 | 3.83 | 705 - 982 | 655 - 1030 |
| Iron | 24100 | 22600 | 2.18 | 16700 - 28600 | 17100 - 28200 |
| Lead | 137 | 133 | 25.2 | 105 - 162 | 103 - 164 |
| Magnesium | 5100 | 4730 | 3.63 | 3880 - 5570 | 3470 - 5990 |
| Manganese | 613 | 600 | 14.8 | 463 - 737 | 462 - 738 |
| Mercury | 12.0 | 11.2 | 43.5 | 6.13 - 16.3 | 3.98 - 18.4 |
| Molybdenum | 108 | 101 | 26.3 | 81.7 - 121 | 78.7 - 124 |
| Nickel | 122 | 115 | 25.8 | 92.3 - 137 | 91.3 - 138 |
| Potassium | 3200 | 3010 | 13.3 | 2230 - 3790 | 2090 - 3930 |
| Selenium | 141 | 133 | 25.6 | 94.4 - 172 | 78.7 - 188 |
| Silver | 124 | 115 | 25.9 | 77.9 - 152 | 103 - 136 |
| Sodium | 1290 | 1280 | 12.1 | 906 - 1640 | 1070 - 1480 |
| Strontium | 616 | 605 | 13.8 | 502 - 708 | 453 - 757 |
| Thallium | 108 | 89.6 | 25.9 | 63.4 - 116 | 40.4 - 139 |



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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 |
| Vanadium | 69.9 | 68.9 | 25.8 | 47.6 - 90.3 | 57.2 - 80.7 |
| Zinc | 1130 | 1170 | 8.65 | 929 - 1400 | 929 - 1400 |

## ANALYTICAL VERIFICATION

| Parameter | Certified Value[1] | Proficiency Testing Study | | | NIST Traceability | |
|---|---|---|---|---|---|---|
| | | Mean | Recovery[5] | n | SRM Number | Recovery |
| | mg/kg | mg/kg | % | | | % |
| Aluminum | 9060 | 9060 | 107 | 7 | - | - |
| Antimony | 179 | 179 | 88.8 | 8 | - | - |
| Arsenic | 157 | 157 | 92.4 | 10 | - | - |
| Barium | 758 | 758 | 94.8 | 7 | - | - |
| Beryllium | 128 | 128 | 94.3 | 7 | - | - |
| Cadmium | 76.0 | 76.0 | 89.6 | 10 | - | - |
| Calcium | 44400 | 44400 | 91.7 | 6 | - | - |
| Chromium | 93.2 | 93.2 | 96.5 | 9 | - | - |
| Cobalt | 26.3 | 26.3 | 89.4 | 7 | - | - |
| Copper | 844 | 844 | 92.1 | 10 | - | - |
| Iron | 22600 | 22600 | 94.1 | 6 | - | - |
| Lead | 133 | 133 | 97.4 | 10 | - | - |
| Magnesium | 4730 | 4730 | 92.7 | 6 | - | - |
| Manganese | 600 | 600 | 97.9 | 8 | - | - |
| Mercury | 11.2 | 11.2 | 93.5 | 7 | - | - |
| Molybdenum | 101 | 101 | 93.8 | 10 | - | - |
| Nickel | 115 | 115 | 93.9 | 10 | - | - |
| Potassium | 3010 | 3010 | 94.0 | 9 | - | - |
| Selenium | 133 | 133 | 94.5 | 10 | - | - |
| Silver | 115 | 115 | 92.7 | 6 | - | - |
| Sodium | 1280 | 1280 | 98.6 | 5 | - | - |
| Strontium | 605 | 605 | 98.2 | 5 | - | - |



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| Parameter | Certified Value[1] | Proficiency Testing Study | | | NIST Traceability | |
|---|---|---|---|---|---|---|
| | | Mean | Recovery[5] | n | SRM Number | Recovery |
| | mg/kg | mg/kg | % | | | % |
| Thallium | 89.6 | 89.6 | 83.0 | 8 | - | - |
| Vanadium | 68.9 | 68.9 | 98.6 | 7 | - | - |
| Zinc | 1170 | 1170 | 103 | 10 | - | - |

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 sludge matrix (measured using 3050 for Metals and 7471 for Mercury), plus the amount of each analyte spiked onto the sludge.

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**

**Brian Miller**

**Quality Officer**

**Patrick Larson**



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