# Certificate of Analysis

**Catalogue Number:** 140-025-001
**Description:** Certified Reference Standard *Enviro*MAT Contaminated Soil
**Lot Number:** SC0063618
**Date of Initial Certification:** May 3rd, 2010
**Date of Last Verification:** N/A

**Consensus Values :**

| Elements | Reference Value (mg/kg) | Confidence Interval (mg/kg) | Tolerance Interval (mg/kg) |
|---|---|---|---|
| Ag | 0.88 | 0.85 – 0.91 | 0.72 – 1.04 |
| Al | 12 163 | 11 753 – 12 572 | 9 579 – 14 746 |
| As | 20.7 | 19.7 – 21.8 | 14.0 – 27.5 |
| B | 26.9 | 18.5 – 35.2 | 0.0 – 77.8 |
| Ba | 464 | 448 – 480 | 359 – 569 |
| Be | 0.48 | 0.43 – 0.53 | 0.22 – 0.74 |
| Ca | 50 265 | 49 052 – 51 478 | 42 222 – 53 308 |
| Cd | 3.2 | 3.0 – 3.5 | 1.8 – 4.7 |
| Ce | (40.1) | ---- | ---- |
| Co | 12.9 | 12.5 – 13.4 | 10.2 – 15.7 |
| Cr | 103 | 97.9 – 109 | 66.6 – 140 |
| Cu | 403 | 393 – 413 | 334 – 472 |
| Fe | 72 00 | 69 728 – 74 273 | 57 212 – 86 789 |
| Hg | 0.41 | 0.39 – 0.43 | 0.29 – 0.53 |
| K | 2232 | 2082 – 2382 | 1257 – 3208 |
| Li | 14.3 | 12.9 – 15.8 | 6.4 – 22.3 |
| Mg | 9690 | 9459 – 9920 | 8141 – 11 239 |
| Mn | 737 | 718 – 756 | 605 – 869 |
| Mo | 6.8 | 6.5 – 7.2 | 4.7 – 9.0 |
| Na | 650 | 587 – 714 | 235 – 1066 |
| Ni | 59.2 | 57.9 – 60.5 | 50.4 – 68.0 |
| P | 1552 | 1518 – 1586 | 1329 – 1775 |
| Pb | 764 | 749 – 779 | 665 – 863 |
| S | 1916 | 1776 – 2057 | 1045 – 2787 |
| Sb | 5.5 | 4.4 – 6.6 | 0.0 – 12.0 |
| Se | 0.78 | 0.64 – 0.92 | 0.02 – 1.54 |
| Sn | 340 | 324 – 357 | 245 – 436 |
| Sr | 114 | 113 - 116 | 106 – 122 |
| Ti | 530 | 473 – 587 | 195 – 865 |
| Tl | (0.19) | ---- | ---- |
| U | (0.76) | ---- | ---- |
| V | 27.2 | 25.9 – 28.6 | 18.8 – 35.7 |
| Zn | 1114 | 1078 – 1151 | 860 – 1369 |

## Organization responsible for the certification:

**SCP SCIENCE**
21800 Clark Graham
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Certified by: Daniel Boisvert
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Person responsible for initial certification: Daniel Boisvert, Chemist

Please note that the Material Safety Data Sheet and this Certificate of Analysis are available on our web site.
(Ce certificat est également disponible en français)

## Description:

The Reference Standard SS-1 is a Type B naturally contaminated soil (not spiked or fortified) with a particle size of -200 mesh. It is designed to be used for quality control verification or methods development for the analysis of soil by ICP, ICP/MS, GFAA or AA Spectroscopy techniques.

## Stability:

This certification is valid for 2 years from the shipping date or 4 years after the verification date, whichever comes first, provided the material is kept sealed and stored under normal laboratory conditions. **SCP SCIENCE** will monitor the stability of representative samples annually and if any changes occur that invalidate this certification, **SCP SCIENCE** will notify purchasers.

## Instructions for use:

The material must be dried at 105°C for two hours before use. Before weighing, mix the material by shaking the container to avoid segregation in the bottle. In order to have a representative sample, the minimum use quantity must be 250 mg to conform with previous homogeneity testing.

## Preparation method:

The initial sample has been dried and sieved through a 0.5 inch sieve. The "fines" portion has been further crushed and sieved with 80% of the material passing through a 200 mesh screen. This portion has been re-pulverized and sieved through a 200 mesh sieve to obtain 100% less than 200 mesh. The final material has then been packaged in 100 g containers and tested for homogeneity.

The homogeneity of the material has undergone third party verification by Particle Size Analysis and by Acid digestion (Extractable metals) using ICP-AES for analysis. The method used for the determination of the homogeneity of the material is based on ISO Guide 35.

## Certification and Calculation Methods:

The Certification Method is based on a "round-robin study" analysis involving twenty-seven laboratories. Each laboratory was asked to supply analysis data for a specific list of elements employing a method based on EPA-3050B Acid Digestion ($HNO_3$/HCl). Not all the laboratories supplied data for the different parameters. Certified Values are based on an average of 14 values per parameter (20 values being the highest and 9 values being the lowest). Values in brackets are not certified as less than 9 values were received. They are provided for information only.

The outliers were removed using the Dixon Test after confirmation that there was neither a connection between outliers and the methods used for analysis nor between the outliers and the nature of the sample.

The Confidence Interval has been calculated using the 95% Confidence Level (equivalent to 2σ) using the following formula:

$$x \pm \frac{ts}{\sqrt{n}}$$

where
- n: number of data
- s: Standard Deviation of the Average
- t: factor for Student Test
- x: Reference Value

The Confidence Interval should be used for routine quality control.

The Tolerance Interval has been calculated using again a 95% probability with a 95% inclusion of the population. The following formula was used:

$$x \pm ks$$

where
- k: factor for two-sided Tolerance Limits
- s: Standard Deviation of the Average
- x: Reference Value

The Tolerance Interval is an indication of the lowest possible value and the highest possible value based on the complete set of data, exclusive of outliers, used to calculate the Certified Value.

The following table is a guideline on how to interpret the results:

| | |
|---|---|
| Results within Confidence Interval | Method working properly |
| Results outside Confidence Interval but within Tolerance Interval | Method needs improvement |
| Results outside Tolerance Interval | Method not working properly |

## References:


ISO Guide 30 (1992): Terms and definitions used in connection with reference materials
ISO Guide 31 (1981): Contents of certificates of reference materials
ISO Guide 35 (1989): Certification of reference materials--General and statistical principles
Standard Reference Materials-Handbook for SRM Users - John K. Taylor
Quality Assurance of Chemical Measurements - John K. Taylor
EPA 3050A - Acid Digestion of Sediments, Sludges and Soils (July 1992)


Date of receipt: _____