

# Certificate of Analysis

**Catalogue Number:** 140-025-041  
**Description:** Matrix Reference Material  
*EnviroMAT Used Oil HU-1*  
**Lot Number:** S140916011  
**Date of Initial Certification:** November 17<sup>th</sup>, 2014  
**Date of Last Verification:** March 25, 2022  
**Expiration date:** 2 years after shipping date

**Method:** dilution with organic solvent

Parameter	Unit	Consensus Value	Uncertainty +/-	Confidence Interval	Tolerance Interval
Ag	mg/kg	17.4	4.0	15.5 – 19.4	4.33 – 30.6
Al	mg/kg	28.9	2.1	27.8 – 29.9	20.7 – 37.0
B	mg/kg	26.7	5.1	24.2 – 29.2	7.55 – 45.9
Ba	mg/kg	18.7	1.3	18.0 – 19.4	13.5 – 23.9
Ca	mg/kg	62.7	6.1	59.7 – 65.8	39.9 – 85.6
Cd	mg/kg	19.5	1.5	18.7 – 20.2	14.2 – 24.8
Cr	mg/kg	18.0	1.3	17.3 – 18.7	12.8 – 23.1
Cu	mg/kg	4182	360	4002 – 4362	2932 – 5431
Fe	mg/kg	94.5	6.9	91.1 – 98.0	68.6 – 120
K	mg/kg	26.7	3.6	24.9 – 28.5	16.3 – 37.1
Mg	mg/kg	18.6	1.5	17.8 – 19.3	12.9 – 24.3
Mn	mg/kg	19.9	1.4	19.3 – 20.6	14.6 – 25.2
Mo	mg/kg	18.0	1.0	17.5 – 18.6	14.0 – 22.1
Na	mg/kg	35.1	6.1	32.0 – 38.2	12.3 – 57.9
Ni	mg/kg	64.0	6.8	60.6 – 67.4	38.8 – 89.3
P	mg/kg	(48)	-----	-----	-----
Pb	mg/kg	25.1	3.2	23.5 – 26.7	12.5 – 37.6
Si	mg/kg	21.3	1.9	20.4 – 22.2	14.5 – 28.2
Sn	mg/kg	510	71	474 – 546	269 – 751
Ti	mg/kg	16.8	1.6	16.0 – 17.6	10.5 – 23.0
V	mg/kg	17.1	1.5	16.4 – 17.9	11.4 – 22.9
Zn	mg/kg	58.5	4.2	56.5 – 60.6	44.0 – 73.1

Notes: Value in brackets is not certified. It is listed for information only.

**Method: Acid digestion**

Parameter	Unit	Consensus Value	Uncertainty +/-	Confidence Interval	Tolerance Interval
Ag	mg/kg	14.8	3.2	13.2 – 16.4	6.83 – 22.8
Al	mg/kg	33.1	4.5	30.8 – 35.3	20.1 – 46.1
B	mg/kg	(18)	-----	-----	-----
Ba	mg/kg	16.7	2.4	15.5 – 17.9	9.51 – 23.8
Ca	mg/kg	67.5	8.5	63.3 – 71.8	45.3 – 89.8
Cd	mg/kg	18.4	1.0	17.9 – 18.9	15.3 – 21.5
Cr	mg/kg	17.4	1.1	16.9 – 18.0	14.2 – 20.7
Cu	mg/kg	4346	400	4148 – 4545	3205 – 5487
Fe	mg/kg	92.8	14	85.9 – 99.7	49.8 – 136
K	mg/kg	32.6	8.5	28.4 – 36.9	10.3 – 55.0
Mg	mg/kg	20.8	5.2	18.3 – 23.4	4.75 – 36.9
Mn	mg/kg	19.8	0.7	19.5 – 20.2	17.8 – 21.9
Mo	mg/kg	15.8	1.3	15.1 – 16.4	11.7 – 19.9
Na	mg/kg	47.8	17	39.3 – 56.3	4.29 – 91.2
Ni	mg/kg	65.8	5.0	63.3 – 68.4	51.1 – 80.6
P	mg/kg	(43)	-----	-----	-----
Pb	mg/kg	25.0	4.6	22.7 – 27.3	12.0 – 38.0
Si	mg/kg	----- (a)	-----	-----	-----
Sn	mg/kg	604	97	556 – 653	350 – 859
Ti	mg/kg	15.9	2.4	14.7 – 17.0	9.68 – 22.0
V	mg/kg	17.8	0.8	17.4 – 18.2	15.4 – 20.2
Zn	mg/kg	59.1	2.7	57.8 – 60.5	52.1 – 66.2

Notes: Value in brackets is not certified. It is listed for information only.

(a): not available

Certified by: *Daniel Boisvert*  
 Daniel Boisvert, Chemist

Date of shipment: \_\_\_\_\_

## Organization responsible for the certification:

### SCP SCIENCE

21800 Clark Graham  
Baie d'Urfé, QC, Canada  
H9X 4B6

Phone: (514) 457-0701

Fax: (514) 457-4499

Web: [www.scpscience.com](http://www.scpscience.com)

e-mail: [sales@scpscience.com](mailto:sales@scpscience.com)

Person responsible for initial certification: Daniel Boisvert, Chemist

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

## Description:

The Matrix Reference Material (MRM) HU-1 is used hydrocarbon oil fortified with metals. It is designed to be used for quality control verification, internal standards validation or methods development for the analysis of the listed parameters.

## Stability:

This certification is valid for 2 years from the shipping date provided the material is kept sealed, stored under normal laboratory conditions and used according to good laboratory practices. Shipping date will be stamped on container at time of shipping. **SCP SCIENCE** will monitor the stability of representative samples every two years and if any changes occur that invalidate this certification, **SCP SCIENCE** will notify purchasers.

## Instructions for use:

Before weighing, mix the material by shaking the container.

## Certification and Calculation Methods:

The Certification Method is based on an inter-laboratory analysis involving 18 International laboratories (Europe, USA and Canada). Each laboratory was asked to supply analysis data on two samples in duplicate for a specific list of parameters. Not all the laboratories supplied data for the different parameters. Certified Values are based on an average of 39 values per parameter (44 values being the highest and 24 values being the lowest). Values in brackets are not certified as less than 12 values were received. They are provided for information only.

Sample treatments used by participating labs are dilution with an organic solvent and acid digestion. The first method consist of dissolving the oil with an organic solvent (Premisolv, kerosene,...) and measure with ICP-MS (example: method ASTM D5708 method A). The second method is an HNO<sub>3</sub>/HCl digestion with a block heater or a micro-wave. Also method based on ASTM D5708 method B has been used. ICP-MS is used by participating labs for the two sample treatment methods.

The outliers were removed using Interquartile range rule and by data comparison 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  $2\sigma$ ) using the following formula:

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

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

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

$$\bar{x} \pm ks$$

where  
k: Factor for two-sided Tolerance Limits  
s: Standard Deviation of the Average  
x: Consensus 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 may needs improvement
Results outside Tolerance Interval	Method not working properly

## References:

ISO Guide 30: Terms and definitions used in connection with reference materials  
ISO Guide 31: Reference materials – Contents of certificates, labels and accompanying documentation  
ISO Guide 35: 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