



## SLEW-3

### *Estuarine Water Reference Material for Trace Metals*

The following table shows the twelve metals for which certified values have been established. Certified values are based on the results of determinations by at least two independent methods of analysis. The uncertainties represent 95 percent confidence limits for an individual subsample. That is, 95 percent of samples from any bottle would be expected to have concentrations within the specified range 95 percent of the time.

#### Trace Metal Concentrations (micrograms/litre)

Arsenic (n,r)	1.36 ± 0.09
Cadmium (i,m,o,r)	0.048 ± 0.004
Chromium (m,o,r)	0.183 ± 0.019
Cobalt (o,q,r)	0.042 ± 0.010
Copper (i,m,o,r)	1.55 ± 0.12
Iron (i,m,o)	0.568 ± 0.059
Lead (m,o,r)	0.0090 ± 0.0014
Manganese (d,i,q)	1.61 ± 0.22
Molybdenum (c)	(5.1)*
Nickel (i,m,o,s)	1.23 ± 0.07
Silver (m,o)	(0.003)*
Uranium (m)	(1.8)*
Vanadium (q,r)	2.57 ± 0.31
Zinc (i,m,o)	0.201 ± 0.037

\*information value only

- c - Direct determination by isotope dilution inductively coupled plasma mass spectrometry (ICPMS)
- d - Direct determination by graphite furnace atomic absorption spectrometry (GFAAS)
- i - Immobilized ligand separation, GFAAS determination
- m - Immobilized ligand separation, isotope dilution ICPMS

- n - In situ hydride generation, GFAAS determination
- o - Co-precipitation, ICPMS determination
- q - Immobilized ligand separation, ICPMS determination
- r - Reductive precipitation separation, GFAAS determination
- s - Solvent extraction, GFAAS determination

SLEW-3 is the third estuarine water certified reference material for trace metals prepared by NRC. Unlike the previous two samples, this water was gathered in the San Francisco Bay at the 5 metre level near Pt. Molate at latitude 37° 57.470' and longitude -122° 25.703'. The water was peristaltically pumped through cleaned polyethylene lined ethylvinyl acetate tubing and 0.45 µm acrylic copolymer filters. It was acidified to pH 1.6 with ultrapure nitric acid during its immediate transfer to 50-litre acid leached polypropylene carboys. The water was later refiltered through 0.2 µm porosity acrylic copolymer filters and homogenized in a 400-litre polyethylene tank in a clean room at NRC in Ottawa. It was subsequently bottled in cleaned 500 mL polyethylene bottles and gamma irradiated with 25 kGy. The salinity is 15.

This certified reference material is primarily intended for use in the calibration of procedures and the development of methods used for the analysis of seawater for trace metals. It is recommended that the material be stored in a cool, clean location. The bottles should be opened only in a clean area with precautions taken against contamination during sampling.

### Homogeneity

Randomly selected bottles were chosen for the analytical determinations. Results from different bottles showed no significant differences, nor was there any correlation between values obtained and bottle sequence. Thus, it is assumed that the trace metal concentrations of all bottles are similar.

### Certification

Certification analysis was carried out within the Institute for National Measurement Standards and by four external expert laboratories. It would appear from the values obtained that the estuarine water was not significantly contaminated in the collection and bottling process. It is anticipated that, as more data become available, certified values may be assigned to more elements. These updates will be posted on our www site ([http://inms-ienm.nrc-cnrc.gc.ca/calserv/chemical\\_metrology\\_e.html](http://inms-ienm.nrc-cnrc.gc.ca/calserv/chemical_metrology_e.html)).

Studies of similar waters indicate that the material is stable with respect to total trace metal concentrations for at least ten years.

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*The results listed in this certificate are traceable to the SI through gravimetrically prepared standards of established purity and international measurement intercomparisons. As such, they serve as suitable reference materials for laboratory quality assurance programs, as outlined in ISO/IEC 17025. This CRM is registered at the Bureau International des Poids et Mesures (BIPM) in Appendix C of the Comité International des Poids et Mesures database listing Calibration and Measurement Capabilities accepted by signatories to the Mutual Recognition Arrangement of the Metre Convention.*

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