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CERTIFICATE OF ANALYSIS FOR

QUARTZ BLANK
OREAS 22c

SUMMARY STATISTICS FOR OREAS 22c

Constituent	Certified Value	1SD	95% Confidence Interval	
			Low	High
Gold, Au (ppb)	<2	IND	IND	IND
Silver, Ag (ppm)	<0.1	IND	IND	IND
Arsenic, As (ppm)	<1	IND	IND	IND
Barium, Ba (ppm)	4.5	0.7	3.5	5.4
Bismuth, Bi (ppm)	<0.1	IND	IND	IND
Cadmium, Cd (ppm)	<0.1	IND	IND	IND
Cobalt, Co (ppm)	0.81	0.06	0.77	0.86
Copper, Cu (ppm)	10	1	9	11
Molybdenum, Mo (ppm)	4.3	0.3	4.0	4.6
Nickel, Ni (ppm)	6.3	1.6	5.1	7.6
Lead, Pb (ppm	1.0	0.5	0.4	1.5
Antimony, Sb (ppm)	0.20	0.04	0.18	0.22
Tin, Sn (ppm)	0.69	0.08	0.61	0.76
Thorium, Th (ppm)	0.70	0.06	0.65	0.74
Uranium, U (ppm)	0.18	0.04	0.16	0.19
Tungsten, W (ppm)	0.27	0.08	0.18	0.36
Zinc, Zn (ppm)	7.5	1.2	6.0	8.9

*IND - indeterminate; intervals may appear asymmetric due to rounding

Prepared by:
Ore Research & Exploration Pty Ltd
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REPORT 10-885-22c

INTRODUCTION

OREAS geochemical reference materials are intended to provide a low cost method of evaluating and improving the quality of precious metal analysis of geological samples. To the analyst they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures. To the geologist they provide a means of implementing quality control in analytical data sets generated in exploration, from the grass roots level through to prospect evaluation, and in grade control at mining operations.

SOURCE MATERIALS

OREAS 22c has been prepared from quartz sand to which 0.5% iron oxide has been added to produce a pale grey pulp. It is characterised by extremely low background gold of less than 2 parts per billion.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material was prepared in the following manner:

a) milling of the quartz sand to approximately 99.95% less than 75 microns;
b) blending with 0.5% iron oxide;
c) collection into 25kg bags;
d) packaging into 10g and 60g units in robust laminated foil pouches and into 0.5kg units in plastic jars.

The presence of a small oversize fraction is intentional in that it more closely resembles a typical sample pulp prepared in a laboratory ring mill.

ANALYTICAL PROGRAM FOR OREAS 22c

Seven laboratories participated in the analytical program to certify Au, Ag, As, Ba, Bi, Cd, Co, Cu, Mo, Ni, Pb, Sb, Sn, Th, U, W and Zn. Their results together with uncorrected means, medians, one sigma standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM^3) are presented in an appendix (Tables A2 – A18). The analytical methods employed by each laboratory are indicated as codes at the head of each laboratory data set and explained in Table A1 of the appendix. Each laboratory has been randomly designated with letter codes A through G in all tables. For gold, all the laboratories used a lead fire assay collection on 40-50g charges with an ICP-MS (5 labs), ICP-OES (1 lab) or solvent extraction AAS (1 lab) finish. The results indicate uniform impoverishment in gold making it an ideal natural blank for monitoring contamination levels in routine assay work. For the other elements, a four acid ($HF-HNO_3-HClO_4-HCl$) digest was employed with an ICP-OES or ICP-MS finish.

STATISTICAL EVALUATION OF OREAS 22c

Certified Value and Confidence Limits

The certified value is the mean of means of accepted replicate values of accepted participating laboratories computed according to the formulae

$$\bar{x}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} x_{ij}$$

$$\ddot{x} = \frac{1}{p} \sum_{i=1}^{p} \bar{x}_i$$

where

x_{ij} *is the jth result reported by laboratory i;*

p is the number of participating laboratories;

n_i *is the number of results reported by laboratory i;*

$\bar{x}_i$ *is the mean for laboratory i;*

$\ddot{x}$ *is the mean of means.*

The confidence limits were obtained by calculation of the variance of the consensus value (mean of means) and reference to Student's-*t* distribution with degrees of freedom (*p*-1).

$$\hat{V}(\ddot{x}) = \frac{1}{p(p-1)} \sum_{i=1}^{p} (\bar{x}_i - \ddot{x})^2$$

$$\text{Confidence limits} = \ddot{x} \pm t_{1-x/2}(p-1)(\hat{V}(\ddot{x}))^{1/2}$$

where $t_{1-x/2}(p-1)$ *is the 1-x/2 fractile of the t-distribution with (p-1) degrees of freedom.*

The distributions of the values are assumed to be symmetrical about the mean in the calculation of the confidence limits.

The test for rejection of individual outliers from each laboratory data set was based on *z* scores (rejected if $|z_i| > 2.5$) computed from the robust estimators of location and scale, *T* and *S*, respectively, according to the formulae

$$S = 1.483 \underset{j=1.\ldots.n}{\text{median}} / x_j - \underset{i=1.\ldots.n}{\text{median}} (x_i) /$$

$$z_i = \frac{x_i - T}{S}$$

where

T is the median value in a data set;
S is the median of all absolute deviations from the sample median multiplied by 1.483, a correction factor to make the estimator consistent with the usual parameter of a normal distribution.

The z-score test is used in combination with a second method of individual outlier detection that determines the percent deviation of the individual value from the median. Outliers in general are selected on the basis of z-scores > 2.5 and with percent deviations > 1.5%. In certain instances statistician's prerogative has been employed in discriminating outliers.
Each laboratory data set is tested for outlying status based on z-score discrimination and rejected if $|z_i| > 2.5$. After individual and lab data set outliers have been eliminated a non-iterative 3 standard deviation filter is applied, with those values lying outside this window also relegated to outlying status.
Individual outliers and, more rarely, laboratory means deemed to be outlying are shown in bold in the tabulated results (Appendix) and have been omitted in the determination of certified values. The magnitude of the confidence interval is inversely proportional to the number of participating laboratories and interlaboratory agreement. It is a measure of the reliability of the certified value, i.e. the narrower the confidence interval the greater the certainty in the certified value.

Table 1. Certified values and 95% confidence intervals for OREAS 22c

Constituent	Certified Value	95% Confidence Interval	
		Low	High
Gold, Au (ppb)	<2	IND	IND
Silver, Ag (ppm)	<0.1	IND	IND
Arsenic, As (ppm)	<1	IND	IND
Barium, Ba (ppm)	4.5	3.5	5.4
Bismuth, Bi (ppm)	<0.1	IND	IND
Cadmium, Cd (ppm)	<0.1	IND	IND
Cobalt, Co (ppm)	0.81	0.77	0.86
Copper, Cu (ppm)	10	9	11
Molybdenum, Mo (ppm)	4.3	4.0	4.6
Nickel, Ni (ppm)	6.3	5.1	7.6
Lead, Pb (ppm)	1.0	0.4	1.5
Antimony, Sb (ppm)	0.20	0.18	0.22
Tin, Sn (ppm)	0.69	0.61	0.76
Thorium, Th (ppm)	0.70	0.65	0.74
Uranium, U (ppm)	0.18	0.16	0.19
Tungsten, W (ppm)	0.27	0.18	0.36
Zinc, Zn (ppm)	7.5	6.0	8.9

*IND - indeterminate; intervals may appear asymmetric due to rounding

Statement of Homogeneity
The standard deviation of each laboratory data set includes error due to both the imprecision of the analytical method employed and to possible inhomogeneity of the material analysed. The standard deviation of the pooled individual analyses of all participating laboratories includes error due to the imprecision of each analytical method, to possible inhomogeneity of the material analysed and, in particular, to deficiencies in accuracy of each analytical method.

The calculation of tolerance was not practical for most elements in OREAS 22c due to their low concentrations and corresponding assay values close to the reading resolution of the analytical instruments employed. In determining tolerance intervals for Cu, Mo and Ni the component of error attributable to measurement inaccuracy was eliminated by transformation of the individual results of each data set to a common mean (the uncorrected grand mean) according to the formula

$$x'_{ij} = x_{ij} - \bar{x}_i + \frac{\sum_{i=1}^{p}\sum_{j=1}^{n_i} x_{ij}}{\sum_{i=1}^{p} n_i}$$

where

x_{ij} *is the jth raw result reported by laboratory i*;

x'_{ij} *is the jth transformed result reported by laboratory i*;

n_i *is the number of results reported by laboratory i*;

p *is the number of participating laboratories*;

$\bar{x}_i$ *is the raw mean for laboratory i.*

The homogeneity of each constituent was determined from tables of factors for two-sided tolerance limits for normal distributions (ISO 3207) in which

$$\textit{Lower limit is } \ddot{x} - k'_2(n,p,1-\alpha)s''_g$$
$$\textit{Upper limit is } \ddot{x} + k'_2(n,p,1-\alpha)s''_g$$

where

n the number of results
1-α is the confidence level;
p is the proportion of results expected within tolerance limits;
k'_2 is the factor for two-sided tolerance limits (m, α unknown);
s''_g is the corrected grand standard deviation.

The meaning of these tolerance limits may be illustrated for copper, where 99% of the time at least 95% of subsamples will have concentrations lying between 8 and 12 ppm (see Table 2). Put more precisely, this means that if the same number of subsamples were taken and analysed in the same manner repeatedly, 99% of the tolerance intervals so constructed would cover at least 95% of the total population, and 1% of the tolerance intervals would cover less than 95% of the total population (IS0 Guide 35).
The corrected grand standard deviation, s''_g, used to compute the tolerance intervals is the weighted means of standard deviations of all data sets for a particular constituent according to the formula

$$s''_g = \frac{\sum_{i=1}^{p}\left(s_i\left(1-\frac{s_i}{s'_g}\right)\right)}{\sum_{i=1}^{p}\left(1-\frac{s_i}{s'_g}\right)}$$

where

$$1 - \left(\frac{s_i}{2s'_g} \right) \text{ is the weighting factor for laboratory } i \text{ ;}$$

$$s'_g \text{ is the grand standard deviation computed from the transformed (i.e. means - adjusted) results}$$

according to the formula

$$s'_g = \left[\frac{\sum_{i=j}^{p} \sum_{j=i}^{n_i} \left(x'_{ij} - \bar{x}'_i \right)^2}{\sum_{i=1}^{p} n_i - 1} \right]^{1/2}$$

$$\text{where } \bar{x}'_i \text{ is the transformed mean for laboratory } i$$

The weighting factors were applied to compensate for the considerable variation in analytical precision amongst participating laboratories. Hence, weighting factors for each data set have been constructed so as to be inversely proportional to the standard deviation of that data set. A weighting factor of zero was applied to those data sets where $s_l / 2s_g' > 1$ (i.e. where the weighting factor $1 - s_l / 2s_g' < 0$). It should be noted that estimates of tolerance by this method are considered conservative as a significant proportion of the observed variance, even in those laboratories exhibiting the best analytical precision, can presumably be attributed to measurement error. Outliers were removed prior to the calculation of tolerance intervals and a weighting factor of zero was applied to those data sets where $s_l / 2s_g' > 1$ (i.e. where the weighting factor $1 - s_l / 2s_g' < 0$).

Table 2. Certified values and tolerance limits for OREAS 22c

Constituent	Certified Value	Tolerance Limits 1-α=0.99, ρ=0.95	
		Low	High
Gold, Au (ppb)	<2	IND	IND
Silver, Ag (ppm)	<0.1	IND	IND
Arsenic, As (ppm)	<1	IND	IND
Barium, Ba (ppm)	4.5	IND	IND
Bismuth, Bi (ppm)	<0.1	IND	IND
Cadmium, Cd (ppm)	<0.1	IND	IND
Cobalt, Co (ppm)	0.81	IND	IND
Copper, Cu (ppm)	10	8	12
Molybdenum, Mo (ppm)	4.3	4.0	4.5
Nickel, Ni (ppm)	6.3	3.2	9.5
Lead, Pb (ppm)	1.0	IND	IND
Antimony, Sb (ppm)	0.20	IND	IND
Tin, Sn (ppm)	0.69	IND	IND
Thorium, Th (ppm)	0.70	IND	IND
Uranium, U (ppm)	0.18	IND	IND
Tungsten, W (ppm)	0.27	IND	IND
Zinc, Zn (ppm)	7.5	IND	IND

*IND - indeterminate; intervals may appear asymmetric due to rounding

Performance Gates

Performance gates provide an indication of a level of performance that might reasonably be expected from a laboratory being monitored by this CRM in a QA/QC program. They take into account errors attributable to measurement and CRM variability. For an effective CRM the contribution of the latter should be negligible in comparison to measurement errors. Sources of measurement error include inter-lab bias and analytical precision (repeatability). Two methods have been employed to calculate performance gates. The first method uses the same filtered data set used to determine the certified value, i.e. after removal of all individual, lab dataset (batch) and 3SD outliers. These outliers can only be removed after the absolute homogeneity of the CRM has been independently established, i.e. the outliers must be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM. The standard deviation is then calculated for each analyte from the pooled individual analyses generated from the certification program. Table 9 shows performance gates calculated for two and three standard deviations. As a guide these intervals may be regarded as warning or rejection for multiple 2SD outliers, or rejection for individual 3SD outliers in QC monitoring, although their precise application should be at the discretion of the QC manager concerned.

A second method utilises a 5% window calculated directly from the certified value. Standard deviation is also shown in relative percent for one, two and three relative standard deviations (1RSD, 2RSD and 3RSD) to facilitate an appreciation of the magnitude of these numbers and a comparison with the 5% window. Caution should be exercised when concentration levels approach lower limits of detection of the analytical methods employed as performance gates calculated from standard deviations tend to be excessively wide whereas those determined by the 5% method are too narrow.

Table 3. Performance gates for OREAS 22c

Constituent	Certified Value	Absolute Standard Deviations					Relative Standard Deviations			5% window	
		1SD	2SD Low	2SD High	3SD Low	3SD High	1RSD	2RSD	3RSD	Low	High
Au (ppb)	<2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Ag (ppm)	<0.1	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
As (ppm)	<1	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Ba (ppm)	4.5	0.7	3.1	5.9	2.3	6.6	15.87%	31.74%	47.62%	4.3	4.7
Bi (ppm)	<0.1	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Cd (ppm)	<0.1	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Co (ppm)	0.81	0.06	0.70	0.93	0.64	0.98	7.02%	14.05%	21.07%	0.77	0.85
Cu (ppm)	10	1	8	12	7	13	10.99%	21.97%	32.96%	10	11
Mo (ppm)	4.3	0.3	3.6	5.0	3.2	5.3	8.09%	16.18%	24.26%	4.1	4.5
Ni (ppm)	6.3	1.6	3.2	9.5	1.6	11.1	24.83%	49.65%	74.48%	6.0	6.7
Pb (ppm)	1.0	0.5	0.0	1.9	-0.5	2.4	50.84%	101.7%	152.5%	0.9	1.0
Sb (ppm)	0.20	0.04	0.13	0.27	0.09	0.31	17.97%	35.95%	53.92%	0.19	0.21
Sn (ppm)	0.69	0.08	0.52	0.85	0.44	0.94	11.91%	23.82%	35.73%	0.65	0.72
Th (ppm)	0.70	0.06	0.57	0.82	0.51	0.88	8.82%	17.64%	26.46%	0.66	0.73
U (ppm)	0.18	0.04	0.10	0.25	0.07	0.28	20.15%	40.29%	60.44%	0.17	0.18
W (ppm)	0.27	0.08	0.12	0.43	0.04	0.51	28.72%	57.43%	86.15%	0.26	0.29
Zn (ppm)	7.5	1.2	5.1	9.8	4.0	11.0	15.64%	31.29%	46.93%	7.1	7.8

*IND - indeterminate; values may appear asymmetric due to rounding

PARTICIPATING LABORATORIES

Acme, Vancouver, BC, Canada
ALS, Brisbane, QLD, Australia
ALS, North Vancouver, BC, Canada
Bureau Veritas Amdel, Adelaide, SA, Australia
Bureau Veritas Ultra Trace, Perth, WA, Australia
Genalysis, Perth, WA, Australia
SGS, Perth, WA, Australia

PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

The quartz blank reference material OREAS 22c has been prepared and certified and is supplied by:

Ore Research & Exploration Pty Ltd
6-8 Gatwick Road
Bayswater North, VIC 3153
AUSTRALIA

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It is available in laminated foil pouches in unit sizes of 10g and 60g and in plastic jars in 0.5kg units.

INTENDED USE

OREAS 22c is a reference material intended for the following:

i) for the calibration of instruments used in the determination of the concentration of Au, Ag, As, Ba, Bi, Cd, Co, Cu, Mo, Ni, Pb, Sb, Sn, Th, U, W and Zn;
ii) for the verification of analytical methods for Au, Ag, As, Ba, Bi, Cd, Co, Cu, Mo, Ni, Pb, Sb, Sn, Th, U, W and Zn ;
iii) for the preparation of secondary reference materials of similar composition;

STABILITY AND STORAGE INSTRUCTIONS

OREAS 22c has been prepared from a barren quartz sample. The robust foil laminate film used to package it is an effective barrier to oxygen and moisture and the sealed CRM is considered to have long-term stability (>10 years) under normal storage conditions.

INSTRUCTIONS FOR THE CORRECT USE OF THE REFERENCE MATERIAL

The certified values for OREAS 22c refer to the concentration levels of Au, Ag, As, Ba, Bi, Cd, Co, Cu, Mo, Ni, Pb, Sb, Sn, Th, U, W and Zn in its packaged state.

LEGAL NOTICE

Ore Research & Exploration Pty Ltd has prepared and statistically evaluated the property values of this reference material to the best of its ability. The Purchaser by receipt hereof releases and indemnifies Ore Research & Exploration Pty Ltd from and against all liability and costs arising from the use of this material and information.

CERTIFYING OFFICER

Craig Hamlyn (B.Sc. Hons.), Geology

REFERENCES

ISO Guide 3207 (1975), Statistical interpretation of data - Determination of a statistical tolerance interval.

ISO Guide 35 (1985), Certification of reference materials - General and statistical principals.

ISO Guide 35 (2006), Reference materials - General and statistical principals for certification.

APPENDIX

Analytical Results for OREAS 22c

Table A1. Explanation of abbreviations used in Tables A2 – A18.

Abbreviation	Explanation
Std.Dev.	one sigma standard deviation
Rel.Std.Dev.	one sigma relative standard deviation
PDM[3]	percent deviation of lab mean from corrected mean of means
FA	fire assay
4A	four acid (HF-HNO_3-$HClO_4$-HCl) digest
OES	inductively coupled plasma optical emission spectrometry
MS	inductively coupled plasma mass spectrometry
SXAAS	solvent extraction atomic absorption spectrometry

Table A2. Results for Au in OREAS 22c (abbreviations as in Table A1; values in ppb).

Replicate No.	Lab A FA*MS 50g	Lab B FA*MS 40g	Lab C FA*MS 50g	Lab D FA*MS 50g	Lab E FA*SXAAS 50g	Lab F FA*OES 40g	Lab G FA*MS 50g
1	1.0	<1	<1	2.0	2.0	4.0	<1
2	1.0	<1	<1	1.0	2.0	4.0	<1
3	1.0	<1	<1	2.0	2.0	4.0	<1
4	1.0	<1	<1	1.0	2.0	4.0	<1
5	1.0	<1	<1	1.0	2.0	3.0	<1
6	1.0	<1	<1	1.0	2.0	3.0	<1
Mean	1.0			1.3	2.0	**3.7**	
Median	1.0			1.0	2.0	4.0	
Std.Dev.	0.0			0.5	0.0	0.5	
Rel.Std.Dev.	0.00%			38.73%	0.00%	14.08%	
PDM[3]	-30.77%			-7.69%	38.46%	153.85%	

Table A3. Results for Ag in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.02	<0.5	<0.1	0.01	<0.1	0.10	<0.1
2	<0.02	<0.5	<0.1	0.01	<0.1	0.10	<0.1
3	<0.02	<0.5	<0.1	0.01	<0.1	0.10	<0.1
4	<0.02	<0.5	<0.1	0.01	<0.1	0.10	<0.1
5	<0.02	<0.5	<0.1	0.01	<0.1	0.10	<0.1
6	<0.02	<0.5	<0.1	0.01	<0.1	0.10	<0.1
Mean	0.02			0.01		0.10	
Median	0.02			0.01		0.10	
Std.Dev.				0.00		0.00	
Rel.Std.Dev.				0.00%		0.00%	
PDM[3]	-53.85%			-76.92%		130.77%	

Table A4. Results for As in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.50	<1	<1	0.20	<1	<0.5	1.00
2	0.40	<1	<1	0.70	<1	<0.5	<1
3	0.50	<1	<1	<0.2	<1	<0.5	1.00
4	0.40	<1	<1	0.20	<1	0.70	2.00
5	0.30	<1	<1	<0.2	<1	0.50	2.00
6	0.40	<1	<1	0.30	<1	<0.5	1.00
Mean	0.42			0.35		0.60	**1.40**
Median	0.40			0.25		0.60	1.00
Std.Dev.	0.08			0.24		0.14	0.55
Rel.Std.Dev.	18.07%			68.01%		23.57%	39.12%
PDM[3]	-8.54%			-23.17%		31.71%	207.32%

Table A5. Results for Ba in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	10.0	4.0	7.0	10.0	4.0	4.4	5.0
2	10.0	4.0	9.0	<10	4.0	4.2	6.0
3	10.0	4.0	7.0	<10	4.0	**7.4**	4.0
4	10.0	4.0	**10.0**	<10	5.0	4.4	6.0
5	10.0	4.0	5.0	<10	4.0	4.0	6.0
6	10.0	4.0	5.0	<10	4.0	5.0	5.0
Mean	**10.0**	4.0	**7.2**	**10.0**	4.2	4.9	5.3
Median	10.0	4.0	7.0	10.0	4.0	4.4	5.5
Std.Dev.	0.0	0.0	2.0		0.4	1.3	0.8
Rel.Std.Dev.	0.00%	0.00%	28.48%		9.80%	25.91%	15.31%
PDM[3]	123.46%	-10.61%	60.15%	123.46%	-6.89%	9.50%	19.18%

Table A6. Results for Bi in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.02	<0.1	<0.1	0.01	<0.05	0.10	<0.1
2	0.01	<0.1	0.20	0.01	<0.05	0.10	<0.1
3	0.02	<0.1	<0.1	0.01	<0.05	0.10	<0.1
4	0.01	<0.1	<0.1	0.01	<0.05	<0.1	<0.1
5	0.01	<0.1	<0.1	0.01	<0.05	<0.1	<0.1
6	0.01	<0.1	<0.1	0.01	<0.05	<0.1	<0.1
Mean	0.01		0.20	0.01		0.10	
Median	0.01		0.20	0.01		0.10	
Std.Dev.	0.01			0.00		0.00	
Rel.Std.Dev.	38.73%			0.00%		0.00%	
PDM[3]	-83.51%		147.42%	-87.63%		23.71%	

Table A7. Results for Cd in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	<0.02	<0.5	<0.1	<0.02	<0.05	<0.1	<0.1
2	<0.02	<0.5	<0.1	<0.02	<0.05	<0.1	<0.1
3	<0.02	<0.5	<0.1	<0.02	0.06	<0.1	<0.1
4	<0.02	<0.5	<0.1	<0.02	0.05	<0.1	<0.1
5	<0.02	<0.5	<0.1	<0.02	<0.05	<0.1	<0.1
6	<0.02	<0.5	<0.1	0.02	<0.05	<0.1	<0.1
Mean					0.06		
Median					0.06		
Std.Dev.					0.01		
Rel.Std.Dev.					12.86%		
PDM[3]				-46.67%	46.67%		

Table A8. Results for Co in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.80	<5	0.90	0.70	0.90	0.90	1.00
2	0.80	<5	0.90	0.80	0.80	0.80	1.00
3	0.80	<5	0.80	0.80	0.70	0.90	0.90
4	0.80	<5	0.80	0.80	0.80	0.90	1.00
5	0.80	<5	0.80	0.80	0.80	0.80	1.10
6	0.80	<5	0.90	0.70	0.80	0.80	1.00
Mean	0.80		0.85	0.77	0.80	0.85	**1.00**
Median	0.80		0.85	0.80	0.80	0.85	1.00
Std.Dev.	0.00		0.05	0.05	0.06	0.05	0.06
Rel.Std.Dev.	0.00%		6.44%	6.74%	7.91%	6.44%	6.32%
PDM[3]	-1.64%		4.51%	-5.74%	-1.64%	4.51%	22.95%

Table A9. Results for Cu in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*MS	Lab G 4A*MS
1	**10.9**	12.0	12.0	**14.4**	10.0	**9.7**	11.4
2	9.4	10.0	10.0	9.4	10.0	6.0	13.1
3	10.3	10.0	10.0	9.8	10.0	4.5	9.6
4	9.4	12.0	10.0	9.0	9.0	2.3	10.8
5	9.2	12.0	9.0	8.8	9.0	1.8	10.9
6	8.8	10.0	10.0	8.8	9.0	2.1	10.1
Mean	9.7	11.0	10.2	10.0	9.5	**4.4**	11.0
Median	9.4	11.0	10.0	9.2	9.5	3.4	10.9
Std.Dev.	0.8	1.1	1.0	2.2	0.5	3.1	1.2
Rel.Std.Dev.	8.06%	9.96%	9.67%	21.67%	5.77%	69.77%	11.07%
PDM[3]	-3.70%	9.58%	1.28%	-0.05%	-5.36%	-56.17%	9.41%

Table A10. Results for Mo in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	4.67	4.50	4.40	4.02	4.00	4.10	5.00
2	4.27	4.00	4.30	3.94	3.90	4.10	5.10
3	4.50	4.50	4.30	3.90	3.90	4.20	4.60
4	4.44	4.50	4.20	3.66	4.30	4.10	4.90
5	4.36	4.50	4.20	3.69	4.10	4.10	4.80
6	4.26	4.50	4.40	3.46	4.10	4.20	4.50
Mean	4.42	4.42	4.30	3.78	4.05	4.13	4.82
Median	4.40	4.50	4.30	3.80	4.05	4.10	4.85
Std.Dev.	0.16	0.20	0.09	0.21	0.15	0.05	0.23
Rel.Std.Dev.	3.52%	4.62%	2.08%	5.58%	3.74%	1.25%	4.81%
PDM[3]	3.36%	3.36%	0.63%	-11.58%	-5.22%	-3.27%	12.72%

Table A11. Results for Ni in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*MS	Lab G 4A*MS
1	8.4	8.0	7.0	4.6	5.0	5.0	6.9
2	7.4	6.0	9.0	5.7	6.0	6.0	6.9
3	6.5	10.0	8.0	5.1	4.0	6.0	5.8
4	6.7	10.0	7.0	**13.6**	4.0	5.0	5.4
5	7.2	8.0	6.0	**13.3**	5.0	6.0	**11.3**
6	5.4	8.0	9.0	4.5	4.0	6.0	6.0
Mean	6.9	8.3	7.7	7.8	4.7	5.7	7.1
Median	7.0	8.0	7.5	5.4	4.5	6.0	6.5
Std.Dev.	1.0	1.5	1.2	4.4	0.8	0.5	2.2
Rel.Std.Dev.	14.47%	18.07%	15.80%	56.39%	17.50%	9.11%	30.75%
PDM[3]	9.21%	31.26%	20.76%	22.86%	-26.50%	-10.74%	11.04%

Table A12. Results for Pb in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	**2.70**	<1	<1	0.50	2.00	**1.10**	0.60
2	1.40	<1	5.00	0.50	2.00	**1.10**	0.60
3	1.70	<1	<1	0.50	1.00	0.90	0.40
4	1.50	<1	2.00	0.60	1.00	0.90	0.50
5	1.50	<1	4.00	0.50	1.00	0.90	0.50
6	**0.90**	<1	1.00	0.50	1.00	0.80	0.50
Mean	1.62		**3.00**	0.52	1.33	0.95	0.52
Median	1.50		3.00	0.50	1.00	0.90	0.50
Std.Dev.	0.59		1.83	0.04	0.52	0.12	0.08
Rel.Std.Dev.	36.79%		60.86%	7.90%	38.73%	12.89%	14.57%
PDM[3]	69.58%		214.69%	-45.80%	39.86%	-0.35%	-45.80%

Table A13. Results for Sb in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.20	<0.2	0.30	0.18	0.20	<0.5	0.20
2	0.18	0.20	0.30	0.17	0.20	<0.5	0.30
3	0.20	<0.2	0.20	0.17	0.20	<0.5	0.20
4	0.18	<0.2	0.20	0.15	0.20	<0.5	0.20
5	0.19	<0.2	0.20	0.17	0.20	<0.5	0.20
6	0.17	<0.2	0.20	0.16	0.20	<0.5	0.20
Mean	0.19	0.20	0.23	0.17	0.20		0.22
Median	0.19	0.20	0.20	0.17	0.20		0.20
Std.Dev.	0.01		0.05	0.01	0.00		0.04
Rel.Std.Dev.	6.49%		22.13%	6.20%	0.00%		18.84%
PDM[3]	-6.93%	-0.28%	16.34%	-16.90%	-0.28%		8.03%

Table A14. Results for Sn in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.70	<1	0.70	0.60	0.80	0.60	0.80
2	0.70	<1	0.80	0.60	0.80	0.60	0.70
3	0.70	<1	0.60	0.60	0.70	0.70	0.60
4	0.70	<1	0.70	0.60	0.80	0.70	0.80
5	0.70	<1	0.70	0.60	0.80	0.60	0.80
6	0.70	<1	0.70	0.50	0.80	0.60	0.70
Mean	0.70		0.70	0.58	0.78	0.63	0.73
Median	0.70		0.70	0.60	0.80	0.60	0.75
Std.Dev.	0.00		0.06	0.04	0.04	0.05	0.08
Rel.Std.Dev.	0.00%		9.04%	7.00%	5.21%	8.15%	11.13%
PDM[3]	1.61%		1.61%	-15.32%	13.71%	-8.06%	6.45%

Table A15. Results for Th in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.80	0.60	0.70	0.70	0.72	0.70	0.50
2	0.80	0.60	0.73	0.80	0.67	0.70	0.50
3	0.70	0.60	0.74	0.60	0.70	0.80	0.40
4	0.70	0.60	0.68	0.70	0.69	0.80	0.60
5	0.70	0.70	0.72	0.60	0.72	0.70	0.40
6	0.70	0.70	0.63	0.60	0.75	0.70	0.50
Mean	0.73	0.63	0.70	0.67	0.71	0.73	**0.48**
Median	0.70	0.60	0.71	0.65	0.71	0.70	0.50
Std.Dev.	0.05	0.05	0.04	0.08	0.03	0.05	0.08
Rel.Std.Dev.	7.04%	8.15%	5.79%	12.25%	3.93%	7.04%	15.57%
PDM[3]	5.39%	-8.98%	0.60%	-4.19%	1.80%	5.39%	-30.54%

Table A16. Results for U in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.20	0.20	0.16	0.10	**0.22**	0.30	0.20
2	0.20	0.20	**0.36**	0.20	0.17	0.30	0.20
3	0.20	0.20	0.17	0.10	0.18	0.20	0.20
4	0.20	0.20	0.15	0.20	0.18	0.20	0.20
5	0.20	0.10	0.16	0.20	0.17	0.30	0.20
6	0.10	0.20	0.17	0.10	0.17	0.20	0.20
Mean	0.18	0.18	0.20	0.15	0.18	**0.25**	0.20
Median	0.20	0.20	0.17	0.15	0.18	0.25	0.20
Std.Dev.	0.04	0.04	0.08	0.05	0.02	0.05	0.00
Rel.Std.Dev.	22.27%	22.27%	41.63%	36.51%	10.68%	21.91%	0.00%
PDM[3]	4.50%	4.50%	11.15%	-14.50%	3.55%	42.50%	14.00%

Table A17. Results for W in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	0.30	<0.5	0.30	0.20	0.20	<0.5	0.20
2	0.30	<0.5	0.40	0.20	0.30	<0.5	0.20
3	0.30	<0.5	0.30	0.20	0.20	<0.5	0.20
4	0.30	<0.5	0.50	0.20	0.20	<0.5	0.20
5	0.30	<0.5	0.40	0.20	0.30	<0.5	0.30
6	0.30	<0.5	0.40	0.20	0.30	<0.5	0.30
Mean	0.30		0.38	0.20	0.25		0.23
Median	0.30		0.40	0.20	0.25		0.20
Std.Dev.	0.00		0.08	0.00	0.05		0.05
Rel.Std.Dev.	0.00%		19.64%	0.00%	21.91%		22.13%
PDM[3]	9.76%		40.24%	-26.83%	-8.54%		-14.63%

Table A18. Results for Zn in OREAS 22c (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A -	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS
1	NR	18.0	10.0	6.0	8.0	7.5	8.0
2	NR	16.0	**13.0**	6.0	7.0	7.1	8.0
3	NR	18.0	8.0	6.0	7.0	7.7	8.0
4	NR	18.0	9.0	6.0	6.0	7.5	9.0
5	NR	16.0	10.0	6.0	6.0	7.2	8.0
6	NR	14.0	8.0	6.0	7.0	6.9	8.0
Mean		**16.7**	9.7	6.0	6.8	7.3	8.2
Median		17.0	9.5	6.0	7.0	7.4	8.0
Std.Dev.		1.6	1.9	0.0	0.8	0.3	0.4
Rel.Std.Dev.		9.80%	19.26%	0.00%	11.02%	4.09%	5.00%
PDM[3]		123.31%	29.52%	-19.61%	-8.44%	-1.97%	9.42%