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CERTIFICATE OF ANALYSIS FOR

FERRUGINOUS SOIL
SECONDARY REFERENCE MATERIAL
OREAS 45P

Prepared by:
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INTRODUCTION

OREAS reference materials (RM) are intended to provide a low cost method of evaluating and improving the quality of precious and base 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 explorationist they provide an important control in analytical data sets related to exploration from the grass roots level through to prospect evaluation. To the production geologist they provide an important QC tool in grade control.

As a rule only source materials exhibiting an exceptional level of homogeneity of the element(s) of interest are used in the preparation of these materials. This has enabled Ore Research & Exploration to produce a range of gold RM exhibiting homogeneity that matches or exceeds that of currently available international reference materials. In some instances RM produced from a single source are sufficiently homogeneous to produce a relatively coarse-grained form designed to simulate drill chip samples. These have a grain size of minus 3mm and are designated with a "C" suffix to the RM identification number. These standards are packaged in 1kg units following homogenisation and are intended for submission to analytical laboratories in subsample sizes of as little as 250g. They offer the added advantages of providing a check on both sample preparation and analytical procedures while acting as a blind standard to the assay laboratory. The more conventional pulped standards have a grain size of minus 20 to 75 microns and a higher degree of homogeneity. In line with ISO recommendations successive batch numbers are now designated by the lower case suffixes "a", "b", "c", "d", etc.

SOURCE MATERIALS

Multi-element soil standard OREAS 45P was prepared from a sample of ferruginous soil, containing anomalous levels of precious and base metals, and a barren soil sample. The anomalous sample was obtained from soil developed over a Ni-Cu-PGE mineralised contact between gabbro and pyroxenite the Southern Murchison region of Western Australia while the barren sample was taken from an in situ layer of mature soil developed over early Tertiary olivine basalt in outer eastern Melbourne, Victoria, Australia.

COMMINUTION AND HOMOGENISATION PROCEDURES

OREAS 45P was prepared in the following manner:

a) drying each sample to constant mass at 105^0 C;
b) crushing and screening each sample;
c) milling anomalous soil to minus 25 microns;
d) milling barren soil to minus 75 microns;
e) thorough homogenisation of a 60:40 blend of the PGE anomalous and barren soils;
f) packaging into 60g lots sealed in laminated foil pouches.

ANALYSIS OF OREAS 45P

Eight commercial laboratories participated in the analytical program to characterise elements listed in Tables 1 - 4. 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 Appendix A, B, C and D. The parameter PDM^3 (percent deviation of lab mean from the corrected mean of means) is a measure of laboratory accuracy while RSD (the relative standard deviation) is an effective measure of analytical precision where homogeneity of the test material has been confirmed. The analytical methods employed by each laboratory are given in column headings and explained in Table 1 of each appendix.

With the exception of Lab A, five 60g were submitted to each laboratory for analysis and were taken at spaced intervals during packaging of the standard in order to maximise their representation. Each laboratory was instructed to determine: Au, Pt and Pd by fire assay ICPMS; Ag, As, Bi, Cd, Co, Cr, Cu, Ni, Pb, Sb, Zn by four-acid digest and ICPOES or ICPMS; Ag, As, Au, Bi, Cd, Co, Cr, Cu, Ni, Pb, Pd, Pt, Sb, Zn by aqua regia and ICPOES or ICPMS; major elements by fusion XRF or fusion ICPOES; C and S by Leco furnace; lithophile trace elements by fusion ICPMS. Lab A determined As, Au, Ce, La, Lu, Na and Sb in twenty two replicates via instrumental neutron activation analysis (INAA) using reduced analytical subsample weights of 4g.

STATISTICAL EVALUATION OF ANALYTICAL DATA FOR OREAS 45P

Recommended 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).

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

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

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

The distribution 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

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

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

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.

Table 1. Recommended values and 95% confidence intervals for major elements, LOI, C & S by fusion XRF/ICPOES and Leco in OREAS 45P.

Constituent	Recommended value	95% Confidence Interval	
		Low	High
Aluminium, Al (% wt.)	6.82	6.71	6.92
Calcium, Ca (% wt.)	0.30	0.30	0.30
Carbon, C (% wt.)	2.36	2.20	2.52
Chromium, Cr (% wt.)	0.114	0.110	0.118
Iron, Fe (% wt.)	19.22	19.09	19.36
Loss on Ignition, LOI (% wt.)	11.19	10.99	11.39
Magnesium, Mg (% wt.)	0.22	0.21	0.23
Manganese, Mn (% wt.)	0.127	0.121	0.133
Phosphorous, P (% wt.)	0.047	0.044	0.050
Potassium, K (% wt.)	0.35	0.34	0.36
Silicon, Si (% wt.)	20.42	20.28	20.55
Sodium, Na (% wt.)	0.081	0.076	0.086
Sulphur, S (% wt.)	0.030	0.027	0.033
Titanium, Ti (% wt.)	1.18	1.15	1.22

In certain instances statistician's prerogative has been employed in discriminating outliers. Individual outliers and, more rarely, laboratory means deemed to be outlying are shown in bold (appendix) and have been omitted in the determination of recommended 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 recommended value, i.e. the narrower the confidence interval the greater the certainty in the recommended value.

Table 2. Recommended values and 95% confidence intervals for precious and base metals by fire assay or four-acid digest ICPOES/MS in OREAS 45P.

Constituent	Recommended value	95% Confidence Interval	
		Low	High
Antimony, Sb (ppm)	0.92	0.83	1.01
Arsenic, As (ppm)	13.4	11.9	14.86
Bismuth, Bi (ppm)	0.21	0.19	0.22
Cadmium, Cd (ppm)	< 0.2	IND	IND
Chromium, Cr (ppm)	1103	1065	1141
Cobalt, Co (ppm)	120	113	127
Copper, Cu (ppm)	749	740	759
Gold, Au (ppb)	55	50	60
Lead, Pb (ppm)	22	22	23
Nickel, Ni (ppm)	385	369	401
Palladium, Pd (ppb)	55	53	58
Platinum, Pt (ppb)	76	71	81
Silver, Ag (ppm)	0.32	0.27	0.36
Zinc, Zn (ppm)	141	136	146

Table 3. Recommended values and 95% confidence intervals for precious and base metals by aqua regia digest ICPOES/MS in OREAS 45P.

Constituent	Recommended value	95% Confidence Interval	
		Low	High
Antimony, Sb (ppm)	0.38	0.30	0.46
Arsenic, As (ppm)	4.2	3.5	4.9
Bismuth, Bi (ppm)	0.18	0.16	0.21
Cadmium, Cd (ppm)	0.09	0.07	0.10
Chromium, Cr (ppm)	873	787	959
Cobalt, Co (ppm)	104	98	111
Copper, Cu (ppm)	646	592	700
Gold, Au (ppb)	49	42	56
Lead, Pb (ppm)	19	17	20
Nickel, Ni (ppm)	281	244	319
Palladium, Pd (ppb)	54	33	75
Platinum, Pt (ppb)	72	57	87
Silver, Ag (ppm)	0.30	0.28	0.32
Zinc, Zn (ppm)	122	116	129

Table 4. Recommended values and 95% confidence intervals for lithophile trace elements by fusion methods in OREAS 45P.

Constituent	Recommended value	95% Confidence Interval	
		Low	High
Barium, Ba (ppm)	281	277	284
Cerium, Ce (ppm)	48.9	46.6	51.1
Dysprosium, Dy (ppm)	4.1	3.9	4.3
Erbium, Er (ppm)	2.2	2.1	2.3
Europium, Eu (ppm)	1.2	1.07	1.24
Gadolinium, Gd (ppm)	4.0	3.7	4.2
Holmium, Ho (ppm)	0.78	0.72	0.84
Lanthanium, La (ppm)	24.8	23.7	25.9
Lutetium, Lu (ppm)	0.31	0.30	0.32
Neodymium, Nd (ppm)	21.0	19.8	22.3
Niobium, Nb (ppm)	24	22	25
Praseodymium, Pr (ppm)	5.4	4.9	5.9
Rubidium, Rb (ppm)	23.0	22.3	23.8
Samarium, Sm (ppm)	4.51	4.48	4.54
Strontium, Sr (ppm)	32.6	31.8	33.4
Terbium, Tb (ppm)	0.69	0.65	0.73
Thorium, Th (ppm)	9.8	8.9	10.7
Thulium, Tm (ppm)	0.32	0.28	0.35
Tin, Sn (ppm)	3.1	2.7	3.4
Uranium, U (ppm)	2.4	2.2	2.6
Ytterbium, Yb (ppm)	2.1	2.1	2.2
Yttrium, Y (ppm)	18.0	16.6	19.5
Zirconium, Zr (ppm)	279	264	294

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. In determining tolerance intervals for elements other than gold that 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

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

where

n *is the number of results*;

$1-\alpha$ *is the confidence level*;

p *is the proportion of results* exp*ected within the tolerance* lim*its*;

k'_2 *is the factor for two-sided tolerance* lim*its* (m, α *unknown*);

s''_g *is the corrected grand s*tan*dard deviation.*

The meaning of these tolerance limits may be illustrated for aluminium by fusion, where 99% of the time at least 95% of subsamples will have concentrations lying between 6.77 and 6.86%. 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

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

where

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

s'_g *is the grand standard deviation computed from the transformed (i.e. means - adjusted) results*

according to the formula

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

where $\bar{x}'_i$ is the transformed mean for laboratorty 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. Outliers were removed prior to the calculation of s_g' and a weighting factor of zero was applied to those data sets where $s_i / 2s_g' > 1$ (i.e. where the weighting factor $1 - s_i / 2s_g' < 0$).

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.

Table 5. Recommended values and tolerance limits for major elements, LOI, C & S by fusion XRF/ICPOES and Leco.

Constituent	Recommended value	Tolerance limits 1-α=0.99, ρ=0.95	
		Low	High
Aluminium, Al (% wt.)	6.82	6.77	6.86
Calcium, Ca (% wt.)	0.30	0.28	0.32
Carbon, C (% wt.)	2.36	2.32	2.40
Chromium, Cr (% wt.)	0.114	0.112	0.116
Iron, Fe (% wt.)	19.22	19.09	19.35
Loss on Ignition, LOI (% wt.)	11.19	11.08	11.29
Magnesium, Mg (% wt.)	0.22	0.22	0.23
Manganese, Mn (% wt.)	0.127	0.121	0.133
Phosphorous, P (% wt.)	0.047	0.045	0.049
Potassium, K (% wt.)	0.35	0.33	0.37
Silicon, Si (% wt.)	20.42	20.29	20.54
Sodium, Na (% wt.)	0.081	0.079	0.084
Sulphur, S (% wt.)	0.030	IND	IND
Titanium,Ti (% wt.)	1.18	1.17	1.19

IND - indeterminate

Table 6. Recommended values and tolerance limits for precious and base metals by fire assay or four-acid digest ICPOES/MS.

Constituent	Recommended value	Tolerance limits 1-α=0.99, ρ=0.95	
		Low	High
Antimony, Sb (ppm)	0.92	0.82	1.02
Arsenic, As (ppm)	13.4	12.14	14.60
Bismuth, Bi (ppm)	0.21	0.20	0.22
Cadmium, Cd (ppm)	< 0.2	IND	IND
Chromium, Cr (ppm)	1103	1072	1134
Cobalt, Co (ppm)	120	115	125
Copper, Cu (ppm)	749	715	784
Gold, Au (ppb)	55	50	60
Lead, Pb (ppm)	22	21	24
Nickel, Ni (ppm)	385	377	393
Palladium, Pd (ppb)	55	51	59
Platinum, Pt (ppb)	76	73	79
Silver, Ag (ppm)	0.32	0.32	0.32
Zinc, Zn (ppm)	141	135	147

IND - indeterminate

Table 7. Recommended values and tolerance limits for precious and base metals by aqua regia digest ICPOES/MS.

Constituent	Recommended value	Tolerance limits 1-α=0.99, ρ=0.95	
		Low	High
Antimony, Sb (ppm)	0.38	0.37	0.40
Arsenic, As (ppm)	4.2	3.8	4.7
Bismuth, Bi (ppm)	0.18	0.18	0.18
Cadmium, Cd (ppm)	0.09	0.08	0.09
Chromium, Cr (ppm)	873	854	892
Cobalt, Co (ppm)	104	101	107
Copper, Cu (ppm)	646	630	662
Gold, Au (ppb)	49	47	52
Lead, Pb (ppm)	19	17	20
Nickel, Ni (ppm)	281	274	289
Palladium, Pd (ppb)	54	42	66
Platinum, Pt (ppb)	72	54	90
Silver, Ag (ppm)	0.30	0.29	0.31
Zinc, Zn (ppm)	122	117	127

Table 8. Recommended values and tolerance limits for lithophile trace elements by fusion ICPMS.

Constituent	Recommended value	Tolerance limits 1-α=0.99, ρ=0.95	
		Low	High
Barium, Ba (ppm)	281	270	292
Cerium, Ce (ppm)	48.9	47.2	50.5
Dysprosium, Dy (ppm)	4.1	3.7	4.5
Erbium, Er (ppm)	2.2	2.2	2.3
Europium, Eu (ppm)	1.2	1.12	1.19
Gadolinium, Gd (ppm)	4.0	3.5	4.4
Holmium, Ho (ppm)	0.78	0.77	0.79
Lanthanium, La (ppm)	24.8	24.1	25.4
Lutetium, Lu (ppm)	0.31	0.30	0.32
Neodymium, Nd (ppm)	21.0	19.4	22.7
Niobium, Nb (ppm)	24	22	25
Praseodymium, Pr (ppm)	5.4	4.9	5.9
Rubidium, Rb (ppm)	23.0	21.8	24.3
Samarium, Sm (ppm)	4.51	4.27	4.75
Strontium, Sr (ppm)	32.6	30.4	34.8
Terbium, Tb (ppm)	0.69	0.53	0.85
Thorium, Th (ppm)	9.8	9.1	10.5
Thulium, Tm (ppm)	0.32	0.31	0.32
Tin, Sn (ppm)	3.1	IND	IND
Uranium, U (ppm)	2.4	2.2	2.6
Ytterbium, Yb (ppm)	2.1	2.0	2.3
Yttrium, Y (ppm)	18.0	17.4	18.6
Zirconium, Zr (ppm)	279	268	290

IND - indeterminate

Performance Gates

Performance gates provide an indication of a level of performance that might reasonably be expected from a laboratory being monitored by this standard in a QA/QC program. They take into account errors attributable to measurement (analytical bias and precision) and standard variability. For an effective standard the contribution of the latter should be negligible in comparison to measurement errors.

The performance gates are calculated from the standard deviation of the pooled individual analyses generated from the certification program. All individual and lab dataset (batch) outliers are removed prior to determination of the standard deviation. These outliers can only be removed if they can be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM.

Performance gates have been calculated for one, two and three standard deviations of the accepted pool of certification data and are presented in Tables 9, 10, 11 and 12. As a guide these intervals may be regarded as informational (1σ), warning or rejection for multiple outliers (2σ), or rejection for individual outliers (3σ) in QC monitoring although their precise application should be at the discretion of the QC manager concerned.

Table 9. Performance gates for major elements, LOI, C & S by fusion XRF/ICPOES and Leco.

Constituent	Recommended	1 σ		2 σ		3 σ	
	Value	Low	High	Low	High	Low	High
Aluminium, Al (% wt.)	6.82	6.71	6.92	6.61	7.02	6.50	7.13
Calcium, Ca (% wt.)	0.30	0.30	0.31	0.29	0.31	0.29	0.32
Carbon, C (% wt.)	2.36	2.20	2.53	2.03	2.69	1.87	2.86
Chromium, Cr (% wt.)	0.114	0.11	0.12	0.10	0.12	0.10	0.13
Iron, Fe (% wt.)	19.22	19.08	19.37	18.94	19.51	18.79	19.65
Loss on Ignition, LOI (% wt.)	11.19	11.00	11.38	10.81	11.57	10.62	11.75
Magnesium, Mg (% wt.)	0.22	0.21	0.23	0.20	0.24	0.19	0.26
Manganese, Mn (% wt.)	0.127	0.12	0.13	0.11	0.14	0.11	0.15
Phosphorous, P (% wt.)	0.047	0.04	0.05	0.04	0.05	0.04	0.06
Potassium, K (% wt.)	0.35	0.34	0.36	0.32	0.37	0.31	0.38
Silicon, Si (% wt.)	20.42	20.28	20.55	20.15	20.68	20.01	20.82
Sodium, Na (% wt.)	0.081	0.08	0.09	0.07	0.09	0.06	0.10
Sulphur, S (% wt.)	0.030	0.03	0.03	0.02	0.04	0.02	0.04
Titanium,Ti (% wt.)	1.18	1.15	1.22	1.11	1.25	1.08	1.28

Table 10. Performance gates for precious and base metals by fire assay or four-acid digest ICPOES/MS.

Constituent	Recommended	1 σ		2 σ		3 σ	
	Value	Low	High	Low	High	Low	High
Antimony, Sb (ppm)	0.92	0.80	1.03	0.69	1.15	0.57	1.26
Arsenic, As (ppm)	13.4	11.8	14.9	10.3	16.5	8.7	18.0
Bismuth, Bi (ppm)	0.21	0.17	0.24	0.13	0.28	0.09	0.32
Cadmium, Cd (ppm)	< 0.2	IND	IND	IND	IND	IND	IND
Chromium, Cr (ppm)	1103	1052	1153	1002	1204	951	1254
Cobalt, Co (ppm)	120	113	128	105	135	98	143
Copper, Cu (ppm)	749	733	766	717	782	700	799
Gold, Au (ppb)	55	50	60	45	65	40	71
Lead, Pb (ppm)	22	21	23	20	24	19	26
Nickel, Ni (ppm)	385	370	400	355	415	340	430
Palladium, Pd (ppb)	55	53	58	51	60	49	62
Platinum, Pt (ppb)	76	70	82	65	87	59	93
Silver, Ag (ppm)	0.32	0.29	0.34	0.27	0.36	0.25	0.38
Zinc, Zn (ppm)	141	135	147	129	153	123	159
Antimony, Sb (ppm)	0.92	0.80	1.03	0.69	1.15	0.57	1.26
Arsenic, As (ppm)	13.4	11.8	14.9	10.3	16.5	8.7	18.0

Table 11. Performance gates for precious and base metals by aqua regia digest ICPOES/MS.

Constituent	Recommended Value	1 σ		2 σ		3 σ	
		Low	High	Low	High	Low	High
Antimony, Sb (ppm)	0.38	0.32	0.45	0.25	0.52	0.18	0.59
Arsenic, As (ppm)	4.2	3.5	4.9	2.8	5.6	2.2	6.3
Bismuth, Bi (ppm)	0.18	0.16	0.20	0.14	0.22	0.12	0.24
Cadmium, Cd (ppm)	0.09	0.07	0.10	0.06	0.12	0.04	0.13
Chromium, Cr (ppm)	873	785	961	697	1049	609	1137
Cobalt, Co (ppm)	104	98	110	92	117	86	123
Copper, Cu (ppm)	646	590	702	534	758	478	814
Gold, Au (ppb)	49	45	53	41	57	37	62
Lead, Pb (ppm)	19	17	20	16	21	14	23
Nickel, Ni (ppm)	281	242	320	203	359	164	398
Palladium, Pd (ppb)	54	40	68	27	81	13	95
Platinum, Pt (ppb)	72	63	81	54	89	46	98
Silver, Ag (ppm)	0.30	0.28	0.32	0.25	0.35	0.23	0.37
Zinc, Zn (ppm)	122	115	129	108	136	101	143

Table 12. Performance gates for lithophile elements by fusion ICPMS.

Constituent	Recommended Value	1 σ		2 σ		3 σ	
		Low	High	Low	High	Low	High
Barium, Ba (ppm)	281	275	286	270	291	265	296
Cerium, Ce (ppm)	48.9	47.3	50.5	45.6	52.1	44.0	53.7
Dysprosium, Dy (ppm)	4.1	3.9	4.3	3.7	4.5	3.6	4.7
Erbium, Er (ppm)	2.2	2.1	2.3	2.0	2.4	2.0	2.5
Europium, Eu (ppm)	1.2	1.1	1.2	1.0	1.3	1.0	1.4
Gadolinium, Gd (ppm)	4.0	3.8	4.2	3.6	4.4	3.3	4.6
Holmium, Ho (ppm)	0.78	0.74	0.83	0.69	0.87	0.64	0.92
Lanthanium, La (ppm)	24.8	23.7	25.8	22.7	26.8	21.7	27.8
Lutetium, Lu (ppm)	0.31	0.29	0.33	0.26	0.36	0.24	0.38
Neodymium, Nd (ppm)	21.0	20.4	21.7	19.7	22.4	19.0	23.1
Niobium, Nb (ppm)	24	23	25	21	26	20	27
Praseodymium, Pr (ppm)	5.42	5.21	5.63	5.00	5.84	4.79	6.06
Rubidium, Rb (ppm)	23.0	22.3	23.7	21.6	24.5	20.9	25.2
Samarium, Sm (ppm)	4.51	4.37	4.65	4.23	4.79	4.09	4.93
Strontium, Sr (ppm)	32.6	31.3	33.9	30.0	35.2	28.7	36.6
Terbium, Tb (ppm)	0.69	0.65	0.73	0.60	0.78	0.56	0.82
Thorium, Th (ppm)	9.8	8.9	10.7	8.0	11.6	7.2	12.5
Thulium, Tm (ppm)	0.32	0.29	0.34	0.26	0.37	0.23	0.40
Tin, Sn (ppm)	3.1	2.8	3.4	2.5	3.6	2.3	3.9
Uranium, U (ppm)	2.4	2.2	2.6	2.0	2.8	1.8	3.0
Ytterbium, Yb (ppm)	2.1	2.0	2.3	1.9	2.4	1.8	2.5
Yttrium, Y (ppm)	18.0	16.6	19.4	15.2	20.8	13.8	22.2
Zirconium, Zr (ppm)	279	265	293	251	307	237	321

PARTICIPATING LABORATORIES

Acme Analytical Laboratories, Vancouver, BC, Canada
ALS Chemex, North Vancouver, BC, Canada
ALS Chemex, Stafford, QLD, Australia
Becquerel Laboratories, Lucas Heights, NSW, Australia
Genalysis Laboratory Services, Maddington, WA, Australia
Lakefield-Geosol, Belo Horizonte, MG, Brasil
SGS Analabs, Welshpool, WA, Australia
Ultra Trace, Cannington, WA, Australia

PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

The multi-element reference material OREAS 45P has been prepared and certified and is supplied by:

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

Telephone	(03) 9729 0333	International	+613-9729 0333
Facsimile	(03) 9729 4777	International	+613-9729 4777
Email	info@ore.com.au		
Web	www.ore.com.au		

It is available in unit sizes of 10 and 60 grams and 1 kg.

INTENDED USE

OREAS 45P is a secondary reference material intended for the quality control monitoring of analytical data sets.

STABILITY AND STORAGE INSTRUCTIONS

OREAS 45P has been prepared from a mixture of a ferruginous soil sample developed over mineralised ultramafics and a mature soil developed over barren olivine basalt. OREAS 45P is an oxidised reference material and is stable in the laminated foil pouches under normal conditions of storage and has a shelf life beyond ten years.

INSTRUCTIONS FOR THE CORRECT USE OF THE REFERENCE MATERIAL

The recommended value for OREAS 45P refers to the concentration level of elements after removal of hygroscopic moisture by drying in air to constant mass at 105^0 C. If the reference material is not dried by the user prior to analysis, the recommended value should be corrected to the moisture-bearing basis.

REFERENCES

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

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

APPENDIX A

Analytical results for precious and base metals by fire assay or four-acid digest ICPOES/MS in OREAS 45P

Table A1. Key to abbreviations used in Tables A2 – A17.

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
4A	four acid (HF-HNO_3-$HClO_4$-HCl) digestion
FA	fire assay (lead collection with HCl leach)
BF	lithium borate fusion
OES	inductively coupled plasma optical emission spectrometry
MS	inductively coupled plasma mass spectrometry
XRF	X-ray fluorescence

Table A2. Analytical results for silver in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS	Lab H 4A*OES
1	0.10	0.33	0.30	0.50	**1.00**	0.30	< 3
2	0.10	0.33	0.35	0.50	< 0.5	0.30	< 3
3	0.10	0.35	0.30	0.50	< 0.5	0.30	< 3
4	0.10	0.32	0.30	0.50	< 0.5	0.30	< 3
5	0.10	0.35	0.30	0.50	< 0.5	0.30	< 3
Mean	**0.10**	0.34	0.31	**0.50**	< 0.5	0.30	< 3
Median	0.10	0.33	0.30	0.50	< 0.5	0.30	< 3
Std.Dev.	0.00	0.01	0.02	0.00	-	0.00	-
Rel.Std.Dev.	0.00%	3.99%	7.21%	0.00%	-	0.00%	-
PDM[3]	-68.29%	6.55%	-1.69%	58.56%	-	-4.86%	-

Table A3. Analytical results for arsenic in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab A INAA (4g)	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS	Lab H 4A*OES
1	11.2	13.0	4.1	14.0	13.0	16.0	12.5	11.5
2	12.5	12.0	4.8	13.5	14.0	16.0	11.6	12.0
3	14.2	11.0	5.0	14.5	14.0	14.0	12.7	12.0
4	11.9	13.0	4.0	15.0	14.0	16.0	11.9	12.0
5	13.4	11.0	3.4	14.0	14.0	16.0	11.5	12.0
6	12.4							
7	12.7							
8	12.3							
9	12.8							
10	12.5							
11	12.3							
12	11.6							
13	**10.1**							
14	11.9							
15	13.5							
16	11.8							
17	12.2							
18	12.7							
19	13.3							
20	13.1							
21	11.7							
22	14.1							
Mean	12.5	12.0	**4.3**	14.2	13.8	15.6	12.0	11.9
Median	12.5	12.0	4.1	14.0	14.0	16.0	11.9	12.0
Std.Dev.	0.9	1.0	0.6	0.6	0.4	0.9	0.5	0.2
Rel.Std.Dev.	7.6%	8.33%	15.18%	4.01%	3.24%	5.73%	4.46%	1.88%
PDM[3]	-6.82%	-10.24%	-68.1%	6.2%	3.22%	16.69%	-9.94%	-11.0%

Table A4. Analytical results for gold in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab A INAA (4g)	Lab B FA*MS	Lab C FA*MS	Lab D FA*MS	Lab E FA*MS	Lab F FA*MS	Lab G FA*MS	Lab H FA*OES
1	52.9	57	56	43	39	56	72	59
2	63.8	58	57	46	40	55	74	60
3	56.0	59	55	47	42	55	67	63
4	47.7	57	56	46	44	56	66	60
5	48.0	57	53	48	42	56	69	**55**
6	49.4							
7	59.7							
8	60.7							
9	51.0							
10	61.2							
11	52.4							
12	65.0							
13	48.5							
14	61.4							
15	66.4							
16	59.8							
17	55.9							
18	55.7							
19	57.5							
20	49.7							
21	61.6							
22	55.1							
Mean	56	58	55	46	**41**	56	**70**	59
Median	56	57	56	46	42	56	69	60
Std.Dev.	6	1	2	2	2	1	3	3
Rel.Std.Dev.	10.3%	1.55%	2.74%	4.07%	4.71%	0.99%	4.83%	4.85%
PDM[3]	1.97%	4.26%	0.3%	-16.7%	-25.06%	0.64%	25.98%	7.5%

Table A5. Analytical results for bismuth in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS	Lab H 4A*OES
1	0.22	0.22	0.20	0.20	0.20	0.22	< 20
2	0.20	0.23	0.20	0.20	0.20	0.21	< 20
3	0.18	0.24	0.20	0.20	0.20	0.22	< 20
4	0.19	0.23	0.20	0.20	0.20	0.21	< 20
5	0.20	0.22	0.20	**0.40**	0.20	0.21	< 20
Mean	0.20	0.23	0.20	0.24	0.20	0.21	< 20
Median	0.20	0.23	0.20	0.20	0.20	0.21	< 20
Std.Dev.	0.01	0.01	0.00	0.09	0.00	0.01	-
Rel.Std.Dev.	7.49%	3.67%	0.00%	37.27%	0.00%	2.56%	-
PDM[3]	-4.19%	10.32%	-3.23%	16.13%	-3.23%	3.55%	-

Table A6. Analytical results for cadmium in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*MS	Lab H 4A*OES
1	0.10	0.08	0.10	< 0.1	< 0.5	<0.1	< 3
2	< 0.1	0.09	0.10	< 0.1	< 0.5	<0.1	< 3
3	0.10	0.09	0.20	< 0.1	< 0.5	<0.1	< 3
4	< 0.1	0.09	0.20	< 0.1	< 0.5	<0.1	< 3
5	0.10	0.09	0.20	< 0.1	< 0.5	<0.1	< 3
Mean	0.1	0.1	0.2	< 0.1	< 0.5	< 0.1	< 3
Median	0.1	0.1	0.2	< 0.1	< 0.5	< 0.1	< 3
Std.Dev.	0.0	0.0	0.1	-	-	-	-
Rel.Std.Dev.	0.00%	5.08%	34.23%	-	-	-	-
PDM[3]	-	-	-	-	-	-	-

Table A7. Analytical results for cobalt in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*OES
1	119	126	115	130	125	115	107
2	116	127	120	129	125	109	111
3	**111**	129	118	131	115	118	108
4	121	**131**	123	132	125	115	111
5	121	126	120	133	120	112	109
Mean	118	128	119	131	122	114	109
Median	119	127	120	131	125	115	109
Std.Dev.	4.2	2.2	2.9	1.6	4.5	3.4	1.8
Rel.Std.Dev.	3.58%	1.70%	2.48%	1.21%	3.67%	3.01%	1.64%
PDM[3]	-2.05%	6.37%	-1.20%	9.03%	1.54%	-5.28%	-9.11%

Table A8. Analytical results for chromium in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*OES
1	1113	923	1161	1090	1160	1080	925
2	1121	924	1149	1090	1150	1030	948
3	**1093**	**977**	1174	1110	980	1110	939
4	1107	941	**1106**	1110	1140	1070	939
5	1111	910	1159	1110	1010	1040	933
Mean	1109	**935**	1150	1102	1088	1066	**937**
Median	1111	924	1159	1110	1140	1070	939
Std.Dev.	10.3	25.9	26.0	11.0	85.8	32.1	8.5
Rel.Std.Dev.	0.93%	2.77%	2.26%	0.99%	7.89%	3.01%	0.91%
PDM[3]	0.55%	-15.23%	4.24%	-0.08%	-1.35%	-3.35%	-15.06%

Table A9. Analytical results for copper in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*OES
1	761	836	743	742	755	753	673
2	771	827	755	740	750	711	679
3	746	**891**	769	749	725	788	668
4	755	856	761	753	740	744	674
5	751	820	751	769	730	725	673
Mean	756.8	**846.0**	755.8	750.6	740.0	744.2	**673.4**
Median	755.0	836.0	755.0	749.0	740.0	744.0	673.0
Std.Dev.	9.7	28.6	9.6	11.5	12.7	29.4	3.9
Rel.Std.Dev.	1.28%	3.38%	1.27%	1.54%	1.72%	3.96%	0.58%
PDM[3]	0.98%	12.88%	0.84%	0.15%	-1.26%	-0.70%	-10.15%

Table A10. Analytical results for sodium in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E BF*XRF	Lab F BF*XRF	Lab G 4A*OES
1	814	800	710	600	890	800
2	819	800	735	700	**816**	800
3	806	800	735	**800**	890	800
4	810	800	710	600	890	800
5	806	800	710	600	890	800
Mean	811	800	720	**660**	875	800
Median	810	800	710	600	890	800
Std.Dev.	5.6	0.0	13.7	89.4	33.2	0.0
Rel.Std.Dev.	0.69%	0.00%	1.90%	13.55%	3.79%	0.00%
PDM[3]	0.84%	-0.53%	-10.47%	-17.94%	8.84%	-0.53%

Table A11. Analytical results for nickel in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*OES
1	392	398	382	395	375	370	299
2	398	400	385	393	375	352	301
3	385	411	390	400	370	376	298
4	386	406	382	401	375	359	301
5	391	394	384	404	370	355	300
Mean	390	402	385	399	373	362	**300**
Median	391	400	384	400	375	359	300
Std.Dev.	5	7	3	5	3	10	1
Rel.Std.Dev.	1.34%	1.67%	0.88%	1.13%	0.73%	2.82%	0.43%
PDM[3]	1.37%	4.33%	-0.15%	3.50%	-3.15%	-5.90%	-22.16%

Table A12. Analytical results for phosphorous in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E BF*XRF	Lab F BF*XRF	Lab G 4A*OES
1	489	350	405	460	458	<1000
2	486	380	425	470	441	<1000
3	466	380	425	470	454	<1000
4	469	330	425	470	445	<1000
5	477	360	420	470	450	<1000
Mean	477	**360**	420	468	450	**<1000**
Median	477	360	425	470	450	<1000
Std.Dev.	10.1	21.2	8.7	4.5	6.9	-
Rel.Std.Dev.	2.12%	5.89%	2.06%	0.96%	1.54%	-
PDM[3]	5.21%	-20.66%	-7.44%	3.14%	-0.92%	-

Table A13. Analytical results for lead in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*OES	Lab G 4A*MS	Lab H 4A*OES
1	24	21	22	22	25	23	18
2	22	21	22	22	24	22	19
3	21	22	23	23	21	23	17
4	22	22	23	22	24	22	17
5	21	21	21	24	**28**	22	18
Mean	22	22	22	23	24	22	**18**
Median	22	21	22	22	24	22	18
Std.Dev.	1.2	0.3	0.8	0.9	2.5	0.6	0.8
Rel.Std.Dev.	5.57%	1.60%	3.84%	3.96%	10.29%	2.91%	4.70%
PDM[3]	-1.51%	-3.31%	-0.84%	1.17%	9.23%	-0.71%	-20.32%

Table A14. Analytical results for palladium in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B FA*MS	Lab C FA*MS	Lab D FA*MS	Lab E FA*MS	Lab F FA*MS	Lab G FA*MS	Lab H FA*OES
1	56	58	**41**	53	57	54	55
2	56	60	43	56	57	**57**	55
3	58	58	45	56	54	51	55
4	56	58	44	58	55	51	54
5	56	55	45	58	55	51	54
Mean	56.4	57.8	**43.5**	56.0	55.6	52.8	54.6
Median	56.0	58.0	44.4	56.0	55.0	51.0	55.0
Std.Dev.	0.9	1.8	1.8	1.8	1.3	2.7	0.5
Rel.Std.Dev.	1.59%	3.09%	4.20%	3.28%	2.41%	5.08%	1.00%
PDM[3]	1.88%	4.41%	-21.38%	1.16%	0.44%	-4.62%	-1.37%

Table A15. Analytical results for platinum in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B FA*MS	Lab C FA*MS	Lab D FA*MS	Lab E FA*MS	Lab F FA*MS	Lab G FA*MS	Lab H FA*OES
1	80	73	64	71	82	86	71
2	82	75	67	72	81	87	73
3	81	73	72	74	81	79	73
4	82	72	68	76	82	80	75
5	80	70	71	75	82	80	74
Mean	81	73	68	73	82	82	73
Median	81	73	68	74	82	80	73
Std.Dev.	1	2	3	2	1	4	1
Rel.Std.Dev.	1.23%	2.48%	4.75%	3.17%	0.67%	4.41%	2.03%
PDM[3]	6.50%	-4.49%	-10.33%	-3.49%	7.29%	8.26%	-3.75%

Table A16. Analytical results for antimony in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab A INAA (4g)	Lab B FA*MS	Lab C FA*MS	Lab D FA*MS	Lab E FA*MS	Lab F FA*MS	Lab G FA*MS	Lab H 4A*OES
1	0.77	0.95	0.33	0.80	1.00	0.80	1.00	< 10
2	0.86	0.73	0.32	0.90	1.00	1.20	0.90	< 10
3	0.86	0.78	0.33	0.75	1.00	1.00	1.00	< 10
4	0.93	0.76	0.30	0.85	1.00	1.00	1.00	< 10
5	1.02	0.85	0.31	0.80	1.00	1.00	0.90	< 10
6	0.91							
7	1.04							
8	0.70							
9	1.18							
10	0.91							
11	0.82							
12	0.71							
13	0.70							
14	1.07							
15	0.68							
16	0.93							
17	1.09							
18	0.81							
19	0.87							
20	1.00							
21	1.06							
22	1.24							
Mean	0.92	0.81	**0.32**	0.82	1.00	1.00	0.96	< 10
Median	0.91	0.78	0.32	0.80	1.00	1.00	1.00	< 10
Std.Dev.	0.16	0.09	0.01	0.06	0.00	0.14	0.05	-
Rel.Std.Dev.	17.2%	10.80%	4.10%	6.95%	0.00%	14.14%	5.71%	-
PDM[3]	-0.03%	-11.20%	-65.3%	-10.5%	9.10%	9.10%	4.73%	-

Table A17. Analytical results for zinc in standard OREAS 45P (refer Table A1 for abbreviations; values in ppm).

Replicate No.	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*OES
1	146	141	139	129	150	142	136
2	148	136	137	136	150	138	138
3	140	142	145	134	145	146	136
4	143	147	**152**	133	150	145	135
5	149	142	140	131	150	140	136
Mean	145.2	141.6	142.5	132.6	149.0	142.2	136.2
Median	146.0	142.0	140.0	133.0	150.0	142.0	136.0
Std.Dev.	3.7	3.9	6.1	2.7	2.2	3.3	1.1
Rel.Std.Dev.	2.55%	2.76%	4.28%	2.04%	1.50%	2.35%	0.80%
PDM[3]	2.99%	0.43%	1.07%	-5.95%	5.68%	0.86%	-3.40%

APPENDIX B

Analytical results for aqua regia digest ICPOES/MS in OREAS 45P

Table B1. Key to abbreviations used in Tables B2 – B15.

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
AR	aqua regia digestion
OES	inductively coupled plasma optical emission spectrometry
MS	inductively coupled plasma mass spectrometry

Table B2. Analytical results for silver in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	0.29	0.31	0.28	0.30	0.20	0.32	< 1
2	0.30	0.30	0.28	0.30	0.30	0.34	< 1
3	0.31	0.30	0.28	0.30	0.30	0.33	< 1
4	0.31	0.31	0.29	0.30	0.30	0.33	< 1
5	0.31	0.31	0.29	0.30	0.30	**0.37**	< 1
Mean	0.30	0.3	0.3	0.3	0.3	0.3	< 1
Median	0.31	0.3	0.3	0.3	0.3	0.3	< 1
Std.Dev.	0.0	0.0	0.0	0.0	0.0	0.0	-
Rel.Std.Dev.	2.94%	1.79%	1.42%	0.00%	15.97%	5.69%	-
PDM[3]	1.21%	1.88%	-6.05%	-0.12%	-6.78%	12.53%	-

Table B3. Analytical results for arsenic in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	4.2	**4.6**	4.6	4.0	5.2	3.1	< 5
2	4.2	4.1	4.6	4.0	4.8	3.1	< 5
3	4.6	4.0	4.6	4.0	5.0	2.9	< 5
4	4.5	3.9	4.8	4.0	**4.2**	2.9	< 5
5	4.6	3.7	4.8	5.0	5.2	3.1	< 5
Mean	4.4	4.1	4.7	4.2	4.9	**3.0**	< 5
Median	4.5	4.0	4.6	4.0	5.0	3.1	< 5
Std.Dev.	0.2	0.3	0.1	0.4	0.4	0.1	-
Rel.Std.Dev.	4.64%	8.28%	2.78%	10.65%	8.50%	3.63%	-
PDM[3]	4.93%	-3.62%	10.62%	-0.30%	15.85%	-28.31%	-

Table B4. Analytical results for gold in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	**59**	N/A	45	N/A	54	47	N/A
2	51	N/A	47	N/A	**50**	46	N/A
3	50	N/A	44	N/A	54	46	N/A
4	53	N/A	42	N/A	53	46	N/A
5	52	N/A	45	N/A	56	47	N/A
Mean	53	-	44	-	53	46	-
Median	52.0	-	44.8	-	54.0	46.0	-
Std.Dev.	3.5	-	1.7	-	2.2	0.5	-
Rel.Std.Dev.	6.67%	-	3.72%	-	4.10%	1.18%	-
PDM[3]	7.81%	-	-9.50%	-	8.62%	-5.61%	-

Table B5. Analytical results for bismuth in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	0.17	0.18	0.19	< 20	0.16	0.21	< 10
2	0.17	0.19	0.19	< 20	0.16	0.21	< 10
3	0.18	0.18	0.19	< 20	0.16	0.20	< 10
4	0.16	0.18	0.19	< 20	0.16	0.21	< 10
5	0.15	0.18	0.19	< 20	0.16	0.23	< 10
Mean	0.17	0.18	0.19	< 20	0.16	0.21	< 10
Median	0.17	0.18	0.19	< 20	0.16	0.21	< 10
Std.Dev.	0.0	0.0	0.0	-	0.0	0.0	-
Rel.Std.Dev.	6.87%	2.46%	0.00%	-	0.00%	5.17%	-
PDM[3]	-8.79%	0.00%	4.40%	-	-12.09%	16.48%	-

Table B6. Analytical results for cadmium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	0.08	0.08	0.09	0.10	0.10	0.09	< 1
2	0.06	0.07	0.09	0.10	0.05	0.09	< 1
3	0.08	0.08	0.09	0.10	0.05	0.09	< 1
4	0.07	0.09	0.09	0.10	0.10	**0.26**	< 1
5	0.07	0.08	0.09	0.10	0.10	0.10	< 1
Mean	0.07	0.08	0.09	0.10	0.08	0.13	< 1
Median	0.07	0.08	0.09	0.10	0.10	0.09	< 1
Std.Dev.	0.01	0.01	0.00	0.00	0.03	0.08	-
Rel.Std.Dev.	11.62%	8.84%	2.51%	0.00%	34.23%	59.55%	-
PDM[3]	-15.87%	-6.52%	3.99%	16.85%	-6.52%	47.22%	-

Table B7. Analytical results for cobalt in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*OES	Lab G AR*MS	Lab H AR*OES
1	108	103	108	110	107	91	93
2	106	99	111	110	108	91	93
3	105	103	110	110	108	90	92
4	105	104	111	110	107	91	95
5	102	98	113	100	108	89	95
Mean	105	101	110	108	108	**90**	94
Median	105	103	111	110	108	91	93
Std.Dev.	2.1	2.4	1.9	4.5	0.5	0.9	1.3
Rel.Std.Dev.	1.98%	2.34%	1.71%	4.14%	0.51%	0.99%	1.43%
PDM[3]	0.79%	-2.89%	5.79%	3.50%	3.11%	-13.37%	-10.30%

Table B8. Analytical results for chromium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*OES	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*OES	Lab G AR*MS	Lab H AR*OES
1	1002	875	922	940	745	821	754
2	984	859	924	980	**735**	826	758
3	990	884	914	955	780	815	759
4	992	901	926	980	775	825	756
5	985	867	936	995	785	812	765
Mean	991	877	924	970	764	820	758
Median	990	875	924	980	775	821	758
Std.Dev.	7	16	8	22	23	6	4
Rel.Std.Dev.	0.73%	1.85%	0.86%	2.28%	2.94%	0.75%	0.55%
PDM[3]	13.46%	0.47%	5.86%	11.10%	-12.49%	-6.10%	-13.13%

Table B9. Analytical results for copper in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*OES	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*OES	Lab G AR*MS	Lab H AR*OES
1	680	745	643	634	548	676	588
2	671	728	644	626	537	682	592
3	673	736	656	632	568	672	597
4	678	761	644	637	559	685	598
5	665	721	651	624	583	675	599
Mean	673	738	648	631	559	678	595
Median	673	736	644	632	559	676	597
Std.Dev.	5.9	15.6	5.7	5.5	17.8	5.3	4.7
Rel.Std.Dev.	0.88%	2.11%	0.88%	0.87%	3.18%	0.79%	0.78%
PDM[3]	4.25%	14.28%	0.27%	-2.38%	-13.46%	4.96%	-7.92%

Table B10. Analytical results for nickel in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*OES	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*OES	Lab G AR*MS	Lab H AR*OES
1	352	305	297	292	248	259	222
2	337	299	303	286	249	260	220
3	334	308	300	289	258	257	217
4	337	**317**	301	290	260	258	220
5	359	304	**310**	285	263	255	223
Mean	344	307	302	288	256	258	220
Median	337	305	301	289	258	258	220
Std.Dev.	11.0	6.7	4.9	2.9	6.7	1.9	2.3
Rel.Std.Dev.	3.21%	2.17%	1.62%	1.00%	2.63%	0.75%	1.04%
PDM[3]	22.14%	8.93%	7.40%	2.46%	-9.19%	-8.41%	-21.70%

Table B11. Analytical results for lead in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	18.0	21.1	18.3	20.0	17.0	17.0	19.0
2	18.0	20.4	18.7	20.0	16.0	18.0	19.0
3	18.0	**20.0**	18.4	**< 20**	16.0	18.0	18.0
4	17.0	20.9	18.6	20.0	17.0	17.0	17.0
5	17.0	21.0	18.8	20.0	17.0	18.0	19.0
Mean	17.6	20.7	18.6	20.0	16.6	17.6	18.4
Median	18.0	20.9	18.6	20.0	17.0	18.0	19.0
Std.Dev.	0.5	0.5	0.2	0.0	0.5	0.5	0.9
Rel.Std.Dev.	3.11%	2.25%	1.11%	0.00%	3.30%	3.11%	4.86%
PDM[3]	-4.95%	11.69%	0.25%	8.01%	-10.35%	-4.95%	-0.63%

Table B12. Analytical results for palladium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C -	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	80	N/A	29	N/A	50	54	N/A
2	72	N/A	27	N/A	60	57	N/A
3	78	N/A	53	N/A	50	51	N/A
4	58	N/A	43	N/A	60	51	N/A
5	66	N/A	40	N/A	50	51	N/A
Mean	70.8	-	38.4	-	54.0	52.8	-
Median	72.0	-	40.0	-	50.0	51.0	-
Std.Dev.	9.0	-	10.7	-	5.5	2.7	-
Rel.Std.Dev.	12.73%	-	27.78%	-	10.14%	5.08%	-
PDM[3]	31.11%	-	-28.89%	-	0.00%	-2.22%	-

Table B13. Analytical results for platinum in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C -	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	64	N/A	59	N/A	75	86	N/A
2	63	N/A	61	N/A	75	87	N/A
3	65	N/A	64	N/A	75	79	N/A
4	68	N/A	66	N/A	75	80	N/A
5	67	N/A	66	N/A	85	80	N/A
Mean	65.4	-	63.2	-	77.0	82.3	-
Median	65.0	-	64.0	-	75.0	80.4	-
Std.Dev.	2.1	-	3.1	-	4.5	3.6	-
Rel.Std.Dev.	3.17%	-	4.93%	-	5.81%	4.41%	-
PDM[3]	-9.15%	-	-12.20%	-	6.97%	14.38%	-

Table B14. Analytical results for antimony in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*MS	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*MS	Lab G AR*MS	Lab H AR*OES
1	0.50	0.33	0.37	0.40	**0.04**	0.30	< 5
2	0.45	0.32	0.36	0.40	0.06	0.40	< 5
3	0.43	0.33	0.36	0.40	0.06	0.30	< 5
4	0.51	0.30	0.36	0.50	0.06	0.30	< 5
5	0.50	0.31	0.36	0.40	0.06	0.40	< 5
Mean	0.5	0.3	0.4	0.4	**0.1**	0.3	< 5
Median	0.5	0.3	0.4	0.4	0.1	0.3	< 5
Std.Dev.	0.0	0.0	0.0	0.0	0.0	0.1	-
Rel.Std.Dev.	7.46%	4.10%	1.70%	10.65%	15.97%	16.11%	-
PDM[3]	24.74%	-17.01%	-6.05%	9.60%	-85.39%	-11.27%	-

Table B15. Analytical results for zinc in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AR*OES	Lab C AR*MS	Lab D AR*MS	Lab E AR*OES	Lab F AR*OES	Lab G AR*MS	Lab H AR*OES
1	134	125	118	126	120	111	118
2	132	**121**	118	**150**	119	113	121
3	131	124	118	137	120	110	117
4	131	127	116	130	120	113	119
5	129	126	119	126	120	111	121
Mean	131.4	124.6	117.8	133.8	119.8	111.6	119.2
Median	131.0	125.0	118.2	130.0	120.0	111.0	119.0
Std.Dev.	1.8	2.3	1.2	10.1	0.4	1.3	1.8
Rel.Std.Dev.	1.38%	1.85%	1.03%	7.56%	0.37%	1.20%	1.50%
PDM[3]	7.57%	2.00%	-3.53%	9.53%	-1.93%	-8.64%	-2.42%

APPENDIX C

Analytical results for major elements, LOI, C & S by fusion XRF/ICPOES and Leco in OREAS 45P

Table C1. Key to abbreviations used in Tables C2 – C15.

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
AF	alkali fusion
BF	lithium borate fusion
Leco	Leco furnace
LOI	Thermo-gravimetric method after heating to 1000°C
OES	inductively coupled plasma optical emission spectrometry
MS	inductively coupled plasma mass spectrometry
XRF	X-ray fluorescence

Table C2. Analytical results for aluminium in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	6.61	7.21	6.74	6.91	6.93	6.66	6.81
2	6.66	7.22	6.76	6.91	6.93	6.82	6.77
3	6.67	7.21	6.73	6.93	6.93	6.90	6.87
4	6.78	7.22	6.72	6.90	6.99	6.88	6.78
5	6.70	7.20	6.70	6.91	6.93	6.80	6.82
Mean	6.68	**7.21**	6.73	6.91	6.95	6.81	6.81
Median	6.67	7.21	6.73	6.91	6.93	6.82	6.81
Std.Dev.	0.06	0.01	0.02	0.01	0.02	0.09	0.04
Rel.Std.Dev.	0.94%	0.11%	0.36%	0.16%	0.34%	1.39%	0.55%
PDM[3]	-1.93%	5.81%	-1.26%	1.42%	1.91%	-0.05%	-0.09%

Table C3. Analytical results for carbon in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B Leco	Lab C Leco	Lab D BF*OES	Lab E Leco	Lab F Leco	Lab G Leco	Lab H BF*XRF
1	2.32	2.43	2.47	2.12	2.62	2.27	2.28
2	2.29	2.40	2.54	2.15	2.70	2.29	2.27
3	2.30	2.41	2.50	2.07	2.64	2.30	2.28
4	2.28	2.40	2.47	2.19	2.64	2.28	2.26
5	2.30	2.41	2.50	2.10	2.67	2.29	2.26
Mean	2.3	2.4	2.5	2.1	2.7	2.3	2.3
Median	2.3	2.4	2.5	2.1	2.6	2.3	2.3
Std.Dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rel.Std.Dev.	0.65%	0.51%	1.20%	2.12%	1.18%	0.50%	0.44%
PDM[3]	-2.73%	2.01%	5.61%	-10.09%	12.34%	-3.24%	-3.91%

Table C4. Analytical results for calcium in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	0.40	0.29	0.31	0.30	0.30	0.29	0.31
2	0.40	0.30	0.30	0.30	0.30	0.31	0.31
3	0.30	0.31	0.30	0.30	0.30	**0.34**	0.30
4	0.40	0.30	0.30	0.30	0.30	0.30	0.29
5	0.40	0.30	0.30	0.30	0.30	0.30	0.29
Mean	**0.38**	0.30	0.30	0.30	0.30	0.31	0.30
Median	0.40	0.30	0.30	0.30	0.30	0.30	0.30
Std.Dev.	0.04	0.01	0.00	0.00	0.00	0.02	0.01
Rel.Std.Dev.	11.77%	2.62%	1.06%	0.00%	0.00%	6.25%	2.38%
PDM[3]	26.61%	-0.45%	0.50%	-0.05%	0.02%	2.62%	0.02%

Table C5. Analytical results for chromium in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	0.114	0.116	0.098	0.120	0.113	0.110	0.109
2	0.115	0.109	0.100	0.110	0.114	0.120	0.109
3	0.114	0.116	0.098	0.110	0.113	0.130	0.109
4	0.117	0.109	0.101	0.110	0.112	0.120	0.109
5	0.117	0.116	0.099	0.110	0.112	0.120	0.109
Mean	0.115	0.114	**0.099**	0.112	0.113	0.120	0.109
Median	0.115	0.116	0.099	0.110	0.113	0.120	0.109
Std.Dev.	0.001	0.004	0.001	0.004	0.001	0.007	0.000
Rel.Std.Dev.	1.20%	3.30%	1.27%	3.99%	0.51%	5.89%	0.00%
PDM[3]	1.23%	-0.24%	-12.62%	-1.60%	-0.97%	5.43%	-3.85%

Table C6. Analytical results for iron in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	19.27	19.06	18.86	19.30	19.30	18.92	19.55
2	19.32	19.09	18.88	19.20	19.37	19.15	19.50
3	**19.06**	19.04	18.72	19.40	19.37	19.31	19.65
4	19.22	19.03	18.97	19.20	19.37	19.48	19.57
5	19.34	19.07	18.79	19.20	19.23	19.06	19.55
Mean	19.24	19.06	**18.84**	19.26	19.33	19.18	**19.56**
Median	19.27	19.06	18.86	19.20	19.37	19.15	19.55
Std.Dev.	0.11	0.02	0.09	0.09	0.06	0.22	0.05
Rel.Std.Dev.	0.58%	0.13%	0.49%	0.46%	0.32%	1.14%	0.28%
PDM[3]	0.10%	-0.86%	-1.98%	0.19%	0.55%	-0.21%	1.76%

Table C7. Analytical results for potassium in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	0.37	0.35	0.33	0.35	0.34	0.33	0.35
2	0.37	0.34	0.32	0.35	0.35	0.35	0.37
3	0.37	0.36	0.34	0.36	0.35	**0.42**	0.37
4	0.40	0.37	0.34	0.35	0.35	0.35	0.37
5	0.38	0.36	0.34	0.35	0.34	0.35	0.37
Mean	**0.38**	0.35	0.33	0.35	0.35	0.36	0.36
Median	0.37	0.36	0.34	0.35	0.35	0.35	0.37
Std.Dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rel.Std.Dev.	3.45%	2.68%	2.05%	1.27%	1.32%	9.62%	2.50%
PDM[3]	8.41%	1.39%	-4.56%	0.96%	-0.99%	3.25%	4.25%

Table C8. Analytical results for loss on ignition in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B LOI	Lab C LOI	Lab D LOI	Lab E LOI	Lab F LOI	Lab G LOI	Lab H LOI
1	11.38	11.20	13.10	11.35	11.07	10.84	11.29
2	11.25	11.25	13.10	11.40	11.03	10.87	11.20
3	11.23	11.25	13.25	11.40	11.06	10.87	11.11
4	11.42	11.35	12.85	11.44	11.13	10.88	11.22
5	11.35	**11.50**	13.25	11.41	11.17	10.87	11.03
Mean	11.33	11.31	**13.11**	11.40	11.09	10.87	11.17
Median	11.35	11.25	13.10	11.40	11.07	10.87	11.20
Std.Dev.	0.1	0.1	0.2	0.0	0.1	0.0	0.1
Rel.Std.Dev.	0.73%	1.06%	1.25%	0.28%	0.51%	0.14%	0.91%
PDM[3]	1.25%	1.11%	17.20%	1.91%	-0.84%	-2.86%	-0.14%

Table C9. Analytical results for magnesium in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	0.23	0.22	0.22	0.21	0.22	0.21	0.22
2	0.23	0.22	0.22	0.21	0.22	0.23	0.21
3	0.23	0.22	0.22	0.20	0.22	0.26	0.22
4	0.23	0.22	0.22	0.21	0.22	**0.39**	0.21
5	0.24	0.22	0.21	0.22	0.22	0.24	0.20
Mean	0.23	0.22	0.22	0.21	0.22	0.27	0.21
Median	0.230	0.223	0.217	0.210	0.223	0.240	0.211
Std.Dev.	0.004	0.003	0.003	0.007	0.000	0.072	0.009
Rel.Std.Dev.	0.019	0.015	0.012	0.034	0.000	0.269	0.042
PDM[3]	0.047	-0.004	-0.017	-0.052	0.007	0.201	-0.042

Table C10. Analytical results for manganese in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	0.131	0.132	0.124	0.130	0.124	0.130	0.116
2	0.132	0.139	0.120	0.120	0.124	0.130	0.116
3	0.130	0.139	0.120	0.130	**0.132**	0.140	0.116
4	**0.135**	0.132	0.124	0.130	0.124	0.130	0.116
5	0.132	0.132	0.124	0.130	0.124	0.130	0.116
Mean	0.132	0.135	0.122	0.128	0.125	0.132	0.116
Median	0.132	0.132	0.124	0.130	0.124	0.130	0.116
Std.Dev.	0.002	0.004	0.002	0.004	0.003	0.004	0.000
Rel.Std.Dev.	1.42%	3.15%	1.73%	3.49%	2.76%	3.39%	0.00%
PDM[3]	4.00%	6.17%	-3.59%	0.83%	-1.15%	3.99%	-8.47%

Table C11. Analytical results for sodium in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab A INAA	Lab B 4A*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	0.076	0.081	0.082	0.082	0.060	0.089	0.080	< 0.07
2	0.081	0.082	0.089	0.078	0.070	0.082	0.080	< 0.07
3	0.085	0.081	0.082	0.067	0.080	0.089	0.080	< 0.07
4	0.081	0.081	0.082	0.067	0.060	0.089	0.080	< 0.07
5	0.084	0.081	0.089	0.074	0.060	0.089	0.080	< 0.07
6	0.079							
7	0.080							
8	0.082							
9	0.081							
10	0.083							
11	0.081							
12	0.081							
13	0.081							
14	0.081							
15	0.076							
16	0.084							
17	0.079							
18	0.079							
19	0.083							
20	0.079							
21	0.083							
22	0.081							
Mean	0.081	0.081	0.085	0.073	**0.066**	0.088	0.080	< 0.07
Median	0.081	0.081	0.082	0.074	0.060	0.089	0.080	< 0.07
Std.Dev.	0.002	0.001	0.004	0.007	0.009	0.003	0.000	-
Rel.Std.Dev.	2.9%	0.69%	4.80%	9.03%	13.55%	3.79%	0.00%	-
PDM[3]	-0.43%	-0.20%	4.1%	-9.6%	-18.8%	7.73%	-1.55%	-

Table C12. Analytical results for phosphorous in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	0.049	0.044	0.048	0.046	0.046	<0.1	0.052
2	0.049	0.048	0.046	0.047	0.044	<0.1	0.052
3	0.047	0.044	0.050	0.047	0.045	<0.1	0.052
4	0.047	0.044	0.048	0.047	0.045	<0.1	0.052
5	0.048	0.044	0.048	0.047	0.045	<0.1	0.052
Mean	0.048	0.045	0.048	0.047	0.045	<0.1	0.052
Median	0.048	0.044	0.048	0.047	0.045	<0.1	0.052
Std.Dev.	0.001	0.002	0.002	0.000	0.001	-	0.000
Rel.Std.Dev.	2.12%	4.38%	3.21%	0.96%	1.54%	-	0.00%
PDM[3]	0.71%	-6.08%	1.29%	-1.27%	-5.16%	-	10.50%

Table C13. Analytical results for sulphur in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B Leco	Lab C Leco	Lab D BF*OES	Lab E Leco	Lab F Leco	Lab G Leco	Lab H BF*XRF
1	0.031	0.010	0.035	0.026	0.040	0.030	0.029
2	0.031	<0.01	0.030	0.028	0.040	0.030	0.030
3	0.029	<0.01	0.035	0.027	0.040	0.030	0.032
4	0.029	<0.01	0.035	0.028	0.040	0.030	0.030
5	0.024	<0.01	0.035	0.030	0.040	0.030	0.030
Mean	0.029	**0.010**	0.034	0.028	**0.040**	0.030	0.030
Median	0.029	0.010	0.035	0.028	0.040	0.030	0.030
Std.Dev.	0.00	-	0.00	0.00	0.00	0.00	0.00
Rel.Std.Dev.	9.94%	-	6.58%	5.34%	0.00%	0.00%	3.63%
PDM[3]	-4.51%	-66.84%	12.73%	-7.82%	32.63%	-0.53%	0.13%

Table C14. Analytical results for silicon in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	20.50	20.35	20.18	20.50	20.48	20.73	20.40
2	20.60	20.36	20.20	20.58	20.43	21.22	20.39
3	20.70	20.33	20.25	20.62	20.34	21.37	20.50
4	20.40	20.30	20.27	20.63	20.43	21.50	20.36
5	20.50	20.33	20.19	20.54	20.43	20.94	20.38
Mean	20.54	20.33	20.22	20.57	20.42	**21.15**	20.40
Median	20.50	20.33	20.20	20.58	20.43	21.22	20.39
Std.Dev.	0.11	0.02	0.04	0.05	0.05	0.31	0.05
Rel.Std.Dev.	0.56%	0.10%	0.19%	0.27%	0.25%	1.49%	0.26%
PDM[3]	0.61%	-0.39%	-0.96%	0.78%	0.03%	3.61%	-0.06%

Table C15. Analytical results for titanium in standard OREAS 45P (refer Table C1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*OES	Lab C BF*XRF	Lab D BF*OES	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*OES	Lab H BF*XRF
1	1.21	1.35	1.18	1.17	1.18	1.21	1.16
2	1.20	1.35	1.19	1.18	1.14	1.23	1.16
3	1.18	1.35	1.17	1.18	1.14	1.27	1.16
4	**1.24**	1.35	1.16	1.16	1.14	1.27	1.16
5	1.20	1.35	1.17	1.17	1.15	1.22	1.16
Mean	1.21	**1.35**	1.17	1.17	1.15	1.24	1.16
Median	1.20	1.35	1.17	1.17	1.14	1.23	1.16
Std.Dev.	0.02	0.00	0.01	0.01	0.02	0.03	0.00
Rel.Std.Dev.	1.82%	0.20%	1.01%	0.71%	1.36%	2.28%	0.28%
PDM[3]	2.03%	14.22%	-0.64%	-0.85%	-2.92%	4.91%	-1.81%

APPENDIX D

Analytical results for lithophile trace elements by fusion ICPMS in OREAS 45P

Table D1. Key to abbreviations used in Tables A2 – A24.

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
AF	alkali fusion
BF	lithium borate fusion
MS	inductively coupled plasma mass spectrometry

Table D2. Analytical results for barium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F AF*MS	Lab G AF*MS
1	284	347	278	275	280	284
2	283	339	281	270	280	283
3	278	329	282	280	290	282
4	275	322	287	280	290	279
5	273	353	284	280	270	286
Mean	279	**338**	282	277	282	283
Median	278	339	282	280	280	283
Std.Dev.	4.8	12.7	3.4	4.5	8.4	2.6
Rel.Std.Dev.	1.73%	3.75%	1.20%	1.61%	2.97%	0.92%
PDM[3]	-0.69%	20.48%	0.63%	-1.26%	0.52%	0.81%

Table D3. Analytical results for cerium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab A INAA (4.0g)	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F -	Lab G AF*MS
1	49.9	46.9	60.2	50.6	47.0	N/A	48.9
2	50.6	47.1	58.0	49.7	**51.3**	N/A	50.7
3	51.6	47.2	57.0	**52.2**	47.6	N/A	49.7
4	49.9	47.6	55.9	49.8	45.6	N/A	50.3
5	53.1	47.7	62.1	49.8	46.2	N/A	49.7
6	49.0						
7	49.3						
8	51.0						
9	51.7						
10	50.9						
11	50.5						
12	49.2						
13	49.2						
14	51.6						
15	52.1						
16	51.5						
17	50.5						
18	48.5						
19	51.6						
20	51.9						
21	51.4						
22	51.5						
Mean	50.7	47.3	**58.6**	50.4	47.5	-	49.9
Median	50.9	47.2	58.0	49.8	47.0	-	49.7
Std.Dev.	1.2	0.3	2.5	1.1	2.2	-	0.7
Rel.Std.Dev.	2.3%	0.72%	4.26%	2.12%	4.70%	-	1.37%
PDM[3]	3.81%	-3.23%	20.0%	3.1%	-2.7%	-	2.01%

Table D4. Analytical results for dysprosium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	4.0	4.3	4.4	N/A	N/A	4.0
2	4.3	4.2	4.0	N/A	N/A	4.1
3	4.1	4.2	4.1	N/A	N/A	3.9
4	4.2	3.9	3.9	N/A	N/A	4.1
5	4.2	4.6	3.8	N/A	N/A	4.0
Mean	4.2	4.2	4.0	-	-	4.0
Median	4.2	4.2	4.0	-	-	4.0
Std.Dev.	0.11	0.25	0.21	-	-	0.08
Rel.Std.Dev.	2.74%	5.92%	5.20%	-	-	2.08%
PDM[3]	1.11%	3.06%	-1.88%	-	-	-2.29%

Table D5. Analytical results for erbium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	2.0	2.3	2.2	N/A	N/A	2.2
2	2.3	2.3	2.1	N/A	N/A	2.2
3	2.3	2.3	2.2	N/A	N/A	2.2
4	2.1	2.3	2.1	N/A	N/A	2.3
5	2.2	**2.6**	2.3	N/A	N/A	2.3
Mean	2.2	2.4	2.2	-	-	2.2
Median	2.2	2.3	2.2	-	-	2.2
Std.Dev.	0.13	0.13	0.08	-	-	0.05
Rel.Std.Dev.	5.98%	5.68%	3.49%	-	-	2.45%
PDM[3]	-2.01%	6.08%	-2.06%	-	-	0.69%

Table D6. Analytical results for europium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	1.1	1.1	1.2	N/A	N/A	1.2
2	1.2	1.0	1.2	N/A	N/A	1.2
3	1.2	1.1	1.2	N/A	N/A	1.2
4	1.1	1.0	1.2	N/A	N/A	1.2
5	1.2	1.2	1.2	N/A	N/A	1.2
Mean	1.2	**1.1**	1.2	-	-	1.2
Median	1.2	1.1	1.2	-	-	1.2
Std.Dev.	0.1	0.1	0.0	-	-	0.0
Rel.Std.Dev.	4.72%	7.75%	2.44%	-	-	0.00%
PDM[3]	-1.83%	-8.60%	0.28%	-	-	1.55%

Table D7. Analytical results for gadolinium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	3.6	4.1	4.2	N/A	N/A	4.4
2	4.0	3.9	3.7	N/A	N/A	4.6
3	4.2	4.2	4.0	N/A	N/A	4.3
4	3.7	3.9	4.0	N/A	N/A	4.5
5	4.0	4.4	3.9	N/A	N/A	4.4
Mean	3.9	4.1	3.9	-	-	**4.4**
Median	4.0	4.1	4.0	-	-	4.4
Std.Dev.	0.2	0.2	0.2	-	-	0.1
Rel.Std.Dev.	6.28%	5.17%	4.20%	-	-	2.57%
PDM[3]	-2.06%	2.96%	-0.90%	-	-	11.50%

Table D8. Analytical results for holmium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	0.70	0.80	0.76	N/A	N/A	0.80
2	0.80	0.80	0.76	N/A	N/A	0.80
3	0.70	0.80	0.77	N/A	N/A	0.80
4	0.70	0.80	0.76	N/A	N/A	0.80
5	0.80	0.90	0.77	N/A	N/A	0.80
Mean	0.7	0.8	0.8	-	-	0.8
Median	0.7	0.8	0.8	-	-	0.8
Std.Dev.	0.1	0.0	0.0	-	-	0.0
Rel.Std.Dev.	7.40%	5.45%	0.72%	-	-	0.00%
PDM[3]	-5.25%	4.99%	-2.18%	-	-	2.43%

Table D9. Analytical results for lanthanium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab A INAA (4.0g)	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E BF*MS	Lab F -	Lab G AF*MS
1	24.5	24.6	30.9	24.9	26.2	N/A	24.7
2	24.6	24.0	29.9	23.9	26.6	N/A	26.0
3	24.9	23.9	28.8	24.5	26.4	N/A	24.5
4	24.6	24.1	28.4	23.6	26.2	N/A	24.9
5	24.7	24.5	32.0	23.5	26.1	N/A	23.9
6	24.7						
7	24.7						
8	24.2						
9	24.8						
10	24.8						
11	24.6						
12	24.5						
13	24.6						
14	24.5						
15	24.5						
16	24.8						
17	24.3						
18	24.8						
19	24.7						
20	24.7						
21	24.3						
22	24.7						
Mean	24.6	24.2	**30.0**	24.1	26.3	-	24.8
Median	24.7	24.1	29.9	23.9	26.2	-	24.7
Std.Dev.	0.2	0.3	1.5	0.6	0.2	-	0.8
Rel.Std.Dev.	0.7%	1.29%	4.95%	2.45%	0.76%	-	3.10%
PDM[3]	720.33%	707.33%	900.0%	702.0%	776.7%	-	726.67%

Table D10. Analytical results for lutetium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab A INAA (4.0g)	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E BF*MS	Lab F -	Lab G AF*MS
1	0.29	0.33	0.30	0.32	N/A	N/A	0.30
2	0.33	**0.36**	0.30	0.31	N/A	N/A	0.30
3	0.31	0.31	0.30	0.32	N/A	N/A	0.30
4	0.30	0.31	0.30	**0.28**	N/A	N/A	0.30
5	0.31	0.32	0.40	0.30	N/A	N/A	0.30
6	0.30						
7	0.30						
8	0.30						
9	0.31						
10	0.29						
11	0.32						
12	0.29						
13	0.30						
14	0.31						
15	0.31						
16	0.30						
17	0.32						
18	0.31						
19	0.29						
20	0.31						
21	0.32						
22	0.31						
Mean	0.31	0.33	0.32	0.30	-	-	0.30
Median	0.31	0.32	0.30	0.31	-	-	0.30
Std.Dev.	0.01	0.02	0.04	0.02	-	-	0.00
Rel.Std.Dev.	3.6%	6.36%	13.98%	5.69%	-	-	0.00%
PDM[3]	-1.42%	5.06%	3.1%	-2.7%	-	-	-3.32%

Table D11. Analytical results for niobium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F AF*MS	Lab G AF*MS
1	25	24	23	24	29	23
2	26	23	22	25	29	24
3	25	24	22	24	30	23
4	25	23	21	**26**	29	23
5	25	25	22	24	28	23
Mean	25	24	22	25	**29**	23
Median	25	24	22	24	29	23
Std.Dev.	0.4	0.8	0.7	0.9	0.7	0.4
Rel.Std.Dev.	1.77%	3.52%	2.95%	3.64%	2.44%	1.93%
PDM[3]	5.90%	0.02%	-6.79%	3.38%	21.87%	-2.50%

Table D12. Analytical results for neodymium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	21.6	26.0	**22.0**	N/A	N/A	22.0
2	21.1	25.0	20.3	N/A	N/A	22.1
3	21.4	24.3	21.0	N/A	N/A	20.3
4	21.8	23.8	20.3	N/A	N/A	21.8
5	20.8	26.5	20.4	N/A	N/A	20.5
Mean	21.3	**25.1**	20.8	-	-	21.3
Median	21.4	25.0	20.4	-	-	21.8
Std.Dev.	0.4	1.1	0.8	-	-	0.9
Rel.Std.Dev.	1.86%	4.50%	3.62%	-	-	4.07%
PDM[3]	1.41%	19.37%	-1.35%	-	-	1.41%

Table D13. Analytical results for praseodymium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	5.75	7.20	5.59	N/A	N/A	5.20
2	5.36	6.80	5.32	N/A	N/A	5.20
3	5.54	6.60	5.57	N/A	N/A	5.00
4	5.57	6.50	5.35	N/A	N/A	5.40
5	5.77	7.20	5.41	N/A	N/A	5.30
Mean	5.60	**6.86**	5.45	-	-	5.22
Median	5.57	6.80	5.41	-	-	5.20
Std.Dev.	0.17	0.33	0.13	-	-	0.15
Rel.Std.Dev.	3.01%	4.79%	2.31%	-	-	2.84%
PDM[3]	3.27%	26.54%	0.44%	-	-	-3.71%

Table D14. Analytical results for rubidium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F AF*MS	Lab G AF*MS
1	22.1	23.4	24.1	23.8	26.0	23.5
2	22.7	22.7	22.6	23.1	24.0	23.7
3	21.8	23.0	23.7	23.9	26.0	22.8
4	22.3	22.6	23.2	23.9	26.0	22.9
5	21.3	**24.5**	23.0	23.7	24.0	23.3
Mean	22.0	23.2	23.3	23.7	**25.2**	23.2
Median	22.1	23.0	23.2	23.8	26.0	23.3
Std.Dev.	0.53	0.77	0.60	0.33	1.10	0.38
Rel.Std.Dev.	2.39%	3.31%	2.56%	1.41%	4.35%	1.66%
PDM[3]	-4.34%	0.87%	1.18%	2.78%	9.38%	0.87%

Table D15. Analytical results for samarium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	4.40	5.80	4.55	N/A	N/A	4.40
2	4.20	5.60	4.45	N/A	N/A	4.50
3	4.50	5.40	4.50	N/A	N/A	4.40
4	4.80	5.20	4.50	N/A	N/A	4.70
5	4.60	5.90	4.50	N/A	N/A	4.60
Mean	4.50	**5.58**	4.50	-	-	4.52
Median	4.50	5.60	4.50	-	-	4.50
Std.Dev.	0.22	0.29	0.04	-	-	0.13
Rel.Std.Dev.	4.97%	5.13%	0.79%	-	-	2.88%
PDM[3]	-0.15%	23.82%	-0.15%	-	-	0.30%

Table D16. Analytical results for tin in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F AF*MS	Lab G AF*MS
1	3.0	3.0	2.5	N/A	< 10	3.0
2	3.0	4.0	2.5	N/A	< 10	3.0
3	3.0	3.0	2.0	N/A	< 10	3.0
4	3.0	3.0	2.5	N/A	< 10	3.0
5	3.0	**5.0**	2.0	N/A	< 10	3.0
Mean	3.0	3.6	**2.3**	-	-	3.0
Median	3.0	3.0	2.5	-	-	3.0
Std.Dev.	0.0	0.9	0.3	-	-	0.0
Rel.Std.Dev.	0.00%	24.85%	11.91%	-	-	0.00%
PDM[3]	-2.70%	16.76%	-25.41%	-	-	-2.70%

Table D17. Analytical results for strontium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F AF*MS	Lab G AF*MS
1	46.0	33.3	33.5	35.5	34.0	33.6
2	44.0	33.4	32.6	30.5	33.0	33.6
3	44.0	32.1	32.4	33.1	30.0	32.8
4	45.0	32.8	31.1	32.9	31.0	32.3
5	42.0	**35.7**	31.3	34.6	31.0	32.2
Mean	**44.2**	33.5	32.2	33.3	31.8	32.9
Median	44.0	33.3	32.4	33.1	31.0	32.8
Std.Dev.	1.5	1.4	1.0	1.9	1.6	0.7
Rel.Std.Dev.	3.36%	4.05%	3.07%	5.73%	5.17%	2.06%
PDM[3]	35.52%	2.59%	-1.40%	2.16%	-2.50%	0.87%

Table D18. Analytical results for terbium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	0.65	0.70	0.69	N/A	N/A	0.70
2	0.65	0.70	0.66	N/A	N/A	0.70
3	0.67	0.70	0.75	N/A	N/A	0.60
4	0.64	0.70	0.67	N/A	N/A	0.70
5	**0.69**	0.80	0.75	N/A	N/A	0.70
Mean	0.66	0.72	0.70	-	-	0.68
Median	0.65	0.70	0.69	-	-	0.70
Std.Dev.	0.02	0.04	0.05	-	-	0.04
Rel.Std.Dev.	3.03%	6.21%	6.42%	-	-	6.58%
PDM[3]	-4.42%	4.27%	1.67%	-	-	-1.52%

Table D19. Analytical results for thorium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F AF*MS	Lab G AF*MS
1	9.1	11.0	10.3	8.3	9.5	10.0
2	9.4	11.0	9.9	**11.8**	9.0	11.0
3	9.2	11.0	**11.0**	10.1	9.0	10.0
4	9.4	11.0	10.2	8.7	9.5	10.0
5	9.4	12.0	10.2	8.5	9.0	10.0
Mean	9.3	11.2	10.3	9.5	9.2	10.2
Median	9.4	11.0	10.2	8.7	9.0	10.0
Std.Dev.	0.1	0.4	0.4	1.5	0.3	0.4
Rel.Std.Dev.	1.52%	3.99%	3.98%	15.6%	2.98%	4.38%
PDM[3]	-5.28%	14.1%	4.70%	-3.45%	-6.30%	3.88%

Table D20. Analytical results for thulium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F -	Lab G AF*MS
1	0.30	0.30	0.35	N/A	N/A	0.30
2	0.30	0.30	0.34	N/A	N/A	0.30
3	0.30	0.30	0.33	N/A	N/A	0.30
4	0.30	0.30	0.36	N/A	N/A	0.30
5	0.30	0.40	0.34	N/A	N/A	0.30
Mean	0.30	0.32	0.34	-	-	0.30
Median	0.30	0.30	0.34	-	-	0.30
Std.Dev.	0.00	0.04	0.01	-	-	0.00
Rel.Std.Dev.	0.00%	13.98%	3.03%	-	-	0.00%
PDM[3]	-4.91%	1.43%	8.40%	-	-	-4.91%

Table D21. Analytical results for uranium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F AF*MS	Lab G AF*MS
1	2.3	2.7	2.4	2.1	3.0	2.4
2	2.3	2.6	2.5	**3.0**	2.5	2.5
3	2.2	2.6	2.3	2.2	2.5	2.2
4	2.3	2.6	2.4	2.1	2.5	2.3
5	2.3	2.8	2.3	2.1	2.5	2.3
Mean	2.3	2.7	2.4	2.3	2.6	2.3
Median	2.3	2.6	2.4	2.1	2.5	2.3
Std.Dev.	0.04	0.09	0.08	0.39	0.22	0.11
Rel.Std.Dev.	1.96%	3.36%	3.36%	17.12%	8.60%	4.87%
PDM[3]	-4.70%	11.18%	-1.78%	-3.87%	8.67%	-2.19%

Table D22. Analytical results for yttrium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F AF*MS	Lab G AF*MS
1	15.9	18.2	**20.0**	17.2	20.0	18.3
2	16.6	18.0	19.0	17.0	20.0	**18.9**
3	16.2	17.8	18.7	16.9	21.0	18.4
4	16.4	17.8	18.3	16.8	20.0	18.5
5	15.7	**19.4**	18.4	16.7	20.0	18.2
Mean	16.16	18.24	18.86	16.92	20.20	18.46
Median	16.20	18.00	18.70	16.90	20.00	18.40
Std.Dev.	0.36	0.67	0.67	0.19	0.45	0.27
Rel.Std.Dev.	2.26%	3.67%	3.57%	1.14%	2.21%	1.46%
PDM[3]	-10.36%	1.18%	4.62%	-6.15%	12.05%	2.40%

Table D23. Analytical results for ytterbium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E AF*MS	Lab F -	Lab G AF*MS
1	2.1	2.4	**2.2**	2.1	N/A	2.1
2	**3.1**	2.1	2.1	2.1	N/A	2.2
3	2.1	2.1	2.1	2.1	N/A	2.1
4	2.4	2.1	2.1	2.1	N/A	2.2
5	2.1	2.5	2.1	2.0	N/A	2.1
Mean	2.36	2.24	2.11	2.08	-	2.14
Median	2.10	2.10	2.09	2.10	-	2.10
Std.Dev.	0.43	0.19	0.07	0.04	-	0.05
Rel.Std.Dev.	18.37%	8.70%	3.30%	2.15%	-	2.56%
PDM[3]	10.11%	4.51%	-1.46%	-2.95%	-	-0.15%

Table D24. Analytical results for zirconium in standard OREAS 45P (refer Table B1 for abbreviations; values in ppm).

Replicate No.	Lab B AF*MS	Lab C AF*MS	Lab D BF*MS	Lab E -	Lab F AF*MS	Lab G AF*MS
1	**272**	262	286	N/A	290	294
2	287	266	269	N/A	290	295
3	269	262	275	N/A	300	286
4	265	263	265	N/A	300	293
5	258	**288**	269	N/A	280	295
Mean	270.2	268.2	272.8	-	292.0	292.6
Median	269.0	263.0	269.3	-	290.0	294.0
Std.Dev.	10.8	11.2	8.3	-	8.4	3.8
Rel.Std.Dev.	3.98%	4.17%	3.04%	-	2.87%	1.29%
PDM[3]	-3.21%	-3.92%	-2.28%	-	4.60%	4.82%

