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CERTIFICATE OF ANALYSIS FOR

TUNGSTEN-COPPER-GOLD-MAGNETITE ORE

CERTIFIED REFERENCE MATERIAL

OREAS 700

Summary Statistics for Key Analytes

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Fire Assay						
Au, Gold (ppm)	0.506	0.023	0.493	0.520	0.493*	0.520*
Borate Fusion XRF						
Fe, Iron (wt.%)	16.06	0.175	15.95	16.16	15.97	16.15
SiO_2, Silicon dioxide (wt.%)	47.30	0.511	47.03	47.58	47.06	47.54
Sn, Tin (ppm)	182	34	156	208	IND	IND
W, Tungsten (wt.%)	1.13	0.025	1.11	1.14	1.12	1.14
WO_3, Tungsten oxide (wt.%)	1.42	0.031	1.40	1.44	1.41	1.44
4-Acid Digestion						
Cu, Copper (wt.%)	0.202	0.007	0.199	0.206	0.191	0.214
Mo, Molybdenum (ppm)	81	7.5	75	86	78	83
Acid Digestion Titration						
FeO, Iron(II) oxide (wt.%)	12.07	0.398	11.81	12.33	11.79	12.35
Davis Tube Recovery						
MassRec, Mass Recovered (wt.%)	11.28	0.240	11.11	11.45	10.86	11.70
Satmagan 135						
Fe_3O_4, Iron(II,III) oxide (wt.%)	10.91	0.196	10.76	11.07	10.76	11.07

Note: intervals may appear asymmetric due to rounding; *determined from RSD of gold INAA data for 30g analytical subsample weight.

Table 1. Certified Values, SDs, 95% Confidence and Tolerance Limits for OREAS 700

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Fire Assay						
Au, Gold (ppm)	0.506	0.023	0.493	0.520	0.493*	0.520*
Borate Fusion XRF						
Al_2O_3, Aluminium(III) oxide (wt.%)	10.62	0.132	10.55	10.69	10.52	10.72
CaO, Calcium oxide (wt.%)	7.86	0.111	7.79	7.92	7.81	7.91
Cl, Chlorine (ppm)	158	22	138	178	IND	IND
Cu, Copper (wt.%)	0.204	0.009	0.198	0.209	0.186	0.221
Fe, Iron (wt.%)	16.06	0.175	15.95	16.16	15.97	16.15
K_2O, Potassium oxide (wt.%)	1.89	0.028	1.87	1.91	1.87	1.90
MgO, Magnesium oxide (wt.%)	1.74	0.038	1.71	1.76	1.72	1.76
MnO, Manganese oxide (wt.%)	0.415	0.010	0.407	0.422	0.410	0.419
Na_2O, Sodium oxide (wt.%)	1.65	0.030	1.63	1.67	1.63	1.68
Ni, Nickel (ppm)	< 50	IND	IND	IND	IND	IND
P, Phosphorus (wt.%)	0.353	0.008	0.348	0.357	0.349	0.356
Pb, Lead (ppm)	< 10	IND	IND	IND	IND	IND
S, Sulphur (wt.%)	0.304	0.014	0.295	0.313	0.288	0.320
SiO_2, Silicon dioxide (wt.%)	47.30	0.511	47.03	47.58	47.06	47.54
Sn, Tin (ppm)	182	34	156	208	IND	IND
TiO_2, Titanium dioxide (wt.%)	0.320	0.010	0.314	0.327	0.309	0.331
V_2O_5, Vanadium(V) oxide (ppm)	110	14	101	120	IND	IND
W, Tungsten (wt.%)	1.13	0.025	1.11	1.14	1.12	1.14
WO_3, Tungsten oxide (wt.%)	1.42	0.031	1.40	1.44	1.41	1.44
Zn, Zinc (ppm)	231	26	216	245	206	255
Thermogravimetry						
LOI, Loss On Ignition @1000°C (wt.%)	1.95	0.20	1.79	2.12	1.86	2.05
4-Acid Digestion						
Al, Aluminium (wt.%)	5.57	0.296	5.38	5.76	5.45	5.69
As, Arsenic (ppm)	4.35	0.57	3.90	4.80	4.08	4.63
Ba, Barium (ppm)	158	6.3	154	162	154	163
Be, Beryllium (ppm)	2.32	0.084	2.27	2.36	2.20	2.44
Ca, Calcium (wt.%)	5.55	0.227	5.41	5.69	5.40	5.69
Co, Cobalt (ppm)	16.8	2.6	15.0	18.5	15.8	17.8
Cr, Chromium (ppm)	47.2	4.8	44.2	50.1	45.0	49.4
Cs, Cesium (ppm)	109	5.5	102	115	102	115
Cu, Copper (wt.%)	0.202	0.007	0.199	0.206	0.191	0.214
Fe, Iron (wt.%)	15.57	0.920	14.94	16.19	15.28	15.86
Ga, Gallium (ppm)	129	5.1	125	134	124	134
Hf, Hafnium (ppm)	1.42	0.141	1.26	1.58	1.35	1.48
In, Indium (ppm)	2.10	0.050	2.06	2.14	2.00	2.20
K, Potassium (wt.%)	1.57	0.056	1.53	1.60	1.53	1.61
La, Lanthanum (ppm)	32.5	2.43	30.7	34.3	30.9	34.1
Li, Lithium (ppm)	223	18.8	205	242	217	230
Lu, Lutetium (ppm)	0.18	0.014	0.16	0.20	0.17	0.19

*determined from RSD of gold INAA data for 30g analytical subsample weight.

Table 1 continued.

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
4-Acid Digestion continued						
Mg, Magnesium (wt.%)	0.995	0.025	0.978	1.012	0.978	1.013
Mn, Manganese (wt.%)	0.314	0.013	0.306	0.323	0.307	0.321
Mo, Molybdenum (ppm)	81	7.5	75	86	78	83
Na, Sodium (wt.%)	1.21	0.053	1.18	1.25	1.19	1.24
Ni, Nickel (ppm)	24.1	2.7	22.3	25.9	22.5	25.7
P, Phosphorus (wt.%)	0.347	0.029	0.329	0.366	0.339	0.355
Pb, Lead (ppm)	6.83	1.33	5.98	7.67	6.43	7.22
Rb, Rubidium (ppm)	444	33.6	416	473	429	459
S, Sulphur (wt.%)	0.295	0.015	0.289	0.301	0.277	0.312
Sb, Antimony (ppm)	0.70	0.059	0.65	0.74	0.64	0.76
Sc, Scandium (ppm)	9.55	0.878	8.80	10.30	9.12	9.98
Sn, Tin (ppm)	133	8.7	125	140	128	138
Sr, Strontium (ppm)	124	7.4	119	129	121	127
Th, Thorium (ppm)	7.75	0.751	7.01	8.49	7.59	7.91
Ti, Titanium (wt.%)	0.179	0.014	0.168	0.190	0.172	0.185
Tl, Thallium (ppm)	2.54	0.43	2.12	2.96	2.45	2.63
U, Uranium (ppm)	4.73	0.49	4.25	5.20	4.58	4.87
V, Vanadium (ppm)	62	2.0	61	63	60	64
W, Tungsten (wt.%)	0.989	0.081	0.910	1.068	0.896	1.081
Y, Yttrium (ppm)	13.5	0.77	12.9	14.1	13.0	14.0
Yb, Ytterbium (ppm)	1.26	0.13	1.09	1.42	1.20	1.32
Zn, Zinc (ppm)	216	16.3	205	227	211	221
Zr, Zirconium (ppm)	47.3	4.8	43.4	51.2	44.3	50.2
Aqua Regia Digestion						
Ag, Silver (ppm)	0.499	0.075	0.450	0.548	0.438	0.560
Al, Aluminium (wt.%)	3.13	0.143	3.05	3.22	3.04	3.23
As, Arsenic (ppm)	3.88	0.73	3.47	4.29	3.59	4.18
Au, Gold (ppm)	0.505	0.034	0.489	0.520	0.468	0.541
B, Boron (ppm)	< 30	IND	IND	IND	IND	IND
Ba, Barium (ppm)	81	6.9	76	86	78	84
Be, Beryllium (ppm)	0.73	0.041	0.70	0.76	0.66	0.81
Bi, Bismuth (ppm)	6.89	0.84	6.58	7.19	6.59	7.18
Ca, Calcium (wt.%)	4.45	0.366	4.21	4.68	4.35	4.55
Cd, Cadmium (ppm)	< 0.5	IND	IND	IND	IND	IND
Ce, Cerium (ppm)	43.9	7.7	36.5	51.3	42.3	45.5
Co, Cobalt (ppm)	15.2	1.21	14.3	16.1	14.5	15.9
Cr, Chromium (ppm)	51	2.6	49	52	49	52
Cu, Copper (wt.%)	0.203	0.008	0.199	0.206	0.192	0.213
Fe, Iron (wt.%)	14.66	0.710	14.22	15.10	14.31	15.00
Ga, Gallium (ppm)	112	9.7	106	119	109	115
Hf, Hafnium (ppm)	0.81	0.12	0.65	0.98	0.79	0.84
In, Indium (ppm)	1.67	0.109	1.56	1.77	1.58	1.75
K, Potassium (wt.%)	1.24	0.044	1.21	1.26	1.21	1.26

Table 1 continued.

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Aqua Regia Digestion continued						
La, Lanthanum (ppm)	20.6	1.71	19.4	21.8	19.9	21.3
Li, Lithium (ppm)	84	6.6	77	91	81	86
Lu, Lutetium (ppm)	0.13	0.011	0.12	0.15	IND	IND
Mg, Magnesium (wt.%)	0.948	0.058	0.910	0.987	0.924	0.972
Mn, Manganese (wt.%)	0.237	0.014	0.227	0.246	0.230	0.243
Mo, Molybdenum (ppm)	83	9	77	89	81	86
Na, Sodium (wt.%)	0.164	0.030	0.143	0.185	0.158	0.170
Nb, Niobium (ppm)	10.4	2.0	8.3	12.5	9.2	11.6
Ni, Nickel (ppm)	24.5	2.6	22.8	26.2	23.5	25.5
P, Phosphorus (wt.%)	0.340	0.012	0.331	0.348	0.330	0.349
Pb, Lead (ppm)	5.10	1.01	4.33	5.87	4.59	5.61
S, Sulphur (wt.%)	0.297	0.017	0.289	0.306	0.281	0.313
Sc, Scandium (ppm)	8.77	1.35	7.83	9.71	8.33	9.22
Se, Selenium (ppm)	2.01	0.151	1.85	2.16	IND	IND
Sn, Tin (ppm)	110	6.7	104	116	106	113
Sr, Strontium (ppm)	46.1	4.07	43.2	49.1	44.2	48.0
Te, Tellurium (ppm)	0.19	0.03	0.16	0.21	0.16	0.22
Ti, Titanium (wt.%)	0.097	0.005	0.093	0.100	0.093	0.100
V, Vanadium (ppm)	56	2.3	55	58	55	58
Y, Yttrium (ppm)	11.5	1.2	10.6	12.5	11.0	12.0
Zn, Zinc (ppm)	207	11.4	199	214	200	213
Zr, Zirconium (ppm)	24.9	1.86	23.2	26.7	23.9	26.0
Acid Digestion Titration						
FeO, Iron(II) oxide (wt.%)	12.07	0.398	11.81	12.33	11.79	12.35
Davis Tube Recovery						
MassRec, Mass Recovered (wt.%)	11.28	0.240	11.11	11.45	10.86	11.70
Satmagan 135						
Fe_3O_4, Iron(II,III) oxide (wt.%)	10.91	0.196	10.76	11.07	10.76	11.07

Note: intervals may appear asymmetric due to rounding.

INTRODUCTION

OREAS reference materials are intended to provide a low cost method of evaluating and improving the quality of analysis of geological samples. 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. To the analyst they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures.

SOURCE MATERIALS

OREAS 700 was prepared from skarn tungsten-magnetite ore from the White Rock W-Sn deposit (also known as the Rye Park mine and is located in southern-central NSW, Australia) with the addition of a minor quantity of Cu-Au concentrate. The skarn mineralisation at White Rock is hosted in flat-lying magnetite lenses within interbedded Silurian dacitic volcaniclastics with minor limestone (Hawkins Volcanics), immediately adjacent to a Late Silurian age greisenised, granite intrusive (Rye Park Granite).

These lithological units lie regionally within the Eastern Subprovince of the Lachlan Orogen and adjacent to the Frogmore Fault Zone. Skarn mineralisation occurs in lenses up to 12m in thickness and is best developed within the limestone units. Tungsten minerals include ferberite ($FeWO_4$) with lesser scheelite ($CaWO_4$) and these occur with very minor, variable amounts of pyrrhotite, pyrite, cassiterite, molybdenite, chalcopyrite and sphalerite within massive magnetite. Gangue minerals include hedenbergite, andradite, grossular, hornblende, actinolite, feldspar, quartz, epidote, biotite and fluorite.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 700 was prepared in the following manner:

- multi-stage crushing to minus 5mm;
- drying to constant mass at 105°C;
- multi-stage milling to 100% minus 30 microns;
- homogenisation;
- packaging into 10 and 60g units in laminated foil pouches and 1kg units in plastic jars.

ANALYTICAL PROGRAM

Twenty three commercial analytical laboratories participated in the program to certify the 105 analytes reported in Table 1. The following methods were employed:

- Gold via 25-40g fire assay with AAS (10 labs) or ICP-OES (2 labs) finish;
- Instrumental neutron activation analysis for Au on 1g subsamples to confirm homogeneity (1 laboratory).
- Borate fusion XRF for full elemental suite (up to 15 laboratories)
- Loss on ignition (LOI) at 1000°C (10 laboratories)
- Four acid digestion for full elemental suite ICP-OES and ICP-MS (12 laboratories; with the exception of Cu and Sn - 13 laboratories);
- Gold via 15-50g aqua regia digestion with ICP-MS (6 labs), AAS (4 labs) finish;
- Aqua regia digestion for full elemental suite ICP-OES and ICP-MS (12 laboratories);
- FeO via acid digestion with titrimetric finish (12 laboratories);
- Mass recovered via Davis tube recovery (10 laboratories);
- Fe_3O_4 via Satmagan (10 laboratories);

For the round robin program twenty 800g test units were taken at predetermined intervals during the bagging stage, immediately following final blending, and are considered representative of the entire batch. Each laboratory received six 100g samples selected from evenly spaced intervals from the 20 sampling lots to maximise representation of the entire batch (eg. 16, 19, 2, 5, 8 and 11). Table 1 presents 105 certified values together with their associated 1SD's, 95% confidence and tolerance limits and Table 2 shows 56 indicative values. Table 3 provides performance gate intervals for the certified values of each method group based on their 1SD's. Tabulated results of all elements (including Au INAA analyses) together with uncorrected means, medians, standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM[3]) are presented in the detailed certification data for this CRM (**OREAS 700 Datapack.xlsx**).

Table 2. Indicative Values for OREAS 700.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Fire Assay								
Pd	ppb	*5*	Pt	ppb	*< 5*			
Borate Fusion XRF								
As	ppm	*33.3*	Cr2O3	ppm	*79*	Zr	ppm	*53*
BaO	ppm	*135*	Mo	ppm	*118*			
Co	ppm	*17.2*	Sr	ppm	*47.5*			
4-Acid Digestion								
Ag	ppm	*0.525*	Gd	ppm	*4.17*	Re	ppm	*0.17*
Bi	ppm	*6.75*	Ge	ppm	*3.43*	Se	ppm	*2.09*
Cd	ppm	*0.37*	Hg	ppm	*< 10*	Sm	ppm	*5.26*
Ce	ppm	*66*	Ho	ppm	*0.56*	Ta	ppm	*0.65*
Dy	ppm	*2.68*	Nb	ppm	*16.1*	Tb	ppm	*0.50*
Er	ppm	*1.38*	Nd	ppm	*26.3*	Te	ppm	*0.16*
Eu	ppm	*0.86*	Pr	ppm	*7.84*	Tm	ppm	*0.19*
Aqua Regia Digestion								
Cs	ppm	*45.0*	Pd	ppb	*< 10*	Tb	ppm	*0.45*
Dy	ppm	*2.27*	Pr	ppm	*4.69*	Th	ppm	*7.19*
Er	ppm	*1.07*	Pt	ppb	*< 1*	Tl	ppm	*2.31*
Eu	ppm	*0.63*	Rb	ppm	*361*	Tm	ppm	*0.15*
Gd	ppm	*3.18*	Re	ppm	*0.045*	U	ppm	*4.46*
Ge	ppm	*2.82*	Sb	ppm	*0.35*	W	wt.%	*0.440*
Hg	ppm	*0.89*	Si	wt.%	*0.139*	Yb	ppm	*0.95*
Ho	ppm	*0.41*	Sm	ppm	*3.86*			
Nd	ppm	*19.9*	Ta	ppm	*0.21*			
Infrared Combustion								
S	wt.%	*0.325*						

STATISTICAL ANALYSIS

Certified Values, Confidence Limits, Standard Deviations and Tolerance Limits (Table 1) have been determined for each analyte following removal of individual, laboratory dataset (batch) and 3SD outliers (single iteration). For individual outliers within a laboratory batch the z-score test is used in combination with a second method that determines the per cent deviation of the individual value from the batch median. Outliers in general are selected on the basis of z-scores > 2.5 and with per cent deviations (i) > 3*

and (ii) more than three times the average absolute per cent deviation for the batch. In certain instances statistician's prerogative has been employed in discriminating outliers. Each laboratory data set mean is tested for outlying status based on z-score discrimination and rejected if > 2.5. After individual and laboratory data set (batch) 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. For Tolerance Limits only individual outliers have been removed.

*1.5% for XRF determinations

Certified Values are the means of accepted laboratory means after outlier filtering. The INAA data is omitted from determination of the certified value for Au and is used solely for the calculation of Tolerance Limits and homogeneity evaluation of OREAS 700. Indicative (uncertified) values (Table 2) are provided where i) the number of laboratories reporting a particular analyte is insufficient (< 5) to support certification; ii) inter-laboratory consensus is poor; or iii) a significant proportion of results are outlying or iv) results are multimodal.

95% Confidence Limits are inversely proportional to the number of participating laboratories and inter-laboratory agreement. It is a measure of the reliability of the certified value. A 95% confidence interval indicates a 95% probability that the true value of the analyte under consideration lies between the upper and lower limits. *95% Confidence Limits should not be used as control limits for laboratory performance.*

Standard Deviation values (1SDs) are reported in Table 1 and 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 uncertainty and CRM variability. For an effective CRM the contribution of the latter should be negligible in comparison to measurement errors. The Standard Deviation values include all sources of measurement uncertainty: between-lab variance, within-run variance (precision errors) and CRM variability. The SD for each analyte's certified value is calculated from the same filtered data set used to determine the certified value, i.e. after removal of all individual, lab dataset (batch) and 3SD outliers (single iteration). 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 accepted analyses generated from the certification program.

Table 3 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.

Tolerance Limits (ISO Guide 3207) were determined using an analysis of precision errors method and are considered a conservative estimate of true homogeneity. The meaning of tolerance limits may be illustrated for tungsten by fusion XRF, where 99% of the time (1-

α=0.99) at least 95% of subsamples (ρ=0.95) will have concentrations lying between 1.12 and 1.14 wt.%. 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 (ISO Guide 35).
For gold the tolerance has been determined by INAA using the reduced analytical subsample method which utilises the known relationship between standard deviation and analytical subsample weight (Ingamells and Switzer, 1973). In this approach the sample aliquot is substantially reduced to a point where most of the variability in replicate assays should be due to inhomogeneity of the reference material and measurement error becomes negligible. In this instance a subsample weight of 1.0 gram was employed and the 1RSD of 4.44% (or 0.868% at a 30g charge weight) confirms the high level of gold homogeneity in OREAS 700.

Based on the statistical analysis of the results of the inter-laboratory certification program it can be concluded that OREAS 700 is fit-for-purpose as a certified reference material (see 'Intended Use' below).

Table 3. Performance Gates for OREAS 700

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
Fire Assay											
Au, ppm	0.506	0.023	0.461	0.552	0.439	0.574	4.45%	8.90%	13.35%	0.481	0.532
Borate Fusion XRF											
Al_2O_3, wt.%	10.62	0.132	10.36	10.89	10.23	11.02	1.24%	2.49%	3.73%	10.09	11.15
CaO, wt.%	7.86	0.111	7.63	8.08	7.52	8.19	1.42%	2.84%	4.25%	7.46	8.25
Cl, ppm	158	22	114	203	91	225	14.11%	28.23%	42.34%	150	166
Cu, wt.%	0.204	0.009	0.186	0.221	0.177	0.230	4.37%	8.74%	13.12%	0.193	0.214
Fe, wt.%	16.06	0.175	15.71	16.41	15.53	16.58	1.09%	2.18%	3.26%	15.25	16.86
K_2O, wt.%	1.89	0.028	1.83	1.94	1.80	1.97	1.49%	2.98%	4.46%	1.79	1.98
MgO, wt.%	1.74	0.038	1.66	1.81	1.63	1.85	2.17%	4.35%	6.52%	1.65	1.83
MnO, wt.%	0.415	0.010	0.394	0.435	0.384	0.445	2.47%	4.93%	7.40%	0.394	0.435
Na_2O, wt.%	1.65	0.030	1.59	1.71	1.56	1.74	1.84%	3.67%	5.51%	1.57	1.74
Ni, ppm	< 50	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
P, wt.%	0.353	0.008	0.337	0.369	0.329	0.377	2.27%	4.54%	6.81%	0.335	0.370
Pb, ppm	< 10	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
S, wt.%	0.304	0.014	0.275	0.333	0.261	0.347	4.73%	9.46%	14.19%	0.289	0.319
SiO_2, wt.%	47.30	0.511	46.28	48.32	45.77	48.84	1.08%	2.16%	3.24%	44.94	49.67
Sn, ppm	182	34	114	250	80	285	18.73%	37.46%	56.19%	173	191
TiO_2, wt.%	0.320	0.010	0.301	0.339	0.292	0.349	2.98%	5.96%	8.94%	0.304	0.336
V_2O_5, ppm	110	14	82	139	67	153	12.98%	25.97%	38.95%	105	116

Table 3 continued.

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
Borate Fusion XRF continued											
W, wt.%	1.13	0.025	1.08	1.18	1.05	1.20	2.19%	4.37%	6.56%	1.07	1.18
WO_3, (wt.%)	1.42	0.03	1.36	1.48	1.33	1.52	2.19%	4.37%	6.56%	1.35	1.49
Zn, ppm	231	26	178	283	152	309	11.37%	22.74%	34.11%	219	242
Thermogravimetry											
LOI, wt.%	1.95	0.20	1.55	2.36	1.34	2.57	10.46%	20.93%	31.39%	1.86	2.05
4-Acid Digestion											
Al, wt.%	5.57	0.296	4.98	6.16	4.68	6.46	5.31%	10.62%	15.93%	5.29	5.85
As, ppm	4.35	0.57	3.20	5.50	2.63	6.07	13.20%	26.40%	39.60%	4.13	4.57
Ba, ppm	158	6	146	171	139	177	4.00%	8.01%	12.01%	150	166
Be, ppm	2.32	0.084	2.15	2.49	2.07	2.57	3.62%	7.24%	10.86%	2.20	2.43
Ca, wt.%	5.55	0.227	5.09	6.00	4.86	6.23	4.10%	8.20%	12.29%	5.27	5.82
Co, ppm	16.8	2.6	11.6	21.9	9.0	24.5	15.40%	30.79%	46.19%	15.9	17.6
Cr, ppm	47.2	4.8	37.7	56.7	32.9	61.4	10.07%	20.13%	30.20%	44.8	49.6
Cs, ppm	109	6	97	120	92	125	5.09%	10.17%	15.26%	103	114
Cu, wt.%	0.202	0.007	0.188	0.217	0.181	0.224	3.49%	6.98%	10.47%	0.192	0.213
Fe, wt.%	15.57	0.920	13.73	17.41	12.81	18.33	5.91%	11.82%	17.73%	14.79	16.35
Ga, ppm	129	5	119	140	114	145	3.98%	7.96%	11.94%	123	136
Hf, ppm	1.42	0.141	1.13	1.70	0.99	1.84	9.95%	19.90%	29.86%	1.35	1.49
In, ppm	2.10	0.050	2.00	2.20	1.95	2.25	2.38%	4.76%	7.15%	2.00	2.21
K, wt.%	1.57	0.056	1.45	1.68	1.40	1.73	3.57%	7.14%	10.71%	1.49	1.64
La, ppm	32.5	2.43	27.6	37.3	25.2	39.8	7.48%	14.96%	22.44%	30.9	34.1
Li, ppm	223	19	186	261	167	280	8.43%	16.87%	25.30%	212	235
Lu, ppm	0.18	0.014	0.15	0.21	0.14	0.22	7.69%	15.39%	23.08%	0.17	0.19
Mg, wt.%	0.995	0.025	0.945	1.046	0.919	1.072	2.55%	5.10%	7.65%	0.946	1.045
Mn, wt.%	0.314	0.013	0.288	0.341	0.274	0.354	4.23%	8.46%	12.70%	0.299	0.330
Mo, ppm	81	7.5	66	96	58	103	9.33%	18.66%	27.99%	77	85
Na, wt.%	1.21	0.053	1.11	1.32	1.06	1.37	4.37%	8.74%	13.11%	1.15	1.28
Ni, ppm	24.1	2.7	18.6	29.6	15.9	32.3	11.36%	22.72%	34.08%	22.9	25.3
P, wt.%	0.347	0.029	0.290	0.405	0.261	0.434	8.32%	16.65%	24.97%	0.330	0.365
Pb, ppm	6.83	1.33	4.16	9.50	2.82	10.83	19.55%	39.11%	58.66%	6.48	7.17
Rb, ppm	444	34	377	511	343	545	7.56%	15.11%	22.67%	422	466
S, wt.%	0.295	0.015	0.265	0.324	0.251	0.339	4.99%	9.97%	14.96%	0.280	0.309

Table 3 continued.

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
4-Acid Digestion continued											
Sb, ppm	0.70	0.059	0.58	0.81	0.52	0.87	8.48%	16.96%	25.43%	0.66	0.73
Sc, ppm	9.55	0.878	7.80	11.31	6.92	12.19	9.19%	18.38%	27.57%	9.08	10.03
Sn, ppm	133	9	115	150	107	159	6.52%	13.04%	19.56%	126	139
Sr, ppm	124	7	109	139	102	146	5.99%	11.98%	17.98%	118	130
Th, ppm	7.75	0.751	6.25	9.25	5.50	10.00	9.69%	19.38%	29.08%	7.36	8.14
Ti, wt.%	0.179	0.014	0.151	0.206	0.137	0.220	7.74%	15.48%	23.22%	0.170	0.188
Tl, ppm	2.54	0.43	1.68	3.40	1.25	3.83	16.89%	33.79%	50.68%	2.41	2.67
U, ppm	4.73	0.49	3.74	5.71	3.25	6.20	10.41%	20.83%	31.24%	4.49	4.96
V, ppm	62	2.0	58	66	56	68	3.16%	6.32%	9.47%	59	65
W, wt.%	0.989	0.081	0.826	1.151	0.745	1.232	8.22%	16.43%	24.65%	0.939	1.038
Y, ppm	13.5	0.77	12.0	15.1	11.2	15.8	5.72%	11.44%	17.15%	12.8	14.2
Yb, ppm	1.26	0.13	1.00	1.51	0.87	1.64	10.18%	20.35%	30.53%	1.19	1.32
Zn, ppm	216	16	183	249	167	265	7.55%	15.09%	22.64%	205	227
Zr, ppm	47.3	4.8	37.8	56.8	33.0	61.6	10.07%	20.13%	30.20%	44.9	49.7
Aqua Regia Digestion											
Ag, ppm	0.499	0.075	0.350	0.649	0.275	0.724	14.97%	29.94%	44.92%	0.474	0.524
Al, wt.%	3.13	0.143	2.85	3.42	2.71	3.56	4.55%	9.11%	13.66%	2.98	3.29
As, ppm	3.88	0.73	2.41	5.35	1.68	6.09	18.91%	37.82%	56.74%	3.69	4.08
Au, ppm	0.505	0.034	0.437	0.572	0.404	0.605	6.65%	13.30%	19.95%	0.479	0.530
B, ppm	< 30	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Ba, ppm	81	6.9	67	95	60	102	8.51%	17.02%	25.54%	77	85
Be, ppm	0.73	0.041	0.65	0.81	0.61	0.85	5.62%	11.25%	16.87%	0.69	0.77
Bi, ppm	6.89	0.84	5.21	8.56	4.37	9.40	12.18%	24.37%	36.55%	6.54	7.23
Ca, wt.%	4.45	0.366	3.71	5.18	3.35	5.54	8.23%	16.46%	24.69%	4.22	4.67
Cd, ppm	< 0.5	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Ce, ppm	43.9	7.7	28.5	59.4	20.7	67.1	17.60%	35.19%	52.79%	41.7	46.1
Co, ppm	15.2	1.21	12.8	17.6	11.6	18.9	7.98%	15.96%	23.94%	14.5	16.0
Cr, ppm	51	2.6	45	56	43	59	5.23%	10.47%	15.70%	48	53
Cu, wt.%	0.203	0.008	0.187	0.218	0.179	0.226	3.90%	7.80%	11.70%	0.192	0.213
Fe, wt.%	14.66	0.710	13.24	16.08	12.53	16.79	4.84%	9.68%	14.52%	13.93	15.39
Ga, ppm	112	10	93	132	83	141	8.63%	17.26%	25.89%	107	118
Hf, ppm	0.81	0.12	0.58	1.05	0.46	1.17	14.57%	29.14%	43.72%	0.77	0.85

Table 3 continued.

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
Aqua Regia Digestion continued											
In, ppm	1.67	0.109	1.45	1.88	1.34	1.99	6.57%	13.14%	19.71%	1.58	1.75
K, wt.%	1.24	0.044	1.15	1.32	1.10	1.37	3.57%	7.13%	10.70%	1.17	1.30
La, ppm	20.6	1.71	17.2	24.0	15.5	25.7	8.29%	16.59%	24.88%	19.6	21.6
Li, ppm	84	6.6	70	97	64	103	7.85%	15.70%	23.55%	79	88
Lu, ppm	0.13	0.011	0.11	0.16	0.10	0.17	8.35%	16.71%	25.06%	0.13	0.14
Mg, wt.%	0.948	0.058	0.832	1.065	0.774	1.123	6.13%	12.26%	18.38%	0.901	0.996
Mn, wt.%	0.237	0.014	0.209	0.265	0.195	0.279	5.90%	11.81%	17.71%	0.225	0.248
Mo, ppm	83	9	66	101	57	110	10.71%	21.43%	32.14%	79	88
Na, wt.%	0.164	0.030	0.104	0.225	0.074	0.255	18.34%	36.67%	55.01%	0.156	0.173
Nb, ppm	10.4	2.0	6.5	14.3	4.5	16.3	18.78%	37.56%	56.34%	9.9	10.9
Ni, ppm	24.5	2.6	19.3	29.7	16.7	32.3	10.62%	21.24%	31.86%	23.3	25.7
P, wt.%	0.340	0.012	0.316	0.364	0.304	0.376	3.54%	7.08%	10.63%	0.323	0.357
Pb, ppm	5.10	1.01	3.07	7.13	2.06	8.14	19.86%	39.72%	59.59%	4.84	5.35
S, wt.%	0.297	0.017	0.263	0.331	0.246	0.348	5.74%	11.48%	17.23%	0.282	0.312
Sc, ppm	8.77	1.35	6.07	11.47	4.72	12.83	15.41%	30.81%	46.22%	8.33	9.21
Se, ppm	2.01	0.151	1.71	2.31	1.55	2.46	7.52%	15.03%	22.55%	1.91	2.11
Sn, ppm	110	7	97	123	90	130	6.09%	12.17%	18.26%	104	115
Sr, ppm	46.1	4.07	38.0	54.3	33.9	58.4	8.83%	17.66%	26.49%	43.8	48.4
Te, ppm	0.19	0.03	0.13	0.24	0.10	0.27	15.03%	30.05%	45.08%	0.18	0.20
Ti, wt.%	0.097	0.005	0.086	0.107	0.081	0.113	5.54%	11.09%	16.63%	0.092	0.101
V, ppm	56	2.3	52	61	49	63	4.08%	8.17%	12.25%	53	59
Y, ppm	11.5	1.2	9.1	14.0	7.9	15.2	10.61%	21.22%	31.84%	11.0	12.1
Zn, ppm	207	11	184	230	172	241	5.52%	11.04%	16.56%	196	217
Zr, ppm	24.9	1.86	21.2	28.7	19.4	30.5	7.46%	14.92%	22.38%	23.7	26.2
Acid Digestion Titration											
FeO, wt.%	12.07	0.398	11.27	12.87	10.87	13.26	3.30%	6.60%	9.90%	11.47	12.67
Davis Tube Recovery											
MassRec, wt.%	11.28	0.240	10.80	11.76	10.56	12.00	2.13%	4.26%	6.38%	10.72	11.85
Satmagan 135											
Fe_3O_4, wt.%	10.91	0.196	10.52	11.31	10.33	11.50	1.79%	3.59%	5.38%	10.37	11.46

Note: intervals may appear asymmetric due to rounding.

PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

Reference material OREAS 700 has been prepared, certified and is supplied by:

ORE Research & Exploration Pty Ltd	Tel: +613-9729 0333
37A Hosie Street	Fax: +613-9729 8338
Bayswater North VIC 3153	Web: www.ore.com.au
AUSTRALIA	Email: info@ore.com.au

It is available in unit sizes of 10 and 60g (single-use laminated foil pouches) and 1kg (plastic jars).

PARTICIPATING LABORATORIES

Acme, Vancouver, BC, Canada
Actlabs, Ancaster, ON, Canada
ALS, Brisbane, QLD, Australia
ALS, Loughrea, County Galway, Ireland
ALS, Johannesburg, Gauteng, South Africa
ALS IOT, Wangara, WA, Australia
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Bureau Veritas Amdel, Adelaide, SA, Australia
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Nagrom Laboratories, Kelmscott, WA, Australia
PT Geoservices, Cikarang, Bekasi, Indonesia
SGS, Lakefield, Ontario, Canada
SGS, Vespasiano, MG, Brazil
Shiva Analyticals, Bangalore North, Karnataka, India

INTENDED USE

OREAS 700 is intended for the following uses:

- for the monitoring of laboratory performance in the analysis of analytes reported in Table 1 in geological samples;
- for the verification of analytical methods for analytes reported in Table 1;
- for the calibration of instruments used in the determination of the concentration of analytes reported in Table 1.

STABILITY AND STORAGE INSTRUCTIONS

OREAS 700 has been sourced from samples of skarn tungsten-magnetite ore with the addition of a minor quantity of Cu-Au concentrate. It is low in reactive sulphide (~0.3% S) and in its unopened state and under normal conditions of storage has a shelf life beyond ten years. Its stability will be monitored at regular intervals and purchasers notified if any changes are observed.

INSTRUCTIONS FOR THE CORRECT USE OF THE REFERENCE MATERIAL

The certified values determined via fire assay, 4-acid digestion, aqua regia digestion, Davis Tube Recovery and Satmagan 135 refer to the concentration levels in the packaged state. There is no need for drying prior to weighing and analysis.

In contrast the certified values determined via lithium borate fusion XRF and for LOI at 1000° C are on a dry basis. This requires the removal of hygroscopic moisture by drying in air to constant mass at 105° C. If the reference material is not dried prior to analysis, the certified values should be corrected to the moisture-bearing basis.

HANDLING INSTRUCTIONS

Fine powders pose a risk to eyes and lungs and therefore standard precautions such as the use of safety glasses and dust masks are advised.

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), Technical Manager (ORE P/L)

REFERENCES

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

ISO Guide 35 (2006), Certification of reference materials - General and statistical principals.