

**CERTIFICATE OF ANALYSIS FOR**  
**HIGH GRADE COPPER ORE REFERENCE MATERIAL**  
**OREAS 935**

**Table 1. Certified Values, SDs, 95% Confidence and Tolerance Limits for OREAS 935**

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
<b>4-Acid Digestion</b>						
Ag, Silver (ppm)	43.87	3.84	42.50	45.25	40.44	47.31
Al, Aluminium (wt.%)	3.55	0.50	2.78	4.32	3.35	3.74
As, Arsenic (ppm)	8.72	1.10	8.32	9.12	7.54	9.90
Be, Beryllium (ppm)	< 2	IND	IND	IND	IND	IND
Bi, Bismuth (ppm)	709	60.4	681	738	685	734
Ca, Calcium (wt.%)	0.320	0.015	0.304	0.337	0.304	0.337
Cd, Cadmium (ppm)	< 2	IND	IND	IND	IND	IND
Co, Cobalt (ppm)	77	4.1	75	79	75	80
Cr, Chromium (ppm)	37.6	4.5	32.6	42.5	34.7	40.4
Cu, Copper (wt.%)	12.55	0.388	12.40	12.71	12.31	12.79
Fe, Iron (wt.%)	22.89	1.607	22.06	23.71	22.43	23.34
La, Lanthanum (ppm)	23.0	2.5	19.8	26.2	21.3	24.6
Li, Lithium (ppm)	12.9	2.3	10.5	15.3	12.0	13.9
Mg, Magnesium (wt.%)	0.802	0.055	0.750	0.855	0.761	0.843
Mn, Manganese (wt.%)	0.070	0.004	0.066	0.074	0.067	0.072
Mo, Molybdenum (ppm)	2.00	IND	IND	IND	IND	IND
Nb, Niobium (ppm)	6.53	0.73	5.75	7.30	6.12	6.94
Ni, Nickel (ppm)	29.7	3.3	27.2	32.3	26.6	32.9
P, Phosphorus (wt.%)	< 0.05	IND	IND	IND	IND	IND
Pb, Lead (ppm)	225	22.3	215	236	220	231
S, Sulphur (wt.%)	11.83	2.29	10.60	13.07	11.54	12.12
Sb, Antimony (ppm)	2.70	0.38	2.49	2.92	2.57	2.83
Se, Selenium (ppm)	88	15	80	95	84	91
Sn, Tin (ppm)	108	7.1	104	111	104	111
Sr, Strontium (ppm)	24.2	2.8	20.4	28.0	22.7	25.6
Th, Thorium (ppm)	7.90	1.18	6.83	8.98	7.52	8.28
Ti, Titanium (wt.%)	0.182	0.014	0.165	0.198	0.169	0.194
V, Vanadium (ppm)	< 60	IND	IND	IND	IND	IND
W, Tungsten (ppm)	36.0	4.3	31.1	40.9	31.5	40.5

Table 1 continued.

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
<b>4-Acid Digestion continued</b>						
Y, Yttrium (ppm)	12.3	1.3	11.0	13.6	11.6	12.9
Zn, Zinc (ppm)	692	51.1	670	715	674	711
Zr, Zirconium (ppm)	47.4	5.5	40.6	54.2	44.8	50.0
<b>Aqua Regia Digestion</b>						
Ag, Silver (ppm)	43.67	5.44	41.24	46.10	40.55	46.79
Al, Aluminium (wt.%)	1.65	0.126	1.49	1.81	1.58	1.72
As, Arsenic (ppm)	8.77	1.59	8.04	9.49	7.15	10.39
Bi, Bismuth (ppm)	680	42.6	657	703	659	701
Ca, Calcium (wt.%)	0.240	0.012	0.230	0.249	0.219	0.261
Co, Cobalt (ppm)	77	4.4	74	79	75	79
Cr, Chromium (ppm)	20.4	1.15	19.0	21.7	IND	IND
Cu, Copper (wt.%)	12.48	0.413	12.26	12.71	12.19	12.78
Fe, Iron (wt.%)	22.76	1.619	21.82	23.70	22.27	23.24
K, Potassium (wt.%)	0.217	0.019	0.196	0.237	IND	IND
Mg, Magnesium (wt.%)	0.665	0.045	0.609	0.722	0.645	0.685
Mn, Manganese (wt.%)	0.064	0.006	0.058	0.071	0.061	0.067
Mo, Molybdenum (ppm)	< 1.6	IND	IND	IND	IND	IND
Na, Sodium (wt.%)	< 0.03	IND	IND	IND	IND	IND
Ni, Nickel (ppm)	26.2	2.8	22.8	29.5	24.0	28.3
Pb, Lead (ppm)	222	15.8	214	230	213	232
Sb, Antimony (ppm)	< 2	IND	IND	IND	IND	IND
Se, Selenium (ppm)	86	10	81	92	82	91
Sn, Tin (ppm)	96	8.4	91	102	93	99
Sr, Strontium (ppm)	13.8	0.94	12.8	14.9	IND	IND
Ti, Titanium (wt.%)	0.041	0.007	0.032	0.051	0.038	0.045
W, Tungsten (ppm)	30.1	4.7	24.0	36.3	23.9	36.3
Zn, Zinc (ppm)	666	59.1	638	693	645	686
<b>Infrared Combustion</b>						
S, Sulphur (wt.%)	14.36	0.339	14.21	14.52	14.03	14.69
<b>Borate Fusion XRF</b>						
Co, Cobalt (ppm)	< 100	IND	IND	IND	IND	IND
Cu, Copper (wt.%)	12.54	0.296	12.33	12.74	12.36	12.71
Fe <sub>2</sub> O <sub>3</sub> , Iron(III) oxide (wt.%)	33.80	1.047	33.09	34.50	33.28	34.32
Pb, Lead (ppm)	255	49	208	302	217	293
S, Sulphur (wt.%)	14.60	0.383	14.12	15.07	14.36	14.83
SiO <sub>2</sub> , Silicon dioxide (wt.%)	31.25	0.703	30.58	31.92	30.58	31.92
Zn, Zinc (ppm)	688	36.7	664	712	664	712
<b>Peroxide Fusion ICP</b>						
Ag, Silver (ppm)	43.73	4.10	40.86	46.60	IND	IND
As, Arsenic (ppm)	< 20	IND	IND	IND	IND	IND
Bi, Bismuth (ppm)	679	27.8	663	695	652	706
Co, Cobalt (ppm)	85	10	78	91	81	88
Cu, Copper (wt.%)	12.43	0.370	12.23	12.63	12.09	12.76

Table 1 continued.

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
<b>Peroxide Fusion ICP continued</b>						
Fe, Iron (wt.%)	23.59	1.153	22.97	24.21	23.20	23.98
Pb, Lead (ppm)	233	33	220	247	222	245
S, Sulphur (wt.%)	14.59	0.340	14.39	14.79	14.34	14.84
Sb, Antimony (ppm)	2.79	0.42	2.54	3.04	2.19	3.39
Se, Selenium (ppm)	105	11	95	115	99	111
Si, Silicon (wt.%)	14.75	0.271	14.56	14.95	14.18	15.32
Sn, Tin (ppm)	119	9.0	113	126	114	124
Zn, Zinc (ppm)	721	43.3	699	743	695	747

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 MATERIAL

OREAS 935 is one of a suite of sixteen copper CRMs (OREAS 920 to OREAS 935) prepared from material from the CSA mine located near the town of Cobar in central western New South Wales, Australia. The copper ore body is hosted by the Early Devonian CSA Siltstone, a thinly bedded turbiditic sequence of carbonaceous siltstones and mudstones with minor coarser units. The CSA Siltstone is part of the Cobar Supergroup, consisting of lower syn-rift sediments and upper post-rift sag phase sediments. The mineralisation is structurally controlled and confined to a number of steeply dipping bodies within a major shear zone on the eastern margin of the Early Devonian Cobar Basin. It is characterised by low-grade greenschist alteration and epigenetic low-grade mineralisation enveloping higher-grade shoots of vein complexes or sub-massive to massive sulphides. The sulphides include chalcopyrite, pyrrhotite, pyrite, sphalerite, galena, bornite and cubanite. Iron-rich chlorite and silica are prominent alterations in the siltstone host.

## COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 935 was prepared in the following manner:

- drying to constant mass at 105°C;
- preliminary blending of copper ores and barren siltstone materials;
- multi-stage milling to approximately 99% less than 75 microns;
- final homogenisation;
- packaging in 10g units sealed under nitrogen, in laminated foil pouches.

## ANALYTICAL PROGRAM

Twenty two commercial analytical laboratories participated in the program to characterise the analytes reported in Table 1. The following methods were employed for method specific certification:

- Four acid (HCl-HNO<sub>3</sub>-HF-HClO<sub>4</sub>) digestion with ICP-OES, ICP-MS or AAS finish (21 laboratories);
- Aqua regia digestion with ICP-OES, ICP-MS or AAS finish (20 laboratories);
- Infrared combustion furnace for sulphur (19 laboratories);
- Borate or pyro-sulphate fusion with XRF (12 laboratories);
- Peroxide fusion with ICP-OES, ICP-MS or AAS finish (16 laboratories).

For the round robin program ten 300g test units were taken at predetermined intervals during the bagging stage, immediately following final homogenisation, and are considered representative of the entire batch. The six samples received by each laboratory were obtained by taking two 20g scoop splits from each of three separate 300g test units. This format enabled nested ANOVA treatment of the results to evaluate homogeneity, i.e. to ascertain whether between-unit variance is greater than within-unit variance. Table 1 presents the certified values together with their associated 1SD's, 95% confidence and tolerance limits and Table 2 shows indicative values. Table 3 provides performance gate intervals for the certified values of each analytical method group based on their pooled 1SD's. Tabulated results of all elements together with uncorrected means, medians, standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM<sup>3</sup>) are presented in the detailed certification data for this CRM (**Datapack for OREAS 935.xlsx**).

**Table 2. Indicative Values for OREAS 935**

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
<b>4-Acid Digestion</b>								
Au	ppm	< 0.1	Hf	ppm	1.49	Sc	ppm	6.70
Ba	ppm	60	Ho	ppm	0.42	Sm	ppm	3.65
Ce	ppm	46.4	In	ppm	12.8	Ta	ppm	0.58
Cs	ppm	5.83	K	wt.%	1.29	Tb	ppm	0.41
Dy	ppm	2.22	Lu	ppm	0.17	Te	ppm	0.37
Er	ppm	1.23	Na	wt.%	0.146	Tl	ppm	0.49
Eu	ppm	0.75	Nd	ppm	19.9	U	ppm	1.77
Ga	ppm	11.6	Pr	ppm	5.12	Yb	ppm	1.13
Gd	ppm	2.77	Rb	ppm	80			
Ge	ppm	0.37	Re	ppm	< 0.005			
<b>Aqua Regia Digestion</b>								
Au	ppm	0.040	In	ppm	10.9	Ta	ppm	0.013
B	ppm	78	La	ppm	13.7	Tb	ppm	0.25
Ba	ppm	29.7	Li	ppm	9.23	Te	ppm	0.39
Be	ppm	0.43	Lu	ppm	0.097	Th	ppm	7.63
Cd	ppm	1.52	Nb	ppm	0.42	Tl	ppm	0.11
Ce	ppm	26.4	P	wt.%	0.037	U	ppm	1.28
Cs	ppm	2.75	Rb	ppm	13.6	V	ppm	18.1
Ga	ppm	5.29	Re	ppm	< 0.001	Y	ppm	6.23
Ge	ppm	0.35	S	wt.%	8.40	Yb	ppm	0.62
Hf	ppm	0.42	Sc	ppm	2.10	Zr	ppm	13.3
Hg	ppm	0.36	Si	wt.%	15.50			

Table 2 continued.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
<b>Infrared Combustion</b>								
C	wt.%	0.062						
<b>Borate Fusion XRF</b>								
Al <sub>2</sub> O <sub>3</sub>	wt.%	7.67	MgO	wt.%	1.48	Sr	ppm	28.3
BaO	ppm	298	MnO	wt.%	0.090	TiO <sub>2</sub>	wt.%	0.320
CaO	wt.%	0.483	Na <sub>2</sub> O	wt.%	0.167	V <sub>2</sub> O <sub>5</sub>	ppm	95
Cr <sub>2</sub> O <sub>3</sub>	ppm	70	Ni	ppm	15.8	Zr	ppm	50
K <sub>2</sub> O	wt.%	1.62	P <sub>2</sub> O <sub>5</sub>	wt.%	0.098			
LOI	wt.%	7.28	Sn	ppm	138			
<b>Peroxide Fusion ICP</b>								
Al	wt.%	4.03	Ho	ppm	0.53	Sc	ppm	7.26
Ba	ppm	204	In	ppm	14.9	Sm	ppm	3.97
Be	ppm	< 5	K	wt.%	1.29	Sr	ppm	25.9
Ca	wt.%	0.358	La	ppm	23.0	Ta	ppm	0.60
Cd	ppm	1.51	Li	ppm	15.0	Tb	ppm	0.51
Ce	ppm	49.9	Lu	ppm	0.22	Th	ppm	8.58
Cr	ppm	43.1	Mg	wt.%	0.866	Ti	wt.%	0.199
Cs	ppm	6.00	Mn	wt.%	0.075	Tl	ppm	0.55
Dy	ppm	2.93	Mo	ppm	2.20	Tm	ppm	0.23
Er	ppm	1.48	Nb	ppm	6.99	U	ppm	2.08
Eu	ppm	0.90	Nd	ppm	21.6	V	ppm	46.3
Ga	ppm	13.5	Ni	ppm	156	W	ppm	35.8
Gd	ppm	3.37	P	wt.%	0.490	Y	ppm	12.6
Ge	ppm	2.80	Pr	ppm	5.88	Yb	ppm	1.32
Hf	ppm	2.28	Rb	ppm	89	Zr	ppm	74

## STATISTICAL ANALYSIS

**Certified Values, Standard Deviations, Confidence and Tolerance Limits** have been determined for each analytical method following removal of individual and laboratory outliers (Table 1). Certified Values are the mean of means after outlier filtering. The 95% Confidence Limit is a measure of the reliability of the certified value, i.e. the narrower the Confidence Interval the greater the certainty in the Certified Value. It should not be used as a control limit 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.

**Performance Gates** (Table 3) are 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 per cent for one, two and three relative standard deviations (1RSD, 2RSD and 3RSD) to facilitate an appreciation of the magnitude of these numbers and a comparison with the 5% window. Caution should be exercised when concentration levels approach lower limits of detection of the analytical methods employed as performance gates calculated from standard deviations tend to be excessively wide whereas those determined by the 5% method are too narrow.

**Table 3. Performance Gates for OREAS 935**

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
<b>4-Acid Digestion</b>											
Ag, ppm	43.87	3.84	36.19	51.56	32.35	55.40	8.75%	17.51%	26.26%	41.68	46.07
Al, wt. %	3.55	0.50	2.54	4.55	2.04	5.06	14.20%	28.40%	42.60%	3.37	3.72
As, ppm	8.72	1.10	6.52	10.93	5.41	12.03	12.65%	25.29%	37.94%	8.29	9.16
Be, ppm	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Bi, ppm	709	60	588	830	528	890	8.52%	17.04%	25.56%	674	745
Ca, wt. %	0.320	0.015	0.290	0.351	0.275	0.366	4.74%	9.48%	14.22%	0.304	0.337
Cd, ppm	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Co, ppm	77	4.1	69	86	65	90	5.32%	10.63%	15.95%	73	81
Cr, ppm	37.6	4.5	28.5	46.6	24.0	51.1	11.99%	23.98%	35.98%	35.7	39.4
Cu, wt. %	12.55	0.388	11.78	13.33	11.39	13.72	3.09%	6.18%	9.27%	11.92	13.18
Fe, wt. %	22.89	1.607	19.67	26.10	18.06	27.71	7.02%	14.04%	21.06%	21.74	24.03
La, ppm	23.0	2.5	18.1	27.9	15.6	30.4	10.73%	21.46%	32.19%	21.8	24.1
Li, ppm	12.9	2.3	8.3	17.6	5.9	19.9	18.00%	35.99%	53.99%	12.3	13.6
Mg, wt. %	0.802	0.055	0.691	0.913	0.636	0.969	6.92%	13.83%	20.75%	0.762	0.842
Mn, wt. %	0.070	0.004	0.061	0.078	0.057	0.082	5.96%	11.93%	17.89%	0.066	0.073
Mo, ppm	2.00	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Nb, ppm	6.53	0.73	5.06	8.00	4.32	8.73	11.25%	22.51%	33.76%	6.20	6.86
Ni, ppm	29.7	3.3	23.1	36.4	19.8	39.7	11.17%	22.34%	33.51%	28.3	31.2
P, wt. %	< 0.05	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Pb, ppm	225	22	181	270	158	292	9.92%	19.84%	29.76%	214	236
S, wt. %	11.83	2.29	7.25	16.42	4.96	18.71	19.36%	38.72%	58.08%	11.24	12.43
Sb, ppm	2.70	0.38	1.95	3.46	1.57	3.83	13.95%	27.90%	41.85%	2.57	2.84
Se, ppm	88	15	58	118	43	133	16.94%	33.87%	50.81%	83	92

**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
<b>4-Acid Digestion continued</b>											
Sn, ppm	108	7	93	122	86	129	6.63%	13.27%	19.90%	102	113
Sr, ppm	24.2	2.8	18.5	29.8	15.7	32.6	11.63%	23.26%	34.88%	23.0	25.4
Th, ppm	7.90	1.18	5.54	10.26	4.36	11.44	14.93%	29.86%	44.80%	7.51	8.30
Ti, wt.%	0.182	0.014	0.154	0.209	0.140	0.223	7.62%	15.23%	22.85%	0.173	0.191
V, ppm	< 60	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
W, ppm	36.0	4.3	27.3	44.7	23.0	49.0	12.06%	24.12%	36.17%	34.2	37.8
Y, ppm	12.3	1.3	9.6	14.9	8.3	16.2	10.78%	21.57%	32.35%	11.6	12.9
Zn, ppm	692	51	590	795	539	846	7.38%	14.76%	22.14%	658	727
Zr, ppm	47.4	5.5	36.5	58.4	31.0	63.8	11.54%	23.09%	34.63%	45.0	49.8
<b>Aqua Regia Digestion</b>											
Ag, ppm	43.67	5.44	32.80	54.54	27.36	59.98	12.45%	24.90%	37.35%	41.49	45.85
Al, wt.%	1.65	0.126	1.40	1.90	1.27	2.03	7.63%	15.27%	22.90%	1.57	1.73
As, ppm	8.77	1.59	5.59	11.95	3.99	13.54	18.15%	36.30%	54.45%	8.33	9.21
Bi, ppm	680	43	595	765	552	808	6.26%	12.52%	18.78%	646	714
Ca, wt.%	0.240	0.012	0.217	0.263	0.205	0.274	4.80%	9.61%	14.41%	0.228	0.252
Co, ppm	77	4.4	68	86	63	90	5.79%	11.59%	17.38%	73	81
Cr, ppm	20.4	1.15	18.1	22.7	16.9	23.8	5.66%	11.33%	16.99%	19.3	21.4
Cu, wt.%	12.48	0.413	11.66	13.31	11.24	13.72	3.31%	6.62%	9.93%	11.86	13.11
Fe, wt.%	22.76	1.619	19.52	26.00	17.90	27.62	7.12%	14.23%	21.35%	21.62	23.90
K, wt.%	0.217	0.019	0.178	0.256	0.158	0.275	8.98%	17.97%	26.95%	0.206	0.228
Mg, wt.%	0.665	0.045	0.576	0.755	0.531	0.800	6.73%	13.45%	20.18%	0.632	0.699
Mn, wt.%	0.064	0.006	0.053	0.076	0.047	0.082	9.02%	18.04%	27.06%	0.061	0.067
Mo, ppm	< 1.6	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Na, wt.%	< 0.03	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Ni, ppm	26.2	2.8	20.5	31.8	17.6	34.7	10.88%	21.77%	32.65%	24.8	27.5
Pb, ppm	222	16	190	254	175	270	7.13%	14.26%	21.39%	211	233
Sb, ppm	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Se, ppm	86	10	66	107	55	117	11.97%	23.94%	35.90%	82	91
Sn, ppm	96	8.4	80	113	71	122	8.72%	17.44%	26.16%	92	101
Sr, ppm	13.8	0.94	11.9	15.7	11.0	16.6	6.78%	13.56%	20.34%	13.1	14.5
Ti, wt.%	0.041	0.007	0.027	0.056	0.020	0.063	17.43%	34.86%	52.29%	0.039	0.043
W, ppm	30.1	4.7	20.7	39.5	16.0	44.2	15.59%	31.18%	46.77%	28.6	31.6



**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
<b>Aqua Regia Digestion continued</b>											
Zn, ppm	666	59	547	784	488	843	8.88%	17.76%	26.63%	632	699
<b>Infrared Combustion</b>											
S, wt.%	14.36	0.339	13.69	15.04	13.35	15.38	2.36%	4.72%	7.07%	13.65	15.08
<b>Borate Fusion XRF</b>											
Co, ppm	< 100	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Cu, wt.%	12.54	0.296	11.94	13.13	11.65	13.42	2.36%	4.72%	7.08%	11.91	13.16
Fe <sub>2</sub> O <sub>3</sub> , wt.%	33.80	1.047	31.70	35.89	30.66	36.94	3.10%	6.19%	9.29%	32.11	35.49
Pb, ppm	255	49	156	354	107	403	19.39%	38.78%	58.17%	242	268
S, wt.%	14.60	0.383	13.83	15.36	13.45	15.74	2.62%	5.24%	7.87%	13.87	15.33
SiO <sub>2</sub> , wt.%	31.25	0.703	29.85	32.66	29.14	33.36	2.25%	4.50%	6.75%	29.69	32.81
Zn, ppm	688	37	615	761	578	798	5.34%	10.68%	16.02%	654	722
<b>Peroxide Fusion ICP</b>											
Ag, ppm	43.73	4.10	35.53	51.92	31.44	56.02	9.37%	18.74%	28.11%	41.54	45.92
As, ppm	< 20	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Bi, ppm	679	28	623	734	595	762	4.10%	8.19%	12.29%	645	713
Co, ppm	85	10	64	105	53	116	12.38%	24.75%	37.13%	80	89
Cu, wt.%	12.43	0.370	11.69	13.17	11.32	13.54	2.98%	5.96%	8.94%	11.80	13.05
Fe, wt.%	23.59	1.153	21.28	25.90	20.13	27.05	4.89%	9.78%	14.67%	22.41	24.77
Pb, ppm	233	33	168	299	136	331	13.99%	27.97%	41.96%	222	245
S, wt.%	14.59	0.340	13.91	15.27	13.57	15.61	2.33%	4.66%	6.99%	13.86	15.32
Sb, ppm	2.79	0.42	1.96	3.63	1.54	4.04	14.97%	29.93%	44.90%	2.65	2.93
Se, ppm	105	11	83	126	73	137	10.18%	20.35%	30.53%	100	110
Si, wt.%	14.75	0.271	14.21	15.29	13.94	15.56	1.84%	3.67%	5.51%	14.02	15.49
Sn, ppm	119	9	101	137	92	146	7.56%	15.11%	22.67%	113	125
Zn, ppm	721	43	634	808	591	851	6.00%	12.01%	18.01%	685	757

Note: intervals may appear asymmetric due to rounding

**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 copper by 4-acid digestion, where 99% of the time ( $1-\alpha=0.99$ ) at least 95% of subsamples ( $p=0.95$ ) will have concentrations lying between 12.31 and 12.79 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).



The homogeneity of OREAS 935 has also been evaluated in an ANOVA study for all certified analytes. This study tests the null hypothesis that no statistically significant difference exists between the *between-unit variance* and the *within-unit variance* (i.e. p-values <0.05 indicate rejection of the null hypothesis). Of the 76 certified values, no failures were observed indicating no evidence to reject the null hypothesis.

Based on the statistical analysis of the results of the inter-laboratory certification program it can be concluded that OREAS 935 is fit-for-purpose as a certified reference material (see 'Intended Use' below).

## PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

Reference material OREAS 935 has been prepared and certified by:

ORE Research & Exploration Pty Ltd  
37A Hosie Street  
Bayswater North VIC 3153  
AUSTRALIA

Tel: +613-9729 0333  
Fax: +613-9729 8338  
Web: [www.ore.com.au](http://www.ore.com.au)  
Email: [info@ore.com.au](mailto:info@ore.com.au)

It has been packaged in 10g units sealed under nitrogen in laminated foil pouches.

## PARTICIPATING LABORATORIES

Accurassay, Thunder Bay, ON, Canada  
Acme, Santiago, Chile  
Acme, Vancouver, BC, Canada  
Actlabs, Ancaster, Ontario, Canada  
Actlabs, Kamloops, BC, Canada  
Actlabs, Thunder Bay, Ontario, Canada  
ALS, Brisbane, QLD, Australia  
ALS, Burnie, TAS, Australia  
ALS, Loughrea, County Galway, Ireland  
ALS, Vancouver, BC, Canada  
Amdel (BV), Cardiff, NSW, Australia  
Intertek Genalysis, Perth, WA, Australia  
Intertek Testing Services, Adelaide, SA, Australia  
Intertek Testing Services, Beijing, China  
Intertek Testing Services, Jakarta Selatan, Indonesia  
Intertek Genalysis, Johannesburg, Sth Africa  
Intertek Testing Services, Muntinlupa, Philippines  
Labtium Oy, Rovaniemi, Finland  
MINTEK, Randburg, Sth Africa  
PT. Geoservices, Cikarang, Indonesia  
SGS, Booyens, Gauteng, South Africa  
SGS Didipio, Makati City, Philippines  
SGS, Lakefield, Ontario, Canada  
SGS Nui Phao, Ha Noi, Vietnam  
SGS, Vancouver, BC, Canada

SGS, Vespasiano, MG, Brazil  
Shiva Analyticals, Bangalore North, Karnataka, India  
Ultra Trace (BV), Perth, WA, Australia

## **INTENDED USE**

OREAS 935 is intended for the following uses:

- for the monitoring of laboratory performance in the analysis of geological samples for the analytes reported in Table 1;
- 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 935 has been prepared from mineralised and altered carbonaceous siltstones and mudstones from the CSA mine located near the town of Cobar in central western New South Wales, Australia. To prolong its shelf life it has been packaged under nitrogen in robust foil laminate pouches. Under normal storage conditions it is considered to have long-term stability beyond 10 years.

## **INSTRUCTIONS FOR THE CORRECT USE OF THE REFERENCE MATERIAL**

The certified values for OREAS 935 refer to the concentration level in its packaged state. It should not be dried prior to weighing and analysis.

## **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

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.