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CERTIFICATE OF ANALYSIS FOR

High Sulphidation Epithermal Au-Cu-Ag Ore

(Mt Carlton, Queensland, Australia)

CERTIFIED REFERENCE MATERIAL

OREAS 606

Summary Statistics for Key Analytes.

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
Pb Fire Assay											
Au, ppm	0.340	0.010	0.321	0.360	0.312	0.369	2.82%	5.65%	8.47%	0.323	0.357
4-Acid Digestion											
Ag, ppm	1.02	0.060	0.90	1.14	0.84	1.20	5.90%	11.81%	17.71%	0.97	1.07
Cu, ppm	268	11	246	291	235	302	4.18%	8.36%	12.55%	255	282

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

Note 1: intervals may appear asymmetric due to rounding.

Note 2: the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

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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
Pb Fire Assay											
Au, ppm	0.340	0.010	0.321	0.360	0.312	0.369	2.82%	5.65%	8.47%	0.323	0.357
Aqua Regia Digestion (sample weights 10-50g)											
Au, ppm	0.315	0.019	0.276	0.354	0.257	0.373	6.15%	12.30%	18.45%	0.299	0.331
Infrared Combustion											
S, wt.%	0.492	0.032	0.428	0.555	0.396	0.587	6.47%	12.94%	19.41%	0.467	0.516
4-Acid Digestion											
Ag, ppm	1.02	0.060	0.90	1.14	0.84	1.20	5.90%	11.81%	17.71%	0.97	1.07
Al, wt.%	6.95	0.339	6.28	7.63	5.94	7.97	4.87%	9.75%	14.62%	6.61	7.30
As, ppm	106	4	98	114	94	118	3.76%	7.52%	11.29%	100	111
Ba, ppm	2506	143	2220	2792	2076	2936	5.71%	11.43%	17.14%	2381	2631
Be, ppm	2.58	0.212	2.16	3.01	1.95	3.22	8.22%	16.43%	24.65%	2.46	2.71
Bi, ppm	5.91	0.384	5.14	6.68	4.76	7.06	6.51%	13.01%	19.52%	5.61	6.20
Ca, wt.%	0.521	0.028	0.465	0.578	0.436	0.606	5.42%	10.84%	16.26%	0.495	0.547
Cd, ppm	0.96	0.058	0.84	1.07	0.78	1.13	6.07%	12.15%	18.22%	0.91	1.01
Ce, ppm	80	4.2	72	89	68	93	5.28%	10.56%	15.83%	76	84
Co, ppm	4.33	0.226	3.88	4.78	3.65	5.01	5.21%	10.43%	15.64%	4.11	4.55
Cr, ppm	30.2	4.3	21.5	38.9	17.1	43.2	14.42%	28.84%	43.26%	28.6	31.7
Cs, ppm	4.97	0.275	4.42	5.52	4.15	5.80	5.53%	11.07%	16.60%	4.72	5.22
Cu, ppm	268	11	246	291	235	302	4.18%	8.36%	12.55%	255	282
Dy, ppm	3.02	0.235	2.55	3.49	2.32	3.72	7.77%	15.54%	23.31%	2.87	3.17
Er, ppm	0.81	0.067	0.68	0.95	0.61	1.01	8.31%	16.62%	24.93%	0.77	0.85
Eu, ppm	1.55	0.115	1.32	1.78	1.21	1.89	7.40%	14.80%	22.20%	1.47	1.63
Fe, wt.%	1.72	0.066	1.59	1.85	1.52	1.92	3.86%	7.71%	11.57%	1.63	1.80
Ga, ppm	20.8	1.03	18.8	22.9	17.7	23.9	4.94%	9.88%	14.82%	19.8	21.9
Gd, ppm	5.98	0.384	5.21	6.75	4.83	7.13	6.42%	12.84%	19.26%	5.68	6.28
Hf, ppm	2.48	0.170	2.14	2.82	1.97	2.99	6.85%	13.71%	20.56%	2.35	2.60
Ho, ppm	0.39	0.031	0.32	0.45	0.29	0.48	8.12%	16.23%	24.35%	0.37	0.41
In, ppm	0.15	0.012	0.13	0.18	0.12	0.19	7.65%	15.31%	22.96%	0.15	0.16
K, wt.%	3.22	0.121	2.98	3.46	2.86	3.58	3.75%	7.50%	11.26%	3.06	3.38
La, ppm	39.7	1.73	36.3	43.2	34.5	44.9	4.36%	8.71%	13.07%	37.7	41.7
Li, ppm	41.3	1.57	38.1	44.4	36.5	46.0	3.80%	7.61%	11.41%	39.2	43.3
Mg, ppm	3628	194	3239	4017	3045	4212	5.36%	10.72%	16.08%	3447	3810
Mn, ppm	104	4	97	112	93	116	3.65%	7.31%	10.96%	99	110
Mo, ppm	4.04	0.228	3.59	4.50	3.36	4.73	5.63%	11.27%	16.90%	3.84	4.25
Na, wt.%	1.77	0.060	1.65	1.89	1.59	1.95	3.36%	6.71%	10.07%	1.68	1.86
Nb, ppm	14.1	0.63	12.8	15.4	12.2	16.0	4.49%	8.97%	13.46%	13.4	14.8
Nd, ppm	35.7	1.45	32.8	38.6	31.4	40.1	4.06%	8.12%	12.19%	33.9	37.5
Ni, ppm	15.0	0.74	13.5	16.4	12.7	17.2	4.98%	9.96%	14.94%	14.2	15.7
P, ppm	817	33	750	884	717	917	4.08%	8.17%	12.25%	776	858
Pb, ppm	107	6	95	118	89	124	5.45%	10.90%	16.35%	101	112

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

Note 1: intervals may appear asymmetric due to rounding.

Note 2: the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

Table 1 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											
Pr, ppm	9.62	0.522	8.58	10.66	8.05	11.19	5.43%	10.85%	16.28%	9.14	10.10
Rb, ppm	166	5	156	176	151	181	3.01%	6.03%	9.04%	158	174
S, wt.%	0.503	0.025	0.452	0.553	0.427	0.578	4.99%	9.99%	14.98%	0.477	0.528
Sb, ppm	19.7	1.80	16.1	23.3	14.3	25.1	9.13%	18.25%	27.38%	18.7	20.7
Sc, ppm	3.48	0.165	3.15	3.81	2.99	3.98	4.73%	9.47%	14.20%	3.31	3.66
Se, ppm	2.05	0.43	1.19	2.90	0.77	3.32	20.84%	41.69%	62.53%	1.94	2.15
Sm, ppm	7.67	0.495	6.68	8.66	6.19	9.15	6.45%	12.90%	19.34%	7.29	8.05
Sn, ppm	4.26	0.168	3.92	4.60	3.75	4.76	3.96%	7.91%	11.87%	4.05	4.47
Sr, ppm	204	11	181	227	169	238	5.62%	11.23%	16.85%	194	214
Ta, ppm	1.11	0.088	0.93	1.29	0.84	1.37	7.98%	15.96%	23.94%	1.05	1.16
Tb, ppm	0.68	0.07	0.55	0.82	0.48	0.89	10.00%	20.01%	30.01%	0.65	0.72
Te, ppm	0.83	0.077	0.67	0.98	0.60	1.06	9.26%	18.52%	27.78%	0.79	0.87
Th, ppm	15.2	0.66	13.8	16.5	13.2	17.1	4.34%	8.67%	13.01%	14.4	15.9
Ti, wt.%	0.170	0.005	0.161	0.180	0.156	0.184	2.74%	5.49%	8.23%	0.162	0.179
Tl, ppm	1.15	0.066	1.02	1.28	0.95	1.35	5.78%	11.56%	17.34%	1.09	1.21
U, ppm	4.41	0.208	3.99	4.83	3.79	5.04	4.72%	9.44%	14.17%	4.19	4.63
V, ppm	25.6	0.98	23.7	27.6	22.7	28.6	3.81%	7.62%	11.44%	24.3	26.9
W, ppm	2.53	0.185	2.16	2.90	1.97	3.08	7.33%	14.66%	21.99%	2.40	2.65
Y, ppm	11.5	0.85	9.9	13.2	9.0	14.1	7.33%	14.65%	21.98%	11.0	12.1
Yb, ppm	0.56	0.06	0.44	0.67	0.39	0.72	10.10%	20.20%	30.30%	0.53	0.58
Zn, ppm	179	5	169	188	164	193	2.71%	5.41%	8.12%	170	188
Zr, ppm	66	3.1	60	72	57	76	4.75%	9.49%	14.24%	63	69
Aqua Regia Digestion											
Ag, ppm	1.03	0.056	0.91	1.14	0.86	1.19	5.42%	10.83%	16.25%	0.97	1.08
Al, wt.%	0.920	0.053	0.814	1.025	0.762	1.078	5.73%	11.46%	17.19%	0.874	0.966
As, ppm	100	8.2	83	116	75	124	8.22%	16.44%	24.66%	95	105
Ba, ppm	261	16	228	293	212	309	6.20%	12.40%	18.60%	247	274
Be, ppm	0.64	0.063	0.51	0.76	0.45	0.82	9.85%	19.70%	29.54%	0.60	0.67
Bi, ppm	6.02	0.360	5.30	6.74	4.94	7.10	5.98%	11.96%	17.93%	5.72	6.32
Ca, wt.%	0.248	0.012	0.225	0.271	0.213	0.282	4.65%	9.30%	13.95%	0.235	0.260
Cd, ppm	0.95	0.061	0.82	1.07	0.76	1.13	6.44%	12.88%	19.32%	0.90	0.99
Ce, ppm	33.8	2.29	29.2	38.4	27.0	40.7	6.76%	13.52%	20.28%	32.1	35.5
Co, ppm	4.11	0.197	3.72	4.50	3.52	4.70	4.79%	9.58%	14.37%	3.90	4.31
Cr, ppm	26.4	1.56	23.3	29.5	21.7	31.1	5.90%	11.81%	17.71%	25.1	27.7
Cs, ppm	1.58	0.054	1.48	1.69	1.42	1.75	3.40%	6.81%	10.21%	1.50	1.66
Cu, ppm	272	13	245	298	232	311	4.81%	9.61%	14.42%	258	285
Fe, wt.%	1.47	0.075	1.32	1.62	1.25	1.70	5.11%	10.22%	15.33%	1.40	1.54
Ga, ppm	4.57	0.323	3.92	5.21	3.60	5.53	7.07%	14.13%	21.20%	4.34	4.80
Hf, ppm	0.49	0.024	0.44	0.53	0.41	0.56	4.99%	9.98%	14.97%	0.46	0.51
Hg, ppm	0.039	0.008	0.023	0.055	0.015	0.062	20.44%	40.89%	61.33%	0.037	0.041

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

Note 1: intervals may appear asymmetric due to rounding.

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Table 1 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	0.11	0.007	0.10	0.13	0.09	0.14	6.46%	12.92%	19.38%	0.11	0.12
K, wt.%	0.285	0.018	0.249	0.322	0.231	0.340	6.39%	12.79%	19.18%	0.271	0.300
La, ppm	16.7	1.20	14.3	19.1	13.1	20.3	7.20%	14.39%	21.59%	15.8	17.5
Li, ppm	16.6	1.7	13.2	20.1	11.4	21.8	10.39%	20.78%	31.17%	15.8	17.5
Mg, ppm	2499	118	2262	2735	2144	2854	4.74%	9.47%	14.21%	2374	2624
Mn, ppm	91	4.3	82	99	78	104	4.79%	9.59%	14.38%	86	95
Mo, ppm	3.74	0.221	3.29	4.18	3.07	4.40	5.91%	11.81%	17.72%	3.55	3.92
Na, wt.%	0.072	0.012	0.048	0.096	0.035	0.109	16.98%	33.97%	50.95%	0.068	0.076
Ni, ppm	14.3	0.58	13.1	15.5	12.6	16.1	4.08%	8.17%	12.25%	13.6	15.0
P, ppm	536	37	461	611	424	649	6.98%	13.97%	20.95%	509	563
Pb, ppm	83	3.6	76	91	73	94	4.30%	8.60%	12.89%	79	88
Rb, ppm	17.9	0.95	16.0	19.8	15.0	20.7	5.30%	10.60%	15.90%	17.0	18.8
S, wt.%	0.275	0.016	0.243	0.308	0.226	0.324	5.94%	11.88%	17.81%	0.261	0.289
Sb, ppm	15.8	1.39	13.0	18.6	11.6	20.0	8.80%	17.61%	26.41%	15.0	16.6
Sc, ppm	1.05	0.15	0.75	1.35	0.60	1.50	14.23%	28.45%	42.68%	1.00	1.11
Se, ppm	1.60	0.27	1.07	2.13	0.81	2.40	16.55%	33.11%	49.66%	1.52	1.68
Sn, ppm	0.71	0.08	0.55	0.88	0.47	0.96	11.26%	22.51%	33.77%	0.68	0.75
Sr, ppm	18.2	0.76	16.7	19.7	15.9	20.5	4.20%	8.40%	12.60%	17.3	19.1
Te, ppm	0.76	0.049	0.66	0.86	0.61	0.91	6.43%	12.87%	19.30%	0.72	0.80
Th, ppm	6.75	0.526	5.70	7.81	5.17	8.33	7.79%	15.59%	23.38%	6.42	7.09
Tl, ppm	0.28	0.015	0.25	0.31	0.23	0.32	5.48%	10.95%	16.43%	0.26	0.29
U, ppm	2.25	0.154	1.94	2.56	1.79	2.71	6.85%	13.71%	20.56%	2.14	2.36
V, ppm	8.89	1.08	6.73	11.05	5.64	12.14	12.17%	24.35%	36.52%	8.45	9.33
W, ppm	0.35	0.05	0.25	0.45	0.20	0.50	14.25%	28.50%	42.74%	0.33	0.37
Y, ppm	6.39	0.342	5.71	7.07	5.36	7.42	5.35%	10.70%	16.05%	6.07	6.71
Zn, ppm	173	5	163	182	159	186	2.65%	5.30%	7.94%	164	181
Zr, ppm	12.4	1.3	9.7	15.1	8.4	16.5	10.84%	21.69%	32.53%	11.8	13.0

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

Note 1: intervals may appear asymmetric due to rounding.

Note 2: the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

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.

OREAS reference materials enable users to successfully achieve process control of these tasks because the observed variance from repeated analysis has its origin almost exclusively in the analytical process rather than the reference material itself.

SOURCE MATERIAL

OREAS 606 was prepared from a blend of silver-copper-gold bearing ores from Evolution Mining's Mount Carlton Operation in Queensland, Australia and argillic rhyodacite waste rock sourced from a quarry east of Melbourne, Australia.

The mineralisation assemblage at Mount Carlton consists of pyrite, enargite/tennantite, tetrahedrite, digenite, covellite, sphalerite, galena, alunite, dickite, kaolinite and vuggy silica, hosted in advanced argillic altered rhyodacite containing sulphur-salts.

PERFORMANCE GATES

Table 1 above shows intervals 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 (also see 'Intended Use' section below). Westgard Rules extend the basics of single-rule QC monitoring using multi-rules (for more information visit www.westgard.com/mltirule.htm). 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. One approach used at commercial laboratories is to set the acceptance criteria at twice the detection level (DL) ± 10%.

i.e. Certified Value ± 10% ± 2DL (adapted from Govett, 1983)

Table 2. Indicative Values for OREAS 606.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Pb Fire Assay								
Pd	ppb	*< 5*	Pt	ppb	*< 5*			
Infrared Combustion								
C	wt.%	*0.175*						
4-Acid Digestion								
Ge	ppm	*0.86*	Lu	ppb	*82.8*	Tm	ppb	*87.1*
Hg	ppm	*0.10*	Re	ppb	*1.85*			
Aqua Regia Digestion								
B	ppm	*< 10*	Lu	ppb	*33.3*	Sm	ppm	*4.52*
Dy	ppm	*1.90*	Nb	ppm	*0.22*	Ta	ppm	*< 0.01*
Er	ppm	*0.47*	Nd	ppm	*21.8*	Tb	ppm	*0.40*
Eu	ppm	*0.60*	Pd	ppb	*13.5*	Ti	wt.%	*0.016*
Gd	ppm	*3.97*	Pr	ppm	*5.28*	Tm	ppb	*< 100*

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE's in-house CRM-specific LIMS.

Table 2 continued.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Aqua Regia Digestion continued								
Ge	ppm	*0.083*	Pt	ppb	*< 2*	Yb	ppm	*0.26*
Ho	ppm	*0.22*	Re	ppb	*1.63*			
Borate Fusion XRF								
Al_2O_3	wt.%	*13.84*	Fe_2O_3	wt.%	*2.49*	S	wt.%	*0.518*
As	ppm	*100*	K_2O	wt.%	*3.95*	SiO_2	wt.%	*73.02*
BaO	ppm	*3230*	MgO	wt.%	*0.650*	Sn	ppm	*< 10*
CaO	wt.%	*0.730*	MnO	wt.%	*0.016*	Sr	ppm	*254*
Cl	ppm	*7.50*	Na_2O	wt.%	*2.53*	TiO_2	wt.%	*0.284*
Co	ppm	*10.0*	Ni	ppm	*25.0*	V_2O_5	ppm	*50*
Cr_2O_3	ppm	*80*	P_2O_5	wt.%	*0.185*	Zn	ppm	*180*
Cu	wt.%	*0.028*	Pb	ppm	*125*	Zr	ppm	*159*
Thermogravimetry								
LOI^{1000}	wt.%	*2.30*						
Laser Ablation ICP-MS								
Ag	ppm	*1.00*	Hf	ppm	*4.93*	Sm	ppm	*7.67*
As	ppm	*106*	Ho	ppm	*0.42*	Sn	ppm	*4.30*
Ba	ppm	*2780*	In	ppm	*0.18*	Sr	ppm	*205*
Be	ppm	*2.60*	La	ppm	*38.9*	Ta	ppm	*1.07*
Bi	ppm	*6.24*	Lu	ppb	*100*	Tb	ppm	*0.76*
Cd	ppm	*1.10*	Mn	ppm	*105*	Te	ppm	*0.90*
Ce	ppm	*78*	Mo	ppm	*4.00*	Th	ppm	*15.0*
Co	ppm	*4.30*	Nb	ppm	*14.1*	Ti	wt.%	*0.167*
Cr	ppm	*33.0*	Nd	ppm	*35.9*	Tl	ppm	*1.40*
Cs	ppm	*4.76*	Ni	ppm	*23.0*	Tm	ppb	*115*
Cu	wt.%	*0.029*	Pb	ppm	*117*	U	ppm	*4.66*
Dy	ppm	*3.06*	Pr	ppm	*9.40*	V	ppm	*25.5*
Er	ppm	*0.93*	Rb	ppm	*156*	W	ppm	*2.50*
Eu	ppm	*1.60*	Re	ppb	*25.0*	Y	ppm	*12.4*
Ga	ppm	*20.6*	Sb	ppm	*19.9*	Yb	ppm	*0.70*
Gd	ppm	*6.01*	Sc	ppm	*3.55*	Zn	ppm	*195*
Ge	ppm	*1.15*	Se	ppm	*< 5*	Zr	ppm	*152*
X-ray Photon Assay								
Au	ppm	*0.355*						

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.
Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE's in-house CRM-specific LIMS.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 606 was prepared in the following manner:

- Drying of ore materials (sulphide-rich) to constant mass at 85°C;
- Drying of barren rhyodacite to constant mass at 105°C;
- Crushing and milling of ore materials to 100% minus 30 microns;
- Crushing and milling of barren rhyodacite to 98% minus 75 microns;
- Blending in appropriate proportions to achieve the desired grades;
- Packaging in 10g and 60g units in laminated foil pouches and 1kg units in plastic jars.

PHYSICAL PROPERTIES

OREAS 606 was tested at ORE Research & Exploration Pty Ltd's onsite laboratory for various physical properties. Table 3 presents these findings which should be used for informational purposes only.

Table 3. Physical properties of OREAS 606.

CRM Name	Bulk Density (g/L)	Moisture%	Munsell Notation‡	Munsell Color‡
OREAS 606	826	0.56	N8	Very Light Gray

‡The Munsell Rock Color Chart helps geologists and archeologists communicate with color more effectively by cross-referencing ISCC-NBS color names with unique Munsell alpha-numeric color notations for rock color samples.

ANALYTICAL PROGRAM

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

- Gold by fire assay using a 25-50g charge weight with AAS finish (13 laboratories), gravimetric finish (7 laboratories) and ICP-OES (5 laboratories);
- Gold by aqua regia digestion using a 15-40g sample mass with ICP-MS finish (11 laboratories) and AAS (3 laboratories) finish;
- Sulphur by infra-red combustion furnace (21 laboratories);
- Full ICP-OES and MS elemental suites by 4-acid digestion (up to 23 laboratories depending on the element; some laboratories employed an AAS finish for Ag and Cu);
- Full ICP-OES and MS elemental suites by aqua regia digestion (up to 24 laboratories depending on the element; some laboratories employed an AAS finish for Cu);
- Gold by instrumental neutron activation analysis (INAA) on 20 x 85mg subsamples to confirm homogeneity (undertaken by ANSTO, Lucas Heights).

It is important to note that in the analytical industry there is no standardisation of the aqua regia digestion process. Aqua regia is a partial empirical digest and differences in recoveries for various analytes are commonplace. These are caused by variations in the digest conditions which can include the ratio of nitric to hydrochloric acids, acid strength, temperatures, leach times and secondary digestions. Recoveries for sulphide-hosted base metal sulphides approach total values, however, other analytes, in particular the lithophile elements, show greater sensitivity to method parameters. This can result in lack of consensus in an inter-laboratory certification program for these elements.

The approach applied here is to report certified values in those instances where reasonable agreement exists amongst a majority of participating laboratories. The results of specific laboratories may differ significantly from the certified values, but will, nonetheless, be valid and reproducible in the context of the specifics of the aqua regia method in use. Users of this reference material should, therefore, be mindful of this limitation when applying the certified values in a quality control program.

Gold was also determined by Chrysos Corporation's new Photon Assay technique at their Perth and Kalgoorlie branches. The mean value is included in Table 2 as an indicative value since it is reported by two laboratories only. Table 2 also includes major and trace element characterisation by BV Perth Geoanalytical laboratory using the following methodologies:

- Major oxides by lithium borate fusion with X-ray fluorescence;
- LOI at 1000°C by thermogravimetric analyser;
- Infra-red combustion furnace for C;
- Trace element characterisation by laser ablation with ICP-MS finish.

For the round robin program twenty 1.2kg test units were taken at predetermined intervals during the bagging stage, immediately following homogenisation and are considered representative of the entire prepared batch. Six 100g pulp samples were submitted to each laboratory for analysis received by each laboratory were obtained by taking two 100g samples from each of three separate 1.2kg 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 4 presents the 103 certified values together with their associated 1SD's, 95% confidence and tolerance limits. Gold homogeneity has been evaluated and confirmed by instrumental neutron activation analysis (INAA) on twenty ~85mg sample portions (see Table 5 below) and by a nested ANOVA program for both fire assay and aqua regia digestion (see '**nested ANOVA**' section).

Tabulated results of all elements together with uncorrected means, medians, standard deviations, relative standard deviations and per cent deviation of lab means from the corrected mean of means (PDM[3]) are presented in the detailed certification data for this CRM (**OREAS 606 DataPack-1.3.200120_143429.xlsx**).

Results are also presented in scatter plots for gold by fire assay, silver by 4-acid digestion and copper by 4-acid digestion (Figures 1 to 3, respectively) together with ±3SD (magenta) and ±5% (yellow) control lines and certified value (green line). Accepted individual results are coloured blue and individual and dataset outliers are identified in red and violet, respectively.

STATISTICAL ANALYSIS

Standard Deviation intervals (see Table 1) 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.

In the application of SD's in monitoring performance it is important to note that not all laboratories function at the same level of proficiency and that different methods in use at a particular laboratory have differing levels of precision. Each laboratory has its own inherent SD (for a specific concentration level and analyte-method pair) based on the analytical process and this SD is not directly related to the round robin program (see Intended Use section for more detail).

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.***

Certified Values, Standard Deviations, Confidence Limits and Tolerance Limits (Table 4) 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.

Certified Values are the means of accepted laboratory means after outlier filtering. The INAA data (see Table 5) 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 606 (see 'Homogeneity Evaluation' section below).

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.***

Indicative (uncertified) values (Table 2) are provided for the major and trace elements determined by borate fusion XRF (Al_2O_3 to Zr), laser ablation with ICP-MS (Ag to Zr), LOI at 1000°C and C by infrared combustion furnace and are the means of duplicate assays from Bureau Veritas, Perth. Additional indicative values by other analytical methods are present where the number of laboratories reporting a particular analyte is insufficient (< 5) to support certification or where inter-laboratory consensus is poor.

Table 4. 95% Confidence & Tolerance Limits for OREAS 606.

Constituent	Certified Value	SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Pb Fire Assay						
Au, Gold (ppm)	0.340	0.010	0.337	0.344	0.339*	0.342*
Aqua Regia Digestion (sample weights 10-50g)						
Au, Gold (ppm)	0.315	0.019	0.304	0.326	0.313*	0.317*
Infrared Combustion						
S, Sulphur (wt.%)	0.492	0.032	0.477	0.506	0.480	0.503
4-Acid Digestion						
Ag, Silver (ppm)	1.02	0.060	1.00	1.04	0.97	1.07
Al, Aluminium (wt.%)	6.95	0.339	6.80	7.11	6.79	7.12
As, Arsenic (ppm)	106	4	104	107	103	108
Ba, Barium (ppm)	2506	143	2435	2578	2444	2568
Be, Beryllium (ppm)	2.58	0.212	2.48	2.69	2.43	2.74
Bi, Bismuth (ppm)	5.91	0.384	5.73	6.09	5.73	6.09
Ca, Calcium (wt.%)	0.521	0.028	0.508	0.534	0.504	0.538
Cd, Cadmium (ppm)	0.96	0.058	0.93	0.98	0.92	1.00
Ce, Cerium (ppm)	80	4.2	78	82	77	84
Co, Cobalt (ppm)	4.33	0.226	4.23	4.43	4.15	4.50
Cr, Chromium (ppm)	30.2	4.3	28.3	32.0	28.5	31.8
Cs, Caesium (ppm)	4.97	0.275	4.83	5.11	4.85	5.10
Cu, Copper (ppm)	268	11	264	273	264	273
Dy, Dysprosium (ppm)	3.02	0.235	2.73	3.31	2.82	3.21
Er, Erbium (ppm)	0.81	0.067	0.77	0.85	IND	IND
Eu, Europium (ppm)	1.55	0.115	1.41	1.68	IND	IND
Fe, Iron (wt.%)	1.72	0.066	1.69	1.75	1.69	1.75
Ga, Gallium (ppm)	20.8	1.03	20.3	21.3	20.3	21.3
Gd, Gadolinium (ppm)	5.98	0.384	5.54	6.42	5.52	6.44
Hf, Hafnium (ppm)	2.48	0.170	2.40	2.55	2.34	2.61
Ho, Holmium (ppm)	0.39	0.031	0.35	0.42	IND	IND
In, Indium (ppm)	0.15	0.012	0.15	0.16	0.15	0.16
K, Potassium (wt.%)	3.22	0.121	3.17	3.27	3.16	3.28
La, Lanthanum (ppm)	39.7	1.73	38.9	40.6	38.0	41.4
Li, Lithium (ppm)	41.3	1.57	40.7	41.8	40.1	42.4
Mg, Magnesium (ppm)	3628	194	3548	3709	3525	3731
Mn, Manganese (ppm)	104	4	103	106	102	107
Mo, Molybdenum (ppm)	4.04	0.228	3.97	4.12	3.82	4.27
Na, Sodium (wt.%)	1.77	0.060	1.75	1.80	1.74	1.81

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

*Gold Tolerance Limits for typical 25-50g fire assay and 15-40g aqua regia digestion methods are determined from 20 x 85mg INAA results and the Sampling Constant (Ingamells & Switzer, 1973).

Note 1: intervals may appear asymmetric due to rounding.

Note 2: the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

Table 4 continued.

Constituent	Certified Value	SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
4-Acid Digestion continued						
Nb, Niobium (ppm)	14.1	0.63	13.8	14.4	13.7	14.4
Nd, Neodymium (ppm)	35.7	1.45	34.5	37.0	32.9	38.5
Ni, Nickel (ppm)	15.0	0.74	14.7	15.2	14.4	15.5
P, Phosphorus (ppm)	817	33	801	833	799	835
Pb, Lead (ppm)	107	6	104	109	104	109
Pr, Praseodymium (ppm)	9.62	0.522	9.08	10.16	8.98	10.26
Rb, Rubidium (ppm)	166	5	163	168	162	170
S, Sulphur (wt.%)	0.503	0.025	0.492	0.514	0.491	0.514
Sb, Antimony (ppm)	19.7	1.80	18.9	20.6	19.2	20.2
Sc, Scandium (ppm)	3.48	0.165	3.41	3.56	3.31	3.65
Se, Selenium (ppm)	2.05	0.43	1.87	2.23	IND	IND
Sm, Samarium (ppm)	7.67	0.495	7.37	7.97	7.25	8.09
Sn, Tin (ppm)	4.26	0.168	4.18	4.34	4.09	4.42
Sr, Strontium (ppm)	204	11	199	209	199	209
Ta, Tantalum (ppm)	1.11	0.088	1.07	1.15	1.06	1.15
Tb, Terbium (ppm)	0.68	0.07	0.63	0.74	0.65	0.72
Te, Tellurium (ppm)	0.83	0.077	0.78	0.87	0.76	0.89
Th, Thorium (ppm)	15.2	0.66	14.9	15.5	14.5	15.9
Ti, Titanium (wt.%)	0.170	0.005	0.168	0.172	0.167	0.174
Tl, Thallium (ppm)	1.15	0.066	1.12	1.18	1.11	1.19
U, Uranium (ppm)	4.41	0.208	4.31	4.52	4.27	4.55
V, Vanadium (ppm)	25.6	0.98	25.3	26.0	24.6	26.6
W, Tungsten (ppm)	2.53	0.185	2.43	2.62	2.37	2.68
Y, Yttrium (ppm)	11.5	0.85	11.2	11.9	11.2	11.9
Yb, Ytterbium (ppm)	0.56	0.06	0.51	0.60	IND	IND
Zn, Zinc (ppm)	179	5	177	181	175	182
Zr, Zirconium (ppm)	66	3.1	65	68	64	68
Aqua Regia Digestion						
Ag, Silver (ppm)	1.03	0.056	1.01	1.04	0.98	1.07
Al, Aluminium (wt.%)	0.920	0.053	0.895	0.945	0.897	0.943
As, Arsenic (ppm)	100	8.2	96	103	97	102
Ba, Barium (ppm)	261	16	253	268	253	268
Be, Beryllium (ppm)	0.64	0.063	0.61	0.66	0.60	0.67
Bi, Bismuth (ppm)	6.02	0.360	5.85	6.19	5.85	6.19
Ca, Calcium (wt.%)	0.248	0.012	0.243	0.252	0.242	0.253
Cd, Cadmium (ppm)	0.95	0.061	0.92	0.98	0.90	0.99

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

Note 1: intervals may appear asymmetric due to rounding.

Note 2: the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

Table 4 continued.

Constituent	Certified Value	SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Aqua Regia Digestion continued						
Ce, Cerium (ppm)	33.8	2.29	32.4	35.2	32.9	34.7
Co, Cobalt (ppm)	4.11	0.197	4.03	4.19	3.90	4.32
Cr, Chromium (ppm)	26.4	1.56	25.8	27.0	25.2	27.7
Cs, Caesium (ppm)	1.58	0.054	1.55	1.61	1.53	1.64
Cu, Copper (ppm)	272	13	266	277	267	276
Fe, Iron (wt.%)	1.47	0.075	1.44	1.50	1.44	1.50
Ga, Gallium (ppm)	4.57	0.323	4.39	4.74	4.33	4.80
Hf, Hafnium (ppm)	0.49	0.024	0.47	0.50	0.47	0.50
Hg, Mercury (ppm)	0.039	0.008	0.034	0.043	IND	IND
In, Indium (ppm)	0.11	0.007	0.11	0.12	0.11	0.12
K, Potassium (wt.%)	0.285	0.018	0.277	0.294	0.273	0.297
La, Lanthanum (ppm)	16.7	1.20	16.1	17.3	16.0	17.3
Li, Lithium (ppm)	16.6	1.7	15.7	17.6	16.1	17.2
Mg, Magnesium (ppm)	2499	118	2449	2548	2420	2577
Mn, Manganese (ppm)	91	4.3	89	92	88	93
Mo, Molybdenum (ppm)	3.74	0.221	3.64	3.83	3.53	3.94
Na, Sodium (wt.%)	0.072	0.012	0.067	0.077	0.067	0.076
Ni, Nickel (ppm)	14.3	0.58	14.1	14.5	13.7	14.9
P, Phosphorus (ppm)	536	37	519	553	525	548
Pb, Lead (ppm)	83	3.6	82	85	81	86
Rb, Rubidium (ppm)	17.9	0.95	17.2	18.5	17.2	18.5
S, Sulphur (wt.%)	0.275	0.016	0.268	0.283	0.266	0.285
Sb, Antimony (ppm)	15.8	1.39	15.1	16.5	15.3	16.3
Sc, Scandium (ppm)	1.05	0.15	0.97	1.14	IND	IND
Se, Selenium (ppm)	1.60	0.27	1.43	1.77	1.39	1.82
Sn, Tin (ppm)	0.71	0.08	0.67	0.76	IND	IND
Sr, Strontium (ppm)	18.2	0.76	17.8	18.6	17.5	18.9
Te, Tellurium (ppm)	0.76	0.049	0.74	0.78	0.73	0.79
Th, Thorium (ppm)	6.75	0.526	6.39	7.11	6.45	7.06
Tl, Thallium (ppm)	0.28	0.015	0.27	0.28	0.26	0.30
U, Uranium (ppm)	2.25	0.154	2.17	2.33	2.17	2.32
V, Vanadium (ppm)	8.89	1.08	8.44	9.33	8.34	9.44
W, Tungsten (ppm)	0.35	0.05	0.31	0.39	0.31	0.39
Y, Yttrium (ppm)	6.39	0.342	6.21	6.56	6.21	6.57
Zn, Zinc (ppm)	173	5	171	174	169	176
Zr, Zirconium (ppm)	12.4	1.3	11.8	13.1	12.0	12.9

SI unit equivalents: ppm, parts per million ≡ mg/kg ≡ µg/g ≡ 0.0001 wt.% ≡ 1000 ppb, parts per billion.

Note 1: intervals may appear asymmetric due to rounding.

Note 2: the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

Homogeneity Evaluation

The tolerance limits (ISO 16269:2014) shown in Table 1 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-α=0.99) at least 95% of subsamples (ρ=0.95) will have concentrations lying between 264 and 273 ppm. 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). ***Please note that tolerance limits pertain to the homogeneity of the CRM only and should not be used as control limits for laboratory performance.***

Table 5 below shows the INAA data determined on 20 x 85mg subsamples of OREAS 606. An equivalent scaled version of the results is also provided to demonstrate an appreciation of what this data means if 30g fire assay determinations were undertaken without the normal measurement error associated with this methodology.

Table 5. Neutron Activation Analysis of Au (in ppm) on 20 x 85mg subsamples showing the equivalent results scaled to a 30g sample mass typical of fire assay determination.

Replicate No	Au 85mg actual	Au 30g equivalent*
1	0.347	0.344
2	0.345	0.344
3	0.333	0.343
4	0.326	0.343
5	0.327	0.343
6	0.358	0.344
7	0.347	0.344
8	0.354	0.344
9	0.345	0.344
10	0.352	0.344
11	0.364	0.345
12	0.335	0.343
13	0.349	0.344
14	0.325	0.343
15	0.342	0.344
16	0.352	0.344
17	0.342	0.344
18	0.343	0.344
19	0.340	0.344
20	0.348	0.344
Mean	0.344	0.344
Median	0.345	0.344
Std Dev.	0.010	0.001
Rel.Std.Dev.	**3.05%**	**0.163%**

*Results calculated for a 30g equivalent sample mass using the formula: $x^{30g\ Eq} = \frac{(x^{INAA} - \bar{X}) \times RSD@30g}{RSD@85mg} + \bar{X}$

where $x^{30g\ Eq}$ = equivalent result calculated for a 30g sample mass
(x^{INAA}) = raw INAA result at 85mg
$\bar{X}$ = mean of 85mg INAA results

The homogeneity of gold 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 85 milligrams was employed and the 1RSD of 0.163% was calculated for a 30g fire assay sample (3.05% at 85mg weights) confirms the high level of gold homogeneity in OREAS 606.

The homogeneity of OREAS 606 has also been evaluated in a **nested ANOVA** of the round robin program. Each of the twenty-five round robin laboratories received six samples per CRM and these samples were made up of paired samples from three different, non-adjacent sampling intervals. The purpose of the ANOVA evaluation is to test that no statistically significant difference exists in the variance between-units to that of the variance within-units. This allows an assessment of homogeneity across the entire prepared batch of OREAS 606. The test was performed using the following parameters:

- Gold fire assay – 150 samples (25 laboratories each providing analyses on 3 pairs of samples);
- Gold aqua regia digestion – 84 samples (14 laboratories each providing analyses on 3 pairs of samples);
- Null Hypothesis, H_0: Between-unit variance is no greater than within-unit variance (reject H_0 if p-value < 0.05);
- Alternative Hypothesis, H_1: Between-unit variance is greater than within-unit variance.

P-values are a measure of probability where values less than 0.05 indicate a greater than 95% probability that the observed differences in within-unit and between-unit variances are real. The datasets were filtered for both individual and laboratory data set (batch) outliers prior to the calculation of *p*-values. This process derived *p*-values of 0.9934 for Au by fire assay and 0.8802 for Au by aqua regia digestion. Both *p*-values are insignificant and the Null Hypothesis is retained.

Additionally, none of the other 102 certified values showed significant *p*-values. Please note that only results for constituents present in concentrations well above the detection levels (i.e. >20 x Lower Limit of Detection) for the various methods undertaken were considered for the objective of evaluating homogeneity. It is important to note that ANOVA is not an absolute measure of homogeneity. Rather, it establishes whether or not the analytes are distributed in a similar manner throughout the packaging run of OREAS 610 and whether the variance between two subsamples from the same unit is statistically distinguishable to the variance from two subsamples taken from any two separate units. A reference material therefore, can possess poor absolute homogeneity yet still pass a relative homogeneity test if the within-unit heterogeneity is large and similar across all units.

Based on the statistical analysis of the results of the inter-laboratory certification program it can be concluded that OREAS 606 is fit-for-purpose as a certified reference material (see ‘Intended Use’ below).

PARTICIPATING LABORATORIES

1. Actlabs, Ancaster, Ontario, Canada
2. AGAT Laboratories, Mississauga, Ontario, Canada
3. Alex Stewart International, Mendoza, Argentina
4. ALS, Brisbane, QLD, Australia
5. ALS, Lima, Peru
6. ALS, Loughrea, Galway, Ireland
7. ALS, Perth, WA, Australia
8. ALS, Vancouver, BC, Canada
9. ANSTO, Lucas Heights, NSW, Australia
10. ARGETEST Mineral Processing, Ankara, Central Anatolia, Turkey
11. Bureau Veritas Commodities Canada Ltd, Vancouver, BC, Canada
12. Bureau Veritas Geoanalytical, Perth, WA, Australia
13. CERTIMIN, Lima, Peru
14. Chrysos Corporation Limited, Kalgoorlie, WA, Australia
15. Chrysos Corporation Limited, Perth, WA, Australia
16. Inspectorate (BV), Lima, Peru
17. Inspectorate America Corporation (BV), Sparks, Nevada, USA
18. Intertek Genalysis, Perth, WA, Australia
19. Intertek Testing Services, Townsville, QLD, Australia
20. Intertek Testing Services Philippines, Cupang, Muntinlupa, Philippines
21. On Site Laboratory Services, Bendigo, VIC, Australia
22. PT Geoservices Ltd, Cikarang, Jakarta Raya, Indonesia
23. PT Intertek Utama Services, Jakarta Timur, DKI Jakarta, Indonesia
24. SGS, Ankara, Anatolia, Turkey
25. SGS Canada Inc., Vancouver, BC, Canada
26. SGS de Mexico SA de CV, Cd. Industrial, Durango, Mexico
27. SGS del Peru, Lima, Peru
28. Skyline Assayers & Laboratories, Tucson, Arizona, USA

Please note: Above numbered alphabetical list of participating laboratories <u>does not</u> reflect the Lab ID numbering on the scatter plots below.

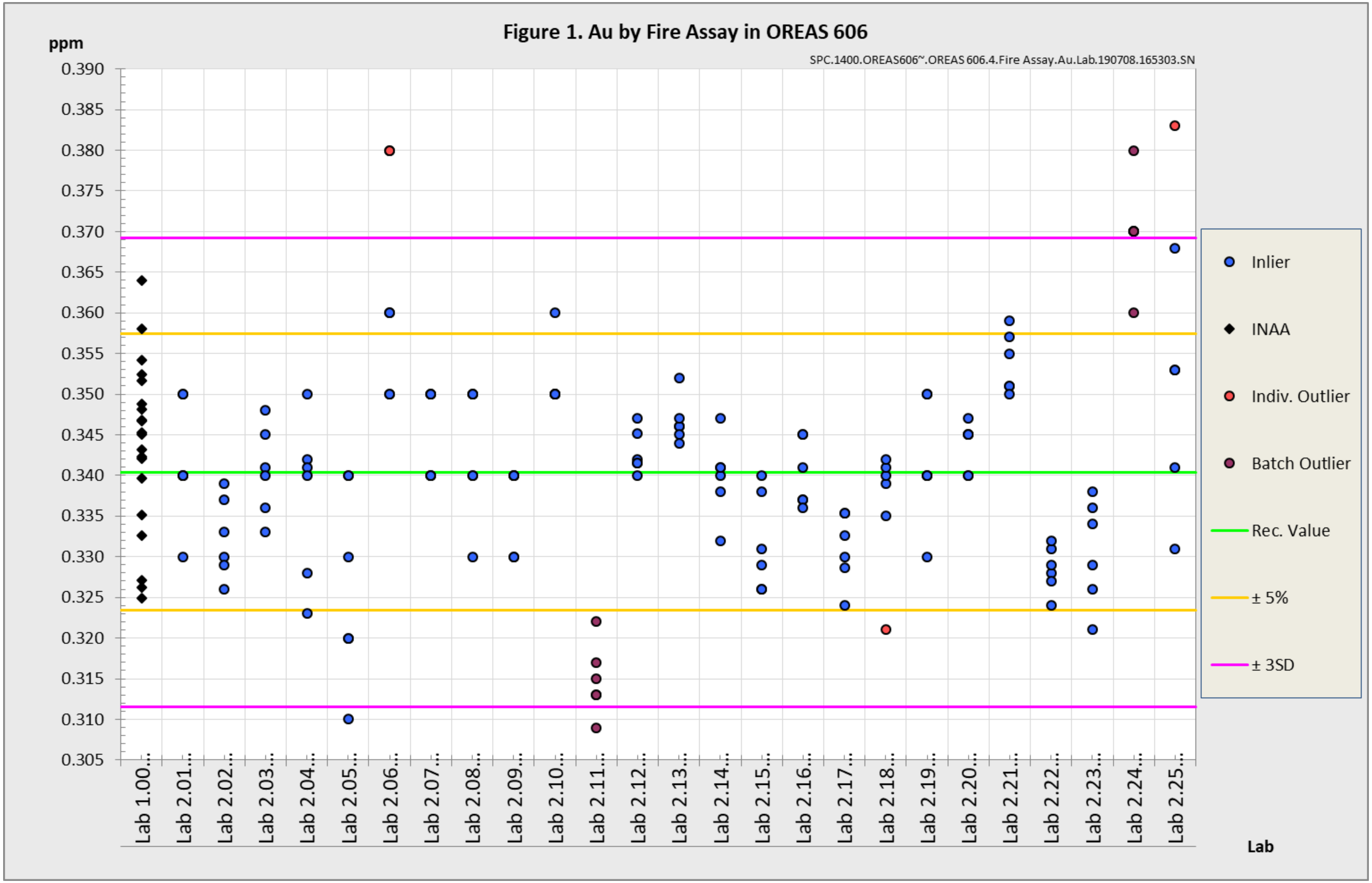
Figure 1. Au by Fire Assay in OREAS 606
SPC.1400.OREAS606~.OREAS 606.4.Fire Assay.Au.Lab.190708.165303.SN
ppm
0.390
0.385
0.380
0.375
0.370
0.365
0.360
0.355
0.350
0.345
0.340
0.335
0.330
0.325
0.320
0.315
0.310
0.305
Lab 1.00...
Lab 2.01...
Lab 2.02...
Lab 2.03...
Lab 2.04...
Lab 2.05...
Lab 2.06...
Lab 2.07...
Lab 2.08...
Lab 2.09...
Lab 2.10...
Lab 2.11...
Lab 2.12...
Lab 2.13...
Lab 2.14...
Lab 2.15...
Lab 2.16...
Lab 2.17...
Lab 2.18...
Lab 2.19...
Lab 2.20...
Lab 2.21...
Lab 2.22...
Lab 2.23...
Lab 2.24...
Lab 2.25...
Lab
Inlier
INAA
Indiv. Outlier
Batch Outlier
Rec. Value
± 5%
± 3SD

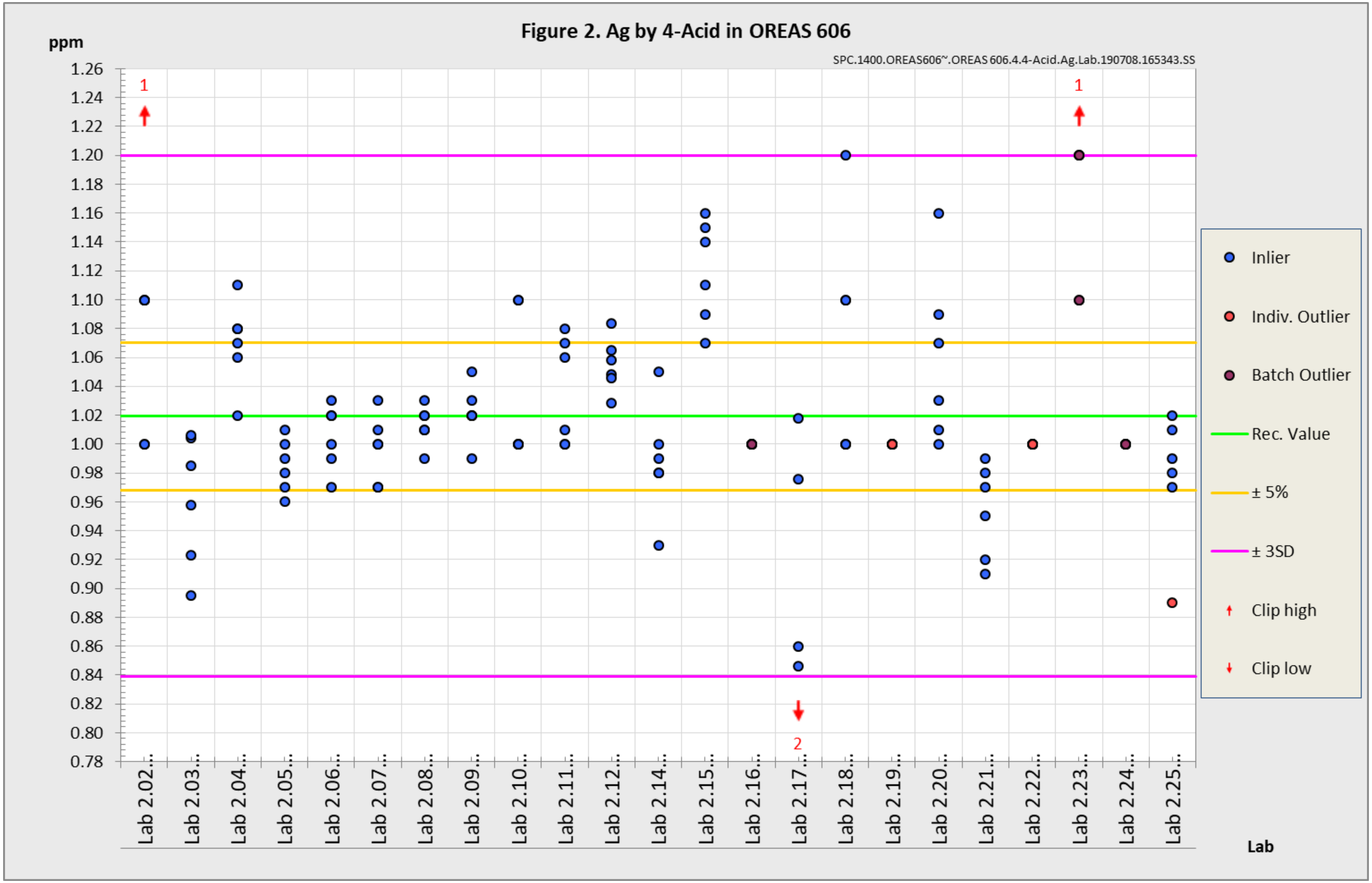
Figure 2. Ag by 4-Acid in OREAS 606
ppm
SPC.1400.OREAS606~.OREAS 606.4.4-Acid.Ag.Lab.190708.165343.SS
1.26
1.24
1.22
1.20
1.18
1.16
1.14
1.12
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.96
0.94
0.92
0.90
0.88
0.86
0.84
0.82
0.80
0.78
1
1
2
Lab 2.02...
Lab 2.03...
Lab 2.04...
Lab 2.05...
Lab 2.06...
Lab 2.07...
Lab 2.08...
Lab 2.09...
Lab 2.10...
Lab 2.11...
Lab 2.12...
Lab 2.14...
Lab 2.15...
Lab 2.16...
Lab 2.17...
Lab 2.18...
Lab 2.19...
Lab 2.20...
Lab 2.21...
Lab 2.22...
Lab 2.23...
Lab 2.24...
Lab 2.25...
Lab
Inlier
Indiv. Outlier
Batch Outlier
Rec. Value
± 5%
± 3SD
Clip high
Clip low

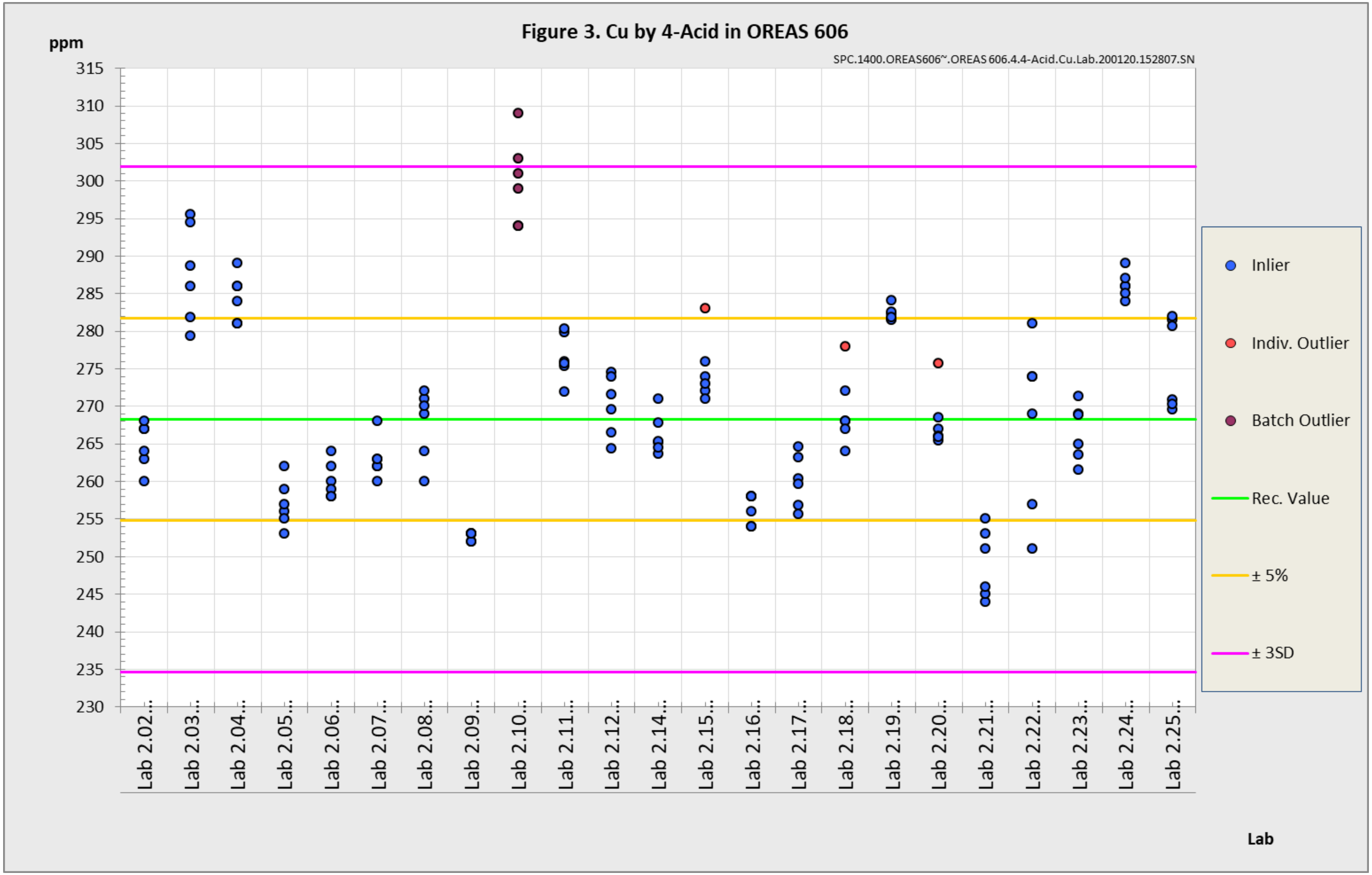

Figure 3. Cu by 4-Acid in OREAS 606
SPC.1400.OREAS606~.OREAS 606.4.4-Acid.Cu.Lab.200120.152807.SN
ppm
315
310
305
300
295
290
285
280
275
270
265
260
255
250
245
240
235
230
Lab 2.02...
Lab 2.03...
Lab 2.04...
Lab 2.05...
Lab 2.06...
Lab 2.07...
Lab 2.08...
Lab 2.09...
Lab 2.10...
Lab 2.11...
Lab 2.12...
Lab 2.14...
Lab 2.15...
Lab 2.16...
Lab 2.17...
Lab 2.18...
Lab 2.19...
Lab 2.20...
Lab 2.21...
Lab 2.22...
Lab 2.23...
Lab 2.24...
Lab 2.25...
Lab
Inlier
Indiv. Outlier
Batch Outlier
Rec. Value
± 5%
± 3SD

PREPARER AND SUPPLIER

Certified reference material OREAS 606 was prepared, certified and 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

METROLOGICAL TRACEABILITY

The analytical samples were selected in a manner to represent the entire batch of prepared CRM. This 'representivity' was maintained in each submitted laboratory sample batch and ensures the user that the data is traceable from sample selection through to the analytical results that underlie the consensus values. Each analytical data set has been validated by its assayer through the inclusion of internal reference materials and QC checks during analysis.

The laboratories were chosen on the basis of their competence (from past performance in inter-laboratory programs undertaken by ORE Pty Ltd) for a particular analytical method, analyte or analyte suite, and sample matrix. Most of these laboratories have and maintain ISO 17025 accreditation. The certified values presented in this report are calculated from the means of accepted data following robust statistical treatment as detailed in this report.

Guide ISO/TR 16476:2016, section 5.3.1 describes metrological traceability in reference materials as it pertains to the transformation of the measurand. In this section it states, *"Although the determination of the property value itself can be made traceable to appropriate units through, for example, calibration of the measurement equipment used, steps like the transformation of the sample from one physical (chemical) state to another cannot. Such transformations may only be compared with a reference (when available), or among themselves. For some transformations, reference methods have been defined and may be used in certification projects to evaluate the uncertainty associated with such a transformation. In other cases,* ***only a comparison among different laboratories using the same method is possible. In this case, certification takes place on the basis of agreement among independent measurement results*** *(see ISO Guide 35:2006, Clause 10)."*

COMMUTABILITY

The measurements of the results that underlie the certified values contained in this report were undertaken by methods involving pre-treatment (digestion/fusion) of the sample. This served to reduce the sample to a simple and well understood form permitting calibration using simple solutions of the CRM. Due to these methods being well understood and highly effective, commutability is not an issue for this CRM. All OREAS CRMs are sourced from natural ore minerals meaning they will display similar behaviour as routine 'field' samples in the relevant measurement process. Care should be taken to ensure 'matrix matching' as close as practically achievable. The matrix and mineralisation style of the CRM is described in the 'Source Material' section and users should select appropriate CRMs matching these attributes to their field samples.

INTENDED USE

OREAS 606 is intended to cover all activities needed to produce a measurement result. This includes extraction, possible separation steps and the actual measurement process (the signal producing step). OREAS 606 may be used to calibrate the entire procedure by producing a pure substance CRM transformed into a calibration solution.

OREAS 606 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 606 has been prepared from sulphide bearing ores and concentrate blended with rhyodacite. It contains a very low level of reactive sulphide (~0.5% S). In its unopened state and under normal conditions of storage the CRM 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 CORRECT USE

The certified values for OREAS 606 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.

DOCUMENT HISTORY

Revision No.	Date	Changes applied
2	20th January, 2020	Changed unit of measure for Cu from wt.% to ppm.
1	24th July 2019	Edited ‘PARTICIPATING LABORATORIES’ list.
0	11th July 2019	First publication.

QMS ACCREDITATION

ORE Pty Ltd is accredited to ISO 9001:2015 by Lloyd's Register Quality Assurance Ltd for its quality management system including development, manufacturing, certification and supply of CRMs.

CERTIFYING OFFICER

20th January, 2020

Craig Hamlyn (B.Sc. Hons - Geology), Technical Manager - ORE P/L

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