

AMIS0374

Certified Reference Material

**Multi element IOCG,
Prominent Hill, South Australia**

Certificate of Analysis

Recommended Concentrations and Limits¹. (at two Standard Deviations)

Certified Concentrations²

Cu M/ICP	47.50	±	1.74	%
Cu Titration	47.1	±	0.4	%
Au Pb Collection	17.12	±	1.06	g/t
Co M/ICP	1413	±	100	ppm
Co XRF	1419	±	120	ppm
Fe M/ICP per	16.25	±	1.76	%
Specific Gravity	4.73	±	0.12	

Provisional Concentrations

Ag M/ICP	101	±	13	g/t
F ISE	593	±	97	ppm
U M/ICP	76	±	12	ppm

Indicated Mean

Ba M/ICP	239	ppm
S M/ICP	21.12	%

1. Manufacturers recommended limits for use of the material as control samples, based on two standard deviations, calculated using "Between Laboratory" statistics for treatment of the data for trivial, non-trivial and technically invalid results. See sections 1, 9 and 12.
2. There is additional certified major element data presented on p2 and uncertified trace element data presented as an appendix.

AMIS

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(Reg. No. 1989/000201/07)

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Major Element Recommended Concentrations and Limits (at two Standard Deviations)

(see appendix for other uncertified major element results)

Certified Concentrations

K ₂ O	0.24	±	0.02	%
S Comb/LECO	24.25	±	1.36	%

Provisional Concentrations

CaO	0.19	±	0.03	%
MgO	0.13	±	0.04	%

1. Intended Use: AMIS0374 is a certified reference material which may be used to demonstrate the validity of measurement results of a single analysis of sulphide copper concentrates with a similar grade and matrix.

It is a matrix matched Certified Reference Material, fit for use as control samples in routine assay laboratory quality control when inserted within runs of samples and measured in parallel to the unknown. Its purpose is to monitor inter-laboratory or instrument bias and within lab precision. It can be used, indirectly, to establish the traceability of results to an SI system of units.

The recommended concentrations and limits for this material are property values based on a measurement campaign (round robin) and reflect consensus results from the laboratories that participated in the round robin.

Slight variations in analytical procedures between laboratories will reflect as slight biases to the recommended concentrations (see 19). Good laboratories will report results within the two standard deviation levels with a failure rate of <10 %.

The material can also be used for method development and for the calibration of equipment.

2. Origin of Material: This standard was made using ore provided by SGS Mineral Services sourced from the Prominent Hill mine which is owned and operated by Oz Minerals Limited. The mine is located 650 kilometres North West of Adelaide, 130 kilometres North West of BHP Billiton's Olympic Dam and 130 kilometres south east of the town of Coober Pedy in the Gawler Craton of South Australia. Prominent Hill, together with Carrapateena, Olympic Dam, Moonta-Wallaroo and Hillside, are all iron oxide copper gold (IOCG) mineralised systems hosted within Palaeo- to Mesoproterozoic rocks and distributed along the eastern edge of the currently preserved Gawler Craton. Mineralization was synchronous with volcanism and sedimentation within a narrow east-west-trending graben that developed at approximately 1600 Ma. The copper and gold bearing hematite rich breccia's were formed by repetitive hydrothermal brecciation, milling and explosive venting within a volcanic setting.

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3. Mineral and Chemical Composition: The host sequence rocks are intensely altered by hematite-sericite-chlorite-carbonate (\pm quartz \pm barite \pm fluorite \pm REE phosphates). Copper mineralisation occurs as fine grained disseminations of chalcocite, bornite and chalcopyrite in the breccia matrices and (to a lesser extent) within clasts of hematite-rich breccia's. The copper sulphides display a variety of intergrowth, replacement and infill textures including chalcocite-bornite and replacement of early formed pyrite.

4. Appearance: The material is a very fine Brownish Black powder (Corstor 5YR 2.5/1).

5. Handling instructions: The material is packaged in Laboratory Packs and Explorer Packs that must be shaken or otherwise agitated before use. Normal safety precautions for handling fine particulate matter are suggested, such as the use of safety glasses, breathing protection, gloves and a laboratory coat.

6. Method of Preparation: The material was crushed, dry-milled and air-classified to $<54\mu\text{m}$. Wet sieve particle size analysis of random samples confirmed the material was 98.5% $<54\mu\text{m}$. It was then homogenized in a double cone blender, systematically divided and then sealed into 1kg Laboratory Packs. Samples were randomly selected for homogeneity testing and third party analysis. Statistical analysis of both homogeneity and the consensus test results were carried out by independent statisticians. Explorer Packs are subdivided from the Laboratory packs as required.

7. Methods of Analysis requested:

1. Au – Pb collection ICP-OES or ICP-MS.
2. Multi acid digest, ICP-OES multi element scan to include; Cu, Fe, Ba, Co, U, S and Ag.
3. 3 acid digest (HCl, HNO₃ and HClO₄) ICP-MS for U and Ag.
4. S combustion IR.
5. Cl by sodium carbonate leach and then titration with AgNO₃.
6. F by ISE.
7. U by pressed powder method.
8. Majors, to include: Cu, Fe, Ba, Co, U, S, SiO₂, Al₂O₃, CaO, MgO, K₂O, Na₂O, TiO₂, and Mn by borate fusion XRF.
9. SG. Gas pycnometer.

8. Information requested:

1. Aliquots used for all determinations.
2. Results for individual PGM's reported in ppb.
3. Results for base metals reported in ppm.
4. QC data, to include replicates, blanks and certified reference materials used.
5. Analytical techniques used.

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9. Method of Certification: Twenty six laboratories were each given eight randomly selected packages of sample. Twenty one of the laboratories submitted results.

Final limits were calculated after first determining if all data was compatible within a spread normally expected for similar analytical methods done by reputable laboratories. Data from any one laboratory was then removed from further calculations when the mean of all analyses from that laboratory failed a “t test” of the global means of the other laboratories. The means and standard deviations were then re-calculated using all remaining data. Any analysis that fell outside of the new two standard deviations was removed from the ensuing data base. The mean and standard deviations were again calculated using the remaining data.

The “between-laboratory” standard deviation is used in the calculation to eliminate technically and statistically invalid data. Upper and lower limits are based on the standard deviation of the remaining data, which reflect individual analyses and can be used to monitor accuracy in routine laboratory quality control. This is different to limits based on standard deviations derived from grouped set of analyses (see 12), which provide important measures for precision and trueness, but which are less useful for routine QC.

Standards with an RSD of near or less than 5 % are termed “Certified”, RSD’s of between near 5 % and 15 % are termed “Provisional”, and RSD’s over 15 % are termed “Informational”.

10. Participating Laboratories: The 21 out of 26 laboratories that provided results timeously were (not in same order as in the table of assays):

1. Acme Analytical Laboratories Chile
2. ACME Analytical Laboratories Ltd CA
3. Activation Laboratories Pty Ltd (ActLabs) CA
4. Activation Laboratorios Ltda (Chile)
5. ALS Ammtec (Australia)
6. ALS Chemex Laboratory Group Johannesburg SA
7. ALS Chemex Laboratory Group Perth WA
8. ALS Chemex Laboratory Zambia
9. ALS OMAC (Ireland)
10. Genalysis Laboratory Services (W Australia P)
11. Namibia Custom Smelters
12. Set Point Laboratories (Isando) SA
13. SGS Australia Pty Ltd (Newburn) WA
14. SGS Geosol Laboratories Ltda (Brazil)
15. SGS Mineral Services Callao (Peru)
16. SGS Mineral Services Lakefield (Canada)
17. SGS Prominent Hill Australia (AU)
18. SGS South Africa (Pty) Ltd - Booyens JHB
19. SGS Townsville (Australia)
20. SGS Vancouver (Canada)
21. Ultra Trace (Pty) Ltd WA

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11. Assay Data: Data as received from the laboratories for the important certified elements listed on p1 are set out below.

Lab Code	Au Pb Coll g/t	Ag M/ICP ppm	Ba M/ICP ppm	Co M/ICP ppm	Co XRF ppm	Cu M/ICP %	Cu Titration %	F ISE ppm	Fe M/ICP %	S M/ICP %	U M/ICP ppm	CaO XRF %	K ₂ O XRF %	MgO XRF %	Scomb LECO %	SG pyc
A	17.4	90.5	343	1410	1440	46.2	47.1	600	17.4	24.3	73.4	0.19	0.24	0.15	24.7	4.82
A	17.7	90.0	341	1400	1410	46.8	47.1	600	17.3	24.6	74.5	0.19	0.24	0.15	24.8	4.80
A	17.4	88.5	336	1400	1420	46.2	47.1	600	17.3	24.7	74.6	0.19	0.24	0.15	24.7	4.81
A	17.5	89.0	346	1400	1450	46.3	47.1	600	17.5	24.8	75.0	0.19	0.25	0.15	24.8	4.77
A	17.4	94.0	344	1420	1440	46.8	47.1	600	17.4	24.7	74.1	0.20	0.25	0.15	24.8	4.80
A	17.4	90.0	350	1390	1440	46.1	47.1	600	17.6	24.9	74.5	0.19	0.24	0.15	24.6	4.81
A	17.5	90.0	341	1430	1440	46.7	47.1	600	17.4	24.6	73.0	0.20	0.25	0.15	24.8	4.77
A	17.1	90.5	346	1410	1440	46.4	47.0	600	17.6	24.3	71.0	0.20	0.25	0.14	24.8	4.78
B	17.2	96.5	202	1380			47.1	510	13.4		70.0				24.6	
B	17.0	94.2	244	1380			46.8	520	13.0		70.0				24.3	
B	17.4	94.3	262	1340			47.0	580	12.4		70.0				24.3	
B	17.2	93.2	251	1360			47.1	560	13.5		70.0				24.2	
B	17.6	91.6	202	1300			47.1	530	12.5		70.0				24.2	
B	17.1	96.2	187	1330			47.0	550	12.4		70.0				24.3	
B	18.4	91.0	266	1290			46.9	510	13.2		70.0				25.9	
B	16.9	92.9	276	1320				550	13.6		70.0				24.4	
C	16.5	101.0					46.9		16.9						24.0	
C	17.5	100.0					46.9		17.1						23.8	
C	17.0	101.0					46.9		17.4						23.9	
C	16.4	102.0					46.8		17.4						23.6	
C	16.0	101.0					46.8		17.2						23.7	
C	16.4	100.0					46.9		17.5						24.3	
C	17.5	103.0					46.9		17.1						24.4	
C	16.7	103.0					46.8		17.6						24.6	
D	17.6				1400			580							25.5	4.59
D	17.6				1500			648							25.5	4.64
D	17.5				1400			634							25.6	4.69
D	17.2				1600			572							25.6	4.62
D	17.4				1500			663							25.6	4.61
D	17.4				1400			606							25.3	4.63
D	17.6				1500			645							25.6	4.69
D	17.6				1500			591							25.7	4.64
E	17.3	109.0	148	1080	1480	46.7	47.3		14.7	19.7	71.4	0.21	0.22	0.14	23.8	4.75
E	17.4	108.0	102	1090	1470	47.3	47.4		15.0	19.7	69.6	0.22	0.22	0.14	23.5	4.69
E	17.1	105.0	99	1030	1470	47.1	47.2		14.4	19.3	69.5	0.22	0.22	0.14	23.5	4.73
E	17.0	106.0	154	1080	1470	46.8	47.5		14.7	19.8	70.1	0.22	0.22	0.14	23.7	4.75
E	16.7	106.0	170	1050	1470	47.5	47.5		14.9	19.9	71.9	0.22	0.22	0.14	23.6	4.72
E	16.8	107.0	188	1100	1480	48.1	47.3		14.9	19.9	70.5	0.21	0.22	0.14	23.6	4.76
E	16.5	108.0	188	1070	1470	48.1	47.0		14.6	19.8	72.1	0.22	0.22	0.14	23.2	4.72
E	16.4	105.0	175	1090	1490	47.9	47.2		15.1		78.8	0.22	0.22	0.15	23.3	4.75
F	16.8	98.0	600	1380	1400	47.4	46.9		16.2			0.17	0.23	0.09	24.4	4.73
F	16.7	102.0	600	1400	1400	46.8	46.8		16.4			0.18	0.23	0.12	24.4	4.81
F	17.0	100.0	600	1440	1400	47.0	47.1		15.8			0.18	0.24	0.10	24.2	4.78
F	17.2	102.0	600	1420	1400	46.7	46.9		16.1			0.18	0.24	0.12	24.2	4.76
F	17.3	98.0	600	1380	1400	46.2	46.9		16.2			0.18	0.24	0.13	24.3	4.81
F	16.7	98.0	600	1420	1400	46.3	46.9		17.2			0.18	0.25	0.12	24.2	4.72
F	17.3	102.0	600	1400	1400	47.2	47.0		16.2			0.17	0.24	0.10	24.3	4.73
F	15.8	104.0	600	1400	1400	46.8	46.9		16.1			0.17	0.24	0.12	24.3	4.82
G	18.2	94.0	160	1340			47.1	535	15.4		95.0				24.9	
G	19.2	95.0	175	1440			47.4	535	15.4		85.0				24.6	
G	19.6	89.0	219	1500			47.4	555	15.3		75.0				24.6	
G	19.1	102.0	207	1410			47.2	555	16.2		85.0				24.9	
G	18.4	95.0	182	1320			47.3	605	15.7		70.0				25.1	
G	19.4	90.0	159	1330			47.5	580	15.6		95.0				25.2	
G	18.4	94.0	182	1360			47.4	555	16.0		85.0				25.1	
G	18.5	92.0	179	1430			47.7	540	15.5		80.0				25.0	
H	16.0	105.0		1470		41.8	47.0	251	17.2	15.8	79.6	0.18	0.25	0.17	23.6	4.63
H	17.0	107.0		1490		43.2	46.8	260	17.4	16.6	82.8	0.18	0.25	0.17	23.7	4.64
H	17.0	106.0		1470		42.7	47.1	212	17.3	16.5	83.4	0.18	0.25	0.17	23.1	4.64
H	17.1	108.0		1500		43.1	47.0	272	17.6	16.6	86.4	0.18	0.25	0.17	23.4	4.63
H	17.3	107.0		1460		42.3	47.2	632	17.4	16.8	83.9	0.18	0.25	0.17	23.4	4.62
H	17.5	108.0		1490		42.2	47.3	560	17.5	17.0	87.9	0.18	0.25	0.17	23.4	4.62
H	17.2	108.0		1490		43.5	46.9	629	17.6	17.4	84.9	0.18	0.25	0.17	23.0	4.64
H	16.8	106.0		1490		42.4	46.9	189	17.7	16.8	85.3	0.18	0.25	0.15	23.8	4.60

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Assay data

Lab Code	Au Pb Coll g/t	Ag M/ICP ppm	Ba M/ICP ppm	Co M/ICP ppm	Co XRF ppm	Cu M/ICP %	Cu Titration %	F ISE ppm	Fe M/ICP %	S M/ICP %	U M/ICP ppm	CaO XRF %	K ₂ O XRF %	MgO XRF %	Scomb LECO %	SG pyc
I						48.2										
I						47.5										
I						47.6										
I						45.7										
I						47.8										
I						46.9										
I						47.9										
I						44.8										
J	17.3	110.0	563	1445		48.2	47.9	668	15.0	22.3	75.2	0.22		0.13	25.0	4.75
J	17.3	104.0	558	1453		47.4	47.3	642	14.6	22.1	73.5	0.20		0.12	24.9	4.61
J	16.5	99.0	564	1362		47.5	47.0	616	14.8	21.2	68.4	0.18		0.12	24.4	4.71
J	17.3	108.0	559	1433		47.1	47.2	641	15.2	22.1	75.0	0.24		0.13	25.5	4.68
J	17.3	104.0	562	1423		47.9	47.3	642	15.4	22.4	72.3	0.21		0.12	25.1	4.61
J	16.9	101.0	545	1366		47.0	47.0	617	14.3	21.5	70.8	0.18		0.12	25.3	4.67
J	17.3	108.0	580	1449		47.8	47.2	618	15.7	22.3	74.6	0.22		0.12	25.6	4.71
J	17.3	110.0	575	1475		48.0	47.1	636	15.0	22.8	72.2	0.20		0.12	25.3	4.67
L	16.3							1100							24.3	4.72
L	16.8							1100							24.0	4.74
L	17.2							1600							24.2	4.74
L	16.7							1100							24.4	4.74
L	16.3							1100							24.3	4.76
L	16.2							1100							23.3	4.74
L	16.6							1100							23.5	4.75
L	16.8							1100							24.0	4.77
M	16.3	102.0		1410					16.3		80.0	0.18	0.24	0.12		
M	17.5	99.0		1380					15.5		80.0	0.18	0.24	0.10		
M	17.2	97.0		1350					15.7		80.0	0.18	0.24	0.12		
M	16.5	100.0		1390					16.0		70.0	0.18	0.24	0.12		
M	15.6	100.0		1390					15.8		80.0	0.18	0.24	0.12		
M	15.7	100.0		1400					15.9		80.0	0.18	0.24	0.12		
M	15.2	99.0		1380					15.7		80.0	0.18	0.24	0.12		
M	15.9	101.0		1390					15.7		80.0	0.18	0.24	0.12		
O	17.8															
O	17.0															
O	16.0															
O	15.4															
O	16.0															
O	15.9															
O	16.0															
O	15.7															
P	17.5						47.2		16.9	24.7						
P	17.5						47.3		16.8	24.2						
P	17.4						47.2		17.0	24.7						
P	17.6						47.2		17.3	24.7						
P	17.5						47.2		17.0	24.7						
P	17.2						47.2		17.2	24.8						
P	17.4						47.3		17.1	24.9						
P	17.6						47.3		17.0	24.7						
Q	17.8	104.0	20.0		1410	48.4			16.4						23.6	4.75
Q	17.8	102.0	20.0		1380	48.1			16.3						24.0	4.76
Q	17.6	105.0	20.0		1410	47.9			16.4						24.0	4.77
Q	18.2	106.0	20.0		1430	48.1			16.6						23.5	4.75
Q	17.6	107.0	20.0		1440	48.0			16.8						23.6	4.77
Q	19.8	109.0	20.0		1460	48.7			17.2						22.9	4.75
Q	17.3	101.0	20.0		1360	48.4			15.9						23.9	4.75
Q	18.3	112.0	20.0		1500	48.4			17.5						24.1	4.74

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R	17.9	101.0		1220	1300		47.0	660							24.2	
R	18.0	103.0		1220	1200		47.0	640							24.1	
R	17.8	100.0		1240	1300		47.1	640							24.4	
R	18.1	98.4		1240	1300		47.0	640							24.3	
R	17.8	100.0		1250	1300		47.0	660							24.0	
R	18.2	102.0		1230	1200		46.9	650							23.2	
R	17.8	104.0		1200	1300		47.0	670							24.2	
R	18.0	102.0		1240	1300		47.0	640							24.4	
S	17.4	113.0	270	1490		48.9	46.9	610			80.0				23.8	
S	18.1	111.0	210	1440		48.2	47.3	670			90.0				24.1	
S	16.9	111.0	270	1460		48.5	47.1	550			90.0				24.1	
S	18.0	114.0	210	1470		48.8	46.7	610			80.0				24.3	
S	18.2	112.0	210	1500		49.0	46.6	590			80.0				23.9	
S	18.1	113.0	280	1500		50.2	46.3	600			100.0				23.9	
S	18.0	111.0	180	1470		49.4	46.8	610			100.0				24.2	
S	18.2	111.0	200	1490		48.7	46.7	660			110.0				24.0	
T		76.7	37.1	1718			45.5		12.4	14.8	62.9				24.3	
T		80.3	43.4	1697			45.4		12.3	16.2	66.7				25.8	
T		82.2	30.4	1747			45.7		12.6	15.7	78.0				24.7	
T		80.9	27.5	1789			44.2		12.8	15.6	69.7				24.7	
T		77.4	31.2	1826			45.2		13.2	14.6	67.3				24.4	
T		80.8	38.0	1729			45.2		12.9	15.0	69.6				24.5	
T		78.0	26.3	1837			45.1		12.9	14.6	68.9				24.3	
T		80.3	37.6	1800			44.9		12.6	15.6	77.5				24.5	
U	14.0	93.0	280	1375			46.7		15.4	24.8	74.8	0.20	0.24	0.13	23.1	4.70
U	16.1	91.6	320	1365			45.7		15.3	24.5	74.4	0.20	0.24	0.13	25.3	4.75
U	15.5	92.3	270	1360			46.3		15.3	24.9	76.3	0.20	0.24	0.12	24.9	4.72
U	16.1	92.7	230	1370			46.3		15.4	24.6	76.5	0.20	0.24	0.13	25.3	4.67
U	16.3	92.1	290	1370			46.1		15.3	24.7	81.2	0.20	0.25	0.12	24.8	4.69
U	14.7	93.0	280	1380			46.0		15.4	24.6	80.5	0.20	0.24	0.13	25.2	4.72
U	14.9	93.8	270	1395			46.4		15.6	24.5	77.0	0.20	0.24	0.13	25.1	4.67
U	16.3	92.8	250	1375			46.4		15.5	24.5	78.1	0.20	0.24	0.13	25.1	4.71
V	16.6							540							23.6	4.80
V	16.3							540							23.5	4.77
V	16.2							530							23.4	4.78
V	16.5							480							23.5	4.79
V	16.9							550							23.6	4.80
V	16.6							510							23.3	4.78
V	16.2							500							23.3	4.80
V	16.3							510							23.3	4.78
Y	16.4						47.1								23.6	4.73
Y	16.6						47.0								23.8	4.74
Y	17.1						47.2								23.7	4.73
Y	16.7						47.1								23.6	4.75
Y	16.9						47.1								23.6	4.74
Y	16.9						47.1								23.8	4.75
Y	16.6						47.0								23.7	4.74
Y	16.7						47.1								23.7	4.77

12. Measurement of Uncertainty: (ref Dr Hugh Bartlett, Hugh Bartlett Consulting CC.)

The samples used in this certification process have been selected in such a way as to represent the entire batch of material and were taken from the final packaged units; therefore all possible sources of uncertainty (sample uncertainty and measurement uncertainty) are included in the final combined standard uncertainty determination.

The uncertainty measurement takes into consideration the between lab and the within lab variances and is calculated from the square roots of the variances of these components using the formula:

$$\text{Combined standard uncertainty} = \sqrt{(\text{between lab.var/no of labs}) + (\text{mean square within lab.var /no of assays})}$$

These uncertainty measurements may be used, by laboratories, as a component for calculating the total uncertainty for method validation according to the relevant ISO guidelines.

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Analyte	Method	Unit	S ¹	σ_L ²	S _w ³	CSU ⁴
Au	Pb Coll	g/t	0.58	0.309	0.364	0.082
Ag	M/ICP	ppm	6.72	5.12	2.33	1.44
Ba	M/ICP	ppm	65.6	73.5	28.0	30.3
Co	M/ICP	ppm	50.2	39.3	30.1	13.6
Co	XRF	ppm	59.9	63.6	28.9	26.3
Cu	M/ICP	%	0.87	0.82	0.48	0.32
Cu	Titration	%	0.18	0.12	0.12	0.04
F	ISE	ppm	48.5	44.2	24.3	15.93
Fe	M/ICP	%	0.99	0.84	0.30	0.25
S	M/ICP	%	3.74	4.22	0.37	1.60
U	M/ICP	ppm	6.01	4.43	3.50	1.46
CaO	XRF	%	0.015	0.015	0.007	0.006
K ₂ O	XRF	%	0.010	0.013	0.003	0.005
MgO	XRF	%	0.019	0.020	0.007	0.007
S Comb	LECO	%	0.676	0.422	0.305	0.106
SG	pyc		0.057	0.045	0.026	0.014

1 S - Std Dev for use on control charts.

2 σ_L - Betw Lab Std Dev, for use to calculate a measure of accuracy.

3 S_w - Within Lab Stc Dev, for use to calculate a measure of precision.

4 CSU - Combined Standard Uncertainty, a component for use to calculate the total uncertainty in method validation.

13. Certified values: The Certified, Provisional and Indicated values listed on p1 and p2 of this certificate fulfill the AMIS statistical criteria regarding agreement for certification and have been independently validated by Dr Barry Smee.

14. Metrological Traceability: The values quoted herein are based on the consensus values derived from statistical analysis of the data from an inter laboratory measurement program. Traceability to SI units is via the standards used by the individual laboratories the majority of which are accredited and who have maintained measurement traceability during the analytical process.

15. Certification: AMIS0374 is a new material.

16. Period of validity: The certified values are valid for this product, while still sealed in its original packaging, until notification to the contrary. The stability of the material will be subject to continuous testing for the duration of the inventory. Should product stability become an issue, all customers will be notified and notification to that effect will be placed on the www.amis.co.za website.

17. Minimum sample size: The majority of laboratories reporting used a 0.5g sample size for the ICP and a 30g sample size for the fire assay. These are the recommended minimum sample sizes for the use of this material.

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18. Availability: This product is available in Laboratory Packs containing 1kg of material and Explorer Packs containing custom weights (from 50 to 250g) of material. The Laboratory Packs are sealed bottles delivered in sealed foil pouches. The Explorer Packs contain material in standard geochem envelopes, nitrogen flushed and vacuum sealed in foil pouches.

19. Recommended use: The data used to characterize this CRM has been scrutinized using outlier treatment techniques. This, together with the number of participating laboratories, should overcome any "inter-laboratory issues" and should lead to a very accurate measure for the given methods, notwithstanding the underlying assumption that what the good inter-laboratory labs reported was accurate. However an amount of bad data might have had an effect, resulting in limits which in some situations might be too broad for the effective monitoring of a single analytical method, laboratory or production process. Users should set their own limits based on their own data quality objectives and control measurements, after determining the performance characteristics of their own particular method, using a minimum of 20 analyses using this CRM. User set limits should normally be within the limits recommended on p1 and 2 of this certificate.

20. Legal Notice: This certificate and the reference material described in it have been prepared with due care and attention. However AMIS, Set Point Technology (Pty) Ltd, Mike McWha, Dr Barry Smee and Smee and Associates Ltd; accept no liability for any decisions or actions taken following the use of the reference material.

23 August 2013

Certifying Officers:



African Mineral Standards: _____

Mike McWha
BSc (Hons), FGSSA, MAusIMM, Pr.Sci.Nat



Geochemist: _____

Barry W. Smee
BSc, PhD, P.Geo, (B.C.)

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Appendix – uncertified trace element statistics

Analyte	Method	Unit	Mean	2SD	RSD%	n
Al	M/ICP	%	0.42	0.05	5.4	56
Al ₂ O ₃	XRF	%	0.82	0.03	2.1	40
As	M/ICP	ppm	177	17.9	5.0	44
Ba	XRF	ppm	669	189	14.2	16
Be	M/ICP	ppm	0.20	0.03	6.9	16
Bi	M/ICP	ppm	56.9	59.5	52.3	40
Ca	M/ICP	%	0.13	0.01	4.9	61
Cd	M/ICP	ppm	0.77	0.34	22.1	31
Ce	M/ICP	ppm	349	105	15.1	24
Cl	Leach	ppm	102	8.7	4.3	13
Cr	M/ICP	ppm	183	60.6	16.6	56
Cs	M/ICP	ppm	0.24	0.11	23.7	24
Cu	XRF	%	46.1	1.5	1.6	30
Fe	XRF	%	16.9	1.1	3.2	39
Ga	M/ICP	ppm	4.8	11.1	115	31
Ge	M/ICP	ppm	0.58	0.51	43.7	16
Hf	M/ICP	ppm	0.78	0.46	29.2	24
In	M/ICP	ppm	0.07	0.02	12.5	22
K	M/ICP	%	0.20	0.04	9.7	56
La	M/ICP	ppm	189	89.0	23.6	32
Li	M/ICP	ppm	2.3	0.82	18.2	31
LOI		%	15.1	0.09	0.30	8
Mg	M/ICP	%	0.08	0.02	12.2	63
Mn	M/ICP	ppm	99.9	12.1	6.1	52
Mo	M/ICP	ppm	229	26.8	5.8	63
Na	M/ICP	%	0.02	0.03	62.6	58
Na ₂ O	XRF	%	0.03	0.02	32.9	39
Nb	M/ICP	ppm	2.3	1.2	26.6	24
Ni	M/ICP	ppm	192	26.0	6.8	63
P	M/ICP	ppm	356	146	20.5	40
Pb	M/ICP	ppm	209	40.5	9.7	55
Rb	M/ICP	ppm	7.2	3.7	25.5	24
Re	M/ICP	ppm	0.74	0.08	5.5	16
S	XRF	%	24.6	0.48	1.0	24
Sb	M/ICP	ppm	10.5	12.9	61.3	36
Sc	M/ICP	ppm	2.1	2.3	55.5	32
Se	M/ICP	ppm	249	57.2	11.5	24
SiO ₂	XRF	%	3.3	0.11	1.8	24
Sn	M/ICP	ppm	1.6	0.57	17.4	24
Sr	M/ICP	ppm	63.5	40.9	32.2	56
Ta	M/ICP	ppm	0.06	0.05	43.2	16
Te	M/ICP	ppm	30.7	8.9	14.4	30
Th	M/ICP	ppm	4.1	0.8	9.2	23
Ti	M/ICP	%	0.02	0.02	43.5	48
TiO ₂	XRF	%	0.08	0.03	22.1	24
Tl	M/ICP	ppm	3.0	1.7	28.6	28
U	XRF	ppm	81.7	11.6	7.1	38
V	M/ICP	ppm	12.1	8.1	33.7	32
W	M/ICP	ppm	17.0	50.5	148	32
Y	M/ICP	ppm	13.2	4.7	17.9	40
Zn	M/ICP	ppm	66.1	16.2	12.2	48
Zr	M/ICP	ppm	39.6	20.0	25.3	38

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