African Mineral Standards
MATRIX REFERENCE MATERIALS

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AMIS0088

Certified Reference Material

Copper Sulphide Ore
Omitiomire Project, Namibia

Certificate of Analysis

Recommended Concentrations and Limits[1. 2.]
(at two Standard Deviations)

Certified Concentrations

Cu F	3226	±	262	ppm
Cu M/ICP	3216	±	222	ppm
Cu P	3165	±	254	ppm
Cu XRF	3187	±	120	ppm
Ni M/ICP	244	±	22	ppm
Zn M/ICP	97.0	±	7.6	ppm
SG	2.81	±	0.10	

Provisional Concentrations

Co M/ICP	29.2	±	4.3	ppm
Pb M/ICP	12.6	±	3.8	ppm
U M/ICP	13.1	±	3.8	ppm

Indicated Mean

Ag M/ICP	0.8	ppm

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, 10 and 13.*
2. *There is additional certified major element data presented on p2 and uncertified trace element data presented as an appendix.*

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

Certified Concentrations

Al_2O_3	14.01	±	0.34	%
CaO	4.74	±	0.07	%
Fe_2O_3	5.69	±	0.12	%
K_2O	2.12	±	0.04	%
MgO	3.82	±	0.14	%
MnO	0.46	±	0.02	%
Na_2O	3.48	±	0.26	%
P_2O_5	0.23	±	0.01	%
S	0.06	±	0.006	%
SiO_2	62.67	±	0.94	%
TiO_2	0.67	±	0.04	%

Provisional Concentrations

Cr_2O_3	0.11	±	0.02	%
LOI	1.44	±	0.40	%

1. Intended Use: AMIS0088 can be used to check the analysis of copper ores hosted by siliceous rocks, 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 RC chips supplied by Craton Mining and Exploration Pty Ltd from the Omitiomire copper sulphide project, situated about 130 km NW of Windhoek. Craton is a wholly-owned Namibian subsidiary of International Base Metals of Australia (www.interbasemetals.com).

Omitiomire is a copper occurrence hosted in a Mesoproterozoic basement gneiss inlier within the Damara orogen of central Namibia. The host rocks consist mainly of banded quartz-feldspar gneiss, biotite-amphibole-feldspar gneiss and amphibolite. Mineralisation is broadly sheet-like, striking N-S and dipping moderately to the east. Intersections above cut-off grade are typically about 20m thick and the widest intersection was 106 m @ 0.48% Cu.

3. Approximate Mineral and Chemical Composition: Chalcocite is the only sulphide commonly seen and is preferentially hosted in mafic gneiss. The chalcocite is finely disseminated but coarser grained in biotite-epidote-rich rock, where the chalcocite is enriched/remobilized during late Damaran tectonism. Subordinate bornite and traces of chalcopyrite occur. Minor magnetite is spatially associated with mineralisation. Malachite and other copper "oxides" are present near surface and form a minor constituent of the standard.

Trace element chemistry data from 14 of the labs has been compiled but has not been certified. Summary statistics for this data are set out as an appendix.

4. Appearance: The material is a very fine powder. It is coloured a Light Greenish Grey (Corstor 5GY 8/1

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 <54um. Wet sieve parti**c**le size analysis of random samples confirmed the material was 98.5% <54um. It was then blended in a bi-conical mixer, systematically divided and then sealed into1kg Laboratory Packs. Explorer Packs are subdivided from the Laboratory packs as required. 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.

7. Methods of Analysis requested:

1. Cu, Fusion AAS or ICP-OES.
2. Multi-acid digest multi-element scan - (to include Cu). ICP-OES or ICP-MS.
3. Aqua regia digest - Cu. ICP-OES or ICP-MS.
4. Pressed pellet multi-element scan - (to include Cu). XRF.
5. Fusion (Majors). XRF.
6. SG. Gas pycnometer.

8. Information requested:

9.

1. State aliquots used for all determinations.
2. Report all results in ppm.
3. All results for major elements to be reported as oxides in percentages.
4. Report all QC data, to include replicates, blanks and certified reference materials used.
5. State and provide brief description of analytical techniques used.

10. Method of Certification: Eighteen laboratories were each given eight randomly selected packages of sample. Seventeen of the laboratories submitted results in time for certification.

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”.

11. Participating Laboratories: The 17 out of 18 laboratories that provided results timeously were (not in same order as in the table of assays):

1. ACME Analytical Laboratories Ltd CA
2. Activation Laboratories Pty Ltd (ActLabs) CA
3. ALS Chemex Laboratory Group Johannesburg SA
4. ALS Chemex Laboratory Group Perth WA
5. ALS Chemex Laboratory Group Vancouver CA
6. Anglo Research (Crown Campus)
7. Assayers Canada
8. Intertek Testing Services Ltd Shanghai (ITS Beijing)
9. Intertek Utama Services (Indonesia)
10. Labtium Inc Finland
11. Nkomati JV Laboratory SA
12. OMAC Laboratories Limited (Ireland)
13. Set Point Laboratories (Isando) SA
14. SGS Australia Pty Ltd (Newburn) WA
15. SGS Lakefield Research Africa Pty Ltd (Booysens) SA
16. SGS Mineral Services Lakefield (Canada)
17. Ultra Trace (Pty) Ltd WA

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

Assay data- Economic Elements

Lab Code	Ag M/ICP ppm	Co M/ICP ppm	Cu 3 Acid ppm	Cu F ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Pb M/ICP ppm	S M/ICP %	U M/ICP ppm	Zn M/ICP ppm
A	0.60	26.8			3303	3226		254	10.5	0.06	18.0	101
A	0.87	27.0			3240	3278		254	10.9	0.06	24.8	101
A	0.79	26.9			3323	3271		257	12.0	0.06	19.8	99.6
A	0.74	26.3			3284	3280		250	11.3	0.06	20.1	102
A	0.76	27.5			3191	3321		257	9.7	0.06	18.8	100
A	0.73	26.8			3363	3235		259	10.3	0.06	19.8	102
A	0.75	26.6			3202	3266		254	10.8	0.06	17.3	102
A	0.50	25.9			3245	3232		252	11.0	0.06	18.3	102
B	0.66	28.7			3120	3090		233	14.3	0.06	13.0	96.0
B	0.75	29.2			3220	3110		236	14.8	0.06	13.7	100
B	0.84	29.1			3250	3120		242	15.3	0.06	11.5	101
B	0.68	28.8			3190	3140		234	14.8	0.06	12.4	99.0
B	0.72	28.6			3150	3080		234	14.7	0.06	12.1	99.0
B	0.66	28.7			3140	3130		236	14.2	0.06	12.7	97.0
B	0.68	28.2			3030	3130		225	14.8	0.05	12.7	95.0
B	0.71	27.6			3090	3020		230	13.9	0.06	11.5	96.0
C	0.50	24.0		3150	3030	3180		234	12.0	0.04	10.0	100
C	0.50	26.0		3120	3070	3250		237	14.0	0.04	10.0	100
C	0.50	24.0		3090	2970	3200		235	12.0	0.03	10.0	96.0
C		23.0		3040	3040	3340		234	12.0	0.03	10.0	98.0
C		24.0		3320	3050	3210		238	9.0	0.03	10.0	98.0
C		24.0		3000	3130	3180		236	11.0	0.03	10.0	99.0
C	0.90	24.0		2990	3050	3240		238	15.0	0.03	10.0	98.0
C	0.60	24.0		2990	3010	3150		234	10.0	0.03	10.0	95.0

Assay data (cont)- Economic Elements

Lab Code	Ag M/ICP ppm	Co M/ICP ppm	Cu 3 Acid ppm	Cu F ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Pb M/ICP ppm	S M/ICP %	U M/ICP ppm	Zn M/ICP ppm
D	0.50	26.0			3020	2880		232	11.0			90.0
D		27.0			3200	3140		247	11.0			95.0
D		31.0			3700	3210		252	13.0			102
D		27.0			3050	3000		235	10.0			95.0
D		30.0			3580	3050		256	14.0			102
D	0.60	27.0			3060	2920		236	12.0			95.0
D		27.0			3270	2950		249	10.0			98.0
D	1.00	24.0			3040	2910		232	7.0			93.0
F		25.0		3100	3220	3100	3247	259	11.3	0.06	12.7	98.0
F		24.9		3080	3260	3120	3271	259	11.1	0.07	12.6	101
F		25.7		3100	3320	3090	3277	253	11.4	0.06	13.4	101
F		25.2		3060	3250	3110	3298	255	10.8	0.06	13.0	98.8
F		24.7		3060	3160	3130	3234	255	11.1	0.06	13.1	96.7
F		25.6		3090	3210	3080	3256	251	11.7	0.06	12.4	103
F		25.7		3090	3220	3070	3245	256	11.4	0.06	13.1	99.0
F		25.3		3110	3230	3080	3251	255	12.2	0.06	12.8	99.6
G	1.00	26.0			3210	3000		224	13.0			100
G	0.90	29.0			3220	2980		228	12.0			109
G	1.00	31.0			3250	3030		220	11.0			98.0
G	0.90	27.0			3150	3080		222	10.0			97.0
G	1.00	27.0			3150	2980		223	11.0			97.0
G	1.10	27.0			3230	2920		229	13.0			101
G	1.00	27.0			3190	2870		226	10.0			100
G	1.00	27.0			3130	2980		225	12.0			105
H		30.0		3048	3240	3056		246	15.0	0.06	15.1	106
H		30.0		3086	3275	3038		244	13.0	0.06	15.8	101
H		31.0		3061	3407	3052		244	13.0	0.06	15.2	102
H		31.0		2924	3395	3076		248	14.0	0.07	15.9	104
H		31.0		3009	3312	3106		245	13.0	0.06	15.5	104
H		31.0		3030	3285	3115		248	12.0	0.07	15.1	103
H		31.0		3100	3323	3014		244	13.0	0.06	15.9	103
H		31.0		2990	3313	3119		244	15.0	0.06	15.7	102
I	1.50	30.0		3200	3190	3170	3139	258	15.0	0.07	12.9	98.0
I	1.00	30.0		3200	3200	3090	3131	248	15.0	0.07	12.2	98.0
I	1.00	30.0		3200	3190	3090	3131	246	15.0	0.06	13.2	96.0
I	1.50	30.0		3200	3190	3030	3131	252	15.0	0.06	12.1	96.0
I	1.00	35.0		3300	3200	3080	3171	252	15.0	0.07	12.4	98.0
I	1.00	30.0		3300	3190	3070	3139	252	15.0	0.07	12.8	96.0
I	1.00	30.0		3300	3270	3100	3171	252	15.0	0.06	12.2	96.0
I	1.00	35.0		3200	3230	3080	3171	258	15.0	0.07	12.9	98.0
J		30.0		3200	3200	3150		240				92.0
J		30.0		3200	3200	3140		250				91.0
J		30.0		3300	3300	3300		240				92.0
J		30.0		3200	3200	3200		250				90.0
J		30.0		3200	3300	3220		250				90.0
J		30.0		3200	3300	3180		250				92.0
J		30.0		3300	3300	3180		240				90.0
J		30.0		3200	3300	3190		250				91.0
K		32.0		3300	3100	2900	3200	220				86.0
K		31.0		3300	3100	3200	3100	220				86.0
K		30.0		3300	3000	3000	3300	210				83.0
K		31.0		3300	3000	3000	3200	220				83.0
K		30.0		3200	3100	3100	3300	220				84.0
K		31.0		3200	3100	3000	3100	220				84.0
K		31.0		3300	3000	3100	3300	210				83.0
K		32.0		3200	3100	3100	3100	220				81.0
L	0.70	29.0			3580	3410	3400	276	30.0	0.06	14.2	93.0
L	0.80	30.0			3410	3270	3400	273	30.0	0.06	13.7	99.0
L	0.90	30.0			3330	3330	3400	267	30.0	0.06	13.6	95.0
L	0.70	30.0			3440	3360	3400	270	30.0	0.06	14.3	98.0
L	0.70	29.0			3460	3440	3400	270	30.0	0.06	14.1	93.0
L	0.70	30.0			3360	3330	3300	268	30.0	0.06	13.8	96.0
L	0.70	29.0			3380	3380	3400	268	30.0	0.06	13.6	96.0
L	0.70	29.0			3400	3340	3400	266	30.0	0.06	13.6	91.0
M	1.00	31.0	3030.00	3250	3200			250	10.6	0.12	15.3	94.0
M	1.00	32.7	3060.00	3340	3163			256	10.7	0.14	15.4	95.0
M	1.10	31.8	3070.00	3380	3189			251	10.9	0.13	15.6	96.0
M	1.30	32.7	3110.00	3490	3261			258	11.5	0.09	15.8	99.0
M	1.00	33.6	3070.00	3310	3260			261	12.0	0.19	15.9	97.0
M	1.00	33.5	3070.00	3340	3229			261	11.5	0.12	15.8	97.0
M	1.10	33.7	3120.00	3420	3176			252	10.5	0.13	15.2	95.0
M	1.00	32.6	3050.00	3220	3266			255	11.2	0.12	15.6	100
N						3229						
N						3307						
N						3424						
N						3429						
N						3382						
N						3338						
N						3218						
N						3305						
O	8.70	15.2		3081	3242	3150	3221	228	20.6		11.7	93.6
O	9.90	19.3		3476	3192	3150	3276	226	17.3		8.1	94.1
O		17.7		3634	3259	3255	3255	222	17.2		9.6	91.8
O		24.1		3239	3220	3360	3180	224	19.7		9.4	93.2
O	7.60	21.5		3318	3248	3255	3157	227	20.2		11.4	95.1
O	6.90	17.5		3476	3222	3255	3166	229	20.4		10.5	94.1
O	8.00	18.0		3318	3230	3150	3114	227	16.4		9.2	92.2
O	7.40	18.5		3476	3254	3150	3189	228	19.3		11.8	94.9
P				3300			3210	252				
P				3200			3150	247				
P				3300			3220	250				
P				3300			3230	251				
P				3200			3140	245				
P				3200			3190	250				
P				3300			3120	248				
P				3300			3170	247				
Q						40						
Q						40						
Q						40						
Q						40						
Q				200		40						
Q						40						
Q						40						
Q						40						
R	1.10	29.0		3350	3600	3420	3140	255	15.0	0.05	10.0	92.0
R	1.00	29.0		3260	3390	3280	3140	248	15.0	0.05	20.0	90.0
R	0.80	31.0		3430	3390	3360	3140	254	14.0	0.06	10.0	94.0
R	0.90	30.0		3380	3360	3290	3120	247	14.0	0.06	10.0	93.0
R	1.00	31.0		3410	3320	3500	3160	265	23.0	0.06	20.0	95.0
R	0.80	30.0		3670	3440	3350	3140	251	15.0	0.06	10.0	91.0
R	0.80	29.0		3400	3180	3320	3140	235	17.0	0.05	10.0	88.0
R	0.80	30.0		3420	3360	3190	3160	242	21.0	0.05	20.0	91.0

Assay data (cont) - Major Oxides

Lab Code	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	P2O5 XRF %	SiO2 XRF %	TiO2 XRF %	V2O5 XRF %	LOI %	SG pyc
A														
A														
A														
A														
A														
A														
A														
A														
B	13.90	4.84	0.11	5.59	2.14	3.60	0.44	3.67		63.00	0.68		1.18	2.71
B	13.90	4.86	0.12	5.63	2.13	3.62	0.45	3.68		62.90	0.71		1.14	2.73
B	13.85	4.89	0.11	5.67	2.17	3.60	0.45	3.68		62.80	0.70		1.18	2.72
B	13.95	4.86	0.11	5.61	2.13	3.60	0.44	3.69		63.00	0.69		1.08	2.74
B	13.95	4.78	0.11	5.51	2.11	3.61	0.44	3.66		62.90	0.67		1.36	2.73
B	13.85	4.80	0.11	5.58	2.12	3.62	0.44	3.68		63.10	0.68		1.06	2.73
B	13.90	4.81	0.11	5.65	2.10	3.62	0.45	3.71		62.90	0.70		1.20	2.72
B	13.85	4.85	0.11	5.59	2.15	3.61	0.44	3.69		62.90	0.68		1.15	2.76
C	14.27	4.73	0.12	5.68		3.85	0.47	3.49	0.22	61.96	0.69		1.48	2.69
C	14.18	4.74	0.12	5.67		3.84	0.46	3.47	0.22	61.86	0.69		1.46	2.64
C	14.28	4.71	0.12	5.67		3.87	0.46	3.47	0.22	61.96	0.69		1.45	2.61
C	14.24	4.72	0.12	5.66		3.82	0.47	3.46	0.22	61.75	0.68		1.45	2.68
C	14.27	4.71	0.12	5.66		3.88	0.47	3.44	0.22	62.03	0.69		1.45	2.69
C	14.23	4.71	0.12	5.65		3.83	0.47	3.47	0.22	61.73	0.69		1.43	2.73
C	14.29	4.74	0.12	5.67		3.88	0.46	3.44	0.22	62.13	0.69		1.41	2.66
C	14.24	4.74	0.12	5.67		3.82	0.47	3.45	0.22	61.79	0.69		1.32	2.71
D														2.80
D														2.79
D														2.78
D														2.80
D														2.78
D														2.78
D														2.79
D														2.78
F	14.00	4.69		5.72	2.10	3.86	0.41	3.57	0.22	63.00	0.70			
F	14.10	4.74		5.80	2.12	3.88	0.41	3.67	0.23	63.50	0.71			
F	14.10	4.74		5.79	2.11	3.88	0.41	3.66	0.23	63.50	0.71			
F	14.10	4.74		5.79	2.11	3.88	0.41	3.67	0.23	63.50	0.71			
F	14.00	4.68		5.72	2.09	3.89	0.41	3.60	0.23	63.10	0.70			
F	14.10	4.73		5.79	2.12	3.86	0.41	3.67	0.22	63.50	0.71			
F	14.00	4.69		5.74	2.10	3.88	0.41	3.61	0.22	63.40	0.71			
F	14.10	4.74		5.78	2.11	3.87	0.41	3.63	0.23	63.60	0.71			
G	13.60	4.74	0.10	5.67	2.13	3.77	0.46	3.47	0.23	62.90	0.66			
G	13.60	4.78	0.11	5.72	2.14	3.80	0.46	3.52	0.23	63.20	0.67			
G	13.50	4.73	0.10	5.64	2.12	3.77	0.46	3.48	0.23	62.60	0.66			
G	13.60	4.74	0.10	5.64	2.13	3.77	0.45	3.47	0.23	62.80	0.66			
G	13.50	4.74	0.11	5.58	2.13	3.74	0.45	3.45	0.23	62.80	0.65			
G	13.50	4.72	0.10	5.62	2.12	3.74	0.45	3.46	0.23	62.60	0.65			
G	13.50	4.74	0.11	5.70	2.12	3.76	0.46	3.60	0.23	62.90	0.67			
G	13.50	4.73	0.10	5.63	2.13	3.73	0.45	3.46	0.23	62.70	0.66			
I	13.90	4.82	0.11	5.70	2.12	3.93	0.46	3.54	0.24	62.98	0.68	0.02		2.88
I	13.90	4.81	0.11	5.69	2.11	3.92	0.46	3.54	0.24	62.93	0.68	0.02		2.91
I	14.00	4.83	0.11	5.72	2.12	3.94	0.46	3.54	0.24	63.09	0.68	0.03		2.87
I	13.90	4.81	0.11	5.68	2.11	3.92	0.45	3.53	0.24	62.89	0.67	0.02		2.88
I	13.90	4.83	0.11	5.71	2.12	3.94	0.47	3.56	0.24	63.05	0.68	0.02		2.89
I	13.90	4.81	0.11	5.68	2.11	3.92	0.46	3.56	0.24	62.90	0.67	0.02		2.88
I	13.90	4.83	0.11	5.72	2.12	3.93	0.46	3.53	0.24	62.94	0.68	0.02		2.88
I	13.90	4.83	0.11	5.69	2.12	3.93	0.46	3.54	0.24	62.92	0.68	0.02		2.89
J	14.10	4.79	0.10	5.79		3.82	0.48	3.50	0.23	62.50	0.67	0.02	1.26	2.79
J	14.10	4.79	0.10	5.83		3.83	0.48	3.49	0.22	62.40	0.67	0.02	1.40	2.78
J	13.90	4.77	0.10	5.63		3.75	0.47	3.48	0.23	61.70	0.67	0.02	1.36	2.77
J	13.90	4.81	0.09	5.77		3.77	0.47	3.48	0.22	62.30	0.68	0.02	1.32	2.79
J	13.80	4.77	0.10	5.73		3.75	0.47	3.45	0.22	62.30	0.66	0.02	1.01	2.78
J	13.80	4.71	0.10	5.65		3.79	0.46	3.47	0.22	61.90	0.66	0.02	1.33	2.80
J	13.90	4.70	0.09	5.66		3.76	0.46	3.41	0.22	61.60	0.65	0.02	1.38	2.79
J	13.80	4.74	0.10	5.56		3.74	0.47	3.47	0.23	62.00	0.67	0.02	1.38	2.78
K	13.80	4.77	0.11	5.67	2.16	3.78	0.48	3.23	0.23	62.50	0.64	0.02	1.81	2.81
K	13.70	4.77	0.11	5.62	2.13	3.76	0.48	3.27	0.21	62.10	0.65	0.02	1.83	2.80
K	13.70	4.75	0.11	5.63	2.16	3.84	0.47	3.34	0.23	62.00	0.65	0.02	1.89	2.83
K	13.70	4.72	0.10	5.63	2.18	3.81	0.47	3.28	0.23	62.50	0.66	0.01	1.75	2.82
K	14.00	4.79	0.11	5.67	2.17	3.87	0.48	3.37	0.25	62.50	0.66	0.03	1.77	2.80
K	13.90	4.75	0.13	5.65	2.17	3.87	0.48	3.30	0.22	62.60	0.65	0.02	1.72	2.81
K	13.70	4.77	0.12	5.63	2.15	3.79	0.48	3.29	0.24	62.10	0.65	0.02	1.70	2.84
K	13.80	4.77	0.12	5.63	2.16	3.81	0.48	3.29	0.22	62.20	0.64	0.01	1.67	2.80
L	14.00	4.74		5.73	2.11	3.92	0.46	3.57	0.23	62.80	0.65		1.12	
L	14.00	4.75		5.75	2.11	3.90	0.47	3.58	0.23	62.70	0.66		1.12	
L	14.00	4.75		5.76	2.11	3.91	0.46	3.57	0.23	62.70	0.65		1.07	
L	14.10	4.74		5.73	2.10	3.90	0.46	3.59	0.23	62.70	0.65		1.04	
L	14.00	4.75		5.78	2.11	3.89	0.47	3.56	0.23	62.80	0.66		1.11	
L	14.00	4.73		5.71	2.10	3.89	0.46	3.57	0.23	62.80	0.65		1.04	
L	14.10	4.74		5.74	2.12	3.89	0.46	3.65	0.23	62.70	0.65		1.06	
L	14.10	4.72		5.72	2.11	3.90	0.46	3.58	0.23	62.80	0.65		1.10	
O	14.22	4.72	0.12	5.85	2.12	3.75	0.43	3.37	0.20	62.94	0.67		1.39	2.79
O	14.10	4.65	0.12	5.79	2.10	3.73	0.43	3.33	0.20	62.21	0.65		1.43	2.81
O	14.14	4.71	0.12	5.81	2.09	3.72	0.42	3.39	0.20	62.55	0.65		1.43	2.80
O	14.28	4.73	0.13	5.86	2.12	3.76	0.43	3.36	0.20	63.13	0.66		1.41	2.81
O	14.50	4.76	0.13	5.85	2.18	3.91	0.43	3.31	0.19	63.33	0.67		1.41	2.81
O	14.30	4.71	0.12	5.85	2.11	3.76	0.43	3.38	0.20	63.03	0.67		1.43	2.80
O	14.14	4.68	0.12	5.80	2.11	3.76	0.43	3.39	0.20	62.41	0.66		1.41	2.81
O	14.32	4.73	0.14	5.86	2.11	3.80	0.43	3.35	0.20	63.22	0.66		1.41	2.81
P	13.30	4.63	0.13	5.68		3.64	0.46		0.22	59.00				2.84
P	13.20	4.62	0.13	5.71		3.57	0.46		0.22	59.00				2.86
P	13.30	4.62	0.12	5.70		3.61	0.46		0.23	59.00				2.87
P	13.20	4.57	0.13	5.61		3.63	0.46		0.22	58.00				2.88
P	13.30	4.60	0.13	5.56		3.73	0.46		0.22	59.00				2.87
P	13.40	4.63	0.13	5.68		3.79	0.46		0.22	59.00				2.87
P	13.20	4.61	0.12	5.62		3.67	0.46		0.22	59.00				2.88
P	13.30	4.59	0.12	5.62		3.79	0.46		0.22	59.00				2.88
R	13.99	4.65	0.11	5.69	2.08	3.71	0.46	3.32	0.23	62.22	0.67		1.59	2.84
R	14.02	4.65	0.11	5.70	2.10	3.71	0.46	3.32	0.22	62.20	0.68		1.62	2.78
R	13.79	4.63	0.11	5.68	2.09	3.68	0.46	3.28	0.23	62.13	0.67		1.61	2.84
R	14.15	4.73	0.11	5.76	2.09	3.75	0.47	3.30	0.23	62.80	0.68		1.52	2.81
R	14.04	4.68	0.12	5.72	2.10	3.73	0.46	3.30	0.24	62.31	0.68		1.63	2.83
R	14.21	4.69	0.11	5.76	2.09	3.74	0.47	3.29	0.23	62.84	0.68		1.60	2.76
R	14.27	4.68	0.11	5.80	2.14	3.78	0.47	3.36	0.23	63.07	0.68		1.59	2.85
R	13.97	4.72	0.11	5.75	2.13	3.74	0.47	3.35	0.23	62.57	0.68		1.63	2.82

13. 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:

Combined standard uncertainty=sqrt((between lab.var/no of labs) + (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.

Analyte	Method	Unit	S [1]	σ_L [2]	Sw [3]	CSU [4]
Ag	M/ICP	ppm	0.18	0.13	0.10	0.04
Co	M/ICP	ppm	2.46	1.82	0.94	0.51
Cu	F	ppm	130.9	98.5	75.2	32.3
Cu	M/ICP	ppm	110.8	73.4	55.7	20.3
Cu	P	ppm	127.0	84.7	62.6	23.4
Cu	XRF	ppm	60.3	45.2	48.3	19.7
Ni	M/ICP	ppm	11.0	8.0	4.81	2.28
Pb	M/ICP	ppm	1.82	1.38	1.01	0.45
S	M/ICP	%	0.010	0.010	0.003	0.004
U	M/ICP	ppm	1.98	2.01	0.53	0.71
Zn	M/ICP	ppm	3.80	2.54	2.11	0.73
Al_2O_3	XRF	%	0.17	0.139	0.088	0.047
CaO	XRF	%	0.049	0.039	0.025	0.013
Cr_2O_3	XRF	%	0.009	0.007	0.005	0.003
Fe_2O_3	XRF	%	0.060	0.041	0.040	0.014
K_2O	XRF	%	0.018	0.013	0.012	0.005
LOI		%	0.224	0.242	0.069	0.092
MgO	XRF	%	0.070	0.062	0.031	0.021
MnO	XRF	%	0.009	0.008	0.005	0.003
Na_2O	XRF	%	0.129	0.117	0.031	0.037
P_2O_5	XRF	%	0.006	0.005	0.004	0.002
SiO_2	XRF	%	0.473	0.382	0.235	0.124
TiO_2	XRF	%	0.018	0.015	0.007	0.005
V_2O_5	XRF	%	0.002	0.004	0.000	0.002
SG	pyc		0.046	0.045	0.015	0.016

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. *Sw - 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.*

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

15. 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.

16. Certification: AMIS0088 is a new material.

17. 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

18. 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. Theseare the recommended minimum sample sizes for the use of this material.

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

20. 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 therefore 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.

21. 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.

14 April 2009 (New Certificate with section 12 added 10 October 2012)

Certifying Officers:

African Mineral Standards: _____

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

Geochemist:_____

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

Appendix – uncertified trace element statistics

	Method	Unit	Mean	2SD	RSD%	n
Al	M/ICP	%	7.11	0.75	5.26	84
As	M/ICP	ppm	2.34	2.80	59.97	31
Ba	M/ICP	ppm	552	38	3.48	77
Be	M/ICP	ppm	1.04	0.24	11.29	61
Bi	M/ICP	ppm	0.32	0.09	13.23	45
Ca	M/ICP	%	3.31	0.40	6.11	78
Ce	M/ICP	ppm	36.0	3.0	4.17	39
Cr	M/ICP	ppm	650	214	16.46	96
Cs	M/ICP	ppm	3.23	0.51	7.88	47
Dy	M/ICP	ppm	2.30	0.28	6.03	23
Er	M/ICP	ppm	0.99	0.20	10.21	23
Eu	M/ICP	ppm	1.13	0.14	6.43	24
Fe	M/ICP	%	3.97	0.30	3.79	83
Ga	M/ICP	ppm	20.2	3.4	8.30	55
Gd	M/ICP	ppm	3.61	0.28	3.89	23
Hf	M/ICP	ppm	1.15	0.26	11.27	47
Ho	M/ICP	ppm	0.39	0.07	8.69	24
K	M/ICP	%	1.73	0.16	4.56	86
La	M/ICP	ppm	20.1	1.3	3.18	47
Li	M/ICP	ppm	20.3	4.7	11.46	54
Lu	M/ICP	ppm	0.10	0.01	6.29	14
Mg	M/ICP	%	2.22	0.24	5.36	85
Mn	M/ICP	ppm	3486	351	5.04	83
Mo	M/ICP	ppm	2.23	0.75	16.87	55
Na	M/ICP	%	2.54	0.24	4.77	86
Nb	M/ICP	ppm	8.47	1.25	7.38	55
Nd	M/ICP	ppm	18.1	2.5	6.89	24
P	M/ICP	%	0.10	0.01	7.08	71
Pr	M/ICP	ppm	4.49	0.77	8.61	24
Rb	M/ICP	ppm	90.5	11.8	6.54	55
Sb	M/ICP	ppm	2.59	0.60	11.53	45
Sc	M/ICP	ppm	14.7	2.1	7.01	70
Sm	M/ICP	ppm	3.81	0.62	8.15	24
Sn	M/ICP	ppm	1.71	0.53	15.43	46
Sr	M/ICP	ppm	263	17	3.25	85
Ta	M/ICP	ppm	0.82	0.22	13.63	37
Tb	M/ICP	ppm	0.46	0.05	4.98	24
Te	M/ICP	ppm	0.43	0.08	9.57	28
Th	M/ICP	ppm	7.38	1.39	9.39	47
Ti	M/ICP	%	0.40	0.03	3.80	79
Tl	M/ICP	ppm	0.36	0.07	10.09	40
Tm	M/ICP	ppm	0.12	0.03	13.31	23
V	M/ICP	ppm	120	11	4.80	69
W	M/ICP	ppm	2.03	0.91	22.42	48
Y	M/ICP	ppm	10.0	1.2	6.19	86
Yb	M/ICP	ppm	0.79	0.22	13.93	24
Zr	M/ICP	ppm	34.1	5.9	8.69	60