African Mineral Standards
MATRIX REFERENCE MATERIALS

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AMIS0312

Certified Reference Material

Gold and Copper ore, greenstone, (flotation tail) Buzwagi Mine, Tanzania

Certificate of Analysis

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

Certified Concentrations

Cu M/ICP	8104	±	315	ppm
Au Pb Collection	4.00	±	0.12	g/t
Specific Gravity	2.84	±	0.10	

Provisional Concentration

Ag M/ICP	5.8	±	0.9	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	11.24	±	0.28	%
CaO	2.37	±	0.06	%
Fe_2O_3	6.55	±	0.10	%
K_2O	3.74	±	0.04	%
MgO	0.69	±	0.06	%
MnO	0.060	±	0.004	%
Na_2O	1.55	±	0.06	%
SiO_2	68.18	±	0.86	%
TiO_2	0.24	±	0.01	%
S Comb / LECO	2.58	±	0.14	%

Provisional Concentration

LOI	3.30	±	0.86	%

Indicated Mean

Cr_2O_3	0.03	%

1. Intended Use: AMIS0312 can be used to check the analysis of gold and copper ores, 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 material was supplied by the open pit Buzwagi Gold and Copper Mine which hosted in the Nzega Greenstone Belt in the Shinyanga Region of Tanzania, located 6 kilometres southeast from the town of Kahama. The mine is operated by African Barrick Gold. The material supplied was described as “flotation tail”.

3. Approximate Mineral and Chemical Composition: The Nzega Belt is comprised of basalts and intermediate volcanics intruded by granitoid masses. Buzwagi is a shear hosted quartz-veined deposit, hosted in porphyritic granite. Gold mineralisation occurs in association with sulphides (pyrite) and quartz and as free grains, while copper mineralisation occurs as primary sulphides (chalcopyrite).

4. Appearance: The material is a very fine powder. It is colored a Medium Dark Grey.

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 partic**l**e 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. Multi-acid digest multi-element scan - (to include Cu & Ag). ICP-OES or ICP-MS.
2. Pressed pellet multi-element scan - (to include Cu). XRF.
3. Au – Pb collection ICP-OES or ICP-MS
4. Majors (Al_2O_3, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, SiO_2, TiO_2. LOI.) XRF fusion.
5. SG. Gas pycnometer.

8. Information requested:

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

9. Method of Certification: Twenty two laboratories were each given eight randomly selected packages of sample. Sixteen 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”.

10. Participating Laboratories: The 16 out of 22 laboratories that provided results timeously were (not in same order as in the table of assays):

1. Activation Laboratories Pty Ltd (ActLabs) CA
2. ALS Chemex Laboratory Group Brisbane Australia
3. ALS Chemex Laboratory Group Johannesburg SA
4. ALS Chemex Laboratory Group Perth WA
5. ALS Chemex Laboratory Group Vancouver CA
6. Bureau Veritas (Namibia)
7. Genalysis Laboratory Services (W Australia P)
8. Intertek Utama Services (Indonesia)
9. Set Point Laboratories (Isando) SA
10. SGS Australia Pty Ltd (Newburn) WA
11. SGS Geosol Laboratories Ltda (Brazil)
12. SGS Mineral Services Callao (Peru)
13. SGS Mineral Services Lakefield (Canada)
14. SGS Toronto (Canada)
15. SGS Townsville (Australia)
16. Ultra Trace (Pty) Ltd WA

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

Lab	Cu	Cu	Cu	Au	Ag	Al2O3	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	SiO2	TiO2	LOI	S Comb	SG
Code	F	M/ICP	XRF	PbColl	M/ICP	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF		LECO	pyc
	ppm	ppm	ppm	g/t	ppm	%	%	%	%	%	%	%	%	%	%	%	%	
A		8280		4.07	6.00	11.20	2.39	0.03	6.60	3.74	0.71	0.06		68.14	0.25	3.33		2.88
A		8090		4.05	6.50	11.17	2.38	0.03	6.59	3.73	0.71	0.06		68.14	0.24	3.39		2.88
A		8040		3.88	6.00	11.21	2.38	0.03	6.59	3.74	0.71	0.06		68.16	0.25	3.35		2.90
A		7870		3.97	6.00	11.24	2.38	0.03	6.60	3.75	0.71	0.06		68.18	0.24	3.37		2.90
A		8020		4.02	6.50	11.23	2.39	0.03	6.61	3.75	0.71	0.06		68.24	0.24	3.37		2.92
A		8190		4.04	6.50	11.21	2.39	0.03	6.59	3.74	0.71	0.06		68.15	0.24	3.37		2.90
A		8230		3.82	6.50	11.19	2.38	0.03	6.59	3.74	0.71	0.06		68.16	0.24	3.38		2.90
A		8060		3.97	6.00	11.22	2.38	0.03	6.60	3.74	0.71	0.06		68.17	0.24	3.36		2.88
B		7850			5.20												2.62	2.86
B		8030			5.60												2.50	2.86
B		7940			5.20												2.52	2.85
B		8190			5.30												2.60	2.85
B		8160			5.50												2.51	2.83
B		8120			5.50												2.50	2.85
B		8160			5.50												2.49	2.86
B		8220			5.70												2.51	2.86
H		8330	8190		6.00	11.35	2.38	0.03	6.52	3.74	0.69	0.06	1.51	68.10	0.23	3.12		
H		8370	8190		6.00	11.35	2.38	0.03	6.50	3.75	0.71	0.06	1.54	68.10	0.23	3.09		
H		8420	8230		7.00	11.40	2.38	0.03	6.54	3.75	0.71	0.06	1.51	68.20	0.24	3.08		
H		8370	8110		6.00	11.30	2.36	0.04	6.49	3.72	0.70	0.06	1.48	67.80	0.23	3.21		
H		8330	8190		6.00	11.35	2.36	0.04	6.50	3.75	0.71	0.06	1.51	67.90	0.23	3.13		
H		8290	8150		6.00	11.25	2.35	0.04	6.47	3.71	0.70	0.06	1.53	68.00	0.23	3.10		
H		8360	8230		5.00	11.35	2.38	0.03	6.54	3.74	0.70	0.06	1.54	68.10	0.24	3.13		
H		8240	8230		6.00	11.40	2.38	0.03	6.50	3.75	0.71	0.06	1.52	68.30	0.24	3.10		
I		8350		4.27	7.00													2.80
I		8070		4.34	7.00													2.81
I		7890		4.24	4.00													2.84
I		8330		4.18	6.00													2.84
I		8120		4.10	6.00													2.83
I		8320		4.29	6.00													2.84
I		8180		4.17	8.00													2.79
I		8520		3.95	5.00													2.83
J	8382	8138			5.70												2.55	
J	8276	8222			6.00												2.53	
J	8228	8152			6.00												2.52	
J	8246	8241			5.80												2.54	
J	8328	8226			5.70												2.57	
J	8398	8225			5.90												2.54	
J	8138	8149			5.60												2.58	
J	8320	8155			5.60												2.54	
K				3.92	5.70	11.30	2.39	0.02	6.52	3.84	0.72	0.06	1.57	67.50	0.24	3.15	2.79	
K				3.91	5.70	11.20	2.42	0.03	6.56	3.86	0.71	0.06	1.57	68.00	0.24	3.13	2.77	
K				3.96	5.60	11.20	2.41	0.03	6.51	3.84	0.72	0.06	1.56	67.30	0.24	3.01	2.65	
K				4.06	5.70	11.20	2.40	0.02	6.45	3.84	0.72	0.06	1.58	67.10	0.24	3.00	2.70	
K				3.98	5.80	11.30	2.39	0.03	6.51	3.89	0.73	0.06	1.59	67.40	0.25	3.29	2.68	
K				3.98	5.60	11.40	2.42	0.03	6.52	3.86	0.71	0.05	1.59	67.80	0.24	3.18	2.64	
K				3.95	5.90	11.40	2.41	0.03	6.52	3.86	0.72	0.05	1.57	67.80	0.24	3.18	2.59	
K				3.92	5.90	11.30	2.40	0.03	6.50	3.82	0.71	0.06	1.55	67.30	0.24	3.16	2.67	

Assay data (cont)

Lab Code	Cu F	Cu M/ICP	Cu XRF	Au PbColl	Ag M/ICP	Al2O3 XRF	CaO XRF	Cr2O3 XRF	Fe2O3 XRF	K2O XRF	MgO XRF	MnO XRF	Na2O XRF	SiO2 XRF	TiO2 XRF	LOI	S Comb LECO	SG pyc
	ppm	ppm	ppm	g/t	ppm	%	%	%	%	%	%	%	%	%	%	%	%	
L	8150	8030			6.10	11.20	2.37		6.63	3.74	0.69	0.06	1.58	68.10	0.24	2.57	2.74	
L	8070	8330			6.40	11.20	2.38		6.66	3.77	0.69	0.06	1.60	68.10	0.24	2.66	2.61	
L	8250	8560			6.00	11.30	2.36		6.59	3.74	0.70	0.06	1.60	68.10	0.24	2.60	2.64	
L	8390	8410			6.30	11.20	2.38		6.57	3.75	0.70	0.06	1.59	68.10	0.24	2.57	2.63	
L	8210	8120			6.20	11.20	2.37		6.60	3.74	0.69	0.06	1.59	68.00	0.24	2.57	2.67	
L	8110	8400			6.20	11.20	2.36		6.60	3.76	0.69	0.06	1.59	68.00	0.24	2.68	2.72	
L	8320	8220			6.30	11.20	2.36		6.61	3.73	0.70	0.06	1.59	68.00	0.24	2.62	2.64	
L	8260	8240			6.30	11.20	2.37		6.61	3.72	0.69	0.06	1.58	68.00	0.24	2.59	2.58	
M		7276		4.06	7.40	10.49	2.28			3.61	0.67		1.49		0.23			2.71
M		7434		3.99	6.40	10.71	2.31			3.68	0.67		1.52		0.23			2.74
M		7418		4.00	6.30	10.51	2.29			3.64	0.65		1.50		0.23			2.76
M		7574		4.05	6.20	10.96	2.38			3.78	0.68		1.57		0.24			2.78
M		7808		4.05	6.80	10.96	2.34			3.78	0.69		1.55		0.24			2.79
M		7800		3.93	6.40	10.92	2.38			3.79	0.68		1.56		0.24			2.74
M		7441		4.10	5.80	10.89	2.35			3.77	0.69		1.56		0.24			2.79
M		8014		4.07	6.10	10.56	2.28			3.77	0.70		1.52		0.23			2.75
N		8150			5.50	11.50	2.42	0.02	6.61	3.75	0.71	0.06			0.24			2.86
N		7960			5.50	11.10	2.39	0.02	6.62	3.70	0.71	0.06			0.24			2.87
N		8060			6.00	11.40	2.42	0.02	6.59	3.72	0.73	0.06			0.24			2.87
N		8150			5.50	11.60	2.48	0.02	6.59	3.74	0.73	0.06			0.24			2.88
N		7960			6.00	11.20	2.39	0.02	6.69	3.66	0.71	0.06			0.24			2.88
N		8080			6.50	11.40	2.42	0.02	6.62	3.72	0.73	0.06			0.25			2.87
N		8020			6.00	11.30	2.39	0.02	6.68	3.68	0.71	0.06			0.24			2.87
N		8130			6.00	11.20	2.45	0.02	6.62	3.74	0.73	0.06			0.24			2.86
O		8570			6.00	11.25	2.31	0.03	6.44	3.73	0.65	0.06	1.52	68.10	0.24	2.81		
O		8470			6.00	11.30	2.32	0.03	6.50	3.75	0.66	0.06	1.53	68.30	0.24	2.98		
O		8470			4.00	11.40	2.35	0.03	6.56	3.80	0.67	0.06	1.55	69.10	0.24	2.96		
O		8540			5.00	11.35	2.33	0.03	6.53	3.76	0.67	0.06	1.54	68.70	0.24	2.98		
O		8530			5.00	11.30	2.31	0.03	6.47	3.75	0.65	0.06	1.52	68.30	0.24	2.78		
O		8490			4.00	11.30	2.32	0.03	6.46	3.74	0.65	0.06	1.53	68.20	0.24	2.98		
O		8570			5.00	11.30	2.33	0.03	6.49	3.75	0.66	0.06	1.52	68.50	0.24	2.89		
O		8630			6.00	11.25	2.31	0.03	6.45	3.73	0.67	0.06	1.51	68.10	0.23	2.71		
P	8000	7710			6.00												2.58	
P	8000	7850			6.00												2.54	
P	8000	7960			6.00												2.56	
P	8000	7870			6.00												2.56	
P	8000	7740			6.00												2.55	
P	8000	7780			6.00												2.56	
P	8000	7870			6.00												2.52	
P	8000	7990			6.00												2.55	
Q		8140		3.96	5.20	11.28	2.73	0.04	6.56	3.72	1.16	0.06	1.55	68.37	0.24	3.20		
Q		8060		3.96	5.40	11.29	2.70	0.03	6.52	3.72	1.13	0.06	1.54	68.47	0.25	3.30		
Q		8090		3.96	5.10	11.31	2.69	0.04	6.55	3.75	1.13	0.06	1.53	68.38	0.24	3.30		
Q		8000		3.99	5.10	11.32	2.69	0.03	6.54	3.72	1.12	0.06	1.55	68.38	0.24	3.30		
Q		8010		3.90	5.00	11.24	2.73	0.03	6.60	3.75	1.15	0.06	1.54	68.21	0.25	3.30		
Q		8020		4.00	5.40	11.30	2.70	0.04	6.58	3.73	1.13	0.06	1.58	68.40	0.25	3.30		
Q		8110		3.97	5.40	11.26	2.73	0.02	6.61	3.72	1.16	0.06	1.55	68.35	0.25	3.20		
Q		8100		4.05	5.40	11.29	2.70	0.03	6.56	3.74	1.13	0.06	1.54	68.23	0.25	3.30		
R		8310		4.07		11.20	2.37	0.03	6.57	3.64	0.68	0.05	1.56	69.10	0.24	3.83		2.85
R		8040		4.00		10.75	2.26	0.03	6.32	3.54	0.66	0.05	1.50	67.60	0.23	3.99		2.89
R		8030		4.09		10.75	2.26	0.03	6.36	3.52	0.67	0.05	1.50	67.50	0.23	3.88		2.81
R		8150		4.00		10.65	2.24	0.03	6.29	3.51	0.66	0.05	1.50	67.20	0.22	3.86		2.98
R		8070		4.01		10.60	2.24	0.03	6.27	3.51	0.66	0.05	1.48	67.00	0.22	4.00		2.93
R		7730		3.98		10.60	2.25	0.04	6.48	3.45	0.65	0.06	1.57	67.60	0.23	3.91		2.81
R		7860		4.02		10.75	2.28	0.03	6.43	3.59	0.67	0.05	1.57	68.60	0.23	4.03		2.71
R		8210		4.01		10.55	2.24	0.04	6.43	3.44	0.65	0.06	1.57	67.20	0.22	3.96		2.83
T	9133	7766		3.96	6.12													
T	9493	7887		3.94	5.69													
T	9425	7887		3.98	6.30													
T	8325	7858		3.94	5.89													
T	7153	7840		3.95	6.10													
T	7466	7906		4.03	6.22													
T	8235	7901		3.97	5.90													
T	7576	8212		3.91	6.11													
U	8570	7340	8320		4.63	10.94	2.34	0.03	6.53	3.70	0.64	0.06	1.52	68.98	0.25	3.98		
U	8590	7700	8300		4.77	11.07	2.37	0.03	6.57	3.76	0.68	0.06	1.60	69.53	0.25	3.89		
U	8510	7410	8320		4.76	10.82	2.36	0.04	6.48	3.72	0.65	0.06	1.56	68.76	0.25	4.05		
U	8720	7520	8330		4.51	11.05	2.38	0.04	6.54	3.76	0.63	0.06	1.53	69.06	0.25	4.01		
U	8480	7840	8310		5.18	10.95	2.33	0.03	6.61	3.74	0.65	0.06	1.50	68.98	0.25	4.03		
U	8550	7470	8350		5.31	11.31	2.38	0.02	6.49	3.70	0.65	0.06	1.54	69.28	0.25	3.98		
U	8500	7790	8320		5.08	11.04	2.38	0.03	6.53	3.75	0.64	0.06	1.53	68.83	0.24	4.05		
U	8320	7670	8310		5.16	10.78	2.34	0.02	6.50	3.74	0.64	0.06	1.55	68.66	0.24	4.02		
V		8075	8069	4.09	5.01	11.24	2.38	0.03	6.68	3.75	0.59	0.06	1.81	68.10	0.23	3.40		2.81
V		8070	8030	4.07	5.41	11.27	2.38	0.03	6.69	3.75	0.60	0.06	1.81	68.28	0.24	3.36		2.80
V		8068	8065	4.11	5.82	11.20	2.37	0.03	6.64	3.76	0.58	0.06	1.86	68.44	0.24	3.40		2.79
V		8048	7999	4.06	5.81	11.26	2.37	0.03	6.68	3.75	0.59	0.06	1.83	68.38	0.24	3.33		2.80
V		8077	8004	4.07	5.81	11.40	2.38	0.03	6.76	3.76	0.60	0.07	1.86	68.36	0.24	3.31		2.80
V		8048	8043	4.12	5.80	11.34	2.40	0.03	6.71	3.76	0.60	0.07	1.85	68.18	0.24	3.33		2.80
V		8054	8028	4.07	5.82	11.33	2.37	0.03	6.73	3.76	0.60	0.06	1.83	68.56	0.24	3.34		2.81
V		8050	8006	4.06	5.83	11.41	2.37	0.03	6.74	3.77	0.62	0.07	1.86	68.50	0.24	3.35		2.80

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:

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]	S_W [3]	CSU [4]
Cu	M/ICP	ppm	157	95.3	107	29.7
Au	PbColl	g/t	0.06	0.05	0.05	0.018
Ag	M/ICP	ppm	0.43	0.26	0.26	0.07
Al_2O_3	XRF	%	0.160	0.120	0.093	0.039
CaO	XRF	%	0.028	0.023	0.015	0.008
Cr_2O_3	XRF	%	0.0054	0.0035	0.0040	0.0013
Fe_2O_3	XRF	%	0.058	0.051	0.032	0.019
K_2O	XRF	%	0.021	0.009	0.020	0.004
LOI		%	0.430	0.422	0.063	0.141
MgO	XRF	%	0.027	0.024	0.010	0.008
MnO	XRF	%	0.0017	0.0014	0.0009	0.0005
Na_2O	XRF	%	0.030	0.022	0.022	0.008
SiO_2	XRF	%	0.431	0.305	0.293	0.108
TiO_2	XRF	%	0.006	0.004	0.004	0.001
S Comb/LECO		%	0.07	0.07	0.04	0.03
SG	pyc		0.046	0.045	0.021	0.008

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 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: AMIS0312 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.

18. 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.

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 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.

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.

17 September 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

Anlayte	Method	Unit	Mean	2SD	RSD%	n
Al	M/ICP	%	5.60	0.97	8.64	89
As	M/ICP	ppm	18.3	6.93	18.9	83
Ba	M/ICP	ppm	634	141	11.1	67
Be	M/ICP	ppm	1.68	0.49	14.6	59
Bi	M/ICP	ppm	24.1	7.80	16.2	76
Ca	M/ICP	%	1.66	0.12	3.70	98
Cd	M/ICP	ppm	1.15	0.87	37.7	61
Ce	M/ICP	ppm	51.2	9.48	9.25	45
Co	M/ICP	ppm	16.2	5.69	17.5	92
Cr	M/ICP	ppm	183	40.0	10.9	80
Cs	M/ICP	ppm	6.07	0.85	7.01	39
Cu	F	ppm	8278	245	2.93	37
Cu	XRF	ppm	8180	28.3	0.35	24
Dy	M/ICP	ppm	0.95	0.08	4.38	30
Er	M/ICP	ppm	0.47	0.07	7.04	31
Eu	M/ICP	ppm	0.68	0.15	11.2	31
Fe	M/ICP	%	4.52	0.30	3.34	100
Ga	M/ICP	ppm	23.5	6.17	13.1	53
Gd	M/ICP	ppm	1.85	0.21	5.68	31
Ge	M/ICP	ppm	0.10	3E-17	2E-14	6
Hf	M/ICP	ppm	2.52	0.45	8.89	32
Ho	M/ICP	ppm	0.18	0.03	7.08	31
In	M/ICP	ppm	0.24	0.05	10.5	39
K	M/ICP	%	2.91	0.57	9.82	99
La	M/ICP	ppm	26.2	5.59	10.7	62
Li	M/ICP	ppm	40.1	3.48	4.34	72
Lu	M/ICP	ppm	0.08	0.03	17.8	29
Mg	M/ICP	%	0.40	0.07	8.26	98
Mn	M/ICP	ppm	415	38.3	4.61	88
Mo	M/ICP	ppm	92.3	11.06	5.99	78
Na	M/ICP	%	1.13	0.08	3.67	82
Nb	M/ICP	ppm	8.81	1.75	9.95	46
Nd	M/ICP	ppm	20.2	2.97	7.34	31
Ni	M/ICP	ppm	37.8	9.69	12.8	99
P	M/ICP	ppm	395	155	19.6	64
Pb	M/ICP	ppm	37.8	9.00	11.9	95
Pr	M/ICP	ppm	5.96	1.02	8.58	31
Rb	M/ICP	ppm	192	35.7	9.32	43
Re	M/ICP	ppm	0.00	0.00	26.2	13
S	M/ICP	%	2.57	0.14	2.63	84
Sb	M/ICP	ppm	2.22	3.33	75.0	36
Sc	M/ICP	ppm	3.83	0.76	9.87	72
Se	M/ICP	ppm	0.54	0.35	32.4	14
Si	M/ICP	%	32.3	0.53	0.82	8
Sm	M/ICP	ppm	2.95	0.55	9.33	31
Sn	M/ICP	ppm	14.3	6.40	22.4	56
Sr	M/ICP	ppm	231	39.6	8.56	84
Ta	M/ICP	ppm	0.26	0.13	24.0	32
Tb	M/ICP	ppm	0.20	0.05	13.6	39
Te	M/ICP	ppm	15.8	7.06	22.4	43
Th	M/ICP	ppm	10.3	1.52	7.38	46
Ti	M/ICP	%	0.14	0.02	7.23	58
Tl	M/ICP	ppm	0.96	0.76	39.8	45
Tm	M/ICP	ppm	0.07	0.01	10.5	24
U	M/ICP	ppm	5.67	0.63	5.54	39
V	M/ICP	ppm	28.3	3.64	6.42	65
W	M/ICP	ppm	18.8	4.15	11.0	60
Y	M/ICP	ppm	5.70	0.84	7.36	69
Yb	M/ICP	ppm	0.45	0.09	9.53	39
Zn	M/ICP	ppm	101	12.5	6.23	96
Zr	M/ICP	ppm	69.2	26.6	19.2	56