



African Mineral Standards

MATRIX REFERENCE MATERIALS

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## AMIS0269

### *Certified Reference Material*

**Gold, silver, epithermal vein, filter concentrate,  
Guanajuato, Mexico**

### *Certificate of Analysis*

#### **Recommended Concentrations and Limits<sup>1</sup> (at two Standard Deviations)**

#### ***Certified Concentrations<sup>2</sup>***

Au Pb Collection	0.23	±	0.02	g/t
Ag M/ICP	40	±	5	g/t
Ag P	39	±	3	g/t
Cu M/ICP	62	±	5	ppm
Pb M/ICP	98	±	9	ppm
Pb P	97	±	8	ppm
Zn M/ICP	248	±	13	ppm
Zn P	241	±	24	ppm
Specific Gravity	2.74	±	0.08	

#### ***Provisional Concentrations***

Cu P 62 ± 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, 9 and 12.
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 <sub>2</sub> O <sub>3</sub>	5.41	±	0.08	%
CaO	3.89	±	0.06	%
Fe <sub>2</sub> O <sub>3</sub>	3.22	±	0.08	%
K <sub>2</sub> O	2.47	±	0.04	%
MgO	1.73	±	0.06	%
MnO	0.125	±	0.010	%
SiO <sub>2</sub>	77.27	±	0.86	%
TiO <sub>2</sub>	0.27	±	0.01	%
LOI	3.56	±	0.40	%
S Comb/ LECO	1.09	±	0.06	%

### ***Provisional Concentrations***

Na <sub>2</sub> O	0.17	±	0.02	%
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### ***Indicated Means***

Cr <sub>2</sub> O <sub>3</sub>	0.03	%
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**1. Intended Use:** AMIS0269 can be used to check analysis of samples of fissure hosted, low-sulphidation, epithermal gold-silver quartz vein 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 Section 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:** AMIS0269 is a commissioned CRM made from material supplied by SGS Minerals Services from the Guanajuato Mine Complex (GMC) located in Guanajuato State, Mexico. GMC is wholly owned by Great Panther Silver Limited through Minera Mexicana El Rosario, S.A. de C.V. The mine is located on the Central Plateau of Mexico. The City of Guanajuato, where the mines are located, is 380 km by road northwest of Mexico City.

Mineralization occurs along regional scale faults, the largest of which is the 25 km long Veta Madre vein structure. The material supplied was described as “filter concentrate”.

**3. Mineral and Chemical Composition:** The economic mineralization is hosted in quartz-carbonate-adularia veins and stockwork systems with identifiable ore-shoots that carry the bulk of the economic mineralization. The ore shoots are discontinuous, 10-40m wide and typically equal in vertical dimensions to strike length. The argentiferous mineralization is hosted in quartz veins with gangue mineralogy of quartz, calcite, pyrite, adularia, and sericite. The principal Ag bearing mineralization is acanthite (argentite), aguilarite and naumannite while Au occurs a free Au and as electrum. The Au to Ag ratios vary from about 1:70 to 1:200. Base metal mineralization is not common; when it occurs it is observed as chalcopyrite, sphalerite and galena.

**4. Appearance:** The material is a very fine powder. It is colored Medium Light Grey (Corstor 10Y6/2).

**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 ore is crushed, then dry-milled and air classified to 100% <54 $\mu$ . This fine powder is mixed in a blender for 14 hours and then split down into numbered 1 kg tubs. These lots are sampled for quality control and for round robin analysis. Quality control will typically comprise sampling 30 tubs selected from the whole stream. Round robin samples are selected the same way, so that one laboratory will receive samples from the beginning, end, and from throughout the batch.

**7. Methods of Analysis requested:**

1. Au – Pb collection, ICP-OES or ICP-MS.
2. Multi-acid digest multi-element scan - ( to include Ag, Cu, Pb, Zn) ICP-OES or ICP-MS.
3. Aqua regia digest multi-element scan - ( to include Ag, Cu, Pb, Zn ) ICP-OES or ICP-MS.
4. Majors ( Al<sub>2</sub>O<sub>3</sub>, CaO, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, SiO<sub>2</sub>, TiO<sub>2</sub>, 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 four laboratories were each given eight randomly selected packages of sample. Nineteen 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 19 out of 24 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 Johannesburg SA
- 3 ALS Chemex Laboratory Group Perth WA
- 4 Bureau Veritas (USA)
- 5 BV (Canada)
- 6 Genalysis Laboratory Services (South Africa) Pty
- 7 Genalysis Laboratory Services (W Australia P)
- 8 Intertek Utama Services (Indonesia)
- 9 OMAC Laboratories Limited (Ireland)
- 10 SGS Australia Pty Ltd (Newburn) WA
- 11 SGS Chelopech (Bulgaria)
- 12 SGS Durango (Mexico)
- 13 SGS Geosol Laboratories Ltda (Brazil)
- 14 SGS Mineral Services Lakefield (Canada)
- 15 SGS South Africa (Pty) Ltd - Booyens JHB
- 16 SGS Toronto (Canada)
- 17 SGS Townsville (Australia)
- 18 SGS Vancouver
- 19 Ultra Trace (Pty) Ltd WA

**11. Assay Data:** Data as received from the laboratories for the important certified elements listed on p1 and 2 are set out below. A proficiency report has been sent to the managers of the participating laboratories. Additional digital data from this round robin is available on request

**Assay data- Economic elements**

Lab Code	Au Pb Coll g/t	Ag M/ICP g/t	Ag P g/t	Cu M/ICP ppm	Cu P ppm	Pb M/ICP ppm	Pb P ppm	Zn M/ICP ppm	Zn P ppm
A	0.31	40.00	38.00	60.00	70.00	110.00	110.00	250.00	260.00
A	0.28	39.00	40.00	60.00	70.00	90.00	100.00	240.00	260.00
A	0.27	36.00	35.00	60.00	60.00	100.00		260.00	330.00
A	0.25	36.00	38.00	60.00	60.00	90.00	100.00	250.00	260.00
A	0.25	37.00	38.00	60.00	60.00	90.00	80.00	250.00	250.00
A	0.25	39.00	38.00	60.00	70.00	100.00	80.00	250.00	250.00
A	0.26	40.00	43.00	60.00	70.00	90.00	100.00	240.00	250.00
A	0.31	42.00	45.00	60.00	70.00	110.00	100.00	250.00	250.00
B	0.23	36.00	35.50	57.00	61.00	93.00	98.00	250.00	240.00
B	0.21	37.30	35.90	58.00	61.00	96.00	97.00	236.00	236.00
B	0.24	35.80	37.00	63.00	63.00	93.00	99.00	228.00	245.00
B	0.24	35.70	36.60	58.00	62.00	94.00	96.00	236.00	241.00
B	0.23	35.40	41.70	58.00	73.00	93.00	113.00	240.00	279.00
B	0.22	36.20	35.60	63.00	62.00	96.00	98.00	241.00	239.00
B	0.22	36.80	36.60	61.00	64.00	95.00	101.00	246.00	251.00
B	0.21	34.70	37.30	58.00	68.00	93.00	104.00	238.00	258.00

**Assay data (cont) – Economic elements**

Lab Code	Au Pb Coll g/t	Ag M/ICP g/t	Ag P g/t	Cu M/ICP ppm	Cu P ppm	Pb M/ICP ppm	Pb P ppm	Zn M/ICP ppm	Zn P ppm
C	0.22								
C	0.23								
C	0.22								
C	0.24								
C	0.23								
C	0.24								
C	0.23								
C	0.25								
E	0.25		38.50						
E	0.25		38.50						
E	0.28		38.50						
E	0.28		39.50						
E	0.28		39.00						
E	0.22		40.80						
E	0.28		39.50						
E	0.30		41.00						
F	0.22		38.90						
F	0.20		39.30						
F	0.21		39.40						
F	0.23		39.10						
F	0.21		38.90						
F	0.22		39.60						
F	0.22		39.60						
F	0.22		39.30						
G	0.24		41.00	65.40	56.00	91.40	89.00	210.00	188.00
G	0.25		41.00	58.70	54.00	88.30	91.00	211.00	197.00
G	0.23		42.00	61.60	54.00	92.80	95.00	207.00	196.00
G	0.23		40.00	61.00	54.00	93.30	93.00	212.00	195.00
G	0.23		40.00	59.50	52.00	90.10	92.00	206.00	190.00
G	0.24		42.00	62.60	55.00	96.10	93.00	203.00	200.00
G	0.24		40.00	57.90	53.00	89.80	92.00	203.00	190.00
G	0.24		40.00	62.50	54.00	93.10	91.00	210.00	194.00
I	0.22	44.20	40.10	72.00	56.00	104.00	100.00	283.00	252.00
I	0.23	43.90	42.10	69.00	60.00	100.00	100.00	283.00	260.00
I	0.26	57.40	40.40	73.00	58.00	108.00	101.00	294.00	249.00
I	0.25	45.70	42.20	75.00	54.00	108.00	99.00	306.00	249.00
I	0.27	41.80	39.60	69.00	54.00	103.00	100.00	278.00	248.00
I	0.25	43.40	40.40	71.00	56.00	105.00	100.00	285.00	246.00
I	0.24	42.20	39.20	69.00	55.00	100.00	95.00	275.00	244.00
I	0.23	44.00	39.20	69.00	54.00	99.00	96.00	269.00	244.00
L	0.22	38.00		68.00	60.00	104.00	96.00	255.00	241.00
L	0.24	37.00		67.00	60.00	101.00	98.00	260.00	241.00
L	0.23	38.00		67.00	60.00	100.00	95.00	255.00	241.00
L	0.22	40.00		65.00	60.00	104.00	96.00	250.00	242.00
L	0.23	37.00		65.00	60.00	100.00	94.00	260.00	236.00
L	0.23	39.00		65.00	55.00	102.00	97.00	255.00	248.00
L	0.23	38.00		64.00	50.00	98.00	97.00	250.00	248.00
L	0.21	36.50		66.00	50.00	100.00	97.00	250.00	243.00
M	0.23	41.00	40.00	60.00	70.00	80.00	110.00	250.00	250.00
M	0.24	41.00	39.00	60.00	60.00	70.00	100.00	250.00	250.00
M	0.24	40.00	39.00	70.00	60.00	80.00	100.00	240.00	240.00
M	0.25	41.00	40.00	60.00	60.00	70.00	90.00	250.00	260.00
M	0.25	39.00	38.00	50.00	60.00	80.00	100.00	240.00	240.00
M	0.23	40.00	40.00	60.00	60.00	70.00	100.00	240.00	240.00
M	0.24	39.00	38.00	60.00	60.00	70.00	100.00	230.00	230.00
M	0.20	39.00	39.00	60.00	60.00	90.00	90.00	240.00	240.00
N	0.22	47.50		73.90		100.00		251.00	
N	0.23	44.90		72.40		98.10		249.00	
N	0.22	47.20		67.40		101.00		244.00	
N	0.23	46.50		69.70		102.00		249.00	
N	0.22	47.30		74.10		101.00		256.00	
N	0.22	45.40		69.40		101.00		246.00	
N	0.25	47.20		71.60		97.90		252.00	
N	0.24	50.00		72.20		103.00		252.00	

**Assay data (cont) – Economic elements**

Lab Code	Au Pb Coll g/t	Ag M/ICP g/t	Ag P g/t	Cu M/ICP ppm	Cu P ppm	Pb M/ICP ppm	Pb P ppm	Zn M/ICP ppm	Zn P ppm
O			40.40	60.00	63.00	100.00	101.00	247.00	241.00
O			40.10	58.00	62.00	100.00	102.00	247.00	237.00
O			39.50	58.00	63.00	100.00	104.00	249.00	256.00
O			39.70	59.00	62.00	100.00	101.00	246.00	247.00
O			40.50	62.00	61.00	110.00	100.00	249.00	243.00
O			39.40	63.00	65.00	100.00	104.00	248.00	255.00
O			40.20	61.00	63.00	100.00	103.00	245.00	255.00
O			39.80	61.00	63.00	100.00	104.00	243.00	253.00
P	0.21		38.20	63.50	71.20	91.00	96.00	222.00	240.00
P	0.22		37.00	62.80	68.00	90.00	94.00	214.00	230.00
P	0.21		37.20	63.20	70.00	93.00	96.00	223.00	229.00
P	0.22		37.40	63.20	68.90	94.00	97.00	218.00	237.00
P	0.22		38.70	62.30	67.70	90.00	96.00	215.00	232.00
P	0.24		36.30	62.80	71.00	93.00	97.00	231.00	237.00
P	0.23		38.30	63.10	68.60	95.00	96.00	226.00	233.00
P	0.23		37.50	64.70	69.80	92.00	97.00	223.00	239.00
Q	0.25	39.30	38.00	62.00	62.00	103.00	91.00	246.00	214.00
Q	0.26	40.70	36.90	64.00	62.00	107.00	90.00	241.00	224.00
Q	0.27	40.70	37.10	62.00	63.00	107.00	93.00	248.00	232.00
Q	0.24	39.10	37.60	62.00	63.00	106.00	93.00	245.00	230.00
Q	0.25	39.80	36.90	61.00	63.00	105.00	93.00	252.00	225.00
Q	0.24	39.40	37.80	62.00	64.00	106.00	94.00	252.00	217.00
Q	0.25	39.40	37.50	61.00	65.00	107.00	94.00	252.00	212.00
Q	0.24	40.50	37.90	60.00	63.00	103.00	92.00	251.00	223.00
R	0.24	39.30		63.00		100.00		257.00	
R	0.25	37.60		61.00		98.00		249.00	
R	0.24	38.20		66.00		99.00		257.00	
R	0.24	39.30		65.00		99.00		258.00	
R	0.24	38.00		70.00		99.00		255.00	
R	0.22	38.50		64.00		99.00		251.00	
R	0.24	39.10		59.00		99.00		251.00	
R	0.25	40.20		63.00		100.00		259.00	
S	0.20	40.30	36.10	66.00	62.00	100.00	100.00	249.00	235.00
S	0.23	40.10	38.50	65.00	63.00	98.00	97.00	254.00	241.00
S	0.22	39.30	39.60	65.00	67.00	99.00	97.00	248.00	248.00
S	0.22	39.50	38.20	66.00	64.00	102.00	97.00	255.00	241.00
S	0.23	39.60	38.50	66.00	63.00	102.00	97.00	252.00	235.00
S	0.21	39.60	39.20	67.00	77.00	99.00	112.00	253.00	249.00
S	0.23	37.90	39.40	65.00	68.00	101.00	100.00	252.00	245.00
S	0.22	38.30	39.90	67.00	68.00	101.00	101.00	253.00	248.00
T	0.21	42.40	41.00	64.00		98.00		241.00	
T	0.23	43.90	40.00	66.00		100.00		256.00	
T	0.21	43.00	42.00	69.00		101.00		269.00	
T	0.23	44.30	39.00	68.00		97.00		257.00	
T	0.22	42.50	43.00	63.00		98.00		248.00	
T	0.23	41.20	45.00	61.00		100.00		243.00	
T	0.21	39.40	39.00	64.00		98.00		261.00	
T	0.21	40.60	40.00	65.00		97.00		253.00	
U	0.24		42.50	64.10	62.50	99.00	99.00	250.00	252.00
U	0.23		41.70	60.20	63.50	97.00	100.00	244.00	259.00
U	0.24		41.10	63.00	63.20	97.00	98.00	247.00	250.00
U	0.22		40.90	64.40	64.20	98.00	100.00	248.00	254.00
U	0.23		40.90	63.70	62.70	97.00	102.00	249.00	257.00
U	0.24		40.60	62.80	63.00	97.00	97.00	247.00	250.00
U	0.24		41.60	61.80	65.70	98.00	103.00	245.00	261.00
U	0.22		40.50	63.10	64.40	97.00	100.00	243.00	256.00
V	0.22	40.50	39.70	61.00	62.00	102.00	96.00	253.00	248.00
V	0.23	42.70	40.70	64.00	63.00	92.00	97.00	237.00	245.00
V	0.23	40.90	37.90	62.00	62.00	93.00	95.00	227.00	239.00
V	0.22	41.80	39.70	66.00	63.00	103.00	95.00	242.00	239.00
V	0.22	43.10	39.90	66.00	63.00	91.00	95.00	242.00	233.00
V	0.22	40.30	39.00	61.00	63.00	91.00	94.00	234.00	227.00
V	0.22	42.10	39.60	64.00	62.00	101.00	91.00	244.00	223.00
V	0.22	41.50	41.20	64.00	62.00	95.00	93.00	246.00	228.00
W	0.23		37.00	62.30	63.00	98.00	90.00	239.00	222.00
W	0.23		36.00	60.10	63.70	98.00	91.00	232.00	221.00
W	0.26		38.00	62.00	63.30	98.00	92.00	238.00	221.00
W	0.22		39.00	62.40	63.10	98.00	92.00	226.00	215.00
W	0.25		37.00	63.10	62.90	100.00	95.00	253.00	219.00
W	0.25		38.00	64.80	60.90	99.00	91.00	255.00	217.00
W	0.23		38.00	62.30	63.40	97.00	90.00	235.00	231.00
W	0.25		38.00	62.20	62.10	98.00	91.00	235.00	231.00

Assay data (cont) – Major Oxides

Lab Code	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	LOI XRF %	S Comb / LECO %	SG pycnometer
A												1.11	2.72
A												1.11	2.75
A												1.12	2.81
A												1.11	2.83
A												1.12	2.77
A												1.12	2.75
A												1.11	2.77
A												1.11	2.77
C													2.81
C													2.82
C													2.81
C													2.83
C													2.81
C													2.82
C													2.80
C													2.79
E												1.09	
E												1.06	
E												1.07	
E												1.07	
E												1.06	
E												1.05	
E												1.07	
E												1.07	
F	5.41	3.88	0.02	3.24	2.51	1.76	0.11	0.16	77.40		3.45	0.95	
F	5.42	3.86	0.03	3.23	2.47	1.74	0.12	0.15	77.70		3.40	1.08	
F	5.43	3.90	0.03	3.25	2.48	1.73	0.10	0.17	78.00		3.38	1.08	
F	5.46	3.91	0.04	3.26	2.50	1.75	0.10	0.16	77.70		3.38	1.08	
F	5.41	3.89	0.02	3.24	2.48	1.74	0.12	0.16	77.30		3.33	1.08	
F	5.43	3.90	0.03	3.26	2.47	1.72	0.10	0.15	77.50		3.34	1.08	
F	5.41	3.90	0.04	3.26	2.48	1.72	0.11	0.16	77.50		3.40	1.08	
F	5.38	3.86	0.02	3.25	2.48	1.73	0.11	0.16	77.10		3.41	1.08	
G													
G													
G													
G													
G													
G													
G													
I	5.43	3.92		3.25	2.49	1.73	0.13		77.40	0.27	3.61	1.02	
I	5.40	3.91		3.26	2.49	1.72	0.13		77.40	0.27	3.46	1.02	
I	5.38	3.93		3.28	2.49	1.74	0.13		77.50	0.27	3.39	1.04	
I	5.40	3.91		3.28	2.48	1.72	0.13		77.40	0.27	3.52	1.06	
I	5.39	3.93		3.27	2.48	1.72	0.13		77.50	0.27	3.37	0.99	
I	5.41	3.92		3.27	2.47	1.73	0.13		77.30	0.27	3.41	1.09	
I	5.39	3.93		3.27	2.48	1.73	0.13		77.40	0.27	3.35	1.00	
I	5.41	3.92		3.27	2.50	1.74	0.13		77.40	0.27	3.51	1.04	
L	5.45	3.92	0.03	3.21	2.48	1.72	0.13	0.18	77.61	0.27	3.32	1.10	2.73
L	5.42	3.91	0.03	3.20	2.47	1.71	0.13	0.17	77.57	0.27	3.30	1.10	2.78
L	5.43	3.90	0.03	3.20	2.47	1.72	0.12	0.17	77.56	0.27	3.27	1.09	2.76
L	5.44	3.92	0.03	3.21	2.48	1.73	0.13	0.17	77.68	0.27	3.28	1.10	2.73
L	5.45	3.91	0.03	3.22	2.48	1.72	0.13	0.17	77.63	0.27	3.26	1.11	2.74
L	5.43	3.91	0.03	3.21	2.48	1.73	0.13	0.17	77.62	0.27	3.24	1.10	2.78
L	5.45	3.91	0.03	3.21	2.48	1.72	0.13	0.17	77.57	0.27	3.23	1.09	2.74
L	5.43	3.91	0.03	3.21	2.47	1.73	0.13	0.17	77.55	0.27	3.26	1.10	2.72
M	5.37	3.77	0.02	3.17	2.45	1.71	0.13	0.18	76.50	0.26	3.60		
M	5.39	3.80	0.03	3.21	2.46	1.76	0.12	0.17	76.60	0.25	3.50		
M	5.38	3.79	0.03	3.17	2.46	1.72	0.12	0.17	76.60	0.25	3.59		
M	5.38	3.79	0.03	3.19	2.45	1.73	0.12	0.17	76.50	0.26	3.65		
M	5.32	3.71	0.03	3.11	2.43	1.69	0.12	0.17	76.80	0.25	3.61		
M	5.37	3.77	0.04	3.18	2.46	1.70	0.12	0.17	76.50	0.25	3.63		
M	5.40	3.80	0.04	3.20	2.46	1.72	0.12	0.19	76.40	0.26	3.57		
M	5.39	3.78	0.04	3.16	2.45	1.70	0.12	0.17	76.60	0.25	3.55		
N	5.33	3.87	0.03	3.25	2.38	1.67	0.12	0.11	76.74	0.27	5.18		
N	5.28	3.85	0.03	3.22	2.43	1.69	0.12	0.12	76.72	0.27	5.09		
N	5.32	3.85	0.03	3.22	2.40	1.69	0.13	0.12	76.59	0.27	5.13		
N	5.31	3.84	0.03	3.23	2.42	1.66	0.12	0.11	76.68	0.27	5.15		
N	5.30	3.86	0.03	3.22	2.41	1.67	0.12	0.13	76.51	0.27	5.14		
N	5.32	3.83	0.03	3.22	2.40	1.67	0.12	0.12	76.35	0.27	5.18		
N	5.21	3.88	0.03	3.23	2.40	1.69	0.13	0.12	76.70	0.27	5.23		
N	5.26	3.83	0.03	3.23	2.39	1.67	0.13	0.11	76.76	0.28	5.15		
P												1.10	2.72
P												1.11	2.66
P												1.11	2.71
P												1.10	2.75
P												1.11	2.64
P												1.11	2.77
P												1.11	2.82
P												1.10	2.74
Q	5.49	3.92	0.03	3.18	2.50	1.88	0.13	0.09	77.87	0.28	3.70		
Q	5.45	3.91	0.02	3.19	2.49	1.86	0.13	0.08	77.88	0.27	3.80		
Q	5.46	3.92	0.02	3.19	2.49	1.89	0.13	0.09	77.76	0.27	3.80		
Q	5.48	3.92	0.03	3.20	2.50	1.89	0.13	0.10	77.81	0.27	3.80		
Q	5.47	3.91	0.04	3.19	2.49	1.88	0.13	0.09	77.79	0.27	3.90		
Q	5.48	3.92	0.04	3.21	2.49	1.87	0.13	0.09	77.74	0.26	3.80		
Q	5.48	3.92	0.03	3.20	2.50	1.87	0.13	0.10	77.90	0.28	3.80		
Q	5.48	3.82	0.03	3.17	2.43	1.84	0.13	0.08	77.95	0.26	3.80		

**Assay data (cont) – Major Oxides**

Lab Code	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	LOI XRF %	S Comb / LECO %	SG pycnometer
R	5.43	3.87	0.03	3.25	2.48	1.74	0.12	0.17	77.19	0.27	3.66	1.07	2.69
R	5.42	3.88	0.03	3.25	2.48	1.72	0.12	0.16	77.17	0.27	3.61	1.11	2.71
R	5.42	3.85	0.03	3.24	2.48	1.72	0.12	0.17	77.37	0.27	3.67	1.06	2.74
R	5.45	3.88	0.03	3.27	2.48	1.74	0.12	0.16	77.44	0.27	3.70	1.10	2.72
R	5.40	3.90	0.03	3.26	2.47	1.73	0.12	0.17	77.42	0.27	3.65	1.07	2.75
R	5.42	3.88	0.03	3.26	2.47	1.74	0.12	0.16	77.25	0.26	3.67	1.11	2.73
R	5.40	3.88	0.03	3.24	2.48	1.72	0.12	0.16	77.12	0.27	3.65	1.10	2.72
R	5.42	3.88	0.03	3.25	2.48	1.72	0.12	0.17	77.10	0.27	3.65	1.07	2.71
S	5.36	3.88	0.02		2.46	1.74		0.14	78.60	0.25	4.48	0.97	2.71
S	5.40	3.89	0.03		2.47	1.74		0.14	78.80	0.26	4.60	1.13	2.71
S	5.45	3.94	0.03		2.51	1.77		0.14	80.00	0.26	4.43	1.16	2.72
S	5.46	3.94	0.03		2.48	1.76		0.15	80.10	0.26	4.39	1.15	2.72
S	5.39	3.89	0.02		2.44	1.74		0.14	79.00	0.25	4.58	1.16	2.73
S	5.45	3.92	0.02		2.47	1.76		0.15	79.60	0.26	4.43	1.18	2.72
S	5.46	3.93	0.02		2.47	1.76		0.15	80.00	0.26	4.60	1.15	2.73
S	5.41	3.90	0.02		2.47	1.75		0.14	79.30	0.25	4.39	1.16	2.71
T												1.10	2.71
T												1.12	2.73
T												1.10	2.72
T												1.08	2.69
T												1.11	2.74
T												1.11	2.74
T												1.11	2.76
T												1.10	2.74
U												1.07	
U												1.07	
U												1.06	
U												1.08	
U												1.08	
U												1.06	
U												1.07	
U												1.08	
V												1.05	
V												1.03	
V												1.04	
V												1.07	
V												1.05	
V												1.08	
V												1.05	
V												0.83	
W	5.64	3.82	0.02	3.13	2.42	1.79	0.12	0.18	77.40	0.27	3.88	1.07	2.73
W	5.72	3.83	0.02	3.15	2.43	1.81	0.12	0.18	77.20	0.27	3.64	1.07	2.70
W	5.70	3.84	0.02	3.15	2.44	1.80	0.12	0.18	77.16	0.27	3.89	1.07	2.72
W	5.58	3.87	0.02	3.15	2.44	1.80	0.12	0.17	77.08	0.28	3.88	1.04	2.74
W	5.64	3.89	0.01	3.18	2.45	1.79	0.12	0.18	77.01	0.28	3.86	1.09	2.70
W	5.55	3.86	0.02	3.16	2.45	1.80	0.12	0.18	77.29	0.27	3.78	1.07	2.72
W	5.60	3.86	0.02	3.18	2.45	1.77	0.13	0.17	77.29	0.27	3.77	1.07	2.73
W	5.65	3.85	0.02	3.15	2.44	1.81	0.13	0.18	77.30	0.27	3.70	1.07	2.72

**12. Measurement of Uncertainty:** 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.

Analyte	Method	Unit	S <sup>1</sup>	σ <sub>L</sub> <sup>2</sup>	Sw <sup>3</sup>	CSU <sup>4</sup>
Au	Pb Coll	g/t	0.012	0.005	0.009	0.002
Ag	M/ICP	g/t	2.372	1.898	1.213	0.615
Ag	P	g/t	1.487	0.820	0.969	0.231
Cu	M/ICP	ppm	2.550	1.495	1.644	0.430
Cu	P	ppm	4.413	2.986	2.298	0.860
Pb	M/ICP	ppm	4.416	2.736	2.414	0.741
Pb	P	ppm	3.868	2.534	2.129	0.735
Zn	M/ICP	ppm	6.528	3.219	5.110	1.030
Zn	P	ppm	12.107	8.586	6.477	2.567
Al2O3	XRF	%	0.051	0.048	0.022	0.017
CaO	XRF	%	0.030	0.026	0.016	0.010
Cr2O3	XRF	%	0.006	0.003	0.005	0.001
Fe2O3	XRF	%	0.037	0.037	0.012	0.013
K2O	XRF	%	0.017	0.014	0.010	0.005
LOI	XRF	%	0.199	0.218	0.060	0.083
MgO	XRF	%	0.031	0.029	0.013	0.010
MnO	XRF	%	0.005	0.004	0.003	0.002
Na2O	XRF	%	0.013	0.015	0.005	0.006
SiO2	XRF	%	0.434	0.434	0.135	0.154
TiO2	XRF	%	0.005	0.003	0.004	0.001
S	Comb / LECO	%	0.032	0.024	0.015	0.007
SG	pycnometer		0.035	0.028	0.022	0.010

1. S - Std Dev for use on control charts.
2. σ<sub>L</sub> - 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.



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.

**13. Certified values:** The Certified, Provisional and Indicated values listed on p1 of each certificate fulfill the AMIS statistical criteria regarding agreement for certification and have been independently validated by Dr Barry Smeets, BSc, PhD, P.Geo, (B.C.).”

**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:** AMIS0269 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](http://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 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.

20 June 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**

Analyte	Method	Unit	Mean	2SD	RSD%	n
Al	M/ICP	%	2.86	0.29	5.02	112
As	M/ICP	ppm	25.81	8.26	16.00	106
Ba	M/ICP	ppm	537	51.56	4.80	109
Be	M/ICP	ppm	1.65	0.27	8.10	74
Bi	M/ICP	ppm	0.26	0.08	15.21	48
Ca	M/ICP	%	2.71	0.21	3.86	114
Cd	M/ICP	ppm	1.77	0.44	12.39	100
Ce	M/ICP	ppm	14.24	4.28	15.04	39
Co	M/ICP	ppm	10.34	2.11	10.18	120
Cr	M/ICP	ppm	148	81.36	27.56	118
Cs	M/ICP	ppm	4.12	0.20	2.46	37
Dy	M/ICP	ppm	1.84	0.24	6.53	32
Er	M/ICP	ppm	1.08	0.13	6.14	32
Eu	M/ICP	ppm	0.43	0.07	7.93	31
Fe	M/ICP	%	2.28	0.22	4.83	121
Ga	M/ICP	ppm	5.95	1.29	10.85	48
Gd	M/ICP	ppm	1.88	0.46	12.30	32
Ge	M/ICP	ppm	0.67	1.01	74.99	15
Hf	M/ICP	ppm	0.55	0.42	38.11	48
Ho	M/ICP	ppm	0.40	0.02	3.00	28
In	M/ICP	ppm	0.04	0.00	0.00	26
K	M/ICP	%	2.02	0.23	5.65	112
La	M/ICP	ppm	7.83	2.26	14.45	88
Li	M/ICP	ppm	106	35.92	16.99	92
Lu	M/ICP	ppm	0.12	0.04	18	40
Mg	M/ICP	%	1.02	0.10	4.67	119
Mn	M/ICP	ppm	928	113.89	6.14	113
Mo	M/ICP	ppm	2.92	0.89	15.34	97
Na	M/ICP	%	0.12	0.01	6.21	110
Nb	M/ICP	ppm	2.45	0.52	10.51	47
Nd	M/ICP	ppm	8.08	1.41	8.76	32
Ni	M/ICP	ppm	24.29	9.21	18.96	114
P	M/ICP	ppm	266	96.72	18.15	96
Pr	M/ICP	ppm	2.00	0.12	2.94	30
Rb	M/ICP	ppm	105	13.26	6.29	40
Re	M/ICP	ppm	0.005	0.002	19.72	8
S	M/ICP	%	1.12	0.08	3.63	69
Sb	M/ICP	ppm	12.46	8.41	33.73	99
Sc	M/ICP	ppm	7.22	1.12	7.76	96
Se	M/ICP	ppm	5.06	1.32	13.03	35
Si	M/ICP	%	35.99	1.18	1.64	8
Sm	M/ICP	ppm	1.83	0.32	8.73	32
Sn	M/ICP	ppm	1.84	1.01	27.43	44
Sr	M/ICP	ppm	92.41	9.81	5.31	112
Ta	M/ICP	ppm	0.15	0.11	36.19	31
Tb	M/ICP	ppm	0.30	0.06	9.55	38
Te	M/ICP	ppm	0.13	0.10	37.21	35
Th	M/ICP	ppm	1.71	0.28	8.13	47
Ti	M/ICP	%	0.15	0.02	6.43	94
Tl	M/ICP	ppm	1.96	0.39	10.00	48
Tm	M/ICP	ppm	0.14	0.05	18.04	32
V	M/ICP	ppm	60.50	11.12	9.19	111
W	M/ICP	ppm	2.63	1.29	24.57	43
Y	M/ICP	ppm	9.82	1.48	7.52	74
Yb	M/ICP	ppm	0.95	0.14	7.54	38
Zr	M/ICP	ppm	17.65	10.49	29.74	88