



African Mineral Standards

MATRIX REFERENCE MATERIALS

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AMIS0272

Certified Reference Material

**Gold, silver, epithermal vein ore (low grade),
Palmarejo, Mexico**

Certificate of Analysis

**Recommended Concentrations and Limits¹
(at two Standard Deviations)**

Certified Concentrations²

Au Pb Collection	1.22 ± 0.10	g/t
Ag M/ICP	110 ± 7	g/t
Ag P	111 ± 6	g/t
Cu M/ICP	418 ± 17	ppm
Cu P	419 ± 24	ppm
Pb M/ICP	839 ± 69	ppm
Pb P	842 ± 69	ppm
Zn M/ICP	1420 ± 120	ppm
Zn P	1385 ± 142	ppm
Specific Gravity	2.76 ± 0.06	

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 ₂ O ₃	9.32	±	0.16	%
CaO	6.50	±	0.12	%
Fe ₂ O ₃	5.21	±	0.06	%
K ₂ O	3.12	±	0.04	%
MgO	2.18	±	0.06	%
MnO	1.06	±	0.02	%
Na ₂ O	0.50	±	0.05	%
SiO ₂	60.95	±	0.78	%
TiO ₂	0.75	±	0.02	%
S Comb/LECO	1.43	±	0.08	%

Provisional Concentrations

Cr ₂ O ₃	0.038	±	0.008	%
LOI	7.80	±	1.48	%

1. Intended Use: AMIS0272 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: AMIS0272 is a commissioned CRM made from material supplied by SGS Minerals Services from the Palmajero Mine. Palmajero is wholly owned by Coeur d'Alene Mines Corporation. The mine is located about 420 kilometers by road southwest of the city of Chihuahua in the state of Chihuahua in northern Mexico and on the western edge of the Sierra Madre Occidental in the Témoris mining district.

The Palmarejo area ore bodies are hosted in northwest trending structures that cut through a late Cretaceous-Paleocene volcano-sedimentary sequence comprising ash-rich mudstones, sandstones, basalt and andesite. The material supplied was described as "ley baya" – low grade.

3. Mineral and Chemical Composition: The economic silver-gold mineralization is hosted in epithermal, intermediate-sulphidation, quartz-carbonate tectonic-hydrothermal breccia veins and quartz-stockworks with strong vertical zoning. Precious and base-metal mineral assemblages are

dominated by fine-grained pyrite, argentite (acanthite), sphalerite, galena, and electrum. Silver occurs as argentite, electrum and as native silver. Gold is present as native gold and electrum.

4. Appearance: The material is a very fine powder. It is colored light Grey (Corstor 5Y 7/1).

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 ore is crushed, then dry-milled and air classified to 100% <54 μ . 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 (Al₂O₃, CaO, Cr₂O₃, Fe₂O₃, K₂O, MgO, MnO, Na₂O, SiO₂, TiO₂, 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: Twentyfour laboratories were each given eight randomly selected packages of sample. Eighteen 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 18 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 (Namibia)
5. Genalysis Laboratory Services (W Australia P)
6. Intertek Utama Services (Indonesia)
7. OMAC Laboratories Limited (Ireland)
8. Set Point Laboratories (Isando) SA
9. SGS Australia Pty Ltd (Newburn) WA
10. SGS Chelopech (Bulgaria)
11. SGS Durango (Mexico)
12. SGS Geosol Laboratories Ltda (Brazil)
13. SGS Mineral Services Callao (Peru)
14. SGS Mineral Services Lakefield (Canada)
15. SGS South Africa (Pty) Ltd - Booyens JHB
16. SGS Toronto (Canada)
17. SGS Townsville (Australia)
18. 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	1.19		83	420	407	850		1450	1450
A	1.23		81	416	430	850		1420	1500
A	1.18		87	426		850		1440	
A	1.18		87	422	412	850		1440	1500
A	1.28		83	422	414	850		1410	1470
A	1.16		80	430	425	800		1430	1500
A	1.19		83	428	410	850		1420	1450
A	1.21		80	428	410	850		1430	1450
B	1.19			389	384	803	865	1317	1335
B	1.21			394	383	825	864	1309	1322
B	1.21			389	380	804	836	1328	1276
B	1.26			396	374	810	841	1309	1277
B	1.19			392	387	801	861	1330	1329
B	1.22			388	391	804	859	1309	1315
B	1.21			396	384	819	845	1357	1301
B	1.25			397	379	803	839	1358	1301
D	1.31	106	101	432	389	888		1450	1360
D	1.27	110	101	420	397	873		1470	1380
D	1.30	109	102	420	392	862		1440	1380
D	1.29	108	103	424	400	857		1440	1390
D	1.28	109	101	416	389	865		1430	1370
D	1.29	111	103	430	394	877		1480	1380
D	1.30	109	101	418	391	865		1450	1370
D	1.27	110	100	423	382	874		1460	1350
E	1.10	117	103	426	419	829	872	1580	1430
E	1.13	112	104	417	403	818	871	1600	1440
E	1.22	117	109	400	413	769	886	1540	1430
E	1.22	120	111	414	404	762	878	1500	1470
E	1.15	111	110	421	427	812	884	1500	1430
E	1.19	113	100	432	436	837	900	1500	1410
E	1.20	116	96	426	428	851	905	1460	1460
E	1.20	113	106	429	431	847	887	1500	1460
F	1.24	108		420	416	833	778	1410	1310
F	1.25	109		420	423	805	837	1400	1340
F	1.21	109		410	421	819	784	1400	1310
F	1.25	108		425	426	808	828	1420	1350
F	1.23	105		420	422	800	793	1420	1320
F	1.19	108		420	434	821	809	1410	1350
F	1.21	108		430	422	808	802	1420	1350
F	1.16	107		420	414	811	795	1430	1320

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
G			113						
G			110						
G			112						
G			115						
G			114						
G			108						
G			109						
G			109						
H	1.23	113	109	416	415	904	866	1471	1352
H	1.28	114	108	414	411	904	863	1464	1355
H	1.28	113	109	414	413	902	850	1470	1357
H	1.24	112	113	408	418	899	883	1454	1370
H	1.25	112	109	411	427	897	872	1457	1349
H	1.33	112	112	408	415	908	859	1464	1350
H	1.30	113	111	411	417	898	870	1465	1360
H	1.28	116	110	413	414	907	866	1466	1360
I		113	115	422	432	870	885	1461	1446
I		108	111	419	437	885	884	1462	1435
I		110	117	413	432	892	876	1464	1423
I		110	116	416	438	887	885	1467	1468
I		112	110	422	431	897	891	1475	1474
I		113	114	422	427	882	893	1467	1450
I		110	115	416	433	878	895	1486	1466
I		112	111	421	431	887	892	1488	1467
K	1.17		110	412	401	791		1330	1310
K	1.10		111	404	399	785		1310	1310
K	1.12		115	396	409	774		1280	1360
K	1.09		115	400	402	791		1310	1330
K	1.22		115	403	404	789		1310	1310
K	1.20		117	407	404	779		1280	1340
K	1.16		114	409	404	786		1320	1310
K	1.23		110	401	409	770		1300	1350
L	1.05		108	417		824			
L	1.17		109	418		835			
L	1.08		113	423		852			
L	1.07		112	427		844			
L	1.19		103	429		872			
L	1.07		110	420		844			
L	1.13		106	425		858			
L	1.06		112	441		878			
M	1.20	106		417	412	834		1430	
M	1.15	106		418	412	844		1436	
M	1.15	106		417	412	834		1437	
M	1.14	108		421	411	835		1435	
M	1.20	107		418	411	842		1441	
M	1.12	106		418	412	846		1443	
M	1.10	108		417	413	836		1435	
M	1.13	108		419	414	835		1449	
N	1.14		112						
N	1.19		109						
N	1.19		110						
N	1.25		112						
N	1.17		111						
N	1.22		109						
N	1.17		112						
N	1.23		108						
O			116		403		819		1460
O			110		420		852		1510
O			114		412		852		1500
O			109		413		844		1480
O			114		429		858		1510
O			113		410		837		1490
O			113		403		835		1480
O			109		412		838		1480
P	1.26		116	427	455	822	831	1386	1349
P	1.25		113	435	468	817	829	1380	1331
P	1.23		109	421	429	816	797	1393	1300
P	1.26		102	422	420	829	768	1391	1218
P	1.29		110	413	431	791	797	1338	1299
P	1.24		111	419	443	790	815	1340	1315
P	1.26		106	418	432	801	781	1400	1263
P	1.26		108	405	427	759	784	1304	1276
Q	1.21		110	414	423	821	825	1370	1420
Q	1.20		100	424	420	840	783	1330	1430
Q	1.20		100	417	440	829	862	1390	1490
Q	1.23		100	408	440	837	822	1360	1470
Q	1.12		100	408	423	827	830	1390	1420
Q	1.19		100	398	432	807	836	1300	1450
Q	1.23		100	402	430	827	825	1370	1440
Q	1.19		100	398	442	806	834	1360	1470
R	1.24	107		367		735		1230	
R	1.17	103		360		743		1230	
R	1.15	106		362		768		1250	
R	1.24	106		378		779		1280	
R	1.27	107		366		722		1240	
R	1.24	102		360		704		1230	
R	1.21	103		359		717		1230	
R	1.18	105		360		734		1220	
V	1.22	109	105	439	440	882	838	1510	1340
V	1.23	116	111	424	420	854	814	1460	1290
V	1.31	106	112	414	430	831	807	1440	1310
V	1.25	111	114	422	409	843	782	1460	1260
V	1.33	112	110	429	412	852	795	1490	1280
V	1.28	108	108	433	428	866	810	1500	1320
V	1.22	111	114	436	457	878	827	1520	1400
V	1.18	112	111	440	427	879	809	1510	1320

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
X	1.29	114		420	420	840		1430	
X	1.26	107		430	420	820		1450	
X	1.24	111		400	430	820		1390	
X	1.28	117		420	420	830		1460	
X	1.30	109		410	420	810		1430	
X	1.12	103		420	420	810		1460	
X	1.29	113		400	420	810		1500	
X	1.29	110		400	430	760		1370	

Assay data (cont) – Major Oxides

Lab Code	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	LOI XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	S Comb/LECO %	SG pycnometer
A	9.33	6.51		5.18	3.19		2.21	1.04		61.00	0.75	1.39	
A	9.37	6.51		5.26	3.18		2.19	1.04		62.90	0.75	1.39	
A	9.43	6.59		5.15	3.13		2.19	1.05		61.20	0.73	1.37	
A	9.28	6.55		5.21	3.15		2.19	1.05		62.20	0.75	1.37	
A	9.49	6.56		5.19	3.12		2.17	1.05		62.90	0.77	1.37	
A	9.43	6.65		5.21	3.16		2.22	1.07		62.00	0.77	1.36	
A	9.45	6.55		5.18	3.15		2.21	1.06		60.70	0.75	1.38	
A	9.33	6.56		5.21	3.12		2.19	1.04		62.50	0.75	1.36	
B	9.36	6.51	0.04	5.23	3.13	7.66	2.19	1.07	0.51	61.04	0.75		2.79
B	9.34	6.52	0.04	5.26	3.14	7.70	2.18	1.07	0.50	61.14	0.75		2.76
B	9.36	6.53	0.04	5.23	3.13	7.52	2.17	1.07	0.50	61.23	0.75		2.76
B	9.31	6.52	0.04	5.25	3.13	7.68	2.17	1.07	0.51	61.24	0.75		2.80
B	9.29	6.52	0.04	5.24	3.13	7.75	2.19	1.07	0.49	61.20	0.75		2.77
B	9.31	6.53	0.04	5.24	3.14	7.76	2.19	1.07	0.51	61.16	0.75		2.80
B	9.36	6.52	0.04	5.21	3.12	7.58	2.18	1.07	0.49	61.07	0.75		2.76
B	9.33	6.51	0.04	5.23	3.13	7.63	2.17	1.07	0.50	61.17	0.75		2.78
D	9.40	6.44	0.05	5.17	3.10	8.60	2.37	1.06	0.50	61.09	0.74		
D	9.44	6.46	0.04	5.19	3.12	8.30	2.36	1.06	0.50	61.32	0.74		
D	9.39	6.42	0.04	5.15	3.10	8.70	2.35	1.06	0.49	60.99	0.74		
D	9.43	6.44	0.04	5.25	3.12	8.70	2.37	1.09	0.49	61.30	0.74		
D	9.42	6.42	0.04	5.19	3.11	8.60	2.34	1.07	0.49	61.20	0.74		
D	9.44	6.45	0.05	5.24	3.12	8.20	2.36	1.08	0.48	61.29	0.74		
D	9.41	6.42	0.04	5.19	3.11	8.50	2.36	1.06	0.48	61.20	0.75		
D	9.40	6.42	0.04	5.17	3.10	8.60	2.34	1.06	0.48	61.00	0.74		
E	9.30	6.56	0.04	5.27	3.15	6.51	2.18	1.09	0.51	61.10	0.75	1.29	
E	9.28	6.54	0.04	5.25	3.12	6.53	2.16	1.08	0.51	61.00	0.75	1.33	
E	9.24	6.50	0.04	5.24	3.11	6.69	2.18	1.08	0.49	61.10	0.75	1.27	
E	9.35	6.53	0.04	5.26	3.11	6.57	2.16	1.09	0.51	61.00	0.75	1.30	
E	9.27	6.52	0.04	5.25	3.13	6.58	2.18	1.08	0.52	61.10	0.75	1.27	
E	9.35	6.53	0.04	5.26	3.14	6.57	2.16	1.08	0.51	61.20	0.75	1.31	
E	9.30	6.51	0.04	5.23	3.11	6.55	2.16	1.08	0.50	61.10	0.75	1.26	
E	9.30	6.49	0.04	5.23	3.12	6.64	2.19	1.08	0.52	61.00	0.75	1.34	
F	9.38	6.60	0.04	5.23	3.14	8.06	2.18	1.05		61.23	0.74		2.80
F	9.39	6.59	0.04	5.22	3.13	8.03	2.18	1.05		61.19	0.75		2.82
F	9.37	6.59	0.04	5.22	3.13	8.05	2.18	1.05		61.14	0.75		2.84
F	9.38	6.60	0.04	5.22	3.14	8.05	2.18	1.05		61.18	0.75		2.80
F	9.40	6.61	0.04	5.21	3.13	8.04	2.18	1.05		61.24	0.75		2.81
F	9.38	6.60	0.04	5.23	3.13	8.05	2.18	1.05		61.18	0.75		2.85
F	9.38	6.59	0.04	5.21	3.13	8.07	2.18	1.04		61.20	0.74		2.82
F	9.41	6.61	0.04	5.23	3.14	8.01	2.19	1.06		61.18	0.75		2.81
G												1.45	
G												1.44	
G												1.44	
G												1.44	
G												1.45	
G												1.44	
G												1.44	
G												1.45	
H	9.39	6.54	0.04	5.16	3.12	9.16	2.20	1.07	0.59	61.50	0.73	1.52	
H	9.37	6.54	0.04	5.19	3.12	9.21	2.20	1.06	0.49	61.15	0.75	1.49	
H	9.19	6.45	0.04	5.04	3.06	9.00	2.13	1.05	0.41	60.55	0.74	1.51	
H	9.52	6.53	0.04	5.16	3.09	9.19	2.19	1.06	0.50	62.47	0.75	1.52	
H	9.21	6.44	0.04	5.05	3.07	9.27	2.15	1.04	0.46	60.92	0.73	1.42	
H	9.24	6.53	0.04	5.07	3.11	9.15	2.14	1.06	0.41	60.83	0.75	1.49	
H	9.04	6.45	0.04	5.01	3.05	9.21	2.13	1.05	0.53	60.42	0.75	1.55	
H	9.26	6.45	0.04	5.09	3.09	9.25	2.17	1.05	0.42	61.08	0.75	1.54	
K												1.40	
K												1.42	
K												1.40	
K												1.42	
K												1.43	
K												1.42	
K												1.42	
K												1.42	

Assay data (cont) – Major Oxides

Lab Code	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	LOI XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	S Comb/LECO %	SG pycnometer
L												1.50	2.79
L												1.49	2.79
L												1.54	2.79
L												1.48	2.80
L												1.49	2.79
L												1.47	2.78
L												1.49	2.81
L												1.49	2.80
M	9.19	6.41	0.04	5.19	3.08	7.33	2.20	1.15	0.46	60.00	0.76	1.43	2.75
M	9.18	6.40	0.04	5.18	3.10	7.13	2.22	1.15	0.47	60.20	0.76	1.43	2.77
M	9.19	6.43	0.05	5.21	3.10	7.05	2.22	1.15	0.48	60.20	0.76	1.43	2.76
M	9.17	6.41	0.04	5.20	3.10	7.29	2.22	1.15	0.47	60.20	0.75	1.44	2.75
M	9.24	6.43	0.04	5.22	3.07	7.41	2.20	1.15	0.46	60.10	0.76	1.44	2.75
M	9.18	6.41	0.04	5.18	3.10	7.34	2.22	1.15	0.48	60.20	0.75	1.45	2.77
M	9.23	6.44	0.04	5.20	3.10	7.29	2.22	1.15	0.46	60.30	0.76	1.44	2.76
M	9.21	6.40	0.04	5.19	3.10	7.59	2.22	1.15	0.47	60.30	0.76	1.43	2.76
N	9.34	6.52	0.04	5.23	3.13	8.01	2.22	1.06	0.55	61.20	0.75	1.36	
N	9.39	6.57	0.04	5.23	3.15	8.09	2.19	1.08	0.53	61.30	0.74	1.36	
N	9.32	6.52	0.03	5.23	3.15	8.03	2.18	1.08	0.55	61.00	0.73	1.36	
N	9.34	6.51	0.04	5.28	3.16	8.04	2.22	1.08	0.55	62.10	0.75	1.38	
N	9.26	6.50	0.04	5.22	3.14	8.04	2.18	1.06	0.53	61.10	0.74	1.36	
N	9.30	6.50	0.03	5.22	3.14	8.04	2.18	1.06	0.54	61.10	0.74	1.37	
N	9.37	6.56	0.03	5.25	3.14	7.95	2.18	1.08	0.54	61.20	0.75	1.36	
N	9.22	6.49	0.03	5.21	3.13	8.64	2.18	1.07	0.55	60.90	0.73	1.38	
Q	9.59	6.56	0.03	5.21	3.12	7.86	2.26	1.07	0.52	61.10	0.75	1.48	2.75
Q	9.33	6.50	0.03	5.14	3.11	7.61	2.18	1.06	0.50	61.10	0.74	1.47	2.73
Q	9.35	6.54	0.03	5.12	3.12	7.55	2.19	1.06	0.50	61.10	0.74	1.47	2.75
Q	9.41	6.61	0.03	5.22	3.13	7.17	2.25	1.08	0.51	61.20	0.76	1.42	2.72
Q	9.38	6.48	0.03	5.14	3.10	7.56	2.18	1.06	0.49	61.00	0.75	1.51	2.76
Q	9.37	6.53	0.03	5.19	3.11	7.50	2.20	1.07	0.51	61.40	0.75	1.46	2.74
Q	9.35	6.51	0.03	5.14	3.09	7.47	2.16	1.06	0.49	61.00	0.75	1.46	2.76
Q	9.39	6.43	0.03	5.18	3.07	7.37	2.16	1.04	0.50	61.10	0.74	1.45	2.74
R	9.36	6.51	0.03	5.14	2.97	10.08	2.14	1.06	0.35	60.76	0.74		2.73
R	9.15	6.52	0.05	5.20	3.05	9.61	2.08	1.07	0.36	60.91	0.72		2.74
R	9.16	6.47	0.05	5.20	3.03	10.08	2.10	1.06	0.32	61.28	0.75		2.73
R	9.14	6.45	0.04	5.16	3.07	10.03	2.13	1.07	0.04	61.66	0.76		2.71
R	9.12	6.45	0.04	5.12	2.99	10.09	2.15	1.08	0.36	60.91	0.72		2.79
R	9.23	6.43	0.03	5.18	2.97	10.02	2.09	1.06	0.41	60.86	0.73		2.75
R	9.15	6.40	0.03	5.13	3.01	10.06	2.11	1.05	0.36	60.85	0.73		2.76
R	9.21	6.52	0.05	5.20	3.05	10.01	2.15	1.04	0.33	61.38	0.75		2.74
V	9.28	6.37	0.04	5.11	3.08	6.95	2.16	1.08	0.45	60.30	0.74		2.37
V	9.23	6.33	0.04	5.07	3.06	7.54	2.15	1.06	0.45	60.00	0.73		2.43
V	9.33	6.33	0.04	5.08	3.10	7.21	2.10	1.06	0.46	60.20	0.72		2.45
V	9.26	6.35	0.04	5.08	3.08	7.22	2.15	1.06	0.46	60.20	0.72		2.56
V	9.35	6.36	0.04	5.14	3.11	6.93	2.11	1.06	0.46	60.40	0.73		2.55
V	9.24	6.34	0.04	5.07	3.07	7.30	2.16	1.06	0.46	60.10	0.73		2.55
V	9.25	6.34	0.04	5.07	3.07	7.25	2.16	1.06	0.46	60.10	0.73		2.57
V	9.25	6.31	0.04	5.09	3.08	7.77	2.08	1.06	0.46	59.80	0.72		2.56
X												1.44	2.73
X												1.42	2.74
X												1.42	2.73
X												1.43	2.72
X												1.42	2.75
X												1.42	2.75
X												1.40	2.74
X												1.40	2.73

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.

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.

Analyte	Method	Unit	S ¹	σ_L ²	Sw ³	CSU ⁴
Au	Pb Coll	g/t	0.049	0.025	0.036	0.008
Ag	M/ICP	g/t	3.446	2.522	2.288	0.884
Ag	P	g/t	3.114	1.404	2.713	0.541
Cu	M/ICP	ppm	8.451	4.039	6.721	1.310
Cu	P	ppm	11.952	7.472	7.220	2.198
Pb	M/ICP	ppm	34.668	24.494	13.812	6.679
Pb	P	ppm	34.542	30.412	15.550	10.304
Zn	M/ICP	ppm	60.235	44.453	22.680	12.536
Zn	P	ppm	71.231	56.529	23.201	16.493
Al ₂ O ₃	XRF	%	0.084	0.060	0.049	0.019
CaO	XRF	%	0.059	0.047	0.032	0.015
Cr ₂ O ₃	XRF	%	0.004	0.003	0.002	0.001
Fe ₂ O ₃	XRF	%	0.034	0.023	0.024	0.008
K ₂ O	XRF	%	0.023	0.017	0.014	0.006
LOI	XRF	%	0.744	0.721	0.165	0.241
MgO	XRF	%	0.026	0.017	0.017	0.006
MnO	XRF	%	0.012	0.008	0.008	0.003
Na ₂ O	XRF	%	0.027	0.026	0.011	0.009
SiO ₂	XRF	%	0.385	0.310	0.178	0.100
TiO ₂	XRF	%	0.008	0.005	0.006	0.002
S	Comb/LECO	%	0.044	0.040	0.016	0.013
SG	pycnometer		0.029	0.028	0.014	0.011

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.

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 Smees, 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: AMIS0272 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 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.

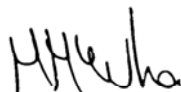
19. Recommended use: The data used to characterize this CRM has been scrutinized using outlier treatment techniques. This, together with the number of participating laboratories, should

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.

08 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	%	4.96	0.44	4.42	98
As	M/ICP	ppm	30.0	9.03	15.05	103
Ba	M/ICP	ppm	1140	300	13.15	80
Be	M/ICP	ppm	1.42	0.36	12.89	76
Bi	M/ICP	ppm	0.31	0.14	23.1	59
Ca	M/ICP	%	4.61	0.34	3.69	97
Cd	M/ICP	ppm	10.5	1.58	7.50	89
Ce	M/ICP	ppm	41.1	7.14	8.69	66
Co	M/ICP	ppm	20.0	3.49	8.71	107
Cr	M/ICP	ppm	194	105	27.1	96
Cs	M/ICP	ppm	2.18	0.31	7.09	55
Dy	M/ICP	ppm	3.13	0.19	3.08	47
Er	M/ICP	ppm	1.66	0.26	7.86	47
Eu	M/ICP	ppm	1.18	0.13	5.55	47
Fe	M/ICP	%	3.59	0.27	3.75	105
Ga	M/ICP	ppm	13.3	5.09	19.2	72
Gd	M/ICP	ppm	3.99	0.55	6.84	45
Ge	M/ICP	ppm	0.19	0.08	20.3	15
Hf	M/ICP	ppm	2.10	1.86	44.3	64
Ho	M/ICP	ppm	0.60	0.06	4.99	46
In	M/ICP	ppm	0.11	0.01	5.78	54
K	M/ICP	%	2.58	0.25	4.82	99
La	M/ICP	ppm	19.7	3.00	7.59	90
Li	M/ICP	ppm	40.1	4.76	5.94	88
Lu	M/ICP	ppm	0.21	0.05	13.0	52
Mg	M/ICP	%	1.30	0.12	4.49	98
Mn	M/ICP	ppm	7930	556	3.50	99
Mo	M/ICP	ppm	2.73	0.89	16.3	77
Na	M/ICP	%	0.38	0.09	12.2	80
Nb	M/ICP	ppm	8.09	2.32	14.3	64
Nd	M/ICP	ppm	20.8	3.30	7.92	47
Ni	M/ICP	ppm	32.3	7.43	11.5	106
P	M/ICP	ppm	1540	175	5.69	76
Pr	M/ICP	ppm	5.21	0.59	5.64	45
Rb	M/ICP	ppm	86.4	14.1	8.16	68
Re	M/ICP	ppm	0.00	0.00	24.8	13
S	M/ICP	%	1.46	0.14	4.94	84
Sb	M/ICP	ppm	8.98	1.61	8.97	80
Sc	M/ICP	ppm	11.0	1.71	7.76	87
Se	M/ICP	ppm	1.41	0.93	33.0	24
Si	M/ICP	%	28.7	0.73	1.27	16
Sm	M/ICP	ppm	4.55	0.58	6.42	44
Sn	M/ICP	ppm	1.59	0.82	25.7	58
Sr	M/ICP	ppm	162	14.4	4.46	88
Ta	M/ICP	ppm	0.45	0.41	45.7	59
Tb	M/ICP	ppm	0.58	0.09	7.68	56
Te	M/ICP	ppm	0.83	0.23	14.1	60
Th	M/ICP	ppm	1.90	0.60	15.8	64
Ti	M/ICP	%	0.43	0.04	4.57	93
Tl	M/ICP	ppm	1.24	0.48	19.5	48
Tm	M/ICP	ppm	0.21	0.04	9.59	47
U	M/ICP	ppm	1.18	0.24	10.2	63
V	M/ICP	ppm	116	12.3	5.28	95
W	M/ICP	ppm	17.6	7.02	20.0	80
Y	M/ICP	ppm	16.0	2.04	6.38	89
Yb	M/ICP	ppm	1.47	0.33	11.1	56
Zr	M/ICP	ppm	94.5	54.9	29.1	86