African Mineral Standards
REFERENCE MATERIALS FOR AFRICAN ORES

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AMIS0107

Certified Reference Material

Platinum (PGM) Merensky Reef Ore
Bushveld Complex, South Africa

Certificate of Analysis

Recommended Concentrations and two "Between Laboratory" Standard Deviations

Certified Concentrations

Pt NIS	0.88	±	0.08	g/t
Pt Pb Collection	0.882	±	0.096	g/t
Pd NIS	0.46	±	0.042	g/t
Pd Pb Collection	0.45	±	0.046	g/t
Cr XRF	4212	±	248	ppm
Cu M/ICP	422	±	22	ppm
Cu P	423	±	32	ppm
Cu XRF	409	±	23	ppm
Ni M/ICP	936	±	98	ppm
Ni P	701	±	72	ppm
Ni XRF	941	±	70	ppm
Specific Gravity	2.94	±	0.12	

Provisional Concentrations

Au NIS	0.093	±	0.016	g/t
Au Pb Collection	0.097	±	0.014	g/t
Ir NiS	0.019	±	0.002	g/t
Rh NiS	0.056	±	0.010	g/t
Ru NiS	0.107	±	0.014	g/t
Co M/ICP	53	±	8	ppm
Co P	21.5	±	3.0	ppm

Informational mean

Cr M/ICP	3425	ppm

4E = 1.536

Directors: GJ Horsfield (CEO), MD Evers (CFO)(British), ND Kennelly, SJ Ingram, MC Louw, Dr CJ Rademeyer, N Robinson, MJ Smith, MH Snelling, J Vassiloudis, D Williams

Major Element Recommended Concentrations and two "Between Laboratory" Standard Deviations

Certified Concentrations

Al2O3	4.16	±	0.10	%
CaO	2.52	±	0.06	%
Cr2O3	0.61	±	0.02	%
Fe2O3	6.12	±	0.14	%
MgO	9.75	±	0.24	%
MnO	0.13	±	0.01	%
SiO2	75.63	±	0.76	%
TiO2	0.14	±	0.01	%

Provisional Concentration

K2O	0.11	±	0.02	%
Na2O	0.41	±	0.06	%

Informational Mean

P2O5	0.24	%
LOI	0.17	%

1. Intended Use: AMIS0107 is a certified reference material which may be used to demonstrate the validity of measurement results of a single analysis of tails or low grade PGE, Cu and Ni ores, hosted by the Merensky Reef or other mafic rocks, with a similar grade and matrix; when measured in parallel to the unknown to be characterised. The material can be used for routine quality control by inserting within a batch of samples, for method development and for the calibration of equipment.

The recommended mean and "Between Lab" standard deviations for this material property values based on a measurement campaign (round robin) and reflect the average results from the laboratories that participated in the round robin, after examination of the data set and removal of technically and statistically invalid results (see Clause 9 - this certificate). Slight variations in analytical procedures between laboratories will reflect as slight biases to the recommended concentrations and this is acceptable. Good laboratories however will report results within the two standard deviation levels with a failure of <10 %.

2. Origin of Material: This standard was made using Merensky Reef Pt/Pd ore material supplied by Anglo Platinum Limited from the Western limb of the Bushveld Complex. This specific material is a blend of ore collected from the Turfontein Mine ore silo and footwall material collected from the Boschfontein Shaft that has been further blended down with blank silica.

3. Mineral and Chemical Composition: The Merensky Reef comprises components of feldspathic pyroxenite, pyroxenite and anorthosite. Peak PGE values are associated with a thin chromitite stringer. Mineralization in this Merensky Reef comprises 2-5% disseminated or net textured magmatic sulphides, predominantly pyrrhotite, pentlandite, chalcopyrite and pyrite. The PGE's occur as micron-sized satellite grains around but rarely within the sulphides.

Major element chemistry data from 12 of the labs has been compiled and certified. Uncertified summary statistics for trace element data are set out in the appendix.

4. Appearance: The material is a very fine powder. It is colored a Very Light Grey (Corstor 5Y 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 into 1kg Laboratory Packs. Explorer Packs are subdivided from the Laboratory packs as required. Samples were randomly selected for homogeneity testing and third party analysis. Statistical tests were carried out for homogeneity and the consensus results.

7. Methods of Analysis requested:

1. Pt, Pd and Au. ICP-OES or ICP-MS, Pb collection with Ag as a co-collector.
2. Au, Pt, Pd, Rh, Ru and Ir. ICP-MS, nickel sulphide collection.
3. Cu and Ni. Multi-acid total digestion, including HF, with ICP-OES finish.
4. Cu and Ni. Aqua regia digestion with ICP-OES finish.
5. Cr, Co, Cu and Ni. Pressed pellet XRF.
6. Cr, Co, Cu and Ni. Fusion, ICP-OES or ICP-MS
7. Specific Gravity. Gas pycnometer.
8. XRF (major elements).
9. Multi acid digest ICP scan – trace elements.

8. Information requested:

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

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

The final limits were calculated after a three step examination of the data, first removing incompatible data outside a spread normally expected for similar analytical methods done by reputable laboratories. Then, data from any one laboratory was removed from further calculations, if the mean of all analyses from that laboratory failed a t-test of the global means of the other laboratories. Next, data that fell outside of the 2 standard deviations were removed. The mean and standard deviations were then re-calculated.

Analytes with an RSD of near or less than 5 % are reported as “Certified Concentrations” with limits at two “Between Laboratory” standard deviations. Those with RSD’s of between near 5 % and 15 % are reported as “Provisional Concentrations” with limits at two “Between Laboratory” standard deviations. Those with RSD’s over 15 % are reported as “Informational Values”.

This method is different from that used by Government agencies in that the actual “between-laboratory” standard deviation is used in the calculations. This produces upper and lower limits that reflect actual individual analyses rather than a grouped set of analyses. The limits can therefore be used to monitor accuracy from individual analyses, unlike the Confidence Limits published on other standards**.**

10. Participating Laboratories: The 25 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. Ammtec Limited WA
7. Anglo Platinum - Eastern Bushveld Regional Laboratory
8. Anglo Research (Crown Campus)
9. Assayers Canada
10. Barplats Laboratory SA
11. Becquerel Laboratories Inc CA
12. Genalysis Laboratory Services (South Africa) Pty
13. Genalysis Laboratory Services WA
14. Geoscience Laboratories (GEO LABS) CA
15. Intertek Testing Services Ltd Shanghai (ITS Beijing)
16. Intertek Utama Services (Indonesia)
17. Labtium Inc Finland
18. OMAC Laboratories Limited (Ireland)
19. Set Point Laboratories (Isando) SA
20. Set Point Laboratories (Mokopane) SA
21. SGS Australia Pty Ltd (Newburn) WA
22. SGS Lakefield Research Africa (Pty) Ltd (Booysens SA)
23. SGS Mineral Services Lakefield (Canada)
24. Ultra Trace (Pty) Ltd WA
25. Zimplats Head Office Assay Laboratory

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

Lab Code	Au NIS ppm	Ir NiS ppm	Pd NIS ppm	Pt NIS ppm	Rh NiS ppm	Ru NiS ppm	Au Pb Col ppm	Pd Pb Col ppm	Pt Pb Col ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr M/ICP ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	SG
A	0.08	0.02	0.50	0.98	0.05	0.10	0.10	0.44	0.84	49.8	20.5		2910	4334	366.0	430.0	431.0	889	741	959	2.91
A	0.09	0.02	0.50	0.96	0.06	0.12	0.10	0.45	0.86	51.7	19.9		2680	4226	369.0	431.0	430.0	914	742	976	2.91
A	0.09	0.02	0.48	0.90	0.06	0.11	0.10	0.45	0.86	49.6	21.2		2770	4262	370.0	428.0	436.0	889	740	989	2.91
A	0.08	0.02	0.47	0.88	0.05	0.10	0.10	0.45	0.86	51.2	21.5		2900	4277	379.0	429.0	428.0	922	751	986	2.91
A	0.09	0.02	0.49	0.92	0.05	0.10	0.10	0.43	0.81	49.2	20.7		2780	4226	359.0	429.0	430.0	891	740	970	2.91
A	0.10	0.02	0.50	0.95	0.06	0.11	0.10	0.45	0.86	47.0	21.5		2690	4256	352.0	431.0	423.0	854	739	982	2.91
A	0.09	0.02	0.50	0.96	0.06	0.11	0.10	0.45	0.87	48.6	23.0		2670	4293	360.0	430.0	429.0	884	743	973	2.91
A	0.08	0.02	0.46	0.87	0.05	0.11	0.10	0.45	0.86	48.8	21.2		2670	4232	366.0	424.0	436.0	888	738	975	2.91
B							0.10	0.48	0.95	56.0	20.4		2755		485.2	391.8		993	665		
B							0.12	0.50	0.94	56.0	20.4		2960		461.5	404.6		964	666		
B							0.09	0.46	0.92	59.0	20.6		3176		474.8	435.0		977	666		
B							0.09	0.46	0.90	56.0	20.3		2862		477.5	385.6		977	671		
B							0.10	0.49	0.92	59.0	19.8		3186		489.1	428.0		984	673		
B							0.09	0.47	0.92	58.0	21.7		3016		461.8	418.2		994	667		
B							0.09	0.45	0.93	54.0	20.7		3001		460.6	409.5		964	673		
B							0.09	0.45	0.90	54.0	22.2		2798		460.2	401.9		960	681		
C	0.06	0.02	0.44	0.86	0.06		0.06	0.45	0.86	62.0	25.0	59.0	3460	4300	428.0	436.0	394.0	962	853	987	2.85
C	0.05	0.03	0.45	0.86	0.06		0.05	0.44	0.86	63.4	24.0	58.0	3530	4280	429.0	444.0	398.0	966	820	983	2.86
C	0.06	0.02	0.45	0.86	0.07		0.06	0.44	0.86	63.2	24.0	59.0	3180	4280	446.0	419.0	396.0	991	808	981	2.85
C	0.06	0.02	0.44	0.85	0.06		0.05	0.45	0.85	60.6	23.0	61.0	3030	4310	420.0	423.0	397.0	964	772	988	2.87
C	0.05	0.02	0.45	0.86	0.06		0.05	0.44	0.85	66.7	23.0	58.0	3330	4270	428.0	430.0	396.0	997	777	980	2.87
C	0.06	0.02	0.44	0.85	0.06		0.06	0.45	0.86	62.8	23.0	59.0	3450	4240	427.0	429.0	392.0	968	785	968	2.86
C	0.06	0.02	0.44	0.86	0.07		0.06	0.45	0.86	62.6	25.0	57.0	3080	4210	426.0	436.0	386.0	995	835	957	2.85
C	0.06	0.02	0.45	0.85	0.07		0.06	0.45	0.86	67.9	24.0	58.0	3260	4280	440.0	439.0	397.0	1000	849	978	2.85
D							0.10	0.46	0.90	50.5	22.2		3099		435.8	427.9		916	739		
D							0.10	0.46	0.93	47.9	23.1		2860		410.1	428.2		921	743		
D							0.09	0.47	0.91	46.7	21.6		2719		408.3	426.9		908	744		
D							0.10	0.47	0.93	48.5	21.8		2997		424.3	424.8		947	739		
D							0.10	0.47	0.94	50.6	22.1		2902		431.2	422.3		960	730		
D							0.09	0.46	0.91	49.3	20.8		2965		423.7	421.2		959	726		
D							0.10	0.45	0.93	47.2	21.6		2936		404.1	424.6		904	730		
D							0.10	0.45	0.93	45.5	22.7		2547		392.2	432.0		878	739		
E		0.02	0.44	0.84	0.06	0.11	0.09	0.44	0.86	56.0	23.0		4300	4275	424.0	425.0		996	690		3.03
E		0.02	0.43	0.83	0.06	0.11	0.08	0.42	0.81	56.0	21.0		4250	4289	420.0	424.0		986	702		3.02
E		0.02	0.44	0.83	0.06	0.11	0.09	0.48	0.87	56.0	23.0		4150	4220	414.0	421.0		980	711		3.05
E		0.02	0.43	0.85	0.06	0.11	0.08	0.42	0.79	56.0	22.0		4300	4268	430.0	399.0		1000	678		3.00
E		0.02	0.44	0.86	0.06	0.12	0.08	0.41	0.80	56.0	21.0		4250	4234	428.0	425.0		988	698		3.01
E		0.02	0.43	0.83	0.06	0.11	0.08	0.47	0.86	58.0	23.0		4200	4248	426.0	420.0		994	691		2.99
E		0.02	0.43	0.82	0.06	0.11	0.08	0.46	0.88	56.0	20.0		4250	4234	420.0	418.0		990	698		3.00
E		0.02	0.44	0.85	0.06	0.11	0.08	0.43	0.81	56.0	21.0		4250	4254	422.0	407.0		988	689		2.98

Assay data (cont)

Lab Code	Au NIS ppm	Ir NiS ppm	Pd NIS ppm	Pt NIS ppm	Rh NiS ppm	Ru NiS ppm	Au Pb Col ppm	Pd Pb Col ppm	Pt Pb Col ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr M/ICP ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	SG
F							0.14	0.49	1.02	40.0					420.0			740			
F							0.13	0.43	1.14	40.0					430.0			740			
F							0.12	0.38	1.13	40.0					430.0			740			
F							0.13	0.50	1.08	40.0					420.0			730			
F							0.13	0.45	1.00	40.0					430.0			700			
F							0.11	0.40	0.93	40.0					420.0			680			
F							0.11	0.44	0.97	40.0					430.0			710			
F							0.14	0.50	1.14	40.0					430.0			710			
G							0.12	0.47	0.92	50.0			4125		419.0			886			
G							0.10	0.46	0.94	50.0			4222		410.0			877			
G							0.08	0.39	0.88	52.0			4054		411.0			892			
G							0.09	0.44	0.89	48.0			4286		403.0			860			
G							0.10	0.46	0.93	53.0			4288		437.0			907			
G							0.09	0.46	0.94	50.0			4013		406.0			855			
G							0.10	0.44	0.94	52.0			4396		427.0			903			
G							0.11	0.46	0.93	53.0			4102		432.0			926			
H							0.10	0.47	0.93								414.0			940	2.88
H							0.10	0.46	0.94								412.0			940	2.88
H							0.10	0.48	0.93								411.0			938	2.89
H							0.10	0.47	0.93								413.0			940	2.86
H							0.09	0.49	0.91								411.0			941	2.87
H							0.10	0.46	0.93								411.0			938	2.86
H							0.09	0.46	0.94								412.0			943	2.87
H							0.10	0.47	0.92								412.0			941	2.88
I					0.05			0.33	0.69						414.9		414.9			953	3.04
I					0.05			0.35	0.86						414.0		414.0			937	3.03
I					0.05			0.32	0.76						406.4		406.4			940	3.04
I					0.05			0.34	0.74						394.0		394.0			932	3.03
I					0.05			0.33	0.75						406.0		406.0			952	3.03
I					0.05			0.35	0.78						404.4		404.4			941	3.04
I					0.05			0.35	0.83						405.1		405.1			934	3.02
I					0.05			0.35	0.78						396.0		396.0			931	3.02
K							0.09	0.41	0.83	55.5	24.0		2671		431.9	428.0		860	693		
K							0.09	0.42	0.82	56.1	23.0		2510		424.5	429.0		855	685		
K							0.09	0.41	0.81	56.0	23.0		2553		422.9	424.0		851	691		
K							0.09	0.40	0.82	58.1	23.0		2772		442.7	417.0		865	687		
K							0.09	0.40	0.81	59.2	25.0		2785		446.4	427.0		858	709		
K							0.09	0.42	0.81	55.4	24.0		2591		426.4	430.0		844	707		
K							0.09	0.40	0.81	57.7	23.0		2697		435.5	420.0		850	700		
K							0.09	0.41	0.82	55.6	23.0		2630		431.3	425.0		844	708		
L	0.09		0.43	0.88	0.04					50.0			5380		646.0			1120			
L	0.09		0.43	0.88	0.05					28.1			4867		806.0			1075			
L	0.12		0.43	0.89	0.04					49.5			5020		631.5			1193			
L	0.09		0.37	0.86	0.03					47.8			4894		929.0			1357			
L	0.09		0.43	0.83	0.05					54.5			4908		636.5			1051			
L	0.09		0.45	0.93	0.05					48.9			4911		646.0			1057			
L	0.09		0.42	0.88	0.05					48.0			4652		661.5			1094			
L	0.08		0.40	0.83	0.06					45.0			5192		841.0			1373			
M	0.08	0.02	0.43	0.84	0.05	0.10	0.10			55.0				4090				920			
M	0.10	0.02	0.44	0.85	0.05	0.10	0.11			52.0				4000				900			
M	0.09	0.02	0.41	0.82	0.05	0.10	0.10			54.0				4060				910			
M	0.10	0.02	0.47	1.00	0.06	0.12	0.11			54.0				4050				910			
M	0.10	0.02	0.51	0.99	0.07	0.12	0.10			52.0				3980				910			
M	0.10	0.02	0.42	0.82	0.05	0.09	0.10			54.0				4070				930			
M	0.10	0.02	0.45	0.89	0.05	0.10	0.10			51.0				3900				930			
M	0.08	0.01	0.34	0.85	0.05	0.08	0.10			51.0				3990				920			
N	0.09	0.02	0.42	0.83	0.05	0.09	0.10	0.44	0.88	48.0	13.3	33.8	4276	4358	420.0	397.4	405.7	884	682	875	2.92
N	0.09	0.03	0.43	0.89	0.06	0.09	0.10	0.42	0.85	49.6	13.7	44.4	4203	4422	433.6	411.8	408.1	920	707	878	2.92
N	0.08	0.02	0.39	0.79	0.05	0.08	0.10	0.41	0.81	48.1	13.6	30.5	4543	4422	430.2	407.7	417.7	896	701	894	2.91
N	0.08	0.02	0.43	0.83	0.05	0.09	0.09	0.40	0.79	47.5	13.8	37.0	4259	4444	419.3	415.3	412.9	871	710	891	2.91
N	0.08	0.02	0.43	0.82	0.05	0.08	0.10	0.45	0.82	47.3	12.5	34.0	4551	4392	425.0	411.8	412.9	873	713	895	2.92
N	0.09	0.02	0.43	0.89	0.05	0.09	0.10	0.44	0.87	51.2	13.0	43.3	4573	4425	441.7	415.3	410.4	949	702	885	2.93
N	0.08	0.02	0.40	0.83	0.05	0.08	0.09	0.43	0.84	47.5	13.9	42.2	4326	4408	426.6	425.4	409.8	883	720	886	2.93
N	0.07	0.02	0.40	0.77	0.05	0.08	0.11	0.43	0.85	49.0	12.4	32.2	4500	4378	417.4	401.2	406.7	918	681	878	2.93
O							0.10	0.46	0.97			37.4		4183			406.6			854	
O							0.10	0.45	0.89			29.6		4243			401.7			854	
O							0.10	0.44	0.91			26.0		4186			391.7			830	
O							0.10	0.45	0.97			33.7		4184			401.8			848	
O							0.10	0.44	0.81			31.7		4163			404.4			849	
O							0.10	0.44	0.91			36.1		4188			413.4			879	
O							0.11	0.46	0.96			35.4		4197			405.8			855	
O							0.09	0.41	0.82			38.2		4195			412.0			865	
P	0.09	0.02	0.46	0.88	0.06	0.11															
P	0.09	0.02	0.46	0.86	0.06	0.11															
P	0.10	0.02	0.47	0.91	0.06	0.11															
P	0.09	0.02	0.44	0.83	0.06	0.10															
P	0.10	0.02	0.46	0.90	0.06	0.11															
P	0.10	0.02	0.46	0.90	0.06	0.11															
P	0.10	0.02	0.46	0.87	0.06	0.12															
P	0.09	0.02	0.45	0.89	0.06	0.11															
Q								0.45	0.86	56.0	19.0			4172	422.0	393.0		971	617		
Q							0.10	0.46	0.89	55.0	19.0			4172	414.0	392.0		956	618		
Q							0.10	0.45	0.88	57.0	18.0			4241	416.0	391.0		963	627		
Q								0.46	0.89	54.0	19.0			4172	415.0	390.0		955	616		
Q							0.10	0.41	0.87	57.0	18.0			4172	415.0	398.0		968	604		
Q								0.45	0.89	57.0	19.0			4172	425.0	395.0		973	627		
Q								0.43	0.83	57.0	18.0			4309	429.0	396.0		992	612		
Q								0.42	0.88	55.0	20.0			4309	405.0	409.0		938	620		
R	0.09	0.02	0.47	0.92	0.06	0.10															
R	0.09	0.02	0.47	0.93	0.06	0.11															
R	0.09	0.02	0.48	0.95	0.06	0.10															
R	0.09	0.02	0.46	0.90	0.06	0.10															
R	0.09	0.02	0.47	0.93	0.06	0.11															
R	0.09	0.02	0.48	0.93	0.06	0.10															
R	0.09	0.02	0.47	0.91	0.06	0.10															
R	0.10	0.02	0.47	0.91	0.06	0.09															

Assay data (cont)

Lab Code	Au NIS ppm	Ir NiS ppm	Pd NIS ppm	Pt NIS ppm	Rh NiS ppm	Ru NiS ppm	Au Pb Col ppm	Pd Pb Col ppm	Pt Pb Col ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr M/ICP ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	SG
S							0.08	0.38	0.77	47.7	20.0		3320	4166	432.0	448.0		926	751		2.59
S							0.07	0.39	0.78	47.7	20.0		3190	4412	405.0	450.0		873	753		2.62
S							0.08	0.41	0.81	47.4	20.0		3280	3824	406.0	448.0		868	753		2.63
S							0.09	0.46	0.94	49.7	21.0		3270	4425	428.0	449.0		921	758		2.64
S							0.09	0.43	0.86	48.4	20.0		3220	4241	412.0	449.0		888	754		2.62
S							0.07	0.36	0.70	49.8	21.0		3250	4241	423.0	449.0		901	755		2.67
S							0.09	0.45	0.91	48.6	20.0		3180	4337	406.0	443.0		876	749		2.66
S							0.07	0.36	0.73	48.6	20.0		3260	4330	414.0	447.0		882	750		2.63
T							0.10	0.45	0.96	50.7	21.6			4050	396.0	434.0	410.0	883	679	890	2.88
T							0.09	0.45	0.81	50.1	22.2			4040	406.0	443.0	400.0	881	693	890	2.85
T							0.10	0.45	0.96	51.2	22.0			4030	411.0	438.0	410.0	895	697	890	2.89
T							0.09	0.48	0.88	50.4	21.7			4020	408.0	437.0	400.0	881	702	890	2.85
T							0.10	0.42	0.89	47.9	21.8			4070	398.0	427.0	400.0	884	687	890	2.81
T							0.11	0.46	0.90	53.3	22.1			4050	396.0	440.0	400.0	895	702	900	2.80
T							0.09	0.47	0.99	50.4	21.7			4040	412.0	429.0	400.0	907	680	910	2.74
T							0.10	0.45	0.96	50.6	20.7			4060	399.0	419.0	410.0	881	667	900	2.80
U							0.08	0.41	0.81	48.1	22.7		3840		409.0	398.0		926	657		3.00
U							0.09	0.40	0.80	49.2	24.2		3620		413.0	424.0		942	675		2.99
U							0.08	0.45	0.93	50.5	23.6		3610		413.0	438.0		936	678		2.98
U							0.08	0.39	0.80	53.0	23.3		3500		411.0	429.0		956	633		2.97
U							0.08	0.44	0.87	51.9	23.4		3520		418.0	418.0		958	623		2.97
U							0.09	0.44	0.80	52.0	23.7		3530		414.0	438.0		937	640		2.99
U							0.08	0.39	0.80	51.9	23.6		3540		411.0	416.0		927	657		2.99
U							0.10	0.51	0.93	54.8	23.4		3830		438.0	431.0		1000	644		2.99
V							0.10	0.46	0.92	59.0	23.0			4172	445.0	436.0		1060	764		
V							0.11	0.47	0.92	58.0	24.0			4172	447.0	445.0		1030	775		
V							0.11	0.48	0.95	59.0	23.0			4241	424.0	444.0		1040	750		
V							0.11	0.47	0.92	60.0	24.0			4172	433.0	453.0		991	773		
V							0.11	0.49	0.96	58.0	23.0			4241	430.0	442.0		1060	753		
V							0.10	0.49	0.96	52.0	23.0			4104	442.0	436.0		1040	760		
V							0.10	0.47	0.95	55.0	23.0			4241	438.0	449.0		1070	742		
V							0.11	0.48	0.92	55.0	23.0			4104	444.0	420.0		1030	764		
W							0.09	0.41	0.78	57.0	19.0			3881	420.0	410.0		970	660	926	2.97
W							0.10	0.43	0.83	58.0	20.0			4091	430.0	420.0		980	670	974	2.95
W							0.10	0.44	0.88	58.0	21.0			4151	450.0	400.0		1000	660	981	2.95
W							0.10	0.45	0.86	58.0	20.0			4101	450.0	400.0		1000	660	974	2.95
W							0.10	0.46	0.89	60.0	21.0			4064	450.0	390.0		1000	650	989	2.95
W							0.10	0.46	0.89	58.0	20.0			4016	430.0	400.0		990	640	898	2.96
W							0.10	0.45	0.85	57.0	21.0			4076	430.0	390.0		1000	660	976	2.95
W							0.10	0.46	0.93	58.0	21.0			4016	430.0	410.0		990	670	975	2.96
X	0.11		0.50	0.89	0.07	0.11	0.10	0.48	0.89	58.0	20.0	54.0		4339	420.0	440.0	423.0	1000	690	919	2.95
X	0.10		0.46	0.87	0.07	0.11	0.10	0.48	0.92	57.0	20.0	57.0		4414	420.0	440.0	423.0	980	690	924	2.90
X	0.11		0.47	0.90	0.07	0.10	0.10	0.48	0.89	54.0	20.0	57.0		4431	420.0	420.0	427.0	1000	700	927	2.91
X	0.10		0.47	0.89	0.06	0.10	0.11	0.48	0.90	57.0	20.0	55.0		4361	420.0	420.0	423.0	1000	690	920	2.93
X	0.10		0.47	0.89	0.07	0.10	0.11	0.49	0.88	58.0	20.0	58.0		4423	420.0	430.0	423.0	1000	700	922	2.90
X	0.10		0.47	0.90	0.08	0.09	0.10	0.48	0.90	58.0	20.0	56.0		4302	420.0	410.0	425.0	970	700	922	2.91
X	0.10		0.45	0.88	0.06	0.11	0.10	0.49	0.90	53.0	20.0	57.0		4371	430.0	420.0	424.0	1000	690	923	2.93
X	0.12		0.46	0.90	0.07	0.10	0.10	0.50	0.89	57.0	20.0	57.0		4413	420.0	420.0	428.0	1000	690	933	2.89
Y	0.10	0.02	0.46	0.86	0.06	0.11	0.11	0.47	0.95												
Y	0.09	0.02	0.43	0.84	0.05	0.11	0.10	0.45	0.90												
Y	0.10	0.02	0.48	0.92	0.06	0.12	0.10	0.48	0.93												
Y	0.10	0.02	0.44	0.82	0.05	0.11	0.10	0.47	0.91												
Y	0.10	0.02	0.47	0.90	0.06	0.12	0.10	0.46	0.89												
Y	0.10	0.02	0.47	0.90	0.06	0.12	0.10	0.46	0.92												
Y	0.10	0.02	0.46	0.87	0.06	0.11	0.10	0.47	0.90												
Y	0.10	0.02	0.45	0.78	0.05	0.10	0.10	0.47	0.93												
Z	0.09	0.02	0.47	0.90	0.06	0.12	0.09	0.43	0.86	50.1	20.0			4063	430.0	384.0	390.0	1000	671	956	2.83
Z	0.10	0.02	0.45	0.91	0.06	0.07	0.09	0.42	0.84	49.2	19.0			4056	416.0	366.0	398.0	966	635	963	2.96
Z	0.10	0.02	0.46	0.92	0.06	0.11	0.09	0.42	0.82	50.7	21.0			4154	425.0	382.0	400.0	994	665	971	2.90
Z	0.09	0.02	0.47	0.90	0.06	0.10	0.09	0.42	0.87	50.7	21.0			4122	433.0	405.0	392.0	1001	707	964	2.95
Z	0.10	0.02	0.45	0.92	0.06	0.11	0.09	0.42	0.89	51.5	20.0			4089	421.0	363.0	392.0	976	632	965	2.94
Z	0.11	0.02	0.46	0.93	0.06	0.10	0.09	0.43	0.89	51.0	20.0			4125	422.0	393.0	401.0	971	690	982	2.94
Z	0.10	0.02	0.45	0.90	0.06	0.11	0.10	0.42	0.86	51.5	20.0			4086	421.0	377.0	383.0	974	683	961	2.98
Z	0.09	0.02	0.44	0.87	0.06	0.11	0.10	0.45	0.91	51.2	20.0			4122	426.0	375.0	406.0	970	647	993	2.93

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:

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 ISO guidelines.

Analyte	Method	CSU*	Unit	Analyte	Method	CSU*	Unit	Analyte	Method	CSU*	Unit
Au	NIS	0.002	ppm	Cr	M/ICP	185.023	ppm	Fe2O3	XRF	0.016	%
Ir	NiS	0.0003	ppm	Cr	XRF	25.902	ppm	K2O	XRF	0.002	%
Pd	NIS	0.005	ppm	Cu	M/ICP	1.512	ppm	LOI	XRF	0.008	%
Pt	NIS	0.008	ppm	Cu	P	2.922	ppm	MgO	XRF	0.037	%
Rh	NiS	0.001	ppm	Cu	XRF	3.401	ppm	MnO	XRF	0.001	%
Ru	NiS	0.001	ppm	Ni	M/ICP	8.391	ppm	Na2O	XRF	0.007	%
Au	Pb Col	0.001	ppm	Ni	P	7.598	ppm	P2O5	XRF	0.001	%
Pd	Pb Col	0.003	ppm	Ni	XRF	10.755	ppm	S	ICP	0.025	%
Pt	Pb Col	0.006	ppm	SG		0.016		SiO2	XRF	0.072	%
Co	M/ICP	0.604	ppm	Al2O3	XRF	0.012	%	TiO2	XRF	0.001	%
Co	P	0.278	ppm	CaO	XRF	0.007	%				
Co	XRF	9.109	ppm	Cr2O3	XRF	0.002	%				

**CSU = Combined Standard Uncertainty*

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

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

15. Certification: AMIS0107 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. 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.

29 June 2009

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
Ag	M/ICP	ppm	0.19	0.05	13.4	33
Al	M/ICP	%	2.23	0.19	4.3	77
As	M/ICP	ppm	0.86	1.31	76.1	28
Ba	M/ICP	ppm	30.2	2.3	3.9	71
Be	M/ICP	ppm	0.12	0.09	37.1	36
Bi	M/ICP	ppm	0.17	0.06	17.7	47
Ca	M/ICP	%	1.78	0.18	5.2	84
Cd	M/ICP	ppm	0.10	0.02	11.3	29
Ce	M/ICP	ppm	5.85	0.86	7.4	71
Cs	M/ICP	ppm	0.20	0.08	19.4	53
Dy	M/ICP	ppm	0.63	0.13	10.5	40
Er	M/ICP	ppm	0.44	0.10	12.0	38
Eu	M/ICP	ppm	0.14	0.04	15.7	39
Fe	M/ICP	%	4.36	0.68	7.8	101
Ga	M/ICP	ppm	4.57	0.85	9.3	55
Gd	M/ICP	ppm	0.60	0.14	11.4	39
Ge	M/ICP	ppm	0.15	0.26	85.6	27
Hf	M/ICP	ppm	0.53	0.19	18.1	63
Ho	M/ICP	ppm	0.15	0.06	20.4	40
In	M/ICP	ppm	0.02	0.01	23.7	32
K	M/ICP	%	0.10	0.02	12.4	95
La	M/ICP	ppm	2.92	0.41	6.9	70
Li	M/ICP	ppm	2.11	0.49	11.5	53
Lu	M/ICP	ppm	0.07	0.03	22.6	32
Mg	M/ICP	%	5.82	0.51	4.4	86
Mn	M/ICP	ppm	1017	160	7.9	96
Mo	M/ICP	ppm	2.17	0.43	10.0	70
Na	M/ICP	%	0.31	0.05	7.5	71
Nb	M/ICP	ppm	0.78	0.33	21.5	71
Nd	M/ICP	ppm	2.86	0.55	9.7	40
P	M/ICP	%	0.01	0.00	12.6	62
Pb	M/ICP	ppm	6.72	1.85	13.8	75
Pr	M/ICP	ppm	0.75	0.16	11.0	32
Rb	M/ICP	ppm	3.83	0.76	9.9	62
Re	M/ICP	ppm	0.003	0.002	33.7	16
S	M/ICP	%	0.18	0.06	17.9	32
Sb	M/ICP	ppm	4.16	0.83	9.9	68
Sc	M/ICP	ppm	11.8	1.5	6.4	61
Se	M/ICP	ppm	3.23	3.67	57.0	16
Sm	M/ICP	ppm	0.57	0.14	11.8	39
Sn	M/ICP	ppm	1.00	0.19	9.4	56
Sr	M/ICP	ppm	56.8	8.8	7.7	85
Ta	M/ICP	ppm	0.06	0.04	32.8	24
Tb	M/ICP	ppm	0.10	0.02	8.3	38
Te	M/ICP	ppm	0.26	0.08	15.8	51
Th	M/ICP	ppm	1.15	0.18	7.8	70
Ti	M/ICP	%	0.07	0.01	6.0	85
Tl	M/ICP	ppm	0.04	0.02	20.0	24
Tm	M/ICP	ppm	0.07	0.03	23.7	39
U	M/ICP	ppm	0.62	0.17	13.9	71
V	M/ICP	ppm	73.9	14.2	9.6	76
W	M/ICP	ppm	0.33	0.11	15.9	37
Y	M/ICP	ppm	3.40	0.49	7.2	77
Yb	M/ICP	ppm	0.45	0.10	10.8	39
Zn	M/ICP	ppm	210	22	5.2	83
Zr	M/ICP	ppm	18.0	4.9	13.7	78