African Mineral Standards
REFERENCE MATERIALS FOR AFRICAN ORES

Tel: +2711 923 7000 Fax: +2711 923 7027 e-mail: info@amis.co.za web: www.amis.co.za
30 Electron Avenue, Isando, 1600. P.O. Box 856, Isando, 1600, South Africa.

AMIS0074

Certified Reference Material

Platinum (PGM) ore, UG2 Reef
Western Limb, Bushveld Complex, South Africa

Certificate of Analysis

Recommended Concentrations and two "Between Laboratory" Standard Deviations

Certified Concentrations

Pt Pb Collection	1.07	±	0.10	g/t
Pt NIS	1.09	±	0.10	g/t
Pd Pb Collection	0.72	±	0.06	g/t
Pd NIS	0.72	±	0.08	g/t
Cr M/ICP	6.80	±	0.55	%
Cr XRF	7.12	±	0.16	%
Cu P	64	±	5.4	ppm
Cu M/ICP	65	±	6.4	ppm
Ni XRF	696	±	70	ppm
Specific Gravity	3.25	±	0.12	

Provisional Concentrations

Au Pb Collection	0.05	±	0.012	g/t
Au NIS	0.05	±	0.01	g/t
Rh NiS	0.21	±	0.04	g/t
Ru NiS	0.35	±	0.04	g/t
Co P	12.3	±	3.5	ppm
Cu XRF	70	±	12	ppm
Ni P	129	±	22	ppm
Ni M/ICP	668	±	94	ppm

Informational Means

Co M/ICP	102	ppm

4E 2.076 g/t

1. Intended Use: AMIS0074 is a certified reference material which may be used to demonstrate the validity of measurement results of a single analysis of PGE, Cu and Ni ores hosted by UG2 Reef or other chromitite rich 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, 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 Pt/Pd rich UG2 chromitite (UG2) material supplied by Anglo Platinum Limited from the Western limb of the Bushveld Complex. This specific material was made from a bulk sample collected from the East Shaft section of the Waterval Mine.

3. Approximate Mineral and Chemical Composition: AMIS0074 comprises approximately 50% UG2 Chromitite seam, 45% pegmatoidal pyroxenite footwall and 5% pyroxenite hanging wall. The UG2 Chromitite is composed of chromite (60-90% by volume), orthopyroxene (5-25%), plagioclase (5-15%) as well as accessory amounts of other minerals, of which the more important are clinopyroxene, base metal sulphides, platinum-group minerals, ilmenite and magnetite. The base metal sulphides are predominantly pentlandite, pyrrhotite, pyrite, chalcopyrite and to a lesser extent millerite. The Platinum Group Minerals identified in the UG2 are cooperite, laurite, braggite, Pt-Fe Alloy and sperrylite.

Major element chemistry data from 12 of the labs has been compiled but has not been certified. Summary statistics for this data are set out in the table below. Additional trace element data is available for this product on request.

	Mean	2SD	RSD%	n
Al_2O_3	7.98	0.20	1.2	69
CaO	2.52	0.10	2.0	85
Cr_2O_3	10.37	0.15	0.7	52
Fe_2O_3	13.05	0.37	1.4	78
K2O	0.13	0.01	4.7	78
LOI	0.22	0.13	29.8	22
MgO	12.19	0.34	1.4	72
MnO	0.17	0.02	5.0	71
Na_2O	0.41	0.06	7.7	84
P_2O_5	0.03	0.01	22.8	48
SiO_2	52.84	0.87	0.8	79
TiO_2	0.35	0.01	1.9	70

4. Appearance: The material is a very fine powder. It is coloured a Greenish Grey (Corstor 5Y 7/2).

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 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 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 analysis of both homogeneity and the consensus test results were carried out by independent statisticians.

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.

Additionally, XRF analyses were requested for the major elements and a multi-element multi acid digest and ICP scan was requested for the 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 nine laboratories were each given eight randomly selected packages of sample. Twenty three 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 23 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. Becquerel Laboratories Inc CA
11. Genalysis Laboratory Services (South Africa) Pty
12. Genalysis Laboratory Services WA
13. Intertek Testing Services Ltd Shanghai (ITS Beijing)
14. Intertek Utama Services (Indonesia)
15. Labtium Inc Finland
16. OMAC Laboratories Limited (Ireland)
17. Set Point Laboratories (Isando) SA
18. Set Point Laboratories (Mokopane) SA
19. SGS Australia Pty Ltd (Newburn) WA
20. SGS Lakefield Research Africa (Pty) Ltd (Booysens SA)
21. SGS Mineral Services Lakefield (Canada)
22. Ultra Trace (Pty) Ltd WA
23. 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 Coll ppm	Pd Pb Coll ppm	Pt Pb Coll ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr M/ICP ppm	Cr F ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	Specific Gravity
A	0.061	0.076	0.682	1.038	0.212	0.360	0.043	0.714	1.076		13.0		69621		71964	73.0	62.0	65.0	710	139	653	
A	0.065	0.072	0.666	1.022	0.208	0.329	0.062	0.717	1.057		15.0		65343		71855	65.0	62.0	66.0	682	155	653	3.32
A	0.057	0.071	0.691	1.051	0.216	0.330	0.049	0.714	1.070		15.0		66269		73463	63.0	67.0	63.0	689	154	652	3.31
A	0.050	0.075	0.696	1.012	0.219	0.335	0.059	0.731	1.097		15.0		67334		71383	62.0	64.0	65.0	675	151	654	3.29
A	0.049	0.074	0.685	1.047	0.216	0.327	0.045	0.764	1.135		13.0		66981		72457	62.0	57.0	66.0	673	134	657	3.32
A	0.053	0.073	0.685	1.042	0.215	0.344	0.049	0.724	1.109		14.0		69684		71102	63.0	67.0	76.0	691	153	659	3.31
A	0.051	0.070	0.693	1.044	0.220	0.332	0.045	0.737	1.101		14.0		70505		72525	64.0	61.0	66.0	687	145	658	3.38
A	0.047	0.075	0.713	1.031	0.224	0.347	0.043	0.724	1.070		14.0		68616		72669	65.0	61.0	65.0	689	146	660	
C							0.100	0.760	1.100	61.0				69000					575			
C							0.070	0.780	1.200	63.0				71000					560			
C							0.050	0.750	1.140	63.0				71800					568			
C							0.060	0.750	1.170	62.0				69300					587			
C							0.060	0.780	1.200	60.0				69100					564			
C							0.050	0.750	1.140	64.0				69800					572			
C							0.060	0.760	1.180	62.0				70400					556			
C							0.050	0.740	1.110	63.0				70300					579			
D							0.050	0.730	1.030													3.33
D							0.040	0.720	1.030													3.34
D							0.040	0.730	1.040													3.32
D							0.050	0.710	1.030													3.34
D							0.040	0.750	1.020													3.31
D							0.040	0.710	1.020													3.32
D							0.040	0.750	1.010													3.35
D							0.050	0.730	1.060													3.35
E											9.7			76191			78.1			123		
E											9.3			76210			68.7			111		
E											9.4			76304			67.6			107		
E											8.9			74928			75.9			104		
E											10.6			75586			67.5			101		
E											11.0			75294			76.4			110		
E											9.1			76750			71.0			111		
E											9.4			75043			76.6			108		
F	0.067											137			79300						770	
F	0.063											137			79300						820	
F	0.064											137			79600						740	
F	0.050											139			80300						730	
F	0.057											138			80100						800	
F	0.051											138			79400						860	
F	0.053											136			79500						780	
F	0.054											136			79100						770	
G	0.048	0.076	0.749	1.128	0.222	0.355	0.054	0.773	1.116				69621		71964							
G	0.047	0.070	0.712	1.004	0.209	0.343	0.049	0.750	1.097				65343		71855							
G	0.048	0.078	0.743	1.122	0.221	0.348	0.056	0.749	1.124				66269		73463							
G	0.051	0.074	0.752	1.088	0.214	0.353	0.049	0.749	1.079				67334		71383							
G	0.048	0.079	0.693	1.069	0.222	0.372	0.045	0.700	1.041				66981		72457							
G	0.053	0.066	0.638	0.960	0.193	0.335	0.054	0.751	1.119				69684		71102							
G	0.051	0.077	0.775	1.113	0.232	0.403	0.053	0.763	1.131				70505		72525							
G	0.047	0.073	0.732	1.076	0.227	0.348	0.048	0.764	1.124				68616		72669							
H							0.054	0.747	1.133													
H							0.056	0.737	1.121													
H							0.055	0.685	1.031													
H							0.054	0.732	1.106													
H							0.057	0.724	1.112													
H							0.055	0.735	1.104													
H							0.061	0.729	1.124													
H							0.053	0.688	1.036													
I							0.051	0.652	1.010	76.0	12.0				70473	61.0	65.0		663	137		
I							0.058	0.697	1.040	83.0	13.0				71157	64.0	65.0		702	140		
I							0.051	0.697	1.060	86.0	12.0				71157	66.0	63.0		719	134		
I							0.048	0.640	0.973	80.0	14.0				71157	63.0	64.0		683	140		
I							0.048	0.634	0.943	85.0	14.0				71157	65.0	65.0		695	139		
I							0.049	0.657	1.000	85.0	13.0				70473	69.0	67.0		697	144		
I							0.057	0.690	1.050	80.0	13.0				71157	63.0	64.0		665	139		
I							0.049	0.633	0.983	76.0	14.0				71157	59.0	69.0		649	146		

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 Coll ppm	Pd Pb Coll ppm	Pt Pb Coll ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr M/ICP ppm	Cr F ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	Specific Gravity
J							0.049	0.690	1.055	101.0	13.0					65.0	59.0		694	127		3.33
J							0.057	0.772	1.190	104.0	12.0					62.0	59.0		681	127		3.33
J							0.043	0.704	1.060	105.0	12.0					65.0	58.0		705	125		3.32
J							0.043	0.708	1.090	98.0	13.0					66.0	59.0		680	129		3.30
J							0.046	0.751	1.160	102.0	13.0					65.0	61.0		661	131		3.31
J							0.047	0.686	1.040	106.0	12.0					65.0	59.0		707	126		3.30
J							0.046	0.692	1.050	86.0	13.0					64.0	60.0		666	128		3.33
J							0.049	0.680	1.055	107.0	12.0					65.0	61.0		700	132		3.29
K	0.042	0.073	0.798	1.240	0.212	0.354	0.055	0.709	1.070	82.5	12.2				67565	55.8	64.8	87.0	573	130	681	3.26
K	0.050	0.075	0.790	1.170	0.212	0.364	0.050	0.713	1.070	77.7	10.4				67558	54.7	65.3	87.0	544	135	711	3.27
K	0.042	0.077	0.799	1.180	0.215	0.364	0.046	0.709	1.070	81.8	12.5				67264	55.3	65.7	79.0	552	138	708	3.27
K	0.042	0.074	0.787	1.190	0.207	0.349	0.064	0.704	1.080	79.7	12.4				67462	54.5	69.4	86.0	566	139	709	3.26
K	0.039	0.074	0.799	1.170	0.211	0.359	0.053	0.730	1.100	85.7	12.3				67264	55.6	63.5	81.0	567	133	755	3.27
K	0.038	0.075	0.778	1.140	0.208	0.360	0.049	0.720	1.100	77.4	10.8				67086	51.7	65.2	84.0	549	135	715	3.26
K	0.043	0.074	0.783	1.180	0.207	0.358	0.053	0.729	1.110	89.5	9.0				67257	51.6	66.1	86.0	601	138	688	3.27
K	0.039	0.074	0.766	1.130	0.206	0.358	0.051	0.740	1.120	78.9	10.9				67188	50.3	64.9	88.0	569	129	680	3.26
L							0.057	0.633	0.976	73.6	18.0					69.3	64.0		456	153		
L							0.051	0.652	1.000	68.2	20.0					71.7	65.0		441	157		
L							0.052	0.694	1.050	92.0	18.0					68.6	66.0		447	154		
L							0.043	0.638	1.000	61.1	19.0					71.5	65.0		493	148		
L							0.050	0.689	1.070	69.8	19.0					68.8	65.0		456	156		
L							0.048	0.616	0.993	70.5	17.0					78.3	66.0		466	150		
L							0.046	0.610	0.986	94.3	17.0					71.2	69.0		457	144		
L							0.054	0.674	1.050	77.9	20.0					68.9	66.0		494	159		
N							0.030	0.540	0.790	110.0	10.0		63470			60.0	60.0		690	110		
N							0.050	0.610	0.960	110.0	10.0		61620			60.0	60.0		690	120		
N							0.040	0.580	0.900	110.0	10.0		63140			70.0	60.0		710	120		
N							0.030	0.580	0.910	110.0	10.0		63890			70.0	60.0		710	120		
N							0.030	0.520	0.830	110.0	10.0		62460			60.0	60.0		720	120		
N							0.040	0.630	0.980	110.0	10.0		63560			70.0	60.0		720	120		
N							0.030	0.600	0.900	110.0	10.0		64800			60.0	60.0		710	120		
N							0.040	0.500	0.840	110.0	10.0		63930			60.0	60.0		710	120		
O	0.051	0.069	0.709	1.122	0.216	0.336				87.0	12.0					65.0	64.0		590	131		
O	0.051	0.066	0.674	1.002	0.196	0.320				88.0	11.0					64.0	64.0		625	127		
O	0.050	0.066	0.689	1.073	0.204	0.325				86.0	11.0					65.0	65.0		625	127		
O	0.051	0.065	0.697	1.052	0.208	0.304				87.0	12.0					65.0	65.0		636	127		
O	0.055	0.067	0.682	1.048	0.204	0.322				91.0	11.0					66.0	64.0		610	127		
O	0.057	0.065	0.677	1.052	0.200	0.309				90.0	12.0					64.0	66.0		609	124		
O	0.049	0.068	0.685	1.106	0.203	0.325				91.0	12.0					65.0	65.0		618	123		
O	0.054	0.068	0.688	1.051	0.203	0.329				91.0	12.0					64.0	66.0		624	127		
P							0.053	0.657	1.080	123.0	15.0				71225	68.0	60.0		712	122		
P							0.053	0.664	1.120	126.0	15.0				70746	66.0	62.0		711	127		
P							0.054	0.664	1.140	125.0	15.0				71088	68.0	62.0		717	127		
P							0.054	0.650	1.130	126.0	14.0				71020	68.0	60.0		716	124		
P							0.054	0.656	1.110	128.0	14.0				71362	63.0	62.0		714	124		
P							0.052	0.660	1.080	129.0	14.0				70199	67.0	61.0		709	123		
P							0.052	0.653	1.160	112.0	14.0				70131	66.0	62.0		709	126		
P							0.053	0.654	1.110	119.0	14.0				70404	67.0	60.0		706	127		
Q							0.062	0.737	1.081	76.7	14.4		35070			67.7	65.2		552	144		
Q							0.047	0.718	1.038	68.7	14.7		24154			64.6	67.6		491	141		
Q							0.051	0.727	1.073	66.1	15.5		25568			64.6	66.8		497	142		
Q							0.047	0.734	1.046	64.7	15.5		23196			67.3	65.0		484	143		
Q							0.053	0.729	1.081	59.8	14.2		17393			65.5	64.7		459	141		
Q							0.060	0.725	1.053	78.0	13.8		37197			64.7	65.5		553	143		
Q							0.049	0.716	1.077	63.0	13.7		22123			65.1	66.8		477	139		
Q							0.048	0.733	1.076	74.0	14.0		32813			66.3	64.2		528	139		
R	0.047	0.092	0.798	1.131	0.235	0.415	0.054	0.729	1.118	60.1	10.3	82	55750		70715	75.8	72.3	71.2	602	127	642	3.23
R	0.047	0.120	0.862	1.150	0.250	0.410	0.056	0.758	1.136	62.3	10.2	71	53250		70720	87.4	70.6	73.1	619	127	643	3.23
R	0.043	0.091	0.810	1.159	0.245	0.401	0.055	0.740	1.138	59.5	11.5	73	49520		71134	71.6	70.3	69.0	613	134	536	3.22
R	0.048	0.084	0.815	1.121	0.244	0.384	0.057	0.759	1.112	61.1	12.0	80	55650		70904	73.4	75.0	69.0	623	129	646	3.23
R	0.039	0.117	0.763	1.064	0.244	0.392	0.054	0.718	1.078	63.7	11.9	79	56230		70858	74.3	70.0	76.6	626	126	648	3.22
R	0.045	0.085	0.819	1.138	0.247	0.401	0.045	0.734	1.103	58.8	11.0	87	53430		70830	76.0	70.1	72.6	603	128	642	3.21
R	0.044	0.093	0.833	1.177	0.265	0.416	0.050	0.720	1.090	60.3	11.6	89	53510		70751	82.5	70.5	72.0	619	125	644	3.22
R	0.037	0.080	0.800	1.121	0.226	0.362	0.056	0.734	1.057	68.4	10.9	82	50970		71109	77.4	73.4	71.5	619	130	653	3.22
S					0.180			0.666										74.3			753	3.46
S					0.185			0.602	0.748									78.8			745	3.48
S					0.198			0.684										79.0			724	3.36
S					0.189			0.628										76.5			736	3.29
S					0.178				0.828									74.0			740	3.41
S					0.183			0.647										73.0			728	3.47
S					0.208			0.680	0.763									88.2			746	3.37
S					0.173			0.640	0.812									70.6			752	3.47
U							0.062	0.794	1.316	100.0						90.0			660			
U							0.060	0.787	1.339	120.0						90.0			650			
U							0.047	0.745	1.229	130.0						100.0			660			
U							0.046	0.769	1.286	130.0						100.0			650			
U							0.064	0.786	1.356	130.0						90.0			650			
U							0.063	0.782	1.301	120.0						90.0			630			
U							0.068	0.749	1.366	120.0						100.0			640			
U							0.068	0.737	1.372	120.0						90.0			630			
V							0.069	0.700	0.999	106.5	12.0					55.7	63.0		611	123		
V							0.057	0.731	1.025	107.5	10.0					55.4	63.0		615	123		3.08
V							0.054	0.687	0.983	114.0	10.0					61.0	60.0		663	116		3.09
V							0.052	0.750	1.065	108.5	11.0					56.7	63.0		615	123		3.11
V							0.052	0.741	1.060	108.5	11.0					57.4	63.0		603	123		3.07
V							0.053	0.732	1.055	111.0	10.0					57.6	62.0		634	121		3.09
V							0.045	0.705	1.010	109.0	10.0					56.7	61.0		620	117		3.13
V							0.056	0.764	1.090	107.5	10.0					56.9	63.0		622	122		3.10
W							0.050	0.700	1.040	130.0	14.0		70400		71157	68.0	67.0		725	131		3.07
W							0.055	0.740	1.100	120.0	14.0		71500		71157	68.0	67.0		710	134		
W							0.060	0.720	1.080	125.0	14.0		70500		71157	70.0	68.0		725	132		
W							0.055	0.700	1.080	130.0	13.0		72000		70473	70.0	66.0		735	129		
W							0.050	0.680	1.060	120.0	15.0		71200		71157	68.0	68.0		730	137		
W							0.060	0.700	1.040	115.0	14.0		72400		70473	70.0	68.0		720	136		
W							0.050	0.680	1.000	125.0	14.0		71400		71157	72.0	69.0		710	138		
W							0.055	0.700	1.080	130.0	15.0		71000		71157	70.0	67.0		730	134		

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 Coll ppm	Pd Pb Coll ppm	Pt Pb Coll ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr M/ICP ppm	Cr F ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	Specific Gravity
Y	0.060		0.760	1.090	0.240	0.330	0.060	0.720	1.050	100.0	20.0	119			71999	62.0	70.0	67.0		160	734	3.30
Y	0.060		0.740	1.090	0.230	0.340	0.060	0.720	1.070	100.0	20.0	122			72183	62.0	70.0	66.0		160	738	3.29
Y	0.060		0.710	1.060	0.220	0.320	0.060	0.720	1.090	100.0	20.0	124			72121	63.0	70.0	65.0		170	733	3.21
Y	0.060		0.750	1.110	0.240	0.350	0.060	0.720	1.080	100.0	20.0	124			72060	62.0	70.0	60.0		160	738	3.24
Y	0.050		0.730	1.080	0.220	0.310	0.050	0.700	1.040	100.0	20.0	121			71919	61.0	70.0	65.0		170	736	3.23
Y	0.050		0.730	1.070	0.230	0.330	0.050	0.720	1.090	100.0	20.0	128			72202	61.0	70.0	65.0		160	751	3.22
Y	0.070		0.720	1.100	0.270	0.350	0.050	0.710	1.050	110.0	20.0	123			71517	63.0	70.0	64.0		170	732	3.22
Y	0.070		0.730	1.090	0.220	0.340	0.050	0.700	1.050	99.0	20.0	129			72355	64.0	70.0	67.0		160	732	3.24
Z	0.059	0.050	0.719	1.080	0.200	0.348	0.048	0.720	1.060	129.0	19.0	113			71225		61.0	67.0	759	198	706	3.21
Z	0.045	0.055	0.712	1.070	0.180	0.351	0.051	0.706	1.080	126.0	18.0	103			70746		58.0	62.0	754	196	661	3.24
Z	0.058	0.055	0.716	1.060	0.183	0.349	0.055	0.725	1.060	133.0	20.0	118			71088		62.0	69.0	759	200	712	3.21
Z	0.058	0.055	0.717	1.100	0.197	0.363	0.055	0.703	1.070	125.0	19.0	108			71020		63.0	67.0	716	200	690	3.17
Z	0.055	0.061	0.730	1.090	0.187	0.351	0.056	0.703	1.090	129.0	20.0	115			71362		65.0	70.0	743	200	711	3.15
Z	0.054	0.055	0.710	1.060	0.204	0.374	0.047	0.702	1.070	125.0	18.0	109			70199		62.0	66.0	718	200	678	3.19
Z	0.052	0.054	0.707	1.000	0.204	0.342	0.051	0.718	1.100	128.0	19.0	107			70131		61.0	64.0	754	201	664	3.20
Z	0.053	0.054	0.719	1.050	0.181	0.360	0.049	0.710	1.080	118.0	19.0	116			70404		62.0	68.0	710	203	715	3.16
ZA							0.050	0.740	1.120		13.0		71000		71417	63.0	65.0		610	120	696	3.24
ZA							0.050	0.730	1.150		12.0	152	69000		69572	63.0	63.0		600	120	706	3.23
ZA							0.040	0.740	1.110		14.0	136	67000		71347	63.0	65.0		660	120	692	3.25
ZA							0.050	0.720	1.110		13.0	132	69000		70179	62.0	63.0		650	120	704	3.22
ZA							0.060	0.740	1.150		13.0	131	68000		69550	62.0	68.0		610	120	732	3.26
ZA							0.040	0.740	1.110		13.0	132	67000		68943	62.0	65.0		620	120	634	3.22
ZA							0.040	0.730	1.120		13.0	144	68000		71366	64.0	63.0		650	120	689	3.23
ZA							0.040	0.720	1.120		14.0	134	69000		67237	64.0	67.0		660	120	662	3.29
ZB							0.050	0.610	0.950	95.0	11.0				71225	65.0	66.0	60.0	635	126	700	3.14
ZB							0.045	0.636	0.963	101.0	11.0				70746	67.0	65.0	70.0	671	125	700	3.24
ZB							0.049	0.665	0.996	100.0	12.0				71088	66.0	65.0	70.0	657	127	700	3.15
ZB							0.051	0.613	0.941	100.0	13.0				71020	66.0	67.0	70.0	661	129	700	3.12
ZB							0.048	0.623	0.962	102.0	11.0				71362	66.0	64.0	70.0	680	120	700	3.12
ZB							0.038	0.586	0.862	103.0	11.0				70199	68.0	65.0	70.0	691	127	700	3.13
ZB							0.052	0.646	0.982	96.0	10.0				70131	64.0	62.0	70.0	637	119	700	3.13
ZB							0.050	0.680	1.030	99.0	12.0				70404	65.0	64.0	70.0	665	121	690	3.24

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	CSU	unit
Au NIS	0.002	ppm
Pd NIS	0.017	ppm
Pt NIS	0.017	ppm
Rh NiS	0.006	ppm
Ru NiS	0.008	ppm
Au Pb Collection	0.001	ppm
Pd Pb Collection	0.004	ppm
Pt Pb Collection	0.007	ppm
Co M/ICP	3.759	ppm
Co P	0.339	ppm

Analyte	CSU	unit
Cr M/ICP	1488	ppm
Cr XRF	182	ppm
Cu M/ICP	0.574	ppm
Cu P	0.480	ppm
Cu XRF	2.253	ppm
Ni M/ICP	0.006	ppm
Ni P	1.986	ppm
Ni XRF	11.701	ppm
Specific Gravity	0.016	

CSU = Combined standard uncertainty

13. Uncertified 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: AMIS0074 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.

14 April 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 – AMIS0074 uncertified trace element statistics

	Method	Unit	Mean	2SD	RSD%	n
Ag	M/ICP	ppm	0.291	0.328	56.4	11
Al	M/ICP	%	4.19	0.28	3.4	53
Ba	M/ICP	ppm	39.0	2.5	3.2	70
Be	M/ICP	ppm	0.138	0.092	33.3	36
Ca	M/ICP	%	1.75	0.14	3.9	72
Ce	M/ICP	ppm	5.97	0.69	5.8	45
Co	M/ICP	ppm	95.8	42.4	22.1	96
Co	XRF	ppm	118.7	42.0	17.7	38
Cr	M/ICP	ppm	65722	11346	8.6	38
Cs	M/ICP	ppm	0.200	0.056	13.9	43
Cu	M/ICP	ppm	65.5	9.2	7.1	86
Dy	M/ICP	ppm	0.549	0.082	7.5	32
Er	M/ICP	ppm	0.348	0.095	13.7	37
Eu	M/ICP	ppm	0.155	0.034	11.0	38
Fe	M/ICP	%	8.93	0.55	3.1	69
Ga	M/ICP	ppm	18.9	8.1	21.4	48
Gd	M/ICP	ppm	0.503	0.153	15.2	40
Ge	M/ICP	ppm	0.287	0.680	118.3	31
Hf	M/ICP	ppm	0.506	0.182	18.0	46
Ho	M/ICP	ppm	0.112	0.031	13.9	37
In	M/ICP	ppm	0.016	0.009	27.5	24
Ir	NiS	g/t	0.069	0.015	10.8	39
K	M/ICP	%	0.113	0.010	4.2	80
La	M/ICP	ppm	3.08	0.79	12.9	63
Li	M/ICP	ppm	2.34	0.45	9.7	47
Lu	M/ICP	ppm	0.071	0.037	26.3	29
Mg	M/ICP	%	7.38	0.49	3.3	76
Mn	M/ICP	ppm	1310	100	3.8	60
Mo	M/ICP	ppm	1.96	0.35	8.9	55
Na	M/ICP	ppm	0.303	0.030	5.0	77
Nb	M/ICP	ppm	0.894	0.445	24.9	51
Nd	M/ICP	ppm	2.81	0.45	7.9	30
Ni	M/ICP	ppm	678	91	6.7	72
P	M/ICP	ppm	114	45	19.8	68
Pb	M/ICP	ppm	4.72	4.12	43.7	58
Pr	M/ICP	ppm	0.736	0.189	12.8	38
Rb	M/ICP	ppm	4.75	1.29	13.6	56
Sb	M/ICP	ppm	7.50	1.98	13.2	55
Sc	M/ICP	ppm	13.4	2.0	7.6	53
Se	M/ICP	ppm	2.23	2.30	51.6	23
Sm	M/ICP	ppm	0.555	0.085	7.7	30
Sn	M/ICP	ppm	1.09	0.22	10.0	46
Sr	M/ICP	ppm	56.3	4.6	4.1	76
Tb	M/ICP	ppm	0.087	0.019	10.8	38
Th	M/ICP	ppm	1.06	0.21	9.7	48
Ti	M/ICP	%	0.203	0.017	4.2	45
Tm	M/ICP	ppm	0.068	0.038	27.7	34
U	M/ICP	ppm	0.816	0.162	9.9	47
V	M/ICP	ppm	534	81	7.6	59
W	M/ICP	ppm	0.365	0.183	25.1	31
Y	M/ICP	ppm	2.84	0.47	8.3	53
Yb	M/ICP	ppm	0.403	0.028	3.5	29
Zn	M/ICP	ppm	224	36	8.1	54
Zr	M/ICP	ppm	15.0	3.9	13.0	55