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AMIS0450

Certified Reference Material

Platinum (PGM), Merensky Ore

Bushveld Complex, South Africa

Certificate of Analysis

Recommended Concentrations and Limits[1.]

(at two Standard Deviations)

Certified Concentrations[2]

Pt Pb Collection	3.17	±	0.20	g/t
Pd Pb Collection	1.56	±	0.09	g/t
Au Pb Collection	0.22	±	0.02	g/t
Co M/ICP	85.8	±	8.8	ppm
Co P	39.3	±	2.3	ppm
Cu M/ICP	990.2	±	94.3	ppm
Cu P	965.6	±	70.8	ppm
Cu XRF	996	±	103	ppm
Ni M/ICP	2004	±	145	ppm
Ni P	1655	±	114	ppm
Specific Gravity	3.05	±	0.06	

Provisional Concentration

Ni XRF	2041	±	239	ppm

3E (Pt, Pd, Au (all Pb Collection)) = 4.95 g/t

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_2O_3	15.18	±	0.25	%
CaO	8.270	±	0.09	%
Cr_2O_3	0.830	±	0.02	%
Fe_2O_3	8.899	±	0.13	%
K_2O	0.170	±	0.002	%
MgO	14.54	±	0.19	%
MnO	0.130	±	0.01	%
Na_2O	0.125	±	0.07	%
SiO_2	49.59	±	0.48	%
TiO_2	0.20	±	0.01	%

Informational Concentration

LOI	0.64	%

1. Intended Use: AMIS0450 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; derived from the Merensky Reef, or from other mafic rocks 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 Section19). 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: AMIS0450 was made from material supplied by Anglo Platinum, using Merensky Reef underground sample material from the Western Limb of the Bushveld complex.

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.

4. Appearance: The material is a very fine powder. It is colored Light Grey (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 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 scientifically 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. Pb collection with Ag as a co-collector, ICP-OES or ICP-MS
2. Pt, Pd, Au, Rh, Ru, Ir. NiS collection, ICP-OES or ICP-MS
3. Multi element scan to include Co, Cu and Ni. Multi-acid total digestion, including HF, ICP-OES or ICP-MS
4. Co, Cu and Ni. Aqua regia digestion with ICP-OES or ICP-MS
5. Co, Cu and Ni. Pressed pellet XRF
6. Majors (Al_2O_3, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, SiO_2, TiO_2. LOI.) XRF fusion
7. SG – gas pycnometer

8. Information requested:

1. State and provide brief description of analytical techniques used.
2. State aliquots used for all determinations.
3. Results for individual analyses to be reported.
4. Report all QC data, to include replicates, blanks and certified reference materials used.

9. Method of Certification: Twenty laboratories were each given eight scientifically selected packages of sample. Sixteen 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 16 out of 20 laboratories that provided results timeously were (not in same order as in the table of assays):

1. ACME Analytical Laboratories Ltd CA
2. ALS Ammtec (Australia)
3. Bureau Veritas (Namibia)
4. Genalysis Laboratory Services (W Australia P)
5. Intertek Utama Services (Indonesia)
6. Mintek (South Africa)
7. Set Point Laboratories (Isando) SA
8. SGS Ankara (Turkey)

9. SGS Geosol Laboratories Ltda (Brazil)
10. SGS Mineral Services Lakefield (Canada)
11. SGS South Africa (Pty) Ltd - Booysens JHB
12. SGS Vancouver (Canada)
13. Suntech Geometallurgical SA
14. Ultra Trace (Pty) Ltd WA
15. Zimplats Ngezi Lab
16. Zimplats SMC Lab

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

Assay Data

Lab Code	Pt PbColl g/t	Pd PbColl g/t	Au PbColl g/t	Co M/ICP ppm	Co P ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Al_2O_3 XRF %	CaO XRF %	Cr_2O_3 XRF %	Fe_2O_3 XRF %	K_2O XRF %	MgO XRF %	MnO XRF %	Na_2O XRF %	SiO_2 XRF %	TiO_2 XRF %	LOI %	SG pyc
A	2.50	1.58	0.22	83.0	39.0	1109	1023		1987	1651											0.90	2.96
A	2.51	1.54	0.21	83.0	40.0	1099	1024		1997	1723											0.80	2.93
A	2.25	1.49	0.20	83.0	40.0	1062	1003		1983	1732											0.80	3.04
A	3.81	1.77	0.22	83.0	40.0	1063	1028		1950	1730											0.70	3.03
A	2.51	1.53	0.23	79.0	40.0	989	1027		1857	1721											0.70	2.90
A	2.88	1.56	0.21	83.0	41.0	1065	1023		1969	1678											0.90	2.92
A	2.43	1.57	0.22	82.0	40.0	1073	1038		2001	1770											1.10	3.02
A	4.22	1.66	0.21	80.0	41.0	1031	1026		1875	1777											1.60	3.01
B	3.30	1.61	0.22	86.0	37.0	988	924		1870	1600	15.3	8.28	0.81	8.95	0.17	14.6	0.13	1.23	50.0	0.19	0.72	
B	3.26	1.61	0.22	86.0	38.0	979	918		1860	1590	15.4	8.36	0.82	9.04	0.17	14.7	0.13	1.23	50.4	0.20	0.63	
B	3.26	1.59	0.21	87.0	39.0	1020	956		1910	1660	15.3	8.29	0.81	8.94	0.17	14.6	0.13	1.22	49.9	0.20	0.73	
B				84.0	38.0	979	960		1870	1610	15.4	8.32	0.82	8.95	0.18	14.6	0.13	1.18	49.9	0.19	0.67	
B				83.0	38.0	955	945		1810	1670	15.3	8.32	0.81	8.98	0.17	14.6	0.13	1.21	49.8	0.20	0.71	
B	3.38	1.66	0.22	86.0	37.0	962	945		1870	1630	15.3	8.30	0.82	8.98	0.17	14.7	0.14	1.23	50.1	0.20	0.88	
B	2.96	1.47	0.22	86.0	37.0	995	921		1920	1600	15.3	8.32	0.82	8.95	0.17	14.7	0.14	1.30	50.1	0.20	0.84	
B				88.0	36.0	1010	927		1950	1560	15.3	8.32	0.82	8.96	0.17	14.7	0.14	1.24	49.9	0.19	0.86	
C	3.22	1.47	0.23	101	39.2	1104	1124	1100	1681	1667	15.2	8.38	0.83	8.84	0.17	14.9	0.13	1.31	49.2	0.18	0.58	
C	3.30	1.50	0.24	104	37.7	1122	1100	1100	1670	1644	15.3	8.41	0.83	8.86	0.17	14.9	0.13	1.34	49.5	0.20	0.63	
C	3.25	1.53	0.23	105	39.8	1134	1130	1200	1665	1647	15.4	8.43	0.84	8.88	0.17	15.0	0.13	1.30	49.7	0.19	0.57	
C	3.12	1.50	0.23	103	37.6	1101	1101	1100	1646	1618	15.4	8.46	0.83	8.94	0.17	15.0	0.14	1.31	49.8	0.20	0.62	
C	3.30	1.54	0.24	103	38.8	1103	1114	1100	1653	1661	15.4	8.44	0.82	8.67	0.17	14.6	0.12	1.31	49.8	0.20	0.53	
C	3.34	1.53	0.24	113	39.3	1147	1139	1100	1723	1695	15.3	8.45	0.84	8.82	0.17	14.9	0.13	1.30	49.6	0.20	0.58	
C	3.26	1.51	0.24	108	39.9	1116	1139	1000	1637	1687	15.3	8.40	0.83	8.85	0.17	14.9	0.13	1.33	49.5	0.19	0.63	
C	3.13	1.55	0.24	105	39.8	1102	1130	1200	1654	1674	15.3	8.44	0.83	8.90	0.17	14.9	0.13	1.28	49.6	0.19	0.56	
E	3.22	1.66	0.21	96.0	39.0	983	972	1100	1970	1580	15.2	8.47	0.84	8.88	0.17	14.6	0.14	1.20	49.9	0.19	0.79	
E	3.30	1.69	0.22	92.0	40.0	981	964	1000	2030	1590	15.1	8.40	0.84	8.90	0.17	14.5	0.14	1.21	49.5	0.19	0.85	
E	3.09	1.61	0.21	96.0	39.0	984	975	1000	1980	1580	15.0	8.46	0.85	8.85	0.17	14.5	0.13	1.19	49.7	0.19	0.72	
E	3.30	1.69	0.22	94.0	38.0	979	987	1000	1960	1580	15.1	8.41	0.83	8.84	0.17	14.6	0.13	1.20	49.4	0.19	0.78	
E	3.22	1.62	0.21	91.0	39.0	1010	967	1000	2000	1580	15.1	8.47	0.84	8.92	0.17	14.7	0.14	1.22	49.9	0.19	0.74	
E	3.31	1.69	0.23	91.0	37.0	961	975	900	1960	1550	15.0	8.38	0.83	8.83	0.17	14.4	0.14	1.19	49.3	0.19	0.71	
E	3.25	1.62	0.21	95.0	39.0	996	1020	1000	1970	1580	15.2	8.47	0.83	8.87	0.17	14.6	0.14	1.21	49.8	0.19	0.87	
E	3.24	1.68	0.21	94.0	37.0	985	990	1000	1940	1530	15.1	8.47	0.85	8.86	0.17	14.5	0.14	1.18	49.9	0.19	0.82	
F	3.21	1.57	0.22	78.0	39.2	923	864	940	1978	1582	15.1	8.33	0.83	8.86	0.17	14.5	0.14	1.27	49.3	0.20	0.73	3.08
F	3.27	1.71	0.20	78.0	40.4	921	889	937	2040	1639	15.1	8.24	0.81	8.71	0.17	14.6	0.13	1.28	49.1	0.20	0.75	3.08
F	3.22	1.57	0.22	78.0	39.7	914	862	943	2070	1587	15.0	8.26	0.82	8.83	0.17	14.5	0.14	1.27	49.2	0.20	0.78	3.09
F	3.27	1.62	0.20	78.0	39.1	925	896	929	1943	1645	14.9	8.26	0.82	8.75	0.17	14.4	0.13	1.25	49.1	0.20	0.76	3.08
F	3.27	1.56	0.21	77.0	38.9	922	896	931	1998	1640	15.1	8.25	0.82	8.76	0.17	14.5	0.13	1.30	49.1	0.19	0.76	3.09
F	3.20	1.54	0.22	79.0	38.5	947	931	936	1994	1692	15.1	8.29	0.82	8.80	0.17	14.5	0.14	1.29	49.2	0.20	0.73	3.08
F	3.24	1.62	0.21	79.0	38.8	927	908	934	2060	1658	15.0	8.27	0.82	8.79	0.17	14.5	0.14	1.28	49.0	0.20	0.81	3.09
F	3.31	1.55	0.22	77.0	37.5	926	877	931	1945	1609	15.0	8.28	0.83	8.84	0.17	14.5	0.13	1.30	49.2	0.20	0.69	3.08
G	3.07	1.58	0.22																			
G	3.05	1.57	0.23																			
G	3.04	1.56	0.21																			
G	3.06	1.56	0.23																			
G	3.06	1.57	0.21																			
G	3.08	1.56	0.21																			
G	3.05	1.58	0.23																			
G	3.06	1.56	0.23																			
H	3.16	1.51	0.21					990														
H	3.20	1.49	0.21					990														
H	3.25	1.56	0.22					980														
H	3.28	1.56	0.21					970														
H	3.17	1.54	0.21					970														
H	3.22	1.52	0.21					980														
H	3.20	1.56	0.21					950														
H	3.14	1.59	0.21					960														
I	3.29	1.60	0.21	90.0		1000			2090		15.2	8.34	0.83	8.85	0.17	14.6	0.13	1.25	49.6	0.20	0.50	3.05
I	3.24	1.57	0.21	85.0		1010			2080		15.2	8.35	0.83	8.88	0.17	14.6	0.13	1.26	49.7	0.20	0.52	3.04
I	3.30	1.62	0.21	90.0		1000			2070		15.2	8.33	0.83	8.84	0.17	14.6	0.13	1.25	49.7	0.20	0.48	3.05
I	3.25	1.57	0.21	90.0		990			2060		15.2	8.34	0.83	8.88	0.17	14.6	0.13	1.26	49.7	0.20	0.50	3.05
I	3.30	1.60	0.21	90.0		990			2050		15.2	8.31	0.83	8.86	0.17	14.6	0.13	1.25	49.8	0.20	0.52	3.05
I	3.33	1.63	0.22	90.0		1010			2090		15.2	8.31	0.83	8.88	0.17	14.6	0.13	1.24	49.8	0.20	0.51	3.05
I	3.27	1.61	0.22	85.0		1000			2090		15.2	8.32	0.83	8.86	0.17	14.6	0.13	1.24	49.8	0.20	0.47	3.04
I	3.29	1.63	0.22	85.0		1000			2060		15.2	8.32	0.83	8.83	0.17	14.6	0.13	1.26	49.8	0.20	0.51	3.06

Assay Data (cont)

Lab Code	Pt PbColl g/t	Pd PbColl g/t	Au PbColl g/t	Co M/ICP ppm	Co P ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Al_2O_3 XRF %	CaO XRF %	Cr_2O_3 XRF %	Fe_2O_3 XRF %	K_2O XRF %	MgO XRF %	MnO XRF %	Na_2O XRF %	SiO_2 XRF %	TiO_2 XRF %	LOI %	SG pyc
J	3.06	1.64	0.23					1000			15.3	8.25	0.82	8.92	0.17	14.5	0.14	1.27	50.2	0.19	0.60	3.09
J	3.12	1.71	0.23					1000			15.2	8.18	0.85	8.89	0.17	14.4	0.14	1.28	50.1	0.19	0.44	3.01
J	3.19	1.69	0.28					1000			15.3	8.19	0.84	8.90	0.17	14.4	0.14	1.24	50.2	0.19	0.55	3.04
J	3.18	1.70	0.25					1000			15.3	8.21	0.81	8.90	0.17	14.4	0.14	1.24	50.3	0.19	0.53	3.03
J	3.18	1.71	0.23					1000			15.3	8.25	0.81	8.89	0.17	14.5	0.13	1.25	50.2	0.19	0.50	3.02
J	3.09	1.67	0.23					1000			15.4	8.25	0.81	8.92	0.17	14.5	0.14	1.26	50.3	0.19	0.59	3.03
J	3.15	1.68	0.21					1000			15.4	8.23	0.81	8.91	0.17	14.5	0.14	1.26	50.3	0.19	0.57	3.03
J	3.11	1.67	0.25					1100			15.3	8.22	0.82	8.89	0.17	14.4	0.14	1.25	50.2	0.19	0.58	3.02
L	2.93	1.48	0.22			976			2044													
L	3.06	1.47	0.22			979			2041													
L	3.10	1.49	0.23			977			2002													
L	3.12	1.51	0.25			975			2008													
L	3.07	1.47	0.25			962			1995													
L	3.04	1.50	0.24			971			1993													
L	2.87	1.36	0.21			960			2009													
L	3.06	1.46	0.23			968			1990													
M	3.22	1.57	0.22	83.7	40.1	1051	953		1957	1496	15.1	8.28	0.83	8.98	0.17	14.5	0.13	1.28	49.7	0.21	0.55	3.13
M	3.22	1.57	0.22	84.3	39.5	1072	928		2040	1475	15.2	8.28	0.84	8.98	0.17	14.5	0.14	1.29	49.6	0.20	0.51	3.39
M	3.25	1.54	0.22	85.1	39.7	1047	939		1978	1470	15.1	8.30	0.84	9.01	0.17	14.5	0.14	1.27	49.7	0.20	0.49	3.40
M	3.18	1.57	0.23	86.3	40.1	1035	944		1999	1492	15.2	8.24	0.83	8.95	0.17	14.4	0.14	1.25	49.8	0.18	0.56	2.74
M	3.25	1.60	0.22	83.3	41.0	1046	960		1944	1519	15.2	8.25	0.84	8.96	0.17	14.5	0.14	1.29	49.6	0.20	0.59	3.27
M	3.18	1.60	0.21	83.2	40.2	1027	948		1967	1489	15.2	8.25	0.83	8.99	0.17	14.4	0.14	1.25	49.7	0.20	0.46	2.97
M	3.19	1.59	0.21	83.4	41.2	1032	959		1971	1526	15.1	8.25	0.83	8.97	0.17	14.4	0.14	1.29	49.8	0.20	0.53	3.25
M	3.22	1.60	0.21	85.5	39.6	1055	961		1998	1502	15.2	8.24	0.84	9.00	0.17	14.4	0.13	1.26	49.8	0.20	0.49	3.28
O	3.12	1.73	0.21	88.9		899			1869												0.62	3.01
O	2.78	1.52	0.19	89.9		919			1919												0.67	3.01
O	2.91	1.58	0.19	87.1		915			1874												0.63	3.01
O	2.71	1.44	0.18	89.6		938			1875												0.61	3.01
O	2.85	1.54	0.17	87.0		914			1869												0.65	3.00
O	2.83	1.52	0.18	86.6		921			1892												0.62	3.01
O	2.77	1.52	0.19	84.4		928			1844												0.61	3.01
O	2.91	1.59	0.19	87.8		923			1894												0.64	3.00
P	3.20	1.52	0.22	89.0		1020			2000		15.1	8.25	0.81	8.96	0.18	14.5	0.13	1.22	49.5	0.20	0.60	
P	3.30	1.50	0.22	87.0		1000			2020		15.2	8.21	0.80	8.92	0.18	14.5	0.13	1.21	49.6	0.20	0.60	
P	3.00	1.52	0.22	86.0		1010			2060		15.1	8.24	0.82	8.98	0.18	14.5	0.14	1.22	49.4	0.20	0.60	
P	3.14	1.50	0.22	84.0		1020			2080		15.1	8.23	0.80	8.94	0.18	14.5	0.13	1.22	49.5	0.20	0.60	
P	3.07	1.53	0.22	88.0		1010			2070		15.2	8.23	0.82	8.98	0.18	14.5	0.13	1.22	49.5	0.20	0.60	
P	3.10	1.55	0.22	84.0		1020			2070		15.2	8.24	0.81	8.96	0.18	14.5	0.13	1.21	49.5	0.20	0.60	
P	3.30	1.57	0.22	86.0		1010			2070		15.1	8.20	0.80	8.90	0.18	14.4	0.13	1.20	49.4	0.20	0.60	
P	3.20	1.60	0.22	87.0		1010			2060		15.1	8.21	0.80	8.94	0.18	14.4	0.13	1.22	49.5	0.20	0.60	
Q	3.14	1.54	0.21	87.0	39.4	940	957		2057	1710	15.1	8.25	0.86	8.83	0.17	14.7	0.13	1.22	49.6	0.21	0.77	3.04
Q	3.22	1.59	0.20	86.1	40.3	919	966		2060	1672	15.0	8.20	0.84	8.77	0.17	14.7	0.13	1.20	49.3	0.20	0.78	3.06
Q	3.28	1.61	0.20	87.2	42.5	980	971		2060	1770	15.1	8.20	0.84	8.76	0.17	14.7	0.13	1.22	49.4	0.22	0.83	3.06
Q	3.08	1.52	0.22	85.3	44.9	997	953		2032	1798	15.1	8.23	0.85	8.81	0.17	14.8	0.13	1.22	49.6	0.20	0.75	3.05
Q	3.06	1.50	0.21	84.0	41.3	959	963		2037	1744	15.0	8.16	0.84	8.71	0.17	14.6	0.13	1.22	49.2	0.21	0.77	3.06
Q	3.11	1.52	0.21	88.8	40.0	962	977		2096	1740	15.1	8.26	0.85	8.84	0.17	14.7	0.13	1.23	49.5	0.21	0.72	3.04
Q	3.18	1.57	0.20	87.2	40.7	938	973		2054	1693	15.0	8.21	0.85	8.78	0.17	14.7	0.14	1.23	49.4	0.20	0.74	3.06
Q	3.19	1.55	0.21	86.2	42.7	960	963		2074	1736	15.0	8.21	0.84	8.72	0.17	14.7	0.13	1.21	49.2	0.21	0.76	3.06
S	3.05	1.59	0.22	74.0	40.0	1059	978	995	2053	1644	14.8	8.29	0.83	8.94	0.17	14.6	0.14	0.84	49.6	0.20	0.57	3.09
S	3.09	1.57	0.22	74.0	41.0	1057	973	997	2060	1658	14.7	8.29	0.83	8.92	0.17	14.5	0.14	0.83	49.5	0.20	0.58	3.10
S	3.11	1.53	0.22	74.0	40.0	1054	977	999	2045	1655	14.8	8.31	0.84	8.99	0.17	14.6	0.14	0.85	49.6	0.20	0.49	3.09
S	3.08	1.51	0.20	73.0	38.0	1053	973	995	2030	1644	14.7	8.30	0.83	8.96	0.17	14.6	0.15	0.84	49.7	0.20	0.51	3.07
S	3.03	1.55	0.21	74.0	39.0	1060	972	982	2034	1647	14.8	8.30	0.84	8.96	0.17	14.6	0.14	0.85	49.7	0.20	0.55	3.08
S	3.05	1.57	0.21	74.0	40.0	1062	978	999	2053	1658	14.7	8.32	0.83	8.97	0.18	14.6	0.15	0.85	49.5	0.20	0.56	3.09
S	3.08	1.49	0.21	70.0	40.0	1056	979	993	2035	1657	14.6	8.24	0.82	8.89	0.17	14.5	0.14	0.86	49.4	0.19	0.56	3.08
S	3.04	1.54	0.20	70.0	40.0	1061	975	989	2052	1651	14.8	8.31	0.83	8.96	0.18	14.6	0.15	0.82	49.7	0.20	0.43	3.08
T	3.10	1.62	0.16						2080													
T	3.12	1.50	0.19						2100													
T	3.07	1.51	0.19						2100													
T	3.06	1.53	0.17						2050													
T	3.13	1.57	0.19						2150													
T	3.21	1.56	0.18						2090													
T	3.14	1.54	0.18						2100													
T	3.21	1.64	0.18						2130													

12. Measurement of Uncertainty :(*ref Dr Hugh Bartlett, Hugh Bartlett Consulting CC.)*

The samples used in this certification process have been selected in such a way as to represent the entire batch of material and were taken from the final packaged units; therefore all possible sources of uncertainty (sample uncertainty and measurement uncertainty) are included in the final combined standard uncertainty determination.

The uncertainty measurement takes into consideration the between lab and the within lab variances and is calculated from the square roots of the variances of these components using the formula:

Combined standard uncertainty=sqrt((between lab.var/no of labs) + (mean square within lab.var /no of assays))

These uncertainty measurements may be used, by laboratories, as a component for calculating the total uncertainty for method validation according to the relevant ISO guidelines.

Analyte	Method	unit	S [1]	σ_L [2]	Sw [3]	CSU [4]
Pt	PbColl	g/t	0.100	0.057	0.067	0.016
Pd	PbColl	g/t	0.043	0.016	0.038	0.006
Au	PbColl	g/t	0.011	0.006	0.007	0.002
Co	M/ICP	ppm	4.39	4.02	1.71	1.35
Co	P	ppm	1.15	0.82	0.83	0.31
Cu	M/ICP	ppm	47.17	39.12	15.65	11.91
Cu	P	ppm	35.40	36.77	12.68	14.01
Cu	XRF	ppm	51.77	50.62	31.17	21.17
Ni	M/ICP	ppm	72.5	55.2	31.3	16.24
Ni	P	ppm	57.18	54.30	30.55	20.94
Al_2O_3	XRF	%	0.123	0.109	0.056	0.037
CaO	XRF	%	0.045	0.041	0.023	0.015
Cr_2O_3	XRF	%	0.012	0.009	0.007	0.003
Fe_2O_3	XRF	%	0.067	0.055	0.030	0.018
K_2O	XRF	%	0.0009	0.001	0.001	0.000
MgO	XRF	%	0.097	0.081	0.052	0.028
MnO	XRF	%	0.005	0.003	0.004	0.001
Na_2O	XRF	%	0.035	0.030	0.017	0.010
SiO_2	XRF	%	0.243	0.193	0.142	0.067
TiO_2	XRF	%	0.006	0.004	0.004	0.001
LOI		%	0.119	0.091	0.051	0.027
SG	pyc		0.030	0.030	0.012	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 Std 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 Informational values listed on p1 and p2 of this certificate fulfil the AMIS statistical criteria regarding agreement for certification and have been independently validated by Ms Margaret Fairhurst.

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: AMIS0450 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.

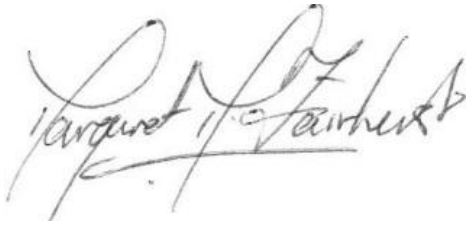
20. **Legal Notice:** This certificate and the reference material described in it have been prepared with due care and attention. However AMIS, Set Point Technology (Pty) Ltd (a part of Torre Industries), Nozibele Mbangula, and Margaret M. Fairhurst; accept no liability for any decisions or actions taken following the use of the reference material.

05 October 2015

Certifying Officers:

African Mineral Standards:_____

Nozibele Mbangula



Geochemist:_____ _____

Margaret M. Fairhurst, PG, MAusIMM

Appendix – uncertified element statistics

Analyte	Method	Unit	Mean	2SD	RSD%	n
Al	M/ICP	%	7.9	1.1	7.3	75
As	M/ICP	ppm	4.6	2.3	25.0	39
Au	NiS	g/t	0.21	0.02	4.6	15
Ba	M/ICP	ppm	63.3	11.2	8.9	85
Be	M/ICP	ppm	0.22	0.11	25.6	15
Bi	M/ICP	ppm	0.38	0.11	14.1	31
Ca	M/ICP	%	5.8	0.27	2.4	75
Cd	M/ICP	ppm	0.17	0.05	14.4	20
Ce	M/ICP	ppm	6.2	1.3	10.8	23
Co	XRF	ppm	93.4	20.3	10.9	30
Cr	M/ICP	ppm	4337	1596	18.4	56
Cr	P	ppm	1614	4896	152	32
Fe	M/ICP	%	6.1	0.49	4.0	77
Ga	M/ICP	ppm	14.3	7.1	24.7	32
Hf	M/ICP	ppm	0.38	0.09	11.4	22
Ir	NiS	g/t	0.08	0.01	9.1	24
K	M/ICP	%	0.15	0.01	4.1	78
La	M/ICP	ppm	3.5	1.6	23.0	64
Li	M/ICP	ppm	4.5	1.5	16.6	67
Mg	M/ICP	%	8.7	0.41	2.3	68
Mn	M/ICP	ppm	1010	63.1	3.1	69
Mo	M/ICP	ppm	0.82	0.35	21.3	35
Na	M/ICP	%	1.0	0.10	5.1	78
Nb	M/ICP	ppm	0.91	0.32	17.4	30
P	M/ICP	ppm	110.0	76.2	34.6	51
Pb	M/ICP	ppm	6.7	5.0	37.4	51
Pd	NiS	g/t	1.6	0.09	2.9	23
Pt	NiS	g/t	3.1	0.20	3.2	22
Rb	M/ICP	ppm	5.2	0.49	4.7	30
Rh		g/t	0.23	0.08	18.0	36
Ru	NiS	g/t	0.43	0.04	4.4	23
S	M/ICP	%	0.48	0.07	7.2	73
Sc	M/ICP	ppm	16.8	2.9	8.7	68
Sr	M/ICP	ppm	212	13.4	3.2	73
Tb	M/ICP	ppm	0.10	0.01	3.6	15
Te	M/ICP	ppm	0.74	0.54	36.6	30
Th	M/ICP	ppm	0.78	0.54	34.3	31
Ti	M/ICP	%	0.11	0.02	7.0	79
Tl	M/ICP	ppm	0.08	0.03	17.6	16
U	M/ICP	ppm	0.24	0.09	18.4	32
V	M/ICP	ppm	108	12.2	5.6	70
W	M/ICP	ppm	0.26	0.14	27.1	15
Y	M/ICP	ppm	4.1	0.41	5.1	68
Yb	M/ICP	ppm	0.49	0.03	2.9	14
Zn	M/ICP	ppm	67.1	14.1	10.5	82
Zr	M/ICP	ppm	14.0	4.4	15.6	75