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A Division of Set Point Industrial Technology (Pty) Ltd. Reg.No. 1989/000201/07.

African Mineral Standards

Nickel-Copper Sulphide Standard Phoenix Deposit Botswana

AMIS0061

Certificate of Analysis

Recommended Concentration and two “Between
Laboratory” Standard Deviations

Certified Concentrations

Ni (M/ICP)	3.549	±	0.307	%
Ni (P)	3.495	±	0.246	%
Ni (XRF)	3.585	±	0.163	%
Cu (M/ICP)*	1.306	±	0.063	%
Cu (P)	1.278	±	0.0865	%
Cu (XRF)	1.33	±	0.092	%
Pt (Pb Collection)	0.46	±	0.06	g/t
Pd (Pb Collection)	3.53	±	0.32	g/t
Co (M/ICP)	972	±	96	ppm
Co (P)	968	±	102	ppm
Co (XRF)	960	±	117	ppm
Specific Gravity	3.55	±	0.12	g/cc

Indicated Mean

Au (Pb Collection) 0.09 g/t

* Addendum. This correct multi acid copper value is a correction from the 1.206% published in error on the original certificate.

Intended use: AMIS0061 is suitable for monitoring the accuracy of a single analysis of nickel-copper sulphide ores hosted by amphibolitic rocks. The material can be used for routine quality control by inserting within a batch of samples.

The recommended mean and "Between Lab" standard deviations for this standard reflect the average 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 and this is acceptable. Good laboratories however will report results within the two standard deviation levels with a failure of <10 %.

Origin of material: The material for this standard was provided by the Tati Nickel Mining Company, a subsidiary of Norilsk Nickel Africa (Pty) Ltd., from the Phoenix open pit mine in Eastern Botswana. The mine is situated approximately 25 km southwest of Francistown. The deposit occurs in mafic intrusive rocks in the Tati Greenstone Belt of the Rhodesian Craton.

Mineral and chemical composition: Nickel-copper mineralization occurs in metasomatised feldspathic amphibolites intruded by pegmatites and granites. Mineralisation is in the form of massive sulphide lenses with secondary thin mineralized fractures into the country rock. The primary sulphide is pyrrhotite with lesser pentlandite, chalcopyrite and minor spalerite.

The major element chemistry has been calculated, from predominantly XRF data submitted by fourteen of the laboratories, from the eight samples sent each lab. Uncertified statistics from this data are:

	mean	2SD	RSD%	n	unit
Al ₂ O ₃	8.84	0.37	2.1	78	%
CaO	5.16	0.35	3.4	86	%
Cr ₂ O ₃	0.06	0.01	9.6	72	%
Fe ₂ O ₃	39.37	2.21	2.8	96	%
K ₂ O	0.18	0.03	8.6	90	%
MgO	5.06	0.24	2.3	85	%
MnO	0.07	0.01	6.3	85	%
Na ₂ O	0.82	0.09	5.3	62	%
P ₂ O ₅	0.05	0.11	118	31	%
S	17.53	1.03	3.0	52	%
SiO ₂	25.19	1.33	2.6	95	%
TiO ₂	0.13	0.01	4.6	84	%
V ₂ O ₅	0.01	0.00	21.7	8	%
LOI	9.04	0.65	3.6	77	%

Additional trace element data is available on request for this material.

Appearance: The material is a very fine powder coloured Dark Blueish Grey (Corstor 5PB 4/1).

Method of preparation: The material was crushed, dry-milled and air-classified to 100% <54um. Wet sieve particle size analysis of random samples confirmed the material was 100% <54um. It was then blended in a bi-conical mixer, systematically divided and then sealed into 1kg Laboratory Packs. Samples were randomly selected for homogeneity testing and third party analysis. Statistical analysis for the consensus test results were carried out by an independent statistician. Explorer Packs are subdivided from the Laboratory packs as required.

Methods of analysis requested:

1. Au, Pt, Pd – Pb collection ICP-OES or ICP-MS.
2. Multi-acid digest multi-element scan - (to include Co, Cu, Ni.). ICP-OES or ICP-MS.
3. Aqua regia digest - Co, Cu, Ni. ICP-OES or ICP-MS.
4. Co, Cu, Ni. XRF.
5. Majors (Al₂O₃, CaO, Cr₂O₃, Fe₂O₃, K₂O, MgO, MnO, Na₂O, SiO₂, TiO₂. LOI.) XRF fusion.
6. SG (gas pycnometer)

Method of certification: Twenty one laboratories were each given eight randomly selected packages of sample. The results from the nineteen laboratories that issued results timeously were used for the certification.

The mean and standard deviation for all data was calculated. Outliers were defined as samples beyond the mean \pm 2 Standard Deviations from all data. These outliers were removed from the data and a new mean and standard deviation was determined.

Standards with an RSD of near or less than 5 % are then certified, RSD's of between near 5 % and 15 % are given Provisional Concentrations and limits, those with RSD's over 15 % are given Indicated Concentrations.

This method is different from that used to calculate the Confidence Interval shown on many Government-produced standards 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 Certified Limits published on other standards which quote a Confidence Interval.

Participating laboratories: (Not in same order as in the table of assays)

1. ACME Analytical Laboratories Ltd., (Canada).
2. Activation Laboratories Ltd., (ActLabs, Ancaster, ON, Canada).
3. ALS Chemex South Africa (Pty) Ltd.
4. ALS Chemex, (Perth, Australia).
5. ALS Chemex, (Vancouver, Canada).
6. Ammtec Ltd., (Western Australia).
7. Assayers Canada, (Vancouver).
8. Genalysis Laboratory Services (Pty) Ltd., (Australia).
9. Geoscience Laboratories, (Geo Labs, Sudbury, Canada).
10. Intertek Testing Services (China)
11. Labtium Inc. (Finland)
12. Nkomati JV Laboratory
13. OMAC Laboratories (Ireland).
14. Pt Intertek Utama Services (Intertek, Indonesia)
15. Set Point Laboratories (Pty) Ltd (South Africa)
16. SGS Lakefield Research (Canada)
17. SGS Lakefield Research Africa (Pty) Ltd. (Joburg, South Africa)
18. SGS Welshpool (Australia).
19. Ultra Trace (Pty) Ltd. (Australia).

Assay Data: Data as received from the laboratories is set out below. A proficiency report has been sent to the managers of the participating laboratories.

Lab Code	Au Pb coll g/t	Pt Pb coll g/t	Pd Pb coll g/t	Co (M/ICP) ppm	Co (P) ppm	Co (XRF) ppm	Cu (M/ICP) ppm	Cu (P) ppm	Cu (XRF) ppm	Ni (M/ICP) ppm	Ni (P) ppm	Ni (XRF) ppm	Specific Gravity g/cc
A	0.11	0.46	3.39	1000	726	900	13200			33800		32900	
A	0.10	0.45	3.33	1020	724	1000	13400			34100		34000	
A	0.11	0.48	3.39	993	746	900	13100			33300		34400	
A	0.12	0.44	3.31	1000	768	900	13200			33600		33500	
A	0.10	0.48	3.25	987	762	1000	12900			33100		33900	
A	0.11	0.47	3.25	1010	746	1000	13300			33800		33300	
A	0.11	0.47	3.26	1010	736	1000	13300			33800		34100	
A	0.10	0.46	3.26	998	750	1000	13200			33500		34600	
B		0.49	3.84	976	1010		12500	12900	12930	33800	35200	35700	
B		0.27		976	1000		12500	12800	12840	33800	34900	35600	
B		0.49	3.86	978	988		12200	12700	12820	33700	34500	35270	
B		0.49	3.83	982	998		12600	12800	12670	34000	34700	35270	
B		0.45	3.53	984	1000		12700	12900	13150	34000	34800	36030	
B		0.40	3.21	985	1010		12200	13000	12880	34100	35100	35520	
B		0.50	3.94	975	989		12600	12800	12830	33600	34600	35440	
B		0.49	3.85	993	990		12500	12700	12960	34100	34400	35910	
C	0.09	0.45	3.63										
C	0.08	0.45	3.57										
C	0.09	0.44	3.47										
C	0.08	0.42	3.32										
C	0.08	0.47	3.58										
C	0.08	0.43	3.43										
C	0.07	0.46	3.62										
C	0.07	0.45	3.60										
D				1170			13256			37317			
D				1178			13278			37451			
D				1175			12680			34911			
D				1150			13188			37603			
D				1166			13338			37597			
D				1180			13363			37728			
D				1088			13035			36722			
D				1218			12991			36611			
E				990			13414			34702			
E				994			13296			35215			
E				1000			13162			35357			
E				1001			13118			35566			
E				999			13131			35218			
E				999			13656			34520			
E				1011			13501			35244			
E				999			13306			34830			
F	0.11	0.43	3.50	994	980	1291	13157	13207	13304	37400	37738	37442	3.56
F	0.08	0.48	3.54	1029	963	1200	13335	13000	13190	37673	36471	37030	3.56
F	0.12	0.42	3.42	1005	981	1194	13018	13280	13119	36987	37278	36966	3.58
F	0.08	0.43	3.26	1026	964	1223	13136	13162	13191	37286	36799	37270	3.55
F	0.10	0.39	3.19	1019	969	1261	13183	13120	13311	36039	36765	37087	3.60
F	0.08	0.39	3.14	1028	966	1256	13190	13160	13132	37719	36680	36688	3.56
F	0.10	0.45	3.45	1022	963	1186	13122	13140	13158	37336	36670	36957	3.58
F	0.12	0.46	3.37	1019	972	1222	13064	13280	13019	37086	37022	37317	3.58
G													
G													
G													
G													
G													
G													
G													
H	0.08	0.48		1040	922		12500			35600			
H	0.09	0.46		1010	951		12700			35500			
H	0.08	0.35		997	943		12800			36000			
H	0.10	0.50		995	994		12700			35700			
H	0.09	0.49		992	994		12600			35300			
H	0.09	0.47		982	957		12700			36100			
H	0.09	0.49		980	955		12500			35600			
H	0.09	0.49		991	956		12500			35100			
I	0.14	0.50	3.71	930	910	1030	12000	13000	13260		34000	36400	3.53
I	0.10	0.50	3.72	930	900	980	12000	13000	13120		34000	35650	3.50
I	0.13	0.54	3.80	910	930	1010	12000	13000	13270		34000	36350	3.52
I	0.12	0.54	3.81	920	920	990	12000	13000	12880		34000	35330	3.55
I	0.07	0.54	3.82	910	910	940	12000	12000	12380		33000	33850	3.51
I	0.10	0.52	3.69	940	920	970	12000	13000	12840		33000	35380	3.51
I	0.15	0.50	3.62	920	920	940	12000	13000	12410		32000	34170	3.53
I	0.11	0.50	3.64	900	930	940	12000	12000	12410		32000	33450	3.50

Lab Code	Au Pb coll g/t	Pt Pb coll g/t	Pd Pb coll g/t	Co (M/ICP) ppm	Co (P) ppm	Co (XRF) ppm	Cu (M/ICP) ppm	Cu (P) ppm	Cu (XRF) ppm	Ni (M/ICP) ppm	Ni (P) ppm	Ni (XRF) ppm	Specific Gravity g/cc
J	0.10	0.46	3.60	1020	900	900	15000	14000	13000	38000		35800	3.56
J	0.09	0.47	3.46	960	880	1000	15000	13000	13500	35000		36000	3.54
J	0.09	0.49	3.56	920	820	1000	14000	12000	13400	33000		36300	3.51
J	0.09	0.47	3.63	890	910	1000	16000	12000	13100	33000		36300	3.52
J	0.10	0.47	3.48	920	920	1000	16000	12000	13100	34000		35900	3.53
J	0.10	0.44	3.56	860	830	1100	14000	11000	13400	31000		36600	3.54
J	0.08	0.48	3.60	880	800	1000	13000	12000	13200	32000		37200	3.53
J	0.08	0.45	3.65	880	940	1000	16000	12000	13100	33000		36600	3.54
K	0.09	0.46	3.58	1040	1050		12700	13200		36600	35700		3.63
K	0.10	0.48	3.58	1050	1010		13000	12500		36900	34700		3.63
K	0.11	0.46	3.60	1060	1030		12800	13100		36900	35500		3.63
K	0.11	0.48	3.56	1070	1030		13000	12800		37000	36100		3.62
K	0.09	0.46	3.68	1050	1050		12900	13600		36400	35700		3.62
K	0.11	0.46	3.62	1090	1060		13100	13200		36600	35600		3.63
K	0.10	0.46	3.60	1020	1040		12800	12400		36000	34900		3.64
K	0.11	0.48	3.66	1030	1050		12800	12800		36300	35500		3.65
L	0.09	0.46	3.56	1047	1055		13381	12878		37748	36745		3.25
L	0.08	0.49	3.46	1080	1062		13254	13018		37239	35783		3.20
L	0.08	0.47	3.50	1047	1034		13097	13174		37397	36200		3.20
L	0.09	0.50	3.54	1029	1045		12697	12798		36397	36107		3.02
L	0.08	0.42	3.10	1016	1047		12966	12912		36753	36204		3.17
L	0.09	0.50	3.32	1007	1046		13100	13085		36651	36816		3.18
L	0.08	0.44	3.46	1040	1036		13162	12790		37158	36112		3.00
L	0.08	0.44	3.26	1051	1045		13159	12997		37047	36248		3.04
M	0.11	0.43	3.39	1080	1040	1060	12400	12300	14200	36000	35300	34700	3.54
M	0.08	0.46	3.59	1120	990	1050	13000	12800	14200	37800	34500	34900	3.54
M	0.08	0.44	3.50	1100	930	1060	12700	12400	14200	36700	31400	34900	3.51
M	0.07	0.41	3.31	1100	1000	1060	12600	12900	14200	36500	34700	34900	3.58
M	0.08	0.44	3.42	1110	960	1060	12700	12500	14200	36800	32700	34800	3.54
M	0.08	0.44	3.52	1080	970	1060	12500	12500	14300	36300	33700	34900	3.49
M	0.09	0.45	3.58	1110	930	1060	12800	12200	14200	37000	32100	34800	3.64
M	0.07	0.41	3.32	1070	960	1050	12300	12600	14200	35800	32700	34700	3.67
N	0.11	0.55	4.27	939	942	800	13300		13600	37500		35400	3.24
N	0.09	0.46	3.69	943	923	900	13350		13700	35700		36400	3.19
N	0.08	0.45	3.67	923	958	900	13200		13600	37000		36400	3.25
N	0.08	0.41	3.40	940	960	900	13300		13700	38100		36500	3.20
N	0.08	0.46	3.69	924	956	900	13350		13600	35000		36200	3.23
N	0.09	0.45	3.72	947	943	900	13300		13600	35700		36100	3.22
N	0.09	0.48	3.82	961	945	900	13500		13800	37400		36700	3.19
N	0.08	0.47	3.74	939	955	900	13500		13600	36100		36300	3.21
O	0.09	0.46	3.50	911	907	910	13000	13200	13250	35000	34200	35100	3.49
O	0.09	0.47	3.63	898	910	930	13150	12800	13300	35400	32700	35200	3.45
O	0.09	0.48	3.67	883	883	940	13150	13200	13250	35300	33700	35200	3.47
O	0.09	0.47	3.50	925	890	940	13150	13100	13300	35100	33900	35200	3.50
O	0.09	0.46	3.41	885	921	950	13200	12800	13300	35500	33900	35200	3.47
O	0.08	0.46	3.34	899	899	930	13300	13100	13250	35700	34100	35300	3.48
O	0.08	0.49	3.57	920	909	940	13200	12900	13250	35400	34800	35300	3.47
O	0.08	0.46	3.49	943	911	950	13200	13000	13200	35400	33900	35300	3.49
P	0.08	0.60	4.28	951			13300	12500		35100			3.46
P	0.09	0.53	3.77	940			13600	12800		35200			3.36
P	0.09	0.51	3.80	958			13300	12700		34500			3.40
P	0.09	0.51	4.08	970			13150	12600		34800			3.39
P	0.08	0.50	4.06	974			12650	12500		33500			3.50
P	0.09	0.55	4.27	953			13300	12500		34900			3.48
P	0.08	0.56	4.10	974			12750	12000		33400			3.39
P	0.08	0.56	3.86	971			13450	12200		35300			3.40
Q	0.10	0.53	3.77	1102			13500			37300			
Q	0.12	0.47	3.61	1136			13500			37200			
Q	0.10	0.48	3.74	1096			13300			36500			
Q	0.18	0.47	3.64	1117			13600			37200			
Q	0.12	0.48	3.65	1117			13500			37200			
Q	0.10	0.47	3.58	1105			13600			36800			
Q	0.11	0.43	3.59	1119			13500			37400			
Q	0.10	0.48	3.69	1120			13500			36800			
R													
R													
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R													

Lab Code	Au Pb coll g/t	Pt Pb coll g/t	Pd Pb coll g/t	Co (M/ICP) ppm	Co (P) ppm	Co (XRF) ppm	Cu (M/ICP) ppm	Cu (P) ppm	Cu (XRF) ppm	Ni (M/ICP) ppm	Ni (P) ppm	Ni (XRF) ppm	Specific Gravity g/cc
S	0.10	0.44	3.48	897	918		11800	11250		33500			
S	0.09	0.45	3.47	900	909		11500	10620		32300			
S	0.08	0.43	3.35	919	972		12000	11160		33600			
S	0.12	0.46	3.46	909	936		11900	10800		33800			
S	0.09	0.44	3.43	953	954		12100	11070		33800			
S	0.09	0.44	3.43	891	963		11000	11070		31900			
S	0.11	0.45	3.47	916	954		11600	10980		32700			
S	0.11	0.45	3.40	886	972		11600	11250		32900			
T	0.10	0.51	3.88	980	960		12824	11921	11709	34005	35037	33103	3.59
T	0.10	0.55	3.96	1012	937		12917	11809	11612	34331	33863	32953	3.59
T	0.08	0.45	3.43	993	1133		12819	13757	11722	33534	35267	33117	3.57
T	0.10	0.54	4.12	966	1132		12776	14000	11571	33237	34104	32971	3.59
T	0.10	0.53	3.77	963	1021		12785	12518	11690	33130	35493	33013	3.65
T	0.09	0.46	3.43	974	888		12831	11127	11654	33284	35283	33014	3.64
T	0.09	0.45	3.40	984	1081		12882	13682	11709	33116	34209	33144	3.62
T	0.08	0.46	3.74	971	1063		12815	13058	11703	33531	35239	33130	3.64
U	0.09	0.46	3.44			896							
U	0.11	0.48	3.42			895							
U	0.10	0.48	3.43			896							
U	0.09	0.47	3.43			894							
U	0.08	0.48	3.42			899							
U	0.09	0.48	3.32			897							
U	0.10	0.46	3.46			896							
U	0.11	0.50	3.39			895							

Availability: This product is available in Laboratory Packs containing 1kg of material or in Explorer Packs containing client specified weights of material from 50g up to 250g. Laboratory Packs are sealed bottles delivered in sealed foil pouches. Explorer Packs contain material in standard geochem envelopes placed into foil pouches that are nitrogen flushed and vacuum sealed.

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 Smees and Smees and Associates Ltd; accept no liability for any decisions or actions taken following the use of the reference material.

5 May 2008

Certifying officers:



African Mineral Standards: _____

Mike McWha
BSc (Hons), FGSSA, MSAIMM, Pr.Sci.Nat



Geochemist: _____

Barry W. Smees
BSc, PhD, P.Geo, (B.C.)