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GeoPT5 - AMH-1, Mount Hood Andesite

Veranstalter: International Association of Geoanalysts and Geostandards Newsletter - GeoPT5
Ringversuchsmaterial: AMH-1, Mount Hood Andesite
RV geschlossen: 1999 – 7
Literatur: Preliminary Report - GeoPT5 Proficiency Testing Round, Geostandards Newsletter, Vol. 24, No. 1, 06/00, p. 137

Hauptelemente [MA%]

	CRB	RV	1sRV	Z-Score
Na_2O	4,18	4,208	0,184	
MgO	3,14	3,156	0,179	
Al_2O_3	17,66	17,53	0,375	
SiO_2	60,45	60,337	0,686	
P_2O5	0,171	0,170	0,011	
K_2O	1,23	1,227	0,047	
CaO	6,02	6,064	0,223	
TiO_2	0,86	0,846	0,052	
Fe_2O_3 tot.	6,13	6,098	0,281	
MnO	0,095	0,094	0,007	

Spurenelemente [µg/g]

	CRB	RV	1sRV	Z-Score
Ba	308	322	24	
Ce	39	33	4,7	
Co	21	18,68	2,64	
Cr	52	40,9	5,8	
Cu	29	30,2	3,2	
Ga	22	20,49	1,5	
Ge	1,1	1,03	0,2	
Hf	2,8	3,7	0,6	
La	17	15,9	2,5	
Mo	2,8	1,2	0,4	
Nb	6	8,3	1,3	
Ni	34	32,4	4,5	
Rb	22	18,3	1,7	
Sr	529	545	30,5	
Th	4,3	2,6	0,4	
V	109	106,4	10,9	
Y	13	16,44	2,6	
Zn	67	66,9	5,5	
Zr	140	146	11,9	

Legende

CRB: Ergebnisse CRB – **RV:** Ergebnisse Ringversuch -- **1s-RV:** Standardabweichung Ringversuch
Z-Score: Differenz des Messwertes vom Mittelwert des Ringversuchs -- ***** Wert nicht zertifiziert

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GEOSTANDARDS NEWSLETTER
The Journal of Geostandards and Geoanalysis

Geo*PT5*. An International Proficiency Test for Analytical Geochemistry Laboratories - Report on Round 5 (August 1999)

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Results are presented from the seventy two laboratories participating in Geo*PT5*, round five of the international proficiency testing programme for analytical geochemistry laboratories. The sample for round five, AMH-1 (Mount Hood andesite), was distributed during March 1999 and participating laboratories were asked to analyse the sample using their routine techniques and submit results to the steering committee by 15th June 1999. In this report, contributed data are listed together with the derived z-scores from which participating laboratories can assess their analytical performance. Z-scores in the range -2 to 2 are considered satisfactory. Z-score values that lie outside this range may indicate unsuspected analytical bias. The distinctive feature of the present round is that AMH-1 is a candidate reference material prepared by the USGS and it is intended that the present proficiency testing data will contribute to the reference material characterisation programme.

On présente les résultats des soixante-douze laboratoires ayant participé au GeoPT5, cinquième édition du programme international de test de compétence destiné aux laboratoires de géochimie analytique. L'échantillon de cette cinquième édition, AMH-1 (andésite du Mont Hood), a été distribué courant Mars 1999 et les laboratoires participants étaient priés d'analyser cet échantillon selon leur procédure de routine et de renvoyer les résultats avant le 15 Juin 1999. Dans ce rapport, les données reçues sont listées avec les z-scores à partir desquels les laboratoires peuvent tester leurs performances analytiques. Les z-scores entre -2 et +2 sont considérés comme satisfaisants. Les z-scores en dehors de cette gamme peuvent indiquer des biais analytiques. Il est à noter que AMH-1 est un matériau de référence, préparé par l'USGS; il est prévu que les données de ce test de compétence contribuent au programme de caractérisation de ce matériau de référence.

Keywords: proficiency testing, Geo*PT*, round 5, AMH-1, quality assurance.

Mots-clés : test de compétence, GeoPT, cinquième édition, AMH-1, assurance-qualité.

Geo*PT*, the international proficiency testing programme, has now become well-established as a standard procedure for contributing to the quality control assessment of data from analytical geochemistry laboratories. The trial involves distributing a sample of established homogeneity to participating laboratories, which are required to analyse the sample using a well-characterized technique or techniques operated under routine analytical conditions. Results are then tabulated by the organisers and a z-score calculated by comparing each analysed result submitted with the consensus value. By examining the magnitude of the z-score, participating laboratories can decide whether the quality of their data is satisfactory in relation to all the other laboratories contributing to the round and choose to take corrective action if this appears justified. This fifth round was conducted in a similar manner to the first four rounds, full details of which were reported by Thompson *et al.* (1996, 1998, 1999, 2000). This report summarises the specific features of the present round, and presents results from participating laboratories, a listing of consensus values and the derived z-scores, together with a discussion of the overall quality of contributed data.

Text continues on page E15

Received 17 Apr 00 — Accepted 15 Jun 00

Table 1.
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	SiO_2	TiO_2	Al_2O_3	Fe_2O_3T	Fe(II)O	MnO	MgO	CaO	Na_2O
E	1	2	XRF, ISE	60.090	0.7600	18.210	6.070	-	0.0900	3.100	5.690	4.170
E	2	2	XRF, ICP-AES, INAA, AAS, other	60.770	0.8560	17.380	6.206	3.790	0.0940	3.186	5.984	4.248
E	3	1	XRF, titrimetry	60.700	0.8440	17.731	6.140	3.650	0.0950	3.173	6.061	4.284
E	4	1	XRF	60.400	0.8450	17.660	6.070	-	0.0980	3.230	6.030	4.130
E	4	2	XRF	-	-	-	-	-	-	-	-	-
E	5	1	XRF	60.260	0.9000	17.480	6.170	-	0.1000	3.190	6.240	4.110
E	6	1	XRF	60.560	0.8790	17.410	6.210	-	0.0880	3.440	6.040	4.160
E	7	1	XRF, ETA-AAS	59.690	0.8450	17.300	6.210	-	0.0930	3.240	5.910	4.120
E	8	1	XRF, AAS, potentiometric	60.600	0.8300	17.670	5.900	4.030	0.1000	3.170	5.960	4.260
E	8	2	XRF, AAS	-	-	-	-	-	-	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	61.500	0.8800	17.000	6.100	3.750	0.0950	3.180	6.100	4.100
E	10	2	XRF	62.030	0.8000	26.840	5.420	-	0.0900	2.090	5.720	4.560
E	11	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	12	2	XRF	63.140	0.7700	16.380	4.860	-	0.0910	1.480	5.900	6.1
E	13	1	XRF	60.260	0.8200	17.720	5.940	-	0.1000	3.200	6.000	4.210
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	60.000	0.8350	17.800	6.000	-	0.0960	3.190	6.050	4.260
E	15	2	XRF, ICP-MS	60.600	0.8600	17.300	6.150	-	0.0900	3.200	6.100	4.100
E	16	2	XRF	60.450	0.8600	17.660	6.130	-	0.0950	3.140	6.020	4.180
E	17	2	XRF, titrimetry	60.590	0.8500	17.510	6.080	3.750	0.0960	3.200	6.020	4.240
E	18	1	ICP-MS, ICP-AES, XRF, AAS	60.620	0.8539	17.740	5.848	-	0.0955	3.170	5.826	4.525
E	19	1	XRF	59.800	0.8600	17.200	6.310	-	0.1000	3.200	6.400	4.500
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	59.700	0.6200	17.000	6.230	-	0.0700	3.830	6.000	4.180
E	21	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	21	2	ICP-MS	-	0.8400	-	-	-	0.0870	-	-	-
E	22	1	XRF, ICP-MS, ES, other	60.670	0.8840	17.580	6.210	-	-	-	6.184	4.210
E	22	2	XRF, DC-AES, AAS, other	-	-	-	-	-	0.0920	3.221	-	-
E	23	1	INAA	-	0.7300	18.400	6.390	-	0.0900	2.440	5.830	4.350
E	24	2	XRF	60.340	0.8600	17.690	6.130	-	0.0900	3.260	5.980	4.140
E	25	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	26	2	XRF	60.050	1.0900	17.850	6.050	-	0.0892	2.430	6.740	4.280
E	27	1	ICP-AES, ICP-MS, XRF, other	59.800	0.8500	17.500	6.020	-	0.0950	3.140	5.990	4.090
E	28	1	INAA	-	-	-	-	-	-	-	-	-
E	28	2	INAA	-	-	-	6.150	-	-	-	6.030	4.150
E	29	1	XRF	61.010	0.8500	17.400	6.180	-	0.1000	3.180	5.920	4.190
E	30	2	XRF, ICP-MS	59.270	0.8700	17.480	6.280	-	0.0900	2.980	6.340	4.670
E	31	1	XRF	59.840	0.8000	18.130	6.050	-	0.0900	3.170	6.070	4.010
E	32	2	XRF, ICP-MS	60.600	0.8400	17.580	6.060	-	0.0900	3.200	6.040	4.250
E	33	2	ICP-AES, ICP-MS	60.430	0.8500	17.520	6.010	-	0.0900	3.120	6.080	4.260
E	34	1	gravimetric	60.100	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	-	0.8300	14.550	4.850	-	0.1760	2.620	7.210	4.400
E	35	1	AAS, ICP-AES, wet chem	60.560	0.8200	17.770	6.130	-	0.1000	3.190	6.530	1.250
E	36	1	ICP-MS, XRF	60.500	0.8300	17.400	6.060	-	0.1000	3.200	5.800	4.200
E	37	2	XRF, ICP-AES	60.860	0.8390	17.220	6.130	3.570	0.0950	3.230	6.120	4.280
E	38	2	ICP-AES, FES, wet chem	60.490	0.8560	17.597	6.170	-	0.0950	3.225	6.102	4.166
E	39	1	XRF, ICP-MS	60.290	0.8400	17.640	6.050	-	0.0900	3.200	6.010	4.280
	40	1	XRF	60.578	0.8291	17.423	6.144	-	0.0946	3.220	5.957	3.980
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	59.700	0.8700	17.900	6.240	-	0.1000	3.290	6.080	4.420
E	42	1	XRF	59.440	0.8600	17.130	6.100	-	0.0900	3.260	6.050	4.230
E	42	2	XRF	-	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	59.850	0.8840	17.610	6.076	-	0.0980	3.270	6.084	4.121
E	44	1	ICP-AES, FAE,	61.200	0.8400	17.250	6.150	-	-	-	-	-
E	44	2	ICP-AES	-	-	-	-	-	0.0980	3.100	5.900	4.100
E	45	1	XRF	60.630	0.8330	17.520	6.090	-	0.0950	3.130	6.050	4.120
E	46	1	XRF	58.760	0.8900	18.140	6.630	-	0.1100	3.280	6.130	4.270
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	59.980	0.8545	17.390	5.990	-	0.09396	3.233	6.128	4.129
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	-	-	-	6.010	-	-	-	-	4.230
E	49	2	XRF, ICP-MS	60.740	0.8800	17.570	6.140	-	0.0950	3.190	6.050	4.210

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	SiO_2	TiO_2	Al_2O_3	Fe_2O_3T	Fe(II)O	MnO	MgO	CaO	Na_2O
E	50	1	XRF, ICP-AES, ICP-MS, other	59.720	0.8500	17.420	6.240	3.710	0.0900	3.190	6.050	4.220
E	50	2	ICP-MS, ICP-AES, AAS	-	-	-	-	-	-	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	59.910	0.8650	17.350	6.300	3.620	0.1000	3.280	6.090	4.000
E	52	1	XRF	59.760	0.8450	17.440	6.180	-	0.0963	3.186	6.012	3.940
E	52	2	XRF	-	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	59.270	0.8500	17.400	6.070	-	0.0930	3.180	6.000	4.190
E	54	2	XRF	58.970	0.8300	17.180	6.060	-	0.0800	3.120	5.840	4.030
E	55	1	XRF	60.048	0.8990	17.131	6.608	-	0.1000	3.368	6.057	4.117
E	56	1	XRF	60.230	0.8510	17.470	6.340	-	0.0960	3.180	6.090	4.160
E	56	2	XRF	-	-	-	-	-	-	-	-	-
E	57	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	58	2	XRF	59.750	0.8400	17.280	6.160	-	0.0900	3.120	6.050	4.140
E	59	2	wet chem	60.280	-	17.890	6.270	3.710	0.0700	3.080	6.050	4.170
E	60	1	ICP-AES, titrimetry	60.480	0.8400	17.630	6.200	3.860	0.1010	3.280	6.030	4.150
E	60	2	ICP-AES, XRF	-	-	-	-	-	-	-	-	-
E	61	1	XRF	61.070	0.8800	17.700	6.110	-	0.0950	3.290	6.210	4.250
E	62	2	ICP-AES, ICP-MS, AAS, other	59.960	0.8300	17.850	6.370	-	0.0800	3.210	6.100	4.140
E	63	1	photometry, AAS	59.600	0.8000	18.500	6.200	3.400	0.1000	3.300	5.950	4.360
E	64	1	XRF	61.120	0.8400	16.510	5.880	-	0.1000	3.200	5.710	4.940
E	65	1	ICP-AES, ICP-MS, XRF	60.600	0.8200	17.240	6.270	3.300	0.0900	3.170	6.240	4.060
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	-	-	-	-	-	-	-	-
E	66	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	60.680	0.8500	17.420	6.140	-	0.0950	3.170	6.160	3.990
E	68	2	XRF	60.700	0.8400	17.370	5.950	-	0.0940	3.120	5.900	3.600
E	69	1	XRF, ET-AAS	60.560	0.8800	18.260	6.440	-	0.0880	2.720	6.120	3.460
E	70	2	XRF	60.730	0.8800	17.470	6.060	-	0.1000	3.180	5.970	4.370
E	71	2	ICP-AES	59.580	0.8200	17.400	6.100	-	0.0900	3.210	6.510	3.250
E	72	1	XRF	60.860	0.8400	17.550	6.020	-	0.1000	3.140	6.050	4.010
				K_2O	P_2O_5	H_2O^+	CO_2T	LOI	Ag	As	Au	B
E	1	2	XRF, ISE	1.190	0.1700	-	-	-	-	-	-	-
E	2	2	XRF, ICP-AES, INAA, AAS, other	1.252	0.1700	-	-	0.010	-	-	-	-
E	3	1	XRF, titrimetry	1.217	0.1700	-	-	-0.050	-	-	-	-
E	4	1	XRF	1.230	0.1740	-	-	-0.030	-	-	-	-
E	4	2	XRF	-	-	-	-	-	-	1.10	-	-
E	5	1	XRF	1.280	0.1800	-	-	-0.040	-	-	-	-
E	6	1	XRF	1.230	0.1800	-	-	-0.100	-	-	-	-
E	7	1	XRF, ETA-AAS	1.220	0.1390	-	-	-0.100	-	-	-	-
E	8	1	XRF, AAS, potentiometric	1.240	0.1700	-	-	-0.120	-	-	-	-
E	8	2	XRF, AAS	-	-	-	-	-	-	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	1.280	0.1700	-	0.110	-0.050	-	0.50	-	-
E	10	2	XRF	1.280	0.1600	-	-	-	-	1.00	-	-
E	11	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	12	2	XRF	1.150	-	-	-	-	-	-	-	-
E	13	1	XRF	1.210	0.1660	-	-	-0.008	-	-	-	-
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	1.250	0.1700	0.285	-	-0.295	-	-	-	-
E	15	2	XRF, ICP-MS	1.220	0.1800	-	-	0.100	-	-	-	-
E	16	2	XRF	1.230	0.1710	-	-	-0.130	-	-	-	-
E	17	2	XRF, titrimetry	1.240	0.1900	-	-	-0.050	-	-	-	-
E	18	1	ICP-MS, ICP-AES, XRF, AAS	1.236	0.1640	0.220	1.041	0.100	-	-	0.03	-
E	19	1	XRF	1.270	0.1700	-	-	-0.170	-	-	-	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	1.290	0.1600	-	-	0.120	-	-	-	-
E	21	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	21	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	1.250	-	-	-	-	-	-	-	-
E	22	2	XRF, DC-AES, AAS, other	-	0.1730	-	-	0.150	0.12	-	-	5.90
E	23	1	INAA	1.290	-	-	-	-	-	-	-	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	K_2O	P_2O_5	H_2O^+	CO_2T	LOI	Ag	As	Au	B
E	24	2	XRF	1.260	0.1800	-	-	-	-	-	-	-
E	25	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	26	2	XRF	1.250	0.1800	-	-	-	-	-	-	-
E	27	1	ICP-AES, ICP-MS, XRF, other	1.230	0.2200	-	-	0.030	-	0.53	-	-
E	28	1	INAA	-	-	-	-	-	-	-	-	-
E	28	2	INAA	1.170	-	-	-	-	-	-	-	-
E	29	1	XRF	1.180	0.1800	-	-	-0.130	-	-	-	-
E	30	2	XRF, ICP-MS	1.260	0.1700	-	-	-0.040	0.43	0.85	0.03	-
E	31	1	XRF	1.210	0.1500	-	-	-	-	-	-	-
E	32	2	XRF, ICP-MS	1.230	0.1800	-	-	-0.040	0.14	0.35	-	-
E	33	2	ICP-AES, ICP-MS	1.210	0.1400	-	-	-	-	-	-	-
E	34	1	gravimetric	-	-	-	-	0.219	-	-	-	-
E	34	2	AAS, ICP-MS	1.130	-	-	-	-	-	-	-	-
E	35	1	AAS, ICP-AES, wet chem	3.900	0.1600	-	-	-	-	-	-	-
E	36	1	ICP-MS, XRF	1.230	0.1800	-	-	0.470	-	-	-	-
E	37	2	XRF, ICP-AES	1.260	0.1800	-	-	-	-	-	-	-
E	38	2	ICP-AES, FES, wet chem	1.253	0.1760	-	-	-	-	-	-	-
E	39	1	XRF, ICP-MS	1.230	0.1600	0.243	0.300	-0.030	-	-	-	-
E	40	1	XRF	1.237	0.1789	-	-	0.145	-	-	-	-
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	1.230	0.1600	-	-	0.500	-	-	-	-
E	42	1	XRF	1.250	0.1750	-	-	-	-	-	-	-
E	42	2	XRF	-	-	-	-	-	-	2.00	-	-
E	43	2	ICP-AES, ICP-MS	1.222	0.1680	-	-	-	-	-	-	-
E	44	1	ICP-AES, FAE,	-	-	-	-	-	-	-	-	-
E	44	2	ICP-AES	1.200	0.1700	-	-	-0.040	-	-	-	-
E	45	1	XRF	1.290	0.1790	0.070	-	-0.070	-	-	-	-
E	46	1	XRF	1.210	-	-	-	-	-	0.90	-	-
E	46	2	XRF	-	0.1100	-	-	0.000	-	-	-	-
E	47	1	ICP-AES	1.356	-	-	-	-	-	-	-	-
E	47	2	ICP-AES	-	0.1650	-	-	-	-	-	-	-
E	48	1	INAA	-	-	-	-	-	0.06	0.57	0.0006	-
E	49	2	XRF, ICP-MS	1.240	0.1780	-	-	0.013	-	10.49	-	-
E	50	1	XRF, ICP-AES, ICP-MS, other	1.270	0.1700	0.120	0.050	-	-	-	-	-
E	50	2	ICP-MS, ICP-AES, AAS	-	-	-	-	-	3.00	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	1.230	0.1600	-	0.200	-	-	29.00	-	-
E	52	1	XRF	1.211	0.1730	-	-	-	-	-	-	-
E	52	2	XRF	-	-	-	-	0.200	-	-	-	-
E	53	2	XRF, ICP-AES	1.200	0.1770	-	-	0.270	-	-	-	-
E	54	2	XRF	1.240	0.1600	-	-	2.760	-	-	-	-
E	55	1	XRF	1.200	0.1580	-	-	-	-	-	-	-
E	56	1	XRF	1.260	0.1750	-	-	-	-	-	-	-
E	56	2	XRF	-	-	-	-	0.000	-	-	-	-
E	57	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	58	2	XRF	1.230	0.1700	-	-	0.770	-	-	-	-
E	59	2	wet chem	1.240	-	0.230	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	1.190	0.1750	-	-	-	-	-	-	-
E	60	2	ICP-AES, XRF	-	-	-	-	-	-	-	-	-
E	61	1	XRF	1.240	0.1770	-	-	0.010	-	-	-	-
E	62	2	ICP-AES, ICP-MS, AAS, other	1.210	0.1700	-	0.070	-0.020	0.05	0.34	-	3.50
E	63	1	photometry, AAS	1.260	0.2000	0.070	0.070	-	-	-	-	-
E	64	1	XRF	1.180	0.1600	-	-	0.010	-	-	-	-
E	65	1	ICP-AES, ICP-MS, XRF	1.150	0.1700	-	-	-	-	-	-	-
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	-	-	-	-	-	0.80	3.00	-
E	66	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	1.140	0.1700	-	-	-	-	-	-	-
E	68	2	XRF	1.190	0.1700	-	-	-	-	-	-	-
E	69	1	XRF, ET-AAS	1.020	0.1550	0.160	-	-	0.044	-	0.002	-
E	70	2	XRF	1.240	0.1800	-	-	-0.080	-	-	-	-
E	71	2	ICP-AES	1.190	0.2700	-	-	0.810	-	-	-	-
E	72	1	XRF	1.240	0.1800	-	-	0.180	-	-	-	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Ba	Be	Bi	Br	Cd	Ce	Cl	Co	Cr
E	1	2	XRF, ISE	-	-	-	-	-	-	-	-	-
E	2	2	XRF, ICP-AES, INAA, AAS, other	302.00	-	-	-	-	25.00	-	20.00	44.00
E	3	1	XRF, titrimetry	327.80	-	-	-	-	29.30	-	-	42.40
E	4	1	XRF	339.50	-	-	-	-	-	-	-	39.10
E	4	2	XRF	-	-	-	-	-	-	-	19.60	-
E	5	1	XRF	329.00	-	-	-	-	-	-	-	41.00
E	6	1	XRF	-	-	-	-	-	-	-	-	-
E	7	1	XRF, ETA-AAS	290.00	-	-	-	0.064	-	-	18.84	46.00
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	-	-	-	-	-	-	-	53.00
E	9	2	ICP-MS, ICP-AES, AAS, other	306.00	1.10	-	-	-	36.00	-	20.00	34.00
E	10	2	XRF	350.00	-	-	-	-	-	-	13.00	42.00
E	11	1	ICP-MS	316.70	1.26	-	-	-	33.70	-	18.80	48.20
E	12	2	XRF	319.00	-	-	-	-	-	-	-	-
E	13	1	XRF	278.00	-	-	-	-	35.00	-	17.00	32.00
E	13	2	XRF	-	-	-	-	-	-	10.00	-	-
E	14	2	ICP-MS, ICP-AES	310.00	-	-	-	-	33.00	-	19.00	33.00
E	15	2	XRF, ICP-MS	318.00	1.21	0.07	-	0.25	36.00	30.00	19.00	35.00
E	16	2	XRF	308.00	-	-	-	-	39.00	-	21.00	52.00
E	17	2	XRF, titrimetry	324.00	-	-	-	-	-	-	23.00	41.00
E	18	1	ICP-MS, ICP-AES, XRF, AAS	314.00	1.00	-	-	-	35.80	69.00	17.60	35.70
E	19	1	XRF	-	-	-	-	-	-	-	-	-
E	19	2	XRF	282.00	-	-	-	-	-	30.00	-	35.00
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	303.00	-	-	-	-	34.90	-	19.40	42.00
E	21	2	ICP-MS	-	-	0.056	-	0.16	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	-	-	-	-	-	29.00	-	-	-
E	22	2	XRF, DC-AES, AAS, other	298.00	1.35	-	-	0.17	-	-	24.00	58.00
E	23	1	INAA	335.00	-	-	-	-	35.10	-	18.10	41.60
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	352.80	-	-	-	-	33.90	-	17.603	-
E	26	2	XRF	-	-	-	-	-	-	-	-	-
E	27	1	ICP-AES, ICP-MS, XRF, other	350.00	1.17	-	-	0.43	34.40	-	18.60	36.50
E	28	1	INAA	-	-	-	-	-	33.78	-	-	-
E	28	2	INAA	360.00	-	-	-	-	-	-	19.30	42.60
E	29	1	XRF	347.00	-	-	-	-	23.00	-	18.00	35.00
E	30	2	XRF, ICP-MS	338.00	1.27	-	-	0.11	34.80	-	18.50	38.00
E	31	1	XRF	-	-	-	-	-	38.00	-	-	41.00
E	32	2	XRF, ICP-MS	356.00	1.05	-	-	0.047	31.50	-	18.00	34.00
E	33	2	ICP-AES, ICP-MS	307.00	-	-	-	-	33.50	-	19.00	-
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	516.00	-	-	-	-	36.10	-	15.05	4.55
E	35	1	AAS, ICP-AES, wet chem	231.00	-	-	-	-	35.38	-	20.98	45.05
E	36	1	ICP-MS, XRF	-	-	-	-	-	-	-	-	40.00
E	37	2	XRF, ICP-AES	320.00	1.20	-	-	-	38.00	-	18.00	39.00
E	38	2	ICP-AES, FES, wet chem	324.60	-	-	-	-	-	-	18.30	40.20
E	39	1	XRF, ICP-MS	330.00	-	0.018	-	-	32.90	-	-	40.00
E	40	1	XRF	348.30	-	-	-	-	-	-	-	39.30
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	290.00	0.80	-	-	-	33.00	-	-	-
E	42	1	XRF	302.00	-	-	-	-	19.00	-	14.00	42.00
E	42	2	XRF	-	-	1.80	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	351.20	1.27	-	-	-	34.30	-	18.35	36.79
E	44	1	ICP-AES, FAE,	328.00	-	-	-	-	34.00	-	-	42.00
E	44	2	ICP-AES	-	1.20	-	-	-	-	-	18.00	-
E	45	1	XRF	350.00	-	-	-	-	-	-	17.00	39.00
E	46	1	XRF	304.00	-	-	-	-	22.00	-	-	48.00
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	311.60	-	-	-	-	-	-	-	-
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	51.40
E	48	1	INAA	319.00	-	-	0.26	-	34.50	-	18.70	39.00
E	49	2	XRF, ICP-MS	318.00	-	1.35	36.61	-	40.90	-	22.26	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Ba	Be	Bi	Br	Cd	Ce	Cl	Co	Cr
E	50	1	XRF, ICP-AES, ICP-MS, other	-	-	-	-	-	34.31	-	-	-
E	50	2	ICP-MS, ICP-AES, AAS	311.00	-	-	-	-	-	-	21.00	43.00
E	51	2	XRF, ICP-AES, ICP-MS	305.00	-	-	-	-	31.90	-	13.00	56.00
E	52	1	XRF	316.00	-	-	-	-	-	-	15.00	42.00
E	52	2	XRF	-	-	-	-	-	21.00	-	-	-
E	53	2	XRF, ICP-AES	322.00	-	-	-	-	32.00	-	19.00	-
E	54	2	XRF	316.80	-	-	-	-	-	-	20.40	34.30
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	319.00	-	-	-	-	-	-	-	38.00
E	56	2	XRF	-	-	-	-	-	34.00	-	-	-
E	57	1	ICP-MS	318.00	-	-	-	-	33.01	-	-	-
E	58	2	XRF	342.00	-	-	-	-	-	-	-	-
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	311.00	-	-	-	-	-	-	-	-
E	60	2	ICP-AES, XRF	-	0.80	3.00	-	-	34.00	201.00	23.00	44.00
E	61	1	XRF	346.00	-	-	-	-	35.00	-	14.00	58.00
E	62	2	ICP-AES, ICP-MS, AAS, other	320.00	-	-	-	0.18	37.10	48.00	18.80	43.60
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	330.00	-	-	-	-	-	-	16.00	39.00
E	65	1	ICP-AES, ICP-MS, XRF	340.00	-	-	-	-	35.00	-	-	-
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	2.00	-	1.90	4.00	-	60.00	21.00	53.00
E	66	1	ICP-MS	325.00	-	0.02	-	-	35.30	-	-	-
E	66	2	ICP-MS	-	-	-	-	-	-	-	18.00	-
E	67	1	ICP-AES	320.00	-	-	-	-	-	-	-	-
E	68	2	XRF	260.00	-	14.00	-	-	54.00	-	21.00	110.00
E	69	1	XRF, ET-AAS	-	4.50	-	-	0.10	-	-	25.00	30.00
E	70	2	XRF	400.00	-	-	-	-	-	-	16.00	34.00
E	71	2	ICP-AES	323.00	1.00	-	-	-	45.90	-	22.00	47.00
E	72	1	XRF	333.00	-	-	-	-	36.00	-	-	36.00

				Cs	Cu	Dy	Er	Eu	F	Ga	Gd	Ge
E	1	2	XRF, ISE	-	-	-	-	-	279.00	-	-	-
E	2	2	XRF, ICP-AES, INAA, AAS, other	-	45.00	2.00	-	-	-	20.70	-	-
E	3	1	XRF, titrimetry	-	31.40	-	-	-	-	-	-	-
E	4	1	XRF	-	27.90	-	-	-	-	20.30	-	-
E	4	2	XRF	-	-	-	-	-	-	-	-	-
E	5	1	XRF	-	37.00	-	-	-	-	22.00	-	-
E	6	1	XRF	-		-	-	-	-	23.00	-	-
E	7	1	XRF, ETA-AAS	-	27.49	-	-	-	-	20.00	-	-
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	35.00	-	-	-	-	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	0.23	27.00	2.96	1.46	1.17	280.00	20.00	3.30	1.00
E	10	2	XRF	-	24.00	-	-	-	-	-	-	-
E	11	1	ICP-MS	0.26	-	2.89	1.44	1.08	-	-	3.34	-
E	12	2	XRF	-	-	-	-	-	-	-	-	-
E	13	1	XRF	-	28.00	-	-	-	-	22.00	-	-
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	0.20	23.00	2.65	1.35	1.10	-	-	3.00	-
E	15	2	XRF, ICP-MS	-	31.00	3.20	1.80	1.20	330.00	20.00	3.90	-
E	16	2	XRF	-	29.00	-	-	-	-	22.00	-	1.10
E	17	2	XRF, titrimetry	-	-	-	-	-	-	20.00	-	-
E	18	1	ICP-MS, ICP-AES, XRF, AAS	0.20	29.00	3.00	1.61	1.16	-	19.70	3.79	1.13
E	19	1	XRF	-	30.00	-	-	-	-	16.00	-	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	0.27	30.60	3.01	1.61	1.15	-	20.30	3.45	-
E	21	2	ICP-MS	-	-	-	-	-	-	-	-	1.12
E	22	1	XRF, ICP-MS, ES, other	-	-	2.23	1.25	0.981	250.00	-	3.01	-
E	22	2	XRF, DC-AES, AAS, other	-	36.00	-	-	-	-	-	-	1.10
E	23	1	INAA	-	-	3.27	-	1.24	-	-	-	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Cs	Cu	Dy	Er	Eu	F	Ga	Gd	Ge
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	0.288	-	2.83	1.49	1.125	-	19.11	3.140	-
E	26	2	XRF	-	-	-	-	-	-	-	-	-
E	27	1	ICP-AES, ICP-MS, XRF, other	-	27.00	-	-	1.31	-	19.70	-	-
E	28	1	INAA	-	-	-	-	1.127	-	-	-	-
E	28	2	INAA	-	-	-	-	-	-	-	-	-
E	29	1	XRF	-	26.00	-	-	-	-	19.00	-	-
E	30	2	XRF, ICP-MS	0.23	34.70	2.76	1.43	1.10	-	21.30	3.46	-
E	31	1	XRF	-	30.00	-	-	-	-	-	-	-
E	32	2	XRF, ICP-MS	0.22	30.00	2.79	1.49	1.12	-	20.00	3.24	1.00
E	33	2	ICP-AES, ICP-MS	0.25	30.00	2.60	1.60	1.20	-	21.00	3.60	-
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	0.26	51.83	3.20	1.45	0.93	-	18.24	3.10	-
E	35	1	AAS, ICP-AES, wet chem	-	28.20	2.86	1.65	1.34	-	-	3.53	-
E	36	1	ICP-MS, XRF	0.25	28.40	-	-	-	-	-	-	-
E	37	2	XRF, ICP-AES	-	34.00	-	1.80	1.18	-	22.00	3.20	-
E	38	2	ICP-AES, FES, wet chem	-	30.20	-	-	-	-	-	-	-
E	39	1	XRF, ICP-MS	0.235	33.40	2.89	1.56	1.16	-	-	3.36	-
E	40	1	XRF	-	34.50	-	-	-	-	-	-	-
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	-	24.00	3.00	1.50	1.20	-	-	3.60	-
E	42	1	XRF	-	30.00	-	-	-	-	18.00	-	-
E	42	2	XRF	7.30	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	-	30.52	2.93	1.53	1.14	-	18.81	3.12	-
E	44	1	ICP-AES, FAE,	-	-	2.85	1.55	1.15	-	-	-	-
E	44	2	ICP-AES	-	30.00	-	-	-	-	-	3.50	-
E	45	1	XRF	-	30.00	-	-	-	-	22.00	-	-
E	46	1	XRF	-	31.00	-	-	-	-	21.00	-	-
E	46	2	XRF	-	-	-	-	-	-	-	-	0.70
E	47	1	ICP-AES	-	-	-	-	-	-	-	-	-
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	0.22	-	-	-	1.19	-	-	-	-
E	49	2	XRF, ICP-MS	12.11	34.40	3.28	1.67	1.36	-	23.20	4.27	-
E	50	1	XRF, ICP-AES, ICP-MS, other	0.25	34.00	2.70	1.40	1.11	-	-	3.37	-
E	50	2	ICP-MS, ICP-AES, AAS	-	-	-	-	-	-	19.83	-	-
E	51	2	XRF, ICP-AES, ICP-MS	-	30.00	2.40	1.10	1.00	300.00	-	3.00	-
E	52	1	XRF	-	-	-	-	-	-	21.00	-	-
E	52	2	XRF	-	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	-	31.00	2.80	1.70	1.10	-	19.00	3.30	-
E	54	2	XRF	-	-	-	-	-	-	19.80	-	-
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	-	29.00	-	-	-	-	23.00	-	-
E	56	2	XRF	-	-	-	-	-	-	-	-	-
E	57	1	ICP-MS	0.23	-	3.08	1.53	1.24	-	-	3.68	-
E	58	2	XRF	-	-	-	-	-	-	-	-	-
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	-	-	-	-	-
E	60	2	ICP-AES, XRF	-	29.00	-	-	-	400.00	22.00	-	-
E	61	1	XRF	-	-	-	-	-	-	21.00	-	-
E	62	2	ICP-AES, ICP-MS, AAS, other	0.88	30.80	2.64	1.45	1.20	320.00	21.40	3.46	0.83
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	-	10.00	-	-	-	-	-	-	-
E	65	1	ICP-AES, ICP-MS, XRF	-	-	2.90	1.60	1.20	-	-	3.30	-
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	27.00	-	-	-	309.00	-	-	-
E	66	1	ICP-MS	0.24	-	2.88	1.53	1.16	-	20.70	3.30	1.30
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	-	-	-	-	-	-	-	-	-
E	68	2	XRF	-	34.00	-	-	-	-	-	-	-
E	69	1	XRF, ET-AAS	-	30.50	-	-	-	-	-	-	-
E	70	2	XRF	-	31.00	-	-	-	-	-	-	-
E	71	2	ICP-AES	-	35.00	-	-	-	-	-	-	-
E	72	1	XRF	-	-	-	-	-	-	20.20	-	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Hf	Hg	Ho	In	La	Li	Lu	Mo	Nb
E	1	2	XRF, ISE	-	-	-	-	-	-	-	-	-
E	2	2	XRF, ICP-AES, INAA, AAS, other	-	-	-	-	13.00	12.00	-	-	7.40
E	3	1	XRF, titrimetry	-	-	-	-	-	-	-	-	8.20
E	4	1	XRF	-	-	-	-	-	-	-	-	9.00
E	4	2	XRF	-	-	-	-	-	-	-	0.60	-
E	5	1	XRF	-	-	-	-	-	-	-	-	11.00
E	6	1	XRF	-	-	-	-	-	-	-	-	8.30
E	7	1	XRF, ETA-AAS	-	-	-	-	-	-	-	-	8.00
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	-	-	-	-	-	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	3.90	-	0.51	0.03	16.90	11.80	0.198	0.90	10.40
E	10	2	XRF	-	-	-	-	-	-	-	-	-
E	11	1	ICP-MS	3.42	-	0.55	-	16.14	-	0.20	0.89	7.77
E	12	2	XRF	-	-	-	-	-	-	-	-	-
E	13	1	XRF	-	-	-	-	14.00	-	-	-	0.00
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	3.50	-	0.55	-	16.10	-	0.19	0.80	7.00
E	15	2	XRF, ICP-MS	4.50	-	0.63	-	17.00	12.00	0.24	1.10	8.50
E	16	2	XRF	2.80	-	-	-	17.00	-	-	2.80	6.00
E	17	2	XRF, titrimetry	-	-	-	-	17.00	-	-	-	9.00
E	18	1	ICP-MS, ICP-AES, XRF, AAS	3.45	-	0.57	-	13.30	-	0.21	1.21	7.65
E	19	1	XRF	-	-	-	-	-	-	-	-	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	4.49	-	0.58	-	16.30	-	0.22	1.24	8.36
E	21	2	ICP-MS	-	-	-	0.025	-	10.10	-	-	-
E	22	1	XRF, ICP-MS, ES, other	3.17	-	0.418	-	14.60	11.00	0.165	-	-
E	22	2	XRF, DC-AES, AAS, other	-	0.019	-	-	-	-	-	1.20	8.00
E	23	1	INAA	3.85	-	-	-	15.70	-	0.21	-	-
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	4.053	-	0.566	-	15.3	-	0.215	0.99	8.431
E	26	2	XRF	-	-	-	-	-	-	-	-	-
E	27	1	ICP-AES, ICP-MS, XRF, other	-	-	-	-	18.80	13.00	-	0.92	10.30
E	28	1	INAA	-	-	0.62	-	15.93	-	0.193	-	-
E	28	2	INAA	3.92	-	-	-	-	-	-	-	-
E	29	1	XRF	-	-	-	-	15.00	-	-	2.00	8.00
E	30	2	XRF, ICP-MS	3.65	-	0.54	-	14.70	11.30	0.20	1.29	9.16
E	31	1	XRF	-	-	-	-	-	-	-	-	7.00
E	32	2	XRF, ICP-MS	4.28	-	0.552	-	13.90	11.60	0.209	0.795	8.16
E	33	2	ICP-AES, ICP-MS	4.00	-	-	-	16.50	12.40	0.20	-	5.00
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	2.78	-	0.66	-	19.35	-	0.21	-	9.33
E	35	1	AAS, ICP-AES, wet chem	-	-	0.88	-	17.55	12.97	0.23	-	-
E	36	1	ICP-MS, XRF	-	-	-	-	-	-	-	-	-
E	37	2	XRF, ICP-AES	-	-	-	-	18.00	11.00	0.22	1.30	9.60
E	38	2	ICP-AES, FES, wet chem	-	-	-	-	-	11.30	-	-	-
E	39	1	XRF, ICP-MS	3.92	-	0.58	-	15.70	-	0.206	-	8.28
E	40	1	XRF	-	-	-	-	-	-	-	-	8.00
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	-	-	0.55	-	17.00	-	0.22	-	-
E	42	1	XRF	3.00	-	-	-	27.00	-	-	2.00	9.00
E	42	2	XRF	-	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	3.60	-	0.61	-	13.58	-	0.21	-	6.82
E	44	1	ICP-AES, FAE,	-	-	-	-	16.50	12.00	-	-	8.20
E	44	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	45	1	XRF	-	-	-	-	-	-	-	-	8.30
E	46	1	XRF	2.00	-	-	-	9.00	-	-	0.70	7.00
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-	-	-	-	-	-	-	-	-
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	3.81	-	-	-	15.90	-	0.23	1.05	-
E	49	2	XRF, ICP-MS	4.35	-	-	-	21.40	-	0.23	-	9.66

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Hf	Hg	Ho	In	La	Li	Lu	Mo	Nb
E	50	1	XRF, ICP-AES, ICP-MS, other	3.67	-	0.59	-	16.56	-	0.20	-	8.05
E	50	2	ICP-MS, ICP-AES, AAS	-	-	-	-	-	13.00	-	1.20	-
E	51	2	XRF, ICP-AES, ICP-MS	3.70	-	0.40	-	15.70	11.00	0.10	-	-
E	52	1	XRF	-	-	-	-	-	-	-	-	8.50
E	52	2	XRF	-	-	-	-	10.00	-	-	-	-
E	53	2	XRF, ICP-AES	5.00	-	-	-	20.00	-	0.30	-	8.00
E	54	2	XRF	-	-	-	-	-	-	-	-	8.10
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	-	-	-	-	-	-	-	-	8.30
E	56	2	XRF	-	-	-	-	18.00	-	-	-	-
E	57	1	ICP-MS	3.61	-	0.60	-	16.64	-	0.21	-	8.09
E	58	2	XRF	-	-	-	-	-	-	-	-	7.00
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	-	-	-	-	-
E	60	2	ICP-AES, XRF	-	-	-	-	17.00	13.00	-	2.00	6.00
E	61	1	XRF	-	-	-	-	16.00	-	-	-	8.00
E	62	2	ICP-AES, ICP-MS, AAS, other	3.76	-	0.53	-	17.10	12.00	0.197	0.85	7.42
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	-	-	-	-	-	-	-	-	11.00
E	65	1	ICP-AES, ICP-MS, XRF	-	-	0.53	-	16.00	-	0.19	-	-
E	65	2	ICP-AES, ICP-MS, XRF, NAA	3.90	-	-	-	-	12.00	-	-	-
E	66	1	ICP-MS	3.59	-	0.56	-	16.60	-	0.20	-	10.30
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	-	-	-	-	-	-	-	-	11.00
E	68	2	XRF	-	-	-	-	10.00	-	-	11.00	16.00
E	69	1	XRF, ET-AAS	-	-	-	-	-	-	-	3.00	-
E	70	2	XRF	-	-	-	-	-	-	-	-	-
E	71	2	ICP-AES	-	-	-	-	-	10.00	-	-	34.00
E	72	1	XRF	-	-	-	-	16.00	-	-	-	8.10

				Nd	Ni	Pb	Pd	Pr	Pt	Rb	S	Sb
E	1	2	XRF, ISE	-	40.00	14.00	-	-	-	16.50	-	-
E	2	2	XRF, ICP-AES, INAA, AAS, other	-	30.00	11.00	-	-	-	17.60	-	-
E	3	1	XRF, titrimetry	-	29.30	9.70	-	-	-	18.50	-	-
E	4	1	XRF	-	-	-	-	-	-	-	27.00	-
E	4	2	XRF	-	35.00	-	-	-	-	17.00	-	-
E	5	1	XRF	-	33.00	12.00	-	-	-	19.00	-	-
E	6	1	XRF	-	33.00	8.49	-	-	-	16.00	-	-
E	7	1	XRF, ETA-AAS	-	-	-	-	-	-	-	-	-
E	8	1	XRF, AAS, potentiometric	-	0.00	-	-	-	-	1.00	-	-
E	8	2	XRF, AAS	17.70	34.00	9.00	-	4.29	-	19.50	-	0.85
E	9	2	ICP-MS, ICP-AES, AAS, other	-	28.00	10.00	-	-	-	-	100.00	-
E	10	2	XRF	17.47	35.90	8.50	-	4.36	-	18.03	-	-
E	11	1	ICP-MS	-	-	-	-	-	-	26.00	-	-
E	12	2	XRF	-	28.00	18.00	-	-	-	17.00	-	-
E	13	1	XRF	-	-	-	-	-	-	-	5.00	-
E	13	2	XRF	16.80	34.00	10.00	-	4.16	-	17.80	-	0.75
E	14	2	ICP-MS, ICP-AES	19.00	27.00	8.90	-	4.60	-	18.00	-	0.60
E	15	2	XRF, ICP-MS	18.00	34.00	-	-	4.00	-	22.00	-	-
E	16	2	XRF	24.00	33.00	-	-	-	-	21.00	-	-
E	17	2	XRF, titrimetry	18.39	36.00	7.84	-	4.37	-	17.40	-	0.66
E	18	1	ICP-MS, ICP-AES, XRF, AAS	-	28.00	6.00	-	-	-	19.00	-	-
E	19	1	XRF	-	-	-	-	-	-	-	-	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	17.80	34.20	9.18	-	4.38	-	18.90	-	-
E	21	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	21	2	ICP-MS	16.10	-	-	-	-	-	16.00	-	-
E	22	1	XRF, ICP-MS, ES, other	-	45.00	9.20	-	3.66	-	-	-	-
E	22	2	XRF, DC-AES, AAS, other	17.50	-	-	-	-	-	26.00	-	0.73
E	23	1	INAA	-	-	-	-	-	-	-	-	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Nd	Ni	Pb	Pd	Pr	Pt	Rb	S	Sb
E	24	2	XRF	16.30	-	9.791	-	4.30	-	19.055	-	-
E	25	2	ICP-MS	-	-	10.21	-	-	-	20.52	-	-
E	26	2	XRF	19.40	33.90	12.30	-	-	-	31.60	-	1.19
E	27	1	ICP-AES, ICP-MS, XRF, other	16.20	-	-	-	-	-	-	-	-
E	28	1	INAA	-	-	-	-	-	-	-	-	0.74
E	28	2	INAA	15.00	26.00	7.00	-	-	-	16.00	-	-
E	29	1	XRF	16.70	33.20	9.92	-	4.05	0.05	17.20	0.00	0.78
E	30	2	XRF, ICP-MS	18.00	34.00	-	-	-	-	19.00	-	-
E	31	1	XRF	15.50	29.00	9.00	-	3.96	-	18.00	-	0.85
E	32	2	XRF, ICP-MS	17.00	34.40	-	-	4.40	-	17.00	-	-
E	33	2	ICP-AES, ICP-MS	-	-	-	-	-	-	-	-	-
E	34	1	gravimetric	25.04	15.10	29.60	-	4.24	-	19.58	-	-
E	34	2	AAS, ICP-MS	19.55	33.68	9.68	-	4.89	-	17.41	-	-
E	35	1	AAS, ICP-AES, wet chem	-	-	-	-	-	-	-	-	0.80
E	36	1	ICP-MS, XRF	16.20	32.00	11.00	-	-	-	19.00	-	-
E	37	2	XRF, ICP-AES	-	35.00	-	-	-	-	-	-	-
E	38	2	ICP-AES, FES, wet chem	17.31	29.20	8.42	-	4.24	-	18.60	-	0.80
E	39	1	XRF, ICP-MS	-	28.40	8.20	-	-	-	15.60	-	-
E	40	1	XRF	18.00	22.00	13.00	-	4.10	-	-	-	-
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	13.00	36.00	8.00	-	6.00	-	19.00	-	-
E	42	1	XRF	-	-	-	-	-	-	-	-	1.40
E	42	2	XRF	16.86	33.47	-	-	3.88	-	16.36	-	-
E	43	2	ICP-AES, ICP-MS	18.00	35.00	-	-	-	-	18.00	-	-
E	44	1	ICP-AES, FAE,	-	-	-	-	-	-	-	-	-
E	44	2	ICP-AES	-	30.00	10.80	-	-	-	18.00	24.00	-
E	45	1	XRF	20.50	26.00	8.00	-	-	-	18.00	-	-
E	46	1	XRF	-	-	-	-	-	-	-	-	-
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-	-	-	-	-	-	-	-	-
E	47	2	ICP-AES	18.40	35.00	-	-	-	-	18.20	-	0.83
E	48	1	INAA	19.20	101.13	10.48	-	4.68	-	22.10	-	-
E	49	2	XRF, ICP-MS	17.65	-	-	-	4.20	-	19.05	-	-
E	50	1	XRF, ICP-AES, ICP-MS, other	-	36.00	9.16	-	-	-	-	-	0.75
E	50	2	ICP-MS, ICP-AES, AAS	15.50	30.00	-	-	3.60	-	19.00	-	-
E	51	2	XRF, ICP-AES, ICP-MS	-	38.00	-	-	-	-	17.60	-	-
E	52	1	XRF	-	-	-	-	-	-	-	-	-
E	52	2	XRF	17.00	33.00	10.00	-	3.90	-	24.00	-	-
E	53	2	XRF, ICP-AES	-	28.90	-	-	-	-	16.50	-	-
E	54	2	XRF	-	-	-	-	-	-	-	-	-
E	55	1	XRF	-	31.00	-	-	-	-	19.00	-	-
E	56	1	XRF	-	-	10.00	-	-	-	-	-	-
E	56	2	XRF	16.04	-	8.45	-	3.91	-	19.90	-	-
E	57	1	ICP-MS	-	-	-	-	-	-	17.00	-	-
E	58	2	XRF	-	-	-	-	-	-	-	-	-
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	15.00	28.00	11.00	-	-	-	15.00	23.00	-
E	60	2	ICP-AES, XRF	-	29.00	9.00	-	-	-	20.00	-	-
E	61	1	XRF	17.90	33.30	9.51	-	4.40	-	20.30	70.00	0.61
E	62	2	ICP-AES, ICP-MS, AAS, other	-	-	-	-	-	-	-	-	-
E	63	1	photometry, AAS	-	26.00	-	-	-	-	22.00	-	-
E	64	1	XRF	18.00	-	-	-	4.30	-	-	-	-
E	65	1	ICP-AES, ICP-MS, XRF	-	26.00	-	-	-	-	21.00	0.01	1.00
E	65	2	ICP-AES, ICP-MS, XRF, NAA	18.40	-	8.70	-	4.40	-	18.40	-	0.79
E	66	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	40.00	45.00	15.00	-	-	-	15.00	-	-
E	68	2	XRF	-	-	3.80	0.036	-	0.10	-	-	-
E	69	1	XRF, ET-AAS	-	38.00	10.00	-	-	-	-	700.00	-
E	70	2	XRF	-	41.00	21.00	-	-	-	-	-	-
E	71	2	ICP-AES	-	27.00	8.50	-	-	-	17.80	-	-
E	72	1	XRF	-	-	-	-	-	-	-	-	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Sc	Se	Sm	Sn	Sr	Ta	Tb	Te	Th
E	1	2	XRF, ISE	-	-	-	-	-	-	-	-	-
E	2	2	XRF, ICP-AES, INAA, AAS, other	12.00	-	-	-	543.00	-	-	-	-
E	3	1	XRF, titrimetry	-	-	-	-	554.00	-	-	-	-
E	4	1	XRF	-	-	-	-	544.20	-	-	-	2.80
E	4	2	XRF	-	-	-	-	-	-	-	-	-
E	5	1	XRF	-	-	-	-	587.00	-	-	-	-
E	6	1	XRF	-	-	-	-	586.00	-	-	-	6.90
E	7	1	XRF, ETA-AAS	16.00	-	-	-	537.00	-	-	-	-
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	-	-	-	533.00	-	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	14.00	-	3.70	1.60	550.00	0.65	0.47	-	2.46
E	10	2	XRF	-	-	-	-	490.00	-	-	-	-
E	11	1	ICP-MS	14.64	-	3.58	-	536.80	0.57	0.52	-	2.42
E	12	2	XRF	-	-	-	-	450.00	-	-	-	-
E	13	1	XRF	-	-	-	-	297.00	-	-	-	-
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	12.70	-	3.66	1.50	535.00	0.56	0.50	-	2.45
E	15	2	XRF, ICP-MS	15.00	-	3.90	1.70	530.00	0.90	0.50	-	2.90
E	16	2	XRF	11.00	-	4.00	-	529.00	7.00	-	1.10	4.30
E	17	2	XRF, titrimetry	-	-	-	-	556.00	-	-	-	-
E	18	1	ICP-MS, ICP-AES, XRF, AAS	14.10	-	3.65	-	539.00	0.50	0.55	-	2.19
E	19	1	XRF	13.00	-	-	-	546.00	-	-	-	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	12.50	-	3.92	-	569.00	0.58	0.52	-	2.78
E	21	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	-	-	3.04	-	584.00	-	0.446	-	2.13
E	22	2	XRF, DC-AES, AAS, other	-	-	-	2.00	-	-	-	-	-
E	23	1	INAA	13.40	-	3.78	-	675.00	0.53	0.51	-	2.47
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	-	-	3.560	2.06	555.68	0.856	0.505	-	2.858
E	26	2	XRF	-	-	-	-	555.80	-	-	-	3.20
E	27	1	ICP-AES, ICP-MS, XRF, other	13.20	-	-	2.12	559.00	-	-	-	2.69
E	28	1	INAA	-	-	3.660	-	-	-	0.54	-	-
E	28	2	INAA	13.50	-	-	-	-	-	-	-	2.64
E	29	1	XRF	15.00	-	-	-	503.00	-	-	-	3.20
E	30	2	XRF, ICP-MS	14.40	0.90	3.51	1.59	539.00	0.86	0.51	-	10.30
E	31	1	XRF	12.00	-	-	-	553.00	-	-	-	-
E	32	2	XRF, ICP-MS	12.00	-	3.29	1.52	548.00	0.547	0.499	-	2.33
E	33	2	ICP-AES, ICP-MS	-	-	3.60	-	527.00	-	0.50	-	-
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	12.75	0.045	4.17	-	551.30	0.15	0.60	-	-
E	35	1	AAS, ICP-AES, wet chem	-	-	3.89	-	506.88	-	0.82	-	-
E	36	1	ICP-MS, XRF	-	1.10	-	-	523.00	-	-	-	3.10
E	37	2	XRF, ICP-AES	-	-	4.10	1.50	551.00	-	-	-	-
E	38	2	ICP-AES, FES, wet chem	-	-	-	-	552.20	-	-	-	-
E	39	1	XRF, ICP-MS	12.40	-	3.68	1.96	554.00	0.60	0.52	-	2.61
E	40	1	XRF	-	-	-	-	536.90	-	-	-	2.10
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	-	-	3.60	-	590.00	-	-	-	-
E	42	1	XRF	17.00	-	3.00	-	540.00	-	-	-	-
E	42	2	XRF	-	-	-	1.00	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	12.82	-	3.77	-	549.70	0.61	0.50	-	2.35
E	44	1	ICP-AES, FAE,	13.00	-	-	-	545.00	-	-	-	2.60
E	44	2	ICP-AES	-	-	3.80	-	-	-	-	-	-
E	45	1	XRF	15.00	-	-	-	557.00	-	-	-	2.60
E	46	1	XRF	-	-	-	1.00	549.00	-	-	-	2.60
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-	-	-	-	557.30	-	-	-	-
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	13.50	-	3.70	-	545.00	0.59	0.49	-	2.55
E	49	2	XRF, ICP-MS	-	28.89	4.11	-	557.00	-	0.59	0.07	-

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Sc	Se	Sm	Sn	Sr	Ta	Tb	Te	Th
E	50	1	XRF, ICP-AES, ICP-MS, other	-	-	3.64	-	569.70	0.61	0.54	-	2.45
E	50	2	ICP-MS, ICP-AES, AAS	13.00	-	-	-	-	-	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	-	-	3.30	-	618.00	-	0.40	-	2.50
E	52	1	XRF	-	-	-	-	558.00	-	-	-	-
E	52	2	XRF	-	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	11.80	-	3.30	-	536.00	-	0.60	-	2.30
E	54	2	XRF	11.20	-	-	-	512.20	-	-	-	-
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	-	-	-	-	544.00	-	-	-	-
E	56	2	XRF	10.00	-	-	-	-	-	-	-	2.00
E	57	1	ICP-MS	15.90	-	3.76	-	559.00	0.57	0.56	-	2.59
E	58	2	XRF	-	-	-	-	511.00	-	-	-	-
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	535.00	-	-	-	-
E	60	2	ICP-AES, XRF	14.00	-	-	-	-	-	-	-	10.00
E	61	1	XRF	17.00	-	-	-	546.00	-	-	-	2.30
E	62	2	ICP-AES, ICP-MS, AAS, other	-	-	3.99	1.40	567.00	0.63	0.458	-	3.49
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	-	-	-	-	519.00	-	-	-	-
E	65	1	ICP-AES, ICP-MS, XRF	-	-	3.80	-	-	-	0.50	-	2.60
E	65	2	ICP-AES, ICP-MS, XRF, NAA	14.00	-	-	-	456.00	2.50	-	-	-
E	66	1	ICP-MS	12.50	-	3.75	-	582.00	-	0.50	-	2.47
E	66	2	ICP-MS	-	-	-	1.50	-	-	-	-	-
E	67	1	ICP-AES	-	-	-	-	556.00	-	-	-	-
E	68	2	XRF	20.00	-	-	72.00	525.00	-	-	-	-
E	69	1	XRF, ET-AAS	14.10	-	-	-	526.00	-	-	-	-
E	70	2	XRF	-	-	-	-	643.00	-	-	-	6.00
E	71	2	ICP-AES	-	-	2.20	-	521.00	-	-	-	-
E	72	1	XRF	-	-	-	-	555.00	-	-	-	-

				Tl	Tm	U	V	W	Y	Yb	Zn	Zr
E	1	2	XRF, ISE	-	-	-	-	-	-	-	-	-
E	2	2	XRF, ICP-AES, INAA, AAS, other	-	-	-	99.00	-	16.80	-	71.00	153.00
E	3	1	XRF, titrimetry	-	-	-	103.70	-	16.00	-	62.70	155.50
E	4	1	XRF	-	-	1.80	99.20	-	16.40	-	61.10	147.60
E	4	2	XRF	-	-	-	-	-	-	-	-	-
E	5	1	XRF	-	-	-	-	-	22.00	-	68.00	132.00
E	6	1	XRF	-	-	-	-	-	18.00	-	68.00	158.00
E	7	1	XRF, ETA-AAS	-	-	-	129.00	-	16.00	-	67.00	143.00
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	-	-	106.00	-	-	-	36.00	-
E	9	2	ICP-MS, ICP-AES, AAS, other	0.07	0.20	0.81	114.00	0.30	15.20	1.31	73.00	136.00
E	10	2	XRF	-	-	-	130.00	-	-	-	67.00	-
E	11	1	ICP-MS	0.13	0.21	0.75	117.20	-	15.93	1.34	-	131.90
E	12	2	XRF	-	-	-	-	-	-	-	-	176.00
E	13	1	XRF	-	-	-	100.00	-	18.00	-	68.00	138.00
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	-	0.21	0.77	112.00	0.87	14.90	1.30	66.00	143.00
E	15	2	XRF, ICP-MS	0.08	0.24	0.88	96.00	0.30	15.00	1.60	67.00	144.00
E	16	2	XRF	0.50	-	-	109.00	8.00	13.00	-	67.00	140.00
E	17	2	XRF, titrimetry	-	-	-	108.00	-	15.00	-	70.00	152.00
E	18	1	ICP-MS, ICP-AES, XRF, AAS	-	0.22	0.78	108.00	-	17.30	1.45	63.10	142.60
E	19	1	XRF	-	-	-	102.00	-	18.00	-	56.00	156.00
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	-	0.23	0.95	114.00	-	15.80	1.49	68.80	147.00
E	21	2	ICP-MS	0.074	-	-	-	-	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	-	0.201	0.715	-	-	-	1.08	-	-
E	22	2	XRF, DC-AES, AAS, other	-	-	-	110.00	0.98	17.00	-	72.00	151.00
E	23	1	INAA	-	-	1.27	108.00	-	-	1.38	-	187.00

Table 1 (continued).
Geo*PT5*. Analytical results for AMH-1 submitted by participating laboratories

Year code	Lab code	Data quality	Techniques	Tl	Tm	U	V	W	Y	Yb	Zn	Zr
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	-	0.224	1.035	-	0.71	15.866	1.490	-	144.24
E	26	2	XRF	-	-	-	-	-	16.72	-	-	157.70
E	27	1	ICP-AES, ICP-MS, XRF, other	0.071	-	0.87	111.00	-	18.00	1.37	69.40	-
E	28	1	INAA	-	-	-	-	-	-	1.330	-	-
E	28	2	INAA	-	-	-	-	-	-	-	-	-
E	29	1	XRF	-	-	-	87.00	-	16.00	-	53.00	139.00
E	30	2	XRF, ICP-MS	0.09	0.21	2.30	108.00	2.59	23.70	1.34	70.30	156.00
E	31	1	XRF	-	-	-	105.00	-	17.00	-	63.00	140.00
E	32	2	XRF, ICP-MS	0.053	0.215	0.848	105.00	2.00	15.00	1.41	62.00	146.00
E	33	2	ICP-AES, ICP-MS	-	0.20	-	105.00	-	14.00	1.40	70.00	141.00
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	-	0.36	-	84.14	-	31.90	1.54	58.32	140.80
E	35	1	AAS, ICP-AES, wet chem	-	0.38	-	114.13	-	17.25	1.40	67.23	-
E	36	1	ICP-MS, XRF	-	-	-	109.00	-	-	-	-	-
E	37	2	XRF, ICP-AES	-	-	-	114.00	-	16.00	1.40	62.00	150.00
E	38	2	ICP-AES, FES, wet chem	-	-	-	114.70	-	-	-	68.90	161.80
E	39	1	XRF, ICP-MS	0.09	0.219	0.83	100.00	-	15.30	1.39	60.60	149.70
E	40	1	XRF	-	-	-	102.10	-	16.20	-	67.90	156.30
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	610.00	0.21	-	-	-	13.00	1.50	74.00	130.00
E	42	1	XRF	-	-	-	104.00	-	15.00	-	61.00	144.00
E	42	2	XRF	-	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	-	-	0.89	62.07	-	15.95	1.40	-	132.60
E	44	1	ICP-AES, FAE,	-	-	-	110.00	-	16.40	1.35	-	-
E	44	2	ICP-AES	-	-	-	-	-	-	-	68.00	142.00
E	45	1	XRF	-	-	-	103.00	-	-	-	61.00	158.00
E	46	1	XRF	0.50	-	-	88.50	-	17.00	3.00	65.00	149.00
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-	-	-	-	-	-	-	-	136.00
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	-	-	0.91	-	0.30	-	1.45	67.00	145.00
E	49	2	XRF, ICP-MS	-	0.24	0.84	121.20	-	25.60	1.49	30.70	150.00
E	50	1	XRF, ICP-AES, ICP-MS, other	-	0.21	0.83	125.00	-	15.00	1.37	80.00	136.41
E	50	2	ICP-MS, ICP-AES, AAS	0.08	-	-	-	0.36	-	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	-	0.20	1.10	102.00	-	21.40	0.80	77.00	109.00
E	52	1	XRF	-	-	-	111.00	-	16.90	-	68.00	154.00
E	52	2	XRF	-	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	-	-	-	103.00	-	16.00	1.30	62.00	154.00
E	54	2	XRF	-	-	-	92.50	-	17.00	-	-	141.30
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	-	-	-	107.00	-	18.00	-	67.00	144.00
E	56	2	XRF	-	-	-	-	-	-	-	-	-
E	57	1	ICP-MS	-	0.22	0.94	-	-	16.43	1.34	-	-
E	58	2	XRF	-	-	-	-	-	12.00	-	-	129.00
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	-	-	-	-	141.00
E	60	2	ICP-AES, XRF	-	-	1.00	111.00	-	15.00	-	64.00	-
E	61	1	XRF	-	-	1.70	106.00	-	10.00	-	62.00	147.00
E	62	2	ICP-AES, ICP-MS, AAS, other	-	0.203	0.85	110.00	0.17	15.10	1.41	75.90	144.00
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	-	-	-	110.00	-	15.00	-	61.00	141.00
E	65	1	ICP-AES, ICP-MS, XRF	-	0.19	0.88	-	-	15.70	1.30	-	-
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	-	-	108.00	-	-	-	78.00	-
E	66	1	ICP-MS	-	0.21	0.85	-	-	15.30	1.37	-	142.00
E	66	2	ICP-MS	0.09	-	-	111.00	-	-	-	70.00	-
E	67	1	ICP-AES	-	-	-	109.00	-	16.00	-	-	148.00
E	68	2	XRF	-	-	-	105.00	10.00	-	-	75.00	163.00
E	69	1	XRF, ET-AAS	-	-	-	110.80	-	19.20	-	70.00	132.40
E	70	2	XRF	-	-	-	-	-	-	-	64.00	-
E	71	2	ICP-AES	-	-	-	90.00	13.00	9.50	-	54.00	-
E	72	1	XRF	-	-	0.00	95.00	-	15.00	-	67.00	156.00

Concentration units. Majors % m/m. Traces $\mu g\ g^{-1}$.

Table 2.
Geo*PT5*. Filtered means used as assigned values

	Number outliers	Fitered mean X_a	A Filtered std dev s	B Target precision H_a	Ratio A/B
SiO_2	-	60.337	0.686	0.651	1.05
TiO_2	-	0.8457	0.0521	0.0173	3.00
Al_2O_3	omit 2	17.530	0.375	0.228	1.64
Fe_2O_3T	-	6.098	0.281	0.093	3.02
Fe(II)O	-	3.678	0.195	0.060	3.22
MnO	omit 1	0.0935	0.0067	0.0027	2.50
MgO	omit 2	3.156	0.179	0.053	3.38
CaO	-	6.064	0.223	0.092	2.41
Na_2O	omit 3	4.208	0.184	0.068	2.71
K_2O	omit 1	1.227	0.047	0.024	1.99
P_2O_5	omit 2	0.1703	0.0106	0.0044	2.38
As	omit 4	0.65	0.24	0.06	4.41
Ba	omit 2	322.3	24.0	10.8	2.22
Be	omit 1	1.19	0.29	0.09	3.09
Ce	omit 1	33.03	4.70	1.56	3.01
Co	-	18.68	2.64	0.96	2.75
Cr	omit 4	40.89	5.83	1.87	3.12
Cs	omit 3	0.24	0.02	0.02	1.01
Cu	omit 3	30.20	3.15	1.45	2.17
Dy	-	2.84	0.29	0.19	1.51
Er	-	1.52	0.15	0.11	1.34
Eu	-	1.16	0.09	0.09	1.03
Ga	-	20.49	1.54	1.04	1.48
Gd	omit 2	3.34	0.22	0.22	0.97
Ge	-	1.03	0.18	0.08	2.16
Hf	-	3.70	0.60	0.24	2.46
Ho	-	0.57	0.09	0.05	1.83
La	omit 1	15.87	2.45	0.84	2.92
Li	-	11.86	0.82	0.65	1.26
Lu	omit 2	0.21	0.02	0.02	0.75
Mo	omit 5	1.21	0.40	0.09	4.27
Nb	omit 2	8.32	1.30	0.48	2.69
Nd	omit 1	17.69	2.21	0.92	2.40
Ni	omit 3	32.36	4.59	1.53	2.99
Pb	omit 4	9.85	1.69	0.56	3.02
Pr	omit 1	4.21	0.30	0.27	1.11
Rb	omit 5	18.31	1.72	0.95	1.82
Sb	omit 1	0.80	0.14	0.07	2.17
Sc	omit 1	13.48	1.61	0.73	2.21
Sm	-	3.68	0.28	0.24	1.17
Sn	omit 1	1.60	0.35	0.12	2.92
Sr	omit 2	545.4	30.5	16.9	1.80
Ta	omit 3	0.64	0.12	0.05	2.27
Tb	omit 1	0.51	0.05	0.05	1.01
Th	omit 4	2.64	0.44	0.18	2.43
Tl	omit 3	0.08	0.02	0.01	2.10
Tm	omit 2	0.21	0.01	0.02	0.62
U	omit 3	0.89	0.12	0.07	1.72
V	-	106.4	10.9	4.2	2.58
Y	omit 1	16.44	2.58	0.86	2.99
Yb	omit 1	1.37	0.14	0.10	1.37
Zn	omit 2	66.90	5.54	2.84	1.95
Zr	-	146.0	11.9	5.5	2.15

Concentration units. Majors % m/m. Traces $\mu g\ g^{-1}$.
Target precision is calculated from a modified version of the Horwitz function and is calculated from = $0.01X_a^{0.8495}$ (for pure geochemistry labs).

Organisation

Steering Committee

M. Thompson (Chair), P.J. Potts (Secretary), J.S. Kane, S. Wilson.

Sample

The sample distributed for Geo*PT5* was AMH-1 (Mount Hood andesite). This sample had been prepared some years ago as a candidate reference material by the US Geological Survey, but never circulated. Approximately 120 bottles were allocated to the Geo*PT5* proficiency testing round and were distributed and analysed as a routine proficiency testing sample. The contributed results have been offered to the US Geological Survey as a preliminary data set for the characterisation of this sample as a reference material.

Timetable for Geo*PT5*

Distribution of sample: March 1999.
Deadline for submission of analytical results:15th June 1999.
Distribution of preliminary report: August 1999.

Analysis of results

Contributed results

Seventy-two laboratories contributed results to the Geo*PT5* round. Elemental concentration data, submitted by these participating laboratories are listed in Table 1.

Analysis of results

In order to provide prompt feedback to participating laboratories, only a partial statistical analysis of contributed data to derive method consensus values was undertaken for this report. Means and standard deviations were calculated from the full data set by sorting results for each element into numeric order. Outliers were then eliminated by visual appraisal of trends in the data. The mean of the resultant data set was then taken as the method consensus value. However, no method consensus was selected for elements with a small number of residual data points, where trends in the data set indicated an absence of a central tendency or where a data set had an excessive high or low concentration tail. The resultant method consensus values (listed in Table 2) were used as the assigned value for elemental compositions [X_a]. The target precision [H_a] was calculated using a modified form of the Horwitz function and laboratories were required to select whether their submitted data was designed to comply with "pure geochemistry" or "applied geochemistry" fitness-for-purpose criteria. For data designated by laboratories to meet the pure geochemistry criterion (data quality designated 1), target precision was calculated from: $H_a = 0.01.X_a^{0.8495}$. For applied geochemistry laboratories (data quality designated 2), target precision was calculated from: $H_a' = 0.02.X_a^{0.8495}$. For each contributed analytical result (X), a z-score was calculated from $z = [X - X_a] / H_a$. Z-scores in the range $-2 < z < 2$ were considered to be satisfactory. For z-score values for any element that fell outside this range, contributing laboratories were advised to examine their procedures to ensure that determinations were not subject to unsuspected analytical bias.

A full z-score assessment was made for the major elements SiO_2, TiO_2, Al_2O_3, Fe_2O_3T, Fe(II)O, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5 and the trace elements As, Ba, Be, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Ga, Gd, Ge, Hf, Ho, La, Li, Lu, Mo, Nb, Nd, Ni, Pb, Pr, Rb, Sb, Sc, Sm, Sn, Sr, Ta, Tb, Th, Tl, Tm, U, V, Y, Yb, Zn, Zr. For other elements, either insufficient data was contributed to the round to derive an assigned value or the contributed data showed a large or significantly skewed distribution from which an estimate of the composition could not be made with sufficient confidence. Data for the oxides/elements H_2O^+, CO_2, LOI, Ag, Au, B, Bi, Br, Cd, Cl, F, Hg, Pd, Pt, S, Se, Te and W fell into this category. Z-score results are listed in Table 3. As outlined above, values falling in the range -2 to +2 are considered satisfactory. Z-score values exceeding this range may indicate unsuspected bias. Laboratories were, therefore, invited to examine their z-score results and take action accordingly.

Contributing laboratories are listed in Table 4. Note that in order to preserve anonymity, there is no correspondence between entries in this table and the order in which laboratory results are listed in Tables 1 and 3.

Participation in future rounds

The benefit from proficiency testing arises from regular participation. All laboratories are invited to register for future rounds of this proficiency testing programme by contacting the Secretary of the Steering Committee.

Text continues on page E26

Table 3.
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	SiO_2	TiO_2	Al_2O_3	Fe_2O_3T	Fe(II)O	MnO	MgO	CaO	Na_2O
E	1	2	XRF, ICP-AES	-0.19	-2.47	1.49	-0.15	-	-0.66	-0.52	-2.02	-0.28
E	2	2	XRF,ICP-AES, INAA, AAS, other	0.33	0.30	-0.33	0.58	0.92	0.09	0.29	-0.43	0.29
E	3	1	XRF, titrimetry	0.56	-0.10	0.88	0.45	-0.47	0.55	0.33	-0.03	1.12
E	4	1	XRF	0.10	-0.04	0.57	-0.30	-	1.67	1.40	-0.37	-1.15
E	4	2	XRF	-	-	-	-	-	-	-	-	-
E	5	1	XRF	-0.12	3.13	-0.22	0.77	-	2.42	0.65	1.91	-1.45
E	6	1	XRF	0.34	1.92	-0.53	1.20	-	-2.07	5.36	-0.26	-0.71
E	7	1	XRF, ETA-AAS	-0.99	-0.04	-1.01	1.20	-	-0.20	1.59	-1.66	-1.30
E	8	1	XRF, AAS, potentiometric	0.40	-0.90	0.61	-2.13	5.82	2.42	0.27	-1.12	0.77
E	8	2	XRF, AAS	-	-	-	-	-	-	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	0.89	0.99	-1.16	0.01	0.59	0.27	0.23	0.20	-0.80
E	10	2	XRF	1.30	-1.32	20.43	-3.65	-	-0.66	-10.04	-1.86	2.60
E	11	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	12	2	XRF	2.15	-2.18	-2.52	-6.66	-	-0.47	-15.78	-0.89	13.95
E	13	1	XRF	-0.12	-1.48	0.83	-1.70	-	2.42	0.84	-0.69	0.03
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	-0.26	-0.31	0.59	-0.53	-	0.46	0.32	-0.07	0.38
E	15	2	XRF, ICP-MS	0.20	0.41	-0.51	0.28	-	-0.66	0.42	0.20	-0.80
E	16	2	XRF	0.09	0.41	0.28	0.17	-	0.27	-0.15	-0.24	-0.21
E	17	2	XRF, titrimetry	0.19	0.12	-0.04	-0.10	0.59	0.46	0.42	-0.24	0.24
E	18	1	ICP-MS, ICP-AES, XRF, AAS	0.43	0.47	0.92	-2.69	-	0.74	0.27	-2.57	4.68
E	19	1	XRF	-0.82	0.83	-1.45	2.28	-	2.42	0.84	3.64	4.31
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-0.49	-6.51	-1.16	0.71	-	-4.40	6.35	-0.35	-0.21
E	21	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	21	2	ICP-MS	-	-0.16	-	-	-	-1.22	-	-	-
E	22	1	XRF, ICP-MS, ES, other	0.51	2.21	0.22	1.20	-	-	-	1.30	0.03
E	22	2	XRF, DC-AES, AAS, other	-	-	-	-	-	-0.29	0.62	-	-
E	23	1	INAA	-	-6.67	3.82	3.14	-	-1.32	-13.48	-2.53	2.09
E	24	2	XRF	0.00	0.41	0.35	0.17	-	-0.66	0.98	-0.45	-0.50
E	25	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	26	2	XRF	-0.22	7.04	0.70	-0.26	-	-0.81	-6.83	3.66	0.53
E	27	1	ICP-AES, ICP-MS, XRF, other	-0.82	0.25	-0.13	-0.84	-	0.55	-0.29	-0.80	-1.74
E	28	1	INAA	-	-	-	-	-	-	-	-	-
E	28	2	INAA	-	-	-	0.28	-	-	-	-0.18	-0.43
E	29	1	XRF	1.03	0.25	-0.57	0.88	-	2.42	0.46	-1.56	-0.27
E	30	2	XRF, ICP-MS	-0.82	0.70	-0.11	0.98	-	-0.66	-1.65	1.49	3.41
E	31	1	XRF	-0.76	-2.63	2.63	-0.52	-	-1.32	0.27	0.07	-2.92
E	32	2	XRF, ICP-MS	0.20	-0.16	0.11	-0.21	-	-0.66	0.42	-0.13	0.31
E	33	2	ICP-AES, ICP-MS	0.07	0.12	-0.02	-0.47	-	-0.66	-0.33	0.09	0.38
E	34	1	gravimetric	-0.36	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	-	-0.45	-6.54	-6.72	-	15.43	-5.04	6.20	1.42
E	35	1	AAS, ICP-AES, wet chem	0.34	-1.48	1.05	0.34	-	2.42	0.65	5.04	-43.6
E	36	1	ICP-MS, XRF	0.25	-0.90	-0.57	-0.41	-	2.42	0.84	-2.85	-0.12
E	37	2	XRF, ICP-AES	0.40	-0.19	-0.68	0.17	-0.90	0.27	0.70	0.30	0.53
E	38	2	ICP-AES, FES, wet chem	0.12	0.30	0.15	0.39	-	0.27	0.65	0.21	-0.31
E	39	1	XRF, ICP-MS	-0.07	-0.33	0.48	-0.52	-	-1.32	0.84	-0.58	1.06
E	40	1	XRF	0.37	-0.96	-0.47	0.49	-	0.40	1.21	-1.16	-3.36
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	-0.49	0.70	0.81	0.76	-	1.21	1.27	0.09	1.56
E	42	1	XRF	-1.38	0.83	-1.76	0.02	-	-1.32	1.97	-0.15	0.32
E	42	2	XRF	-	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	-0.37	1.10	0.17	-0.12	-	0.84	1.08	0.11	-0.64
E	44	1	ICP-AES, FAE,	1.33	-0.33	-1.23	0.56	-	-	-	-	-
E	44	2	ICP-AES	-	-	-	-	-	0.84	-0.52	-0.89	-0.80
E	45	1	XRF	0.45	-0.73	-0.05	-0.09	-	0.55	-0.48	-0.15	-1.30
E	46	1	XRF	-2.42	2.56	2.68	5.72	-	6.16	2.34	0.72	0.91
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-0.55	0.51	-0.62	-1.16	-	0.16	1.46	0.69	-1.17
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	-	-	-	-0.95	-	-	-	-	0.32
E	49	2	XRF, ICP-MS	0.31	0.99	0.09	0.23	-	0.27	0.32	-0.07	0.01

Table 3 (continued).
GeoPT5. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	SiO_2	TiO_2	Al_2O_3	Fe_2O_3T	Fe(II)O	MnO	MgO	CaO	Na_2O
E	50	1	XRF,ICP-AES, ICP-MS, other	-0.95	0.25	-0.48	1.53	0.52	-1.32	0.65	-0.15	0.18
E	50	2	ICP-MS, ICP-AES, AAS	-	-	-	-	-	-	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	-0.33	0.56	-0.40	1.09	-0.48	1.21	1.17	0.14	-1.53
E	52	1	XRF	-0.89	-0.04	-0.40	0.88	-	1.04	0.57	-0.56	-3.95
E	52	2	XRF	-	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	-0.82	0.12	-0.29	-0.15	-	-0.10	0.23	-0.35	-0.13
E	54	2	XRF	-1.05	-0.45	-0.77	-0.21	-	-2.53	-0.33	-1.21	-1.31
E	55	1	XRF	-0.44	3.07	-1.75	5.49	-	2.42	4.00	-0.07	-1.34
E	56	1	XRF	-0.16	0.31	-0.26	2.60	-	0.92	0.46	0.28	-0.71
E	56	2	XRF	-	-	-	-	-	-	-	-	-
E	57	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	58	2	XRF	-0.45	-0.16	-0.55	0.33	-	-0.66	-0.33	-0.07	-0.50
E	59	2	wet chem	-0.04	-	0.79	0.92	0.26	-4.40	-0.71	-0.07	-0.28
E	60	1	ICP-AES, titrimetry	0.22	-0.33	0.44	1.10	3.00	2.79	2.34	-0.37	-0.86
E	60	2	ICP-AES, XRF	-	-	-	-	-	-	-	-	-
E	61	1	XRF	1.13	1.98	0.74	0.13	-	0.55	2.53	1.58	0.62
E	62	2	ICP-AES, ICP-MS, AAS, other	-0.29	-0.45	0.70	1.46	-	-2.53	0.51	0.20	-0.50
E	63	1	photometry, AAS	-1.13	-2.63	4.26	1.10	-4.60	2.42	2.72	-1.23	2.24
E	64	1	XRF	1.20	-0.33	-4.48	-2.35	-	2.42	0.84	-3.83	10.80
E	65	1	ICP-AES, ICP-MS, XRF	0.40	-1.48	-1.27	1.85	-6.26	-1.32	0.27	1.91	-2.18
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	-	-	-	-	-	-	-	-
E	66	1	ICP-MS	-	-	-	-	-	-	-	-	-
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	0.53	0.25	-0.48	0.45	-	0.55	0.27	1.04	-3.22
E	68	2	XRF	0.28	-0.16	-0.35	-0.80	-	0.09	-0.33	-0.89	-4.48
E	69	1	XRF, ET-AAS	0.34	1.98	3.20	3.68	-	-2.07	-8.20	0.61	-11.04
E	70	2	XRF	0.30	0.99	-0.13	-0.21	-	1.21	0.23	-0.51	1.19
E	71	2	ICP-AES	-0.58	-0.74	-0.29	0.01	-	-0.66	0.51	2.41	-7.07
E	72	1	XRF	0.80	-0.33	0.09	-0.84	-	2.42	-0.29	-0.15	-2.92
				K_2O	P_2O_5	As	Ba	Be	Ce	Co	Cr	Cs
E	1	2	XRF, ICP-AES	-0.78	-0.03	-	-	-	-	-	-	-
E	2	2	XRF,ICP-AES, INAA, AAS, other	0.53	-0.03	-	-0.94	-	-2.57	0.69	0.83	-
E	3	1	XRF, titrimetry	-0.42	-0.07	-	0.51	-	-2.39	-	0.81	-
E	4	1	XRF	0.13	0.83	-	1.59	-	-	-	-0.96	-
E	4	2	XRF	-	-	4.07	-	-	-	0.48	-	-
E	5	1	XRF	2.23	2.18	-	0.62	-	-	-	0.06	-
E	6	1	XRF	0.13	2.18	-	-	-	-	-	-	-
E	7	1	XRF, ETA-AAS	-0.29	-7.04	-	-2.99	-	-	0.17	2.73	-
E	8	1	XRF, AAS, potentiometric	0.55	-0.07	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	-	-	-	-	-	-	3.24	-
E	9	2	ICP-MS, ICP-AES, AAS, other	1.12	-0.03	-1.34	-0.75	-0.49	0.95	0.69	-1.84	-0.20
E	10	2	XRF	1.12	-1.16	3.17	1.28	-	-	-2.95	0.30	-
E	11	1	ICP-MS	-	-	-	-0.52	0.74	0.43	0.13	3.91	0.86
E	12	2	XRF	-1.62	-	-	-0.15	-	-	-	-	-
E	13	1	XRF	-0.71	-0.97	-	-4.10	-	1.26	-1.74	-4.75	-
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	0.49	-0.03	-	-0.57	-	-0.01	0.17	-2.11	-0.83
E	15	2	XRF, ICP-MS	-0.14	1.09	-	-0.20	0.10	0.95	0.17	-1.57	-
E	16	2	XRF	0.07	0.08	-	-0.66	-	1.91	1.21	2.97	-
E	17	2	XRF, titrimetry	0.28	2.22	-	0.08	-	-	2.25	0.03	-
E	18	1	ICP-MS, ICP-AES, XRF, AAS	0.38	-1.42	-	-0.77	-2.06	1.77	-1.12	-2.77	-1.67
E	19	1	XRF	1.81	-0.07	-	-	-	-	-	-	-
E	19	2	XRF	-	-	-	-1.87	-	-	-	-1.57	-
E	20	2	XRF	1.33	-1.16	-	-	-	-	-	-	-
E	21	1	ICP-MS	-	-	-	-1.79	-	1.20	0.75	0.59	1.28
E	21	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	0.97	-	-	-	-	-2.58	-	-	-
E	22	2	XRF, DC-AES, AAS, other	-	0.30	-	-1.13	0.85	-	2.77	4.57	-
E	23	1	INAA	2.65	-	-	1.17	-	1.32	-0.60	0.38	-

Table 3 (continued).
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	K_2O	P_2O_5	As	Ba	Be	Ce	Co	Cr	Cs
E	24	2	XRF	0.70	1.09	-	-	-	-	-	-	-
E	25	2	ICP-MS	-	-	-	1.41	-	0.28	-0.56	-	1.02
E	26	2	XRF	0.49	1.09	-	-	-	-	-	-	-
E	27	1	ICP-AES, ICP-MS, XRF, other	0.13	11.18	-2.15	2.56	-0.23	0.88	-0.08	-2.35	-
E	28	1	INAA	-	-	-	-	-	0.48	-	-	-
E	28	2	INAA	-1.20	-	-	1.74	-	-	0.32	0.46	-
E	29	1	XRF	-1.97	2.18	-	2.28	-	-6.43	-0.70	-3.15	-
E	30	2	XRF, ICP-MS	0.70	-0.03	1.82	0.73	0.42	0.57	-0.09	-0.77	-0.20
E	31	1	XRF	-0.71	-4.57	-	-	-	3.18	-	0.06	-
E	32	2	XRF, ICP-MS	0.07	1.09	-2.70	1.56	-0.76	-0.49	-0.35	-1.84	-0.41
E	33	2	ICP-AES, ICP-MS	-0.35	-3.41	-	-0.71	-	0.15	0.17	-	0.22
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	-2.04	-	-	8.96	-	0.98	-1.89	-9.71	0.43
E	35	1	AAS, ICP-AES, wet chem	112.4	-2.32	-	-8.45	-	1.50	2.39	2.22	-
E	36	1	ICP-MS, XRF	0.13	2.18	-	-	-	-	-	-0.48	0.44
E	37	2	XRF, ICP-AES	0.70	1.09	-	-0.11	0.05	1.59	-0.35	-0.51	-
E	38	2	ICP-AES, FES, wet chem	0.55	0.64	-	0.11	-	-	-0.20	-0.18	-
E	39	1	XRF, ICP-MS	0.13	-2.32	-	0.71	-	-0.09	-	-0.48	-0.19
E	40	1	XRF	0.42	1.94	-	2.40	-	-	-	-0.85	-
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	0.07	-1.16	-	-1.50	-2.11	-0.01	-	-	-
E	42	1	XRF	0.97	1.06	-	-1.88	-	-8.99	-4.86	0.59	-
E	42	2	XRF	-	-	12.20	-	-	-	-	-	148.59
E	43	2	ICP-AES, ICP-MS	-0.10	-0.26	-	1.34	0.42	0.41	-0.17	-1.10	-
E	44	1	ICP-AES, FAE,	-	-	-	0.53	-	0.62	-	0.59	-
E	44	2	ICP-AES	-0.57	-0.03	-	-	0.05	-	-0.35	-	-
E	45	1	XRF	2.65	1.96	-	2.56	-	-	-1.74	-1.01	-
E	46	1	XRF	-0.71	-	4.53	-1.70	-	-7.07	-	3.80	-
E	46	2	XRF	-	-6.78	-	-	-	-	-	-	-
E	47	1	ICP-AES	5.43	-	-	-0.99	-	-	-	-	-
E	47	2	ICP-AES	-	-0.60	-	-	-	-	-	2.81	-
E	48	1	INAA	-	-	-1.42	-0.31	-	0.94	0.02	-1.01	-0.82
E	49	2	XRF, ICP-MS	0.28	0.87	88.83	-0.20	-	2.52	1.86	-	249.82
E	50	1	XRF,ICP-AES, ICP-MS, other	1.81	-0.07	-	-	-	0.82	-	-	0.44
E	50	2	ICP-MS, ICP-AES, AAS	-	-	-	-0.52	-	-	1.21	0.56	-
E	51	2	XRF, ICP-AES, ICP-MS	0.07	-1.16	255.92	-0.80	-	-0.36	-2.95	4.04	-
E	52	1	XRF	-0.67	0.61	-	-0.58	-	-	-3.82	0.59	-
E	52	2	XRF	-	-	-	-	-	-3.85	-	-	-
E	53	2	XRF, ICP-AES	-0.57	0.75	-	-0.01	-	-0.33	0.17	-	-
E	54	2	XRF	0.28	-1.16	-	-0.26	-	-	0.90	-1.76	-
E	55	1	XRF	-1.13	-2.77	-	-	-	-	-	-	-
E	56	1	XRF	1.39	1.06	-	-0.31	-	-	-	-1.54	-
E	56	2	XRF	-	-	-	-	-	0.31	-	-	-
E	57	1	ICP-MS	-	-	-	-0.40	-	-0.01	-	-	-0.40
E	58	2	XRF	0.07	-0.03	-	0.91	-	-	-	-	-
E	59	2	wet chem	0.28	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-1.55	1.06	-	-1.05	-	-	-	-	-
E	60	2	ICP-AES, XRF	-	-	-	-	-2.11	0.31	2.25	0.83	-
E	61	1	XRF	0.55	1.51	-	2.19	-	1.26	-4.86	9.14	-
E	62	2	ICP-AES, ICP-MS, AAS, other	-0.35	-0.03	-2.79	-0.11	-	1.30	0.06	0.72	13.48
E	63	1	photometry, AAS	1.39	6.68	-	-	-	-	-	-	-
E	64	1	XRF	-1.97	-2.32	-	0.71	-	-	-2.78	-1.01	-
E	65	1	ICP-AES, ICP-MS, XRF	-3.23	-0.07	-	1.64	-	1.26	-	-	-
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	-	1.36	-	4.36	-	1.21	3.24	-
E	66	1	ICP-MS	-	-	-	0.25	-	1.45	-	-	0.02
E	66	2	ICP-MS	-	-	-	-	-	-	-0.35	-	-
E	67	1	ICP-AES	-3.65	-0.07	-	-0.21	-	-	-	-	-
E	68	2	XRF	-0.78	-0.03	-	-2.88	-	6.72	1.21	18.47	-
E	69	1	XRF, ET-AAS	-8.70	-3.44	-	-	35.65	-	6.57	-5.82	-
E	70	2	XRF	0.28	1.09	-	3.59	-	-	-1.39	-1.84	-
E	71	2	ICP-AES	-0.78	11.21	-	0.03	-1.03	4.12	1.73	1.63	-
E	72	1	XRF	0.55	2.18	-	0.99	-	1.90	-	-2.61	-

Table 3 (continued).
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	Cu	Dy	Er	Eu	Ga	Gd	Ge	Hf	Ho
E	1	2	XRF, ICP-AES	-	-	-	-	-	-	-	-	-
E	2	2	XRF,ICP-AES, INAA, AAS, other	5.11	-2.16	-	-	0.10	-	-	-	-
E	3	1	XRF, titrimetry	0.83	-	-	-	-	-	-	-	-
E	4	1	XRF	-1.59	-	-	-	-0.18	-	-	-	-
E	4	2	XRF	-	-	-	-	-	-	-	-	-
E	5	1	XRF	4.70	-	-	-	1.45	-	-	-	-
E	6	1	XRF	-	-	-	-	2.41	-	-	-	-
E	7	1	XRF, ETA-AAS	-1.88	-	-	-	-0.47	-	-	-	-
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	1.66	-	-	-	-	-	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	-1.11	0.32	-0.27	0.07	-0.23	-0.09	-0.19	0.41	-0.62
E	10	2	XRF	-2.14	-	-	-	-	-	-	-	-
E	11	1	ICP-MS	-	0.27	-0.71	-0.86	-	0.00	-	-1.16	-0.44
E	12	2	XRF	-	-	-	-	-	-	-	-	-
E	13	1	XRF	-1.52	-	-	-	1.45	-	-	-	-
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	-2.49	-0.48	-0.75	-0.32	-	-0.76	-	-0.42	-0.22
E	15	2	XRF, ICP-MS	0.27	0.94	1.22	0.24	-0.23	1.26	-	1.64	0.59
E	16	2	XRF	-0.42	-	-	-	0.73	-	0.42	-1.86	-
E	17	2	XRF, titrimetry	-	-	-	-	-0.23	-	-	-	-
E	18	1	ICP-MS, ICP-AES, XRF, AAS	-0.83	0.84	0.78	0.03	-0.76	2.02	1.20	-1.04	-0.03
E	19	1	XRF	-0.14	-	-	-	-4.31	-	-	-	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	0.27	0.89	0.78	-0.08	-0.18	0.50	-	3.24	0.17
E	21	2	ICP-MS	-	-	-	-	-	-	0.54	-	-
E	22	1	XRF, ICP-MS, ES, other	-	-3.13	-2.37	-1.95	-	-1.48	-	-2.19	-3.09
E	22	2	XRF, DC-AES, AAS, other	2.00	-	-	-	-	-	0.42	-	-
E	23	1	INAA	-	2.23	-	0.91	-	-	-	0.61	-
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	-	-0.02	-0.14	-0.18	-0.66	-0.45	-	0.72	-0.06
E	26	2	XRF	-	-	-	-	-	-	-	-	-
E	27	1	ICP-AES, ICP-MS, XRF, other	-2.22	-	-	1.68	-0.76	-	-	-	-
E	28	1	INAA	-	-	-	-0.34	-	-	-	-	0.97
E	28	2	INAA	-	-	-	-	-	-	-	0.45	-
E	29	1	XRF	-2.91	-	-	-	-1.43	-	-	-	-
E	30	2	XRF, ICP-MS	1.55	-0.20	-0.40	-0.32	0.39	0.27	-	-0.11	-0.32
E	31	1	XRF	-0.14	-	-	-	-	-	-	-	-
E	32	2	XRF, ICP-MS	-0.07	-0.12	-0.14	-0.21	-0.23	-0.22	-0.19	1.19	-0.20
E	33	2	ICP-AES, ICP-MS	-0.07	-0.61	0.35	0.24	0.25	0.58	-	0.61	-
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	7.47	0.94	-0.31	-1.26	-1.08	-0.54	-	-1.90	0.89
E	35	1	AAS, ICP-AES, wet chem	-1.39	0.12	1.13	2.02	-	0.85	-	-	6.20
E	36	1	ICP-MS, XRF	-1.25	-	-	-	-	-	-	-	-
E	37	2	XRF, ICP-AES	1.31	-	1.22	0.12	0.73	-0.31	-	-	-
E	38	2	ICP-AES, FES, wet chem	0.00	-	-	-	-	-	-	-	-
E	39	1	XRF, ICP-MS	2.21	0.27	0.34	0.03	-	0.09	-	0.89	0.17
E	40	1	XRF	2.97	-	-	-	-	-	-	-	-
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	-2.14	0.42	-0.09	0.24	-	0.58	-	-	-0.22
E	42	1	XRF	-0.14	-	-	-	-2.39	-	-	-2.89	-
E	42	2	XRF	-	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	0.11	0.24	0.04	-0.10	-0.81	-0.49	-	-0.21	0.39
E	44	1	ICP-AES, FAE,	-	0.07	0.25	-0.08	-	-	-	-	-
E	44	2	ICP-AES	-0.07	-	-	-	-	0.36	-	-	-
E	45	1	XRF	-0.14	-	-	-	1.45	-	-	-	-
E	46	1	XRF	0.55	-	-	-	0.49	-	-	-7.00	-
E	46	2	XRF	-	-	-	-	-	-	-2.02	-	-
E	47	1	ICP-AES	-	-	-	-	-	-	-	-	-
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	-	-	-	0.36	-	-	-	0.44	-
E	49	2	XRF, ICP-MS	1.45	1.14	0.65	1.12	1.30	2.09	-	1.33	-

Table 3 (continued).
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	Cu	Dy	Er	Eu	Ga	Gd	Ge	Hf	Ho
E	50	1	XRF,ICP-AES, ICP-MS, other	2.62	-0.71	-1.06	-0.52	-	0.14	-	-0.13	0.37
E	50	2	ICP-MS, ICP-AES, AAS	-	-	-	-	-0.32	-	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	-0.07	-1.13	-1.84	-0.87	-	-0.76	-	-0.01	-1.73
E	52	1	XRF	-	-	-	-	0.49	-	-	-	-
E	52	2	XRF	-	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	0.27	-0.10	0.78	-0.32	-0.72	-0.09	-	2.67	-
E	54	2	XRF	-	-	-	-	-0.33	-	-	-	-
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	-0.83	-	-	-	2.41	-	-	-	-
E	56	2	XRF	-	-	-	-	-	-	-	-	-
E	57	1	ICP-MS	-	1.25	0.08	0.91	-	1.53	-	-0.38	0.57
E	58	2	XRF	-	-	-	-	-	-	-	-	-
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	-	-	-	-	-
E	60	2	ICP-AES, XRF	-0.42	-	-	-	0.73	-	-	-	-
E	61	1	XRF	-	-	-	-	0.49	-	-	-	-
E	62	2	ICP-AES, ICP-MS, AAS, other	0.21	-0.51	-0.31	0.24	0.44	0.27	-1.22	0.12	-0.42
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	-13.97	-	-	-	-	-	-	-	-
E	65	1	ICP-AES, ICP-MS, XRF	-	0.32	0.69	0.47	-	-0.18	-	-	-0.84
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-1.11	-	-	-	-	-	-	0.41	-
E	66	1	ICP-MS	-	0.22	0.08	0.03	0.20	-0.18	3.28	-0.46	-0.23
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	-	-	-	-	-	-	-	-	-
E	68	2	XRF	1.31	-	-	-	-	-	-	-	-
E	69	1	XRF, ET-AAS	0.20	-	-	-	-	-	-	-	-
E	70	2	XRF	0.27	-	-	-	-	-	-	-	-
E	71	2	ICP-AES	1.66	-	-	-	-	-	-	-	-
E	72	1	XRF	-	-	-	-	-0.28	-	-	-	-

				La	Li	Lu	Mo	Nb	Nd	Ni	Pb	Pr
E	1	2	XRF, ICP-AES	-	-	-	-	-	-	-	-	-
E	2	2	XRF,ICP-AES, INAA, AAS, other	-1.71	0.11	-	-	-0.95	-	2.49	3.71	-
E	3	1	XRF, titrimetry	-	-	-	-	-0.26	-	-1.54	2.05	-
E	4	1	XRF	-	-	-	-	1.40	-	-2.00	-0.27	-
E	4	2	XRF	-	-	-	-3.24	-	-	-	-	-
E	5	1	XRF	-	-	-	-	5.53	-	1.72	-	-
E	6	1	XRF	-	-	-	-	-0.05	-	0.41	3.84	-
E	7	1	XRF, ETA-AAS	-	-	-	-	-0.67	-	0.41	-2.44	-
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	-	-	-	-	-	-10.55	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	0.61	-0.05	-0.23	-1.64	2.14	0.01	0.53	-0.76	0.15
E	10	2	XRF	-	-	-	-	-	-	-1.42	0.13	-
E	11	1	ICP-MS	0.32	-	-0.37	-3.38	-1.14	-0.24	2.31	-2.42	0.55
E	12	2	XRF	-	-	-	-	-	-	-	-	-
E	13	1	XRF	-2.24	-	-	-	-17.20	-	-2.85	14.59	-
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	0.14	-	-0.42	-2.17	-1.37	-0.48	0.53	0.13	-0.09
E	15	2	XRF, ICP-MS	0.67	0.11	0.76	-0.57	0.18	0.72	-1.75	-0.85	0.72
E	16	2	XRF	0.67	-	-	8.48	-2.40	0.17	0.53	-	-0.39
E	17	2	XRF, titrimetry	0.67	-	-	-	0.70	3.44	0.21	-	-
E	18	1	ICP-MS, ICP-AES, XRF, AAS	-3.07	-	0.10	0.03	-1.39	0.77	2.37	-3.60	0.59
E	19	1	XRF	-	-	-	-	-	-	-2.85	-6.90	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	0.51	-	0.58	0.35	0.07	0.12	1.20	-1.21	0.62
E	21	2	ICP-MS	-	-1.35	-	-	-	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	-1.52	-1.31	-2.03	-	-	-1.73	-	-	-
E	22	2	XRF, DC-AES, AAS, other	-	-	-	-0.04	-0.33	-	4.12	-0.58	-1.02
E	23	1	INAA	-0.21	-	0.10	-	-	-0.20	-	-	-

Table 3 (continued).
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	La	Li	Lu	Mo	Nb	Nd	Ni	Pb	Pr
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	-0.34	-	0.17	-1.16	0.11	-0.76	-	-0.06	0.16
E	26	2	XRF	-	-	-	-	-	-	-	0.32	-
E	27	1	ICP-AES, ICP-MS, XRF, other	3.50	1.74	-	-3.06	4.08	1.87	1.00	4.38	-
E	28	1	INAA	0.07	-	-0.70	-	-	-1.62	-	-	-
E	28	2	INAA	-	-	-	-	-	-	-	-	-
E	29	1	XRF	-1.04	-	-	8.44	-0.67	-2.93	-4.15	-5.11	-
E	30	2	XRF, ICP-MS	-0.70	-0.43	-0.19	0.44	0.86	-0.54	0.27	0.06	-0.30
E	31	1	XRF	-	-	-	-	-2.74	0.34	1.07	-	-
E	32	2	XRF, ICP-MS	-1.18	-0.20	0.03	-2.20	-0.17	-1.19	-1.10	-0.76	-0.46
E	33	2	ICP-AES, ICP-MS	0.37	0.41	-0.19	-	-3.43	-0.37	0.66	-	0.35
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	2.08	-	0.05	-	1.04	4.00	-5.63	17.68	0.05
E	35	1	AAS, ICP-AES, wet chem	2.00	1.70	1.05	-	-	2.03	0.86	-0.31	2.50
E	36	1	ICP-MS, XRF	-	-	-	-	-	-	-	-	-
E	37	2	XRF, ICP-AES	1.27	-0.66	0.29	0.49	1.32	-0.81	-0.12	1.03	-
E	38	2	ICP-AES, FES, wet chem	-	-0.43	-	-	-	-	0.86	-	-
E	39	1	XRF, ICP-MS	-0.21	-	-0.09	-	-0.09	-0.41	-2.06	-2.57	0.11
E	40	1	XRF	-	-	-	-	-0.67	-	-2.58	-2.96	-
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	0.67	-	0.29	-	-	0.17	-3.38	2.82	-0.20
E	42	1	XRF	13.29	-	-	8.44	1.40	-5.10	2.37	-3.32	6.60
E	42	2	XRF	-	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	-1.37	-	0.05	-	-1.55	-0.45	0.36	-	-0.61
E	44	1	ICP-AES, FAE,	0.75	0.21	-	-	-0.26	0.34	1.72	-	-
E	44	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	45	1	XRF	-	-	-	-	-0.05	-	-1.54	1.69	-
E	46	1	XRF	-8.21	-	-	-5.41	-2.74	3.06	-4.15	-3.32	-
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-	-	-	-	-	-	-	-	-
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	0.03	-	1.05	-1.68	-	0.78	1.72	-	-
E	49	2	XRF, ICP-MS	3.30	-	0.53	-	1.38	0.82	22.42	0.56	0.86
E	50	1	XRF,ICP-AES, ICP-MS, other	0.82	-	-0.37	-	-0.57	-0.04	-	-	-0.04
E	50	2	ICP-MS, ICP-AES, AAS	-	0.87	-	-0.04	-	-	1.19	-0.62	-
E	51	2	XRF, ICP-AES, ICP-MS	-0.10	-0.66	-2.56	-	-	-1.19	-0.77	-	-1.13
E	52	1	XRF	-	-	-	-	0.36	-	3.67	-	-
E	52	2	XRF	-3.51	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	2.46	-	2.19	-	-0.33	-0.37	0.21	0.13	-0.57
E	54	2	XRF	-	-	-	-	-0.23	-	-1.13	-	-
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	-	-	-	-	-0.05	-	-0.89	-	-
E	56	2	XRF	1.27	-	-	-	-	-	-	0.13	-
E	57	1	ICP-MS	0.92	-	0.10	-	-0.48	-1.79	-	-2.51	-1.11
E	58	2	XRF	-	-	-	-	-1.37	-	-	-	-
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	-	-	-	-	-
E	60	2	ICP-AES, XRF	0.67	0.87	-	4.22	-2.40	-1.46	-1.42	1.03	-
E	61	1	XRF	0.15	-	-	-	-0.67	-	-2.19	-1.53	-
E	62	2	ICP-AES, ICP-MS, AAS, other	0.73	0.11	-0.26	-1.90	-0.93	0.12	0.31	-0.31	0.35
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	-	-	-	-	5.53	-	-4.15	-	-
E	65	1	ICP-AES, ICP-MS, XRF	0.15	-	-0.85	-	-	0.34	-	-	0.33
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	0.11	-	-	-	-	-2.07	-	-
E	66	1	ICP-MS	0.87	-	-0.37	-	4.08	0.78	-	-2.07	0.70
E	66	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	67	1	ICP-AES	-	-	-	-	5.53	-	-	-	-
E	68	2	XRF	-3.51	-	-	52.16	7.93	12.15	4.12	4.61	-
E	69	1	XRF, ET-AAS	-	-	-	19.09	-	-	-	-10.84	-
E	70	2	XRF	-	-	-	-	-	-	1.84	0.13	-
E	71	2	ICP-AES	-	-1.42	-	-	26.53	-	2.81	9.98	-
E	72	1	XRF	0.15	-	-	-	-0.46	-	-3.50	-2.42	-

Table 3 (continued).
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	Rb	Sb	Sc	Sm	Sn	Sr	Ta	Tb	Th
E	1	2	XRF, ICP-AES	-	-	-	-	-	-	-	-	-
E	2	2	XRF,ICP-AES, INAA, AAS, other	-0.96	-	-1.02	-	-	-0.07	-	-	-
E	3	1	XRF, titrimetry	-0.75	-	-	-	-	0.51	-	-	-
E	4	1	XRF	0.20	-	-	-	-	-0.07	-	-	0.89
E	4	2	XRF	-	-	-	-	-	-	-	-	-
E	5	1	XRF	-1.39	-	-	-	-	2.46	-	-	-
E	6	1	XRF	0.73	-	-	-	-	2.40	-	-	23.38
E	7	1	XRF, ETA-AAS	-2.45	-	3.45	-	-	-0.50	-	-	-
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-9.15	-	-	-	-	-0.37	-	-	-
E	9	2	ICP-MS, ICP-AES, AAS, other	0.63	0.41	0.35	0.03	-0.01	0.14	0.14	-0.48	-0.49
E	10	2	XRF	-	-	-	-	-	-1.64	-	-	-
E	11	1	ICP-MS	-0.30	-	1.59	-0.43	-	-0.51	-1.20	0.15	-1.19
E	12	2	XRF	4.07	-	-	-	-	-2.82	-	-	-
E	13	1	XRF	-1.39	-	-	-	-	-14.70	-	-	-
E	13	2	XRF	-	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	-0.27	-0.35	-0.54	-0.05	-0.43	-0.31	-0.69	-0.14	-0.51
E	15	2	XRF, ICP-MS	-0.17	-1.49	1.04	0.45	0.40	-0.45	2.43	-0.14	0.72
E	16	2	XRF	1.95	-	-1.70	0.65	-	-0.48	58.50	-	4.56
E	17	2	XRF, titrimetry	1.42	-	-	-	-	0.31	-	-	-
E	18	1	ICP-MS, ICP-AES, XRF, AAS	-0.96	-2.06	0.85	-0.14	-	-0.38	-2.49	0.81	-2.45
E	19	1	XRF	0.73	-	-0.66	-	-	0.04	-	-	-
E	19	2	XRF	-	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	0.62	-	-1.35	0.97	-	1.40	-1.01	0.15	0.78
E	21	2	ICP-MS	-	-	-	-	-	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	-2.45	-	-	-2.66	-	2.29	-	-1.48	-2.78
E	22	2	XRF, DC-AES, AAS, other	-	-	-	-	1.66	-	-	-	-
E	23	1	INAA	8.13	-1.00	-0.11	0.40	-	7.67	-1.93	-0.07	-0.92
E	24	2	XRF	-	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	0.39	-	-	-0.26	1.91	0.31	2.03	-0.09	0.61
E	26	2	XRF	1.17	-	-	-	-	0.31	-	-	1.54
E	27	1	ICP-AES, ICP-MS, XRF, other	14.05	5.99	-0.39	-	4.32	0.81	-	-	0.29
E	28	1	INAA	-	-	-	-0.10	-	-	-	0.59	-
E	28	2	INAA	-	-0.42	0.01	-	-	-	-	-	0.01
E	29	1	XRF	-2.45	-	2.08	-	-	-2.51	-	-	3.09
E	30	2	XRF, ICP-MS	-0.59	-0.12	0.63	-0.36	-0.06	-0.19	2.07	-0.03	21.02
E	31	1	XRF	0.73	-	-2.03	-	-	0.45	-	-	-
E	32	2	XRF, ICP-MS	-0.17	0.41	-1.02	-0.81	-0.35	0.08	-0.81	-0.16	-0.84
E	33	2	ICP-AES, ICP-MS	-0.69	-	-	-0.17	-	-0.54	-	-0.14	-
E	34	1	gravimetric	-	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	0.67	-	-0.50	1.00	-	0.18	-4.46	0.96	-
E	35	1	AAS, ICP-AES, wet chem	-0.95	-	-	0.85	-	-2.28	-	6.76	-
E	36	1	ICP-MS, XRF	-	0.07	-	-	-	-1.32	-	-	2.54
E	37	2	XRF, ICP-AES	0.36	-	-	0.86	-0.43	0.17	-	-	-
E	38	2	ICP-AES, FES, wet chem	-	-	-	-	-	0.20	-	-	-
E	39	1	XRF, ICP-MS	0.30	0.07	-1.49	-0.02	2.98	0.51	-0.65	0.15	-0.15
E	40	1	XRF	-2.87	-	-	-	-	-0.50	-	-	-2.95
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	-	-	-	-0.17	-	1.32	-	-	-
E	42	1	XRF	0.73	-	4.82	-2.83	-	-0.32	-	-	-
E	42	2	XRF	-	4.59	-	-	-2.53	-	-	-	-
E	43	2	ICP-AES, ICP-MS	-1.03	-	-0.45	0.18	-	0.13	-0.23	-0.14	-0.79
E	44	1	ICP-AES, FAE,	-0.33	-	-0.66	-	-	-0.02	-	-	-0.20
E	44	2	ICP-AES	-	-	-	0.24	-	-	-	-	-
E	45	1	XRF	-0.33	-	2.08	-	-	0.69	-	-	-0.20
E	46	1	XRF	-0.33	-	-	-	-5.05	0.21	-	-	-0.20
E	46	2	XRF	-	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-	-	-	-	-	0.71	-	-	-
E	47	2	ICP-AES	-	-	-	-	-	-	-	-	-
E	48	1	INAA	-0.12	0.52	0.02	0.07	-	-0.02	-0.83	-0.51	-0.48
E	49	2	XRF, ICP-MS	2.00	-	-	0.88	-	0.34	-	0.85	-

Table 3 (continued).
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	Rb	Sb	Sc	Sm	Sn	Sr	Ta	Tb	Th
E	50	1	XRF,ICP-AES, ICP-MS, other	0.78	-	-	-0.18	-	1.44	-0.46	0.59	-1.03
E	50	2	ICP-MS, ICP-AES, AAS	-	-0.35	-0.33	-	-	-	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	0.36	-	-	-0.79	-	2.15	-	-1.25	-0.38
E	52	1	XRF	-0.75	-	-	-	-	0.75	-	-	-
E	52	2	XRF	-	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	3.01	-	-1.15	-0.79	-	-0.28	-	0.96	-0.92
E	54	2	XRF	-0.96	-	-1.57	-	-	-0.98	-	-	-
E	55	1	XRF	-	-	-	-	-	-	-	-	-
E	56	1	XRF	0.73	-	-	-	-	-0.08	-	-	-
E	56	2	XRF	-	-	-2.39	-	-	-	-	-	-1.75
E	57	1	ICP-MS	1.68	-	3.32	0.31	-	0.81	-1.20	1.03	-0.26
E	58	2	XRF	-0.69	-	-	-	-	-1.02	-	-	-
E	59	2	wet chem	-	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	-	-0.61	-	-	-
E	60	2	ICP-AES, XRF	-1.75	-	0.35	-	-	-	-	-	20.20
E	61	1	XRF	1.79	-	4.82	-	-	0.04	-	-	-1.85
E	62	2	ICP-AES, ICP-MS, AAS, other	1.05	-1.41	-	0.63	-0.85	0.64	-0.05	-0.61	2.34
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-	-
E	64	1	XRF	3.90	-	-	-	-	-1.56	-	-	-
E	65	1	ICP-AES, ICP-MS, XRF	-	-	-	0.48	-	-	-	-0.29	-0.20
E	65	2	ICP-AES, ICP-MS, XRF, NAA	1.42	1.55	0.35	-	-	-2.64	17.14	-	-
E	66	1	ICP-MS	0.09	-0.09	-1.35	0.27	-	2.17	-	-0.29	-0.92
E	66	2	ICP-MS	-	-	-	-	-0.43	-	-	-	-
E	67	1	ICP-AES	-	-	-	-	-	0.63	-	-	-
E	68	2	XRF	-1.75	-	4.47	-	294.64	-0.60	-	-	-
E	69	1	XRF, ET-AAS	-	-	0.85	-	-	-1.15	-	-	-
E	70	2	XRF	-	-	-	-	-	2.89	-	-	9.22
E	71	2	ICP-AES	-	-	-	-3.06	-	-0.72	-	-	-
E	72	1	XRF	-0.54	-	-	-	-	0.57	-	-	-

				Tl	Tm	U	V	Y	Yb	Zn	Zr
E	1	2	XRF, ICP-AES	-	-	-	-	-	-	-	-
E	2	2	XRF,ICP-AES, INAA, AAS, other	-	-	-	-0.88	0.21	-	0.72	0.64
E	3	1	XRF, titrimetry	-	-	-	-0.65	-0.51	-	-1.48	1.73
E	4	1	XRF	-	-	12.54	-1.71	-0.04	-	-2.04	0.29
E	4	2	XRF	-	-	-	-	-	-	-	-
E	5	1	XRF	-	-	-	-	6.45	-	0.39	-2.53
E	6	1	XRF	-	-	-	-	1.81	-	0.39	2.18
E	7	1	XRF, ETA-AAS	-	-	-	5.35	-0.51	-	0.03	-0.54
E	8	1	XRF, AAS, potentiometric	-	-	-	-	-	-	-	-
E	8	2	XRF, AAS	-	-	-	-0.05	-	-	-5.44	-
E	9	2	ICP-MS, ICP-AES, AAS, other	-0.66	-0.30	-0.56	0.90	-0.72	-0.29	1.07	-0.90
E	10	2	XRF	-	-	-	2.80	-	-	0.02	-
E	11	1	ICP-MS	4.90	-0.14	-1.94	2.55	-0.59	-0.29	-	-2.55
E	12	2	XRF	-	-	-	-	-	-	-	2.72
E	13	1	XRF	-	-	-	-1.52	1.81	-	0.39	-1.45
E	13	2	XRF	-	-	-	-	-	-	-	-
E	14	2	ICP-MS, ICP-AES	-	-0.07	-0.83	0.66	-0.89	-0.33	-0.16	-0.27
E	15	2	XRF, ICP-MS	-0.15	0.63	-0.07	-1.24	-0.83	1.10	0.02	-0.18
E	16	2	XRF	21.65	-	-	0.31	-1.99	-	0.02	-0.54
E	17	2	XRF, titrimetry	-	-	-	0.19	-0.83	-	0.54	0.55
E	18	1	ICP-MS, ICP-AES, XRF, AAS	-	0.32	-1.53	0.37	1.00	0.77	-1.34	-0.61
E	19	1	XRF	-	-	-	-1.05	1.81	-	-3.84	1.82
E	19	2	XRF	-	-	-	-	-	-	-	-
E	20	2	XRF	-	-	-	-	-	-	-	-
E	21	1	ICP-MS	-	0.79	0.82	1.80	-0.74	1.15	0.67	0.19
E	21	2	ICP-MS	-0.46	-	-	-	-	-	-	-
E	22	1	XRF, ICP-MS, ES, other	-	-0.56	-2.43	-	-	-2.77	-	-
E	22	2	XRF, DC-AES, AAS, other	-	-	-	0.42	0.33	-	0.90	0.46
E	23	1	INAA	-	-	5.23	0.37	-	0.10	-	7.44

Table 3 (continued).
Geo*PT5*. Z-scores derived from elemental concentration data listed in Table 1

Year code	Lab code	Data quality	Techniques	Tl	Tm	U	V	Y	Yb	Zn	Zr
E	24	2	XRF	-	-	-	-	-	-	-	-
E	25	2	ICP-MS	-	0.25	0.99	-	-0.33	0.57	-	-0.16
E	26	2	XRF	-	-	-	-	0.16	-	-	1.06
E	27	1	ICP-AES, ICP-MS, XRF, other	-1.22	-	-0.29	1.08	1.81	0.00	0.88	-
E	28	1	INAA	-	-	-	-	-	-0.38	-	-
E	28	2	INAA	-	-	-	-	-	-	-	-
E	29	1	XRF	-	-	-	-4.61	-0.51	-	-4.89	-1.27
E	30	2	XRF, ICP-MS	0.37	-0.07	9.72	0.19	4.21	-0.14	0.60	0.91
E	31	1	XRF	-	-	-	-0.34	0.65	-	-1.37	-1.08
E	32	2	XRF, ICP-MS	-1.55	0.04	-0.30	-0.17	-0.83	0.19	-0.86	0.00
E	33	2	ICP-AES, ICP-MS	-	-0.30	-	-0.17	-1.41	0.14	0.54	-0.45
E	34	1	gravimetric	-	-	-	-	-	-	-	-
E	34	2	AAS, ICP-MS	-	3.41	-	-2.64	8.96	0.81	-1.51	-0.47
E	35	1	AAS, ICP-AES, wet chem	-	7.76	-	1.83	0.94	0.29	0.12	-
E	36	1	ICP-MS, XRF	-	-	-	0.61	-	-	-	-
E	37	2	XRF, ICP-AES	-	-	-	0.90	-0.25	0.14	-0.86	0.36
E	38	2	ICP-AES, FES, wet chem	-	-	-	0.98	-	-	0.35	1.43
E	39	1	XRF, ICP-MS	0.75	0.27	-0.84	-1.52	-1.32	0.19	-2.22	0.67
E	40	1	XRF	-	-	-	-1.03	-0.28	-	0.35	1.87
E	41	2	ICP-AES, ICP-MS, XRF, GF-AAS	31650	-0.07	-	-	-1.99	0.62	1.25	-1.45
E	42	1	XRF	-	-	-	-0.58	-1.67	-	-2.08	-0.36
E	42	2	XRF	-	-	-	-	-	-	-	-
E	43	2	ICP-AES, ICP-MS	-	-	-0.01	-5.26	-0.28	0.14	-	-1.21
E	44	1	ICP-AES, FAE,	-	-	-	0.85	-0.04	-0.19	-	-
E	44	2	ICP-AES	-	-	-	-	-	-	0.19	-0.36
E	45	1	XRF	-	-	-	-0.81	-	-	-2.08	2.18
E	46	1	XRF	43.30	-	-	-4.25	0.65	15.60	-0.67	0.55
E	46	2	XRF	-	-	-	-	-	-	-	-
E	47	1	ICP-AES	-	-	-	-	-	-	-	-1.81
E	47	2	ICP-AES	-	-	-	-	-	-	-	-
E	48	1	INAA	-	-	0.26	-	-	0.77	0.03	-0.18
E	49	2	XRF, ICP-MS	-	0.63	-0.35	1.75	5.31	0.57	-6.37	0.36
E	50	1	XRF,ICP-AES, ICP-MS, other	-	-0.14	-0.84	4.40	-1.67	0.00	4.61	-1.74
E	50	2	ICP-MS, ICP-AES, AAS	-0.15	-	-	-	-	-	-	-
E	51	2	XRF, ICP-AES, ICP-MS	-	-0.30	1.44	-0.53	2.88	-2.73	1.78	-3.35
E	52	1	XRF	-	-	-	1.08	0.54	-	0.39	1.45
E	52	2	XRF	-	-	-	-	-	-	-	-
E	53	2	XRF, ICP-AES	-	-	-	-0.41	-0.25	-0.33	-0.86	0.73
E	54	2	XRF	-	-	-	-1.65	0.33	-	-	-0.42
E	55	1	XRF	-	-	-	-	-	-	-	-
E	56	1	XRF	-	-	-	0.14	1.81	-	0.03	-0.36
E	56	2	XRF	-	-	-	-	-	-	-	-
E	57	1	ICP-MS	-	0.32	0.68	-	-0.01	-0.29	-	-
E	58	2	XRF	-	-	-	-	-2.57	-	-	-1.54
E	59	2	wet chem	-	-	-	-	-	-	-	-
E	60	1	ICP-AES, titrimetry	-	-	-	-	-	-	-	-0.90
E	60	2	ICP-AES, XRF	-	-	0.75	0.54	-0.83	-	-0.51	-
E	61	1	XRF	-	-	11.16	-0.10	-7.46	-	-1.72	0.19
E	62	2	ICP-AES, ICP-MS, AAS, other	-	-0.23	-0.28	0.42	-0.78	0.19	1.58	-0.18
E	63	1	photometry, AAS	-	-	-	-	-	-	-	-
E	64	1	XRF	-	-	-	0.85	-1.67	-	-2.08	-0.90
E	65	1	ICP-AES, ICP-MS, XRF	-	-1.07	-0.15	-	-0.86	-0.67	-	-
E	65	2	ICP-AES, ICP-MS, XRF, NAA	-	-	-	0.19	-	-	1.95	-
E	66	1	ICP-MS	-	-0.14	-0.56	-	-1.32	0.00	-	-0.72
E	66	2	ICP-MS	0.37	-	-	0.54	-	-	0.54	-
E	67	1	ICP-AES	-	-	-	0.61	-0.51	-	-	0.37
E	68	2	XRF	-	-	-	-0.17	-	-	1.42	1.54
E	69	1	XRF, ET-AAS	-	-	-	1.04	3.20	-	1.09	-2.46
E	70	2	XRF	-	-	-	-	-	-	-0.51	-
E	71	2	ICP-AES	-	-	-	-1.95	-4.02	-	-2.27	-
E	72	1	XRF	-	-	-12.29	-2.71	-1.67	-	0.03	1.82

Table 4.
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Acknowledgements

The authors are very grateful to Liz Lomas and to John Watson valued assistance with packaging and distributing samples. The program was organised by the International Association of Geoanalysts.

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Appendix 1

Sample collection and preparation

Mount Hood andesite (AMH-1) is a candidate reference material originally prepared some time ago by the US Geological Survey. Approximately 120 glass screw-top bottles each containing approximately 25 g of powder were supplied for the Geo*PT5* proficiency testing round. The contents of each bottle were transferred into plastic sachets and hermetically sealed, following the practice used in previous rounds. Twelve of these sachets were selected at random for homogeneity testing, the remainder were available for distribution. No account was taken of the status of this sample as a candidate reference material as far as the proficiency testing analysis was concerned. However, the US Geological Survey can make use of the analytical results derived from this proficiency testing round as a contribution to the preliminary characterisation of this sample as a new reference material. Although these data have been made available to the USGS without revealing the identity of the source laboratory, laboratories were invited to submit a confidentiality release form to permit the USGS to invite selected laboratories to submit additional data to the reference material characterisation programme, if this is justified.

Homogeneity testing

Homogeneity testing was based on analysis of single test samples taken from each of twelve packets. These samples were analysed in duplicate by WD-XRF at the Open University for the major elements (SiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5, TiO_2, LOI, Ba, Cr, Ni) on glass discs and the trace elements (As, Ba, Co, Cr, Cu, Ga, Mo, Nb, Ni, Pb, Rb, S, Sc, Sr, Th, U, V, Y, Zn, Zr) on powder pellets, following the procedures described in the GeoPT1 report (Thompson *et al.* 1996). Results for twelve major/minor and nineteen trace elements were analysed using standard analysis of variance (ANOVA) procedures, as described in the Geo*PT2* report (Thompson *et al.* 1998).

The power of the ANOVA test depends on the inherent measurement precision with which individual elements are determined and is poorest for those elements whose concentrations approach the method detection limits. For the Geo*PT5* homogeneity data, Pb, Th, U, Mo, As, S all occurred at concentrations in the detection limit range, and Sc occurred at only a slightly higher concentration. Homogeneity conclusions for these elements were not reached because of the poor measurement precision of the test data. Homogeneity was demonstrated most reliably for Sr, Zr, Ba, V, and Zn, all occurring at concentrations › 10 times the detection limit. It was also demonstrated for the trace elements occurring at concentrations between five and ten times the detection limit, Ni, Cu, Rb, Y, Nb, Cr, Co, Ga.

For most of the major/minor elements, no significant differences between packets were detected at the 95% confidence level. However, SiO_2, Fe_2O_3 and MgO showed significant heterogeneities. These heterogeneities amount to 83% or more of the homogeneity test data standard deviations. However, the homogeneity test data standard deviations were small in comparison to the between-laboratory differences of the final PT data set, and therefore the heterogeneity of these three elements does not compromise the conclusions regarding laboratory performance with respect to these elements.

Detailed results of the homogeneity tests are listed in the Table below. The first and second columns giving the probability that the packets are the same is for packets 1-6 and 7-12 respectively, as the software used precludes testing involving more than ten packets (see the Geo*PT2* report for more detail). When one column indicates homogeneity and the other indicates heterogeneity, it is possible to hand-calculate the overall result from intermediate data in the program output. This shows, for example, that the probability for Zn being homogeneous is 0.06, so at the 95% confidence level, the conclusion of homogeneity is accepted. Similarly, Al_2O_3 and K_2O are homogeneous at the 99% and 95% confidence levels, respectively.

Results of ANOVA analysis of homogeneity data

Oxide	Mean	Std. Dev.	Probability	Homogeneous
SiO_2	60.547	0.186	0.00007	0.00033
TiO_2	0.849	0.0061	0.068	0.15
Al_2O_3	17.72	0.043	0.015	0.14
Fe_2O_3	6.044	0.053	‹ 0.00001	0.00003
MnO	0.097	0.0011	0.13	0.34
MgO	3.23	0.045	‹ 0.00001	0.0001
CaO	6.08	0.021	0.14	0.077
Na_2O	4.195	0.023	0.204	0.27
K_2O	1.246	0.011	0.033	0.68
P_2O_5	0.178	0.002	0.46	0.89
Ba	307.9	1.77	0.53	0.73
Cr	37.3	0.62	0.076	0.12
Ni	24.7	2.4	0.33	0.29

Trace elements present at › 10x detection limit - highly reliable				
Sr	544.3	2.03	0.081	0.078
Zr	148.1	1.33	0.067	0.8
Ba	340.1	4.91	0.29	0.18
V	100.5	3.09	0.052	0.4
Zn	62.42	0.94	0.13	0.041
Trace elements present at between 5x and 10x detection limit - moderately reliable				
Ni	30.9	1.17	0.17	0.095
Cu	29.52	0.73	0.27	0.33
Rb	18.76	0.54	0.62	0.74
Y	16.78	0.45	0.49	0.47
Nb	8.77	0.37	0.78	0.28
Cr	39.15	1.34	0.25	0.29
Co	19.17	1.17	0.57	0.22
Ga	19.95	0.66	0.41	0.34
Trace elements present at between 2x and 5x detection limit -low reliability				
Sc	13	1.47	0.48	0.75
Trace elements present at ‹ 2x detection limit - useful interpretation is not possible				
Pb	8.75	1.12	-	-
Th	2.91	1.05	-	-
U	1.7	0.76	-	-
Mo	0.54	0.52	-	-
As	negative	-	-	-
S	28.8	2.48	-	-