

Appendix B:

Whole sample chemical analyses

sample	context	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO (*)	MnO	MgO	CaO	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅	LOI	LOI (*)	Total	S%
LP3-01	50261	42.80	21.09	2.15	1.93	0.04	0.59	3.59	3.73	1.17	0.97	0.23	0.61	0.83	76.96	0.02
LP3-04	50275	38.90	12.60	5.60	5.04	0.11	4.88	31.80	1.49	0.93	0.75	0.12	1.65	2.21	98.84	0.08
LP3-05	50244	56.84	12.02	4.15	3.74	0.10	1.96	8.69	2.77	2.61	0.60	0.22	9.97	10.39	99.95	0.05
LP3-06	50405	60.48	11.14	3.72	3.35	0.11	1.86	6.08	2.49	2.22	0.59	0.19	5.68	6.05	94.55	0.03
LP4-07	60598	35.85	38.56	16.85	15.17	2.08	1.08	2.39	0.15	0.98	1.81	0.26	0.28	1.96	100.29	0.04
LP4-08	60598	53.64	34.38	2.47	2.22	1.56	1.07	2.98	0.26	1.65	1.44	0.04	1.71	1.96	101.19	0.04
LP4-09	60559	49.78	35.54	4.13	3.71	1.52	0.98	1.70	0.13	1.49	1.51	0.04	3.45	3.86	100.26	0.04
LP4-11	60262	51.47	12.87	15.94	14.35	10.27	0.78	2.86	0.28	0.98	2.09	0.17	-1.06	0.53	96.65	0.22
LP4-12	60262	58.30	27.83	5.33	4.80	0.54	0.86	2.60	0.23	1.72	1.27	0.08	0.86	1.40	99.63	0.04
LP4-13	60537	51.78	14.27	11.50	10.35	5.01	2.50	11.53	0.29	1.08	1.54	0.20	-0.96	0.19	98.73	0.10
LP4-14	60263	55.49	28.24	8.20	7.38	2.10	0.73	1.73	0.23	1.62	1.51	0.09	0.19	1.01	100.12	0.03
LP4-18	60344	43.24	28.67	19.04	17.14	0.10	1.09	2.28	0.18	1.87	1.12	0.25	1.66	3.56	99.48	0.08
LP4-19	60344	42.90	29.37	19.52	17.57	0.07	1.26	2.25	0.24	2.25	1.08	0.14	0.95	2.90	100.03	0.11

Table B1. Samples from WP3: Major elements determined by XRF, expressed as wt% oxides except where stated. Columns in grey (*) are alternative calculations with iron expressed as FeII instead of FeIII. LOI = loss on ignition

sample	context	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO (*)	MnO	MgO	CaO	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅	LOI	LOI (*)	Total	S%
GOV1	22061	38.55	12.82	3.28	2.95	1.74	3.14	39.49	0.22	1.03	0.56	0.10	-2.07	-1.74	98.85	1.26
GOV2	22061	37.22	11.94	2.59	2.34	1.31	3.39	41.15	0.23	1.08	0.50	0.14	-0.99	-0.73	98.57	0.70
GOV3	22061	37.46	15.53	0.86	0.78	1.13	8.97	31.59	0.25	1.20	0.41	0.01	-1.85	-1.76	95.57	2.27
GOV4	22061	35.14	14.30	0.66	0.59	0.82	8.18	37.51	0.23	0.64	0.39	0.02	-0.99	-0.92	96.89	1.50
GOV5	23119	32.05	14.46	0.50	0.45	0.57	9.00	38.96	0.12	0.09	0.40	0.01	1.24	1.29	97.40	0.65
GOV6	23119	32.03	15.10	0.44	0.40	0.49	9.64	37.09	0.10	0.06	0.35	0.01	1.84	1.88	97.16	0.60
GOV7	22286	44.49	18.54	5.88	5.29	1.20	0.99	27.91	0.11	0.33	1.05	0.07	-1.14	-0.55	99.44	0.50
GOV8	22286	50.39	17.15	3.58	3.22	2.30	1.06	24.42	0.21	0.56	1.62	0.02	-0.57	-0.21	100.74	0.35
GOV9	22286	10.62	1.71	87.47	78.72	0.23	0.17	0.16	0.09	0.09	0.19	0.46	-2.40	6.35	98.78	0.04
GOV10	22769	11.07	0.76	93.00	83.70	0.29	0.16	0.14	0.11	0.05	0.10	0.68	-6.54	2.76	99.82	0.04
GOV11	22769	24.20	1.37	76.87	69.18	0.45	0.16	0.18	0.09	0.16	0.13	0.89	-6.34	1.35	98.15	0.08
GOV13	23140	0.12	0.16	104.85	94.37	0.08	0.16	0.03	0.12	0.00	0.14	0.18	-7.13	3.36	98.71	0.01
GOV22	22960															
GOV23	22960															
GOV24	22421	45.19	16.73	11.47	10.32	2.07	0.91	20.57	0.18	0.45	1.87	0.06	1.73	2.88	101.22	0.53
GOV28	22067	45.92	11.24	0.61	0.55	0.59	2.80	38.01	0.20	1.18	0.37	0.01	-1.50	-1.44	99.43	0.36
GOV29	23203	51.49	16.66	18.24	16.41	0.13	0.93	7.08	1.37	0.91	0.93	3.04	-0.97	0.85	99.80	0.05
GOV30	22969	49.84	10.98	0.61	0.55	0.57	2.41	34.57	0.18	1.06	0.43	0.01	-0.25	-0.19	100.40	0.46
GOV31	22286	56.68	37.20	2.17	1.95	0.01	0.55	0.32	0.20	1.59	1.25	0.08	0.34	0.56	100.40	0.01
GOV32	22286	63.77	18.60	10.28	9.25	0.09	1.70	0.65	0.67	2.41	1.14	0.20	1.11	2.14	100.61	0.04
GOV33	22363	31.76	19.30	40.98	36.89	0.06	0.90	2.41	0.13	0.92	0.75	0.16	2.95	7.05	100.33	0.15
GOV34	22512	40.90	24.74	28.55	25.70	0.06	0.75	4.80	0.28	1.37	0.90	0.25	-1.36	1.50	101.23	0.05

Table B2 Samples from WP5: Major elements determined by XRF, expressed as wt% oxides except where stated. Columns in grey (*) are alternative calculations with iron expressed as FeII instead of FeIII. LOI = loss on ignition

sample	MnO	Fe ₂ O ₃	TiO ₂	P ₂ O ₅
	wt%	wt%	wt%	wt%
LP3-01	0.02	2.07	0.92	0.15
LP3-04	0.09	5.70	0.81	0.13
LP3-05	0.10	4.77	0.70	0.26
LP3-06	0.10	4.12	0.64	0.20
LP4-07	1.93	17.09	1.90	0.33
LP4-08	1.53	2.99	1.41	0.04
LP4-09	1.63	4.47	1.59	0.04
LP4-11	10.53	14.82	1.97	0.16
LP4-12	0.55	5.66	1.30	0.08
LP4-13	5.05	11.23	1.55	0.19
LP4-14	2.27	8.61	1.51	0.10
LP4-18	0.08	18.85	1.14	0.28
LP4-19	0.05	19.07	1.04	0.14
LP3-01	0.02	2.07	0.92	0.15
LP3-04	0.09	5.70	0.81	0.13

Table B3 Samples from WP3: Major elements determined by ICP-MS expressed as wt% oxides

sample	TiO ₂ wt%	Fe ₂ O ₃ wt%	MnO wt%	P ₂ O ₅ wt%
GOV1	1.69	2.21	0.68	0.10
GOV2	1.33	1.80	0.60	0.14
GOV3	1.29	0.16	0.50	0.00
GOV4	0.88	0.12	0.48	0.01
GOV5	0.61	0.15	0.50	0.00
GOV6	0.53	0.15	0.44	0.00
GOV7	1.30	5.25	1.23	0.06
GOV8	2.59	2.38	1.88	0.01
GOV9	0.25	91.50	0.23	0.50
GOV10	0.33	97.97	0.13	0.68
GOV11	0.51	79.91	0.17	0.96
GOV13	0.07	98.79	0.15	0.14
GOV22	0.08	96.22	0.08	0.41
GOV23	0.15	69.91	0.35	0.59
GOV24	2.39	10.61	2.19	0.05
GOV28	0.62	0.24	0.44	0.00
GOV29	0.15	19.39	1.18	3.49
GOV30	0.61	0.33	0.49	0.00
GOV31	0.01	2.31	1.45	0.07
GOV32	0.11	10.76	1.39	0.19
GOV33	0.07	43.78	0.93	0.17
GOV34	0.07	31.04	1.02	0.25

Table B4. Samples from WP5: Major elements determined by ICP-MS expressed as wt% oxides

sample	Sc ppm	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Ga ppm	Rb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Mo ppm	Sn ppm	Cs ppm	Ba ppm
LP3-01	21.18	124.30	142.56	454.15	326.85	2038.05	70487.92	50.79	44.24	311.44	36.43	215.81	16.12	4.36	687.23	4.41	325.04
LP3-04	22.03	199.07	205.44	119.27	200.60	92.01	212.52	13.76	43.50	541.73	39.95	212.94	13.25	2.88	2.85	5.01	253.73
LP3-05	10.03	75.30	42.94	38.89	43.78	35.95	135.51	17.32	91.36	393.93	20.59	283.37	12.59	0.56	4.16	5.13	697.81
LP3-06	8.86	75.16	41.59	78.22	70.40	65.28	144.58	17.06	84.56	393.93	22.12	252.56	13.51	0.53	7.71	5.02	584.13
LP4-07	53.57	147.55	103.89	153.63	69.26	22.59	69.27	8.32	38.93	735.72	129.53	444.91	19.76	0.87	1.17	3.50	1209.72
LP4-08	34.11	130.04	98.03	25.97	55.17	10.43	54.27	8.30	76.14	292.76	71.17	393.03	25.28	0.38	1.17	9.68	500.83
LP4-09	37.07	129.50	113.49	127.24	28.80	44.01	25.36	9.25	72.56	406.24	76.47	399.21	28.38	0.52	1.03	8.91	529.66
LP4-11	14.20	302.89	148.82	83.74	351.95	45.29	99.96	13.88	41.61	123.39	32.31	199.51	44.39	0.58	3.42	4.49	359.96
LP4-12	24.05	150.50	158.80	229.67	186.92	172.77	111.35	17.53	88.82	229.91	35.78	250.22	18.21	1.05	1.90	12.05	578.71
LP4-13	16.59	312.20	137.33	127.35	47.34	35.26	159.65	12.46	36.82	266.10	36.19	208.42	29.25	4.04	5.74	2.44	419.03
LP4-14	23.74	144.41	137.53	200.95	105.06	26.03	71.68	10.90	85.63	181.17	42.21	264.72	20.36	0.74	2.83	11.92	481.60
LP4-18	49.30	423.10	158.03	208.91	494.17	110.74	49.92	9.21	89.72	478.72	124.76	296.28	25.27	4.15	2.79	11.34	693.46
LP4-19	47.96	492.28	190.91	425.08	1052.10	151.08	14.82	7.39	104.54	378.37	119.74	275.90	22.43	15.75	0.60	15.07	625.75

Table B5. Samples from WP3: Trace elements determined by ICP-MS in ppm

sample	Sc ppm	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Ga ppm	Rb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Mo ppm	Sn ppm	Cs ppm	Ba ppm
GOV1	19.66	83.21	26.44	0.85	3.74	4.51	17.33	3.04	42.95	650.19	50.76	164.62	6.37	0.62	1.10	2.38	763.74
GOV2	19.65	82.94	28.77	1.11	11.09	1.89	36.19	3.08	44.25	615.48	46.38	155.89	5.25	0.54	0.94	2.08	750.54
GOV3	20.13	9.66	5.70	0.78	1.37	1.30	17.44	2.60	32.31	779.29	68.47	211.39	1.18	0.53	0.29	0.58	1532.26
GOV4	17.83	9.52	6.02	1.13	6.26	3.35	29.80	2.30	15.37	792.28	64.15	213.62	1.20	0.66	0.61	0.30	1307.90
GOV5	17.96	7.14	5.87	0.83	7.63	1.02	15.21	1.98	1.16	826.08	63.00	223.77	1.14	0.56	0.82	0.03	1007.70
GOV6	18.98	7.05	5.63	0.90	5.90	7.18	14.14	1.93	1.01	826.45	66.46	210.77	0.90	0.58	0.58	-0.02	1031.76
GOV7	20.89	35.72	23.09	2.37	10.41	21.26	18.46	3.39	11.48	575.96	52.40	329.26	7.31	0.74	2.11	0.71	483.23
GOV8	18.96	48.96	28.95	2.63	28.28	7.14	35.39	3.14	18.72	512.52	45.17	261.03	13.29	0.86	1.08	1.27	445.33
GOV9	1.56	77.56	66.14	35.40	67.85	51.36	133.07	17.91	3.43	26.46	3.23	135.80	4.18	3.36	4.96	0.20	72.97
GOV10	0.89	53.89	38.45	35.24	51.19	70.65	103.48	13.05	1.72	17.69	1.98	114.12	3.21	5.44	5.79	0.05	59.22
GOV11	1.32	67.02	35.85	21.41	38.46	77.33	93.88	13.31	5.30	27.56	3.90	136.14	4.73	3.24	6.66	0.28	90.34
GOV13	0.68	25.17	48.64	68.12	641.95	97.02	112.62	13.53	0.50	16.39	0.98	88.64	1.35	2.74	3.62	0.02	44.85
GOV22	2.68	49.84	21.48	128.36	166.04	120.06	99.97	16.83	1.83	74.44	7.06	93.12	2.36	6.63	4.73	0.07	109.62
GOV23	30.47	379.47	88.65	93.13	167.85	107.40	89.35	23.02	13.90	873.93	75.75	178.22	11.42	6.05	4.47	0.73	894.70
GOV24	20.88	99.87	102.74	9.65	131.29	14.78	26.39	3.52	16.73	501.43	47.97	310.98	23.37	1.66	1.41	1.01	406.58
GOV28	17.83	18.43	22.93	1.05	105.71	0.61	17.50	1.87	50.26	657.65	46.82	178.64	1.28	0.57	0.17	2.25	816.57
GOV29	58.23	641.73	206.68	206.59	801.54	452.81	9377.63	902.95	51.42	1627.71	204.94	424.33	48.92	11.21	3.15	5.66	659.75
GOV30	16.22	22.80	19.33	1.10	14.27	2.31	37.65	1.85	45.65	646.46	38.95	186.04	1.70	0.61	0.60	2.29	839.30
GOV31	30.42	290.09	213.09	13.85	78.93	69.46	132.08	59.54	90.56	175.11	35.59	211.26	19.89	0.84	7.14	9.90	458.56
GOV32	16.30	135.82	144.17	27.94	107.98	31.69	137.32	25.51	93.95	122.14	29.85	314.77	16.84	1.07	3.47	5.08	513.76
GOV33	37.02	343.26	150.18	94.99	275.11	66.32	74.39	24.59	46.04	265.10	85.91	259.31	16.79	3.82	5.12	3.42	465.52
GOV34	39.15	354.46	159.45	127.36	280.16	94.65	65.60	26.58	61.71	422.79	80.04	275.69	17.76	3.79	3.57	5.04	591.32

Table B6. Samples from WP5: Trace elements determined by ICP-MS in ppm

sample	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Hf ppm	Ta ppm	Pb ppm	Th ppm	U ppm
LP3-01	60.43	107.86	12.70	43.21	7.41	1.78	7.05	1.02	6.21	1.21	3.59	0.56	3.55	0.56	6.30	1.38	6761.45	14.06	5.17
LP3-04	51.17	93.45	11.84	41.63	7.68	1.73	6.91	1.00	6.10	1.17	3.48	0.53	3.30	0.52	5.39	1.02	16.73	9.42	5.45
LP3-05	36.41	71.40	8.41	28.88	5.27	1.24	4.59	0.62	3.59	0.65	1.90	0.30	1.82	0.30	7.23	1.15	34.12	14.74	3.73
LP3-06	38.83	76.45	9.23	31.76	5.82	1.26	4.99	0.69	3.94	0.70	2.00	0.31	1.88	0.30	6.29	1.23	48.74	11.03	2.97
LP4-07	150.10	301.47	35.56	124.04	23.79	5.31	21.87	3.18	19.29	3.70	11.28	1.74	10.74	1.72	11.83	2.10	6.20	27.01	8.86
LP4-08	79.53	162.62	19.58	68.55	13.41	3.02	12.19	1.82	11.42	2.13	6.46	1.03	6.50	1.02	9.94	2.53	4.92	21.54	7.43
LP4-09	87.81	182.06	21.94	76.36	14.82	3.33	13.68	2.04	12.60	2.32	7.12	1.13	7.03	1.12	10.28	2.63	4.47	23.21	7.27
LP4-11	36.02	67.98	8.50	30.72	6.17	1.43	5.76	0.84	5.05	0.96	2.84	0.44	2.80	0.43	5.21	4.38	12.86	8.52	4.25
LP4-12	55.44	104.81	12.60	43.27	8.01	1.69	6.94	1.00	6.10	1.16	3.41	0.53	3.45	0.55	7.20	1.65	15.45	16.10	4.80
LP4-13	45.66	84.28	10.87	38.81	7.24	1.66	6.36	0.89	5.33	1.01	3.06	0.45	2.93	0.47	5.33	2.85	24.07	8.67	5.46
LP4-14	56.48	107.17	12.74	44.68	8.56	1.81	7.56	1.10	6.83	1.31	3.88	0.61	3.94	0.62	7.27	2.12	7.30	16.43	5.39
LP4-18	128.91	253.61	31.23	117.75	23.92	5.41	21.59	3.01	17.63	3.40	10.05	1.50	9.39	1.48	7.70	1.61	6.56	20.18	10.02
LP4-19	114.06	221.76	27.33	99.24	19.22	4.38	18.04	2.72	16.46	3.33	9.97	1.53	9.56	1.53	7.58	1.58	4.82	20.31	11.93

Table B7. Samples from WP3: Trace elements determined by ICP-MS in ppm (continued)

sample	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Hf ppm	Ta ppm	Pb ppm	Th ppm	U ppm
GOV1	63.38	110.14	14.26	54.22	11.67	3.12	10.99	1.49	8.16	1.47	4.23	0.63	3.84	0.59	4.39	0.67	2.26	7.93	6.55
GOV2	55.93	95.04	12.24	45.51	9.68	2.58	8.99	1.27	7.13	1.31	3.82	0.56	3.46	0.53	3.85	0.55	2.49	7.25	6.11
GOV3	71.20	132.73	17.33	66.15	13.24	3.31	12.95	1.83	10.18	1.87	5.30	0.77	4.53	0.72	5.31	0.20	1.71	9.87	4.55
GOV4	65.33	119.71	15.71	59.70	11.93	2.92	11.54	1.64	9.20	1.69	4.82	0.70	4.23	0.65	5.18	0.18	2.31	8.95	4.17
GOV5	65.48	117.67	15.31	57.74	11.50	2.82	11.23	1.60	9.00	1.65	4.69	0.68	4.08	0.63	5.56	0.20	1.96	8.56	4.35
GOV6	67.74	122.25	16.00	60.48	12.24	3.07	11.83	1.69	9.50	1.74	4.92	0.71	4.27	0.66	5.25	0.16	1.78	8.65	4.33
GOV7	65.40	119.30	15.08	55.07	10.93	3.01	9.91	1.42	8.00	1.50	4.42	0.66	4.07	0.64	7.87	1.25	2.71	13.47	8.42
GOV8	63.51	115.89	14.37	53.05	10.58	2.98	9.54	1.33	7.49	1.38	4.11	0.62	3.76	0.58	6.42	2.89	1.95	12.10	7.64
GOV9	4.90	9.25	1.06	3.70	0.68	0.14	0.58	0.09	0.53	0.10	0.30	0.05	0.31	0.05	3.59	0.28	19.64	1.06	0.36
GOV10	3.02	5.91	0.64	2.28	0.41	0.09	0.36	0.05	0.34	0.06	0.20	0.03	0.18	0.03	2.91	0.22	6.02	0.66	0.20
GOV11	5.67	10.89	1.22	4.34	0.78	0.17	0.66	0.10	0.61	0.12	0.36	0.05	0.36	0.06	3.35	0.34	15.28	1.30	0.41
GOV13	1.50	2.89	0.30	1.04	0.18	0.04	0.15	0.02	0.15	0.03	0.09	0.01	0.08	0.01	2.21	0.09	4.03	0.28	0.08
GOV22	6.24	12.73	1.54	5.79	1.14	0.28	1.05	0.16	0.98	0.20	0.64	0.10	0.61	0.09	2.31	0.13	8.40	0.81	0.63
GOV23	72.22	143.34	17.83	66.54	12.91	3.04	11.72	1.70	10.21	2.02	6.27	0.97	6.27	0.99	4.25	0.52	17.58	6.73	6.32
GOV24	58.81	108.09	13.40	49.31	9.81	2.63	8.76	1.24	7.18	1.34	4.01	0.59	3.69	0.58	7.07	3.94	2.94	12.09	7.31
GOV28	59.23	102.43	12.95	48.99	10.43	2.82	9.09	1.24	7.04	1.31	3.89	0.59	3.70	0.57	4.27	0.18	1.66	7.69	9.39
GOV29	249.37	454.60	55.27	205.14	35.05	7.30	31.28	4.63	28.20	5.43	16.54	2.45	15.28	2.38	9.71	2.69	144.77	20.01	17.90
GOV30	60.24	98.31	12.13	45.27	9.42	2.52	8.03	1.11	6.32	1.14	3.42	0.50	3.17	0.50	4.53	0.23	1.89	7.78	10.36
GOV31	70.43	127.85	15.17	52.07	9.43	2.10	7.73	1.09	6.48	1.20	3.55	0.54	3.45	0.52	5.62	1.37	92.62	19.02	6.54
GOV32	45.56	89.89	10.65	38.13	7.08	1.68	6.25	0.88	5.19	0.95	2.81	0.43	2.71	0.42	7.42	1.39	25.71	10.41	3.04
GOV33	70.73	135.40	16.50	60.77	11.67	2.91	11.20	1.72	11.28	2.33	7.51	1.16	7.71	1.23	6.39	1.03	6.84	13.01	7.41
GOV34	93.26	176.99	21.57	79.05	14.38	3.46	12.69	1.83	11.03	2.21	6.99	1.06	6.84	1.04	7.00	1.09	14.29	15.57	7.90

Table B8. Samples from WP5: Trace elements determined by ICP-MS in ppm (continued)