



ALS Laboratory Group, SL
Poligono Parque Plata
Calle Camino Mozarabe naves 13 y 15
Camas (Sevilla) 41900
www.alsglobal.com/geochemistry

An INAB accredited testing laboratory Reg. No. 173T. Accredited methods are listed in the Scope of Accreditation available on request.

CERTIFICATE SV19286172

Project: Numão

P.O. No.: PO-19-008

This report is for 30 Rock samples submitted to our lab in Seville, Spain on 12-NOV-2019.

The following have access to data associated with this certificate:

JOSE BEMPOSTA

JOAO GONCALVES

JOHN MORRIS

To: MINAPORT - MINAS DE PORTUGAL LDA
ROTUNDA ENGº. EDGAR CARDOSO 23 3ºD
VILA NOVA DE GAIA 4400 676
PORTUGAL

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SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI-21	Received Sample Weight

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	
ME-MS61	48 element four acid ICP-MS	
ME-ICP06	Whole Rock Package - ICP-AES	ICP-AES
TOT-ICP06	Total Calculation for ICP06	
OA-GRA05	Loss on Ignition at 1000C	WST-SEQ
C-IR07	Total Carbon (IR Spectroscopy)	LECO
S-IR08	Total Sulphur (IR Spectroscopy)	LECO
ME-MS81	Lithium Borate Fusion ICP-MS	ICP-MS
ME-MS42	Up to 34 elements by ICP-MS	ICP-MS

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:

Andrey Tairov, Technical Manager, Ireland



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CERTIFICATE OF ANALYSIS SV19286172

Sample Description	Method Analyte Units LOD	WEI-21	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	ME-ICP06	TOT-ICP06
		Recvd Wt.	SiO2	Al2O3	Fe2O3	CaO	MgO	Na2O	K2O	Cr2O3	TiO2	MnO	P2O5	SrO	BaO	Total
		kg	%	%	%	%	%	%	%	%	%	%	%	%	%	%
		0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.002	0.01	0.01	0.01	0.01	0.01	0.01
A07351		18.42	59.0	18.65	7.01	0.78	2.15	1.29	4.22	0.013	0.87	0.07	0.13	0.01	0.09	99.04
A07352		15.74	59.3	18.50	7.42	1.21	2.30	1.41	3.88	0.014	0.88	0.08	0.13	0.01	0.09	99.81
A07353		15.12	59.1	19.10	7.71	1.20	2.44	1.57	3.76	0.015	0.92	0.08	0.13	0.01	0.08	100.48
A07354		16.90	61.9	17.75	6.68	0.65	2.04	1.28	3.72	0.012	0.80	0.07	0.14	<0.01	0.09	100.34
A07355		19.06	60.9	17.85	6.93	0.85	2.19	1.57	3.80	0.013	0.86	0.08	0.14	<0.01	0.09	99.35
A07356		16.10	64.0	16.80	6.43	1.09	1.96	2.62	3.39	0.011	0.80	0.07	0.24	0.01	0.08	100.84
A07357		13.44	47.9	24.6	9.24	0.38	2.72	2.32	4.84	0.017	1.02	0.06	0.18	0.01	0.11	99.74
A07358		13.60	54.0	22.8	8.40	0.31	2.55	0.98	5.00	0.017	0.94	0.07	0.18	<0.01	0.10	101.11
A07359		13.04	57.3	20.4	6.63	0.25	1.81	1.12	4.61	0.015	0.94	0.05	0.15	<0.01	0.11	98.59
A07360		11.54	60.4	19.55	6.76	0.26	2.00	1.20	4.30	0.015	0.91	0.05	0.13	<0.01	0.09	100.27
A07361		14.18	57.8	21.3	7.76	0.23	2.31	1.03	4.74	0.015	0.88	0.06	0.14	<0.01	0.10	100.89
A07362		19.68	64.6	17.95	6.37	2.37	1.98	3.22	2.23	0.013	0.82	0.13	0.16	0.02	0.04	101.81
A07363		11.78	58.1	20.2	7.42	0.47	2.52	1.58	4.10	0.015	0.83	0.07	0.16	<0.01	0.06	98.87
A07364		20.98	62.5	18.60	7.53	0.47	2.36	1.95	3.56	0.013	0.76	0.08	0.14	<0.01	0.07	100.95
A07365		18.18	59.4	20.5	6.75	0.70	2.24	1.77	4.50	0.014	0.83	0.10	0.17	<0.01	0.09	99.96
A07366		19.42	63.8	18.10	6.75	0.75	2.16	1.92	3.63	0.013	0.76	0.08	0.14	<0.01	0.06	100.78
A07367		23.76	69.6	13.50	4.89	1.55	1.09	2.37	2.30	0.010	0.62	0.06	0.15	0.01	0.03	98.17
A07368		15.82	72.2	12.80	4.75	1.25	1.19	1.90	2.43	0.008	0.53	0.05	0.13	<0.01	0.03	99.04
A07451		1.00	71.4	11.15	6.15	1.04	0.96	2.10	2.03	0.006	0.48	0.05	0.12	<0.01	0.02	98.57
A07452		1.00	71.2	11.10	6.82	1.06	0.95	2.09	2.04	0.008	0.48	0.06	0.13	<0.01	0.02	99.06
A07453		1.00	71.6	11.25	6.14	1.05	0.95	2.10	2.08	0.005	0.48	0.05	0.12	0.01	0.02	98.63
A07454		1.00	71.4	11.20	6.12	1.05	0.95	2.09	2.07	0.006	0.47	0.05	0.12	0.01	0.02	98.07
A07455		0.90	78.3	10.55	2.89	1.52	0.78	1.96	1.75	0.009	0.49	0.07	0.12	<0.01	0.02	99.59
A07456		0.90	79.1	10.60	2.95	1.56	0.78	1.97	1.74	0.009	0.50	0.07	0.13	<0.01	0.02	100.26
A07457		0.90	77.5	10.50	2.84	1.52	0.78	1.94	1.72	0.009	0.49	0.07	0.13	<0.01	0.02	98.43
A07458		0.90	78.5	10.60	2.89	1.53	0.78	1.97	1.74	0.009	0.49	0.07	0.13	<0.01	0.02	99.58
A07459		1.00	73.0	10.40	6.29	1.28	0.80	1.93	1.82	0.012	0.47	0.06	0.11	<0.01	0.02	98.23
A07460		1.00	73.1	10.45	6.37	1.28	0.80	1.93	1.84	0.012	0.48	0.06	0.11	<0.01	0.02	98.85
A07461		1.00	72.7	10.45	6.16	1.26	0.79	1.90	1.84	0.010	0.46	0.06	0.11	0.01	0.02	98.27
A07462		1.00	72.6	10.35	6.34	1.27	0.79	1.92	1.82	0.012	0.47	0.06	0.11	<0.01	0.02	98.02



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CERTIFICATE OF ANALYSIS SV19286172

Sample Description	Method Analyte Units LOD	OA-GRA05	C-IR07	S-IR08	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81
		LOI	C	S	Ba	Ce	Cr	Cs	Dy	Er	Eu	Ga	Gd	Ge	Hf
		%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		0.01	0.01	0.01	0.5	0.1	10	0.01	0.05	0.03	0.03	0.1	0.05	5	0.2
A07351		4.76	0.05	<0.01	827	79.6	80	7.77	5.17	2.91	1.32	24.5	5.94	<5	5.2
A07352		4.59	0.07	0.39	803	98.9	80	8.55	5.55	3.38	1.54	25.1	6.71	<5	5.0
A07353		4.36	0.09	<0.01	702	92.5	90	7.37	5.13	2.72	1.52	25.7	5.68	<5	4.9
A07354		5.21	0.06	<0.01	694	82.1	70	5.62	4.73	2.95	1.30	21.0	5.42	<5	4.8
A07355		4.08	0.05	<0.01	760	93.7	80	6.65	5.62	3.06	1.63	22.8	6.74	<5	5.8
A07356		3.34	0.05	<0.01	702	97.4	60	11.70	5.98	3.58	1.50	22.0	6.57	<5	6.8
A07357		6.34	0.04	<0.01	935	112.0	100	6.56	6.61	4.26	2.00	28.1	8.25	<5	5.3
A07358		5.76	0.01	<0.01	924	122.0	100	9.52	7.35	4.01	1.80	31.5	8.33	<5	5.6
A07359		5.20	0.02	<0.01	1025	109.5	100	6.17	6.21	3.64	1.69	28.8	7.50	<5	5.0
A07360		4.60	0.02	0.01	793	98.8	90	6.56	5.59	3.27	1.74	26.8	6.69	<5	5.3
A07361		4.52	0.01	<0.01	897	101.5	90	8.26	6.13	3.34	1.73	28.6	7.48	<5	4.5
A07362		1.91	<0.01	0.17	334	101.5	80	10.85	5.97	3.51	1.75	23.1	7.10	<5	8.9
A07363		3.34	<0.01	0.10	589	104.5	90	8.71	5.84	3.52	1.57	28.4	6.48	<5	4.7
A07364		2.92	0.01	0.20	579	81.8	70	8.83	4.84	2.82	1.39	23.2	6.10	<5	4.9
A07365		2.90	0.01	0.07	812	103.5	90	12.75	5.51	2.90	1.68	27.7	6.32	<5	5.1
A07366		2.62	0.01	0.32	571	87.4	80	12.45	4.84	2.95	1.44	23.9	6.18	<5	5.5
A07367		1.99	0.02	0.91	279	74.5	50	8.85	4.32	2.52	1.41	16.9	5.37	<5	9.2
A07368		1.77	0.06	0.63	280	63.2	60	8.72	3.40	1.97	1.02	16.7	4.19	<5	7.0
A07451		3.06	0.02	1.58	198.0	55.6	40	7.77	3.61	2.11	1.08	13.8	4.32	<5	7.9
A07452		3.10	0.03	1.66	198.0	55.8	40	7.96	3.24	1.83	1.02	14.7	4.18	<5	8.0
A07453		2.77	0.02	1.68	199.0	58.0	40	8.14	3.46	1.97	0.98	14.2	4.08	<5	7.5
A07454		2.51	0.03	1.64	206	62.7	40	8.41	3.43	1.91	1.00	15.8	4.17	<5	8.8
A07455		1.13	<0.01	0.37	158.0	56.5	50	8.09	3.87	2.51	1.28	13.8	4.51	<5	9.5
A07456		0.83	<0.01	0.35	154.5	56.4	50	8.41	4.25	2.16	1.23	13.4	4.70	<5	10.8
A07457		0.91	<0.01	0.37	159.5	57.6	50	8.50	3.94	2.43	1.38	14.2	4.83	<5	9.8
A07458		0.85	<0.01	0.34	162.0	57.7	60	8.39	3.71	2.18	1.31	14.3	4.60	<5	9.2
A07459		2.04	0.01	1.63	173.5	55.9	80	7.50	3.70	2.32	1.22	14.2	4.47	<5	9.0
A07460		2.40	0.01	1.60	174.0	57.0	70	8.02	3.80	2.36	1.13	13.7	4.29	<5	8.5
A07461		2.50	0.02	1.65	161.0	54.1	70	7.53	3.77	2.43	1.08	13.1	4.31	<5	8.6
A07462		2.26	0.02	1.66	169.5	58.8	80	7.98	3.47	2.09	1.22	15.1	4.47	<5	10.1



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Sample Description	Method Analyte Units LOD	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81
		La	Lu	Nb	Nd	Pr	Rb	Sm	Sn	Sr	Ta	Tb	Th	Tm	U
		ppm 0.1	ppm 0.01	ppm 0.2	ppm 0.1	ppm 0.03	ppm 0.2	ppm 0.03	ppm 1	ppm 0.1	ppm 0.1	ppm 0.01	ppm 0.05	ppm 0.01	ppm 0.05
A07351		42.0	0.42	16.1	39.7	9.93	185.5	7.63	6	116.0	1.1	0.95	16.60	0.45	2.82
A07352		49.3	0.46	16.2	44.2	11.20	182.0	8.48	6	156.5	1.2	1.09	17.30	0.47	2.89
A07353		42.6	0.39	16.4	37.9	9.78	171.0	6.94	4	167.0	1.2	0.96	17.20	0.41	2.49
A07354		38.4	0.38	14.0	34.8	8.76	136.5	6.84	5	89.7	0.9	0.95	14.80	0.39	2.25
A07355		48.4	0.47	16.1	43.9	11.05	165.5	8.64	4	133.5	1.2	1.12	16.95	0.50	2.78
A07356		37.4	0.54	15.0	37.2	9.16	155.0	7.31	4	192.0	1.0	1.05	14.05	0.53	2.56
A07357		55.5	0.58	17.3	51.6	13.10	172.0	9.92	5	101.5	0.9	1.36	19.00	0.57	3.98
A07358		61.6	0.61	17.8	56.6	14.55	189.5	10.80	10	73.4	1.1	1.37	19.80	0.61	3.43
A07359		53.7	0.54	17.6	51.3	12.80	157.5	9.21	7	54.8	1.2	1.07	17.20	0.50	3.36
A07360		50.0	0.49	15.1	47.8	12.00	167.5	8.89	7	68.9	1.0	1.09	15.35	0.42	3.60
A07361		52.9	0.48	15.4	45.9	11.85	191.0	8.69	5	71.5	1.1	1.14	16.75	0.49	3.53
A07362		50.4	0.51	15.8	46.7	11.70	124.0	9.02	3	278	1.2	1.14	19.20	0.50	3.88
A07363		52.9	0.45	15.3	47.3	12.25	173.0	9.03	4	95.1	1.0	1.11	16.70	0.45	3.58
A07364		41.0	0.44	13.5	38.1	9.35	149.5	7.34	4	101.5	0.9	0.97	13.80	0.41	3.05
A07365		52.2	0.44	15.5	47.7	11.80	201	8.30	5	132.0	1.0	1.10	16.25	0.46	3.64
A07366		43.1	0.43	14.2	38.9	9.91	167.5	7.52	9	128.5	1.0	0.99	14.25	0.44	3.00
A07367		35.0	0.36	11.9	33.2	8.24	109.5	6.48	23	142.0	0.9	0.89	13.45	0.36	3.00
A07368		30.0	0.32	10.8	27.9	7.07	131.0	5.34	34	128.0	0.7	0.69	9.96	0.28	2.43
A07451		25.5	0.33	9.5	24.7	6.09	105.5	4.93	24	121.0	0.7	0.70	10.05	0.32	2.32
A07452		25.8	0.31	9.0	25.3	6.13	103.5	4.94	24	118.0	0.7	0.70	10.25	0.28	2.33
A07453		26.7	0.28	9.7	26.2	6.46	106.5	5.45	24	120.5	0.6	0.65	10.05	0.26	2.27
A07454		29.1	0.30	10.2	27.6	6.90	110.0	5.40	25	124.5	0.7	0.73	10.65	0.30	2.33
A07455		26.4	0.33	9.7	25.5	6.36	93.1	5.77	47	134.0	0.7	0.77	8.99	0.33	2.21
A07456		25.6	0.36	9.6	26.2	6.30	91.2	5.60	48	135.0	0.7	0.77	9.19	0.34	2.22
A07457		26.6	0.35	9.4	26.0	6.22	91.3	5.52	49	131.5	0.7	0.75	9.25	0.36	2.30
A07458		26.5	0.36	10.2	26.7	6.50	98.9	5.92	48	146.0	0.7	0.77	8.95	0.36	2.22
A07459		26.0	0.32	9.8	26.0	6.32	97.2	5.28	39	130.5	0.7	0.74	9.81	0.28	2.30
A07460		26.8	0.31	9.7	26.3	6.52	96.1	5.02	39	126.5	0.7	0.69	9.55	0.30	2.05
A07461		25.2	0.38	9.2	23.8	5.99	91.6	4.90	37	121.0	0.7	0.70	10.70	0.37	2.42
A07462		26.5	0.33	9.8	25.8	6.43	96.3	5.20	39	128.5	0.7	0.78	10.05	0.32	2.40



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Sample Description	Method Analyte Units LOD	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS42	ME-MS42	ME-MS42	ME-MS42	ME-MS42	ME-MS42	ME-MS42	ME-MS42	ME-MS61	ME-MS61	
		W	Y	Yb	Zr	As	Bi	Hg	In	Re	Sb	Se	Te	Tl	Ag	Cd
		ppm 1	ppm 0.1	ppm 0.03	ppm 2	ppm 0.1	ppm 0.01	ppm 0.005	ppm 0.005	ppm 0.001	ppm 0.05	ppm 0.2	ppm 0.01	ppm 0.02	ppm 0.01	ppm 0.02
A07351		3	29.2	2.96	164	42.1	0.37	<0.005	0.019	0.001	0.10	0.2	0.03	0.42	0.02	0.19
A07352		4	30.5	2.91	153	105.5	0.31	<0.005	0.020	0.001	0.12	0.2	0.02	0.55	0.02	0.07
A07353		4	27.7	2.86	151	13.8	0.34	<0.005	0.024	0.001	0.11	<0.2	0.03	0.46	<0.01	0.03
A07354		3	27.1	2.61	159	59.3	0.37	0.011	0.019	0.001	0.14	0.2	0.02	0.17	0.04	0.06
A07355		3	31.0	2.89	189	5.4	0.37	<0.005	0.021	0.001	0.12	0.2	0.04	0.44	<0.01	0.02
A07356		2	34.9	3.19	227	24.7	0.21	0.008	0.020	0.001	0.10	<0.2	0.03	0.58	0.01	0.04
A07357		4	35.8	3.80	165	92.7	0.14	<0.005	0.026	0.001	0.08	<0.2	0.01	0.04	0.04	0.02
A07358		8	40.8	3.85	187	17.4	3.12	0.005	0.025	0.001	0.09	<0.2	0.03	0.10	0.26	<0.02
A07359		6	34.9	3.27	154	93.9	1.42	<0.005	0.025	0.001	0.10	0.4	0.03	0.06	0.04	0.05
A07360		4	32.8	3.18	174	136.0	0.33	<0.005	0.016	<0.001	0.10	0.2	0.04	0.09	0.03	0.03
A07361		4	32.3	3.07	141	16.4	0.63	0.010	0.018	0.001	0.10	<0.2	0.03	0.15	0.02	0.03
A07362		2	33.7	3.39	321	30.0	0.77	<0.005	0.032	0.001	0.13	0.3	0.05	0.51	0.04	0.04
A07363		4	31.9	3.05	161	20.8	0.63	0.018	0.014	0.001	0.16	<0.2	0.03	0.27	0.03	<0.02
A07364		3	27.6	2.72	160	7.6	0.52	<0.005	0.013	0.001	0.13	<0.2	0.03	0.32	0.06	0.02
A07365		4	29.8	2.88	157	37.1	0.62	0.009	0.019	0.001	0.18	<0.2	0.03	0.53	<0.01	<0.02
A07366		13	28.6	2.92	189	>250	1.67	0.010	0.020	0.001	1.64	0.2	0.04	0.38	0.13	0.16
A07367		653	24.3	2.58	331	>250	17.90	0.101	0.076	0.002	5.27	1.2	0.08	0.27	0.83	0.75
A07368		144	20.2	1.95	230	>250	6.43	0.037	0.053	0.001	13.75	0.6	0.07	0.33	13.90	0.52
A07451		700	20.7	2.07	274	>250	98.6	0.159	0.082	0.004	9.33	2.1	0.36	0.27	0.77	0.47
A07452		900	18.2	1.98	258	>250	68.0	0.200	0.081	0.004	9.66	2.0	0.26	0.28	0.83	0.43
A07453		693	18.8	1.88	264	>250	88.3	0.145	0.080	0.004	9.39	1.6	0.22	0.28	0.66	0.51
A07454		706	19.2	1.81	298	>250	77.3	0.133	0.095	0.005	9.62	2.0	0.32	0.29	0.83	0.58
A07455		1980	23.0	2.15	336	>250	9.28	0.398	0.020	0.008	2.44	0.4	0.04	0.25	0.27	0.06
A07456		2040	23.5	2.26	342	>250	8.53	0.398	0.023	0.006	2.40	0.3	0.03	0.25	0.19	<0.02
A07457		1820	23.0	2.30	347	>250	7.49	0.359	0.023	0.007	2.60	<0.2	0.04	0.26	0.18	<0.02
A07458		1860	23.8	2.34	338	>250	7.90	0.355	0.021	0.008	2.43	0.7	0.04	0.24	0.25	<0.02
A07459		1480	21.2	2.36	305	>250	25.8	0.260	0.036	0.004	9.68	2.3	0.07	0.26	0.40	0.27
A07460		1470	21.5	2.23	301	>250	23.0	0.278	0.037	0.006	9.56	1.6	0.08	0.25	0.64	0.22
A07461		1480	21.2	2.26	311	>250	23.6	0.329	0.041	0.007	9.90	1.4	0.08	0.26	0.41	0.32
A07462		1440	20.9	2.19	342	>250	25.1	0.318	0.037	0.006	9.85	1.7	0.07	0.26	0.40	0.28



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Total # Appendix Pages: 1
Finalized Date: 26-NOV-2019
Account: MINORT

An INAB accredited testing laboratory Reg. No. 173T. Accredited methods are listed in the Scope of Accreditation available on request.

Project: Numão

CERTIFICATE OF ANALYSIS SV19286172

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Applies to Method: REE's may not be totally soluble in this method.
ME-MS61

ACCREDITATION COMMENTS

Applies to Method: The methods immediately below this line are ISO 17025:2005 Accredited. INAB Registration No: 173T
C-IR07 ME-ICP06 ME-MS61 ME-MS81
OA-GRA05 S-IR08



LABORATORY ADDRESSES

Applies to Method: Processed at ALS Seville located at Poligono Parque Plata, Calle Camino Mozarabe naves 13 y 15, Camas (Sevilla), Spain.
WEI-21

Applies to Method: Processed at ALS Loughrea located at Dublin Road, Loughrea, Co. Galway, Ireland.
C-IR07 ME-ICP06 ME-MS42 ME-MS61
ME-MS81 OA-GRA05 S-IR08 TOT-ICP06