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Mineralogical - Geochemical Investigation of two sections across the Permian-Triassic Boundary in the Continental Realm of the Southern Karoo Basin, South Africa

Coney, Louise

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Rare Earth Element Results:Commando Drift Dam section (Normalization factors from Taylor and McLennan, 1985)

Sample No.	PCD 1	PCD 2	PCD 3	PCD 4	PCD 5	PCD 6	PCD 7	PCD 8	PCD 9	PCD 10	PCD 11	PCD 12	PCD 13	PCD 16	PCD 17	PCD 22	PCD 24	PCD 27	PCD 28
Element																			
La	37.3	41.3	33.3	34.9	36.9	37.1	40.5	31.3	37.9	27.7	39.2	40.7	41.6	37.2	36.2	33.9	34.5	31.7	33.6
Ce	73.7	82.9	64.1	70.4	50.5	72.9	85.3	53.0	74.5	48.6	76.8	81.3	82.7	79.2	72.5	67.7	70.2	62.2	69.9
Nd	36.7	41.8	30.9	35.3	27.7	37.3	41.3	28.1	38.8	25.1	38.1	40	41.3	39.7	37	33.8	36.5	31.2	34.9
Sm	6.33	6.98	5.62	6.21	5.77	6.55	7.28	5.42	7.00	4.63	6.39	7.37	6.97	6.77	6.25	5.95	5.93	5.55	5.94
Eu	1.19	1.27	1.03	1.13	0.74	1.13	1.23	0.77	1.19	0.61	1.23	1.35	1.33	1.27	1.1	1.09	1.06	1	1.1
Gd	5.14	5.98	3.65	5.53	3.59	5.37	6.79	4.40	5.27	3.29	5.31	5.02	6.64	5.54	5.95	5.17	4.84	4.65	6.25
Tb	0.87	0.97	0.71	0.95	0.68	0.82	1.13	0.78	0.98	0.52	0.95	0.93	1.08	0.87	0.91	0.79	0.77	0.76	0.95
Tm	0.46	0.44	0.32	0.40	0.39	0.42	0.43	0.42	0.34	0.25	0.42	0.45	0.46	0.40	0.4	0.38	0.42	0.42	0.41
Yb	2.61	2.77	2.30	2.48	2.65	2.57	2.79	2.33	2.68	1.63	2.78	3.24	3.05	2.63	2.88	2.55	2.56	3.04	3.05
Lu	0.44	0.46	0.40	0.42	0.43	0.43	0.46	0.37	0.46	0.25	0.45	0.54	0.48	0.43	0.48	0.42	0.44	0.52	0.51
Normalised REE:																			
La	101.6	112.5	90.7	95.1	100.5	101.1	110.4	85.3	103.3	75.5	107	111	113	101	98.6	92.4	94.0	86.4	91.6
Ce	77.0	86.6	67.0	73.6	52.8	76.2	89.1	55.4	77.8	50.8	80.3	85.0	86.4	82.8	75.8	70.7	73.4	65.0	73.0
Nd	51.6	58.8	43.5	49.6	39.0	52.5	58.1	39.5	54.6	35.3	53.6	56.3	58.1	55.8	52.0	47.5	51.3	43.9	49.1
Sm	27.4	30.2	24.3	26.9	25.0	28.4	31.5	23.5	30.3	20.0	27.7	31.9	30.2	29.3	27.1	25.8	25.7	24.0	25.7
Eu	13.7	14.6	11.8	13.0	8.5	13.0	14.1	8.9	13.7	7.0	14.1	15.5	15.3	14.6	12.6	12.5	12.2	11.5	12.6
Gd	16.8	19.5	11.9	18.1	11.7	17.5	22.2	14.4	17.2	10.8	17.4	16.4	21.7	18.1	19.4	16.9	15.8	15.2	20.4
Tb	15	16.7	12.2	16.4	11.7	14.1	19.5	13.4	16.9	9.0	16.4	16.0	18.6	15.0	15.7	13.6	13.3	13.1	16.4
Tm	12.9	12.4	8.99	11.24	10.96	11.80	12.08	11.80	9.55	7.02	11.8	12.6	12.9	11.2	11.2	10.7	11.8	11.8	11.5
Yb	10.5	11.2	9.27	10	10.69	10.36	11.25	9.40	10.81	6.57	11.2	13.1	12.3	10.6	11.6	10.3	10.3	12.3	12.3
Lu	11.5	12.1	10.5	11.0	11.3	11.3	12.1	9.7	12.1	6.6	11.8	14.2	12.6	11.3	12.6	11.0	11.5	13.6	13.4
Ratios:																			
La/Lu	8.80	9.32	8.64	8.63	8.91	8.96	9.14	8.78	8.55	11.44	9.07	7.82	8.97	8.94	7.83	8.40	8.17	6.35	6.84
La/Th	2.21	2.42	2.87	2.22	7.06	2.29	2.31	4.24	2.48	4.89	2.51	2.37	2.45	2.02	2.06	2.02	2.17	2.28	2.21
LaN/YbN	9.66	10.08	9.78	9.51	9.41	9.75	9.81	9.08	9.56	11.48	9.53	8.49	9.22	9.56	8.49	8.98	9.11	7.05	7.44
Eu/Eu*	0.64	0.60	0.69	0.59	0.50	0.58	0.53	0.48	0.60	0.48	0.65	0.68	0.60	0.63	0.55	0.60	0.60	0.60	0.55
Th (ppm)	16.9	17.1	11.6	15.7	5.23	16.2	17.5	7.38	15.3	5.67	15.6	17.2	17.0	18.4	17.6	16.8	15.9	13.9	15.2

LaN/YbN = (Norm La)/(Norm Yb) where Norm is the normalised value of the REE

Eu* = SQRT [(Norm Sm)x(Norm Gd)]

INAA Results:Commando Drift Dam

Sample No.	PCD 1	PCD 2	PCD 3	PCD 4	PCD 5	PCD 6	PCD 7	PCD 8	PCD 9	PCD 10	PCD 11	PCD 12	PCD 13	PCD 16	PCD 17	PCD 22	PCD 24	PCD 27	PCD 28
Element																			
Na	1.02	1.53	0.82	1.45	0.19	1.33	1.05	0.41	1.36	0.42	1.46	1.42	1.32	1.21	0.61	0.59	0.68	0.64	0.69
K	2.38	2.45	1.76	2.20	0.98	2.57	3.07	1.38	2.36	0.90	2.62	2.63	3.05	2.83	3.63	3.00	3.47	2.9	3.74
Sc	12.4	11.1	7.97	10.5	5.10	11.7	13.8	6.56	9.60	4.05	11.1	11.3	11.5	11.7	16.5	16.0	15.7	14.5	14.7
Cr	44.7	42.6	30.7	35.8	16.5	41.7	45.3	22.2	39.9	14.1	39.0	43.8	38.4	46.4	56.7	56.7	56.0	51.8	52.3
Fe	3.5	2.90	2.25	2.69	1.17	3.24	3.64	1.80	2.59	0.96	2.74	3.17	2.93	3.22	4.74	4.58	5.75	4.6	5.18
Co	8.46	7.55	7.04	6.90	3.45	8.02	9.83	5.28	7.63	3.06	7.58	8.53	8.31	9.59	12.2	11.6	12.8	11.2	13.5
Zn	89.0	82.0	78.0	73.6	43.4	85.5	100	62.4	93	33.5	76.2	117	78.4	107	124	167	159	131	114
As	6.00	4.64	7.03	4.80	7.46	7.08	7.11	7.04	6.88	10.4	7.15	8.46	7.75	6.64	10.6	11.0	16.3	13.4	12.9
Br	0.20	< 0.35	0.14	< 0.23	0.42	0.50	< 0.4	0.26	< 0.74	0.14	< 0.3	< 0.72	0.12	< 0.50	<0.7	< 0.9	< 1.1	<0.5	<0.9
Rb	141	138	99.8	144	58.2	162	175	82.4	146	50.1	143	161	158	163	219	200	192	170	182
Sr			231	402	388		205		333	451		271	293	192	104	54.9	48.1	63.5	75.5
Zr	232	287	166	235	205	214	171	177	249	213	254	282	262	228	153	120	152	147	204
Sb	0.82	0.70	0.62	0.68	0.35	0.89	0.89	0.53	0.67	0.40	0.75	0.77	0.70	0.76	1.2	1.10	1.36	1.13	1.17
Cs	8.07	6.97	6.57	7.67	3.5	9.77	10.8	5.05	7.09	2.74	7.67	9.03	8.93	10.2	16.8	16.0	14.2	12.6	13.1
Ba	877	849	407	836	1040	901	948	615	1010	6190	1090	1140	1080	933	1030	942	1020	979	879
La	37.3	41.3	33.3	34.9	36.9	37.1	40.5	31.3	37.9	27.7	39.2	40.7	41.6	37.2	36.2	33.9	34.5	31.7	33.6
Ce	73.7	82.9	64.1	70.4	50.5	72.9	85.3	53.0	74.5	48.6	76.8	81.3	82.7	79.2	72.5	67.7	70.2	62.2	69.9
Nd	36.7	41.8	30.9	35.3	27.7	37.3	41.3	28.1	38.8	25.1	38.1	40	41.3	39.7	37	33.8	36.5	31.2	34.9
Sm	6.33	6.98	5.62	6.21	5.77	6.55	7.28	5.42	7.00	4.63	6.39	7.37	6.97	6.77	6.25	5.95	5.93	5.55	5.94
Eu	1.19	1.27	1.03	1.13	0.74	1.13	1.23	0.77	1.19	0.61	1.23	1.35	1.33	1.27	1.1	1.09	1.06	1	1.1
Gd	5.14	5.98	3.65	5.53	3.59	5.37	6.79	4.40	5.27	3.29	5.31	5.02	6.64	5.54	5.95	5.17	4.84	4.65	6.25
Tb	0.87	0.97	0.71	0.95	0.68	0.82	1.13	0.78	0.98	0.52	0.95	0.93	1.08	0.87	0.91	0.79	0.77	0.76	0.95
Tm	0.46	0.44	0.32	0.40	0.39	0.42	0.43	0.42	0.34	0.25	0.42	0.45	0.46	0.40	0.4	0.38	0.42	0.42	0.41
Yb	2.61	2.77	2.30	2.48	2.65	2.57	2.79	2.33	2.68	1.63	2.78	3.24	3.05	2.63	2.88	2.55	2.56	3.04	3.05
Lu	0.44	0.46	0.40	0.42	0.43	0.43	0.46	0.37	0.46	0.25	0.45	0.54	0.48	0.43	0.48	0.42	0.44	0.52	0.51
Hf	5.25	7.62	3.54	5.70	1.29	5.52	4.66	1.97	6.07	2.01	6.44	6.41	5.88	6.10	4.08	3.78	3.86	3.53	4.06
Ta	1.07	1.18	0.73	1.14	0.34	1.29	1.10	0.56	1.18	0.37	1.02	1.11	1.12	1.17	1.1	1.01	0.89	0.86	0.89
Ir	< 1.1	< 1.2	< 1	< 0.5	< 0.8	< 1.1	< 1.2	< 0.7	< 1.1	< 0.8	< 0.9	< 1.6	< 0.9	<1.3	<1.2	< 1.3	< 1.9	<1.6	<1.9
Au	0.62	< 1.86	0.55	< 1.52	1.73	< 2	< 2.2	1.00	0.87	0.83	4.80	< 1.2	< 2.2	3.24	<0.98	< 1.0	< 1.3	0.98	0.56
Th	16.9	17.1	11.6	15.7	5.23	16.2	17.5	7.38	15.3	5.67	15.6	17.2	17.0	18.4	17.6	16.8	15.9	13.9	15.2
U	3.15	3.14	3.49	3.06	16.3	3.27	3.28	13.3	3.32	15.6	2.90	3.44	3.37	3.24	3.21	3.30	3.60	3.08	3.13

***All elements in ppm, except for Na, K, Fe in wt%, and Ir, Au in ppb; blank fields: not analysed; < lower limit of detection**

XRF Results: **Commando Drift Dam Section**

Sample No.	PCD 1	PCD 2	PCD 3	PCD 4	PCD 5	PCD 6	PCD 7	PCD 8	PCD 9	PCD 10	PCD 11	PCD 12	PCD 13	PCD 16	PCD 17	PCD 22	PCD 24	PCD 27	PCD 28
Depth (cm)*	-650	-495	-445	-425	-335	-245	-220	-160	-95	-70	-45	-15	-5	-2	0	2	4	6	8
Element																			
Na2O	1.19	1.62	0.5	1.66	0.31	1.37	1.27	0.55	1.42	0.47	1.49	1.59	1.29	1.31	0.84	0.84	0.93	0.9	0.98
MgO	1.65	1.39	1.04	1.34	1.18	1.43	1.59	1.38	1.29	1.18	1.5	1.53	1.61	1.69	2.01	1.81	1.86	1.84	1.98
Al2O3	15.71	15.42	6.27	15.62	4.8	15.48	16.14	7.21	13.95	5.52	15.61	15.72	15.93	15.52	16.21	15.77	15.65	15.48	16.03
SiO2	64.96	67.31	26.18	68.77	18.78	67.44	66.9	31.57	63.79	23.22	66.69	65.63	64.75	66.75	63.52	63.14	62.65	62.08	62.82
P2O5	0.11	0.14	0.88	0.13	0.24	0.1	0.09	0.22	0.15	0.52	0.17	0.2	0.2	0.12	0.09	0.07	0.08	0.08	0.09
K2O	3.11	2.92	1.28	2.97	0.73	3.2	3.39	1.59	2.84	1.11	3.25	3.36	3.46	3.13	4.01	4.26	4.08	3.76	3.88
CaO	1.57	1.77	34.32	1.66	39.42	1.52	1.11	29.41	5.01	35.21	1.66	1.77	2.06	1.35	0.83	1.34	0.94	0.94	1.09
TiO2	0.69	0.67	0.3	0.64	0.19	0.63	0.66	0.31	0.59	0.25	0.64	0.64	0.64	0.66	0.65	0.64	0.62	0.63	0.65
MnO	0.06	0.07	0.36	0.06	0.41	0.06	0.06	0.26	0.13	0.55	0.06	0.06	0.06	0.06	0.06	0.08	0.08	0.09	0.09
Fe2O3	5.29	4.25	1.68	4.28	1.68	4.94	5.2	2.7	3.87	1.58	4.14	4.5	4.35	4.33	6.17	6.49	7.84	7.02	7.76
LOI	4.49	3.48	27.55	3.42	32.64	3.87	4.08	25.08	6.15	29.93	3.69	4.06	4.25	4.08	4.78	5.04	4.76	5.54	4.67
TOTAL:	127.4	143.6	109	122.8	92.45	127.5	146.7	95.59	131.2	84.88	132.43	140.2	144.01	136.81	127.47	117.85	122.72	109.34	123.01
V	77	81	38	70	27	76	77	48	61	35	70	73	71	89	103	102	112	103	98
Cr	46	41	24	48	17	45	40	22	40	13	40	44	48	47	52	52	51	57	50
Co	8	9	8	8	6	7	7	6	8	7	8	11	6	10	11	9	9	12	12
Ni	19	15	8	12	6	17	19	9	14	9	16	16	15	18	27	27	27	28	26
Cu	22	24	12	20	15	17	16	6	18	7	20	21	25	38	17	17	20	18	30
Zn	91	76	46	75	43	84	96	64	68	39	77	81	76	97	104	118	114	117	115
Rb	147	135	60	140	55	153	167	81	134	53	151	158	161	158	207	202	195	185	186
Sr	245	418	334	388	320	297	181	270	334	420	341	302	273	229	78	78	94	105	103
Y	33	33	34	31	32	29	33	32	32	23	34	36	35	31	30	30	30	32	35
Zr	182	252	98	201	50	188	158	69	205	78	221	225	205	212	135	130	132	129	150
Nb	19	19	10	18	8	17	18	10	17	8	18	19	19	19	18	17	17	17	19
Ba	928	864	323	810	528	864	902	359	949	4673	1098	1152	1103	971	1067	1047	1047	1169	1004

All major elements in wt%
All trace elements in ppm
***All depths taken from the palaeontological bounday (0.0 cm)**

PCD 26	PCD 29	PCD 30	PCD 31	PCD 32	PCD 33	PCD 34	PCD 35	PCD 36	PCD 37	PCD 38	PCD 39	PCD 40	PCD 42	PCD 43	PCD 44	PCD 46
34.8	35.1	35.6	37.8	37.8	40.1	42.6	42.2	39.3	38.9	36.7	34.5	41.1	42.8	40.0	34.9	37.5
70	71.9	72.1	76	79.8	77.5	81	77.6	75.6	59.3	63.6	61.9	72.5	83.5	78.0	75.3	73.3
35.4	36.3	33.6	38.3	39.9	39.9	40.7	40.8	37.7	31.6	32.6	31.1	37.7	41.9	40.9	37.5	36.2
6.45	5.94	6.05	6.72	6.75	6.80	7.23	7.45	6.43	5.83	5.59	5.28	6.72	7.20	6.66	6.28	6.29
1.11	1.21	1.13	1.21	1.23	1.20	1.31	1.36	1.23	0.92	1.11	1.11	1.18	1.31	1.15	1.07	1.12
5.38	5.08	5.94	4.81	5.45	6.42	6.31	5.59	5.31	4.55	4.63	4.76	7.11	7.09	7.15	5.76	6.98
0.89	0.81	0.9	0.92	0.96	0.98	1.02	1.04	0.94	0.79	0.86	0.86	1.05	1.04	1.06	0.99	0.98
0.46	0.32	0.37	0.43	0.44	0.41	0.51	0.49	0.43	0.45	0.36	0.36	0.42	0.46	0.44	0.43	0.42
2.56	2.46	2.51	2.69	2.95	2.79	2.93	3.42	2.58	2.8	2.21	2.25	2.83	2.84	2.85	2.83	2.71
0.42	0.37	0.4	0.45	0.44	0.45	0.48	0.57	0.41	0.42	0.34	0.37	0.45	0.46	0.46	0.48	0.45

94.8	95.6	97.0	103.0	103.0	109.3	116.1	115.0	107.1	106.0	100	94.0	112.0	116.6	109.0	95.1	102.2
73.1	75.1	75.3	79.4	83.4	81.0	84.6	81.1	79.0	62.0	66.5	64.7	75.8	87.3	81.5	78.7	76.6
49.8	51.1	47.3	53.9	56.1	56.1	57.2	57.4	53.0	44.4	45.9	43.7	53.0	58.9	57.5	52.7	50.9
27.9	25.7	26.2	29.1	29.2	29.4	31.3	32.3	27.8	25.2	24.2	22.9	29.1	31.2	28.8	27.2	27.2
12.8	13.9	13.0	13.9	14.1	13.8	15.1	15.6	14.1	10.6	12.8	12.8	13.6	15.1	13.2	12.3	12.9
17.6	16.6	19.4	15.7	17.8	21.0	20.6	18.3	17.4	14.9	15.1	15.6	23.2	23.2	23.4	18.8	22.8
15.3	14.0	15.5	15.9	16.6	16.9	17.6	17.9	16.2	13.6	14.8	14.8	18.1	17.9	18.3	17.1	16.9
12.9	8.99	10.39	12.08	12.36	11.52	14.33	13.76	12.08	12.64	10.11	10.11	11.80	12.92	12.36	12.08	11.80
10.3	9.92	10.12	10.85	11.90	11.25	11.81	13.79	10.40	11.29	8.91	9.07	11.41	11.45	11.49	11.41	10.93
11.0	9.7	10.5	11.8	11.5	11.8	12.6	15.0	10.8	11.0	8.9	9.7	11.8	12.1	12.1	12.6	11.8

8.62	9.85	9.24	8.72	8.92	9.25	9.21	7.69	9.95	9.62	11.21	9.68	9.48	9.66	9.03	7.55	8.65
2.07	2.18	2.17	2.30	2.05	2.39	2.39	2.62	2.62	4.70	3.11	2.97	2.63	2.46	2.13	1.96	2.21
9.19	9.64	9.58	9.50	8.66	9.71	9.82	8.34	10.29	9.39	11.22	10.36	9.81	10.18	9.48	8.33	9.35
0.58	0.67	0.58	0.65	0.62	0.56	0.59	0.64	0.64	0.55	0.67	0.68	0.52	0.56	0.51	0.54	0.52
16.8	16.1	16.4	16.4	18.4	16.8	17.8	16.1	15.0	8.27	11.8	11.6	15.6	17.4	18.8	17.8	17.0

PCD 26	PCD 29	PCD 30	PCD 31	PCD 32	PCD 33	PCD 34	PCD 35	PCD 36	PCD 37	PCD 38	PCD 39	PCD 40	PCD 42	PCD 43	PCD 44	PCD 46
0.77	0.77	0.83	1.00	0.98	0.89	1.1	1.12	1.31	0.46	1.62	1.38	1.04	1.17	0.57	0.43	0.57
3.15	3.24	3.15	2.78	3.28	3.05	2.76	2.38	2.89	0.74	1.76	2.26	2.89	3.13	3.75	3.41	3.30
14.9	15.5	15.1	13.8	14.8	14.3	13.2	11.4	12.0	8.51	7.71	8.65	11.5	13.7	17.5	17.7	16.6
53.5	56.1	55.5	53.2	57.1	47.8	53	43.4	46.7	28.6	36.3	35.1	41.6	48.8	48.8	48.3	49.5
4.25	4.21	4.29	3.79	4.31	3.78	3.78	2.9	3.15	1.75	1.96	1.99	3.15	3.67	4.89	4.45	4.81
11.3	10.9	12	10.2	11.6	9.86	10.2	9.81	8.96	5.51	4.83	6.28	9.48	10.7	13.6	13.4	12.5
132	163	115	117	153	91.6	99.2	125	85.4	78.1	46.8	56.5	94.3	94.7	113	113	111
11.1	10.3	10.7	9.24	12.3	11.0	10.5	8.45	8.97	8.05	8.34	8.93	14.0	18.4	17.6	14.1	17.4
0.77	<0.7	< 0.6	<0.4	0.7	0.72	<0.7	< 1.00	0.21	0.58	< 0.34	0.11	0.19	< 0.4	< 0.5	0.28	< 0.4
191	183	184	168	193	180	171	150	141	82.8	95.5	112	153	176	205	195	187
70.1	61.5	72.2	82.3	114	155	141	190	246	374	570	377	404	235	92.3	45.7	76.6
232	124	156	153	248	181	225	174	194	109	283	181	233	258	174	149	165
1.22	1	0.94	0.79	1.2	1.07	0.8	0.77	0.75	0.43	0.56	0.50	0.97	1.05	1.74	1.20	1.43
14	13.3	13.3	11.9	13.3	12.0	11.3	9.22	7.84	5.54	4.48	5.69	8.66	11.0	15.2	14.8	13.4
928	849	894	816	956	1110	86.8	1020	902	13010	6200	1320	12100	1590	994	806	771
34.8	35.1	35.6	37.8	37.8	40.1	42.6	42.2	39.3	38.9	36.7	34.5	41.1	42.8	40.0	34.9	37.5
70	71.9	72.1	76	79.8	77.5	81	77.6	75.6	59.3	63.6	61.9	72.5	83.5	78.0	75.3	73.3
35.4	36.3	33.6	38.3	39.9	39.9	40.7	40.8	37.7	31.6	32.6	31.1	37.7	41.9	40.9	37.5	36.2
6.45	5.94	6.05	6.72	6.75	6.80	7.23	7.45	6.43	5.83	5.59	5.28	6.72	7.20	6.66	6.28	6.29
1.11	1.21	1.13	1.21	1.23	1.20	1.31	1.36	1.23	0.92	1.11	1.11	1.18	1.31	1.15	1.07	1.12
5.38	5.08	5.94	4.81	5.45	6.42	6.31	5.59	5.31	4.55	4.63	4.76	7.11	7.09	7.15	5.76	6.98
0.89	0.81	0.9	0.92	0.96	0.98	1.02	1.04	0.94	0.79	0.86	0.86	1.05	1.04	1.06	0.99	0.98
0.46	0.32	0.37	0.43	0.44	0.41	0.51	0.49	0.43	0.45	0.36	0.36	0.42	0.46	0.44	0.43	0.42
2.56	2.46	2.51	2.69	2.95	2.79	2.93	3.42	2.58	2.8	2.21	2.25	2.83	2.84	2.85	2.83	2.71
0.42	0.37	0.4	0.45	0.44	0.45	0.48	0.57	0.41	0.42	0.34	0.37	0.45	0.46	0.46	0.48	0.45
3.67	3.65	3.91	4.32	4.59	4.50	5.32	4.58	5.24	2.24	6.96	4.31	5.01	6.17	4.41	4.38	4.06
1.16	1.08	0.99	1.02	1.24	1.20	1.24	1.01	1.11	0.43	0.77	0.69	0.94	1.35	1.12	0.97	1.15
<1.6	<1.1	< 1.3	<1.8	<1.7	< 0.8	<1.6	< 1.5	< 1.3	<1.4	< 0.6	< 0.9	< 1.1	0.37	< 0.9	< 1.2	< 1.3
<0.98	<1.2	< 1.0	<0.64	<1.2	1.46	0.96	< 1.4	<2.0	0.53	< 1.9	0.97	< 1.8	< 2.2	7.12	1.64	1.99
16.8	16.1	16.4	16.4	18.4	16.8	17.8	16.1	15.0	8.27	11.8	11.6	15.6	17.4	18.8	17.8	17.0
4.1	2.58	2.9	2.99	3.27	3.31	3.11	4.52	3.08	9.22	2.89	2.75	3.59	3.59	3.73	3.22	3.59

PCD 26	PCD 29	PCD 30	PCD 31	PCD 32	PCD 33	PCD 34	PCD 35	PCD 36	PCD 37	PCD 38	PCD 39	PCD 40	PCD 42	PCD 43	PCD 44	PCD 46
10	12	14	26	36	46	60	70	170	210	260	360	460	480	530	580	590

1.1	1.08	1.08	1.23	1.17	1.1	1.24	1.38	1.43	0.66	1.87	1.35	1.03	1.2	0.75	0.63	0.76
1.91	1.87	1.89	1.84	1.89	1.8	1.82	1.63	1.72	1.38	0.91	1.04	1.53	1.68	2.08	2.06	2.11
16.45	16.63	16.43	16.19	16.49	16.3	16.32	14.73	16.14	7.49	12.65	12.71	13.86	17.3	16.41	16.9	16.16
64.35	63.42	64.21	63.83	63.15	62.48	63.83	60.1	64.7	32.47	57.38	55.97	56.51	63.45	58.69	60.84	58.9
0.09	0.08	0.08	0.11	0.12	0.11	0.12	0.13	0.14	0.17	0.13	0.09	0.16	0.2	0.13	0.13	0.13
3.86	3.9	4	3.49	3.73	3.73	3.59	3.2	3.26	1.62	2.35	2.61	3.24	4.2	4.2	4.45	4.25
0.98	1.09	1.05	1.68	1.21	2.38	1.49	5.67	2.01	27.91	10.67	11.03	7.93	1.06	3.05	1.17	2.48
0.69	0.69	0.7	0.72	0.74	0.7	0.71	0.64	0.69	0.35	0.54	0.47	0.57	0.71	0.66	0.65	0.67
0.07	0.07	0.08	0.08	0.07	0.08	0.06	0.1	0.07	0.24	0.38	0.41	0.29	0.11	0.11	0.09	0.09
6.41	6.19	6.36	5.66	6.03	5.7	5.5	4.52	4.9	2.57	3.35	2.92	4.6	5.02	7.25	6.75	7.37
4.42	4.51	4.43	4.45	4.31	5.19	4.2	7.2	3.93	23.9	9.77	10.19	8.3	4.18	6.09	5.73	5.99
122.67	124.39	123	131.53	137.92	136.45	141.49	138.32	130.63	106.66	111.3	107.99	129.96	145.8	138.67	130.64	128.45

97	90	93	93	94	97	89	72	91	65	76	56	84	97	124	114	126
49	51	58	55	54	49	50	40	53	22	42	46	38	46	49	51	59
14	12	11	11	11	15	10	7	10	9	7	8	14	13	16	21	12
24	26	23	24	25	24	23	20	18	17	11	11	23	22	26	34	26
17	17	19	19	21	23	29	26	30	14	23	24	24	26	25	24	23
106	104	100	100	98	93	94	85	85	64	50	58	87	93	114	132	112
186	189	186	184	180	179	168	147	151	87	98	112	147	170	202	218	198
112	115	124	130	159	163	200	279	274	469	521	348	354	222	93	69	95
32	29	29	30	32	34	34	38	33	36	26	27	34	33	32	33	33
133	134	138	140	159	153	181	171	180	81	235	135	163	203	140	157	140
18	18	17	18	19	18	20	18	18	10	16	14	16	19	18	18	18
958	986	983	980	971	1081	933	983	961	9671	5203	1167	9850	1530	978	865	802

Rare Earth Elements: Wapadsberg Section (Normalization factors from Taylor and McLennan, 1985)

Sample No.	PW 1	PW 2	PW 4	PW 5	PW 6	PW 7	PW 8	PW 9	PW 10	PW 11	PW 12	PW 13	PW 14	PW 15	PW 16c	PW 17	PW 18	PW 19	PW 20	PW 21	PW 22	PW 23a
Element																						
La (ppm)	38.4	47.7	49.2	35.9	42.1	41.1	47.3	43.5	40.7	51.2	48.6	31.4	42.0	53.0	44.1	43.0	41.5	114	40.6	37.5	47.2	39.2
Ce (ppm)	74.1	86.0	93.8	69.2	76.8	78.2	88.4	81.8	76.2	97.5	89.1	57.5	91.4	101	84.7	77.4	79.1	216	76.9	68.6	90.3	77.4
Nd (ppm)	37.5	43.6	46.2	33.1	39.9	37.8	43.0	40.4	39.1	48.3	44.1	31.3	46.0	52.2	41.9	38.9	39.2	101	39.9	36.3	45.0	39.8
Sm (ppm)	6.48	7.56	7.73	5.52	7.43	6.42	7.37	6.41	6.91	7.84	7.39	6.73	7.71	11.3	6.84	6.92	6.61	12.4	7.34	6.93	7.43	7.22
Eu (ppm)	1.29	1.31	1.43	1.18	1.39	1.18	1.32	1.23	1.28	1.48	1.45	1.00	1.38	1.95	1.30	1.19	1.28	1.57	1.20	1.16	1.40	1.33
Gd (ppm)	6.88	9.38	6.93	7.00	7.50	6.08	7.44	5.56	9.63	6.63	5.75	6.75	5.38	9.13	7.00	5.24	8.88	7.44	5.88	10.4	7.32	6.64
Tb (ppm)	1.03	0.80	1.16	0.69	0.90	0.83	0.78	0.92	0.83	1.00	0.90	0.84	0.92	1.43	1.01	0.82	0.72	1.00	1.03	0.89	1.10	1
Tm (ppm)	0.70	0.48	0.59	0.42	0.53	0.41	0.39	0.39	0.43	0.55	0.49	0.41	0.52	0.77	0.59	0.45	0.40	0.51	0.49	0.51	0.50	0.47
Yb (ppm)	2.60	3.00	3.37	2.36	3.25	2.58	2.83	2.47	2.71	3.09	3.26	3.26	3.26	4.54	3.14	3.04	2.50	4.09	3.09	2.79	2.87	3.2
Lu (ppm)	0.43	0.45	0.50	0.40	0.53	0.38	0.47	0.36	0.47	0.45	0.47	0.53	0.47	0.74	0.46	0.44	0.43	0.70	0.47	0.45	0.42	0.47
Normalised REE:																						
La	105	130	134	97.8	115	112	129	119	111	140	132	85.6	114	144	120	117	113	311	111	102	129	107
Ce	77.4	89.9	98.0	72.3	80.3	81.7	92.4	85.5	79.6	101.9	93.1	60.1	95.5	105.5	88.5	80.9	82.7	225.7	80.4	71.7	94.4	80.9
Nd	52.7	61.3	65.0	46.6	56.1	53.2	60.5	56.8	55.0	67.9	62.0	44.0	64.7	73.4	58.9	54.7	55.1	142.1	56.1	51.1	63.3	56.0
Sm	28.1	32.7	33.5	23.9	32.2	27.8	31.9	27.7	29.9	33.9	32.0	29.1	33.4	48.9	29.6	30.0	28.6	53.7	31.8	30.0	32.2	31.3
Eu	14.8	15.0	16.4	13.5	16.0	13.5	15.2	14.1	14.7	17.0	16.6	11.5	15.8	22.4	14.9	13.7	14.7	18.0	13.8	13.3	16.1	15.3
Gd	22.5	30.7	22.6	22.9	24.5	19.9	24.3	18.2	31.5	21.7	18.8	22.1	17.6	29.8	22.9	17.1	29.0	24.3	19.2	34.0	23.9	21.7
Tb	17.8	13.8	20.0	11.9	15.5	14.3	13.4	15.9	14.3	17.2	15.5	14.5	15.9	24.7	17.4	14.1	12.4	17.2	17.8	15.3	19.0	17.2
Tm	19.7	13.5	16.6	11.8	14.9	11.5	11.0	11.0	12.1	15.4	13.8	11.5	14.6	21.6	16.6	12.6	11.2	14.3	13.8	14.3	14.0	13.2
Yb	10.5	12.1	13.6	9.5	13.1	10.4	11.4	10.0	10.9	12.5	13.1	13.1	13.1	18.3	12.7	12.3	10.1	16.5	12.5	11.3	11.6	12.9
Lu	11.3	11.8	13.1	10.5	13.9	10.0	12.3	9.4	12.3	11.8	12.3	13.9	12.3	19.4	12.1	11.5	11.3	18.4	12.3	11.8	11.0	12.3
Ratios:																						
La/Lu	9.27	11.0	10.2	9.32	8.25	11.2	10.4	12.5	8.99	11.8	10.7	6.15	9.28	7.44	9.95	10.1	10.0	16.9	8.97	8.65	11.7	8.66
La/Th	3.00	3.20	3.08	2.99	2.68	2.98	2.88	3.13	2.51	2.88	2.89	1.80	2.28	3.19	2.74	2.61	2.40	6.30	2.19	2.34	2.68	2.28
LaN/YbN	9.98	10.7	9.87	10.3	8.75	10.8	11.3	11.9	10.1	11.2	10.1	6.51	8.71	7.89	9.49	9.56	11.2	18.8	8.88	9.08	11.1	8.28
Eu/Eu*	0.59	0.47	0.60	0.58	0.57	0.58	0.54	0.63	0.48	0.63	0.68	0.45	0.65	0.59	0.57	0.60	0.51	0.50	0.56	0.42	0.58	0.59
Th (ppm)	12.8	14.9	16.0	12.0	15.7	13.8	16.4	13.9	16.2	17.8	16.8	17.4	18.4	16.6	16.1	16.5	17.3	18.1	18.5	16.0	17.6	17.2

LaN/YbN = (Norm La)/(Norm Yb) where Norm is the normalised value of the REE

Eu* = SQRT [(Norm Sm)x(Norm Gd)]

INAA Results: Wapadsberg

Sample No.	PW 1	PW 2	PW 4	PW 5	PW 6	PW 7	PW 8	PW 9	PW 10	PW 11	PW 12	PW 13	PW 14	PW 15	PW 16c	PW 17	PW 18	PW 19	PW 20	PW 21	PW 22	PW 23a
Element																						
Na	2.79	2.25	1.89	2.11	1.89	2.28	1.82	1.92	1.28	1.81	1.69	0.86	1.60	1.41	1.33	1.43	1.16	0.50	0.84	1.08	1.64	1.28
K	1.70	2.37	2.33	1.62	2.49	1.88	2.63	1.84	2.74	2.40	2.42	3.48	2.52	2.90	2.57	2.41	3.03	3.34	2.91	3.06	2.49	2.56
Sc	8.66	9.98	9.98	8.93	11.8	8.75	11.6	8.82	15.1	11.4	11.8	15.3	12.6	14.0	12.5	12.1	13.0	17.5	15.6	15.3	12.2	11.6
Cr	38.8	41.4	37.8	38.8	46.6	35.8	45.5	37.6	54.5	45.9	46.7	52.4	47.8	51.4	47.4	44.9	49.9	61.1	53.8	57.0	46.8	44.7
Fe	2.43	3.11	2.78	2.38	3.40	1.94	3.02	2.24	4.44	3.11	2.87	3.92	3.44	3.17	3.58	3.55	3.46	8.08	4.16	4.40	3.42	3.26
Co	8.48	10.4	8.27	7.86	10.7	6.58	8.90	7.60	11.5	8.99	9.13	10.2	10.0	10.2	10.1	9.30	10.3	14.2	11.9	12.4	10.3	10.3
Ni		31.7		16.0	19.9		13.9		39.0			16.4		35.5			20.1	40.5		25.2		
Zn	67.4	107	87.2	75.0	107	63.2	101	72.5	105	83.8	99.0	137	103	113	101	93.7	113	146	106	145	87.3	105
As	4.42	9.64	5.99	5.26	8.38	3.11	4.77	3.25	7.03	3.79	3.95	9.63	4.47	21.0	5.76	4.77	5.93	24.0	5.92	11.5	5.65	7.35
Br	0.16	<0.4	0.12	<0.3	<0.4	0.07	0.16	< 0.3	<0.3	0.10	< 0.2	0.13	< 0.3	<0.3	< 0.3	0.07	<0.2	0.19	< 0.2	<0.3	<0.3	<0.2
Rb	90.2	131	138	97.3	120	122	132	107	165	136	139	192	155	155	149	147	163	214	187	182	152	158
Sr	588	68.8	386	74.9	57.4	421	63.0	482	35.0	36.0	316	26.2	380	49.9	213	285	33.7	9.47	112	28.1	314	266
Zr	243	282	260	273	251	279	292	263	125	290	226	173	220	256	171	229	187	286	150	154	241	215
Sb	0.98	1.11	1.00	0.38	0.63	0.53	0.44	0.55	0.66	0.74	0.72	0.84	0.78	0.68	0.88	0.86	0.60	1.80	0.94	0.90	0.89	1.1
Cs	3.01	5.09	6.01	3.35	6.18	3.93	6.47	4.43	10.9	6.74	6.88	12.9	8.80	9.53	9.46	8.59	10.4	15.1	12.9	12.6	8.37	9.47
Ba	3440	612	1110	370	334	990	394	1140	347	859	692	340	675	302	631	625	300	277	655	278	598	599
La	38.4	47.7	49.2	35.9	42.1	41.1	47.3	43.5	40.7	51.2	48.6	31.4	42.0	53.0	44.1	43.0	41.5	114	40.6	37.5	47.2	39.2
Ce	74.1	86.0	93.8	69.2	76.8	78.2	88.4	81.8	76.2	97.5	89.1	57.5	91.4	101	84.7	77.4	79.1	216	76.9	68.6	90.3	77.4
Nd	37.5	43.6	46.2	33.1	39.9	37.8	43.0	40.4	39.1	48.3	44.1	31.3	46.0	52.2	41.9	38.9	39.2	101	39.9	36.3	45.0	39.8
Sm	6.48	7.56	7.73	5.52	7.43	6.42	7.37	6.41	6.91	7.84	7.39	6.73	7.71	11.3	6.84	6.92	6.61	12.4	7.34	6.93	7.43	7.22
Eu	1.29	1.31	1.43	1.18	1.39	1.18	1.32	1.23	1.28	1.48	1.45	1.00	1.38	1.95	1.30	1.19	1.28	1.57	1.20	1.16	1.40	1.33
Gd	6.88	9.38	6.93	7.00	7.50	6.08	7.44	5.56	9.63	6.63	5.75	6.75	5.38	9.13	7.00	5.24	8.88	7.44	5.88	10.4	7.32	6.64
Tb	1.03	0.80	1.16	0.69	0.90	0.83	0.78	0.92	0.83	1.00	0.90	0.84	0.92	1.43	1.01	0.82	0.72	1.00	1.03	0.89	1.10	1
Tm	0.70	0.48	0.59	0.42	0.53	0.41	0.39	0.39	0.43	0.55	0.49	0.41	0.52	0.77	0.59	0.45	0.40	0.51	0.49	0.51	0.50	0.47
Yb	2.60	3.00	3.37	2.36	3.25	2.58	2.83	2.47	2.71	3.09	3.26	3.26	3.26	4.54	3.14	3.04	2.50	4.09	3.09	2.79	2.87	3.2
Lu	0.43	0.45	0.50	0.40	0.53	0.38	0.47	0.36	0.47	0.45	0.47	0.53	0.47	0.74	0.46	0.44	0.43	0.70	0.47	0.45	0.42	0.47
Hf	6.34	5.90	6.67	7.22	5.49	6.22	7.11	7.24	4.37	6.60	5.55	4.26	5.93	4.96	5.42	5.97	5.42	4.26	4.98	3.78	6.13	5.39
Ta	0.94	0.92	1.19	0.75	1.02	1.00	0.96	0.92	1.02	1.25	1.17	1.03	1.41	1.01	1.08	1.11	1.02	0.82	1.10	0.99	1.17	1.23
Ir	< 0.8	<2	< 0.8	0.14	<1.3	0.51	<1.2	< 1.1	0.48	< 2	< 1.1	0.36	< 0.9	<1.3	< 1.6	< 1.7	<0.8	<1.4	< 1.6	<1.9	< 1.7	<1.1
Au	< 2.6	<1	0.95	<1.1	0.86	1.06	0.38	< 2.3	1.02	< 3.1	2.14	<0.8	< 2.9	0.33	< 2.2	1.05	<0.9	<1.0	0.81	<1.0	2.18	<2.3
Th	12.8	14.9	16.0	12.0	15.7	13.8	16.4	13.9	16.2	17.8	16.8	17.4	18.4	16.6	16.1	16.5	17.3	18.1	18.5	16.0	17.6	17.2
U	2.58	2.92	2.74	2.32	3.11	4.88	2.72	1.84	2.71	2.24	2.17	3.24	2.51	4.28	1.84	2.09	2.41	4.14	1.93	2.77	2.16	2.5

All elements in ppm, except for Na, K, Fe in wt%, and Ir, Au in ppb; blank fields: not analysed; < lower limit of detection

XRF Results: Wapadsberg

Sample No.	PW 1	PW 2	PW 4	PW 5	PW 6	PW 7	PW 8	PW 9	PW 10	PW 11	PW 12	PW 13	PW 14	PW 15	PW 16c	PW 17	PW 18	PW 19	PW 20	PW 21	PW 22	PW 23a
Depth (cm)*	-695	-675	-630	-610	-585	-575	-562	-552	-522	-472	-422	-367	-357	-317	-277	-252	-220	-197	-192	-147	-132	-112
Element																						
Na2O	3.02	2.05	2.09	2.43	1.91	2.72	1.86	2.14	1.53	1.81	1.76	1.03	1.73	1.58	1.49	1.45	1.33	0.73	0.99	1.45	1.68	1.44
MgO	1.13	1.46	1.44	1.16	1.68	0.9	1.49	1.27	1.82	1.54	1.62	1.62	1.64	1.67	1.74	1.56	1.7	1.85	1.62	1.84	1.65	1.68
Al2O3	14.4	15.9	16.7	14.5	16.2	13.1	15.9	14.6	15.93	15.85	15.65	16.51	15.96	16.18	15.93	16.22	16.31	16.02	16.53	16.13	15.47	15.6
SiO2	70.5	68.5	67.5	71.3	66.2	62.2	66.1	68.7	63.98	65.59	66.91	63.34	66.63	65.1	66.51	65.09	65.02	57.62	64.38	64.72	65.43	63
P2O5	0.12	0.13	0.14	0.15	0.14	0.11	0.13	0.12	0.12	0.13	0.12	0.11	0.14	0.6	0.16	0.1	0.12	0.06	0.15	0.16	0.16	0.24
K2O	1.99	2.8	3.22	2.2	2.79	2.32	3.08	2.57	3.21	3.09	3.04	3.83	3.1	3.49	3.46	3.36	3.86	4.15	3.69	3.58	3.11	3.5
CaO	1.21	1.24	1.16	1.68	1.14	0.85	2.18	1.77	1.22	1.87	1.62	0.93	1.31	2.03	1.4	1.67	1.25	0.6	1.07	1.04	2.06	3.51
TiO2	0.56	0.61	0.66	0.57	0.7	0.48	0.67	0.59	0.69	0.7	0.69	0.65	0.7	0.69	0.69	0.67	0.68	0.59	0.64	0.67	0.67	0.65
MnO	0.06	0.05	0.05	0.05	0.06	0.03	0.12	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.06	0.05	0.05	0.08
Fe2O3	3.63	4.5	4.33	3.73	5.3	2.47	4.44	4.19	6.18	4.54	4.71	5.92	4.87	5.4	5.42	5.03	5.15	11.55	5.7	6.31	4.89	4.97
LOI	2.29	3.14	3.2	2.66	3.45	14.2	3.19	3.12	4.02	3.65	3.75	4.93	3.53	3.76	3.75	3.87	4.05	5.26	5.36	4.03	3.65	5.56
TOTAL	98.9	100	100	100	99.6	99.4	99.2	99.1	98.76	98.82	99.92	98.92	99.66	100.6	191.04	177.4	180.6	458.71	176.9	165.5	203.5	176.73
V	64	68	69	68	81	59	85	77	102	87	78	92	78	81	83	80	86	147	98	94	80	83
Cr	40	42	42	38	45	30	42	40	50	53	46	46	49	44	45	47	47	56	49	47	60	45
Co	9	11	8	8	10	7	8	7	10	8	9	10	12	11	13	10	12	12	11	11	9	11
Ni	15	17	17	11	18	10	16	11	21	18	19	22	18	20	20	19	21	30	23	20	18	21
Cu	14	17	17	20	24	19	23	35	20	34	27	19	25	26	23	19	29	18	26	18	28	26
Zn	69	82	82	65	99	61	80	69	98	79	87	100	90	92	91	87	91	120	105	100	82	103
Rb	90	128	143	104	133	122	140	115	160	141	141	189	148	155	159	156	169	210	191	179	148	159
Sr	664	506	450	544	414	518	428	519	247	404	347	163	333	282	262	298	231	115	150	200	331	289
Y	29	31	38	30	38	30	34	30	33	35	35	34	34	58	36	30	31	37	36	34	31	35
Zr	206	203	235	256	208	198	256	230	150	218	194	161	193	193	188	205	196	177	161	134	194	194
Nb	16	18	20	17	19	17	20	17	18	19	19	18	20	18	18	19	20	19	17	17	18	19
Ba	3513	1387	1155	887	815	980	920	1195	758	799	694	729	643	657	666	633	667	650	692	604	552	559

All major elements in wt% ***All sample depths taken from the palaeontological boundary (0.0 cm)**

All trace elements in ppm

PW 23a = Av. PW23, PW34

PW 24a =Av. PW24, PW25, PW38

PW 27a = Av. PW27, PW39

PW 26a = Av. PW26, PW40

PW 31a = Av. PW31, PW32

PW 35	PW 36	PW 24a	PW 27a	PW 29	PW 26a	PW 30	PW 33	PW 41	PW 31a	PW 42	PW 43	PW 44	PW 45	PW 46	PW 47	PW 48	PW 49	PW 51	PW 52	PW 53	PW 55
38.8	41.4	41.2	39.2	41.6	37.7	43.6	40.4	23.8	38.1	39.6	29.2	43.2	40.8	45.1	49.0	44.0	48.2	31.2	38.8	40.5	39.1
73.1	81.5	78.5	75.9	80.4	73.1	72.0	76.5	45.0	67.8	67.1	65.8	78.4	76.5	83.0	86.6	81.4	88.5	63.6	65.8	73.8	72.2
37.2	40.7	40.5	38.6	40.1	36.8	35.8	39.8	23.1	33	40.5	32.8	40.9	40.9	41.7	43.9	42.2	44.7	31.4	34.2	38.1	36.1
6.74	6.93	7.10	6.91	6.96	6.34	5.26	7.17	3.85	5.71	9.03	6.83	7.68	7.52	6.89	7.25	7.68	7.54	5.80	6.31	6.98	6.07
1.20	1.26	1.27	1.20	1.25	1.19	0.90	1.27	0.72	1.01	1.48	1.14	1.33	1.20	1.36	1.56	1.36	1.58	1.09	1.19	1.26	1.31
8.38	6.25	8.07	8.49	7.00	7.85	4.46	6.81	4.17	4.3	11.3	5.55	5.92	7.39	5.77	6.38	11.1	6.23	6.32	8.1	5.12	5.99
0.85	1.00	0.93	0.97	1.07	0.84	0.76	0.86	0.42	0.78	0.99	0.96	1.01	1.05	0.90	0.82	0.88	1.10	0.93	0.76	0.88	0.90
0.39	0.49	0.48	0.51	0.61	0.43	0.42	0.49	0.21	0.41	0.45	0.53	0.52	0.51	0.41	0.44	0.41	0.53	0.35	0.46	0.48	0.51
2.81	2.89	3.01	3.16	3.28	2.38	2.81	2.8	1.33	2.68	2.81	2.90	3.10	3.24	2.48	2.40	2.81	2.80	2.25	2.54	2.75	2.66
0.47	0.46	0.48	0.47	0.49	0.42	0.47	0.47	0.20	0.44	0.44	0.44	0.48	0.47	0.40	0.40	0.47	0.44	0.32	0.43	0.47	0.42

106	113	112	107	113	103	119	110	64.9	104	108	79.6	118	111	123	134	120	131	85.0	106	110	107
76.4	85.2	82.0	79.3	84.0	76.4	75.2	79.9	47.0	70.8	70.1	68.8	81.9	79.9	86.7	90.5	85.1	92.5	66.5	68.8	77.1	75.4
52.3	57.2	57.0	54.3	56.4	51.8	50.4	56.0	32.5	46.4	57.0	46.1	57.5	57.5	58.6	61.7	59.4	62.9	44.2	48.1	53.6	50.8
29.2	30	30.7	29.9	30.1	27.4	22.8	31.0	16.7	24.7	39.1	29.6	33.2	32.6	29.8	31.4	33.2	32.6	25.1	27.3	30.2	26.3
13.8	14.5	14.6	13.8	14.4	13.7	10.3	14.6	8.27	11.6	17.0	13.1	15.3	13.8	15.6	17.9	15.6	18.1	12.5	13.7	14.5	15.0
27.4	20.4	26.4	27.7	22.9	25.7	14.6	22.3	13.6	14.1	36.9	18.1	19.3	24.2	18.9	20.8	36.3	20.4	20.7	26.5	16.7	19.6
14.7	17.2	16.0	16.7	18.4	14.5	13.1	14.8	7.24	13.4	17.1	16.6	17.4	18.1	15.5	14.1	15.2	19.0	16.0	13.1	15.2	15.5
11.0	13.8	13.5	14.3	17.1	12.1	11.8	13.8	5.90	11.5	12.6	14.9	14.6	14.3	11.5	12.4	11.5	14.9	9.8	12.9	13.5	14.3
11.3	11.7	12.1	12.7	13.2	9.60	11.3	11.3	5.36	10.8	11.3	11.7	12.5	13.1	10.0	9.7	11.3	11.3	9.1	10.2	11.1	10.7
12.3	12.1	12.6	12.3	12.9	11.0	12.3	12.3	5.25	11.5	11.5	11.5	12.6	12.3	10.5	10.5	12.3	11.5	8.4	11.3	12.3	11.0

8.57	9.34	8.91	8.66	8.81	9.32	9.63	8.92	12.4	8.99	9.34	6.89	9.34	9.01	11.7	12.7	9.72	11.4	10.1	9.37	8.95	9.66
2.49	2.56	2.59	2.39	2.63	2.48	5.41	2.75	3.50	3.34	2.43	1.59	2.36	2.18	3.39	3.74	2.89	3.42	2.76	3.37	3.02	3.10
9.33	9.68	9.25	8.38	8.57	10.7	10.5	9.75	12.1	9.61	9.52	6.80	9.42	8.51	12.3	13.8	10.6	11.6	9.37	10.3	9.95	9.93
0.49	0.58	0.51	0.48	0.55	0.51	0.57	0.55	0.55	0.62	0.45	0.57	0.60	0.49	0.66	0.70	0.45	0.70	0.55	0.51	0.64	0.66
15.6	16.2	15.9	16.4	15.8	15.2	8.06	14.7	6.80	11.4	16.3	18.4	18.3	18.7	13.3	13.1	15.2	14.1	11.3	11.5	13.4	12.6

PW 35	PW 36	PW 24a	PW 27a	PW 29	PW 26a	PW 30	PW 33	PW 41	PW 31a	PW 42	PW 43	PW 44	PW 45	PW 46	PW 47	PW 48	PW 49	PW 51	PW 52	PW 53	PW 55
1.27	1.29	1.65	1.25	1.25	1.21	0.51	1.24	0.57	0.8	0.75	0.54	0.68	0.73	1.29	1.60	1.24	2.01	2.44	2.61	2.40	2.53
2.90	2.50	2.85	2.64	2.32	2.52	1.27	2.75	1.11	1.8	3.47	3.23	3.18	3.50	2.47	2.22	2.92	1.74	1.39	1.93	1.55	1.70
12.4	11.6	12.0	11.3	11.3	11.6	8.58	11.3	5.35	8.22	16.2	17.6	17.6	19.6	12.3	10.8	13.6	9.25	6.12	7.19	7.84	7.40
49.4	45.5	47.7	43.4	44.0	44.7	20.2	46.4	21.4	29.6	64.8	62.6	60.5	59.9	46.3	41.3	51.5	36.4	27.9	31.7	35.3	32.0
3.87	3.33	3.22	3.00	3.22	3.17	1.61	3.34	1.56	2.28	3.27	4.43	4.57	5.09	3.49	3.22	4.01	2.61	1.56	1.82	2.28	2.11
11.1	10.7	10.6	10.4	10.1	9.83	5.23	10.1	5.22	6.89	17.0	14.7	14.2	14.3	11.1	9.69	11.2	8.63	5.23	6.15	7.62	6.70
23.1		22.0	20.0		16.3		28.7	16.6	24	27.3				30.8	31.2	21.2			19.3		
110	91.4	109	104	90.8	91.1	50.9	117	60.1	77.8	113	114	106	111	127	113	131	94.9	55.8	69.3	69.2	65.6
9.12	6.57	13.4	6.89	6.36	7.22	9.41	10.0	4.86	7.27	12.7	15.0	7.77	8.93	5.98	5.23	8.77	4.57	4.52	6.48	6.34	5.58
<0.3	< 0.3	<0.2	0.24	0.31	0.14	0.77	0.43	0.43	0.25	1.29	0.54	< 0.2	< 0.2	<0.2	<0.3	<0.3	< 0.4	< 0.3	<0.3	< 0.4	< 0.3
149	146	145	146	137	138	70.9	141	56.0	102	177	212	214	212	124	118	154	116	92.1	99.1	120	109
42.9	260	143	194	359	200	540	42.1	47.2	278	14.2	22.5	58.7	74.2	23.9	42.8	25.2	282	42.8	62.5	377	349
186	212	227	221	212	182	116	245	105	166	239	154	206	153	179	199	216	230	231	233	284	248
0.73	1.00	1.51	0.85	0.97	0.84	0.74	0.68	0.34	0.69	0.86	1.55	1.47	1.61	0.63	0.59	0.92	0.82	0.69	0.54	0.90	0.76
9.61	9.17	8.48	8.79	8.64	8.88	4.12	9.02	3.67	6.34	11.9	15.9	15.2	14.7	8.50	6.65	10.5	5.15	3.30	3.33	3.93	3.84
254	584	378	465	1420	397	1300	259	114	411	291	709	627	631	190	179	238	481	466	234	655	666
38.8	41.4	41.2	39.2	41.6	37.7	43.6	40.4	23.8	38.1	39.6	29.2	43.2	40.8	45.1	49.0	44.0	48.2	31.2	38.8	40.5	39.1
73.1	81.5	78.5	75.9	80.4	73.1	72.0	76.5	45.0	67.8	67.1	65.8	78.4	76.5	83.0	86.6	81.4	88.5	63.6	65.8	73.8	72.2
37.2	40.7	40.5	38.6	40.1	36.8	35.8	39.8	23.1	33	40.5	32.8	40.9	40.9	41.7	43.9	42.2	44.7	31.4	34.2	38.1	36.1
6.74	6.93	7.10	6.91	6.96	6.34	5.26	7.17	3.85	5.71	9.03	6.83	7.68	7.52	6.89	7.25	7.68	7.54	5.80	6.31	6.98	6.07
1.20	1.26	1.27	1.20	1.25	1.19	0.90	1.27	0.72	1.01	1.48	1.14	1.33	1.20	1.36	1.56	1.36	1.58	1.09	1.19	1.26	1.31
8.38	6.25	8.07	8.49	7.00	7.85	4.46	6.81	4.17	4.3	11.3	5.55	5.92	7.39	5.77	6.38	11.1	6.23	6.32	8.1	5.12	5.99
0.85	1.00	0.93	0.97	1.07	0.84	0.76	0.86	0.42	0.78	0.99	0.96	1.01	1.05	0.90	0.82	0.88	1.10	0.93	0.76	0.88	0.90
0.39	0.49	0.48	0.51	0.61	0.43	0.42	0.49	0.21	0.41	0.45	0.53	0.52	0.51	0.41	0.44	0.41	0.53	0.35	0.46	0.48	0.51
2.81	2.89	3.01	3.16	3.28	2.38	2.81	2.8	1.33	2.68	2.81	2.90	3.10	3.24	2.48	2.40	2.81	2.80	2.25	2.54	2.75	2.66
0.47	0.46	0.48	0.47	0.49	0.42	0.47	0.47	0.20	0.44	0.44	0.44	0.48	0.47	0.40	0.40	0.47	0.44	0.32	0.43	0.47	0.42
5.04	5.71	5.38	5.43	5.45	5.17	2.43	5.13	2.12	3.47	4.03	4.00	4.14	4.29	3.56	3.65	4.24	4.44	5.72	5.71	6.12	6.29
0.86	1.14	1.08	1.10	1.21	1.07	0.56	0.94	0.38	0.71	1.05	1.29	1.14	1.20	0.85	0.90	1.05	1.11	0.93	0.90	1.08	0.98
<1.2	< 1.1	<0.8	<1.1	< 1.6	<1.4	0.85	0.94	0.33	0.34	<1.5	< 1.9	< 1.6	< 1.1	0.50	0.82	0.48	< 1.3	< 0.9	<1.2	< 0.9	0.45
<1.0	< 2.8	<0.8	1.57	< 2.2	1.10	< 1.2	<1	<0.6	0.47	2.58	0.90	5.12	< 1.5	0.83	3.56	0.44	1.18	< 2.6	<1.2	2.08	13.5
15.6	16.2	15.9	16.4	15.8	15.2	8.06	14.7	6.80	11.4	16.3	18.4	18.3	18.7	13.3	13.1	15.2	14.1	11.3	11.5	13.4	12.6
2.54	2.66	3.63	3.12	2.74	2.64	3.20	2.83	3.78	3.37	6.80	4.64	2.78	2.68	2.18	2.36	2.74	2.26	2.65	3.14	2.66	2.04

PW 35	PW 36	PW 24a	PW 27a	PW 29	PW 26a	PW 30	PW 33	PW 41	PW 31a	PW 42	PW 43	PW 44	PW 45	PW 46	PW 47	PW 48	PW 49	PW 51	PW52	PW 53	PW 55
-102	-77	-52	-45	-35	-19	-6	-3	-2	0	2	12	22	35	47	52	82	117	140	155	185	210

1.39	1.36	4.04	1.27	1.27	1.3	0.59	1.27	0.61	0.83	0.95	0.77	0.99	0.94	1.62	1.91	1.56	2.42	3.13	3.13	2.98	2.86
1.75	1.75	1.74	1.75	1.8	1.75	1.31	1.72	1.42	1.43	1.7	1.8	1.89	1.99	1.72	1.47	1.61	1.26	0.72	0.76	1.05	0.9
15.4	15.23	15.29	15.1	14.8	14.7	6.72	14.69	6.06	9.45	16.05	17.72	17.08	17.55	15.13	14.06	15.37	14.14	12.5	12.89	14.91	13.55
61.66	62.23	61.96	60.01	58.41	60.3	30.4	57.14	27.9	38.6	63.6	60.94	60.3	60.65	67.39	68.9	65.56	71.34	69.37	69.11	70.25	66.99
0.2	0.27	0.3	0.29	0.24	0.26	0.18	0.34	0.24	0.27	0.25	0.1	0.16	0.17	0.16	0.16	0.17	0.18	0.13	0.13	0.16	0.14
3.42	3.4	3.43	3.47	3.19	3.33	1.44	3.32	1.47	2.06	3.83	4.29	4.39	4.62	3.17	2.56	3.45	2.46	2.02	2.09	2.66	2.29
3.5	4.32	4.42	5.86	6.59	5.85	28.8	7.16	30.92	21.4	1.92	0.81	0.89	0.96	1.01	1.07	0.84	1.29	3.93	4.1	1.01	4
0.65	0.64	0.65	0.64	0.63	0.64	0.28	0.61	0.28	0.42	0.69	0.68	0.67	0.7	0.71	0.63	0.71	0.66	0.5	0.5	0.6	0.54
0.09	0.07	0.08	0.09	0.1	0.12	1.56	0.3	2.3	1.5	0.08	0.08	0.07	0.08	0.06	0.05	0.05	0.07	0.14	0.09	0.06	0.15
5.24	4.96	4.77	4.49	4.8	4.76	2.33	4.87	2.35	3.23	5.34	6.68	6.68	7.38	5.46	4.73	5.88	3.86	2.37	2.7	3.58	3.07
5.34	5.73	5.72	6.82	7.64	7.06	25.44	8.45	26.78	20.1	4.78	6.65	5.59	5.52	3.9	3.23	4.04	1.83	4.23	3.21	2.62	4.45
169.9	182.9	181.54	175.41	182.8	167.05	166.5	176.6	102.8	154.23	173.7	146.2	182.5	179.6	188	198.8	192.3	201.6	143.3	158.6	170.3	165.3

77	77	75	68	69	72	39	71	37	49	140	127	115	119	93	74	95	74	61	61	72	56
46	47	50	42	42	43	17	46	22	28	61	58	57	56	44	36	44	67	27	33	38	30
11	9	10	11	9	9	8	9	6	8	18	15	14	14	10	9	12	8	6	6	9	7
19	20	20	19	18	19	10	20	7	13	23	23	26	25	17	19	19	18	9	9	13	7
20	28	24	24	20	23	11	21	9	12	35	35	89	22	20	21	21	24	24	21	21	19
87	85	87	87	88	85	52	91	50	65	87	100	111	115	103	91	100	80	50	51	64	54
156	147	150	144	142	145	71	145	62	96	194	203	204	212	141	117	158	113	91	95	121	103
275	307	307	347	398	328	473	303	310	291	113	78	95	95	182	231	140	281	403	394	385	376
33	33	34	32	35	33	30	34	18	30	36	27	35	32	33	30	35	34	27	28	30	28
183	187	192	186	181	182	83	181	71	116	155	128	132	137	131	129	155	152	192	198	216	197
18	18	18	18	18	18	9	17	8	13	19	18	17	17	17	16	18	16	15	15	16	15
538	524	566	547	1255	508	818	483	159	299	649	631	597	613	468	432	522	468	404	485	645	599