

Supplementary Material

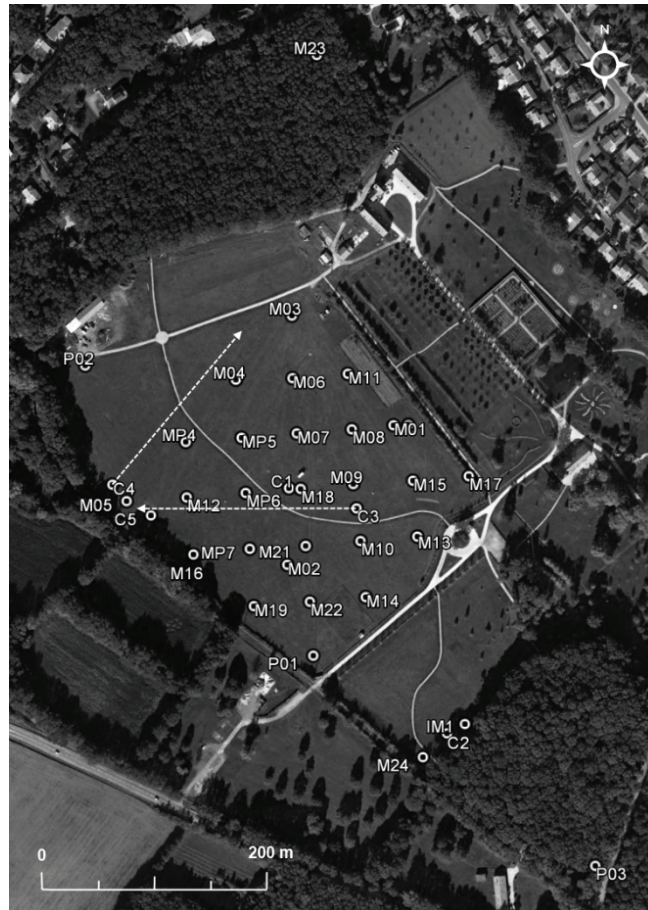


Fig. 1: The location of the wells at the HES (Google Earth v 7.1.2.2041, imagery date: October 30, 2012). The wells IM1 and C2 intercept the lower- and middle-Lias aquifer whereas the 35 other wells intercept the Dogger aquifer. The dotted lines indicate the direction of the two oblique cored wells C3 and C4.

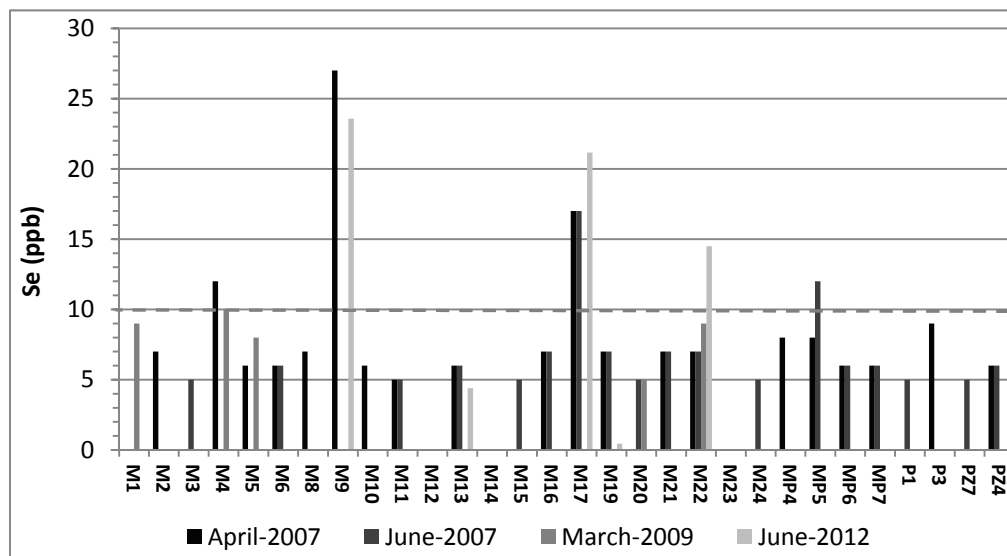


Fig. 2: Se concentrations measured in HES wells

Table 1 : Total rock analysis (A)

	Se	SiO2	Al2O3	SiO2 + Al2O3	H2Otot	CaO	MgO	CO2	CaO + CO2	CaO + MgO + CO2	Fe2O3	FeO	S tot	C org	MnO	Na2O	K2O	Li	Cs	Rb
	ppm	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm
C4 Qu1	0.18	51.61	10.01	61.62	13.20	0.70	0.96	0.02	0.72	1.69	23.05	<0.05	<0.01	<0.01	0.04	<LD	0.40	50.00	9.35	73.51
C4 Qu2	0.05	66.74	12.57	79.31	13.74	0.87	1.31	0.01	0.88	2.19	3.51	<0.05	<0.01	<0.01	0.03	<LD	1.08	58.00	18.80	187.90
C4 Qu3	1.72	53.77	15.16	68.93	12.66	0.52	0.62	0.01	0.53	1.15	12.30	**	<0.01	<0.01	3.19	<LD	0.37	85.00	8.11	49.37
C4 Bt1	0.07	0.40	0.07	0.47	0.24	55.84	0.39	42.21	98.05	98.44	0.06	<0.05	0.03	0.03	0.02	<LD	<LD	1.00	<LD	0.68
C4 Bt2	0.28	2.23	0.20	2.43	0.43	54.73	0.42	43.13	97.86	98.28	0.28	0.07	0.02	0.03	0.04	<LD	<LD	1.70	0.17	2.07
C4 Bt3	0.03	1.19	0.30	1.49	0.65	55.25	0.46	43.37	98.62	99.08	0.11	0.07	0.01	0.02	0.03	<LD	<LD	1.60	0.22	2.54
C4 Bt4	0.05	0.78	0.13	0.91	0.36	55.91	0.44	43.58	99.49	99.93	0.12	0.05	0.03	0.04	0.02	<LD	<LD	1.40	0.12	1.37
C4 Bt5	0.21	0.71	0.09	0.80	0.36	56.00	0.44	43.68	99.68	100.12	0.15	<0.05	0.02	0.04	0.02	<LD	<LD	1.10	<LD	0.92
C4 Bt6	0.07	0.17	0.15	0.32	0.42	56.10	0.53	42.71	98.81	99.34	0.07	<0.05	0.03	0.05	0.02	<LD	<LD	1.30	0.11	1.43
C4 Bt1	0.11	0.06	0.08	0.13	0.35	56.25	0.43	44.31	100.56	100.99	0.27	0.03	0.03	0.04	0.02	<LD	<LD	1.00	<LD	0.67
C4 Bt2	28.00	0.07	0.13	0.20	0.47	55.61	0.51	44.27	99.88	100.39	0.28	0.14	0.07	0.06	0.03	<LD	<LD	0.90	0.10	0.94
C4 Bt3	153.00	59.99	16.09	76.08	7.75	6.42	0.38	8.15	14.57	14.95	1.44	0.53	0.34	0.91	0.01	0.08	88.00	4.04	37.55	
C4 Bt4	0.19	0.58	0.35	0.93	0.65	54.71	0.44	44.03	98.74	99.18	0.72	0.10	0.02	0.03	0.03	<LD	0.06	1.70	0.35	3.10
C4 Bt5	0.14	0.59	0.34	0.93	0.57	54.85	0.55	43.91	98.76	99.30	0.42	0.11	0.23	0.07	0.01	<LD	0.07	1.60	0.32	3.32
C4 Bt6	6.40	1.38	0.65	2.03	0.81	53.96	0.65	43.55	97.51	98.16	0.67	0.09	0.04	0.06	0.01	<LD	0.13	2.20	0.80	6.53
C4 Bt7	8.10	33.02	24.23	57.25	12.20	14.44	0.45	13.24	27.68	28.13	1.03	0.46	0.13	0.57	0.01	<LD	0.11	181.00	2.05	6.87
C4 Bt8	10.50	0.83	0.42	1.26	0.64	54.70	0.59	43.84	98.54	99.13	0.66	0.10	0.04	0.04	0.01	<LD	0.10	1.80	0.39	4.49
C4 Bt9	0.11	2.41	0.63	3.04	0.89	52.58	0.57	42.43	95.01	95.58	0.78	0.20	0.36	0.09	0.03	<LD	0.15	2.60	0.79	7.62
C4 Bt10	6.10	25.10	9.37	34.47	7.71	15.90	0.48	11.15	27.05	27.53	17.32	1.86	13.17	0.73	0.01	<LD	0.45	42.00	3.84	24.49
C4 Bt12	3.80	13.85	7.81	21.66	8.22	32.02	0.80	29.74	61.76	62.56	4.84	1.42	3.72	1.08	0.02	<LD	0.68	31.00	5.27	36.13
C4 Bt13	495.00	34.26	21.86	56.12	15.63	4.17	0.99	8.46	12.63	13.62	10.06	2.52	7.26	1.22	0.01	0.09	1.24	109.00	12.12	66.11
C4 Bt14	0.05	0.83	0.48	1.31	0.63	54.37	0.50	44.02	98.39	98.89	0.58	0.15	0.02	0.04	0.03	<LD	0.08	1.90	0.38	3.90
C4 Bt15	0.14	4.12	1.07	5.19	1.26	51.56	0.58	41.37	92.93	93.51	1.50	0.20	0.03	0.04	0.03	<LD	0.29	4.40	1.91	13.13
C4 Bt16	0.12	1.91	0.54	2.45	0.75	35.89	14.76	45.28	81.17	95.94	1.13	0.61	0.36	0.10	0.03	<LD	0.14	4.00	0.75	5.53
C4 Aa1	0.04	2.35	0.55	2.90	0.74	52.45	1.79	43.05	95.50	97.29	0.59	0.22	0.17	0.07	0.01	<LD	0.20	2.70	0.88	6.44
C4 Aa2	0.17	2.86	0.60	3.46	0.86	43.59	7.86	43.06	86.65	94.51	1.33	0.42	0.65	0.12	0.02	<LD	0.21	4.30	0.86	6.22
C4 Aa3	0.09	6.96	1.02	7.97	1.12	30.45	17.16	42.85	73.30	90.46	1.90	0.54	0.53	0.13	0.01	<LD	0.37	7.80	1.13	10.14
C4 Aa4	0.12	12.64	2.38	15.01	1.37	40.54	3.94	36.96	77.50	81.44	1.93	0.31	1.11	0.27	0.01	<LD	1.12	11.50	3.40	27.43
C5 Bt1	1.70	15.57	12.00	27.57	34.18	0.35					0.87			2.94	0.03	0.02	0.05		0.817	3.009
C5 Bt2	2.10	39.49	29.23	68.72	1.22	1.22	0.31				1.71			7.51	0.00	0.03	0.06		1.319	4.195

Table 1 : Total rock analysis (B)

	As	B	Ba	Be	Bi	Cd	Cl	Co	Cr	Cs	Cu	Ga	Ge	Hg	HF	In	Mo	Nb	Ni	Pb	Rb	Sb	Sn	Sr	Ta	V	W	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
C4 Qu1	60.92	42	59.32	16.90	0.46	0.43	40	35.30	49.06	9.35	21.24	15.49	1.64	18	7.21	0.09	17.32	12.92	53.94	19.11	73.51	3.81	4.61	18.25	1.35	300.20	6.32	193.90
C4 Qu2	10.27	58	110.90	7.59	0.64	0.35	33	23.07	66.28	18.80	15.76	18.73	1.92	60	8.77	0.10	0.99	16.34	54.26	21.52	187.90	1.53	6.06	23.20	1.67	82.07	5.41	89.29
C4 Qu3	168.60	33	4.01	24.12	0.65	21.69	33	97.28	106.00	8.11	28.53	23.63	3.11	335	6.13	0.08	5.49	15.27	238.10	46.21	49.37	3.18	2.74	29.95	1.54	237.20	4.52	426.80
C4 B1	<LD	2	3.10	0.39	<LD	<LD	44	1.70	3.25	<LD	<LD	0.13	<LD	<10	<LD	<LD	0.09	12.16	1.05	0.68	<LD	<LD	<LD	113.70	0.03	7.96	0.15	<LD
C4 B2	2.49	4	6.57	0.39	<LD	0.41	49	4.07	7.44	0.17	<LD	0.41	<LD	24	0.08	0.42	0.42	25.68	75.68	2.07	0.13	<LD	112.50	0.03	15.08	0.16	<LD	
C4 B3	<LD	3	5.11	0.44	<LD	<20	<LD	1.50	11.91	0.22	<LD	0.41	0.06	11	0.08	<LD	0.44	0.57	11.85	16.13	2.54	<LD	<LD	92.97	0.04	13.69	0.27	<LD
C4 B4	<LD	3	4.08	0.29	<LD	<LD	40	1.92	8.18	0.12	<LD	0.22	<LD	<10	0.04	<LD	0.53	0.19	14.64	8.77	1.37	<LD	0.26	118.10	0.01	10.80	<LD	<LD
C4 B5	4.10	3	3.56	0.27	<LD	<LD	46	1.99	7.26	<LD	<LD	0.14	<LD	<10	<LD	<LD	0.47	0.12	15.85	1.21	0.92	<LD	0.60	137.20	<LD	13.84	<LD	<LD
C4 B6	<LD	3	5.34	0.48	<LD	0.82	71	1.68	8.55	0.11	<LD	0.28	<LD	86	0.06	<LD	0.46	0.16	15.23	2.11	1.43	<LD	<LD	158.90	0.02	6.38	<LD	<LD
C4 B1	<LD	2	2.92	0.40	<LD	0.21	68	1.90	<LD	<LD	<LD	0.11	<LD	28	<LD	<LD	0.50	0.09	13.58	2.27	0.67	<LD	0.23	142.30	<LD	11.30	<LD	<LD
C4 B2	2.33	2	3.05	0.42	<LD	0.25	<20	2.29	<LD	0.10	<LD	0.16	<LD	<10	0.04	<LD	0.68	0.13	14.84	5.32	0.94	<LD	<LD	50.54	0.01	6.84	<LD	<LD
C4 B3	8.29	63	178.50	6.15	0.42	14.09	46	10.43	111.40	4.04	7.76	18.65	2.26	14	11.53	0.08	1.75	25.36	42.09	17.58	37.55	2.21	7.05	39.08	2.52	130.00	7.08	256.00
C4 B4	6.22	4	9.58	0.65	<LD	<LD	44	3.34	9.01	0.35	3.60	0.51	0.07	<10	0.10	<LD	0.50	0.43	20.33	4.14	3.10	0.31	0.39	114.00	0.03	19.23	0.18	<LD
C4 B5	5.23	5	6.24	0.32	<LD	0.21	180	2.21	11.23	0.32	3.75	0.58	0.08	<10	0.09	<LD	0.84	0.39	15.73	4.49	3.32	0.18	0.38	152.80	0.03	10.17	<LD	10.90
C4 B6	3.98	8	12.17	0.51	<LD	0.34	120	1.80	17.07	0.80	<LD	1.07	0.12	<10	0.21	<LD	0.59	0.86	15.79	7.87	6.53	0.26	0.24	177.20	0.06	20.53	0.30	15.77
C4 B7	14.04	176	31.75	9.65	0.80	3.93	1075	30.46	210.70	2.05	17.38	26.50	3.06	19	40.11	0.11	1.26	55.17	157.30	35.62	6.87	2.41	13.42	56.29	5.77	155.80	16.52	96.51
C4 B8	12.52	9	8.62	0.40	<LD	0.24	63	2.64	18.30	0.39	<LD	0.71	0.07	<10	0.16	<LD	0.56	0.60	19.80	3.18	4.49	0.25	<LD	154.10	0.04	20.05	0.20	12.30
C4 B9	5.41	7	10.52	0.48	<LD	<LD	76	2.17	19.19	0.79	<LD	0.93	0.12	<10	0.25	<LD	0.90	0.98	15.80	3.38	7.62	0.14	0.34	109.50	0.06	23.52	0.29	6.56
C4 B10	24.16	45	53.46	3.49	<LD	0.35	37	11.05	88.21	3.84	18.46	11.16	1.34	24	5.66	<LD	7.00	12.20	35.42	87.25	24.49	0.91	1.26	50.36	1.18	97.48	21.11	19.79
C4 B12	40.77	38	47.90	3.19	<LD	0.84	62	13.45	100.50	5.27	19.38	10.37	1.09	41	2.11	0.07	8.86	8.45	66.13	19.08	36.13	1.49	<LD	91.83	0.65	110.30	3.50	62.78
C4 B13	46.83	62	134.40	7.15	0.13	3.66	170	44.08	184.70	12.12	24.05	25.04	2.26	79	4.57	0.08	4.90	21.23	73.53	37.50	66.11	2.43	2.94	43.22	1.86	360.10	7.32	70.89
C4 B14	5.94	6	9.13	0.54	<LD	<LD	79	1.96	10.43	0.38	6.78	0.62	0.08	12	0.15	<LD	0.60	0.56	13.91	7.29	3.90	0.14	0.74	143.80	0.04	21.53	0.21	6.35
C4 B15	6.11	15	18.21	1.29	<LD	<LD	64	3.19	28.55	1.91	<LD	1.67	0.20	20	0.40	<LD	0.77	1.93	15.10	7.30	13.13	0.14	0.36	143.10	0.12	37.18	0.36	10.28
C4 B16	10.17	9	7.90	0.39	<LD	<LD	135	1.48	17.25	0.75	<LD	0.75	0.08	<10	0.26	<LD	<LD	0.86	10.70	4.28	5.53	0.11	0.24	124.50	0.05	29.28	<LD	<LD
C4 Aa1	<LD	8	10.06	0.21	<LD	<LD	89	1.33	17.05	0.88	<LD	0.76	0.09	<10	0.19	<LD	<LD	0.85	10.73	56.02	6.44	<LD	0.34	159.10	0.05	13.63	0.19	<LD
C4 Aa2	26.33	12	10.38	<LD	<LD	<LD	86	1.56	20.28	0.86	8.82	0.85	0.10	<10	0.66	<LD	0.94	1.12	10.72	3.86	6.22	0.12	1.47	97.79	0.08	21.39	<LD	<LD
C4 Aa3	7.82	8	19.76	0.29	<LD	<LD	125	1.53	17.87	1.13	3.57	1.36	0.16	<10	1.31	<LD	0.65	1.45	9.58	731.71	10.14	<LD	0.48	102.60	0.11	16.61	0.24	6.86
C4 Aa4	12.69	23	45.59	0.41	<LD	<LD	73	2.83	23.10	3.40	4.79	3.23	0.30	<10	1.43	<LD	4.76	2.94	15.18	6.68	27.43	0.21	0.60	187.70	0.24	22.18	0.35	8.79
C5 B1	8.77		12.74	6.304	0.258	10.68		15.46	95.37	0.817	12.63	12.85	7.371		8.488	<LD	27.58	18.54	43.02	28.642	3.009	0.669	3.282	74.36	1.547	87.88	4.754	382.8
C5 B2	13.05		22.19	20.84	0.48	7.403		33.41	211.6	1.319	18.62	32.48	8.876		17.72	0.144	74.28	41.69	78.56	58.919	4.195	1.01	6.451	22.4	3.467	155.6	8.999	246.3

Table 1: Total rock analysis (C)

	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	REE	Y	REY	Th	U	Zr	TiO2	P2O5	F
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%
C4 Qu1	21.46	573.60	6.28	24.65	6.23	1.39	8.00	1.03	6.21	1.22	3.59	0.57	4.09	0.62	658.94	35.68	694.62	11.64	6.75	294.80	0.64	0.12	0.17
C4 Qu2	31.90	124.10	8.01	28.12	5.52	1.03	4.23	0.66	3.97	0.76	2.27	0.37	2.72	0.41	214.07	20.29	234.36	14.91	4.39	337.90	0.76	0.03	0.18
C4 Qu3	559.80	271.80	92.78	376.50	72.09	16.04	74.03	10.76	63.45	12.52	33.57	4.61	26.77	3.99	1618.71	498.90	2117.61	17.57	6.83	227.00	0.80	0.21	0.11
C4 Bk1	8.76	3.35	1.07	4.28	0.76	0.18	0.88	0.13	0.78	0.17	0.48	0.06	0.35	0.06	21.31	11.05	32.36	0.16	2.78	<LD	<LD	<LD	0.01
C4 Bk2	13.56	6.89	1.92	7.70	1.48	0.34	1.61	0.23	1.43	0.30	0.78	0.10	0.58	0.08	36.99	16.82	53.81	0.46	1.46	3.45	0.01	<LD	0.01
C4 Bk3	17.47	7.64	2.49	10.15	1.99	0.49	2.36	0.35	2.20	0.46	1.19	0.15	0.85	0.13	47.91	23.85	71.76	0.59	3.79	2.89	0.02	0.06	0.02
C4 Bk4	13.63	5.09	1.83	7.29	1.34	0.32	1.50	0.22	1.34	0.29	0.77	0.10	0.58	0.08	34.37	15.71	50.08	0.32	1.72	<LD	0.01	<LD	0.01
C4 Bk5	8.02	3.57	0.99	4.07	0.73	0.17	0.86	0.13	0.81	0.18	0.48	0.06	0.38	0.06	20.51	10.82	31.33	0.27	2.33	<LD	0.01	0.02	0.01
C4 Bk6	13.55	9.64	2.34	11.00	2.71	0.73	4.18	0.66	4.47	1.00	2.65	0.33	1.85	0.26	55.37	46.08	101.45	0.31	1.40	1.78	0.01	0.02	0.01
C4 Bk1	7.76	4.96	1.11	4.54	0.87	0.21	1.04	0.15	0.96	0.22	0.65	0.09	0.55	0.09	23.19	15.74	38.93	0.22	1.55	<LD	<LD	<LD	0.01
C4 Bk2	7.29	4.13	0.97	3.99	0.78	0.19	0.96	0.14	0.90	0.20	0.56	0.07	0.42	0.07	20.66	12.86	33.52	0.19	3.11	<LD	0.01	0.04	0.01
C4 Bk3	92.11	87.46	15.50	57.23	10.23	2.05	9.59	1.50	9.35	1.95	5.63	0.83	5.39	0.84	299.65	84.91	384.56	17.20	27.28	492.30	1.38	0.05	0.05
C4 Bk4	12.26	6.68	1.73	7.01	1.31	0.32	1.40	0.21	1.39	0.29	0.82	0.11	0.65	0.10	34.26	15.75	50.01	0.66	1.54	3.40	0.02	0.02	0.01
C4 Bk5	23.09	10.64	3.57	14.20	2.56	0.60	2.69	0.39	2.32	0.48	1.28	0.17	0.98	0.14	63.11	24.81	87.92	0.90	7.07	2.99	0.02	<LD	0.01
C4 Bk6	28.10	14.48	4.38	17.61	3.29	0.73	3.31	0.47	2.77	0.56	1.50	0.20	1.16	0.17	78.71	29.16	107.87	1.93	0.53	7.22	0.04	0.02	0.02
C4 Bk7	285.20	235.10	44.82	171.50	30.28	6.02	27.24	4.00	24.73	5.19	15.15	2.22	14.57	2.31	868.33	273.80	1142.13	30.82	25.94	1525.00	2.61	0.08	0.05
C4 Bk8	16.19	10.21	2.60	10.34	1.95	0.45	2.04	0.30	1.81	0.37	1.04	0.14	0.84	0.13	48.41	19.73	68.14	1.20	0.58	5.73	0.03	<LD	0.01
C4 Bk9	21.02	13.22	3.36	13.30	2.49	0.55	2.45	0.35	2.04	0.41	1.09	0.15	0.85	0.12	61.39	21.92	83.31	1.74	24.73	9.10	0.04	0.03	0.02
C4 Bk10	86.71	89.94	15.70	60.31	10.94	2.18	9.50	1.30	7.57	1.47	4.05	0.59	3.59	0.54	294.39	67.20	361.59	11.00	12.58	219.20	0.61	0.12	0.07
C4 Bk12	37.76	42.43	7.18	27.85	4.95	1.02	4.21	0.60	3.44	0.66	1.79	0.26	1.65	0.25	134.05	27.07	161.12	7.79	18.54	76.81	0.38	0.12	0.10
C4 Bk13	106.50	130.80	20.84	77.93	14.34	2.87	11.83	1.62	8.93	1.60	4.19	0.60	3.75	0.56	386.35	65.19	451.54	19.93	36.09	168.50	0.95	0.30	0.19
C4 Bk14	13.68	11.07	2.35	9.70	1.96	0.45	2.03	0.30	1.88	0.40	1.14	0.15	0.94	0.14	46.21	21.41	67.62	0.87	1.16	5.09	0.03	<LD	0.02
C4 Bk15	21.25	19.47	4.14	17.22	3.45	0.77	3.45	0.50	2.83	0.55	1.46	0.19	1.11	0.17	76.55	27.44	103.99	3.76	2.96	15.00	0.07	0.17	0.05
C4 Bk16	11.81	14.24	2.45	9.93	2.02	0.46	1.92	0.28	1.51	0.29	0.75	0.10	0.61	0.09	46.45	11.69	58.14	1.45	3.25	9.72	0.04	<LD	0.05
C4 Aa1	8.87	12.99	2.05	8.24	1.74	0.38	1.58	0.23	1.22	0.23	0.60	0.08	0.51	0.08	38.79	8.59	47.38	1.90	2.82	6.95	0.04	<LD	0.02
C4 Aa2	12.72	19.09	3.06	12.65	2.37	0.50	1.93	0.28	1.50	0.26	0.72	0.10	0.62	0.09	55.89	9.30	65.19	2.21	3.00	26.26	0.05	0.04	0.03
C4 Aa3	14.60	22.39	3.55	14.18	2.73	0.57	2.15	0.32	1.69	0.31	0.82	0.12	0.72	0.11	64.24	10.50	74.74	2.37	1.40	52.86	0.08	0.02	0.05
C4 Aa4	14.92	23.78	3.62	14.28	2.59	0.54	2.09	0.31	1.72	0.31	0.85	0.12	0.79	0.12	66.05	9.91	75.96	2.91	2.53	56.28	0.17	0.03	0.05
C5 Bk1	88.13	138.50	18.59	69.25	12.20	2.40	9.65	1.33	7.23	1.32	3.61	0.52	3.34	0.52	356.59	49.69	406.28	10.77	190.90	338.60	0.78	0.07	
C5 Bk2	178.70	313.40	39.03	149.10	28.35	5.65	22.73	3.37	18.89	3.56	9.87	1.47	9.49	1.50	785.10	127.5	912.60	23.02	47.32	742.00	1.74	0.11	