APPENDIX 1

List of Physical and Chemical Data

A) Location: Villa Cave, Batu Caves

Sample ID	K	Na	Ca	Mg	Fe	Mn	Al	Pb	Zn	Cl	F	SO4	CO3	HCO3	NO3	DO	SI (Calcite)
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
081207 CA1	3.111	2.761	74.616	8.666			15			12.075		20.831	2.1	171.2	61.169	4.4	-0.5014
101007 CA1	2.957	1.836	31.25	5.101	0.029				15	2.322		3.93	3.4	111	21.768	3.05	-1.4467
121107 CA1	1.086	3.32	78.18	10.56			100	300	29	4.934		26.157	2.9	181	33.647	4.54	-0.1923
211207 CA1	1.469	3.238	78.75	11.18						4.715		27.858	2.9	320.4	35.33	4.5	0.9041
231107 CA1	1.28	2.944	76.64	10.67						3.854		27.645	3.4	316.2	26.398	3.48	0.1242
081207 CA2	3.5	13.6	28.31	6.16						4.69	0	21.68	0.12	181.06	58.94	4.8	-0.6611
090108 CA2	1.65	1.39	43.26	4.91		0	10			4.55		4.96	3	121.25		4.7	0.212
101007 CA2	1.87	1.9	50.17	5.96						5.32		4.35		165.7	21.76	5.3	-0.2545
121107 CA2	1.58	1.56	47.41	5.47			10		220	6.19	0.02	6.76	0	119.14	40.8	5.2	-0.9621
211207 CA2	2.28	1.67	45.65	5.46		0.01				3.61		5.09	4.1	181.68	25.2	6	0.3435
231107 CA2	2.12	1.66	48.03	5.58						4.57		5.25	3.2	160.31	31.06	4.5	-1.2107
261007 CA2	0.97	2.73	79.69	10.61					120	4.68	0.03	25.88	5.7	381.39	32.33	5.4	1.0103
081207 CA3	1.337	2.552	67.73	17.98						19.915		8.809	1.84	179.09	28.696	5	-0.2384
090108 CA3	1.465	2.68	47.74	17.47		0.003	1			1.034		4.6	0	234.83		3.2	0.401
090408 CA3	4.822	11.11	27.16	5.713						16.518		8.052	1.74	211.11	39.98	3.8	0.4768
101007 CA3	3.899	12.7	30.77	6.875					154	19.913		9.12	3.08	113.77		5.11	-0.1485
110208 CA3	3.872	12.4	27.8	6.343				10		18.408		8.571	1.04	97.74	37.774	3.8	-0.6963
121107 CA3	3.754	13.47	28.12	6.079		0.001	7		7	15.95		8.136	0.627	109.14	29.688	5.15	-1.9081
140308 CA3	3.295	11.09	27.41	5.909						5.213			0.73	156.61	71.3	4.5	0.1149
211207 CA3	3.686	11.92	27.34	6.019						13.502		6.335	1.94	107.09	29.717	5.8	-0.4164
231107 CA3	3.509	11.4	28.56	6.215						13.048		6.314	1.02	109.4	28.28	3.45	-1.6794
260308 CA3	3.684	11.41	29.01	6.254						2.69		2.39	0	73.99	75.3	4.6	0.2341
261007 CA3	2.551	9.288	27.36	5.918			474		16				0	144.88		5.43	-0.7103
010708 CA4	1.444	2.266	46.2	17.19						4.627		22.196	1.6	141.035	66.248	5.1	0.3721
010808 CA4	1.442	2.172	51.99	18.26						4.322		22.055	3.4	122.0465	59.47	3.5	0.3785
050608 CA4	1.315	2.176	48.73	17.17						5.254		22.042	3.4	95.17454	69.051	4	0.5711
070508 CA 4	1.41	2.066	49.43	16.91						4.718		22.877	5	145.8165	60.955	4.8	0.3258
091008 CA4	1.486	2.315	52.99	18.4								22.451	3.5	129.5272	60.794	5.3	0.3975
101007 CA4	2.143	3.551	71.6	16.72						3.038		9.515	7.9	241.8414	80.0883	3.08	0.2366
110208 CA4	1.45	2.689	45.29	17.39				13		4.925		21.203	4.2	135.1676	64.992	3.4	0.1339
110908 CA4	1.413	2.164	52.89	18.5						5.355		22.847	2.4	129.1611	58.881	5.6	0.4078
121107 CA4	1.407	2.801	52.06	18.72					8	4.695		22.978	2.7	142.3	61.485	5.2	-1.1665
140308 CA4	1.259	2.264	45.4	16.46						5.203		22.116	5.2	104.9312	73.017	3.8	0.3812
140808 CA4	1.1	1.64	32	10.84						4.532		25.32	4.3	216.3729	62.1	3.5	0.4101
160708 CA4	1.413	2.15	47.32	17.79						4.878		24.736	1.7	110.3129	65.023	4.2	0.1535
180608 CA4	1.398	2.252	53.83	18.56						5.041		23.817	2.5	126.6106	70.024	4.5	0.6481

CONTINUED															
210508 CA4	1.699	2.746	66.05	23.02					4.858	22.496	3.6	272.3866	65.276	3.5	0.9063
211207 CA4	1.499	2.718	49.76	17.48					3.401	16.25		209.6305	49.572	6.2	0.3979
231107 CA4	1.522	2.669	53.2	18.5	0.049				3.249	17.136		236.8258	46.689	3.42	0.4357
240408 CA4	1.55	2.151	54.14	19.26					4.968	30.115		193.9064	83.369	4.2	-0.2832
250908 CA4	1.42	2.202	52.57	18.16					5.765	26.477	3.2	147.0477	69.697	5.2	0.4188
261007 CA4	3.36	5.123	57.07	9.793		15	1	24			5	241.9176		5.15	-0.1971
270808 ca4	3.529	4.349	53.9	9.059					3.973	21.56	1.5	148.595	57.259	3.6	0.554
290208 CA4	0.926	1.722	43.7	16.47					4.861	20.957	7.1	173.2338	65.138	4	0.0152
010708 CA5	3.703	4.332	50.12	8.419					5.873	26.294	2.2	90.8835	76.813	5.2	0.4075
010808 CA5	2.826	3.407	41.88	7.007					5.556	28.236	2.7	55.2948	76.522	3.4	0.1523
050608 CA5	3.472	4.119	48.92	8.18					5.891	27.007	2.2	179.2867	77.286	4	0.5784
070508 CA 5	3.36	4.213	54.2	9.084					5.67	30.734		105.0898	85.856	5	0.1944
081207 CA5	3.383	4.869	55.13	9.564		1	600		5.436	30.668	3.2	113.6688	79.505	5.06	-0.4456
090408 CA5	4.153	4.495	45.74	7.853					7.268	21.994	2	112.9976	66.481	4	0.2314
091008 CA5	1.486	2.315	52.99	18.4					4.573	22.451	2.4	129.5272	60.794	5.3	0.3901
101007 CA5	3.955	5.121	53.13	9.358		1			4.326	20.185	5	138.8628	61.95	4.3	-0.0888
110208 CA5	4.27	4.731	46.44	8.425			200	800	6.295	25.952	3	122.6078	74.588	3.8	0.2748
110909 CA5	1.413	2.164	52.89	18.5					5.355	22.847	2.4	129.1611	58.881	5.6	0.4078
121107 CA5	3.662	5.308	51.24	8.925		1	900		5.639	28.064	3	110.9392	75.265	4.58	-1.271
140308 CA5	3.581	4.139	46.92	8.038					6.685	25.594	4.7	80.4704	76.502	4.8	-0.0616
140808 CA5	3.338	3.968	48.07	8.199					5.831	27.569	2.4	122.1502	78.548	3.6	0.5502
160708 CA5	3.739	4.276	49.96	8.351					5.96	25.379	2.9	96.3352	73.477	4.1	0.2728
180608 CA5	3.538	4.106	48.43	8.141					5.884	26.042	5	112.54	74.584	4	0.4519
211207 CA5	3.382	4.398	48.92	8.734		6	90	210	3.927	22.233	4.4	140.0038	61.74	5.5	0.1721
231107 CA5	3.222	4.437	54.55	9.617					3.716	23.504	3.9	140.7604	65.624	3.35	0.3523
240408 CA5	1.55	2.151	54.14	19.26					4.968	30.115	2.4	193.9064	83.369	4.2	-0.2731
250908 CA5	1.42	2.202	52.57	18.16					5.765	26.477	3.2	147.0477	69.697	5.2	0.4188
260308 CA5	3.809	4.313	47.63	8.156			15		5.318	10.511	5	96.4937	85.646	4.2	0.4462
261007 CA5	1.541	3.439	53.39	19.14			300		4.399	25.388	3.4	200.5163	30.346	5.45	0.1091
270808 CA5	1.335	2.122	52.4	17.83					5.364	29.816	2	129.8872	79.128	5.5	0.271
290208 CA5	2.827	3.636	42.43	7.475					6.433	25.399	2.5	158.5896	73.805	3	-0.0422

B) Sampling Site: Dark Caves, Batu Caves

Sample ID	Temperature	TDS	Conductivity	Drip rates	pH	K	Na	Ca	Mg	Fe	Al	Cl	F	SO4	CO3	HCO3	NO3	DO	SI (Calcite)
	°C	mg/l	uS/cm	ml/s		mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
020508 A1	26.8	143.2	298.0	0.2	7.64	0.98	1.33	46.81	9.32	0.08	0	1.15	0.02	6.01	3.4	167.23	10.7	4.1	0.151
040408 A1	26.6	98.0	205.0	0.5	8.03	0.91	1.48	46.89	9.51	0.07	0	1.35	0.04	5.75	3.5	165.51	13.7	3.9	0.5229
070308 A1	26.1	371.0	766.0	0.2	8.05	1.02	1.43	38.89	10.25	0	0	0.9	0	5.94	0	153.75	12.6	4	0.4144
160508 A1	27.0	80.6	168.6	1.0	8.23	1.07	1.42	42.98	9.65	0.1	28	1.13	0.03	6.07	4.7	155.79	11.7	4.2	0.666
180408 A1	24.9	141.8	294.0	0.9	8.19	0.91	1.34	45.44	9.19	0	0	1.03	0	5.56	3.9	162.32	10.6	4.3	0.6372
210308 A1	24.9	94.7	198.0	0.2	8.25	0.86	1.27	43.78	9.41	0.01	0	0.96	0	5.69	4.5	152.33	15.1	3.9	0.6554
020508 A2	26.0	199.2	412.0	0.1	7.46	0.67	1.32	69.65	7.46	0.05	0	0.07	0.03	6.06	4.2	235.05	2.61	3.9	0.2589
040408 A2	26.9	133.0	277.0	0.1	7.64	0.74	1.46	73.5	7.87	0.13	0	0.81	0	7.6	3.2	243.25	7.66	4.4	0.4749
070308 A2	26.2	552.0	1122.0	0.3	7.9	0.7	1.39	72.08	7.79	0.04	0	0.83	0	7.77	4.9	234.32	7.91	3.9	0.7019
160508 A2	25.8	124.6	260.0	0.2	7.89	0.67	1.28	69.73	7.01	0.03	0	1.07	0.05	7.69	4	224.51	7.66	4	0.656
180408 A2	24.8	189.8	394.0	0.3	7.92	0.73	1.39	71.51	7.78	0	0	0.84	0	13.6	5	225.56	7.29	4.8	0.6829
210308 A2	24.6	130.5	273.0	0.2	8.1	0.68	1.34	71.87	7.56	0.06	0	0.93	0.06	7.78	3.4	234.95	7.99	3.6	0.867
020508 A3	25.9	170.8	355.0	0.0	7.75	0.84	1.8	50.49	8.84	0.01	0	1.22	0	8.39	4.9	146.76	35.3	4.3	0.222
040408 A3	27.7	145.0	301.0	0.0	7.85	0.88	2.44	60.52	11.12	0.1	10	2.64	0	20.19	6.7	109.25	96.5	4.2	0.2824
070308 A3	25.3	679.0	1372.0	0.1	7.97	0.83	2.66	68.03	11.95	0	0	3.09	0	22.01	4	136.4	99.2	3.7	0.4785
160508 A3	26.5	118.9	248.0	0.1	8.04	0.83	1.77	51.64	8.91	0.06	0	2.28	0.06	14.23	6	102.59	72.1	4.3	0.3735
180408 A3	25.1	171.3	356.0	0.1	8.23	0.97	1.99	51.72	9.15	0	0	0	0	0	3.4	181.7	22	4.7	0.7669
210308 A3	24.8	153.2	319.0	0.1	8.14	0.98	2.59	66	12.03	0.39	0	3.08	0.02	21.87	5	131.79	96.2	3.1	0.6148
020508 A4	26.7	126.2	251.0	0.1	7.8	0.74	1.37	43.21	4.55	0.05	20	0.95	0.03	6.09	9.2	124.81	6.45	4	0.2049
040408 A4	28.0	85.7	179.7	0.1	8.03	0.78	1.49	45.83	5.27	0.01	0	0.56	0.03	3.99	3.7	153.64	3.95	3.8	0.517
070308 A4	25.1	300.0	618.0	0.0	7.89	0.78	1.41	37.6	4.64	0	0	1.02	0.04	7.07	3.4	117.71	7.37	3.5	0.1579
160508 A4	26.1	69.7	146.3	0.1	8.2	0.65	1.21	34.5	4.01	0.14	0	1.18	0.04	6.87	3.2	104.75	7.38	3.9	0.3905
180408 A4	26.0	126.1	263.0	0.1	8.4	0.75	1.36	45.96	5.3	0	0	1.1	0.15	11.89	3.7	139.6	6.83	4.7	0.7965
210308 A4	24.8	70.9	148.8	0.1	8.24	0.73	1.37	36.48	4.57	0.04	30	0.95	0.02	7.31	0	120.33	7.81	3.5	0.4632
020508 A6	26.1	137.9	287.0	0.1	7.89	0.83	1.18	43.7	7.74	0	0	0.9	0	5.52	4	149.55	10.3	4.3	0.3215
040408 A6	27.2	102.6	215.0	0.1	7.95	0.85	1.38	50.48	8.97	0	0	0.91	0	5.35	0	185.08	10.5	3.6	0.5136
070308 A6	26.5	268.0	554.0	0.1	7.57	1.02	1.77	24.28	8.7	0.01	0	1.04	0	5.69	2.9	97.605	11.6	4.1	-0.3983
160508 A6	26.0	89.9	188.0	0.2	8.05	0.82	1.17	44.6	8.12	0.02	0	1.01	0.04	5.54	8	146.02	9.92	4.5	0.4938
180408 A6	26.6	142.8	297.0	0.1	8.15	0.96	1.29	48.25	8.42	0.15	0	1.01	0.07	5.62	3.2	168.38	10.3	3.9	0.6566
210308 A6	25.0	102.4	214.0	0.1	8.08	0.86	1.25	50.04	8.92	0	0	1.06	0.07	5.45	3.9	174.17	10.9	3.9	0.5991

C) Sampling site : Gua Tempurung, Perak

Sample ID	Temp	TDS	Conductivity	pH	K	Na	Ca	Mg	Fe	Mn	Al	As	Cd	Cu	Zn	Cl	F	SO4	CO3	HCO3	NO3	SI (Calcite)
	°C	mg/l	uS/cm		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
270908 GT1	25.5	100.7	210	7.99	0.96	1.56	63.90	0.69	0.02	0.59			7	11	107	1.359		4.74	2.30	155.60	9	0.5729
290608 GT 1	25.4	97.6	204	8.09	1.60	2.34	38.00	0.74	0.06					5		0.22	1.23	4.42		172.60	8.84	0.4961
291109 GT1	27.2	82.5	196.8	7.62	0.76	2.97	50.92	0.78	0.03	0.00				4	16	6.846	0.73	0.64		206.80	2.58	0.2551
310708 GT1	28.4	83.1	173.8	8.09	0.80	2.10	34.16	0.73	0.05					7		1.203		4.28	2.40	130.50	6.74	0.399
80309 GT1	26.1	91.9	196.3	7.93	0.06	1.65	45.14	0.63	0.02	0.03			6		7	1.264		4.44	3.20	98.50	10.8	0.2182
11108 GT2	27.6	99.5	208	8.01	0.77	3.10	76.06	0.86	0.00	1.14	853			43	156	1.253		4.84		240.79	4.98	0.8344
250109 GT2	27.9	63.2	153.8	8.11	0.09	0.79	66.40	0.68	0.00				5		2	1.238		4.74	3.10	173.30	7.48	0.7819
260708 GT2	27.7	88.3	184.6	8.01	0.74	1.10	46.39	0.50	0.00	0.06	103			10		1.716		4.21	2.30	128.80	5.95	0.4257
270908 GT2	25.9	103.8	217	8.21	0.08	1.93	47.22	0.58	0.03	0.00			6		9	1.173		4.21	3.00	133.35	5.21	0.6205
291109 GT2	26.7	63	132	7.79	0.54	0.95	52.18	0.26	0.00	0.10	173				3	7.254	1.18		2.30	139.64	4.39	0.2767
80309 GT02	26.9	73.2	154.6	7.85	0.07	1.47	61.43	0.72	0.08	0.71	892		7	28	143	2.31	0.07		3.20	192.40	9.49	0.5132
11108 GT3	28.5	125.8	262	8.18	0.52	0.80	60.84	1.14	0.03							1.083	0.02	3.22	4.60	150.70	5.19	0.7778
230808 GT3	27.9	37.6	80	8.25	0.73	1.96	51.41	1.50						1	42	0.678		2.57		219.70	7.33	0.8937
250109 GT3	27.6	79.2	160.9	7.53	0.71	1.93	53.96	1.51	0.06				7			0.788	0.04	3.11	4.40	239.30	7.64	0.2633
260708 GT3	29	57.2	133.6	8.1	0.59	0.84	69.71	5.94	0.01		41				47	0.843		2.99		240.40	7.57	0.9132
270908 GT3	26	125.3	261	8.26	0.10	1.03	53.52	1.47	0.39	0.00			6		13	0.736		2.93	3.50	145.30	4.93	0.7517
290608 GT 3	26.3	126.4	264	8.31	0.77	0.98	60.64	1.30			3			7	27	0.634		2.89	2.30	153.60	7.04	0.8641
291109 GT3	27.2	98.3	204.8	7.89	1.30	1.81	52.28	1.56						2		5.246	0.68			143.20	3.02	0.3821
80309 GT 03	27.5	41.5	87.7	8.16	0.12	1.45	54.20	1.43	0.01	0.00			6		12	0.748		3.02	5.30	248.60	8.27	0.8886
11108 GT4	27.4	140.8	293	7.71	0.71	1.32	58.82	3.63								0.945	0.03	3.67	4.00	255.50	9.02	0.4909
230808 GT4	25.6	156.4	325	7.88	0.77	1.35	61.23	3.76								0.794		2.95		208.70	10.4	0.5559
250109 GT4	26.1	83.5	170.5	7.96	0.26	0.96	54.22	2.99	0.02	0.00			6		7	1.03			2.80	193.70	9.41	0.5778
290608 GT 4	25.8	131.5	274	7.92	0.84	0.97	61.18	3.54						6	55	0.639	0.03	2.68	2.20	215.00	8.87	0.6178
291108 GT 4	27	40.9	86.4	7.35	0.48	0.60	46.70	2.75	0.01						4	0.459	0.26	1.87	3.60	130.50	1.36	-0.2109
80309 GT4	27	61.2	128.4	7.62	0.82	2.19	61.61	3.53		0.01				7	52	0.082	0.04	3.25	3.60	203.40	9.57	0.3275
11108 GT5	27.5	121	219	7.91	0.54	0.85	51.27	0.43	0.22		261				3	0.743		0.48	2.60	177.20	6.69	0.4905
230808 GT5	28.5	103.8	217	8.3	0.67	0.06	43.22	0.97												137.69		0.7056
250109 GT5	27.5	64.3	136.1	8.16	0.12	1.17	46.22	0.86	0.27	0.04	403		6		40	2.291	0.11	3.07	2.40	182.40	8.54	0.6924

CONTINUED																					
260708 GT5	28.2	104.8	219	8.19	0.45	0.76	53.18	0.42	0.38	0.04	523			8	154	6.483	0.76	0.55	2.00	155.00	2.67	0.7188
270908 GT5	26.9	102.5	209	8.29	0.50	0.80	49.32	0.40	0.04		316					4.723	0.26	6.33		108.10	8.6	0.6077
290608 GT 5	25.8	106.6	223	8.25	0.74	0.94	54.91	0.59	0.67	0.04	617	1		24	39	0.736		2.58	2.40	163.00	5.61	0.7747
291109 GT5	26.8	114.6	198	7.56	0.74	2.07	41.66	0.89	0.01	0.01	116			10	930	0.79		2.72		128.00	7.46	-0.0887
80309 GT5	26.7	63.3	132.9	7.92	0.07	1.12	44.27	0.85	0.06	0.04	263		6		20	2.107	0.02	3.47	2.80	177.00	14.9	0.4253
11108 GT6	28.1	165	343	7.61	0.59	0.90	72.06	6.59			5					1.215		3.22		210.50	7.22	0.3901
230808 GT6	26.7	150.3	312	7.78	0.81	0.05	55.23	6.43						5		1.17		2.90		287.30	9.49	0.5556
260708 GT 6	29	157.5	329	7.5	0.73	1.96	51.41	1.50						1	42000	0.765		3.21		135.60	6.52	-0.1097
270908 GT6	25.9	154.4	322	8.14	0.21	2.00	60.98	5.96	0.00	0.00	28		6		7000	0.836		3.54	5.60	274.10	7.3	0.9035
291109 GT6	27.3	96.2	190.3	8.07	1.12	4.29	54.36	5.41	0.02	0.01				14	43000	0.684		2.67		245.30	7.3	0.6258
80309 GT6	27.3	98.3	205	8.02	0.11	0.81	66.67	5.68		0.00			5		3000	3.34	0.12	3.80	3.00	265.60	10.6	0.8364
11108 GT11	27.6	102.6	214	7.74	0.75	0.16	35.96	6.75						42	32000	1.414		1.64	2.50	120.08	8.56	-0.5083
11108 GT11	27.5	115.7	241	7.98	0.56	0.97	86.61	0.34	0.04	0.63				26	142	1.194		4.32		241.60	7.23	-0.284
230808 GT11	28.8	103.9	217	7.98	1.27	0.15	43.60	1.23						63		1.39		1.57		183.50	7.45	-0.119
250109 GT11	27.6	65.2	141.5	8.03	0.74	1.94	43.29	1.01		0.00			6		9000	2.521	0.34			183.10	2.18	-0.2232
260708 GT11	28.2	103.5	215	7.19	1.14	0.89	47.40	0.64							2000	8.206	1.40		2.30	187.70	1.65	-1.9159
291109 GT11	26.9	66.7	140	8.08	1.42	2.63	43.67	1.13						7	24000	5.929	0.13			182.90	1.93	-0.2331
80309 GT 11	27.4	64.2	134.9	7.96	0.70	1.94	42.82	1.01		0.00			6		14000	1.797	0.04	1.67	4.80	120.10	8.67	-0.708
291109 GT21	27.4	53	111.4	8.11	1.20	2.59	58.50	0.75	0.14	0.00								0.91	0.04	4.12	3.4	-0.7382
80309 GT21	27.3	125.1	262.15	8.31	0.07	1.57	51.42	0.61	0.03	0.01			5				0.02	3.47	2.80	177.00	14.9	0.4253

D) Sampling site: Sungai Tempurung

Date	Station ID	Temp	TDS	Conductivity	pH	K	Na	Ca	Mg	Fe	Mn	Al	Cu	Cd	Pb	As	Zn	Cl	F	SO4	CO3	HCO3	NO3	DO	SI (Calcite)
23/8/08	SGT1	27.5	140.0	291.0	7.72	1.81	1.13	36.07	15.27	bdl	bdl	bdl	0.01	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	275.00	bdl	3	0.3154
24/5/08	SGT1	26.1	89.6	187.4	7.74	1.63	1.71	37.83	17.53	bdl	0.56	0.03		bdl	bdl	bdl	bdl	0.64	bdl	bdl	2.30	210.27	0.35	6	0.2349
26/7/08	SGT1	26.7	135.5	282.0	7.89	1.79	1.78	37.77	17.34	bdl	bdl	bdl	0.01	bdl	bdl	bdl	bdl	0.32	0.43	1.57	bdl	270.00	bdl	4	0.4776
23/8/08	SGT2	27.8	56.8	119.5	7.83	1.44	2.23	19.56	2.49	0.19	0.11	0.22	0.01	bdl	bdl	bdl	0.10	0.63	0.28	2.03	bdl	95.60	1.39	6	-0.2253
24/5/08	SGT2	26.1	60.2	126.6	7.54	1.56	1.89	37.00	6.23	bdl	bdl	bdl	bdl	bdl	bdl	bdl		0.41	bdl	0.67	1.30	149.42	0.42	6	-0.0918
25/1/09	SGT2	26.8	58.4	110.4	7.65	1.62	3.68	31.35	5.76	bdl		0.17	0.05	bdl	bdl	bdl	0.28	0.46	0.36	1.88	bdl	133.73	0.39		-0.1938
26/7/08	SGT2	26.7	66.4	139.5	7.64	1.39	1.74	25.83	3.14	0.10	0.07	0.12	0.01	bdl	bdl	bdl	0.49	0.47	0.26	2.03	2.00	125.50	1.37	5	-0.1959
1/11/08	SGT2	27.9	66.9	140.7	6.53	1.60	3.26	25.83	4.29	0.32	0.11	0.29	0.01	bdl	bdl	0.01	0.02	0.60	0.30	2.06	2.20	143.60	2.58	6	-1.2343
23/8/08	SGT3	29	79.3	166.0	8.04	1.49	3.29	25.35	4.26	0.16	0.05	0.17	0.01	bdl	0.00	bdl	0.02	0.65	0.30	2.20	bdl	143.50	2.34	6	0.2596
25/1/09	SGT3	26.4	65.3	138.3	7.96	0.93	2.06	34.74	6.88			0.04	0.01	0.06	0.01	bdl	0.14	2.04	0.53	bdl	bdl	201.60	2.16		0.3191
24/5/08	SGT3	25.4	67.1	140.9	8.13	1.58	1.89	36.31	6.46	0.04	0.01	0.12	bdl	bdl	bdl	bdl	bdl	0.39	bdl	1.17	8.70	148.69	0.46	5	0.4983
1/11/08	SGT3	28	76.8	160.8	7.91	1.38	1.65	28.24	4.33		0.06	0.18	bdl	bdl	bdl	bdl	0.26	0.77	0.40	2.01	13.50	108.72	1.99	5	0.0475
26/7/08	SGT3	25.2	80.2	168.0	8	1.38	1.68	30.43	4.40	0.69	0.05	0.19	0.01	bdl	bdl	0.00		0.53	0.24	2.33	bdl	143.30	1.97	3	0.2387
29/11/08	SGT3	26.8	54.1	109.3	7.32	1.18	1.49	25.63	3.17	0.12	0.02	0.21	bdl	bdl	bdl	bdl	bdl	0.70	0.27	2.23	2.20	114.70	1.91		-0.5506
23/8/08	SGT4	28.5	76.4	188.9	8.42	1.58	4.29	26.11	3.37	0.28	0.10	0.02	0.01	bdl	0.01	bdl	0.57	0.63	0.31	2.03	bdl	105.18	1.80		-1.0048
25/1/09	SGT4	26.7	67.4	144.2	7.98	0.92	2.17	36.59	6.56	bdl	bdl	0.01	0.00	0.8	0.01	bdl	0.07	0.72	0.35	bdl	bdl	196.70	2.76		0.351
24/5/08	SGT4	25.3	68.7	144.1	8.13	1.51	1.84	33.59	5.45	bdl	bdl	bdl	0.34	0.16	bdl	bdl	bdl	bdl	bdl	6.21	bdl	128.70	1.13	6	0.3636
26/7/08	SGT4	27.2	89.7	187.0	7.93	1.14	1.44	36.34	4.26	0.13	bdl	0.18	bdl	bdl	bdl	bdl	0.39	0.55	0.23	2.27	bdl	162.20	2.63	4	0.3184
29/11/08	SGT4	27.1	51.9	109.5	7.64	1.12	1.40	32.15	3.12	0.10	0.02	0.29	bdl	bdl	bdl	bdl		0.22		2.47	bdl	138.80	0.49	4	-0.0766
1/11/08	SGT4	29.8	81.3	170.0	8.19	1.42	1.71	32.21	4.37	0.24	0.02	0.27	bdl	bdl	bdl	bdl	0.30	0.53	0.30	1.99	2.30	131.20	1.92	5	0.4811
23/8/08	SGT7	28.3	66.2	136.7	7.13	1.42	0.82	20.22	3.49	bdl	bdl	bdl	0.01	bdl	bdl	bdl	bdl	0.82	0.34	2.07	3.50	69.80	1.50	5	-0.9878
26/7/08	SGT7	26.5	75.3	158.0	7.71	1.58	4.29	26.11	3.37	0.28	0.10	0.02	0.01	bdl	0.01	bdl	0.57	0.49	0.26	2.05	bdl	126.70	1.40	4	-0.1401
29/11/08	SGT7	26.8	103.2	217.0	7.02	1.10	1.37	33.06	3.14	bdl	0.02	0.28	bdl	bdl	bdl	bdl		0.50	0.21	2.13	2.60	148.00	2.62	3	-0.6443
1/11/08	SGT7	27.4	74.9	157.4	7	1.48	1.85	26.17	3.46	0.26	0.07	0.17	bdl	bdl	bdl	bdl	0.09	1.57	0.44	bdl	2.80	99.52	2.15	6	-0.9019
25/1/09	SGT7	26.9	66.2	139.8	7.42	1.01	2.37	31.10	5.97	bdl		0.19	0.01	0.01	0.01	bdl	0.26	3.36	0.59	bdl	bdl	191.80	2.89		-0.2789
23/8/08	SGT8	29.8	69.1	144.5	8.19	1.60	2.88	26.66	4.00	0.20	0.04	0.15	0.01	bdl	bdl	bdl	0.01	0.59	0.28	2.07	bdl	147.60	2.30	8	0.4453
26/7/08	SGT8	25.6	85.5	179.3	7.1	1.40	1.98	31.71	4.14	0.16	0.04	0.23	0.01	bdl	bdl	bdl	0.17	2.06	0.24	2.49	3.80	151.60	2.12	4	-0.5838
1/11/08	SGT8	28.1	79.5	166.4	7.45	1.42	1.72	30.47	4.31	0.26	0.03	0.25	bdl	bdl	bdl	bdl	bdl	0.71	0.32	2.09	4.10	151.60	1.50	6	-0.2162
23/8/08	SGT9	27.9	82.0	171.9	8.11	1.39	0.73	28.75	4.13	0.02	0.02	0.07	0.04	bdl	bdl	bdl	bdl	0.58	0.28	2.18	bdl	143.50	3.17	5	0.3644
24/5/08	SGT9	26.3	67.6	142.2	7.72	1.48	1.72	37.21	6.31	0.10	bdl	0.08	bdl	bdl	bdl	bdl	0.17	0.38	bdl	1.55	3.60	149.66	0.48	6	0.0998
25/1/09	SGT9	26.8	66.4	140.2	8.04	0.94	2.65	35.88	6.76	bdl	bdl	0.03	0.01	0.01	0.01	bdl	0.11	1.77	0.41	bdl	bdl	173.30	2.23		0.35
26/7/08	SGT9	26	86.5	181.0	8.04	1.34	1.65	34.39	4.12	0.08	0.03	0.15	0.01	bdl	0.00	bdl	0.51	0.54	0.26	2.19	bdl	158.90	2.30	5	0.3788
29/11/08	SGT9	27.1	46.3	97.7	7.58	1.18	1.52	28.02	3.07	0.14	0.04	0.29	bdl	bdl	bdl	bdl	0.33	0.48	0.24	2.02	bdl	118.30	1.90	4	-0.2581
25/1/09	SGT5	26.8	67.6	149.3	8.01	0.95	2.34	37.39	6.59	bdl	bdl	0.12	0.01	0.01	0.01	bdl	0.24	###	2.57	bdl	bdl	188.40	2.92		0.3655
24/5/08	SGT5	27.7	68.6	143.9	8.26	0.70	1.22	40.20	0.43	bdl	0.01	0.04	bdl	bdl	bdl	bdl	bdl	0.37	bdl	2.10	3.20	125.34	0.53	5	0.6101

CONTINUED																								
29/11/08	SGT5	27.6	67.4	142.8	7.98	1.10	1.38	32.84	3.14	0.10	0.01	0.28	bdl	bdl	bdl	bdl	bdl	0.50	0.21	2.17	2.30	111.50	2.60	4	0.1965
1/11/08	SGT5	27.7	81.0	169.7	8.1	1.62	2.98	28.60	4.20	0.43	0.14	0.69	0.01	bdl	0.00	bdl	bdl	0.58	0.30	2.05	2.40	113.40	2.06	6	0.2489
1/11/08	SGT6	27.7	81.1	169.7	8.11	1.41	1.67	31.07	4.32	0.41	0.12	0.57	bdl	bdl	bdl	bdl	bdl	0.48	0.33	1.80	2.20	117.53	0.92	6	0.3104
29/11/08	SGT6	27.6	60.6	131.7	7.56	0.62	0.84	72.26	3.43	bdl	bdl	0.01	bdl	bdl	bdl	bdl	bdl	0.77	bdl	3.89	4.00	301.60	8.91	4	0.4895
25/1/09	SGT6	26.9	67.1	142.7	8.03	1.24	1.64	41.38	8.38	bdl	bdl	0.27	0.03	0.01	0.01	bdl	0.38	###	2.77	bdl	bdl	176.40	3.99	5	0.3914
24/5/08	SGT6	27.8	68.9	143.9	8.23	1.46	1.69	39.01	6.54	0.11	0.02	0.35	bdl	bdl	bdl	bdl	bdl	0.35	bdl	1.98	4.90	157.11	0.57	5	0.6482

APPENDIX 2

Representative Results of Source Rock Deduction Analyses

A) Location: Villa Cave, Batu Caves

Sample ID:010708 CA5

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.011	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.532	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.820, 8.20	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	168	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.046	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.519	Seawater or brine
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	0.494	Oversaturated with respect to calcite
	=0	Saturated with respect to calcite		
	<0	Undersaturated with respect to calcite		

Note: n/a – not available

Sample Designation: 240408 CA4

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.018	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.571	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.842, 8.00	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	107	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.022	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.507	Seawater or brine
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	0.821	Oversaturated with respect to calcite
	=0	Saturated with respect to calcite		
	<0	Undersaturated with respect to calcite		

Note: n/a – not available

Sample Designation: 211207 CA3

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.1	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.577	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.912, 7.50	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	90	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.139	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.625	Seawater or brine
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	-0.398	Undersaturated with respect to calcite
	=0	Saturated with respect to calcite		
	<0	Undersaturated with respect to calcite		

Note: n/a – not available

Sample Designation: 090108 CA2

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	-0.032	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.32	Analysis Error
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.954, 7.86	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	80	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.058	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.896	Silicate or carbonate weathering
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	0.212	Oversaturated with respect to calcite
	=0	Saturated with respect to calcite		
	<0	Undersaturated with respect to calcite		

Note: n/a – not available

Sample Designation: 211207 CA1

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.003	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.514	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.871, 7.99	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	148	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.021	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.835	Silicate or carbonate weathering
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	0.904	Oversaturated with respect to calcite
	=0	Saturated with respect to calcite		
	<0	Undersaturated with respect to calcite		

Note: n/a – not available

B) Villa Cave, Batu Caves

Sample Designation: 160508 A6

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.011	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.641	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.951, 8.05	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	90	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.01	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.862	Silicate or carbonate weathering
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	0.494	Oversaturated with respect to calcite
	=0	Saturated with respect to calcite		

Note: n/a – not available

Sample Designation: 020508 A4

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.016	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.69	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.944, 7.80	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	126	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.011	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.854	Silicate or carbonate weathering
	<0.8 sulfate high	Gypsum dissolution		
SI Calcite	>0	Oversaturated with respect to calcite	0.205	Oversaturated with respect to calcite

Note: n/a – not available

Sample Designation:210308 A3

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.009	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.565	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.878, 8.14	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	153	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.021	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.526	Seawater or brine
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	0.615	Oversaturated with respect to calcite

Note: n/a – not available

Sample Designation: 210308 A2

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.009	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.69	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.957, 8.10	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	131	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.006	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.929	Silicate or carbonate weathering
	<0.8 sulfate high	Gypsum dissolution		
	<0.8 sulfate low	Seawater or brine		
SI Calcite	>0	Oversaturated with respect to calcite	0.867	Oversaturated with respect to calcite

Note: n/a – not available

Sample Designation: 210308 A1

Parameter	Attention Value	Conclusion	Value	Result
SiO2 (mmol/l)	> 0.5	Volcanic Glass or hydro thermal water possible	n/a	
HCO3-/SiO2	>10	Carbonate weathering	n/a	
	>5 and <10	Ambiguous		
	<5	Silicate weathering		
SiO2/(Na+K-Cl)	<1	Cation exchange	n/a	
	>1 and <2	Albite weathering		
	>2	Ferromagnesian Minerals		
(Na+K-Cl)/(Na+K-Cl+Ca)	> 0.2 and < 0.8	Plagioklase weathering possible	0.013	Plagioklase weathering unlikely
	< 0.2 or > 0.8	Plagioklase weathering unlikely		
(Na/(Na+Cl)	>0.5	Sodium source other than halite - albite, ion exchange	0.671	Sodium source other than halite - albite, ion exchange
	=0.5	Halite solution		
	<0.5, TDS >500	Reverse Softening, seawater		
	<0.5, TDS <500 and >50	Analysis Error		
	<0.5, TDS <50	Rainwater		
Mg/(Ca+Mg)	=0.5 and HCO3-/Si>10	Dolomite Weathering	n/a	
	<0.5	Limestone-dolomite weathering		
	>0.5	Dolomite dissolution, calcite precipitation or seawater		
	<0.5 and HCO3-/Si<5	Ferromagnesian Minerals		
	>0.5	Granitic weathering		
Ca/(Ca+SO4)	=0.5	Gypsum dissolution	0.949, 8.25	Calcium source other than gypsum - carbonate or silicates
	<0.5, and pH <5.5	Pyrite oxidation		
	<0.5, and pH neutral	Calcium removal - ion exchange or calcite precipitation		
	>0.5	Calcium source other than gypsum - carbonate or silicates		
TDS	>500	Carbonate weathering or brine or seawater	95	Silicate weathering
	<500	Silicate weathering		
Cl-/Sum Anions	>0.8 and TDS>500	Seawater or brine or evaporites	0.009	Rock weathering
	>0.8 and TDS<100	Rainwater		
	<0.8	Rock weathering		
HCO3-/Sum Anions	>0.8	Silicate or carbonate weathering	0.86	Silicate or carbonate weathering
	<0.8 sulfate high	Gypsum dissolution		
SI Calcite	>0	Oversaturated with respect to calcite	0.655	Oversaturated with respect to calcite

Note: n/a – not available