

APPENDIX 7

DISSOLUTION COLUMNS

SAMPLEID	LOCATION	DEPOSITED APPROXIMATELY	SiO2	TiO2	Al2O3	Fe2O3T	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	LOI	SUM
GYP01	Emergency stockpile (part HH/part DH)	25-29.12.00	29.21	0.04	0.65	0.11	0.04	0.11	22.05	0.10	0.12	2.29	26.42	0.56	19.07	100.50
GYP02	Cell 2	10-16.7.01	61.30	0.05	0.69	0.24	0.06	0.11	11.05	0.11	0.12	2.20	12.24	0.44	10.97	99.56
GYP_NEW	Cell 2 NE corner	23.4.02	14.06	0.02	0.31	0.03	0.01	0.04	20.25	0.08	0.06	2.32	41.59		20.60	100.00
GYP_OLD	~3m below surface, NE cnr Cell 2	Nov 01-Jan02	37.79	0.03	0.50	0.12	0.03	0.06	14.86	0.11	0.09	3.78	29.52		12.31	100.00
		Average	35.59	0.04	0.54	0.13	0.03	0.08	17.05	0.10	0.10	2.65	27.44	0.50	15.74	100.02
		Min	14.10	0.02	0.31	0.11	0.01	0.04	11.10	0.08	0.06	2.20	12.20	0.40	11.00	99.60
		Max	61.30	0.05	0.69	0.24	0.06	0.11	22.10	0.11	0.12	3.78	41.59	0.60	20.60	100.50
		Median	33.50	0.04	0.57	0.12	0.03	0.08	17.56	0.10	0.10	2.30	27.97	0.50	15.69	100.00
		SD	19.75	0.01	0.17	0.09	0.02	0.03	5.03	0.01	0.03	0.76	12.07	0.08	4.80	0.38
	Slurry average DH	Slurry XRF Solids Average	22.27	0.04	0.59	0.12	0.03	0.10	23.87	0.12	0.13	2.59	30.32	0.55	19.78	
		Min	13.60	0.04	0.39	0.08	0.02	0.09	19.49	0.06	0.09	1.79	24.39	0.30	16.16	
		Max	30.01	0.05	0.76	0.18	0.04	0.13	26.60	0.16	0.17	4.31	36.10	1.10	22.52	
		Median	22.20	0.04	0.60	0.12	0.03	0.10	23.75	0.12	0.13	2.34	30.19	0.53	20.14	
		Std Dev	5.92	0.00	0.08	0.04	0.01	0.01	2.33	0.03	0.02	0.77	3.51	0.20	2.19	
	Slurry PG011	Slurry XRF PG011 Solids Arith Avg	33.64	0.05	0.53	0.21	0.05	0.11	17.90	0.10	0.10	3.96	21.77	0.37	21.22	
		Min	30.11	0.04	0.52	0.20	0.05	0.11	17.69	0.09	0.10	3.54	21.44	0.20	17.72	
		Max	37.18	0.05	0.53	0.23	0.05	0.12	18.10	0.10	0.11	4.38	22.10	0.53	24.71	
		Median	33.64	0.05	0.53	0.21	0.05	0.11	17.90	0.10	0.10	3.96	21.77	0.37	21.22	
		Std Dev	5.00	0.00	0.01	0.02	0.00	0.00	0.29	0.01	0.01	0.60	0.47	0.23	4.94	
	ALL DH	Average	30.50	0.04	0.55	0.15	0.04	0.10	19.61	0.10	0.11	3.07	26.51	0.47	18.91	
		Min	13.60	0.02	0.31	0.08	0.01	0.04	11.10	0.06	0.06	1.79	12.20	0.20	11.00	
		Max	61.30	0.05	0.76	0.24	0.06	0.11	26.60	0.16	0.17	4.38	41.59	1.10	24.71	
		SD	10.23	0.01	0.09	0.05	0.01	0.02	2.55	0.02	0.02	0.71	5.35	0.17	3.98	
HH	Overland conveyer	<5 minutes before sampling	21.14	0.03	0.37	0.08	0.02	0.03	20.04	0.11	0.08	2.16	40.17		15.22	100.00
			SiO2	TiO2	Al2O3	Fe2O3T	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	LOI	
	All Crystalline	Average	35.59	0.04	0.54	0.13	0.03	0.08	17.05	0.10	0.10	2.65	27.44	0.50	15.74	
	Slurry		22.27	0.04	0.59	0.12	0.03	0.10	23.87	0.12	0.13	2.59	30.32	0.55	19.78	
	All DH		30.50	0.04	0.55	0.15	0.04	0.10	19.61	0.10	0.11	3.07	26.51	0.47	18.91	
	PG011		33.64	0.05	0.53	0.21	0.05	0.11	17.90	0.10	0.10	3.96	21.77	0.37	21.22	
			All Crystalline	All Slurry	All DH	PG011										
			SiO2	35.59	22.27	30.50	33.64									
			CaO	17.05	23.87	19.61	17.90									
			P2O5	2.65	2.59	3.07	3.96									
			SO3	27.44	30.32	26.51	21.77									

XRF MAJORS % - PG SOLIDS – ALL SAMPLES

SAMPLE	Sc	Ba	Ti	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Pb	Sr	Y	Zr
GYP01	9	341	182	20	28	525	8	6	24	43	bd	3	15	360	199	17
GYP02	5	428	275	16	31	336	4	3	14	27	3	8	9	185	71	48
GYP_NEW	4	250	195	22	43	284	10	11	25	48	bd	12	10	354	94	1
GYP_OLD	6	251	166	34	64	492	11	9	25	45	bd	7	9	267	112	5
Average	6	317.5	204.5	23	41.5	409.25	8.25	7.25	22	40.75	3	7.5	10.75	291.5	119	17.75
Min	4	250	166	16	28	284	4	3	14	27	bd	3	9	185	71	1
Max	9	428	275	34	64	525	11	11	25	48	3	12	15	354	199	48
Median	5.5	296	188.5	21	37	414	9	7.5	24.5	44	3	7.5	9.5	310.5	103	11
SD	2.160247	85.12931	48.47336	7.745967	16.34013	117.3297	3.095696	3.5	5.354126	9.394147		3.696846	2.872281	82.7466	55.91064	21.28184
HH	9	329	193	18	56	139	7	4	21	27	bd	3	12	348	152	3

XRF TRACE ppm PG SOLIDS PRE-DISSOLUTION, FIELD & LAB COLUMNS

SAMPLE	Quartz	Gypsum	Anhydrite	Bassanite	Clinoptilolite	Thaumasite	Sepiolite	Expanding clay
GYP01	29.00	52.00	5.00	12.00	1.00	1.00	0.00	
GYP02	19.00	26.00	32.00	17.00	2.00	1.00	1.00	
GYP_NEW	16.30	82.90	1.00	0.00				
GYP_OLD	27.50	56.20	7.00	8.00				1.00
Average	22.95	54.28	11.25	9.25	1.50	1.00	0.50	1.00
Min	16.30	26.00	1.00	0.00	1.00	1.00	0.00	
Max	29.00	82.90	32.00	17.00	2.00	1.00	1.00	
Median	23.25	54.10	6.00	10.00	1.50	1.00	0.50	1.00
SD	6.248466	23.2934	14.05643388	7.18215381	0.707106781	0	0.707107	
HH	32.00	43.00	1.00	25.00				
PG Slurry	17.73	64.86	5	5.94	2.75			
All DH	20.34	59.5675	8.125	7.595	2.125			
PG011	19	35.5	28	11.5	2.5			

XRD MINERALOGY % PG SOLIDS - PRE-DISSOLUTION - FIELD AND LAB COLUMNS

SAMPLE	SiO2	TiO2	Al2O3	Fe2O3T	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	LOI	SUM						
GYP_NEW Pre	14.06	0.02	0.31	0.03	0.01	0.04	20.25	0.08	0.06	2.32	41.59		20.60	100.00						
GYP_NEW Post	13.75	0.04	0.30	0.02	0.00	0.05	26.99	0.00	0.03	0.43	33.41	0.19	24.90	100.05						
difference	0.31	-0.02	0.01	0.01	0.01	-0.01	-6.74	0.08	0.03	1.89	8.18	-0.19								
absolute	0.98	2.20	0.97	0.67	-100.00	1.25	1.33	-100.00	0.57	0.18	0.80									
absolute %	0.02	-1.20	0.03	0.33	101.00	-0.25	-0.33	101.00	0.43	0.82	0.20									
GYP_OLD Pre	37.79	0.03	0.50	0.12	0.03	0.06	14.86	0.11	0.09	3.78	29.52		12.31	100.00						
GYP_OLD Post	43.90	0.05	0.51	0.14	0.01	0.07	17.16	0.00	0.07	0.55	20.24	0.25	17.05	99.90						
difference	-6.11	-0.02	-0.01	-0.02	0.02	-0.01	-2.30	0.11	0.02	3.23	9.29	-0.25								
absolute	1.16	1.50	1.03	1.18	0.66	1.22	1.15	0.00	0.74	0.15	0.69									
absolute %	-0.16	-0.50	-0.03	-0.18	0.34	-0.22	-0.15	1.00	0.26	0.85	0.31									
	Sc	Ba	Ti	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Pb	Rb	Sr	Y	Zr	Nb	Th	U
GYP_NEW Pre	4.00	250.00	195.00	22.00	43.00	284.00	10.00	11.00	25.00	48.00	bd	12.00	10.00	bd	354.00	94.00	1.00	bd	bd	bd
GYP_NEW Post	5.00	250.00	207.00	10.00	29.00	0.00	4.00	0.00	13.00	14.00	0.00	0.00	21.00	0.00	367.00	88.00	1.00	0.00	0.00	0.00
difference	-1.00	0.00	-12.00	12.00	14.00	284.00	6.00	11.00	12.00	34.00		12.00	-11.00		-13.00	6.00	0.00			
absolute	1.25	1.00	1.06	0.45	0.66	0.00	0.40	0.00	0.52	0.29		0.00	2.10		1.04	0.94	1.00			
absolute %	-0.25	0.00	-0.06	0.55	0.34	1.00	0.60	1.00	0.48	0.71		1.00	-1.10		-0.04	0.06	0.00			
GYP_OLD Pre	6.00	251.00	166.00	34.00	64.00	492.00	11.00	9.00	25.00	45.00	bd	7.00	9.00	bd	267.00	112.00	5.00	bd	bd	bd
GYP_OLD Post	5.00	366.00	234.00	16.00	73.00	30.00	5.00	1.00	12.00	16.00	0.00	5.00	6.00	0.00	207.00	61.00	9.00	1.00	0.00	0.00
difference	1.00	-115.00	-68.00	18.00	-9.00	462.00	6.00	8.00	13.00	29.00		2.00	3.00		60.00	51.00	-4.00			
absolute	0.83	1.46	1.41	0.47	0.66	0.06	0.45	0.11	0.48	0.36		0.71	0.67		0.78	0.54	1.80			
absolute %	0.17	-0.46	-0.41	0.53	0.34	0.94	0.55	0.89	0.52	0.64		0.29	0.33		0.22	0.46	-0.80			
SAMPLE	Quartz	Gypsum	Anhydrite	Bassanite	Clinoptilolite	Thaumasite	Sepiolite	Expanding clay												
GYP_N pre	16.30	82.90	1.00	0.00																
post	13.70	80.20	0.00	6.10																
difference	2.60	2.70	1.00	-6.10																
absolute	0.84	0.97	0.00																	
absolute %	0.16	0.03	1.00																	
GYP_O pre	27.50	56.20	7.00	8.00				1.00												
post	32.40	61.90	0.00	3.70				2.00												
difference	-4.90	-5.70	7.00	4.30				-1.00												
absolute	1.18	1.10	0.00	0.46				2.00												
absolute %	-0.18	-0.10	1.00	0.54				18.00												

DH PRE- AND POST-DISSOLUTION PG SOLIDS – LAB COLUMNS – XRF AND XRD – MAJORS AND TRACE

SAMPLE	SiO2	TiO2	Al2O3	Fe2O3T	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	LOI	SUM							
HH Pre	21.14	0.03	0.37	0.08	0.02	0.03	20.04	0.11	0.08	2.16	40.17		15.22	100.00							
HH Post	25.27	0.04	0.43	0.09	0.01	0.07	23.70	0.00	0.05	0.75	27.85	0.28	22.23	100.64							
difference	-4.13	-0.01	-0.06	-0.01	0.01	-0.04	-3.66	0.11	0.03	1.41	12.32	-0.28									
absolute	1.20	1.43	1.15	1.10	0.50	2.17	1.18	0.00	0.64	0.35	0.69										
absolute %	-0.20	-0.43	-0.15	-0.10	0.50	-1.17	-0.18	1.00	0.36	0.65	0.31										
	Sc	Ba	Ti	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Pb	Rb	Sr	Y	Zr	Nb	Th	U	
SAMPLE																					
HH Pre	9.00	329.00	193.00	18.00	56.00	139.00	7.00	4.00	21.00	27.00	bd	3.00	12.00	bd	348.00	152.00	3.00	bd	bd	bd	
HH Post	8.00	295.00	205.00	8.00	52.00	6.00	5.00	1.00	14.00	15.00	0.00	1.00	18.00	0.00	332.00	112.00	2.00	0.00	0.00	0.00	
difference	1.00	34.00	-12.00	10.00	4.00	133.00	2.00	3.00	7.00	12.00		2.00	-6.00		16.00	40.00	1.00				
absolute	0.89	0.90	1.06	0.44	0.93	0.04	0.71	0.25	0.67	0.56		0.33	1.50		0.95	0.74	0.67				
absolute %	0.11	0.10	-0.06	0.56	0.07	0.96	0.29	0.75	0.33	0.44		0.67	-0.50		0.05	0.26	0.33				
SAMPLE	Quartz	Gypsum	Anhydrite	Bassanite	Clinoptilolite	Thaumasite	Sepiolite	Expanding clay													
HH pre	32.00	43.00	1.00	25.00																	
post	31.50	65.60	6.00	2.30																	
difference	0.50	-22.60	-5.00	22.70																	
absolute	0.98	1.53	6.00	0.09																	
absolute %	0.02	-0.53	-5.00	0.91																	

HH PRE- AND POST-DISSOLUTION PG SOLIDS- LAB COLUMNS - XRF AND XRD - MAJORS AND TRACE

Hemihydrate	25.4.02	5 minutes	Overland conveyor	HH	29.4.02	100g	Just moist powder		
New Dihydrate	25.4.02	2 days	NE corner Cell 2	Gyp_N	29.4.02	100g	Semi-liquefied		
Old Dihydrate	25.4.02	3-6 months	~3m from surface down ramp, NE corner Cell 2	Gyp_O	29.4.02	100g	Dry powder		
Date	Sample No.	Distilled Water In (ml)	Leachate Out (ml)	Leaching Time	Total Water (294ml/yr x 50mm dia)	Remaining to be fed (ml)	Water retained in column (ml)	Cumulative moisture retained (ml)	Comments
13.5.02	LHH_1	180	108	1 minute	640ml	460	72	72	Water passed straight through. Material combined in larger, granular aggregates. 180ml was entered in order to obtain the minimum 100ml leachate required for analysis. Fast flow-through rate.
13.5.02	LGN_1	140	121	1 minute	640ml	500	19	19	Material had hardened slightly in the time between loading column and feeding water thus water passed through quickly. Material disturbed to make it more closely resemble actual conditions on the gypsum stack.
13.5.02	LGO_1	140	110	10 minutes	640ml	500	30	30	Material had not appreciably hardened from original loading conditions but proved to be much more impermeable, only allowing fluid through at a slow drip.
13.5.02	Blank (distilled water)	100							QA - blank of distilled water passed through columns.
27.5.02	LHH_2	125	102	2 minutes		335	23	95	Material remained as it was after the first feed. Fast flow-through of leachate.
27.5.02	LGN_2	125	105	60 minutes		375	20	39	Material had set quite hard during the intervening 14 days thus a slow drip rate. Sample still quite wet after 60 minutes.
27.5.02	LGO_2	125	113	45 minutes		375	12	42	Material remained quite consolidated as at previous attempt. Very slow drip of leachate.
27.5.02	Blank_2 (distilled water)	100							
11.6.02	LHH_3	175	140	2 minutes		160	35	130	Fast flow-through of distilled water. Material aggregating into larger clumps.
11.6.02	LGN_3	305	204	several hours/days		70	101	140	Very slow drip rate. Original water (125ml) fed on Friday 7/6/02, only produced 40ml of leachate thus another 180ml fed on Tuesday 11/6/02, producing the rest. ~30ml of leachate was lost through over-topping of the beaker below the leach column.
11.6.02	LGO_3	125	104	several hours/days		250	21	63	Very slow drip rate. Water fed on Friday 7/6/02.
11.6.02	Blank_3 (distilled water)	100							
24.6.02	LHH_4	160	107	2 minutes		0	53	183	Fast flow-through of distilled water. Material aggregating into larger clumps.
24.6.02	LGN_4	175	87	several hours/days		-105	88	228	Very slow drip rate. Water fed 21/6/02, sampled 24/6/02. Extra water (105ml) was fed to provide enough leachate for sampling purposes (100ml required) but, as only 87ml of leachate was recovered, this required the addition of an extra 13ml of distilled water to the leachate.
24.6.02	LGO_4	150	110	several hours/days		100	40	103	Very slow drip rate. Water fed 21/6/02, sampled 24/6/02.
24.6.02	Blank_4 (distilled water)	100							
24.6.02	LGO_5	130	121	several hours		-30	9	112	Faster drip as the material was already wet. Extra water (30 ml) fed to provide enough leachate for sampling.
									% TOTAL WATER RETAINED
	LHH	640	457					183	0.2859375
	LGN	745	517					228	0.30604268
	LGO	670	558					112	0.167164179

LAB DISSOLUTION COLUMN GENERAL NOTES (WATER INPUT)

Date	Sample No.	Distilled Water In (ml)	Leachate Out (ml)				Cumulative moisture retained (ml)	% TOTAL WATER RETAINED
	LHH	640	457				183	0.2859375
	LGN	745	517				228	0.306040268
	LGO	670	558				112	0.167164179
	LHH	180	108				72	0.4
		125	102				23	0.184
		175	140				35	0.2
		160	107				53	0.33125
	LGN	140	121				19	0.135714286
		125	105				20	0.16
		305	204				101	0.331147541
		175	87				88	0.502857143
	LGO	140	110				30	0.214285714
		125	113				12	0.096
		125	104				21	0.168
		150	110				40	0.266666667
		130	121				9	0.069230769
				HH	DHN	DHO		
	pH	HH pH	DHN pH	DHO pH				
		2.06	2.79	2.01	72	19	30	
		2.65	2.12	2.64	23	20	12	
		2.99	2.35	3.3	35	101	21	
		3.75	3.82	3.58	53	88	40	
				4.08			9	
		HH EC	DHN EC	DHO EC				
	EC	12.3	1.68	14.5				
		5.94	17.1	6.34				
		2.84	5.64	2.66				
		2.31	2.15	2.44				
				2.33				
	5.85	6.64	6.03	6.04	6.04			

LAB DISSOLUTION COLUMN GENERAL NOTES (CONT.)

generals	Blank	LHH	LGN	LGO	Blank2	LHH2	LGN2	LGO2	Blank3	LHH3	LGN3	LGO3	Blank4	LHH4	LGN4	LGO4	LGO5
pH	5.85	2.06	2.79	2.01	6.64	2.65	2.12	2.64	6.03	2.99	2.35	3.3	6.04	3.75	3.82	3.58	4.08
conductivity (mS/cm)	0.02	12.3	1.68	14.5	0.03	5.94	17.1	6.34	0.03	2.84	5.64	2.66	0.03	2.31	2.15	2.44	2.33
Majors (mg/L)																	
Suphate	<1	2700	450	2500	<1	1700	5200	2100	5	1100	2100	1200	3	1100	990	1000	360
Chloride	<1	35	<1	48	<1	6	80	22	<1	6	19	3	<1	1	<1	3	1
Sodium	2.8	212	51	315	2.5	152	236	88	2.7	17	31	11	1.8	9.9	3.6	5.6	3.1
Potassium	<0.5	109	9.6	231	<0.5	139	135	67	<0.5	19	48	10	<0.5	9.2	1.9	5	2.1
Calcium	0.2	966	303	1290	0.4	738	969	824	7.6	802	741	715	5	667	629	705	695
Magnesium	0.1	23	1	66	0.1	7.5	31	16	0.1	0.9	6.9	0.5	<0.1	0.2	<0.1	<0.1	<0.1
Nutrients																	
Total Phosphorous (mg P/L)	0.009	3500	77	7600	0.006	1200	4200	1400	0.007	200	584	106	0.006	58	15	53	34
FRP (mg P/L)	0.002	3500	77	7600	0.005	1100	4200	1400	0.001	178	539	90	0.005	58	15	53	34
Silica (mg SiO2/L)	1.2	1.3	53	0.5	1.2	1.6	2.3	0.6	1.4	0.7	1.9	11.3	1.2	1.6	5.3	0.6	2.1
Trace (micrograms/L)																	
Al	2	311000	8680	312000	7	112000	232000	79500	167	13300	41000	22600	24	7770	3820	13000	11800
As	<1	178	4	463	<1	43	212	85	<1	1	25	5	<1	<1	<1	<1	<1
Ba	1	150	62	314	2	84	112	57	7	73	89	55	4	42	44	61	43
Cd	0.2	80	3	230	<0.1	53	132	54	0.2	9	28	3	0.1	9	5	1	0.6
Ce	<0.05	1240	79	1920	<0.05	75	423	94	<0.05	34	99	28	0.3	48	35	45	24
Co	0.1	478	13	2080	<0.1	138	601	445	<0.1	12	105	9	0.1	4	2	3	0.8
Cr	<0.1	892	6	1820	<0.1	168	1030	295	<0.1	13	156	3	<0.1	11	0.6	<0.1	<0.1
Cu	<0.1	2040	55	4210	<0.1	656	1710	899	<0.1	63	317	39	<0.1	29	19	23	2
Fe	<100	200000	3	55800	<100	16500	97400	6510	<100	1050	17800	352	<100	2510	<100	<100	<100
Ga	<0.1	71	<0.1	114	<0.1	10	71	12	<0.1	2	2	1	<0.1	<0.1	<0.1	<0.1	<0.1
Mn	<0.1	15900	1020	67100	<0.1	6320	29600	16500	4	1230	6410	586	4	1180	753	216	74
Ni	<0.1	700	33	2280	<0.1	233	812	528	<0.1	54	175	48	<0.1	17	12	15	12
Pb	<0.05	97	155	751	<0.05	25	298	160	<0.05	12	48	6	1	12	10	9	2
Sc	<1	120	8	103	<1	28	144	5	<1	5	21	2	<1	<1	<1	<1	<1
Sr	3	5380	792	12500	3	5020	5055	6474	29	2350	2920	2190	12	1740	1260	1680	1370
Th	<0.05	202	7	463	<0.05	10	241	19	<0.05	1	30	0.2	<0.05	5	0.2	<0.05	<0.05
Ti	<0.05	1220	42	574	<0.05	108	1030	117	<0.05	45	204	42	0.3	30	9	8	8
U	<0.05	4820	57	4550	<0.05	2570	2840	829	0.9	198	450	9	0.1	54	8	4	0.6
V	3	1430	39	3500	3	384	1620	761	2	32	268	44	<0.05	6	3	19	6
Y	<0.05	19400	336	15400	<0.05	682	5670	447	2	187	514	113	0.9	251	91	181	57
Zn	10	3970	140	1030	6	1160	4460	2170	<5	118	808	55	10	65	30	24	16
Zr	0.8	142	6	154	0.6	13	119	8	0.7	2	22	0.8	0.3	4	3	0.5	0.3

ALL LEACHATE RESULTS FROM AUST. CENTRE FOR TROPICAL & FRESHWATER RESEARCH

Loaded	Amount	Condition			
29.4.02	100g	Just moist powder			
	LHH	LHH2	LHH3	LHH4	TOTAL
Fluid in (ml)	180	125	175	160	640
Fluid out (ml)	108	102	140	107	457
Fluid retained (ml)	72	23	35	53	183
					640

generals

pH	2.06	2.65	2.99	3.75
conductivity (mS/cm)	12.3	5.94	2.84	2.31

Majors (mg/L)

Suphate	2700	1700	1100	1100
Chloride	35	6	6	1
Sodium	212	152	17	9.9
Potassium	109	139	19	9.2
Calcium	966	738	802	667
Magnesium	23	7.5	0.9	0.2

Nutrients

Total Phosphorous (mg P/L)	3500	1200	200	58
FRP (mg P/L)	3500	1100	178	58
Silica (mg SiO ₂ /L)	1.3	1.6	0.7	1.6

Trace

(micrograms/L)

Al	311000	112000	13300	7770
As	178	43	1	<1
Ba	150	84	73	42
Cd	80	53	9	9
Ce	1240	75	34	48
Co	478	138	12	4
Cr	892	168	13	11
Cu	2040	656	63	29
Fe	200000	16500	1050	2510
Ga	71	10	2	<0.1
Mn	15900	6320	1230	1180
Ni	700	233	54	17
Pb	97	25	12	12
Sc	120	28	5	<1
Sr	5380	5020	2350	1740
Th	202	10	1	5
Ti	1220	108	45	30
U	4820	2570	198	54
V	1430	384	32	6
Y	19400	682	187	251
Zn	3970	1160	118	65
Zr	142	13	2	4

HEMIHYDRATE RESULTS

Leach Column	Loaded	Amount	Condition		
	29.4.02	100g	Semi-liquefied		
	LGN	LGN2	LGN3	LGN4*	
Fluid in (ml)	140	125		305	175 745
Fluid out (ml)	121	105		204	87 517
Fluid retained (ml)	19	20		101	88 228
					745

NB: 30ml of leachate lost through over-topping of the holding beaker.
***NB:** 13ml distilled water added to bring leachate volume up to minimum 100ml.

generals

pH 2.79 2.12 2.35 3.82

conductivity (mS/cm) 1.68 17.1 5.64 2.15

Majors (mg/L)

Suphate 450 5200 2100 990

Chloride <1 80 19 <1

Sodium 51 236 31 3.6

Potassium 9.6 135 48 1.9

Calcium 303 969 741 629

Magnesium 1 31 6.9 <0.1

Nutrients

Total Phosphorous (mg P/L) 77 4200 584 15

FRP (mg P/L) 77 4200 539 15

Silica (mg SiO₂/L) 53 2.3 1.9 5.3

Trace (micrograms/L)

Al 8680 232000 41000 3820

As 4 212 25 <1

Ba 62 112 89 44

Cd 3 132 28 5

Ce 79 423 99 35

Co 13 601 105 2

Cr 6 1030 156 0.6

Cu 55 1710 317 19

Fe 3 97400 17800 <100

Ga <0.1 71 2 <0.1

Mn 1020 29600 6410 753

Ni 33 812 175 12

Pb 155 298 48 10

Sc 8 144 21 <1

Sr 792 5055 2920 1260

Th 7 241 30 0.2

Ti 42 1030 204 9

U 57 2840 450 8

V 39 1620 268 3

Y 336 5670 514 91

Zn 140 4460 808 30

Zr 6 119 22 3

FRESHLY-DEPOSITED DIHYDRATE RESULTS

Leach Column	Loaded	Amount	Condition				
	29.4.02	100g	Dry powder				
	LGO	LGO2	LGO3	LGO4	LGO5		
Fluid in (ml)	140	125	125	150	130	670	
Fluid out (ml)	110	113	104	110	121	558	
Fluid retained (ml)	30	12	21	40	9	112	
						670	

generals

pH	2.01	2.64	3.3	3.58	4.08	3.122
conductivity (mS/cm)	14.5	6.34	2.66	2.44	2.33	5.654

Majors (mg/L)

Suphate	2500	2100	1200	1000	360	1432
Chloride	48	22	3	3	1	15.4
Sodium	315	88	11	5.6	3.1	84.54
Potassium	231	67	10	5	2.1	63.02
Calcium	1290	824	715	705	695	845.8
Magnesium	66	16	0.5	<0.1	<0.1	27.5

Nutrients

Total Phosphorous (mg P/L)	7600	1400	106	53	34	1838.6
FRP (mg P/L)	7600	1400	90	53	34	1835.4
Silica (mg SiO ₂ /L)	0.5	0.6	11.3	0.6	2.1	3.02

Trace (micrograms/L)

Al	312000	79500	22600	13000	11800	87780
As	463	85	5	<1	<1	184.3333
Ba	314	57	55	61	43	106
Cd	230	54	3	1	0.6	57.72
Ce	1920	94	28	45	24	422.2
Co	2080	445	9	3	0.8	507.56
Cr	1820	295	3	<0.1	<0.1	706
Cu	4210	899	39	23	2	1034.6
Fe	55800	6510	352	<100	<100	20887.33
Ga	114	12	1	<0.1	<0.1	42.33333
Mn	67100	16500	586	216	74	16895.2
Ni	2280	528	48	15	12	576.6
Pb	751	160	6	9	2	185.6
Sc	103	5	2	<1	<1	36.66667
Sr	12500	6474	2190	1680	1370	4842.8
Th	463	19	0.2	<0.05	<0.05	160.7333
Ti	574	117	42	8	8	149.8
U	4550	829	9	4	0.6	1078.52
V	3500	761	44	19	6	866
Y	15400	447	113	181	57	3239.6
Zn	1030	2170	55	24	16	659
Zr	154	8	0.8	0.5	0.3	32.72

AGED DIHYDRATE RESULTS

generals	HH Avg	GN Avg	GO Avg	Tot Avg
pH	2.8625	2.77	3.122	2.918167
conductivity (mS/cm)	5.8475	6.6425	5.654	6.048
Majors (mg/L)				
Suphate	1650	2185	1432	1755.667
Chloride	12	49.5	15.4	25.63333
Sodium	97.725	80.4	84.54	87.555
Potassium	69.05	48.625	63.02	60.23167
Calcium	793.25	660.5	845.8	766.5167
Magnesium	7.9	12.96667	27.5	16.12222
Nutrients				
Total Phosphorous (mg P/L)	1239.5	1219	1838.6	1432.367
FRP (mg P/L)	1209	1207.75	1835.4	1417.383
Silica (mg SiO2/L)	1.3	15.625	3.02	6.648333
Trace (micrograms/L)				
Al	111017.5	71375	87780	90057.5
As	74	80.33333	184.3333	112.8889
Ba	87.25	76.75	106	90
Cd	37.75	42	57.72	45.82333
Ce	349.25	159	422.2	310.15
Co	158	180.25	507.56	281.9367
Cr	271	298.15	706	425.05
Cu	697	525.25	1034.6	752.2833
Fe	55015	38401	20887.33	38101.11
Ga	27.66667	36.5	42.33333	35.5
Mn	6157.5	9445.75	16895.2	10832.82
Ni	251	258	576.6	361.8667
Pb	36.5	127.75	185.6	116.6167
Sc	51	57.66667	36.66667	48.44444
Sr	3622.5	2506.75	4842.8	3657.35
Th	54.5	69.55	160.7333	94.92778
Ti	350.75	321.25	149.8	273.9333
U	1910.5	838.75	1078.52	1275.923
V	463	482.5	866	603.8333
Y	5130	1652.75	3239.6	3340.783
Zn	1328.25	1359.5	659	1115.583
Zr	40.25	37.5	32.72	36.82333

AVERAGE, ALL SAMPLES

Majors

Majors						Nutrients			
HH SO4	DHN SO4	DHO SO4	HH Ca	DHN Ca	DHO Ca	HH Total P	DHN Total P	DHO Total P	
2700	450	2500	966	303	1290	3500	77	7600	
1700	5200	2100	738	969	824	1200	4200	1400	
1100	2100	1200	802	741	715	200	584	106	
1100	990	1000	667	629	705	58	15	53	
		360			695			34	

Trace

HH Al	DHN Al	DHO Al	HH Fe	DHN Fe	DHO Fe	HH Mn	DHN Mn	DHO Mn
311000	8680	312000	200000	3	55800	15900	1020	67100
112000	232000	79500	16500	97400	6510	6320	29600	16500
13300	41000	22600	1050	17800	352	1230	6410	586
7770	3820	13000	2510	100	100	1180	753	216
		11800			100			74

	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5		Flush 1	Flush 2	Flush 3	Flush 4	Flush 5
HH Cond	12.3	5.94	2.84	2.31		HH pH	2.06	2.65	2.99	3.75	
DHN Cond	1.68	17.1	5.64	2.15		DHN pH	2.79	2.12	2.35	3.82	
DHO Cond	14.5	6.34	2.66	2.44	2.33	DHO pH	2.01	2.64	3.3	3.58	4.08
Blank	0.02	0.03	0.03	0.03	0.03	Blank	5.85	6.64	6.03	6.04	6.04

LEACHATE

Nutrients mg P/L	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5
HH_TP	3500	1200	200	58	
GN_TP	77	4200	584	15	
GO_TP	7600	1400	106	53	34
Blank TP	0.009	0.006	0.007	0.006	0.006
HH_Si	1.3	1.6	0.7	1.6	
GN_Si	53	2.3	1.9	5.3	
GO_Si	0.5	0.6	11.3	0.6	2.1
Blank Si	1.2	1.2	1.4	1.2	1.2

NUTRIENTS

Radionuclides

HH Th	DHN Th	DHO Th	HH U	DHN U	DHO U
202	7	463	4820	57	4550
10	241	19	2570	2840	829
1	30	0.2	198	450	9
5	0.2	0.05	54	8	4
		0.05			0.6

RADIONUCLIDES

HH	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5	GN	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5	GO	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5
Sulphate	2700	1700	1100	1100		Sulphate	450	5200	2100	990		Suphate	2500	2100	1200	1000	360
Chloride	35	6	6	1		Chloride	1	80	19	1		Chloride	48	22	3	3	1
Sodium	212	152	17	9.9		Sodium	51	236	31	3.6		Sodium	315	88	11	5.6	3.1
Potassium	109	139	19	9.2		Potassium	9.6	135	48	1.9		Potassium	231	67	10	5	2.1
Calcium	966	738	802	667		Calcium	303	969	741	629		Calcium	1290	824	715	705	695
Magnesium	23	7.5	0.9	0.2		Magnesium	1	31	6.9	0.1		Magnesium	66	16	0.5	0.1	0.1

MAJOR ELEMENT TRENDS - LEACHATE

HH	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5
Al	311000	112000	13300	7770	
As	178	43	1	1	
Ba	150	84	73	42	
Cd	80	53	9	9	
Ce	1240	75	34	48	
Co	478	138	12	4	
Cr	892	168	13	11	
Cu	2040	656	63	29	
Fe	200000	16500	1050	2510	
Ga	71	10	2	0.1	
Mn	15900	6320	1230	1180	
Ni	700	233	54	17	
Pb	97	25	12	12	
Sc	120	28	5	1	
Sr	5380	5020	2350	1740	
Th	202	10	1	5	
Ti	1220	108	45	30	
U	4820	2570	198	54	
V	1430	384	32	6	
Y	19400	682	187	251	
Zn	3970	1160	118	65	
Zr	142	13	2	4	

GN	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5
Al	8680	232000	41000	3820	
As	4	212	25	1	
Ba	62	112	89	44	
Cd	3	132	28	5	
Ce	79	423	99	35	
Co	13	601	105	2	
Cr	6	1030	156	0.6	
Cu	55	1710	317	19	
Fe	3	97400	17800	100	
Ga	0.1	71	2	0.1	
Mn	1020	29600	6410	753	
Ni	33	812	175	12	
Pb	155	298	48	10	
Sc	8	144	21	1	
Sr	792	5055	2920	1260	
Th	7	241	30	0.2	
Ti	42	1030	204	9	
U	57	2840	450	8	
V	39	1620	268	3	
Y	336	5670	514	91	
Zn	140	4460	808	30	
Zr	6	119	22	3	

GO	Flush 1	Flush 2	Flush 3	Flush 4	Flush 5
Al	312000	79500	22600	13000	11800
As	463	85	5	1	1
Ba	314	57	55	61	43
Cd	230	54	3	1	0.6
Ce	1920	94	28	45	24
Co	2080	445	9	3	0.8
Cr	1820	295	3	0.1	0.1
Cu	4210	899	39	23	2
Fe	55800	6510	352	100	100
Ga	114	12	1	0.1	0.1
Mn	67100	16500	586	216	74
Ni	2280	528	48	15	12
Pb	751	160	6	9	2
Sc	103	5	2	1	1
Sr	12500	6474	2190	1680	1370
Th	463	19	0.2	0.05	0.05
Ti	574	117	42	8	8
U	4550	829	9	4	0.6
V	3500	761	44	19	6
Y	15400	447	113	181	57
Zn	1030	2170	55	24	16
Zr	154	8	0.8	0.5	0.3

TRACE ELEMENT TRENDS - LEACHATE