

Table 1
Leachate sampling points

Sample Number	Landfill type	Sampling point
S1	Hazardous	Covered leachate pond, 0.3 m from surface
S2	Hazardous	Covered leachate pond, 1.5 m from surface
S3	Non-Hazardous	Covered leachate pond
S4	Non-Hazardous	Uncovered leachate pond
S5	Non-Hazardous	Outlet of leachate collection system
S6	Non-Hazardous	Uncovered leachate pond
S7	Non-Hazardous	Covered leachate pond
S8	Non-Hazardous	Outlet of leachate collection system
S9	Non-Hazardous	Outlet of leachate collection system

Table 2

Physico-chemical parameters on-site on untreated leachate samples

On site measurements							Redox potential according to the speciation calculations					
N°	Temp.		E _H (mV) *	Conductivity (μS/cm at 25°C)	O ₂ dissolved		O ₂	S(-2)/	S(+2)/	S(-2)/	Fe(+2) /	N(-3)/
	(°C)	pH			%	mg/l		S(+6)	S(+6)	S(+2)	Ferrihydrite	N(+5)
S1	17.8	7.74	247.3	20900	15	1.07	774	-62	-273	-53	NA	309
S2	18.5	7.78	83.8	21600	26	1.85	760	-66	-279	-55	NA	304
S3	11.6	7.84	112.2	3800	1	0.07	750	-70	NA	NA	100	309
S4	14.3	8.65	-92.9	19510	0	0	NA**	-217	-352	-83	-508	245
S5	35.2	7.61	47.6	33000	3.2	0.27	730	-195	-336	-58	-60	275
S6	29.2	7.74	-150.7	15550	2	0.01	710	NA	-317	NA	-18	275
S7	17.5	8.26	128.6	16300	2	0.13	720	-201	NA	NA	-235	258
S8	26.3	7.25	295.6	9930	50	4.11	780	-155	-271	-39	197	316
S9	29.8	7.60	-145.1	17490	0	0	NA	-179	-304	-54	83	285

*E_H (redox potential in relation to normal hydrogen electrode), **NA: Not Applicable

Table 3

Concentration of some dissolved species in filtered leachates accordingly direct colorometric determination

N°	On site analyses performed on filtrated (< 0.1 µm) samples (mg L ⁻¹)				
	Fe ²⁺	SO ₃ ²⁻	S ²⁻	NO ₂ ⁻	Cr(6+)
S1	<1.0	4.6	0.17	0.04	0.29
S2	<1.0	2.8	0.10	0.05	0.21
S3	2.3	5.1	0.15	0.09	0.28
S4	39	1.0	1.00	1.42	2.70
S5	5.1	14.1	0.80	0.22	1.20
S6	2.8	18	<0.10	0.25	0.65
S7	7.6	21	0.85	0.52	1.40
S8	4.4	5.1	0.13	0.10	0.84
S9	2.2	9.1	3.88	0.19	0.72

Table 4

Results of anion and cation analyses on leachates filtered at 0.1µm

Leachates	Anions (mg/L)						Cations (mg/L)					
	CH ₃ COO ⁻	Cl ⁻	Br ⁻	NO ₃ ⁻	SO ₄ ²⁻	S ₂ O ₃ ²⁻	PO ₄ ³⁻	Na ⁺	NH ₄ ⁺	K ⁺	Mg ²⁺	Ca ²⁺
S1	<0.25	6351	176	8	2107	5	5	3461	80	1623	29	652
S2	<0.25	5789	168	8	1831	4	6	3412	120	1572	28	643
S3	<0.25	455	3	2	64	<0.25	11	298	112	314	27	76
S4	158	2179	28	26	320	64	5	2073	1867	906	91	21
S5	<0.25	3307	88	1	3	7	44	3309	1136	1479	41	32
S6	<0.25	3355	14	1	133	135	28	2622	1182	929	59	109
S7	<0.25	1382	20	1	133	<0.25	70	2480	1127	1541	46	62
S8	<0.25	1382	8	1	37	2	<0.25	1069	1081	752	113	67
S9	1986	1974	46	1	82	16	10	1659	1307	608	115	158

Note: F⁻ and Li⁺ were below detection limits (i.e.. 0.25 mg L⁻¹ and 2.5 mg L⁻¹ respectively).

Table 5

Concentrations of trace metals in the leachates fractions < 0.1 µm and < 30KDa

Leachate	Fraction	Leachate concentration (µg/L)							
		Cr	Co	Ni	Cu	Zn	As	Cd	Pb
S1	< 0.1 µm	47	24	285	50	135	730	2	40
S2	< 0.1 µm	50	26	285	24	110	760	2	28
S3	< 0.1 µm	70	11	70	39	335	40	1	10
S4- 1	< 0.1 µm	378	45	168	98	760	116	1	39
S4- 2	< 0.1 µm	383	46	161	52	1138	115	1	22
S5	< 0.1 µm	1370	70	330	7	225	305	1	17
S6	< 0.1 µm	465	39	270	65	400	230	1	12
S7	< 0.1 µm	745	65	385	90	940	155	2	150
S8	< 0.1 µm	110	29	140	5	430	39	1	8
S9	< 0.1 µm	298	23	135	197	394	55	1	15
S1	< 30KDa	46	24	275	12	670	865	2	30
S2	< 30KDa	33	21	235	10	575	725	3	75
S3	< 30KDa	40	9	85	11	245	42	1	12
S4	< 30KDa	190	38	223	21	585	123	1	13
S5	< 30KDa	937	65	316	112	212	295	1	27
S6	< 30KDa	185	28	195	36	130	220	1	13
S7	< 30KDa	475	60	355	55	320	155	2	95
S8	< 30KDa	110	30	165	23	850	39	1	14
S9	< 30KDa	184	19	163	119	939	51	1	19

Table 6

Total Organic Carbon, Dissolved Inorganic carbon and Dissolved organic carbon measurements.

Leachate	<0.1 µm (mg C/L)		<30KDa (mg C/L)		
	TOC	DIC	DOC	DIC	DOC
	mgC/L				
S1	NA*	94	155	88	150
S2	NA*	93	172	90	165
S3	NA*	270	341	259	281
S4	NA*	1191	4443	1114	2968
S5	1570	2508	1528	2378	856
S6	1090	1511	1008	1331	783
S7	1630	1739	1277	1650	906
S8	548	1136	562	1087	418
S9	3330	1248	1532	1086	1486

Note: NA* = Not Analysed. due to observation of gaseous emissions following acidification (destruction of organic matter) and/or precipitation

Table 7

Input data for the WHAM parameter in PHREEQC.

	Ionic Strength	A (m ² /g)	DOC (g)	H_a	H_b	H_c	H_d	H_e	H_f	H_g	H_h
S1	0.2508	26289.264	0.15	0.000106	0.000106	0.000106	0.000106	5.32E-05	5.32E-05	5.32E-05	5.32E-05
S2	0.2375	26213.67	0.165	0.000117	0.000117	0.000117	0.000117	0.000059	0.000059	0.000059	0.000059
S3	0.03653	27464.894	0.281	0.000199	0.000199	0.000199	0.000199	9.97E-05	9.97E-05	9.97E-05	9.97E-05
S4	0.1915	25967.91	2.968	0.002106	0.002106	0.002106	0.002106	0.001053	0.001053	0.001053	0.001053
S5	0.2546	26311.053	0.856	0.000607	0.000607	0.000607	0.000607	0.000304	0.000304	0.000304	0.000304
S6	0.202	26020.814	0.783	0.000556	0.000556	0.000556	0.000556	0.000278	0.000278	0.000278	0.000278
S7	0.1874	25948.003	0.906	0.000643	0.000643	0.000643	0.000643	0.000321	0.000321	0.000321	0.000321
S8	0.1301	25751.978	0.418	0.000297	0.000297	0.000297	0.000297	0.000148	0.000148	0.000148	0.000148
S9	0.1668	25856.447	1.486	0.001054	0.001054	0.001054	0.001054	0.000527	0.000527	0.000527	0.000527

	H_ab	H_ad	H_af	H_ah	H_bc	H_be	H_bg	H_cd	H_cf	H_ch	H_de	H_dg
S1	2.6606E-05	2.661E-05	2.66E-05	2.66E-05	2.66E-05	2.66E-05	2.66E-05	2.66E-05	2.66E-05	2.66E-05	2.66E-05	2.66E-05
S2	2.9267E-05	2.9267E-05	2.93E-05	2.93E-05	2.93E-05	2.93E-05	2.93E-05	2.93E-05	2.93E-05	2.93E-05	2.93E-05	2.93E-05
S3	4.9842E-05	4.984E-05	4.98E-05	4.98E-05	4.98E-05	4.98E-05	4.98E-05	4.98E-05	4.98E-05	4.98E-05	4.98E-05	4.98E-05
S4	0.00052645	0.0005264	0.000526	0.000526	0.000526	0.000526	0.000526	0.000526	0.000526	0.000526	0.000526	0.000526
S5	0.00015183	0.0001518	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152
S6	0.00013888	0.0001389	0.000139	0.000139	0.000139	0.000139	0.000139	0.000139	0.000139	0.000139	0.000139	0.000139
S7	0.0001607	0.0001607	0.000161	0.000161	0.000161	0.000161	0.000161	0.000161	0.000161	0.000161	0.000161	0.000161
S8	7.4143E-05	7.414E-05	7.41E-05	7.41E-05	7.41E-05	7.41E-05	7.41E-05	7.41E-05	7.41E-05	7.41E-05	7.41E-05	7.41E-05
S9	0.00026358	0.0002636	0.000264	0.000264	0.000264	0.000264	0.000264	0.000264	0.000264	0.000264	0.000264	0.000264