

Armidale Solid Waste Landfill Facility

Location: 108 Long Swamp Road, Armidale NSW 2350 Environment Protection Licence Number: 5860 Activities: Waste disposal to land and waste processing
 The internet link to Licence No. 5860 is <https://apps.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=137211&SYSUID=1&LICID=5860>

Licensee under Protection of Environment Operations Act 1997 (POEO Act):
 Armidale Regional Council, PO Box 75A, Armidale NSW 2350

Council is required to monitor methane, groundwater, surface water and leachate at various sampling points. This document details recent results. To meet its obligation under Section 66 (6) of the POEO Act, a link to the current version of this document is available on Council's website.

On the adjacent figure, sampling locations are given historical names and colour coded according to the type of monitoring: L = Long Swamp; S = Surface water; O = Overflow; W = Well; LL = Leachate; GW = Groundwater; and EX = Extension. Corresponding Environment Protection Authority (EPA) Identification Numbers detailed on the Licence are provided below. A few EPA ID numbers are missing due to changes since initial licensing of the landfill.

- EPA No. 2 LSO1 (surface water + leachate overflow)
- EPA No. 4 LSO2 (surface water + leachate overflow)
- EPA No. 5 Annual leachate volume discharge to utilisation area (Pump 1)
- EPA No. 6 LSO3 (surface water + leachate overflow)
- EPA No. 7 LSO4 (surface water + leachate overflow)
- EPA No. 8 LW1 (groundwater monitoring well)
- EPA No. 9 LW2 (groundwater monitoring well)
- EPA No. 10 LW3 (groundwater monitoring well)
- EPA No. 12 LS2 (surface water + leachate)
- EPA No. 13 LS3 (surface water + leachate)
- EPA No. 14 LS4 (surface water + leachate)
- EPA No. 15 LS5 (farmer's dam)
- EPA No. 16 LL1 (leachate)
- EPA No. 17 Surface methane
- EPA No. 18 Building methane
- EPA No. 19 LL2 (leachate)
- EPA No. 20 LSO5 (surface water + leachate overflow)
- EPA No. 21 SWEX-01 (surface water)
- EPA No. 22 Annual leachate volume transfer from landfill extension ponds
- EPA No. 23 GWEX-01 (groundwater monitoring well)
- EPA No. 24 GWEX-02 (groundwater monitoring well)
- EPA No. 25 GWEX-03 (groundwater monitoring well)



Monitoring results for the last four years are presented on following pages – as required in the EPA publishing requirements.

Water quality analytes are organised in tables on following pages according to chemical grouping to assist chemical review. [Analytes are listed on the licence in alphabetical order.] They include analytes for groundwater, surface water and landfill leachate.

The left hand table provides the field test results. The field tests are conducted on the same date that a sample is collected.

The right hand table provides analytical results from the NATA registered laboratory. The date the laboratory issued the results is first, followed by the date by which results were placed on the Armidale Regional Council website.

Abbreviations in the tables are provided here in alphabetical order:

Alk = Alkalinity measured as mg/L CaCO₃ equivalent; BTEX = Benzene, Toluene, Ethylbenzene, Xylene; Ca = Calcium; Cl = Chloride; D = Depth to water from top of internal well PVC casing; DO = Dissolved Oxygen; EC = Electrical Conductivity also called conductivity; Eh = Redox Potential; Fe = Iron; Hg = Mercury; K = Potassium; Mg = Magnesium; Mn = Manganese; Na = Sodium; ND = Nil detected; NH₃ = Ammonia as a measure of ammonium ions; NO_x = Nitrite + Nitrate; NR = not required by licence; OC&OP = Organochlorine & Organophosphorus; WL RL = water level converted to Reduced Level relative to mean sea level; PAH = Polynuclear aromatic hydrocarbons; SO₄ = Sulphate; SS = Total suspended solids; Temp = Temperature; TKN = Total Kjeldahl Nitrogen (organic nitrogen + ammonia); TN = Total Nitrogen; TOC = Total Organic Carbon; VFR = Volumetric Flow Rate; Zn = Zinc.

Measures:

mg/L = milligram per litre (equivalent to ppm); µS/cm = micro Siemens per centimetre; mV = millivolts; °C= degrees Celsius; kL = kilolitres; ppm = parts per million.

Choice of water quality analytes:

Some analytes are tested because they give a general understanding of groundwater, surface water and leachate quality. Often the concentrations are greater in leachate than in groundwater and surface water. A simple comparison can tell us if landfill leachate may have escaped into groundwater or surface water. However, care is needed when reviewing these general results so that false conclusions are not made. The salt levels in groundwater are a case in point. EC is an indicator of salt levels. If the EC has previously been low, and then becomes at least three to four times higher, one would assume it is due to landfill leachate ingress into groundwater. The Long Swamp Road Landfill groundwater has relatively low EC (Table 1) except for well LW1. So landfill leachate intrusion may be indicated if the EC in other wells becomes a lot higher. (LW1 is an upgradient well contaminated with nitrogen compounds. Historical photos have revealed that it is not due to landfill leachate, but due to old night soil trenches that are close by.)

Other analytes give us more specific information about the possible presence of landfill leachate in groundwater and surface water. Even with these we must carefully consider if their increased concentrations are definitely due to landfill leachate and are not from some other source.

- Nitrogen compounds indicate biodegradation of the plant and animal waste in our solid waste. They may also be due to fertilizer use on nearby properties or old night soil trenches. A general rule of thumb is that total nitrogen (TKN + NO_x) should be <5 mg/L.
- Iron and manganese above 10 mg/L is an indicator that landfill leachate may be present in groundwater. However, these groundwater analytes may increase due to leaching of iron and manganese from the soil after excessive rainfall or flood water infiltration.
- Organic analytes such as BTEX compounds are most likely to indicate landfill leachate, especially if they haven't been detected before.

So it is important to monitor on a regular basis to note any changes in water quality analyte concentrations and to judiciously review the results. Increases in groundwater and surface water analyte concentrations due to landfill leachate intrusion are often at least three to four times the previous concentrations.

Comments on water quality results: Wells (LW2, LW3, GWEX-02, GWEX-03) are downgradient of the landfill and are at most risk from landfill leachate ingress. There is no indication of contamination in these wells. The LS5 dam is also an environmental value to be protected. Its water quality results show no indication of landfill leachate ingress.

Table 1a: Groundwater quality & depth

Frequency required by licence		DO	EC	pH	Eh	Temp	D	WL	RL	Alk	Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH ₃	NO _x	TKN	TN	TOC	PAH
Measure		mg/L	µS/cm	1-14	mV	°C	m	m	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	mg/L
LW1 6 monthly												LW1										NR	
08/07/18		0.18	3505	4.10	+325	19.0	2.85	1020.94	<1		19/07/18	09/08/18	474	0.403	0.133	0.08	<0.0001	0.03	279	24.8	304	6	
13/10/18		1.46	3268	4.11	+405	15.9	2.99	1020.80	<1		23/10/18	12/11/18	455	0.383	0.230	0.07	0.0004	<0.01	263	22.9	286	4	
15/03/19		0.13	3290	4.38	+447	19.2	2.78	1021.01	<1		25/03/19	15/04/19	434	0.332	0.121	0.07	0.0005	0.05	210	<0.1	210	2	
09/10/19		0.53	3298	3.98	+343	16.0	3.35	1020.44	<1		21/10/19	08/11/19	468	0.423	0.255	0.07	0.0012	0.02	261	36.5	298	7	
19/05/20		0.07	2950	4.10	+371	17.2	3.35	1020.44	<1		27/05/20	16/06/20	427	0.322	0.258	0.08	<0.0001	0.04	215	32.5	248	<1	
14/10/20		1.58	2885	4.26	+431	16.8	2.94	1020.85	<1		22/10/20	11/11/20	443	0.403	0.130	0.07	0.0028	0.02	215	26.1	241	6	
22/05/21		0.29	3028	3.96	+406	18.0	2.53	1021.26	<1		01/06/21	22/06/21	434	0.431	0.232	0.10	0.0023	<0.01	250	18.2	268	8	
20/10/21		0.30	2925	3.97	+401	17.1	2.37	1021.42	<1		01/11/21	19/11/21	428	0.480	0.110	0.07	0.0036	0.04	211	<10.0	211	8	
20/04/22		0.15	2690	4.06	+239	18.9	1.94	1021.85	<1		03/05/22	19/05/22	434	0.451	0.132	0.09	0.0020	0.04	198	15.4	213	4	
12/10/22		0.30	2908	3.79	+419	17.5	1.88	1021.91	<1		24/10/22	11/11/22	430	0.480	0.136	0.07	<0.0001	<1.00	226	12.8	239	10	
LW2 6 monthly												LW2										NR	
10/07/18		0.89	838	6.67	+125	14.6	4.55	1001.66	170		19/07/18	09/08/18	128	0.074	0.090	<0.05		0.08	0.090	0.5	0.6	4	
12/10/18		0.89	544	7.85	+68	15.4	5.28	1000.93	171		23/10/18	12/11/18	61	0.020	0.084	<0.05		0.01	0.090	<0.1	<0.1	2	
15/03/19		0.73	533	6.71	+103	22.8	5.58	1000.63	160		25/03/19	15/04/19	55	0.026	0.074	<0.05		0.05	0.150	<0.1	0.2	3	
08/10/19		4.23	562	6.62	+125	22.2	6.51	999.70	167		21/10/19	08/11/19	56	0.339	0.096	<0.05		0.17	0.02	0.4	0.4	2	
20/05/20		0.54	563	6.77	+161	16.8	6.76	999.45	168		27/05/20	16/06/20	60	0.089	0.073	<0.05		0.12	0.020	0.2	0.2	<1	
13/10/20		0.67	539	6.70	+156	19.8	6.10	1000.11	170		22/10/20	11/11/20	60	0.100	0.141	<0.05		0.03	0.130	<0.1	0.1	2	
21/05/21		0.64	527	6.53	+139	20.1	5.12	1001.09	180		01/06/21	22/06/21	57	0.018	0.106	<0.05		<0.01	0.120	<0.1	0.1	3	
19/10/21		1.54	567	6.59	+79	19.4	4.16	1002.05	167		01/11/21	19/11/21	67	0.039	0.028	<0.05		<0.01	0.080	<0.1	<0.1	3	
18/04/22		0.96	518	6.89	+89	18.7	3.49	1002.72	167		29/04/22	19/05/22	60	0.027	0.126	<0.05		0.03	0.06	<0.1	<0.1	4	
12/10/22		1.38	535	6.58	+156	18.3	3.48	1002.73	167		24/10/22	11/11/22	63	0.011	0.110	<0.05		<0.01	0.09	0.2	0.3	4	
LW3 6 monthly												LW3										NR	
09/07/18		9.59	489	6.50	-28	17.0	12.03	997.38	213		19/07/18	09/08/18	15	0.560	0.122	4.17		0.36	<0.01	0.3	0.3	9	
12/10/18		0.64	438	6.09	-4	16.0	12.16	997.25	203		23/10/18	12/11/18	15	0.544	0.172	2.87		0.36	0.02	0.4	0.4	3	
15/03/19		0.57	477	6.40	+8	20.7	17.35	992.06	203		25/03/19	15/04/19	14	0.567	0.144	4.26		0.06	<0.01	<0.1	<0.1	5	
08/10/19		5.97	465	6.33	+39	24.1	12.73	996.68	210		21/10/19	08/11/19	14	0.532	0.041	3.34		0.35	<0.01	0.7	0.7	5	
20/05/20		0.14	528	6.48	+149	15.8	13.27	996.14	193		27/05/20	16/06/20	43	0.608	<0.005	<0.05		0.05	0.02	0.1	0.1	2	
13/10/20		0.11	511	6.34	+166	17.1	13.24	996.17	193		22/10/20	11/11/20	43	0.681	0.015	<0.05		0.03	0.02	<0.1	<0.1	3	
21/05/21		0.11	483	6.28	+79	16.6	12.83	996.58	207		01/06/21	22/06/21	31	0.603	0.010	0.31		0.10	<0.01	0.2	0.2	5	
19/10/21		0.25	528	6.29	+41	17.5	12.26	997.15	210		01/11/21	19/11/21	34	0.701	0.009	0.43		0.16	<0.01	0.1	0.1	5	
18/04/22		0.15	441	6.24	+23	18.8	11.58	997.83	207		29/04/22	19/05/22	24	0.615	0.021	0.48		0.13	<0.01	0.2	0.2	6	
12/10/22		0.09	462	6.26	+99	18.4	11.06	998.35	193		24/10/22	11/11/22	28	0.659	0.009	0.32		0.10	<0.01	0.2	0.2	5	

Table 1b: Groundwater quality & depth

Frequency required by licence	DO	EC	pH	Eh	Temp	D	WL	RL	Alk
Measure	mg/L	µS/cm	1-14	mV	°C	m	m	mg/L	
GWEX-01 6 monthly									
10/07/18	0.71	641	5.64	+523	15.3	5.52	1018.47	2	
13/10/18	0.53	606	5.41	+452	15.9	5.69	1018.30	1	
15/03/19	0.35	600	5.07	+597	18.1	5.66	1018.33	1	
09/10/19	0.44	580	4.47	+582	15.5	6.27	1017.72	1	
19/05/20	0.22	572	4.65	+558	17.2	6.26	1017.73	1	
13/10/20	0.39	570	4.54	+466	18.1	6.00	1017.99	1	
22/05/21	0.33	569	4.48	+552	17.4	5.35	1018.64	<1	
20/10/21	0.37	580	4.63	+571	16.8	5.03	1018.96	1	
20/04/22	0.27	576	4.54	+367	16.8	4.32	1019.67	2	
12/10/22	0.38	588	4.56	+572	15.8	4.11	1019.88	3	
GWEX-02 3 monthly									
22/01/18	0.44	362	6.17	+89	17.7	14.89	992.56	100	
08/07/18	0.23	366	6.77	+120	19.3	15.46	991.99	100	
08/09/18	0.39	348	6.21	+152	16.3	15.55	991.90	107	
13/10/18	0.35	344	6.53	+155	16.6	15.62	991.83	102	
05/01/19	0.31	366	6.05	+228	18.5	15.67	991.78	102	
15/03/19	0.32	356	6.14	+212	17.3	15.84	991.61	93	
13/08/19	0.40	352	6.05	+130	16.3	16.27	991.18	97	
09/10/19	0.24	355	5.80	+340	15.7	16.38	991.07	117	
25/02/20	0.35	348	5.87	+140	18.6	16.59	990.86	107	
19/05/20	0.26	558	6.14	+350	16.7	16.36	991.09	120	
01/09/20	0.29	350	6.15	+179	17.6	16.23	991.22	107	
13/10/20	0.32	353	6.19	+154	17.4	16.17	991.28	110	
17/02/21	0.31	346	5.98	+191	16.7	15.83	991.62	110	
22/05/21	0.36	359	5.99	+195	17.9	15.24	992.21	109	
11/08/21	0.34	362	6.03	+159	17.2	14.83	992.62	109	
20/10/21	0.39	347	6.03	+138	17.0	14.19	993.26	103	
14/01/22	0.54	344	6.10	+171	17.4	13.28	994.17	110	
20/04/22	0.39	352	6.01	+154	17.1	12.70	994.75	110	
28/06/22	0.40	347	6.12	+143	15.6	12.67	994.78	107	
13/10/22		NO 4 WHEEL	DRIVE	ACCESS					

Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH ₃	NO _x	TKN	TN	TOC	PAH
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L
GWEX-01												Annually
19/07/18	09/08/18	184	0.045	0.102	<0.05	0.0034	0.06	0.02	<0.1	<0.1	5	ND
23/10/18	12/11/18	187	0.041	0.117	<0.05	0.0029	0.03	0.01	<0.1	<0.1	2	NR
25/03/19	15/04/19	172	0.041	0.139	0.07	0.0035	0.09	0.10	<0.1	0.1	4	ND
21/10/19	08/11/19	180	0.040	0.031	<0.05	0.0014	<0.01	0.02	<0.1	<0.1	4	NR
27/05/20	16/06/20	180	0.039	0.033	<0.05	0.0024	0.02	0.01	<0.1	<0.1	2	ND
22/10/20	11/11/20	188	0.042	0.197	<0.05	0.0019	0.01	0.03	<0.1	<0.1	3	NR
01/06/21	22/06/21	184	0.042	0.025	<0.05	0.0018	0.01	0.03	<0.1	<0.1	6	ND
01/11/21	19/11/21	180	0.041	0.023	<0.05	0.0018	<0.01	0.06	<0.1	<0.1	<1	NR
03/05/22	19/05/22	193	0.038	0.025	<0.05	0.0014	<0.01	0.02	<0.1	<0.1	4	ND
24/10/22	11/11/22	171	0.043	0.166	<0.05	0.0010	<0.01	0.04	<0.1	<0.1	4	NR
GWEX-02												Annually
30/01/18	19/02/18	27	<0.001	<0.005	<0.05	<0.0001	<0.01	0.14	<0.1	0.1	2	NR
19/07/18	09/08/18	24	<0.001	<0.005	<0.05	<0.0001	0.04	0.15	<0.1	0.2	5	ND
21/09/18	12/10/18	23	<0.001	<0.005	<0.05	<0.0001	0.01	0.14	<0.1	0.1	5	NR
23/10/18	12/11/18	30	<0.001	<0.005	<0.05	<0.0001	<0.01	0.14	<0.1	0.1	9	NR
17/01/19	07/02/19	26	<0.001	<0.005	<0.05	<0.0001	0.05	0.14	0.3	0.4	<1	NR
25/03/19	15/04/19	26	<0.001	<0.005	<0.05	<0.0001	0.08	0.15	<0.1	0.2	1	ND
23/08/19	12/09/19	27	<0.001	<0.005	<0.05	<0.0001	<0.01	0.13	0.1	0.2	<1	NR
21/10/19	08/11/19	26	<0.001	<0.005	<0.05	<0.0001	<0.01	0.14	<0.1	0.1	2	NR
05/03/20	25/03/20	45	<0.001	<0.005	<0.05	<0.0001	0.02	0.13	<0.1	0.1	5	NR
27/05/20	16/06/20	25	<0.001	<0.005	<0.05	<0.0001	<0.01	0.12	<0.1	0.1	2	ND
15/09/20	05/10/20	26	<0.001	<0.005	<0.05	<0.0001	0.02	0.14	<0.1	0.1	6	NR
22/10/20	11/11/20	27	<0.001	<0.005	<0.05	<0.0001	<0.01	0.13	<0.1	0.1	3	NR
02/03/21	22/03/21	28	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	8	NR
01/06/21	22/06/21	28	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	4	ND
20/08/21	09/09/21	28	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	<1	NR
01/11/21	19/11/21	27	<0.001	0.006	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	4	NR
27/01/22	16/02/22	29	<0.001	<0.005	<0.05	<0.0001	<0.01	0.16	<0.1	0.2	<1	NR
03/05/22	19/05/22	31	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	5	ND
11/07/22	29/07/22	24	<0.001	<0.005	<0.05	<0.0001	0.01	0.14	0.1	0.2	4	NR

Table 1c: Groundwater quality & depth

Frequency required by licence	DO	EC	pH	Eh	Temp	D	WL	RL	Alk
Measure	mg/L	µS/cm	1-14	mV	°C	m	m	m	mg/L
GWEX-03	3 monthly								
22/01/18	0.20	880	6.49	-28	19.3	11.08	993.10	273	
08/07/18	0.15	880	7.11	+107	19.2	11.80	992.38	279	
08/09/18	0.32	805	6.47	+139	16.1	11.92	992.26	260	
12/10/18	0.28	869	7.05	+101	16.0	11.98	992.20	277	
05/01/19	0.70	867	6.43	+205	18.2	12.03	992.15	280	
15/03/19	0.21	875	6.71	+146	18.0	12.27	991.91	283	
13/08/19	0.24	865	6.44	+117	16.1	12.79	991.39	273	
08/10/19	0.19	878	6.41	+129	17.6	12.91	991.27	283	
25/02/20	0.38	833	6.42	+120	19.5	13.03	991.15	283	
19/05/20	0.19	848	6.55	+247	17.2	12.72	991.46	282	
01/09/20	0.32	832	6.57	+161	17.4	12.47	991.71	293	
13/10/20	0.21	797	6.52	+157	19.2	12.42	991.76	287	
17/02/21	0.19	828	6.44	+146	17.1	11.99	992.19	287	
21/05/21	0.28	825	6.24	+148	17.0	11.29	992.89	293	
11/08/21	0.22	849	6.43	+143	16.2	10.76	993.42	290	
20/10/21	0.28	811	6.49	+78	17.5	10.05	994.13	287	
14/01/22	0.19	824	6.53	-74	18.1	9.25	994.93	293	
20/04/22	0.13	840	6.52	-103	18.0	8.67	995.51	307	
28/06/22	0.30	832	6.26	+130	15.0	8.50	995.68	293	
13/10/22	0.43	833	6.39	+157	15.7	7.89	996.29	270	

Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH ₃	NO _x	TKN	TN	TOC	PAH
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L
GWEX-03												Annually
30/01/18	19/02/18	109	<0.001	<0.005	<0.05	<0.0001	<0.01	0.10	<0.1	0.1	1	NR
19/07/18	09/08/18	105	<0.001	<0.005	<0.05	<0.0001	0.04	0.11	<0.1	0.1	6	ND
21/09/18	12/10/18	106	<0.001	<0.005	<0.05	<0.0001	<0.01	0.10	<0.1	0.1	3	NR
23/10/18	12/11/18	108	<0.001	<0.005	<0.05	<0.0001	<0.01	0.09	<0.1	<0.1	4	NR
17/01/19	07/02/19	104	<0.001	<0.005	<0.05	<0.0001	0.04	0.09	0.1	0.2	1	NR
25/03/19	15/04/19	103	<0.001	<0.005	<0.05	<0.0001	0.04	0.10	<0.1	0.1	<1	ND
23/08/19	12/09/19	109	<0.001	0.005	<0.05	<0.0001	0.02	0.09	0.2	0.3	4	NR
21/10/19	08/11/19	109	<0.001	0.007	<0.05	<0.0001	<0.01	0.11	<0.1	0.1	6	NR
05/03/20	25/03/20	108	0.001	<0.005	<0.05	<0.0001	0.04	0.09	<0.1	<0.1	<1	NR
27/05/20	16/06/20	111	<0.001	<0.005	<0.05	<0.0001	0.03	0.08	0.1	0.2	4	ND
15/09/20	05/10/20	110	0.001	0.005	<0.05	<0.0001	0.02	0.09	<0.1	<0.1	9	NR
22/10/20	11/11/20	113	<0.001	0.005	<0.05	<0.0001	0.01	0.08	<0.1	<0.1	3	NR
02/03/21	22/03/21	110	<0.001	<0.005	<0.05	<0.0001	<0.01	0.08	<0.1	<0.1	8	NR
01/06/21	22/06/21	108	<0.001	<0.005	<0.05	<0.0001	<0.01	0.08	<0.1	<0.1	9	ND
20/08/21	09/09/21	114	<0.001	0.006	<0.05	<0.0001	<0.01	0.10	<0.1	0.1	<1	NR
01/11/21	19/11/21	109	0.001	0.005	<0.05	<0.0001	<0.01	0.09	<0.1	<0.1	5	NR
27/01/22	16/02/22	118	0.012	0.007	0.06	<0.0001	0.02	0.09	<0.1	<0.1	4	NR
03/05/22	19/05/22	125	0.008	0.006	<0.05	<0.0001	0.02	0.08	0.1	0.2	6	NR
11/07/22	29/07/22	117	0.004	0.006	<0.05	<0.0001	<0.01	0.15	0.2	0.4	7	NR
24/10/22	11/11/22	112	0.002	0.010	<0.05	<0.0001	<0.01	0.17	0.3	0.5	8	NR

Table 2: Surface water quality

Frequency required by licence		DO	EC	pH	Eh	Temp	Alk	Received from laboratory	Accessible on Council website by	SS	SO ₄	Cl	Ca	Mg	Na	K	Mn	Zn	Fe	NH ₃	NO _x	TKN	TN	TOC	Phenols	
Measure		mg/L	µS/cm	1-14	mV	°C	mg/L			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	
LS5	6 monthly							LS5		NR	NR	NR	NR	NR	NR	NR			NR						NR	
10/07/18		19.27	462	10.09	+109	10.6	40	19/07/18	09/08/18	76							0.004	<0.005	0.26	0.01	3.6	3.6	19			
15/10/18		9.08	235	7.61	+289	15.5	53	23/10/18	12/11/18	34							0.034	0.007	0.26	0.03	1.8	1.8	<1			
16/04/19		4.61	565	6.68	+153	13.6	123	26/04/19	16/05/19	70							0.576	0.006	<0.05	<0.01	4.3	4.3	33			
08/10/19		Insuffi cient water						27/05/20	16/06/20	<5							0.014	<0.005	0.36	<0.01	0.8	0.8	11			
20/05/20		15.52	269	9.51	+128	16.5	60	22/10/20	11/11/20	9							0.052	<0.005	0.49	<0.01	0.9	0.9	14			
14/10/20		9.37	279	8.74	+247	16.6	67	01/06/21	22/06/21	<5							0.026	0.008	0.25	<0.01	1.2	1.2	14			
24/05/21		9.78	269	6.85	+163	13.4	87	01/11/21	19/11/21	28							0.078	<0.005	0.42	0.01	1.4	1.4	13			
20/10/21		6.62	257	6.78	+58	16.4	53	03/05/22	19/05/22	<5							0.013	<0.005	0.16	<0.01	3.8	3.8	20			
20/04/22		11.01	570	7.25	+114	18.0	147	24/10/22	11/11/22	22							0.129	<0.005	0.41	<0.01	1.8	1.8	22			
13/10/22		11.60	426	8.10	+182	20.2	113																			
SWEX-01	3 monthly							SWEX-01																		
22/01/18	Flow hint	5.15	346	6.13	+98	27.2	147	30/01/18	19/02/18	7	5	10	36	8	11	12	0.470	<0.005	0.32	0.08	<0.01	1.2	1.2	16	<0.05	
08/07/18	Flow hint	5.76	235	6.73	+85	15.9	35	19/07/18	09/08/18	11	25	17	16	4	5	12	0.057	0.015	0.53	0.06	0.01	0.8	0.8	14	<0.05	
08/09/18	33.23 kL/day	6.11	242	6.14	+114	14.0	56	21/09/18	12/10/18	12	30	16	19	6	10	12	0.010	0.015	0.07	0.03	<0.01	0.9	0.9	9	<0.05	
15/10/18	3.70 kL/day	5.85	248	6.42	+112	15.2	57	23/10/18	12/11/18	6	23	27	22	6	10	9	0.007	0.006	0.15	0.03	<0.01	0.5	0.5	<1	<0.05	
05/01/19	dry																									
15/03/19	dry																									
16/04/19	dry																									
13/08/19	dry																									
09/10/19	dry																									
25/02/20	2.59 kL/day	4.41	242	6.98	+106	22.5	107	05/03/20	25/03/20	<5	11	6	28	8	9	9	0.084	<0.005	0.17	0.04	<0.01	0.7	0.7	6	<0.05	
19/05/20	dry																									
01/09/20	Flow hint	7.15	214	7.51	+180	16.6	80	15/09/20	05/10/20	<5	17	10	24	6	9	6	0.007	<0.005	0.19	0.24	<0.01	<0.5	<0.5	4	<0.05	
13/10/20	dry																									
17/02/21	Flow hint	4.14	331	6.74	+207	17.4	40	02/03/21	22/03/21	12	90	12	37	9	12	11	0.321	0.013	0.29	0.04	<0.01	1.3	1.3	14	<0.05	
24/05/21	Flow hint	3.31	278	6.37	+150	12.9	107	01/06/21	22/06/21	10	10	8	25	7	10	32	1.080	0.006	0.62	<0.01	<0.01	0.4	0.4	8	<0.05	
11/08/21	Flow hint	10.20	184	6.59	+137	11.1	67	20/08/21	09/09/21	<5	15	9	18	5	8	4	0.002	<0.005	<0.05	<0.01	<0.01	0.2	0.2	5	<0.05	
20/10/21	Flow hint	7.96	221	7.05	+163	18.3	90	01/11/21	19/11/21	<5	11	6	28	6	10	4	0.061	<0.005	0.52	0.02	0.01	0.5	0.5	8	<0.05	
14/01/22	Flow hint	3.13	256	6.45	+95	21.8	117	27/01/22	16/02/22	20	2	9	31	8	12	7	1.470	0.011	1.13	0.02	0.02	0.7	0.7	11	<0.05	
20/04/22	Flow hint	6.05	242	6.90	+125	19.8	110	03/05/22	19/05/22	11	1	10	25	7	12	7	0.957	0.008	0.36	<0.01	<0.01	0.8	0.8	10	<0.05	
28/06/22	Flow hint	4.47	205	6.15	+55	9.1	67	11/07/22	29/07/22	<5	17	12	20	6	11	5	0.521	0.015	2.15	0.02	0.01	0.5	0.5	5	<0.05	
13/10/22	51.8kL.day	10.19	289	7.11	+173	14.6	100	24/10/22	11/11/22	<5	7	20	27	9	25	10	0.037	0.008	0.13	<0.01	0.83	1.2	2.0	12	<0.05	

Table 3a: Concentrated leachate quality – LL1 & LL2

Frequency required by licence								Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH ₃	NO _x	TKN	TN	TOC	PAH	OC&OP Pesticides	BTEX compounds		
Measure	mg/L	µS/cm	pH 1-14	Eh mV	Temp °C	Alk mg/L			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as n	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
LL1 Annually								LL1														NR		
15/10/18	7.42	3375	7.97	+38	16.8	920	23/10/18	12/11/18	530	0.432	0.013	0.49	<0.0001	5.27	22.7	13.0	35.7	72			ND	ND		
08/10/19	6.36	3970	7.60	+193	22.7	550	21/10/19	08/11/19	628	0.202	0.030	4.57	<0.0001	0.22	101.0	8.6	110	47			ND	ND		
14/10/20	8.24	3330	7.91	+189	22.1	920	22/10/20	11/11/20	516	0.688	0.014	0.57	<0.0001	16.6	48.8	23.5	72.3	66			ND	ND		
19/10/21	3.63	3410	7.83	+68	21.7	1327	01/11/21	19/11/21	327	1.330	0.077	6.70	<0.0001	81.3	1.14	83.6	84.7	80			ND	ND		
12/10/22	3.90	2448	7.56	+179	18.8	1160	24/10/22	11/11/22	225	0.928	0.028	6.33	<0.0001	53.0	0.48	73.2	73.7	74			ND	ND		
LL2 6 monthly								LL2														Annually	Annually	Annually
22/01/18	28.91	4530	8.54	+9	31.4	1160	30/01/18	19/02/18	826	0.127	0.010	0.92	<0.0001	126.0	1.95	28.3	30.2	130			NR	NR	NR	
08/09/18	30.49	4110	6.97	+59	17.8	867	21/09/18	12/10/18	869	0.043	0.017	1.64	<0.0001	1.48	0.22	39.8	40.0	170			ND	ND	ND	
05/01/19	29.43	4980	10.07	+142	32.3	1087	17/01/19	07/02/19	1020	0.148	<0.005	0.69	<0.0001	0.60	0.04	19.7	19.7	142			NR	NR	NR	
13/08/19	31.72	7315	9.57	+110	14.1	1233	23/08/19	12/09/19	1710	0.058	0.019	5.37	<0.0001	1.21	0.01	55.5	55.5	255			ND	ND	ND	
25/02/20	8.29	2497	8.29	+49	23.9	787	05/03/20	25/03/20	329	0.080	<0.005	0.51	<0.0001	75.9	4.47	85.9	90.4	37			NR	NR	NR	
01/09/20	6.85	3385	8.44	+112	20.1	1073	15/09/20	05/10/20	538	0.089	<0.005	0.35	<0.0001	70.8	5.99	80.8	86.8	67			ND	ND	ND	
17/02/21	8.40	3740	8.41	+58	22.5	1267	02/03/21	22/03/21	574	0.073	<0.005	0.43	<0.0001	105.0	0.42	102.0	102.0	89			ND	ND	ND	
11/08/21	15.24	3605	8.31	+97	14.8	1360	20/08/21	09/09/21	506	0.106	<0.005	0.75	<0.0001	123.0	1.34	132.0	133.0	86			ND	ND	ND	
14/01/22	14.10	3695	7.99	-38	23.7	1400	27/01/22	16/02/22	467	0.101	<0.005	0.82	<0.0001	125.0	1.95	129.0	131.0	91			NR	NR	NR	
28/06/22	12.69	3150	7.76	+63	9.6	1300	11/07/22	29/07/22	443	0.174	0.005	1.39	<0.0001	103.0	0.28	118.0	118.0	90			ND	ND	ND	

Table 3b: Weaker leachate quality – LS2, LS3, LS4 – previously surface water

Frequency required by licence		DO	EC	pH	Eh	Temp	Alk	Received from laboratory	Accessible on Council website by	VFR	SS	Cl	Mn	Zn	Fe	Hg	NH ₃	NO _x	TKN	TN	TOC	PAH	OC&OP Pesticides	BTEX compounds	
LS2 6 monthly								LS2		NR		NR				NR	NR					NR	NR	NR	
09/07/18		19.24	3715	8.32	+64	10.1	667	19/07/18	09/08/18		80		0.025	0.008	0.32			<0.01	7.6	7.6	80				
15/10/18		10.94	3780	7.95	-11	17.5	667	23/10/18	12/11/18		58		0.067	<0.005	0.80			0.01	9.4	9.4	74				
16/04/19		13.52	14730	9.86	+105	13.7	553	26/04/19	16/05/19		213		0.022	0.016	0.41			<0.01	30.6	30.6	307				
08/10/19		No water																							
20/05/20		10.73	600	9.23	+123	17.8	67	27/05/20	16/06/20		<5		0.001	0.006	<0.05			0.04	1.0	1.0	7				
14/10/20		9.71	765	9.76	+154	19.1	50	22/10/20	11/11/20		16		0.005	<0.005	0.37			0.01	0.5	0.5	8				
24/05/21		12.06	1033	8.78	+159	14.8	93	01/06/21	22/06/21		<5		0.014	0.005	0.08			0.02	2.4	2.4	23				
19/10/21		10.30	1247	8.41	+36	19.4	373	01/11/21	19/11/21		<5		0.024	<0.005	0.08			1.78	9.6	11.4	28				
18/04/22		9.50	1686	8.24	+40	21.7	467	29/04/22	19/05/22		5		0.008	0.007	<0.05			0.74	9.3	10.0	47				
13/10/22		7.38	1802	8.31	+128	16.8	500	24/10/22	11/11/22		<5		0.018	<0.005	0.57			3.33	19.1	22.4	45				
LS3 6 monthly								LS3		NR		NR				NR						NR	NR	NR	
09/07/18		16.38	3820	7.86	+107	10.6	533	19/07/18	09/08/18		25		0.020	<0.005	0.21			0.08	0.01	6.2	6.2	79			
15/10/18		12.34	3730	7.54	-9	16.4	533	23/10/18	12/11/18		42		0.030	<0.005	0.33			0.08	<0.01	8.7	8.7	72			
16/04/19		9.67	1214	8.30	+167	14.1	17	26/04/19	16/05/19		<5		0.002	<0.005	<0.05			0.14	3.62	1.2	4.8	9			
08/10/19		No water																							
25/02/20		7.23	1365	7.99	+70	23.4	207	05/03/20	25/03/20		<5		0.034	0.007	0.64			0.72	6.93	5.0	11.9	31			
14/10/20		10.09	1483	9.12	+186	18.2	160	22/10/20	11/11/20		<5		0.032	<0.005	0.06			0.10	<0.01	2.9	2.9	36			
24/05/21		6.66	1803	8.27	+168	14.2	487	01/06/21	22/06/21		<5		0.076	<0.005	0.20			3.49	2.06	10.1	12.2	55			
19/10/21		9.29	2079	8.36	+31	20.0	513	01/11/21	19/11/21		<5		0.060	0.006	0.10			8.67	7.19	13.6	20.8	53			
18/04/22		9.73	2096	8.27	+41	21.4	700	29/04/22	19/05/22		6		0.153	0.011	0.08			24.40	5.68	29.0	34.7	73			
12/10/22		6.05	1931	8.13	+147	18.7	587	24/10/22	11/11/22		6		0.128	0.010	0.57			15.0	7.19	25.9	33.1	58			
LS4 6 monthly								LS4		NR		NR				NR						NR	NR	NR	
10/07/18		27.50	2477	8.89	+43	11.7	220	19/07/18	09/08/18		36		0.143	0.007	0.56			0.08	2.87	5.8	8.7	46			
15/10/18		9.91	2167	7.42	+14	14.9	237	23/10/18	12/11/18		57		0.134	0.030	1.41			0.14	3.34	7.0	10.3	50			
16/04/19		4.62	2780	8.73	+142	15.2	193	26/04/19	16/05/19		85		0.114	0.008	0.60			0.57	<0.01	9.7	9.7	104			
08/10/19		No water																							
25/02/20		5.70	2023	8.16	+81	23.6	500	05/03/20	25/03/20		27		1.010	0.014	1.36			6.37	4.73	10.3	15.0	34			
14/10/20		12.21	1998	8.53	+240	17.3	387	22/10/20	11/11/20		24		0.514	<0.005	0.39			0.80	0.18	5.9	6.1	54			
24/05/21		16.89	2290	8.52	+167	15.5	607	01/06/21	22/06/21		29		0.339	<0.005	0.52			9.00	0.62	19.1	19.7	75			
19/10/21		7.68	2533	8.26	+115	22.8	633	01/11/21	19/11/21		6		0.629	0.005	0.53			14.00	2.36	20.0	22.4	65			
18/04/22		4.24	2506	7.36	-24	24.0	840	29/04/22	19/05/22		<5		1.760	0.008	0.59			34.50	0.12	38.3	38.4	83			
12/10/22		5.49	2510	7.90	+112	21.8	787	24/10/22	11/11/22		8		1.080	<0.005	0.73			34.00	1.79	48.8	50.6	73			

Table 3c: Leachate quality – overflows (LSO1, LSO2, LSO3, LSO4, LSO5)

Frequency required by licence		pH	EC	Received from laboratory	Accessible on Council website by	VFR	SS	Alk	TOC	Cl	Mn	Zn	Fe	NH ₃	NO _x	TKN	TN	BTEX compounds	
Measure		1-14	µS/cm			kL/day	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as n	mg/L	mg/L	
LSO1 overflow																			
No overflow																			
LSO2 overflow																			
	05/08/16	7.99	1460			648	68	248	35	209	0.043	0.031	1.32	1.00	8.74	5.5	14.2	ND	
	01/09/16	8.30	2030			5	100	560	55	299	0.09	0.011	1.17	0.09	<0.01	3.4	3.4	ND	
	19/09/16	8.45	1660			108	38	354	96	231	0.06	0.019	0.25	1.93	5.78	5.7	11.5	ND	
	31/03/17	7.26	1678			173	32	296	41	216	0.05	0.016	0.72	0.55	3.16	4.3	7.5	ND	
LSO3(downstream) If LSO1,2or5																			
	05/08/16	7.77	1510				54	214	40	244	0.011	0.020	0.33	0.14	8.91	4.2	13.1	ND	
	01/09/16	7.43	164				14	54	18	13	0.20	0.009	3.21	0.04	0.02	1.3	1.3	ND	
	19/09/16	8.00	430				18	111	25	42	0.04	<0.005	1.80	0.08	0.22	1.6	1.8	ND	
	31/03/17	6.71	181				34	54	15	9	0.10	0.009	3.86	0.01	<0.01	1.4	1.4	ND	
LSO4 (upstream) If LSO1,2or5																			
	05/08/16	7.44	164				<5	49	14	13	0.009	0.012	1.56	0.01	<0.01	0.9	0.9	ND	
	01/09/16	7.67	253				<5	97	18	21	0.03	0.007	0.45	0.02	0.01	1.1	1.1	ND	
	19/09/16	7.92	213				16	73	22	18	0.04	<0.005	1.92	0.18	0.06	1.4	1.5	ND	
	31/03/17	6.67	247				7	69	20	14	0.05	0.007	2.08	0.06	<0.01	1.4	1.4	ND	
LSO5 overflow																			
No overflow																			

Table 4: Leachate volume

Discharge for irrigation	Year 2018	Accessible on Council website by	Discharge for irrigation	Year 2019	Accessible on Council website by	Discharge for irrigation	Year 2020	Accessible on Council website by	Discharge for irrigation	Year 2021	Accessible on Council website by	Discharge for irrigation	Year 2022	Accessible on Council website by
Jan 2018	122	19/02/18	Jan 2019	0.0	16/05/19	Jan 2020	136.8	25/03/20	Jan 2021	216.0	22/03/21	Jan 2022	453.6	19/05/22
Feb 2018	149	09/08/18	Feb 2019	43.2	16/05/19	Feb 2020	180.0	25/03/20	Feb 2021	280.8	22/03/21	Feb 2022	3060.0	19/05/22
Mar 2018	156	09/08/18	Mar 2019	0.0	16/05/19	Mar 2020	223.2	16/06/20	Mar 2021	172.8	22/06/21	Mar 2022	2016.0	19/05/22
Apr 2018	46	09/08/18	Apr 2019	0.0	12/09/19	Apr 2020	372.0	16/06/20	Apr 2021	187.2	22/06/21	Apr 2022	532.8	19/05/22
May 2018	84	09/08/18	May 2019	0.0	12/09/19	May 2020	136.8	16/06/20	May 2021	259.2	22/06/21	May 2022	374.4	29/07/22
June 2018	127	09/08/18	June 2019	0.0	12/09/19	June 2020	100.1	05/10/20	June 2021	93.6	09/09/21	June 2022	345.6	29/07/22
July 2018	107	09/08/18	July 2019	0.0	12/09/19	July 2020	101.5	05/10/20	July 2021	108.0	19/11/21	July 2022	259.2	11/11/22
Aug 2018	0	12/11/18	Aug 2019	0.0	12/09/19	Aug 2020	266.4	05/10/20	Aug 2021	180.0	19/11/21	Aug 2022	187.2	11/11/22
Sept 2018	84	12/11/18	Sept 2019	0.0	08/11/19	Sept 2020	64.8	11/11/20	Sept 2021	165.6	19/11/21	Sept 2022	957.6	11/11/22
Oct 2018	82	12/11/18	Oct 2019	0.0	25/03/20	Oct 2020	172.8	11/11/20	Oct 2021	259.2	19/11/21	Oct 2022	2534.6	11/11/22
Nov 2018	130	07/02/19	Nov 2019	0.0	25/03/20	Nov 2020	424.8	22/03/21	Nov 2021	1483.2	16/02/22			
Dec 2018	101	07/02/19	Dec 2019	0.0	25/03/20	Dec 2020	151.2	22/03/21	Dec 2021	2044.8	16/02/22			

Methane is a colourless, odourless gas that is flammable and explosive. It is generated approximately three months after the deposition of putrescible solid waste and once oxygen is depleted. Testing is conducted above ground surfaces to assure that none is escaping to air, and in buildings to assure against asphyxiation and explosion.

Comments on methane monitoring results: Methane is occasionally detected but remediated with soil cover usually by the next day.

Table 5: Methane detections (surface or building)

Frequency required by licence	Detection locations	Methane (CH ₄) by volume in air	Methane (CH ₄) by volume in air	Methane (CH ₄) as % LEL (Lower Explosive Limit)	Accessible on Council website by	Remediation
Measure		ppm CH ₄ in air	% CH ₄ in air	% LEL		
3 monthly						
22/01/18	On ground outside Vent 4, Fig 1	9,000	0.999	19.98	19/02/18	YES
14/07/18	On ground outside Vent 4, Fig 1	155	0.015	0.310	09/08/18	
10/09/18	Nil methane detected				12/10/18	
15/10/18	On ground outside Vent 4, Fig 1	510	0.051	1.020	12/11/18	
07/01/19	Nil methane detected				07/02/19	
11/03/19	Nil methane detected				15/04/19	
15/08/19	Nil methane detected				12/09/19	
09/10/19	Nil methane detected				08/11/19	
20/02/20	Nil methane detected				25/03/20	
19/05/20	Nil methane detected				16/06/20	
09/09/20	Nil methane detected				05/10/20	
15/10/20	Nil methane detected				11/11/20	
17/02/21	Nil methane detected				22/03/21	
21&25/05/21	Nil methane detected				22/06/21	
09/08/21	On ground outside Vent 4, Fig 1	4,750	0.475	9.5	09/09/21	
20/10/21	Nil methane detected				19/11/21	
14/01/22	Nil methane detected				16/02/22	
25/04/22	Nil methane detected				19/05/22	
28/6&1/7/22	Nil methane detected				29/07/22	
12/10/22	Nil methane detected				11/11/22	

Note: 500 ppm CH₄ by volume in air = 0.05% CH₄ by volume in air = 1% LEL

Table 6: Monthly rainfall (from daily rainfall)

Landfill rain gauge Daily rainfall summarised here as monthly rainfall	Year 2018 (mm)	Accessible on Council website	Year 2019 (mm)	Accessible on Council website	Year 2020 (mm)	Accessible on Council website	Year 2021 (mm)	Accessible on Council website	Year 2022 (mm)	Accessible on Council website
January	59.0	19/02/18	84.0	16/05/19	171.0	25/03/20	31.0	22/03/21	89.0	19/05/22
February	33.0	09/08/18	12.0	16/05/19	165.0	25/03/20	133.0	22/03/21	88.8	19/05/22
March	33.0	09/08/18	53.0	16/05/19	54.0	16/06/20	131.0	22/06/21	191.0	19/05/22
April	28.0	09/08/18	11.0	12/09/19	44.0	16/06/20	22.0	22/06/21	29.0	19/05/22
May	7.0	09/08/18	0.0	12/09/19	35.0	16/06/20	15.0	22/06/21	42.0	29/07/22
June	18.0	09/08/18	13.0	12/09/19	34.0	05/10/20	32.0	09/09/21	10.0	29/07/22
July	32.0	09/08/18	6.5	12/09/19	41.0	05/10/20	42.0	09/09/21	72.0	11/11/22
August	11.0	12/11/18	3.0	12/09/19	43.0	05/10/20	65.0	19/11/21	69.0	11/11/22
September	52.0	12/11/18	1.0	08/11/19	32.0	11/11/20	44.0	19/11/21	114.0	11/11/22
October	96.0	12/11/18	25.0	25/03/20	102.0	11/11/20	78.0	19/11/21	125.0	11/11/22
November	70.0	07/02/19	42.0	25/03/20	18.0	22/03/21	200.0	16/02/22		
December	45.0	07/02/19	48.0	25/03/20	238.0	22/03/21	134.0	16/02/22		