

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 Dumaresq 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	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	
LW1 6 monthly											LW1													NR
	22/03/16	0.20	3323	4.08	+440	18.9	2.72	1021.07	<1		04/04/16	22/04/16	441	0.158	0.070	<0.05	<0.0001	0.02	264	61.0	325	2		
	27/09/16	2.06	3160	3.86	+419	15.4	2.82	1020.97	<1		07/10/16	27/10/16	441	0.253	0.078	<0.05	0.0001	0.34	323	42.0	365	2		
	12/05/17	0.18	3315	4.04	+383	17.5	2.67	1021.12	<1		23/05/17	13/06/17	440	0.310	0.174	0.06	<0.0001	0.04	259	<10.0	259	3		
	06/10/17	1.42	3365	4.10	+429	17.6	2.53	1021.26	<1		13/10/17	02/11/17	504	0.457	0.141	0.06	0.0003	0.03	294	<10.0	294	3		
	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		
LW2 6 monthly										LW2														
	22/03/16	1.64	546	6.71	+182	16.7	5.36	1000.85	156		04/04/16	22/04/16	51	0.010	0.018	<0.05		<0.01	0.100	<0.1	0.1	<1		
	29/09/16	0.90	522	6.70	+148	13.6	5.25	1000.96	150		07/10/16	27/10/16	49	0.080	0.011	<0.05		0.09	0.040	0.2	0.2	<1		
	12/05/17	1.06	554	6.52	+126	16.9	4.70	1001.51	160		23/05/17	13/06/17	56	0.105	0.145	<0.05		0.12	0.060	0.1	0.2	<1		
	06/10/17	0.46	529	6.56	+107	19.2	4.27	1001.94	157		13/10/17	02/11/17	61	0.236	0.079	<0.05		0.11	0.090	0.2	0.3	4		
	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		
LW3 6 monthly										LW3														
	22/03/16	0.56	468	6.32	+11	17.8	12.42	996.99	193		04/04/16	22/04/16	13	0.580	0.050	4.91		0.33	<0.01	0.6	0.6	2		
	29/09/16	0.57	467	6.16	+60	15.3	12.46	996.95	203		07/10/16	27/10/16	23	0.604	0.015	1.25		0.26	0.04	0.4	0.4	12		
	12/05/17	0.55	450	6.19	+11	17.3	12.43	996.98	207		23/05/17	13/06/17	16	0.552	0.012	3.42		0.34	<0.01	0.4	0.4	5		
	06/10/17	0.55	482	6.26	+13	17.6	12.18	997.23	200		13/10/17	02/11/17	30	0.656	0.148	2.28		0.28	<0.01	0.4	0.4	7		
	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		

Table 1b: 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 as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	
GWEX-01	6 monthly										GWEX-01													Annually
27/09/16		0.78	615	4.67	+579	15.3	4.89	1019.10	2		07/10/16	27/10/16	181	0.043	0.024	<0.05	0.0029	0.01	0.06	<0.1	<0.1	2		NR
14/05/17		0.56	649	4.68	+556	16.4	4.79	1019.20	1		23/05/17	13/06/17	190	0.045	0.073	<0.05	0.0039	0.12	0.05	<0.1	<0.1	4		ND
06/10/17		0.50	638	5.06	+569	17.3	4.85	1019.14	1		13/10/17	02/11/17	210	0.045	0.034	<0.05	0.0041	0.02	0.06	<0.1	<0.1	5		NR
10/07/18		0.71	641	5.64	+523	15.3	5.52	1018.47	2		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
13/10/18		0.53	606	5.41	+452	15.9	5.69	1018.30	1		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
15/03/19		0.35	600	5.07	+597	18.1	5.66	1018.33	1		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
09/10/19		0.44	580	4.47	+582	15.5	6.27	1017.72	1		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
19/05/20		0.22	572	4.65	+558	17.2	6.26	1017.73	1		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
GWEX-02	3 monthly										GWEX-02													Annually
27/09/16		0.39	352	6.09	+239	15.8	14.84	992.61	113		07/10/16	27/10/16	23	<0.001	<0.005	<0.05	<0.0001	<0.01	0.14	<0.1	0.1	7		NR
17/01/17		0.43	351	6.26	+197	17.6	14.75	992.70	103		24/01/17	14/02/17	24	<0.001	0.005	<0.05	<0.0001	0.06	0.15	<0.1	0.2	5		NR
14/05/17		0.34	354	5.86	+154	16.7	14.82	992.63	103		23/05/17	13/06/17	26	<0.001	<0.005	<0.05	<0.0001	0.04	0.14	<0.1	0.1	3		ND
28/07/17		0.30	357	5.90	+156	15.5	14.72	992.73	97		08/08/17	28/08/17	23	<0.001	0.006	<0.05	<0.0001	0.01	0.12	<0.1	0.1	<1		NR
06/10/17		0.27	350	6.00	+252	16.4	14.68	992.77	100		13/10/17	02/11/17	31	<0.001	0.005	<0.05	<0.0001	0.01	0.17	<0.1	0.2	7		NR
22/01/18		0.44	362	6.17	+89	17.7	14.89	992.56	100		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
08/07/18		0.23	366	6.77	+120	19.3	15.46	991.99	100		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
08/09/18		0.39	348	6.21	+152	16.3	15.55	991.90	107		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
13/10/18		0.35	344	6.53	+155	16.6	15.62	991.83	102		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
05/01/19		0.31	366	6.05	+228	18.5	15.67	991.78	102		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
15/03/19		0.32	356	6.14	+212	17.3	15.84	991.61	93		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
13/08/19		0.40	352	6.05	+130	16.3	16.27	991.18	97		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
09/10/19		0.24	355	5.80	+340	15.7	16.38	991.07	117		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
25/02/20		0.35	348	5.87	+140	18.6	16.59	990.86	107		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
19/05/20		0.26	558	6.14	+350	16.7	16.36	991.09	120		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
01/09/20		0.29	350	6.15	+179	17.6	16.23	991.22	107		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

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								
29/09/16	0.41	838	6.46	+179	15.6	10.92	993.26	293	
17/01/17	0.46	869	6.62	+159	19.0	10.90	993.28	277	
12/05/17	0.17	855	6.36	+168	17.7	10.93	993.25	277	
28/07/17	0.21	864	6.36	+158	15.5	10.77	993.41	273	
06/10/17	0.18	1016	6.42	+122	17.1	10.86	993.32	277	
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	

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
07/10/16	27/10/16	102	<0.001	<0.005	<0.05	<0.0001	<0.01	0.09	<0.1	<0.1	<1	NR
24/01/17	14/02/17	99	<0.001	<0.005	<0.05	<0.0001	0.05	0.09	<0.1	<0.1	3	NR
23/05/17	13/06/17	102	<0.001	<0.005	<0.05	<0.0001	0.05	0.08	<0.1	<0.1	7	ND
08/08/17	28/08/17	104	0.002	0.005	<0.05	<0.0001	0.01	0.12	<0.1	0.1	3	NR
13/10/17	02/11/17	112	<0.001	<0.005	<0.05	<0.0001	0.03	0.16	<0.1	0.2	8	NR
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

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
21/03/16		9.05	191	8.42	+150	18.9	67	04/04/16	22/04/16	10							0.011	<0.005	0.08		0.02	1.2	1.2	12	
19/09/16		12.37	274	8.44	+165	12.2	67	27/09/16	27/10/16	9							0.019	0.008	0.32		0.04	1.4	1.4	20	
14/05/17		12.74	249	8.28	+250	14.7	77	23/05/17	13/06/17	48							0.018	0.051	0.34		<0.01	1.1	1.1	15	
03/10/17		15.73	694	8.72	+172	17.8	77	13/10/17	02/11/17	46							0.028	<0.005	<0.05		<0.01	1.8	1.8	17	
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		Insufficient water						27/05/20	16/06/20	<50							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																		
SWEX-01	3 monthly							SWEX-01																	
24/08/16	1728 kL/day	7.89	808	7.42	+230	10.7	103	01/09/16	27/10/16	31	93	70	54	14	16	89	0.022	0.023	0.09	0.98	1.42	3.2	4.6	21	<0.05
17/01/17	dry							23/05/17	13/06/17	81	26	16	42	13	18	14	1.81	0.107	3.02	0.05	0.19	1.6	1.8	17	<0.05
14/05/17	Flow hint	5.44	418	6.54	-109	19.3	150	08/08/17	28/08/17	7	25	12	20	7	11	9	0.004	0.012	<0.05	0.27	<0.01	0.6	0.6	4	<0.05
28/07/17	2 kL/day	8.88	237	6.40	+175	9.9	70	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
06/10/17	dry							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
22/01/18	Flow hint	5.15	346	6.13	+98	27.2	147	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
08/07/18	Flow hint	5.76	235	6.73	+85	15.9	35	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
08/09/18	33.23 kL/day	6.11	242	6.14	+114	14.0	56																		
15/10/18	3.70 kL/day	5.85	248	6.42	+112	15.2	57																		
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

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	1-14	mV	°C	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	mg/L	mg/L		
LL1 Annually								LL1														NR		
19/09/16	2.91	3000	7.78	+88	13.8	1040		27/09/16	27/10/16	345	0.921	0.017	0.21	<0.0001	45.6	12.2	39.5	51.7	71			ND	ND	
03/10/17	3.27	3690	7.63	+202	16.7	333		13/10/17	02/11/17	580	1.57	0.034	9.02	<0.0001	32.9	33.3	55.4	88.7	95			ND	ND	
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	
LL2 6 monthly								LL2														Annually	Annually	Annually
03/06/16	7.52	4990	8.82	+188	10.9	1460		16/06/16	06/07/16	884	0.152	<0.005	0.62	<0.0001	24.0	0.06	42.0	42.1	136	ND	ND	ND	ND	
17/01/17	17.02	4985	8.55	+90	25.9	1590		24/01/17	14/02/17	755	0.227	<0.005	0.93	<0.0001	90.5	0.30	94.5	94.8	128	NR	NR	NR	NR	
28/07/17	15.55	4295	7.46	+85	11.1	1480		08/08/17	28/08/17	572	0.241	0.011	1.93	<0.0001	96.6	1.43	135.0	136.0	107	ND 3/10/17	ND 3/10/17	ND	ND	
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	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	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	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	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	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	ND	

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

Frequency required by licence								Received Accessible													OC&OP Pesticides		BTEX compounds
DO	EC	pH	Eh	Temp	Alk	from laboratory	on Council website by	VFR	SS	Cl	Mn	Zn	Fe	Hg	NH ₃	NO _x	TKN	TN	TOC	PAH			
LS2 6 monthly								LS2													NR	NR	NR
21/03/16	9.72	4570	9.07	+160	19.6	907	04/04/16	22/04/16	27	0.054	<0.005	0.56				0.02	15.7	15.7	114				
19/09/16	10.35	1873	8.93	+105	13.5	333	27/09/16	27/10/16	39	0.057	0.011	0.18				1.20	6.6	7.8	46				
14/05/17	11.72	2354	7.29	+329	16.3	513	23/05/17	13/06/17	26	0.028	<0.005	0.12				0.25	5.8	6.0	54				
03/10/17	9.01	2459	8.27	+189	17.7	152	13/10/17	02/11/17	8	0.035	<0.005	0.22				0.21	5.8	6.0	57				
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				
LS3 6 monthly								LS3													NR	NR	NR
21/03/16	8.13	1845	9.00	+155	18.4	380	04/04/16	22/04/16	49	0.047	<0.005	0.35			0.01	0.01	4.9	4.9	40				
19/09/16	17.86	1670	8.66	+96	13.9	347	27/09/16	27/10/16	28	0.051	0.014	0.22			1.59	5.65	7.0	12.6	40				
14/05/17	9.17	1754	7.83	+281	14.7	357	23/05/17	13/06/17	32	0.097	<0.005	0.42			1.13	0.11	4.6	4.7	42				
03/10/17	4.71	2024	8.15	+191	16.6	103	13/10/17	02/11/17	16	0.084	0.005	0.38			2.19	0.12	4.9	5.0	34				
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				
LS4 6 monthly								LS4													NR	NR	NR
21/03/16	12.58	1799	8.77	+179	20.3	313	04/04/16	22/04/16	19	0.179	<0.005	0.76			0.02	0.02	4.4	4.4	40				
19/09/16	12.63	1728	8.26	+84	19.0	353	27/09/16	27/10/16	11	0.070	0.036	0.77			0.92	8.66	5.2	13.9	33				
14/05/17	6.77	2111	7.69	+257	15.3	470	23/05/17	13/06/17	34	0.373	<0.005	0.55			0.38	0.24	4.1	4.3	44				
03/10/17	7.09	2059	8.36	+156	18.6	109	13/10/17	02/11/17	24	0.919	<0.005	0.47			0.75	0.24	4.2	4.4	40				
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	1.01	0.014	1.36			6.37	4.73	10.3	15.0	34				

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 2016	Accessible on Council website by	Discharge for irrigation	Year 2017	Accessible on Council website by	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
Jan 2016	65	22/04/16	Jan 2017	72	13/06/17	Jan 2018	122	19/02/18	Jan 2019	0.0	16/05/19	Jan 2020	136.8	25/03/20
Feb 2016	79	22/04/16	Feb 2017	122	13/06/17	Feb 2018	149	09/08/18	Feb 2019	43.2	16/05/19	Feb 2020	180.0	25/03/20
Mar 2016	86	22/04/16	Mar 2017	540	13/06/17	Mar 2018	156	09/08/18	Mar 2019	0.0	16/05/19	Mar 2020	223.2	16/06/20
Apr 2016	65	06/07/16	Apr 2017	371	13/06/17	Apr 2018	46	09/08/18	Apr 2019	0.0	12/09/19	Apr 2020	372.0	16/06/20
May 2016	72	06/07/16	May 2017	515	28/08/17	May 2018	84	09/08/18	May 2019	0.0	12/09/19	May 2020	136.8	16/06/20
June 2016	22	27/10/16	June 2017	371	28/08/17	June 2018	127	09/08/18	June 2019	0.0	12/09/19	June 2020	100.1	05/10/20
July 2016	58	27/10/16	July 2017	986	28/08/17	July 2018	107	09/08/18	July 2019	0.0	12/09/19	July 2020	101.5	05/10/20
Aug 2016	1829	27/10/16	Aug 2017	216	02/11/17	Aug 2018	0	12/11/18	Aug 2019	0.0	12/09/19	Aug 2020	266.4	05/10/20
Sept 2016	137	27/10/16	Sept 2017	94	02/11/17	Sept 2018	84	12/11/18	Sept 2019	0.0	08/11/19			
Oct 2016	72	14/02/17	Oct 2017	187	19/02/18	Oct 2018	82	12/11/18	Oct 2019	0.0	25/03/20			
Nov 2016	108	14/02/17	Nov 2017	216	19/02/18	Nov 2018	130	07/02/19	Nov 2019	0.0	25/03/20			
Dec 2016	108	14/02/17	Dec 2017	180	19/02/18	Dec 2018	101	07/02/19	Dec 2019	0.0	25/03/20			

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						
22/03/16	On ground outside Vent 4, Fig 1	1,450	0.145	2.9	22/04/16	YES
03/06/16	On ground outside Vent 4, Fig 1	3,850	0.385	7.7	06/07/16	YES
27/09/16	On ground outside Vent 4, Fig 1	2,250	0.225	4.5	27/10/16	
18/01/17	Nil methane detected.				14/02/17	
15/05/17	On ground outside Vent 4, Fig 1	6,550	0.655	13.1	13/06/17	
29/07/17	On ground outside Vent 4, Fig 1	4,700	0.470	9.4	28/08/17	
06/10/17	On ground outside Vent 4, Fig 1	7,760	0.776	15.52	02/11/17	
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	

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 2016 (mm)	Accessible on Council website	Year 2017 (mm)	Accessible on Council website	Year 2018 (mm)	Accessible on Council website	Year 2019 (mm)	Accessible on Council website	Year 2020 (mm)	Accessible on Council website
January	117.0	22/04/16	43.0	13/06/17	59.0	19/02/18	84.0	16/05/19	171.0	25/03/20
February	21.0	22/04/16	59.0	13/06/17	33.0	09/08/18	12.0	16/05/19	165.0	25/03/20
March	28.0	22/04/16	193.0	13/06/17	33.0	09/08/18	53.0	16/05/19	54.0	16/06/20
April	23.0	06/07/16	9.0	13/06/17	28.0	09/08/18	11.0	12/09/19	44.0	16/06/20
May	37.0	06/07/16	40.0	28/08/17	7.0	09/08/18	0.0	12/09/19	35.0	16/06/20
June	75.0	27/10/16	88.0	28/08/17	18.0	09/08/18	13.0	12/09/19	34.0	05/10/20
July	29.0	27/10/16	14.0	28/08/17	32.0	09/08/18	6.5	12/09/19	41.0	05/10/20
August	156.0	27/10/16	12.0	02/11/17	11.0	12/11/18	3.0	12/09/19	43.0	05/10/20
September	55.0	27/10/16	4.0	02/11/17	52.0	12/11/18	1.0	08/11/19		
October	22.0	14/02/17	99.5	19/02/18	96.0	12/11/18	25.0	25/03/20		
November	19.5	14/02/17	64.0	19/02/18	70.0	07/02/19	42.0	25/03/20		
December	153.0	14/02/17	49.0	19/02/18	45.0	07/02/19	48.0	25/03/20		