

Appendix 10

Water standards

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WATER QUALITY STANDARDS - A SYNOPSIS

Environmental Protection Agency,
Regional Water Laboratory,
Butts Green,
Kilkenny.

PARAMETERS	UNITS	SURFACE WATER ABSTRACTION			DRINKING WATERS			FRESHWATER FISH				
		Directive 75/440/EEC A1-Treatment		Irish Standard SI No.294 of 1989	Directive 80/778/EEC		Irish Standard SI No.81 of 1988	EC Directive 78/659/EEC				Irish Salmonid Standards SI No 293 of 1988
		Guide	M.A.C.		Guide	M.A.C.		SALMONID		CYPRINID		
				Guide			M.A.C.	Guide	M.A.C.	Guide	M.A.C.	
Temperature	°C	22	25	25	12	25	25	---	21.5(a)	---	28(a)	21.5(b)
Dissolved Oxygen	mg/l O2	---	---	---	---	---	---	50%>9	50%>9	50%>8	50%>7	50%>9
" "	mg/l O2	---	---	---	---	---	---	100%>7	---	100%>5	---	---
" "	% Sat	>70%	---	>60%	---	---	---	---	---	---	---	---
B.O.D.	mg/l O2	3.0	---	5.0	---	---	---	3.0	---	6.0	---	95%<5
Conductivity	µS/cm	1000	---	1000	---	---	1500	---	---	---	---	---
pH		6.5-8.5	---	5.5-8.5	6.5-8.5	---	6-9	---	6-9	---	6-9	6-9
Colour	Hazen	10	20	20	1.0	20	20	---	---	---	---	---
Turbidity	N.T.U.	---	---	---	0.4	4	4	---	---	---	---	---
Phosphorous	mg/l P	0.17	---	0.22	0.17	2.18	2.18	---	---	---	---	---
Nitrate	mg/l N	5.65	11.3	11.3	5.65	11.3	11.3	---	---	---	---	---
Nitrite	mg/l NO2	---	---	---	---	0.1	0.1	0.01	---	0.03	---	---
Sulphate	mg/l SO4	150	250	200	25	250	250	---	---	---	---	---
Residue (180°C)	mg/l	---	---	---	---	1500	1000	---	---	---	---	---
Suspended Solids	mg/l	25	---	50	Nil	---	(c)	25	---	25	---	25
Odour	Dilution	3@25°C	---	5@25°C	None	2@12°C	2@12°C	---	---	---	---	---
Taste	Dilution	---	---	---	None	3@25°C	3@25°C	---	---	---	---	---
Fluoride	mg/l F	0.7-1.0	1.5	1.0	---	1.5(d)	1.0	---	---	---	---	---
Chloride	mg/l Cl	200	---	250	25	---	250	---	---	---	---	---
Chloride	mg/l Cl	---	0.05	0.05	---	0.05	0.05	---	---	---	---	---
Sulphide	mg/l S	---	---	---	---	No Smell	No Smell	---	---	---	---	---
Ammonia (Total)	mg/l NH4	0.05	---	0.20	0.05	0.5	0.3	0.04	1.0	0.2	1.0	1.0
Non-ionised Ammonia	mg/l NH3	---	---	---	---	---	---	0.005	0.025	0.005	0.025	0.02
Nitrogen (Kjeldahl)	mg/l N	1.0	---	1.0	---	1.0	1.0	---	---	---	---	---
Residual Chlorine	mg/l Cl2	---	---	---	---	0.25(e)	---	---	0.005	---	0.005	0.005
Total Coliforms	/100ml	50	---	5000	---	Nil	Nil	---	---	---	---	---
Fecal Coliforms	/100ml	20	---	1000	---	Nil	Nil	---	---	---	---	---
Fecal Streptococci	/100ml	20	---	200	---	Nil	Nil	---	---	---	---	---
Salmonella	/5000ml	Nil	---	Nil/500ml	---	---	---	---	---	---	---	---
Total Bacteria	/ml @ 37°C	---	---	---	10	---	(f)	---	---	---	---	---
" "	/ml @ 22°C	---	---	---	100	---	(f)	---	---	---	---	---
Calcium	mg/l Ca	---	---	---	100	---	200	---	---	---	---	---
Magnesium	mg/l Mg	---	---	---	30	---	50	---	---	---	---	---
Sodium	mg/l Na	---	---	---	20	---	150	---	---	---	---	---
Potassium	mg/l K	---	---	---	10	---	12	---	---	---	---	---
Iron	mg/l Fe	0.1	0.3	0.2	0.05	0.2	0.2	---	---	---	---	---
Copper	mg/l Cu	0.02	0.05	0.05	0.1(g)	---	0.5(g)	0.04(h)	---	0.04(h)	---	0.04(h)
Manganese	mg/l Mn	0.05	---	0.05	0.02	0.05	0.05	---	---	---	---	---
Zinc	mg/l Zn	0.5	3.0	3.0	0.1(g)	---	1.0(g)	---	0.3(h)	---	1.0(h)	0.3(h)
Chromium	mg/l Cr	---	0.05	0.05	---	0.05	0.05	---	---	---	---	---
Lead	mg/l Pb	---	0.05	0.05	---	0.05	0.05	---	---	---	---	---
Nickel	mg/l Ni	---	---	---	---	0.05	0.05	---	---	---	---	---
Aluminium	mg/l Al	---	---	---	0.05	0.2	0.2	---	---	---	---	---
Cadmium	mg/l Cd	0.001	0.005	0.005	---	0.005	0.005	---	---	---	---	---
Arsenic	mg/l As	0.01	0.05	0.05	---	0.05	0.05	---	---	---	---	---
Mercury	mg/l Hg	0.0005	0.001	0.001	---	0.001	0.001	---	---	---	---	---
Boron	mg/l B	1.0	---	2.0	1.0	---	2.0	---	---	---	---	---
Silver	mg/l Ag	---	---	---	---	0.01	0.01	---	---	---	---	---
Antimony	mg/l Sb	---	---	---	---	0.01	0.01	---	---	---	---	---
Selenium	mg/l Se	---	0.01	0.01	---	0.01	0.01	---	---	---	---	---
Barium	mg/l Ba	---	0.1	0.1	0.1	---	0.5	---	---	---	---	---
Detergents (MBAS)	mg/l	0.2	---	0.2	---	0.2	0.2	---	---	---	---	---
Phenol	mg/l C6H5OH	---	0.001	0.0005	---	0.0005	0.0005	---	No taste	---	No taste	No taste
Hydrocarbons	mg/l	---	0.05	0.01	---	0.01	0.01	---	(c)	---	(c)	(c)
Aromatics (PAH)	mg/l	---	0.0002	0.0002	---	0.0002	0.0002	---	---	---	---	---
Pesticides (total)	mg/l	---	0.001	0.0005	---	0.0005	0.0005	---	---	---	---	---
Pesticides (single)	mg/l	---	---	---	---	0.0001	0.0001	---	---	---	---	---
CHCL3 Extract	mg/l	0.1	---	0.2	0.1	---	(f)	---	---	---	---	---
Oxidizability(KMnO4)	mg/l O2	---	---	---	2.0	5.0	5.0	---	---	---	---	---
Organochlorine	mg/l	---	---	---	0.001	---	0.1	---	---	---	---	---

- NOTES: M.A.C. = Maximum Admissible Concentration.
 (a) 10°C Limit for certain periods - See Directive.
 (b) 10°C Limit - November to April inclusive.
 (c) None Visible.
 (d) Varies with average temperature of geographical location.
 (e) Residual Chlorine from proposed Directive - not included in final Directive.
 (f) No increase from background level.
 (g) Higher levels allowed where water has been standing in pipes - see Directive.
 (h) Standards for Copper and Zinc vary with Hardness.

QUARTER 3 2004

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Comhairle Contae Thiobraid Árann Thuaidh
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Machinery Yard,
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23/12/04
Our ref: WM/122/LF/R7

Mr. Caoimhin Nolan,
Waste Licence Inspector,
EPA Regional Inspectorate,
John Moore Rd.
Castlebar,
Co. Mayo.

REF: Waste Licence 78 – 1, Ballaghveny Landfill – Environmental Monitoring Data and Interpretation.

Dear Mr. Nolan,

I am corresponding with you in regard to Schedule C – Table C. 1 specifically:

- Groundwater composition, groundwater levels and groundwater visual inspections (Schedule E.5 – Table E.5.2 & Table E.5.5)
- Leachate levels, leachate composition and leachate visual inspections (Schedule E.5 – Table E.5.3 & Table E.5.5),
- Surface water inspections and surface water composition (Schedule E.5 – Table E.5.1 & Table E.5.5) and
- Landfill gas composition and landfill gas migration monitoring (Schedule E.1) taken around and within Ballaghveny landfill site as per the conditions of waste licence 78 – 1 (Ballaghveny Landfill Site).

Please find attached detailed reports on the leachate composition, groundwater composition and surface water composition results. The samples were taken and tested by the EPA Regional Laboratory, Butts Green, Kilkenny.

Please also find attached detailed reports on groundwater levels and groundwater visual inspections, leachate levels and leachate visual inspections, surface water inspections, landfill gas composition and landfill gas migration monitoring. Please find attached an interpretation of the above environmental data.

Yours sincerely

Frank O'Halloran



Introduction

This is the quarterly report for July, August and September 2004. The quarterly monitoring is done by the EPA, Butts Green, Kilkenny except for monthly gas monitoring, weekly surface water inspection, weekly leachate levels and the monthly groundwater levels which are carried out by the Landfill Manager.

The results of analysis carried out are compared to strict water standards, as there are no set limits for leachate, surface and groundwater's for Landfill Sites.

Any exceedances to these strict water standards are highlighted in bold in the tables below.

1. Leachate

(A) Leachate composition (See appendix 1)

There are nine purpose installed leachate extraction wells in cells 1-5.

Samples were taken from LM01, LM03, LM05, LM07 and LM08 on the 14/07/04. Additionally two routine leachate samples were taken from the landfill. The Old Lagoon (LL1 serves cells 3, 4 & 5 and the new lagoon (LL2) serves Cell 6, 7 & 8 (Currently filling Cell 8).

The sample results were compared to drinking water standards (EU Directive 80/778/EEC and Irish Standard S.I. No. 81 of 1988 – see appendix 10), as there is no set standard for leachate samples.

Table 1.0 shows a comparison between the leachate samples and the drinking water standards, Irish Standard S.I. No. 81 of 1988 – see appendix 10

All figures marked in bold are exceedances of the Irish drinking water standards.

Table 1.0 Shows a comparison of leachate composition to Drinking water standards (Irish Standards SI No. 81 of 1988

	M.A.C. Values of Irish Standard SI No. 81 of 1988	LM01	LM03	LM05	LM07	LM08	L1	LL1	LL2
<i>Parameters</i>									
Temperature °C	25	13	15	22	34	37	-	19	19
PH	6 – 9	Nm	7.4	7.6	7.8	8.1	-	8.0	8.1
∞S/cm	1500	Nm	1164	1521	2490	2840	-	763	1617
BOD	-	23	72.5	68	145.0	310.0	-	60	>1360
COD	-	213	1070	1330	2240	3685	-	790	2635
Ammonia	0.23 (Total Ammonia mg/l N)	195.7	831.3	912.5	2112.7	2683.1	-	376.9	968.5
Chloride	250	432	1231	1404	2832	2685	-	790	1715
TON	-	0.3	0.3	0.1	0.2	0.4	-	<0.1	<0.1
Nitrite	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001

As can be expected the

- Conductivity
- Ammonia
- BOD and COD
- And chlorides are high, as are the other test parameters.

The test results for the leachate boreholes and lagoons are higher than the drinking water standards. This is the case for all landfill sites. The test results for Temperature and pH show no significant change from the last quarter. Conductivity is lower for this quarter. Ammonia and Chloride levels are higher for this quarter than the last quarter.

(B) Leachate Levels (See appendix 2)

Leachate levels in cells 1 – 5 inclusive are remaining static or reducing.

LM01 has gone from >4.3m above the liner in the third quarter of 2003 to 3.0m or below for the third quarter of 2004. The pumping system is put on this station over one third of the time because of the levels at this point.

LM02 isn't showing a reduction in its levels and is still averaging at 2m above the liner.

LM03 is reaching the license requirements on occasion but is having difficulty continually keeping the level at 1m above the liner.

LM04 is within the license requirements.

LM05 is also now within the license requirements.

LM07 and LM08 are not yet within the limits of the license but the levels are reducing on a monthly basis.

LM09 is within the license limits.

This is due to the fact that the gravity flow system draining cells 3,4 and 5 was jet - vac'd in January 2003. The flow into the old lagoon is more constant now than previous.

Ballaghveny Landfill purchased a new mobile leachate management system. This system has further reduced the leachate levels especially in cells 1 and 2 where there is no gravity flow system. This system was commissioned in July 2003

The leachate levels in L1 are within the license limits for this quarter. This chamber is emptied on a weekly basis for a 4 to 5 hour period depending on levels. The old lagoon (LL1) and the new lagoon (LL2) maintained a freeboard of 1m as per license conditions.

The mobile leachate system will help maintain the current level of leachate in the cells and will also aid level reduction. However it will take the system some time before it can get the levels to 1m or below in cells 1 – 5. The capping and restoration contract will aid the reduction in leachate production.

(C) Leachate Visual Inspections (See appendix 3)

The quarterly leachate visual inspections showed that the leachate is generally a brown, black, yellow, amber or clear colour.

(D) Conclusion

The leachate samples appear to be normal for a Landfill Site. The leachate levels are reducing and will continue to reduce to the specified license conditions over the next quarter with the aid of the leachate management system and the capping and restoration of cells 1 - 5. Ballaghveny landfill is awaiting the outcome of the license review before it can proceed with Contract 3 'The Capping and Restoration Contract'

2. Surface Water

(A) Surface water composition (See appendix 4)

The sample results were compared to the standards set in the surface water abstraction S.I. No. 294 of 1989 – see appendix 10. The sample results were also compared to freshwater fish, Irish Salmonid Standards SI No 293 of 1988 – see appendix 10. The results were further compared to a guide issued by the EPA – see appendix 10.

Table 2 below shows the limits expressed in tabular form and how the sample results for Ballaghveny compared. Any exceedances are highlighted in bold.

	Irish Standards SI no. 294 of 1989	Irish Salmonid Standards SI No 293 of 1988	SW1	SW2	SW3	SW4	SW6	SWD1
Parameters								
Temperature °C	25	21.5	14.9	15.2	17.1	14.5	17.5	-
Dissolved Oxygen % Saturation	>60%	50% >9	29.7	62.4	116.0	37.9	118.0	-
PH	5.5 – 8.5	6-9	8.0	8.1	8.5	7.5	8.4	-
Conductivity μ S/cm	1,000	None listed	755	839	483	685	500	-
BOD mg/l O ₂	5.0	-	4.9	4.5	3.7	11.6	4.6	-
COD mg/l O ₂	None listed	None listed	34	<8	<8	83	<8	-
Ammonia mg/l N	0.1556	0.778	0.058	0.027	0.007	0.284	0.015	-
Chloride mg/l Cl	250	None listed	22	32	19	16	19	-
TON mg/l N	None listed	None listed	0.1	6.2	2.8	<0.1	2.9	-
Nitrite mg/l N	None listed	None listed	0.008	0.054	0.013	<0.001	0.014	-
O.P mg /l P	None listed	None listed	0.007	0.032	0.006	<0.006	<0.006	-
Suspended Solids mg/l	50	25	103.8	37.0	16.4	225.9	16.4	-

Note: There is currently no surface water discharge from Ballaghveny Landfill

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% Saturation

SW4 and SW1 are both showing exceedances to this limit.

Turf cutting operations are being carried out upstream and adjacent to SW4. This is having a negative impact on sampling points SW4 and SW1 which is the next sampling point downstream of SW4. There is abundant algal growth at SW4 due to silage effluent which is adding further to the negative quality of the sampling station.

Conductivity & pH

All conductivity and pH results were within the limits set in table 2 above.

BOD

All sampling stations are within the limits set in table 2 above except for sampling station SW4. The results for this date give a reading of 11.6 mg/l O₂. Silage effluent and turf cutting activities are adversely interfering with this monitoring point.

Ammonia

SW4 is showing an exceedance to this limit with a reading of 0.284mg/lN

Suspended Solids

SW1, SW2, and SW4 are all in excess of the limit. It is the increased commercial activity at SW4 and SW1 and the low flow at SW2 which is causing these high readings.

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Chlorides

There was no significant change in the chloride levels between the two quarters. All results were within the limits specified in table 2 above.

(C) Surface water Visual Inspection (See appendix 5)

The weekly surface water visual inspections show that the Ballaghveny Stream appears not to be contaminated by landfill leachate.

(C) Conclusion

The surface water results show that the Ballaghveny Stream and the Ollatrim River are unpolluted by leachate. Biological monitoring showed that there has been an improvement in the water quality in the area since last year except for SW4, which is u/s of Ballaghveny landfill.

SW4 is currently being polluted by turf cutting and silage effluent. SW4 is a point u/s of Ballaghveny landfill and is used as a control i.e. where the landfill can not be impacting on the water quality. As mentioned earlier SW4 is a point u/s on the Ballaghveny stream but it is feeding SW1 which is the first monitoring point d/s on the Ballaghveny Stream. This monitoring station is being negatively impacted on by commercial activities feeding SW4 which in turn feed SW1.

3.0 Groundwater

(A) Groundwater composition (see appendix 6)

The groundwater sample results were compared with drinking water standards (EU Directive 80/778/EEC and S.I. No. 81 of 1988 – see appendix 10)

A new borehole has been installed at BH3.

Table 3.0 Shows a comparison of groundwater composition to Drinking water standards (Irish Standards SI No. 81 of 1988) on the 14/07/04. All values marked in bold are exceedances to the set directive limits

	M.A.C. Values of Irish Standard SI No. 81 of 1988	GW5	GW6	GW10	GW12	BH3
<i>Parameters</i>						
Temperature °C	25	12.3	15.3	11.7	11.4	11.5
PH	6 – 9	7.2	7.3	7.3	7.5	7.0
αS/cm	1500	702	794	853	656	1121
BOD	-					
COD	-					
Ammonia Mg/l – N	0.2333	0.54	<0.003	0.017	0.004	0.43
Chloride mg/l Cl	250	15	26	40	25	62
TON	-	<0.06	9.8	9.3	6	9.8
Nitrite mg/l N	0.0304	<0.001	<0.001	<0.001	0.007	0.007

Summary of table

Results from the 14/7/04 show that GW5 and BH3 have slightly elevated ammonia readings. These elevated readings are consistent with previous monitoring results for these stations. Groundwater flow within the landfill is in a southerly direction towards the Ollatrim River. GW5 is to the west of the landfill so it is unlikely that the landfill is impacting on the groundwater quality of this monitoring point. GW5 is surrounded by boggy land that is naturally high in ammonia.

BH3 is however situated to the south east in agricultural land that frequently receives both chemical and organic fertilizer. Cattle congregate around this monitoring point and further contribute to the organic fertilizer load at this monitoring station.

(B) Groundwater Levels (see appendix 7)

The groundwater levels appear to be normal.

(C) Quarterly groundwater visual inspection (see appendix 8)

The quarterly groundwater visual inspection showed all samples had no visible or nasal evidence of leachate contamination. BH3 was a reddish colour but that is consistent with the high iron levels in the vicinity.

4. Landfill Gas Monitoring (see appendix 9)

Routine gas monitoring carried out on gas vents drilled into the waste bodies showed that the gas vents are working quite well with a variance in the rates of methane production. Monitoring of landfill gas migration boreholes did not show any presence of methane gas and so I can conclude that there is no landfill gas migration.

The gas flare is due to be commissioned after cells 1 – 5 have been capped. This will burn off gases produced within the waste cells.

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