Comhairle Cathrach na Gaillimhe
Galway City Council

Halla na Cathrach
Bóthar an Choláiste
Gaillimh
H91 X4K8

City Hall
College Road
Galway
H91 X4K8

31st May 2016.

To: AER Returns Team, Environmental Protection Agency.

Re: Annual Environment Report 2015 for Carrowbrowne Landfill Facility.
Waste Licence Reference Number W0013-01.

A Chara,

I attach herewith Annual Environmental Report 2015 for Carrowbrowne Landfill Facility.

We recently had changes in staff and I apologise for the delay in submitting same.

You will note from the report that significant works were undertaken last year and that further works are planned for this year.

Please note that I am available to meet with you regarding these works or any other items contained in this report.

Mise le meas,

pp. Ethna [illegible]

Mr. Thomas Connell,
Director of Services,
Housing & Social Inclusion, Environment & Recreation and Amenity

Annual Environmental Report 2015 for Carrowbrowne Landfill facility.

Waste License Reference no. W0013-01

Prepared By:
Eithne Murphy,
Executive Engineer – Environment Section
Galway City Council.

Report Contents:

1.0 Introduction

2.0 Galway City Council Policy Statement

3.0 Reporting period

4.0 Waste Activities Carried out at the facility

5.0 Quantity and Composition of waste accepted, disposed and recovered during the reporting period and each previous year

6.0 Summary report on emissions

7.0 Summary of results and interpretation of environmental monitoring

8.0 Resource and energy consumption summary

9.0 Volume of leachate produced and volume of leachate transported/discharged off site

10.0 Report on development works undertaken during the reporting period, and a timescale for those proposed during the coming year

11.0 Report on restoration

12.0 Site survey showing existing levels of the facility at the end of the reporting period

13.0 Estimated annual and cumulative quantities of landfill gas emitted from the facility

14.0 Estimated annual and cumulative quantity of indirect emissions to groundwater

15.0 Annual water balance calculation and interpretation

16.0 Report on the progress towards achievement of the Environmental Objectives and Targets contained in the previous year's report

17.0 Schedule of environmental Objectives and Targets for the forthcoming year

18.0 Full title and written summary of any procedures developed by the licensee in the year which relates to the facility operation

19.0 Tank, pipeline and bund testing inspection report.

20.0 Reported incidents and complaints summaries

21.0 Review of nuisance controls

22.0 Reports on financial provision made under the license, management and staffing structure for the facility, and a programme for public information

23.0 Report on training of staff

24.0 Any other items specified by the Agency – PRTR return

1.0 Introduction

Galway City Council was granted a Waste Licence- Landfill for Inert Waste (W0013-01) for Carrowbrowne landfill site on 28th August 2003, which was subsequently amended on 15th January, 2013. The Licence sets out in detail the conditions under which Galway City Council is allowed to operate and manage this facility.

The Licence is for the restoration of the landfill at Carrowbrowne, Headford Rd., Galway. This landfill facility has been closed (and no landfill waste has been accepted) since approx. 1999. Galway City Council is only permitted to accept inert waste for the purposes of restoration of this facility. Activities on site consist of the collection and management of leachate generated from the historical landfilling activities and the management of landfill gas on site.

The Licence also provides for the acceptance of waste at a Civic Amenity facility and the development of composting operations at the facility. The civic amenity site and composting facilities are closed (and no waste has been accepted) since 31st December 2013.

This Annual Environmental Report (AER) is drafted in line with the content requirements as set out under schedule G of the License

2.0 Policy

Galway City Council is committed to meeting all conditions as set out in the Licence.

3.0 Reporting Period

January 2015 - December 2015

4.0 Waste Activities carried out at the facility

No waste was accepted at the landfill facility during the reporting period.

No waste was accepted in the civic amenity or composting facilities during the reporting period, as the acceptance of waste ceased following Galway City Council's cessation of the direct provision of a household waste collection service on 31st December 2013.

The waste accepted up to this date (31st December 2013) was processed in line with License requirements. Contaminants from the material processed at the facility were mechanically removed from the material and dispatched to suitably licensed facilities. All compost produced at the composting facility was utilised to enrich and enhance the topsoil layer of the remediated landfill site contained within the license.

5.0 Quantity and Composition of waste accepted, disposed and recovered during the reporting period and each previous year

No waste was accepted at the facility during the reporting period.

Waste emanating from the composting process was issued to Barna recycling in previous reporting periods (see table below). The waste consists of items that are contained in the organic waste accepted but that are not compostable and are therefore removed manually and mechanically as part of the composting process. This waste is categorised as household waste, EWC 20 03 01.

	2013	2014	2015
Waste In (Tonnes)	2429	0	0
Waste Out (Tonnes)	743	936	0
Recovered (Tonnes)	1686	0	0

6.0. Summary report on emissions

Condition 6 of the license details the requirements for the facility with regard to emissions with the emission limit values outlined in Schedule C of the license.

6.1 Noise Emissions

Schedule C Section C.1 details the emission limit values (ELV) for noise, as follows:

Day dB(A)L_{AEQ}(30 minutes)	Night dB(A)L_{AEQ}(30 minutes)
55	45

An annual noise survey at the facility was carried out in the reporting period. The site does not operate at night therefore a daytime survey only was undertaken. Sampling was taken at 6 locations (N1-N6) on three occasions, as per EPA Guidance Document for Noise (NG4). Results are on table below:

Location	Average Mean L (A) eq.
NI	47
N2	42
N3	41
N4	48
N5	73
N6	52

1 no. of the locations (N5) was found to be in excess of the ELV as set out. The survey stated that: 'there was no audible noise from the landfill site. All noise recorded at this location was generated from passing traffic on the N84 Headford Rd'. This result is similar to previous years whereby exceedences have occurred due to traffic on the nearby road rather than the site itself. All other locations were within the ELV.

6.2 Landfill Gas Concentration Limits

Schedule C Section C.2 details the landfill gas concentration limits (measured in any building on or adjacent to the facility), as follows:

Methane	Carbon Dioxide
20% LEL (1% v/v)	1.5% v/v

An alarm with the limits as outlined is in place in the composting facility office. There were no exceedances during the reporting period.

6.3 Dust Deposition Limits

Schedule C Section C.3 details the dust deposition limits, as follows:

Level ($mg/m^2/day$)
350

The dust deposition at the facility is assessed at 4 no. locations (D1-D4) on three occasions in the reporting period of 2015. Results are on the table below:

Locations	Jan – April ($mg/m^2/day$)	May – Aug ($mg/m^2/day$)	Sept – Dec ($mg/m^2/day$)
D1	188.6	49.4	102.2
D2	355.6	92.6	136.8
D3	195.4	120.4	191.4
D4	425.5	248.8	63.6

The results show exceedences at Location D2 and D4 in teh first round of samopling early in the monitoring period.

D2 is located adjacent to the composting maturation and final storage area of the facility. D4 is to the north west of the site and far from any works activities. Exceedences at these locations are out of line with previous years results. Galway City council will discuss these findings further with the service provider.

It is noted that exceedences did not occur in any of the 4 locations in teh further two rounds of sampling in the reporting period.

6.4 Surface water

Schedule C Section C.4 details the surface water discharge limits, as follows:

Parameter	Emission Limit Value (mg/l)
Mineral Oils	5

Surface Water discharges at the Carrowbrowne facility are not relevant as it is closed.

6.5 Emission Limits for Enclosed Landfill Gas Flare Unit/Utilisation Plant

Schedule C Section C5 details the Emission Limit Values for Enclosed Landfill Gas Flare, as follows:

Parameter	ELV (mg/m^3)
Nitrogen Oxides	150
CO	50
Particulates	130
Hydrogen Chlorides	50
Hydrogen Flouride	5

The analysis of the emissions from the Flare stack outlet is pending final report at the time of writing and will be forwarded to the agency via the Eden system when the final report is issued.

6.6 Emission Limits Values for Composting Process

Schedule C Section C6 details the Emission Limit Values for Composting Process, as follows:

Parameter	ELV (mg/m^3)
Ammonia	50
Hydrogen Sulphide	5
Mercaptans	5

The composting facility comprises of 2 no. Biofilters which are monitored quarterly as per the license requirements (Table D.2.3). The bed media and odour are visually inspected daily by facility staff as required. Both filters are monitored quarterly as per the license requirements.

A summary of the findings are detailed below:

Bed Media	Q1 (24/03/'15)		Q2(04/06/'15)		Q3(23/09/'15)		Q4 (18/11/'15)	
	Reception filter	ASP filter	Reception filter	ASP filter	Reception filter	ASP filter	Reception filter	ASP filter
pH	5.1	4.0	4.4	5.7	4.1	5.0	4.4	6.0
Ammonia Mg/Kg of N	6.31	8.82	4.17	4.08	8.1	9.13	6.62	6.62
TVC @22C/72H	5,800	19,400	240,000	430,000	930,000	3,600,000	750,000	256,000
TVC @37C/48H	4,400	1,250	102,000	5,200	100,000	46,000	128,000	7,000

Inlet and outlet gas	Q1 (24/03/'15)				Q2(04/06/'15)				Q3(23/09/'15)			
	Rec in	Rec out	Asp in	Asp out	Rec in	Rec out	Asp in	Asp out	Rec in	Rec out	Asp in	Asp out
Ammonia ppm	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydrogen Sulphidepm	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2
Mercaptans ppm	<.5	<.5	<.05	<.5	<.5	<.5	<.05	<.5	<.5	<.5	<.5	<.5

The results indicate no exceedances of the ELV's.

The composting facility was not in operation and it was completely closed down with all materials removed by the end of the reporting period of 2015.

7.0 Summary of results and interpretation of environmental monitoring

The licence requires that monitoring of surface water, ground water and leachate is carried out at Carrowbrowne in line with Table D.4.4. in the licence.

7.1 Surface Water Monitoring

7.1.1 Surface Water – Quarterly Monitoring

As per Table D4.4 Monitoring is required Quarterly for the following parameters:

- Ammoniacal Nitrogen
- BOD (mg/l O_2)
- COD (mg/l O_2)
- Chloride (mg/l Cl)
- Dissolved Oxygen (% Saturation)
- Electrical Conductivity (µS/cm)
- pH
- Total Suspended Solids (mg/l)
- Temperature (°C)

Monitoring took place at 7 locations: G12s, G21s, G22s,G23s ,G24s,G37s and G38s.

Quarterly monitoring was undertaken in: Q1 on 4th March, Q2 on 25th May, Q3 on 7th October and Q4 on 19th October in the monitoring period of 2015.

The tables below summarises the results:.

Parameter	Q	G12s	G21s	G22s	G23s	G24s	G37s	G38s
Ammoniacal Nitrogen (mg/l N)	1	4.70	0.336	0.997	0.046	1.2	1.24	0.019
	2	5.85	0.15	0.368	0.057	0.804	0.825	0.205
	3	19.98	0.244	0.728	0.9811	0.251	4.94	0.04
	4	13.41	0.412	0.081	0.02	2.12	0.095	<0.01
BOD (mg/l O_2)	1	18	16	17	16	16	17	15
	2	18	<2	<2	<2	<2	<2	<2
	3	2	11	6	<2	14	<2	<2
	4	<2	7	<2	<2	9	<2	<2
Chloride (mg/l Cl)	1	58.69	35.53	26.88	25.62	31.38	26.92	26.06
	2	33.85	27.25	24.08	21.77	25.77	24.02	28.54
	3	56.7	24.06	25.65	24.64	24.61	32.32	22.68
	4	42.94	24.13	23.88	22.26	26.46	23.16	19.44
COD (mg/l O_2)	1	49	36	57	45	44	58	49
	2	44	38	65	74	66	58	131
	3	43	40	42	40	45	49	63
	4	82	45	47	53	51	42	64
Electrical Conductivity (µS/cm)	1	700	511	413	131.5	477	412	129.5
	2	592	466	289	125.2	371	185.2	128.5
	3	904	519	552	576	523	495	168.2
	4	768	608	543	171.4	587	559	95
Dissolved Oxygen (% Saturation)	1	52.7	51.4	48.1	46.7	64.0	51.9	49.9
	2	5.9	7.6	7.9	8.0	6.7	7.1	5.6
	3	105	46.6	87.0	97.0	44.0	95.0	98.0
	4	39.9	47.8	42.8	47.7	54.7	39.4	56.8
pH	1	7.4	7.4	7.5	7.1	7.4	7.4	7.2
	2	7.3	7.3	7.3	7.0	7.2	7.1	6.7
	3	7.4	7.3	7.1	7.1	7.3	7.2	7.1
	4	7.4	7.2	7.2	7.3	7.1	7.2	7.2

Suspended Solids (mg/l)	1	6	4	2	<2	8	2	3
	2	31	4	4	<2	19	5	63
	3	13	216	13	6	78	3	<2
	4	7	5	6	3	7	5	9
Temperature (°C)	1	8.8	7.6	9.8	9.3	10.1	8.9	9.3
	2	8.2	8.2	8.3	9.7	8.0	8.2	9.7
	3	10.2	8.6	9.8	10.1	8.2	10.0	10.4
	4	7.1	7.5	7.2	7.2	7.8	7.4	7.0

Table: Results of Quarterly Monitoring of Surface Waters

The results show the following:

•Ammonia levels at G12s in Q1, Q3 & Q4 and at G37s in Q3 were outside the levels as outlined in the EPA parameters of water quality document for A3 waters. Overall the ammonia levels are low at the sample points with 85% below the A3 waters limit.

•There were exceedences in BOD levels in all monitoring points in Q1, however there were no exceedences in the following three quarterly samples.

•Chlorine levels were within acceptable parameters in all quarterly samples.

•COD levels were exceeded in 18 samples during the reporting period with all other test results within the limits as outlined in the reference document.

•Conductivity levels were within acceptable parameters in all quarterly samples.

•Dissolved oxygen levels are acceptable in all samples taken in the monitoring period.

•All pH levels are all within the parameters for A1 waters (5.5-8.5)

•Suspended solids levels were exceeded in 2 samples taken. All other levels were below the 50mg/l limit for A1 waters.

•All Temperature samples were below the 25 °C limit set for A3 waters.

7.1.2 Surface Water – Annual Monitoring

Monitoring took place at 7 locations: G12s, G21s, G22s,G23s ,G24s,G37s and G38s for the following parameters:

•Sulphate (mg/l SO_4)
•Total Alkalinity (mg/l $CaCO_3$)
•Total Phosphorous/orthophosphate (mg/l P)
•Total Oxidised Nitrogen (mg/l N)
•Metals and non-metals
•Mercury (µg/l)
•Biological Assessment

The monitoring was carried out on 19th October 2015 and the results are on the table below:

Parameter (mg/L unless stated)	Units	location							
		G12s	G21s	G22s	G23s	G24s	G37s	G38s	Env quality standard
Alkalinity	Mg/L CaCO3	374	258.85	387.27	290.91	258.88	237.09	55.79	Not specified
Boron	µ g/L		90.63			50.4			Not specified
Cadmium	µ g/L		0.205			0.065			0.08
Calcium	mg/L		98.45			85.98			Not specified
Chromium	µ g/L		0.755			<0.58			0.6
Copper	µ g/L		2.248			1.67			5
Iron	µ g/L		24.1			202.3			Not specified
Lead	µ g/L		0.216			0.153			7.2
Magnesium	mg/L		5.985			5.977			Not specified
Manganese	µ g/L		49.77			31.68			Not specified
Mercury	µ g/L	0.095	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.05
Nickel	µ g/L		2.897			2.342			20
Total oxidised Nitrogen	mg/L as N	0.08	<0.07	0.39	0.24	0.98	0.69	<0.07	Not specified
Phosphate (ortho)	mg/L as P	0.330	0.038	0.013	0.036	0.046	0.009	<0.006	0.035
Potassium	mg/L		4.461			4.097			Not specified
Sodium	µ g/L		17.20			17.54			Not specified
Sulphate	mg/L	42.03	85.32	26.96	26.86	84.43	<0.72	<0.72	Not specified
Zinc	µ g/L		22.49			6.093			40

Table: Results of Annual Monitoring of Surface Waters

The results of the monitoring are:

- Levels of Mercury and Phosphate exceeded parameters at Location G12s
- Levels of Cadmium and Chormium and Phosphate exceeded paramaters at Location G21s.
- Levels of Phosphate exceeded parameters at Locations G23s and G24s.
- All other parameters were within the guidance levels.

7.2 Ground Water Monitoring

7.2.1 Ground Water – Quarterly Monitoring

There are 12 sampling locations: G1A, G1AP, G4AP, G9AP, G10AP 108A, G108AP, G1A, G2A, G4A, G10A, 105A, 106A and 116A.

The above locations are monitored for the following parameters:

- Visual inspection/odour
- groundwater level

•Ammoniacal Nitrogen (mg/l N)
•Chloride (mg/l Cl)
•Electrical Conductivity (µS/cm)
•pH
•Total Organic Carbon

Quarterly monitoring took place on: 24th&31st March, 6thMay&3rd June, 24th September and 18th November in the monitoring period of 2015.

The monitoring results are shown on the table below:

Parameter	Quarter	Locations							
		G1A	G1AP	G4A	G4AP	G9AP	108A	G108AP	G10AP
Visual inspection/ odour	1	ok	ok	ok	ok	ok	Well dry	Well Dry	ok
	2	ok	ok	ok	ok	ok	ok	ok	Well Dry
	3	ok	ok	ok	ok	ok	ok	ok	Well Dry
	4	ok	ok	ok	ok	ok	ok	ok	Well Dry
Static Water level (m)	1	1.4	1.7	1.2	1.1	1.6	-	-	0.7
	2	1.4	0.7	2.5	2.7	1.7	2.3	1.7	-
	3	0.7	1.3	1.2	0.9	1.3	2.1	0.7	-
	4	0.5	1.2	1.1	0.5	0.95	2.0	1.6	-
Electrical Conductivity (µS/cm)	1	634	604	751	821	1261	-	859	859
	2	620	845	734	801	1021	747	790	-
	3	616	841	765	819	804	767	641	-
	4	626	833	739	798	704	742	535	-
pH	1	7	7.1	7.1	7	7	-	-	6
	2	7	6.5	7	7	6.7	7	7.2	-
	3	7	6.6	6.8	7	7	7	7	-
	4	7	6.6	7	6.6	7	6.7	7.1	-
Ammoniacal Nitrogen (mg/l N)	1	3.73	6.47	16.63	0.469	49.92		-	8.43
	2	3.75	8.08	13.81	0.468	34.50	1.81	11.76	-
	3	3.57	8.28	14.38	17.34	21.30	0.538	7.11	-
	4	3.66	7.50	13.39	0.513	13.76	3.48	1.64	-
Chloride (mg/l Cl)	1	22.09	30.74	30.74	22.74	83.52	-	-	26.62
	2	20.51	26.98	34.12	22.51	68.45	20.37	44.29	-
	3	21.21	26.87	32.83	44.63	42.56	15.65	32.55	-
	4	21.06	26.81	33.52	28.34	32.06	21.12	24.74	-
Total Organic Carbon (mg/l)	1	34.90	31.82	44.58	77.45	104.30	-	-	99.51
	2	7.68	87.80	91.24	121.30	19.02	9.19	14.67	-
	3	7.04	87.40	5.76	6.73	16.32	10.96	11.62	-
	4	6.68	82.45	5.20	13.34	14.45	10.31	12.91	-

Table: Results of Quarterly Monitoring of Ground Waters

The above tabular results show:
•Ammonia levels are above the limit as outlined in the reference document *Reference document EPA Interim report 'towards setting guideline values for the protection of groundwater in ireland' whereby they exceed the Guidance Threshold Value (GTV) of 0.136 mg/L.*
•All wells monitored for Chlorine were within the GTV range during the monitoring period.
•Electrical conductivity results were within the GTV value set in the above reference document
•pH levels of all samples were within the range detailed in the reference document
•There is no GTV stated for Total Organic Carbon in the reference document. In the main there is no obvious abnormal change in the results obtained during the reporting period.

7.2.2 Ground Water – Annual Monitoring

Monitoring took place at 7 locations: G4A, G4AP, G9AP, G1A , G1AP, G108A and G108AP for the following parameters:

•Cyanide (mg/l CN)
•Fluoride (mg/l F)
•Sulphate (mg/l SO_4)
•Total Alkalinity (mg/l $CaCO_3$)
•Ortho-Phosphate (mg/l P)
•Total Oxidised Nitrogen (mg/l N)
•Faecal Coliforms (No. /100ml)
•Total Coliforms (No./100ml)
•Metals and non metals
•Mercury (µg/l Hg)
•List I and List II organic substances

The monitoring was carried out on 19th October 2015 and the results are on the table below:

Parameter	Units	location							
		G4A	G4AP	G9AP	G1A	G1AP	G108A	G108AP	threshold
Boron	µ g/L		370	200.5		689.9			750
Cadmium	µ g/L		0.561	0.095		0.686			3.75
Calcium	Mg/L		217.0	108.1		110.70			
Chromium	µ g/L		<2.14	<2.14		3.852			37.5
Faecal coliforms	Cfu/100ml	0	0	0	0	0	0	10	Not specified
Total Coliforms	Cfu/100ml	0	0	0	0	0	0	100	Not specified
Copper	µ g/L		4.693	0.666		4.185			1500

Cyanide	µ g/L	<5	<5	<5	<5	<5	<5	<5	37.5
Flouride	Mg/L	0.67	0.22	0.82	0.68	0.19	0.37	0.42	Not specified
Iron	µ g/L		15960	3461		17630			Not specified
Lead	µ g/L		4.353	0.778		4.751			18.75
Magnesium	Mg/L		2.937	5.294		9.147			Not specified
Manganese	µ g/L		1180	173		2070			Not specified
Mercury	µ g/L	0.052	0.051	0.048	0.069	0.642	0.096	0.858	.75
Nickel	µ g/L		7.679	0.971		6.387			15
Total oxidised Nitrogen	Mg/L as N	<0.28	<0.28	0.52	1.08	<0.028	<0.28	0.37	Not specified
Total Alkalinity	Mg/L CaCO3	357.1	461.05	362.65	335.03	483.33	333.54	415.63	Not specified
Phosphate (ortho)	Mg/L as P	<0.005	<0.005	0.081	0.022	0.251	<0.005	<0.005	35
Potassium	Mg/L		2.921	11.49		14.32			Not specified
Semi volotile organic compounds	µ g/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	Not specified
Sodium	Mg/L		27.48	31.69					150
Sulphate	Mg/L	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	18.41	187.5
Temperature on site	Degree C	8.4	8.6	8.2	8.4	8.6	8.1	8.0	Not specified
VOCs	µ g/L	<5	<5	<5	<5	<5	<5	<5	Not specified
Water level	m	1.2	0.9	1.3	0.7	1.3	0.7	2.1	Not specified
Zinc	µ g/L		38.77	28.85		55.26			Not specified

Table: Results of Annual Monitoring of Ground Water

All parameters were analysed and compared against the threshold values as set out in the european communities environmental objectives (ground waters) regulations 2009. All parameters were found to be within these limits.

7.3 Leachate Monitoring

It was agreed with the agency in 2007/2008 that the monitoring of the leachate at locations L1, L3 and L4 entering the leachate treatment system and location L2 exiting the leachate treatment system would be sufficient for the purposes of leachate monitoring and management in accordance with licence no. 13-1. Signs have been installed to clearly identify each inlet pipe and the outlet pipe in this regard.

7.3.2 Leachate – Weekly Monitoring

The level of leachate in the leachate treatment system is required to be monitored weekly. This is recordeded via a digital reader on site and also a manual site visual inspection.

7.3.2 Leachate – Quarterly Monitoring & 7.3.3 Leachate – Annual Monitoring

In 2015 the leachate lagoon was by-passed and the leacahate is pumped directkly via Rising Main to Mutton Island wastewater treatment plant.

No quarterly or annual monitoring was undertaken as the points were inaccessible.

8.0 Resource and energy consumption summary

The fuel source is Gas oil and there are 3 MPRN electricity points on site

Gas Oil used was for the VOLVO Shovel Loader at Composting, which was not operational for the reporting period of 2015, as follows:

Fuel source	Site	Consumption (KWh)
Gas oil - SFGO	Carrowbrowne composting facility	0

There are 3 MPRN electricity points on the site, the consumption for the reporting period of 2015 is as follows:

MPRN	Sites	Consumption (KWh)
10010866161	Carrowbrowne, Leachate Treatment Lagoons	108,470
10018686632	Carrowbrowne, Compost 1. Foul Water Pumps	100,650
10304176356	Carrowbrowne, Compost 2. Composting Facility	22,450
	Total	231,570

All electricity data is verifiable through the SEAI Monitoring and Reporting system for which Galway City Council have given EPA shared access to all inputted data.

9.0 Volume of leachate produced and volume of leachate transported/discharged off- site

A new flow meter to record leachate quantity was installed on the outlet from the facility on 1st August 2014. Information was provided for August to December for the reporting period of 2014 and the flow for the full year of this reporting period (2015) is as follows:

Period	Flow (m^3)

Aug-Dec 2014	8,789 m^3
Jan-Nov 2015 *	45,327 m^3

•Figure for month of December 2015 not readily available, however by estimation 12 month period from Jan 2015 to December 2015 flow would be 49,447 m^3

Leachate at the facility is collected and is pumped via a rising main to the waste water treatment plant at Mutton Island for final treatment.

10.0 Report on development works undertaken during the reporting period, and a timescale for those proposed during the coming year

In 2015 the leachate lagoon was by-passed and the leacahate is pumped directkly via Rising Main to Mutton Island wastewater treatment plant.

This measure was undertaken to ensure there were no overflows at site. This measure is working well.

There has been gradual removal of material from retention lagoon via storm water pump carried out also via outlet pumping station to empty retention lagoon.

The main storm pump was removed, overhauled and replaced in August/Sept. Of 2015.

An assessment of the material from the lagoon took place and it was found to be detrimental to pump system due to 'grit like' material.

11.0 Report on restoration

The restoration and capping of the landfill was completed in 2009. In 2014 additional compost from the composting facility was spread across parts of the site that were affected by the gas network rehabilitation works to enhance the re growth of grass on site.

No further works were undertaken inthe reporting period of 2015.

12.0 Site survey showing existing levels of the facility at the end of the reporting period

A topographical survey of the facility was carried out during the reporting period of 2014. The drawing is maintained on the site files.

No further surveys were carried out in 2015.

13.0 Estimated annual and cumulative quantities of landfill gas emitted from the facility

Automatic Flare System (AFS) are contracted by Galway City Council to manage and maintain the flare system at the site.

In addition to this, weekly checks/monitoring is undertaken by the Executive Engineer in Galway City Council and the Waste Operations Supervisor visits/is on site most days.

The table below was generated by AFS for the purposes of the landfill gas return and for this report for the reporting period of 2015.

Date	Method	Flare Run	Run time	Run time	Downtime	Total Run time	~ Inlet Pressure	~ Flow rate	~ CH4	~ CO2	~ O2	CE	Total Ch4
	M/C/E	Hrs	days/M	Hrs/D	Hrs	hrs/ visit	mbg	m^3hr	%	%	%	%	m^3
1/01/2015	E	16618											
9/03/2015	M	17595	67	24	631	977	-20	125.0	50	31	0.1	94	62308.67
6/06/2015	M	19156	109	24	1055	1561	-19	184.0	31.6	26.4	2.1	98	92615.09
7/10/2015	M	20110	103	11	179	954	-20	190.0	39	29	1.8	96	72134.08
1/01/2016	M	20972	86	11	84	862	-21	190.0	39	29	1.8	98	65177.76
Totals			365		1949	4354							292235.60
Averages				17.5			-20	172.3	39.9	28.85	1.45	98	

Table: Carrowbrowne Annual Environmental Returns Report 2015 (Source AFS)

Please note that the above figures are approximated figures for the reporting period of 2015 and should be used as a guide only.

14.0 Estimated annual and cumulative quantity of indirect emissions to groundwater

Potential sources of indirect emissions to groundwater are leachate and runoff from the landfill capping layer.

14.1 Leachate

A leachate containment system is in place at the facility which consists of the following:

- HDPE Cut-off Wall/Liner installed around the perimeter of the landfill, adjacent to the site perimeter road. The liner has been bedded into the marl layer underneath the site
- 200mm slotted HDPE Pipe installed inside the cut-off liner to collect leachate from the waste mound. The slotted pipe has been placed at an approximate depth of 2.5m (on top of the marl layer). The collected leachate is then conveyed to the aeration lagoon (see note previously)
- The excavated trench is backfilled with free Draining Material to allow for the ease of collection of runoff water.

The collected leachate is treated in the onsite Leachate Treatment Compound, which consists of surface aeration via 2No. surface aerators in a large leachate lagoon, aeration basin, followed by settlement in settlement lagoon and final pumping to Mutton Island Wastewater Treatment Facility via wastewater pumping stations. There is also sludge draw-off to a sludge lagoon and sludge recirculation.

This treatment system is currently by-passed with leachate pumped directly to Mutton Island wastewater treatment plant.

14.2 Capping Layer

The capping layer in place at Carrowbrowne comprises:

- 100mm topsoil layer
- 300-400mm subsoil layer
- Surface water drainage layer entailing mole drains with a hydraulic conductivity, $k > 1x10^{-4}$ m/s;
- Barrier layer consisting of at least 700mm of compacted clay with a hydraulic conductivity, $k < 1x10^{-9}$ m/s; and,

As the landfill is contained by the provisions as outlined the risk of indirect emissions to ground water is greatly minimised.

15.0. Annual water balance calculation and interpretation

The landfill facility has not accepted waste since 1998 and final restoration was completed in 2007 and therefore an annual water balance calculation and interpretation is not necessary for the purposes of this report.

16.0 Report on the progress towards achievement of the Environmental Objectives and Targets contained in the previous year's report

Objective 2015	Progress 2015	Result
Upgrade of pumps where required	Complete	Good
Assess and upgrade interconnecting gas collection pipework	Not undertaken due to additional spend required on leachate management	
Continue to improve routine monitoring	Ongoing monitoring of facility weekly by Engineer and daily by Supervisor	Good
Maintenance of topsoil and grass layer to landfill	Ongoing. Grass cutting in 2015.	Good
Improve access to monitoring locations	90% complete. Monitoring points upgraded and labelled.	Good
Carry out ground water assessment as required under the Technical ammendment to the license	Initial assessment carried out by Consultants (McCarthy Keville O'Sullivan)	Good
Carry out further examination of the leachate lagoon system	Ongoing	Good

17.0 Schedule of environmental Objectives and Targets for the forthcoming year

Objective 2016	Target 2016
Carry out further ground water assessment	Quarter 3 of 2016
Consider permanent (underground pipe work) bypass of lagoon system	Quarter 3 of 2016
Assess and consider removal of lagoon system (based on above)	Quarter 3 of 2016
Engage consultants to assess outsourcing composting facility and tender for Expressions of Interest of same.	Quarter 2 & 3 of 2016

18.0 Full title and written summary of any procedures developed by the licensee in the year which relates to the facility operation

A full revision of the routine monitoring requirements at the facility was conducted during the reporting period of 2014. This process resulted in revised monitoring arrangements and revised monitoring forms for the facility.

These are completed for the reporting period of 2015 and retained by the licensee for inspection.

19.0 Tank, pipeline and bund testing inspection report.

Visual inspections of the lagoon and fuel bunds on site took place during the reporting period of 2015. No expert reports were generated for same.

A level survey of the leachate lagoon system was undertaken over a 5-day period with inlets and outlets closed in the reporting period of 2014. It was found that the level in the lagoon system remained relatively constant throughout the survey period indicating a sound liner system in place.

No further surveys were undertaken in the current reporting period of 2015.

20.0 Reported incidents and complaints summaries

There were no reported incidents during the reporting period of 2015.

21.0 Review of nuisance controls

The composting facility was not operational for the reporting period of 2015.

The landfill area of the site is assessed weekly and any additional cleaning that is required is carried out.

A pest control company is contracted to carry out vermin control at the facility. There was no issue with litter, birds, flies, vermin or odour at the facility during the reporting period.

22.0 Reports on financial provision made under the license, management and staffing structure for the facility, and a programme for public information

22.1 Financial provision

The budgetary allocation for the facility for this (2015) and previous (2014) reporting periods: follows:

Title	2014 Amount (€)	2015 Amount (€)
Landfill – operation, aftercare and maintenance	298,299.00	58,297.28
Composting facility	451,475.00	412,628.07
Total	**749,774.00**	**470,925.35**

22.2 Management and staffing during the reporting period

The following table details the management and staffing for the reporting period of 2015:

Name(s)	Position	Responsibility
Senior management team	Senior management	Ensuring that budget and staffing needs are in place
Tom Connell	Director of Services	Overall management
Joe Tansey	Senior Engineer	Management of the facility
Ronan O'Reilly	Executive Engineer	Management of the facility
Jim O Connor	Waste Operations Supervisor	Landfill management including daily inspection and monitoring
Mike Maloney Justin Wynne & Julius Dermokas (p/t)	General operatives	Site maintenance

22.3 Programme for public information

There is no programme for public information.

23.0 Report on training of staff

Staff were trained in Health and Safety as required throughout the year. This training took the form of site tool box talks and staff briefings.

The Executive Engineer for the reporting period of 2015 undertook training in 'Practical Management and Control of Landfill Gas' run by the Chartered Institution of Wastes Management in the UK as recommended by the EPA.

24.0 Any other items

24.1 Annual PM_{10} Monitoring Report

Particulate matter PM_{10} was monitored at 3 locations during the reporting period of 2015.

The PM_{10} trigger level set out in the Waste Licence W0013-01 is less than 50 µg/m3 for a daily sample.

The samples at the three monitoring points gave a value of approx. 8.33 50 µg/m3. All of which are below the limits of detection.

24.2 Biological Monitoring of Surface Water Quality

As part of the monitoring of water quality in the vicinity of Carrowbrowne Landfill Site, Conservation Services, Ecological & Environmental Consultants were commissioned to carry out biological sampling and water quality assessment in accordance with EPA Q-rating methodology at three locations adjacent to the landfill site. Sampling was carried out on 3rd October 2015.

Monitoring results were recorded and compared to previous years, as shown below:

	G22S	G24S	G12S
2004	Q2/0	Q2/0	Q1-2
2005	Q2/0	Q2/0	Q1
2006	Q1-2/0	Q1-2	Q1-2
2007	Q1-2	Q1-2/0	Q1
2008	Q1-2/0	Q2	Q1-2
2014	Q3	Q2-3/0	No invertebrates recorded
2015	Q2-3	Q2	Q1-2
Quality Status	Moderately Polluted	Seriously Polluted	Seriously Polluted
Water Framework Directive Ecological Quality	Poor	Bad	Bad

24.3 Cover Letter attached to this report

Please see cover letter attached to this Report.

Environmental Protection Agency

Guidance to completing the PRTR workbook

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2015

1. FACILITY IDENTIFICATION

Parent Company Name	Galway City Council
Facility Name	Carrowbrowne Landfill Site
PRTR Identification Number	W0013
Licence Number	W0013-01

Classes of Activity

No.	class_name
-	Refer to PRTR class activities below

Address 1	Carrowbrowne
Address 2	Headford Road
Address 3	Galway
Address 4	
	Galway
Country	Ireland
Coordinates of Location	-9.01465 53.3292
River Basin District	IEWE
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Eithne Murphy
AER Returns Contact Email Address	eithne.murphy@galwaycity.ie
AER Returns Contact Position	Executive Engineer
AER Returns Contact Telephone Number	091 536 463
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	Composting Facility did not receive any waste in 2015
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
5(a)	Installations for the recovery or disposal of hazardous waste
5(c)	Installations for the disposal of non-hazardous waste
50.1	General

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE

Guidance on waste imported/accepted onto site

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	

This question is only applicable if you are an IPPC or Quarry site

4.1 RELEASES TO AIR

Link to previous years emissions data

| PRTR# : W0013 | Facility Name : Carrowbrowne Landfill Site | Filename : W0013_2015.PRTR Workbook.xls | Return Year : 2015 |

31/05/2016 16:18

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR		METHOD			Please enter all quantities in this section in KGs	QUANTITY		
POLLUTANT			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
	Methane (CH4)	E	Estimate		202334.0	1200000.0	0.0	997666.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR		METHOD			Please enter all quantities in this section in KGs	QUANTITY		
POLLUTANT			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR		METHOD			Please enter all quantities in this section in KGs	QUANTITY		
POLLUTANT			Method Used					
Pollutant No	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Carrowbrowne Landfill Site

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	1200000.0				N/A	
Methane flared	202334.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	997666.0				N/A	

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country			17462.0	Landfill Leachate Waste other than those mentioned in 19 07 02		E	Volume Calculation	Offsite in Ireland				

* Select a row by double-clicking the Description of Waste then click the delete button

Link to previous years waste data
Link to previous years waste summary data & percentage change
Link to Waste Guidance