Annual Environmental Report 2014 for Carrowbrowne Landfill facility.

Waste License Reference no. W013-01

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Report Contents:

Introduction

The landfill facility at Carrowbrowne was granted an EPA waste license on the 28th August 2003. The facility currently incorporates an invessel composting facility and a closed landfill facility. Waste has not been accepted at the landfill facility since approximately 1999.
This annual environmental report is drafted in line with the content requirements as set out under schedule G of the waste license

Policy

Galway City Council is committed to meeting all conditions as set out in waste license W013-01.

1. Reporting Period

January 2014 - December 2014

2. Waste Activities Carried out at the facility

During the reporting period the facility did not accept organic household waste at the in vessel composting facility. Waste was accepted upto the 31-12-13 and ceased following Galway City Councils cessation of the direction provision of a household waste collection service at that time. The waste accepted up to the 31-12-13 continued to be processed in line with license requirements during the reporting period. Contaminants from the material processed at the facility were mechanically removed from the material and dispatched to suitably licensed facilities. No waste was accepted at the landfill facility. 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.

3. 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 eminating from the composting process was issued to Barna recycling during the reporting period. This waste consists of items that are contained in the organic waste accepted but that are not compostible and are therefore removed manually and mechanically as part of the composting process. This waste is categorised as household waste, EWC 20 03 01.

<u>Reporting period</u>
Waste In: 0tonnes
Waste out: 936tonnes

<u>2013</u>
Waste In: 2429tonnes
Waste out: 743tonnes
Recovered: 1686tonnes

4. 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.

Noise

emission limits

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

Summary of survey

Location	Mean L(A)eq
N1	42
N2	47
N3	45
N4	47
N5	65
N6	45

An annual noise survey at the facility was carried out. This survey included daytime noise sampling at 5no. Locations around the facility. 1 no. of the locations were found to be in excess of the ELV as set out. N5 is located in close proximity to the heavily trafficed N84 Galway-Headford national road and this is likely the reason for the exceedance. All other locations were within the ELV. As the facility was not operational during the night time during the reporting period no noise recordings were taken at night time. Th enoise sensitive receptor N6 showed no exceedence of the ELV.

Dust Deposition

limits

Level (mg/m^2/day)
350

Summary of surveys

	January- April(mg/m^2/day)	May-August(mg/m^2/day)	September-December(mg/m^2/day)
D1	61	184	238
D2	58	940	1798
D3	56	125	474
D4	103	208	1430

The dust deposition at the facility is assessed at 4 no. locations on three occassions throughout the year. The results for same detail that:

- exceedences at D2 in mid and late year monitoring
- exceedences at D3 and D4 in late year monitoring

D2 is located adjacent to the composting maturation and final storage area of the facility. The facility was utilised heavily during the reporting period and may perhaps offer an explanation to the exceedances. It is however out of line with previous years results. Algal infiltration is thought to

have caused issues with the readings also and GCC are discussing this matter with their service provider.
D3 is located behind the composting reception building. The results obtained are out of line with previous years results. Algal infiltration is thought to have caused issues with the readings also and GCC are discussing this matter with their service provider.
D4 is to the north west of the site and far from any ongoing works activities. The results obtained are out of line with previous years results. Algal infiltration is thought to have caused issues with the readings also and GCC are discussing this matter with their service provider.

Surface Water

Surface Water discharge at civic amenity facility is not relevant as there is no civic amenity facility within the licensed site.

Landfill gas

The gas system at the landfill facility is split in 3 areas of monitoring. 1. Gas Flare unit; 2. Gas collection system; 3. Gas boreholes. Emissions are required to be monitored at the composting building at the facility and at the flare unit.

Landfill gas concentration limits (measured in buildings at the facility)

Methane	Carbon Dioxide
20% LEL v/v	1.5% v/v

This refers to any buildings at the facility. An alarm with the limits as outlined is in place in the composting facility office. There were no exceedances during the reporting period.

Emission limit values for enclosed landfill gas flare unit

Outlet

parameter	ELV
Nitrogen oxides	150mg/m^3
CO	50mg/m^3
Particulates	130mg/m^3
Hydrogen Chlorides	50mg/m^3
Hydrogen Flouride	5mg/m^3

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.

Composting Process

The composting facility comprises of 2 no. Biofilters which are monitored quarterly as per the license requirements (table D.2.3). The ELVs are detailed in the license in schedule C.6. 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:

parameter	ELV
Ammonia	50mg/m^3
Hydrogen Sulphide	5mg/m^3
Mercaptans	5mg/m^3

Bed Media	Q1		Q2		Q3		Q4	
	Reception filter	ASP filter	Reception filter	ASP filter	Reception filter	ASP filter	Reception filter	ASP filter
pH	5.5	6.5	5.8	6.5	6.4	6.6	7.5	7.4
Ammonia	5.03mg/m^3	5.91mg/m^3	3.82mg/m^3	4.15mg/m^3	2.32mg/m^3	3.47mg/m^3	21.57mg/m^3	60.52mg/m^3
Total viable counts	154000cfu/g	13600cfu/g	200000cfu/g	115000cfu/g	76000cfu/g	430000cfu/g	5300000cfu/g	870000cfu/g

The results indicate one exceedance of the ELV's in Q3 on the ASP biofilter bed media. This figure is hugely distorted from the other readings over the reporting period and as such is unreliable.

Inlet and outlet gas	Q1 (mg/m^3 unless stated)				Q2(mg/m^3 unless stated)				Q3(mg/m^3 unless stated)				Q4(mg/m^3 unless stated)			
	Recep in	Recep out	Asp in	Asp out	Recep in	Recep out	Asp in	Asp out	Recep in	Recep out	Asp in	Asp out	Recep in	Recep 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	<0.5	<0.5	<0.5	<0.5
Hydrogen Sulphidepm	<.2	<.2	<.2	<.2	<.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	<.5	<.5	<.5	<.5

The results indicate no exceedances of the ELV's.

5. Summary of results and interpretation of environmental monitoring

The license requires that GCC carry out monitoring of surface water, ground water and leachate at the landfill facility in line with table D.4.4. in the license. Locations are detailed in the drawings at the end of this report.

Surface Water Monitoring

The sampling locations were G12s,G21s,G22s,G23s,G24s,G37s,G38s,

Quarterly monitoring requirement:

GCC are required to monitor the above locations for the following parameters:

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

Quarterly monitoring was carried out on four occasions during the reporting period; these were 24th Jan, 21st Mar, 13th May, 18th June, 17th July, 18th Aug, 18th Nov, 19th Nov 24th.

Summary

The table below summarises the test results for surface water at all locations over the four quarters of the reporting period. *Reference document used 'Parameters of Water Quality – Interpretation and Standards'; EPA publication.*

The results show the following:

- Ammonia levels at G12s in Q1, 2 and 4 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 90% below the A3 waters limit.
- BOD levels in general are low. There are 8 no. exceedences of the A3 waters limit. The other 20 results are within the A1 waters limits.
- Chloride levels are all within the A1 waters limits.
- COD levels were exceeded in 21 samples during the reporting period with all other test results within the limits as outlined in the reference document.
- Conductivity levels in all samples is within the limits for A1 waters as outlined in the reference document.
- Dissolved oxygen levels in 6 no of the 28 samples during the reporting period were below the 30% threshold level for A3 waters. This would be affected given the nature of the streams sampled.
- The pH levels are all within the parameters for A1 waters (5.5-8.5)
- Suspended solids levels were exceeded in 6 samples taken. All other levels were below the 50mg/l limit for A1 waters.
- The temperature of samples were all below the 25 °C limit set for A3 waters.

		locations						
parameter	Qtr	G12s	G21s	G22s	G23s	G24s	G37s	G38s
Ammoniacal Nitrogen (mg/l N)	1	5.13	.493	.701	.015	.582	.375	.102
	2	6.21	.926	.44	.03	.514	.34	.023
	3	.255	.047	.04	.592	2.55	.015	.058
	4	8.53	.583	.35	.055	1.05	.262	.02
BOD (mg/l O_2)	1	<2	<2	<2	<2	<2	<2	<2
	2	25	3	<2	21	32	18	5
	3	<2	<2	21	38	<2	10	<2
	4	31	<2	<2	<2	<2	<2	5
Chloride (mg/l Cl)	1	41.46	42.52	32.09	25.49	38.99	31.02	39.2
	2	37.32	32.55	28.79	25.8	32.72	28.3	30.75
	3	24.17	29.36	26.01	24.92	33.13	26.23	21.87
	4	50.59	30.92	26.96	16.69	28.77	27.23	19.31
COD (mg/l O_2)	1	74	30	54	37	47	61	17
	2	56	67	38	68	60	65	85
	3	43	20	28	47	26	43	109
	4	100	42	65	81	75	69	62
Electrical Conductivity (µS/cm)	1	546	472	35	117.5	361	353	454
	2	603	530	550	170.8	523	496	503
	3	441	555	503	467	615	503	120.9
	4	962	543	412	75.9	453	453	74.2
Dissolved Oxygen (% Saturation)	1	20.7	82.4	69	82.4	86.1	68.9	80
	2	79.5	26.2	85	50.6	26.4	56.1	40.1
	3	52.57	27.4	48.8	18.1	25.2	52.3	53.3
	4	14.1	30.5	41.8	23.6	32.3	45.1	45.5
Mineral oil(ug/L)	1	<2.5	<2.5	<2.5	185.83	<2.5	<2.5	<2.5
	2	<2.5	<2.5	<2.5	<2.5	14.73	<2.5	13.23
	3	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	4	1.58	3.44	4.92	2.86	3.68	5.07	5.51
pH	1	7.1	7.2	7.3	8.5	7.2	7.4	7.2
	2	7	7.4	7.3	6.3	7.3	7.1	7.2
	3	7.1	7	7.4	7.1	7.2	7.5	6.3
	4	7.1	7.2	7.2	7	6.5	7	6.3
Suspended Solids (mg/l)	1	331	<2	<2	<2	6	<2	<2
	2	14	3	2	<2	192	4	343
	3	79	331	22	32	3	38	19
	4	1130	<2	<2	<2	<2	<2	5
Temperature (˚C)	1	9.1	9.8	8.3	8.1	10.5	7.9	8.7
	2	26	13.8	20	19	13.6	18	11
	3	19.3	20.1	21.8	20.3	18.9	23	22.1
	4	10.6	9	8.8	6.8	8	9.1	7.6

Annual Monitoring Requirement:

GCC are required to monitor at 2no. locations 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

Parameter (mg/L unless stated)	Units	location							
		G12s	G21s	G22s	G23s	G24s	G37s	G38s	Env quality standard
Alkalinity	Mg/L CaCO3	314	228	163	7	174	186	7	Not specified
Boron	µ g/L		17.22			20.55			Not specified
Cadmium	µ g/L		.019			.03			.08
Calcium	mg/L		96.86			84.75			Not specified
Chromium	µ g/L		<.58			<.58			.6
Copper	µ g/L		1.614			1.68			5
Iron	µ g/L		98.48			247.2			Not specified
Lead	µ g/L		.033			.121			7.2
Magnesium	mg/L		5.126			4.87			Not specified
Manganese	µ g/L		2.89			7.59			Not specified
Mercury	µ g/L	<.03	<.03	<.03	<.03	<.03	<.03	<.03	.05
Nickel	µ g/L		1.809			2.142			20
Total oxidised Nitrogen	mg/L as N	2.82	2.26	2.64	<.07	2.83	2.86	<.07	Not specified
Phosphate (ortho)	mg/L as P	.074	.04	.091	.037	.08	.114	.019	.035
Potassium	mg/L		5.139			4.078			Not specified
Sodium	µ g/L		15.51			14.72			Not specified
Sulphate	mg/L	145.8	45.63	26.95	<.72	47.09	32.1	<.72	Not specified
Zinc	µ g/L		2.283			13.24			40

The levels of phosphate at 6 locations exceeded that outlined in the european communities environmental objectives(surface waters) regulations 2009. All other parameters were within the guidance levels.

Ground Water Monitoring

The sampling locations were G1AP, G4AP, G9AP, G10AP, G108AP, G1A, G2A, G4A, G10A, 105A, 106A, 108A, 116A.

Quarterly monitoring requirement:
GCC are required to monitor the above locations 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 was carried out on four occasions during the reporting period; these were 24th Jan, 21st Mar, 13th May, 18th June, 17th July, 18th Aug, 19th Nov.

Summary

The table below summarises the test results for ground water at all locations over the four quarters of the reporting period. *Reference document used EPA Interim report 'towards setting guideline values for the protection of groundwater in ireland'*

The results show the following:

- Ammonia levels are above the limit as outlined in the reference document for the reporting period
- Chloride levels were all found to be within the limits as outlined within the reference document
- Electrical conductivity for 99% of samples was below the limits outlined in the reference document
- pH levels of all samples was within the range detailed in the reference document with the exception of two readings that were slightly greater than the upper limit as set out in the guidance manual .
- Total Organic Carbon was tested for however there is no guideline limit for this item in the reference document. In the main there is no obvious abnormal change in the results obtained during the reporting period.

parameter	QTR	locations						
		G1AP	G4AP	G9AP	108A	G108AP	G1A	G4A
Visual inspection/odour	1	ok	ok	ok	ok	ok	ok	ok
	2	ok	ok	ok	ok	ok	ok	ok
	3	ok	ok	ok	ok	ok	ok	ok
	4	ok	ok	ok	Well dry	Well dry	ok	ok
Gw level	1	2.2	1.8	2.1	3.2	2.4	1	3.2
	2	2.6	1	1.2	1.9	2.1	4.3	1.5
	3	2.8	1.4	1.9	2.5	2	2.2	1.8
	4	4.2	3.3	4.3	Well dry	Well dry	3.2	2.4
Electrical Conductivity (µS/cm)	1	824	1347	2260	604	797	569	815
	2	600	853	783	888	823	738	1537
	3	888	833	1242	813	810	624	759
	4	860	2540	924	Well dry	Well dry	620	831
pH	1	6.6	10.3	6.8	7	7	7.1	7.2
	2	7.1	6.8	7	7	7	7	7
	3	6.6	6.8	7	7	7	7	7
	4	6.3	9.7	7.1	Well dry	Well dry	7.1	7
Ammoniacal Nitrogen (mg/l N)	1	8.41	.262	118.16	.544	18.03	3.44	23.78
	2	3.33	8.19	3.35	19.51	19.96	.959	67.31
	3	9.05	.942	46.54	4.17	15.3	3.78	16.02
	4	8.66	5.64	24.42	Well dry	Well dry	3.68	18.66
Chloride (mg/l Cl)	1	27.67	21.61	202.79	24.91	46.99	21.57	58.2
	2	22.05	30.21	27.79	47.77	49.56	26.33	122.85
	3	28.76	22.24	92.15	29.33	38.63	21.06	39.37
	4	27.59	36.49	49.68	Well dry	Well dry	20.93	49.75
Total organic carbon (mg/l)	1	84.3	13.5	1.65	8.19	17.7	7.95	9.70
	2	83.2	6.75	10.5	18.1	7.43	12.6	29.1
	3	90.84	15.05	21.69	11.71	16.05	7.64	6.91
	4	83.64	184	16.27	Well dry	Well dry	7.72	8.17

<u>Annual monitoring requirement</u>

GCC are required to monitor the locations annually 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

Parameter	Units	location							
		108A	G108AP	G4A	G4AP	G9AP	G1A	G1AP	threshold
Boron	µ g/L				7.779	119.4		12.53	750
Cadmium	µ g/L				<.09	<.09		<.09	3.75
Calcium	Mg/L				154.6	95.56		126.2	
Chromium	µ g/L				<2.14	<2.14		2.227	37.5
Faecal coliforms	Cfu/100ml				0	0		0	Not specified
Total Coliforms	Cfu/100ml				17	0		9	Not specified
Copper	µ g/L				1.179	<.11		.795	1500
Cyanide	µ g/L				<5	<5		<5	37.5
Dissolved oxygen (%)	%				32.6	23.7		39.1	Not specified
Dissolved oxygen (mg/l)	Mg/L				3.57	2.41		3.18	Not specified
Flouride	Mg/L				.17	.91		.11	Not specified
Iron	µ g/L				71.75	3081		13660	Not specified
Lead	µ g/L				<.02	.061		.45	18.75
Magnesium	Mg/L				5.139	10.08		8.776	Not specified
Manganese	µ g/L				345.1	46.34		1978	Not specified
Mercury	µ g/L				<.04	<.04		<.04	.75
Nickel	µ g/L				2.343	.719		3.798	15
Total oxidised Nitrogen	Mg/L as N				<.28	<.28		<.28	Not specified
pesticides(organochloride)	µ g/L				<.1	<.1		<.1	Not specified
Peesticides (Organophosphorous)	µ g/L				<.1	<.1		<.1	Not specified
Phosphate (ortho)	Mg/L as P				<.005	.065		.139	35
Potassium	Mg/L				3.618	18.21		8.555	Not specified
Semi volotile organic compounds	µ g/L				<.5	<.5		<.5	Not specified
Sodium	Mg/L				19.8	27.65		69.59	150
Sulphate	Mg/L				<.75	<.75		1.18	187.5
Temperature on site	Degree C				10.9	11.5		10.6	Not specified
VOCs	µ g/L				<1	<1		<1	Not specified
Water level	m				.8	1.5		1.4	Not specified
Zinc	µ g/L				<.41	1.794		5.085	Not specified

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.

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.

Weekly monitoring requirement

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. See example extract from site records in the appendix to this report.

Quarterly monitoring requirement

GCC are required to monitor the locations for the following parameters:

- Visual Inspection and odour
- Ammonia
- BOD
- COD
- Chloride
- Electrical Conductivity
- pH

Quarterly monitoring was only carried out in quarter 2 and quarter 3 (18th June 2014; 18th August 2014) during the reporting period. A summary of the results are detailed below.

parameter	Qtr	location			
		L1 (north landfill)	L2 (outlet)	L3 (south landfill)	L4 (composting)
Ammonia mg/L as N	3	139.16	298.77	60.73	242.65
BOD	3	12	925	27	1775
Chloride	3	218.99	655.58	102.19	789.84
COD	3	156	5030	157	6070
Conductivity	3	(2700	5600	1477	5660
pH	3	7.2	(7	7	7

There are no emission limits stipulated in the waste license for the facility, therefore the analysis results have been compared to the IGVs as listed in the EPA document "EPA landfill Manual".

The ammonia levels at the 4 locations exceed the levels outlined. This is in line with previous test results.

The COD levels at the outlet point and at the composting facility exceed the levels outlined. This is in line with previous test results.

Annual Monitoring Requirement

GCC are required to monitor the locations for the following parameters:

- Cyanide (mg/l CN)
- Fluoride (mg/l F)
- Sulphate (mg/l SO_4)
- Ortho-Phosphate (mg/l P)
- Total Oxidised Nitrogen (mg/l N)
- Faecal Coliforms (No. /100ml)
- Total Coliforms (No./100ml)
- Metals and non metals (2 locations only)
- Mercury (µg/l Hg)

Parameter (mg/L unless stated)	location						Epa landfill manual threshold	units
	North inlet(L3)	Aeration lagoon(L5)	South inlet(L4)	Settlement lagoon(L6)	Aeration lagoon(L1)	Outlet point (L2)		
Boron	2315	781	374.4	730.1	875	615.3		ug/L
Cadmium	.1	.203	.222	.399	.453	.458		ug/L
Chromium	8.243	17.24	3.946	15.21	19.74	14.63		ug/L
Faecal Coliforms	920	8500	3000	5800	8400	9900		cfu/100ml
Total Coliforms	4000	8500	270000	160000	240000	230000		cfu/100ml
Copper	17.14	42.62	13.63	44.47	40.31	53.01		ug/L
Cyanide	<5	<5	<5	<5	<5	<5		ug/L
Flouride	1.14	5.84	.86	5.11	6.02	4.82		mg/L
Iron	11730	8935	19.28	6719	8781	6745	70000	ug/L
Lead	<.12	<.12	<.12	<.12	1.596	<.12		ug/L
Manganese	366.9	493	209.8	293.8	593.4	288.5		ug/L
Mercury	<.04	<.04	<.04	<.04	<.04	<.04		ug/L
Nickel	6.255	50.89	2.896	48.79	60.28	44.31		ug/L
Total oxidised Nitrogen	2.07	.82	<.27	1.01	.85	.81		mg/L as N
Phosphate (ortho)	.633	7.984	1.734	21.765	8.883	17.696		mg/L as P
Phosphate (total)	1.436	25.243	2.241	42.143	32.333	46.751		mg/L as P
Sulphate	<.82	119.01	92.33	52.18	105.09	84.47	212	mg/L as SO4
VOCs	<1	<1	54.885	301.449	<1	163.313		ug/L
Zinc	78.31	596.4	84.94	490.9	609.8	442.2		ug/L

Results of the annual leachate analysis indicate that the parameters analysed are within the guidance limits outlined for a typical non hazardous landfill as set out in appendix D of the EPA 2000, Landfills Manual.

6 Resource and energy consumption summary

The composting facility operates the following equipment:

- 2 no. Loading shovels
- 1 no. Site van
- 1 no. Site road sweeper
- 1 no. Mixer
- 1 no. Trommelling screen + conveyors
- 5 no air blowers for invessel composting
- 2 no. Heavy duty leachate pumps

The landfill facility operates the following equipment:

- 3 no. Heavy duty leachate pumps
- 2no. Lagoon aerators
- 1 no. Gas flare

Energy consumption during the reporting period was:

1. electricity 220000kWhr (estimated)
2. Fuel 200000kWhr (estimated)

   Total 420000kWhr (estimated)

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

Following the installation of a new flow meter on the outlet from the facility the leachate quantity was recorded accurately from 1st August 2014 onwards.
Leachate at the facility is collected and delivered to the onsite leachate lagoon where following aeration the material is pumped via a rising main to the waste water treatment plant at Mutton island for final treatment.

The volume of leachate discharged off site from August 1st 2014 – December 31st 2014 was 8789m^3.

It must be noted that during this period there was extensive works carried out to the leachate collection and distribution system which lead to periods where the outlet flow was restricted and thus the figure whilst accurate for the period may not be indicative of the flow that would be expected generally. In the next reporting period the flow reading across the 12month period will be more accurate for a typical 12 month cycle for the facility.

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

During the reporting period improvements were made to the gas collection network at the facility. These works included the rehabilitation of all gas wells and manifolds at the facility as well as upgrade works to the ring main at the north side of the facility.

The leachate collection system was inspected and all pumps were removed, repaired and cleaned during the reporting period. The rising main from the facility to the city foul network was

thoroughly inspected during the reporting period. This inspection lead to a major clean of the line. In addition to the cleaning, all air valves along the line (6no.) were removed and replaced with new valves. This consitituted a significant amount of work and investment by the licensee and has greatly improved the leachate management system with a vast reduction in air locks along the rising main which were an issue given that the facility pumps leachate from the site intermittently and thus a system such as this allows for the management of air within the sealed main and is vitally important to ensuring that there are no blockages that may cause issues on site.

The licensee hopes to carry out additional gas network rehabilitation works during the summer period this year wherby the interconnecting pipe work between the gas wells and the gas ring main at the facility will be inspected and replaced as necessary. It is hoped that this will further improve the gas quantities collected from the waste. Following this works an analysis will be carried out on the gas flare unit on site and its appropriateness to the quantity of gas being collected by the site network.

9. Report on restoration

The restoration and capping of the landfill was completed in 2009.
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.

10. 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. The drawing is maintained on the site files.

11. Estimated annual and cummulative quantities of landfill gas emmitted from the facility

The information available for gas flow rates and flare operational timings is approximated for the purposes of this item

Estimated figures are:

- Flare operaated on a timer system of 8hours per day 7 days per week. During august, september and october the flare unit ran continuously following remediation to the network. However with a reduction in ambient temperatures a timed system was put back in place for the remainder of the year.
- Total operating hours 2920hrs
- Average total flow rate to the the flare from the gas field was 174 cubic meters/hour
- Total gas flow to flare for the reporting period was 533484cubic meters
- Average quantity of methane for the reporting period was 26% v/v
  - total methane for the reporting period was 138705cubic meters
- Average quantity of carbon dioxide for the reporting period was 19.65%
  - total carbon dioxide for the reporting period was 104562 cubic meters
- Average quantity of carbon monoxide for the reporting period was .00017%
  - total carbon monoxide for the reporting period was 0.9 cubic meters
- Average quantity of hydrogen sulphide for the reporting period was .00022%
  - total hydrogen sulphide for the reporting period was 1.17cubic meters
- Average quantity of oxygen for the reporting period was 8.17%
  - total oxygen for the reporting period was 43212 cubic meters

(note the above calculations are approximated figures for the reporting period and should be used as a guide only)

12. Estimated annual and cummulative quantity of indirect emissions to groundwater

Potential sources of indirect emissions to groundwater are:

Leachate

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

- HDPE Cut-off Wall/Liner has been 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 has been 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 on leachate treatment system. (aeration lagoon)
- The excavated trench has been 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 to augment the treatment process.

Capping layer

The capping layer in place at Carrowbrowne is of the following make up:

- 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.

13. 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.

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

OBJECTIVE 2014	TARGET 2014	RESULT
Remediation works to gas network	Upgrade gas wells and section of gas ring main	completed
Improve leachate management records	Site monitoring records to be improved and a flowmeter to be installed on outlet	complete
Improve routine daily/weekly/monthly monitoring	Programme to be implemented and commenced	complete
Maintenance of topsoil and grass layer to landfill	Utilise compost product produced at compost facility to enhance the growth in areas of poor grass	complete

	growth	
Improve access to monitoring locations	Assess all monitoring points and improve access where required	60% complete. Some difficulties with monitoring points in private property
Review monitoring requirements	A review was completed.	Complete – ongoing task
Develop leacate management plan	A formal plan has not been put in place. Site operations have however improved during 2014 and flows in and out are now being measured as well as the improvement works to the rising main carrying the leachate off site	Ongoing – formal plan to be drafted

15. Schedule of environmental Objectives and Targets for the forthcoming year

Objective	Target 2015
Upgrade of pumps where required	Year end
Assess and upgrade interconnecting gas collection pipework	Year end
Continue to improve routine monitoring	Year end
Maintenance of topsoil and grass layer to landfill	Year end
Improve access to monitoring locations	Year end
Carry out ground water assessment as required under the Technical ammendment to the license	Year end
Carry out further examination of the leachate lagoon system	Year end

16. 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. This process resulted in revised monitoring arrangements and revised monitoring forms for the facility. These are completed as required by the license and retained by the licensee for inspection.

17. Tank, pipeline and bund testing inspection report.

Visual inspections of the lagoon and fuel bunds on site took place during the reporting period. No expert reports were generated for same. A level survey of the leachate lagoon system was carried out to assess the possible leakages from the liner system in place. The level survey was taken over a 5 day period where all inlets and outlets from the system were closed. It was found that the level in the lagoon system remained relatively constant throughout the survey period. This indicates a sound liner system in place. It is hoped to carry out a further survey in the next reporting period.

18. Reported incidents and complaints summaries

There were no reported incidents during the reporting period.

A complaint was received from the EPA in July 2014 regarding odour allegedly eminating from the landfill facility. (ref COM002157). This complaint was inspected and followed up by GCC. A response was issued to the EPA regarding the complaint.

19. Review of nuisance controls

The composting facility is the only area where there is constant operational activity. In order to ensure best practice in this area there is a strict cleaning regime in place and this is recorded daily as per the Standard operating procedures for the facility.

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

There is a road sweeper assigned to the facility on a permanent basis and this ensures that all roadways, yards and buildings are maintained clean at all times.

Rentokil are 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.

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

The budgetry allocation for the reporting period was as follows:

Landfill operation, aftercare and maintenance: €298,299

Composting facility: €451,475

Management and staffing during the reporting period:
Landfill

Name	Position	Responsibility
Senior management team	Senior management	Ensuring that budget and staffing needs are in place
Tom Connell/Joe O Neill	Directior of service	Overall management
Joe Tansey	Senior eng	Management of the facility
Ronan O'Reilly	Exec Eng	Management of the facility
Jim O Connor	Waste ops supervisor	Landfill management, daily monitoring

Composting

Name	Position	Responsibility
Senior management team	Senior management	Ensuring that budget and staffing needs are in place
Tom Connell/Joe O Neill	Directive of service	Overall management
Joe Tansey	Senior eng	Management of the facility
Ronan O'Reilly	Exec eng	Management of the facility
Jim O Connor	Waste ops supervisor	management, daily monitoring
Richard Devlin	Deputy site manager	Daily management of the facility
David Noone	Plant operator	Operation of loading shovel
Michael Cooley	General operative	General site requirements

21. 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.
Staff were trained in the use of mini diggers to assist with site operations.

22. Any other items

PRTR return detailed below.

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.18

REFERENCE YEAR	2014

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	Ronan Oreilly
AER Returns Contact Email Address	Ronan.Oreilly@galwaycity.ie
AER Returns Contact Position	exec engineer
AER Returns Contact Telephone Number	091536463
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	
Production Volume	200.0
Production Volume Units	tonnes
Number of Installations	1
Number of Operating Hours in Year	1917
Number of Employees	4
User Feedback/Comments	composting facility did not accept any waste in in 2014
Web Address	www.galwaycity.ie

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?	No
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) ?	

4.1 RELEASES TO AIR Link to previous years emissions data | PRTR# : W0013 | Facility Name : Carrowbrowne Landfill Site | Filename : W0013_2014.xls | Return Year : 2014 | 17/04/2015 16:15

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used		on site flare			
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
01	Methane (CH4)	E	ESTIMATE		138705.0	1200000.0	0.0	1061295.0
03	Carbon dioxide (CO2)	E	ESTIMATE		104562.0	3000000.0	0.0	2895438.0

* 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					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			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					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			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		estimated	awaiting gas sim/land gen modelling for site	N/A	
Methane flared	138705.0				1000.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	1061295.0				N/A	

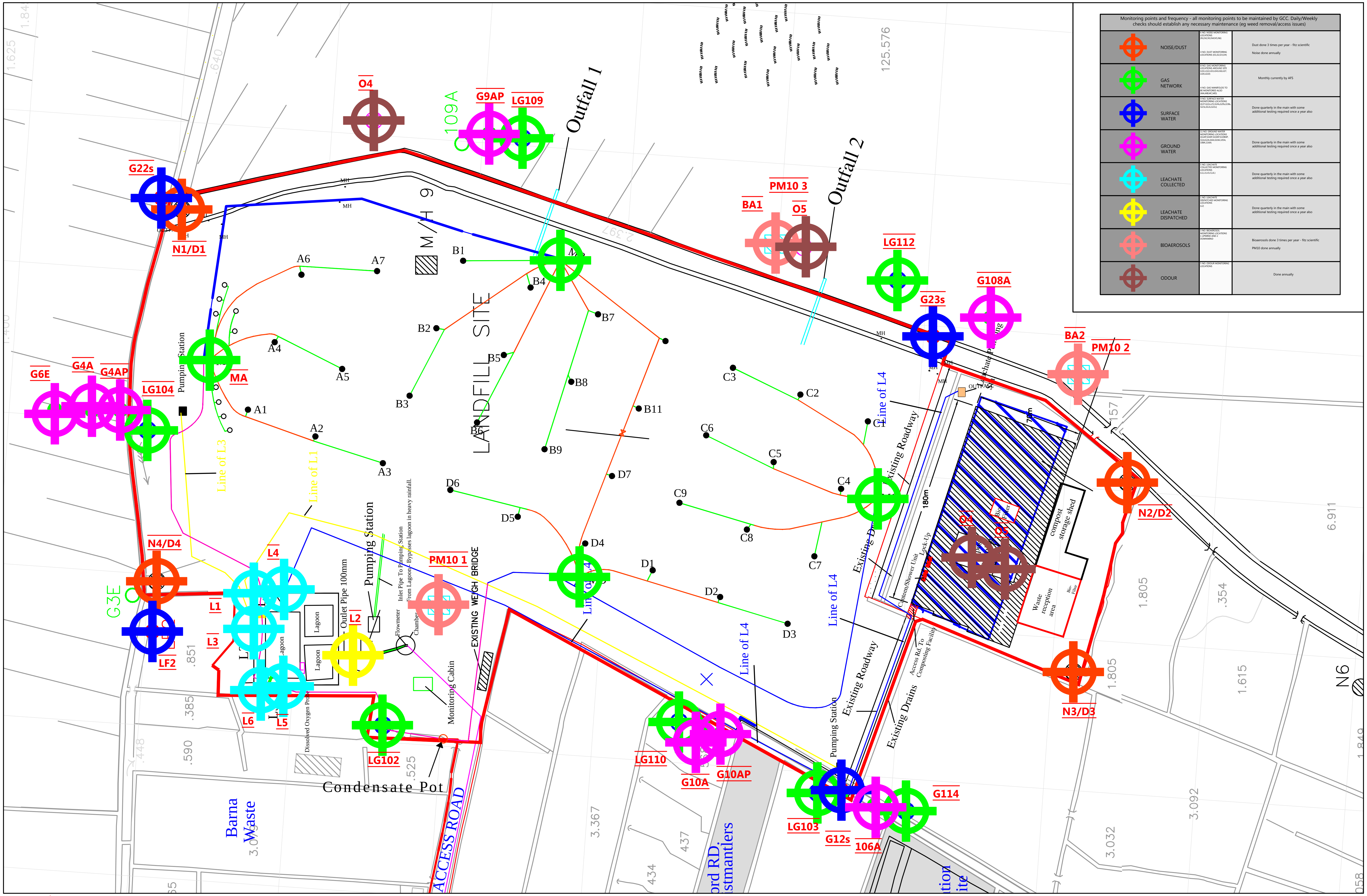
5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

3

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	19 07 03	No	30000.0	landfill leachate other than those mentioned in 19 07 02	D8	E	Volume Calculation	Offsite in Ireland	mutton island waste water treatment plant,D0050-01	grattan rd,salthill,.,galway,ireland		
Within the Country	20 03 01	No	936.0	mixed municipal waste	D1	M	Weighed	Offsite in Ireland	barna recycling ltd,wcp-mo-08-0604-01/w0106-02	headford road,carrowbrowne,galway,.,Ireland		

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

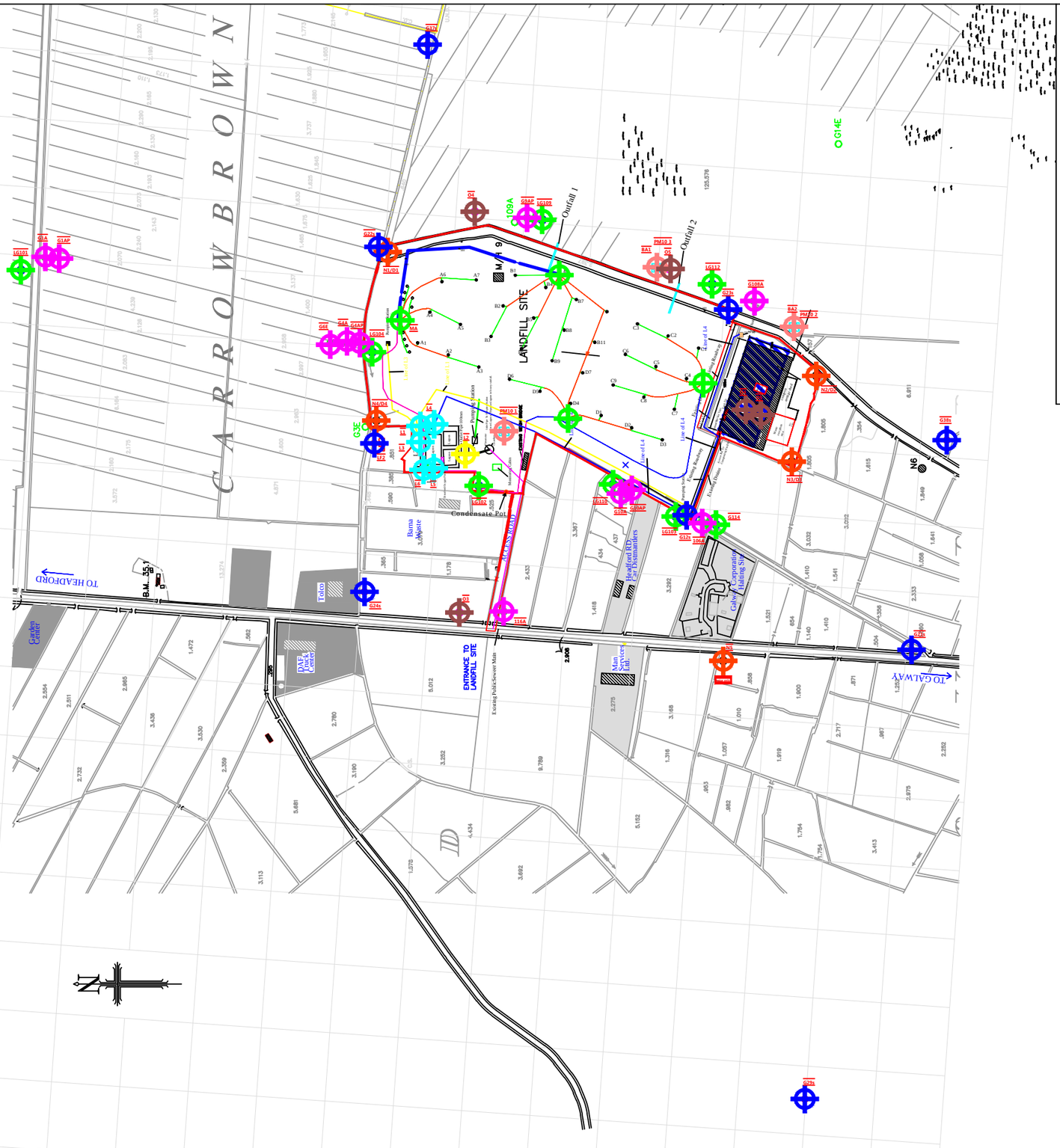


1

Carrowbrowne landfill routine monitoring guidance map - waste license 13-01

date 14/05/14 drawn by ROR

This drawing details the site based monitoring points, there is a further drawing detailing the monitoring points further from the facility



Monitoring points and frequency - all monitoring points to be maintained by GCC. Daily/Weekly checks should establish any necessary maintenance (eg weed removal/access issues)			
NOISE/DUST	4 NO. NOISE MONITORING LOCATIONS IN N1,N3,N4,N5,N6	4 NO. DUST MONITORING LOCATIONS D1,D2,D3,D4N	Dust done 3 times per year - fitz scientific Noise done annually
GAS NETWORK	8 NO. GAS MONITORING LOCATIONS AROUND SITE WITH G1,G2,G3,G4,G5,G6,G7, G8 & G10	3 NO. GAS MANIFOLDS TO BE MONITORED ALSO WITHIN BUILDING	Monthly currently by AFS
SURFACE WATER	4 NO. SURFACE WATER MONITORING LOCATIONS SW1,SW2,SW3,SW4		Done quarterly in the main with some additional testing required once a year also
GROUND WATER	12 NO. GROUND WATER MONITORING LOCATIONS G1,G2,G3,G4,G5,G6,G7,G8,G9,G10,G11,G12		Done quarterly in the main with some additional testing required once a year also
LEACHATE COLLECTED	1 NO. LEACHATE MONITORING LOCATIONS L1,L2,L3,L4,L5,L6		Done quarterly in the main with some additional testing required once a year also
LEACHATE DISPATCHED	1 NO. LEACHATE DISPATCHES MONITORING LOCATIONS L6		Done quarterly in the main with some additional testing required once a year also
BIOAEROSOLS	2 NO. BIOAEROSOL MONITORING LOCATIONS 1 UPWIND AND 2 DOWNWIND		Bioaerosols done 3 times per year - fitz scientific PM10 done annually
ODOUR	4 NO. ODOUR MONITORING LOCATIONS		Done annually

2

Carrowbrowne landfill routine monitoring guidance map - waste license 13-01

date 14/05/14 drawn by ROR