ANNUAL ENVIRONMENTAL REPORT

January - December 2012

For

Dundalk Landfill Site

Co. Louth

Waste Licence Reference W0034-02

By

Dundalk Town Council

To

Environmental Protection Agency

DUNDALK LANDFILL & RECYCLING CENTRE (W0034-02)

ANNUAL ENVIRONMENTAL REPORT

JANUARY – DECEMBER 2012

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1.0 INTRODUCTION

This Annual Environmental Report (AER) has been prepared to meet the requirements of Waste Licence W0034-02 for Dundalk Landfill.

The site is owned by Dundalk Town Council and is located at Newry Road, Dundalk. It is situated on the northern bank of the Castletown River in an area of intertidal mudflats. The northern boundary of the site adjoins low lying and poorly drained agricultural lands. Residential and industrial properties adjoin the western boundary of the site.

Dundalk Landfill Site has been in operation since 1980. In 2000 Dundalk Town Council submitted an application to the Environmental Protection Agency (EPA) for the continued operation of the landfill site, as required by the Waste Management (Licensing) Regulations 1997. The landfill site ceased to accept waste in October 2002.

In March 2005, the EPA granted the Council a revised Waste Licence (registration number W0034-02) for the facility, in accordance with the Third and Fourth Schedule of the Waste Management Act, 1996-2003.

A hydrogeological study[1] was undertaken in accordance with Condition 4.14 of the Waste Licence W0034-01 in 2004 to develop a leachate management system at the site. The report recommended that the Best Practicable Environmental Option for the remediation of Dundalk landfill is the capping of the landfill with a low permeability liner augmented by monitored natural attenuation. Groundwater remediation of the Quaternary gravel aquifer impacted by Dundalk landfill leachate is reliant on both the landfill capping intervention and on monitored in-situ natural attenuation processes. Discharge into the Northern Stream will reduce following capping of the site owing the reduction of the leachate head within the waste.

The landfill site was restored in 2006. Works include installation of capping layer, provision of storm water drainage, leachate collection trench, provision of gas collection system, provision of gas flare, grading of site to provide for future football pitches and the provision of access road.

Gas abstraction system provided on site includes for a Gas collection layer under the impermeable layer of capping material which provides a path of least resistance to the 47 No boreholes laid out on a grid system over the main body of the site. The boreholes are connected via 63mm. diameter pipework to a 250mm diameter main gas collection pipe which transfers the gas collected, under suction, provided by compressor, and to the 600 m^3 enclosed Flare Unit. A SCADA system and Programmable Logic Controller produces data

[1] Proposal for leachate management, July 2004. RPS MCOS.

which is available by download weekly or by telephone from council offices. The boreholes in the area of historical fill adjoining the rear of Hardy's Grainstore have also been attached to the active gas collection system.

1.1 REPORT PERIOD

The reporting period of this report refers to January to December 2012. The landfill site ceased to accept waste in October 2002. A Recycling Centre is currently in operation at the facility.

2.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

Waste is no longer accepted at the landfill facility except for restoration purposes. The maximum tonnage of waste to be accepted at the Recycling Centre is 20,000 tonnes per annum in accordance with Table A1 of the Waste Licence.

The waste intake at the Recycling Centre is limited to 20,000 tonnes per annum of municipal waste and construction and demolition waste. The licence also allows composting of biodegradable waste and green waste to 4,000 tonnes per annum.

The licensed disposal activities, in accordance with the Third Schedule of the Waste Management Act, 1996, are restricted to those listed as follows:

Class 11 **Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.**

Class 12 **Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.**

Class 13 **Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.**

Licensed waste recovery activities, in accordance with the Fourth Schedule of the Waste Management Act, 1996, are restricted to those listed as follows:

Class 2 **Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).**

Class 3 **Recycling or reclamation of metals and metal compounds.**

Class 4 **Recycling or reclamation of other inorganic materials.**

Class 10 **The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.**

Class 11 **Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.**

Class 13 **Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.**

3.0 QUANTITY AND COMPOSITION OF WASTE RECEIVED AND DISPOSED OF DURING THE REPORTING PERIOD AND EACH PREVIOUS YEAR.

3.1 LANDFILL

Dundalk Landfill Site was in operation for the acceptance of waste for disposal from 1980 until 2002. The site ceased to accept waste for disposal in October 2002 and waste was only brought on site for restoration purposes after this date. Waste data figures are derived from estimates and weighbridge readings. These figures are shown in Table 3.1.

Table 3.1 Waste Quantities Accepted (Tonnes) at Landfill[2]

Waste Types	1997	1998	1999	2000	2001	2002	2003	2004
Total	37,060	37,560	38,000	36,000	32,000	32,420	27,417	3,018

3.2 RECYCLING CENTRE

The Recycling Centre is open;

- Monday - Friday 9.30am - 6.00pm
- Saturday 9.00am - 3.00pm

In accordance with Condition 5 of the waste licence only those waste types and quantities listed in Schedule A shall be disposed of at the facility unless prior agreement from the Agency has been obtained. The maximum annual tonnage of individual waste categories for acceptance to the site is listed in Schedule A of the Waste Licence.

The following are accepted at the Recycling Centre;

- mixed residual waste
- cardboard
- glass
- magazines/newspaper
- building rubble
- plastics
- clothing/textiles
- green/garden waste
- wood
- aluminium cans/steel cans
- domestic appliances
- batteries
- electrical appliances
- scrap metal

[2] 1997-2001 figures based on estimates.

- waste engine oil
- waste cooking oil

The quantity of waste received during the reporting period at the recycling facility is 8,549 tonnes. The figures are taken from National Waste Report 2012 Survey.

478 tonnes of mixed residual waste arising from members of the public was accepted for disposal at the recycling facility. Building Rubble (945 tonnes), wood packaging (540 tonnes) and wood non-packaging (580 tonnes) accepted at Dundalk recycling facility was also sent to Whiteriver Landfill Site were it was recovered. The remaining waste was recovered on or off site as listed in Table 3.2. 2,665 tonnes of garden and park waste from municipal sources (landscapers, householders etc.) was composted onsite. 1,620 tonnes of compost was produced in 2012. Compost analysis has been undertaken and is detailed in Section 5.12.

WEEE is collected by ERP from the recycling facility from the compliance schemes.

Table 3.2 Waste Quantities Accepted for Disposal and Recovery (Tonnes) at CWF[3]

Material Type	EWC Codes		Tonnage	Name of Destination Facility(ies), or Collector(s) If Directly Exported	Disposal Or Recovery "D" or "R" or "Both"
Mixed residual waste	20 03 01		478	Whiteriver landfill w0060-02	D
garden	20 02 01	Garden and park waste from municipal sources (landscapers, householders etc.)	2665	Dundalk town council W0034-	R
cardboard packaging	15 01 01		960	Peute Europe ni 6000076	R
newspaper and magazines	20 01 01		470	Peute Europe nl 6000076	R
glass packaging	15 01 07		406	Glasson N.I l-n06/08	R
Metals	0		227	Tinnelly N.I wmex22/00	R
plastic packaging	15 01 02		590	Shabra Plastic IRL mn-080022-01	R
textiles, non-packaging	20 01 11		21	Cookstown N.I wmex01/11	R
wood packaging	15 01 03		540	Whiteriver landfill w0060-02	R
wood non-packaging	20 01 38		580	Whiteriver landfill w0060-02	R
lead acid batteries and accumulators	16 06 01*	non-portable (automotive and industrial)	606	RILTA IRL WO192-02	R
Waste mineral oils	13 02 05*	lubrication, vehicle, machine, etc.	5.56	Enva Portlaoise (W0184-01)	R
Waste cooking or vegetable oils	20 01 25		3	Enva Portlaoise (W0184-01)	R
Building Rubble	17 01 07		945	Whiteriver landfill w0060-02	R

[3] National Waste Report 2012 Survey.

Material Type	EWC Codes		Tonnage	Name of Destination Facility(ies), or Collector(s) If Directly Exported	Disposal Or Recovery "D" or "R" or "Both"
Inks, paints adhesives and resins	20 01 28		2.73	Enva Portlaoise (W0184-01)	R
Total			**8,549**		

4.0 SUMMARY REPORT ON EMISSIONS

4.1 EMISSIONS TO SEWER

4.1.1 Discharge Point (From Landfill Site)

A leachate collection trench has been constructed on the southern slope of the landfill. The trench is lined on the estuary side of the trench and also to a level of 3.65mOD on the landfill side of the trench. The trench is connected to the foul sewer running along the western boundary of the site. Zero flow has been measured to date. The flow monitoring device has been removed from this trench as agreed with the EPA.

4.1.2 Discharge Point (from recycling facility)

In accordance with The PRTR Regulations releases of pollutants and off site transfers of waste by facilities operating in relevant industrial sectors are to be reported by the EPA to the European E-PRTR website where the facility exceeds specified thresholds. The PRTR reporting has been completed for Dundalk landfill site and submitted to the EPA.

S1 is the sewer discharge monitoring location at manhole No 2, adjacent to weighbridge. This monitors run-off from the Recycling Centre and Material Recovery Facility and discharge from the composting facility. The estimated flow to sewer from this area is 11,300 m^3. Reportable emissions for this location as per PRTR requirement are;

- Chlorides (as Cl)
- Ammonia (NH^3)
- BOD
- COD
- Suspended solids
- Sulphate

4.2 EMISSIONS TO GROUNDWATER AND SURFACE WATER

There are no direct emissions to groundwater or surface water. A water balance calculation has been completed for Dundalk landfill site and is presented in Appendix A. The site is unlined and an area of approximately 79,000 m^2 has been capped. There is no active leachate extraction system on the site. Infiltrations in restored areas are in the range of 2-10% of effective rainfall. This equate to 1,342 m^3 to 6,711 m^3 of leachate produced.

4.3 EMISSIONS TO AIR

4.3.1 COMPOSTING AND BIOFILTER EMISSIONS

Compost analysis and biofilter emission monitoring has been undertaken during the reporting period. These are discussed in section 5.13 and 5.14.

4.3.2 FLARE EMISSIONS

The PRTR reporting and landfill gas survey have been completed for Dundalk landfill site and submitted to the EPA. The PRTR is including in Appendix B.

A 600m^3 flare has been installed at Dundalk Landfill Site. Based on model predications and information from the landfill gas flare the estimated net emission of methane from the flare combustion process and both surface and lateral emissions from the landfill body is 227,229 kg/year (Table 4.1).

Table 4.1 Net Methane Emission

Quantities of Methane Flared and / or Utilised	T (Total) kg/Year
Total estimated methane generation (as per site model)	423805.0
Methane flared	196576.0
Methane utilised in engine/s	0.0
Net Methane Emission	**227229.0**

Flue gas monitoring was also undertaken on the permanent landfill gas flare. All monitoring was carried out in accordance with Environmental Protection Agency Office of Environmental Enforcement (OEE) Air Emission Monitoring Guidance Note 2 (AG2). These results are provided in Appendix C. NO_x as NO_2 emissions from the flare were within the emission limit values specified in Waste licence W0034-02.

5.0 SUMMARY OF RESULTS AND INTERPRETATIONS OF ENVIRONMENTAL MONITORING, INCLUDING LOCATION PLAN OF ALL MONITORING LOCATIONS

5.1 MONITORING LOCATIONS

Monitoring is carried out at locations and frequencies as specified in Schedules D of the waste licence. Monitoring points are labelled and permanent access to all monitoring points is maintained. The following parameters form the monitoring programme;

- Groundwater Quality
- Groundwater Levels
- Surface Water Quality
- Leachate Quality
- Leachate Levels
- Landfill Gas

All ditches and drains around the perimeter of the facility are kept clear to allow for surface water monitoring points to be maintained.

All monitoring points are detailed in Drawing Monitoring Locations as shown in Appendix D.

5.2 LEACHATE QUALITY

Leachate quality can vary during the lifetime of landfill sites depending on the phase of decomposition of the waste. Leachate results for the reporting period are presented in Appendix E and some of the characteristic parameters of the leachate are listed in Table 5.1

Raw leachate results have been compared to “Typical Leachate Composition of 30 Samples from UK/Irish Landfills accepting mainly Domestic Waste” (Landfill Operational Practices). As can be seen from the Table 5.2 all of the parameters are below the maximum concentration.

Table 5.1 Raw Leachate Concentrations

Parameters	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Alkalinity	**mg/l CaCO3**					
Aluminium	**µg/l**	4	5	17.5	10	6
Ammonia	**mg/l N**	16	1.4	107.62	48	48
Antimony	**µg/l**	4	<0.5	0.91		
Arsenic	**µg/l**	4	0.76	4.53	2	2
Barium	**µg/l**	4	103.4	465.9	287	171
Beryllium	**µg/l**	4	<0.5	<0.5		
B.O.D.	**mg/l O2**	16	10.1	163.4	50	51
Boron	**µg/l**	4	98.3	2319.3	1468	961
Cadmium	**µg/l**	4	<0.1	<0.1		
Calcium	**mg/l Ca**	4	194.66	260.08	229	34
C.O.D.	**mg/l O2**	16	77	757	279	250
Chloride	**mg/l Cl**	16	40	334	161	89
Chromium	**µg/l**	4	1.3	7.4	4	3
Cobalt (µg/l)	**µg/l**	4	1.9	4.6	3	1
Conductivity	**µS/cm @ 25**	16	1657	5080	3018	1103
Copper	**µg/l**	4	<0.5	0.5		
Cyanide	**mg/l CN**	16	<0.05	<0.05		
D.O.	**% Saturation**					
Fluoride	**mg/l**	4	<0.150	0.15		
Iron	**µg/l**	4	10759.3	32084.8	25765	10050
Lead	**µg/l**	4	<0.5	<0.5		
Magnesium	**mg/l Mg**	4	41.08	100.14	73	26
Manganese	**µg/l**	4	647.2	4272.6	1709	1717
Mercury	**µg/l**	4	<0.05	<0.05		
Molybdenum	**µg/l**	4	0.5	1.6	1.1	0.8
Nickel	**µg/l**	4	1.2	3.8	2.3	1.1
o-Phosphate	**mg/l P**	16	<0.02	1.24	0.5	0.5
pH	**0**	16	6.9	7.1	7.0	0.1
Potassium	**mg/l**	4	17.36	157.91	84.6	58.1
Residue on Evaporation	**mg/l**					
Sampling Depth	**m**					
Selenium	**µg/l**	4	<0.5	0.6	0.6	0.1
Silver	**µg/l**					
Sodium	**mg/l**	4	101.34	203.55	140	44
Strontium	**µg/l**	4	653.49	1169.14	992	231
Sulphate	**mg/l SO4**	12	2.2	4.5	4	1
Suspended Solids	**mg/l**					
Temp	**°C**	16	10	16	12	2
Thallium	**µg/l**	4	<0.1	<0.1		
Time Sampled	**0**					
Tin	**µg/l**	4	<1	<1		
T.O.C.	**mg/l**					
T.O.N	**mg/l N**	16	<0.08	0.3		
Total S Solids	**mg/l**					
Uranium	**µg/l**	4	<0.1	1.38		
Vanadium	**µg/l**	4	0.7	3.56	2	1
Zinc	**µg/l**	4	2.4	23	11	10

Table 5.2 Raw Leachate Concentrations

	Dundalk Landfill Site		From 30 Samples from UK/Irish Landfills Accepting Domestic Waste Results in mg/l		
Parameter	Min.Conc	Max.Conc	Min.Conc	Max.Conc	Mean
Ammonia (mg/N)	1.4	107.62	<0.2	1700	491
BOD	10.1	163.4	4.5	>4800	>834
COD	77	757	<10	33,700	3078
Chloride (mg/l)	40	334	27	3410	1256
Iron (μg/l)*	10759.3	32084.8	0.4	664	54.4
Potassium (mg/l)	17.36	157.91	2.7	1480	491
Sodium (mg/l)	101.34	203.55	12	3000	904
TON (mg/l N)	<0.08	0.3	/	/	/
Conductivity (μS/cm)	1657	5080	503	19,200	7789
pH (pH units)	6.9	7.1	6.4	8.0	7.2

Leachate levels monitoring is undertaken at four locations on site as show on Table 5.3. The highest leachate head with the landfill site is at LG6. LG7 is no longer in use.

Table 5.3 Leachate Levels mOD

Date	L1	L2	L4	L6
Cover Level mOD	5.33	4.53	10.51	13.36
18/01/12	2.28	1.58	-0.29	1.86
17/02/12	2.18	1.48	2.46	4.46
16/03/12	2.03	1.58	2.51	4.76
23/04/12	1.91	1.43	2.11	4.46
14/05/12	1.99	1.03	1.90	4.36
06/06/12	2.28	1.45	2.13	4.11
23/07/12	1.93	1.53	2.01	4.01
10/08/12	1.73	1.43	1.81	3.96
10/09/12	2.23	1.63	2.11	4.06
08/10/12	2.13	1.43	2.41	4.36
05/11/12	2.28	1.73	2.31	4.46
10/12/12	2.23	1.53	2.21	4.26

5.3 GROUNDWATER

As required under the Waste Licence, groundwater monitoring has been undertaken at the borehole locations as set out in Table D1.1 of the waste licence. Schedule D of the waste licence requires the monitoring of certain parameters on either a monthly, quarterly or annual basis; the frequencies of the monitoring of groundwater parameters are shown in Table 5.4 below.

Table 5.4 Groundwater Parameters Monitoring Frequencies

Monthly	Quarterly	Annually		
Groundwater Level	Visual Inspection/Odour	Aluminium	Manganese	Total Alkalinity
Ammoniacal Nitrogen	Dissolved Oxygen	Boron	Nickel	Orthophosphate
Chloride	pH	Cadmium	Potassium	TON
Electrical Conductivity	Temperature	Calcium	Sodium	Residue on Evaporation
	TOC	Chromium	Zinc	List I/II Organic
		Copper	Cyanide	
		Iron	Fluoride	
		Lead	Mercury	
		Magnesium	Sulphate	

A hydrogeological study was undertaken in accordance with Condition 4.14 of the Waste Licence W0034-01 in 2004 to develop a leachate management system at the site. The report recommended that the Best Practicable Environmental Option for the remediation of Dundalk landfill is the capping of the landfill with a low permeability liner augmented by monitored natural attenuation. Groundwater remediation of the Quaternary gravel aquifer impacted by Dundalk landfill leachate is reliant on both the landfill capping intervention and on monitored in-situ natural attenuation processes. Discharge into the Northern Stream will reduce following capping of the site owing the reduction of the leachate head within the waste.

The landfill site was restored in 2006. Works include installation of capping layer, provision of storm water drainage, leachate collection trench, provision of gas collection system, provision of gas flare, and grading of site.

A leachate collection trench has been constructed on the southern slope of the landfill. The trench is lined on the estuary side of the trench and also to a level of 3.65 mOD on the landfill side of the trench. The trench is connected to the foul sewer running along the western boundary of the site. Zero flow has been measured and subsequently the flow meter has now been removed.

The main groundwater flow path is generally towards the estuary, which is located to the south of the site. Groundwater monitoring has been undertaken at boreholes WM1, WM4, WM5, WM6, WM8, WM9 and WM10. Groundwater monitoring results are provided in full within Appendix F. These results are also presented graphically.

Groundwater was assessed against;

Groundwater: the European Communities (Drinking Water) (No. 2) Regulations 2007 parametric value (DWR), Interim Guideline Value (IGV) Towards Setting Guideline Values for the Protection of Ground Water in Ireland and SI. No. 9/2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 (GWR 2010). A table showing the DWR, IGV and GWR 2010 from applicable regulations is to be found in Appendix F.

Total pesticides means the sum of all individual pesticides detected and quantified in the course of the monitoring procedure. The DWR is 0.50µg/l. (Only those pesticides which are likely to be present in a given supply require to be monitored - organic insecticides, organic herbicides, organic fungicides, organic nematocides, organic acaricides, organic algicides, organic rodenticides, organic slimicides , related products (*inter alia*, growth regulators and their relevant metabolites, degradation and reaction products).

Polycyclic aromatic hydrocarbons are the sum of concentrations of specified compounds. The DWR is 0.10ug/l. The specified compounds are benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene.

Total trihalomethanes are the sum of concentrations of specified compounds. The DWR is 100ug/l. The specified compounds are: chloroform, bromoform, dibrom-ochloromethane and bromodichloromethane

5.4 BASELINE DATA

Monitoring was carried out up-gradient of the site in order to obtain an overview of the baseline monitoring water quality of the surrounding groundwater. This allows for a baseline to be established from which the actual impact caused by the site on the down-gradient groundwater can be assessed. WM1 is the up-gradient monitoring point. Monitoring is undertaken on a monthly, quarterly and annual basis.

5.4.1 Monthly Parameters

Electrical Conductivity in WM1 was above the IGV (1000 µScm), GWR (800-1875 µScm) and DWR (2500 µScm) throughout the monitoring period. All Ammonia concentrations recordings were below the GWR 2010 (0.175 mg/l N), IGV (0.15 mg/l) and the DWR (0.30 mg/l). The

concentrations in WM1 were <0.03 mg/l at times during the monitoring period. Chloride concentrations were above the GWR 2010 (187.5 mg/l), IGV (30 mg/l) and the DWR (250 mg/l) throughout the monitoring period. The highest chloride reading recorded was 553 mg/l in February.

5.4.2 Quarterly Parameters

Dissolved Oxygen (DO) levels ranges from 22% to 26 %. WM1 exhibits TOC values ranging from 3.0 mg/l to 111.5 mg/l. The pH levels in WM1 are within the IGV and DWR of 6.5 and 9.5.

5.4.3 Annually

Aluminium, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Copper, Cobalt, Copper, Cyanide, Fluoride, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium Thallium Tin and Zinc are all below the relevant IGV, GWR 2010 where comparable or the lower limit of detection.

Magnesium, Potassium and Sodium and Sulphate exceed the IGV. Magnesium exceeds the IGV of 50 mg/l in WM1 with a reading of 54.92 mg/l. Potassium exceeds the IGV of 5 mg/l with a result of 23 mg/l. Sodium is above the IGV (150 mg/l) and DWR (200 mg/l) with a value of 461.43 mg/l and Sulphate exceeds the GWR 2010 of 187.5 mg/l with a reading of 249.4 mg/l.

Ortho-phosphate is below the IGV of 0.03 mg/l with a recording of < 0.02 mg/l. Total Alkalinity shows no abnormal change with a reading of 396 mg/l. TON shows no abnormal change with a value of 0.97 mg/l for WM1. Residue on Evaporation recorded 1654 mg/l in WM1 in April.

Analysis for Polycyclic Aromatic Hydrocarbons (Total 16 EPA PAHs) was carried out in WM1 in April and recorded <0.1µg/l and is below the DWR of 0.1µg/l for PAH. All other parameters measured were less than the lower level of detection.

Phenols levels were <0.002 mg/l which is the lower limit of detection for the methodology used for Phenols. This is above the IGV of 0.5µg/l.

Pesticide and Herbicides analysis was carried out in WM1 in April. Pesticide levels were <0.01µg/l which is the lower limit of detection for the methodology used. The total pesticides could be above or below the IGV 0.5µg/l. Herbicides levels were less than the lower level of detection (< 1µg/l).

Total-Trihalomethanes (THM) is the sum of Dichloromethane, Chloroform, Bromodichloromethane and Bromoform. Dichloromethane, Bromodichloromethane and

Bromoform were below the lower detection limit for the analytical methodology used (<0.1 µg /l), however Chloroform (0.1 µg/l) was detected. However it does not exceed the DWR of 12µg/l. THM is below the DWR of 100 µg/l total trihalomethanes.

Volatiles and semi volatiles parameters were either below the IGV or less than the detection limit for those comparable.

The lower limit of detection for the methodology used is higher than the IGV for a number of parameters.

5.5 DOWN-GRADIENT DATA

The impact on the groundwater from leachate generated within the landfill can be identified from Boreholes WM4, WM5, WM6, WM8, WM9 and WM10. WM4 and WM8 are located in the gravel aquifer.

Table 5.5 Groundwater Parameters Down Gradient

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Alkalinity	**mg/l CaCO3**	6	1020	1400	1238	173
Aluminium	**µg/l**	6	<5	8.6		
Ammonia	**mg/l N**	72	0.06	128.39	48	29
Antimony	**µg/l**	24	<0.5	1.11	1	0
Arsenic	**µg/l**	24	<5	3.81	2	1
Barium	**µg/l**	6	<0.5	232.8	139	76
Beryllium	**µg/l**	6	<0.5	<0.5		
B.O.D.	**mg/l O2**					
Boron	**µg/l**	6	1736.2	2895.5	2045	431
Cadmium	**µg/l**	6	<0.1	0.4		
Calcium	**mg/l Ca**	6	95.36	269.27	189	67
C.O.D.	**mg/l O2**					
Chloride	**mg/l Cl**	72	44	5943	1405	1364
Chromium	**µg/l**	6	<0.5	1.2		
Cobalt	**µg/l**	6	1.5	7.8	3	2
Conductivity	**µS/cm @ 25**	72	1697	14710	6073	3688
Copper	**µg/l**	24	<0.5	91.4		
Cyanide	**mg/l CN**	24	<0.05	<0.05		
D.O.	**% Saturation**	48	12	35	18	10
Fluoride	**mg/l**	24	<0.60	<0.60		
Iron	**µg/l**	6	64.3	20497.2	4826	8122
Lead	**µg/l**	6	<0.5	<0.5		
Magnesium	**mg/l Mg**	6	73.07	319.23	160	92
Manganese	**µg/l**	6	148.5	2919.9	1005	1017
Mercury	**µg/l**	6	<0.05	<0.05		
Molybdenum	**µg/l**	6	<0.5	4.6		
Nickel	**µg/l**	6	1.9	22.9	9	9
o-Phosphate	**mg/l P**	24	0.03	0.93	0	0

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
pH	**0**	48	6.8	7.4	7	4
Potassium	**mg/l**	9	4.2	146.12	75	55
Residue on Evaporation	**mg/l**	27	1489	8423	4031	2171
Sampling Depth	**m**	72	1.3	5.6	4	2
Selenium	**µg/l**	21	0.7	6.4	4	1
Silver	**µg/l**					
Sodium	**mg/l**	6	250.64	2498.04	1008	880
Strontium	**µg/l**	6	771.63	2293.52	1350	532
Sulphate	**mg/l SO4**	24	10.2	486.2	172	110
Suspended Solids	**mg/l**					
Temp	**°C**	46	9.9	18	14	7
Thallium	**µg/l**	8	<0.1	0.21		
Time Sampled	**0**					
Tin	**µg/l**	9	<1	<1		
T.O.C.	**mg/l**	30	17.6	456.4	196	140
T.O.N	**mg/l N**	24	0.16	3.47	1	1
Total S Solids	**mg/l**					
Uranium	**µg/l**	6	0.14	1.1	1	1
Vanadium	**µg/l**	6	0.87	3.37	2	1
Zinc	**µg/l**	6	<0.5	88.7	28	33

5.5.1 Monthly Parameters

Results from down gradient boreholes indicate elevated levels of Ammonia in the majority of boreholes. The highest Ammonia level recorded was 128.39 mg/l N WM8 in April. Elevated levels of Ammonia are indicative of leachate contamination. The hydrogeological study undertaken in 2004 predicated a range of concentrations in groundwater in the estuarine perimeter of the site after 10 years from the completion of the landfill capping. For Ammoniacal Nitrogen this range was 67-71 mg/l. WM5, WM6, WM8 and WM9 exceed this range during the monitoring period.

Electrical Conductivity exceeds the DWR and GWR in all boreholes. The highest level was recorded in WM4 (14,710 µS/cm). Chloride levels also exceeded the DWR throughout the monitoring period. The highest Chloride concentration recorded was 5,943 mg/l in WM4. It should be noted that saline water intrusion may contribute to the high levels of Chloride and Electrical Conductivity recorded down-gradient of the site as seawater can contain Chloride levels up to 20,000 mg/l.

5.5.2 Quarterly Parameters

TOC values provide a measure of organic contamination of the water, the higher the content the more oxygen is consumed. Organic contamination results in an increase in the growth of micro-organisms. TOC results show spike in concentrations in a number of boreholes. This

also increased in the upstream borehole but not to the same concentrations. DO ranges from 12% to 35%.

5.5.3 Annually

Aluminium, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Copper, Cobalt, Copper, Cyanide, Fluoride, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium Thallium Tin and Zinc are all below the relevant IGV, ECOC where comparable or the lower limit of detection.

Cadmium, Chromium, Copper, Cyanide, Fluoride, Lead, Mercury, Nickel and Zinc are all below the relevant IGV.

Aluminium, Boron, Calcium, Iron, Magnesium, Manganese, Potassium and Sodium, and Sulphate exceed the IGV. Magnesium exceeds the IGV of 50 mg/l in WM1 with a reading of 59.58 mg/l. Potassium exceeds the IGV of 5 mg/l with a result of 21.34 mg/l. Sodium is above the IGV (150 mg/l) and DWR (200 mg/l) with a value of 463.85 mg/l and Sulphate exceeds the IGV of 200 mg/l with a reading of 225.7 mg/l.

Ortho-phosphate is above the IGV of 0.03 mg/l with a recording of 0.04 mg/l to 0.24 mg/l. Total Alkalinity readings ranged from 820 mg/l to 1,470 mg/l. TON concentrations range from <0.08 to 4.37 mg/l. Residue on Evaporation recorded reading of 1,638 mg/l to 2195.13 mg/l in downstream boreholes in April. These results are included in Appendix F.

Annual analysis for List I and II substances were undertaken at WM5 and WM6 downstream of the site.

Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.17 μg/l in WM5 but 0.202μg/l in WM6 which is above the DWR and IGV of 0.1μg/l for PAH. A number of parameters were detected above the lower level of detection and Benzo (a) pyrene (0.0261μg/l) exceed IGV for those comparable.

Phenols levels were lower than the limit of detection for the methodology used (<0.013 μg/l) but this is above the appropriate IGV of 0.5μg/l.

Pesticide and Herbicides analyses were carried out in WM6 and WM8 in April. Pesticide levels were <0.01μg/l which is the lower limit of detection for the methodology used. Herbicides levels were less than the lower level of detection.

Total-Trihalomethanes (THM) is the sum of Dichloromethane, Chloroform, Bromodichloromethane and Bromoform. Bromodichloromethane, Bromoform and Chloroform

were below the lower detection limit for the analytical methodology used (<0.1 µg /l), however Dichloromethane was detected at 0.1µg/l in WM6. However it does not exceed the DWR of 10µg/l. THM is below the DWR of 100 µg/l total trihalomethanes.

Volatiles and semi volatiles parameters were either below the IGV or less than the detection limit for those comparable. 1,1-Dichloroethane, Benzene , Chlorobenzene, Dichloromethane, and Isopropylbenzene were all detected above the detection limit of 0.1µg/l. These do not exceed the IGV for those comparable. The detection limit of 0.1µg/l is higher than the IGV for a number of parameters.

5.5.4 Groundwater Levels

Groundwater levels monitoring is undertaken at six locations on site as show on Table 5.6. WM1 is upgradient of the site and WM4 and WM8 are located in gravel aquifer.

Table 5.6 Groundwater Level mOD

Location	WM1	WM4	WM5	WM6	WM8	WM9	WM10
Cover Level mOD	4.77	5.12	5.57	5.87	5.15	5.78	5.64
16-Jan-12	1.97	0.12	0.27	0.97	2.15	0.88	0.44
06-Feb-12	3.57	3.82	3.17	3.37	1.85	2.78	3.84
12-Mar-12	nm	nm	nm	nm	nm	nm	nm
23/04/2012	1.87	0.52	0.85	0.97	1.25	1.38	0.64
14/05/2012	1.75	0.61	0.47	0.89	0.19	0.73	0.34
06/06/2012	1.90	0.76	0.59	1.20	0.65	1.21	0.81
23-Jul-12	1.87	1.62	0.87	0.97	1.25	1.38	0.64
13-Aug-12	2.47	1.12	1.37	1.57	2.05	1.88	1.14
10-Sep-12	1.87	1.02	0.47	0.87	-0.05	0.68	0.74
08-Oct-12	1.87	0.12	0.27	0.87	1.05	1.58	0.04
05-Nov-12	1.87	0.52	0.77	1.07	1.35	0.88	2.34
10-Dec-12	1.87	0.12	0.27	0.87	1.05	1.48	0.14

5.6 REMEDIATION

The results show that groundwater is being impacted by the landfill site. A hydrogeological study was undertaken and the recommended Best Practicable Environmental Option for the remediation of Dundalk landfill was the capping of the landfill with a low permeability liner augmented by monitored natural attenuation. The hydrogeological study predicated a range of concentrations in groundwater (along boundary with estuary) after 10 years from the

completion of the landfill. Capping was completed in 2006. A review of monitoring results shows some improvement in groundwater and surface water quality over time since capping was completed. This will continue to be monitored for longer term trends to assess the extent of the natural attenuation of the site.

In the 'Predicted Environmental Risk Assessment' represented by the Dundalk landfill to the Quaternary Gravel Aquifer and the Castletown Estuary after 10 years from the completion of the landfill capping it is predicted that the concentration range for Ammoniacal Nitrogen will be between 67 mg/l and 71 mg/l in groundwater (along boundary with estuary). In WM4 and WM10 the concentrations are below the maximum predicted concentration range. WM5 and WM6 are below the maximum in all but one occasion in 2012. WM9 exceeds the maximum predicted concentration range for Ammoniacal Nitrogen on four sampling rounds in 2012. WM8 (gravel aquifer) exceeds the maximum predicted concentration range for Ammoniacal Nitrogen for the majority of the year.

5.7 SURFACE WATER

The results contained in this report are Assessed against the Surface Water Quality Standards (SWQS) laid out in the European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989, European Communities Environmental Objectives (Surface Water) Regulations 2009 as amended (ECEO) and Interim Guideline Value (IGV) Towards Setting Guideline Values for the Protection of Ground Water in Ireland. The frequencies of the monitoring of surface water parameters are shown in Table 5.7.

Table 5.7 Surface Water Parameters Monitoring Frequencies

Monthly	Quarterly	Annually	
Ammoniacal Nitrogen	BOD	Aluminium	Manganese
Chloride	COD	Boron	Nickel
Electrical Conductivity	Dissolved Oxygen	Cadmium	Potassium
	pH	Calcium	Sodium
	Total Suspended Solids	Chromium	Zinc
	Temperature	Copper	Mercury
	TON	Iron	Sulphate
		Lead	Alkalinity
		Magnesium	Orthophosphate

Samples SW1 to SW4 are taken along the course of the drainage ditch, which adjoins the northern boundaries of the landfill. Monitoring points SW5 to SW9 are located in the estuary. SW5 and SW6 are adjacent (AD) to the landfill, whilst SW7 and SW8 are upstream (US) and SW9 downstream (DS) of the site.

Table 5.8 provides a summary of results in 2012 for SW1 to SW4 surface water locations.

Table 5.8 Surface Water Parameters SW1 to SW4

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Alkalinity	**mg/l CaCO3**	4	242	352	298	46
Aluminium	**µg/l**	4	<5	21		
Ammonia	**mg/l N**	48	<0.03	43.86		
Antimony	**µg/l**	4	0.68	6.56	2.5	2.8
Arsenic	**µg/l**	4	0.91	2.03	1.3	0.5
Barium	**µg/l**	4	39.6	90	61.2	22.6
Beryllium	**µg/l**	4	<0.5	0		
B.O.D.	**mg/l O2**	32	2.8	417	44	113
Boron	**µg/l**	4	126.1	317.3	250	85
Cadmium	**µg/l**	4	<0.1	<0.1		
Calcium	**mg/l Ca**	4	86.58	115.55	99.6	12.4
C.O.D.	**mg/l O2**	32	44	1750	224	423
Chloride	**mg/l Cl**	48	79	467	189	69
Chromium	**µg/l**	4	<0.5	<0.5		
Cobalt (µg/l)	**µg/l**	4	<0.5	0.9		
Conductivity	**µS/cm @ 25**	48	695	2080	1524	337
Copper	**µg/l**	4	0.9	2.5	1.8	0.7
Cyanide	**mg/l CN**					
D.O.	**% Saturation**	32	10	170	52	38
Fluoride	**mg/l**					
Iron	**µg/l**	4	28.6	42.6	33.9	6.1
Lead	**µg/l**	4	<0.5	<0.5		
Magnesium	**mg/l Mg**	4	24.23	40.42	30.9	7.0
Manganese	**µg/l**	4	17.8	285.4	178	114
Mercury	**µg/l**	4	<0.05	<0.05		
Molybdenum	**µg/l**	4	1.6	2.5	2.1	0.4
Nickel	**µg/l**	4	1.7	3.3	2.5	0.8
o-Phosphate	**mg/l P**	28	<0.02	<0.02		
pH	**0**	32	7.2	7.9	7.5	0.2
Potassium	**mg/l**	4	12	23.63	19.0	5.5
Residue on Evaporation	**mg/l**					
Sampling Depth	**m**					
Selenium	**µg/l**	4	<0.5	<0.5		
Silver	**µg/l**					
Sodium	**mg/l**	4	69.9	157.56	100.7	40.5
Strontium	**µg/l**	4	373.08	670.58	482.6	135.5
Sulphate	**mg/l SO4**	28	54.9	165.7	97.6	51.4
Suspended Solids	**mg/l**					
Temp	**°C**	32	6.6	17.7	12.6	4.0
Thallium	**µg/l**	4	<0.1	<0.1		
Time Sampled	**0**					
Tin	**µg/l**	4	<1	<1		

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
T.O.C.	**mg/l**					
T.O.N	**mg/l N**	32	<0.08	3.97	1.5	1.1
Total S Solids	**mg/l**	32	6	3200	497	924
Uranium	**µg/l**	6	0.61	1.06	0.9	0.2
Vanadium	**µg/l**	4	<0.5	1.82		
Zinc	**µg/l**	4	1.5	3.6	2.6	1.1

Table 5.9 Surface Water Parameters SW5 to SW9

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Alkalinity	**mg/l CaCO3**	17	107	140	121	12
Aluminium	**µg/l**	6	12.6	91.8	32	33
Ammonia	**mg/l N**	59	0.04	1.38	0.3	0.4
Antimony	**µg/l**	17	<0.5	<0.5		
Arsenic	**µg/l**	6	0.67	0.96	0.8	0.1
Barium	**µg/l**	6	25	29.2	28	2
Beryllium	**µg/l**	6	<0.5	<0.5		
B.O.D.	**mg/l O2**	39	1.5	17.4	5	5
Boron	**µg/l**	13	63.2	1079.4	354	412
Cadmium	**µg/l**	6	<0.1	<0.1		
Calcium	**mg/l Ca**	6	43.43	120.71	68	30
C.O.D.	**mg/l O2**	39	15	486	85	141
Chloride	**mg/l Cl**	66	21	9113	1562	2480
Chromium	**µg/l**	17	<0.5	<0.5		
Cobalt (µg/l)	**µg/l**	6	<0.5	0.5		
Conductivity	**µS/cm @ 25**	59	321	17770	3505	4564
Copper	**µg/l**	17	1.8	2.7	2	0
Cyanide	**mg/l CN**					
D.O.	**% Saturation**	44	89	123	96	9
Fluoride	**mg/l**					
Iron	**µg/l**	5	76.5	444.1	240	137
Lead	**µg/l**	6	<0.5	0.6		
Magnesium	**mg/l Mg**	6	20.6	271.08	95	101
Manganese	**µg/l**	6	64.8	177	115	42
Mercury	**µg/l**	6	<0.05	<0.05		
Molybdenum	**µg/l**	6	0.6	3	1.3	1.1
Nickel	**µg/l**	6	1.3	2.5	1.9	0.5
o-Phosphate	**mg/l P**	35	0.03	0.07	0.0	0.0
pH	**0**	45	7.5	8.4	8.0	0.2
Potassium	**mg/l**	13	7.65	92.51	32.8	34.1
Residue on Evaporation	**mg/l**					
Sampling Depth	**m**					
Selenium	**µg/l**	11	<0.5	0.8		
Silver	**µg/l**					
Sodium	**mg/l**	6	133.05	2359.42	780.0	897.3
Strontium	**µg/l**	6	210.88	1933.79	719.1	690.6
Sulphate	**mg/l SO4**	35	44.8	598	218	256
Suspended	**mg/l**					

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Solids						
Temp	**°C**	44	7	20	13	5
Thallium	**µg/l**	13	<0.1	<0.1		
Time Sampled	**0**					
Tin	**µg/l**	17	<1	<1		
T.O.C.	**mg/l**					
T.O.N	**mg/l N**	44	0.39	2.65	1	1
Total S Solids	**mg/l**	46	<0.08	82		
Uranium	**µg/l**	13	0.31	0.98	1	0
Vanadium	**µg/l**	6	<0.5	0.98		
Zinc	**µg/l**	6	<0.5	73.7		

5.7.1 Monthly Parameters

Monthly chemical analyses of surface water are summarised in Appendix G. The results indicate elevated levels of Ammonia mg/l N, the highest concentration recorded in the stream was 43.86 mg/l N in SW1 and in the estuary was 1.36 mg/l N in SW9 (DS). Elevated levels of Electrical Conductivity, and Chloride recorded at SW5 to SW9 are also due to the presence of estuarine water.

5.7.2 Quarterly Parameters

The pH values range from 7.2 to 7.9 in all surface water locations which are between the SWQS of 5.5 to 9.

The results indicate elevated levels of BOD and COD, the highest concentration recorded in the stream was 417 mg/l in SW2 and in the estuary was 17.4 mg/l in SW9 (DS) for BOD and for COD the stream was 1,750 mg/l in SW2 and in the estuary was 486 mg/l in SW9 (DS).

Total Suspended Solids exceed the SWQS in all surface water monitoring locations at times, the highest concentration recorded in the stream was 3,200 mg/l in SW1 and in the estuary was 82 mg/l in SW6 (AD).

The Total Organic Nitrogen (TON) showed no abnormal change throughout 2012, the highest concentration recorded in the stream was 3.97 mg/l in SW3 and in the estuary was 2.65 mg/l in SW8 (US).

The majority of parameters assessed show that levels of contamination increase between sampling points SW1 and SW4, which are located along the drainage ditch running along the north of the site. It can be seen that elevated levels of Ammonia, COD and BOD have been recorded at the various monitoring locations along the drainage ditch. These results are presented graphical in Appendix G. A review of the contamination in the stream has been undertaken and submitted to EPA for agreement. The following actions are to be undertaken as agreed;

- The review of existing gas wells to determine if they can also be used for leachate head monitoring shall be completed.
- Leachate head shall be recorded during the quarterly discharge points monitoring rounds.
- The scope of the monitoring shall be to determine if any discharge from the landfill site, including the recycling/composting centre, is impacting on the northern stream (i.e. not just at station SW1).
- A summary report of monitoring undertaken shall be submitted to the Agency within one month of the completion of the fourth recommended monitoring round. The findings of the two already completed surveys shall be incorporated into this report. All monitoring stations shall be clearly shown within the context of the stream setting.
- During the survey period, any adverse impact(s) detected shall be treated as an incident in accordance with the waste licence requirements.

5.7.3 Annual Parameters

Annual analysis was undertaken on 23rd April, 2012.

Aluminium, Arsenic, Barium Beryllium Boron, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Selenium, Thallium, and Tin are below the IGV, DWR and ECEO were applicable. The remaining parameters are below the lower limits of detection;

- Antimony exceeds DWR at SW1.
- Iron exceeds the DWR at a number of the estuarine locations.
- Magnesium exceeds IGV at SW6 (271.08 mg/l).
- Manganese exceeds IGV and DWR at a number of surface water locations.
- Potassium exceeds IGV at all locations.
- Sodium exceeds IGV and DWR at SW6, SW7 and SW9.
- Sulphate exceeds IGV and DWR at SW4.
- Zinc exceeds ECEO at SW5.

Concentrations above the limit of detection were measured for the following parameters;

- Cobalt <0.5 µg/l to 0.9 µg/l.
- Molybdenum <0.5 µg/l to 2.5 µg/l.
- Strontium 210.88 µg/l to 1,933.79 µg/l
- Uranium 0.31 to 1.06 µg/l and
- Vanadium <0.5 to 73.7 µg/l

Total Suspended Solids in the stream surface water monitoring locations ranged from 8 mg/l (SW3) to 1,640 mg/l (SW2). Total Suspended Solids in the estuarine stream surface water monitoring locations ranged from 6 mg/l to 43 mg/l.

Alkalinity concentrations range from 242 mg/l to 352 mg/l the stream surface water monitoring locations and from 107 mg/l to 140 mg/l in the estuarine water

Ortho-phosphate is above the IGV of 0.03 mg/l at SW6 and SW7.

The remaining parameters are below the lower limits of detection.

5.8 REMEDIATION

The results show that surface water is being impacted by the landfill site. In the hydrogeological study an Ammoniacal Nitrogen contaminant discharge was estimated at 70 mg/l after capping (after 10 years), predicting a long term concentration of 0.26 mg/l in the estuary. The results show the highest Ammoniacal Nitrogen concentration value for the stream is in SW1 at 43.86 mg/l.

The highest concentration for the estuary is in SW9 (1.38 mg/l) which is downstream of the site. SW5 and SW6 are adjacent to the site. Ammoniacal Nitrogen ranged from 0.1 to 1.34 mg/l in SW5 and 0.1 to 1.36 mg/l in SW6. Ammoniacal Nitrogen exceeds the predicting a long term concentration of 0.26 mg/l in these locations in the estuary on two sampling periods during 2012.

5.9 SEWER DISCHARGES

The Waste Licence in Schedule D requires the monitoring of the BOD, COD, Ammonia, Suspended Solids, Sulphates, pH and Temperature on a quarterly basis.

S1 is the sewer discharge monitoring location at manhole No 2, adjacent to weighbridge. This monitors run-off from the Recycling Centre and Material Recovery Facility and discharge from the composting facility.

Table 5.8 illustrates the parameters that were monitored in S1. S1 results can be found in full in Appendix H. BOD, COD and pH exceeds the ELV in October.

Table 5.8 Parameters Monitored in S1

Parameter	Jan	Mar	April	June	Aug	Sept	Oct	Nov	Dec	Emission Limit Value (ELV)	
										S1: Civic Waste Facility Grab Sample (mg/l)	S2: Leachate from Landfill Grab Sample (mg/)
BOD	153.4	27.9	66.6	27.8	202.3	257.3	5193.0	45.2	78.6	750	2000
COD	299	245	481	247	911	1250	7880	193	600	1000	9000
Suspended Solids	560		206	27	139	705	576	297	228	1000	2000
Sulphate		4.9	16	49.1	23.9	18.2	114.7	8.3	15.8	300	400
pH	7.4	7.3	7.2	7.2	7.1	7.3	6.3	7.2	6.9	6-9	6-9
Temperature	9.4		11.3	nm	nm	nm	13.3	nm	nm	40°C	40°C

5.10 PERIMETER GAS MONITORING AND LANDFILL GAS EXTRACTION

Schedule D of the licence requires the licensee to conduct monthly monitoring of gas levels on the perimeter and in the waste of the landfill site. The gas is monitored using a GA2000 infra-red monitoring device. The monitoring locations are shown on Table 5.9 and shown in Drawing in Appendix I (External Gas Monitoring Points).

Table 5.9 Landfill Gas Monitoring Locations

Landfill Gas Wells within Waste and Boundary Locations	GW1 to GW47 inclusive (as shown on Drawing No. 004 of the Restoration Plan for 34-1 (Nov 2002) agreed by the Agency)
Piezometers Boundary Locations	G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G16, G17, GM1, GM2, GM3, GM4, GM5, GM6, GM7, GM8, GM24

Landfill gas around the periphery of the site is indicated by piezometers as shown in Table 5.7 above. GM7 and GM8 are no longer monitored.

A landfill gas trench has been installed to the west of the active landfill site to intercept the potential pathway of the gas migrating from the current active landfill site. Piezometers GM5 to GM7, G4 to G10 are to the west of the landfill gas trench.

A permanent gas extraction system has been installed at the facility. This includes a gas collection layer and 47 landfill gas extraction wells laid out on a grid system over the main body of the site. The wells are connected via 63mm diameter pipework to a 250mm diameter main gas collection pipe. A 600m^3 enclosed Flare Unit and SCADA system has been installed. The boreholes in the area of historical fill have also been attached to the active gas collection system. Records of field balancing are maintained.

Monthly monitoring of periphery piezometers around Dundalk Landfill site have indicated no exceedances for methane greater than or equal to 1.0% v/v. The highest recording was G6 of 0.8% v/v during the monitoring period.

There were a number of exceedances of Carbon Dioxide greater than or equal to 1.5% v/v as follows;

- April G9 7.5% v/v, G20 5.7 % v/v
- May G9 7.5% v/v, G20 4.2 % v/v
- June G9 5.5 % v/v, G20 3.9 % v/v

5.11 ESTUARINE SOIL SAMPLES

Sediment sampling was not undertaken in 2012.

5.12 DUST MONITORING

Dust monitoring was carried out three times in the year. Table 5.10 details the results of the three dust monitors installed on site. The waste licence requires dust deposition limits to be no more than **350** mg/m^2/day.

Table 5.10 Dust Monitoring Results

Sampling Period	Dust Monitor 1	Dust Monitor 2	Dust Monitor 3
22/05/2012 19/06/2012	362.8	29.5	53
24/07/2012 22/08/2012	15.3	25	26.2
Date collected 07/01/2013	37.5	105.4	25.2

From Table 5.10 it can be seen that all dust deposition levels in all periods are below the limits except in DG1, which exceeds the licence requirements in June – July which is slightly over the **350** mg/m^2/day limit. It not thought that these exceedances are a result of operations at the recycling facility. No complaints were received nor was problem with dust noted during this period.

5.13 COMPOSTING MONITORING

V & W recycling compost hedge grass & hedge cuttings from Civic Amenity users. 2,827 tonnes was received for composting in 2012. Compost testing was undertaken by Bord na Mona Ltd and is provided in Appendix J. Samples are taken from 5 separate locations and depths within the compost pile to ensure a representative composite sample can be achieved. The sampling of compost takes place from the static pile before the screening process and hence does not take account of the filtering process. The compost is passed through a rotating drum type sieve prior to bagging. Heavier material is returned to the process. Compost is also stored on site for 6 months (held over winter).

The four samples of compost were sent for analysis. The samples of compost were checked for compliance against Schedule F of Waste Licence W0034-02;

- **24th May 2012**

  Sample complied with Schedule F, Maturity tests 1, 3 and 4. The results show that the compost if fully stable. Contaminants were <0.01 % for all sieve sizes from 2-4 mm above. Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost. Sample complied with the human pathogen test BSI PAS 100 Standard Limits (Salmonella s.p.p absent in 25g sample and E. coli <1,000 CFU/g)

- **11th July 2012**

  Sample complied with Schedule F, Maturity tests 3 and 4. The specific oxygen uptake test was >10 mgO_2/gdm/h. Contaminants were <0.01 % for all sieve sizes above from 2-4 mm except for stone at 1.02%. Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost. Sample complied with the human pathogen test BSI PAS 100 Standard Limits (Salmonella s.p.p absent in 25g sample and E. coli <1,000 CFU/g)

- **6th November 2012**

  Sample complied with Schedule F, Maturity tests 3 and 4. The specific oxygen uptake test was 11.5 $mmolO_2$/kgOS/h which is moderately stable in accordance with Bord Na Mona Maturity Indicator Values. Contaminants were <0.01 % for all sieve sizes above from 2-4 mm except for stone at 0.78% (2-4 mm) and 1.72 (4-8 mm). Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost. Sample complied with the human pathogen test BSI PAS 100 Standard Limits (Salmonella s.p.p absent in 25g sample and E. coli <1,000 CFU/g)

- **29th January 2012**

  Sample complied with Schedule F, Maturity tests 1, 3 and 4. The results show that the compost if fully stable. Contaminants were <0.01 % for all sieve sizes from 2-4 mm above. Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost except for Nickel (58.6 mg/kg,dry mass). Sample complied with the human pathogen test BSI PAS 100 Standard Limits (Salmonella s.p.p absent in 25g sample and E. coli <1,000 CFU/g).

As stated above the sampling of compost takes place from the static pile before the screening process and hence does not take account of the filtering process. Contaminants are removed on site by a screening process undertaken by V&W Recycling, whereby the compost is passed through a rotating drum type sieve prior to bagging. Heavier material is returned to the process.

5.14 BIOFILTER MONITORING

Composting is undertaken in a proprietary vacuum aerated static pile system complete with Biofilters, supplied by Celtic Composting Systems of Cork. Biofilter monitoring has also been undertaking in accordance with Schedule D of the licence.

5.14.1 Bed Media

Moisture content, pH, Ammonia and Total viable counts were analysed for the bed media gases and are provided in Appendix J. There are no limits in waste licence for these parameters.

5.14.2 Inlet and Outlet Gas

Ammonia, Hydrogen sulphide and Mercaptans were measured on inlet and outlet gases and the results are provided in Appendix J. These are below the emission limit in C5.

5.15 METEOROLOGICAL MONITORING

Temperature and rainfall readings are taken from Dublin Airport.

Table 5.11 Summary of Meteorological Monitoring for the Reporting Period

Total Rainfall in Millimetres for Dublin Airport													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2012	63.0	20.5	25.6	90.2	60.4	147.7	85.3	78.1	83.4	71.0	72.0	52.3	849.5
mean	62.6	48.8	52.6	54.1	59.5	66.7	56.2	73.3	59.5	79.0	72.9	72.7	757.9

Mean Temperature in Degrees C. for Dublin Airport													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2012	6.1	6.6	8.0	6.6	9.8	12.7	14.0	15.3	12.0	8.4	6.4	5.4	9.3
mean	5.3	5.3	6.8	8.3	10.9	13.6	15.6	15.3	13.4	10.5	7.4	5.6	9.8

6.0 RESOURCE AND ENERGY CONSUMPTION SUMMARY

Consumption of resources for the reporting period is shown in Table 6.1 below.

Table 6.1 Consumption of Resources

Parameters	CWF	Unit
Electricity	3,970	kWh
Water	2,640	m^3

7.0 DEVELOPMENT / INFRASTRUCTURAL WORKS IN PLACE AND PLANNED, TO PROCESS WASTE QUANTITIES PROJECTED FOR THE FOLLOWING YEAR (INCLUDING PLANT OPERATING CAPACITY, PROVISION OF ADEQUATE STANDBY CAPACITY AND PROVISION OF CONTINGENCY, BACKUP AND SPARES IN THE CASE OF BREAKDOWN).

There is no additional development /infrastructural works planned for 2013 in the recycling facility and landfill site.

7.1 PLANTS AND METHODS

The current plant on site comprises of;

- Compactor – The current compactor is used to bale recyclable materials
- Hopper – The hopper is used to accept recyclables.
- Conveyer Belt – The conveyer belt is used to sort materials
- Wood Shredder – The wood shredder is used to shred wood received at the Civic Waste Facility.

All machines have a 50% back-up capacity and V & W Recycling also have access to spares as required.

7.2 PROPRIETARY VACUUM AERATED STATIC PILE SYSTEM

The licence also allows composting of biodegradable waste and green waste to 4,000 tonnes per annum. A Proprietary Vacuum Aerated Static Pile System has been installed. No food waste is utilised through the composting system. Celtic Composting systems biofilters (2) were specified to have capacity of 8,000 tonnes of compost, thus providing 100% spare capacity in the event of breakdown.

8.0 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS FOR THE FORTHCOMING YEAR

The following developments works (Environmental Objectives and Targets) will be carried out in 2013;

1. Investigate the potential impact on the stream to the north of the site
2. Investigate the feasibility of using the landfill gas to;
    - Recharge electric vehicles for use by DTC works department. This energy recovery may reduce DTC fuel costs and the carbon footprint and provide a lead by example to the Dundalk community.
    - Provide power for use by the compost making facility.
3. Investigate the potential to downsize flare from 600 m3 to 300 m3 . This will better aid run time and burn temperatures.
4. Investigate the potential to run flare on a timer.

9.0 TANK, DRUM, PIPELINE AND BUND TESTING AND INSPECTION REPORT

The use of specialist Oil tanks was approved by EPA and installed as part of the extension to the Civic Amenity Site in 2004/2005, provided these tanks were protected from vehicular impact. This was done by the provision of railings and the tanks are then set in additional recesses. There are no other bunds on site. No other inspections are undertaken.

10.0 FULL TITLE AND A WRITTEN SUMMARY OF ANY PROCEDURES DEVELOPED BY THE LICENSEE IN THE YEAR, WHICH RELATES TO THE FACILITY OPERATION

The Environmental Management System and Environmental Management Plan were reviewed and updated in 2006 to include the procedures for the Recycling Centre and the closure of the Landfill site. A new flare procedure was developed in 2012 and is available for viewing on site.

11.0 REPORT ON INCIDENTS AND COMPLAINTS SUMMARIES

No complaints were received from the public and no incidents were reported. A site audit was carried out at the facility in July 2012. A summary is provided in Table 11.1.

Table 11.1 Summary of Non Compliances and Audit Observations Noted During Audits/Landfill Site Inspections Undertaken During the Reporting Period by EPA

Inspection Date and Reference	Summary of Audit Findings	Actions Taken to Address the Observations
12/07/12 **Issue date:** **26/07/12 Reference No:** **(W0034-02/02/12/SI10EM**	**Non Compliances** None **Audit Observations** Landfill Gas. Leachate Other Issues	A new flare procedure has been developed. New management staff have familiarise themselves with landfill gas system. Surface water steam investigation underway.

12.0 REVIEW OF NUISANCE CONTROLS

12.1 DUST CONTROL

There was one breach of the dust deposition limit in 2012. Daily wind directions are taken and during episodes of high winds no movement of compost is undertaken. In addition operational activities to 'wet down' materials are in place.

12.2 LITTER

The landfill site was closed in October 2002 and therefore there is no wind blown litter arising from the landfill site. V & W Recycling (operators) of recycling facility do regular litter picks on blown paper waste etc and regular site clean up.

12.3 ODOURS

The landfill site was closed in October 2002 and therefore the potential for odours has been reduced. The permanent capping and installation of an active extraction system reduces the occurrence of odour from landfill gas.

The doors to the waste processing building are kept closed where possible; the biofilters minimize the odours from the composting process in the recycling facility.

Odour is checked on a daily basis by V & W Recycling.

12.4 PEST CONTROL (VERMIN)

Pest control is undertaken by V & W Recycling. Bait traps are checked on a weekly basis.

12.5 NOISE

The measurements were completed completed on Wednesday and Thursday 28th – 29th November in accordance with the following environmental noise standards:

- ISO 1996: 2007 Acoustics – Description and Measurement of Environmental Noise, Parts 1-4.
- EPA Guidance Note for Noise (NG4) 2012.

NSL 1: Daytime: LAeq (T 30 min) 69-68dBA;
Evening time: LAeq (T 15 min) constant at 65dBA;
Night time: LAeq (T 15 min 61-51dBA

NSL 2: Daytime: LAeq (T 30 min) 57-55dBA;

Evening time: LAeq (T 15 min) constant at 52dBA;
Night time: LAeq (T 15 min) 49-44dBA

NSL 3: Daytime: LAeq (T 30 min) 69-67dBA;
Evening time: LAeq (T 15 min) 63-62dBA;
Night time: LAeq (T 15 mins) 59-54dBA

NSL 4: Daytime: LAeq (T 30 min) 66-65dBA;
Evening time: LAeq (T 15 min) 57-56dBA;
Night time: LAeq (T 15 mins) 55-54dBA

Traffic was found to be the predominant source of noise at all locations. Reduced traffic noise levels during the night-time measuring period provides a more accurate representation of background noise against which any potential noise levels arising from the site activities could be compared. The findings show that during the night-time measurements and during lulls in traffic noise there was no noise audible from the landfill site. Hence it is considered to be in compliance with NG4 and Waste licence W0034-02 requirements.

13.0 VOLUME OF LEACHATE PRODUCED AND VOLUME OF LEACHATE TRANSPORTED DISCHARGED OFF SITE

A leachate drainage ditch has been constructed along the southern boundary of the landfill, laid to a nominal invert of 3.65 m (this being the level of the highest tide recorded in Dundalk). The base of the trench is lined with bentonite matting over which a 150 mm diameter perforated pipe is placed and the trench is then backfilled with clean stone. Any leachate/runoff entering the trench drains to the perforated pipe and from there drains via a manhole/ monitoring point to the foul sewer.

The trench is connected to the foul sewer running along the western boundary of the site. The in situ flow meter has been removed as agreed with the EPA. No flow has been observed in this trench during inspections.

14.0 REPORTS ON FINANCIAL PROVISION MADE UNDER THIS LICENCE, MANAGEMENT AND STAFFING STRUCTURE OF THE FACILITY, AND A PROGRAMME FOR PUBLIC

The management and staffing structure for the facility is as follows;

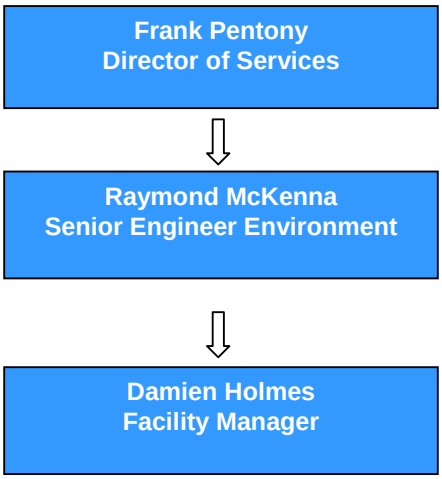


Figure 14.1 Management Structure at Dundalk Landfill Site

14.1 STAFFING STRUCTURE

The recycling facility is being operated by third party (V & W recycling) on behalf of Dundalk Town Council. There is currently 14 staff members employed at the recycling facility. This consists of:

- managers
- supervisors
- general operatives

The public information programme is provided in the Environmental Management System for the site.

15.0 ANNUAL BUDGET AND SITE RUNNING COSTS

The recycling facility is operated by third party (V & W Recycling) on behalf of Dundalk Town Council. A €2.00 entrance charge is applicable to all users of the site except for the disposal of electrical goods.

The budget for 2013 for landfill site is €65,000.

APPENDIX A

WATER BALANCE CALCULATION

WATER BALANCE CALCULATION

Year	Active Phase	Active Area $A(m^2)$	Waste Input t/month	Rainfall mm	Active Area Infilitration $AR(A)(m^3)$	Temp Restored area	Temp Restored area(Temp) $RCA(m^2)$	Restored area(Temp) infiltration IRCA(m3)	Permanently Restored area	Restored area $RCA(m^2)$	Total Water	Cumulative Water	Absorptive Capacity aW(m3)	Cumulative Absorptive Capacity	Cumulative Leachate	Leachate produced Lo(m3)
2012	Closed		0.00	849.5	0				79000	6711	6711	6711	0.00	0.00	6711	6711
Total			**0.00**	**849.5**	**0**			**0**		**6711**			**0**			**6711**

Assumptions

IRCA	Temporarily capped/restored area infiltration of rainfall estimated %	30%	%
	Permanent capped/restored area infiltration of rainfall estimated % (2-10%)	10%	%
Absorptive Capacity	waste density of 0.8 tonnes/m3. Estimated absorptive capacity (water per tonne waste before leachate is produced) t/m3	0.06	t/m3
Restored Area	Area	79,000	m^2
Rainfall	Rainfall taken from Dublin Airport	849.5	mm

APPENDIX B

PRTR REPORTING

| PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility | Filename : W0034_2012.xls | Return Year : 2012 |

Environmental Protection Agency

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.16

REFERENCE YEAR	2012

1. FACILITY IDENTIFICATION

Parent Company Name	Dundalk Town Council
Facility Name	Dundalk Landfill & Civic Waste Facility
PRTR Identification Number	W0034
Licence Number	W0034-02

Waste or IPPC Classes of Activity

No.	class_name
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
3.11	Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.12	Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
4.10	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.3	Recycling or reclamation of metals and metal compounds.
4.4	Recycling or reclamation of other inorganic materials.
Address 1	Newry Road
Address 2	Dundalk
Address 3	Co. Louth
Address 4	
	Louth
Country	Ireland
Coordinates of Location	-6.39622 54.0147
River Basin District	GBNIIENB
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Damien Holmes
AER Returns Contact Email Address	damien.holmes@louthcoco.ie
AER Returns Contact Position	Facility Manager
AER Returns Contact Telephone Number	041 6859019
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	
Production Volume	20000.0
Production Volume Units	tonnes
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0

4.1 RELEASES TO AIR

Link to previous years emissions data

| PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility | Filename : W0034_2012.xls | Return Year : 2012 | 07/05/2013 10:25

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used		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)					4011.8	227229.1	0.0	223217.3

* 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: Dundalk Landfill & Civic Waste Facility

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used		Facility Total Capacity m3 per hour	
			Method Code	Designation or Description		
Total estimated methane generation (as per site model)	423805.0				N/A	
Methane flared	196576.0				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)	227229.0				N/A	

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

| PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility | Filename : W003 07/05/2013 10:25

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used		S1			
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
06	Ammonia (NH3)	C			715.0	715.0	0.0	0.0
79	Chlorides (as Cl)	C			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 B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs				
POLLUTANT		METHOD			QUANTITY				
			Method Used		S1				
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
303	BOD	C			9027.0	0.0	9027.0	0.0	0.0
306	COD	C			16054.0	0.0	16054.0	0.0	0.0
240	Suspended Solids	C			3567.0	0.0	3567.0	0.0	0.0
343	Sulphate	C			393.0	0.0	393.0	0.0	0.0

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

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility | Filename : W0034_2012.xls | Return Year : 2012 | 07/05/2013 10:26

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	20 01 99	No		other fractions not otherwise specified	D1	M	Weighed	Onsite of generati	V&W Recycling to Whiteriver Landfill Co Louth,WCP?MH?2001/90C	Dundalk Civic amenity Site,Newry Road,Dundalk .,.,Ireland		
Within the Country	20 03 03	No		street-cleaning residues	D1	M	Weighed	Onsite of generati	V& W Recycling Whiteriver Landfill Co Louth,WCP/MH/200190C	Dundalk Civic Amenity Site,Newry Road,Dundalk.,.,Ireland		
Within the Country	20 03 01	No	478.0	mixed municipal waste	D1	M	Weighed	Offsite in Ireland	Whiteriver Landfill Site ,W0060-03	Gunstown Townland,Dunleer,.,Co Louth,Ireland		
Within the Country	20 02 01	No	2665.0	biodegradable waste	R3	M	Weighed	Onsite of generati	V& W Recycling ,W0034-02	Dundalk Civic Amenity Site,Newry Road,Dundalk.,.,Ireland		
To Other Countries	15 01 01	No	960.0	paper and cardboard packaging	R3	M	Weighed	Abroad	Peute Europe,nl 6000076	Baahoekweg 4,LA Dordrecht,.,.,Netherlands		
To Other Countries	20 01 01	No	470.0	paper and cardboard	R3	M	Weighed	Abroad	Peute Europe,nl 6000076	Baahoekweg 4,LA Dordrecht,.,.,Netherlands		
To Other Countries	15 01 07	No	406.0	glass packaging	R5	M	Weighed	Abroad	Glassdon ,NI licenceLN/06/08	52 Creagh Road,Toomebridge,Co Antrim,BT41 3SE,United Kingdom		
To Other Countries	15 01 04	No	277.0	metallic packaging	R4	M	Weighed	Abroad	John Tinnelly & Sons,WMEX 20/01	Newtowncloughogue,Newry, Co Down,BT38 8LZ,United Kingdom		
Within the Country	15 01 02	No	590.0	plastic packaging	R3	M	Weighed	Offsite in Ireland	Shrabra Plastic IRL,Licence No 15/5	Killycard ind est ,Castleblayey,Co Monaghan,.,Ireland		
To Other Countries	20 01 11	No	21.0	textiles	R3	M	Weighed	Abroad	Cookstown NI WMEX 01/11,Cookstown NI WMEX 01/11	36 Magheralane Road,Randalstown,County Antrim,.,United Kingdom		
Within the Country	15 01 03	No	540.0	wooden packaging	D1	M	Weighed	Offsite in Ireland	Whiteriver Landfill Site ,W0060-03	Gunstown Townland,Dunleer,.,Co Louth,Ireland		
Within the Country	20 01 38	No	580.0	wood other than that mentioned in 20 01 37	D1	M	Weighed	Offsite in Ireland	Whiteriver Landfill Site ,W0060-03	Gunstown Townland,Dunleer,.,Co Louth,Ireland		
Within the Country	16 06 01	Yes	606.0	lead batteries	R4	M	Weighed	Offsite in Ireland	Rilta Environmental Ltd,Licence No W0192-02	Block 402 Grants Drive,Greenogue Business Park,Rathcoole ,Co Dublin,Ireland		
Within the Country	13 02 05	Yes	5.56	mineral-based non-chlorinated engine, gear and lubricating oils	R9	M	Weighed	Offsite in Ireland	Enva ,WO184-01	Clonminam Industrial Estate,Portlaoise,Co. Laois .,.,Ireland		
Within the Country	20 01 25	No	3.0	edible oil and fat	R9	M	Weighed	Offsite in Ireland	Enva ,WO184-01	Clonminam Industrial Estate,Portlaoise,Co. Laois .,.,Ireland		
Within the Country	17 01 07	No	945.0	mixture of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	D1	M	Weighed	Offsite in Ireland	Whiteriver Landfill Site ,W0060-03	Gunstown Townland,Dunleer,.,Co Louth,Ireland		
Within the Country	20 01 28	No	2.73	paint, inks, adhesives and resins other than those mentioned in 20 01 27	R3	M	Weighed	Offsite in Ireland	Enva ,WO184-01	Clonminam Industrial Estate,Portlaoise,Co. Laois .,.,Ireland		

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

APPENDIX C

FLARE EMISSION REPORT

ODOUR & ENVIRONMENTAL ENGINEERING CONSULTANTS

Unit 32 De Granville Court, Dublin Rd, Trim, Co. Meath

Tel: +353 46 9437922
Fax: +353 46 9483696
Mobile: +353 86 8550401
E-mail: info@odourireland.com
www.odourireland.com

TITLE: AIR EMISSION TESTING OF ONE LANDFILL FLARE LOCATED IN DUNDALK TOWN COUNCIL LANDFILL, NEWRY ROAD, DUNDALK, CO. LOUTH

PREFORMED BY ODOUR MONITORING IRELAND ON BEHALF OF LOUTH COUNTY COUNCIL

PREPARED BY:	Dr. John Casey
ATTENTION:	Mr. Damien Holmes
LICENCE NUMBER:	WL0034-02
LICENCE HOLDER:	Dundalk Town Council
FACILITY NAME:	Dundalk Town Landfill Facility
DATE OF MONITORING VISIT:	23rd Nov. 2012
NAME AND ADDRESS OF CLIENT ORGANISATION:	Dundalk Town Council Landfill, Newry Road, Dundalk, Co. Louth
NAME AND ADDRESS OF MONITORING ORGANISATION:	Odour Monitoring Ireland, Unit 32 DeGranville Court, Dublin Road, Trim, Co. Meath
DATE OF REPORTING:	01st Feb. 2013
NAME AND THE FUNCTION OF THE PERSON APPROVING THE REPORT:	Dr. Brian Sheridan, Managing Partner, Odour Monitoring Ireland
REPORT NUMBER:	2013585(1)
REVIEWERS:	Dr. Brian Sheridan

TABLE OF CONTENTS

Document Amendment Record

Client: ***Dundalk Town Council***

Project: Air emission testing of one enclosed Landfill flare located in Dundalk Town Council Landfill, Newry Road, Dundalk, Co. Louth

Project Number: 2013585(1)			**Document Reference:**		
2013585(1)	Document for review	B.A.S.	JWC	B.A.S	01/02/2013
Revision	**Purpose/Description**	**Originated**	**Checked**	**Authorised**	**Date**

Signing sheet

_____

Brian Sheridan Ph.D Eng

For and on behalf of Odour Monitoring Ireland

1. Executive Summary

The results of the monitoring exercise are contained in Section 2 of this report.

- NO_x as NO_2 emissions from flare 1 were within the emission limit values specified in Waste licence W0034-02;

1.1 Monitoring Objectives

This report has been prepared by Odour Monitoring Ireland and contains the results of emission testing carried out on 1 No. Enclosed ground flare at Dundalk Town Council Landfill, Newry Road, Dundalk, Co. Louth. The monitoring was carried out at this facility as part of compliance monitoring with the requirements of Waste licence W0034-02. The emission testing was carried out by Odour Monitoring Ireland on behalf of Louth County Council.

1.2 Special Monitoring Requirements

There were no special monitoring requirements for this campaign.

1.3 The substances to be monitored at each emission point

The parameters listed in *Table 1.1* were monitored using the appropriate instrumentation as illustrated in *Table 1.1*. All monitoring was carried out in accordance with Environmental Protection Agency Office of Environmental Enforcement (OEE) Air Emission Monitoring Guidance Note 2 (AG2).

Table 1.1. Monitored parameters and techniques for Dundalk Town Council Landfill 1 No. Enclosed flare

Sample location	Parameter	Analytical method
1 Landfill Flare outlet	Volumetric airflow rate & Temperature (^{0}C)	Pitot in accordance with EN13284-1 where possible. MGO coated K type thermocouple and PT100 Volumetric airflow rate theoretical calculated for Landfill flare.
1 Landfill Flare outlet	Oxides of nitrogen (NO_X as NO_2), Carbon monoxide (CO), Carbon dioxide (CO_2), Sulphur dioxide (SO_2), and Oxygen (O_2)	Horiba PG250 gas analyser, NOx ISEN14792-2006

This report presents details of this monitoring programme. This environmental monitoring was carried out Dr. John Casey, Managing Partner, Odour Monitoring Ireland on the 23rd Nov. 2012. Methodology, Results, Discussion and Conclusions are presented herein.

2. Monitoring Results

This section will present the results of the monitoring exercise.

2.1 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load
Flare1	23/11/2012	Landfill flare	Continuous	Landfill Gas	N/A	None	Landfill Gas

2.2 Monitoring Result Reference Conditions

Emission Point Reference	Temperature (K)	Pressure	Moisture Correction	Oxygen Correction (%)
Flare1	K	101.3	Yes	3

2.3. Sampling Location Summary

Comment	Yes/No
Recommended 5 hydraulic diameters straight length before sampling plane	N/A
Recommended 2 hydraulic diameters straight length after sampling plane	N/A
Ports number <1.5m - 2 ports >1.5m - 4 ports	1 port
Appropriate port size	Yes
Suitable working platform	Yes

Note: Temperature and airflow rate traverse measurements were performed across the stack in one plane only. Only one plane was possible due to access port issues.

2.4. Sampling run times for the monitoring of 1 landfill flare

Parameter	**Approx. Sampling period for 1 landfill flare**
Inlet CH_4	30 minutes
Inlet O_2	30 minutes
Volumetric air flow rate	Theoretically calculated
SO_2	30 minutes
NO_x	30 minutes
CO	30 minutes
O_2	30 minutes
CO_2	30 minutes
Stack gas temp	30 minutes

2.5. Characteristics of raw inlet gas to 1 enclosed Landfill flare gas burner

Parameter	Compound loading Con 1 Flare1	Units
CH_4	28.3	%
CO_2	20.9	%
O_2	2.2	%
Volumetric flow rate	194	m^3/hr

2.6. Theoretically calculated landfill gas exhaust volume and physical characteristics from the Landfill flare.

Parameter	Con 1 Fl 1
Total Volumetric methane loading (m^3/hr)	54.9
Total Volumetric Oxygen loading (m^3/hr)	4.2
Ratio to complete combustion of methane assuming no excess Oxygen	9.57
Oxygen concentration level in flue gas (%)	7.88
Flue gas temperature (Kelvin)[2]	1,337
Theoretical calculated Volumetric exhaust airflow rate (m^3/h)	1,147
Normalised average exhaust airflow rate ($Nm^3\ h^{-1}$)[3]	234

Notes: [1] denotes data from 23/11/2012.
[2] denoted converted from degrees Celsius to Kelvin (^0C + 273.15);
[3] denotes normalised to 273.15 Kelvin and 101.3 kPa.

Table 2.7. Emission value results for landfill gas Flare 1.

Flare 1	Conc.	Normalised (mgN/m^3)	Oxygen corrected emission concentration to flare (mgN/m^3) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%)[1]	Emission limit Values	Operating Status
Total NOx [as NO_2] (ppm)	17	34.85	47.91	0.008	16.54	<150 mg/Nm^3	As Normal
CO (ppm)	0	0	0.00	-	3.21	-	As Normal
SO_2 (ppm)	2	5.7	7.84	0.001	21.4	-	As Normal
O_2 (%)	7.88	-	-	-	-	-	As Normal
Temperature (degrees)	1064	1337K	-	-	-	>1273K	As Normal
CO_2 (%)	7.25	-	-	-	-	-	As Normal
Volumetric Airflow (m^3/hr)	-	-	-	170		<3,000 m^3/hr	As Normal
Efficiency (%)	99.99	-	-	-	-	-	As Normal

Notes: [1] denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources.
Span concentration NO = 300 ppm, Span value at analyser = 300ppm, Leak check <2% = 299 ppm.

3. Discussion of results

Tables 2.1 to *2.7* present the results of the emission monitoring carried out on the 1 landfill flare located in Dundalk Town Council Landfill, Newry Road, Dundalk, Co. Louth.

There was very little variation at one traverse in oxygen and flue gas temperature profiles across the stack during the monitoring exercise (i.e. less than 15% as recommended by the Environment Agency, UK (Environment Agency, 2002)).

A high temperature Inconel 625 and ceramic probe (Testo, Germany) was used to prevent variations in CO emissions data. Normal stainless steel probes when subjected to temperatures above 600^0C can release CO from within the structure of the material and cause the recording of erroneous results (Environment Agency, 2002).

Correction of data to 3% oxygen was performed. Due to possible inaccuracies in airflow rate measurement, it was not possible to determine the oxygen intake of the flare through the louver system using measurement. Since the volume of intake air required for complete combustion was known and the oxygen concentration in the exhaust flue gas was known, the volume of intake excess fuel air could be theoretically calculated through numerous iterations using the Solver program (i.e. Microsoft Excel). This allows for the calculation of the volume of intake excess air through the louver landfill flare intake system (Environment Agency, 2002).

4. Conclusion

The following conclusions can be drawn from this study:

1. A theoretically exhaust flue gas volume was calculated for the landfill flare.
2. NO_x as NO_2, SO_2, CO and O_2 monitoring and analysis was carried out in accordance with specified requirements;
3. All data was standardised to 273.15 Kelvin, 101.3 kPa;
4. All data is presented as Oxygen corrected to 3% (v/v) using the appropriate equations;
5. NO_x as NO_2 emissions from Flare 1 were within the emission limit values specified in Waste licence W0034-02;

5. References

1. Environment Agency. (2002). Guidance for Monitoring Enclosed Landfill Gas Flares. www.environment-agency.co.uk
2. Environmental Protection Agency. (2009). Air Emissions Monitoring Guidance Note 2 (AG2).

6. *Appendix I*-Sampling, analysis

6.1.1 Location of Sampling

Dundalk Town Council Landfill, Newry Road, Dundalk, Co. Louth

6.1.2 Date & Time of Sampling

23/11/2012

6.1.3 Personnel Present During Sampling

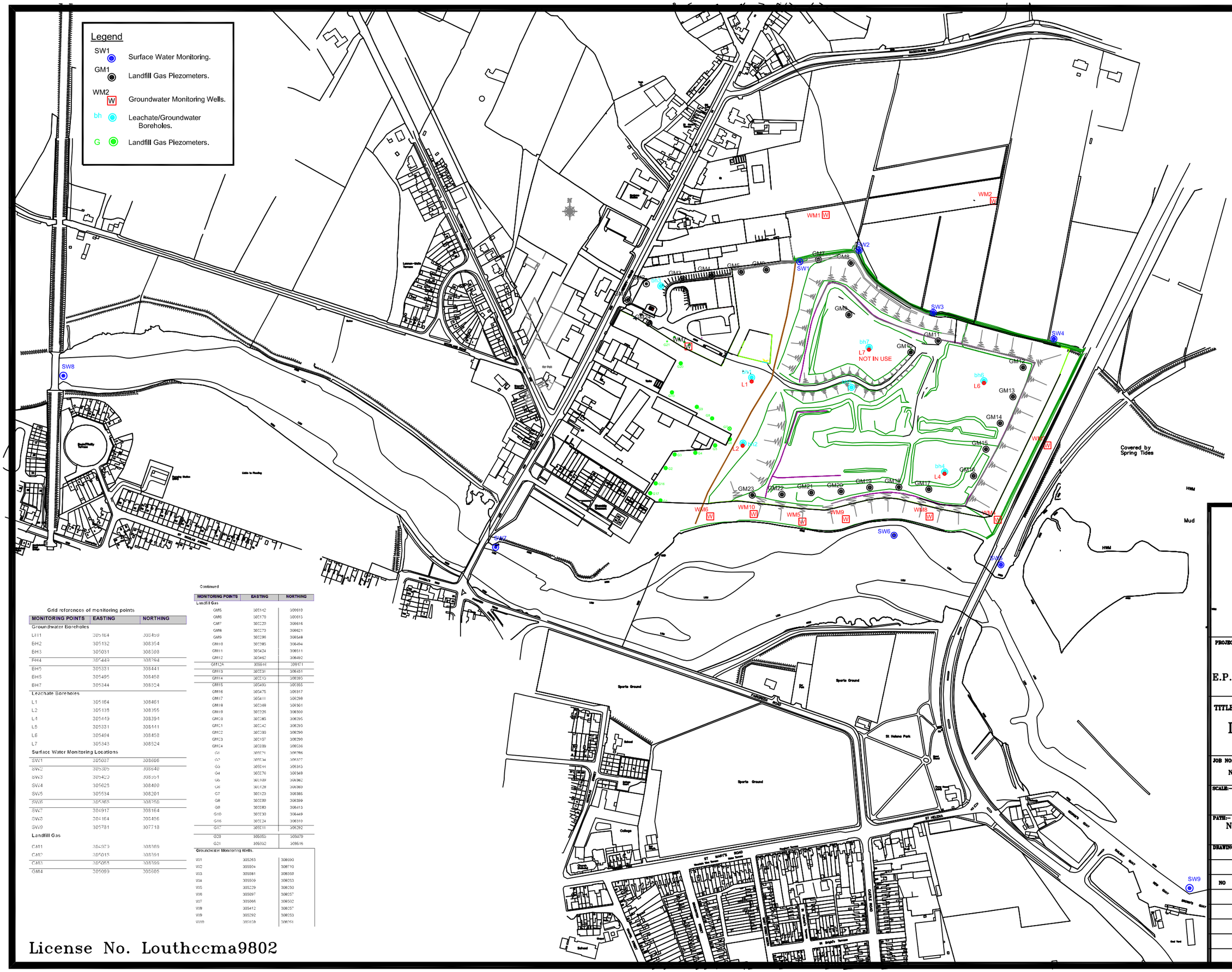
Dr. John Casey, Odour Monitoring Ireland, Trim, Co. Meath.

6.1.4 Instrumentation check list

Testo 350 MXL/454 in stack analyser;
Horiba PG250 gas analyser,
Federal Method 2 S type pitot and MGO coated thermocouple;
L type pitot tube
Testo 400 handheld and appropriate probes.
Ceramic and Inconel 625 sampling probes.

APPENDIX D

MONITORING POINTS DRAWING



Grid references of monitoring points

MONITORING POINTS	EASTING	NORTHING
Groundwater Boreholes		
BH1	305164	308459
BH2	305132	308354
BH3	305031	308308
BH4	305449	308394
BH5	305331	308441
BH6	305495	308458
BH7	305344	308524
Leachate Boreholes		
L1	305164	308461
L2	305138	308355
L4	305449	308394
L5	305331	308441
L6	305494	308458
L7	305343	308524
Surface Water Monitoring Locations		
SW1	305087	308606
SW2	305305	308640
SW3	305423	308551
SW4	305628	308400
SW5	305534	308201
SW6	305365	307950
SW7	304917	308164
SW8	304164	308456
SW9	305781	307718
Landfill Gas		
GM1	304973	308369
GM2	305015	308391
GM3	305068	308399
GM4	305099	308505

Continued

MONITORING POINTS	EASTING	NORTHING
Landfill Gas		
GM5	305142	308510
GM6	305179	308515
GM7	305220	308516
GM8	305273	308521
GM9	305296	308548
GM10	305285	308494
GM11	305424	308511
GM12	305462	308492
GM12A	305516	308471
GM13	305531	308451
GM14	305510	308395
GM15	305493	308355
GM16	305476	308317
GM17	305411	308298
GM18	305369	308301
GM19	305326	308300
GM20	305185	308295
GM21	305142	308293
GM22	305100	308290
GM23	305157	308290
GM24	305009	308336
G1	305071	308766
G2	305134	308377
G3	305091	308343
G4	305076	308348
G5	305109	308362
G6	305129	308369
G7	305123	308385
G8	305098	308399
G9	305083	308413
G10	305030	308449
G16	305024	308310
G17	305011	308292
G20	305053	308479
G21	305062	308616
Groundwater Monitoring Wells.		
W1	305263	308390
W2	305504	308710
W3	305581	308368
W4	305509	308253
W5	305229	308250
W6	305097	308257
W7	305066	308302
W8	305412	308257
W9	305292	308253
W10	305458	308261

License No. Louthccma9802

COMHAIRLE BHAILE DUN DEALGAN

DUNDALK TOWN COUNCIL

Phone (042) 9335579 Fax (042) 9335581

TOWN ENGINEER:- C. DUFF

PROJECT:- Landfill Site Newry Road. E.P.A. LICENCE No.WL 34-2

TITLE:- Location Map

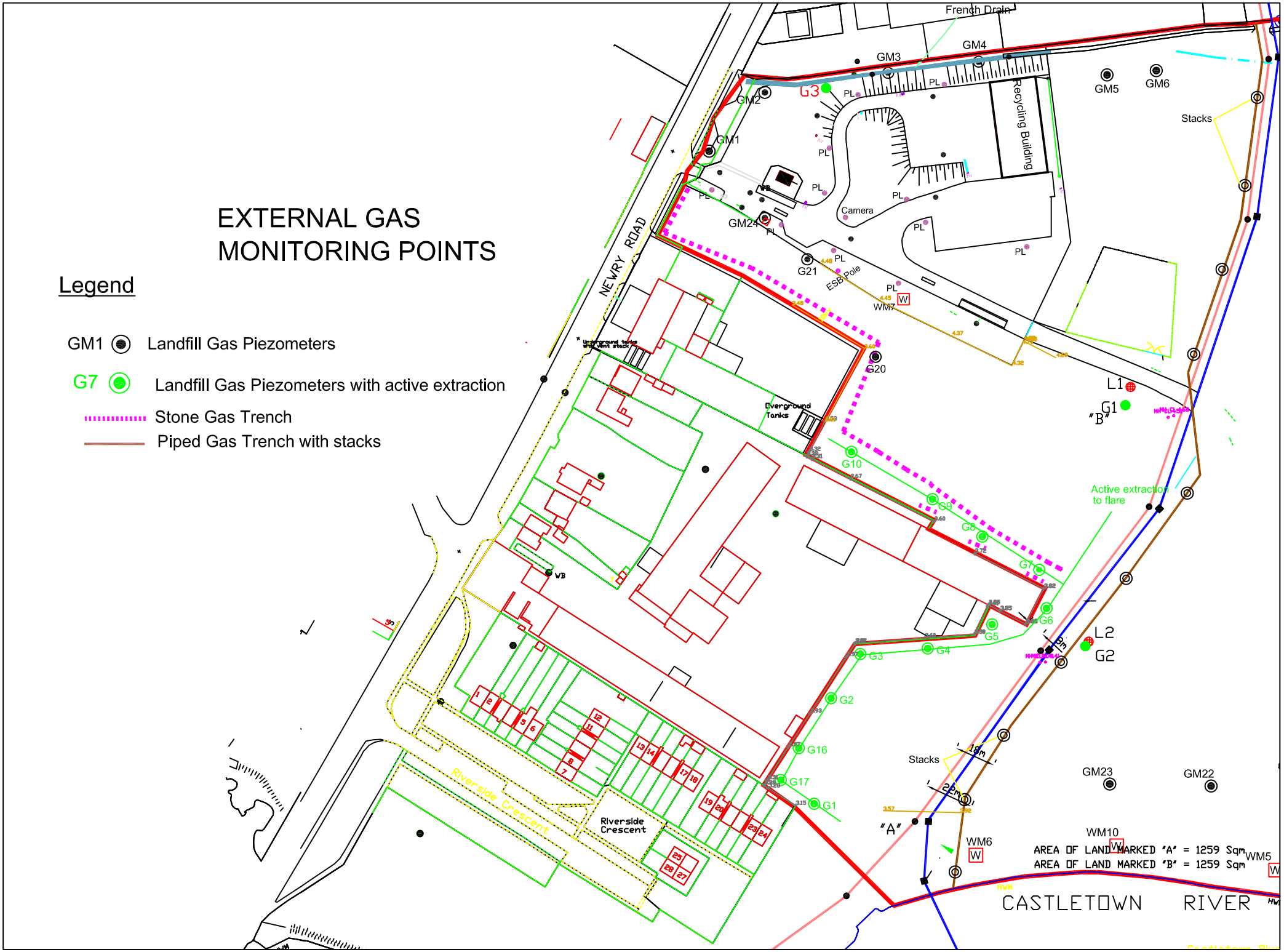
JOB NO:-	DRN.NO:-
NO.2	1
SCALE:-	DATE:-
1 / 2500	14/06/05

PATH:- N:Landfill\Landfill drawings\ Monitoring Locations.dwg

DRAWING BY:- P Mulligan

DRN. No. REVISION

NO	DATE	DETAILS


EXTERNAL GAS
MONITORING POINTS
Legend
GM1 Landfill Gas Piezometers
G7 Landfill Gas Piezometers with active extraction
Stone Gas Trench
Piped Gas Trench with stacks
French Drain
GM4
GM3
GM2
G3
GM1
GM5
GM6
Stacks
Recycling Building
PL
WB
Camera
GM24
G21
ESB Pole
WM7
NEWRY ROAD
G20
L1
G1
"B"
Overground Tanks
G10
G9
G8
G7
G6
G5
G4
G3
G2
G16
G17
G1
Active extraction to flare
L2
G2
Riverside Crescent
Stacks
15m
2m
GM23
GM22
"A"
WM6
WM10
WM5
AREA OF LAND MARKED 'A' = 1259 Sqm
AREA OF LAND MARKED 'B' = 1259 Sqm
CASTLETOWN RIVER
HWM

Dust Mointoring points

Customs Station

Concrete Mixing Plant

Dwelling House

Portacabin Office

N

Car Sales Show Room And Offices

Office

Garage

3.3 m High Block Wall

Existing White Goods Storage Area.

Public Recycling Waste Delivery Area.

Lighting standards to be relocated

EXISTING COMPACTION & SEPARATION AREA

ADDITIONAL STORAGE AREA UNDER CONSTRUCTION

Stacks

ENTRANCE

NEWRY ROAD

WEIGHBRIDGE

4.44

Recycling Trailor Storage Area.

4.51

Proposed Loading Ramp Under construction.

WHEEL WASH

Gates to be Moved to here.

New Palisade Fence

Tanks

COMHAIRLE BHAILE DHUN DEALGAN

DUNDALK TOWN COUNCIL

Phone (042) 32170 Fax (042) 32701

TOWN ENGINEER:- C.DUFF

PROJECT:-

Dust Mointoring Location points.

TITLE:-

SITE LAYOUT MAP

JOB NO:-	DRN.NO:-
	XXXX
SCALE:-	DATE:-
1 / 500	16/06/08

PATH:- O:\ LANDFILL\LANDFILL DRAWINGS\ NEW LOCATION OF DUST MOINTORING .DWG.

DRAWING BY:- P. Mulligan

DRN. No. REVISION

NO	DATE	DETAILS

APPENDIX E

LEACHATE RESULTS

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point:		LH1																		
		RESULTS																		
		Date																		
PARAMETERS	**Units**	**30-Jul-08**	**28-Oct-08**	**27-Jan-09**	**29-Apr-09**	**23-Jul-09**	**28-Oct-09**	**19-Jan-10**	**20-Apr-10**	**28-Jul-10**	**26-Oct-10**	**25-Jan-11**	**11-Apr-11**	**11-Jul-11**	**03-Oct-11**	**16-Jan-12**	**23-Apr-12**	**23-Jul-12**	**08-Oct-12**
Alkalinity	**mg/l CaCO3**																		
Aluminium	**µg/l**				<50				49.6				5.3				6.5		
Ammonia	**mg/l N**	114.43	>80	112.55	1.54	102.7	107.92	1.75	154	103.42	109.52	104.63	102.03	101.78	90.83	93.87	107.62	99.60	101.22
Antimony	**µg/l**																<0.5		
Arsenic	**µg/l**																0.76		
Barium	**µg/l**																465.9		
Beryllium	**µg/l**																<0.5		
B.O.D.	**mg/l O2**	25	23.1		8.4	7.4	12.7	11.6	6.7	4.2	7.7	20.2	21.6	10.8	15	11.7	24.1	14.0	9.6
Boron	**µg/l**				1595.1	1961.2			1140				1249.9				1594.7		
Cadmium	**µg/l**				<0.1	0.1			<0.1				<0.1				<0.1		
Calcium	**mg/l Ca**				167.32	191.32			183.58				180.02				204.92		
C.O.D.	**mg/l O2**	147	238		80	102	145	73	124	116	105	83	95	100	107	102	80	82	104
Chloride	**mg/l Cl**	221	216	176	170	171	154	144	139	166	180	161	154	203	231	195	159	195	182
Chromium	**µg/l**				23	30.1			11.1				9.7				7.4		
Cobalt (µg/l)	**µg/l**																2.2		
Conductivity	**µS/cm @ 25**	2740	2760	2770	2610	2580	2660	2590	2960	2500	2720	2600	2710	2560	2630	2660	2480	2580	2690
Copper	**µg/l**				1.2	3.3			2.6				<0.5				<0.5		
Cyanide	**mg/l CN**						nm				nm	<0.01	nm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
D.O.	**% Saturation**			nm															
Fluoride	**mg/l**					<0.150			<0.150				<0.150				<0.150		
Iron	**µg/l**				11227.3	33120.5			30325.1				19811.7				30384.3		
Lead	**µg/l**				<1	<1			1.1				<0.5				<0.5		
Magnesium	**mg/l Mg**				60.21	56.47			58.55				62.84				66.33		
Manganese	**µg/l**				578.3	604.7			627.3				565.6				647.2		
Mercury	**µg/l**				<0.1	<0.1			<0.1				<0.05				<0.05		
Molybdenum	**µg/l**																0.5		
Nickel	**µg/l**				11	28.5			5.4				<0.5				1.2		
o-Phosphate	**mg/l P**				0.3	0.18	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	0.17	<0.02	<0.02	0.02
pH		6.7	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.7	6.8	6.8	6.9	6.7	6.8	6.9	6.9	7.0	6.7
Potassium	**mg/l**				62.43	74.57			66.39				62.55				70.91		
Residue on Evaporation																			
Sampling Depth (m)	**m**		2.6	5.5				3.2	3.1	4.2									
Selenium	**µg/l**																<0.5		
Silver	**µg/l**																nm		
Sodium	**mg/l**				97.54	124.03			106.98				111.5				130.76		
Strontium	**µg/l**																1169.14		
Sulphate	**mg/l SO4**				<2.0	<2.0			6.6				2.2				4.1		
Suspended Solids	**mg/l**																		
Temp	**°C**	12.9	11	10	15.8	14.8	nm	8.2	9.4	nm	13.1	11.1	nm	18.2	16.1	10.8	10.5	18.2	12.8
Thallium	**µg/l**																<0.1		
Time Sampled		11.3	11.2	11	11	11.3	nt	10.5	10.5	10.45	11:00	11:15	0.454861	11:00	10:15	11:10	10:30	10:20	10:45
Tin (µg/l)	**µg/l**																<1		
T.O.C.	**mg/l**			35.5															
T.O.N	**mg/l N**	<0.05	<0.05		0.11	0.12	<0.08	<0.08	<0.08	<0.08	<0.08	0.18	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Total S Solids	**mg/l**																		
Uranium	**µg/l**																<0.1		
Vanadium	**µg/l**																1.07		
Zinc	**µg/l**				5.2	21			20.7				5				2.4		

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point:		LH2																	
		RESULTS																	
		Date																	
PARAMETERS	**Units**	**30-Jul-08**	**28-Oct-08**	**27-Jan-09**	**29-Apr-09**	**23-Jul-09**	**28-Oct-09**	**19-Jan-10**	**20-Apr-10**	**28-Jul-10**	**26-Oct-10**	**25-Jan-11**	**11-Apr-11**	**11-Jul-11**	**03-Oct-11**	**16-Jan-12**	**23-Apr-12**	**23-Jul-12**	**08-Oct-12**
Alkalinity	**mg/l CaCO3**																		
Aluminium	**µg/l**				<50				23.4				63.8				5		
Ammonia	**mg/l N**	181.92	89.61	107.71	1.79	5.04	91.17	48.07	111.95	80.95	85.94	81.31	101.56	100.18	25.18	56.09	104.8	8.40	76.78
Antimony	**µg/l**																<0.5		
Arsenic	**µg/l**																1.23		
Barium	**µg/l**																393.3		
Beryllium	**µg/l**																<0.5		
B.O.D.	**mg/l O2**	21.3	18.5		35.4	5.1	6.4	60.1	28.1	7.5	5.1	144.4	26	7.1	24.2	10.1	15.8	nm	18.5
Boron	**µg/l**				2335.2	241.1			1335.4				1401.9				1858.9		
Cadmium	**µg/l**				<0.1	<0.1			<0.1				0.1				<0.1		
Calcium	**mg/l Ca**				180.22	99.57			234.08				226.83				260.08		
C.O.D.	**mg/l O2**	186	128		180	13	121	72	148	108	76	222	168	100	38	77	148	21	144
Chloride	**mg/l Cl**	197	115	113	170	15	83	62	114	98	85	78	112	108	27	78	114	11	79
Chromium	**µg/l**				19.8	4			9				17.6				2.7		
Cobalt (µg/l)	**µg/l**																2.6		
Conductivity	**µS/cm @ 25**	3700	2450	2790	3310	680	2260	1803	3020	2260	2250	2300	2810	2610	1148	2110	2700	685	2320
Copper	**µg/l**				3.3	4.7			2.3				4				0.5		
Cyanide	**mg/l CN**						nm				nm	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
D.O.	**% Saturation**			nm															
Fluoride	**mg/l**					0.19			0.16				<0.150				0.15		
Iron	**µg/l**				4909.2	867.4			24610.8				54713.6				10759.3		
Lead	**µg/l**				<1	<1			1.8				3.8				<0.5		
Magnesium	**mg/l Mg**				87.71	14.66			67.31				73.28				86.04		
Manganese	**µg/l**				668.2	130.9			767.7				784.4				855.8		
Mercury	**µg/l**				<0.1	<0.1			<0.1				<0.05				<0.05		
Molybdenum	**µg/l**																1.6		
Nickel	**µg/l**				18	4.7			14.3				1.5				2.2		
o-Phosphate	**mg/l P**				0.54	0.02	0.02	<0.02	<0.02	<0.02	0.03	0.10	0.15	0.03	0.16	0.16	0.03	0.04	0.19
pH		6.9	6.8	6.9	6.9	7.2	6.9	6.9	6.9	6.8	6.9	6.9	6.9	6.8	6.9	6.9	7.1	7.2	6.8
Potassium	**mg/l**				106.62	14.34			73.89				73.94				92.07		
Residue on Evaporation																			
Sampling Depth (m)	**m**		2.4	1				2.9	2.9	4									
Selenium	**µg/l**																<0.5		
Silver	**µg/l**																nm		
Sodium	**mg/l**				142.74	16.09			101.24				102.15				124.94		
Strontium	**µg/l**																1043.19		
Sulphate	**mg/l SO4**				10.1	86.2			10.9				<2.0				4.1		
Suspended Solids	**mg/l**																		
Temp	**°C**	12	11	9	16	14.8	nm	8.9	9.5	nm	13.3	10.0	nm	17.9	16.7	10	10.7	17.9	13.0
Thallium	**µg/l**																<0.1		
Time Sampled		11.5	12.05	11.2	11.2	11.45	nt	11.2	11.2	11.05	11:25	11:45	11:20	11:25	10:35	11:25	10:45	10:35	11:00
Tin (µg/l)	**µg/l**																<1		
T.O.C.	**mg/l**			33.1															
T.O.N	**mg/l N**	<0.05	0.54		0.46	0.45	<0.08	<0.08	<0.08	<0.08	0.09	<0.08	<0.08	0.16	<0.08	<0.08	0.3	0.13	0.98
Total S Solids	**mg/l**																		
Uranium	**µg/l**																0.1		
Vanadium	**µg/l**																0.7		
Zinc	**µg/l**				33.6	15.6			27.5				31.7				23		

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point:		LH4																	
		RESULTS																	
		Date																	
PARAMETERS	**Units**	**30-Jul-08**	**28-Oct-08**	**27-Jan-09**	**29-Apr-09**	**23-Jul-09**	**28-Oct-09**	**19-Jan-10**	**20-Apr-10**	**28-Jul-10**	**26-Oct-10**	**25-Jan-11**	**11-Apr-11**	**11-Jul-11**	**03-Oct-11**	**16-Jan-12**	**23-Apr-12**	**23-Jul-12**	**08-Oct-12**
Alkalinity	**mg/l CaCO3**																		
Aluminium	**µg/l**				<50				35.7				68				9.5		
Ammonia	**mg/l N**	194.38	242.41	1.41	1.22	1.78	131.19	1.58	118.86	169.97	124.6	195.90	1.95	196.2	154.17	1.64	1.63	154.03	114.18
Antimony	**µg/l**																<0.5		
Arsenic	**µg/l**																2.6		
Barium	**µg/l**																185.2		
Beryllium	**µg/l**																<0.5		
B.O.D.	**mg/l O2**	15.5	6.3		10.3	13.4	14.1	16.3	15.9	16	15.4	16.1	24.8	11	19	44.4	71.1	1121.0	33.8
Boron	**µg/l**				2298.4	2888.4			1086.9				1713.5				2319.3		
Cadmium	**µg/l**				<0.1	<0.1			<0.1				<0.1				<0.1		
Calcium	**mg/l Ca**				140.09	162.01			143.63				159.24				194.66		
C.O.D.	**mg/l O2**	212	209		170	190	156	145	147	209	109	174	180	266	140	249	265	2450	176
Chloride	**mg/l Cl**	330	240	199	205	169	98	179	95	255	118	168	211	397	187	181	185	34	132
Chromium	**µg/l**				23.4	28			2.8				6				1.3		
Cobalt (µg/l)	**µg/l**																4.6		
Conductivity	**µS/cm @ 25**	3870	4480	4310	3800	3620	2590	3450	2820	3490	2660	3450	3810	4410	3360	3890	3570	1690	2790
Copper	**µg/l**				2.4	13.4			6.2				1.3				<0.5		
Cyanide	**mg/l CN**						nm				nm	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
D.O.	**% Saturation**			nm															
Fluoride	**mg/l**					<0.150			0.15				<0.150				<0.150		
Iron	**µg/l**				5416.5	30127.9			26317.3				15907.8				29832.9		
Lead	**µg/l**				<1	3			<1				0.5				<0.5		
Magnesium	**mg/l Mg**				86.67	93.1			59.14				88.67				100.14		
Manganese	**µg/l**				780.6	860.7			805				786				1060		
Mercury	**µg/l**				<0.1	<0.1			<0.1				<0.05				<0.05		
Molybdenum	**µg/l**																<0.5		
Nickel	**µg/l**				13.2	29.9			4				1.7				3.8		
o-Phosphate	**mg/l P**				1.6	0.94	0.1	0.14	1.14	0.09	0.09	0.38	0.23	0.07	0.36	1.24	0.57	<0.02	0.16
pH		6.9	7	6.8	6.9	6.9	6.9	6.9	6.9	6.9	6.8	6.9	7	6.9	6.9	6.9	7	7.2	6.8
Potassium	**mg/l**				151.94	149.12			82.74				136.66				157.91		
Residue on Evaporation																			
Sampling Depth (m)	**m**		8.5	8.5				8.9	7.9	4									
Selenium	**µg/l**																0.5		
Silver	**µg/l**																nm		
Strontium	**µg/l**																203.55		
Sodium	**mg/l**				172.92	179.3			92.42				188.7				1101		
Sulphate	**mg/l SO4**				<2.0	<2.0			<2.0				<2.0				2.2		
Suspended Solids	**mg/l**																		
Temp	**°C**	14.2	14	14	16.4	15.9	nm	12.8	12	nm	13.7	13.6	nm	18.1	15.8	12.4	12.1	18.1	13.7
Thallium	**µg/l**																<0.1		
Time Sampled		12.35	12.3	11.45	11.45	12.4	nt	11.5	11.55	11.15	12:20	12:10	12:00	12:00	10:50	12:15	11:10	11:45	11:25
Tin (µg/l)	**µg/l**																<1		
T.O.C.	**mg/l**			45.3															
T.O.N	**mg/l N**	<0.05	<0.05		<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.08	<0.08	<0.08	<0.08	0.89
Total S Solids	**mg/l**																		
Uranium	**µg/l**																<0.1		
Vanadium	**µg/l**																2.51		
Zinc	**µg/l**				4.7	64.9			19.3				13				13.8		

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point:		LH6																	
		RESULTS																	
		Date																	
PARAMETERS	**Units**	**30-Jul-08**	**28-Oct-08**	**27-Jan-09**	**29-Apr-09**	**23-Jul-09**	**28-Oct-09**	**19-Jan-10**	**20-Apr-10**	**28-Jul-10**	**26-Oct-10**	**25-Jan-11**	**11-Apr-11**	**11-Jul-11**	**03-Oct-11**	**16-Jan-12**	**23-Apr-12**	**23-Jul-12**	**08-Oct-12**
Alkalinity	**mg/l CaCO3**																		
Aluminium	**µg/l**				<500				738.1				2554.8				17.5		
Ammonia	**mg/l N**	708.87	707.34	0.05	<0.03	98.25	4.49	1.15	509.45	0.47	<0.03	461.24	0.49	508.6	71.67	1.4	16.75	10.11	14.17
Antimony	**µg/l**																0.91		
Arsenic	**µg/l**																4.53		
Barium	**µg/l**																103.4		
Beryllium	**µg/l**																<0.5		
B.O.D.	**mg/l O2**	211.2	35.6		<40	41	139.5	22	35.9	27.5	28.4	30.0	51.3	24	36	56.1	163.4	141.2	21.7
Boron	**µg/l**				5898.8	667			2099.6				2696.1				98.3		
Cadmium	**µg/l**				<1	<0.1			<0.1				0.4				<0.1		
Calcium	**mg/l Ca**				115.4	227.8			138.39				184.46				257.21		
C.O.D.	**mg/l O2**	1035	818		842	541	703	336	660	486	529	424	785	684	275	557	757	819	255
Chloride	**mg/l Cl**	635	676	442	655	90	500	243	451	445	478	341	570	484	164	334	40	31	28
Chromium	**µg/l**				55.3	19.3			12.1				16.4				<0.5		
Cobalt (µg/l)	**µg/l**																1.9		
Conductivity	**µS/cm @ 25**	8800	9220	7610	9910	2670	8100	4240	8270	6980	7680	5760	7550	6910	2350	5080	1657	1096	1681
Copper	**µg/l**				<10	8.8			5.2				20.6				<0.5		
Cyanide	**mg/l CN**										nm	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	nm	<0.05
D.O.	**% Saturation**			nm															
Fluoride	**mg/l**					0.18			<0.150				<0.150				<0.150		
Iron	**µg/l**				10645	32103.5			26643.2				30512.2				32084.8		
Lead	**µg/l**				<10	6.3			4.1				16.6				<0.5		
Magnesium	**mg/l Mg**				119.1	50.8			83.86				111.45				41.08		
Manganese	**µg/l**				632.9	4635.2			936.7				1276.8				4272.6		
Mercury	**µg/l**				0.2	<0.1			<0.1				<0.05				<0.05		
Molybdenum	**µg/l**																<0.5		
Nickel	**µg/l**				105.1	48.8			52.6				91.6				1.8		
o-Phosphate	**mg/l P**				3.32	2.01	2.95	1.52	2.08	2.37	2.17	0.42	1.13	1.74	<0.02	0.96	<0.02	0.03	<0.02
pH		7.1	7.1	7	7.2	6.7	7.1	6.8	7	7.1	7	7.0	7.2	7	6.8	7	7.1	7.0	6.7
Potassium	**mg/l**				370.32	40.31			257.56				341.6				17.36		
Residue on Evaporation																			
Sampling Depth (m)	**m**		7.5	8				8.1	7.5	3.5									
Selenium	**µg/l**																0.6		
Silver	**µg/l**																nm		
Strontium	**µg/l**																101.34		
Sodium	**mg/l**				535.8	175.45			360.75				526.92				653.49		
Sulphate	**mg/l SO4**				7.4	20.4			8.6				28.3				4.5		
Suspended Solids	**mg/l**																		
Temp	**°C**	16.6	17	16	16.5	15.9	nm	15.1	15.5	nm	13.4	16.9	nm	18	18.4	16	12.2	18.0	14.7
Thallium	**µg/l**																<0.1		
Time Sampled		12.15	12.5	11.55	12.1	12.25	nt	12.15	12.2	11.35	12:20	12:35	12:30	12:20	11:10	12:45	11:30	12:10	11:50
Tin (µg/l)	**µg/l**																<1		
T.O.C.	**mg/l**			134.5															
T.O.N	**mg/l N**	<0.05	<0.05		0.11	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.17	<0.08	<0.08	<0.08	<0.08
Total S Solids	**mg/l**																		
Uranium	**µg/l**																1.38		
Vanadium	**µg/l**																3.56		
Zinc	**µg/l**				<10	141.7			70.2				390.9				3.1		

APPENDIX F

GROUNDWATER RESULTS

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM1

PARAMETERS	Units	RESULTS Date																							
		25-Jan-11	14-Feb-11	28-Mar-11	11-Apr-11	09-May-11	13-Jun-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	**mg/l CaCO3**				408												396								
Aluminium	**µg/l**				<5												<5								
Ammonia	**mg/l N**	0.04	0.05	0.03	0.04	<0.03	0.03	0.04	<0.03	0.87	0.05	0.04	0.17	0.05	0.07	<0.03	<0.03	<0.03	0.06	0.04	<0.03	0.05	0.04	0.03	0.06
Antimony	**µg/l**																<0.5								
Arsenic	**µg/l**																<0.5								
Barium	**µg/l**																87.9								
Beryllium	**µg/l**																<0.5								
B.O.D.	**mg/l O2**																								
Boron	**µg/l**				6												421.7								
Cadmium	**µg/l**				<0.1												<0.1								
Calcium	**mg/l Ca**				118.01												102.99								
C.O.D.	**mg/l O2**																								
Chloride	**mg/l Cl**	598	584	623	623	622	576	530	516	393	459	520	398	524	553	471	512	486	464	435	435	436	463	483	482
Chromium	**µg/l**				0.7												<0.5								
Cobalt	**µg/l**																<0.5								
Conductivity	**µS/cm @ 25**	2920	2930	3080	3060	30100	3010	2640	2780	2310	2700	2700	2090	2890	2760	2680	2680	2620	16860	2600	2730	2700	2720	3090	2560
Copper	**µg/l**				4.6												<0.5								
Cyanide	**mg/l CN**				<0.05												<0.05								
D.O.	**% Saturation**	35			29			46			34			26			22			27			18		
Fluoride	**mg/l**				<0.150						<0.150						<0.60								
Iron	**µg/l**				48.3												<10								
Lead	**µg/l**				<0.5												<0.5								
Magnesium	**mg/l Mg**				59.58												54.92								
Manganese	**µg/l**				10.8												9.7								
Mercury	**µg/l**				<0.05												<0.05								
Molybdenum	**µg/l**																1.9								
Nickel	**µg/l**				<0.5												<0.5								
o-Phosphate	**mg/l P**				<0.02						0.02						0.03								
pH		7.5			7.5			7.4			7.3			7.5			7.6			7.4			7.3		
Potassium	**mg/l**				21.34												23								
Residue on Evaporation	**mg/l**				1802												1654								
Sampling Depth	**m**							3	3	2.5		nm	1.9	2.8	1.2	nm	2.9	3	nm	2.9	2.3	2.9	2.9	2.9	2.9
Selenium	**µg/l**																<0.5								
Silver	**µg/l**																nm								
Sodium	**mg/l**				463.85												461.43								
Strontium	**µg/l**																567.58								
Sulphate	**mg/l SO4**				225.7						225						249.4								
Suspended Solids	**mg/l**																								
Temp	**°C**	11.0			14			18.4			16.6			9.4			12.1			16			15.5		
Thallium	**µg/l**																<0.1								
Time Sampled		12:30	nt	9:45	11:15	09:40	08:55	12:10	11:45	10:45	11:00	11:15	16:10	12:05	10:40	10:10	10:05	11:15	10:40	10:30	10:05	10:00	11:40	09:15	9:30
Tin	**µg/l**																<1								
T.O.C.	**mg/l**	2.3			96			99.3						108			111.5						3		
T.O.N	**mg/l N**				1.33						1.8						0.97								
Total S Solids	**mg/l**																								
Uranium	**µg/l**																1.08								
Vanadium	**µg/l**																0.59								
Zinc	**µg/l**				3												<0.5								
Water Level m OD	**4.77**							1.77	1.77	2.27	4.77	#VALUE!	2.87	1.97	3.57	#VALUE!	1.87	1.77		1.87	2.47	1.87	1.87	1.87	1.87

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM4

PARAMETERS	Units	RESULTS Date																							
		25-Jan-11	14-Feb-11	28-Mar-11	11-Apr-11	09-May-11	13-Jun-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	**mg/l CaCO3**				820												1020								
Aluminium	**µg/l**				6.3												<5								
Ammonia	**mg/l N**	32.23	15.10	16.09	20.74	16.79	23.09	26.45	38.39	27.71	27.17	11.91	20.5	25.52	14.98	0.06	30.36	22.42	17.25	36.98	39.89	31.47	17.56	40.52	35
Antimony	**µg/l**																<0.5								
Arsenic	**µg/l**																<5								
Barium	**µg/l**																31.3								
Beryllium	**µg/l**																<0.5								
B.O.D.	**mg/l O2**																								
Boron	**µg/l**				1499.3												1879.5								
Cadmium	**µg/l**				<0.1												<0.1								
Calcium	**mg/l Ca**				200.54												229.75								
C.O.D.	**mg/l O2**																								
Chloride	**mg/l Cl**	3300	2646	3620	3586	4631	4177	5383	4475	3575	5427	6878	5039	3395	2844	473	3670	4750	5943	3669	3145	2909	4441	3424	3581
Chromium	**µg/l**				1.4												<0.5								
Cobalt	**µg/l**																2								
Conductivity	**µS/cm @ 25**	11540	9550	12430	12100	150800	14700	16300	14800	12330	18630	20900	14130	12180	10320	2670	12500	14390	7960	13400	11550	11520	14710	13790	10750
Copper	**µg/l**				<0.5												<0.5								
Cyanide	**mg/l CN**				<0.05												<0.05								
D.O.	**% Saturation**	28			29			32			23			21			20			35			17		
Fluoride	**mg/l**				<0.150												<0.60								
Iron	**µg/l**				2278.8												814.5								
Lead	**µg/l**				<0.5												<0.5								
Magnesium	**mg/l Mg**				278.44												319.23								
Manganese	**µg/l**				1000												926.1								
Mercury	**µg/l**				<0.05												<0.05								
Molybdenum	**µg/l**																2.3								
Nickel	**µg/l**				<0.5												1.9								
o-Phosphate	**mg/l P**				0.8												0.49								
pH		7.1			7			6.9			7			7.2			7.1			7.2			6.9		
Potassium	**mg/l**				122.37												146.12								
Residue on Evaporation	**mg/l**				7811												8423								
Sampling Depth	**m**							4.1	4.7	4	4.7	nm	1.2	5	1.3	nm	4.6	4.5	nm	3.5	4	4.1	5	4.6	5
Selenium	**µg/l**																6.4								
Silver	**µg/l**																nm								
Sodium	**mg/l**				2195.13												2498.04								
Strontium	**µg/l**																2293.52								
Sulphate	**mg/l SO4**				464.2												486.2								
Suspended Solids	**mg/l**																								
Temp	**°C**	11.8			13			19.8			17.5			9.9			11.9			18			15.4		
Thallium	**µg/l**																<0.1								
Time Sampled		14:10	nt	11:05	11:55	11:10	10:50	13:55	11:05	11:45	11:30	11:45	16:45	13:00	13:35	13:15	11:15	12:00	12:20	12:45	15:30	13:10	13:10	11:50	11:00
Tin	**µg/l**																<1								
T.O.C.	**mg/l**	23.9			>100			19.4			21.1			221			225						17.6		
T.O.N	**mg/l N**				<0.08												0.16								
Total S Solids	**mg/l**																								
Uranium	**µg/l**																0.49								
Vanadium	**µg/l**																1.24								
Zinc	**µg/l**				1.5												<0.5								
Water Level m OD	**5.12**							1.02	0.42	1.12	0.42	#VALUE!	3.92	0.12	3.82	#VALUE!	0.52	0.62		1.62	1.12	1.02	0.12	0.52	0.12

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM5

PARAMETERS	Units	RESULTS Date																							
		25-Jan-11	14-Feb-11	28-Mar-11	11-Apr-11	09-May-11	13-Jun-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	**mg/l CaCO3**				1370												1360								
Aluminium	**µg/l**				19.7												5.8								
Ammonia	**mg/l N**	77.88	74.51	37.43	79.74	59.03	45.9	45.82	36.84	30.12	33.26	51.34	10.31	75.68	87.15	30.2	28.48	25.88	20.56	37.04	14.34	33.82	27.59	42.91	44.31
Antimony	**µg/l**																<0.5								
Arsenic	**µg/l**																3.81								
Barium	**µg/l**																221.3								
Beryllium	**µg/l**																<0.5								
B.O.D.	**mg/l O2**																								
Boron	**µg/l**				1700.4												2055.3								
Cadmium	**µg/l**				<0.1												<0.1								
Calcium	**mg/l Ca**				145.59												194.49								
C.O.D.	**mg/l O2**																								
Chloride	**mg/l Cl**	1912	700	731	1511	1477	1616	2079	2112	2496	2792	3574	1214	2542	1789	1783	1970	2158	2192	2504	1556	2700	3289	2869	2569
Chromium	**µg/l**				4.1												0.8								
Cobalt	**µg/l**																2.3								
Conductivity	**µS/cm @ 25**	7760	4290	4220	7070	68000	7450	8040	8570	9750	11080	12230	4880	10130	7300	7360	7720	8260	2510	10080	6890	10810	12000	12270	8710
Copper	**µg/l**				2.4												0.5								
Cyanide	**mg/l CN**				<0.05												<0.05								
D.O.	**% Saturation**	25			21			34			17			15			15			16			16		
Fluoride	**mg/l**				<0.150						<0.150						<0.60								
Iron	**µg/l**				2391.3												6968.1								
Lead	**µg/l**				<0.5												<0.5								
Magnesium	**mg/l Mg**				170.37												215.18								
Manganese	**µg/l**				454.4												718.9								
Mercury	**µg/l**				<0.05												<0.05								
Molybdenum	**µg/l**																<0.5								
Nickel	**µg/l**				<0.5												2.6								
o-Phosphate	**mg/l P**				0.77						2.48						0.93								
pH		7.1			7.2			7.1			7.1			7.1			7.1			7.1			7		
Potassium	**mg/l**				103.51												110.26			4.7	4.2	5.1			
Residue on Evaporation	**mg/l**				3950												4747						5888		
Sampling Depth	**m**							5.1	4.1	6.3		nm	3.7	5.3	2.4	nm	4.7	5.1	nm				5.3	4.8	5.3
Selenium	**µg/l**																<0.5								
Silver	**µg/l**																nm								
Sodium	**mg/l**				957.81												1402.7								
Strontium	**µg/l**																1505.19								
Sulphate	**mg/l SO4**				111.9						318						209.9								
Suspended Solids	**mg/l**																								
Temp	**°C**	12.4			13			19.8			17.4			12.4			12.7			15.5			15.8		
Thallium	**µg/l**																<0.1								
Time Sampled		12:50	nt	13:50	12:30	13:00	13:30	12:30	12:35	13:35	11:45	13:40	17:30	13:50	12:30	12:45	11:30	12:20	13:40	11:50	14:40	12:05	12:50	13:15	12:55
Tin	**µg/l**																<1								
T.O.C.	**mg/l**	52.0			>100			59.4						294.5			318.4						52.5		
T.O.N	**mg/l N**				1.03						<0.08						0.16								
Total S Solids	**mg/l**																								
Uranium	**µg/l**																<0.1								
Vanadium	**µg/l**																1.53								
Zinc	**µg/l**				6.9												4.3								
Water Level m OD	**5.57**							0.47	1.47	-0.73	5.57	#VALUE!	1.87	0.27	3.17	#VALUE!	0.87	0.47		#VALUE!	#VALUE!	#VALUE!	0.27	0.77	0.27

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM6

RESULTS

PARAMETERS	Units	Date																							
		25-Jan-11	14-Feb-11	28-Mar-11	11-Apr-11	09-May-11	13-Jun-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	**mg/l CaCO3**				973												1040								
Aluminium	**µg/l**				21.6												<5								
Ammonia	**mg/l N**	57.24	56.28	57.40	64.3	90.48	66.34	59.63	77.44	75.79	78.39	65.05	71.02	67.11	59.59	56.17	55.37	50.5	50.81	58.74	54.01	67.27	77.64	54.54	56.22
Antimony	**µg/l**																<0.5								
Arsenic	**µg/l**																3.24								
Barium	**µg/l**																124								
Beryllium	**µg/l**																<0.5								
B.O.D.	**mg/l O2**																								
Boron	**µg/l**				1454.1												1736.2								
Cadmium	**µg/l**				<0.1												<0.1								
Calcium	**mg/l Ca**				125.79												122.15								
C.O.D.	**mg/l O2**																								
Chloride	**mg/l Cl**	379	367	356	326	272	295	318	295	349	331	371	345	335	352	336	326	343	334	309	298	294	290	295	299
Chromium	**µg/l**				2.8												1.2								
Cobalt	**µg/l**																2.8								
Conductivity	**µS/cm @ 25**	3100	3020	3030	3070	30900	3020	2890	3050	3060	3060	2930	2620	3080	2720	2800	2690	2710	8420	2970	2890	2850	3140	3100	2760
Copper	**µg/l**				8.9												4.5								
Cyanide	**mg/l CN**				<0.05												<0.05								
D.O.	**% Saturation**	14			18			17			<10			15			17			15			15		
Fluoride	**mg/l**				0.25												<0.60								
Iron	**µg/l**				2424.8												353.9								
Lead	**µg/l**				<0.5												<0.5								
Magnesium	**mg/l Mg**				73												73.07								
Manganese	**µg/l**				422.5												188.1								
Mercury	**µg/l**				<0.05												<0.05								
Molybdenum	**µg/l**																1.3								
Nickel	**µg/l**				4												4.8								
o-Phosphate	**mg/l P**				0.04												0.03								
pH		7.2			7.5			7.1			7.1			7.3			7.4			7.3			7.1		
Potassium	**mg/l**				97.5												103.76								
Residue on Evaporation	**mg/l**				1632												1489								
Sampling Depth	**m**							4.9	4.1	5	4.8	nm	3.9	4.9	2.5	nm	4.9	5	nm	4.9	4.3	5	5	4.8	5
Selenium	**µg/l**																<0.5								
Silver	**µg/l**																nm								
Sodium	**mg/l**				260.76												301.84								
Strontium	**µg/l**																771.63								
Sulphate	**mg/l SO4**				9.4												10.2								
Suspended Solids	**mg/l**																								
Temp	**°C**	13.0			14			27.5			17.2			12.6			12.7			16			15.8		
Thallium	**µg/l**																<0.1								
Time Sampled		13:10	nt	13:00	12:50	13:15	12:45	12:50	12:55	14:10	12:00	13:15	17:50	14:15	12:05	11:00	11:40	12:35	13:05	12:25	13:30	11:15	11:55	13:35	12:15
Tin	**µg/l**																<1								
T.O.C.	**mg/l**	27.3			>100			28			94.5			247			241						30.7		
T.O.N	**mg/l N**				4.37												3.47								
Total S Solids	**mg/l**																								
Uranium	**µg/l**																0.14								
Vanadium	**µg/l**																0.87								
Zinc	**µg/l**				8.8												9.9								
Water Level m OD	**5.87**							0.97	1.77	0.87	1.07	#VALUE!	1.97	0.97	3.37	#VALUE!	0.97	0.87		0.97	1.57	0.87	0.87	1.07	0.87

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM8

RESULTS

PARAMETERS	Units	Date 25-Jan-11	14-Feb-11	28-Mar-11	11-Apr-11	09-May-11	13-Jun-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	**mg/l CaCO3**				1470												1400								
Aluminium	**µg/l**				81.6												8.6								
Ammonia	**mg/l N**	60.90	42.43	76.72	105.89	97.93	77.2	123.4	130.15	123.59	58.76	6.28	85.86	84.99	84.9	89.46	128.39	119.24	38.38	90.22	89.57	1.69	91.91	79.52	86.29
Antimony	**µg/l**																<0.5								
Arsenic	**µg/l**																1.22								
Barium	**µg/l**																232.8								
Beryllium	**µg/l**																<0.5								
B.O.D.	**mg/l O2**																								
Boron	**µg/l**				1865.3												2895.5								
Cadmium	**µg/l**				0.1												<0.1								
Calcium	**mg/l Ca**				237.68												269.27								
C.O.D.	**mg/l O2**																								
Chloride	**mg/l Cl**	181	149	182	367	636	6792	2256	2374	1632	2566	361	174	130	123	107	516	662	2315	112	116	91	168	147	177
Chromium	**µg/l**				3												1.1								
Cobalt	**µg/l**																4.5								
Conductivity	**µS/cm @ 25**	2680	2390	2830	3660	44100	22100	8960	9760	7590	10100	3180	2640	2930	2540	2640	4130	4500	8490	2770	2720	2590	2940	3070	2700
Copper	**µg/l**				5.4												0.6								
Cyanide	**mg/l CN**				<0.05												<0.05								
D.O.	**% Saturation**	21			20			15			16			16			12			16			15		
Fluoride	**mg/l**				<0.150												<0.60								
Iron	**µg/l**				11859.6												20497.2								
Lead	**µg/l**				1.9												<0.5								
Magnesium	**mg/l Mg**				87.61												111.42								
Manganese	**µg/l**				2996.8												2919.9								
Mercury	**µg/l**				<0.05												<0.05								
Molybdenum	**µg/l**																2.8								
Nickel	**µg/l**				15.2												22.9								
o-Phosphate	**mg/l P**				0.24												0.57								
pH		6.8			7.8			6.6			6.7			6.8			6.8			7			6.8		
Potassium	**mg/l**				83.36												108.05								
Residue on Evaporation	**mg/l**				2015												2257								
Sampling Depth	**m**							4.1	5.3	4.9	3.6	nm	2.9	3	3.3	nm	3.9	5	nm	3.9	3.1	5.2	4.1	3.8	4.1
Selenium	**µg/l**																<0.5								
Silver	**µg/l**																nm								
Sodium	**mg/l**				249.89												390.79								
Strontium	**µg/l**																1376.28								
Sulphate	**mg/l SO4**				15.3												38								
Suspended Solids	**mg/l**																								
Temp	**°C**				13			19.2			17.2			12.4			13.4			17.2			16.7		
Thallium	**µg/l**																<0.1								
Time Sampled		13.0	nt	14:35	13:05	12:45	14:15	14:00	13:15	14:50	12:20	12:55	17:00	14:00	13:15	11:25	12:00	13:00	14:15	12:10	15:15	12:40	12:10	12:35	13:35
Tin	**µg/l**																<1								
T.O.C.	**mg/l**	13:20			>100			107.6			98.4			314.8			456.4						42.6		
T.O.N	**mg/l N**	35.4			0.16												0.26								
Total S Solids	**mg/l**																								
Uranium	**µg/l**																<0.1								
Vanadium	**µg/l**																3.37								
Zinc	**µg/l**				36.6												17.5								
Water Level m OD	**5.15**							1.05	-0.15	0.25	1.55	#VALUE!	2.25	2.15	1.85	#VALUE!	1.25	0.15		1.25	2.05	-0.05	1.05	1.35	1.05

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM9

PARAMETERS	Units	RESULTS Date																							
		25-Jan-11	14-Feb-11	28-Mar-11	11-Apr-11	09-May-11	13-Jun-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	**mg/l CaCO3**				1010												1385								
Aluminium	**µg/l**				27.7												8								
Ammonia	**mg/l N**	17.34	13.98	12.47	12.83	15.65	18.54	14.67	17.2	24.5	22.95	2.51	5.85	2.17	27.97	83.28	79.79	48.99	42.36	69.89	99.62	74.24	67.99	69.6	54.97
Antimony	**µg/l**																1.11								
Arsenic	**µg/l**																1.14								
Barium	**µg/l**																122.9								
Beryllium	**µg/l**																<0.5								
B.O.D.	**mg/l O2**																								
Boron	**µg/l**				739.9												1907.2								
Cadmium	**µg/l**				<0.1												0.4								
Calcium	**mg/l Ca**				77.08												224.02								
C.O.D.	**mg/l O2**																								
Chloride	**mg/l Cl**	661	704	712	700	738	711	753	728	725	672	39	43	44	69	141	244	516	546	258	249	420	484	431	98
Chromium	**µg/l**				<0.5												<0.5								
Cobalt	**µg/l**																7.8								
Conductivity	**µS/cm @ 25**	3480	3530	5100	3600	36400	3740	3580	3570	3630	3620	1539	1559	1697	1903	2860	2980	3350	2960	3070	3440	3600	3700	4010	2310
Copper	**µg/l**				8.3												91.4								
Cyanide	**mg/l CN**				<0.05												<0.05								
D.O.	**% Saturation**	20			15			36			16			19			16			28			16		
Fluoride	**mg/l**				<0.150						0.18						<0.150								
Iron	**µg/l**				1297.9												64.3								
Lead	**µg/l**				1.1												<0.5								
Magnesium	**mg/l Mg**				73.59												102.01								
Manganese	**µg/l**				410.7												1127.2								
Mercury	**µg/l**				<0.05												<0.05								
Molybdenum	**µg/l**																4.6								
Nickel	**µg/l**				16.5												18								
o-Phosphate	**mg/l P**				<0.02						0.11						0.04								
pH		7.2			7.3			7.3			7.3			7.4			7.4			7.2			7.1		
Potassium	**mg/l**				41.59												101.86								
Residue on Evaporation	**mg/l**				3511												1726								
Sampling Depth	**m**							4.6	5.5	4.3		nm	2.9	4.9	3	nm	4.4	5.1	nm	4.4	3.9	5.1	4.2	4.9	4.3
Selenium	**µg/l**																0.7								
Silver	**µg/l**																nm								
Sodium	**mg/l**				493.07												250.64								
Strontium	**µg/l**																990.11								
Sulphate	**mg/l SO4**				128.4						107.1						128.8								
Suspended Solids	**mg/l**																								
Temp	**°C**	15.0			15			19.9			17.1			13.8			13.5			16.2			17		
Thallium	**µg/l**																0.21								
Time Sampled		13:35	nt	14:10	13:20	12:30	14:00	13:50	13:40	14:35	12:45	12:30	17:10	13:10	12:50	11:55	12:20	13:15	14:00	12:55	15:00	12:55	12:30	12:55	13:15
Tin	**µg/l**																<1								
T.O.C.	**mg/l**	12.2			>100			13.3						174.7			320.4						28.9		
T.O.N	**mg/l N**				<0.08						0.1						1.92								
Total S Solids	**mg/l**																								
Uranium	**µg/l**																1.1								
Vanadium	**µg/l**																1.42								
Zinc	**µg/l**				14.3												88.7								
Water Level m OD	5.78							1.18	0.28	1.48	5.78	#VALUE!	2.88	0.88	2.78	#VALUE!	1.38	0.68		1.38	1.88	0.68	1.58	0.88	1.48

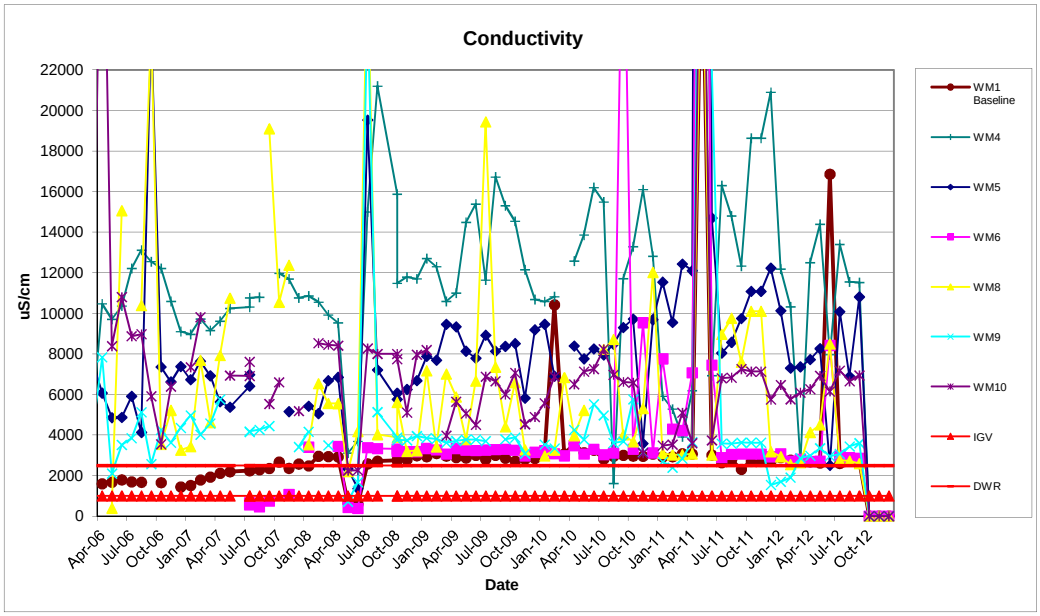
Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM10

RESULTS

PARAMETERS	Units	Date																							
		25-Jan-11	14-Feb-11	28-Mar-11	11-Apr-11	09-May-11	13-Jun-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	**mg/l CaCO3**				nm												1220								
Aluminium	**µg/l**				28.7												<5								
Ammonia	**mg/l N**	11.38	7.27	8.27	19.78	23.14	20.29	16.2	13.19	15.74	23.95	14.45	70.12	18.09	17.72	16.36	20.46	21.95	21.79	18.36	17.35	18.16	20.92	21.06	17.62
Antimony	**µg/l**																<0.5								
Arsenic	**µg/l**																1.39								
Barium	**µg/l**																103.1								
Beryllium	**µg/l**																<0.5								
B.O.D.	**mg/l O2**																								
Boron	**µg/l**				1475												1796.3								
Cadmium	**µg/l**				<0.1												<0.1								
Calcium	**mg/l Ca**				85.7												95.36								
C.O.D.	**mg/l O2**																								
Chloride	**mg/l Cl**	1408	1182	755	1506	1593	1603	1733	1680	1843	1696	1425	1952	1429	1423	1406	1523	1760	1777	1705	1600	1546	1600	1680	1600
Chromium	**µg/l**				0.9												<0.5								
Cobalt	**µg/l**																1.5								
Conductivity	**µS/cm @ 25**	5910	5280	3910	6190	66600	6930	6800	6830	7250	7130	5750	10910	6470	5760	6090	6260	6920	6150	7180	6650	6940	6950	7930	6180
Copper	**µg/l**				5												5.2								
Cyanide	**mg/l CN**				<0.05												<0.05								
D.O.	**% Saturation**	22			24			33			18			15			20			22			18		
Fluoride	**mg/l**				0.15												<0.60								
Iron	**µg/l**				2211.1												257.4								
Lead	**µg/l**				0.6												<0.5								
Magnesium	**mg/l Mg**				125.98												141.65								
Manganese	**µg/l**				192.7												148.5								
Mercury	**µg/l**				<0.05												<0.05								
Molybdenum	**µg/l**																1.4								
Nickel	**µg/l**				4.1												5.6								
o-Phosphate	**mg/l P**				0.03												0.05								
pH		7.5			7.3			7.2			7.2			7.3			7.3			7.3			7		
Potassium	**mg/l**				82.85												93.89								
Residue on Evaporation	**mg/l**				3567												3689								
Sampling Depth	**m**							5.3	5.3	4.8	5	nm	2.8	5.2	1.8	nm	5	5.3	nm	5	4.5	4.9	5.6	3.3	5.5
Selenium	**µg/l**																<0.5								
Silver	**µg/l**																nm								
Sodium	**mg/l**				1044.07												1205.87								
Strontium	**µg/l**																1160.86								
Sulphate	**mg/l SO4**				115.9												157.6								
Suspended Solids	**mg/l**																								
Temp	**°C**				14			19.6			17.1			12.8			13.1			16.1			16.1		
Thallium	**µg/l**																<0.1								
Time Sampled		12.6			13:35	12:10	13:05	13:40	14:00	13:50	13:00	12:00	17:30	12:40	12:15	12:15	12:45	13:30	13:20	13:10	14:05	11:35	11:50	12:10	12:35
Tin	**µg/l**																<1								
T.O.C.	**mg/l**	13:55	nt	13:20	12.7			14.4			34.3			254.5			252.2						35.8		
T.O.N	**mg/l N**	13.2			0.26												0.45								
Total S Solids	**mg/l**																								
Uranium	**µg/l**																1.05								
Vanadium	**µg/l**																<0.5								
Zinc	**µg/l**				12.1												20.8								
Water Level m OD	**5.64**							0.34	0.34	0.84	0.64	#VALUE!	2.84	0.44	3.84	#VALUE!	0.64	0.34		0.64	1.14	0.74	0.04	2.34	0.14


Conductivity
uS/cm
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
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Jan-09
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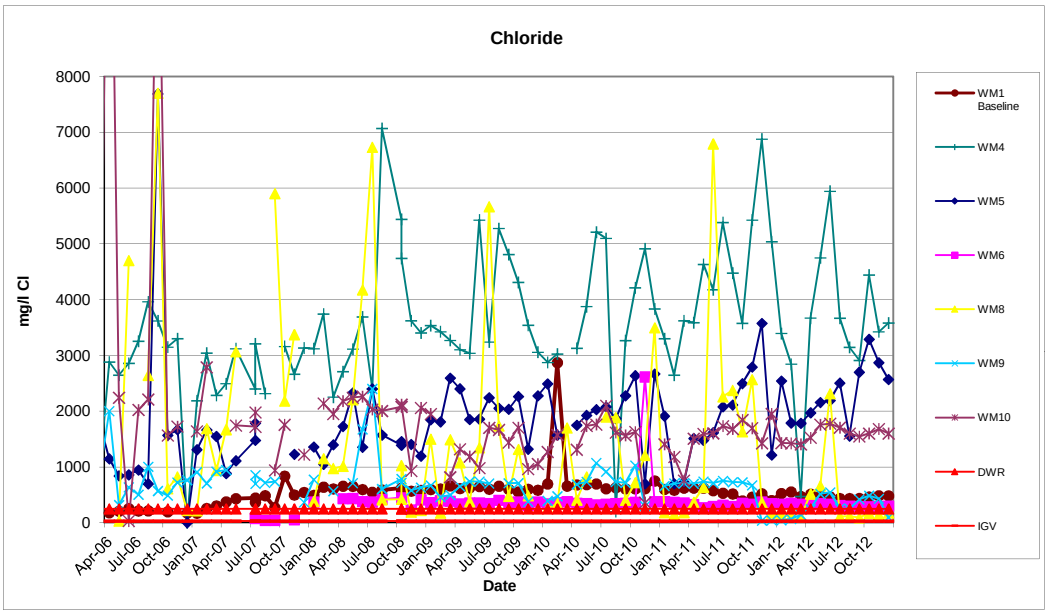
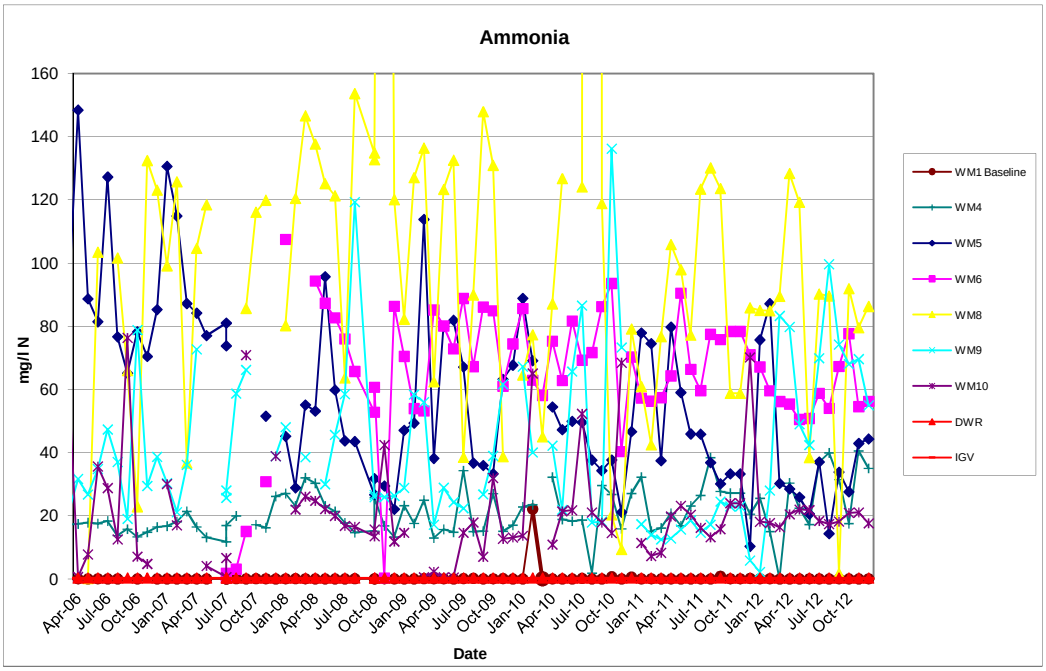
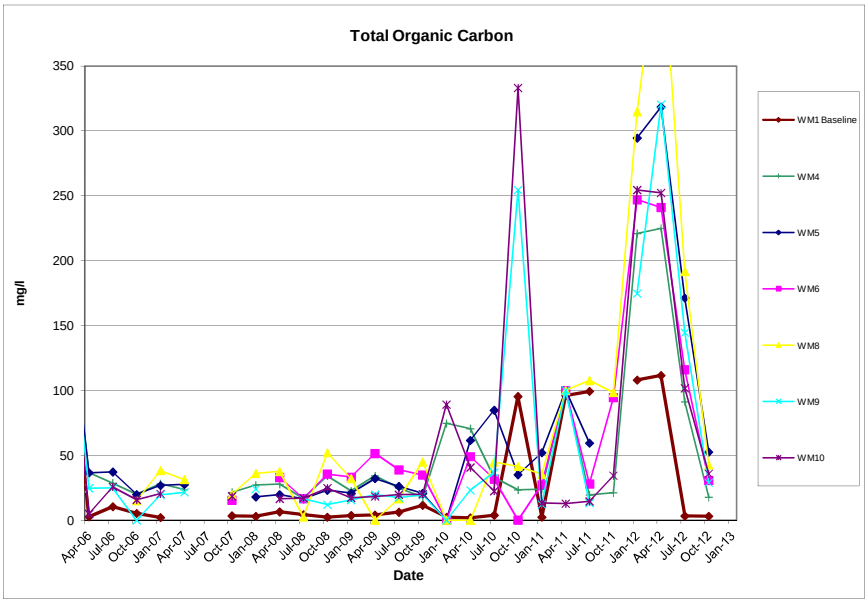
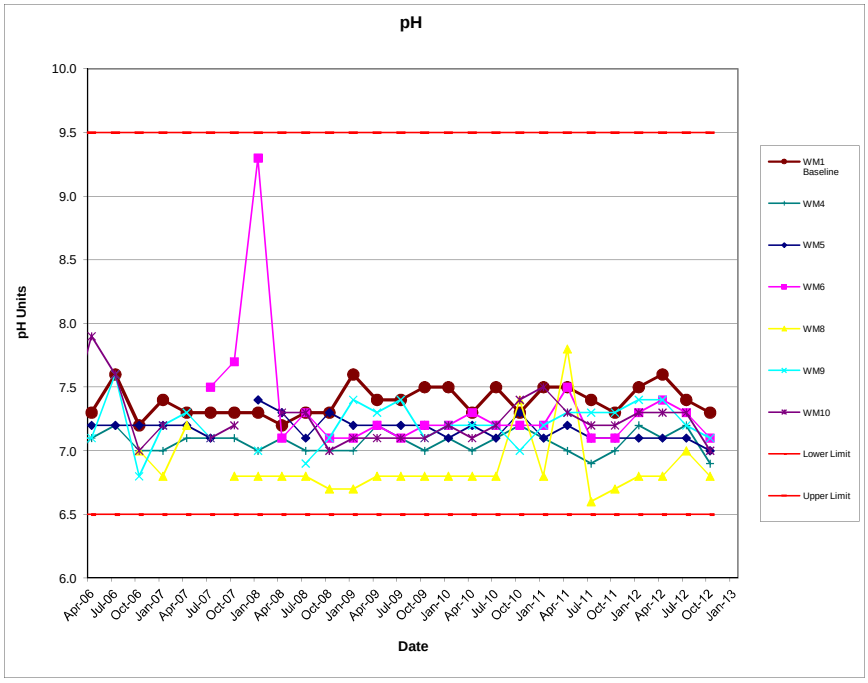
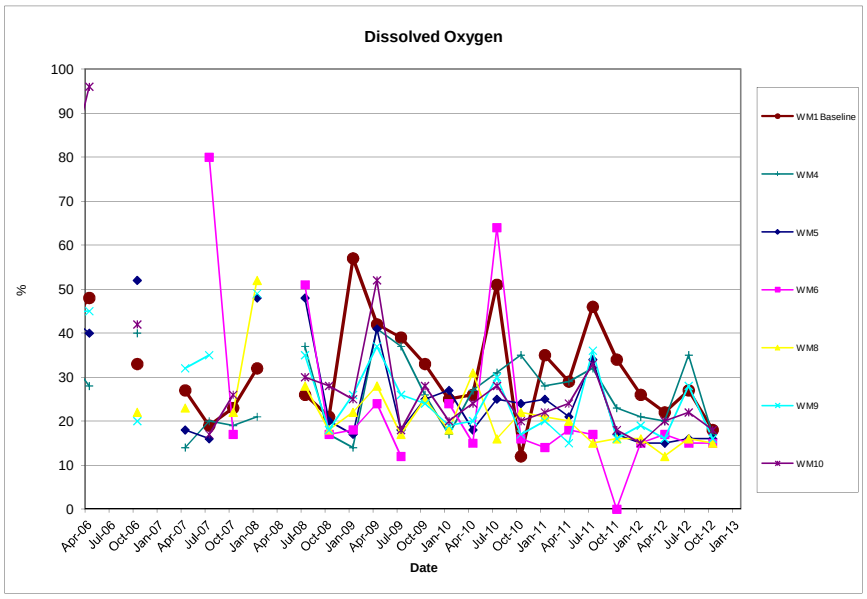
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Date
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
IGV
DWR


Chloride
mg/l Cl
8000
7000
6000
5000
4000
3000
2000
1000
0
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Date
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
DWR
IGV


Ammonia
mg/l N
160
140
120
100
80
60
40
20
0
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Date
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
DWR
IGV


Total Organic Carbon
mg/l
350
300
250
200
150
100
50
0
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Date
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10


pH
pH Units
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Date
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
Lower Limit
Upper Limit


Dissolved Oxygen
%
100
90
80
70
60
50
40
30
20
10
0
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Date
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10

APPENDIX G

SURFACE WATER RESULTS

APPENDIX H

DISCHARGE TO SEWER

Dundalk Landfill Site

DISCHARGE TO SEWER

Monitoring Point:		S1																			
		RESULTS																			
		Date																			
PARAMETERS	Units	11-Apr-11	09-May-11	11-Jul-11	08-Aug-11	21-Sep-11	03-Oct-11	07-Nov-11	12-Dec-11	16-Jan-12	06-Feb-12	12-Mar-12	23-Apr-12	14-May-12	06-Jun-12	23-Jul-12	13-Aug-12	10-Sep-12	08-Oct-12	05-Nov-12	10-Dec-12
Alkalinity	mg/l CaCO3	700																			
Aluminium	µg/l	895.4																			
Ammonia	mg/l N	73.08	53.62	25.69	89.59	14.27	19.64	55.7	13.6	35.57		58.44	10.76		26.87		69.19	10.70	186.57	58.02	66.76
Antimony (µg/l)																					
Arsenic (µg/l)																					
Barium (µg/l)																					
Beryllium (µg/l)																					
B.O.D.	mg/l O2	87.6		101			10.7			153.4		27.9	66.6		27.8		202.3	257.3	5193	45.2	78.6
Boron	µg/l																				
Cadmium	µg/l	0.4																			
Calcium	mg/l Ca	134.32																			
C.O.D.	mg/l O2	577		520			72			299		245	481		247		911	1250	7880	193	600
Chloride	mg/l Cl	83	76	58	155	47	41	66	106	61											
Cobalt (µg/l)																					
Chromium	µg/l	7.3																			
Conductivity	µS/cm @ 25	2370	1174	1192	2790	614	1019	1922	912	1246											
Copper	µg/l	38.1																			
Depth	m																				
D.O.	% Saturation	nm		nm			53			nm											
Fluoride	mg/l																				
Iron	µg/l	9970.3																			
Lead	µg/l	32.5																			
Magnesium	mg/l Mg	41.96																			
Manganese	µg/l	721.9																			
Molybdenum (µg/l)																					
Mercury	µg/l	<0.05																			
Nickel		3.7																			
o-Phosphate	mg/l P	1.71																			
pH		7.4		7			7.1			7.4		7.3	7.2		7.2		7.3	7.1	6.3	7.2	6.9
Potassium	mg/l	49.64																			
Sampling Depth	mg/l CN																				
Selenium (µg/l)																					
Silver (µg/l)																					
Residue on Evaporation																					
Strontium (µg/l)																					
Sodium	mg/l	71.41																			
Suspended Solids (mg/l)																					
Sulphate	mg/l SO4	31.6		34.5			55.2					4.9	16		49.1		23.9	18.2	114.7	8.3	15.8
Thallium (µg/l)													206		27		139	705	576	297	228
Temp	°C	nm		18			18.8			9.4		nm	11.3		nm		nm	nm	13.3	nm	nm
Tin (µg/l)																					
Time Sampled		12:45	14:10	14.2	14:20	15:25	11:30	14:45	15:45	13:30		15:00	13:40		10:15		13:10	14:05	12:10	13:55	14:05
T.O.C.	mg/l																				
T.O.N	mg/l N	<0.08		<0.08			1.82			<0.08											
Uranium (µg/l)																					
Vanadium (µg/l)																					
Total S Solids	mg/l	660		298			26			560											
Zinc	µg/l	111.4																			
No sample																					

APPENDIX I

LANDFILL GAS MONITORING RESULTS

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date:** 19:01:2012	**Time:** 16.00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** May 2012	
Monitoring Personnel: aw		**Weather:** Drizzle	**Barometric pressure:** 1017mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0	0.4	18.9	
G2	PIEZO		0.1	0.6	18.6	
G3	PIEZO		0	0.4	18.6	
G4	PIEZO		0.3	0.6	18.9	
G5	PIEZO		0	0.4	18.4	
G6	PIEZO		0.4	0.5	18.6	
G7	PIEZO		0	0.4	18.6	
G8	PIEZO		0.3	0.5	18.6	
G9	PIEZO		0.1	0.4	18.6	
G10	PIEZO		0.1	0.4	18.6	
G16	PIEZO		0	0.3	18.6	
G17	PIEZO		0.1	0.4	19.1	
G20	PIEZO		0.3	0.4	18.6	
G21	PIEZO		0	0.4	18.4	
GM1	PIEZO		0.1	0.5	18.6	
GM2	PIEZO		0	0.5	18.8	
GM3	PIEZO		0	0.5	18.7	
GM4	PIEZO		0	0.4	18.7	
GM5	PIEZO		0	0.3	18.7	
GM6	PIEZO		0	0.4	18.6	
GM24	PIEZO		0	0.4	18.9	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM	(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date:** 19:01:2012	**Time:** 16.00pm

Instrument used:	**Normal Analytical Range:**	**Date Next Calibration:**
GA2000/FID		May 2012

Monitoring Personnel:	**Weather:**	**Barometric pressure:**
aw	Drizzle	1017mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
Pipe to flare monitor	PIEZO		29.4	10.8	3.5	
Landfill flare monitor			29	11	3	

The following houses and commercial properties were visited and surveyed using GA2000 infra-red gas and FID analyser.

No's 2, 3, 4, 5, ,8, 9, 10, 11, 12, 15, 18,19,20, Riverside Crescent

.

No's 2, 3 & Newry Road

Mc Kevitts, Maxol, Yard Mace Shop, Autoglass, Peugeot Office, Lynch Mini Mix (Yard), Portway Travel Agents, Hardys (offices & Yard), Road Drains.

All levels detected using the FID where below 15 part per million (10,000ppm = 1% v/v).

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date:** 16:02:2012	**Time:** 16.00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** May 2012	
Monitoring Personnel: aw		**Weather:** Drizzle	**Barometric pressure:** 1026mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0	0.6	18.6	
G2	PIEZO		0.2	0.4	18.3	
G3	PIEZO		0	0.6	19.2	
G4	PIEZO		0.1	0.4	18.6	
G5	PIEZO		0	0.6	19.1	
G6	PIEZO		0.5	0.6	19.2	
G7	PIEZO		0	0.3	18.8	
G8	PIEZO		0.4	0.6	18.9	
G9	PIEZO		0.2	0.5	18.2	
G10	PIEZO		0	0.6	18.9	
G16	PIEZO		0	0.4	18.2	
G17	PIEZO		0	0.8	18.4	
G20	PIEZO		0.4	0.3	18.9	
G21	PIEZO		0	0.6	19.1	
GM1	PIEZO		0.1	0.4	18.1	
GM2	PIEZO		0	0.3	18.6	
GM3	PIEZO		0	0.4	18.5	
GM4	PIEZO		0	0.3	19.1	
GM5	PIEZO		0	0.2	19.1	
GM6	PIEZO		0	0.2	18.9	
GM24	PIEZO		0	0.4	18.2	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date:** 16:02:2012	**Time:** 16.00pm
Instrument used: GA2000/FID	**Normal Analytical Range:**	**Date Next Calibration:** May 2012	
Monitoring Personnel: aw		**Weather:** Drizzle	**Barometric pressure:** 1026mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
Pipe to flare monitor	PIEZO		30.1	11.1	4.2	
Landfill flare monitor			30	11	4	

The following houses and commercial properties were visited and surveyed using GA2000 infra-red gas and FID analyser.

No's 2, 3, 4, 5, ,8, 9, 10, 11, 12, 15, 18,19,20, Riverside Crescent

.

No's 2, 3 & Newry Road

Mc Kevitts, Maxol, Yard Mace Shop, Autoglass, Peugeot Office, Lynch Mini Mix (Yard), Portway Travel Agents, Hardys (offices & Yard), Road Drains.

All levels detected using the FID where below 15 part per million (10,000ppm = 1% v/v).

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM	(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date:** 6:03:2012	**Time:** 16.00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** May 2012
Monitoring Personnel: aw	**Weather:** Drizzle	**Barometric pressure:** 1018mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.3	0.5	19.1	
G2	PIEZO		0.2	0.2	18.4	
G3	PIEZO		0	0.5	18.8	
G4	PIEZO		0.2	0.5	18.2	
G5	PIEZO		0.1	0.6	18.6	
G6	PIEZO		0.8	1.1	18.8	
G7	PIEZO		0	0.2	19.4	
G8	PIEZO		0.2	0.4	19.1	
G9	PIEZO		0.2	0.4	19.1	
G10	PIEZO		0.2	0.4	18.2	
G16	PIEZO		0	0.5	19.1	
G17	PIEZO		0.1	0.6	18.6	
G20	PIEZO		0.5	0.2	19.1	
G21	PIEZO		0.2	0.5	18.6	
GM1	PIEZO		0	0.6	19.1	
GM2	PIEZO		0	0.4	19.2	
GM3	PIEZO		0	0.4	18.6	
GM4	PIEZO		0	0.3	8.8	
GM5	PIEZO		0	0.4	18.9	
GM6	PIEZO		0	0.3	19.1	
GM24	PIEZO		0	0.3	18.6	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date:** 6:03:2012	**Time:** 16.00pm
Instrument used: GA2000/FID	**Normal Analytical Range:**	**Date Next Calibration:** May 2012	
Monitoring Personnel: aw		**Weather:** Drizzle	**Barometric pressure:** 1018mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
Pipe to flare monitor	PIEZO		28.6	9.6	4	
Landfill flare monitor			29	10	4	

The following houses and commercial properties were visited and surveyed using GA2000 infra-red gas and FID analyser.

No's 2, 3, 4, 5, ,8, 9, 10, 11, 12, 15, 18,19,20, Riverside Crescent

No's 2, 3 & Newry Road

Mc Kevitts, Maxol, Yard Mace Shop, Autoglass, Peugeot Office, Lynch Mini Mix (Yard), Portway Travel Agents, Hardys (offices & Yard), Road Drains.

All levels detected using the FID where below 15 part per million (10,000ppm = 1% v/v).

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 11:05:2012	**Time:** 16.00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** September 2012	
Monitoring Personnel: J.O'N		**Weather:** Drizzle	**Barometric pressure:** 1022mb

Results

Sample Station **Number**	**Borehole/** spike/other	**Survey** Depth	**CH_4** (% v/v)	**CO_2** (% v/v)	**O_2** (% v/v)	**Comments**
G1	PIEZO		0.1	0	19.0	
G2	PIEZO		0.1	0.1	18.7	
G3	PIEZO		0.1	0.1	19	
G4	PIEZO		0.1	0.1	18.9	
G5	PIEZO		0	0	18.9	
G6	PIEZO		0.1	0.1	18.8	
G7	PIEZO		0.1	0	19.9	
G8	PIEZO		0.2	0	19.7	
G9	PIEZO		0.1	7.5	9.6	
G10	PIEZO		0.2	0	19.9	
G16	PIEZO		0.1	0	20.1	
G17	PIEZO		0.1	0	19.8	
G20	PIEZO		0.2	4.2	18.1	
G21	PIEZO		0	0.5	18.9	
GM1	PIEZO		0	0.4	18.9	
GM2	PIEZO		0	0.5	18.6	
GM3	PIEZO		0	0.3	18.8	
GM4	PIEZO		0	0.2	19.5	
GM5	PIEZO		0	0.3	18.9	
GM6	PIEZO		0	0.3	18.8	
GM24	PIEZO		0	0.4	18.5	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date:** 11:05:2012	**Time:** 16.00pm
Instrument used: GA2000/FID	**Normal Analytical Range:**	**Date Next Calibration:** September 2012	
Monitoring Personnel: J.O'N		**Weather:** Drizzle	**Barometric pressure:** 1022mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE	PIEZO		30.9	20.5	4.3	
HUT			30	19	3.2	

The following houses and commercial properties were visited and surveyed using GA2000 infra-red gas and FID analyser.

No's 2, 3, 4, 5, ,8, 9, 10, 11, 12, 15, 18,19,20, Riverside Crescent

.

No's 2, 3 & Newry Road

Mc Kevitts, Maxol, Yard Mace Shop, Autoglass, Peugeot Office, Lynch Mini Mix (Yard), Portway Travel Agents, Hardys (offices & Yard), Road Drains.

All levels detected using the FID where below 15 part per million (10,000ppm = 1% v/v).

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)		
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date** 22:06:2012	**Time:** 16.00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** September 2012
Monitoring Personnel: J.O'N	**Weather:**	**Barometric pressure:** 1002mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.1	18.8	
G2	PIEZO		0.1	0.1	19.8	
G3	PIEZO		0.1	0.1	18.8	
G4	PIEZO		0.1	0.2	18.5	
G5	PIEZO		0.1	0.1	18.6	
G6	PIEZO		0.1	0.9	18.5	
G7	PIEZO		0.1	0.2	20.2	
G8	PIEZO		0.2	0.1	19.3	
G9	PIEZO		0.1	5.5	19.6	
G10	PIEZO		0.2	0.1	19.5	
G16	PIEZO		0.1	0.1	19.9	
G17	PIEZO		0.1	0.1	19.4	
G20	PIEZO		0.2	3.9	17.9	
G21	PIEZO		0.1	0.4	19.5	
GM1	PIEZO		0	0.4	18.9	
GM2	PIEZO		0.1	0.6	19.6	
GM3	PIEZO		0	0.5	17.8	
GM4	PIEZO		0	0.4	18.7	
GM5	PIEZO		0	0.5	19.2	
GM6	PIEZO		0	0.6	19.3	
GM24	PIEZO		0	0.5	17.7	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)			
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date:** 22:06:2012	**Time:** 16.00pm
Instrument used: GA2000/FID	**Normal Analytical Range:**	**Date Next Calibration:** September 2012	
Monitoring Personnel: J.O'N		**Weather:** Drizzle	**Barometric pressure:** 1002mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
Pipe to flare monitor	PIEZO		28.9	19.8	8.1	

The following houses and commercial properties were visited and surveyed using GA2000 infra-red gas and FID analyser.

No's 2, 3, 4, 5, ,8, 9, 10, 11, 12, 15, 18,19,20, Riverside Crescent

.

No's 2, 3 & Newry Road

Mc Kevitts, Maxol, Yard Mace Shop, Autoglass, Peugeot Office, Lynch Mini Mix (Yard), Portway Travel Agents, Hardys (offices & Yard), Road Drains.

All levels detected using the FID where below 15 part per million (10,000ppm = 1% v/v).

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)		
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date** 11:04:2012	**Time:** 16.00 pm

Instrument used:	**Normal Analytical Range:**	**Date Next Calibration:**
GA2000		September 2012

Monitoring Personnel:	**Weather:**	**Barometric pressure:**
J.O'N	Drizzle	997mb

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
G1	PIEZO		0.1	0	19.8	
G2	PIEZO		0.1	0.1	19.4	
G3	PIEZO		0.1	0	19.8	
G4	PIEZO		0.1	0	19.8	
G5	PIEZO		0.1	0	19.9	
G6	PIEZO		0.1	0.1	19.4	
G7	PIEZO		0.1	0	19.9	
G8	PIEZO		0.2	0	19.7	
G9	PIEZO		0.1	7.5	9.6	
G10	PIEZO		0.2	0	19.9	
G16	PIEZO		0.1	0	20.1	
G17	PIEZO		0.1	0	19.8	
G20	PIEZO		0.2	5.7	12.9	
G21	PIEZO		0.1	0.6	19.3	
GM1	PIEZO		0	0.4	18.9	
GM2	PIEZO		0	0.6	18.6	
GM3	PIEZO		0	0.5	18.8	
GM4	PIEZO		0	0.4	19.1	
GM5	PIEZO		0	0.3	18.4	
GM6	PIEZO		0	0.4	18.5	
GM24	PIEZO		0	0.4	18.7	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)			
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date:** 11:04:2012	**Time:** 16.00pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** September 2012	
Monitoring Personnel: J.O'N		**Weather:** Drizzle	**Barometric pressure:** 997mb

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
Pipe to flare monitor	PIEZO		23.2	15	8.6	
Landfill flare monitor			25	18	3	

The following houses and commercial properties were visited and surveyed using GA2000 infra-red gas and FID analyser.

No's 2, 3, 4, 5, ,8, 9, 10, 11, 12, 15, 18,19,20, Riverside Crescent

.

No's 2, 3 & Newry Road

Mc Kevitts, Maxol, Yard Mace Shop, Autoglass, Peugeot Office, Lynch Mini Mix (Yard), Portway Travel Agents, Hardys (offices & Yard), Road Drains.

All levels detected using the FID where below 15 part per million (10,000ppm = 1% v/v).

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 11:05:2012	**Time:** 16.00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** September 2012	
Monitoring Personnel: J.O'N		**Weather:** Drizzle	**Barometric pressure:** 1022mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0	19.0	
G2	PIEZO		0.1	0.1	18.7	
G3	PIEZO		0.1	0.1	19	
G4	PIEZO		0.1	0.1	18.9	
G5	PIEZO		0	0	18.9	
G6	PIEZO		0.1	0.1	18.8	
G7	PIEZO		0.1	0	19.9	
G8	PIEZO		0.2	0	19.7	
G9	PIEZO		0.1	7.5	9.6	
G10	PIEZO		0.2	0	19.9	
G16	PIEZO		0.1	0	20.1	
G17	PIEZO		0.1	0	19.8	
G20	PIEZO		0.2	4.2	18.1	
G21	PIEZO		0	0.5	18.9	
GM1	PIEZO		0	0.4	18.9	
GM2	PIEZO		0	0.5	18.6	
GM3	PIEZO		0	0.3	18.8	
GM4	PIEZO		0	0.2	19.5	
GM5	PIEZO		0	0.3	18.9	
GM6	PIEZO		0	0.3	18.8	
GM24	PIEZO		0	0.4	18.5	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM	(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date:** 11:05:2012	**Time:** 16.00pm

Instrument used:	**Normal Analytical Range:**	**Date Next Calibration:**
GA2000/FID		September 2012

Monitoring Personnel:	**Weather:**	**Barometric pressure:**
J.O'N	Drizzle	1022mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
Pipe to flare monitor	PIEZO		30.9	20.5	4.3	
Landfill flare monitor			30	19	3.2	

The following houses and commercial properties were visited and surveyed using GA2000 infra-red gas and FID analyser.

No's 2, 3, 4, 5, ,8, 9, 10, 11, 12, 15, 18,19,20, Riverside Crescent

.

No's 2, 3 & Newry Road

Mc Kevitts, Maxol, Yard Mace Shop, Autoglass, Peugeot Office, Lynch Mini Mix (Yard), Portway Travel Agents, Hardys (offices & Yard), Road Drains.

All levels detected using the FID where below 15 part per million (10,000ppm = 1% v/v).

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)			
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 11:07:2012	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** September 2012	
Monitoring Personnel: J.O'N		**Weather:** Wet/dull	**Barometric pressure:** 983mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.1	19.5	
G2	PIEZO		0.1	0.1	19.8	
G3	PIEZO		0.1	0.1	19.9	
G4	PIEZO		0.1	0.1	18.6	
G5	PIEZO		0.1	0.1	19.5	
G6	PIEZO		0.1	0.2	19.2	
G7	PIEZO		0.1	0.2	19.8	
G8	PIEZO		0.1	0.2	18.5	
G9	PIEZO		0.1	0.5	19.8	
G10	PIEZO		0.2	0.1	19.8	
G16	PIEZO		0.1	0.1	19.2	
G17	PIEZO		0.1	0.4	19.3	
G20	PIEZO		0.1	0.6	18.9	
G21	PIEZO		0.1	0.4	19.2	
GM1	PIEZO		0.1	0.3	18.5	
GM2	PIEZO		0.1	0.6	18.9	
GM3	PIEZO		0.1	0.4	19.6	
GM4	PIEZO		0	0.4	19.0	
GM5	PIEZO		0	0.3	19.1	
GM6	PIEZO		0	0.4	19.7	
GM24	PIEZO		0	0.4	18.2	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM	(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date** 11:07:2012	**Time:** 16:00 pm

Instrument used:	**Normal Analytical Range:**	**Date Next Calibration:**
GA2000/FID		September 2012

Monitoring Personnel:	**Weather:**	**Barometric pressure:**
J.O'N	Wet/dull	983mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE	PIEZO		22.9	15.6	9	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 22:08:2012	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** September 2012	
Monitoring Personnel: J.O'N		**Weather:** Dull	**Barometric pressure:** 1012mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.2	18.5	
G2	PIEZO		0.1	0.1	19.5	
G3	PIEZO		0.1	0.2	19.1	
G4	PIEZO		0.1	0.2	20.1	
G5	PIEZO		0	0.2	18.9	
G6	PIEZO		0.1	0.4	19.2	
G7	PIEZO		0.1	0.2	19.8	
G8	PIEZO		0.2	0.2	19.5	
G9	PIEZO		0.1	0.6	19.8	
G10	PIEZO		0.1	0.1	19.4	
G16	PIEZO		0.1	0.1	19.9	
G17	PIEZO		0.1	0.2	18.9	
G20	PIEZO		0.2	0.4	17.8	
G21	PIEZO		0.1	0.5	19.8	
GM1	PIEZO		0	0.5	18.7	
GM2	PIEZO		0	0.6	18.9	
GM3	PIEZO		0	0.4	19.5	
GM4	PIEZO		0	0.3	18.8	
GM5	PIEZO		0	0.4	19.1	
GM6	PIEZO		0	0.3	19.0	
GM24	PIEZO		0	0.5	18.7	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM	(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date** 22:08:2012	**Time:** 16:00 pm

Instrument used:	**Normal Analytical Range:**	**Date Next Calibration:**
GA2000/FID		September 2012

Monitoring Personnel:	**Weather:**	**Barometric pressure:**
J.O'N	Dull	1012mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE	PIEZO		32	10.9	9	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM	(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date** 21:09:2012	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** September 2012
Monitoring Personnel: J.O'N	**Weather:** Cloud	**Barometric pressure:** 1016mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.1	18.9	
G2	PIEZO		0.1	0.1	19.6	
G3	PIEZO		0.1	0.1	19.7	
G4	PIEZO		0.1	0.1	19.5	
G5	PIEZO		0.1	0	19.8	
G6	PIEZO		0.1	0.1	19.3	
G7	PIEZO		0.1	0	19.5	
G8	PIEZO		0.2	0.1	19.3	
G9	PIEZO		0.1	0.4	19.6	
G10	PIEZO		0.2	0.1	19.9	
G16	PIEZO		0.1	0	20.1	
G17	PIEZO		0.1	0	19.9	
G20	PIEZO		0.2	0.4	19.5	
G21	PIEZO		0.1	0.4	19.8	
GM1	PIEZO		0	0.4	18.7	
GM2	PIEZO		0	0.4	18.9	
GM3	PIEZO		0	0.5	18.5	
GM4	PIEZO		0	0.6	19.6	
GM5	PIEZO		0	0.3	18.4	
GM6	PIEZO		0	0.4	18.4	
GM24	PIEZO		0	0.4	19.0	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 21:09:2012	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:**	
Monitoring Personnel: J.O'N		**Weather:** Cloud	**Barometric pressure:** 1016mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE	PIEZO		35	9	3	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)			
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 13-12-12	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** August 2013	
Monitoring Personnel: J.O'N		**Weather:** Dry/Damp	**Barometric pressure:** 1002mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.4	19.4	
G2	PIEZO		0.1	0.3	18.7	
G3	PIEZO		0	0.5	18.7	
G4	PIEZO		0.2	0.6	19.2	
G5	PIEZO		0	0.4	18.8	
G6	PIEZO		0.2	0.5	19.9	
G7	PIEZO		0.1	0.2	18.9	
G8	PIEZO		0.1	0.5	19.8	
G9	PIEZO		0.2	0.2	19.0	
G10	PIEZO		0.1	0.4	18.5	
G16	PIEZO		0.1	0.2	19.8	
G17	PIEZO		0.1	0.5	19.7	
G20	PIEZO		0.2	0.4	19.6	
G21	PIEZO		0.1	0.4	19.6	
GM1	PIEZO		0.1	0.4	19.7	
GM2	PIEZO		0	0.2	19.2	
GM3	PIEZO		0.1	0.4	19.3	
GM4	PIEZO		0	0.3	19.4	
GM5	PIEZO		0	0.4	19.2	
GM6	PIEZO		0.1	0.2	18.5	
GM24	PIEZO		0.1	0.3	19.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 13:12:2012	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** August 2013	
Monitoring Personnel: J.O'N		**Weather:** Dry/Damp	**Barometric pressure:** 1002mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE	PIEZO		27	8	2	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 24-10-12	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** August 2013	
Monitoring Personnel: J.O'N		**Weather:** Cloud	**Barometric pressure:** 1005mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.2	18.9	
G2	PIEZO		0.1	0.4	18.6	
G3	PIEZO		0.1	0.4	18.7	
G4	PIEZO		0.2	0.5	19.4	
G5	PIEZO		0.1	0.4	19.6	
G6	PIEZO		0.2	0.2	19.4	
G7	PIEZO		0.1	0.1	19.4	
G8	PIEZO		0.2	0.1	19.0	
G9	PIEZO		0.2	0.1	19.5	
G10	PIEZO		0.3	0.4	19.0	
G16	PIEZO		0.1	0.2	19.4	
G17	PIEZO		0.1	0.4	19.5	
G20	PIEZO		0.3	0.5	19.5	
G21	PIEZO		0.1	0.5	19.2	
GM1	PIEZO		0	0.2	18.9	
GM2	PIEZO		0	0.2	18.8	
GM3	PIEZO		0	0.2	18.5	
GM4	PIEZO		0	0.1	19.0	
GM5	PIEZO		0	0.3	18.5	
GM6	PIEZO		0	0.3	18.9	
GM24	PIEZO		0	0.4	19.1	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM	(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL	**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL	**National Grid Reference:** 1632-12	
Site Status: Closed	**Date** 24-10-12	**Time:** 16:00 pm

Instrument used:	**Normal Analytical Range:**	**Date Next Calibration:**
GA2000		August 2013

Monitoring Personnel:	**Weather:**	**Barometric pressure:**
J.O'N	Cloud	1005mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE	PIEZO		31	7	3	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		(Baseline☐ Ambient☐)	
Site Name: DUNDALK LANDFILL		**Site Address:** NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference:** 1632-12	
Site Status: Closed		**Date** 27-11-12	**Time:** 16:00 pm
Instrument used: GA2000	**Normal Analytical Range:**	**Date Next Calibration:** August 2013	
Monitoring Personnel: J.O'N		**Weather:** Cloud	**Barometric pressure:** 1004mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.4	19.0	
G2	PIEZO		0.1	0.5	18.9	
G3	PIEZO		0.1	0.4	19.2	
G4	PIEZO		0.2	0.4	19.5	
G5	PIEZO		0.1	0.2	18.9	
G6	PIEZO		0.2	0.4	19.5	
G7	PIEZO		0.1	0.1	19.0	
G8	PIEZO		0.2	0.2	18.8	
G9	PIEZO		0.3	0.2	19.7	
G10	PIEZO		0.2	0.3	19.4	
G16	PIEZO		0.1	0.1	19.6	
G17	PIEZO		0.1	0.4	19.5	
G20	PIEZO		0.1	0.4	19.7	
G21	PIEZO		0.1	0.3	19.5	
GM1	PIEZO		0.1	0.4	18.7	
GM2	PIEZO		0	0.2	18.7	
GM3	PIEZO		0.1	0.4	18.3	
GM4	PIEZO		0	0.2	18.7	
GM5	PIEZO		0	0.2	19.5	
GM6	PIEZO		0	0.4	19.8	
GM24	PIEZO		0	0.5	19.9	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)			
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 27-11-12	**Time**: 16:00 pm
Instrument used: GA2000	**Normal Analytical Range**:	**Date Next Calibration**: August 2013	
Monitoring Personnel: J.O'N		**Weather**: Cloud	**Barometric pressure**: 1004mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE	PIEZO		28	9	3	

APPENDIX J

COMPOSTING MONITORING AND BIOFILTER RESULTS

BORD NA MÓNA

BORD NA MÓNA HORTICULTURE LIMITED

ANALYSIS OF COMPOSTED GREEN MATERIAL FROM V&W RECYCLING

REPORT NO: GW 120405

ATTENTION:

V&W RECYCLING,
NEWRY ROAD,
DUNDALK,
CO. LOUTH

PREPARED BY: Sarah Lombard
Scientist,
Bord na Móna ltd.

DATE: 24 May 2012

1 Introduction

1 sample was received from V&W Recycling on the 25th of April 2012. No details of this sample are known; it was received in good condition and labelled as follows:

BnM lab code	Client code
GW120405	Not known

The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: GW 120405

Sample reference: **GW 120405**
Sample matrix: not known

Maturity Tests

Specific Oxygen Uptake Rate

Sample no	$mgO_2/gdm/h$
GW 120405	2.3

Self Heating

Sample no	Self Heating (°C)
GW120405	20

Moisture content

Sample no	% Moisture (w/w)
GW 120405	58.1

Extractable nutrients (CAT soluble)

Sample no	pH	EC $\mu S.cm^{-1}$	NH_4-N $mg.L^{-1}$	NO_3-N $mg.L^{-1}$	PO_4-P $mg.L^{-1}$	K $mg.L^{-1}$
GW 120405	7.04	1384	<0.01	337	26	1150

Total Plant Nutrients and Organic Matter

Sample no	% Organic Matter	%C	%N	%P	%K
GW 120405	57.1	31.7	2.1	0.3	1.0

Particle Size Analysis (Dry Wt. Basis)

<1mm %	1-2mm %	2-4mm %	4-8mm %	8-16.5mm %	16.5-31.5mm %	>31.5 mm %
5	2	2	89	2	<0.01	<0.01

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	n/d	n/d	n/d	n/d	n/d
1-2mm	n/d	n/d	n/d	n/d	n/d
2-4mm	<0.01	<0.01	<0.01	<0.01	<0.01
4-8mm	<0.01	<0.01	<0.01	<0.01	<0.01
8-16mm	<0.01	<0.01	<0.01	<0.01	<0.01
16-31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01
>31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01

Heavy Metals (Dry Wt. Basis)

Sample no	Cd $mg.kg^{-1}$	Cr $mg.kg^{-1}$	Cu $mg.kg^{-1}$	Hg $mg.kg^{-1}$	Ni $mg.kg^{-1}$	Pb $mg.kg^{-1}$	Zn $mg.kg^{-1}$
GW 120405	0.27	13.9	23.6	0.05	10	22.4	90.9

Microbiological Analysis

E. Coli (cfu/g)	Salmonella (sp/25g)
<10	Not Detected

BORD NA MÓNA

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ANALYSIS OF COMPOSTED GREEN MATERIAL FROM V&W RECYCLING

REPORT NO: GW 120610

ATTENTION:

V&W RECYCLING,
NEWRY ROAD,
DUNDALK,
CO. LOUTH

PREPARED BY: Sarah Lombard
Scientist,
Bord na Móna ltd.

DATE: 11 July 2012

1 Introduction

1 sample was received from V&W Recycling on the 25th of June 2012. No details of this sample are known; it was received in good condition and labelled as follows:

BnM lab code	Client code
GW120610	Not known

The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: GW 120610

Sample reference: **GW 120610**
Sample matrix: not known

Maturity Tests

Specific Oxygen Uptake Rate

Sample no	$mgO_2/gdm/h$
GW 120610	14.0

Self Heating

Sample no	Self Heating (°C)
GW120610	20

Moisture content

Sample no	% Moisture (w/w)
GW 120610	55.5

Extractable nutrients (CAT soluble)

Sample no	pH	EC $\mu S.cm^{-1}$	NH_4-N $mg.L^{-1}$	NO_3-N $mg.L^{-1}$	PO_4-P $mg.L^{-1}$	K $mg.L^{-1}$
GW 120610	6.78	2260	3	493	22	1690

Total Plant Nutrients and Organic Matter

Sample no	% Organic Matter	%C	%N	%P	%K
GW 120610	56.6	31.4	2.5	0.4	1.3

Particle Size Analysis (Dry Wt. Basis)

<1mm %	1-2mm %	2-4mm %	4-8mm %	8-16.5mm %	16.5-31.5mm %	>31.5 mm %
55	18	15	10	2	<0.01	<0.01

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	n/d	n/d	n/d	n/d	n/d
1-2mm	n/d	n/d	n/d	n/d	n/d
2-4mm	1.02	<0.01	<0.01	<0.01	<0.01
4-8mm	<0.01	<0.01	<0.01	<0.01	<0.01
8-16mm	<0.01	<0.01	<0.01	<0.01	<0.01
16-31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01
>31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01

Heavy Metals (Dry Wt. Basis)

Sample no	Cd $mg.kg^{-1}$	Cr $mg.kg^{-1}$	Cu $mg.kg^{-1}$	Hg $mg.kg^{-1}$	Ni $mg.kg^{-1}$	Pb $mg.kg^{-1}$	Zn $mg.kg^{-1}$
GW 120610	0.5	39	40.3	0.16	20.4	31.9	168

Microbiological Analysis

E. Coli (cfu/g)	Salmonella (sp/25g)
<10	Not Detected

BORD NA MÓNA

BORD NA MÓNA HORTICULTURE LIMITED

ANALYSIS OF COMPOSTED GREEN MATERIAL FROM V&W RECYCLING

REPORT NO: GW 121009

ATTENTION:

V&W RECYCLING,
NEWRY ROAD,
DUNDALK,
CO. LOUTH

PREPARED BY: Sarah Lombard
Scientist,
Bord na Móna ltd.

DATE: 06 November 2012

1 Introduction

1 sample was received from V&W Recycling on the 04th of October 2012. No details of this sample are known; it was received in good condition and labelled as follows:

BnM lab code	Client code
GW121009	Not known

The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: GW 121009

Sample reference: **GW 121009**
Sample matrix: not known

Maturity Tests
Oxygen Uptake Rate

Sample no	Test Method	OUR Stability results ($mmolO_2/kg$ OS/h)
GW 121009	PrEN 16087-1	11.5

Self Heating

Sample no	**Maximum Temperature reached (ambient 20^0C)**
GW 121009	20

Plant Nutrient

Sample no	**pH**	**EC** $\mu S.cm^{-1}$
GW 121009	7.39	1159
Test Method	I.S. EN13037	I.S. EN13038

CAT Soluble Nutrients

Sample no	**NH_4-N** $mg.L^{-1}$	**NO_3-N** $mg.L^{-1}$	**PO_4-P** $mg.L^{-1}$	**K** $mg.L^{-1}$
GW121009	9	252	29	1250
Test Method	I.S. EN 13652	I.S. EN 13652	I.S. EN 13652	I.S. EN 13652

Total Plant Nutrients and Carbon Content (Dry Wt. Basis)

Sample no	**N** %	**P** %	**K** %	**C** %
GW121009	2.3	0.4	1.1	13.2
Test Method	I.S.EN 13554-1	I.S. EN 13650	I.S. EN 13650	I.S. EN 13039

Heavy Metals (Dry Wt. Basis)

Sample no	Cd $mg.kg^{-1}$	Cr $mg.kg^{-1}$	Cu $mg.kg^{-1}$	Hg $mg.kg^{-1}$
GW121009	0.58	18.7	39.3	0.14
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650	ISO 16772

Sample no	Ni $mg.kg^{-1}$	Pb $mg.kg^{-1}$	Zn $mg.kg^{-1}$
GW121009	17.3	40.1	160
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650

Physical Analysis

Sample no	H_20 %	Dry Matter %	Organic Matter %
GW121009	55.5	44.5	56
Test Method	I.S. EN 13041	I.S. EN 13041	I.S. EN 13039

Particle Size Analysis (Dry Wt. Basis)

<1mm %	1-2mm %	2-4mm %	4-8mm %	8-16.5mm %	16.5-31.5mm %	>31.5 mm %
34	24	19	19	4	<0.01	<0.01

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	n/d	n/d	n/d	n/d	n/d
1-2mm	n/d	n/d	n/d	n/d	n/d
2-4mm	0.78	<0.01	<0.01	<0.01	<0.01
4-8mm	1.72	<0.01	<0.01	<0.01	<0.01
8-16mm	<0.01	<0.01	<0.01	<0.01	<0.01
16-31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01
>31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01

Microbiological Analysis

Sample no	E. coli (cfu/g)	Salmonella (spp/25g)
GW121009	300	Not Detected
Test Method	ISO 11866-2	I.S. EN ISO 6579

ANUA
Bord na Móna - with nature

Analysis of Composted Green Material from V&W Recycling

Report No: 12-33867

Attention:

V&W Recycling,
Newry Road,
Dundalk,
Co. Louth

Prepared by: Aoife Doyle
Environmental Scientist,
ANUA

Date: 29 January 2013 (ref 2012)

1 Introduction

1 sample was received from V&W Recycling on the 29th of November 2012. No details of this sample are known; it was received in good condition and labelled as follows:

ANUA lab code	Client code
343753	Not known

The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: 12-33867

Sample reference: **343753**
Sample matrix: not known

Maturity Tests
Oxygen Uptake Rate

Sample no	Test Method	OUR Stability results ($mmolO_2/kg$ OS/h)
343753	PrEN 16087-1	4.4

Self Heating

Sample no	**Maximum Temperature reached (ambient 20^0C)**
343753	16

Plant Nutrient

Sample no	**pH**	**EC** $\mu S.cm^{-1}$
343753	7.6	1475
Test Method	I.S. EN13037	I.S. EN13038

CAT Soluble Nutrients

Sample no	**NH_4-N** $mg.L^{-1}$	**NO_3-N** $mg.L^{-1}$	**PO_4-P** $mg.L^{-1}$	**K** $mg.L^{-1}$
GW121009	14	443	46	1630
Test Method	I.S. EN 13652	I.S. EN 13652	I.S. EN 13652	I.S. EN 13652

Total Plant Nutrients (Dry Wt. Basis)

Sample no	**N** %	**P** %	**K** %
343753	2.1	0.4	1.0
Test Method	I.S.EN 13554-1	I.S. EN 13650	I.S. EN 13650

Microbiological Analysis

Sample no	E. coli (cfu/g)	Salmonella (spp/25g)
343753	<10	Not detected
Test Method	ISO 11866-2	I.S. EN ISO 6579

Heavy Metals (Dry Wt. Basis)

Sample no	Cd $mg.kg^{-1}$	Cr $mg.kg^{-1}$	Cu $mg.kg^{-1}$	Hg $mg.kg^{-1}$
GW121009	.051	59.6	47.5	0.08
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650	ISO 16772

Sample no	Ni $mg.kg^{-1}$	Pb $mg.kg^{-1}$	Zn $mg.kg^{-1}$
GW121009	58.6	39.2	161
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650

Physical Analysis

Sample no	H_20 %	Dry Matter %	Organic Matter %
GW121009	48	52.05	47.26
Test Method	I.S. EN 13041	I.S. EN 13041	I.S. EN 13039

Particle Size Analysis (Dry Wt. Basis)

<1mm %	1-2mm %	2-4mm %	4-8mm %	8-16.5mm %	16.5-31.5mm %	>31.5 mm %
50	18	16	14	2	<0.01	<0.01

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	<0.01	<0.01	<0.01	<0.01	<0.01
1-2mm	1.74	<0.01	<0.01	<0.01	<0.01
2-4mm	2.17	<0.01	<0.01	<0.01	<0.01
4-8mm	3.70	<0.01	0.05	<0.01	<0.01
8-16mm	<0.01	<0.01	<0.01	<0.01	<0.01
16-31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01
>31.5mm	<0.01	<0.01	<0.01	<0.01	<0.01

Cress Germination Test

Sample no	Sample Diluted with 50% peat, to bring to correct	% Germination compared to control*	Root Index Compared to control (%)	MLVI compared to control (%)
343753	EC	100	64.2	65.6

* <80% = fail (method based on pr EN 16086-2)

Fitz scientific

Monitoring and Testing Services

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Customer		*Lab Report Ref. No.*	**1143/014/01**
	V & W Recycling	*Date of Receipt*	**31/07/2012**
		Sampled On	**31/07/2012**
	Newry Rd	*Date Testing Commenced*	**31/07/2012**
	Dundalk	*Received or Collected*	**Delivered by Customer**
	Co. Louth	*Condition on Receipt*	**Acceptable**
Customer PO		*Date of Report*	**28/08/2012**
Customer Ref	**Biofilter 1**	*Sample Type*	**Other**
Ref 2			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
% Moisture Content	0	Drying @ 104 C	71.32	%	
Ammonia (Solid)	114	Colorimetry	163.26	mg/Kg as N	
pH (Solid)	110	Electrometry	7.4	pH Units	
TVC @ 22°C (Solid)	141	Incubation @ 22C/ 72H	$194x10^8$	cfu/g	
TVC @ 37°C (Solid)	141	Incubation @ 37C/ 48H	$15x10^8$	cfu/g	

Signed : A Harmon

Aoife Harmon - Technical Supervisor

Date : 28/08/2012

Acc. : Accredited Parameters by ISO 17025:2005
PVL - Parametric Value Limit as per EU Drinking water Regulations (SI 278 2007)
All organic results are analysed as received and all results are corrected for dry weight at 104 C

Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

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Monitoring and Testing Services

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Customer		*Lab Report Ref. No.*	**1143/014/02**
	V & W Recycling	*Date of Receipt*	**31/07/2012**
		Sampled On	**31/07/2012**
	Newry Rd	*Date Testing Commenced*	**31/07/2012**
	Dundalk	*Received or Collected*	**Delivered by Customer**
	Co. Louth	*Condition on Receipt*	**Acceptable**
Customer PO		*Date of Report*	**28/08/2012**
Customer Ref	**Biofilter 2**	*Sample Type*	**Other**
Ref 2			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
% Moisture Content	0	Drying @ 104 C	68.38	%	
Ammonia (Solid)	114	Colorimetry	11.93	mg/Kg as N	
pH (Solid)	110	Electrometry	7.2	pH Units	
TVC @ 22°C (Solid)	141	Incubation @ 22C/ 72H	80[6]	cfu/g	
TVC @ 37°C (Solid)	141	Incubation @ 37C/ 48H	54[6]	cfu/g	

Signed : A Harmon

Aoife Harmon - Technical Supervisor

Date : 28/08/2012

Acc. : Accredited Parameters by ISO 17025:2005
PVL - Parametric Value Limit as per EU Drinking water Regulations (SI 278 2007)
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
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Customer	**Manager** **V & W Recycling**	*Lab Report Ref. No.*	**1143/016/01**
		Date of Receipt	**24/01/2013**
		Sampled On	**24/01/2013**
	Newry Rd	*Date Testing Commenced*	**24/01/2013**
	Dundalk	*Received or Collected*	**Delivered by Customer**
	Co. Louth	*Condition on Receipt*	**Acceptable**
Customer PO		*Date of Report*	**29/01/2013**
Customer Ref	**Biofilter 1 (December 2012)**	*Sample Type*	**Other**
Ref 2			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
% Moisture Content	0	Drying @ 104 C	65.63	%	
Ammonia (Solid)	114	Colorimetry	204.50	mg/Kg as N	
pH (Solid)	110	Electrometry	8.3	pH Units	
TVC @ 22°C (Solid)	141	Incubation @ 22C/ 72H	290000	cfu/g	
TVC @ 37°C (Solid)	141	Incubation @ 37C/ 48H	123000	cfu/g	

Signed : A Harmon

Aoife Harmon - Technical Supervisor

Date : 29/01/2013

Acc. : Accredited Parameters by ISO 17025:2005

PVL - Parametric Value Limit as per EU Drinking water Regulations (SI 278 2007)

All organic results are analysed as received and all results are corrected for dry weight at 104 C

Results contained in this report relate only to the samples tested

**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

Biofilter Bi-Annual Monitoring Dundalk Civic Waste Facility W0034-02

		BED						Inlet & Outlet Gasses					
Date Checked	BY	No.	Moisture Content (%)	pH	Ammonia (ppm v/v)	TVC @22 deg C	TVC @37 degC	Ammonia In	Ammonia Out	Hyd. Sulph. In	Hyd. Sulph. Out	Mercaptans In	Mercaptans Out
July/2012	Fitz Scientific	1	71.32	7.4	163.26	194×10^3	15×10^3						
July/2012	Fitz Scientific	2	68.35	7.2	11.93	80°	54°						
16/7/2012	VRW Rec.	1						45	20	0	0	0	0
16/7/2012	VRW Rec.	2						47	21	0	0	0	0
DEC/2012	Fitz Scientific	1	65.63	5.3	204.50	240000	123000						
18/12/2012	VRW Rec.	1						44	18	0	0	0	0