



ANNUAL ENVIRONMENTAL REPORT

January - December 2015

For

Dundalk Landfill Site

Co. Louth

Waste Licence Reference W0034-02

By

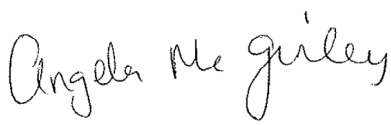
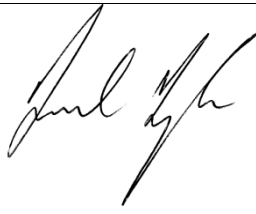
Louth County Council

To

Environmental Protection Agency

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1 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 study¹ 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 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

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

which transfers the gas collected, under suction, provided by compressor, and to the 600 m³ enclosed Flare Unit. A SCADA system and Programmable Logic Controller produces data 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 2015. The landfill site ceased to accept waste in October 2002. A Recycling Centre is currently in operation at the facility.

2 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 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 Landfill²

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

² 1997-2001 figures based on estimates.

- glass
- magazines/newspaper
- building rubble
- plastics
- clothing/textiles
- green/garden waste
- wood
- aluminium cans/steel cans
- domestic appliances
- batteries
- electrical appliances
- scrap metal
- waste engine oil
- waste cooking oil

The quantity of waste received during the reporting period at the recycling facility is 7,689 tonnes. The figures are taken from National Waste Report 2015 Survey.

156 tonnes of mixed residual waste arising from members of the public was accepted for disposal at the recycling facility. The remaining waste was recovered on or off site as listed in Table 3.2. 2,529 tonnes of garden and park waste from municipal sources (landscapers, householders etc.) was composted onsite. 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

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	156	Indaver Incinerator W0167-02	D
Garden	20 02 01	2,529	Dundalk town council W0034-02	R
Cardboard packaging	15 01 01	589	Peute Europe NI6000076	R
Newspaper and magazines	20 01 01	252	Peute Europe NI6000076	R
Glass packaging	15 01 07	363	Glasson NI LN06/08	R
Aluminium cans	15 01 04	7	Tinnelly NI LN09/10	R
Steel cans	15 01 04	31	Tinnelly NI LN09/10	R
Metals	15 01 40	359	Tinnelly NI LN09/10	R
Plastic packaging	15 01 02	573	Shabra Plastics MN 080022-01	R
Clothes/Textiles	20 01 10 & 20 01 011	25	Cookstown N.I WMEX 01/11	R
Wood packaging	15 01 03	165	Thornton Waste W0195-02	R
Wood non-packaging	20 01 38	245	Thornton Waste W0195-02	R
Lead acid batteries and accumulators	16 06 01*	6	Rilta W0192-02	R

Material Type	EWC Codes	Tonnage	Name of Destination Facility(ies), or Collector(s) If Directly Exported	Disposal Or Recovery "D" or "R" or "Both"
Paint, inks, adhesives and resins (non-hazardous)	20 01 26*	1.0	Enva Portlaoise WO184-01	R
Waste mineral oils	13 02 05*	6	Enva Portlaoise (W0184-01)	R
Building Rubble	17 01 07	1,473	Scotch Corner Landfill W0020-01	R
Total		6,863		

4 Summary Report on Emissions

There is no continuous wastewater (sewer), surface water or groundwater emissions monitoring at Dundalk landfill site. Periodic/non-continuous monitoring is carried out for sewer, groundwater, surface water and landfill gas.

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.

Periodic/non-continuous monitoring is carried out at S1. 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 1,600 m³. Reportable emissions for this location as per PRTR requirement are;

- Ammonia (NH₃)
- 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 m² 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 equates to 1,388 to 6,939 m³ of leachate produced.

4.3 Emissions to Air

There is no continuous air emission monitoring at Dundalk landfill site. Periodic/non-continuous monitoring is carried out on the flare. This is further discussed in Section 5.11.

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 600m³ flare was installed at Dundalk Landfill Site. This was downsized in 2013 to a 300m³ flare.

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 55,664 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)	248,940.0
Methane flared	193,276.0
Methane utilised in engine/s	0.0
Net Methane Emission	55,664.0

5 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 C.

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 D 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
Aluminium	µg/l	4	<10.0	<10.0	
Ammonia	mg/l N	16	4.6	190	91
Antimony	µg/l	4	<1.0	<1.0	
Arsenic	µg/l	4	<1.0	3.3	
Barium	µg/l	4	90	460	290
Beryllium	µg/l	4	<1.0	<1.0	
B.O.D.	mg/l O ₂	16	10	170	44
Boron	µg/l	4	65	1500	989
Cadmium	µg/l	4	<0.020	0.03	
Calcium	mg/l Ca	4	170	240	190
C.O.D.	mg/l O ₂	16	47	1200	321
Chloride	mg/l Cl	16	26	195	105
Chromium	µg/l	4	1.7	12	8
Cobalt	µg/l	4	1.7	6.3	3
Conductivity	µS/cm @ 25	16	496	3600	2312
Copper	µg/l	4	<1.0	<1.0	
Cyanide	mg/l CN	16	<0.05	<0.05	
Fluoride	mg/l	4	1.5	2	2
Iron	µg/l	4	8100	27000	19775

Parameters	Units	No. of Samples	Minimum	Maximum	Mean
Lead	µg/l	4	<1.0	<1.0	
Magnesium	mg/l Mg	4	24	85	58
Manganese	µg/l	4	530	3300	1448
Mercury	µg/l	4	<0.020	<0.020	
Molybdenum	µg/l	4	<1.0	9.3	
Nickel	µg/l	4	1.2	15	7
o-Phosphate	mg/l P	16	<0.010	0.53	
pH		16	6.6	7.1	7
Potassium	mg/l	4	9.4	100	61
Selenium	µg/l	4	<1.0	<1.0	
Sodium	mg/l	4	50	120	92
Strontium	µg/l	4	450	1000	845
Sulphate	mg/l SO4	16	<10	<10	
Temp	°C	16	8.6	13.4	12
Thallium	µg/l	4	<1.0	<1.0	
T.O.N	mg/l N	12	<0.20	8.3	
Uranium	µg/l	4	<1.0	<1.0	
Vanadium	µg/l	4	<1.0	2	
Zinc	µg/l	4	4.8	18	8

Table 5.2 Raw Leachate Concentrations

Parameter	Dundalk Landfill Site		From 30 Samples from UK/Irish Landfills Accepting Domestic Waste		
	Min.Conc	Max.Conc	Min.Conc	Max.Conc	Mean
Ammonia (mg/N)	4.6	190	<0.2	1700	491
BOD (mg/l)	10	170	4.5	>4800	>834
COD (mg/l)	47	1200	<10	33,700	3078
Chloride (mg/l)	26	195	27	3410	1256
Iron (µg/l)*	8100	27000	0.4	664	54.4
Potassium (mg/l)		100	2.7	1480	491
Sodium (mg/l)	9.4	120	12	3000	904
TON (mg/l N)	<0.20	8.3	/	/	/
Conductivity (µS/cm)	496	3600	503	19,200	7789
pH (pH units)	6.6	7.1	6.4	8.0	7.2

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 5.3 below.

Table 5.3 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 E. These results are also presented graphically.

A hydrogeological risk assessment was undertaken in 2014 on foot of a technical amendment to the waste license as per a notification issued by the EPA on 15/01/13. This has been submitted to the EPA under a separate cover. This report found there are no sustained upward trends in contaminant export from the site.

Groundwater was assessed against;

- EPA Interim guideline values³ (IGV),
- SI No 278 of 2007 EC (Drinking water) Regulations (DWR),
- SI No 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 as amended (GTV),
- SI No 294 of 1989 European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations (SWQS),and
- SI No 272 of 2009 European Communities Environmental Objectives (Surface Water) Regulations 2009 (EQS).

³EPA (2003) Towards setting guideline values for the protection of groundwater in Ireland. Interim Report

5.4 Baseline Data

Monitoring was carried out upgradient 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 downgradient groundwater can be assessed. WM1 is the upgradient monitoring point. Monitoring is undertaken on a monthly, quarterly and annual basis.

5.4.1 Monthly Parameters

Electrical Conductivity readings in WM1 were above the GTV (800 to 1875 μScm) throughout the monitoring period. Ammonia concentrations exceeded the GTV (0.175 mg/l N) in six of the twelve sampling dates. The highest concentration was 2.5 mg/l in July. Chloride concentrations were above the GTV (187.5 mg/l) throughout the monitoring period. The highest chloride reading recorded was 435 mg/l in March.

5.4.2 Quarterly Parameters

Dissolved Oxygen (DO) levels ranged from 16 to 37 % saturation. WM1 exhibits TOC values ranging from 2.8 to 19.9 mg/l. The pH levels in WM1 are within the IGTV and DWR of 6.5 and 9.5.

5.4.3 Annually

Annual analysis for List I and II substances, metals and non-metals were undertaken on the 13th April 2015 at one location upgradient of the site (WM1).

Aluminium, Antimony Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Fluoride, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Orthophosphate, Selenium, and Zinc are below the IGTV, DWR and GWR 2010 were applicable. Parameters concentrations above the IGTV, DWR and GWR 2010 are:

- Magnesium 54 mg/l.
- Potassium 21 mg/l.
- Sodium 410 mg/l.
- Sulphate 386 mg/l,

- Total Oxidised Nitrogen (TON) was 0.96 mg/l and TOC 3.8 mg/l.

Other parameters detected above the limit of detection were:

- Alkalinity 438 mg/l,
- Calcium 110 mg/l,
- Strontium 560 µg/l, and
- Uranium 1.6 µg/l⁴.

Beryllium, Cobalt and Thallium were below the lower limit of detection.

A cyanide concentration of <0.05 mg/l was detected in all upgradient boreholes. This concentration is the lowest limit of detection for the methodology used for cyanide; therefore this could be lower than the IGV of 0.01 mg/l. The results are below the DWR of 0.05 mg/l.

Analysis for Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.344 µg/l. All parameters measured were less than the limit of detection. For the purposes of determining compliance with the DWR of 0.1µg/l for PAH only four are considered – benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene. Concentrations were as follows:

- benzo(b)fluoranthene <0.023 µg/l,
- benzo(k)fluoranthene <0.027 µg/l,
- benzo(ghi)perylene <0.016 µg/l, and
- indeno (1,2,3-cd) pyrene <0.014 µg/l.

Pesticide and herbicide, volatile organic compound (VOC) and semi volatile organic compound (SVOC) parameters were carried out in WM1 in April. The results were either below the IGV for those comparable or were below the lower detection limit for the analytical methodology used analysis except for following bis(2-ethylhexyl)phthalate (2.02 µg/l).

⁴ World Health Organisation (2011) Guidelines for Drinking-water Quality, Fourth Edition. Table A3.3 Guideline values for chemicals that are of health significance in drinking-water. Uranium 30 µg/l.

5.5 Downgradient 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
Alkalinity	mg/l CaCO ₃	16	831	1190	1006.17
Aluminium	µg/l	16	<10.0	10	
Ammonia	mg/l N	64	8.5	150	52.85
Antimony	µg/l	16	<1.0	0	
Arsenic	µg/l	16	<1.0	27	
Barium	µg/l	16	26	200	128.17
Beryllium	µg/l	16	<1.0	<1.0	
B.O.D.	mg/l O ₂				
Boron	µg/l	16	940	1800	1306.67
Cadmium	µg/l	16	<0.020	0.04	0.03
Calcium	mg/l Ca	16	140	210	170.00
C.O.D.	mg/l O ₂				
Chloride	mg/l Cl	64	79	4270	986.45
Chromium	µg/l	16	2.9	6.2	4.18
Cobalt	µg/l	16	1.7	3.6	2.55
Conductivity	µS/cm @ 25	64	1828	12960	4721.13
Copper	µg/l	16	<1.0	8.8	4.70

	Units	No. of Samples	Minimum	Maximum	Mean
Cyanide	mg/l CN	64	<0.05	<0.05	
D.O.	% Sat	64	10	28	16.77
Fluoride	mg/l	16	0.69	1.8	1.18
Iron	µg/l	11	54	40000	8172.33
Lead	µg/l	16	<1.0	<1.0	
Magnesium	mg/l Mg	16	48	230	119.33
Manganese	µg/l	16	250	2400	756.67
Mercury	µg/l	16	<0.020	<0.020	
Molybdenum	µg/l	16	<0.020	1.9	1.40
Nickel	µg/l	16	2.7	11	5.38
o-Phosphate	mg/l P	64	0.018	0.55	0.17
pH		64	6.6	7.3	7.0
Potassium	mg/l	16	45	120	81.50
Residue on Evaporation	mg/l	16	1096	6755	3054
Sampling Depth	m	64	2.2	5.3	4.16
Selenium	µg/l	16	<1.0	<1.0	
Sodium	mg/l	16	76	1700	672.67
Strontium	µg/l	16	750	1700	1105.00
Suspended Solids	mg/l	64	2	389	118.33

	Units	No. of Samples	Minimum	Maximum	Mean
Temp	°C	64	6.4	14.6	11.37
Thallium	µg/l	16	<1.0	<1.0	
T.O.C.	mg/l	64	14	36.5	22.82
T.O.N	mg/l N	40	0.4	79	21.03
Uranium	µg/l	21	<1.0	1.3	1.30
Vanadium	µg/l	21	<1.0	2	1.85
Zinc	µg/l	16	3.6	17	9.82

5.5.1 Monthly Parameters

Results from downgradient boreholes indicate elevated levels of Ammonia in the majority of boreholes. The highest Ammonia concentration recorded was 150 mg/l N in WM8 in August.

A hydrogeological risk assessment was undertaken in 2014. This report found that concentrations of ammonia in groundwater at the periphery of the landfill are somewhat similar to those currently observed in leachate. This would suggest that there is minimal attenuation of ammonia in the unsaturated zone between the waste cell and the gravel aquifer, and that upgradient groundwater moving below the source does not have a significant dilution effect on infiltrating leachate.

Electrical Conductivity exceeded the DWR and GTV in all boreholes. The highest level was recorded in WM10 (12,960 µS/cm). Chloride levels also exceeded the DWR throughout the monitoring period. The highest Chloride concentration recorded was 4,270 mg/l also in WM10.

It should be noted that saline water intrusion may contribute to the high levels of Chloride and Electrical Conductivity recorded downgradient of the site as seawater can contain Chloride levels up to 20,000 mg/l. Conductivity range detected in groundwater is significantly higher than that reported in leachate.

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. The highest concentration was recorded in WM5 (36.5 mg/l) in January. DO concentrations ranged from 10 to 28 % saturation.

5.5.3 Annually

Annual analysis for List I and II substances, metals and non-metals were undertaken on the 13th April 2015.

Aluminium, Antimony Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, and Zinc are below the IGV, DWR and GWR 2010 were applicable in all downgradient borehole.

Parameters concentrations above the IGV, DWR and GWR 2010 were:

- Barium at WM5, WM6 and WM8 (160 to 190 mg/l),
- Boron 1,100 to 1800 µg/l except WM9 (940 µg/l),
- Fluoride 1.0 to 1.8 mg/l except WM9 (0.69 mg/l),
- Iron 240 to 40,000 µg/l except WM9 (54 µg/l) and WM10 (140 µg/l)
- Magnesium 64 to 230 mg/l except WM8 (48 mg/l),
- Manganese 250 to 2,400 µg/l
- Orthophosphate 0.083 mg/l to 0.55 mg/l except WM8 (<0.010 mg/l) and WM9 (0.018 mg/l),
- Potassium 45 to 120 mg/l,
- Sodium 170 to 1,700 mg/l except at WM8 (76 mg/l),
- Sulphate at WM4 (389 mg/l)and WM10 (237 mg/l)

Total Oxidised Nitrogen (TON) values downgradient ranged from 0.40 to 79 mg/l. TOC values downgradient ranged from 16.8 to 26.6 mg/l. Other parameters detected above the limit of detection were:

- Alkalinity 447 to 1,190 mg/l
- Calcium 140 to 190 mg/l
- Cobalt 1.7 to 3.6 µg/l
- Strontium 750 to 1,700 µg/l
- Uranium WM10 1.3 µg/l⁶

Beryllium and Thallium are below the lower limit of detection.

A cyanide concentration of <0.05 mg/l was detected in all upgradient boreholes. This concentration is the lowest limit of detection for the methodology used for cyanide; therefore this could be lower than the IGV of 0.01 mg/l. The results are below the DWR of 0.05 mg/l.

Analysis for List I and II were undertaken at WM4 and WM5. Analysis for Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.344 µg/l. All parameters measured were less than the limit of detection. For the purposes of determining compliance with the DWR of 0.1µg/l for PAH only four are considered – benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene. Concentrations were as follows:

- benzo(b)fluoranthene <0.023 µg/l,
- benzo(k)fluoranthene <0.027 µg/l,
- benzo(ghi)perylene <0.016 µg/l, and
- indeno(1,2,3-cd)pyrene <0.014 µg/l.

⁶ World Health Organisation (2011) Guidelines for Drinking-water Quality, Fourth Edition. Table A3.3 Guideline values for chemicals that are of health significance in drinking-water. Uranium 30 µg/l.

Pesticide and herbicide, VOC and SVOC parameters were either below the IGV for those comparable or were below the lower detection limit for the analytical methodology used except for the following:

SVOC

- bis(2-ethylhexyl)phthalate - WM4 (5.32 µg/l) and WM5 (4.56 µg/l),
- n-Dibutyl phthalate - WM4 (2.86 µg/l) and WM5 (2.45 µg/l),
- diethyl phthalate - WM4 (7.9 µg/l) and WM5 (6.54 µg/l),

VOC

- 1,2-Dichlorobenzene 0.1 µg/l (WM5).
- Benzene 0.2 µg/l (WM5).

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
20/01/2015	2.17	1.12	0.47	1.37	2.05	1.58	1.44
23/02/2015		1.02	0.87	1.67	2.95	1.48	1.34
09/03/2015			1.57	1.17	2.85	1.28	1.24
13/04/2015	1.97	0.52	0.37	1.07	1.85	1.18	0.94
18/05/2015	2.17		1.57	1.77	0.85	1.68	1.44
15/06/2015	1.77		0.27	0.77	1.45	0.88	0.74

Location	WM1	WM4	WM5	WM6	WM8	WM9	WM10
21/07/2015	2.27		1.57	1.67	1.35	1.28	1.64
10/08/2015	2.17		0.57	0.97	1.95	0.98	0.44
07/09/2015	2.57		1.27	1.27	1.25	1.68	2.64
04/11/2015	2.17		0.77	2.57	1.25	2.98	0.34
16/11/2015	2.27		1.27	2.77	1.65	3.18	0.74
14/12/2015	2.87		1.07	2.67	1.35	3.08	0.54

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 hydrogeological risk assessment was undertaken in 2014 on foot of a technical amendment to the waste license as per a notification issued by the EPA on 15/01/13. This has been submitted to the EPA under a separate cover. This report found there are no sustained upward trends in contaminant export from 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, WM6 WM9 and WM10 concentrations are below the maximum predicted concentration range. For the remaining boreholes:

- WM5 exceeds the maximum predicted concentration range for Ammoniacal Nitrogen in 6 of the 12 sampling
- WM8 (gravel aquifer) exceeds the maximum predicted concentration range for Ammoniacal Nitrogen in 8 of the 12 sampling rounds.

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/EQS) 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 2015 for SW1 to SW4 surface water locations.

Table 5.8 Surface Water Parameters SW1 to SW4

	Units	No. of Samples	Minimum	Maximum	Mean
Alkalinity	mg/l CaCO ₃	4	339	471	388
Aluminium	µg/l	5	12	38	25
Ammonia	mg/l N	45	0.022	18	6
Antimony	µg/l	8	<1.0	<1.0	
Arsenic	µg/l	8	<1.0	2.2	
Barium	µg/l	8	24	110	57
Beryllium	µg/l	8	<1.0	<1.0	
B.O.D.	mg/l O ₂	42	1.4	28	7
Boron	µg/l	8	140	290	220
Cadmium	µg/l	8	<0.020	0.07	0
Calcium	mg/l Ca	8	100	130	115
C.O.D.	mg/l O ₂	42	35	174	70
Chloride	mg/l Cl	45	52	507	183
Chromium	µg/l	8	1.1	1.4	1
Cobalt (µg/l)	µg/l	8	<1.0	<1.0	
Conductivity	µS/cm @ 25	45	495	2500	1471
Copper	µg/l	8	1.3	2.5	2
D.O.	% Saturation	42	25	193	58
Iron	µg/l	8	58	330	175
Lead	µg/l	8	<1.0	<1.0	
Magnesium	mg/l Mg	8	17	27	23
Manganese	µg/l	8	83	560	336
Mercury	µg/l	8	<0.020	0.02	

	Units	No. of Samples	Minimum	Maximum	Mean
Molybdenum	µg/l	8	1.9	2.9	
Nickel	µg/l	8	1.7	2.8	2
o-Phosphate	mg/l P	42	<0.010	0.043	
pH	0	42	7.2	8.2	8
Potassium	mg/l	8	14	19	17
Selenium	µg/l	8	<1.0	<1.0	
Sodium	mg/l	8	59	84	72
Strontium	µg/l	8	410	490	440
Sulphate	mg/l SO ₄	42	49	96	69
Suspended Solids	mg/l	42	4	650	112
Temp	°C	42	4.5	19.4	10
Thallium	µg/l	8	<1.0	<1.0	
T.O.N	mg/l N	30	0.22	5.8	2
Uranium	µg/l	8	<1.0	1.6	1
Vanadium	µg/l	8	1.1	1.8	1
Zinc	µg/l	8	3.1	4.6	4

Table 5.9 Surface Water Parameters SW5 to SW9

	Units	No. of Samples	Minimum	Maximum	Mean
Alkalinity	mg/l CaCO ₃	2	87	94	91
Aluminium	µg/l	2	56	57	57
Ammonia	mg/l N	54	0.027	0.57	0
Antimony	µg/l	8	<1.0	<1.0	
Arsenic	µg/l	8	1.3	1.3	1
Barium	µg/l	8	31	36	34
Beryllium	µg/l	8	<1.0	<1.0	
B.O.D.	mg/l O ₂	49	1	11	4
Boron	µg/l	8	17	33	25
Cadmium	µg/l	8	0.05	0.05	0
Calcium	mg/l Ca	8	31	33	32
C.O.D.	mg/l O ₂	49	24	1550	330
Chloride	mg/l Cl	54	18	14200	2408
Chromium	µg/l	8	<1.0	<1.0	
Cobalt (µg/l)	µg/l	8	<1.0	<1.0	
Conductivity	µS/cm @ 25	54	241	34100	4501
Copper	µg/l	8	3.8	4	4
D.O.	% Saturation	49	71	170	97
Fluoride	mg/l	8			

	Units	No. of Samples	Minimum	Maximum	Mean
Iron	µg/l	8	210	220	215
Lead	µg/l	8	<1.0	<1.0	
Magnesium	mg/l Mg	8	5.5	8.3	7
Manganese	µg/l	8	23	48	36
Mercury	µg/l	8	<0.020	<0.020	
Molybdenum	µg/l	8	<1.0	<1.0	
Nickel	µg/l	8	2.7	3.2	3
o-Phosphate	mg/l P	49	0.08	0.089	0
pH	0	49	7.6	8.7	8
Potassium	mg/l	8	4.4	5.8	5
Selenium	µg/l	8	<1.0	<1.0	
Sodium	mg/l	8	12	38	25
Strontium	µg/l	8	98	120	109
Sulphate	mg/l SO4	49	12	19	16
Suspended Solids	mg/l	49	5	46	21
Temp	°C	49	7.3	17.8	11
Thallium	µg/l	8	<1.0	<1.0	
Tin	µg/l	0			
T.O.C.	mg/l	26			
T.O.N	mg/l N	34	1.3	3.5	2
Total S Solids	mg/l				

	Units	No. of Samples	Minimum	Maximum	Mean
Uranium	µg/l	8	<1.0	<1.0	
Vanadium	µg/l	8	1	1.1	1
Zinc	µg/l	8	4.6	4.7	5

5.7.1 Monthly Parameters

Monthly chemical analyses of surface water are summarised in Appendix F. The results indicate elevated levels of Ammonia mg/l N, the highest concentration recorded in the stream was 18 mg/l N in SW2 and in the estuary was 0.57 mg/l N in SW6 (AD).

Electrical Conductivity and Chloride also exceeded the SWQS at time in the steam an throughout the monitoring period in the estuary. The highest Chloride concentration recorded in the stream was 507 mg/l at SW4 in July and 14,200 mg/l in the estuary at SW5 in June.

Elevated levels of Electrical Conductivity, and Chloride recorded at SW5 to SW9 were also due to the presence of estuarine water.

5.7.2 Quarterly Parameters

The pH values ranged from 7.2 to 8.7 in all surface water locations which are between the SWQS of 5.5 to 9.

The results indicated elevated levels of BOD and COD. The highest concentration for BOD in the stream was 28 mg/l in SW2 and in the estuary was 11 mg/l in SW6 (AD). For COD the highest concentration was 174 mg/l in SW4 and in the estuary was 1,550 mg/l in SW9 (DS).

Suspended Solids exceeded the SWQS in all a number of surface water monitoring locations at times, the highest concentration recorded in the stream was 650 mg/l in SW1 and in the estuary was 46 mg/l in SW9 (DS).

The Total Organic Nitrogen (TON) showed no abnormal change throughout 2015, the highest concentration recorded in the stream was 5.8 mg/l in SW3 and in the estuary was 2.1 mg/l in SW9 (DS).

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. Plans are in place to drain a section of this ditch to the foul sewer as part of the compliance investigation for the site. Approval is required from Irish Water to allow this to proceed.

5.7.3 Annual Parameters

Annual analysis was undertaken on 13th April, 2015.

Aluminium, Antimony, Arsenic, Boron, Cadmium, Calcium, Chromium, Copper, Lead, Magnesium, Mercury, Nickel, Selenium Sodium and Zinc are below the IGTV, DWR and EQS were applicable. Parameters exceeding the standards are as follows:

- Barium exceeded the IGTV at SW1,
- Iron exceeded the DWR at SW1 and a number of the estuarine locations,
- Manganese exceeded the IGTV and DWR at the surface water locations in the stream,
- Potassium exceeded the IGTV at the surface water locations in the stream,
- Sulphate exceeded IGTV at SW3 and SW4,

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

- Molybdenum <1.0 to 2.9 µg/l,
- Strontium 98 to 490 µg/l,
- Uranium <1.0 to 1.6 µg/l, and
- Vanadium 1.0 to 1.8 µg/l

Beryllium and Thallium concentrations were below the limit of detection.

Alkalinity concentrations ranged from 339 to 471 mg/l the stream surface water monitoring locations and from 87 to 94 mg/l in the estuarine water.

Ortho-phosphate concentrations in the stream ranged from <0.010 to 0.043 mg/l below the EQS MAC of 0.045 (High). Ortho-phosphate in the estuary ranged from <0.080 to 0.089 mg/l.

Analysis for List I and II was undertaken at SW1. Analysis for Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.344 µg/l. All other parameters measured were less than the limit of detection. For the purposes of determining compliance with the DWR of 0.1µg/l for PAH only four are considered – benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene. Concentrations were as follows:

- benzo(b)fluoranthene <0.023 µg/l,
- benzo(k)fluoranthene <0.027 µg/l,
- benzo(ghi)perylene <0.016 µg/l, and
- indeno(1,2,3-cd)pyrene <0.014 µg/l.

Pesticide and herbicide and semi volatile organic compound parameters were either below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used except for bis(2-ethylhexyl)phthalate (2.86 µg/l).

Volatile organic compound parameters were either below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used except for:

- 1,2,4-Trimethylbenzene 0.1 µg/l.
- 1,2-Dichlorobenzene 0.1 µg/l.
- 1,4-Dichlorobenzene 0.1 µg/l.
- 4-Isopropyltoluene 0.1 µg/l.

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 (or total ammonia 0.31 mg/l N⁸) in the estuary.

The highest concentration for the estuary is in SW6 (0.57 mg/l N) which is adjacent to the site. An upgradient source of contamination is detected in the monitoring results (SW7 and SW8) at times.

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.

Samples were not collected landfill discharge monitoring location (S2) during the monitoring period as there was No flow.

Table 5.10 illustrates the parameters that were monitored in S1. All parameter were within the ELV.

Table 5.10 Parameters Monitored in S1

Parameter	Jan	April	July	Nov	Emission Limit Value (ELV)	
					S1: Civic Waste Facility (mg/l)	S2: Leachate from Landfill (mg/)
BOD	27	<40	22	89	750	2000
COD	175	349	73	309	1000	9000
Suspended Solids	47	430	12	82	1000	2000

⁸ ammonia to ammoniacal nitrogen then multiply the value by 14/17

Parameter	Jan	April	July	Nov	Emission Limit Value (ELV)	
					S1: Civic Waste Facility (mg/l)	S2: Leachate from Landfill (mg/)
Sulphate	40	4	44	35	300	400
pH	7.4	7.2	7.5	7.1	6-9	6-9
Temperature	6.4	10.7	17.3	14.0	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 5.11 and shown in Drawing in Appendix C (External Gas Monitoring Points).

Table 5.11 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, GM24 ⁹

Landfill gas around the periphery of the site is indicated by piezometers as shown in Table 5.11 above.

⁹ 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 GM6, 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 600m³ enclosed Flare Unit and SCADA system was installed. This was downsized in 2013 to a 300m³ flare. 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 of licence requirements of methane greater than or equal to 1.0% v/v. The highest recording was 0.5% v/v during the monitoring period.

There were no exceedances of licence requirements of carbon dioxide greater than or equal to 1.5% v/v. The highest recording was 1.1 % v/v during the monitoring period.

5.11 Flue Gas Monitoring

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). This report is available on site for inspection. NO_x as NO₂ emissions from the flare were within the emission limit values specified in Waste licence W0034-02.

5.12 Estuarine Soil Samples

Sediment sampling was undertaken at five locations in the estuary in December 2015. These results are presented in Table 5.12. These results have been compared to the Dutch Target values and intervention values for soil remediation soil/sediment. The results are below the Target Value for all parameters except Zinc at 4 locations and Copper at 2 locations.

The results are below the intervention value for those parameters comparable. No Targets Values are given for Manganese or Cyanide. Cyanide levels are below the lower detection limit for the analytical method used. SW7 and SW8 are located upstream of the site.

Table 5.12 Sediment Results

Parameter (mg/kg)	SW5	SW6	SW7	SW8	SW9	Target Value (Dutch)	Inter - vention Value (Dutch)
Total Solids %	47	60	52	43	55		
Cadmium	0.407	0.0324	0.387	0.452	0.495	0.8	1.2
Copper	67.8	2.26	29	31.1	44.2	36	190
Lead	35.2	1.55	46.2	34.3	29.4	85	530
Manganese	662	22.7	438	445	458		
Mercury	<0.14	<0.14	<0.14	<0.14	<0.14	0.3	10
Zinc	237	5.39	143	180	190	140	720
Total cyanide	<1	<1	<1	<1	<1		

5.13 Dust Monitoring

Dust monitoring was carried out three times in the year. Table 5.11 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/m²/day. From Table 5.13 it can be seen that all dust deposition levels in all periods are below the limit.

Table 5.13 Dust Monitoring Results (mg/m²/day)

Sampling Period	Dust Monitor 1	Dust Monitor 2	Dust Monitor 3
July	77.4	11.8	9.2
September	70.3	30.7	18.0
November	34.9	6.3	35.4

5.14 Composting Monitoring

V & W recycling compost hedge grass & hedge cuttings from Civic Amenity users. 2,715 tonnes was received for composting in 2015. Compost testing was undertaken by Bord na Mona Ltd and is provided in Appendix I. 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) in accordance with Schedule F, Maturity test 4.

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 and Oxygen Uptake Rate Bord na Móna Maturity Indicator Values (OS = organic solids) $\text{mmolO}_2/\text{kg OS/h}$.

Table 5.14 Bord na Móna Maturity Indicator Values

Compost Process Stage ($\text{mmolO}_2/\text{kg OS/h}$)	
>26	Very Unstable
16-25	Unstable
11-15	Moderately Stable
5-10	Stable
<5	Completely stable

- 18th May 2015

Sample complied with Schedule F, Maturity tests 3 and 4. The oxygen uptake test was 2.7 $\text{mmolO}_2/\text{kgOS/h}$ which is completely stable in accordance with Bord Na Móna Maturity Indicator Values. A germination test was not undertaken during this monitoring period.

Contaminants were <0.01 % for all sieve sizes from <1 to >31.5 mm except for stones in the 2-4mm (1.21%) and 4-8mm (5.37%) sieve size. Stones in the 2-4mm sieve size were not in compliance with the limit for impurities >2mm (<0.5%). and stones in the 4-8mm sieve size were not in compliance with the limit for gravel and stones >5mm (<5%).

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).

- 22nd June 2015

Sample complied with Schedule F, Maturity tests 3 and 4. The oxygen uptake test was 1.2 mmolO₂/kgOS/h which is completely stable in accordance with Bord Na Móna Maturity Indicator Values. A germination test was not undertaken during this monitoring period.

Contaminants were <0.01 % for all sieve sizes from <1 to >31.5mm except for stones in the 1-2mm (0.68%), 2-4mm (2.15%) and 4-8mm (2.15%) sieve sizes. Stones in the 2-4mm sieve size were not in compliance limit for impurities >2mm (<0.5%). Stones in the 4-8mm size sieve were within the compliance limit for gravel and stones >5mm (<5%).

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).

- 2nd October 2015

Sample complied with Schedule F, Maturity tests 3 and 4. The oxygen uptake test was 3.9 mmolO₂/kgOS/h which is completely stable in accordance with Bord Na Móna Maturity Indicator Values. A germination test was not undertaken during this monitoring period.

Contaminants were <0.01 % for all sieve sizes from <1mm to >31.5mm except for stones in the 1-2mm (0.13%), 2-4mm (1.31%), 4-8mm (2.56%) and 8-16mm (2.10%) sieve sizes. Stones in the 2-4mm sieve size exceeded the compliance limit for impurities >2mm (<0.5%). Stones in the 4-8mm and 8-16mm size sieve were within the compliance limit for gravel and stones >5mm (<5%).

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).

- 23rd November 2015

Sample complied with Schedule F, Maturity tests 3 and 4. The oxygen uptake test was 13.7 mmolO₂/kgOS/h which is moderately stable in accordance with Bord Na Móna Maturity Indicator Values. A germination test was not undertaken during this monitoring period.

Contaminants were <0.01 % for all sieve sizes from <1mm to >31.5mm except for stones in the 2-4mm (0.75%), 4-8mm (3.92%) and 8-16mm (2.50%) sieve sizes. Stones in the 2-4mm sieve size exceeded the compliance limit for impurities >2mm (<0.5%). Stones in the 4-8mm and 8-16mm size sieve were within the compliance limit for gravel and stones >5mm (<5%).

Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost. Microbiological analysis was not undertaken during this monitoring period.

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.

5.15 Bed Media

Moisture content, pH, Ammonia and Total viable counts were analysed for the bed media gases from Biofilter. These are available on site. There are no limits in waste licence for these parameters.

5.16 Meteorological Monitoring

Temperature and rainfall readings are taken from Dublin Airport.

Table 5.15 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
2015	47.7	34.6	57.5	43.9	90.5	14.1	69.2	100.1	56.6	49.1	121.6	193.5	878.4

Mean Temperature in Degrees C. for Dublin Airport													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2015	4.7	4.0	5.8	7.4	9.6	12.9	13.8	14.0	11.8	10.2	8.7	8.6	9.3

6 Resource and Energy Consumption Summary

Consumption of resources for the reporting period is shown in Table 6.1 below. An energy efficiency audit has not been carried out at this facility as the landfill site is closed it is not a requirement of the licence.

Table 6.1 Consumption of Resources

Parameters	Unit	CWF 2013	CWF 2014	CWF 2015	% difference +/-
Electricity	kWh	3,850	3,900	3,800	-2.5
Water	m ³	2,810	2,700	2,500	-7.4

7 Development / Infrastructural Works in Place and Planned, to Process Waste Quantities Projected

There is no additional development /infrastructural works planned for 2016 in the recycling facility and landfill site.

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.

7.1 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 Schedule of Environmental Objectives and Targets for the Forthcoming Year

There are no proposed developments works (Environmental Objectives and Targets) to be carried out in 2016.

9 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. A bund integrity test was undertaken on these areas and a report is provided in Appendix J. No other inspections are undertaken.

10 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 Report on Incidents and Complaints Summaries

No complaints were received from the public and no incidents were reported in 2015. A compliance investigation is ongoing in relation to elevated ammonia concentration in surface water along the northern boundary of the site.

12 Review of Nuisance Controls

12.1 Dust Control

There were no breaches of the dust deposition limit in 2015. 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 windblown 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 cleanup.

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 on Tuesday 23rd and Wednesday 24th of February 2016 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: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) 2016.

The range of noise levels, at each noise sensitive location during respective measuring periods, were as follows:

- NSL 1: Daytime: LAeq (T 30 min) constant at 68dBA;

 Evening time: LAeq (T 15 min) constant at 65dBA;

 Night time: LAeq (T 15 min) 54-56dBA
- NSL 2: Daytime: LAeq (T 30min) 50-53dBA;

 Evening time: LAeq (T 15 min) constant at 50dBA;

 Night time: LAeq (T 15 min) 43-46dBA
- NSL 3: Daytime: LAeq (T 30 min) 68-70dBA;

 Evening time: LAeq (T 15 min) constant at 67dBA;

 Night time: LAeq (T 15 min) 51-55dBA
- NSL 4: Daytime: LAeq (T 30 min) constant at 62dBA;

 Evening time: LAeq (T 15 min) constant at 62dBA;

 Night time: LAeq (T 15 min) 46-51dBA

The report found that traffic was 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 requirements.

13 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 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 6 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 Annual Budget and Site Running Costs

The recycling facility is operated by third party (V & W Recycling) on behalf of Dundalk Town Council. A €3.00 entrance charge is applicable to all users of the site except for the disposal of electrical goods.

Funding is provided by Louth County Council for all monitoring requirements.

An Environmental Liability Risk Assessment has not been carried out at this facility as the landfill site is closed it is not a requirement of the licence.

Appendix A

Water balance calculation

WATER BALANCE CALCULATION																
Year	Active Phase	Active Area A(m ²)	Waste Input t/month	Rainfall mm	Active Area Infiltration AR(A)(m ³)	Temp Restored area	Temp Restored area(Temp) RCA(m ²)	Restored area(Temp) infiltration IRCA(m ³)	Permanently Restored area	Restored area RCA(m ²)	Total Water	Cumulative Water	Absorptive Capacity aW(m ³)	Cumulative Absorptive Capacity	Cumulative Leachate	Leachate produced Lo(m ³)
2015	Closed		0.00	878.4	0				79000	1388	1388	1388	0.00	0.00	1388	1388
Total			0.00	878.4	0			0		1388			0			1388

Assumptions

IRCA	Temporarily capped/restored area infiltration of rainfall estimated %	30%	%
	Permanent capped/restored area infiltration of rainfall estimated % (2-10%)	2%	%
Absorptive Capacity	waste density of 0.8 tonnes/m ³ . Estimated absorptive capacity (water per tonne waste before leachate is produced) t/m ³	0.06	t/m ³
Restored Area	Area	79,000	m ²
Rainfall	Rainfall taken from Dublin Airport	878.4	mm

Appendix B

PRTR Reporting



| PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility - Dundalk Town Council | Filename : W0034_2015(1).xls | Return Year : 2015 |

[Guidance to completing the PRTR workbook](#)

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2015
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1. FACILITY IDENTIFICATION

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

Classes of Activity

No.	class_name
-	Refer to PRTR class activities below

Address 1	Newry Road
Address 2	Dundalk
Address 3	
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	Executive Scientist
AER Returns Contact Telephone Number	042 9392920
AER Returns Contact Mobile Phone Number	086 6097315
AER Returns Contact Fax Number	041 6851623
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	6
User Feedback/Comments	Emission sto sewer based on rainfall figures and average emissson concentrations
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

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

4. WASTE IMPORTED/ACCEPTED ONTO SITE

[Guidance on waste imported/accepted onto site](#)

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

[Link to previous years emissions data](#)

| PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility - Dundalk Town Council | Filename : W0034_2015(1).xls | Return Year : 2015 |

07/04/2016 16:24

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

POLLUTANT		METHOD		Please enter all quantities in this section in KGs				
No. Annex II	Name	M/C/E	Method Used		Emission Point 1	QUANTITY		
			Method Code	Designation or Description		T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	M	OTH	Gassim	0.0	0.0	0.0	0.0
					0.0	55664.0	0.0	55664.0

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

SECTION B : REMAINING PRTR POLLUTANTS

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

POLLUTANT		METHOD		Please enter all quantities in this section in KGs				
Pollutant No.	Name	M/C/E	Method Used		Emission Point 1	QUANTITY		
			Method Code	Designation or Description		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 - Dundalk Town Council

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)	248940.0	C	Gassim	Gassim Lite	N/A
Methane flared	193276.0	M	Flare Records	Flare Records	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)	55664.0	C	Calculation	Net emission calculation	N/A

4.3 RELEASES TO WASTEWATER OR SEWER

[Link to previous years emissions data](#)

| PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility - Dundalk Town Council | Fil

07/04/2016 16:25

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			
No. Annex II	Name	M/C/E	Method Used		S1			
			Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
06	Ammonia (NH3)	C	OTH		78.0	78.0	0.0	0.0
					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			
Pollutant No.	Name	M/C/E	Method Used		S1			
			Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
303	BOD	C	OTH		187.6	187.6	0.0	0.0
306	COD	C	OTH		954.9	954.9	0.0	0.0
343	Sulphate	C	OTH		129.65	129.65	0.0	0.0
240	Suspended Solids	C	OTH		601.87	601.87	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 - Dundalk Town Council | Filename : W0034_2015(1).xls | Return Year : 2015 |

07/04/2016 16:25

Please enter all quantities on this sheet in Tonnes

8

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	Haz Waste : Address of Next Destination Facility	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		Haz Waste : Name and Licence/Permit No of Recover/Disposer	Non Haz Waste: Address of Recover/Disposer		
Within the Country	13 02 05	Yes	6.0	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	Enva,W0184-01,Clonminam ,Industrial,Estate,Portlaois,Ireland	Enva,Clonminam ,Industrial,Portlaois,Ireland
To Other Countries	15 01 01	No	589.0	cardboard packaging	R3	M	Weighed	Abroad	Peute Europe,nl 6000076	Baahoekweg 4,LA Dordrecht,,Netherlands		
To Other Countries	15 01 01	No	252.0	newspapers and magazines	R3	M	Weighed	Abroad	Peute Europe,nl 6000076	Baahoekweg 4,LA Dordrecht,,Netherlands		
Within the Country	15 01 01	No	0.0	newspapers and magazines	R3	M	Weighed	Offsite in Ireland	Thornton Waste Disposal,Waste Licence W0195-02	Kimlainham wood,,Meath,Ireland		
Within the Country	15 01 02	No	573.0	plastic packaging	R3	M	Weighed	Offsite in Ireland	Shrabra Plastic IRL,Licence No 15/5	Killycard ind est ,Castleblayne,Co Monaghan,,Ireland		
To Other Countries	15 01 04	No	380.0	metallic packaging	R4	M	Weighed	Abroad	John Tinnelly & Sons,WMEX 20/01	Newtowncloughogue,Newry, Co Down,BT38 8LZ,United Kingdom		
To Other Countries	15 01 07	No	363.0	glass packaging	R5	M	Weighed	Abroad	Glassdon ,NI licenceLN/06/08	52 Creagh Road,Toomebridge,Co Antrim,BT41 3SE,United Kingdom	Rilta Env,W0192-02,Block 402,Grant Drive,Greenogue,Rathcoole,Ireland	Rilta Env,Block 402,Grant Drive,Greenogue,Ireland
Within the Country	16 06 01	Yes	6.0	lead batteries	R4	M	Weighed	Offsite in Ireland	Rilta Environmental Ltd,Licence No W0192-02	Park,Rathcoole ,Co Dublin,Ireland		
Within the Country	17 01 07	No	1473.0	mixture of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	R5	M	Weighed	Offsite in Ireland	Scotch Corner Landfill,W0020-01	Annyalla,,Castleblayney,Co. Monaghan,Ireland		
To Other Countries	20 01 11	No	25.0	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	20 01 28	No	1.0	paint, inks, adhesives and resins other than those mentioned in 20 01 27	R3	M	Weighed	Offsite in Ireland	Enva ,WO184-01 Thornton Waste Disposal,Waste Licence W0195-02	Clonminam Industrial Estate,Portlaoise,Co. Laois ,Ireland		
Within the Country	20 01 38	No	410.0	wood other than that mentioned in 20 01 37	R3	M	Weighed	Offsite in Ireland	Dundalk Town Council,W0034-02	Kimlainham wood,,Meath,Ireland		
Within the Country	20 02 01	No	2529.0	Biodegradable waste	R3	M	Weighed	Offsite in Ireland		Newry Road,,Dundalk Town Council,,Ireland		
Within the Country	20 03 01	No	128.0	mixed municipal waste	D1	M	Weighed	Offsite in Ireland	Indaver Ireland,W0167-02	Carranstown,Duleek,,Co. Meath,Ireland		

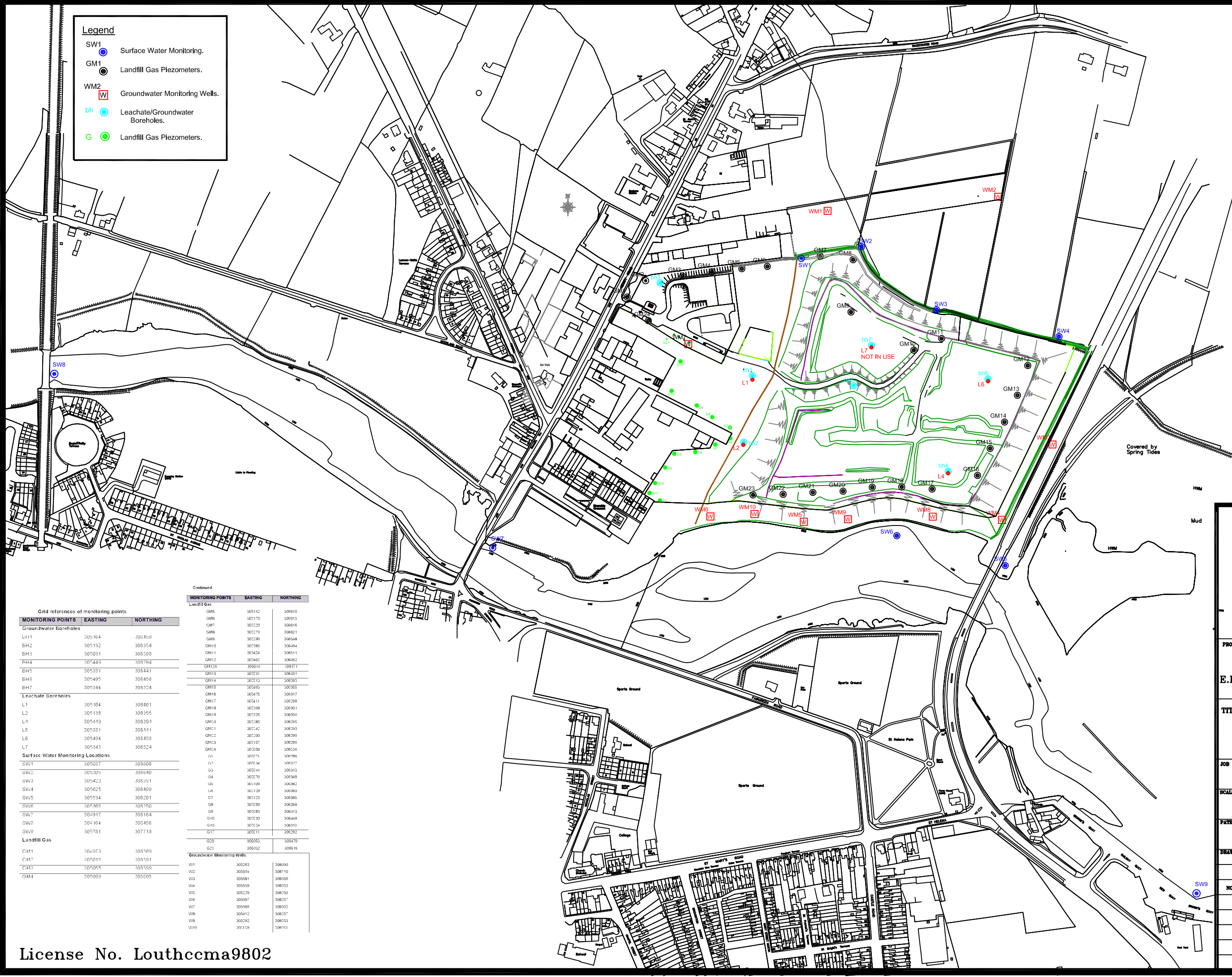
* Select a row by double-clicking the Description of Waste then click the delete button

Appendix C

Monitoring Points Drawing

Legend

- SW1 Surface Water Monitoring.
- GM1 Landfill Gas Piezometers.
- WM2 Groundwater Monitoring Wells.
- bh Leachate/Groundwater Boreholes.
- G Landfill Gas Piezometers.



Grid references of monitoring points

MONITORING POINTS	EASTING	NORTHING
Groundwater Boreholes		
LH11	305164	308459
BH2	305132	308354
BH3	305031	308308
BH4	305449	308794
BH5	305531	308441
BH5	305495	308458
BH7	305344	308324
Leachate Boreholes		
L1	305164	308461
L2	305138	308355
L1	305419	308391
L5	305531	308111
L6	305494	308458
L7	305343	308524
Surface Water Monitoring Locations		
SW1	305037	308608
SW2	305305	308640
SW3	305423	308901
SW4	305625	308409
SW5	305534	308201
SW6	305485	308750
SW7	305917	308164
SW8	304164	308456
SW9	305781	307718
Landfill Gas		
GM1	304973	308169
GM7	305015	308191
GM3	305068	308199
GM4	305099	308505

Continued

MONITORING POINTS	EASTING	NORTHING
Landfill Gas		
GM5	305142	308610
GM6	305170	308515
GM7	305220	308616
GM8	305273	308621
GM9	305296	308548
GM10	305385	308494
GM11	305424	308511
GM12	305482	308492
GM12A	305516	308171
GM13	305531	308451
GM14	305570	308393
GM15	305585	308355
GM16	305475	308317
GM17	305411	308298
GM18	305398	308301
GM19	305326	308300
GM20	305385	308295
GM21	305342	308293
GM22	305300	308290
GM23	305197	308290
GM24	305209	308250
Groundwater Monitoring Wells		
G1	305171	308786
G2	305134	308177
G3	305141	308413
G4	305076	308348
G6	305108	308362
G6	305128	308369
G7	305123	308386
G8	305038	308399
G8	305083	308413
G10	305130	308449
G16	305124	308319
G17	305111	308292
G20	305055	308479
G21	305052	308516
Groundwater Monitoring Wells		
W1	305263	308930
W2	305004	308710
W3	305081	308339
W4	305059	308233
W5	305229	308250
W6	305097	308257
W7	305096	308302
W8	305412	308257
W9	305292	308253
W10	305159	308751

COMHAIRLE BHAILE DUN DEALGAN

DUNDALK TOWN COUNCIL
Phone (045) 858765 Fax (045) 858881

TOWN ENGINEER:- C. DUFF

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

TITLE:- Location Map

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

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

DRAWING BY:- P Mulligan

DRN. No. REVISION		
NO	DATE	DETAILS

Appendix D

Leachate Results



Dundalk Landfill Site
LEACHATE QUALITY

Monitoring Point:		LH1															
		RESULTS															
		Date															
PARAMETERS	Units	16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15
Alkalinity	mg/l CaCO3																
Aluminium	µg/l		6.5				<5				<10.0				<10.0		
Ammonia	mg/l N	93.87	107.62	99.60	101.22	113.65	100.89	11.54	102.62	160	92	110	87	84	87	95	97
Antimony	µg/l		<0.5				<0.5				<1.0				<1.0		
Arsenic	µg/l		0.76				<0.5				<1.0				<1.0		
Barium	µg/l		465.9				500.4				380				460		
Beryllium	µg/l		<0.5				<0.5				<1.0				<1.0		
B.O.D.	mg/l O2	11.7	24.1	14.0	9.6	19.6	16.6	17.8	<10	14	17	15	31	10	<8	11	13
Boron	µg/l		1594.7				1150.7				1100				990		
Cadmium	µg/l		<0.1				<0.1				<0.020				<0.020		
Calcium	mg/l Ca		204.92				161.65				180				170		
C.O.D.	mg/l O2	102	80	82	104	120	95	32	109	133	101	134	92	137	87	118	163
Chloride	mg/l Cl	195	159	195	182	146	114	50	154	126	123	104	106	103	103	94	129
Chromium	µg/l		7.4				7.5				7.9				11		
Cobalt (µg/l)	µg/l		2.2				3.2				2				2.1		
Conductivity	µS/cm @ 25	2660	2480	2580	2690	2750	2450	1062	2590	2700	2360	2450	2170	2180	2190	496	2490
Copper	µg/l		<0.5				0.7				11				<1.0		
Cyanide	mg/l CN	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
D.O.	% Saturation																
Fluoride	mg/l		<0.150				<0.150				<0.150				2		
Iron	µg/l		30384.3				102.3				620				24000		
Lead	µg/l		<0.5				<0.5				<1.0				<1.0		
Magnesium	mg/l Mg		66.33				54.11				56				49		
Manganese	µg/l		647.2				520.1				730				530		
Mercury	µg/l		<0.05				<0.05				<0.050				<0.020		
Molybdenum	µg/l		0.5				5.5				<1.0				<1.0		
Nickel	µg/l		1.2				8.5				2.2				1.2		
o-Phosphate	mg/l P	0.17	<0.02	<0.02	0.02	0.13	<0.02	<0.02	<0.02	<0.010	<0.010	<0.010	0.017	0.25	<0.010	<0.010	<0.010
pH		6.9	6.9	7.0	6.7	6.8	6.8	7.2	6.8	6.8	6.7	6.7	6.7	6.8	6.7	6.8	6.8
Potassium	mg/l		70.91				55.18				59				53		
Residue on Evaporation																	
Sampling Depth (m)	m																
Selenium	µg/l		<0.5				<0.5				<1.0				<1.0		
Silver	µg/l		nm				nm										
Sodium	mg/l		130.76				99.43				110				89		
Strontium	µg/l		1169.14				956.28				890				960		
Sulphate	mg/l SO4		4.1				<2.0				<2.0				<10		
Suspended Solids	mg/l																
Temp	°C	10.8	10.5	18.2	12.8	9.1	12.1	11.3	13.1	10.1	9.7	14.5	13.7	9.2	11.1	11.1	12.2
Thallium	µg/l		<0.1				<0.1				<1.0				<1.0		
Time Sampled		11:10	10:30	10:20	10:45	09:30	10:35	12:25	10:30	11:00	10:30	10:20	10:30	09:50	12:30	10:00	15:15
Tin (µg/l)	µg/l		<1				nm										
T.O.C.	mg/l																
T.O.N	mg/l N	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	7.32	<0.08	<0.20	<0.20	<0.20	<0.20		<0.20	<0.20	<0.20
Total S Solids	mg/l																
Uranium	µg/l		<0.1				<0.1				<1.0				<1.0		
Vanadium	µg/l		1.07				0.7				<1.0				1.1		
Zinc	µg/l		2.4				57.6				29				5.5		



Dundalk Landfill Site
LEACHATE QUALITY

Monitoring Point:		LH2																
		RESULTS																
		Date																
PARAMETERS	Units	16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15	
Alkalinity	mg/l CaCO3																	
Aluminium	µg/l		5				<5				<10.0				<10.0			
Ammonia	mg/l N	56.09	104.8	8.4	76.78	22.51	93.57	11.54	12.19	2.9	49	140	130	100	110	130	30	
Antimony	µg/l		<0.5				0.63				1				<1.0			
Arsenic	µg/l		1.23				0.88				<1.0				2.4			
Barium	µg/l		393.3				707.7				330				410			
Beryllium	µg/l		<0.5				<0.5				<1.0				<1.0			
B.O.D.	mg/l O2	10.1	15.8	nm	18.5	15.4	16	17.8	<10	4.8	6	<20	26	20	14	17	<10	
Boron	µg/l		1858.9				1162.5				830				1500			
Cadmium	µg/l		<0.1				<0.1				0.06				0.03			
Calcium	mg/l Ca		260.08				228.26				200				240			
C.O.D.	mg/l O2	77	148	21	144	92	107	32	49	48	68	186	152	134	128	146	47	
Chloride	mg/l Cl	78	114	11	79	39	85	50	76	26	65	132	167	111	124	148	100	
Chromium	µg/l		2.7				6.6				4.8				12			
Cobalt (µg/l)	µg/l		2.6				5				3.4				6.3			
Conductivity	µS/cm @ 25	2110	2700	685	2320	1424	2660	1062	1212	936	1782	3300	3360	2720	3000	2290	1582	
Copper	µg/l		0.5				3.5				12				<1.0			
Cyanide	mg/l CN	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
D.O.	% Saturation																	
Fluoride	mg/l		0.15				<0.150				0.26				1.7			
Iron	µg/l		10759.3				178.8				160				20000			
Lead	µg/l		<0.5				<0.5				<1.0				<1.0			
Magnesium	mg/l Mg		86.04				67.69				48				85			
Manganese	µg/l		855.8				639.4				690				660			
Mercury	µg/l		<0.05				<0.05				<0.050				<0.020			
Molybdenum	µg/l		1.6				5.5				8.6				9.3			
Nickel	µg/l		2.2				11.1				14				15			
o-Phosphate	mg/l P	0.16	0.03	0.04	0.19	0.02	<0.02	<0.02	0.02	0.034	<0.010	0.098	<0.010	0.085	<0.010	0.019	0.08	
pH		6.9	7.1	7.2	6.8	6.8	6.9	7.2	7.2	7	6.9	6.8	6.9	6.9	6.7	6.9	7.1	
Potassium	mg/l		92.07				63.17				45				83			
Residue on Evaporation																		
Sampling Depth (m)	m																	
Selenium	µg/l		<0.5				<0.5				<1.0				<1.0			
Silver	µg/l		nm				nm											
Sodium	mg/l		124.94				90.9				64				110			
Strontium	µg/l		1043.19				931.56				650				970			
Sulphate	mg/l SO4		4.1				77.3				87				<10			
Suspended Solids	mg/l																	
Temp	°C	10	10.7	17.9	13.0	8.1	11.9	11.3	12.6	7	9.3	14.2	13.6	8.6	11.2	12.2	12	
Thallium	µg/l		<0.1				<0.1				<1.0				<1.0			
Time Sampled		11:25	10:45	10:35	11:00	09:55	11:00	12:25	10:40	11:25	10:50	10:40	10:45	10:35	12:40	10:20	15:30	
Tin (µg/l)	µg/l		<1				nm											
T.O.C.	mg/l																	
T.O.N	mg/l N	<0.08	0.3	0.13	0.98	0.11	0.3	7.32	4.08	0.73	<0.20	<0.20	<0.20		1.6	<0.20	8.3	
Total S Solids	mg/l																	
Uranium	µg/l		0.1				0.46				<1.0				<1.0			
Vanadium	µg/l		0.7				0.83				<1.0				1.3			
Zinc	µg/l		23				110.6				44				18			




Dundalk Landfill Site
LEACHATE QUALITY
LH4

Monitoring Point:		RESULTS															
PARAMETERS	Units	Date															
		16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	17-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15
Alkalinity	mg/l CaCO3																
Aluminium	µg/l		9.5				8.3				<10.0				<10.0		
Ammonia	mg/l N	1.64	1.63	154.03	114.18	121.22	106.56	132.12	117.27	300	200	190	180	190	150	120	140
Antimony	µg/l		<0.5				<0.5				<1.0				<1.0		
Arsenic	µg/l		2.6				0.71				1				1.8		
Barium	µg/l		185.2				117.9				180				200		
Beryllium	µg/l		<0.5				<0.5				<1.0				<1.0		
B.O.D.	mg/l O2	44.4	71.1	1121	33.8	72.1	30.2	142.8	82	34	61	20	82	15	17	20	18
Boron	µg/l		2319.3				1045.3				1900				1400		
Cadmium	µg/l		<0.1				<0.1				0.09				<0.020		
Calcium	mg/l Ca		194.66				135.03				170				180		
C.O.D.	mg/l O2	249	265	2450	176	197	218	217	275	212	179	205	366	183	124	128	225
Chloride	mg/l Cl	181	185	34	132	129	95	130	234	235	207	170	204	195	132	128	138
Chromium	µg/l		1.3				3.7				8.4				7.8		
Cobalt (µg/l)	µg/l		4.6				3.2				4.4				3.7		
Conductivity	µS/cm @ 25	3890	3570	1690	2790	2650	2350	2660	3310	3880	3830	3560	3620	3600	3070	3310	3000
Copper	µg/l		<0.5				4.8				13				<1.0		
Cyanide	mg/l CN	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
D.O.	% Saturation																
Fluoride	mg/l		<0.150				<0.150				<0.150				1.5		
Iron	µg/l		29832.9				2079.2				240				27000		
Lead	µg/l		<0.5				<0.5				<1.0				<1.0		
Magnesium	mg/l Mg		100.14				51.61				90				73		
Manganese	µg/l		1060				1154.5				960				1300		
Mercury	µg/l		<0.05				<0.05				<0.050				<0.020		
Molybdenum	µg/l		<0.5				<0.5				1.5				<1.0		
Nickel	µg/l		3.8				4.6				8				9.6		
o-Phosphate	mg/l P	1.24	0.57	<0.02	0.16	0.44	1.02	0.1	<0.02	0.52	0.37	<0.010	0.033	0.53	<0.010	<0.010	0.021
pH		6.9	7	7.2	6.8	6.8	6.8	6.8	6.9	7	6.9	6.8	6.9	6.9	6.7	6.8	6.9
Potassium	mg/l		157.91				75.82				140				100		
Residue on Evaporation																	
Sampling Depth (m)	m																
Selenium	µg/l		0.5				<0.5				<1.0				<1.0		
Silver	µg/l		nm				nm										
Strontium	µg/l		203.55				93.03				180				120		
Sodium	mg/l		1101				749.32				900				1000		
Sulphate	mg/l SO4		2.2				4.2				3.4				<10		
Suspended Solids	mg/l																
Temp	°C	12.4	12.1	18.1	13.7	7.5	12.2	11.8	12.7	11.4	12	14.6	13.5	10.7	12.7	12.6	13.2
Thallium	µg/l		<0.1				<0.1				<1.0				<1.0		
Time Sampled		12:15	11:10	11:45	11:25	10:30	11:35	10:45	10:55	12:50	11:30	11:35	11:10	11:40	12:50	10:55	15:50
Tin (µg/l)	µg/l		<1				nm										
T.O.C.	mg/l																
T.O.N	mg/l N	<0.08	<0.08	<0.08	0.89	<0.08	0.55	0.18	<0.08	1	1.8	<0.20	<0.20		<0.20	<0.20	<0.20
Total S Solids	mg/l																
Uranium	µg/l		<0.1				0.1				<1.0				<1.0		
Vanadium	µg/l		2.51				1.12				<1.0				2		
Zinc	µg/l		13.8				71.4				37				4.9		



Dundalk Landfill Site
LEACHATE QUALITY

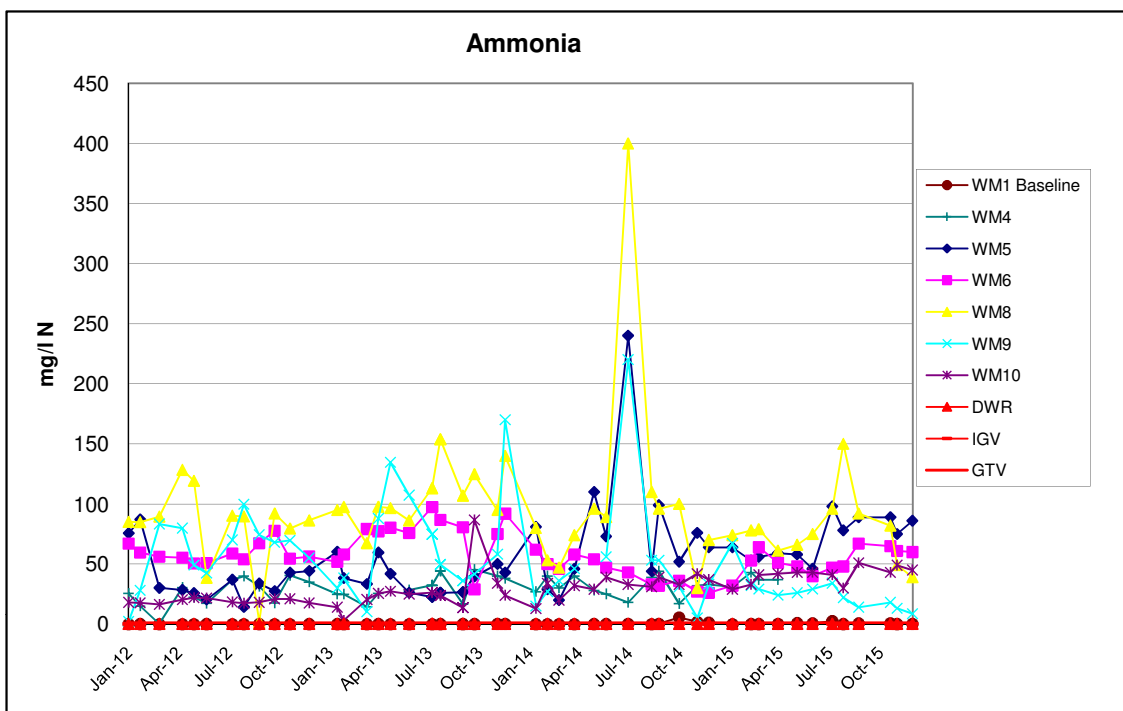
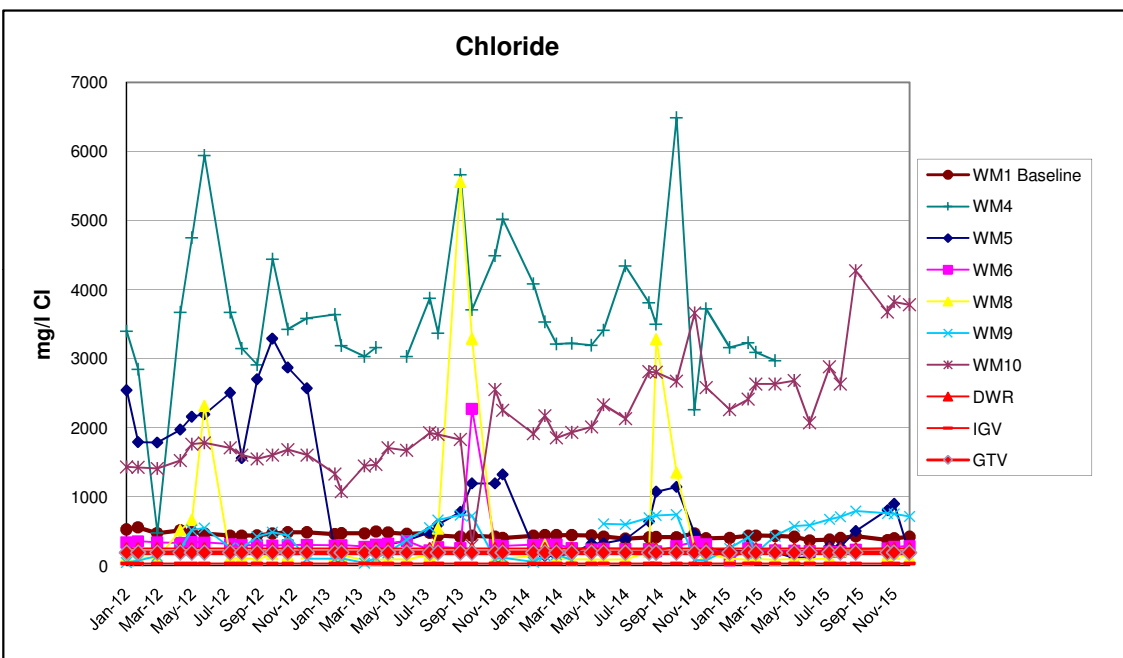
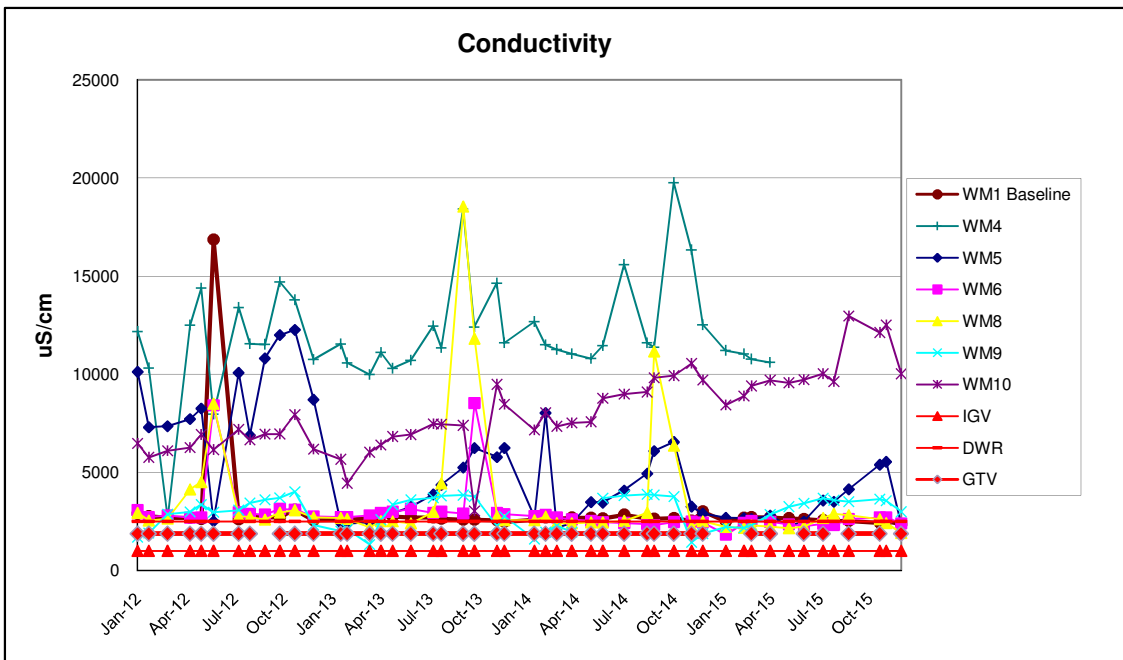
Monitoring Point:		LH6															
		RESULTS															
		Date															
PARAMETERS	Units	16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15
Alkalinity	mg/l CaCO3																
Aluminium	µg/l		17.5				6.7			<10.0				<10.0			
Ammonia	mg/l N	1.4	16.75	10.11	14.17	1.74	5.85	33.79	66.68	5.4	5.7	38	51	12	4.6	82	22
Antimony	µg/l		0.91				<0.5			<1.0					<1.0		
Arsenic	µg/l		4.53				1.03			1.3					3.3		
Barium	µg/l		103.4				50			98					90		
Beryllium	µg/l		<0.5				<0.5			<1.0					<1.0		
B.O.D.	mg/l O2	56.1	163.4	141.2	21.7	9	33.6	246.5	75	24	45	120	<100	66	170	120	110
Boron	µg/l		98.3				63.2			180					65		
Cadmium	µg/l		<0.1				<0.1			<0.020					<0.020		
Calcium	mg/l Ca		257.21				91.45			140					170		
C.O.D.	mg/l O2	557	757	819	255	58	92	1041	802	191	107	1150	640	1010	1200	568	740
Chloride	mg/l Cl	334	40	31	28	12	26	53	69	24	20	55	85	26	26	95	32
Chromium	µg/l		<0.5				<0.5			1.5					1.7		
Cobalt (µg/l)	µg/l		1.9				1.5			1.6					1.7		
Conductivity	µS/cm @ 25	5080	1657	1096	1681	427	729	1727	2040	913	886	2010	1985	1320	1215	2790	1745
Copper	µg/l		<0.5				1.1			12					<1.0		
Cyanide	mg/l CN	<0.05	<0.05	nm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
D.O.	% Saturation																
Fluoride	mg/l		<0.150				<0.150			0.19					<1		
Iron	µg/l		32084.8				2325.8			430					8100		
Lead	µg/l		<0.5				<0.5			<1.0					<1.0		
Magnesium	mg/l Mg		41.08				11.59			23					24		
Manganese	µg/l		4272.6				2015.8			1900					3300		
Mercury	µg/l		<0.05				<0.05			<0.050					<0.020		
Molybdenum	µg/l		<0.5				<0.5			<1.0					<1.0		
Nickel	µg/l		1.8				2.8			3.7					1.8		
o-Phosphate	mg/l P	0.96	<0.02	0.03	<0.02	0.06	0.09	nr	0.37	0.062	0.027	0.94	0.26	0.017	0.074	0.1	0.27
pH		7	7.1	7	6.7	7.1	6.8	6.8	6.8	6.8	6.7	6.5	6.7	6.9	6.6	6.9	6.7
Potassium	mg/l		17.36				6.7			16					9.4		
Residue on Evaporation																	
Sampling Depth (m)	m																
Selenium	µg/l		0.6				<0.5			<1.0					<1.0		
Silver	µg/l		nm				nm										
Strontium	µg/l		101.34				27.96			41					50		
Sodium	mg/l		653.49				245.66			400					450		
Sulphate	mg/l SO4		4.5				5.2			11.2					<10		
Suspended Solids	mg/l																
Temp	°C	16	12.2	18	14.7	6.9	10.1	11.6	14.2	8.2	10.6	15.1	13.5	9.6	11.9	13.4	13.2
Thallium	µg/l		<0.1				<0.1			<1.0					<1.0		
Time Sampled		12:45	11:30	12:10	11:50	10:50	11:55	11:30	11:20	12:15	11:55	11:05	11:30	12:15	13:05	11:15	16:10
Tin (µg/l)	µg/l		<1				nm										
T.O.C.	mg/l																
T.O.N	mg/l N	<0.08	<0.08	<0.08	<0.08	0.08	<0.08	<0.08	<0.08	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Total S Solids	mg/l																
Uranium	µg/l		1.38				0.3			<1.0					<1.0		
Vanadium	µg/l		3.56				0.82			<1.0					<1.0		
Zinc	µg/l		3.1				31.8			43					4.8		

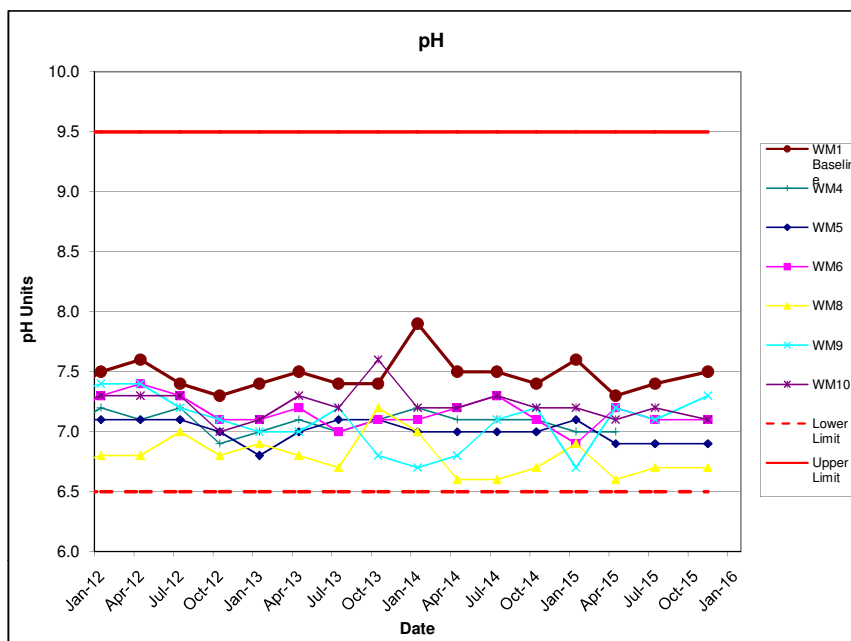
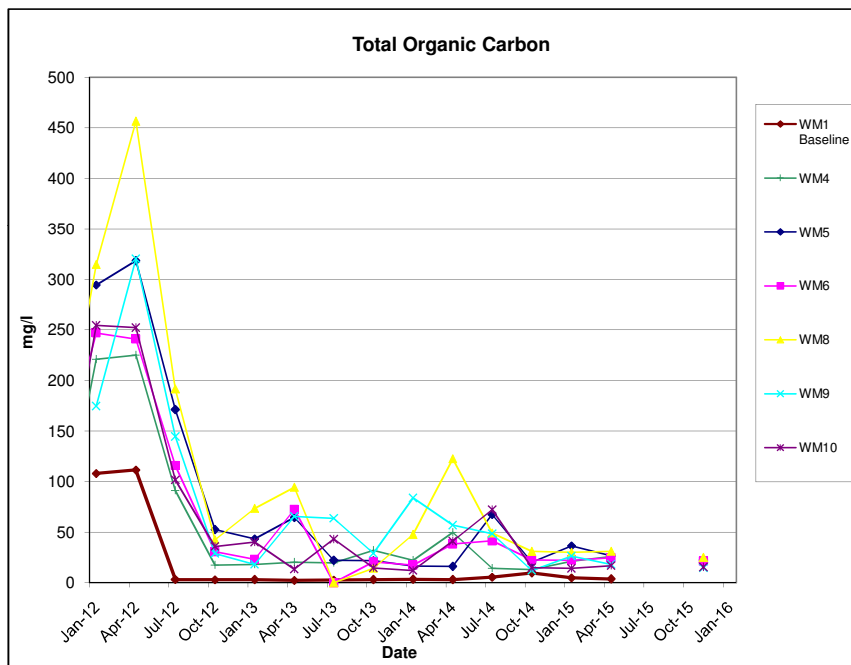
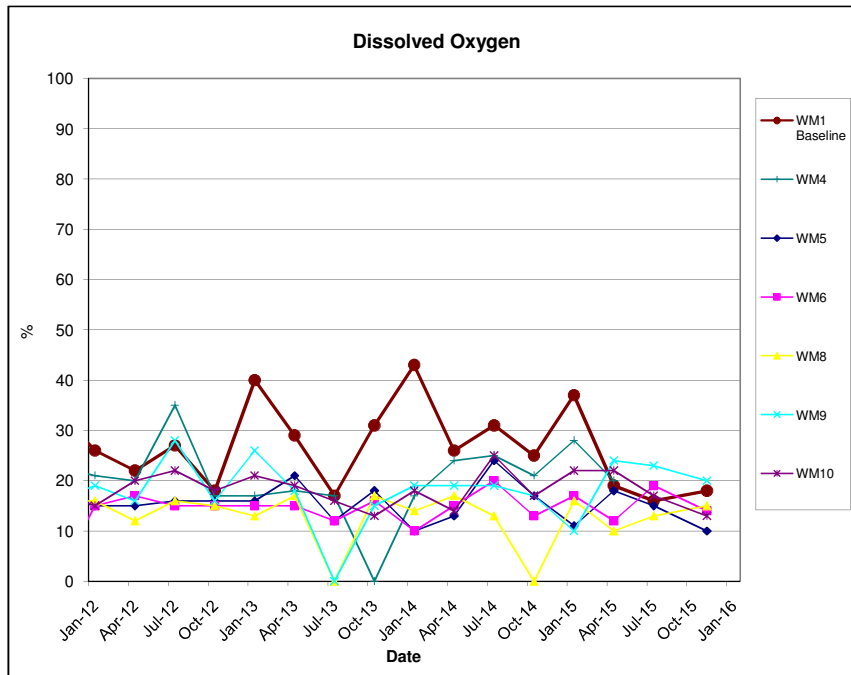
	Dundalk Landfill Site					
	LEACHATE QUALITY					
PARAMETERS						
		No. of Samples	Minimum	Maximum	Mean	Standard Deviation
	Units					
Alkalinity	mg/l CaCO ₃					
Aluminium	µg/l	4	<10.0	<10.0		
Ammonia	mg/l N	16	4.6	190	91	52
Antimony	µg/l	4	<1.0	<1.0		
Arsenic	µg/l	4	<1.0	3.3		
Barium	µg/l	4	90	460	290	175
Beryllium	µg/l	4	<1.0	<1.0		
B.O.D.	mg/l O ₂	16	10	170	44	52
Boron	µg/l	4	65	1500	989	654
Cadmium	µg/l	4	<0.020	0.03		
Calcium	mg/l Ca	4	170	240	190	34
C.O.D.	mg/l O ₂	16	47	1200	321	358
Chloride	mg/l Cl	16	26	195	105	46
Chromium	µg/l	4	1.7	12	8	5
Cobalt (µg/l)	µg/l	4	1.7	6.3	3	2
Conductivity	µS/cm @ 25	16	496	3600	2312	855
Copper	µg/l	4	<1.0	<1.0		
Cyanide	mg/l CN	16	<0.05	<0.05		
D.O.	% Saturation					
Fluoride	mg/l	4	1.5	2	2	0
Iron	µg/l	4	8100	27000	19775	8295
Lead	µg/l	4	<1.0	<1.0		
Magnesium	mg/l Mg	4	24	85	58	27
Manganese	µg/l	4	530	3300	1448	1280
Mercury	µg/l	4	<0.020	<0.020		
Molybdenum	µg/l	4	<1.0	9.3		
Nickel	µg/l	4	1.2	15	7	7
o-Phosphate	mg/l P	16	<0.010	0.53		
pH		16	6.6	7.1	7	0
Potassium	mg/l	4	9.4	100	61	40
Residue on Evaporation						
Sampling Depth (m)	m					
Selenium	µg/l	4	<1.0	<1.0		
Silver	µg/l					
Sodium	mg/l	4	50	120	92	31
Strontium	µg/l	4	450	1000	845	264
Sulphate	mg/l SO ₄	16	<10	<10		
Suspended Solids	mg/l					
Temp	°C	16	8.6	13.4	12	1
Thallium	µg/l	4	<1.0	<1.0		
Time Sampled						
Tin (µg/l)	µg/l					
T.O.C.	mg/l					
T.O.N	mg/l N	12	<0.20	8.3		
Total S Solids	mg/l					
Uranium	µg/l	4	<1.0	<1.0		
Vanadium	µg/l	4	<1.0	2		
Zinc	µg/l	4	4.8	18	8	6

Appendix E

Groundwater Results

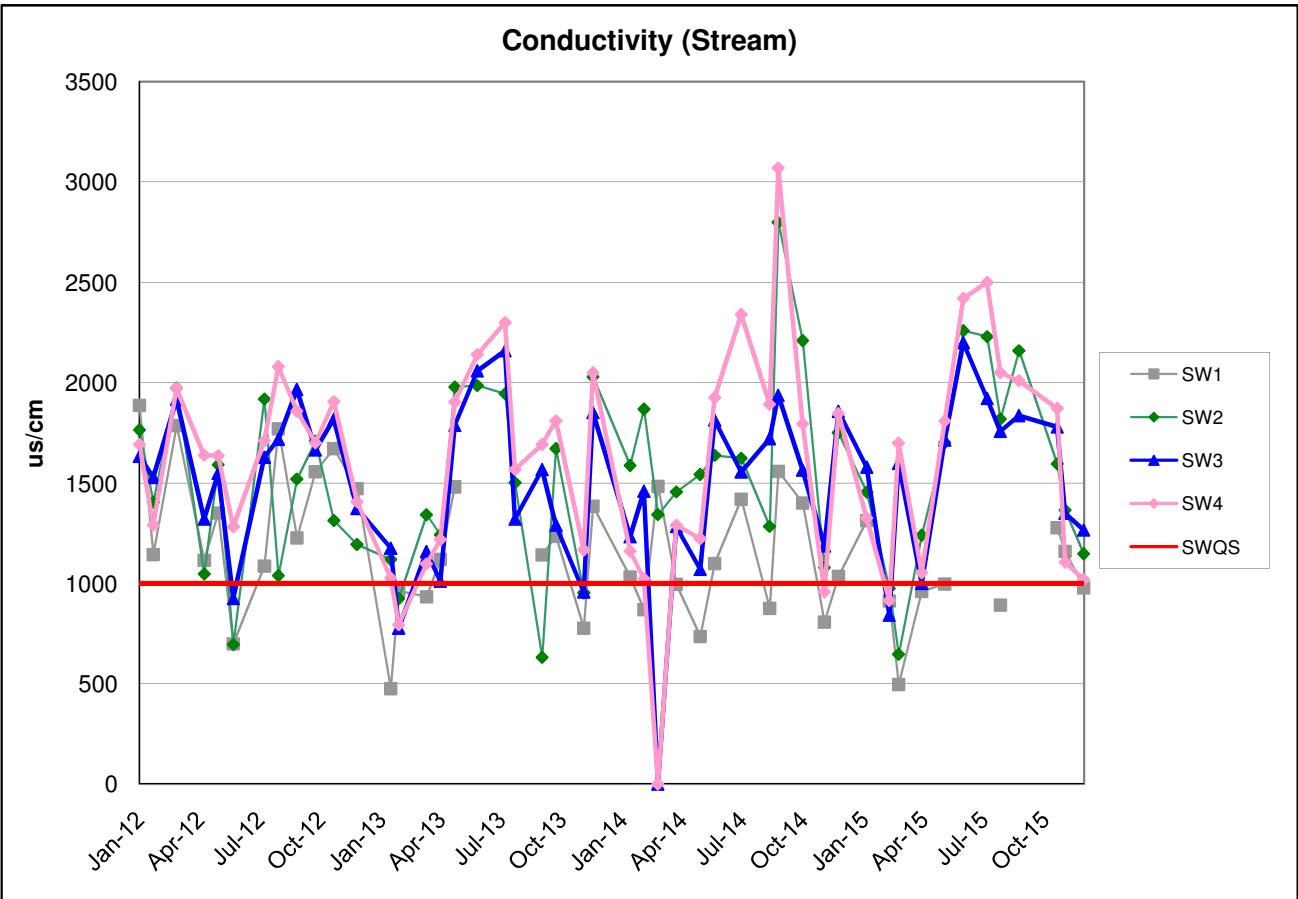
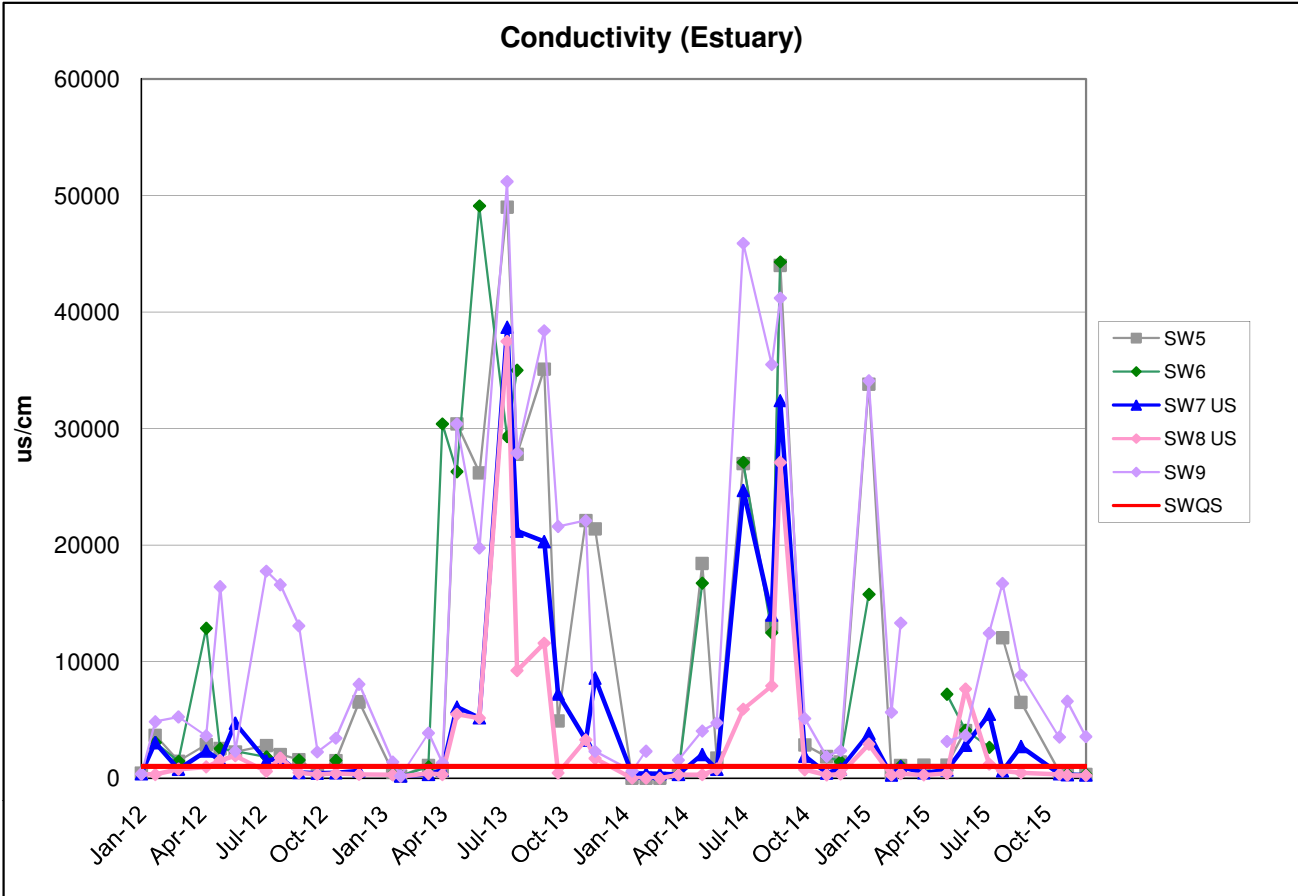
		Dundalk Landfill Site																																																												
		GROUNDWATER QUALITY																																																												
		WM1																																																												
		RESULTS																																																												
		Date																																																												
PARAMETERS	Units	10-Dec-12	30-Jan-13	11-Feb-13	25-Mar-13	15-Apr-13	07-May-13	10-Jun-13	22-Jul-13	06-Aug-13	16-Sep-13	07-Oct-13	18-Nov-13	02-Dec-13	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15-10-2014	17-11-2014	08-12-2014	20-01-2015	23-02-2015	09-03-2015	13-04-2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15																								
Alkalinity	mg/l CaCO3					436												458																																												
Aluminium	µg/l					<5												<10.0																																												
Ammonia	mg/l N	0.06	0.06	0.11	<0.03	0.09	<0.03	<0.03	<0.03	0.06	0.09		0.13	0.3	0.15	0.057	0.038	0.081	<0.020	0.045	0.067		0.26	0.026	0.24	5.5	1.8	1.3	0.031	0.081	0.052	<10.0	0.23	0.92	0.66	2.5	0.13	0.65	0.67	0.12	0.28																					
Antimony	µg/l					<0.5													<1.0																																											
Arsenic	µg/l					0.57													<1.0																																											
Barium	µg/l					96.4													90																																											
Beryllium	µg/l					<0.5													<1.0																																											
B.O.D.	mg/l O2																																																													
Boron	µg/l					390.8													400																																											
Cadmium	µg/l					<0.1													<0.020																																											
Calcium	mg/l Ca					100.82													110																																											
C.O.D.	mg/l O2																																																													
Chloride	mg/l Cl	482	454	469	467	495	480	459	475	434	417	433	418	401	432	441	440	440	440	438	421	391	408	413	411	466	394	402	432	435	432	432	419	366	377	399	425	369	395	417																						
Chromium	µg/l					<0.5													<1.0																																											
Cobalt	µg/l					<0.5													<1.0																																											
Conductivity	µS/cm @ 25	2560	2580	2590	2670	2800	2750	2700	2700	2630	2590	2590	2560	2480	2590	2700	2630	2690	2680	2650	2840	2660	2630	2670	2530	3010	2490	2680	2720	2710	2710	2660	2620	2560	2530	2530	2430	2520	2360																							
Copper	µg/l					0.7													<1.0																																											
Cyanide	mg/l CN					<0.05													<0.05																																											
D.O.	% Saturation		40						17						43				29			31			25		37	nm						16																												
Fluoride	mg/l					0.2													0.26																																											
Iron	µg/l					<10													<10.0																																											
Lead	µg/l					<0.5													<1.0																																											
Magnesium	mg/l Mg					48.83													54																																											
Manganese	µg/l					2.5													<5.0																																											
Mercury	µg/l					<0.05													<0.05																																											
Molybdenum	µg/l					2													2.3																																											
Nickel	µg/l					0.9													<1.0																																											
o-Phosphate	mg/l P					<0.02													0.012																																											
pH			7.4			7.5		7.4				7.4			7.9				7.5			7.5			7.4		7.6	7.5									7.4																									
Potassium	mg/l					21.43													21																																											
Residue on Evaporation	mg/l					1723													1476																																											
Sampling Depth	m	2.9	2.6	2.5	2.8	3.1	2.8	3.1	2.9	2.9	3.1	2.9	2.9	nm	2.6	2.7	2.6	2.7	2.5	2.9	nm	2.5	3	2.9	2.3	2.8	2.6																																			
Selenium	µg/l					<0.5													<1.0																																											
Silver	µg/l					nm																																																								
Sodium	mg/l					399.21													420																																											
Strontium	µg/l					331.62													520																																											
Sulphate	mg/l SO4																																																													



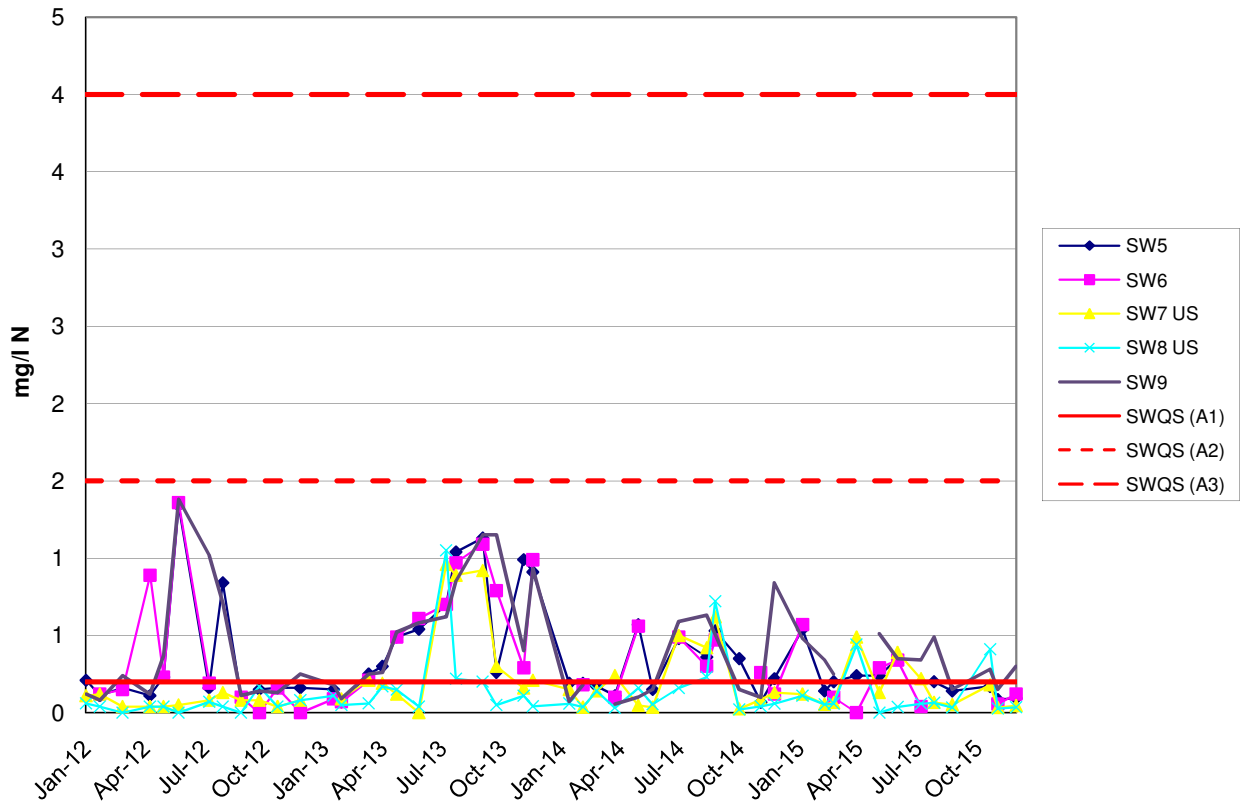


Appendix F

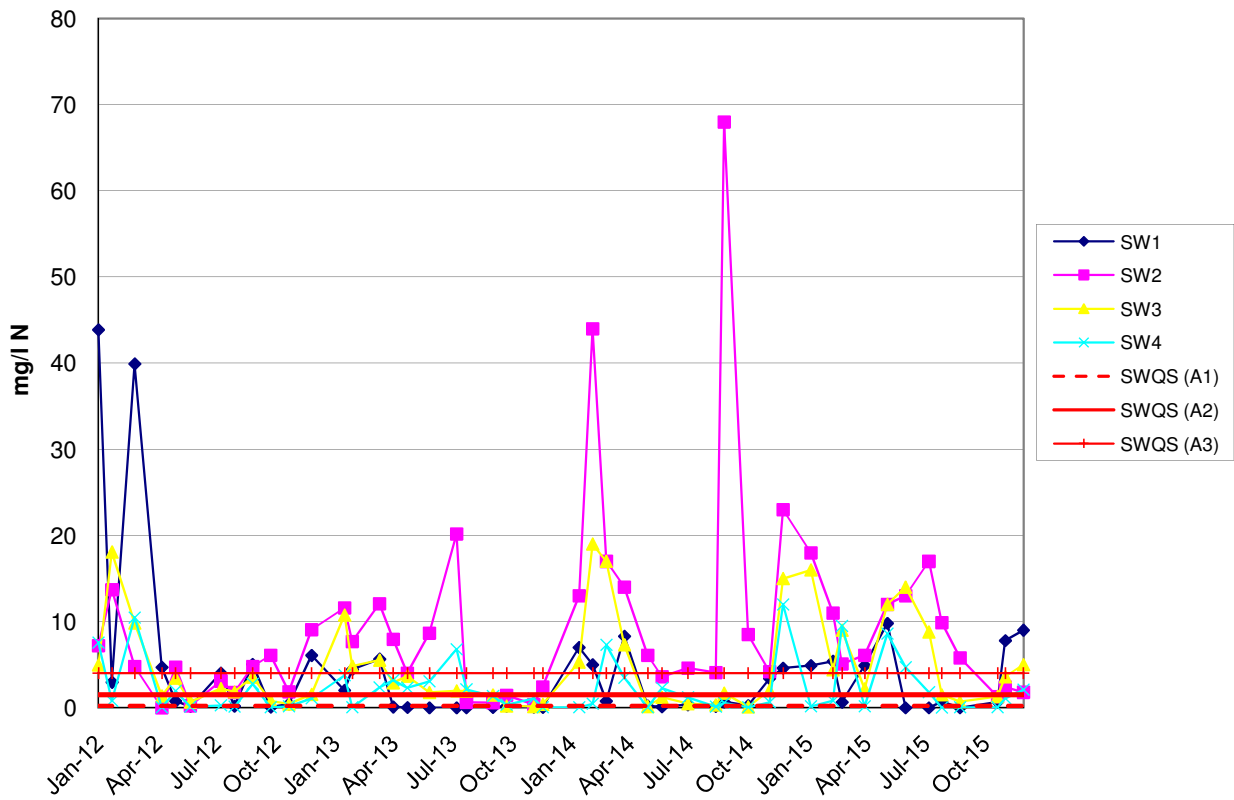
Surface Water Results

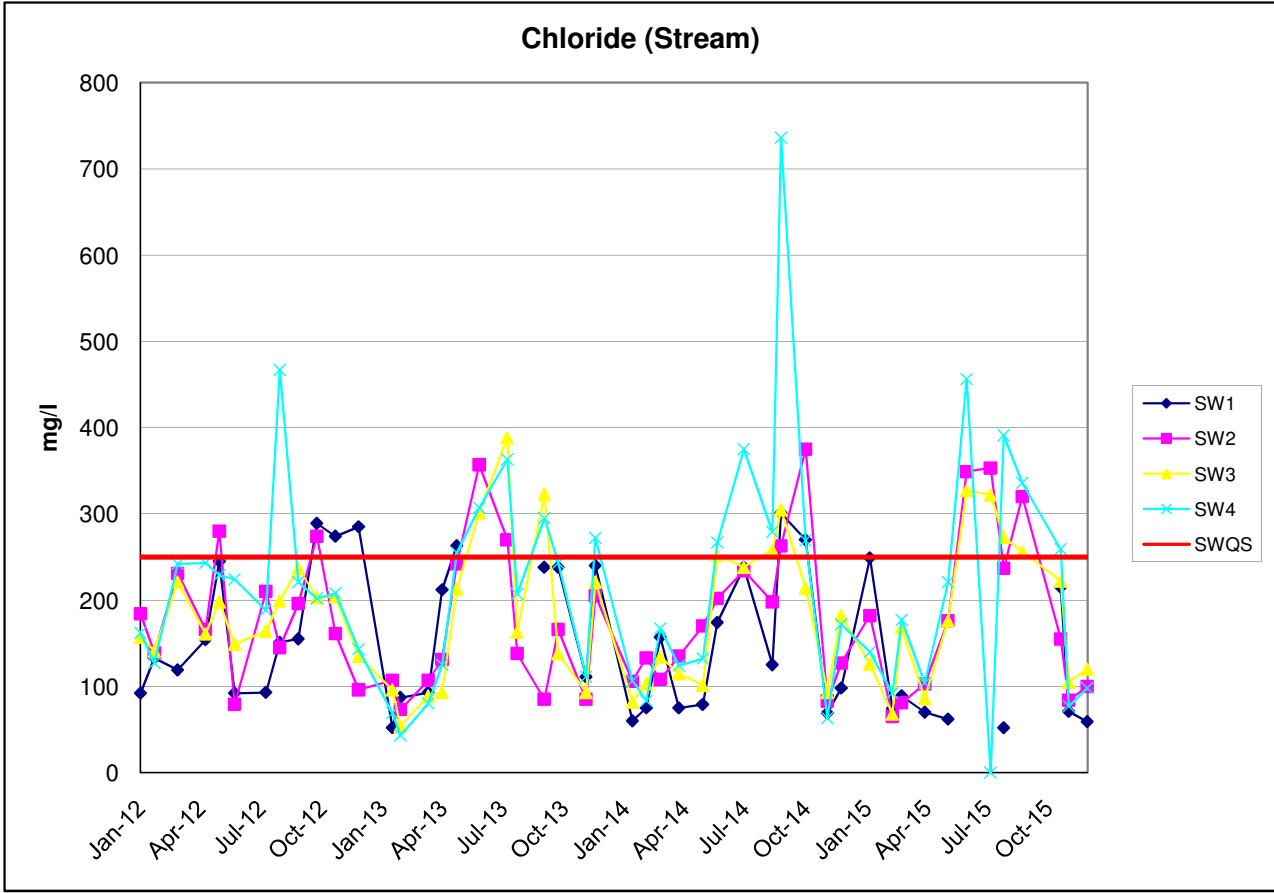
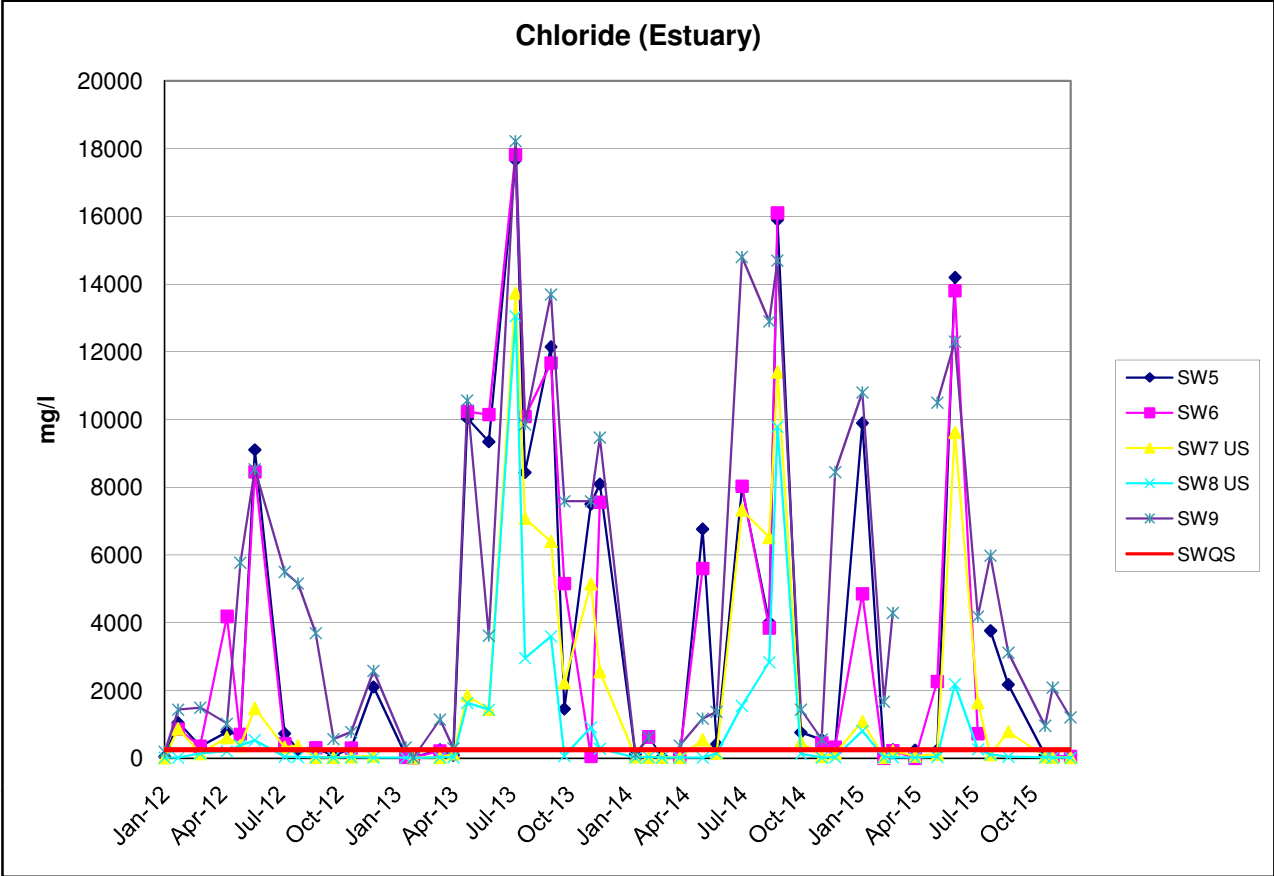


Ammonia (Estuary)



Ammonia (Stream)





Appendix G

Discharge to Sewer

Appendix H

Landfill Gas Monitoring Results

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input type="checkbox"/>)
Site Name: DUNDALK LANDFILL			Site Address: NEWRY ROAD, DUNDALK				
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12				
Site Status: Closed			Date: 19-01-2015		Time: 11.00am		
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: July 2015			
Monitoring Personnel: Damien Holmes			Weather: Showers		Barometric pressure: 1010mb		
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	0.5	19.8		
G2	PIEZO		0	0.8	19.4		
G3	PIEZO		0	0.2	19.8		
G4	PIEZO		0	0.4	19.4		
G5	PIEZO		0	0.3	20.1		
G6	PIEZO		0.1	0.3	20.1		
G7	PIEZO		0	0.4	20.1		
G8	PIEZO		0	0.4	19.2		
G9	PIEZO		0	0.1	20.2		
G10	PIEZO		0	0.2	19.9		
G16	PIEZO		0	0.4	20.2		
G17	PIEZO		0	0.2	20.4		
G20	PIEZO		0.1	0.3	19.9		
G21	PIEZO		0	0.5	20.5		
GM1	PIEZO		0	0.5	19.5		
GM2	PIEZO		0	0.4	20.2		
GM3	PIEZO		0	0.2	19.8		
GM4	PIEZO		0	0.4	20.1		
GM5	PIEZO		0	0.1	19.9		
GM6	PIEZO		0	0.4	20.1		
GM24	PIEZO		0	0.2	20.2		

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input type="checkbox"/>)
Site Name: DUNDALK LANDFILL			Site Address: NEWRY ROAD, DUNDALK				
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12				
Site Status: Closed			Date: 10-02-2015		Time: 09:00 am		
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: July 2015			
Monitoring Personnel: Damien Holmes			Weather: Showers		Barometric pressure: 1008mb		
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	0.3	20		
G2	PIEZO		0.1	0.2	20.1		
G3	PIEZO		0	0.3	19.9		
G4	PIEZO		0	0.2	20.1		
G5	PIEZO		0.2	0.5	19.7		
G6	PIEZO		0.1	0.1	20		
G7	PIEZO		0	0.2	19.8		
G8	PIEZO		0	0.3	20		
G9	PIEZO		0	0.4	19.9		
G10	PIEZO		0	0.1	19.8		
G16	PIEZO		0	0.4	19.8		
G17	PIEZO		0	0.3	20.1		
G20	PIEZO		0	0.1	20.1		
G21	PIEZO		0	0.5	19.9		
GM1	PIEZO		0	0.4	19.8		
GM2	PIEZO		0	0.2	20.1		
GM3	PIEZO		0	0.2	19.9		
GM4	PIEZO		0	0.4	19.9		
GM5	PIEZO		0	0.1	19.6		
GM6	PIEZO		0	0.2	20.1		
GM24	PIEZO		0	0.2	19.9		

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date 09-03-2015		Time: 9.00am						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: July 2015							
Monitoring Personnel: Damien Holmes			Weather: Showers		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	0.1	20						
G2	PIEZO		0	0.4	19.7						
G3	PIEZO		0	0.3	19.6						
G4	PIEZO		0	0.2	19.5						
G5	PIEZO		0.2	0.4	19.4						
G6	PIEZO		0.1	0.2	19.7						
G7	PIEZO		0	0.5	20						
G8	PIEZO		0	0.2	20.1						
G9	PIEZO		0	0.3	19.9						
G10	PIEZO		0.2	0.4	19.4						
G16	PIEZO		0	0.3	19.4						
G17	PIEZO		0.1	0.3	20						
G20	PIEZO		0	0.2	20.1						
G21	PIEZO		0	0.4	19.9						
GM1	PIEZO		0	0.4	19.3						
GM2	PIEZO		0.2	0.5	19.9						
GM3	PIEZO		0.1	0.5	19.6						
GM4	PIEZO		0	0.3	19.7						
GM5	PIEZO		0	0.4	19.8						
GM6	PIEZO		0	0.4	19.9						
GM24	PIEZO		0	0.2	19.9						

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date 27-04-2015		Time: 14.00						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: July 2015							
Monitoring Personnel: Damien Holmes			Weather: Dry		Barometric pressure: 1020mb						
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	20						
G2	PIEZO		0	0.4	19.6						
G3	PIEZO		0	0.3	19.7						
G4	PIEZO		0	0.2	19.5						
G5	PIEZO		0.2	0.4	20						
G6	PIEZO		0	0.2	19.9						
G7	PIEZO		0	0.4	20.1						
G8	PIEZO		0	0.2	20.1						
G9	PIEZO		0	0.3	19.9						
G10	PIEZO		0.4	0.8	19.2						
G16	PIEZO		0	0.2	19.9						
G17	PIEZO		0.2	0.3	20.1						
G20	PIEZO		0	0.3	20.1						
G21	PIEZO		0	0.4	19.9						
GM1	PIEZO		0	0.2	19.8						
GM2	PIEZO		0.3	0.5	19.5						
GM3	PIEZO		0.2	0.6	19.4						
GM4	PIEZO		0	0.2	19.9						
GM5	PIEZO		0	0.6	18.8						
GM6	PIEZO		0	0.4	19.9						
GM24	PIEZO		0	0.2	19.8						

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date: 19-05-2015		Time: 09:00						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: July 2015							
Monitoring Personnel: Damien Holmes			Weather: Dry		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		0.1	0.5	19.9						
G2	PIEZO		0	0.3	19.6						
G3	PIEZO		0	0.2	19.8						
G4	PIEZO		0	0.3	19.2						
G5	PIEZO		0	0.4	20						
G6	PIEZO		0	0.2	19.7						
G7	PIEZO		0	0.5	20						
G8	PIEZO		0	0.2	20.1						
G9	PIEZO		0	0.3	19.9						
G10	PIEZO		0.3	0.7	19.4						
G16	PIEZO		0	0.2	19.9						
G17	PIEZO		0.1	0.4	20						
G20	PIEZO		0	0.3	20.1						
G21	PIEZO		0	0.5	19.8						
GM1	PIEZO		0	0.2	19.8						
GM2	PIEZO		0.2	0.4	19.3						
GM3	PIEZO		0.2	0.6	19.4						
GM4	PIEZO		0	0.1	19.2						
GM5	PIEZO		0	0.4	19.1						
GM6	PIEZO		0	0.4	19.9						
GM24	PIEZO		0	0.1	19.9						

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date: 26-06-2015		Time: 11:00						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: July 2015							
Monitoring Personnel: Damien Holmes			Weather: Dry		Barometric pressure: 1020mb						
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	19.4						
G2	PIEZO		0	0.2	19.6						
G3	PIEZO		0	0.3	19.6						
G4	PIEZO		0	0.2	19.5						
G5	PIEZO		0	0.2	20.1						
G6	PIEZO		0	0.2	20						
G7	PIEZO		0	0.5	19.8						
G8	PIEZO		0	0.2	20.1						
G9	PIEZO		0	0.3	19.9						
G10	PIEZO		0	0.8	19.2						
G16	PIEZO		0	0.2	20						
G17	PIEZO		0	0.5	19.2						
G20	PIEZO		0	0.3	20						
G21	PIEZO		0	0.6	19.7						
GM1	PIEZO		0	0.2	20						
GM2	PIEZO		0.2	0.4	19.2						
GM3	PIEZO		0.1	0.5	19.1						
GM4	PIEZO		0	0.2	20						
GM5	PIEZO		0	0.4	19.9						
GM6	PIEZO		0	0.4	20						
GM24	PIEZO		0	0.5	19.5						

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM				(Baseline <input type="checkbox"/> Ambient <input type="checkbox"/>)		
Site Name: DUNDALK LANDFILL			Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12			
Site Status: Closed			Date 21-07-2015		Time: 09:00	
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: July 2015		
Monitoring Personnel: Damien Holmes			Weather: Dry		Barometric pressure: 1020mb	
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	0.8	19.8	
G2	PIEZO		0	0.2	20	
G3	PIEZO		0	0.2	19.8	
G4	PIEZO		0	0.4	19.8	
G5	PIEZO		0	0.4	20	
G6	PIEZO		0	0.2	20.2	
G7	PIEZO		0	0.6	19.4	
G8	PIEZO		0	0.2	20.1	
G9	PIEZO		0	0.3	19.9	
G10	PIEZO		0	0.6	19.6	
G16	PIEZO		0	0.2	19.9	
G17	PIEZO		0.2	0.4	19.8	
G20	PIEZO		0	0.2	20.1	
G21	PIEZO		0	0.6	19.4	
GM1	PIEZO		0	0.2	19.8	
GM2	PIEZO		0	0.4	19.8	
GM3	PIEZO		0.1	0.8	19.2	
GM4	PIEZO		0	0.1	19.8	
GM5	PIEZO		0	0.4	20	
GM6	PIEZO		0	0.2	20	
GM24	PIEZO		0	0.1	20	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date 27-08-2015		Time: 14.00						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: December 2015							
Monitoring Personnel: Damien Holmes			Weather: Dry		Barometric pressure: 1021mb						
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	0.9	19.9						
G2	PIEZO		0	0.2	20						
G3	PIEZO		0	0.4	19.9						
G4	PIEZO		0	0.2	20.2						
G5	PIEZO		0.4	0.8	19.2						
G6	PIEZO		0	0.2	20.2						
G7	PIEZO		0	0.4	20.1						
G8	PIEZO		0	0.4	20						
G9	PIEZO		0	0.3	20.1						
G10	PIEZO		0.5	0.6	19.2						
G16	PIEZO		0	0.2	20.2						
G17	PIEZO		0	0.4	19.8						
G20	PIEZO		0	0.2	20.1						
G21	PIEZO		0	0.6	19.6						
GM1	PIEZO		0	0.2	20.2						
GM2	PIEZO		0.2	0.6	19.4						
GM3	PIEZO		0	0.8	19.2						
GM4	PIEZO		0	0.2	20.2						
GM5	PIEZO		0	0.4	20.2						
GM6	PIEZO		0	0.4	20						
GM24	PIEZO		0	0.2	20.2						

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date 23-09-2015		Time: 11:00						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: December 2015							
Monitoring Personnel: Damien Holmes			Weather: Dry		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		0.2	0.8	19.2						
G2	PIEZO		0	0.2	20.2						
G3	PIEZO		0	0.3	20.2						
G4	PIEZO		0	0.4	20						
G5	PIEZO		0	0.2	20.1						
G6	PIEZO		0	0.4	19.8						
G7	PIEZO		0	0.7	19.6						
G8	PIEZO		0	0.2	20.2						
G9	PIEZO		0	0.5	19.6						
G10	PIEZO		0	1.0	19.4						
G16	PIEZO		0	0.2	20						
G17	PIEZO		0	0.4	19.5						
G20	PIEZO		0	0.2	20						
G21	PIEZO		0	0.4	19.2						
GM1	PIEZO		0	0.4	19.8						
GM2	PIEZO		0.4	0.0.6	19						
GM3	PIEZO		0	0.8	19						
GM4	PIEZO		0	0.2	20.2						
GM5	PIEZO		0	0.4	19.9						
GM6	PIEZO		0	0.4	20						
GM24	PIEZO		0	0.6	19.6						

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date 22-10-2015		Time: 10:00						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: December 2015							
Monitoring Personnel: Damien Holmes			Weather: Dry		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		0.3	1.0	19.1						
G2	PIEZO		0	0.0	20.4						
G3	PIEZO		0	0.2	20.4						
G4	PIEZO		0	0.4	20.2						
G5	PIEZO		0	0.2	20.1						
G6	PIEZO		0	0.2	20.1						
G7	PIEZO		0	0.6	20						
G8	PIEZO		0	0.0	20.4						
G9	PIEZO		0	0.4	19.8						
G10	PIEZO		0	0.8	19.8						
G16	PIEZO		0	0.0	20.2						
G17	PIEZO		0	0.2	19.8						
G20	PIEZO		0	0.2	20.2						
G21	PIEZO		0	0.6	19.1						
GM1	PIEZO		0	0.2	20						
GM2	PIEZO		0	0.8	20.1						
GM3	PIEZO		0	0.6	19.6						
GM4	PIEZO		0	0.2	20.2						
GM5	PIEZO		0	0.4	20						
GM6	PIEZO		0	0.2	20						
GM24	PIEZO		0	0.8	19.4						

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input type="checkbox"/>)
Site Name: DUNDALK LANDFILL			Site Address: NEWRY ROAD, DUNDALK				
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12				
Site Status: Closed			Date 30-11-2015		Time: 14:00		
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: December 2015			
Monitoring Personnel: Damien Holmes			Weather: Dry		Barometric pressure: 1010mb		
Results							
Sample Station Number	Borehole/spike/other	Survey Depth	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	Comments	
G1	PIEZO		0.2	1.0	19.6		
G2	PIEZO		0	0.0	20.2		
G3	PIEZO		0	0.0	20.2		
G4	PIEZO		0	0.6	19.6		
G5	PIEZO		0	0.4	20.1		
G6	PIEZO		0	0.2	20.2		
G7	PIEZO		0	0.6	19.4		
G8	PIEZO		0	0.2	20.1		
G9	PIEZO		0	0.3	19.9		
G10	PIEZO		0	0.6	19.6		
G16	PIEZO		0	0.2	19.9		
G17	PIEZO		0.4	1.1	19.2		
G20	PIEZO		0	0.2	20.1		
G21	PIEZO		0	0.5	19.3		
GM1	PIEZO		0	0.0	19.8		
GM2	PIEZO		0	0.4	19.8		
GM3	PIEZO		0	0.6	19.1		
GM4	PIEZO		0	0.1	19.8		
GM5	PIEZO		0	0.2	20.1		
GM6	PIEZO		0	0.2	20.2		
GM24	PIEZO		0	0.1	20		

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM							(Baseline <input type="checkbox"/> Ambient <input 3"="" type="checkbox/>)</th> </tr> </thead> <tbody> <tr> <td colspan="/> Site Name: DUNDALK LANDFILL <td colspan="4">Site Address: NEWRY ROAD, DUNDALK</td>	Site Address: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			National Grid Reference: 1632-12								
Site Status: Closed			Date 21-12-2015		Time: 14.00						
Instrument used: GA2000		Normal Analytical Range:		Date Next Calibration: December 2015							
Monitoring Personnel: Damien Holmes			Weather: Dry		Barometric pressure: 1011mb						
Results											
Sample Station Number	Borehole/ spike/other	Survey Depth	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	Comments					
G1	PIEZO		0.5	1.1	18.9						
G2	PIEZO		0	0.0	20.4						
G3	PIEZO		0	0.4	20						
G4	PIEZO		0	0.0	20						
G5	PIEZO		0	1.0	19.2						
G6	PIEZO		0	0.2	20.2						
G7	PIEZO		0	0.0	20.4						
G8	PIEZO		0	0.4	20						
G9	PIEZO		0	0.3	20.1						
G10	PIEZO		0.4	0.5	19.0						
G16	PIEZO		0	0.2	20.2						
G17	PIEZO		0	0.4	19.8						
G20	PIEZO		0	0.2	20.1						
G21	PIEZO		0	0.6	19.6						
GM1	PIEZO		0	0.2	20.2						
GM2	PIEZO		0	0.4	19.8						
GM3	PIEZO		0	0.8	19.2						
GM4	PIEZO		0	0.2	20.2						
GM5	PIEZO		0	0.0	20.4						
GM6	PIEZO		0	0.2	20.2						
GM24	PIEZO		0	0.2	20.4						

Appendix I

Composting Monitoring



*ANALYSIS OF COMPOSTED GREEN
MATERIAL FROM V&W RECYCLING
RECEIVED 18th MAY 2015*

REPORT NO: 50359

ATTENTION:
V&W RECYCLING
NEWRY ROAD
DUNDALK
CO. LOUTH

PREPARED BY: Roisin Kavanagh
Team Leader
ANUA

DATE: 18 June 2015

1 Introduction

1 sample was received from V&W Recycling on the 18th of May 2015. No details of this sample are known: it was received in good condition and labelled as follows:

ANUA lab code	Client code
419181	Organic Compost 15/05/15

The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: 15-44894

Sample reference: **419181**
 Sample matrix: not known

Maturity Tests Oxygen Uptake Rate

Sample no	Test Method	OUR Stability results (mmolO ₂ /kg OS h)
419181	PrEN 16087-1	2.7

Self Heating

Sample no	Maximum Temperature reached (ambient 26°C)
419181	22

Plant Nutrient

Sample no	pH	EC µS.cm ⁻¹
419181	6.6	899
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
419181	0.6	72.1	-	154
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 %
419181	2.31	0.40	0.66
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)
419181	160	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
419181	0.45	13.1	31.8	<0.05
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
419181	13.2	24.6	142
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650

Physical Analysis

Sample no	H ₂ O %	Dry Matter %	Organic Matter %
419181	59.7	40.3	66.1
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 %
43	20	18	18	2.1	0	0

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	<0.01	<0.01	<0.01	<0.01	<0.01
1-2mm	<0.01	<0.01	<0.01	<0.01	<0.01
2-4mm	1.21	<0.01	<0.01	<0.01	<0.01
4-8mm	5.37	<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

Cress Germination Test

Sample no	Sample Diluted with 50% peat. to bring to correct	% Germination compared to control*	Root Index Compared to control (1%)	MLVI compared to control (%)
NA				

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



ANUA

*ANALYSIS OF COMPOSTED GREEN
MATERIAL FROM V&W RECYCLING*

RECEIVED 22ND JUNE 2015

REPORT NO: 51610

ATTENTION:
V&W RECYCLING
NEWRY ROAD
DUNDALK
CO. LOUTH

PREPARED BY: Roisin Kavanagh
Team Leader
ANUA

DATE: 28 July 2015

1 Introduction

1 sample was received from V&W Recycling on the 22nd of June 2015. No details of this sample are known; it was received in good condition and labelled as follows:

ANUA lab code	Client code
422612	Organic Compost 19.06/15

The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: 15-45397

Sample reference: 422612
Sample matrix: not known

Maturity Tests Oxygen Uptake Rate

Sample no	Test Method	OUR Stability results (mmolO ₂ /kg OS/h)
422612	PrEN 16087-1	1.2

Self Heating

Sample no	Maximum Temperature reached (ambient 26°C)
422612	23

Plant Nutrient

Sample no	pH	EC uS.cm ⁻¹
422612	6.5	708
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
422612	7	74	67	187
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 mg/kg	K mg/kg
422612	2.07	1770	2778
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)
422612	<100	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
422612	0.31	11.7	16.8	<0.05
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
422612	10.8	15.1	70.5
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650

Physical Analysis

Sample no	H ₂ O %	Dry Matter %	Organic Matter %
422612	61.4	38.6	72.4
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 %	>31.5mm %
50	16	16	14	3.3	0.4	0

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	<0.01	<0.01	<0.01	<0.01	<0.01
1-2mm	0.68	<0.01	<0.01	<0.01	<0.01
2-4mm	2.15	<0.01	<0.01	<0.01	<0.01
4-8mm	2.15	<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

Cross Germination Test

Sample no	Sample Diluted with 50% peat. to bring to correct	% Germination compared to control*	Root Index Compared to control (%)	MLV1 compared to control (%)
NA				

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



ANUA

*ANALYSIS OF COMPOSTED GREEN
MATERIAL FROM V&W RECYCLING
RECEIVED 2ND OCTOBER 2015*

REPORT NO: 52434

ATTENTION: V&W RECYCLING
NEWRY ROAD
DUNDALK
CO. LOUTH

PREPARED BY: Roisin Kavanagh
Team Leader
ANUA

DATE: 03 December 2015

1 Introduction

1 sample was received from V&W Recycling on the 2nd of October 2015. No details of this sample are known; it was received in good condition and labelled as follows:

ANUA lab code	Client code
433094	Organic Compost 29/09/15

The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: 15-46721

Sample reference: **433094**
Sample matrix: not known

Maturity Tests

Oxygen Uptake Rate

Sample no	Test Method	OUR Stability results (mmolO ₂ /kg OS h)
433094	PrEN 16087-1	3.9

Self Heating

Sample no	Maximum Temperature reached (ambient 22°C)
433094	19

Plant Nutrient

Sample no	pH	EC uS.cm ⁻¹
433094	6.4	579
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
433094	7	198	147	416
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 %
433094	2.29	0.41	0.40
Test Method	I.S. EN 13554-1	I.S. EN 13650	I.S. EN 13650

Microbiological Analysis

Sample no	E. coli (cfu/g)	Salmonella (sp/25g)
433094	<10	Not detected

Test Method	ISO 11866-2	I.S. EN ISO 6579
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Heavy Metals (Dry Wt. Basis)

Sample no	Cd mg.kg ⁻¹	Cr mg.kg ⁻¹	Cu mg.kg ⁻¹	Hg mg.kg ⁻¹
433094	0.56	14.6	41.5	0.21
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
433094	21.4	34.6	158
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650

Physical Analysis

Sample no	H ₂ O %	Dry Matter %	Organic Matter %
433094	59.8	40.2	66.3
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 %
47	17	15	13	7.6	0.1	1

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	<0.01	<0.01	<0.01	<0.01	<0.01
1-2mm	0.13	<0.01	<0.01	<0.01	<0.01
2-4mm	1.31	<0.01	<0.01	<0.01	<0.01
4-8mm	2.56	<0.01	<0.01	<0.01	<0.01
8-16mm	2.10	<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 (%)	MLV compared to control (%)
NA				

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



*ANALYSIS OF COMPOSTED GREEN
MATERIAL FROM V&W RECYCLING
RECEIVED 23RD NOVEMBER 2015*

REPORT NO: 52667

ATTENTION: V&W RECYCLING
NEWRY ROAD
DUNDALK
CO. LOUTH

PREPARED BY: Roisin Kavanagh
Team Leader
ANUA

DATE: 23 December 2015

1 Introduction

1 sample was received from V&W Recycling on the 23rd of November 2015. No details of this sample are known: it was received in good condition and labelled as follows:

ANUA lab code 437825	Client code Organic Compost 19/11/15
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The sample was analysed as requested by the client.

2 Results of Analysis

Compost Testing and Analysis Service

Report ref: 15-437339

Sample reference: **437825**
Sample matrix: not known

Maturity Tests

Oxygen Uptake Rate

Sample no	Test Method	OUR Stability results (mmolO ₂ /kg OS h)
437825	PrEN 16087-1	13.7

Self Heating

Sample no	Maximum Temperature reached (ambient 20°C)
437825	16

Plant Nutrient

Sample no	pH	EC µS.cm ⁻¹
437825	6.3	743
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
437825	-	-	-	-
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 %
437825	-	-	-
Test Method	I.S. EN 13534-1	I.S. EN 13650	I.S. EN 13650

Microbiological Analysis

Sample no	E. coli (cfu/g)	Salmonella (spp 25g)
437825	-	-

Test Method	ISO 11866-2	I.S. EN ISO 6579
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Heavy Metals (Dry Wt. Basis)

Sample no	Cd mg.kg ⁻¹	Cr mg.kg ⁻¹	Cu mg.kg ⁻¹	Hg mg.kg ⁻¹
437825	0.35	9.49	21.5	<0.05
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
437825	10.3	16.5	89.1
Test Method	I.S. EN 13650	I.S. EN 13650	I.S. EN 13650

Physical Analysis

Sample no	H ₂ O %	Dry Matter %	Organic Matter %
437825	57.9	42.1	67.7
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 %
44	18	16	17	5	0	0

Contaminants (Dry Wt. Basis)

Sieve size	Stones %	Metals %	Plastic %	Glass %	Other %
<1mm	<0.01	<0.01	<0.01	<0.01	<0.01
1-2mm	<0.01	<0.01	<0.01	<0.01	<0.01
2-4mm	0.75	<0.01	<0.01	<0.01	<0.01
4-8mm	3.92	<0.01	<0.01	<0.01	<0.01
8-16mm	2.50	<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

Appendix J

Bund Integrity Test

**DUNDALK LANDFILL &
CIVIC WASTE FACILITY,
NEWRY ROAD,
DUNDALK, COUNTY
LOUTH**

W0034-02

**BUND INTEGRITY
TEST REPORT**

P. HERR & ASSOCIATES

CIVIL ENGINEERS & BUILDING SURVEYORS

2 Jocelyn Place, Dundalk, Co. Louth.

Tel: (042)9330019

Fax: (042)9331832

E-Mail: info@pherr.ie

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1.0 INTRODUCTION

P. Herr & Associates were commissioned by Louth County Council to conduct inspections and integrity testing of two bunded areas at the Dundalk Landfill & Civic Waste Facility, Newry Road, Dundalk, County Louth in accordance with Condition 3.11 of the Waste Licence for the Facility

The bunds are located together and each one and are constructed with reinforced concrete base (300mm) and walls (225mm). Each bund houses a plastic integrally bunded oil storage tank.

Details of each bund are as follows:

	<i>Dimensions</i>	<i>Details of integrally bunded Oil Storage Tank</i>
Bund No.1	2.3m x 1.6m x 0.5m deep	Titan ES1360 EcoSafe Bunded Oil Tank (1.935m x 1.265m x 1.31m high)
Bund No.2	2.65m x 1.6m x 0.85m deep	Titan ES1800 EcoSafe Bunded Oil Tank (2.36m x 1.30m x 1.35m high)

2.0 BUND FUNCTION/CAPACITY

Each oil storage tank is integrally bunded and certified to provide 110% secondary containment in the event of a leak.

The function of the concrete bunds is to provide secondary containment in the event of spillages during the filling or emptying of the tanks. The requirement that the bunds offer 110% capacity of the stored oil is not applicable in this case.

3.0 TEST PROCEDURE

Testing was carried out to the protocol set out in the Environmental Agency of England and Wales Technical Report P16 (equivalent to CIRIA 163).

The bunds were initially inspected on 26/02/16 at 09.30.

The weather was dry during the initial inspection and remained dry throughout the test period.

Bund dimensions were recorded and a visual inspection of the walls and floors were carried out.

Each bund was filled with water to a depth of circa 0.4m in the case of Bund No.1 and circa 0.7m in the case of Bund No.2.

The water was retained in the tank and the depth recorded once more after six hours

4.0 TEST RESULTS

4.1 Visual Inspection:

No cracks or defects were found in the bund walls or floor and each bund appeared to be of sound construction

4.2 Bund Integrity

	Initial Water Depth (10.05)	Final Water Depth (16.05)	Difference	Result
Bund No.1	0.405m	0.405m	0	PASS
Bund No.2	0.695m	0.695m	0	PASS

There was no drop in water level and no rainfall was recorded.

5.0 CONCLUSION

Each bund is certified to have passed the integrity test as per Environmental Agency of England and Wales Technical Report P16 (equivalent to CIRIA 163).

Signed: 
Eamonn Mc Mahon
B.E., M.Eng.Sc
F.I.E.I., Chartered Engineer
On behalf of P. Herr & Associates

29/02/16