Comhairle Chontae chill Mhantáin
WICKLOW COUNTY COUNCIL

BALLYMURTAGH LANDFILL
Waste Licence W0011-01

ANNUAL ENVIRONMENTAL REPORT 2010

May 2011

RPS

Ballymurtagh Landfill
W0011-01

Annual Environmental Report
2010

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1 INTRODUCTION

This Annual Environmental Report (AER) summarises the environmental performance of Ballymurtagh Landfill between January and December 2010 and outlines proposals for the 2011 reporting period to help minimise environmental impacts. RPS have prepared this AER on behalf of Wicklow County Council in accordance with the conditions of waste licence W0011-01, the Environmental Protection Agency (EPA) "Draft Guidance on Environmental Management Systems and Reporting to the Agency" and the EPA "Landfill Manuals – Landfill Monitoring 2nd Edition".

Wicklow County Council operate Ballymurtagh Landfill in accordance with Waste Licence Register No. W0011-01.

It is the policy of Wicklow County Council to comply fully with the conditions of this waste licence, to minimise impact on the environment and ensure that members of staff are aware of the environmental impacts associated with their work on the landfill.

1.1 WASTE MANAGEMENT POLICY

The County Wicklow Waste Management Plan outlines the following policy;

"*..to move quickly to a 'maximum recycling' scenario, which will meet the wishes of the public and also meet the mandatory targets for recycling set out by government… The Council aims to arrest and counteract the current trend of waste growth through concerted measures aimed at waste minimisation and prevention".*

1.2 SITE DESCRIPTION

Ballymurtagh Landfill is located in the townlands of Ballymurtagh, Ballygahan Upper, Ballygahan Lower, and Tinnahinch in the Vale of Avoca approximately 1.5 km north-west of the village of Avoca in County Wicklow. It is situated in the catchment of the Avoca River, which rises in the Wicklow Mountains and enters the Irish Sea at Arklow. The landfill is located within a disused Open Lode pit of the former Avoca Mines. Prior to landfilling the pit was used for the settlement of mine tailings, a layer of which underlies the body of waste. The bedrock underlying the landfill consists of volcanic rock, which is part of the Avoca Formation. The lithologies based on drilling carried out by the Geological Survey of Ireland consists of light greenish grey, fine grained, well foliated metavolcanic rock.

The principal activity from 1989 to 2002, was to 'deposit in, on or under land'. Waste acceptance ceased for landfilling on the 31st December 2002 and recycling is now the principal activity. It is estimated that approximately 480,000m^3 of waste were deposited at the site since it commenced operation in 1989. The Civic Waste Facility was opened in February 2003. The layout of the facility is shown on Figure 2.2.

Restoration works in accordance with the Waste Licence commenced in October 2004 and were completed in November 2005. The site has been landscaped and vegetation was successfully established during 2006.

1.3 WASTE ACCEPTANCE

A procedure for the acceptance of waste at the Civic Waste Facility has been developed and is outlined in the Environmental Management Plan (EMP).

2 ENVIRONMENTAL MONITORING

The following sections summarise the monitoring undertaken at Ballymurtagh during the 2010 reporting period. More detailed interpretations can be found within the quarterly monitoring reports, which were submitted to the EPA throughout 2010.

2.1 SURFACE WATER

TE Laboratories (TelLabs), Co Carlow collected and analysed samples from 5 monitoring locations (see Figure 2.1) specified in the waste licence. Samples were collected in March, June, September and November. Parameters requiring annual analysis were monitored in November. Results were compared with the European Community (Quality of Surface Water intended for Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294 of 1989) and the EPA's Environmental Quality Objectives and Environmental Quality Standards 2003.

Section 2.1.1 summarises the overall surface water quality at the landfill. However, it should be noted that the Ballygahan Adit and Ballymurtagh Road Adit carry acid mine drainage (AMD). Surface water quality monitoring point SW3 is located in close proximity to the adits. Parameters which would mainly originate from acid mine drainage include sulphate, copper, lead, iron, manganese and zinc. These, along with low pH and elevated electrical conductivities, are continuously found at these monitoring points.

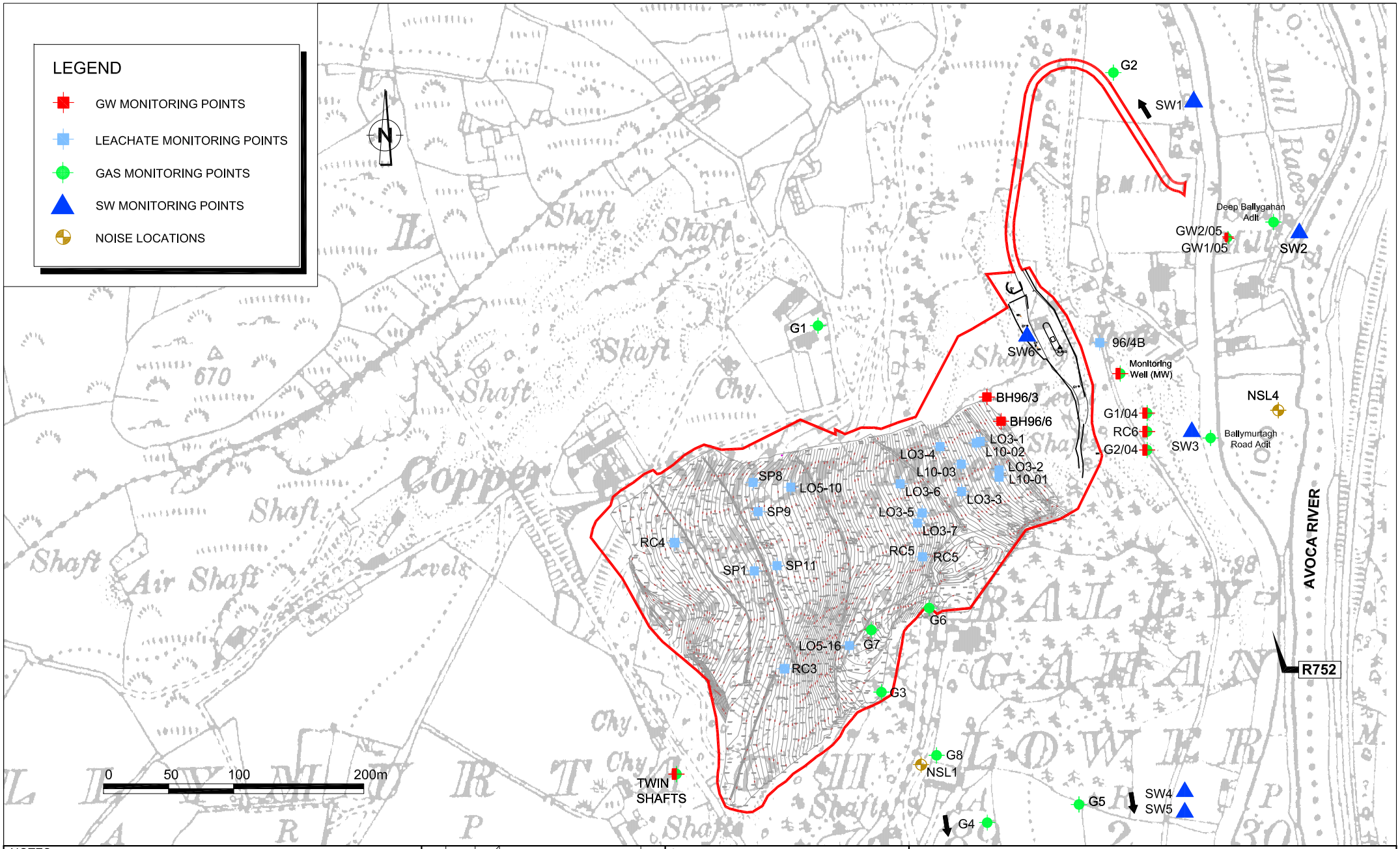
Full copies of all results can be found in Appendix A.

2.1.1 Interpretation

Surface water quality upstream of the facility (at SW1 and SW2) was generally of good quality during the 2010 monitoring period with no quarterly limits exceeded. Iron was recorded during the annual round of monitoring and was elevated at both monitoring points. SW1 recorded 0.23 mg/l Fe and SW2 recorded 0.25 mg/l Fe.

Surface water quality at SW3 (Ballymurtagh Road Adit) shows evidence of Acid Mine Drainage in the form of low pH (range 3.9 – 4.3) (see Figure 2.3), elevated conductivity (ranging from 1,810µS/cm to 2,200µS/cm), and elevated sulphate (1,195mg/l – 1,581mg/l). Sulphate concentrations were elevated throughout the year and remain similar to those recorded in previous years as shown in Figure 2.5. Elevated concentrations of iron, cadmium, copper, manganese, lead and zinc were also detected in the annual sample. Dissolved oxygen concentrations ranged from 7.4 mg/l in August 2010 to 8.1 mg/l in November 2010. The lowest dissolved oxygen concentration was recorded in the 3rd quarter (7.4 mg/l) and this is likely due to seasonal variances. BOD levels ranged from (<2 mg/l – 15mg/l). Ammoniacal Nitrogen levels were elevated at SW3, ranging from 6.9mg/l NH_4 to 9.6mg/l NH_4). Since the site was capped, the overall trend is that the Ammoniacal Nitrogen levels have gradually decreased, as can be seen in Figure 2.4.

Surface water quality at SW4 and SW5, (approx 300-400m downstream of SW3) is generally of good quality and similar to that of 2009. Ammoniacal Nitrogen was elevated at SW4 in the 1st Quarter of 2010 (0.15 mg/L). Iron was elevated at 0.34 mg/l at SW4 and 0.26 mg/l at SW5 during the annual round of monitoring in November 2010. All other parameters were within recommended limits.



NOTES

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A02	Dec'10	RH / CC	Issue for Approval	CC
A01	Sep'10	HF / CC	Issue for Approval	CC

Client: Wicklow County Council, County Buildings, Wicklow, Co. Wicklow

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HF	CC	CC	Sept. '10

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Project: **Ballymurtagh Landfill Environmental Management Plan**

Drawing Status	Sheet Size	Scale
Preliminary	A4	NTS

Drawing Number: MDE0046/Fig. 2.1

Rev: A02

Title: MONITORING POINTS

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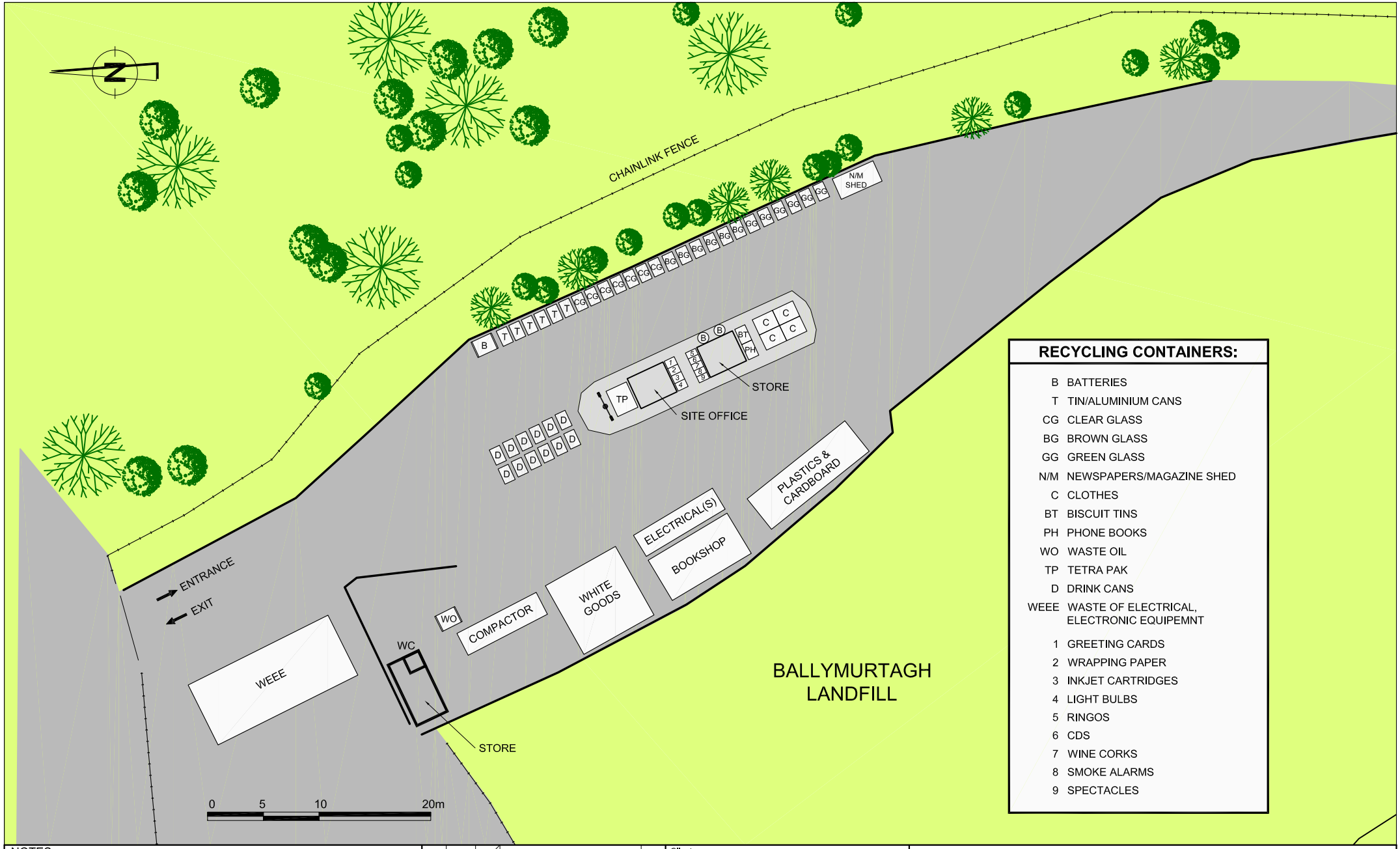

RECYCLING CONTAINERS:

B	BATTERIES
T	TIN/ALUMINIUM CANS
CG	CLEAR GLASS
BG	BROWN GLASS
GG	GREEN GLASS
N/M	NEWSPAPERS/MAGAZINE SHED
C	CLOTHES
BT	BISCUIT TINS
PH	PHONE BOOKS
WO	WASTE OIL
TP	TETRA PAK
D	DRINK CANS
WEEE	WASTE OF ELECTRICAL, ELECTRONIC EQUIPEMNT
1	GREETING CARDS
2	WRAPPING PAPER
3	INKJET CARTRIDGES
4	LIGHT BULBS
5	RINGOS
6	CDS
7	WINE CORKS
8	SMOKE ALARMS
9	SPECTACLES

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Project: **Ballymurtagh Landfill Environmental Management Plan**

Drawing Status	Sheet Size	Scale
Preliminary	A4	NTS

Drawing Number | Rev

Title

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Figure 2.3: pH concentrations at all surface water monitoring locations from Feb 2005 to Nov 2010

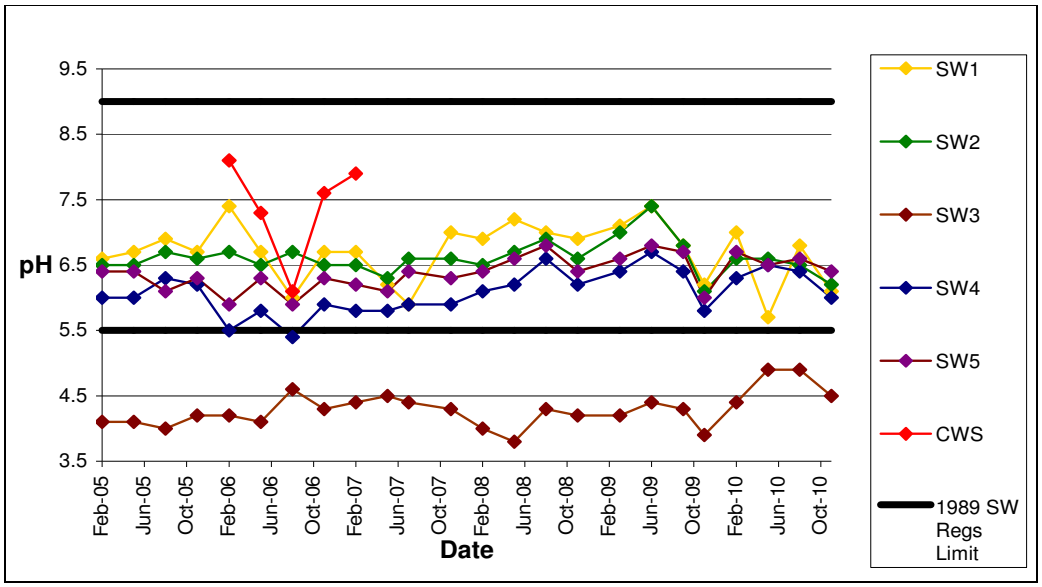


Figure 2.4: Ammoniacal Nitrogen concentrations at SW3 (Aug 04 - Nov 10)

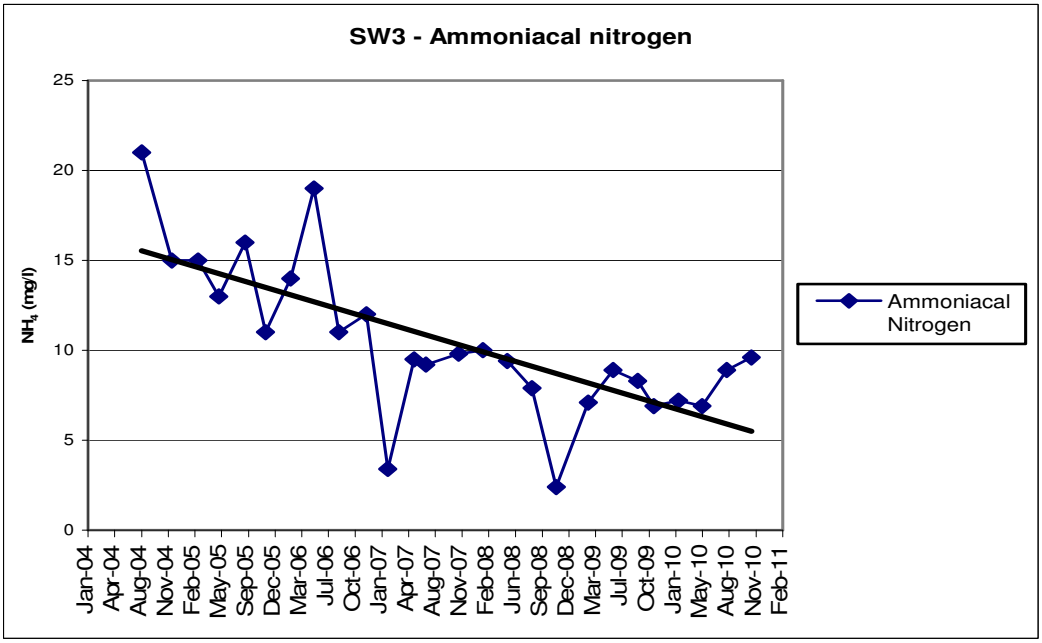
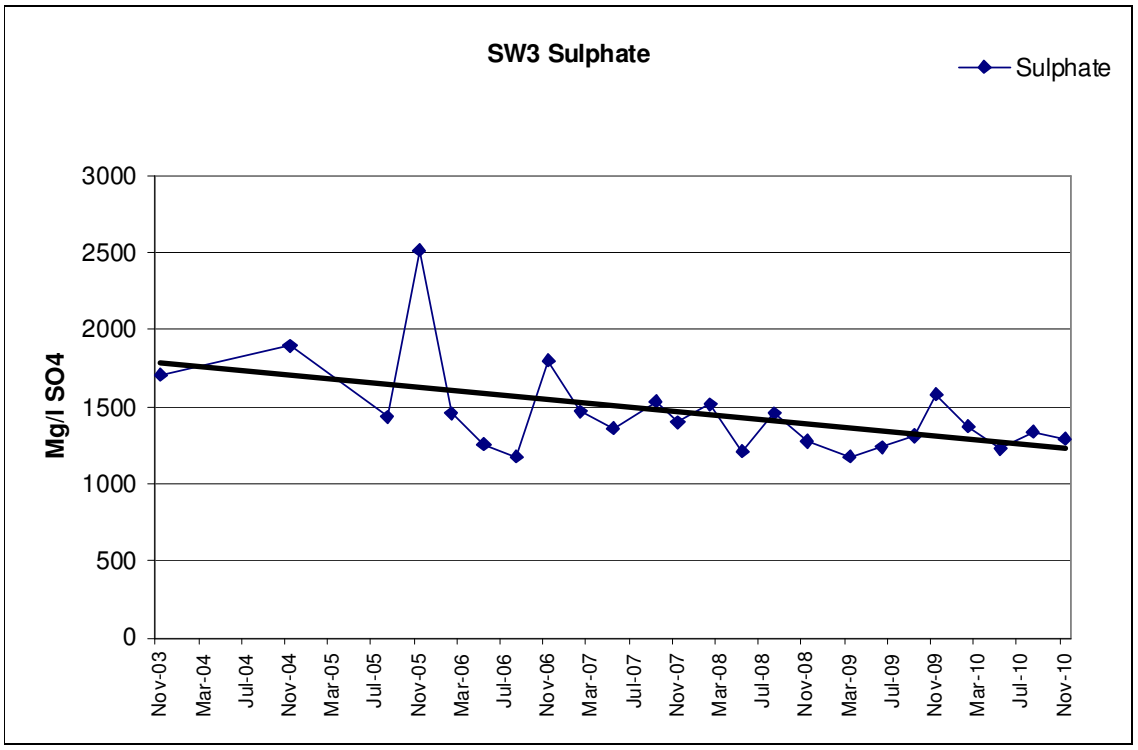


Figure 2.5: Sulphate concentrations at SW3 from Nov 03 - Nov 10



2.1.2 ELV Compliance

There is a surface water discharge limit of 35mg/l suspended solids. No exceedances of this limit were recorded during 2010.

2.2 GROUNDWATER

TelLabs took groundwater samples in February, May, August and November 2010, the results of which are contained within Appendix A. Samples were obtained from the Twin Shafts, G1/04, G1/05, G2/05 and BH96/3, and RC6. Four private groundwater wells (Thomas & Mary Merrigan, Donal O' Leary, Eddie Coleman and Jeffery Green) were also monitored in 2010. Parameters that require analysis on an annual basis were sampled in November.

The results are compared with the EPA Groundwater Interim Guideline Values (2003) (IGV).

As discussed in the 'Monitoring Infrastructure Assessment Report' and the 'Groundwater Flow and Contaminant Transport Modelling Study', Ballymurtagh Landfill is located within a disused open mine pit, which is underlain by 6 - 16.5m of mine tailings and an underground mine. This underground mine was allowed to flood after closing and overflows mainly at the Ballymurtagh Road Adit (SW3) and on occasion at the Deep Ballygahan Adit (SW2). Any leachate generated within the body of waste seeps into the underground tailings and subsequently into the underground mine. Consequently, landfill leachate contamination may be observed at the Ballymurtagh Road Adit (SW3) as well as being evident in the groundwater down gradient of the mine / landfill.

RC6 was dry in 2010. The last sample obtained was in November 2009, with the sample before that taken in November 2006.

The following interpretations summarise the overall groundwater quality. More detailed interpretations can be found within the quarterly monitoring reports, which were submitted to the Agency throughout the reporting period.

2.2.1 Interpretation

The groundwater up-gradient of the landfill (Twin Shafts) is generally of good quality, however during analysis of annual parameters in the fourth quarter, high concentrations of zinc (2.8mg/l), manganese (0.20mg/l) and cadmium by GFAAS (13 µg/l) were recorded. The potassium limit (5mg/l) was exceeded in all quarters of 2010 with levels ranging from 5 mg/l to 12 mg/l. Bacteriological quality is generally poor and high concentrations of total coliforms, i.e. >100 CFU/100mls were recorded in February and May of 2010. Ammoniacal Nitrogen levels were exceeded once, in November 2010.

BH96/3 is located down gradient but adjacent to the main body of waste and is therefore more representative of leachate than groundwater. Samples taken at BH96/3 are of poor quality with conductivity, chloride, ammonium, potassium and sulphate exceeding the relevant IGV limits on all sampling occasions. Iron was elevated in three of the four quarters of 2010 ranging from 0.05 mg/l in Quarter 1 to 1.58 mg/l in Q3 of 2010. Total coliforms exceeded IGV concentrations for all quarters of 2010. Calcium, manganese and magnesium were also elevated in the 4th quarter for the annual round of monitoring.

Groundwater quality at other down-gradient (G1/04, G1/05 and G2/05) monitoring points is also considered poor with low pH concentrations, incidences of high conductivity and sulphate concentrations in all four quarters.

Exceedances for ammonium were recorded at G1/04 ranging from 0.23mg/l in Quarter 3 to 2.7mg/l in Quarter 1 of 2010. The limits for calcium, cadmium, chromium, copper, fluoride, iron, lead, magnesium, manganese and zinc, were also exceeded at G1/04 during monitoring of annual parameters. Incidents of high total coliforms were recorded throughout the year indicating poor bacteriological quality.

Water quality at the private wells is generally good. However the pH concentrations were outside the recommended range in Jeff Green's well, the Merrigans' well and Eddie Coleman's well throughout the year. The pH concentrations in Eddie O'Leary's well were outside the range in all quarters apart from Quarter 11 (6.6).

Elevated total coliforms were detected in all wells; Merrigans' well and Jeff Green's well in all four quarters, Eddie Coleman's well in the 1st, 2nd and 4th quarters and Donal O' Leary's well in the 1st and 4th Quarters. No Faecal coliforms were detected in the private wells in the 1st, 2nd and 3rd Quarters of 2010. During the 4th Quarter of 2010, faecal coliforms were detected in Donal O'Leary's well (1CFU/100mls). Interpretations and results are provided to each well owner after each quarter.

2.3 LEACHATE

Leachate samples were taken from leachate monitoring points at L05/16, L10/01, L10/02 and L10/03. L05/16 produced readings until April 2010 and was dry thereafter. Three new boreholes (L10/01, L10/02 and L10/03) were commissioned during 2010.

The samples obtained in November were analysed for a broader range of parameters to comply with the annual monitoring requirements of the licence. The results were compared with typical leachate compositions of 30 samples from UK/Irish landfills (EPA, 1997).

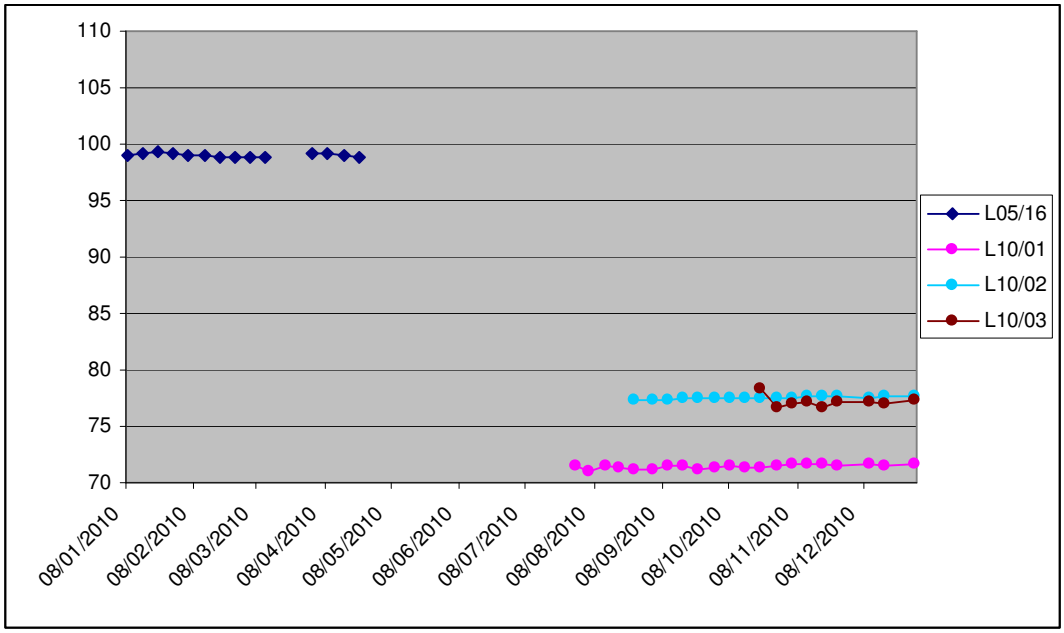
The concentrations of most of the indicator parameters, including all the metals for most of the samples taken, are within the typical/average values for landfill leachate from municipal waste.

2.3.1 Leachate Levels

Wicklow County Council record leachate levels at a number of monitoring locations in accordance with Condition 9.4 of the W0011-01. Historically, readings from L03/1, L03/2 and L03/4 were recorded and graphed. However, these boreholes were recorded as blocked and levels were not recorded in the 3rd & 4th quarters of 2010.

The borehole L05/16 continued to record readings until April. Three new boreholes (L10/01, L10/02 and L10/03) were commissioned in the 3rd and 4th Quarters of 2010. Leachate levels fluctuate as shown in Figure 2.6.

Figure 2.6: Leachate Levels at L05/16, L10/01, L10/02 and L10/03



2.4 NOISE

Noise monitoring was undertaken by Euro Environmental at 2 monitoring locations (NSL1 and NSL4) (see Figure 2.1) on 17th January 2011. The 55dB(A) day limit was exceeded at both monitoring points. NSL 1 exceeded the recommended daytime limits of 55dB(A) at 58.5 dB(A) and NSL 4 exceeded the recommended daytime limits at 55.5 dB(A). This was attributed to a dog barking and traffic on the main road. No noise could be heard from operations at the landfill at NSL1 at the time of monitoring. No noise emanating from the flare was audible at NSL1, the nearest noise sensitive location to the flare. This report is attached in Appendix F.

2.5 GAS

Wicklow County Council undertook landfill gas monitoring during 2010 at the monitoring locations shown on Figure 2.1, summary results of which are contained in Appendix A. Table 2.1 outlines the exceedances in CO_2 during 2010.

Table 2.1: CO_2 Exceedances in 2010

	Unit	$C0_2$ ELV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G2	%v/v	1.5%	1.0	NE	NE	NE	NE	NE	NE	NE	NE	2.6	NE	2.4
G3			NE	NE	NE	NE	NE	1.7	NE	NE	2.2	NE	NE	NE
G4			NE	NE	NE	NE	NE	NE	4.5	2.6	0.9	4.2	3.1	6.3
G6			2.6	4.4	4.5	4.3	3.9	4.3	3.6	3.6	4.2	3.4	3.2	3.7
G7			2.0	2.9	3.1	2.6	2.4	2.2	2.6	3.2	1.9	2.4	2.1	2.1
GW2/05			NE	NE	NE	NE	1.7	1.9	2.8	3.1	NE	1.8	NE	NE
NE: CO_2 ELV not exceeded														

CO_2 levels consistently exceeded the limit of 1.5 %v/v at G6 (2.6% - 4.5%) and G7 (1.9% - 3.2%) throughout the reporting period. Exceedances of CO_2 were recorded at other wells on occasion throughout the reporting period as shown in Table 2.1. CH_4 levels did not exceed the limit at any of the points monitored during the reporting period.

2.5.1 Investigation into Elevated CO_2 levels

RPS carried out a Phase 1 desk study review of the available and relevant geological, hydrogeological and geochemical information for the area including the landfill itself and the mine workings. This report was forwarded to the agency on 5th December 2007.

2.6 LANDFILL GAS FLARE

Bioverta Power Systems Ltd undertook monitoring of the landfill gas flare and gas abstraction sampling points throughout 2010. Methane levels averaged at 17.7%, carbon dioxide at 22.0% and oxygen at 2.4%. Although the methane content is low and decreasing, this is indicative of the stage of the microbial degradation. The remaining % is most likely made up of hydrogen, nitrogen, carbon monoxide and water vapour derived from the atmosphere. The methane levels recorded at the flare have decreased while oxygen levels have increased. CO_2 levels have decreased on 2009 levels.

The flare outlet monitoring could not be completed due to issues with access as a result of a prolonged period of bad weather.

2.7 METEOROLOGICAL DATA

No meteorological data was obtained on-site during the reporting period, however data was obtained from the weather station at Casement Aerodrome.

2.8 SITE SURVEY

A site survey was undertaken in April 2011 and is attached in appendix B.

2.9 ECOLOGY

An assessment of the ecology of the restored landfill and adjoining habitats was carried out in September 2010. This report has been forwarded separately to the agency and is also attached in Appendix E.

3 WASTE TYPES

The landfill ceased disposal of waste in December 2002.

In total 465.253 tonnes of waste was disposed of at the Civic Amenity in 2010.

Table 3.1 provides summary information on wastes received at the Civic Waste Facility and which whether it was sent for disposal or recovery.

Table 3.1: Total Quantities of Waste Accepted at the Civic Waste Facility during 2010

Waste Type	EWC Code	Quantity (tonnes)	Disposal / Recovery (D/R)
Mixed Residual Waste	20 03 01	12	D
Cardboard Packaging	15 01 01	86	R
Cardboard Non-packaging	20 01 01	1	R
Paper Non-packaging	20 01 01	3	R
Newspaper and Magazines	20 01 01	141	R
Glass Packaging	15 01 07	83	R
Aluminium Cans	15 01 04	3	R
Steel Cans	15 01 04	15	R
Other metals (non-packaging)	20 01 40	37	R
Plastic Packaging	15 01 02	49	R
Composite Packaging	20 01 39	6	R
Textiles	15 01 05	21	R
Lead Acid batteries and Accumulators	16 06 01*	2.33	R
Other (portable) Batteries and Accumulators	16 06 02*	1.453	R
Waste Mineral Oils	13 02 04*	2.9	R
Waste Cooking or Vegetable Oils	20 01 25	0.36	R
Polystyrene	-	1.21	-
Total		**465.253**	

4 MASS BALANCE OF SPECIFIED SUBSTANCES (MBSS)

According to the Agency's 'Waste Licensing, Draft Guidance on Environmental Management Systems and Reporting to the Agency', the purpose of a MBSS is to produce a detailed analysis of the facility in order to itemise and quantify all material flows i.e. Inputs = Output + Accumulation + Consumption - Generation. Since activities at the landfill ceased in December 2002 the main inputs during 2010 relate to incoming waste to the Civic Amenity Site. The main outputs are leachate (section 4.4), air emissions (section 4.3), noise (section 2.4) and waste departing the Civic Amenity Site (section 3). In terms of generation, leachate and air emissions (mainly landfill gas) are generated because of the decomposition of waste, which result in their output. However, the site was restored during 2005 and 2006 and it is expected that these emissions will continue to reduce over time. The main activity at the Civic Waste Facility is the transfer of the waste accepted at the site to suitable recovery/recycling facilities.

4.1 EPRTR REQUIREMENTS

As part of the requirements of the European Pollutant Release and Transfer Register, Ballymurtagh Landfill uploaded the results of emissions on the 20th April 2011. Further details can be seen in Appendix C.

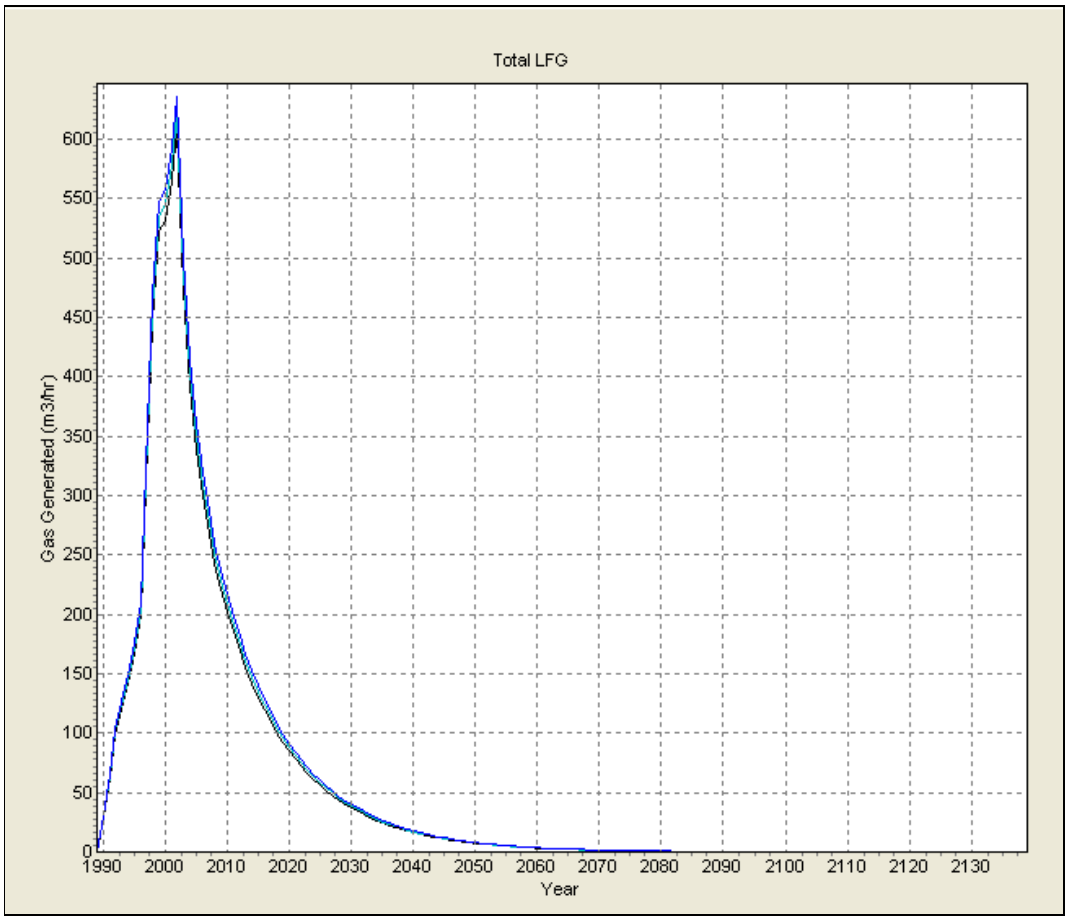
4.2 RESOURCE AND ENERGY CONSUMPTION SUMMARY

The operation of the landfill required 62,189 units of electricity (45,917 for the flare and 16,272 at the Civic Waste facility), 4,800L of diesel (to operate the generator at the civic amenity site) and 8,300L of water during 2010.

4.3 ESTIMATED & CUMULATIVE QUANTITES OF LANDFILL GAS

GasSim 2.0, a landfill gas modeling software package (developed by the UK Environmental Agency), was used to simulate the expected production of landfill gas at Ballymurtagh Landfill based on the input information. Figure 4.1 shows the average hourly rate of landfill gas generation for each year for Ballymurtagh landfill.

Figure 4.1: Average hourly rate of landfill gas generated at the facility (1990 to 2130)

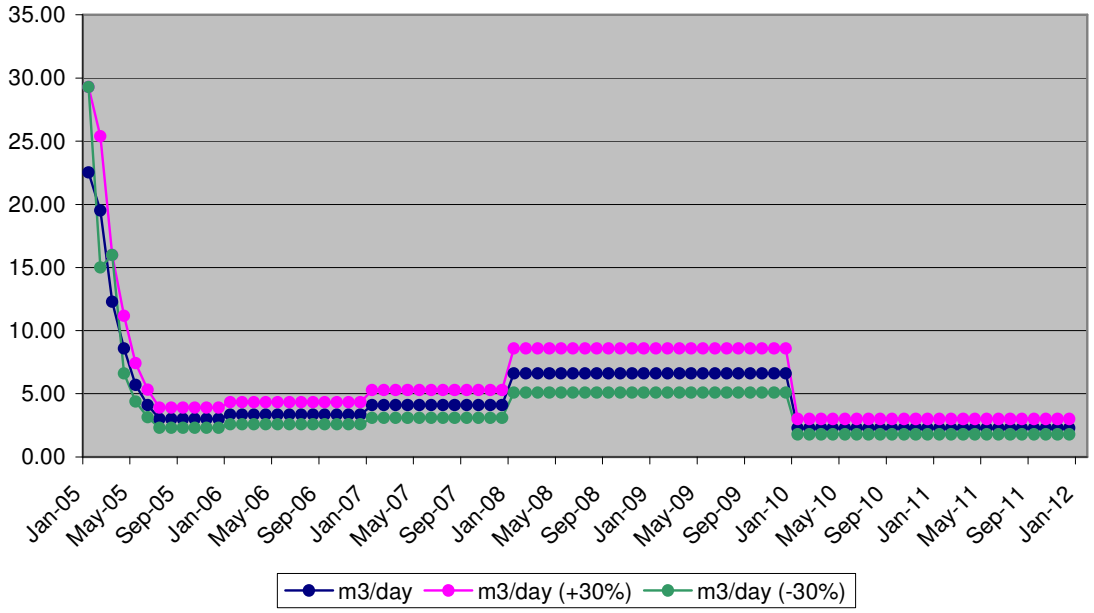


The flare at Ballymurtagh has a capacity of 500m^3/hr.

4.4 MONTHLY WATER BALANCE CALCULATION AND INTERPRETATION

Monthly rainfall data obtained from the Met Eireann weather station at Casement Aerodrome recorded a total of approximately 619.3 mm of rainfall in 2010. Evapotranspiration data was also obtained. The total estimated amount of rainfall lost to evapotranspiration is estimated at 514.3 mm. Monthly volumes of leachate were calculated for the entire landfill area based on monthly rainfall, area and the stage at which the area is at i.e. completely filled and permanently capped. The water balance calculations are outlined in Appendix D. Figure 4.2 shows the estimated leachate generation for 2005 - 2010 and projections for 2011.

Figure 4.2: Estimated leachate generation at Ballymurtagh Landfill 2005-2011



It is estimated that up to 839.5 m^3 of leachate was generated during the reporting period, 70 m^3/month.

**Note Casement data was used to calculate leachate generation in 2010*

4.5 EMISSIONS TO GROUNDWATER

The landfill was designed on a 'dilute and disperse' principle with no leachate containment measures put in place. The leachate, which is attenuated by the underlying soil and groundwater, drains naturally to the Avoca River.

5 SITE DEVELOPMENT WORKS

5.1 DEVELOPMENT WORKS UNDERTAKEN DURING 2010

Three new leachate monitoring wells were installed at the site in 2010. See Section 2.3 for further details.

5.2 PROPOSED DEVELOPMENT WORKS

No new developments have been proposed for the site at present.

6 ENVIRONMENTAL MANAGEMENT

The Facility Manager, assisted by the Senior Engineer, is responsible for achieving the schedule of objectives and targets, which are set out in the EMP. The responsibilities and time scales for achieving the objectives and targets for 2010 - 2014 are outlined in Table 6.1. As waste acceptance ceased in 2002, the objectives and targets mainly relate to the protection of the receiving environment and the aftercare of the facility.

Table 6.2 discusses the % completion of the Schedule of Objective & Targets set for 2009 - 2013.

6.1 ENVIRONMENTAL INCIDENTS

Corrective Action Report Forms relating to incidents occurring in 2010 are included in quarterly reports forwarded to the agency throughout the year.

6.2 PROCEDURES

The updated Environmental Management Plan and associated procedures was forwarded to the Agency in October 2009. This Environmental Management Plan is currently under review.

6.3 REPORTS ON FINANCIAL PROVISIONS

Wicklow County Council allocates funding on an annual basis from its revenue sources. The fund will be maintained in an amount always sufficient to underwrite the current Restoration and Aftercare Plan in accordance with Condition 11 of the Waste Licence.

Table 6.1: Schedule of Environmental Objectives and Targets for 2010 - 2014

SCHEDULE OF OBJECTIVES AND TARGETS 2010 - 2014			
Objective	**Target**	**Responsible Party**	**Completion Date**
Improve the environmental performance of the facility	Undertake regular reviews of Facility to assess compliance of site with Waste Licence	Facility Manager	Ongoing
Reduce potential odour at the facility	Minimise the number of landfill gas flare shutdowns and ensure that the flare is operating as near to 100% of the time as possible.	Facility Manager	Ongoing
Encourage public to recycle their waste	To inform the public of the waste accepted at the civic waste facility by issuing information at the civic waste facility office to members of the public, radio and newspaper advertisements	CWF Supervisor Facility Manager	Ongoing
Provide for the protection of the receiving environment.	Wicklow County Council will support any remedial action taken to improve the quality of the Avoca River. A report into the investigation of treatment of groundwater discharges from the adits was completed in February 2007. (University of Newcastle)	Senior Engineer	Ongoing
Accept additional waste materials at the Civic Waste Facility	Source further recycling/re-use opportunities	CWF Supervisor Facility Manager	Ongoing

Table 6.2. % Completion of Schedule of Objectives & Targets for 2009-2013

SCHEDULE OF OBJECTIVES AND TARGETS 2009-2013				
Objective	**Target**	**Responsible Party**	**%Completion**	**Comment**
Improve the environmental performance of the facility	Undertake regular reviews of Facility to assess compliance of site with Waste Licence	Facility Manager	Ongoing	Compliance of the facility is discussed on a regular basis.
	Submit Application for Review of Waste Licence (and accompanying EIS)	Director of Services	100%	A review of Waste Licence and an accompanying EIS was submitted in November 2010.
Reduce potential odour at the facility	Minimise the number of landfill gas flare shutdowns and ensure that the flare is operating as near to 100% of the time as possible.	Facility Manager	Ongoing	
Encourage public to recycle their waste	To inform the public of the waste accepted at the civic waste facility by issuing information at the civic waste facility office to members of the public, radio and newspaper advertisements	CWF Supervisor Facility Manager	Ongoing	
Provide for the protection of the receiving environment.	Wicklow County Council will support any remedial action taken to improve the quality of the Avoca River. A report into the investigation of treatment of groundwater discharges from the adits was completed in February 2007. (University of Newcastle)	Senior Engineer	Ongoing	
Accept additional waste materials at the Civic Waste Facility	Source further recycling/re-use opportunities	CWF Supervisor Facility Manager	Ongoing	

7 STAFFING AT BALLYMURTAGH LANDFILL

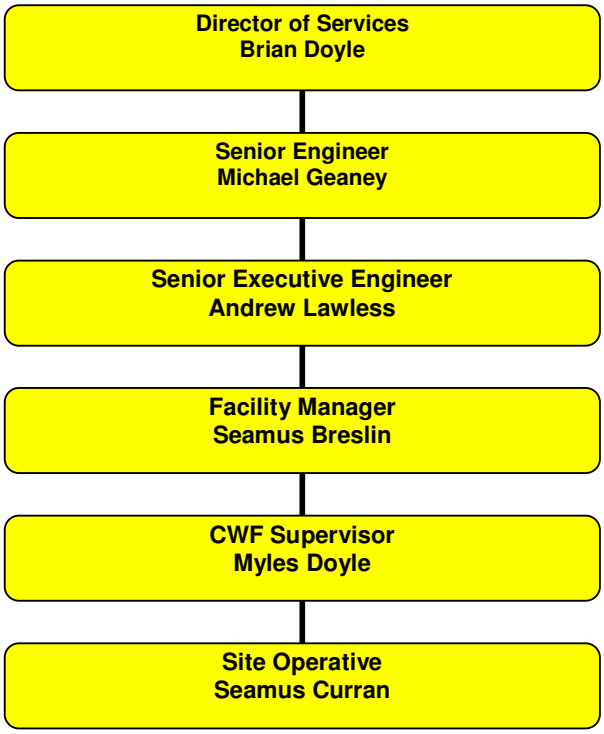
The site is under the overall operational control of the Director of Services and the Senior Engineer who provide office support as required. The Facility Manager is responsible for the day-to-day supervision and management of the site. The Facility Manager maintains regular contact with County Buildings, with regular site visits from the Senior Executive Engineer. RPS Consulting Engineers advises Wicklow County Council on operations at the facility and waste licence compliance issues. Table 7.1 provides details of the management in 2010.

Table 7.1: Managerial Staff

Position	Contact details
Mr Brian Doyle, Director of Services (Environmental & Sanitary Services)	Wicklow County Council, County Buildings, Wicklow. Telephone No: 0404 20100 Fax No: 0404-67792
Mr Michael Geaney, Senior Engineer (Environmental & Sanitary Services)	Wicklow County Council, County Buildings, Wicklow.
Mr Andrew Lawless, Senior Executive Engineer (Environmental & Sanitary Services)	Wicklow County Council, County Buildings, Wicklow.
Mr Seamus Breslin, Facility Manager	Wicklow County Council, County Buildings, Wicklow.

Figure 7.1 outlines the management structure for the site. A supervisor is also employed to run the civic waste facility. Any changes to this structure will be submitted to the Agency for agreement in accordance with Condition 2.6 of Waste Licence Reg. No. W0011-1.

Figure 7.1: Management Structure & Organisational Chart



7.1 ECONOMIC CONTRIBUTION

Four local employees worked at the landfill when it was in operation. Since closing in December 2002, one employee has taken the position of site supervisor at the Civic Waste Facility and another employee as Civic Waste Facility operator.

8 NUISANCE CONTROL

Wicklow County Council undertake weekly inspections of the landfill and civic waste facility to identify any environmental nuisances caused by litter, dust, odour and vermin. An inspection form is outlined in the EMP and forms part of the Corrective Action Procedure.

8.1 LITTER

The Facility Manager ensures that the facility is kept free from litter. In the event of fly tipping, the Facility Manager notifies and organises for the proper disposal of the waste.

8.2 ODOUR

In the event of odour detection, the Facility Manager has regard to the Corrective Action Procedure.

Bioverta Power Systems visit the site on a weekly basis to maintain the gas extraction system so as to minimise flare failure which may lead to landfill gas migration and subsequent odour complaints.

8.3 VERMIN CONTROL

The Procedure for the Control of Vermin (set out in the EMP) outlines measures to ensure that vermin do not give rise to nuisance at the landfill and civic waste facility.

The Facility Manager oversees the implementation of the procedure for the control and eradication of pests. However, since waste acceptance has ceased at the landfill facility, the potential for vermin, pests, birds, etc has been much reduced.

APPENDIX A

Monitoring Results

Ballymurtagh Landfill, Co Wicklow - Surface Water Quality – Q1 2010								
Parameters	**Units**	**Surface water Regulations 1989**	**Environmental Quality Standards**	**SW1**	**SW2**	**SW3**	**SW4**	**SW5**
Q1 2010		**MAC**	**EPA Interim Report 2003**	**22-Feb-10**	**22-Feb-10**	**22-Feb-10**	**22-Feb-10**	**22-Feb-10**
Ammoniacal Nitrogen	mg/L	0.2	0.02	<0.08	<0.08	**7.2**	**0.15**	<0.08
BOD	mg/L	5	–	<2	<2	**15**	<2	<2
Chloride	mg/L	250	250	10	10	37	10	16
COD	mg/L	40	–	8	7	22	8	5
Conductivity (uS/cm @20°C)	uS/cm at 20°C	1,000	1,000	78	91	**1,933**	124	99
Dissolved Oxygen	mg/L	<5	–	12.8	12.9	7.9	12.4	12.3
pH	pH Units	5.5<pH< 8.5	–	7.0	6.6	**4.4**	6.3	6.7
Sulphate	mg/L	200	200	9	19	**1,373**	32	20
Suspended Solids	mg/L	35	–	2	7	3	11	9
Temperature 'C	°C	25	–	6	6	6	5	6

Ballymurtagh Landfill, Co Wicklow - Surface Water Quality – Q2 2010								
Parameters	**Units**	**Surface water Regulations 1989**	**Environmental Quality Standards**	**SW1**	**SW2**	**SW3**	**SW4**	**SW5**
Q2 2010		**MAC**	**EPA Interim Report 2003**					
Ammoniacal Nitrogen	mg/L	0.2	0.02	<0.08	<0.08	**6.9**	0.09	<0.08
BOD	mg/L	5	–	<2	<2	<2	<2	<2
Chloride	mg/L	250	250	10	10	37	10	10
COD	mg/L	40	–	8	10	10	6	6
Conductivity (uS/cm @20°C)	uS/cm at 20°C	1,000	1,000	115	92	**1,911**	140	111
Dissolved Oxygen	mg/L	<5	–	**10.9**	**11**	**8**	**9**	**9.4**
pH	pH Units	5.5<pH< 8.5	–	5.7	6.6	**4.9**	6.5	6.5
Sulphate	mg/L	200	200	30	16	**1,226**	30	22
Suspended Solids	mg/L	35	–	12	5	3	8	9
Temperature 'C	°C	25	–	7	8	11	12	11

Ballymurtagh Landfill, Co Wicklow - Surface Water Quality – Q3 2010								
Parameters	**Units**	**Surface water Regulations 1989**	**Environmental Quality Standards**	**SW1**	**SW2**	**SW3**	**SW4**	**SW5**
		MAC	**EPA Interim Report 2003**	**3/8/2010**	**3/8/2010**	**3/8/2010**	**3/8/2010**	**3/8/2010**
Ammoniacal Nitrogen	mg/L	0.2	0.02	<0.08	<0.08	**8.9**	<0.08	<0.08
BOD	mg/L	5	–	<2	<2	8	<2	<2
Chloride	mg/L	250	250	9	9	37	9	9
COD	mg/L	40	–	6	10	12	10	13
Conductivity (uS/cm @20°C)	uS/cm at 20°C	1,000	1,000	73	76	**1970**	102	82
Dissolved Oxygen	mg/L	<5	–	9.5	9.7	7.4	9.9	10.0
pH	pH Units	5.5<pH< 8.5	–	6.8	6.5	**4.9**	6.4	6.6
Sulphate	mg/L	200	200	8	13	**1338**	21	16
Suspended Solids	mg/L	35	–	2	1	2	4	2
Temperature 'C	°C	25	–	14	14	12	15	15

Ballymurtagh Landfill, Co Wicklow - Surface Water Quality – Q4 2010								
Parameters	**Units**	**Surface water Regulations 1989**	**Environmental Quality Standards**	**SW1**	**SW2**	**SW3**	**SW4**	**SW5**
		MAC	**EPA Interim Report 2003**	**3/8/2010**	**3/8/2010**	**3/8/2010**	**3/8/2010**	**3/8/2010**
Ammoniacal Nitrogen	mg/L	0.2	0.02	<0.08	<0.08	**9.6**	<0.08	<0.08
BOD	mg/L	5	–	<2	<2	12	<2	3
Chloride	mg/L	250	250	6	6	39	6	6
COD	mg/L	40	–	7	14	14	8	25
Conductivity (uS/cm @20°C)	uS/cm at 20°C	1,000	1,000	42	44	**1952**	49	48
Dissolved Oxygen	mg/L	<5	–	10.3	9.4	8.1	9.5	9.7
pH	pH Units	5.5<pH< 8.5	–	6.1	6.2	**4.5**	6.0	6.4
Sulphate	mg/L	200	200	5	5	**1294**	8	5
Suspended Solids	mg/L	35	–	10	7	3	4	3
Temperature 'C	°C	25	–	9	10	12	10	9

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality – Q1 2010								
Parameters	**Units**	**EU Drinking Water Regulations 2007**	**EPA Groundwater Guidelines 2003**	**BH96/3**	**Twin Shafts**	**G1/04**	**G1/05**	**G2/05**
		SI 278 of 2007	**IGV**					
				22-Feb-10	**22-Feb-10**	**22-Feb-10**	**22-Feb-10**	**22-Feb-10**
Ammoniacal Nitrogen	mg/L	0.30	0.15	**169**	0.09	**2.7**	<0.08	<0.08
Chloride	mg/L	250	30	**63**	21	20	15	15
Conductivity (uS/cm @20'C)	uS/cm at 20°C	2500	1000	**3,560**	333	**8,960**	**14,88**	**1,218**
Dissolved Oxygen	mg/L	–	–	3.2	10.8	8.4	8.4	8.9
Iron	mg/L	0.2	0.2	0.05	0.10	**65**	0.18	0.51
Odour		–	–	Odourless	Odourless	Odourless	Odourless	Odourless
pH	pH Units	6.5 ≥ pH ≤ 9.5		7.5	7.3	**3.1**	**4.0**	**4.0**
Phenols	mg/L	–	0.50	0.10	<0.05	<0.05	0.23	0.10
Potassium	mg/L	12	5	**63**	**12**	<5	2	2
Sodium	mg/L	150	150	45	10	5	11	10
Sulphate	mg/L	250	200	**1,123**	93	**12,367**	**1,070**	**804**
Temperature °C	°C	–	25	8	8	8	9	8
TOC	mg/L	–	No Abnormal Change	21	1.7	6.8	1.1	1.1
TON	mg/L	–	No Abnormal Change	<0.50	3.5	<1.01	1.4	1.2
Visual	–	–	–	brownish, lots of suspended solids	colourless, some suspended solids	yellowish, turbid, lots of suspended solids	colourless, some suspended solids	brown, turbid, lots of suspended solids
Faecal Coliforms	cfu/100mls	0	0	0	**>100**	**6**	0	**6**
Total Coliforms	cfu/100mls	0	0	**30**	**>100**	**>100**	**>100**	**45**

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality – Q2 2010								
Parameters	**Units**	**EU Drinking Water Regulations 2007**	**EPA Groundwater Guidelines 2003**	**BH96/3**	**Twin Shafts**	**G1/04**	**G1/05**	**G2/05**
		SI 278 of 2007	**IGV**					
				13-May-10	**14-May-10**	**13-May-10**	**13-May-10**	**13-May-10**
Ammoniacal Nitrogen	mg/L	0.30	0.15	**150**	<0.08	**0.43**	<0.08	0.10
Chloride	mg/L	250	30	**58**	22	14	15	16
Conductivity (uS/cm @20'C)	uS/cm at 20°C	2500	1000	**3,250**	374	**8,880**	**1,372**	**1,202**
Dissolved Oxygen	mg/L	–	No Abnormal Change	4.0	8.6	8.1	7.6	7.6
Iron	mg/L	0.2	0.2	**0.21**	0.07	**63**	**0.21**	**0.32**
Odour		–	–	Slightly musty	Odourless	Odourless	Odourless	Odourless
pH	pH Units	6.5 ≥ pH ≤ 9.5	6.5 ≥ pH ≤ 9.5	7.9	7.0	**3.5**	**4.2**	**4.3**
Phenols	ug/L	–	0.50	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L	12	5	**54**	**8**	<2	2	2
Sodium	mg/L	150	150	43	10	7	11	11
Sulphate	mg/L	250	200	**1,213**	101	**11,566**	**1,005**	**826**
Temperature °C	°C	–	25	6	9	9	7	7
TOC	mg/L	–	No Abnormal Change	15	1.7	7.2	1.4	1.3
TON	mg/L	–	No Abnormal Change	<0.41	2.1	<1.1	1.3	1.2
Visual	–	–	–	brown, suspended solids	brown, some suspended solids	brown, Turbid suspended solids	Clear, colourless	brown, turbid, suspended solids
Faecal Coliforms	cfu/100mls	0	0	0	**8**	**1**	0	**4 (cfu/80mls)**
Total Coliforms	cfu/100mls	0	0	**>100**	**20**	**5**	**81**	**11 (cfu/80mls)**

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality – Q3 2010								
Parameters	**Units**	**EU Drinking Water Regulations 2007 SI 278 of 2007**	**EPA Groundwater Guidelines 2003 IGV**	**BH96/3**	**Twin Shafts**	**G1/04**	**G1/05**	**G2/05**
				3/8/2010	**3/8/2010**	**3/8/2010**	**3/8/2010**	**3/8/2010**
Ammoniacal Nitrogen	mg/L	0.30	0.15	193	<0.08	0.23	<0.08	<0.08
Chloride	mg/L	250	30	69	21	40	16	17
Conductivity (uS/cm @20'C)	uS/cm at 20°C	2500	1000	3640	367	9330	1575	1186
Dissolved Oxygen	mg/L	–	No Abnormal Change	3.1	11.1	5.6	6.2	8.1
Iron	mg/L	0.2	0.2	1.58	<0.05	82(n/a)	0.19	0.20
Odour		–	–	Odourless	Odourless	Odourless	Odourless	Odourless
pH	pH Units	6.5 ≥ pH ≤ 9.5	6.5 ≥ pH ≤ 9.5	7.7	6.8	3.9	4.5	4.5
Potassium	mg/L	12	5	63	7	<5	2	2
Sodium	mg/L	150	150	50	9	8	11	11
Sulphate	mg/L	250	200	1280	120	12588(n/a)	1150	800
Temperature °C	°C	–	25	14	not recorded	14	11	11
TOC	mg/L	–	No Abnormal Change	24	0.76	6.8	1.0	0.95
TON	mg/L	–	No Abnormal Change	<0.17	1.5	<0.85	1.4	1.4
Total Phenols	ug/L	–	0.50	<0.05	<0.05	<0.05	<0.05	<0.05
Visual	–	–	–	Colourless, some brown suspended solids	clear, colourless	Slightly brown, some suspended solids	Clear, colourless	Clear, colourless
Faecal Coliforms	cfu/100mls	0	0	0	18 (note 1)	0 (note 1)	0	0
Total Coliforms	cfu/100mls	0	0	>100	0 (note 1)	32 (note 1)	0	1

n/a = Non-INAB Accredited Tests **Note 1** - sample taken 11.08.2010 **Note 2** -G2/04 and RC6-dry

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality – Q4 2010								
Parameters	**Units**	**EU Drinking Water Regulations 2007 SI 278 of 2007**	**EPA Groundwater Guidelines 2003 IGV**	**BH96/3**	**Twin Shafts**	**G1/04**	**G1/05**	**G2/05**
				4/11/2010	**4/11/2010**	**3/11/2010**	**3/11/2010**	**3/11/2010**
Ammoniacal Nitrogen	mg/L	0.30	0.15	173	0.19	0.26	<0.08	<0.08
Chloride	mg/L	250	30	73	20	29	15	18
Conductivity (uS/cm @20'C)	uS/cm at 20°C	2500	1000	3640	377	9040	1547	1185
Dissolved Oxygen	mg/L	–	No Abnormal Change	4.0	10.1	7.3	5.9	8.9
Iron	mg/L	0.2	0.2	1.32	<0.05	68(n/a)	0.29	0.21
Odour		–	–	Musty	Odourless	Odourless	Odourless	Odourless
pH	pH Units	6.5 ≥ pH ≤ 9.5	6.5 ≥ pH ≤ 9.5	7.5	6.8	5	4.1	4.0
Potassium	mg/L	12	5	64	5	<5	2	2
Sodium	mg/L	150	150	43	9	11	11	11
Sulphate	mg/L	250	200	1463	127	13533(n/a)	1199	816
Temperature °C	°C	–	25	12	9	13	10	12
TOC	mg/L	–	No Abnormal Change	23	0.96	9.7	1.3	1.1
TON	mg/L	–	No Abnormal Change	<0.84	1.1	<1.7	1.4	1.4
Total Phenols	ug/L	–	0.50	<0.01	<0.05	<0.05	<0.05	<0.05
Visual	–	–	–	Black, lots of suspended solids	Colourless, few solids	Turbid, yellow solution	Clear, colourless	Clear, colourless
Faecal Coliforms	cfu/100mls	0	0	>100	70	7 (note1)	0	0
Total Coliforms	cfu/100mls	0	0	>100	>100	33 (note 1)	0	1

n/a = Non-INAB Accredited Tests **Note 1** – units cfu/50mls **Note 2** -G2/04 and RC6-dry

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality - Private Wells – Q1 2010							
Parameters	**Units**	**EU Drinking Water Regulations 2007**	**EPA Groundwater Guidelines 2003**	**Mary Merrigan**	**Jeff Green**	**Eddie Coleman**	**Donal O' Leary**
		SI 278 of 2007	**IGV**	**22-Feb-10**	**22-Feb-10**	**22-Feb-10**	**22-Feb-10**
Ammoniacal Nitrogen	mg/L	0.30	0.15	<0.08	<0.08	<0.08	<0.08
Chloride	mg/L	250	30	8	13	12	13
Conductivity (uS/cm @20°C)	uS/cm at 20°C	2500	1000	163	142	131	136
Dissolved Oxygen	mg/L	–	–	9.4	8.5	9.4	9.8
Iron	mg/L	0.2	0.2	<0.05	<0.05	<0.05	<0.05
Odour	–	–	–	Odourless	Odourless	Odourless	Odourless
pH	pH Units	6.5 ≥ pH ≤ 9.5	6.5 ≥ pH ≤ 9.5	6.2	5.7	5.5	6.4
Phenols	mg/L	–	0.5	0.05	<0.05	0.08	0.06
Potassium	mg/L	12	5	<1	2	2	2
Sodium	mg/L	150	150	5	8	8	10
Sulphate	mg/L	250	200	29	32	25	12
Temperature 'C	°C	–	25	5	5	5	5
TOC	mg/L	–	No Abnormal Change	1.2	0.62	0.87	0.27
TON	mg/L	–	No Abnormal Change	2.4	2.0	3.1	4.5
Visual	–	–	–	clear, colourless	clear, colourless	clear, colourless	clear, colourless
Faecal Coliforms	cfu/100mls	0	0	0	0	0	0
Total Coliforms	cfu/100mls	0	0	**20**	**11**	2	**1**

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality - Private Wells – Q2 2010							
Parameters	**Units**	**EU Drinking Water Regulations 2007**	**EPA Groundwater Guidelines 2003**	**Mary Merrigan**	**Jeff Green**	**Eddie Coleman**	**Donal O' Leary**
		SI 278 of 2007	**IGV**	**13-May-10**	**13-May-10**	**13-May-10**	**13-May-10**
Ammoniacal Nitrogen	mg/L	0.30	0.15	<0.08	<0.08	<0.08	<0.08
Chloride	mg/L	250	30	8	12	12	13
Conductivity (uS/cm @20°C)	uS/cm at 20°C	2500	1000	160	151	130	135
Dissolved Oxygen	mg/L	–	No Abnormal Change	8.8	9.2	8.4	9.2
Iron	mg/L	0.2	0.2	<0.05	<0.05	<0.05	<0.05
Odour	–	–	–	Odourless	Odourless	Odourless	Slightly Musty
pH	pH Units	6.5 ≥ pH ≤ 9.5	6.5 ≥ pH ≤ 9.5	6.0	5.9	5.1	6.3
Phenols	ug/L	–	0.5	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L	12	5	<1	2	2	2
Sodium	mg/L	150	150	6	8	8	11
Sulphate	mg/L	250	200	26	31	25	14
Temperature 'C	°C	–	25	8	9	9	7
TOC	mg/L	–	No Abnormal Change	4.5	2.7	0.79	1.0
TON	mg/L	–	No Abnormal Change	2.0	1.7	2.9	3.3
Visual	–	–	–	clear, colourless	clear, colourless	clear, colourless	clear, colourless
Faecal Coliforms	cfu/100mls	0	0	0	0	0	0
Total Coliforms	cfu/100mls	0	0	**1**	**8**	**1**	0

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality - Private Wells – Q3 2010							
Parameters	**Units**	**EU Drinking Water Regulations 2007** **SI 278 of 2007**	**EPA Groundwater Guidelines 2003** **IGV**	**Mary Merrigan**	**Jeff Green**	**Eddie Coleman**	**Donal O' Leary**
Ammoniacal Nitrogen	mg/L	0.30	0.15	<0.08	<0.08	<0.08	<0.08
Chloride	mg/L	250	30	10	13	12	13
Conductivity (uS/cm @20°C)	uS/cm at 20°C	2500	1000	149	129	132	145
Dissolved Oxygen	mg/L	–	No Abnormal Change	9.0	8.8	9.8	9.2
Iron	mg/L	0.2	0.2	<0.05	0.05	<0.05	<0.05
Odour	–	–	–	Odourless	Odourless	Odourless	Odourless
pH	pH Units	6.5 ≥ pH ≤ 9.5	6.5 ≥ pH ≤ 9.5	6.1	5.6	5.6	6.6
Potassium	mg/L	12	5	1	2	2	2
Sodium	mg/L	150	150	6	8	8	10
Sulphate	mg/L	250	200	25	30	25	17
Temperature 'C	°C	–	25	13	12	12	13
TOC	mg/L	–	No Abnormal Change	0.65	0.30	0.30	<0.25
TON	mg/L	–	No Abnormal Change	2.0	1.4	3.2	2.5
Total Phenols	ug/L	–	0.5	<0.05	<0.05	<0.05	<0.05
Visual	–	–	–	Clear, colourless	Clear, colourless	Clear, colourless	Clear, colourless
Faecal Coliforms	cfu/100mls	0	0	0	0	0	0
Total Coliforms	cfu/100mls	0	0	10	4	0	0

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality - Private Wells – Q4 2010							
	Units	**EU Drinking Water Regulations 2007**	**EPA Groundwater Guidelines 2003**	**Mary Merrigan**	**Jeff Green**	**Eddie Coleman**	**Donal O' Leary**
Parameters		**SI 278 of 2007**	**IGV**				
Ammoniacal Nitrogen	mg/L	0.30	0.15	<0.08	<0.08	<0.08	<0.08
Chloride	mg/L	250	30	9	11	11	12
Conductivity (uS/cm @20°C)	uS/cm at 20°C	2500	1000	147	126	127	121
Dissolved Oxygen	mg/L	–	No Abnormal Change	9.0	7.7	7.7	9.6
Iron	mg/L	0.2	0.2	<0.05	0.05	<0.05	<0.05
Odour	–	–	–	Odourless	Odourless	Odourless	Odourless
pH	pH Units	6.5 ≥ pH ≤ 9.5	6.5 ≥ pH ≤ 9.5	5.9	5.2	5.2	6.1
Potassium	mg/L	12	5	<1	2	2	2
Sodium	mg/L	150	150	6	7	7	9
Sulphate	mg/L	250	200	24	27	23	12
Temperature 'C	°C	–	25	10	10	9	10
TOC	mg/L	–	No Abnormal Change	0.94	0.67	0.55	0.75
TON	mg/L	–	No Abnormal Change	2.2	2.4	3.1	4.4
Total Phenols	ug/L	–	0.5	<0.05	<0.05	<0.05	<0.05
Visual	–	–	–	Clear, colourless	Clear, colourless	Clear, colourless	Clear, colourless
Faecal Coliforms	cfu/100mls	0	0	0	0	0	1
Total Coliforms	cfu/100mls	0	0	20	6	2	2

Leachate Composition on Site			
Q2 2010			
Parameter	**Units**	**Typical Leachate Range (EPA Manual)**	**L05/12 14/05/2010**
Ammonia	mg/l NH_4	**<0.2 - 1700**	2.5
B.O.D	mg/l	**4.5 - >4800**	35
C.O.D.	mg/l	**<10 - 33700**	202
Chloride	mg/l	**27 - 3410**	14
Conductivity	uS/cm @20°C	**503 - 19,200**	1,494
Odour	-	**-**	Musty,strong
pH	pH unit	**6.4 - 8.0**	6.9
Phenols	mg/l	**-**	<0.05
Temperature (on site)	°C	**-**	13
Total Oxidised Nitrogen	mg/l N	**-**	<0.17
Faecal Coliforms	cfu per 100 ml	**-**	**3 (cfu/10mls)**
Total Coliforms	cfu per 100 ml	**-**	**10 (cfu/10mls)**
Visual Description	-	**-**	Black,turbid,lots of suspended solids

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality - Private Wells – Q3 2010						
Parameters	**Units**	**Typical Leachate Range (EPA Manual)**	**L05/12 3/8/2010**	**L10/01 3/8/2010**		
Ammonia	mg/l NH4	<0.2 - 1700	1.3	460		
B.O.D	mg/l	4.5 - >4800	32	101		
C.O.D.	mg/l	<10 - 33700	13	909		
Chloride	mg/l	27 - 3410	77	1470		
Conductivity	uS/cm @20oC	503 - 19,200	1825	7430		
Odour	-	-	Musty	Musty		
pH	pH unit	6.4 - 8.0	6.8	7.7		
Temperature (on site)	oC	-	17	24		
Total Oxidised Nitrogen	mg/l N	-	<0.17	<1.17		
Total Phenols	mg/l	-	<0.05	<0.05		
Visual Description	-	-	Brown, lots of black suspended solids	Black, turbid, lots of suspended solids		
Faecal Coliforms	cfu per 100 ml	-	0	>100		
Total Coliforms	cfu per 100 ml	-	>100	>100		

Ballymurtagh Landfill, Co Wicklow - Ground Water Quality - Private Wells – Q4 2010						
Parameters	**Units**	**Typical Leachate Range (EPA Manual)**	**L10/01 3/11/2010**	**L10/02 3/11/2010**		
Ammonia	mg/l NH4	<0.2 - 1700	216	63		
B.O.D	mg/l	4.5 - >4800	36	51		
C.O.D.	mg/l	<10 - 33700	439	713		
Chloride	mg/l	27 - 3410	303	717		
Conductivity	uS/cm @20oC	503 - 19,200	3330	4000		
Odour	-	-	Musty	Musty		
pH	pH unit	6.4 - 8.0	7.2	7.4		
Temperature (on site)	oC	-	35	38		
Total Oxidised Nitrogen	mg/l N	-	5.9	11		
Total Phenols	mg/l	-	<0.05	<0.10		
Visual Description	-	-	Turbid, brown, with plenty of solids	Very turbid, black solution, plenty of solids		
Faecal Coliforms	cfu per 100 ml	-	11(see note1)	12 (see note 2)		
Total Coliforms	cfu per 100 ml	-	>100 (see note 1)	>100 (see note 2)		

Note 1 – units cfu per 40 ml Note 2 - units cfu per 20 ml

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:**		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 29/01/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010		
	Last Field Calibration: December 2009		
Monitoring Personnel: Seamus Breslin	**Weather:**	**Barometric pressure:** 983-995	
		Mean Temperature: 5.1℃	

Results

Sample Station Number	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Comments:
G1	0.0	0.4	20.5	
G2	0.0	1.0	18.7	
G3	0.0	0.5	20.6	
G4	0.0	1.9	18.0	
G6	0.0	2.6	16.2	
Ballygahan Adit	0.0	0.0	20.7	
Ballymurtagh Adit	0.0	0.0	20.8	
G7	0.0	2.0	18.0	
G8	0.0	0.1	20.7	
GW2/04	0.0	0.3	20.1	
RC 6	0.0	0.0	20.8	
GW1/04	0.0	0.0	20.8	
GW1/05	0.0	0.6	20.0	
GW2/05	0.0	0.1	20.6	
FLARE	28.0	29.0	0.7	
TWIN SHAFTS	0.0	0.0	20.8	

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 26/02/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010		
	Last Field Calibration: December 2009		
Monitoring Personnel: Seamus Breslin	**Weather:**	**Barometric pressure:** 974-985	
		Mean Temperature: 6.3℃	

Results

Sample Station Number	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Comments:
G1	0.0	0.0	20.8	
G2	0.0	0.0	20.9	
G3	0.0	0.2	20.7	
G4	0.0	6.2	9.5	
G6	0.0	4.4	14.7	
Ballygahan Adit	0.0	0.0	20.8	
Ballymurtagh Adit	0.0	0.0	20.8	
G7	0.0	2.9	16.5	
G8	0.0	0.2	20.8	
GW2/04	0.0	0.3	20.4	
RC 6	0.0	0.0	20.8	
GW1/04	0.0	0.1	20.8	
GW1/05	0.0	0.5	20.5	
GW2/05	0.0	0.0	20.9	
FLARE	15.0	20.5	2.8	
TWIN SHAFTS	0.0	0.2	20.8	

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow	
Licence no.: W0011-01		
Licensee: Wicklow Co. Co.		
Date of Licensing:	**Date of sampling:** 24/03/2010	**Time of Sampling:**
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010	
	Last Field Calibration: December 2009	
Monitoring Personnel: Seamus Breslin	**Weather:**	**Barometric pressure: 982 - 994**
		Mean Temperature: 9.4 ℃

Results

Sample Station Number	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Comments:
G1	0.0	0.4	20.5	
G2	0.0	0.0	20.8	
G3	0.0	0.5	20.3	
G4	0.0	0.0	20.6	
G6	0.0	4.5	13.8	
Ballygahan Adit	0.0	0.0	20.8	
Ballymurtagh Adit	0.0	0.0	20.8	
G7	0.0	3.1	15.7	
G8	0.0	0.0	20.6	
GW2/04	0.0	0.2	20.4	
RC 6	0.0	0.0	20.7	
GW1/04	0.0	0.0	20.6	
GW1/05	0.0	1.0	19.4	
GW2/05	0.0	0.9	19.4	

FLARE				
TWIN SHAFTS				

LANDFILL GAS MONITORING FORM				
Facility Name: Ballymurtagh Landfill	**Facility Address:**			
Licence no.: W0011-01				
Licensee: Wicklow Co. Co.				
Date of Licensing:	**Date of sampling:** 30/04/2010		**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010			
	Last Field Calibration: December 2009			
Monitoring Personnel: Seamus Breslin	**Weather:**		**Barometric pressure:** 989-1001	
			Mean Temperature: 10.8℃	
Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	0.0	0.3	20.4	
G2	0.0	0.0	20.7	
G3	0.0	0.0	20.8	
G4	0.0	0.0	20.8	
G6	0.0	4.3	14.0	
Ballygahan Adit	0.0	0.3	20.4	
Ballymurtagh Adit	0.0	0.0	20.6	
G7	0.0	2.6	16.5	
G8	0.0	0.1	20.8	
GW2/04	0.0	0.0	20.8	
RC 6	0.0	0.0	20.8	
GW1/04	0.0	0.0	20.7	
GW1/05	0.0	0.8	19.3	
GW2/05	0.0	1.3	18.7	
FLARE	16.1	20.8	2.5	
TWIN SHAFTS	0.0	0.0	20.9	

LANDFILL GAS MONITORING FORM			
Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 28/05/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010		
	Last Field Calibration: December 2009		
Monitoring Personnel:		**Barometric pressure:** 998-1010	

Monitoring Personnel: Seamus Breslin	**Weather:**		**Mean Temperature:** 14.0℃	
Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	0.0	0.2	20.6	
G2	0.0	0.0	20.8	
G3	0.0	1.2	19.5	
G4	0.0	0.0	20.8	
G6	0.0	3.9	14.5	
Ballygahan Adit	0.0	0.1	20.8	
Ballymurtagh Adit	0.0	0.0	20.8	
G7	0.0	2.4	16.7	
G8	0.0	0.4	20.3	
GW2/04	0.0	0.1	20.2	
RC 6	0.0	0.0	20.7	
GW1/04	0.0	0.0	20.7	
GW1/05	0.0	0.8	20.2	
GW2/05	0.0	1.7	18.4	
FLARE	15.8	19.0	3.8	
TWIN SHAFTS	0.0	0.0	20.8	

LANDFILL GAS MONITORING FORM			
Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 29/06/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010		
	Last Field Calibration: December 2009		
Monitoring Personnel: Seamus Breslin	**Weather:**	**Barometric pressure: 1006-1017**	
		Mean Temperature: 22.4 ℃	

Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	0.0	0.0	20.9	
G2	0.0	0.0	20.9	
G3	0.0	1.7	18.6	
G4	0.0	0.0	20.7	
G6	0.0	4.3	13.7	
Ballygahan Adit	0.0	0.0	20.7	
Ballymurtagh Adit	0.0	0.0	20.8	
G7	0.0	2.2	17.1	
G8	0.0	0.3	20.2	
GW2/04	0.0	0.0	20.7	
RC 6	0.0	0.1	20.5	

GW1/04	0.0	0.1	20.6	
GW1/05	0.0	1.0	19.2	
GW2/05	0.0	1.9	18.1	
FLARE	16.7	19.6	3.1	
TWIN SHAFTS	0.0	0.0	20.9	

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:**		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 30/07/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010		
	Last Field Calibration: December 2009		
Monitoring Personnel: Seamus Breslin	**Weather:**	**Barometric pressure:** 995-1006	
		Mean Temperature: 18.5℃	

Results

Sample Station Number	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Comments:
G1	0.0	0.2	20.5	
G2	0.0	0.1	20.6	
G3	0.0	**1.8**	18.2	
G4	0.0	**4.5**	14.7	
G6	0.0	**3.6**	14.7	
Ballygahan Adit	0.0	0.0	20.8	
Ballymurtagh Adit	0.0	0.0	20.8	
G7	0.0	**2.6**	16.8	
G8	0.0	0.3	19.8	
GW2/04	0.0	0.0	20.7	
RC 6	0.0	0.1	20.4	
GW1/04	0.0	0.0	20.6	
GW1/05	0.0	0.5	20.1	
GW2/05	0.0	**2.8**	16.3	
TWIN SHAFTS	0.0	0.0	0.0	

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 31/08/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010		
	Last Field Calibration: December 2009		
Monitoring Personnel:		**Barometric pressure:** 1009-1020	

Monitoring Personnel: Seamus Breslin	**Weather:**	**Mean Temperature:** 20.0℃

Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	0.0	0.0	20.7	
G2	0.0	0.0	20.7	
G3	0.0	1.1	19.8	
G4	0.0	**2.6**	17.5	
G6	0.0	**3.6**	14.6	
Ballygahan Adit	0.0	0.1	20.7	
Ballymurtagh Adit	0.0	0.0	20.7	
G7	0.0	**3.2**	15.3	
G8	0.0	0.3	19.8	
GW2/04	0.0	0.4	19.4	
RC 6	0.0	0.1	20.6	
GW1/04	0.0	0.1	20.6	
GW1/05	0.0	0.9	19.2	
GW2/05	0.0	**3.1**	15.7	
TWIN SHAFTS	0.0	0.0	20.7	

LANDFILL GAS MONITORING FORM		
Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow	
Licence no.: W0011-01		
Licensee: Wicklow Co. Co.		
Date of Licensing:	**Date of sampling:** 24/09/2010	**Time of Sampling:**
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010	
	Last Field Calibration: December 2009	
Monitoring Personnel: Seamus Breslin	**Weather:**	**Barometric pressure: 999-1010**
		Mean Temperature: 12.0 ℃

Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	0.0	0.0	20.7	
G2	0.0	0.1	20.8	
G3	0.0	**2.2**	17.6	
G4	0.0	0.9	19.5	
G6	0.0	**4.2**	13.8	
Ballygahan Adit	0.0	0.0	20.8	
Ballymurtagh Adit	0.0	0.0	20.7	
G7	0.0	**1.9**	18.6	
G8	0.0	0.4	20.3	
GW2/04	0.0	0.3	19.9	
RC 6	0.0	0.2	20.4	
GW1/04	0.0	0.2	20.6	

GW1/05	0.0	1.1	19.2	
GW2/05	0.0	0.5	20.0	
TWIN SHAFTS	0.0	0.0	20.8	

LANDFILL GAS MONITORING FORM			
Facility Name: Ballymurtagh Landfill	**Facility Address:**		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 28/10/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** October 2011		
	Last Field Calibration: October 2010		
Monitoring Personnel: Seamus Breslin	**Weather:**	**Barometric pressure:** 988 - 1000	
		Mean Temperature: 14C	

Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	0.0	0.2	20.2	
G2	0.0	**2.6**	15.4	
G3	0.0	0.9	19.9	
G4	0.0	**4.2**	14.9	
G6	0.0	**3.4**	14.8	
Ballygahan Adit	0.0	0.0	20.8	
Ballymurtagh Adit	0.0	0.0	20.8	
G7	0.0	**2.4**	16.7	
G8	0.0	0.6	19.3	
GW2/04	0.0	0.3	19.3	
RC 6	0.0	0.0	20.8	
GW1/04	0.0	0.1	20.6	
GW1/05	0.0	1.1	19.5	
GW2/05	0.0	**1.8**	16.8	
FLARE	17.3	**22.7**	1.4	
TWIN SHAFTS	0.0	0.0	20.8	

LANDFILL GAS MONITORING FORM			
Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow		
Licence no.: W0011-01			
Licensee: Wicklow Co. Co.			
Date of Licensing:	**Date of sampling:** 14/12/2010	**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** November 2011		
	Last Field Calibration: December 2010		

Monitoring Personnel: Seamus Breslin	**Weather:**		**Barometric pressure:** 1018 - 1032	
			Mean Temperature: 3.4C	
Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	No access due to snow and ice			
G2	0.00	**1.90**	16.70	
G3	0.00	0.30	20.60	
G4	0.00	0.20	20.30	
G6	0.00	**4.60**	13.10	
Ballygahan Adit	0.00	0.00	20.70	
Ballymurtagh Adit	0.00	0.00	20.80	
G7	0.00	**3.20**	15.20	
G8	0.00	0.30	20.30	
GW2/04	0.00	0.40	19.80	
RC 6	0.00	0.00	20.70	
GW1/04	0.00	0.00	20.60	
GW1/05	0.00	1.00	19.10	
GW2/05	0.00	**1.70**	18.60	
FLARE	20.50	**26.00**	0.50	
TWIN SHAFTS	0.00	0.40	20.40	

LANDFILL GAS MONITORING FORM				
Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow			
Licence no.: W0011-01				
Licensee: Wicklow Co. Co.				
Date of Licensing:	**Date of sampling:** 31/12/2010		**Time of Sampling:**	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2011			
	Last Field Calibration: December 2010			
Monitoring Personnel: Seamus Breslin	**Weather:**		**Barometric pressure:** 1009 - 1022	
			Mean Temperature: 7.6C	
Results				
Sample Station Number	**CH_4**	**CO_2**	**O_2**	**Comments:**
	(%v/v)	**(%v/v)**	**(%v/v)**	
G1	0.0	0.2	20.6	
G2	0.0	2.4	17.0	
G3	0.0	0.3	20.6	
G4	0.0	6.3	10.1	
G6	0.0	3.7	15.1	
Ballygahan Adit	0.0	0.1	20.7	
Ballymurtagh Adit	0.0	0.0	20.9	
G7	0.0	2.1	17.7	
G8	0.0	0.0	20.7	
GW2/04	0.0	0.4	19.7	

RC 6	0.0	0.1	20.8	
GW1/04	0.0	0.1	20.8	
GW1/05	0.0	1.2	19.8	
GW2/05	0.0	0.7	20.2	
FLARE	16.7	21.6	2.4	
TWIN SHAFTS	0.0	0.1	20.8	

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow
Waste Licence no.: W0011-01	
Licensee: Wicklow Co. Co.	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010
	Last Field Calibration: December 2009
Monitoring Personnel: Seamus Breslin	

Results

Date	Sample Station Number	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Pressure ATM	Temp C
08/01/2010	Site Office	0.00	0.00	20.90	1014	-2.50
15/01/2010	Site Office	0.00	0.00	20.70	993	7.50
22/01/2010	Site Office	0.00	0.00	20.80	1003	3.00
29/01/2010	Site Office	0.00	0.00	20.80	988	5.10
05/02/2010	Site Office	0.00	0.00	20.70	981	8.90
12/02/2010	Site Office	0.00	0.00	20.70	1013	7.20
19/02/2010	Site Office	0.00	0.00	20.60	982	5.20
26/02/2010	Site Office	0.00	0.00	20.80	976	4.30
05/03/2010	Site Office	0.00	0.00	20.70	1018	9.80
12/03/2010	Site Office	0.00	0.00	20.80	1013	9.40
19/03/2010	Site Office	0.00	0.00	20.80	995	10.70
26/03/2010	Site Office	0.00	0.00	20.70	995	10.70

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow
Waste Licence no.: W0011-01	
Licensee: Wicklow Co. Co.	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010
	Last Field Calibration: December 2009
Monitoring Personnel: Seamus Breslin	

Results

Date	Sample Station Number	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Pressure ATM	Temp C
02/04/2010	Site Office	0.00	0.00	20.70	979	8.60
09/04/2010	Site Office	0.00	0.00	20.80	1019	13.70
16/04/2010	Site Office	0.00	0.00	20.90	1016	12.50
23/04/2010	Site Office	0.00	0.00	20.80	1001	13.40

30/04/2010	Site Office	0.00	0.00	20.90	992	10.80
07/05/2010	Site Office	0.00	0.00	20.90	1002	11.00
14/05/2010	Site Office	0.00	0.00	20.80	996	15.50
21/05/2010	Site Office	0.00	0.00	20.80	1019	18.90
28/05/2010	Site Office	0.00	0.00	20.90	1002	14.00
04/06/2010	Site Office	0.00	0.00	20.80	1005	20.10
11/06/2010	Site Office	0.00	0.00	20.80	1000	20.60
18/06/2010	Site Office	0.00	0.00	20.80	1010	20.70
25/06/2010	Site Office	0.00	0.00	20.80	1006	17.70

LANDFILL GAS MONITORING FORM

Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow
Waste Licence no.: W0011-01	
Licensee: Wicklow Co. Co.	
Instrument used: G A 2000	**Date Next Full Calibration:** December 2010
	Last Field Calibration: December 2009
Monitoring Personnel: Seamus Breslin	

Results

Date	Sample Station Number	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Pressure ATM	Temp C
07/07/2006	Site Office	0.00	0.00	21	1002	19.1
14/07/2006	Site Office	0.00	0.00	21.2	1018	24.9
21/07/2006	Site Office	0.00	0.00	21	1005	21.8
28/07/2006	Site Office	0.00	0.00	21.6	999	20.4
04/08/2006	Site Office	0.00	0.00	21.3	1005	22.5
11/08/2006	Site Office	0.00	0.00	21.1	1003	16.6
18/08/2006	Site Office	0.00	0.00	20.9	988	20.6
25/08/2006	Site Office	0.00	0.00	20.8	991	19.4
01/09/2006	Site Office	0.00	0.00	21.1	994	19.8
08/09/2006	Site Office	0.00	0.10	21.1	1014	18.4
15/09/2006	Site Office	0.00	0.00	20.9	1001	16.5
22/09/2006	Site Office	0.00	0.00	20.8	984	15.9
29/09/2006	Site Office	0.00	0.00	20.8	989	18.2

LANDFILL GAS MONITORING FORM

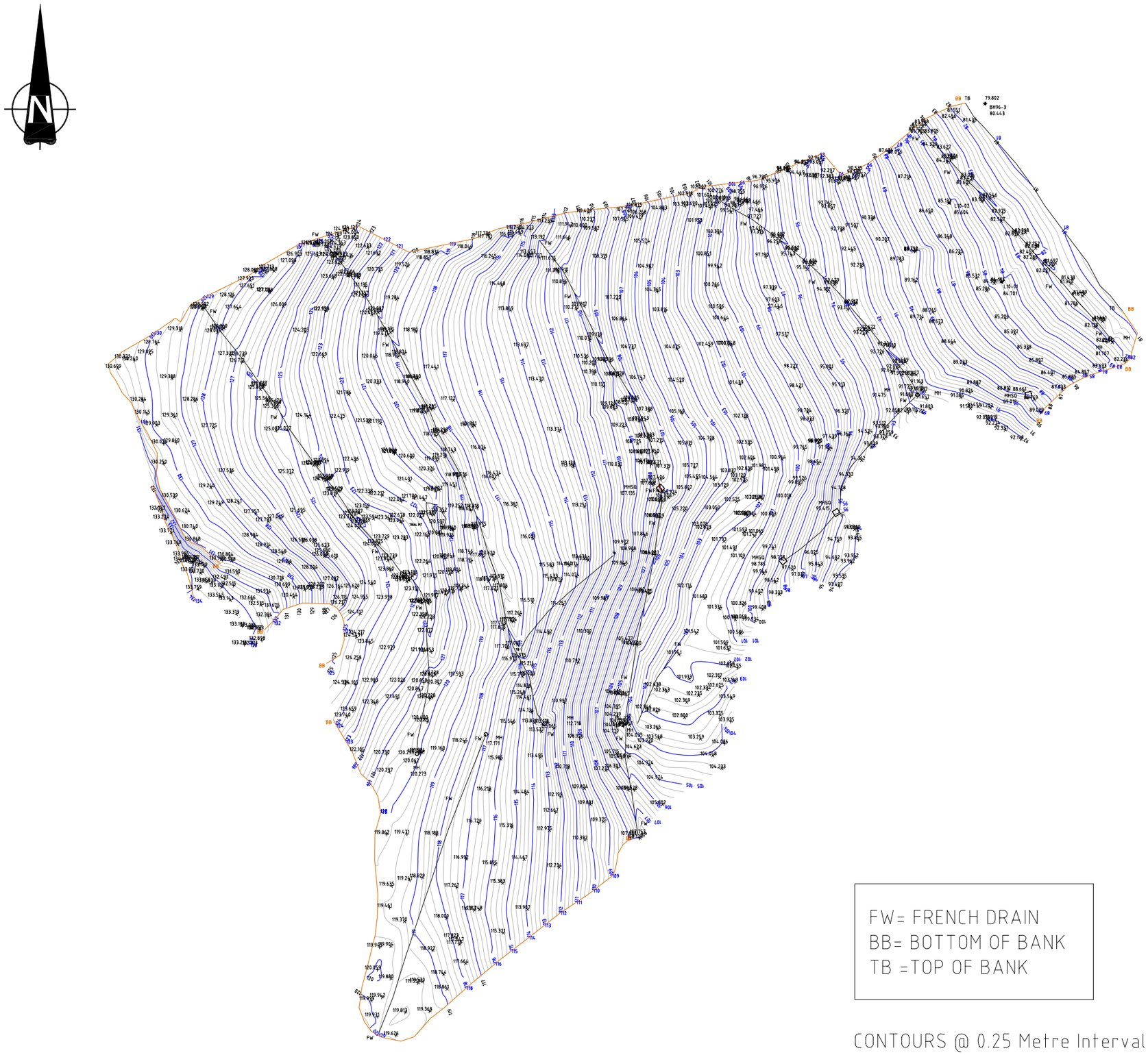
Facility Name: Ballymurtagh Landfill	**Facility Address:** Ballymurtagh, Avoca, Co. Wicklow
Waste Licence no.: W0011-01	
Licensee: Wicklow Co. Co.	

Instrument used: G A 2000	**Date Next Full Calibration:** December 2010
	Last Field Calibration: December 2009
Monitoring Personnel: Seamus Breslin	

Results						
Date	**Sample Station Number**	**CH_4 (%v/v)**	**CO_2 (%v/v)**	**O_2 (%v/v)**	**Pressure ATM**	**Temp C**
01/10/2010	Site Office	0.0	0.0	20.7	980	15.6
08/10/2010	Site Office	0.0	0.0	20.8	999	16.6
15/10/2010	Site Office	0.0	0.0	20.9	1010	11.5
22/10/2010	Site Office	0.0	0.0	20.8	1001	10.9
29/10/2010	Site Office	0.0	0.0	20.8	969	10.2
05/11/2010	Site Office	0.0	0.0	20.8	1005	11.6
12/11/2010	Site Office	0.0	0.0	20.9	978	8.3
19/11/2010	Site Office	0.0	0.0	20.8	995	6.7
26/11/2010	Site Office	0.0	0.0	20.8	996	3.1
03/12/2010	Site Office	0.0	0.0	20.8	993	1.5
10/12/2010	Site Office	0.0	0.0	20.8	1019	5.4
17/12/2010	Site Office	0.0	0.1	20.7	987	1.1
22/12/2010	Site Office	0.0	0.0	20.8	996	0.9
31/12/2010	Site Office	0.0	0.0	20.8	1013	7.6

APPENDIX B

Site Survey



FW= FRENCH DRAIN
BB= BOTTOM OF BANK
TB =TOP OF BANK

CONTOURS @ 0.25 Metre Intervals

NO	INLS	DATE	DESCRIPTION

WICKLOW
COUNTY
COUNCIL

JOB : BALLYMURTAGH LANDFILL

GROUNDMODEL & SURVEY 2011

TITLE : CONTOUR SURVEY & GROUNDMODEL

SCALE:
HORIZ = 1:500 @ A0
VERT =

Drawn JAR | Checked

Date: APRIL 2011

DRAWING NO: BLM /2011/2

APPENDIX C

E-PRTR

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	20 03 01	No	12.1	mixed municipal waste	D5	M	Weighed	Offsite in Ireland	Rampere Landfill,W0062/02	Rampere,,,County Wicklow,,,Ireland		
Within the Country	15 01 01	No	86.36	paper and cardboard packaging	R3	M	Weighed	Offsite in Ireland	Baileys Waste Recycling Ltd,WPT1-94	Rosemount Business Park,Ballycoolin Road,Blanchardstown,Dublin 11,Ireland		
Within the Country	20 01 01	No	1.0	paper and cardboard	R3	M	Weighed	Offsite in Ireland	Baileys Waste Recycling Ltd,WPT1-94	Rosemount Business Park,Ballycoolin Road,Blanchardstown,Dublin 11,Ireland		
Within the Country	20 01 01	No	143.76	paper and cardboard	R3	M	Weighed	Offsite in Ireland	Baileys Waste Recycling Ltd,WPT1-94	Rosemount Business Park,Ballycoolin Road,Blanchardstown,Dublin 11,Ireland		
Within the Country	15 01 07	No	82.6	glass packaging	R5	M	Weighed	Offsite in Ireland	Rehab Glassco Ltd,WP-247-2006	Unit 4 Osberstown Industrial Park,Carragh Road ,Naas,Co Kildare,Ireland		
Within the Country	15 01 04	No	17.81	metallic packaging	R4	M	Weighed	Offsite in Ireland	Rehab Glassco Ltd,WP-247-2006	Unit 4 Osberstown Industrial Park,Carragh Road ,Naas,Co Kildare,Ireland		
Within the Country	20 01 40	No	36.87	metals	R4	M	Weighed	Offsite in Ireland	Leon Recycling Ltd,WP-08-308	Arklow,,,County Wicklow,,,Ireland		
Within the Country	15 01 02	No	48.89	plastic packaging	R3	M	Weighed	Offsite in Ireland	Baileys Waste Recycling Ltd,WPT1-94	Rosemount Business Park,Ballycoolin Road,Blanchardstown,Dublin 11,Ireland		
Within the Country	15 01 05	No	6.3	composite packaging	R3	M	Weighed	Offsite in Ireland	Baileys Waste Recycling Ltd,WPT1-94	Rosemount Business Park,Ballycoolin Road,Blanchardstown,Dublin 11,Ireland		
Within the Country	20 01 11	No	21.13	textiles	R3	M	Weighed	Offsite in Ireland	N.C.B.I.,WP-214-2005	...,Naas ,County Kildare,Ireland		
To Other Countries	16 06 01	Yes	2.33	lead batteries	R4	M	Weighed	Abroad	Recycling Village,WP 2007-20	Unit 4 Tenure Business Park,Monasterboice,Drogheda,County Louth,Ireland	Citron,NAF: 3822Z,Port Sud du Havre,BP51-76700,Rogerville ,,,France	Port Sud du Havre,BP51-76700,Rogerville ,,,France
Within the Country	**16 06 04**	**No**	1.45	alkaline batteries (except 16 06 03)	R4	M	Weighed	Offsite in Ireland	Recycling Village,WP 2007-20	Unit 4 Tenure Business Park,Monasterboice,Drogheda,County Louth,Ireland		
Within the Country	13 02 05	Yes	2.9	mineral-based non-chlorinated engine, gear and lubricating oils	R9	M	Weighed	Offsite in Ireland	Enva Ireland,W0184/01	Clonminham Industrial Estate,Portlaoise,County Laois,,,Ireland	Enva Ireland,W0184,Clonminham Industrial Estate,Portlaoise,Co Laois,,,Ireland	Clonminham Industrial Estate,Portlaoise,Co Laois,,,Ireland
Within the Country	20 01 25	No	0.36	edible oil and fat	R9	M	Weighed	Offsite in Ireland	Frilite,LN-08-11	Orchard Road Industrial Estate,Orchard Road,Strabane,County Tyrone,Ireland		
Within the Country	20 01 39	No	1.21	Polystyrene	R3	M	Weighed	Offsite in Ireland	Danelle,WP-01-08	Kilnock,Ballon,,,County Carlow,Ireland		
Within the Country	20 01 36	No	52.423	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	R4	M	Weighed	Offsite in Ireland	Rehab Recycle,WFP-DS-10-0008-01	Rehab Building,Kylemore Road,Ballyfermot,Dublin 10,Ireland		
Within the Country	20 01 36	No	14.202	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	R4	M	Weighed	Offsite in Ireland	Recycling Village,WP2007/20	Unit 4 Tenure Business Park,Monasterboice,Drogheda,Louth,Ireland		

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

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

4.2 RELEASES TO WATERS Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

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

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

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

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

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
240	**Suspended Solids**	C	OTH	Scaled up using quarterly results	2119.92	2119.92	0.0	0.0

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

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

SECTION A : PRTR POLLUTANTS

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

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

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

4.1 RELEASES TO AIR

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	C	OTH	Gas Sim 2 & SITE DATA	6996.122	171723.0	0.0	164726.878
03	Carbon dioxide (CO2)	C	OTH	Gas Sim 2 & SITE DATA	7054.7	3447000.0	0.0	3439945.3

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
15	Chlorofluorocarbons (CFCs)	C	OTH	Gas Sim 2 - PI Report	0.0	0.649	0.0	0.649
14	**Hydrochlorofluorocarbons (HCFCs)**	C	OTH	Gas Sim 2 - PI Report	0.0	0.333	0.0	0.333

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

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

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

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

Additional Data Requested from Landfill operators

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

Landfill: Ballymurtagh Landfill Facility

Please enter summary data on the quantities of methane flared and / or utilised			Method Used			
	T (Total) kg/Year	**M/C/E**	**Method Code**	**Designation or Description**	**Facility Total Capacity m3 per hour**	
Total estimated methane generation (as per site model)	514533.0	C	SSC	Gas Sim 2 - Statistics	N/A	
Methane flared	342810.0	M	OTH	Site data	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)	171723.0	C	OTH	Gas Sim 2 Statistics - Site da	N/A	

Environmental Protection Agency

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.11

REFERENCE YEAR	2010

1. FACILITY IDENTIFICATION

Parent Company Name	Wicklow County Council
Facility Name	Ballymurtagh Landfill Facility
PRTR Identification Number	W0011
Licence Number	W0011-01

Waste or IPPC Classes of Activity

No.	class_name
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
3.1	Deposit on, in or under land (including landfill).
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
3.2	Land treatment, including biodegradation of liquid or sludge discards in soils.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
3.7	##
4.10	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.3	Recycling or reclamation of metals and metal compounds.
4.4	Recycling or reclamation of other inorganic materials.
4.9	Use of any waste principally as a fuel or other means to generate energy.

Address 1	Ballymurtagh, Ballygahan Upper, Ballygahan Lower
Address 2	Tinnahinch
Address 3	Co. Wicklow
Address 4	
Country	Ireland
Coordinates of Location	-6.22452 52.8711
River Basin District	IEEA
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Seamus Breslin
AER Returns Contact Email Address	sbreslin@wicklowcoco.ie
AER Returns Contact Position	Facility Manager
AER Returns Contact Telephone Number	087 2301627
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

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

APPENDIX D

Water Balance Calculations

Medium precipitation, Covered cells Completed cell with topcover				Surface flow %= 65 Evaporation factor = 1						Unit of data: mm			
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
precipitation	45.4	36.6	34.65	32.7	41.6	48.5	81.7	43.5	102.7	37.7	120	66.2	691.3
surface run-off	30	24	23	21	27	32	53	28	67	25	78	43	449
infiltration	16	13	12	11	15	17	29	15	36	13	42	23	242
potential evapotranspiration	8.0	12	35	58	76	90	79	68	45	28	11	-4	506
infiltration-pot. evaporation	8	1	-23	-47	-62	-73	-51	-53	-9	-14	31	27	
waterdeficit (*)	0	0	-23	-50	-50	-50	-50	-50	-50	-50	-19	0	
actual evaporation	8	12	35	38	15	17	29	15	36	13	11	-4	225
leachate, infiltration-act. evaporation	8	1	0	0	0	0	0	0	0	0	0	8	17
equalization, factor 12	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	17.1

APPENDIX E

ECOLOGY REPORT

Monitoring report on Ballymurtagh Landfill, Avoca, Co Wicklow

Terrestrial Flora & Fauna

November 2010

Roger Goodwillie & Associates, Lavistown House, Kilkenny. Tel. 056-7765145

1. INTRODUCTION

This description and assessment of terrestrial ecology is written as part of the monitoring protocol for the closed landfill at Ballymurtagh. It has been prepared to comply with Condition 9.13 of Wicklow County Council's waste licence from the EPA.

The site was visited in September 2010 and a walkover survey carried out to cover the entire area as well as the near surroundings. Previous similar visits had been made in July 2007 and May 2009 and also when the landfill was active, in 1998.

The report is arranged in the same order as in 2009 so any changes will be apparent.

2. DESCRIPTION OF SITE

The landfill occupies a gap in the valley side above the Avoca River which was created by an opencast mining operation and is now filled and capped. It slopes generally in an easterly direction, culminating in a steep slope of 20-30^{o} above the recycling depot. There are small drops also to the margins where the original schistose rock or hillside is exposed. Two flatter parts on the SE margin are occupied by the gas flaring plant and a settlement lagoon taking surface run-off. There is also an 'island' of pre-existing rock at the south-western end, covered by pine and birch trees.

2.1 Vegetation

The surface has been sown with grasses into which other plants are now spreading and tending to replace some of the original species. Trees and bushes cover the steeper slope at the eastern end. Many of these were originally planted and they have been augmented in 2009/10 by additional lines of hawthorn, ash, birch and oak along the crest. Other new planting has been done southwest of the gas flaring plant while a number of willows Salix x rubens and S.alba have been set throughout on the main surface (Photo 1).

The main part of the site still has a mixed cover of grasses with some broad-leaved herbs and a few scattered gorse bushes (Photo 2). The species lists for 2007 and 2009 are compared below with 2010. All are in rough order of abundance and stem from the same type of walkover transect. They show an obvious fall-off in the amount of

ryegrass Lolium from the original seeding and also the disappearance of species that require open soils to survive such as centaury Centaurium erythraea, black medick Medicago lupulina, yellow trefoil Trifolium dubium, wild carrot Daucus carota, toad rush Juncus bufonius and spear thistle Cirsium vulgare. Vetches and gorse are increasing all the time and there has been some diversification in recent years with two sedge species Carex pendula and C.divulsa. Rushes may be responding to the soil compaction as Juncus inflexus has now joined J.effusus and tufted hairgrass Deschampsia cespitosa is also more frequent than it was. Grassland species not seen before 2010 were knapweed Centaurea nigra, creeping bent Agrostis stolonifera, common mouse-ear Cerastium fontanum and meadow vetchling Lathyrus pratensis.

2007		2009		2010
Holcus lanatus		*Festuca rubra*		*Festuca rubra*
Lolium perenne		*Holcus lanatus*		*Holcus lanatus*
Festuca rubra		*Anthoxanthum odoratum*		*Agrostis capillaris*
Agrostis capillaris		*Poa pratensis*		*Elytrigia repens*
Anthoxanthum odoratum		*Elytrigia repens*		*Anthoxanthum odoratum*
Trifolium repens		*Agrostis capillaris*		*Vicia sativa*
Medicago lupulina		*Lolium perenne*		*Trifolium pratense*
Trifolium pratense		*Vicia sativa*		*Epilobium parviflorum*
Vicia sativa		*Trifolium pratense*		*Lolium perenne*
Vicia cracca		*Rumex crispus*		*Lotus corniculatus*
Rumex crispus		*R.obtusifolius*		*Poa pratensis*
R.obtusifolius		*Lotus corniculatus*		*Ranunculus acris*
Epilobium parviflorum		*Medicago lupulina*		*Lolium perenne*
Daucus carota		*Cirsium arvense*		*Rumex obtusifolius*
Hypochoeris radicata		*Stellaria graminea*		*Juncus effusus*
Stellaria graminea		*Calliergon cuspidatum*		*Calliergonella cuspidata*
Cirsium vulgare		*Lotus pedunculatus*		*Ulex europaeus*
C.palustre		*Epilobium parviflorum*		*Epilobium hirsutum*
Juncus bufonius		*Cardamine pratensis*		*Deschampsia cespitosa*
Prunella vulgaris		*Ulex europaeus*		*Juncus inflexus*
Centaurium erythraea		*Ranunculus acris*		*Trifolium repens*
Lotus corniculatus		*Bellis perennis*		*Agrostis stolonifera*
Trifolium dubium		*Juncus effusus*		*Juncus conglomeratus*
Deschampsia cespitosa		*Deschampsia cespitosa*		*Cerastium fontanum*
Viola arvensis		*Ranunculus repens*		*Potentilla anserina*
		Potentilla reptans		*Lotus pedunculatus*
		Juncus conglomeratus		*Lathyrus pratensis*
				Calystegia sepium
				Stellaria graminea
				Senecio jacobaea
				Hypericum tetrapterum
				Carex pendula
				Cytisus scoparius
				Carex divulsa

In general the soil has been compacted by machinery but is well covered by vegetation except at the western end where there are some patches in which underlying gravel shows through. In one place water flowing in from adjoining lands results in a track of sparse vegetation although soft rush *Juncus effusus* and glaucous sedge *Carex flacca* survive, along with a little broad-leaved dock *Rumex obtusifolius.*

A peripheral effect is also noticed under the rock face on the northern side where surface flow off the rocks raises the nutrient content of the vegetation and allows for vigorous plant growth (Photo 4). This has been noted in previous years but shows every sign of increasing its influence southward. Scutch Elytrigia repens is a dominant ground cover and there is also broad-leaved dock Rumex obtusifolius, bush vetch Vicia sepium, hairy sedge Carex hirta and bramble Rubus fruticosus colonising away from the edge. Under the cliff itself grey willow Salix cinerea, large bindweed Calystegia silvatica, butterfly bush Buddleja davidii, winter heliotrope Petasites fragrans and the two horsetails Equisetum arvense and E.telmateia still occur. The latter also grows below the island of original woodland at the western end, along with hedge woundwort Stachys sylvatica.

Gorse Ulex europaeus is an important and spreading species in the NW corner of the site forming a dense stand of 1.5-2m on the level ground in the corner and thinning out on the slope to the east. A belt of docks Rumex obtusifolius and R.crispus also occurs in this corner (Photo 5) with some Cirsium arvense which may reflect an area with distinct capping soil or an enrichment effect by the nitrogen-fixing gorse. Cocksfoot Dactylis glomerata, knapweed Centaurea nigra and dandelion Taraxacum agg and a single plant of tall fescue Festuca arundinacea also suggest a richer soil here than elsewhere. The hybrid tormentil Potentilla x mixta is spreading in places. It is derived from P.reptans (which was found at the western end of the site) and P.erecta which is the prevailing form in hill areas.

Trees are present on the island of original surface at the western end (Photo 6) and on the front slope of the site. The former consists of a group of shore pine Pinus contorta with birches Betula pubescens and B.pendula, both spreading onto the surrounding ground. There are also trees of holly Ilex aquifolium and rowan Sorbus aucuparia along with bramble Rubus fruticosus, greater stitchwort Stellaria holostea, wood sage Teucrium scorodonia, bracken Pteridium aquilinum and ling Calluna vulgaris.

The older trees on the slope are now 4m or more in height (Photo 7) and include birches Betula pubescens and B.pendula, pines Pinus contorta, P.sylvestris, and willows Salix cinerea and a little S.aurita. Alder Alnus glutinosa is growing particularly well (8m) in a few places. The shaded conditions in 2009 suited

Rubus fruticosus	bramble
Cytisus scoparius	broom
Anthoxanthum odoratum	sweet vernal grass
Agrostis capillaris	common bent

Potentilla erecta	tormentil
Polytrichum commune	a moss
Lotus pedunculatus	greater birdsfoot trefoil
Vicia sepium	bush vetch
Chamerion angustifolium	rose-bay
Rhytidiadelphus squarrosus	a moss
Calluna vulgaris	ling
Blechnum spicant	hard fern
Dryopteris affinis	scaly male fern

In 2010 oval sedge Carex ovalis, creeping cinquefoil Potentilla reptans great willowherb Epilobium hirsutum and montbretia Crocosmia x crocosmiiflora were also found here but probably established earlier in more open conditions. Other newcomers – hedge woundwort Stachys sylvatica, wood sedge Carex sylvatica and wild raspberry Rubus idaeus – are probably more recent colonists as they are woodland species. The existing heathland plants like ling Calluna vulgaris, catsear Hypochaeris radicata and autumn gorse Ulex gallii are tending to be shaded by tree growth but are likely to survive for several more years.

The upper, younger trees on the crest of the slope are planted in several lines (Photo 8). Recent soil disturbance has almost disappeared and the herbaceous plants in between the trees are reverting to the prevailing grassland species. Timothy Phleum pratense, cocksfoot Dactylis glomerata and scutch Elytrigia repens continue to be main grasses with the more widespread red fescue Festuca rubra and Yorkshire fog Holcus lanatus, and also ribwort plantain Plantago lanceolata. A few remnants of the disturbance persist such as soft cranesbill Geranium molle, hoary willowherb Epilobium parviflorum, jointed rush Juncus articulatus, curled dock Rumex crispus and smooth hawksbeard Crepis capillaris.

The upper trees are planted along a new bank and drain in which water accumulates towards the south. This allows floating sweet grass Glyceria fluitans, jointed rush Juncus articulatus and a single plant of pendulous sedge Carex pendula into the vegetation. The latter is yellow as conditions are not good for it but it still sets seed.

The small lagoon and its surrounds on the SE side of the site is undergoing a gradual development of the flora with the appearance of two new aquatic species. Gorse forms a hedge around this area (Photo 9) between which red fescue Festuca rubra and sweet vernal grass Anthoxanthum odoratum are common. Species on the edges of this area now include hedge parsley Torilis japonica, wild rose Rosa canina, nettle Urtica dioica, red bartsia Odontites vernus, distant sedge Carex remota and creeping buttercup Ranunculus repens. These are mostly frequent hedge and field edge plants.

The lagoon itself supports a flora of

2009	2010
Juncus effusus	*Juncus effusus*
Juncus articulatus	*Juncus inflexus*

Glyceria fluitans	*Agrostis stolonifera*
Agrostis stolonifera	*Rumex crispus*
R.obtusifolius	*Glyceria fluitans*
Rumex crispus	*Calliergonella cuspidata*
Lemna minor	*Juncus articulatus*
Potamogeton natans	*Veronica anagallis-aquatica*
Callitriche sp	*Lemna minor*
	Callitriche stagnalis
	Potamogeton natans

These are recorded as a transect from shallow to deep water

2.2 Surrounding habitat

No changes were seen in the surrounding lands which are mostly under coniferous forestry. Considerable areas to the west of the site are bare because of metal toxicity (Photo 10).

3. FAUNA

The grassland fauna consists primarily of insects and the ringlet and meadow brown butterflies have been noted in the past. In 2010 there were still small tortoiseshells in flight in the autumn and the willow sawfly Nematus capreae was obvious on some of the newly planted Salix x rubens. The grasshopper active at that time of year was common field grasshopper Chorthippus brunneus while there were also some Bombus pascuorum bumblebees.

Frogs breed in the lagoon on the southern margin where there are also three dragonfly species: the common darter Sympetrum striolatum, ruddy darter S.sanguineum and black darter Sympetrum danae (seen in 2010).

Widespread mammals are the rabbit and hare while a fox occurs regularly on the site and a badger occasionally (S.Breslin pers. comm.). The area is fenced so that sika deer do not as yet enter it and there is no browsing of the trees.

The birds seen on or over the landfill have been raven, sparrowhawk, jackdaw, wood pigeon, pheasant, blackbird, dunnock, willow warbler, goldfinch, linnet and meadow pipit. A pair of meadow pipits was nesting on site in 2009. Some of the Wicklow red kites (re-introduced) have been seen soaring over the site in sunny weather in 2010 (S.Breslin pers.comm.)

4. ASSESSMENT

The flora and fauna on site suggest that the landfill remains isolated below the capping material and causes little if any impact on the surface or the surroundings. Some surface inflow of drainage occurs at the western end but it has very localised effects on the vegetation and is being managed effectively.

The changes in the vegetation reflect changes in soil conditions and generally a decline in nutrient status. This allows a greater diversity of species in all habitats. The spread of gorse and the appearance of several sedges may be noted, as these plants are generally associated with soils of low nutrient status. Low fertility is also seen in the yellowed condition of several of the planted tree species. Only willow, alder, birch and pines are doing consistently well.

An opposite soil tendency is seen in the NW corner and along the northern edge of the site where the growth of vegetation is dense, perhaps derived from inflow of nutrients or the greater availability that comes from moving water.

Several additional species in the various habitats are recorded above. The significance of this should be treated with caution as it may be caused by visits at different seasons of the year or by the normal variation of fieldwork methods. However it seems almost certain that species diversity is increasing in most if not all habitats within the site.

Changes in the large fauna are always slower than with plants and invertebrates and often depend more on habitat structure (scrub, woodland etc) than species content. The gradual appearance of more passerine birds seems likely to be occurring however.

The prognosis for the site is a gradual extension of the tree growth but also the further colonisation by plant and animal species from the surroundings.

Photo 1. Young willows *Salix* x *rubens* on main surface

Photo 2. Spread of gorse in upper part of landfill

Photo 3. Effect of drainage on vegetation at western end

Photo 4. Zone of high nutritional status close to northern side

Photo 5. Docks *Rumex* spp and rushes *Juncus* spp within gorse stand in NW corner

Photo 6. ‘Island’ of trees at western end viewed from NW corner

Photo 7. Good growth of birches on main slope

Photo 8. New planting of hawthorn, ash etc at crest of slope

Photo 9. Lagoon on southern side of site

Photo 10. Acid drainage off site to west. ‘Island’ trees in background.

APPENDIX F

ENVIRONMENTAL NOISE SURVEY

APPENDIX G

Slope Stability Assessment

09 March 2011

Mr. Seamus Breslin
Wicklow County Council
County Buildings
Wicklow
Co. Wicklow

Our Ref: 501.0147.00004

Dear Seamus

RE: GEOTECHNICAL INSPECTION OF BALLYMURTAGH LANDFILL

Further to my visit to Ballymurtagh Landfill site on Wednesday 16th February last to undertake a geotechnical inspection of existing slope stability, I write to formally advise of my findings.

At the time of the inspection, the landfill capping and restoration works had been completed approximately 5 years and grass cover was well established across the entire site. The healthy vegetation growth at the site promotes local stability of slopes and minimises soil erosion.

A number of locally disturbed and/or bare patches of soil were identified across the site at the time of the site inspection. It is understood that these were all associated with the installation and/or upgrading of landfill monitoring infrastructure undertaken during 2010 (gas / leachate monitoring wells). These areas of exposed or disturbed soil should be regraded and seeded early in the 2011 growing season to promote stability and reduce erosion and potential dust emissions.

In view of the high level of rain which had fallen in the two weeks preceeding the site inspection, some surface water contour drains collecting run-off at the site were softened around the floor and sides and were holding small volumes of ponded water. They were however generally observed to be

(i) stable, with little or no exposed soil and good vegetation cover on sides and base, and
(ii) free of silt, suggesting little or no ongoing soil erosion.

Lower Retention Berm

At the present time, there are no indications of imminent large-scale (global) instability of the existing retention berm between 60mOD and 90mOD, immediately upslope of the recycling facility at Ballymurtagh. This assessment is primarily informed by the following observations made in the course of the geotechnical inspection :

(i) there is no large-scale slip, back-scarp or toe bulging evident along the front (east face) of the retention berm;
(ii) there are no tension cracks or fissures over the slope or across the flat area at the top of the berm;
(iii) vegetation is well established and there are no bare soil surfaces (other than that around base of gorse bushes uprooted in December 2010 by the weight of snow);
(iv) the slope face is dry with no evidence of groundwater emerging on the slope face.

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(v) Monitoring of the recently installed leachate monitoring wells (Ref. L10/1 to 10/3) over the past 6 months has not indicated any significant rise in leachate levels behind the berm

(vi) there is no evidence of vegetation leaning back into the slope or being otherwise disturbed by instability in root systems. Vegetation everywhere across the slope is growing vertically upward.

At the time of my visit, surface water run-off was again observed ponding immediately upstream of the manhole behind the crest of the lower retention berm. Ponding at this location is most likely caused by a blockage or low gradient along the interceptor drainage channel at the back of the crest or by excessive grass growth restricting flow along the floor of the channel.

As ponded surface water behind the crest increases the risk of recharge into the underlying ground and possible build of water pressures within the slope, it is recommended that the existing manhole is lowered or the existing channel is regraded and reconstructed in order to function more effectively.

Mid-Slope

No evidence of either localised or more deep-seated instability (tension cracking, back-scarp or toe bulging) was identified over the less steeply inclined mid-slope area, nor were any groundwater seepages or patches of bare or eroded soil observed. Marker posts at environmental monitoring locations are generally at or near vertical, with no pronounced lean back into the slope. These observations suggest that the existing mid-slope remains stable.

A back up of surface water run-off was observed at the eastern end of a contour drain around the mid-slope area at the time of the site inspection. It is understood that this was due to relatively high water levels in the stormwater retention pond nearby. The performance of this drain should be kept under review and in the event that repeated backing up of the drainage channel is observed, some works may be necessary to avoid its recurrence.

A notable closed depression appears to be forming in the fill on the northern side of the landfill and this may give rise to a reduction or reveral in gradients of existing contour drains, thereby inhibiting their effectiveness. On receipt of the annual topographical survey for 2011, ground levels in this area should be reviewed and consideration given to replacing, deepening or re-aligning contour drains, installing additional drains which intersect with downslope contour drains or such other works as may be required to ensure continued removal of surface water run-off from the slopes.

Upper Slope

Some evidence of highly localised instability was identifed at the very back of the landfill (western end). This instability was most likely induced by a combination of friction resistance upslope (holding waste against the former quarry face) and settlement of waste downslope. This localised instability is not considered significant and the exposed soil / capping layer should be regraded and reseeded, as and when practicable to do so.

Otherwise, no evidence of localised or more deep-seated instability (tension cracking, back-scarp or toe bulging) was identified across the upper slope area, nor were any groundwater seepages or patches of bare or eroded soil observed. Marker posts at environmental monitoring locations are generally at or near vertical, with no pronounced lean back into the slope. These observations suggest that the existing upper slope remains largely stable.

Conclusion

The existing slopes at Ballymurtagh are stable and are expected to remain so, provided there is ongoing maintenance of existing collector drains and re-establishment of vegetation cover.

Groundwater monitoring instruments within the former landfill should continue to be maintained and monitored to ensure that there is no systematic increase in water levels within the landfill, particularly behind the lower retention slope.

Should you wish to discuss any of the issues raised herein, please contact the undersigned.

Yours sincerely
SLR Consulting Limited

Derek Luby
Technical Director