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Our Ref: 801(07)_03_12

Administration,
Office of Environmental Enforcement,
EPA Headquarters,
PO Box 3000,
Johnstown Castle Estate,
Wexford.

F.A.O. Ms. Juliet McCarthy, Waste License Inspector

25th June 2012

Re: Killurin Landfill Site, Waste License W0016-02
Annual Environmental Report 2011.

Dear Ms. French,

Please find attached our Annual Environmental Report 2011 for Killurin Landfill for your attention.

We have enclosed one original and three copies of this document in accordance with clause 11.1.

Yours Sincerely,

Fintan Ryan
Assistant Executive Engineer
Facility Manager

Wexford County Council

Killurin Landfill
W0016-02

Annual Environmental Report 2011

Quality Control Sheet

Publication title	Annual Environmental Report for Killurin Landfill
Date	June 2012
Address:	Wexford County Council County Hall, Wexford. Fintan Ryan, Facility Manager Tel 053-9120922 Mob 087-1227314 Email fintan.ryan@wexfordcoco.ie

Doc No.	Issue No.	Reason for Issue	Author	Approved
Kill16-02_EPA_2011 AER	1	Compliance with Waste Licence W0016-02	Fran Hobbs Facility Technician Billy Byrne Facility Supervisor	Fintan Ryan Assistant Engineer, Facility Manager

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EXECUTIVE SUMMARY

This *Annual Environmental Report* has been prepared for Killurin Landfill, Waste Licence 16-2, for the reporting period from **1 January 2011 to 31 December 2011 inclusive**. The report includes the information specified in Schedule G of the Waste Licence, Content of the Annual Environmental Report, in accordance with Waste Licensing - *Draft Guidance on Environmental Management Systems (EMS) and Reporting to the Agency, 1999'.* The main topics discussed with this report are as follows:

- General Site Information
- Management and Staffing
- Reported Incidents and Complaints
- Development Works
- Waste Acceptance and Handling
- Emissions Management
- Environmental Nuisances
- Resource and Energy Consumption
- Environmental Monitoring and Emissions

Killurin Landfill was closed to accepting waste on the 07 June 2008. No waste was accepted to landfill in 2011.

Wexford County Council continued to carry out a comprehensive environmental monitoring programme during 2011, in compliance with the waste licence conditions (Schedule D), to assess the significance of emissions. The monitoring programme included Landfill Gas, Leachate Level & Quality, Surface Water Quality, Groundwater Level & Quality, Construction Noise monitoring, Odour monitoring and Meteorological monitoring as well as Topographical.

1 INTRODUCTION

1.1 General Information

The Annual Environmental Report (AER) for Killurin Landfill includes the information specified in Schedule G of the Waste Licence 16-2, *Content of Annual Environmental Report* and has been prepared in accordance with the Environmental Protection Agency (EPA) publication *'Waste Licensing – Draft Guidance on Environmental Management Systems (EMS) and Reporting to the Agency, 1999'.*

The reporting period for this AER is **1 January 2011 to 31 December 2011 inclusive**.

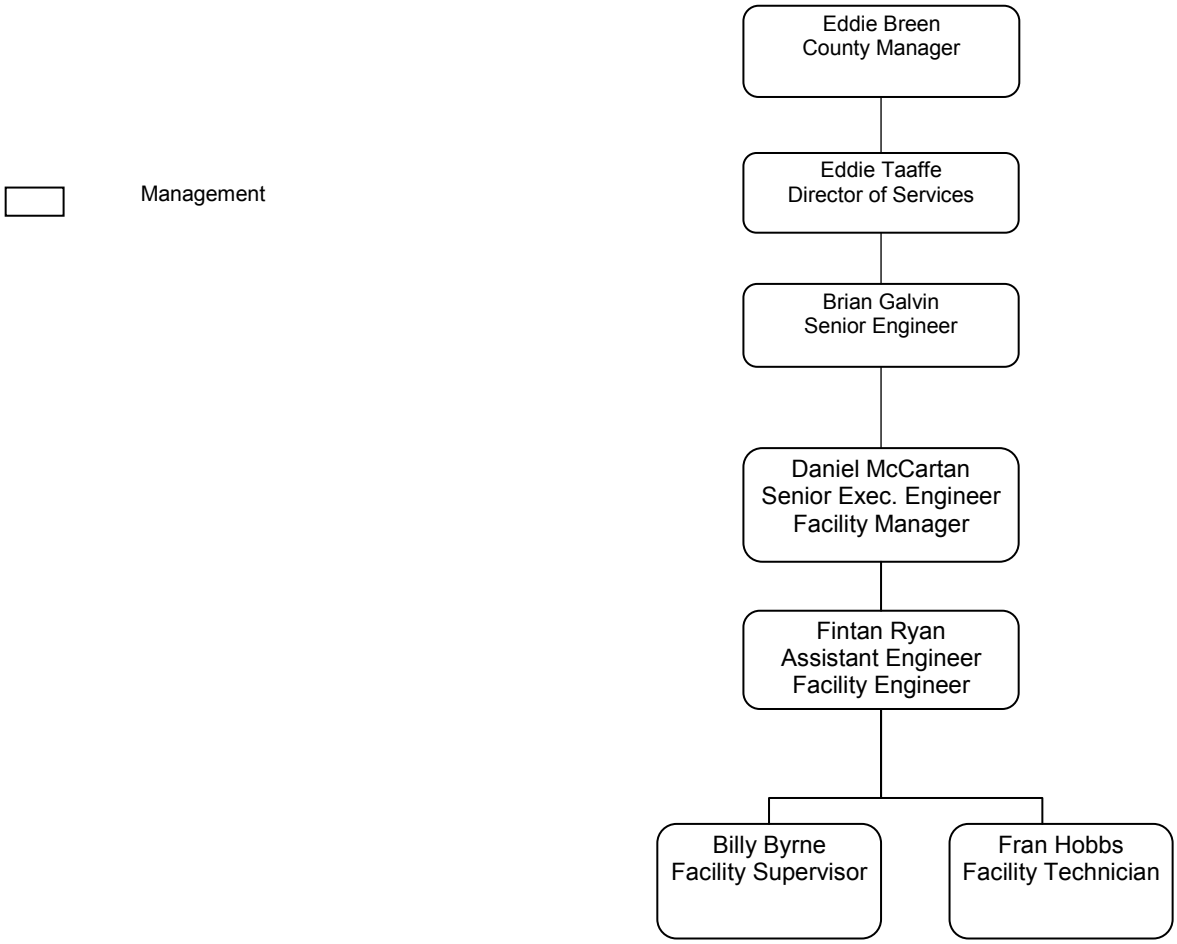
1.2 Site information

Table 1 Site information for Killurin Landfill

KILLURIN LANDFILL	
Waste licence register no:	16-2
Name and address of operator:	Wexford County Council County Hall Spawell Road County Wexford
Name and address of facility:	Killurin Landfill Killurin County Wexford
Site Description:	Killurin Landfill site is located in the town land of Newtown lower, Killurin, close to Deeps Bridge on a meander of the eastern bank of the River Slaney. The site is approximately 11km from Wexford town and covers an area of 10.7 hectares, of which 4.9 hectares are landfill and the remainder is CA site, buildings, car parking and buffer zones/screening. The facility is located in what once was a sand and gravel quarry. The area surrounding the site is rural with a mixed pattern of highly productive pasture and arable land use, with the River Slaney being the prominent landscape feature. Landfilling and CA site operations ceased in June 2008.

2 MANAGEMENT & STAFFING STRUCTURE

2.1 Management and staffing structure for Killurin Landfill 2011



The Killurin Landfill was operated by Wexford County Council during 2011 with consultancy support provided by sub consultants including Fehily Timoney & Company, Irish Biotech Services and Enviros Consulting.

2.2 Financial provisions

In accordance with Condition 12.1 Wexford County Council paid a sum of €17,988 to the Environmental Protection Agency for the management and monitoring of the waste licence.

2.2.1 *Provision for the Closure, Restoration and Aftercare*

Wexford County Council (WCC), as a Local Authority, has made the necessary provisions, for the development, management, restoration and aftercare of Killurin Landfill. WCC has assigned engineering and technical staff to manage the facility. Wexford County Council is committed to the ongoing provision of funding for all site development works, environmental monitoring costs and restoration and aftercare works at Killurin Landfill for the duration of the Waste Licence.

2.3 Environmental Management System

2.3.1 *Environmental Management Programme*

The site has an operational environmental management system (EMS) in accordance with the Waste Licence condition 2.3.2.1. Implementation of the EMS continued during this reporting period (January 2011 - December 2011). The Objectives and Targets of the EMS were reviewed and revised for the reporting period 2011.

2.3.2 *Environmental objectives and targets.*

Table 2 below provides the Objectives and Targets for 2011 and details progress made regarding each objective. Table 3 provides the Objectives and Targets for 2012 and the methods by which they will be achieved.

An environmental management plan (EMP) was prepared as part of the EMS for the facility. The EMP comprises information on the following topics:

- Site description
- Site infrastructure
- Leachate Collection and treatment Leachate Management System
- Landfill Gas Abatement Methods
- Surface water Control Measures
- Environmental Monitoring
- Site Security and Site Offices
- Operational Matters
- Vermin control
- Fires
- Restoration and Aftercare

2.3.3 *Corrective action Procedure*

Procedures are in place in accordance with Condition 2.3.2.3 of the licence to monitor, measure, audit and record the environmental performance of the environmental management system. These procedures establish how non-conformance within the system is dealt with and how any corrective and preventive action is carried out. A corrective action procedure was prepared in October 2008 (reviewed in 2010) and is included in the overall EMS report.

2.3.4 *Awareness and Training Programme*

In accordance with Condition 2.3.2.4 of the licence, an awareness and training programme has been developed to increase environmental awareness among staff and identify training needs of all personnel working at Killurin Landfill. The facility manager has overall responsibility for reviewing training needs on an annual basis to ensure that all staff have the necessary skills and level of awareness to carry out their duties to the highest environmental and safety standards. Training records are kept on file at Holmestown Waste Management Facility.

Table 2 **Achievements of Objectives and Targets for 2011**

Achievements of Objectives and Targets for 2011			
Objective	Comments	Target	Progress
Objective No 1: To maintain a documented EMS			
1.1 Review existing EMS annually	Ensure that annual modifications, omissions or deletions are incorporated into the EMS and agreed for inclusion into the AER	2011	Ongoing
Objective No 2: To maintain a system for the notification of incidents and improve record keeping methods used at the facility			
2.1 Improve current site record keeping and performance of site procedures including documentation of procedure reviews due to the closure of the landfill	Review existing filing system and record storage for the facility, in particular the retention of records for historical review of the facilities environmental performance. This will include for the archiving of files related to the sites' operations, communications and compliance of the waste licence at any time.	2011	Ongoing
Objective No 3: To maintain the current site infrastructure			
3.1 Ensure ongoing maintenance of the following site infrastructure: Site security; Roads; Surface Water drainage; Weighbridge; Fuel storage; Surface water drains; Site offices and plant shed; Landfill gas extraction system; Leachate extraction system; Scrap	All of the items of existing infrastructure Are to be maintained as required and in accordance with suppliers/manufacturers instructions where applicable.	2011	Complete for 2011. Maintenance Ongoing into 2012 .Decommissioning ongoing

Achievements of Objectives and Targets for 2011			
Objective	Comments	Target	Progress
metal area.			
Objective No 4: To control emissions from the facility			
4.1 Assess current leachate extraction system to determine a schedule of maintenance and improvement to optimise the amounts of leachate removed for treatment from the facility	Create a structured approach to the monitoring and performance of the leachate extraction system to include a schedule for servicing of pumps, compressors, air and leachate lines. The assessment of the system should provide increased leachate removal, additional control of leachate migration and preventative measures against failure of the system and additional protection against potential pollution sources.	2011	Twelve new leachate and landfill gas extraction wells installed in 2011. Review is ongoing
Objective No 5: To provide for the restoration and aftercare of the facility			
5.1 Update the Restoration and Aftercare Plan for the facility in 2011	This will include a schedule of site inspections for routine maintenance of site infrastructure, monitoring of emissions, pollution control framework and slope stability.	2011	Incomplete 2011. Additional infrastructure required. Review is ongoing
Objective No 6: To develop a post operational plan for the site			
6.1 Review options under consideration at present and prepare proposals.	Landscaping plan for fully capped landfill.	2011	Incomplete. Final proposal to be completed in 2012.
6.2 Review Waste Licence,	Review of waste licence W0016/02, prepare submission for EPA on monitoring regime.	2011	Incomplete

Achievements of Objectives and Targets for 2011			
Objective	Comments	Target	Progress
6.3 Complete capping works	Complete capping of landfill during 2011	2011	Stage 5/2 capping complete 2010 .Final capping of site road to be completed in 2012/2013
6.4 Leachate extraction system	Full service and replacement (& where necessary installation) of wells for leachate extraction system	2011	Ongoing

Table 3 **Objectives and Targets for 2012**

Objectives and Targets for 2012			
	Comments	Target	Responsibility
Objective No 1:			
1.1 Improve current site record keeping and performance of site procedures including documentation of procedure reviews due to the closure of the landfill	Review existing filing system and record storage for the facility, in particular the retention of records for historical review of the facilities environmental performance. This will include for the archiving of files related to the site's operations, communications and compliance of the waste licence at any time.	2012	Facility Technician
Objective No 2:			
2.1 Ensure ongoing maintenance of the following site infrastructure: Roads; Surface Water drainage infrastructure; Weighbridge; Site offices and Plant shed; Landfill gas extraction system; Leachate extraction system.	All of the items of existing infrastructure are to be maintained as required and in accordance with suppliers/manufacturers instructions where applicable.	2012	Facility Technician
Objective No 3:			
3.1 Complete the capping of the landfill	There is a gravel access ring road (1km long approx. and 4.5m wide) on the landfill. The landfill cap is to be extended to seal below the access ring road. The surface water drainage and leachate infrastructure where affected to be upgraded as required.	Sep_Oct 2012	Facility Manager
Objective No 4:			

Objectives and Targets for 2012			
	Comments	Target	Responsibility
4.1 To improve surface water discharge from the landfill	Complete the Surface Water Management plan and implement the proposal on site. These works are to be carried out as part of the capping works contract.	Sep_Oct 2012	Facility Manager
Objective No 5:			
5.1 Develop a leachate extraction / assessment management plan to reduce the potential for pollution of the local environment.	Install new and modify existing infrastructure as recommended in the plan. These works are to be carried out as part of the capping works contract.	Sep_Oct 2012	Facility Manager
Objective No 6:			
6.1 Complete the Aftercare plan	A basic restoration and aftercare plan was completed in 2002, this plan is to be further developed and completed.	2012	Facility Manager / Facility Technician
Objective No 7:			
Monitoring requirement review	As the landfill is now closed and some existing monitoring points have been damaged lost etc. a review is to be undertaken. The objective of this review is to identify and agree the monitoring points required for ongoing monitoring	2012	Facility Manager / Facility Technician

2.3.5 *Full title of any procedures developed by the licensee in the year which relates to the facility operation*

No additional procedures were developed or submitted during the reporting period.

2.3.6 *Report on communication programme*

The site's EMS includes a procedure for communication. In addition Wexford County Council provides the following documentation for public viewing at Holmestown Waste Management Facility:

Table 4 List of records available for public viewing in relation to the landfill

List of records available for public viewing
Waste Licence W0016-2
Waste Licence application
Correspondence with the EPA
Incident / complaints records
Audit records
Waste acceptance records
Material acceptance dockets
All monitoring records
Leachate removal records
Vermin control reports

3 REPORTED INCIDENTS & COMPLAINTS SUMMARIES

3.1 Incidents

No incidents were recorded during this reporting period.

3.2 Complaints

No complaints were received during this reporting period.

4 DEVELOPMENT WORKS UNDERTAKEN DURING THE REPORTING PERIOD & THOSE PROPOSED FOR THE COMING YEAR

4.1 Landfill Engineering Works

4.1.1 *Completed Engineering Works 2011*

- Connection of the 12 new multipurpose in-waste boreholes for gas/leachate extraction and monitoring.

4.1.2 *Proposed Engineering Works 2012*

Proposed engineering works for 2012 are summarized as follows

- Completion of Landfill cap on existing roads
- Demobilising of site accommodation
- Install additional Leachate Management infrastructure

4.2 Restoration and Aftercare

Several proposals for the end use of the site are currently being reviewed. It is envisaged that the review will be completed in 2012. A report will be submitted to the EPA for approval when the review is complete.

5 WASTE ACCEPTANCE & HANDLING

5.1 Waste Activities carried out at the Facility

No waste disposal operations took place on site at Killurin Landfill during the reporting period 1st January 2011 to 31st December 2011. Scrap metal was stored on site until 31st March 2011 from Holmestown before it was transported off-site.

5.2 Total quantity of wastes accepted on site

A summary of the total quantity of waste accepted at the facility for the reporting period 1st January to 31st December 2011 is presented below in table 5.

5.3 Total Quantity of Waste Consigned Off Site

A summary of the total quantity of waste consigned off site at Killurin Landfill for the period 1st January 2011 to 31st December 2011 is presented below in table 6.
The total volume of leachate sent off site for treatment at Enniscorthy Wastewater Treatment Works was 2627 tonnes.

Table 5 **Waste accepted to Killurin Landfill from 1st January 2009 to 31st December 2011 (tonnes)**

Waste In	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly totals
SCRAP METAL	9.52	17.5	17.12	0	0	0	0	0	0	0	0	0	44.410
DEAD DOGS	0	0.260	1.7	1.252	0.760	0.660	1.160	0.940	1.260	0.980	0.960	1.440	11.272
Total													55.682

Table 6 **Waste consigned off-site from Killurin Landfill from 1st January to 31st December 2011 (tonnes)**

Waste Out	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly totals
SCRAP METAL				44.41									44.41
DEAD DOGS	0	0.260	1.7	1.252	0.760	0.660	1.160	0.940	1.260	0.980	0.960	1.440	11.272
LEACHATE	503	347	382	118	110	205	249	77	76	175	341	44	2627
Total													2682.68

5.4 Remaining capacity of the site

Killurin Landfill closed in the end of June 2008. There is no space remaining in the landfill for deposition of waste.

6 ENVIRONMENTAL NUISANCES

6.1 Review of environmental nuisance control at the facility for the reporting period

Nuisances at Killurin Landfill are logged in a weekly tick-box report and action is taken immediately to address any identified issues. Table 7 below summarises the measures implemented on site to combat environmental nuisances during 2011.

Table 7 Environmental Nuisance Control during 2011

Nuisance	Mitigation Measures in Place
Vermin	Permanent bait points set up on site (internal and external). Inspections carried out on a monthly basis. If infection found then weekly inspections until rodent free. Monthly reports produced and kept at Holmestown site office.
Litter	Killurin landfill is litter free.
Flies	No flies present.
Odour	No odour emissions

7 RESOURCE & ENERGY CONSUMPTION

7.1 Electricity and Energy Usage

The cost of electricity on site for 2011 was €32,565.44.

7.2 Water

Domestic water usage data was not recorded.

7.3 Diesel

Total diesel fuel consumption is estimated to be 100 litres from 01 January to 31 December 2011.

8 ENVIRONMENTAL MONITORING & EMISSIONS SUMMARY

8.1 Summary report on emissions

A summary of emissions monitoring at Killurin Landfill carried out during this reporting period (January 2011 – December 2011) is contained in Table 8 below. The E-PRTR Regulation (EC) No. 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register came into force in February 2006 and was brought into Irish law through SI No 123 of 2007. As a result all industries have to annually report environmental emissions and waste transfer data through a web-based form as part of their AER. The PRTR 2011 document is included in Appendix A1.

Table 8 **A summary of Emissions monitoring as specified in Waste Licence W0016-2**

Note 1: When specific engineering works are being carried out

Note 2: Additional monitoring of the groundwater downstream of the Landfill footprint took place during 2011

Emission Monitoring	Frequency
Landfill Gas	Continuously (Dwellings adjacent to Landfill, Flare) Weekly (Site Accommodation) Monthly (Boreholes) Annual (Flare)
Leachate	Monthly (Borehole Level) Quarterly (Analysis) Annually (Analysis)
Surface water	Weekly (Visual) Quarterly (Analysis) Annually (Analysis)
Groundwater Levels	Monthly (Borehole Level)
Groundwater	Quarterly (Analysis) (Note 2) Annually (Analysis)
Noise	As required (Note 1)
Dust	As required (Note 1)
River Water	Quarterly (Analysis)

8.2 Environmental Monitoring

Wexford County Council carries out a comprehensive environmental monitoring programme, in compliance with the waste licence conditions, to assess the significance of emissions. The monitoring programme includes Landfill Gas, Leachate Level & Quality, Surface Water Quality, Groundwater Level & Quality, Noise and Dust monitoring (as required), Odour monitoring and Meteorological monitoring, as well as Flare emission and Topographical.

Monitoring during this reporting period was carried out according to Schedule D of Waste Licence W0016-2. Quarters 1, 2, 3 and 4 of 2011 are summarised in this chapter. A monitoring point location plan is provided see appendix A2

8.2.1 *Landfill gas*

In accordance with Schedule D.1 of the Waste Licence W0016-2, the following monitoring has been carried out and reported to the Agency.

- Monitoring boreholes LB2, LB3, LB4, LB5, LB6, LB7, LB8, LB12, LB13, LB15, LB16 as specified in the licence.
- Perimeter boreholes T1, T2, T3, T5, T6, T7, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18 and T19 were monitored on a monthly basis by Wexford County Council site staff.

The majority of boreholes have varying levels of gas quality over the reporting period and no particular trend could be identified. Gas monitoring details are provided in Table 9 below.

Table 9 Gas Monitoring Points

Off site and on site gas boreholes		
CO2 and CH4 levels (monthly)	40 points	In waste gas monitoring wells LB 2 - LB8, LB 12 - LB 16
		Boundary gas monitoring wells T1 –T3, T5- T7, T9- T20 GW1, GW9- GW11, GW17-GW19.
		Resident gas boreholes: GB1 and GB2
Residential Dwelling gas alarms		
CO2 and CH4 levels (continuously)	2 points	Two closest residences

CO2 and CH4 levels (weekly)	10 points	All site buildings

Perimeter boreholes

Methane and Carbon Dioxide levels are elevated in gas monitoring wells T14, T15, T16, GW17, GW18 and GW19. The elevated Methane and Carbon Dioxide levels result from the location of these boreholes which are either in or on the periphery of the waste body. WCC propose to discontinue monitoring at these locations as they are no longer deemed as being peripheral wells. T17, T18, T19, GBH1 and GBH2 are in a similar orientation but further removed from the waste body and are considered suitable for ongoing monitoring in this area. No exceedences of licence limits were recorded at T17, T18, T19, GBH1 or GBH2 which would indicate that no landfill gas migration off site has taken place.

Carbon Dioxide levels in T7 and T12 are slightly elevated. The most likely cause of the slightly elevated readings is their location in a mature wooded area. The exceedences are low (max 3.1% in T12).

No exceedences of licence limits were recorded at any of the remaining peripheral gas monitoring wells. This indicates that landfill gas migration off site has not taken place.

Methane (CH_4)

Resident's boreholes

The following was recorded at resident's boreholes during this reporting period:

- **GB1 at Carley's:** Methane levels at this monitoring location were seen to be below the 1.0% volume per volume (v/v) trigger-level throughout the reporting period.
- **GB2 at Foxes:** Methane levels at this monitoring location were seen to be below the 1.0% volume per volume (v/v) trigger-level throughout the reporting period.

The CH_4 trigger level at the gas monitoring wells is 1.0% volume by volume (v/v)

Carbon Dioxide (CO_2)

Resident's boreholes

The following was recorded at resident's boreholes during this reporting period:

- **GB1 at Carley's:** All results were below the 1.5% volume per volume (v/v) trigger-level.
- **GB2 at Foxe's:** All results were below the 1.5% volume per volume (v/v) trigger-level.

The CO_2 trigger level at the gas monitoring wells is 1.5% volume by volume (v/v)

Monitoring boreholes GB1 and GB2 are located on the resident's side of the gas migration cut off trench. The cut off trench consists of an excavated trench along the landfill boundary adjacent to Carley's and Fox's residents. Installed in this trench is an impermeable geotextile membrane with a series of gas extraction wells installed on the landfill side. The results indicate that the gas migration cut off trench combined with the gas abstraction system is operating as designed.

Methane and Carbon Dioxide levels (as expected) remain elevated in the dual leachate/Gas monitoring wells which are located in the waste body. This gas is being continuously extracted and flared off.

8.2.2 *Flare Emissions*

An air emission test of the landfill flare was carried out by Odour Monitoring Ireland Ltd. on the 16th December 2011. NO_x, SO_2, CO, O_2, HCL, HF and TOC were found to be in compliance with the emission limit values contained in Waste Licence W0016-2 – Schedule C4. The report will be included in the annual monitoring results report and will be submitted to the EPA under separate cover.

8.2.3 *Leachate levels and monitoring*

Leachate monitoring points

Leachate Monitoring			
Level	10 points	LB2-LB8, LB12-LB16	Weekly
Analysis	3 points	Leachate storage tanks, LB2, LB12,	Annual

Leachate levels

Leachate levels were taken at 10 leachate boreholes during 2011 in compliance with Schedule D.5 of the waste licence. Samples were obtained for analysis from LB2 and the leachate storage tank on 30th March 2011. The levels were recorded using a dip meter on a weekly basis by Wexford County Council staff at the landfill. Wexford County Council has adopted a Leachate Management Plan designed to maintain

leachate at acceptable levels by routine removal from the holding tank. The volumes of leachate removed from the tank in 2011 are detailed in Table 10. The quantity exported off-site in 2011 was 2,627 cubic metres compared to 3,570 cubic metres in 2010.

Leachate is collected from 30 extraction wells located around the site within the waste boundary. This leachate is directed to the three holding tanks located in the northwest of the landfill. It is then removed by road tanker on a routine basis and transported to Enniscorthy Wastewater Treatment Plant for treatment in accordance with the leachate management plan.

Leachate monitoring

Annual monitoring was undertaken on 30th March 2011. Leachate samples were collected from three locations, LB2 and the leachate storage tanks. The samples were analysed for a range of organic and inorganic parameters as defined in Table D.5.1 of the Waste Licence 16-2.

The levels recorded did not reveal any significant change to those recorded in the previous reporting period.

The typical characteristics of leachate generated on site are presented in Table 10. The results are similar to those obtained for the last reporting period and are in general indicative of a landfill in the methanogenic stage of decomposition of organic compounds i.e. conversion of organic compounds to landfill gas.

Table 10 Leachate analysis results 2011

Sampling Points		LB2	Tanks
Parameters	Units	Annual	Annual
Depth of Borehole	m	6.8	
Leachate level	m	1.6	
Temperature	^{o}C	11.1	9.7
pH	pH	6.6	7.9
Conductivity	µS/cm	1222	7320
Ammonia	mg/l N	31	470
Chloride	mg/l Cl	54	767
Nitrite	mg/l N		
Ortho-Phosphate	mg/l P	0.05	1.3
Total Oxidised Nitrogen	mg/l N	<0.5	1.11
Chemical Oxygen Demand	mg/l 02	30	200
Biochemical Oxygen Demand	mg/l 02	0.9	42
Fluoride	mg/l F	<0.5	<2.5
Sulphate	mg/l SO4	24	100
Aluminium	µg/l	<25	28
Antimony	µg/l	1.8	2.9
Arsenic	µg/l	22	16
Barium	µg/l	160	71

Beryllium	µg/l	1.4	1.4
Boron	µg/l	170	650
Cadmium	µg/l	<0.5	<0.5
Calcium	mg/l	31	47
Chromium	µg/l	1.2	15
Cobalt	µg/l	3.7	5.9
Copper	µg/l	2.4	15
Iron	µg/l	6600	4500
Lead	µg/l	1.8	2.8
Magnesium	mg/l	22	29
Manganese	µg/l	2600	120
Mercury	µg/l	<0.5	<0.5
Molybdenum	µg/l	0.6	1
Nickel	µg/l	2.7	24
Potassium	mg/l	19	180
Selenium	µg/l	3.3	35
Sodium	mg/l	45	430
Thallium	µg/l	1.7	1.7
Tin	µg/l	1	6
Uranium	µg/l	<0.5	0.5
Vanadium	µg/l	1.4	9.4
Zinc	µg/l	8	44
Total Cyanide	mg/l	<0.05	<0.05

Inspection and testing of leachate storage tanks

In December 2011 Capital Surveys Ltd. carried out an inspection of the leachate storage tanks at Killurin Landfill. The tanks passed the integrity test and are deemed fit for storing leachate. The tanks are due to be re- tested in December 2014. The report on the inspection is attached in Appendix A3 . Visual examination records were recorded on DVD and are available upon request at HWMF site offices.

8.2.4 *Surface Water*

Under Schedule D.5 of the Waste Licence 16-2, surface water monitoring was required in the locations listed below. SW1 is located upstream of the site, SW2 is situated downstream of the site and SW4 is located at the southern tip of the facility. The site streams sometimes run dry during the drier months of the year and consequently surface water samples cannot be obtained. These are discussed in subsequent sections.

Table 11 Surface water monitoring locations and frequency

Surface water monitoring locations and frequency			
Parameter	**Location**	**Name**	**Frequency**
Visual Inspection/ Odour	Off site (River Slaney)	S1, S2, S4	Quarterly
Chemical analysis	Off site (River Slaney)	S1, S2, S4	Quarterly and Annual
Visual inspection	On site	SW1, SW2, SW4	Weekly
Chemical analysis	On site	SW1, SW2 and SW4,	Quarterly and Annual

Visual inspection of surface water

Surface water on site consists of a series of open and piped drains. Weekly visual inspections of surface water were conducted for monitoring points SW1, SW2 and SW4, and quarterly at off-site locations (River Slaney) S1, S2 and S3. All surface water details are included in previously submitted monitoring reports for the landfill. No visual abnormalities were recorded for any of the surface water inspection points during the reporting period.

Surface water quality analysis

Results for all surface water monitoring carried out in 2011 have been submitted to the Agency in quarterly monitoring reports. Due to dry periods it was not always possible to retrieve samples from all of the monitoring points. Only 1 sample was collected for SW4 during 2011.

All sampling and analysis was carried out in accordance with recognised quality assurance and control procedures. The detailed monitoring results are presented in the quarterly monitoring reports submitted to the Agency in the reporting period. The range of analysis is as specified in Schedule D.5 of the Waste Licence 16-2 and includes parameters such as ammoniacal nitrogen, BOD, COD, dissolved oxygen, pH, electrical conductivity and organic and inorganic parameters. No exceedences were recorded during the quarterly monitoring in 2011.

8.2.5 *Groundwater*

Table 12 **Groundwater monitoring locations**

Groundwater Monitoring Locations		
Downgradient	1 point	GW1
Downgradient (border of reed beds)	1 point	GW9
Downgradient (border of reed beds)	1 point	GW10
Upgradient	1 point	GW11
Upgradient	1 point	GW17
Upgradient	1 point	GW18
Upgradient	1 point	GW19

Upgradient	1 point	GBH1
Upgradient	1 point	GBH2

Groundwater levels

Groundwater levels were measured on a monthly basis using a dip meter. The groundwater dip levels have been submitted to the Agency in the quarterly monitoring reports. Groundwater levels remained relatively constant throughout the monitoring period, with only minor variations in groundwater levels in accordance with prevailing weather conditions. During the drier months the groundwater levels were seen to gradually decrease while during wetter periods where prolonged rain was evident, levels of groundwater were noted to rise slightly over a number of months.

Groundwater quality boreholes

No significant variation from historical result trends were noted in Q3/Q4. The highest levels of contaminants have been recorded in the boreholes located along the south east side of the landfill. These BH's are on the maximum hydraulic groundwater gradient that falls from the landfill towards the river. Samples were taken from both soil and underlying rock layers. In both cases the distribution of contamination was not even, with certain boreholes recording higher results than others. This may be due to preferential flow paths caused by gravel/sand lenses in the soils and increased permeability due to higher levels of fracturing or faults in the underlying rock. The result trends show that leachate management on site has had a beneficial effect on these wells and Ammonal, Chloride and Conductivity levels have been decreasing since 2006. Boreholes with low contaminant readings have exhibited little change since 2006. This may be due to the lower permeability and recharge in these zones.

Boreholes GW17-19 are included as groundwater (and peripheral gas) monitoring locations in Table D1.1 of the Licence. They have been reported as dry since 2006. The boreholes are too shallow and too close to the landfill. GBH1 and GBH2 are in a similar orientation and are considered suitable for ongoing monitoring in this area. A report, detailing proposals for amendments to monitoring locations, will be submitted to the Agency for agreement.

Private Well water analysis

Table 13 Private well monitoring locations

Drinking water		
Private residence	UV treated	Kitchen tap

Quarterly and annually monitoring was carried out on drinking water samples from our neighbours private well.

8.2.6 *Noise*

As no specific engineering works which could generate noise were carried out on site during 2011 no noise survey was undertaken.

8.2.7 *River water*

The river water monitoring results for the river Slaney are reported in the Table 14 below. Monitoring location S1 is located upstream of the landfill, monitoring location S2 in the river adjacent to the landfill and monitoring location S3 is located downstream of the landfill and all are located within the tidal zone of the river estuary. Chloride and Conductivity readings were high in the river Slaney 2011. Ammonia results were relatively low and the elevated readings are probably linked to saline conditions due to tidal influence in the estuary. Similar results are evident in the historical trends. There is no evidence from the upstream and downstream river results that the landfill is impacting negatively on the Slaney.

Table 14 **River water monitoring results for River Slaney 2011**

River water monitoring results for River Slaney 2011													
		Monitoring Locations											
		S1				S2				S3			
Parameter	**Limit/ Units**												
Date		15-Feb	14-Apr	29-Jun	07-Nov	15-Feb	14-Apr	29-Jun	07-Nov	15-Feb	14-Apr	29-Jun	07-Nov
BOD	5	1.2	1.1	7.50	1.4	1.2	1.3	6.8	<1	1.2	<1	5.5	1.9
COD	40	<10	34	49	11	12	15	57	13	12	28	55	13
Chloride as Cl	250	22	535	2000	28.5	17.5	1230	2150	27.5		1770	1975	28.5
Dissolved oxygen		10	10.39	9.61	10.13	10.34	10.75	9.29	9.98	10.34	10.72	8.64	10.56
Conductivity	1500	221	1820	5400	254	217	3550	5740	249	217	4790	5340	246
pH	6<pH>9	7.5	8.2	7.8	7.8	7.6	8.3	7.7	7.8	7.6	8.3	7.7	7.8
Suspended Solids	30	15	<10	<20	14.2	32	<10	<20	<20	32	<10	17	20
Ammonia as NH3-N	0.3	<0.03	0.07	0.07	0.05	<0.03	0.07	0.05	0.05	<0.03	0.08	0.08	0.05

8.2.8 *Dust*

As no specific engineering works which could generate dust were carried out on site during 2011 no dust monitoring was undertaken.

8.2.9 *Meteorological monitoring*

All 2011 meteorological monitoring information was obtained from the Met Éireann weather station located at Johnstown Castle, Wexford; this station is within 10km of the Killurin Landfill site. The monitoring data is contained in Appendix A4.

8.2.10 *Topographical Survey*

A topographical survey of the site was carried out by Capital Surveys Ltd. in October 2011. The site survey drawing is contained in Appendix A2.

APPENDICES

A1 PRTR 2011

A2 Topographical and Monitoring location drawings

A3 Integrity test

A4 Meteorological Data

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.13

REFERENCE YEAR	2011

1. FACILITY IDENTIFICATION

Parent Company Name	Wexford County Council
Facility Name	Killurin Landfill Site
PRTR Identification Number	W0016
Licence Number	W0016-02

Waste or IPPC Classes of Activity

No.	class_name
3.1	Deposit on, in or under land (including landfill).
3.10	Release of waste into a water body (including a seabed insertion).
3.12	Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
4.10	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
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.

Address 1	Newtown Lower
Address 2	Killurin
Address 3	Co. Wexford
Address 4	
	Wexford
Country	Ireland
Coordinates of Location	-6.56116 52.3816
River Basin District	IESE
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Fintan Ryan
AER Returns Contact Email Address	fintan.ryan@wexfordcoco.ie
AER Returns Contact Position	Facility Manager
AER Returns Contact Telephone Number	053 9120972 Ext. 223
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
5(d)	Landfills
5(c)	Installations for the disposal of non-hazardous waste
50.1	General

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

Is it applicable?	No
Have you been granted an exemption ?	No
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

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		Flare Biogas 1250 m3/hr			
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
03	Carbon dioxide (CO2)	M	ISO 12039:2001		231408.0	231408.0	0.0	0.0
01	Methane (CH4)	M	ALT	EN12619:1999	24.25	24.25	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	M	EN 14792:2005		225.0	225.0	0.0	0.0
11	Sulphur oxides (SOx/SO2)	M	EN 14791:2005		357.0	357.0	0.0	0.0
02	Carbon monoxide (CO)	M	EN 15058:2004		20.0	20.0	0.0	0.0
					0.0	0.0	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used		Flare Biogas 1250 m3/hr			
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
351	Total Organic Carbon (as C)	M	ALT	EN12619:1999	24.25	24.25	0.0	0.0
319	**Inorganic acids**	M	ALT	EN1911:2010 & EN15713:2010	15.0	15.0	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: Killurin Landfill Site

Please enter summary data on the quantities of methane flared and / or utilised	**T (Total) kg/Year**	**M/C/E**	**Method Used**		**Facility Total Capacity m3 per hour**	
			Method Code	**Designation or Description**		
Total estimated methane generation (as per site model)	807107.0				N/A	
Methane flared	506091.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	301016.0				N/A	

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	02 02 02	No	11.272	animal-tissue waste	D10	M	Weighed	Offsite in Ireland	Waterford Proteins ,Dept. of Agriculture - R919	Ferrybank,.',Waterford,.',Ireland		
Within the Country	20 01 40	No	44.41	metals	R4	M	Weighed	Offsite in Ireland	Mulligan Dismantiling & Salvage,WP/05/20	Lower,Inch,Gorey,Co.Wexford,Ireland		
Within the Country	19 07 03	No	2664.91	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Enniscorthy Wate Water Treatment Plant,Wexford County Council	Saint Johns,Enniscorthy ,.',Co. Wexford,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

KILLURIN BRIDGE APPROX 150m

SITE ENTRANCE

0m | 25m | 50m | 75m | 100m

SCALE BAR

Map Legend

- Site Boundary
- W02 Gas extraction wells - gas connections to tl
- A10 Gas extraction wells (New Wells (2010))- D
- T1 Perimeter Gas migration wells
- W05 Leachate and Gas extraction wells- Dual c
- LB 5 Leachate dipping wells
- BRO 1 Bored rock wells
- GW12 Ground water wells

SHED
SW 2
GW 1
LEACHATE STORAGE TANKS
SHED
WHEELWASH
B2
T1
GW 27
W1
W2
W3
W4
W5
W57
W56
W6
A12
W7
W8
W9
GW 17
GBH1
GW 18
GBH2
SW 1
GW 19
T16
BRO1
LB14
W58
W55
W59
W32
LB3
A10
A9
A8
W10
W52
W11
W53
A7
W12
T2
GW 26
W31
W60
W46B
A11
W47
A6
W13
W51
T15
T17
T18
W30
W61
T3
GW 25
BRO7
W29
LB4
W46A
W14
W26
W28
LB5
W27
A5
A4
W15
W25
W33
LB6
W50
LB13
SW 3
W34
W16
T14
T19
W24
GW 24
BRO6
T6
T5
W35
A3
BRO5
W36
W49
W17
W23
A2
T7
LB7
LB12
W37
W18
W45
W48
T13
W22
A1
GW 23
W19
W44
W38
W21
W20
W43
BRO4
W39
GW 22
BRO3
T9
W40
W41
W42
LB8
REED BEDS
GW 21
River Slaney
T10
GW 9
T12
CR
Mud
BRO2
T11
GW 10
SW 4
HWM

GW11: 115m to the south east
PW1: 370m to the south east

Drawn by:	F. Ryan
Checked by:	FH
Date	21-11-11
Scale	1:6000
	Drawing No.

Drawing

Monitoring Locations

Killurin Landfill

Wexford County Council,
Wexford
Tel: 053-9120922

Wexford County Council

KILLURIN BRIDGE APPROX 150m

SITE ENTRANCE

CR

30m

25m

20m

15m

10m

5m

2m

30m

25m

20m

REED BEDS

River Slaney

Mud

CR

Map Legend

Site Boundary

1m interval contours

Drawn by:	F. Ryan
Checked by:	FH
Date	21-11-11
Scale	1:6000
	Drawing No.

Drawing

Topographical Survey 2011

Killurin Landfill

Wexford County Council,
Wexford
Tel: 053-9120922

Wexford County Council

Capital Surveys Ltd

Bricketstown, Taghmon,
Co.Wexford.
(053) 9240825
(087) 6857464

info@capitalsurveys.ie capitalsurveys@eircom.net www.capitalsurveys.ie

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G.P.S Land Surveying . Land Registry Mapping . Environmental & Marine Surveying. Building and Elevational Surveys.

Publication - Report on Inspection and Testing of Leachate Storage Tanks at Killurin Landfill.

Version - Final Report.

Date - December 2011.

Report By - Justin Kelly BEng MIEI.

Inspection & Testing Engineer - Justin Kelly BEng MIEI.

Client - Wexford County Council.
County Hall,
Carricklawn,
Wexford.

REF – Mr Fran Hobbs. Facility Director.

1) **Introduction**

2) **Summary of Inspection.**

3) **Summary of Integrity Test -**

   3.1 - Test Protocol.
   3.2 Visual Inspection.
   3.3 Testing Results

4) **Conclusion**

Plates

Appendices.

1) Procedure for inspection and testing of Bunded areas and leachate Storage Tanks at Killurin Landfill.

2) Visual Examination records of Leachate Storage Tanks interior (Video File on CD).

1) Introduction .

This report covers the inspection and testing of leachate storage tanks (LST s) at Killurin Landfill, Killurin, Co Wexford.

The LSTs were inspected and tested in compliance with Condition 3 . 12 . 2 of the licence, which states

The licensee shall provide and maintain leachate storage tanks at the facility to facilitate the storage of leachate abstracted / collected from the waste. All leachate storage structures on the facility shall be inspected and certified fit for purpose every three years by an independent and appropriately qualified engineer.

There are three LST s connected in series on site

The structures were inspected and tested in October 2008, following the procedure for inspection and testing of the bunded areas and leachate storage tanks contained in Appendix 1, and a CCTV recording is included of a visual inspection which was also carried out on each tank internally.

2.) Summary of Inspection.

The LSTs comprise of three tanks connected in series. Each tank comprises of two precast concrete box culvert sections laid on their side and stacked. The joint between the lower section and the reinforced concrete base, and the joint between the upper and lower sections are sealed using a bitumen based seal .Each tank is covered by reinforced concrete slabs laid across the top of the tank.

Each tank measures 4.1m long, by 5.0 m wide externally. The walls are nominally 260mm thick. Internally, each tank measures 3.58 m by 4.48m by 2.9m deep. The tanks were constructed in early 2003.

The summary details of the construction and capacity of the tanks is given in Table 2.

Table 1. Summary of Inspection of Leachate Storage Tanks.

TANK. NO	VOLUME OF TANKS (LITERS) A	EFFECTIVE CAPACITY OF TANKS (LITERS) B	TANK CONSTRUCTION
1	46,500	40,150	Precast Concrete.
2	46,500	38,800	Precast Concrete
3	46,500	46,500	Precast Concrete

Note.

a) *This is the gross volume of the tanks using the internal dimensions.*

b) *This is the volume of the tanks up to the level of the invert of the outflow from the tanks.*

The tanks are partially buried, and the eastern faces of all tanks, the southern faces of LST 1 and the northern face of LST 3 are covered with soil. An inspection of the exposed external faces of each tank was made. The sealed joints between the precast concrete sections are pointed with cement mortar on the external faces of LST3, but are not pointed on LTS 1 and LST 2. The exposed bitumen seals are continuous and show no signs of cracking or weathering. The joints are approximately 1.32m above the base of the tank.

The exposed concrete is in good condition and there are no cracks or corrosion in evidence, as shown on the enclosed CCTV DVD.

There is some damage to the external north western corner of LST 3, where a thin layer of concrete has broken away. There are no cracks or deterioration of the concrete around the damaged area.

Hoist anchors are located at the external corners of each precast section where the thickness of concrete is significantly reduced. The anchors are exposed and are rusted on the surface.

There is no evidence of leakage or staining by leachate on the exposed external walls of the tanks.

The LST s were pumped out and visually inspected using a surveying camera. Some residual sediment and leachate remained on the floor of each tank, precluding a visual inspection of the floor and the floor to wall joint of each tank.

The internal joints between the upper and lower sections are pointed with cement mortar in LST 3 only, while in LST 1 and LST2, only some of the internal joints are pointed. The bitumen seal behind the cement pointing remains intact however.

The concrete is in good condition throughout the internal surfaces on the tanks and no defects to the concrete joints, water bar or reinforcement are in evidence.

3. Summary of Integrity Tests.

3.1 Test Protocol.

The procedure for integrity of bunded areas and LST s was designed to comply with the requirements of Section 9.2 of BS 8007 : 1987 the British Standards Codes of practice for design of concrete structures for retaining aqueous liquids.. The relevant sections of the procedure are summarised in the form contained in Appendix 1.

BS 8007 calls for a minimum 7 day integrity test for concrete structures designed and constructed in accordance with the requirements of the standard. While the standard is not applicable to the structure to be tested on site, this testing period was used as a guide for tests..

The LST s were tested over 7 days. The record of Hydrostatic test form also contained in Appendix 1, was completed for each LST. Each structure would be deemed to have failed the test if the level of water in the structure dropped by more than 10mm over the duration of the test, as required by the standard.

As the LST s area covered, it was not necessary to measure and record the daily rainfall and evaporation for the duration of the test.

3.2 Visual Inspection.

In addition to the integrity testing all three of the tanks were visually inspected and a CCTV recording of the tank inspection is included. (DVD in Appendix 2).

The results of the test are discussed in the following section

3.3 Testing Results.

The LST s are connected in series with Leachate from the landfill discharging to LST 1. A gravity overflow arrangement ensures that water above a level of approximately 2.57m in LST 1 will flow in to LST 2. Water above 2.43M in LST 2 discharges to LST 3. As the landfill leachate in pumped continuously to LST 1 , it was not practicable to test this tank. By ensuring that LST 1 was emptied frequently, seven day tests were possible on LST 2 and LST 3.

LST 2 and LST 3 were filled with water and were allowed to stabilise for 24 hrs prior to the commencement of the test on the Wednesday 14th Dec 2011. Measurements of the liquid levels were made each day for the following 7 days. The external wall were also tested for signs of seepage from the tanks.

The results of the tests indicated that the water levels in LST2 and LST3 fell by 2 – 4 mm respectively . No Seepage from the tanks were observed on the external tank walls during the test. Both these tanks are deemed to have passed the integrity teat and are deemed fit for storing leachate.

Operational restrictions precluded the testing procedure being applied to LST 1. Therefore I cannot categorically certify that the condition of this tank is appropriate for the storage of leachate . However the tank was constructed similary to LST 2 and LST3, at the same time, by the same company, using the same method. Based on the results of the integrity tests on LST2 and LST3, and considering the similar physical condition of LST 1 to the other tanks, I consider that it is reasonable to assume to LST 1 is also fit for storing leachate as the other tanks pass the test.

Table 2 Test Records.

Tank 2.

Date	Day	Time	Liquid Level	Signed.
15/12/2011	Thursday	9.45 am	634 mm	J Kelly
16/12/2011	Friday	9.45	636mm	J Kelly
17/12/2011	Saturday	10.00	635mm	J Kelly
18/12/2011	Sunday	10.05	634mm	J Kelly
19/12/2011	Monday	9.50	634mm	J Kelly
20/12/2011	Tuesday	9.45	637mm	J Kelly
21/12/2011.	Wednesday	8.30	635mm	J Kelly

Tank 3.

Date	Day	Time	Liquid Level	Signed.
15/12/2011	Thursday	9.45 am	644 mm	J Kelly
16/12/2011	Friday	9.45	647mm	J Kelly
17/12/2011	Saturday	10.00	646mm	J Kelly
18/12/2011	Sunday	10.05	645mm	J Kelly
19/12/2011	Monday	9.50	646mm	J Kelly
20/12/2011	Tuesday	9.45	644mm	J Kelly
21/12/2011	Wednesday	8.30	645mm	J kelly

Civil Engineer Certification.

I confirm that as Project manager and supervising engineer, the tests were carried out by myself, and I certify that these tanks are certified fit for use.

_____,

Justin Kelly BEng MIEI

4.0 Conclusion.

The LST s were drained and inspected. Some of the seals in LST 1 and LST 2 were not pointed with cement mortar, however the bitumen seal were found to be intact. The mortar should be replaced to maintain the integrity of the seals.

A small amount of damaged concrete was noted on the upper north western corner of LST 3. This damage should be made good.

The steel anchors should be cleaned and covered to reduce corrosion of the concrete around these points and to provide uniform thickness of concrete at all points of the tanks.

LST 2 and LST 3 were integrity tested between the 12th of December and the 21st of December 2011. Tanks passed and deemed fit for purpose.

LST 1 was not tested due to operational demands, but were inspected and construed in accordance with LST 2 and LST 3, and therefore I consider LST 1 also fit for purpose.

Site Photographs.

TANK 2.

TANK 1

TANK 3.

Procedure for Inspection and Testing of Bunded Area and LST s.

1) Clean out and drain LST s.

2) Measure up structure.

3) Carry out visual inspection.

4) Fill tanks with water. Do not fill above 50mm from the to of the tank wall if tank is open to the atmosphere.

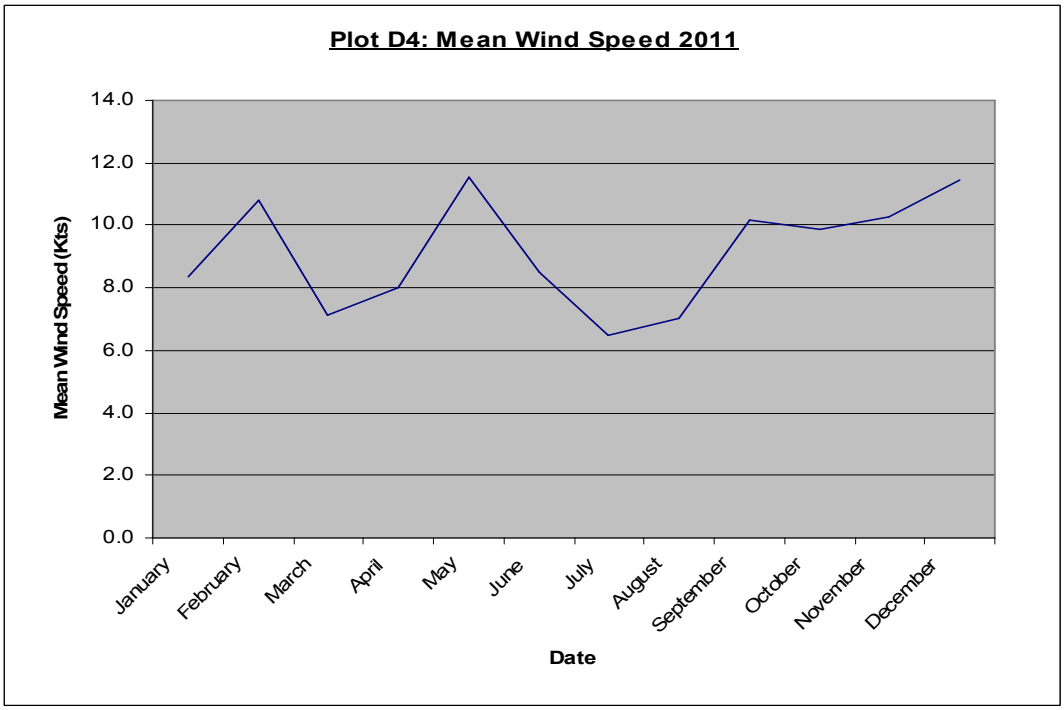
5) Allow liquid to stabilise in accordance with Section 9-2 of BS 2008:1987 adding make up water if required.

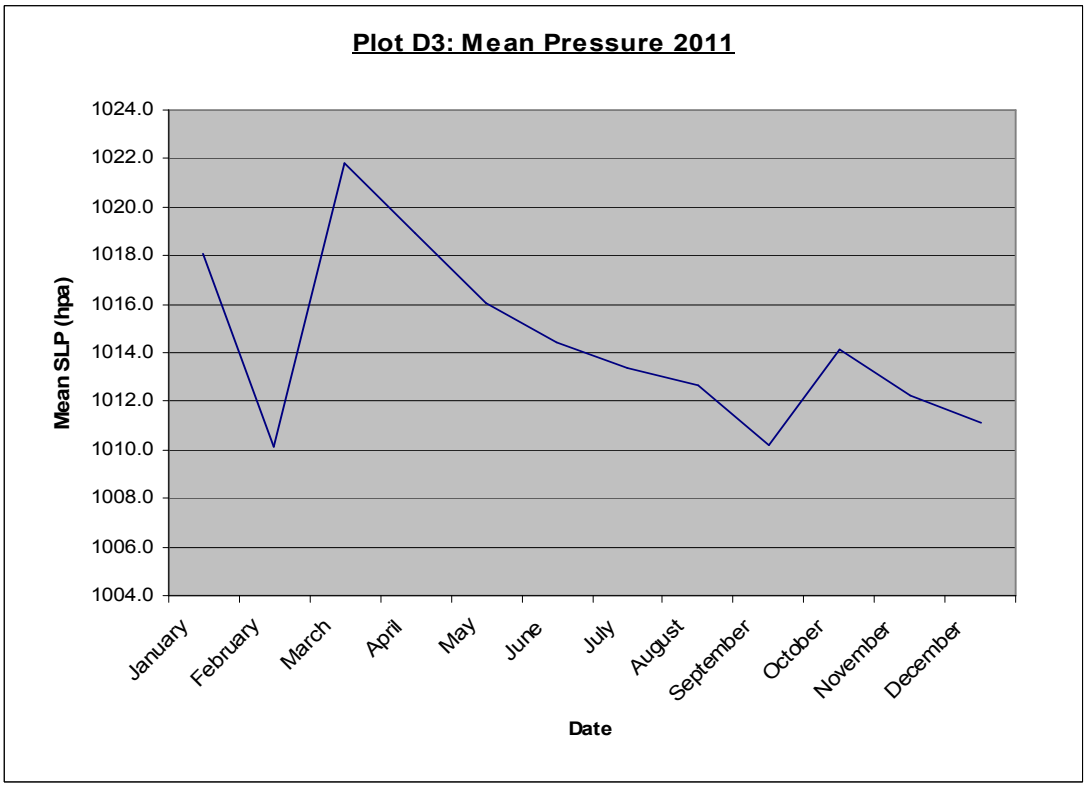
6) Measure and record liquid levels in structure at start of test and once every 24 hrs.

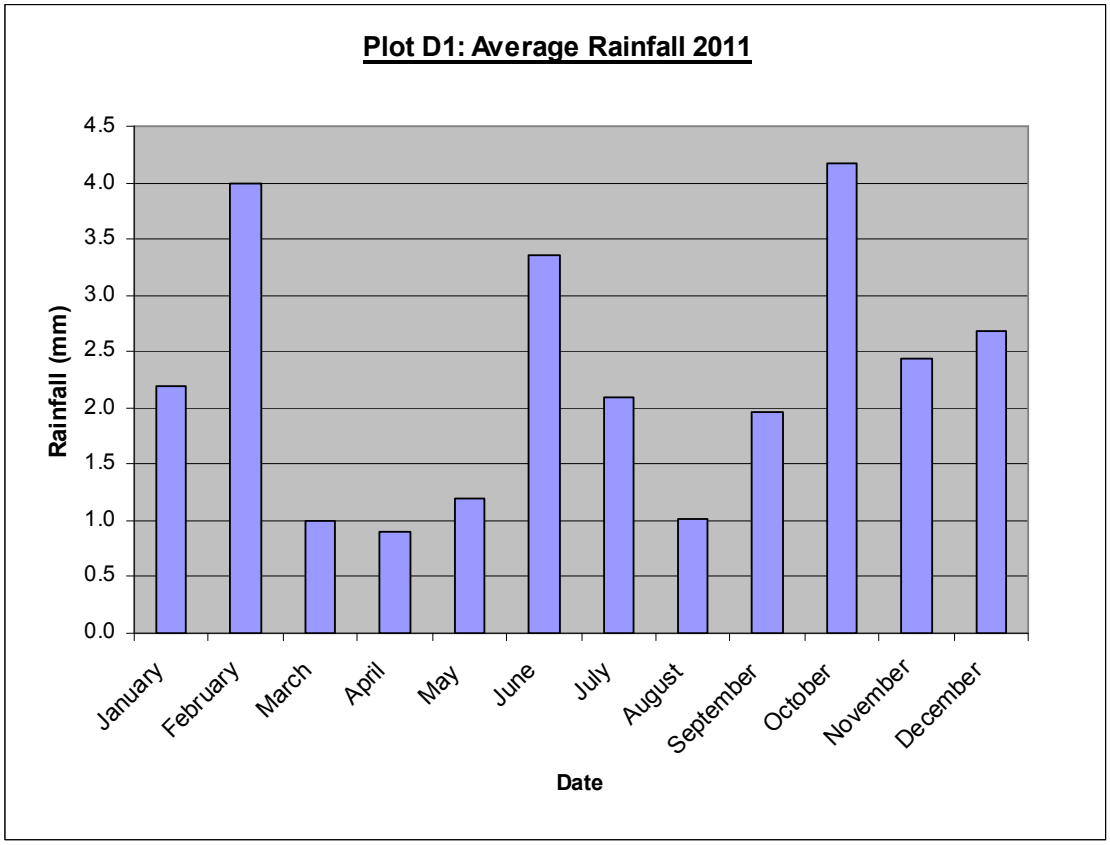
7) Check seepage to the external walls of the tank every 24 hrs.

8) At test end, pump out the structure and dispose of the liquid in accordance with legislation.

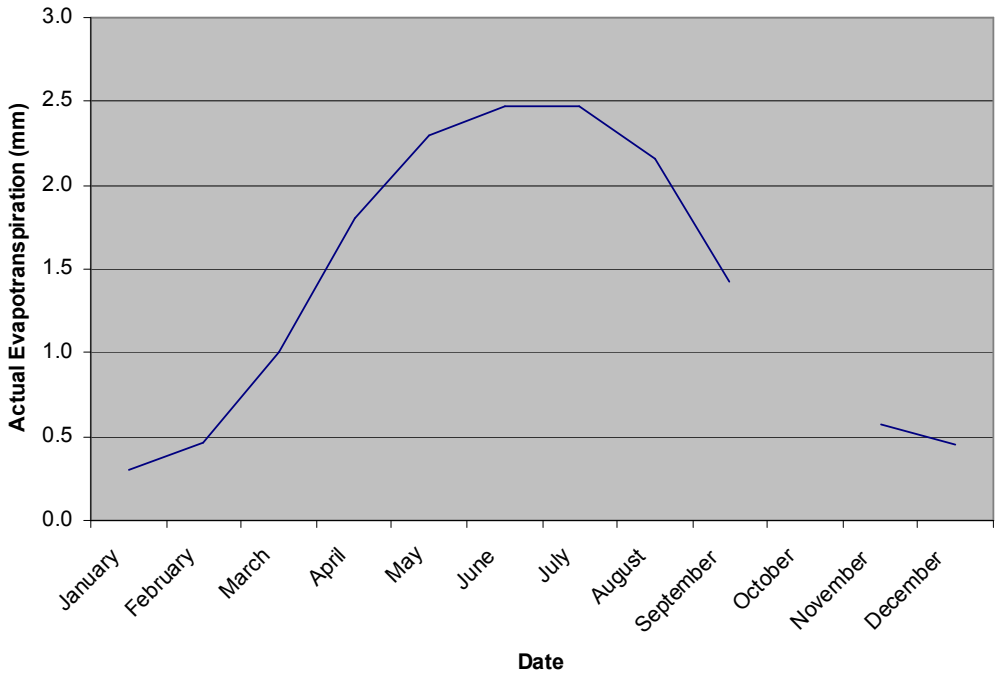
9) Determine the drop in water level in the structure over a 7 day period.


Plot D4: Mean Wind Speed 2011
Mean Wind Speed (Kts)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
January
February
March
April
May
June
July
August
September
October
November
December
Date


Plot D3: Mean Pressure 2011
Mean SLP (hpa)
1024.0
1022.0
1020.0
1018.0
1016.0
1014.0
1012.0
1010.0
1008.0
1006.0
1004.0
January
February
March
April
May
June
July
August
September
October
November
December
Date


Plot D1: Average Rainfall 2011
Rainfall (mm)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
January
February
March
April
May
June
July
August
September
October
November
December
Date

Plot D2: Predicted Evapotranspiration 2011



Plot D5: Mean Humidity 2011