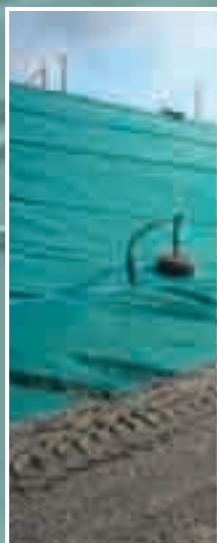
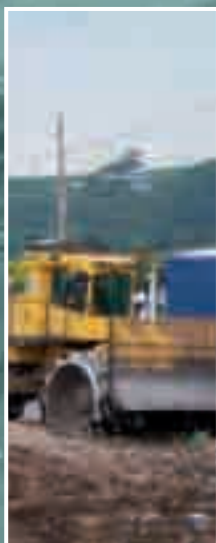


FOCUS ON LANDFILLING IN IRELAND

The Environmental Protection Agency



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Focus on Landfilling in Ireland

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KEY TERMS

Landfill Directive Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

The Landfill Directive classifies landfills by waste type as follows:

- Landfill for inert waste
- Landfill for non-hazardous waste
- Landfill for hazardous waste

However, for the purposes of this report it is more useful to group landfills under the following headings:

- **Municipal solid waste (MSW) landfills** MSW landfills accept predominately household and commercial waste, and lesser quantities of industrial waste. These landfills are limited to accepting non-hazardous waste (with some exceptions, see Chapter 5) and, therefore, are classified as landfills for non-hazardous waste under the Landfill Directive. MSW landfills were predominantly operated by local authorities in the past but private sector involvement has increased. MSW landfills are licensed under the Waste Management Act, 1996 (as amended).
- **Inert landfills** Stand-alone landfills for inert waste licensed under the Waste Management Act, 1996 (as amended) and operated on a commercial/merchant basis taking in inert waste from external sources.
- **Mono landfills** Landfills licensed under the Waste Management Act, 1996 (as amended) which accept single waste types from a single source.

- **Integrated pollution prevention and control (IPPC) landfills** Landfills associated with IPPC activities and licensed under the Environmental Protection Agency (EPA) Act, 1992 (as amended), e.g. landfills for ash from power plants. In terms of the Landfill Directive classifications, these include both landfills for inert waste and landfills for non-hazardous waste.
- **Illegal landfills** Landfills that operated illegally and are now subject to EPA waste licences for remediation/restoration.

Where a landfill is referred to as **open** in this document, it means the landfill is accepting or open to accepting waste for disposal during the time period in question.

Where a landfill is referred to as **closed**, it means the landfill has permanently ceased accepting waste for disposal. Landfills that are closed may still be accepting waste for recovery, e.g. construction and demolition waste for use in capping works.

Municipal waste means household waste as well as commercial and other waste which, because of its nature or composition, is similar to household waste.

Biodegradable waste means waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, paper and cardboard.

Biodegradable municipal waste (BMW) means the biodegradable component of municipal waste. BMW is typically composed of food and garden waste, wood, paper, cardboard and textiles.

EXECUTIVE SUMMARY

National and EU waste policy is based on the waste hierarchy whereby waste should be prevented and where this is not feasible, re-used, recycled or recovered. The least preferred option is disposal to landfill as it represents a loss of resources. The net effect of waste policy is to encourage a move towards a recycling and recovery society by diverting waste from landfill through promotion of prevention, recycling and recovery. The EPA publishes a comprehensive report each year on waste generation and management. This national waste report covers waste generated by households, commercial premises, industrial operators, as well as illustrating progress towards recovery and recycling targets. In 2000 Ireland landfilled approximately 90% of municipal waste arisings and while this has reduced to 62.5% in 2008, Ireland remains predominantly reliant on landfill in managing waste.

The 1999 Landfill Directive^a was a major milestone in the regulation of landfills in Europe as it specified the technical requirements for landfill design, operation and closure, and set deadlines for the diversion of biodegradable municipal waste from landfill. It was later supplemented by a Council Decision^b which specified the criteria for the acceptance of waste at landfills. Landfills in Ireland were brought under the regulatory control of the Environmental Protection Agency (EPA) with the introduction of the Environmental Protection Agency Act, 1992 and the Waste Management Act, 1996. Many landfills closed around this time while the remainder of operational landfills became licensed by the EPA.

This EPA report provides an assessment of the performance of landfills in Ireland against the requirements of the Landfill Directive and outlines the future challenges and issues for this sector.

a Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.

b Council Decision (2003/33/EC) of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.

Report findings

Number and types of landfill

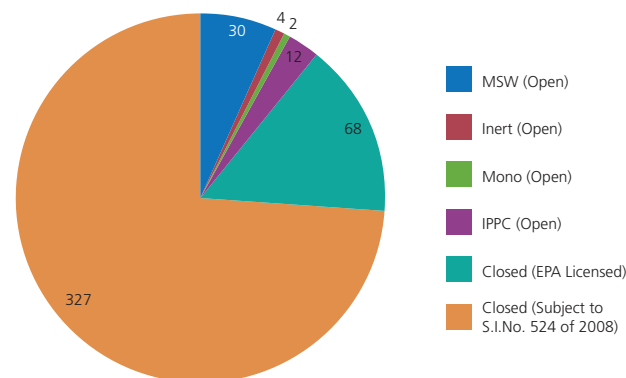
The number of open landfills decreased from over 200 in the mid-1980s to 48 in 2009. The 48 open landfills in 2009 consisted of 30 municipal solid waste (MSW), four inert, two mono landfills and the 12 landfills associated with integrated pollution prevention and control (IPPC) activities.

Consolidation in the MSW landfill sector is ongoing with 29 MSW landfills remaining open at the end of 2009 and more to close in the short-term. The remaining MSW landfill capacity at the end of 2008 was approximately 24 million tonnes and represents 12 years capacity, i.e. to 2020.

Private sector involvement in MSW landfilling has increased and accounts for approximately one third of the sector in terms of licensed capacity and waste landfilled.

Regulation of closed landfills has become an increasingly significant issue with 68 closed landfills covered by EPA licences. In addition, there are over 300 local authority landfills which closed before 1997 and require regulation under the 2008 Certification of Historic Unlicensed Waste Disposal and Recovery Activity Regulations^c.

Number of landfills by type in 2009



c Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008 [S.I. No. 524 of 2008].

Compliance assessment

The regulation of landfills by the EPA has resulted in significant improvement in landfill operational standards. By July 2009 (the latest date for compliance with Landfill Directive requirements), all open MSW landfills were landfilling in lined cells, collecting leachate, undertaking extensive environmental monitoring, operating a weighbridge and maintaining records of waste accepted. In addition, all open MSW landfills with the exception of one were flaring/utilising landfill gas.

Standards at open MSW landfills in 1995-1997 versus 2009

Indicator	1995-1997	2009
Number of open MSW landfills	95*	30
%		
Records kept of waste accepted	71**	100
Weighbridge operating	10**	100
Landfilling in lined cells	26***	100
Collecting leachate	33***	100
Using daily cover	30***	97****
Flaring/utilising landfill gas	15***	97****
Monitoring surface water	42*	100
Monitoring groundwater	19*	100
Monitoring leachate	29*	100
Monitoring landfill gas	7*	100

*Based on a survey of standards at 95 local authority MSW landfills in 1995 and 1996

**Based on a survey of standards at 87 local authority MSW landfills in 1995

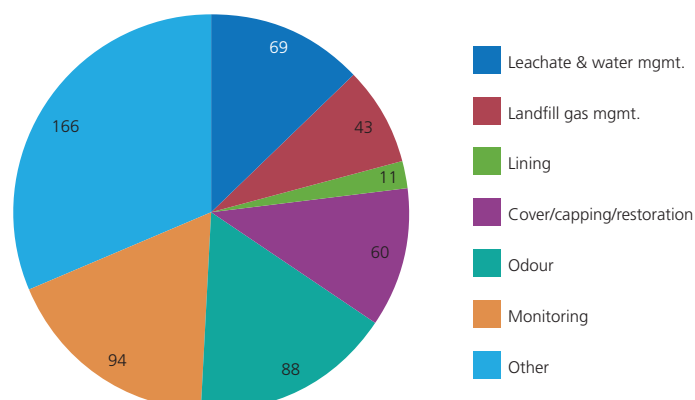
***Based on inspections of 27 local authority MSW landfills in 1997

****3% 'non-compliance' refers to one landfill

Compliance with legislation is assessed by the EPA through the completion of site inspections and audits and monitoring of both emissions and the quality of the environment. Where necessary to secure compliance, enforcement actions are taken which may include the issue of notices of non-compliance and prosecutions. In this regard:

- EPA inspectors conducted 434 audits and inspections and 147 monitoring visits to sample surface water, groundwater and leachate and 44 landfill gas monitoring visits in 2008/2009.
- The EPA took 15 successful prosecutions in relation to landfills during 2001 to 2009 and referred two cases for prosecution on indictment. Total fines and costs awarded by the courts amounted to €250,347.
- Despite the dramatic improvements in operational standards at landfills, the EPA issued 207 Notifications of Non-Compliance containing 531 individual non-compliances to MSW, inert and mono landfills in 2008/2009.

Non-compliances issued in relation to MSW, inert & mono landfills in 2008/2009



Outcomes

Regulation of landfills and enforcement of licence conditions and waste legislation, coupled with consolidation of the landfill sector has led to positive environmental outcomes. These outcomes include:

- In excess of 150 hectares of lining was installed in MSW landfills up to the end of 2008.
- Approximately 1.4 million cubic metres of MSW leachate was collected and treated in 2008 protecting ground and surface waters.
- Final capping was in place over approximately 61% of the area of open MSW landfills in 2008 with temporary capping in place over a further 30% of this area.
- There has been a significant increase in the use and flaring of landfill gas resulting in a reduction of 20% in greenhouse gas emissions from the landfill sector between 1990 and 2008.

Review of landfill licences

The EPA is currently completing a review of landfill licences to address the requirement under the Landfill Directive to reduce landfilling of biodegradable municipal waste (BMW) to 75%, 50% and 35% of 1995 levels by 16/07/2010, 16/07/2013 and 16/07/2016 respectively. Landfill of BMW in 2008 was found to be 280,000 tonnes over the 2010 Landfill Directive limit. The reviews are also addressing odour management issues identified as part of EPA audits. The EPA has completed reviews of 25 licences to-date.

Conclusions & future priorities

The EPA has identified seven priorities for the landfill sector. These are:

■ Diversion of BMW

Almost 1.2 million tonnes of BMW were landfilled in 2008. In line with EU Directive requirements this needs to reduce to 0.916 million tonnes in 2010, 0.610 million tonnes in 2013 and 0.427 million tonnes in 2016.

Increased diversion will require that landfill operators gain an understanding of and control the BMW content of waste accepted to landfill, the provision of capacity for treatment of BMW and priority enforcement by Regulators.

■ Landfill gas

Landfill gas is a source of greenhouse gas (methane) and poses other environmental risks if not managed properly. Landfill operators must ensure that landfill gas is collected and used to produce energy or flared and avoid causing harm or nuisance off-site. In this regard, there appears to be greater scope to use landfill gas to produce energy and operators should pursue this.

Landfill gas is also odorous and accounted for 71% of all complaints in relation to licensed facilities in 2009. Landfill operators should implement odour management plans to provide for comprehensive control of odour. The EPA has engaged in significant enforcement in relation to this issue and will continue to prioritise it.

■ Legacy landfills

There are over 300 local authority landfills that operated between 1977 and 1997 without specific authorisation. These landfills must now be controlled and managed under the Historic Unlicensed Waste Disposal and Recovery Activity Regulations to ensure there is no environmental impact.

■ Environmental liabilities & financial provision

Significant financial provision is required to fund future closure, restoration and aftercare costs at landfills which continue to pose an environmental risk after closure. This challenge becomes even greater against a backdrop of declining revenues at landfills in recent years. Landfill operators must ensure that plans and financial provision are in place for closure/aftercare.

■ Cover & capping

Cover and capping of landfilled waste are critical to the successful prevention of nuisance and control of landfill gas and leachate. Although cover was applied at all landfills in 2008, EPA surveys have found that it was applied correctly in only 50% of cases and operators need to address this in accordance with EPA guidance.

■ Leachate management

Landfill leachate poses an environmental risk to ground and surface water if not properly controlled. The licensing of urban wastewater treatment plants by the EPA may limit leachate treatment capacity at urban wastewater treatment plants and landfill operators need to be aware of and plan for this.

The EPA has observed reoccurring failures to maintain leachate levels less than the maximum 1m above the base of landfills and landfill operators must take measures to strictly comply with this requirement.

■ Waste acceptance

Robust waste acceptance procedures are required to ensure that waste is disposed of in the correct class of landfill (inert, non-hazardous or hazardous). Gypsum waste, for example, deposited with organic waste can break down into hydrogen sulphide gas, which is colourless, odorous, toxic and flammable. The waste sector needs to take measures to prevent disposal of gypsum waste with organic waste.

Significant measures are already in place to address some of the priorities identified above. Chapter 11 of this report sets out the overall actions necessary and those responsible for implementation. Future EPA reports will assess the progress or otherwise of implementing these actions and in addressing the priorities.

1. INTRODUCTION

1.1 Background

This report presents a review of landfilling in Ireland and documents the progress made since the Environmental Protection Agency (EPA) began regulating landfills in the mid-1990s. Its scope includes landfills licensed by the EPA under both the waste and integrated pollution prevention and control (IPPC) licensing systems and legacy landfills which under recent legislation will come under the regulation of the EPA.

The focus of this report is on compliance with the Landfill Directive¹ and the minimum standards for landfilling it imposes on EU Member States. The Landfill Directive came into effect on 16/07/2001 and all landfills were required to comply with its general technical requirements by 16/07/2009 at the latest. In addition, the first Landfill Directive target for diversion of biodegradable municipal waste applies from 16/07/2010 for Ireland.

This report is based on information provided by landfill operators in their Annual Environmental Reports (AERs) to the EPA, in responses to questionnaires and on the experience of the EPA in licensing and enforcing landfills over the past 15 years. It covers all environmental aspects of landfilling including: waste acceptance; infrastructure; monitoring; financial provision; and closure and aftercare.

1.2 Legal and regulatory framework

The 1975 Waste Framework Directive² required EU Member States to establish a permitting system for the recovery or disposal of waste. This was implemented in Ireland by the European Communities (Waste) Regulations, 1979 but was restricted to private sector waste activities which were required to obtain a permit from the Local Authorities. This remained the situation until the Environmental Protection Agency Act, 1992 established the EPA. In 1994, the EPA commenced integrated pollution control (IPC) licensing and any

landfills associated with IPC activities became regulated by an IPC licence, e.g. landfills for disposal of ash from power plants. The Waste Management Act, 1996 introduced licensing by the EPA of stand-alone landfills from 1997 onwards. From that point, all landfills required an EPA licence. The EPA Act also required the EPA to specify criteria for landfill sites and these were published as follows:

- 1995–Investigations for landfills³
- 1995 updated 2003–Landfill monitoring^{4,5}
- 1997–Landfill operational practices⁶
- 1999–Landfill restoration and aftercare⁷
- 2000–Landfill site design⁸

The Landfill Directive¹ was the next major development in landfill regulation at EU level; it was published on the 16/07/1999 and Member States were required to bring it into force by 16/07/2001. Its overall objective is to prevent or reduce any negative effects on the environment or human health that are associated with the landfilling of waste. It specifies technical requirements for landfill design, operation and closure and sets deadlines for the diversion of biodegradable municipal waste from landfill. It was supplemented by Council Decision 2003/33/EC⁹ which specifies detailed criteria for acceptance of waste at landfill.⁹ The Landfill Directive and Council Decision are implemented in Ireland by the Waste Management (Licensing) Regulations, 2004.

There have been a number of other recent legislative developments that are important to the regulation of landfills:

- The Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009 [S.I. No. 566 of 2009] transpose the requirements

of the Extractive Waste Directive¹⁰ in Ireland. Waste that falls under this legislation (e.g. mine tailings waste) is not subject to the Landfill Directive.

- The Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008 provide for the regulation of local authority landfills that operated without specific authorisation between 15/07/1977 and 27/03/1997.
- The European Communities (Environmental Liability) Regulations, 2008 transpose the Environmental Liability Directive¹¹ in Ireland and cover environmental liability in relation to the prevention and remedying of environmental damage.

Further detail on the legal and regulatory framework is provided in Appendix 1.



Figure 1.1
Waste disposal at landfill in 2009

2. OVERVIEW OF LANDFILLING IN IRELAND

2.1 Number & types of landfill

There has been a dramatic change in landfilling in Ireland over the last 25 years and in particular since licensing of landfills commenced in mid-1990s. The number of open landfills has decreased from over 200 in the mid-1980s to 48 in 2009 (Figure 2.1). While this trend was evident before 1997, the introduction of Environmental Protection Agency (EPA) waste licensing in 1997 and the associated requirement for higher standards of design and operation made the operation of many landfills, especially smaller scale landfills, unfeasible. Approximately 45 local authority landfills closed around the time the EPA waste licensing regime came into force. In addition, a number which applied to the EPA for licences were licensed for closure and aftercare only, e.g. Belturbet Landfill and Bailieborough Landfill. Regulation of closed landfills has become an increasingly significant issue. The number of closed landfills covered

by EPA licences or requiring regulation under the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008 [S.I. No. 524 of 2008] is approximately 10 times the number of open landfills (Figure 2.2).

Figure 2.2
Number of landfills by type in 2009

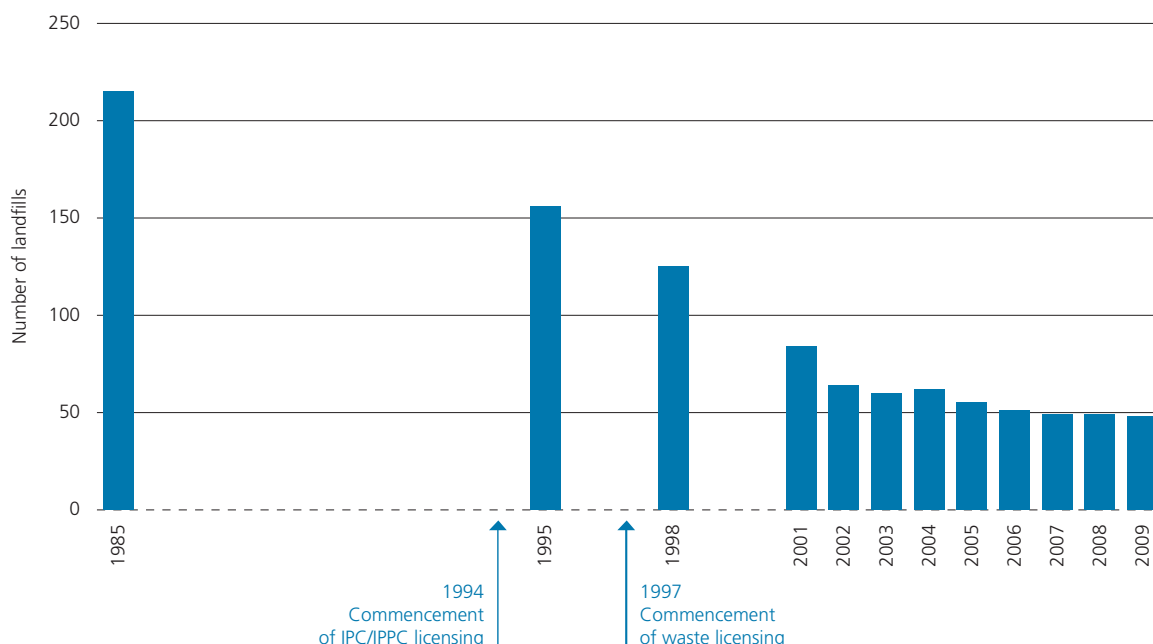
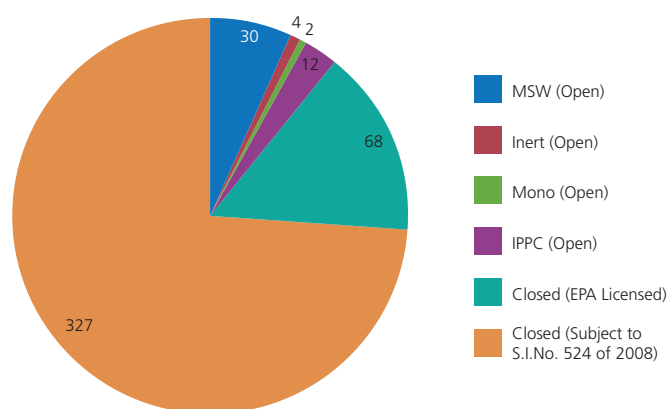


Figure 2.1
Numbers of open landfills – 1985 to 2009 (Based on information from an An Foras Forbartha 1985 national waste database report¹², an EPA survey of local authority landfills in Ireland from 1995-1997¹³, the EPA national waste database reports for the years 1995¹⁴, 1998¹⁵ and 2001 to 2008¹⁶⁻²³ and from information gathered from landfill operators in 2009 for the purposes of this report.)

Open landfills

Ireland remains very reliant on landfill for the disposal of municipal waste as is evident from the rate of landfill of municipal waste in 2008 (62.5%)²³ which is well above the EU average (42% in 2007).²⁴ There were 30 municipal solid waste (MSW) landfills open during 2009 (Cork City Council, Kinsale Road Landfill closed in mid-2009 leaving 29 open MSW landfills at the end of 2009). This reduction in the number of MSW landfills and the consolidation of the sector into fewer predominantly large-scale landfills mirrors experience in other European Member States²⁴ and is also consistent with government policy to reduce the number of MSW landfills to 20.²⁵ Although the number of private MSW landfills open in 2009 (6) was small relative to the number of local authority MSW landfills (24), the private MSW landfills account for approximately one third of the sector in terms of licensed capacity and waste landfilled.

There were four open inert landfills in Ireland in 2009. These provide for disposal of mainly construction and demolition wastes. However, the majority of this waste stream is recovered at landfills (e.g. used in capping or other engineering works at MSW landfills) or local authority permitted sites. Of the 13.5 million tonnes of C&D waste reported in 2008, only 0.22 million tonnes (2%) was reported as being disposed of at inert landfill.²³ The other types of landfills in Ireland are mono landfills (2 open in 2009) and integrated pollution prevention and control (IPPC) landfills (12 open in 2009). One of the IPPC landfills (Gypsum Industries Limited) closed in mid-2009.

Figure 2.3 lists and shows the location of open landfills in Ireland in 2009 with further information given in Appendix 2.

EPA licensed closed landfills

Figure 2.4 lists and shows the location of closed landfills covered by EPA licences in 2009 with further information given in Appendix 2. It should be noted that a number of these landfills were closed before the EPA waste licensing system but came into the waste licensing system because other waste licensable activities (e.g. waste transfer stations) were located at these sites. The number of closed landfills covered by

EPA licences represents only part of the closed landfill 'sector'. Other categories of closed landfills include:

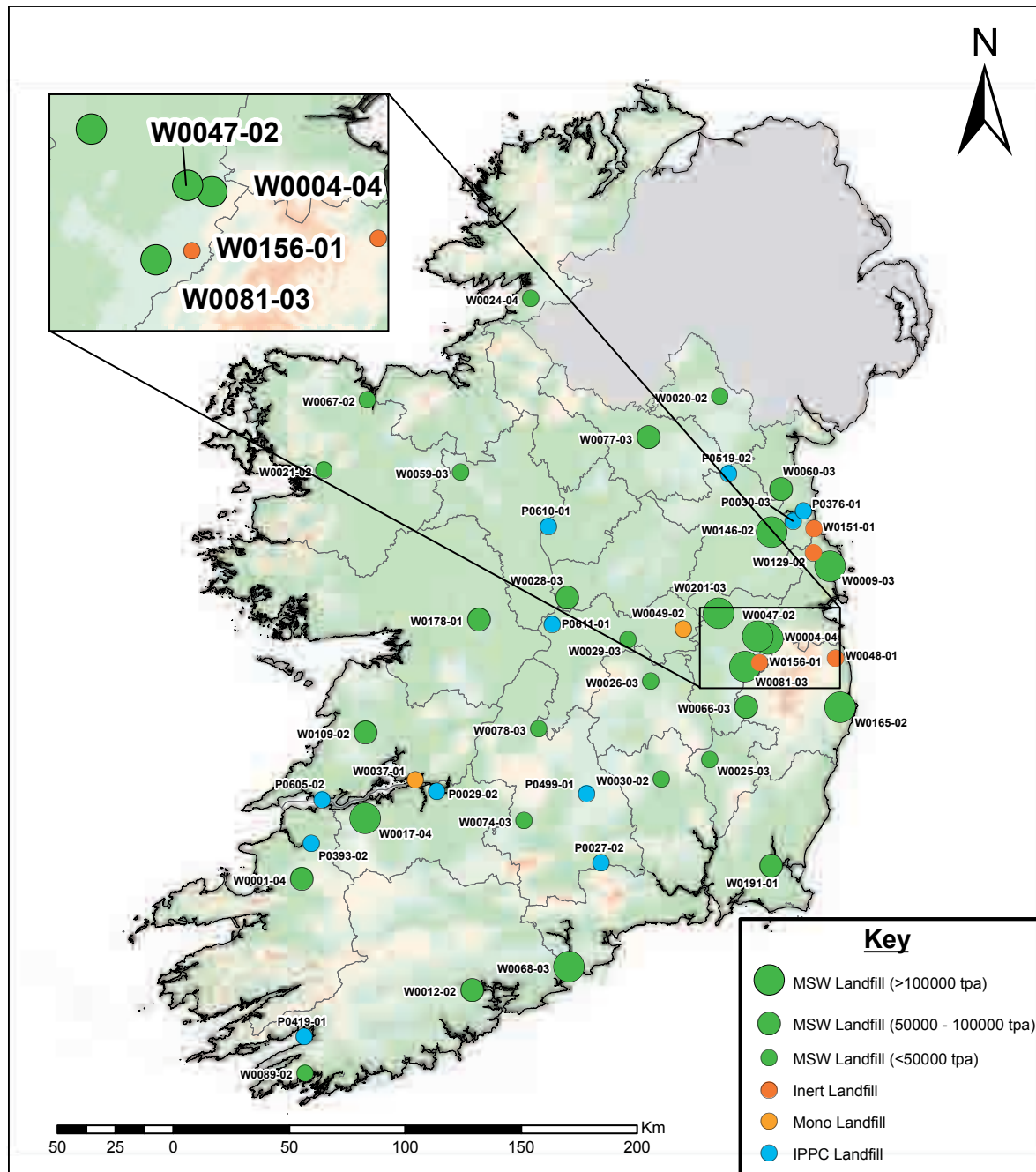
- Closed landfills falling under the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008 [S.I. No. 524 of 2008] (see Section 2.3 and Figure 2.2); and
- Landfills that closed prior to the European Communities (Waste) Regulations, 1979 and private landfills that operated solely under the European Communities (Waste) Regulations, 1979 (these latter two categories are not covered by this report).

An integrated pollution control (IPC) licence for the initial melting or production of iron or steel was granted by the EPA to Irish Ispat Limited on the 02/06/2001. The licence contained conditions dealing with a large-scale on-site landfill. The company went into liquidation and the Liquidator applied to the High Court to disclaim the licence as onerous property. The application was successful and responsibility for the site reverted to the State. An environmental risk assessment has been completed for the landfill. An Office of Public Works working group established by the Government is considering options for the future use of the site, the determination of which will inform the extent and nature of the remediation required.

In addition, the EPA has licensed the remediation/restoration of three illegal landfills in County Wicklow. These licences require the segregation of inert wastes from other wastes. Non-inert waste is required to be sent off-site to waste facilities agreed with the EPA and inert waste is to be used for on-site restoration works. The relevant sites are:

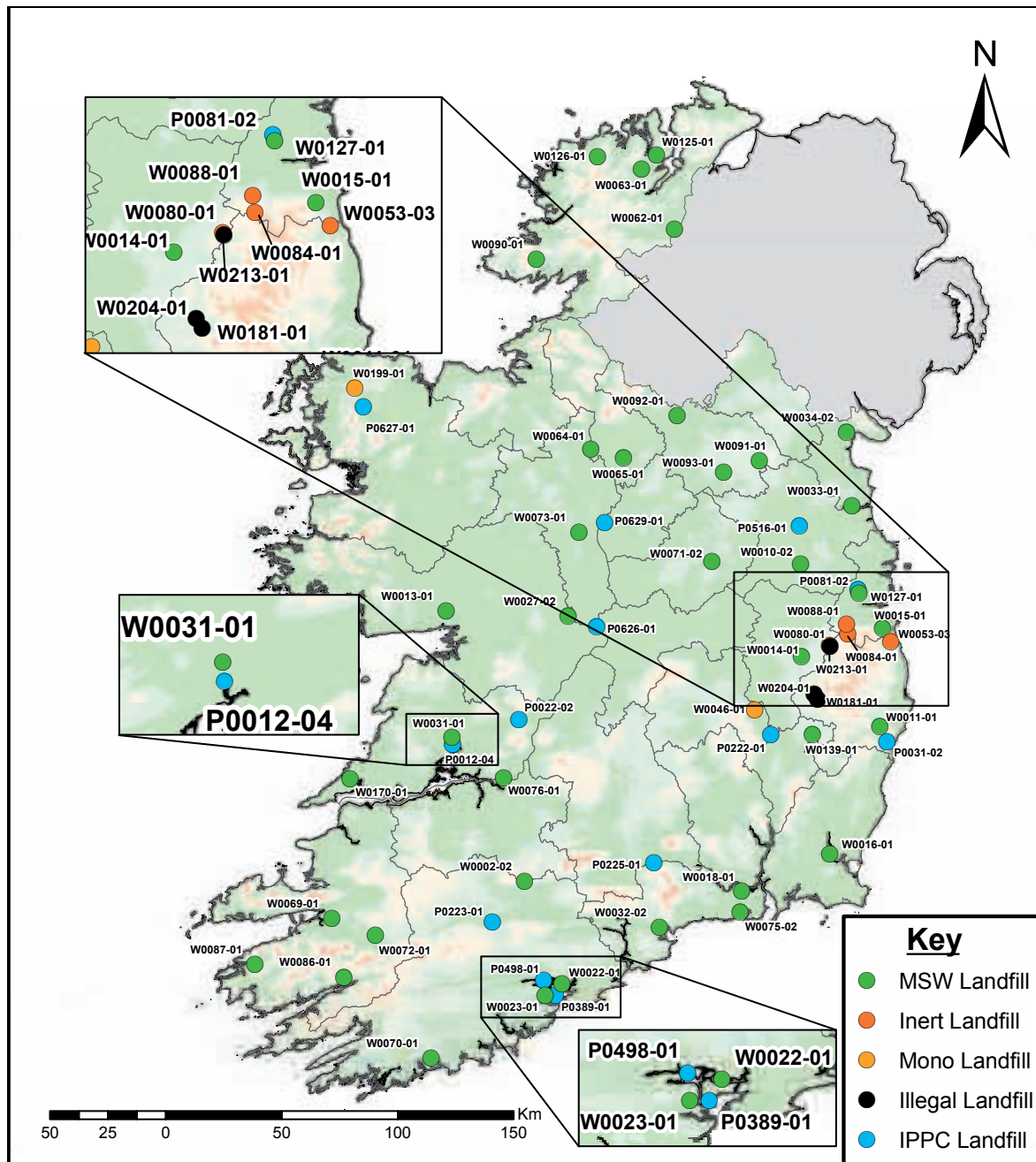
- Swalcliffe Ltd (Licence No: W0181-01)
- Brownfield Restoration Ireland Ltd (Licence No: W0204-01)
- Roadstone Dublin Remediation Landfill (Licence No: W0213-01)

Two of these sites (Swalcliffe Ltd and Roadstone Dublin Remediation Landfill) have been remediated. The other site (Brownfield Restoration Ireland Ltd) is the subject of a High Court case.



Licence Reg. No.	Name of Facility	Licence Reg. No.	Name of Facility	Licence Reg. No.	Name of Facility
P0027-02	Medite Europe Limited	W0021-02	Derrinnumera Landfill Facility	W0077-03	Corranure Landfill
P0029-02	Irish Cement Limited (Limerick)	W0024-04	Ballynacarrick Landfill Site	W0078-03	Ballaghveny Landfill
P0030-03	Irish Cement Limited (Drogeda)	W0025-03	Powerstown Landfill Site	W0081-03	KTK Landfill Limited
P0376-01	Premier Periclase Limited	W0026-03	Kyletalesha Landfill	W0089-02	Derryconnell Landfill
P0393-02	Kerry Ingredients (Ireland) Limited	W0028-03	Ballydonagh Landfill	W0109-02	Central Waste Management Facility
P0419-01	Conoco Philips Bantry Bay Terminals Limited	W0029-03	Derryclure Landfill	W0129-02	Murphy Environmental Hollywood Limited
P0499-01	Bord na Móna Fuels Limited, Littleton	W0030-02	Dunmore Landfill	W0146-02	Knockharley Landfill
P0519-02	Gypsum Industries Limited*	W0037-01	Tradaree Point E.T.P.	W0151-01	Murphy Concrete Manufacturing Ltd
P0605-02	Electricity Supply Board (Moneypoint)**	W0047-02	Kerdiffstown	W0156-01	KTK Sand & Gravel Ltd
P0610-01	Electricity Supply Board (Lough Ree Power)	W0048-01	Kilmurry South	W0165-02	Ballynagran Residual Landfill
P0611-01	Electricity Supply Board (West Offaly Power)	W0049-02	Clonbulloge Ash Repository	W0178-02	East Galway Residual Landfill Site
W0001-04	North Kerry Landfill	W0059-03	Ballaghaderreen Landfill	W0191-02	Holmestown Waste Management Facility
W0004-04	Arthurstown Landfill	W0060-03	Whiteriver Landfill Site	W0201-03	Drehid Waste Management Facility
W0009-03	Balleally Landfill	W0066-03	Rampere Landfill		
W0012-02	Kinsale Road Landfill*	W0067-02	Rathroeen Landfill		
W0017-04	Gortadroma Landfill Site	W0068-03	Youghal Landfill		
W0020-02	Scotch Corner Landfill	W0074-03	Donohill Landfill		

Figure 2.3 Open landfills in 2009 (See Appendix 2 for further details).



Licence Reg. No.	Name of Facility	Licence Reg. No.	Name of Facility	Licence Reg. No.	Name of Facility
P0012-04	Roche Ireland Limited	W0022-01	East Cork Landfill Site	W0084-01	Aghfarrell
P0022-02	Finsa Forest Products Limited	W0023-01	Raffeen Landfill Site	W0086-01	Kenmare Transfer Station
P0031-02	Holfield Plastics Ltd*	W0027-02	Pollboy Landfill Facility	W0087-01	Cahirciveen Transfer Station
P0081-02	Irish Asphalt Limited	W0031-01	Doora Landfill Site	W0088-01	Corbally
P0222-01	Irish Sugar plc (Carlow)**	W0032-02	Dungarvan Waste Disposal Site	W0090-01	Balbane Landfill Site
P0223-01	Irish Sugar plc (Cork)***	W0033-01	Drogheda Landfill Site	W0091-01	Bailieborough Landfill
P0225-01	John Ronan & Sons	W0034-02	Dundalk Landfill & Civic Waste Facility	W0092-01	Belturbet Landfill
P0389-01	Thornbrush Holdings Limited	W0046-01	Ballylinan Landfill Site	W0093-01	Ballyjamesduff Landfill
P0498-01	Irish Ispat Limited	W0053-03	Greenstar Limited	W0125-01	Glenalla Landfill Site
P0516-01	Tara Mines Limited	W0062-01	Churchtown Landfill	W0126-01	Muckish Landfill Site
P0626-01	Electricity Supply Board (Shannonbridge)	W0063-01	Drumabodan Landfill Site	W0127-01	Dunsink Landfill
P0627-01	Electricity Supply Board (Bellacorick)	W0064-01	Carrick-on-Shannon Landfill	W0139-01	Haroldstown Transfer Station
P0629-01	Electricity Supply Board (Lanesborough)	W0065-01	Mohill Landfill	W0170-01	Lisdeen Recycling Centre & Transfer Station
W0002-02	Ballyguyroe Landfill Site	W0069-01	Milltown Transfer Station	W0181-01	Swalcliffe Ltd
W0010-02	Basketstown Landfill Facility	W0070-01	Benduff Landfill Site	W0199-01	Srahmore Peat Deposition Site
W0011-01	Ballymurtagh Landfill Facility	W0071-02	Marlinstown Landfill	W0204-01	Brownfield Restoration Ireland Limited
W0013-01	Carrowbrowne Landfill Site	W0072-01	Coolcaslagh Transfer Station	W0213-01	Roadstone Dublin Remediation Landfill
W0014-01	Silliot Hill Landfill	W0073-01	Roscommon Landfill Facility		
W0015-01	Ballyogan Landfill Facility & Recycling park	W0075-02	Tramore Waste Disposal Site		*There are four closed landfills on this site
W0016-02	Killurin Landfill Site	W0076-01	Longpavement		**There are two closed landfills on this site
W0018-01	Kilbary Landfill Site	W0080-01	Dillonsdown		***There are six closed landfills on this site

Figure 2.4 EPA licensed closed landfills in 2009 (See Appendix 2 for further details).

Future trends

The number of open landfills is expected to decline further in the short-term due to the closure of existing landfills that are near capacity and the lack of new projects coming on-line. In the MSW landfill sector, the rate of application for licences has slowed considerably, particularly in relation to new developments. The licence recently granted to Fingal County Council for the proposed landfill at Nevitt, Lusk, Co. Dublin was the first licence for a new MSW landfill granted by the EPA since 2006. The remaining fully consented MSW landfill capacity (i.e. with waste licence and planning permission in place) was approximately 24 million tonnes nationally at the end of 2008.²³ If disposal to MSW landfill continues at the 2008 rate of approximately 2 million tonnes per annum, there is approximately 12 years MSW landfill capacity remaining, i.e. to 2020. The diversion of biodegradable municipal waste (BMW) from landfill and other potential changes in how waste is managed are likely to reduce the demand for MSW landfill. The future of inert, mono and IPPC landfilling is difficult to predict. The last inert, mono and IPPC landfill licences were granted in 2003, 2004 and 2004 respectively and there are two inert landfill applications currently with the EPA.

2.2 Environmental standards & enforcement

Table 2.1 summarises the change in environmental standards at MSW landfills since the commencement of EPA licensing and shows that the licensing of landfills and the associated implementation of EPA standards and EU legislation has resulted in a dramatic improvement in standards overall.

Surveys of standards at MSW landfills in 1995-1996 found that environmental monitoring was carried out at 7% to 42% depending on the environmental medium (surface water, groundwater, leachate or landfill gas), records of waste accepted were kept at 71% and a weighbridge was operated at only 10% of landfills.^{13,14}

Inspections of 27 MSW landfills in 1997 found that 26% were landfilling in lined cells, 33% were collecting leachate and 15% were flaring/utilising landfill gas.¹³ By 16th July 2009 (the latest date for compliance with Landfill Directive requirements), all open MSW landfills were landfilling in lined cells, collecting leachate, undertaking extensive environmental monitoring, operating a weighbridge and maintaining records of waste accepted. In addition, all open MSW landfills, except one, were flaring/utilising landfill gas.

Table 2.1

Comparison of standards pertaining at open MSW landfills in 1995-1997 versus 2009

Indicator	1995-1997	2009
Number of open MSW landfills	95*	30
%		
Records kept of waste accepted	71**	100
Weighbridge operating	10**	100
Landfilling in lined cells	26***	100
Collecting leachate	33***	100
Using daily cover	30***	97****
Flaring/utilising landfill gas	15***	97****
Monitoring surface water	42*	100
Monitoring groundwater	19*	100
Monitoring leachate	29*	100
Monitoring landfill gas	7*	100

*Based on a survey of standards at 95 local authority MSW landfills in 1995 and 1996¹³

**Based on a survey of standards at 87 local authority MSW landfills in 1995¹⁴

***Based on inspections of 27 local authority MSW landfills in 1997¹³

****3% 'non-compliance' refers to one landfill



Figure 2.5
Poor environmental management at MSW landfill in 1997

Similar baseline information is not available on which to assess changing standards at inert, mono and IPPC landfills. However, as with MSW landfills, these landfills are now subject to much stricter standards than would have applied historically. For example, ash landfills were historically unlined, however, any new ash landfills licensed by the EPA (of which there are four since 2000) are required to be lined.

The EPA enforces landfill licences through audit, inspection, monitoring and assessment of reports submitted by landfill operators. EPA inspectors conducted 333 audits and inspections of MSW, inert and mono landfills in 2008/2009. In addition, EPA Regional Laboratory personnel carried out 120 monitoring visits



Figure 2.6
Good environmental management at MSW landfill in 2008

to sample surface water, groundwater and leachate and 44 landfill gas monitoring visits. The EPA also deployed site agents to investigate odour issues at landfills and commissioned external experts to conduct 54 landfill gas management and surface emissions assessments at landfills in 2008/2009. There were 47 audits and inspections and 27 water monitoring visits to IPPC sites with landfills in 2008/2009. The EPA took 15 successful prosecutions in relation to landfills during 2001 to 2009 and referred two cases to the Director of Public Prosecutions (DPP) which were successfully prosecuted on indictment (Table 2.2). These resulted in total fines and costs of €250,347 being imposed by the courts. The EPA submitted a further three cases to the DPP in 2009.

Table 2.2
Prosecutions relating to landfills 2001 to 2009

Licensee	Landfill	Year	Fines	Costs
South Dublin Co. Co.	Arthurstown Landfill	2009	€600	€9,850
Greenstar Recycling Holdings Ltd	East Galway Residual Landfill	2009	€3,500	€47,145
Roscommon Co. Co.	Ballaghaderreen Landfill	2008	€5,000	€8,300
Cavan Co. Co.	Corranure Landfill	2007	€4,500	€21,500
Ballinasloe Town Council	Pollboy Landfill Facility	2006	€1,750	€10,104
Waterford City Council*	Kilbarry Landfill Site	2006	€6,000	€10,801
Waterford Co. Co.*	Tramore Waste Disposal Site	2006	€4,000	€12,719
Cavan Co. Co.	Corranure Landfill	2005	€1,900	€6,008
Monaghan Co. Co.	Scotch Corner Landfill	2005	€1,600	€7,142
Offaly Co. Co.	Derryclure Landfill	2005	€2,500	€5,293
Roscommon Co. Co.	Ballaghaderreen Landfill	2005	€2,250	€7,296
Limerick City Council	Longpavement	2005	€3,000	€3,152
Dundalk Town Council	Dundalk Landfill	2004	€4,800	€4,596
Murphy Concrete Manufacturing	Murphy Concrete Manufacturing	2003	€1,200	€11,326
Dun Laoghaire-Rathdown Co. Co.	Ballyogan Landfill Facility	2002	€3,200	€9,457
Donegal Co. Co.	Muckish Landfill	2002	€2,000	€9,565
Fingal Co. Co.	Balleally Landfill	2001	€4,444	€13,849
Total			€52,244	€198,103

*Prosecution on indictment.

Despite the dramatic improvements in environmental standards at landfills as detailed above, the EPA is still detecting non-compliances through its enforcement activities. The EPA issued 207 Notifications of Non-Compliance containing 531 individual non-compliances to MSW, inert and mono landfills in 2008/2009. The

breakdown in terms of non-compliance type is shown in Figure 2.7 and further analysis is provided in the relevant chapters. Similar analysis is not possible for IPPC landfills due to the difficulties in isolating non-compliances relating to IPPC landfills from non-compliances relating to the principal IPPC activities on such sites.

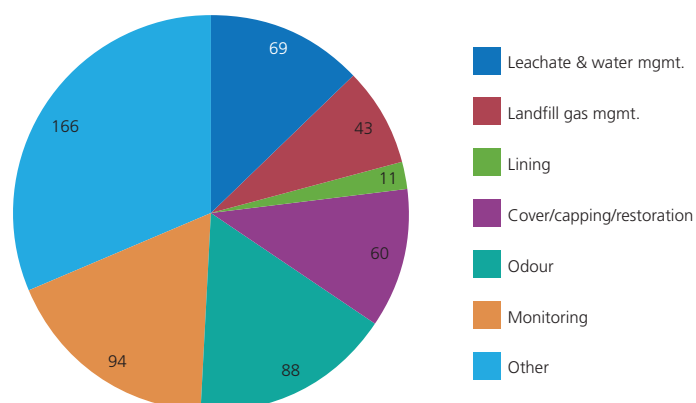


Figure 2.7
Non-compliances issued in relation to MSW, inert & mono landfills in 2008/2009

2.3 Legacy landfills

The Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008 [S.I. No. 524 of 2008] require local authorities to complete the following in relation to local authority landfills that operated without a waste licence between 15/07/1977 and 27/03/1997 (referred to as 'closed landfills'):

- identify all closed landfills by 30/06/2009
- maintain a register of closed landfills
- carry out a risk assessment of closed landfills under an EPA Code of Practice²⁶
- apply to the EPA for a certificate of authorisation for closed landfills

The EPA developed an electronic register of closed landfills that can be accessed by local authorities via the internet. There were 327 sites that fall under the Certification of Historic Unlicensed Waste Disposal and Recovery Activity Regulations entered in the register at the end of 2009 (Table 2.3). The website also assists

users in completing Tier 1 of the risk assessment which consists of desk-based studies and a site walkover. The boundary of the site is entered in a Geographic Information System (GIS) tool that automatically generates a risk classification for the site (Figure 2.8) using information regarding the local environment contained in the GIS, e.g. details of surface water features, groundwater vulnerability and proximity to protected areas and human presence. The information must be validated using site-specific information gathered during a site walkover survey. This risk classification facilitates the scoping and prioritising of Tier 2 of the risk assessment which consists of more detailed on-site intrusive investigations such as monitoring of waste, emissions, surface water and groundwater. The Department of the Environment, Heritage and Local Government (DEHLG) is funding a pilot project on environmental risk assessment of historic landfills involving 17 sites (15 local authorities). Exploratory investigations at these sites were completed at the end of 2009 and main site investigations were being commenced. The EPA is providing assistance by developing decision matrices to ensure site investigations are carried out to the standards required under the Code of Practice.

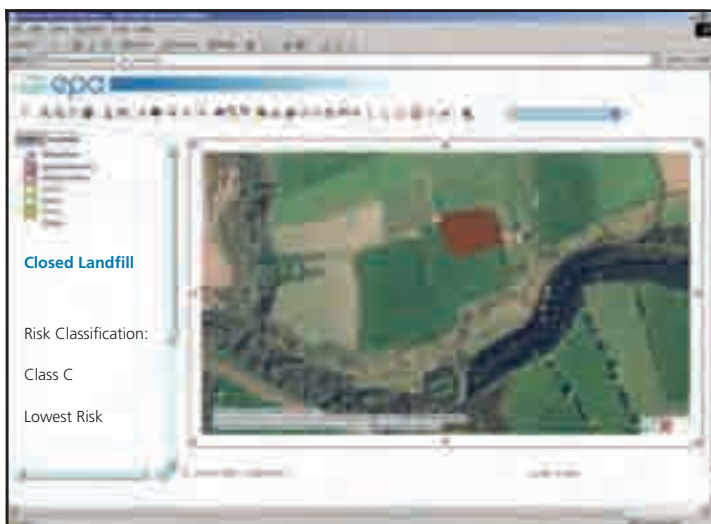


Figure 2.8
Electronic register and risk classification for closed landfill

Table 2.3
Sites entered in the closed sites register (S.I. No. 524 of 2008) at the end of 2009

Local authority	No. sites	Local authority	No. sites	Local authority	No. sites
Carlow Co. Co.	1	Kildare Co. Co.	19	Offaly Co. Co.	5
Cavan Co. Co.	14	Kilkenny Co. Co.	12	Roscommon Co. Co.	4
Clare Co. Co.	8	Laois Co. Co.	15	Sligo Co. Co.	2
Cork Ci. Co.	5	Leitrim Co. Co.	6	South Dublin Co. Co.	6
Cork Co. Co.	50	Limerick Ci. Co.	1	South Tipp Co. Co.	9
Donegal Co. Co.	24	Limerick Co. Co.	20	Waterford Ci. Co.	3
Dublin Ci. Co.	0	Longford Co. Co.	9	Waterford Co. Co.	2
DLR Co. Co.	0	Louth Co. Co.	4	Westmeath Co. Co.	13
Fingal Co. Co.	4	Mayo Co. Co.	5	Wexford Co. Co.	13
Galway Ci. Co.	1	Meath Co. Co.	7	Wicklow Co. Co.	10
Galway Co. Co.	22	Monaghan Co. Co.	5		
Kerry Co. Co.	13	North Tipp Co. Co.	15		

3. Landfill conditioning plans

Landfill Directive

Article 14 required that existing landfills (i.e. those already operational or licensed on 16/07/2001) be closed unless the following steps were completed by 16/01/2001:

- The operators were required to submit a landfill conditioning plan by 16/07/2002 which would detail any corrective measures necessary to comply with the Landfill Directive; and
- The competent authority (EPA) would decide on the basis of the landfill conditioning plan whether the site could continue to operate and, if so, authorise and specify a period by which the necessary measures would be taken to comply with the Landfill Directive no later than 16/07/2009; or
- The landfill would be required to close in accordance with Articles 7(g) and 13 of the Landfill Directive.

3.1 Introduction

In order to implement Article 14 of the Landfill Directive, the Environmental Protection Agency (EPA) developed landfill conditioning plan guidance and a template for landfill operators and held a workshop for landfill operators in 2002 in relation to the preparation of landfill conditioning plans. The landfill conditioning plans were submitted by the operators and assessed in conjunction with any other relevant information (licences, monitoring results, etc.) by the EPA to check compliance with the Landfill Directive. The outcome of the assessment in relation to the various landfill types is detailed below. It should be noted that many of the standards which came to be specified in the Landfill Directive when it came into force in 2001 were already being specified by the EPA in licences issued before that time. Any issues identified by the landfill conditioning plan assessment process are being addressed through licence reviews to specify any measures necessary to reinforce compliance with the Landfill Directive.

3.2 MSW landfills

Fifty municipal solid waste (MSW) landfills were operational on 16/07/2001 and were subject to the landfill conditioning plan requirement. Twenty-four of these continued to operate after 16/07/2009 which is the final deadline for compliance with the Landfill

Directive. While the vast majority of the requirements of the Landfill Directive were provided for in the licences for these landfills, the licences are being reinforced where necessary to:

- Give effect to the Landfill Directive requirements to divert BMW and treat waste before landfill.
- Upgrade landfill gas management and odour control conditions.
- Require the setting of groundwater trigger levels.
- Make certain waste acceptance procedures more explicit, e.g. the checking of waste and documentation at the entrance, waste testing requirements, notification of reject loads, provision of receipts for waste accepted and the ban on disposal of gypsum waste in cells taking biodegradable waste.

The other 26 MSW landfills which were subject to the landfill conditioning plan requirement closed by the 16/07/2009 deadline and, following assessment, the licences for these landfills were found to be satisfactory and provide for closure and aftercare in accordance with the Landfill Directive.

3.3 Inert, mono & IPPC landfills

Twelve of the open inert, mono and integrated pollution prevention and control (IPPC) landfills were operational on 16/07/2001 and were subject to the landfill conditioning plan requirement. Seven of these landfills do not have a liner installed (Table 3.1). The Landfill Directive does allow departure from the lining standards specified therein where justifiable based on environmental risk and this issue is being further assessed as part of the licence review process referred to above.

Table 3.1
Unlined inert and IPPC landfills

Landfill	Waste type
Kilmurry South [Marrakesh Limited]	Inert
Electricity Supply Board (Moneypoint)	Coal ash
Kerry Ingredients (Ireland) Limited	Coal ash
Premier Periclase Limited	Lime dust, spent refractories and grits
Irish Cement Ltd [Drogheda]	Inert
Bord na Mona Fuels Limited [Littleton]	Peat ash, peat
Conoco Philips	Inert

The inert and mono landfills are for the most part compliant with the Landfill Directive. Amendments to licences are being undertaken to make waste acceptance procedures more explicit and require the setting of groundwater trigger levels. The IPPC landfill licences also require such amendments and amendments to address some or all of the following issues depending on the landfill:

- Landfill classification
- Waste testing
- Monitoring
- Site security
- Landfill stability

The EPA also assessed the landfill conditioning plans and licences for inert and IPPC landfills which were subject to the landfill conditioning plan requirement but which have closed. The licences for these landfills were found to be satisfactory and provide for closure and aftercare in accordance with the Landfill Directive.



Figure 3.1
IPPC landfill

4. Treatment of waste and diversion of BMW

Landfill Directive

Article 5 requires that Member States establish a national strategy to reduce the amount of BMW going to landfills as follows:

- To 75% of the total amount of BMW generated in 1995 by 16/07/2006
- To 50% of 1995 levels by 16/07/2009
- To 35% of 1995 levels by 16/07/2016

Member States which landfilled more than 80% of their MSW in 1995 were allowed a derogation of up to four years. Ireland availed of this for the first two targets which have been deferred to 16/07/2010 and 16/07/2013 respectively and intends to review whether a derogation is necessary in relation to the 2016 target.²⁷

Article 6(a) specifies that Member States shall take measures in order that:...

...only waste that has been subject to treatment is landfilled. This provision may not apply to inert waste for which treatment is not technically feasible, nor to any other waste for which such treatment does not contribute to the objectives of this Directive, as set out in Article 1, by reducing the quantity of the waste or the hazards to human health or the environment...

4.1 Introduction

Treatment of waste prior to landfill and diversion of biodegradable municipal waste (BMW) from landfill are two key elements of EU waste policy. Many waste streams that can be recovered are ending up in landfill representing an inefficient use of resources. Landfilling of BMW results in high emissions of methane which is a significant greenhouse gas (with a global warming potential 21 times that of carbon dioxide²⁸) and a potential source of odour nuisance. The EU Landfill Directive requires measures to be taken to reduce the landfill of BMW and encourages the separate collection of BMW and the sorting, recovery and recycling of this waste. Articles 5 and 6 of the Landfill Directive set out Member State obligations in relation to the diversion of BMW from landfill and treatment of waste prior to acceptance at landfill. These two separate, yet parallel, issues are dealt with in the following sections.

4.2 Treatment of waste

Sometimes known as 'pre-treatment', treatment includes but is not limited to the following processes²⁹:

- Source separation (e.g. home composting)
- Separate collections (e.g. 2 or 3 bin systems)
- Manual Sorting
- Composting
- Energy recovery
- Rendering
- Mechanical treatment of waste (e.g. crushing, tromelling, magnetic separation etc)
- Biological stabilisation of residues from mechanical treatment
- Thermal treatment
- Aerobic/anaerobic digestion

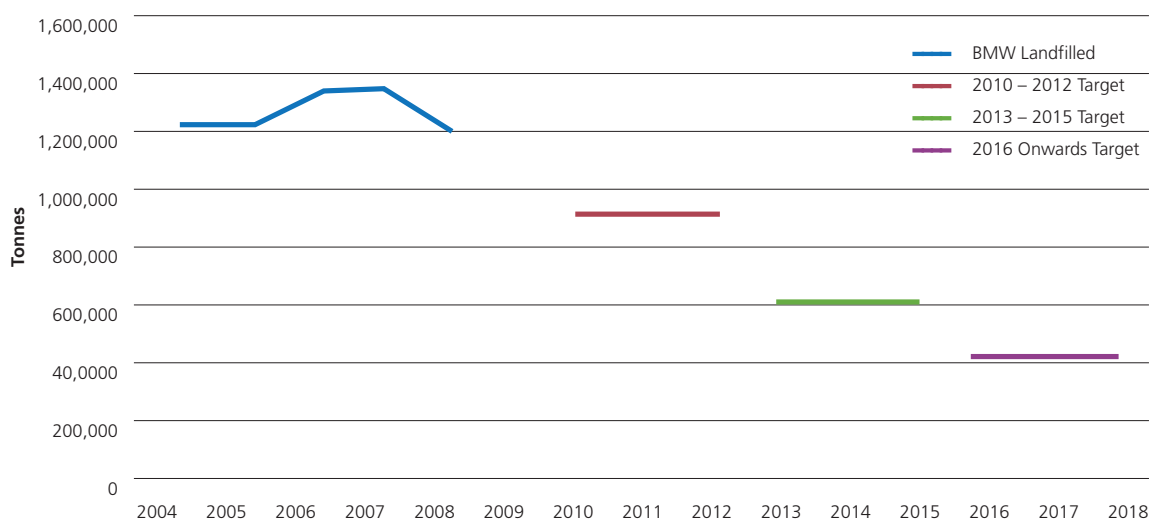
4.3 Diversion of BMW

The percentage limits for diversion of BMW specified in the Landfill Directive are shown in actual waste quantities in Table 4.1 and Figure 4.1. The distance-to-target or ‘gap’ between the 2008 rate of landfill of BMW (1,196,044 tonnes) versus the 2010 Landfill Directive limit (916,000 tonnes) is 280,000 tonnes. The Environmental Protection Agency (EPA) funded ISus model predicts further reductions in municipal waste generation, which has been declining since 2007, until 2011/2012 which will assist in meeting the Landfill Directive target for 2010.²³ However, assuming an economic recovery in 2011 and beyond, the ISus model predicts that the volume of municipal waste will increase by 3 to 4% per annum which will increase the challenge in meeting the 2013 and 2016 targets for diversion of BMW from landfill.²³

Table 4.1
BMW baseline, quantities landfilled, Landfill Directive % limits and converted to tonnage limits²³

BMW generation – 1995 baseline		
1995		Quantity generated (tonnes)
		1,220,840
BMW landfilled – current position		
		Quantity landfilled (tonnes)
2004		1,218,159
2005		1,221,483
2006		1,324,700
2007		1,342,646
2008		1,196,044
BMW Landfill Directive obligations		
	Landfill Directive obligations	Maximum quantity allowed to be landfilled (tonnes)
2010	75% of quantity generated in 1995	916,000
2013	50% of quantity generated in 1995	610,000
2016	35% of quantity generated in 1995	427,000

Figure 4.1
BMW landfilled versus Landfill Directive % limits converted to tonnage limits²³



In 2008, the EPA published *Hitting the Targets for Biodegradable Municipal Waste: Ten Options for Change*. It proposed ten possible public policy interventions to encourage changes in management practices for biodegradable wastes.³⁰

In 2009, the EPA published *Municipal Solid Waste – Pre-Treatment & Residuals Management*.²⁹ This document set-out the EPA position in relation to the Landfill Directive treatment and BMW diversion requirements and the EPA plan to review waste licences for operational landfills accepting municipal waste. It set out what waste treatment obligations will apply at landfill facilities and indicated that diversion of BMW will have to be demonstrated by individual landfill facilities. The EPA proposed that the Landfill Directive obligations for diversion of BMW be translated into a maximum BMW content allowed in MSW disposed of to individual landfills. Based on latest waste data, it is considered necessary to limit the amount of BMW accepted at landfills to 47% of MSW in order to meet the 2010 Landfill Directive target.³¹ The EPA has also specified a stabilisation standard for waste:

‘stabilisation’ means the reduction of the decomposition properties of biowaste to such an extent that offensive odours are minimised and that the Respiration Activity after four days (AT₄) is <10mg O₂/g DM (until 1-1-2015), and <7mg O₂/g DM thereafter.

Waste which is stabilised in accordance with the above standard will not be considered BMW when determining the quantity of BMW disposed of to landfill.

4.4 Implementation of waste treatment & BMW diversion

The EPA has developed a waste characterisation protocol for calculating BMW content in municipal waste consigned for disposal at landfill. The protocol was issued for public consultation on 25/11/2009³²:

<http://www.epa.ie/downloads/advice/waste/municipalwaste/name,27244,en.html>

The EPA also commenced a sampling/analysis campaign in December 2009 which is characterising the outputs to landfill from pre-treatment facilities in order to identify the BMW content in these waste streams. This work is ongoing in 2010 with 25 pre-treatment facilities visited by end of April 2010.

The EPA held a landfill conference in October 2009 focusing on the diversion of BMW. Presentations by EPA speakers are available as video broadcasts on the EPA website:

<http://www.epa.ie/downloads/videos/wasteworkshop/#d.en.28003>

Review of landfill licences to implement waste treatment and diversion of BMW requirements commenced in June 2009 focusing on open MSW landfills that were predicted to remain open after the 2010 deadline for diversion of BMW. Twenty-five of these MSW landfill licences were reviewed and issued by end of March 2010. Enforcement of these requirements will present a major challenge and will require significant work in the development of guidance for operators and the implementation of additional waste characterisation and recording. Full participation of all stakeholders in the waste sector will be required to meet the Landfill Directive targets.

The Waste Management (Food Waste) Regulations, 2009 came into operation on 01/01/2010 with the main provisions having effect from 01/07/2010. The Regulations are designed to promote the segregation and recovery of food waste arising in the commercial sector to facilitate the achievement of the targets set out in the Landfill Directive for the diversion of BMW from landfill to composting and other forms of authorised treatment. The Regulations impose obligations on the major sources of food waste, such as State buildings where food is prepared, restaurants and cafés, hot

food outlets, canteens, hotels and larger guest houses, supermarkets and other food retailers, to segregate these materials and make them available for separate collection. Alternatively, these materials can be treated on the premises where they arise under specified conditions.

The Minister for Environment, Heritage and Local Government issued Circular WPRR 17/08 to all City and County Managers in July 2008.³³ The circular letter requested local authorities to accelerate the roll-out of “brown bin” source-segregated collection systems for organic waste in order to drive the diversion of BMW from landfill. Annual Implementation Reports are required and the circular points to the need to ensure that the Waste Management Plans are used to implement biowaste measures.

In addition to the above, there are a number of priority actions identified in the 2008 National Waste Report that are necessary for improvements in BMW management in Ireland.²³ These are:

- Continue to promote food waste prevention through the National Waste Prevention Programme
- Put in place services for the separate collection of organic (particularly food) waste at household and commercial premises
- Ensure there is adequate infrastructure to treat the very large quantities of organic (particularly food) waste that must be diverted from landfill
- Develop outlets for the products of such treatment
- Make regulations/bye-laws that can be used to enforce the segregation and separate collection of food waste at household and commercial premises
- Deliver new waste policy on foot of the *International Review of Waste Management Policy in Ireland* as quickly as possible to provide certainty and to allow for accelerated investment programmes that are necessary if organic waste is to be treated and landfill avoided

Future National Waste reports will track how Ireland meets these challenges and the Landfill Directive targets.



Figure 4.2
Overview of Waste Transfer Station



Figure 4.3
Treatment of waste – separation of cardboard and metal



Figure 4.4
Compost facility for treatment of waste

5. Waste Acceptance

Landfill Directive

Article 5(3) bans the following wastes from landfill:

- Liquid waste
- Waste which is explosive, corrosive, oxidising, highly flammable or flammable in the conditions of a landfill
- Hospital and other clinical wastes which are infectious
- Whole used tyres and shredded tyres (excluding tyres used as engineering material, bicycle tyres and tyres with an outside diameter above 1,400mm)

Article 6(b),(c) & (d) specify that:

- Landfills for non-hazardous waste can only be used for:
 - municipal waste
 - non-hazardous waste which fulfils the waste acceptance criteria
 - stable, non-reactive hazardous waste (in separate cells to biodegradable non-hazardous waste)
- Landfills for inert waste can only be used for inert waste

Article 11 requires that landfill waste acceptance procedures must include the following:

- Demonstration by means of documentation that the waste can be accepted
- Checking of waste documentation
- Visual inspection of the waste at the entrance and point of deposit
- The keeping of samples and sample results
- The keeping of a register of the wastes deposited
- Provision of written receipt of each delivery
- The notification to the competent authority of non-acceptance of waste

Annex II specifies general principles and procedures for characterisation and acceptance of waste at each class of landfill: inert, non-hazardous and hazardous.

Council Decision 2003/33/EC

Council Decision 2003/33/EC expands on Annex II of the Landfill Directive and its requirements include:

- Basic characterisation and compliance testing except for:
 - Certain inert waste streams for disposal in inert landfill (e.g. concrete, bricks)
 - Municipal waste for disposal in non-hazardous landfill
- Compliance with the limit values specified for the various classes of landfill
- Testing by independent and qualified persons in accordance with European Committee for Standardisation (CEN) standards or national standards
- Restrictions on disposal of non-hazardous gypsum-based materials and construction materials containing asbestos

5.1 Introduction

The Landfill Directive classifies landfills as inert, non-hazardous or hazardous and specifies technical requirements accordingly.¹ For example, the lining systems required for non-hazardous landfills are of a much higher specification as compared to inert landfills and are of a higher specification again for hazardous landfills. It is therefore important that proper waste acceptance procedures are in place to ensure that waste is disposed of in the correct class of landfill. Controls are also necessary to ensure waste is correctly characterised, inspected and documented.

5.2 Pre-EPA licensing

Prior to EPA licensing, waste acceptance procedures at landfills were poor. An EPA survey of local authority operated municipal solid waste (MSW) landfills in 1995 found that 10% had a weighbridge and 71% kept records of the quantity and type of waste accepted.¹⁴

5.3 Implementation of waste acceptance requirements

Licence requirements

Environmental Protection Agency (EPA) licences for MSW landfills require waste characterisation and acceptance procedures. The following are explicit requirements:

- The categories (e.g. household, commercial) and quantities of waste that can be accepted
- The prohibitions regarding hazardous waste, liquid waste and waste tyres
- The operation of a weighbridge, waste inspection area and waste quarantine area
- The inspection of waste and associated documentation

- The maintenance of records of waste accepted and rejected

Detailed testing requirements are agreed through the waste acceptance procedures conditioned in each licence. MSW licences are currently under review by the EPA. The reviewed licences will bring greater clarity in relation to waste acceptance. For example, the requirement to check waste at the entrance (as well as at the working face), check waste documentation and the ban on gypsum waste will be made explicit in the reviewed MSW licences.

Inert landfills are limited to the acceptance of inert waste and detailed acceptance criteria are specified in Council Decision 2003/33/EC. The mono and integrated pollution prevention and control (IPPC) landfills only accept a very limited number of waste types from single activities usually located on the same site. The majority are for ash from power plants. Waste acceptance criteria are specified accordingly.

Enforcement

The EPA enforces waste acceptance requirements during the audits and inspections conducted by its inspectors and through the auditing of waste records maintained at the landfills and submitted to the EPA in Annual Environmental Reports. The EPA also cross checks records held at facilities consigning waste to landfill. The EPA issued 20 non-compliances relating to waste acceptance in 2008/2009. Common issues identified were:

- Failure to inspect waste adequately at the working face
- Acceptance of unsuitable waste types
- Acceptance of waste outside of authorised hours

The EPA facilitated visits by the European Commission to three MSW landfills in early 2009 to examine waste acceptance procedures. This was part of a wider European Commission survey of waste acceptance across the EU. The final report³⁴ is available on the EU website:

http://ec.europa.eu/environment/waste/landfill_index.htm

5.4 Specific waste acceptance issues

Gypsum waste

Gypsum waste co-disposed with organic waste can break down into hydrogen sulphide (H₂S) gas, which is colourless, toxic and flammable and can lead to odour nuisance. Council Decision 2003/33/EC prohibits the disposal of non-hazardous gypsum-based materials in landfills for non-hazardous waste unless in cells where no biodegradable waste is accepted.⁹ This essentially amounts to a ban on the landfilling of gypsum waste in Ireland at present as none of the MSW landfills has a separate cell for gypsum waste and disposal to inert landfill is not acceptable. Recycling facilities for gypsum waste are available in Ireland. In 2007/2008, the EPA issued a circular letter to EPA licensed waste operators informing them of these legal requirements and advising that gypsum wastes should be segregated from other construction and demolition (C&D) waste and sent to authorised gypsum recycling facilities. The EPA also wrote to local authority waste regulators to ensure compliance at local authority regulated sites and asked the Construction Industry Federation (CIF) and the National Construction and Demolition Waste Council (NCDWC) to bring the matter to the attention of the C&D sector. In 2009, the EPA piloted a test method for measuring gypsum content in C&D fines at two EPA licensed transfer stations. As a result, one of the sites was required to examine its waste handling procedures to ensure effective gypsum waste separation. Enforcement in this area will continue. Compliance with the gypsum ban was raised at a meeting of the EU Landfill Directive Committee*

* Committee for the Adaptation to Scientific and Technical Progress - Directive 1999/33/EC on the Landfill of Waste

on 13/11/2009 and the European Commission are to follow-up further in relation to this issue.

Asbestos

The Landfill Directive permits the landfill of stabilised non-reactive hazardous waste in non-hazardous landfill in separate cells to biodegradable waste.¹ Council Decision 2003/33/EC expands on this in relation to construction material containing asbestos (EWC 17 06 05*) and other suitable asbestos waste which are allowed to be landfilled in separate cells in non-hazardous landfills subject to a strict set of criteria.⁹ These include: the asbestos must be covered daily, no works can be carried out that could release fibres (e.g. drilling of holes), the location of the cell must be recorded, after use must be limited to avoid human contact, etc..

There is currently no non-hazardous landfill in Ireland with a separate cell for asbestos waste. Nor is there a general hazardous waste landfill. The National Hazardous Waste Management Plan 2008-2012 raised concerns that the resultant export costs associated with disposal of asbestos encourages illegal disposal and identified a required landfill capacity of 20,000 tonnes per annum for asbestos waste.³⁵ The Plan recommends that at least one national hazardous waste landfill be developed in Ireland with a capacity of at least 15,000 tonnes per annum for asbestos and that at least one non-hazardous landfill be authorised to accept 5,000 tonnes per annum of asbestos (in a separate cell as provided for under the Landfill Directive). A reviewed waste licence was granted in respect of Greenstar Holdings Limited, East Galway Residual Landfill Site, on 23/03/2010 which provides for the landfilling in a separate cell of 3,000 tonnes per annum of asbestos.

Hazardous waste landfill capacity

The deficiency in landfill capacity for hazardous waste has been raised in successive National Hazardous Waste Management Plans^{35,36} In addition to the requirements for landfill capacity for asbestos waste (see above), the 2008-2012 plan identifies a required hazardous

landfill capacity of 10,000 tonnes per annum for other hazardous wastes such as industrial waste and contaminated soil and recommends that this be provided at a national hazardous waste landfill.³⁵ The Plan recommends that the EPA commission a study to clarify the technical and economic aspects of providing hazardous waste landfill capacity. This study was completed in June 2010.

Waste acceptance matters to be decided by Member States under Council Decision 2003/33/EC

While Council Decision 2003/33/EC is a relatively explicit and detailed technical document, a number of matters are to be decided by Member States.⁹ The EPA has approached these issues on a case-by-case as they arise.

A significant issue left to Member States was to specify the limit value for polycyclic aromatic hydrocarbons (PAHs) in waste accepted for disposal in landfills for inert waste. The EPA currently specifies a limit of 100mg/kg for a suite of 17 PAHs.³⁷ In addition, in the absence of limits for disposal to general non-hazardous landfill, the EPA specifies that the levels of PAH must be such that they (in combination with any other contaminants present) do not render the waste hazardous.

The EPA has also specified the procedure that must be followed in relation to application of higher limit values (Council Decision 2003/33/EC allows limit values to be exceeded by up to three times in certain circumstances) and requires that the landfill operator:

- Make an application in writing to the EPA
- Detail the reasons for the application
- Provide a risk assessment of the impact of the waste in question

The EPA will only authorise the application of higher limit values on a case-by-case basis, where there is good reason and emissions will present no additional environmental risk.

Finally, Council Decision 2003/33/EC specifies limit values for granular waste but not for monolithic waste.⁹ Member States were to set criteria for monolithic waste to provide the same level of environmental protection as the limit values for granular waste. Ireland has not specified specific criteria for monolithic waste. This issue was addressed at a meeting of the EU Landfill Directive Committee on 13/11/2009 where it was recognised that this is a very complex area and there is variance in how it is being implemented across the EU Member States. The Committee has now established a sub-Committee to develop criteria for monolithic waste at EU level.

5.5 Guidance & standards

The correct classification of waste and the identification of whether it is hazardous or not is a prerequisite to decide whether it is acceptable for disposal in a particular class of landfill. The following guidance can be used to determine same:

European Waste Catalogue and Hazardous Waste List – Valid From 1 January 2002³⁸

Procedure for the Identification of the Hazardous Components of Waste & Hazardous Waste Classification Worksheet³⁹

The EPA intends to develop further guidance in relation to waste acceptance in 2010.

Finalised European Committee for Standardization (CEN) documents relating to the sampling and testing of waste are available through the National Standards Authority of Ireland (NSAI):

<http://www.nsa.ie/>

Details of draft European Standards can be found on the CEN website:

<http://www.cen.eu/cenorm/homepage.htm>



Figure 5.1
Landfill entrance including weighbridge

6. Landfill lining & leachate management

Landfill Directive

Annex I requires that:

... Protection of soil, groundwater and surface water is to be achieved by the combination of a geological barrier and a bottom liner...

The landfill base and sides shall consist of a mineral layer...at least equivalent to...the following:

- Landfill for hazardous waste: permeability $\leq 1 \times 10^{-9}$ m/s; thickness ≥ 5 m
- Landfill for non-hazardous waste: permeability $\leq 1 \times 10^{-9}$ m/s; thickness ≥ 1 m
- Landfill for inert waste: permeability $\leq 1 \times 10^{-7}$ m/s; thickness ≥ 1 m

Where the geological barrier does not naturally meet the above conditions it can be completed artificially... giving equivalent protection. An artificially established geological barrier should be no less than 0.5 metres thick.

In addition to the geological barrier described above a leachate collection and sealing system must be added for hazardous and non-hazardous landfills as follows:

- Artificial sealing liner
- Drainage layer ≥ 0.5 m

If, on the basis of an assessment of environmental risks...the competent authority has decided...that collection and treatment of leachate is not necessary or it has been established that the landfill poses no potential hazard to soil, groundwater or surface water, the above requirements...may be reduced accordingly.

Appropriate measures shall be taken...to:

- control water from precipitations entering into the landfill body
- prevent surface water and/or groundwater from entering into the landfilled waste
- collect contaminated water and leachate [if an assessment...shows that the landfill poses no potential hazard to the environment, the competent authority may decide that this provision does not apply]
- treat contaminated water and leachate collected from the landfill to the appropriate standard required for their discharge

The above provisions may not apply to landfills for inert waste.

6.1 Introduction

Municipal solid waste (MSW) landfill leachate typically contains elevated levels of, amongst other things, biochemical oxygen demand, ammonia, chloride, heavy metals and organic pollutants and poses a significant risk to ground and surface waters if not properly controlled. The lining system for a landfill provides a barrier which contains leachate and prevents it impacting on the environment. Leachate is required to be collected and treated to an appropriate standard for discharge.

6.2 Pre-EPA licensing

Environmental Protection Agency (EPA) inspections of 27 MSW landfills in 1997 found that only 26% had engineered liners and 33% were collecting leachate.¹³ There was no on-site treatment and the collected leachate was either tankered or discharged via sewer to municipal urban wastewater treatment plants. Evidence of leachate discharges to surface waters, leachate contamination or leachate seepages were found at 67% of the landfills and build up of leachate or contaminated surface water in bunds, ditches, ponds, drains or cut-off channels at 52%.

6.3 Implementation of lining & leachate management requirements

Licence requirements

EPA licence requirements for landfill lining are generally the same as those specified in the Landfill Directive. In the case of MSW landfills, the EPA specifies the drainage layer in more detail and requires a geotextile protection layer. Reduced specifications have been allowed at a limited number of integrated pollution prevention and control (IPPC) landfills in particular following risk assessments as provided for in the Landfill Directive. For example, a liner consisting of a

geo-synthetic clay liner (GCL) overlain by a synthetic drainage layer was agreed for three ash landfills (Clonbulloge Ash Repository, ESB Lough Ree and ESB West Offaly). Also, a liner consisting of a conditioned mix of Flue Gas Desulphurisation (FGD) waste, coal ash and cement placed in compacted raises to 1 metre such that permeability does not exceed 1×10^{-9} m/s was agreed for the ESB Moneypoint Flue Gas Desulphurisation (FGD) waste landfill. In addition, as detailed in Chapter 3, the absence of liners at seven of the older (inert and IPPC) landfills is being reassessed as part of a licence review process.

Requirements with respect to leachate management are much more explicit in EPA MSW landfill licences than in the Landfill Directive and include the following where relevant:

- Provision and maintenance of leachate management infrastructure
- Enclosure of leachate storage/treatment structures
- Leachate levels not to exceed a level of 1.0 metre over the top of the liner
- A minimum freeboard of 0.5 metres be maintained in the final leachate holding structure
- Recirculation of leachate only be undertaken with EPA agreement
- EPA approved agreements required for off-site removal and treatment
- Compliance with limit values for discharges of treated leachate to surface waters
- Monitoring of leachate levels and quality

EPA MSW landfill licences also contain specific conditions regarding installation of capping (see Chapter 7) which is an important factor in limiting the generation of leachate in the first instance. In addition, both lining and leachate management systems are specified engineering works under EPA MSW landfill licences and accordingly are subject to the satisfactory completion of the following before the EPA will agree to the use of any new landfill cell:

- detailed proposals must be submitted for prior EPA agreement
- works must be supervised by a qualified person who is present at all times
- construction quality assurance must be carried out and reported to the EPA

Leachate collection and treatment is not required at inert landfills due to the nature of the wastes, as allowed for under the Landfill Directive. Both mono landfills collect leachate. Leachate from Tradaree Point E.T.P. is pumped back to the Tradaree Point wastewater treatment plant. Leachate from Clonbulloge Ash Repository is permitted to be discharged to surface water when sufficient dilutions are available—pH adjustment is required before discharge and the emission limit values are specified for pH, suspended solids and toxicity.

Leachate is collected at some of the IPPC landfills (e.g. Gypsum Industries Limited), however, leachate is not collected at the majority. While this is not an issue for the IPPC landfills that landfill inert waste, the EPA is assessing the other IPPC landfills that are not collecting leachate and will require leachate collection if necessary.

Enforcement

Lining of landfills and leachate management has been a significant enforcement issue for the EPA^{40,41} and major emphasis has been placed on enforcement of the relevant licence conditions since licensing commenced.

Landfill lining and leachate management requirements are enforced through the review and approval of relevant specified engineering works proposals and construction quality assurance reports and through audit and inspection. In addition, landfill operators are required to monitor leachate and ambient groundwater and surface water and the EPA conducts verification monitoring. Seven successful prosecutions were taken between 2004 and 2009 for offences relating to inadequate leachate management (Table 6.1).

Enforcement of EPA licence conditions with respect to lining and leachate management has resulted in significant progress since the EPA commenced licensing of landfills. By 16th July 2009 (the latest date for compliance with Landfill Directive requirements), all open MSW landfills were landfilling in lined cells. This progression in lining of landfills represents a significant investment and it is estimated that in excess of 150 hectares of lining was installed in MSW landfills in Ireland up to the end of 2008. The cost in developing landfill cells to full Landfill Directive/EPA waste licence specification is considerable. South Dublin County Council reports that the contracts for the development of the landfill cells at Arthurstown Landfill totalled €23.3 million.⁴² In addition, approximately 1.4 million cubic metres of MSW leachate was collected for treatment from MSW landfills in Ireland in 2008, 1 million cubic metres from open MSW landfills and 0.4 million cubic metres from closed MSW landfills. 99% of this leachate was either tankered or discharged via sewer to urban wastewater treatment plants (Table 6.2). The remaining 1% was sent to two private facilities or treated on-site and discharged to water. On-site leachate treatment was carried out at six open MSW landfills in 2008 and mainly consisted of aeration/air-stripping of methane before consignment to urban wastewater treatment plants. One MSW landfill is treating leachate using aeration/settlement/sand-filtration and discharging to surface water – the licence for this landfill limits the rate of discharge of the treated leachate and the levels of pH, BOD, suspended solids, phosphorus and ammonia.

There remain, however, a number of significant issues to address with respect to leachate management at landfills. In 2008/2009, the EPA issued 69 non-compliances relating to management of leachate and contaminated water. The most significant issues arising were:

- Failure to maintain leachate head $\leq 1\text{m}$ above the basal liner
- Emissions related non-compliances, e.g. non-compliant emissions to surface water, groundwater or sewer

- Failure to provide adequate leachate management infrastructure

The phased introduction of an EPA authorisation system for urban wastewater treatment plants commenced in December 2007. The need for emissions from urban wastewater treatment plants to meet authorised emission limit values may limit their capacity to treat landfill leachate and on-site treatment of landfill leachate may become increasingly necessary. Benefits of reducing tankering of leachate include reduced greenhouse gas emissions and transport costs.

Table 6.1
Landfills prosecuted by the EPA for inadequate leachate management – 2004 to 2009
(years for which consolidated records are available)

Licensee	Landfill	Year*
Cavan Co. Co.	Corranure Landfill	2007
Waterford City Council	Kilbarry Landfill Site	2006
Limerick City Council	Longpavement	2005
Offaly Co. Co.	Derryclure Landfill	2005
Monaghan Co. Co.	Scotch Corner	2005
Cavan Co. Co.	Corranure Landfill	2005
Dundalk Town Council	Dundalk Landfill	2004

*There were no relevant prosecutions 2008 and 2009

Table 6.2
Urban wastewater treatment plants receiving MSW landfill leachate in 2008

Urban wastewater treatment plant			
Athy	Cashel	Mohill	Purcellsinch
Athlone	Castelbar	Monaghan	Ringsend
Ballinasloe	Castletroy	Mortarstown	Roscommon
Ballaghaderreen	Cavan	Muinebheag	Shanganagh
Ballina	Charleville	Mullingar	Sixmilebridge
Ballybay	Clonmel	Mutton Island	Swords
Baltinglass	Drogheda	Navan	Tralee
Bandon	Dungarvan	Nenagh	Tuam
Bray	Enniscorthy	Newcastle West	Tullamore
Limerick City	Enniskerry	Osberstown	Waterford City
Carrick on Shannon	Leixlip	Portlaoise	Wexford
Carrigrennan	Letterkenny	Purcellsinch	
Carrigtohill	Lisdoonvarna	Portlaoise	



Figure 6.1
Installation of liner at MSW landfill



Figure 6.2
Testing of welds on liner at MSW landfill

7. Landfill cover & capping

Landfill Directive

Annex I requires that:

Measures shall be taken to minimise nuisances and hazards arising from the landfill through:

- emissions of odours and dust
- wind-blown materials
- noise and traffic
- birds, vermin and insects
- formation and aerosols
- fires

... Protection of soil, groundwater and surface water is to be achieved by the combination of a geological barrier and a top liner during the passive phase/post closure.

The following minimum requirements for final capping of landfills for non-hazardous waste:

- Topsoil cover > 1m
- Drainage layer > 0.5m
- Impermeable mineral liner
- Gas drainage layer

7.1 Introduction

Landfill cover and capping perform a number of important functions. Daily and intermediate cover is applied during the operational phase and mitigates against nuisance caused by odour, litter, vermin, etc. When a cell is filled, temporary capping is applied first to allow time for settlement and final capping is applied following settlement. The main functions of the capping system are to:

- Minimise the infiltration of water into the waste and thus the generation of leachate

- Provide for the capture and management of landfill gas
- Provide a physical separation between the waste and plant and animal life

7.2 Pre-EPA licensing

Environmental Protection Agency (EPA) inspections of 27 municipal solid waste (MSW) landfills in 1997 found that covering of waste was carried out at 30% of the landfills inspected.¹³

7.3 Implementation of cover & capping requirements

Licence requirements

The types of cover/capping applied at landfills are defined in Table 7.1.

EPA MSW landfill licences require that daily cover is applied at the end of each working day and intermediate cover where waste is left for extended periods. Temporary capping is installed in areas where landfilling is completed until such time as the waste body has settled sufficiently to allow final capping. In addition, it is best practice when installing temporary capping to include a gas barrier membrane and a sacrificial gas barrier membrane on the interfaces between the cell being capped and future cells. EPA MSW landfill licences currently require installation of final capping within 12-14 months of completion of landfilling in a cell. The specification for final capping at MSW landfills is consistent with the Landfill Directive requirements for non-hazardous landfills and is as follows:

- 1 metre of soil
- Drainage layer of 0.5 metre thickness having a minimum hydraulic conductivity of 1×10^{-4} m/s or a geosynthetic material that provides equivalent transmissivity
- Compacted mineral layer of a minimum 0.6 metre thickness with a permeability of less than 1×10^{-9} m/s or a geosynthetic material (e.g. LLDPE) or similar that provides equivalent protection
- Gas collection layer of natural material (minimum 0.3 metres) or a geosynthetic layer

In addition, capping is a specified engineering work under MSW landfill licences and is subject to the satisfactory completion of the following:

- detailed proposals must be submitted for EPA agreement

- works must be supervised by an appropriately qualified person who is present at all times during the works
- Construction quality assurance (CQA) must be carried out and reported to the EPA

Cover is not generally required for the inert, mono and integrated pollution prevention and control (IPPC) landfills due to the nature of the wastes deposited. However, measures are required where necessary to prevent dust emissions. There are no specifications in the Landfill Directive for capping of landfills for inert waste. EPA inert landfill licences require 1 metre of soil as final capping. Specifications for final capping of mono landfills and IPPC landfills vary but the general requirement has been for a layer of soil 0.5 metres to 1 metre thick.

Table 7.1
Descriptions of cover and capping terms based on EPA guidance manuals and EPA licences

Daily cover

Daily cover is material placed over deposited waste at the end of each day (about 150mm if soil cover is used). The objective is to minimise odour, the amount of litter generated and to control flies and access to the waste by birds and vermin.

Intermediate cover

Intermediate cover is material other than daily cover placed over deposited waste for a period of time prior to temporary capping (minimum of 300mm if soil is used).

Temporary capping

Temporary capping is installed in completed areas until such time as the waste body has settled sufficiently to allow final capping to be installed. Temporary capping should be at least 0.5m thick.

Final capping

Final permanent capping – see text for specifications.

Enforcement

An EPA survey of 27 MSW landfills in 2008 found that cover is applied at all landfills.⁴³ The range of materials used was extensive and included:

- Soil
- Construction and demolition fines
- Shredded wood
- Composted material
- LDPE/PE
- Hessian
- Automobile shredder residue
- Ash
- Foams/sprays
- Peat
- Quarry sand/gravel

However, the survey found that cover materials were not applied correctly on open areas in 50% of the landfills with the following issues noted:

- Inadequate cover material depth, e.g. waste visible
- Inadequate application and compaction, e.g. material poorly compacted and application depth not uniform
- Poor preventative maintenance following storm water conditions resulting in etching and channelling within the cover material

Application and maintenance of cover on side slopes was found to be a particular problem.

There are various advantages and disadvantages associated with different cover materials and it is important that landfills have a cover management plan to ensure the required objectives are met. Proper application of cover materials will continue to be enforced by the EPA during inspections and audits of landfills. In addition, the EPA held a workshop for landfill operators in October 2009 at which best practice in relation to daily and intermediate cover was presented and the EPA intends to develop further guidance in 2010. The workshop presentation can be viewed on video via the EPA website:

<http://www.epa.ie/downloads/videos/wasteworkshop/>

In 2009, the EPA required that EPA agreed cover management plans must be in place when fabric based daily cover is used. This was due to concerns in relation to the ability of these materials to prevent nuisance when used in isolation as cover. The cover management plans must specify the:

- Areas in which fabric based cover can be used (limited to areas where waste exposure is for one night only)
- Criteria for placement of the fabric based cover (e.g. overlap, stapling of joins and use of soils to weigh down the material)
- Daily inspection regime
- Remediation measures in the event of odour or fly nuisance (including covering of waste with soil or other suitable cover material where problems persist)

The failure to install capping in a timely manner has been a significant enforcement issue for the EPA.^{40,41} Capping requirements are enforced through the review and approval of relevant specified engineering works proposals and construction quality assurance reports and through audit and inspection. In 2005, charges were brought against the operators of Kilbarry Landfill Site and Tramore Waste Disposal Site for failing to install capping within the timeframe specified in the licences (other charges were brought in relation to landfill gas and leachate management). These cases were heard at Circuit Court level due to the seriousness of the offences. The outcome of the cases was fines totalling €10,000 and the award of costs totalling €23,520.

A review of progress at the end of 2008 shows that there is a high rate of completion of capping at MSW landfills. The amount of capping at MSW landfills open in 2008 was approximately 169 hectares (61%) final capped, 82 hectares (30%) temporary capped and 24 hectares (9%) uncapped, i.e. active areas subject to daily/intermediate cover (Figure 7.1). However, there are still a number of MSW landfills that have not installed final capping within the specified timeframes. The EPA issued Notifications of Non-Compliance to seven MSW landfills in 2008/2009 for failure to meet the deadlines specified in the licences for final capping/restoration:

- Waterford City Council, Kilbarry Landfill Site
- Monaghan County Council, Scotch Corner Landfill
- Kerry County Council, North Kerry Landfill Site
- Kilkenny County Council, Dunmore Landfill
- Kildare County Council, Silliot Hill Landfill
- Westmeath County Council, Marlinstown Landfill
- Galway City Council, Carrowbrowne Landfill Site

Failure to install capping as required is considered a significant issue by the EPA and will continue to be enforced. Court actions will be taken if necessary.

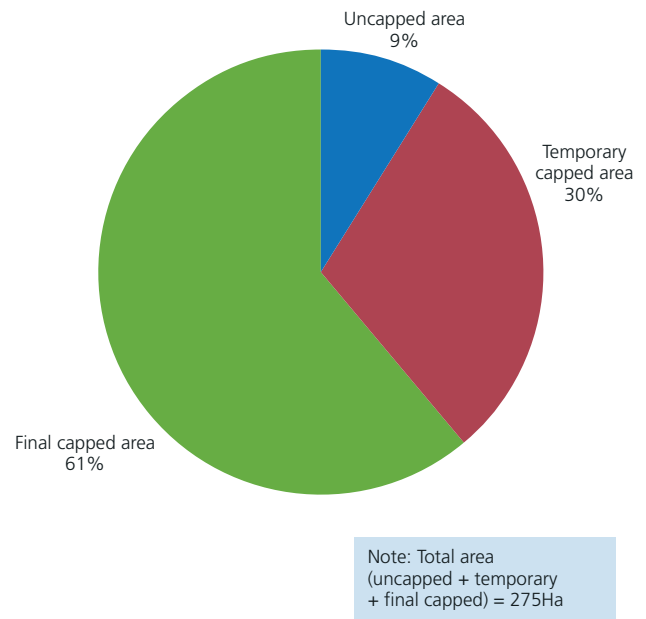


Figure 7.1
Capping at open MSW landfills in 2008



Figure 7.2
Installation of final cap at MSW landfill

8. Landfill gas management & odour control

Landfill Directive

Annex I requires that:

Landfill gas shall be collected from all landfills receiving biodegradable waste and the landfill gas must be treated and used. If the gas collected cannot be used to produce energy, it must be flared.

The collection, treatment and use of landfill gas shall be carried on in a manner which minimises damage to or deterioration of the environment and risk to human health

Measures shall be taken to minimise nuisances and hazards arising from...emissions of odours...

8.1 Introduction

Landfill gas is principally composed of methane (up to 65% by volume) and carbon dioxide (up to 35% by volume) and contains many minor constituents at low concentrations (typically less than 1% volume contains 120-150 trace constituents). Risks posed by landfill gas include:

- flammability and explosion risks
- asphyxiation risks
- potential health impacts due to many minor constituents present at low concentrations
- odour impacts from trace constituents, e.g. hydrogen sulphide and mercaptans
- environmental impacts due to the global warming potential of methane and carbon dioxide
- vegetation dieback

Given these risks, it is important that landfill gas is contained and collected to minimise migration off-site and that the collected gas is utilised or flared.

8.2 Pre-EPA licensing

Environmental Protection Agency (EPA) inspections of 27 municipal solid waste (MSW) landfills in 1997 found that only 4 (15%) had active gas extraction with three of those using the landfill gas to generate electricity and a further one flaring the gas mainly to alleviate odour problems.¹³

8.3 Implementation of gas management requirements

Licence requirements

EPA MSW licences require the following with respect to landfill gas management:

- Provision and maintenance of gas management infrastructure
- All buildings constructed in accordance with Department of Environment 1994 publication *Protection of New Buildings and Occupants from Landfill Gas*
- The utilization of landfill gas where feasible, otherwise landfill gas must be flared

- The flaring of landfill gas must be in an enclosed flare with a burn chamber residence time of minimum 0.3 seconds and burn temperature of minimum 1000°C. The use of open flares is only acceptable as an interim measure on a temporary basis and with prior EPA agreement
- Compliance with specified limit values for emissions from flares and utilization plant
- Monitoring of landfill gas

The principal treatment for landfill gas at MSW landfills is flaring. A 2008 survey of MSW landfills by the EPA for this report identified that flares were operated at all of the 31 MSW landfills open that year apart from two who had just commenced waste disposal, flares were operated at 18 of the closed MSW landfills and landfill gas was not collected at the remaining 18 closed MSW landfills. In relation to the latter 18, flaring is not required at the majority due to factors such as the limited quantities of waste deposited, the age of waste, etc. and they are authorised to passively vent landfill gas to atmosphere to prevent lateral migration.

Table 8.1

Landfills prosecuted by the EPA/DPP for inadequate landfill gas management – 2004 to 2009 (years for which consolidated records are available)

Licensee	Landfill	Year*
Cavan Co. Co.	Corranure Landfill	2007
Waterford County Council	Tramore Waste Disposal Site	2006
Waterford City Council	Kilbarry Landfill Site	2006
Limerick City Council	Longpavement	2005
Offaly Co. Co.	Derryclure Landfill	2005
Monaghan Co. Co.	Scotch Corner	2005
Cavan Co. Co.	Corranure Landfill	2005
Dundalk Town Council	Dundalk Landfill	2004

*There were no relevant prosecutions 2008 and 2009

Enforcement

Landfill gas management has been a significant enforcement issue for the EPA.^{40,41} Landfill gas management infrastructure and its installation are enforced through the review and approval of specified engineering works proposals and construction quality assurance reports submitted by landfill operators and through audit and inspection. In addition, landfill operators are required to monitor landfill gas emissions and ambient landfill gas levels. Verification monitoring is conducted by the EPA to ensure the accuracy of the data submitted. Eight successful prosecutions were taken between 2004 and 2009 for offences relating to inadequate landfill gas management (Table 8.1).

However, flaring is possible at two of these sites and enforcement action is ongoing to require the provision of landfill gas collection and flaring infrastructure at those landfills. The EPA requires the use of enclosed flares as these can maintain sufficient temperature and residence time to meet the emission standards that apply. EPA guidance does provide for the use of open flares but only as a temporary measure. The 2008 survey identified there were 58 enclosed flares and seven open flares at MSW landfills. The open flares were generally only in temporary use or maintained as backup to an enclosed flare. Only one site was identified that operated an open flare solely and that was replaced with an enclosed flare in 2009.



Figure 8.1
Enclosed flare

There were seven EPA licensed MSW landfills and one unlicensed landfill using landfill gas to generate electricity in 2008 with a total capacity of approximately 29MW (Table 8.2). There were some minor changes in 2009: landfill gas was not utilised at Silliot Hill

Landfill during 2009 but utilisation may recommence if gas quality improves; operation of a 1MW engine commenced at Gortadroma Landfill Site in mid-2009. The EPA is aware of plans to commence generation at four other MSW landfills during 2010: Knockharley Landfill, East Galway Residual Landfill Site, Ballynagran Residual Landfill and North Kerry Landfill.



Figure 8.2
Landfill gas utilisation plant

Table 8.2
MSW landfills using landfill gas to generate electricity in 2008

Licensee	Landfill	No of Engines	Power capacity (MW)
South Dublin Co. Co.	Arthurstown Landfill	11	14.2
Fingal Co. Co.	Balleally Landfill	5	5
Cork City Council	Kinsale Road Landfill	1	1
KTK Landfill Limited	KTK Landfill Limited	3	3.75
Dun Laoghaire-Rathdown Co. Co.	Ballyogan Landfill Facility	2	2
Fingal Co. Co.	Dunsink Landfill	1	1.25
Kildare Co. Co.	Silliot Hill Landfill	1	1.25
South Dublin Co. Co.	Friarstown*	1	0.6
Total		25	29

*This landfill closed in 1997⁴⁸ and does not come under an EPA waste licence. It has been entered on the register of sites under the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008 (see Section 2.3). Data regarding engine from presentation by Bioverda Power Systems.⁴⁹

The increased flaring and utilisation of landfill gas has resulted in decreased emissions of methane from the landfill sector despite increased landfilling of waste, with landfill gas flaring and utilisation offsetting more than 60 percent of landfill methane production in 2008 (Figure 8.3).^{44,45} As a result, greenhouse gas (GHG) emissions from landfills decreased by 20% from 1,173ktCO₂eq* in 1990 to 936ktCO₂eq in 2008 (1.4% of total Irish GHG emissions). This in turn has meant that the largest relative reduction in GHG emissions in

Ireland from 1990 to 2008 was in the waste sector** (Figure 8.4). GHG emissions in all other sectors except agriculture increased over this period.

* CO₂ equivalent: greenhouse gases other than CO₂ (i.e. methane, nitrous oxide and so-called F gases) may be converted to CO₂ equivalent using their global warming potentials.^{44,45}

** GHG emissions data are typically broken down by the following sectors: energy; residential; industry and commercial; agriculture; transport; waste. GHG emissions from landfills were 85.5% of GHG emissions from the waste sector in 2008

Figure 8.3
Methane emissions from landfill 1990-2008⁴⁵

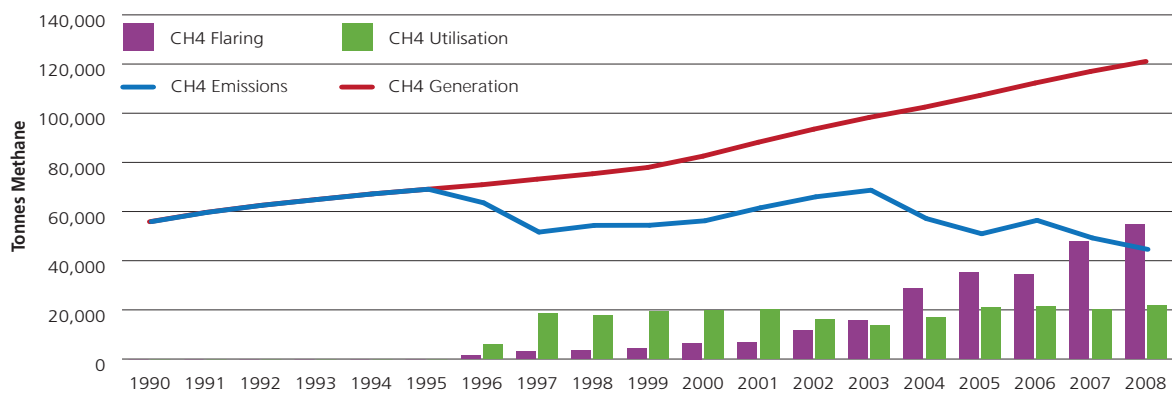
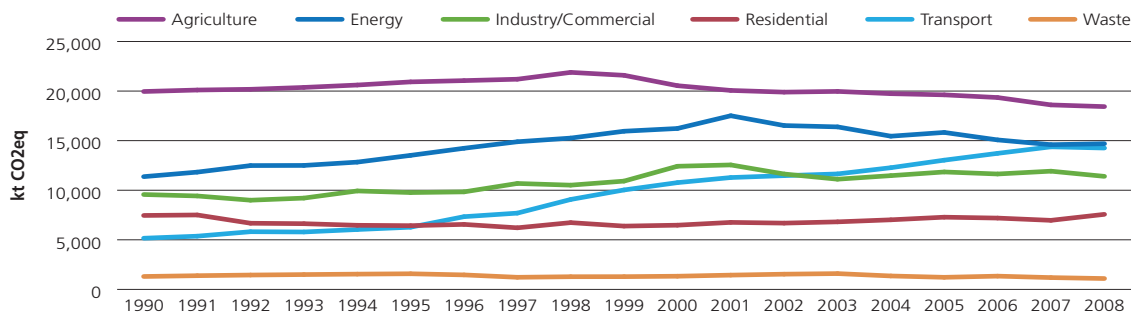


Figure 8.4
Greenhouse gas emissions in Ireland 1990-2008⁴⁴



While the management of landfill gas has improved over the years, it remains a significant issue. In 2008/2009, the EPA issued 43 non-compliances relating to landfill gas management. The most significant issues were:

- Failure to operate flares properly, e.g. issues such as flares being non-operational, of inadequate capacity or being operated at inadequate combustion temperatures
- Failure to maintain and manage the landfill gas collection system so that it performs adequately, e.g. issues such as condensate build-up and gas well maintenance

Sustainable Energy Ireland predicted that the accessible landfill gas resource would be 80MW in 2010 which indicates that there is potential for significant additional utilisation of landfill gas.⁴⁶ Furthermore, at the end of

2009 landfill gas was utilised at landfills with greater than 1 million tonnes of total waste disposed* whereas the UK Environment Agency consider 200,000 tonnes of total waste disposed as an indicative benchmark for landfill gas utilisation.⁴⁷ There are 32 MSW landfills with greater than 200,000 tonnes of waste disposed that were not utilising landfill gas at the end of 2009, at least 15 of which had greater than 500,000 tonnes disposed. The EPA is aware of plans to commence utilisation at a further four landfills in 2010. While there are factors other than the quantity of waste that affect the feasibility of utilisation of landfill gas (e.g. age of waste, biodegradable content of waste, methane content of gas, site geometry, grid access), there exists greater scope to exploit this resource and every effort should be made by landfill operators in this regard. As such, the EPA will continue to encourage the use of this resource in 2010.



Figure 8.5
IT based data management system for interpretation of gas field balancing results

* All MSW landfills with greater than 1 million tonnes of total waste disposed were utilising or had utilised landfill gas whereas no MSW landfill below 1 million tonnes had utilised landfill gas as of end of 2009.

8.4 Odour control

Landfills are currently operated to much higher standards than previously with improved design, infrastructure, management and monitoring. However, BMW is disposed of in a fewer number of larger-scale landfills resulting in significantly higher rates of landfill gas generation on a site-specific basis. The effective management of potential odour nuisance requires tight control in relation to covering waste, installation and operation of landfill gas infrastructure and other mitigation measures. Failure by landfill operators in this regard leads to odour nuisance for residents living near landfill facilities.

Odour from landfills, in particular from open MSW landfills, has become the single biggest cause of complaint to the EPA accounting for 71% of all complaints in relation to all waste and IPPC licensed facilities in 2009 (Figure 8.6). The total number of odour complaints received by the EPA in relation to open MSW landfills increased more than 10-fold from 94 in 2004 to 1568 in 2009. Table 8.3 lists all landfills for which the EPA received more than 20 odour

complaints in 2009. These eight landfills accounted for 99% of the MSW landfill odour complaints received in 2009.

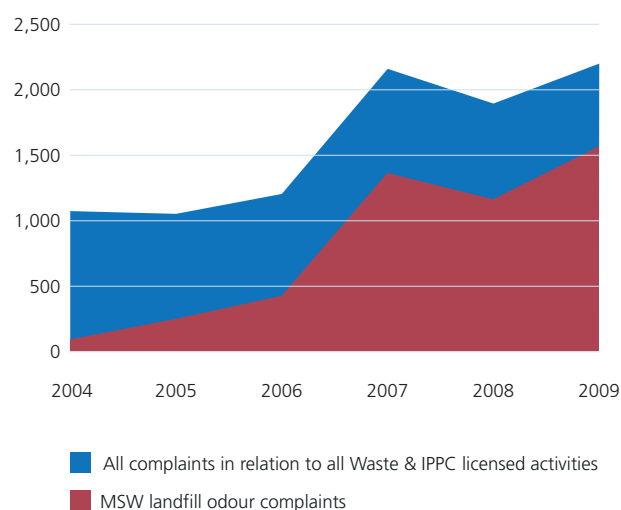


Figure 8.6
MSW landfill odour complaints versus total complaints in relation to waste and IPPC licensed activities, 2004 – 2009

Table 8.3
Landfills for which the EPA received more than 20 odour complaints in 2009

Licensee	Landfill	No. of odour complaints	
		2008	2009
Cavan Co. Co.	Corranure Landfill*	235	613
Greenstar Holdings Limited	Knockharley Landfill	362	311
Neiphin Trading Limited	Kerdiffstown	87	308
Roscommon Co. Co.	Ballagherreen Landfill*	63	118
Cork Co. Co.	Youghal Landfill	127	90
Westmeath Co. Co.	Ballydonagh Landfill	6	49
Greenstar Holdings Limited	Ballynagran Residual Landfill	48	46
Greenstar Holdings Limited	East Galway Residual Landfill Site*	117	25

*Landfills previously prosecuted in relation to odour (see Table 8.4)

In response to the increase in odour complaints, the EPA has dedicated significant resources towards regulating odour from landfills. The following are some of the initiatives taken by the EPA in recent years:

Assessment & enforcement

- The EPA has taken seven successful prosecutions in relation to odour impact (Table 8.4) and submitted three files to the Director of Public Prosecutions (DPP) in 2009.
- Corranure Landfill was temporarily closed for a two-week period in 2008 to facilitate the installation of vital infrastructure for the management of landfill gas arising at the facility.
- There has been a significant level of odour related assessments, inspections and audits including deployment of site agents (Box 8.1)
- The EPA has deployed external experts to assess landfill gas management at MSW landfills (see Box 8.2).
- The EPA developed guidance on odour impact assessment.⁵¹ This provides a basis for a consistent and systematic approach to odour assessment and reporting and for assessment of compliance with licence conditions relating to odour control.

Table 8.4

**Landfills prosecuted by the EPA in relation to odour impact – 2004 to 2009
(years for which consolidated records are available)**

Licensee	Landfill	Year*
South Dublin County Council	Arthurstown Landfill	2009
Greenstar Holdings Limited	East Galway Residual Landfill Site	2009
Roscommon County Council	Ballaghaderreen Landfill	2008
Cavan County Council	Corranure Landfill	2007
Ballinasloe Town Council	Pollboy Landfill Facility	2006
Monaghan County Council	Scotch Corner Landfill	2005
Roscommon County Council	Ballaghaderreen Landfill	2005

*There were no relevant prosecutions in 2004

Box 8.1 Focus on use of site agents

The EPA deploys site agents to investigate odour issues at landfills. Site agents are typically deployed for a number of days at a particular landfill during which the site agent assesses odour management on an ongoing basis and is available to residents and the EPA to verify odour complaints. During 2007-2009, a total of four person-months were spent on-site at landfills with odour issues. This is in addition to office based time associated with the preparation of notices of non-compliance and evidence for court proceedings.



Figure 8.7
Monitoring of surface emissions from the flank of a landfill cell

Box 8.2 Focus on external expert assessment & surface emissions monitoring

The EPA uses external experts to assess landfill gas management systems at landfills and conduct surface emissions monitoring. This consists of audits of landfill gas infrastructure/management and monitoring of surface VOC emissions (Figures 8.7 & 8.8). This commenced with assessment of 10 landfills in 2007, stepping up to cover 25 landfills in 2008 and 29 landfills in 2009. Reports were prepared and issued to all operators setting out any mitigation measures required and the results of the 2009 assessments were published by the EPA in 2010.⁵⁰

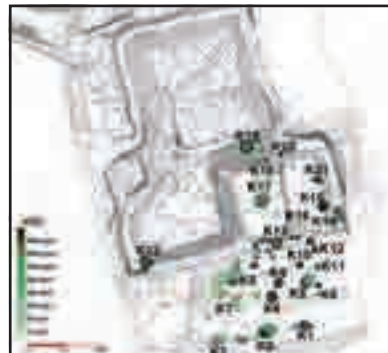


Figure 8.8
Landfill surface emissions map showing results of monitoring

Over half of the landfills assessed in 2009 showed improvements in terms of reduced surface emissions when compared to 2008 surveys (Figure 8.9). The most common issues identified from the surveys were emissions from flanked surfaces, inadequate sealing around gas wells and emissions associated with leachate management systems.

The EPA is developing guidance on surface emissions monitoring in 2010.

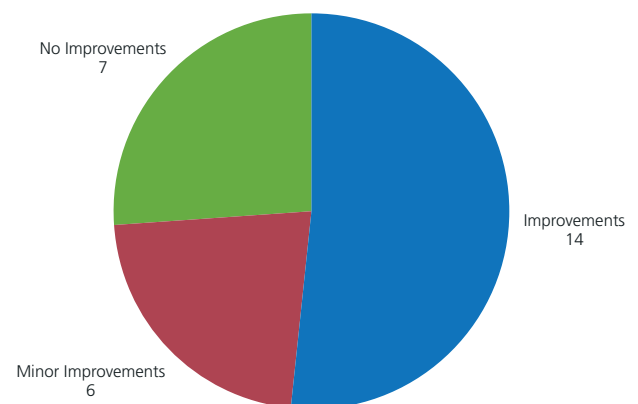


Figure 8.9
Changes in surface emissions at landfills surveyed in 2008 and 2009

Improving standards

- The EPA has reviewed MSW landfill licences with odour issues to ensure that odour management planning and control is carried out in a comprehensive manner (see Chapter 3). Each MSW landfill should develop an odour management plan (OMP) that should address the following as a minimum:
 - Resources and training
 - Acceptance and management of odorous waste deliveries
 - Independent assessment and reporting on surface VOC emissions
 - Use of sacrificial gas extraction systems, phased capping of the waste body and interim capping at inter-cell boundaries
 - Working face/active cell sizing and covering
 - Landfill gas collection:- locations of infrastructure including access/haul roads, well design and density, monitoring, condensate management, field balancing, flare/combustion plant operation
 - Identification and mitigation of fugitive sources of landfill gas emissions, e.g. from leachate management infrastructure
 - Monitoring:- VOC surface emissions from capped areas, odour checks off- and on-site, receipt and evaluation/verification of odour complaints received
 - Monthly review and reporting of odour control measures in place at the facility to include review of odour complaints, monitoring results, landfill gas control infrastructure/management and remedial/corrective actions
- There is a strong link between BMW landfilled and landfill gas/odour generated. As such, the implementation of the Landfill Directive requirements in relation to diversion of BMW from landfill (Chapter 4) should lead to reduced landfill gas emissions and thus reduced odour in the coming years.
- The EPA held a waste workshop in October 2009 which was attended by 183 delegates and addressed a range of topics including diversion of BMW, effective landfill gas management and use of cover materials. Presentations by EPA speakers are available as video broadcasts on the EPA website:

<http://www.epa.ie/downloads/videos/wasteworkshop/#d.en.28003>
- An important factor in relation to odour nuisance is the location of the landfill with respect to sensitive receptors. The Landfill Directive requires that the location of a landfill must take into consideration the distances from the boundary of the site to residential and recreation areas. The landfill can be authorised only if the characteristics of the site or the corrective measures to be taken indicate that the landfill does not pose a serious environmental risk. Set-back when locating landfills is being considered as part of the current process to derive landfill best available techniques (BAT). The current draft landfill BAT recommends a set-back distance of 750m.

Liaison with local residents

- The EPA continues to meet with local residents, community groups, and public representatives in order to communicate and focus on residents concerns with a view to improving environmental performance at the landfills. These include open forum public meetings, meetings on site with residents and meetings on an individual basis. It should be noted, however, that EPA communications may be restricted in circumstances where legal cases may arise or are in progress.

9. MONITORING

This chapter covers the implementation of monitoring requirements only and does not cover the results of monitoring which has been used to inform the relevant sections above and in particular Chapter 6 and 8.

Landfill Directive

Article 12 requires that:

The operator of a landfill shall carry out during the operational phase a control and monitoring programme as specified in Annex III. Annex III of the Landfill Directive specifies the monitoring requirements for the following aspects of landfills:

- Meteorological
- Surface water
- Groundwater
- Leachate
- Landfill gas
- Topography/stability

The operator shall notify the competent authority of any significant adverse environmental effects revealed by the control and monitoring procedures and follow the decision of the competent authority on the nature and timing of the corrective measures to be taken...

...At least once a year, the operator shall report, on the basis of aggregated data, all monitoring results to the competent authorities...

9.1 Introduction

The landfilling of waste poses a potential long-term threat to the environment. Landfills should be located, designed, operated and monitored to ensure that they do not to any significant extent:

- Harm the environment
- Endanger human health
- Create an unacceptable risk to water, soil, atmosphere, plant or animals
- Create nuisances through noise or odours, or adversely affect the countryside or places of special interest

Monitoring is necessary throughout the life of a landfill from the pre-operational stage through the operational stage and into the aftercare stage. Environmental Protection Agency (EPA) licences specify monitoring programmes covering the following as appropriate:

- Surface water
- Ground water
- Leachate
- Landfill gas and landfill gas combustion products
- Meteorological conditions
- Odours

- Noise
- Dust/particulate matter
- Ecology
- Landfill stability and topography

The EPA published revised guidance on landfill monitoring in 2003 which is available on the EPA website:

<http://www.epa.ie/downloads/advice/waste/waste/name,26169,en.html>



Figure 9.1
EPA Landfill Manuals: Landfill Monitoring, 2nd Edition⁵

9.2 Incidents & reporting

EPA licences require that monitoring results are submitted at specified frequencies with a summary report submitted annually – referred to as an Annual Environmental Report (AER). Since 2009, AERs are available through the EPA website.

In addition, landfill operators are required to notify the EPA of any incident which is typically defined as:

- An emergency
- Any emission which does not comply with the requirements of the licence
- Any exceedance of the daily duty capacity of waste handling equipment
- Any trigger level specified in the licence which is attained or exceeded
- Any indication that environmental pollution has, or may have, taken place

In determination of the significance of incidents, landfill operators are required to classify incidents as follows:

Category 1

An environmental incident, which is causing, has caused or which could have caused **significant** environmental damage or **significant** environmental risk or hazard to the public or to the general environment. Incidents that fall into this category are those having any of the impacts listed below:

- Significant effects on water quality
- Significant effects on air quality
- Major damage to an ecosystem

- Closure of potable water extractors
- Reduction in amenity value of an area
- Damage to agriculture or commerce
- Impact on local residents or community
- Urgent remedial action necessary

Category 2

A minor environmental incident with typical impacts:

- Local impact to water or land
- Notification to and precautionary short-term closure of potable water extractions required
- Public warnings not required
- Effect on air quality as evidenced by odour complaints

Category 3

An environmental incident where there was never at any time any damage injury or significant risk or exposure to hazard to the public or the general environment.

In the event of an incident occurring at a facility, the landfill operator must notify and submit a record by fax to the EPA. Category 1 and 2 incidents are typically published on the EPA web site where warranted:

<http://www.epa.ie/news/incidents/>

9.3 Surface water

Surface water comprises of rainwater from uncontaminated areas and ambient surface water. The main risk of contamination of the surface water is from non-compliant discharges of leachate with other potential sources consisting of contaminated run-off or accidental spillages of materials used on site such as fuels. The Landfill Directive requires at least two monitoring locations, one upstream and one downstream of the landfill. EPA landfill licences specify the location, parameters and frequency of surface water monitoring. While monitoring requirements are site-specific, typical requirements for MSW landfills are a weekly visual/odour inspection, quarterly monitoring for core parameters such as conductivity, temperature, COD/BOD, ammonia, suspended solids and chloride with annual monitoring for other parameters.

Chemical analysis of surface water is essential in identifying possible contaminants and in quantifying their concentrations and provides an instantaneous picture of water quality. Since some contaminants can interact and occur in complex mixtures, such analyses alone will give little indication on the potential biological impacts. Therefore, landfill operators may also need to complete biological assessments on the quality of surface water around landfills. Analysis of the macro-invertebrates that inhabit the substrata is satisfactory for routine biological water quality monitoring. As pollution increases there is a decrease in the faunal diversity with an increase in the numbers of pollution tolerant forms. The biological information gathered is presented as a biotic index, which relates the benthic community composition and water quality. This five point scale ranges from Q1–Q5 with Q5 being unpolluted and Q1 being seriously polluted.



Figure 9.2
Surface water management infrastructure

9.4 Groundwater

Ground water is that part of the subsurface water which is in the saturated zone. It is a major natural resource and its protection is of prime importance. The purpose of groundwater monitoring at landfills is to assess the groundwater quality and quantity and in the process determine the effectiveness of the environmental control systems. The monitoring points must provide information on the groundwater likely to be affected with at least one monitoring point upgradient and two downgradient of the landfill. The Landfill Directive specifies that the groundwater composition and level that must be tested at specific frequencies depending on the operation phase of the landfill. EPA licences specify the location, parameters and the frequency of groundwater monitoring. While monitoring requirements are site-specific, typical requirements for MSW landfills are monthly monitoring of groundwater level, quarterly monitoring of ammonia, chloride, dissolved oxygen, pH, temperature and total organic carbon and annual monitoring of metals, sulphates, alkalinity, total oxidised nitrogen and faecal coliforms.

The Landfill Directive states that significant adverse effects should be considered to have occurred when an analysis of the ground water shows significant change in the water quality and requires that trigger levels are established. Trigger levels should take hydrogeological conditions and the background groundwater quality into account. A review by the EPA of open MSW landfills in 2008 identified that approximately one-third had not established trigger levels. In some cases, not all of the EPA licences provided for the establishment of trigger levels and these licences are being amended accordingly (Chapter 3).

9.5 Leachate

Understanding the volume and composition of the leachate allows for effective environmental protection. The Landfill Directive stipulates that the leachate volume and composition must be monitored at specific frequencies, which are dependant on the operation phase on the landfill.

Monitoring of the leachate generated from a landfill site ensures that:

- The leachate management system on site is operating as designed
- Detail on the waste decomposition is gathered
- Revision of the ground water and surface water monitoring parameters if required

EPA licences specify the location, parameters and the frequency of leachate monitoring. Typical requirements in the licences for MSW landfills are monthly, quarterly and annual monitoring for parameters such as the leachate level, pH, conductivity, temperature, ammonia, chloride, BOD/COD, total oxidised nitrogen, total phosphate, metals, sulphates and fluoride. Monitoring

the leachate levels is important within the waste body to ensure that the leachate head (level above the basal liner) is successfully controlled. The volume of leachate discharged or transported from the landfill site must be recorded on an ongoing basis and reported in the annual environmental report.

9.6 Landfill gas

The Directive requires that landfill gas monitoring must be representative for each section of the landfill. The individual EPA licences specify the locations, frequencies and the parameters that must be monitored within and outside the waste body. Location of the monitoring points are identified individually on each landfill site through detailed risk assessment that includes assessment of:

- Geology of site
- Type of waste
- Containment measures adopted
- Proximity of buildings and developments to the site
- Permeability of the waste
- Quality and volume of gas being generated

Requirements for MSW landfills include monitoring for methane, carbon dioxide, oxygen, atmospheric pressure and temperature at different frequencies at specified locations within and outside the waste body. Landfill gas where practicable is collected from MSW sites and is either converted to energy or flared. Continuous monitoring of the gas flow rate, temperature, carbon monoxide, methane, carbon dioxide and oxygen with annual monitoring for other parameters is required for enclosed flares.

EPA licences set out gas trigger levels values that once exceeded must have controls implemented and the hazard contained. Identification of background levels is important in the establishment of the trigger levels

as geology can impact on the methane and carbon dioxide background level. However, in the absence of background levels the EPA licences specify the following trigger levels:

- Methane greater than or equal to 1 % v/v
- Carbon dioxide greater than or equal to 1.5%

The landfill operator must record any exceedences of trigger levels and notify the EPA.

It should be noted that the EPA has initiated a number of developments relating to landfill gas surface emissions monitoring and increased monitoring will be required in future (Chapter 8). In addition, greater emphasis will be placed on balancing of the landfill gas field.



Figure 9.3
Landfill gas monitoring

9.7 Odour

EPA licences for MSW landfills require operators to undertake monitoring for odour. However, this is an area that has undergone significant development in recent years. Licence conditions at a number of landfills have been reviewed to include stricter requirements to control and monitor odorous gases (Chapter 8).

9.8 Meteorological

Meteorological monitoring is an integral part of the overall management of a landfill. Meteorological information is obtained from on-site weather stations or Met Éireann data or a combination of both. The Meteorological data assists in a number of ways in the management of a landfill, e.g. information on precipitation can be used to predict leachate and landfill gas generation and information on wind speed and direction is relevant to litter and odour control.

9.9 Stability & topography

A specific requirement outlined in the Landfill Directive is to complete a topographical study of the landfill. This is to include an annual review of the structure and composition of the landfill body as well as the settling behaviour of the landfill. During 2008, 29 of the MSW landfills completed topographical surveys, which were submitted as part of the Annual Environmental Report for that reporting period. Three of the open IPPC landfills completed the survey.

9.10 Noise

The following noise limits are generally specified in EPA licences unless site-specific circumstances dictate otherwise:

- 55 dB(A) L_{Aeq} (30 minutes) (Daytime)
- 45 dB(A) L_{Aeq} (30 minutes) (Night time)

Landfill operators are required to monitor noise at least annually. There were 30 noise complaints in relation to waste licensed landfills in 2009, though the majority (24) related to a single landfill: Knockharley Landfill.



Figure 9.4
Noise monitoring

9.11 Dust

The following dust limit is specified in EPA licences:

- 350 mg/m²/day

Landfill operators are required to monitor dust continuously using the Bergerhoff Instrument which consists of a collecting bottle mounted on a 2m pole.



Figure 9.5
Dust monitoring

9.12 EPA enforcement of monitoring requirements

A review of monitoring carried out at MSW landfills in 1995 showed that:

- 29.5% carried out leachate monitoring
- 7.4% carried out landfill gas monitoring
- 42.1% carried out some level of surface water monitoring with the number of samples varying from one sample to 95 samples per site
- 18.9% carried out some level of groundwater monitoring with the number of samples varying from one to 72 samples per site and the number of sampling points ranging from one to 19 per site

EPA licensing and enforcement has led to a much improved situation in 2009 with all landfills conducting extensive leachate, landfill gas, surface water and groundwater monitoring and in addition monitoring of odours, noise, dust/particulate matter, ecology and landfill stability and topography as appropriate. Nonetheless, in 2008/2009, the EPA issued 94 non-compliances related to monitoring. In general, these relate to failure to monitor all parameters, or at the specified frequencies or at all monitoring points rather than complete systematic monitoring failures. Common issues that arise include:

- Inadequate flare monitoring
- Telemetry systems not linked to aspects of the monitoring network such as leachate level monitors

10. Closure, aftercare & financial provision

Landfill Directive

Article 8 requires that:

Adequate provisions, by way of a financial security or any other equivalent...will be made...prior to the commencement of disposal operations to ensure that the obligations (including after-care provisions) arising... are discharged and that the closure procedures...are followed.

Article 10 requires that:

All of the costs involved in the setting up and operation of a landfill site, including as far as possible the cost of the financial security...and the estimated costs of the closure and after-care of the site for a period of at least 30 years shall be covered by the price to be charged by the operator for the disposal of any type of waste in that site...

Article 13 requires that:

...a landfill or part of it shall start the closure procedure

- when the relevant conditions stated in the permit are met; or
- under the authorisation of the competent authority, at the request of the operator; or
- by reasoned decision of the competent authority.

A landfill or part of it may only be considered as definitely closed after the competent authority has carried out a final on-site inspection, has assessed all the reports submitted by the operator and has communicated to the operator its approval for the closure. This shall not in any way reduce the responsibility of the operator under the conditions of the permit

After a landfill has been definitely closed, the operator shall be responsible for its maintenance, monitoring and control in the after-care phase for as long as may be required by the competent authority, taking into account the time during which the landfill could present hazards

For as long as the competent authority considers that a landfill is likely to cause a hazard to the environment and without prejudice to any Community or national legislation as regards liability of the waste holder, the operator of the site shall be responsible for monitoring and analysing landfill gas and leachate from the site and the groundwater regime in the vicinity of the site in accordance with Annex III

10.1 Introduction

Following cessation of waste disposal, landfills continue to pose an environmental risk and as such require proper closure, restoration and aftercare to minimise environmental impact. Landfills that are subject to high standards of closure, restoration and aftercare have the potential to provide amenity value, e.g. through the development of sports pitches or areas of nature conservation. Significant investment is required to fund the closure, restoration and aftercare of a landfill and it is important that adequate financial provision is made. Cork City Council report that the cumulative investment to end of 2008 for the closure of the Kinsale Road Landfill was in excess of €20 million and further expense will be incurred until the landfill no longer poses an environmental risk.

10.2 Implementation of closure, aftercare & financial provision requirements

On foot of the Environmental Protection Agency Act, 1992 and subsequently the Waste Management Act, 1996, the Environmental Protection Agency (EPA) specified criteria for landfill sites. One of the technical documents published in 1999 was guidance on landfill restoration and aftercare which deals with restoration design, afteruse, soils handling, vegetation establishment and the production of site specific restoration and aftercare management plans.⁷ The EPA initially commenced licensing of IPPC landfills in 1995 and the first waste license (MSW, inert and mono landfills are covered by waste licenses) for a landfill was granted in 1998. Requirements for financial provision for closure and aftercare were included in all waste licences and also became incorporated into the IPPC landfill licenses over time. All operating landfills were licensed by 2003. In 2002, a review of compliance indicated that there was a lack of technical guidance in relation to financial provision and this led to the development of EPA guidance on Environmental

Liability Risk Assessment (ELRA), Residuals Management Plans (RMP) and Financial Provision (FP) which was supplemented with further EPA guidance in 2006.⁵² The ELRA/RMP/FP guidance provides a framework for assessing environmental liabilities associated with a site and guidance on financial provision. It was supplemented by training provided to licensees in its use and meetings with the financial sector to stimulate the market in relation to the provision of financial products to meet the licence requirements.

Assessment of landfill conditioning plans has led to the strengthening of conditions relating to financial liabilities, as part of the recent licence review process, to ensure all environmental liabilities are addressed at landfills and that charges in respect of the disposal of waste are sufficient to meet the total costs necessary for:

- the costs incurred by the operator in the acquisition or development of the facility
- the costs of operating the facility
- the estimated costs of the closure, restoration, remediation or aftercare of the facility

The EPA conducted further surveys on environmental liability risk assessment and financial provision at licensed sites in 2008. Furthermore, due to falling landfill gate fees (from an average of €150/tonne⁵³ in 2004 to €100/tonne in 2008) and poor levels of compliance in relation to the furnishing of financial information, the EPA issued a template form to 28 MSW landfill operators in 2009 for the submission of annual financial statements. This gathered valuable information in relation to the financial systems at landfills, in particular in relation to the charging structures and whether financial provision was being made for closure, restoration and aftercare. As a result of this survey, the EPA issued notifications of non-compliance to 16 landfills and has requested further

information from an additional nine. This enforcement work is ongoing and is a priority in 2010. Further enforcement action will be taken in situations where the EPA is not satisfied that adequate provision is being made for closure and aftercare.

The EPA established an Environmental Liability Unit in 2009 tasked with the implementation of the Environmental Liability Directive and other related duties including the coordination of the assessment of closure plans, aftercare and financial provision requirements, contaminated land, remediation and the costing of damage to the environment. The Environmental Liability Unit adds to the EPA's capacity to give technical advice and guidance to licensees about their obligations and will assist in the EPA's enforcement programme to ensure that those obligations are met. The Environmental Liability Unit is actively reviewing ELRA, RMP and FP methodologies including provision at landfills.



Figure 10.1
Restored landfill cell

11 Action plan

The EPA has identified seven priorities for the landfill sector that need to be tackled. These are in the following aspects of landfill management:

- Diversion of BMW
- Landfill gas
- Legacy landfills
- Environmental liabilities and financial provision
- Cover and capping
- Leachate management
- Waste acceptance

This chapter sets out the issues in more detail, identifies the actions that have already been taken and presents an action plan to ensure these issues are tackled going forward.

Significant measures have already been taken to address these challenges. The key stakeholders are landfill operators and they need to examine their activities in light of the issues highlighted in this report and take its findings into account. The EPA will continue its work towards meeting the challenges and will continue to collaborate with all stakeholders (e.g. other state agencies, local communities and licensees) to help foster a common understanding of the problems and interventions necessary to meet the challenges ahead.

Diversion of BMW

Issues

- Landfilling of BMW results in high emissions of methane which is a greenhouse gas and a potential source of odour nuisance.
- Ireland faces daily fines for non-compliance with Landfill Directive targets for diversion of BMW from landfill.
- Almost 1.2 million tonnes of BMW were landfilled in 2008; just 0.916 million tonnes can be landfilled in 2010, reducing to 0.610 million tonnes in 2013 and 0.427 million tonnes in 2016.

Actions Taken

- Publication by the EPA in 2008 of Hitting the Targets for Biodegradable Municipal Waste: Ten Options for Change.
- Publication by the EPA in 2009 of Municipal Solid Waste – Pre-Treatment & Residuals Management including a stabilisation standard for waste.
- Major conference organised in October 2009 dealing with the topic (presentations available on www.epa.ie).
- Twenty-five revised landfill licences issued by the EPA in 2009/early 2010 limiting the disposal of BMW at landfill.
- Publication of the Food Waste Regulations in 2009.
- Minister of the Environment, Heritage and Local Government circular regarding the roll-out of brown bins.

What Else Needs To Be Done

- The EPA will complete waste characterisation surveys at approximately 20 waste treatment facilities in 2010.
- The EPA will develop a protocol for waste characterisation surveys.
- The EPA will develop a robust system for reporting BMW disposal at landfills.
- Landfill operators must fully understand the nature of waste disposed at their landfill.
- The waste sector must provide adequate capacity for collection and treatment of BMW.
- Local Authorities must implement the DEHLG Circular on roll-out of brown bins and enforce the Food Waste Regulations.
- The recommendations of the National Waste Report regarding diversion of BMW must be implemented.

Landfill Gas

Issues

- The landfilling of waste produces landfill gas which poses an environmental risk if not managed properly.
- Landfill gas must either be collected and used to produce energy, or flared according to EPA guidance.
- Landfill gas is odorous and accounted for 71% of all complaints in relation to licensed facilities in 2009.

Actions Taken

- Implementation of the licensing system has led to major improvements in terms of containment, collection and flaring/utilisation of landfill gas – emissions of greenhouse gas from landfills decreased by 20% from 1990 to 2008.
- The EPA has reviewed MSW landfill licences to ensure that odour management planning and control is carried out in the most comprehensive manner.
- Extensive landfill gas and odour assessments are carried out by landfill operators and the EPA.
- The EPA took 13 successful prosecutions in relation to landfill gas management and odour impact, and submitted three files to the Director of Public Prosecutions (DPP) in 2009.

What Else Needs To Be Done

- Landfill operators must implement the recommendations of EPA reports on landfill gas emissions and management systems.
- Landfill operators must implement an odour management plan approach to ensure that their facilities do not cause odour nuisance.
- There appears to be greater scope to use landfill gas and landfill operators should examine the feasibility of utilisation of landfill gas.
- Landfill operators must limit intake of BMW in compliance with licence conditions.

Legacy Landfills

Issues

- There are over 300 landfills that were operated by local authorities between 1977 and 1997 without specific authorisation and which must now be regularised under the Historic Unlicensed Waste Disposal and Recovery Activity Regulations.

Actions Taken

- The EPA published a Code of Practice for risk assessment of legacy landfills in 2007.
- The EPA established an electronic register and GIS based risk assessment tool for legacy landfills in 2009.
- The DEHLG funded a pilot project (involving Local Authorities) on environmental risk assessment of legacy landfills in 2009/2010.
- The EPA developed decision matrices to ensure site investigations are carried out to the standards required under the Code of Practice.
- The authorisation process for legacy landfills has commenced.

What Else Needs To Be Done

- Local Authorities must ensure all legacy landfills have been identified and registered.
- Local Authorities must ensure all legacy landfills are risk assessed and applications made for authorisation.
- Local Authorities must implement remediation actions in accordance with risk assessments and EPA authorisations.
- Additional DEHLG funding for risk assessments should be directed to high and moderate risk landfills as a priority.

Environmental Liabilities & Financial Provision

Issues

- Landfills continue to pose an environmental risk after closure and require proper closure, restoration and aftercare to minimise environmental impact.
- Significant financial provision is required to fund closure, restoration and aftercare costs.
- Landfill gate fees have declined by one third between 2004 and 2008 which raises concerns in relation to funding of closure, restoration and aftercare costs in particular.

Actions Taken

- The EPA issued guidance on landfill restoration and aftercare in 1999 and environmental liabilities management in 2006.
- The EPA initiated enforcement actions in relation to financial systems at open MSW landfills in 2009.
- The EPA established an Environmental Liabilities Unit.

What Else Needs To Be Done

- Landfill operators must ensure that the closure/aftercare plans are in place that are fully compliant with EPA requirements and that these plans are properly costed and financed.
- Landfill operators must ensure that the price charged for disposal of waste is sufficient to cover the costs of set-up, operation and closure/aftercare of the landfill.

Cover & Capping

Issues

- The proper covering and capping of landfilled waste are critical to the successful prevention of nuisance and control of landfill gas and leachate.
- Although cover was applied at all landfills in 2008, a survey found that it was only applied correctly at 50%.
- Although there has been significant improvement in capping of landfills since licensing, non-compliances, in particular with capping/restoration deadlines, are still occurring.

Actions Taken

- The EPA presented cover best practice at a conference for landfill operators in October 2009 (presentations available on www.epa.ie).
- Cover management plans are now being required at landfills.
- The EPA enforces capping requirements on an ongoing basis and two landfills were prosecuted on indictment for failure to install capping.

What Else Needs To Be Done

- The EPA will develop guidance on landfill cover in 2010.
- Landfill operators must implement best practice in relation to cover in order to prevent nuisance.
- Landfill operators must carry out capping works in strict compliance with approved plans and in a timely manner.

Leachate Management

Issues

- Landfill leachate poses an environmental risk to ground and surface water if not properly controlled.
- Approximately 1.4 million cubic metres of leachate was collected at landfills in 2008.
- 99% of collected leachate was treated at off-site Urban Wastewater Treatment Plants.
- There were reoccurring failures during 2008 and 2009 to maintain leachate levels less than the required 1m above the base of landfills.

Actions Taken

- Implementation of the licensing system has led to major improvements in terms of minimising and managing leachate – 100% of open MSW landfills are now lined and are collecting the contained leachate for treatment.
- The introduction of an EPA authorisation system for urban wastewater treatment plants in December 2007 is resulting in greater control on discharges from urban wastewater treatment plants taking leachate.
- The EPA took nine successful prosecutions in relation to inadequate leachate management.

What Else Needs To Be Done

- The need for urban wastewater treatment plants to meet authorisation requirements may limit their capacity to treat landfill leachate and on-site treatment of landfill leachate may become increasingly necessary in the future. Landfill operators need to be aware of this issue and plan accordingly.
- Landfill operators shall manage leachate in full compliance with licence requirements.

Waste Acceptance

Issues

- It is important that proper waste acceptance procedures are in place to ensure that waste is disposed of in the correct class of landfill (inert, non-hazardous or hazardous).
- There is a lack of hazardous waste landfill capacity in Ireland.
- Gypsum waste co-disposed with organic waste can break down into hydrogen sulphide gas, which is colourless, toxic and flammable and can lead to odour nuisance.

Actions Taken

- The EPA developed guidance on waste classification and implemented European waste acceptance requirements through its licensing system.
- All landfills now maintain extensive records of waste accepted at their facilities.
- The EU completed a survey of waste acceptance at landfills in 2009.
- The EPA commissioned a study in 2009 to examine the provision of hazardous waste landfill capacity in Ireland.
- The EPA engaged extensively with all stakeholders in relation to prevention of inappropriate landfill of gypsum waste and piloted a method for measuring gypsum in waste going to landfill.

What Else Needs To Be Done

- Landfill operators must implement strict waste acceptance procedures to ensure only appropriate wastes are accepted into landfills.
- The recommendations of the National Hazardous Waste Management Plan with respect to provision of hazardous landfill capacity must be implemented.
- The Construction & Demolition waste sector (producers, transfer stations, landfill operators) should segregate gypsum waste at source for recovery. Gypsum waste should not be landfilled with biodegradable waste.
- Ireland needs to continue to monitor EU developments in relation to waste acceptance. The EPA will develop further guidance on waste acceptance.

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Appendix 1 Legal & regulatory framework

1975–Waste Framework Directive

The original Waste Framework Directive^a was adopted in 1975 and required any facility treating, storing or tipping waste on behalf of third parties to obtain a permit specifying:

- the type and quantity of waste to be treated
- the general technical requirements
- the precautions to be taken
- the information to be made available at the request of the competent authority concerning the origin, destination and treatment of waste and the type and quantity of such waste

Member States were required to bring the 1975 Waste Framework Directive into force by 15/07/1977. The 2008 Waste Framework Directive^b will replace the 1975 Waste Framework Directive (and its amendments) when it comes into force on 12/12/2010.

1979–Waste Regulations

The European Communities (Waste) Regulations, 1979 [S.I. No. 390/1979] came into operation on the 01/04/1980 and gave effect to the requirements of the 1975 Waste Framework Directive. These Regulations stipulated that a person other than a local/sanitary authority shall not carry out the treating, storing or tipping of waste on behalf of another person without an appropriate permit from a local authority. This permit system was superseded by the requirements of the Waste Management Act, 1996.

a Council Directive of 15 July 1975 on waste (75/442/EEC). Official Journal of the European Communities L 194, 25/07/1975.

b Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. Official Journal of the European Communities L 312/3, 22/11/2008.

1992–Environmental Protection Agency Act

The Environmental Protection Agency Act, 1992 established the EPA and required it to specify and publish criteria for the selection, management, operation and termination of landfill sites. These were published as follows:

- 1995–Investigations for landfills^c
- 1995 updated 2003–Landfill monitoring^{d, e}
- 1997–Landfill operational practices^f
- 1999–Landfill restoration and aftercare^g
- 2000–Landfill site design^h

Local authorities were required to operate their landfills in accordance with the criteria specified by the EPA, to monitor their landfills and to submit the monitoring results to the EPA. The Act also required the EPA to publish reports on the operation of local authority landfill sites from time to time.

The EPA commenced integrated pollution control (IPC) licensing under the Act in 1994 and any landfills associated with IPC activities became regulated under the IPC licence, e.g. landfills for disposal of ash from power plants.

c Environmental Protection Agency (1995) *Landfill Manuals: Investigations for Landfills*. EPA, Wexford.

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g Environmental Protection Agency (1999) *Landfill Manuals: Landfill Restoration and Aftercare*. EPA, Wexford.

h Environmental Protection Agency (2000) *Landfill Manuals: Landfill Site Design*. EPA, Wexford.

The Environmental Protection Agency Act, 1992 was amended by the Protection of the Environment Act, 2003. The IPC licensing system was updated to an Integrated Pollution Prevention Control (IPPC) licensing system to give effect to the IPPC Directive.ⁱ

1996–Waste Management Act

The Waste Management Act, 1996 introduced the licensing of stand-alone landfills. Prescribed dates for waste licence applications were specified in the Waste Management (Licensing) Regulations, 1997 [S.I. No. 133/1997] and varied from 01/05/1997 to 01/03/1999 depending on whether the activity was existing or new, whether it was operated by a local authority or private body and its size. The first applications for landfills were received by the EPA on 30/04/1997.

The Waste Management Act, 1996 also expanded on the existing requirement for local authorities to make waste management plans. Plans have been prepared on a regional basis. Further information on waste management planning, including a national overview^j, is available on:

<http://www.environ.ie/en/Environment/Waste/>

The Act also required the EPA to make a national hazardous waste management plan. The current national hazardous waste management plan covers the years 2008 to 2012^k and is available on:

<http://www.epa.ie/downloads/pubs/waste/haz/name,25129,en.html>

ⁱ Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control. Official Journal of the European Communities L 257, 10/10/1996.

^j Department of Environment, Heritage and Local Government (2004) *National Overview of Waste Management Plans*. DEHLG, Dublin.

^k Environmental Protection Agency (2008) *National Hazardous Waste Management Plan 2008-2012*. EPA, Wexford.

2001–Landfill Directive

Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (referred to herein as the 'Landfill Directive'), was published on the 16/07/1999 and Member States were required to bring it into force by 16/07/2001.^l The overall objective of the Landfill Directive is:

by way of stringent operational and technical requirements on the waste and landfills, to provide for measures, procedures and guidance to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, from landfilling of waste, during the whole life-cycle of the landfill [Article 1(1)]

The Landfill Directive details requirements for landfill classification, waste acceptance, permitting, design, control, monitoring, financial provision, closure and aftercare. It also sets targets for the diversion of biodegradable municipal waste from landfill. Existing landfills (i.e. those already permitted or in operation at the time of transposition of the Landfill Directive) were required to be assessed vis a vis the requirements of the Landfill Directive and either closed or brought into line with Landfill Directive standards by 16/07/2009.

2002 – Waste Acceptance Decision

Council Decision 2003/33/EC of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC came into force on 16/07/2004 and Member States were required to

^l Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. Official Journal of the European Communities L 182, 16/07/1999.

apply the criteria therein by 16/07/2005.^m The Decision expands on the waste acceptance criteria specified in the Landfill Directive and sets detailed criteria for waste characterisation and acceptance at each class of landfill: inert, non-hazardous and hazardous.

2002–Waste Licensing Regulations

The Waste Management Licensing (Amendment) Regulations, 2002 [S.I. No. 336 of 2002] and European Communities (Amendment of Waste Management (Licensing) Regulations 2000) Regulations, 2002 [S.I. No. 377 of 2002] transpose the requirements of the Landfill Directive in Ireland. They require the EPA to give effect to specific requirements of the Landfill Directive in landfill licences and explicitly address landfill classification and aspects of waste acceptance and financial provision. They also provide a framework to address existing landfills as required by the Landfill Directive. These Regulations came into effect on 02/06/2002 and have been replaced by the Waste Management Licensing Regulations, 2004 [S.I. No. 395 of 2004].

2006 – Extractive Waste Directive

Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industriesⁿ came into force on the 01/04/2006 and applies to:

the management of waste resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries [Article 2(1)]¹³

Waste that falls under this Directive is not subject to the Landfill Directive.

^m Council Decision (2003/33/EC) of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC. Official Journal of the European Communities L 11/27, 16/01/2003.

ⁿ Directive 2006/21/EC of The European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC. Official Journal of the European Communities L 102/15, 11/04/2006.

2008 – Historic Unlicensed Waste Disposal and Recovery Activity Regulations

The Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008 [S.I. No. 524 of 2008] came into effect on 08/12/2008. These Regulations address a gap in transposition of the 1975 Waste Framework Directive under the 1979 Waste Regulations in that local authorities were not required to have authorisation for their waste management activities. These regulations also respond to the findings of the European Court of Justice in its ruling of 26/04/2005 against Ireland regarding failure to implement the Waste Framework Directive (Case C-494/01). The regulations require local authorities to carry out the following in relation to the landfills they operated without a waste licence between 15/07/1977 and 27/03/1997 (referred to as ‘closed landfills’):

- identify all closed landfills by 30/06/2009
- maintain a register of closed landfills
- carry out a risk assessment of closed landfills
- apply to the EPA for a certificate of authorisation for closed landfills

Local authorities are required to have regard to the Code of Practice–Environmental Risk Assessment for Unregulated Waste Disposal Sites^o in identifying and risk assessing closed landfills.

The EPA certificate of authorisation must determine the adequacy of the risk assessment, specify necessary measures for protection of human health, the environment and compliance with European law, and require a remediation validation report.

^o Environmental Protection Agency (2007) CODE OF PRACTICE – Environmental Risk Assessment for Unregulated Waste Disposal Sites. EPA, Wexford.

2008 – Environmental Liability Regulations

The European Communities (Environmental Liability) Regulations, 2008 implement Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage.^p The Regulations came into operation on 01/04/2009 and apply inter alia to facilities licensed by the EPA. The Regulations are designed to discourage environmental damage and make operators liable for preventing and remedying any damage caused. The EPA is the competent authority and its activities in this regard will include:

- assessing/investigating cases of possible environmental damage
- issuing remediation notices
- overseeing implementation of remediation notices
- taking further enforcement action where appropriate

2009–Extractive Waste Regulations

The Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009 [S.I. No. 566 of 2009] transpose the requirements of the Extractive Waste Directive in Ireland. Waste that falls under the Directive and these Regulations is not subject to the Landfill Directive. Accordingly, a number of waste management facilities in Ireland that formerly fell under the Landfill Directive now fall under the Extractive Waste Directive/Regulations instead, e.g. tailing management facilities for mine tailings waste.

Best Available Techniques (BAT)

The EPA published draft landfill best available techniques (BAT) guidance notes for comment in 2003 and 2008. BAT notes represent best practice and the specifications in the BAT guidance notes apply to new waste and IPPC landfills and existing waste and IPPC landfills where the licences are reviewed.

^p Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. Official Journal of the European Communities L 143/56, 30/04/2004.

Appendix 2 List of landfills

Landfills open in 2009

Licence Reg. No.	Licensee	Name of Facility
Municipal solid waste (MSW) landfills		
W0001-04	Kerry County Council	North Kerry Landfill
W0004-04	South Dublin County Council	Arthurstown Landfill
W0009-03	Fingal County Council	Balleally Landfill
W0012-02	Cork City Council	Kinsale Road Landfill*
W0017-04	Limerick County Council	Gortadroma Landfill Site
W0020-02	Monaghan County Council	Scotch Corner Landfill
W0021-02	Mayo County Council	Derrinnumera Landfill Facility
W0024-04	Donegal County Council	Ballynacarrick Landfill Site
W0025-03	Carlow County Council	Powerstown Landfill Site
W0026-03	Laois County Council	Kyletalesha Landfill
W0028-03	Westmeath County Council	Ballydonagh Landfill
W0029-03	Offaly County Council	Derryclure Landfill
W0030-02	Kilkenny County Council	Dunmore Landfill
W0047-02	Neiphin Trading Limited	Kerdiffstown
W0059-03	Roscommon County Council	Ballaghaderreen Landfill
W0060-03	Louth County Council	Whiteriver Landfill Site
W0066-03	Wicklow County Council	Rampere Landfill
W0067-02	Mayo County Council	Rathroeen Landfill
W0068-03	Cork County Council	Youghal Landfill
W0074-03	South Tipperary County Council	Donohill Landfill
W0077-03	Cavan County Council	Corranure Landfill
W0078-03	North Tipperary County Council	Ballaghveny Landfill
W0081-03	KTK Landfill Limited	KTK Landfill Limited
W0089-02	Cork County Council	Derryconnell Landfill
W0146-02	Greenstar Holdings Limited	Knockharley Landfill
W0165-02	Greenstar Holdings Limited	Ballynagran Residual Landfill
W0201-03	Bord na Móna plc	Drehid Waste Management Facility
W0109-02	Clare County Council	Central Waste Management Facility
W0178-02	Greenstar Holdings Limited	East Galway Residual Landfill Site
W0191-02	Wexford County Council	Holmestown Waste Management Facility

Licence Reg. No.	Licensee	Name of Facility
Inert landfills		
W0048-01	Marrakesh Limited	Kilmurry South
W0129-02	Murphy Environmental Hollywood Limited	Murphy Environmental Hollywood Limited
W0151-01	Murphy Concrete Manufacturing Ltd	Murphy Concrete Manufacturing Ltd
W0156-01	KTK Sand and Gravel Limited	KTK Sand & Gravel Ltd
Mono landfills		
W0037-01	Clare County Council	Tradaree Point E.T.P.
W0049-02	Bord NaMona	Clonbulloge Ash Repository
Integrated Pollution Prevention & Control (IPPC) landfills		
P0027-02	Medite Europe Limited	Medite Europe Limited
P0029-02	Irish Cement Limited	Irish Cement Limited (Limerick)
P0030-03	Irish Cement Limited	Irish Cement Limited (Drogeda)
P0376-01	Premier Periclase Limited	Premier Periclase Limited
P0393-02	Kerry Ingredients (Ireland) Limited	Kerry Ingredients (Ireland) Limited
P0419-01	Conoco Philips Bantry Bay Terminals Limited	Conoco Philips Bantry Bay Terminals Limited
P0499-01	Bord NaMona Fuels Limited	Bord NaMona Fuels Limited (Littleton)
P0519-02	Gypsum Industries Limited	Gypsum Industries Limited*
P0605-02	Electricity Supply Board (Moneypoint)	Coal Ash Landfill & FGD Landfill A**
P0610-01	Electricity Supply Board (Lough Ree Power)	Electricity Supply Board (Lough Ree Power)
P0611-01	Electricity Supply Board (West Offaly Power)	Electricity Supply Board (West Offaly Power)

*Closed during 2009

**Two open landfills on-site in 2009

EPA licensed closed landfills in 2009

Licence Reg. No.	Licensee	Name of Facility
Municipal solid waste (MSW) landfills		
W0002-02	Cork County Council	Ballyguyroe Landfill Site
W0010-02	Meath County Council	Basketstown Landfill Facility
W0011-01	Wicklow County Council	Ballymurtagh Landfill Facility
W0013-01	Galway City Council	Carrowbrowne Landfill Site
W0014-01	Kildare County Council	Silliot Hill Landfill
W0015-01	Dun Laoghaire–Rathdown County Council	Ballyogan Landfill Facility & Recycling park
W0016-02	Wexford County Council	Killurin Landfill Site
W0018-01	Waterford City Council	Kilbarry Landfill Site
W0022-01	Cork County Council	East Cork Landfill Site
W0023-01	Cork County Council	Raffeen Landfill Site
W0027-02	Ballinasloe Town Council	Pollboy Landfill Facility
W0031-01	Clare County Council	Doora Landfill Site
W0032-02	Waterford County Council	Dungarvan Waste Disposal Site
W0033-01	Drogheda Borough Council	Drogheda Landfill Site
W0034-02	Dundalk Town Council	Dundalk Landfill & Civic Waste Facility
W0062-01	Donegal County Council	Churchtown Landfill
W0063-01	Donegal County Council	Drumabodan Landfill Site
W0064-01	Leitrim County Council	Carrick-on-Shannon Landfill
W0065-01	Leitrim County Council	Mohill Landfill
W0069-01	Kerry County Council	Milltown Transfer Station
W0070-01	Cork County Council	Benduff Landfill Site
W0071-02	Westmeath County Council	Marlinstown Landfill
W0072-01	Kerry County Council	Coolcaslagh Transfer Station
W0073-01	Roscommon County Council	Roscommon Landfill Facility
W0075-02	Waterford County Council	Tramore Waste Disposal Site
W0076-01	Limerick City Council	Longpavement
W0086-01	Kerry County Council	Kenmare Transfer Station
W0087-01	Kerry County Council	Cahirciveen Transfer Station
W0090-01	Donegal County Council	Balbane Landfill Site
W0091-01	Cavan County Council	Bailieborough Landfill
W0092-01	Cavan County Council	Belturbet Landfill
W0093-01	Cavan County Council	Ballyjamesduff Landfill
W0125-01	Donegal County Council	Glenalla Landfill Site

Licence Reg. No.	Licensee	Name of Facility
W0126-01	Donegal County Council	Muckish Landfill Site
W0127-01	Fingal County Council	Dunsink Landfill
W0139-01	Carlow County Council	Haroldstown Transfer Station
W0170-01	Clare County Council	Lisdeen Recycling Centre & Transfer Station
Inert landfills		
W0053-03	Greenstar Limited	Greenstar Limited
W0080-01	Carnegie J.W. & Co. Limited	Dillonsdown
W0084-01	Hegarty Demolition Limited	Aghfarrell
W0088-01	Paul Joyce	Corbally
Mono landfills		
W0046-01	Tegral Building Products Limited	Ballylinan Landfill Site
W0199-01	Bord na Mona Energy Limited	Srahmore Peat Deposition Site
Integrated Pollution Prevention & Control (IPPC) landfills		
P0012-04	Roche Ireland Limited	Roche Ireland Limited
P0022-02	Finsa Forest Products Limited	Finsa Forest Products Limited
P0031-02	Holfield Plastics Ltd	Holfield Plastics Ltd*
P0081-02	Irish Asphalt Limited	Irish Asphalt Limited
P0222-01	Irish Sugar plc	Irish Sugar plc (Carlow)**
P0223-01	Irish Sugar plc	Irish Sugar plc (Cork)***
P0225-01	John Ronan & Sons	John Ronan & Sons
P0389-01	Thornbrush Holdings Limited	Thornbrush Holdings Limited
P0498-01	Irish Ispat Limited	Irish Ispat Limited
P0516-01	Tara Mines Limited	Tara Mines Limited
P0626-01	Electricity Supply Board (Shannonbridge)	Electricity Supply Board (Shannonbridge)
P0627-01	Electricity Supply Board (Bellacorick)	Electricity Supply Board (Bellacorick)
P0629-01	Electricity Supply Board (Lanesborough)	Electricity Supply Board (Lanesborough)
Illegal landfills		
W0181-01	Swalcliffe Ltd	Swalcliffe Ltd
W0204-01	Brownfield Restoration Ireland Limited	Brownfield Restoration Ireland Limited
W0213-01	Roadstone Dublin Limited	Roadstone Dublin Remediation Landfill

* There are four closed landfills on this site

** There are two closed landfills on this site

*** There are six closed landfills on this site

Focus on Landfilling in Ireland

ENVIRONMENTAL PROTECTION AGENCY

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