Office of the
Deputy Prime Minister
Creating sustainable communities

Planning for Waste Management Facilities

A Research Study

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August 2004
Enviros Consulting
Office of the Deputy Prime Minister: London

The findings and recommendations in this report are those of the consultant authors and do not necessarily represent the views or proposed policies of the Office of the Deputy Prime Minister.

Following the reorganisation of the government in May 2002, the responsibilities of the former Department of the Environment, Transport and the Regions (DETR) and latterly Department for Transport, Local Government and the Regions (DTLR) in this area were transferred to the Office of the Deputy Prime Minister.

The Office of the Deputy Prime Minister
Eland House
Bressenden Place
London SW1E 5DU
Telephone 020 7944 4400
Web site www.odpm.gov.uk

Further copies of this publication are available from:
ODPM Publications
PO Box 236
Wetherby
West Yorkshire
LS23 7NB
Tel: 0870 1226 236
Fax: 0870 1226 237
Textphone: 0870 120 7405
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Preface

This research study was commissioned by the Office of the Deputy Prime Minister (ODPM), into the planning considerations associated with waste management facilities. The study was undertaken by Enviros Consulting, and the majority of the work was carried out by Tim Hammond, Linda Crichton, Debbie Everard, Paul Hatherley and Dave Sellwood. The consultants were assisted throughout the study by a steering group whose advice and guidance was gratefully received. The members of the steering group were:

Tom Simpson, ODPM

David Stritch, ODPM

Andrew Lipinski, ODPM

Gillian Neville, DEFRA

Nigel Hunt, Leicestershire County Council and Planning Officers Society

Phil Ackerley, Environment Agency

Michael Oliver, Viridor Waste Management and Environmental Services Association

Nick Hollands, Onyx UK Ltd and Environmental Services Association

Wayne Laramee, Environmental Services Association

The research included remote consultation with over 180 local authorities, waste management professionals and organisations with an interest in waste management, as well as more in depth interviews with individuals in these fields. We are grateful to everyone who has contributed. This research reflects the views of the study team and does not necessarily represent the views of the ODPM or any other parties involved. It is a stand alone study and does not represent new ODPM good practice guidance, which is proposed to be prepared as part of the review of PPG 10.

Introduction to this research

The research has been produced in two parts. Part 1 sets out generic issues facing those involved with planning for waste management, and considers:

- Current Practices
- Generic Planning Considerations
- National and European Policy
- Future Trends
- Waste Facility Options

Part 2 contains profiles for each kind of waste management facility, all based upon a common format. The facilities are described in terms of use and waste stream processed, site setting, planning issues, mitigation and future issues. The content required for a planning application for each type of facility is discussed, as is the need for Environmental Impact Assessment. A scoping matrix is included with each facility profile, to facilitate the identification of any potentially significant effects of the facility. Case examples of representative facilities are also included.

Part I – General Planning Issues

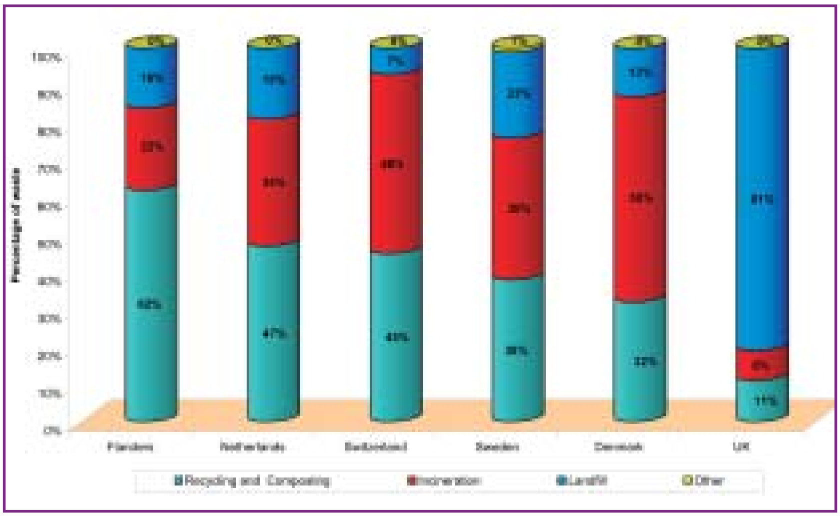
Current Practice

Introduction

This research considers planning issues associated with waste management facilities that primarily handle household and other commercial and industrial waste streams that are similar in type and composition. Municipal waste is the waste stream that local authorities have a duty to collect and dispose of and, in terms of numbers of facilities, the majority of operations are likely to be subject to planning control. However in terms of the total waste generated in England, household and commercial wastes represent only 26% (49 million tonnes) of all controlled wastes or 13% of all wastes. The larger proportion is made up from waste produced by industry, construction and demolition activities, agriculture, mining & quarrying and the waste water industry.

Today's waste management industry is going through a major process of change. These changes are being brought about by legislative and fiscal drivers as summarised later in this document. The likely consequences of these changes are also discussed later. In terms of today's practices we are still dominated by landfill as the primary means of waste disposal.

England recycles about 13% of its municipal waste stream, and deals with 9% by thermal treatment, primarily incineration with energy recovery. This does not compare favourably with the waste management methods of most of the UK's European neighbours. For example, Switzerland recycles and composts 45%, incinerates 48% and landfills just 7%.



Waste management measures by country, 1999/2000

Current Experience of Planning Issues for Waste Facilities

Experience in waste planning issues extends beyond the planning and development control issues associated with landfill sites. There is very good understanding and practical knowledge of the planning issues associated with a wide range of facility types. Most Waste Planning Authorities have many years experience of working with industry to permit facilities such as civic amenity sites, transfer stations and certain recycling operations.

Although there is good experience in certain parts of the Country, this is heavily influenced by local circumstances. This research involved wide consultation with waste planning officers and industry representatives and identified a relatively predictable pattern, as summarised in the table below.

WPA experience of waste facilities	
Planning Experience	Facility Type
Little or none	Anaerobic digestion, Pyrolysis/Gasification, In-vessel composting
Patchy	Leachate treatment, Mixed waste processing (e.g. mechanical biological treatments)
	Large scale thermal treatment, Small scale thermal treatment, Windrow composting, Processing of recyclables
Good	Landfills, Civic amenity sites, Waste transfer stations, Landfill gas extraction/utilisation

There is good experience of the traditional and established waste management techniques but only patchy practical experience associated with new and emerging facilities. Many new and emerging facilities have very different siting and general planning control issues compared with methods such as landfill, with many involving the application of process techniques more characteristic of industrial processing. These are usually housed within modern industrial type buildings and are more typical of developments which have business class land use characteristics.

Local Authority Responsibilities

Local authorities have a number of responsibilities with respect to waste management. These relate to the delivery of services for the collection of municipal waste, making arrangements for disposal of waste, for making land use provision for the management of all waste streams produced within their area, and the determination of planning applications for new waste facilities. The different roles of local authorities are often misunderstood by the public and developers. These responsibilities are summarised in the table overleaf.

At present the regional tier of Government through the Regional Assemblies has no statutory responsibility for waste strategy and waste planning matters. The Planning and Compulsory Purchase Act 2004 introduced the concept of Regional Spatial Strategies to replace the existing Regional Planning Guidance. Local Development Documents have replaced Local Plans, Structure Plans and UDPs.

Regional Technical Advisory Bodies (RTABs) were established by the Regional Assemblies in response to guidance in Planning Policy Guidance Note 10 “Planning and Waste Management” (PPG 10). The role of the RTABs is to assemble relevant waste data and provide advice on options for the management of waste in each region within the framework set out in Waste Strategy 2000. Technical reports have been produced by the RTABs and most regions have consulted on draft strategies.

Key Issues Facing Waste Planners and Developers

An unprecedented number of new facilities will require planning permissions in order that the UK as a whole can meet the various statutory and non statutory targets. There are a number of issues identified which are resulting in delays and practical difficulties in delivering these facilities. A particular issue in two tier authority areas is the need for cooperation and agreement between District and County Council stakeholders before development proposals can be brought forward in the form of planning applications.

The progression towards sustainable waste management practices requires a holistic approach. This applies to the choice of options in making decisions on waste collection and transport systems all the way to the mode of final disposal of residual wastes.

The design, planning and construction phases of new waste facilities can take a considerable period of time. If statutory targets are to be met, sufficient lead in times are required before facilities become operational. This needs to be accommodated within new waste contracts.

Waste management responsibilities of local authorities	
	Waste Planning & Development Control Responsibilities
Regional Assemblies & Regional Technical Advisory Bodies (RTABs)	• At present a non statutory role in providing information and input to strategy and policy formulation
Waste Planning Authorities (WPAs) (County Councils and Unitary Authorities)	• Preparation of Local Development Documents for waste. These should provide appropriate guidance on the location and siting of new waste facilities • Granting and enforcement of planning permissions for new facilities
District/Borough Councils	• Granting and enforcement of planning permissions for non waste or mineral activities
	Key Service Delivery Responsibilities
Waste Collection Authorities (WCAs) (Districts/Boroughs & Unitary Authorities)	• Must arrange for the collection of waste from households and, if requested, from commercial premises • Must dispose of waste as directed by WDA (under two tier arrangements) • Street cleaning & litter control • Achievement of best value performance standards for recycling and composting
Waste Disposal Authorities (WDAs) (County Councils and Unitary Authorities)	• Must arrange for the treatment/disposal of controlled County waste collected by the WCAs (for two tier arrangements) • Must provide places where residents can take general and bulky household waste items for disposal, free of charge (i.e. Civic Amenity or Household Waste & Recycling Centres) • Achievement of best value performance standards for recycling and composting • Will have responsibility for achieving targets for diverting biodegradable municipal waste from landfill under measures introduced under the Waste & Emissions Trading Act • Preparation of municipal waste management strategy that has become a statutory responsibility for two-tier authorities to produce these jointly

This research has looked in particular at the main concerns associated with gaining planning permissions for new waste facilities. The key issues identified by the waste industry and waste planning officers are presented below.

Government departments are focused on the need to resolve many of these issues. New guidance on waste planning to replace the existing PPG 10 is underway.

Current questions and issues raised by waste planners & developers	
Key issues for waste planning authorities	• Need for clarity on the role of BPEO assessments, and how should it be applied in the context of development control? When should it be applied? • New planning guidance required in advance of legislative changes which affect waste management practices. (e.g. planning for hazardous waste facilities including fridge storage) • Clearer distinction required between the roles of the waste planning authority and the Environment Agency • Existing guidance in PPG 10 needs to be revised
Key issues for the waste industry	• Clarity required on the role of BPEO in the context of new development proposals • Time delays in gaining planning permissions lead to unreasonable expense and contractual difficulties • Lack of locational guidance and proactive planning on the part of Waste Planning Authorities leads to too much uncertainty • Concerns over the inability of the existing planning system to deliver what is required in order for legislative requirements and the targets and aspirations of Waste Strategy 2000 to be met

Generic Planning Considerations

Introduction

There are a number of general planning considerations which are relevant to all proposals for waste management facilities. These are issues which it is necessary for applicants and waste planning authorities to have regard to whilst preparing and determining applications for waste management proposals.

Waste Management Principles

PPG 10 lists four fundamental waste management principles which should represent the main cornerstones of waste management strategy and planning. These have been established primarily through European legislation starting with the 1975 Framework Directive on Waste (75/442/EEC). Implicit in the definition of these principles is the need to promote the concept of sustainable development. These cornerstones are:

- Best Practicable Environmental Option
- Regional Self Sufficiency
- Proximity Principle
- Waste Hierarchy

The relevance of these in the context of waste planning is discussed below.

Best Practicable Environmental Option

Best Practicable Environmental Option (BPEO) is defined in PPG 10, adopting the definition of the Royal Commission's Twelfth Report on Environmental Pollution, as:

"… the outcome of a systematic consultative and decision making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long term as well as in the short term."

Waste Strategy 2000 notes that the determination of the BPEO is not a simple process and BPEO varies from product to product, from area to area and from time to time. It is expected that assessment methodologies should be comprehensive, flexible, iterative, and transparent.

It is important that a planning application for a larger, strategic waste facility should demonstrate that the proposed development is consistent with an agreed BPEO for the waste stream(s) to be managed. The way in which this can be achieved will vary depending on availability of existing local and regional information on BPEO and the relevance of that BPEO work to the waste streams to be managed by the proposed facility.

Regional Self Sufficiency and the Proximity Principle

These considerations suggest that most waste should be treated and disposed of in the region where it is generated and as near as possible to its place of production. PPG 10 states that each region should make provision for facilities that have capacity to deal with at least ten years supply of waste. The Regional Planning Bodies and RTABs should take an overview of the waste needs and options for their region.

There are certain contradictions that may need to be reconciled when considering these issues, including certain economies of scale and transport issues. In some situations it may be appropriate for centralised facilities to be developed which take in wastes from outside the immediate area, for example, the use of rail as a means of waste transfer is generally not economic over short distances. Similarly achieving certain economies of scale can be critical to the financial viability of certain thermal and mechanical processing operations.

Waste Hierarchy

This is a theoretical hierarchy of techniques/approaches to waste management first set out in the EC Framework Directive. Waste disposal in the form of landfill is at the bottom of the hierarchy and waste minimisation and recycling towards the top. Waste Strategy 2000 sets out the Government's priorities and targets in this regard.

One difficulty with some simplistic interpretations of the waste hierarchy is that the impression given is that options at the top of the hierarchy are good and options at the bottom are bad. The reality is much more complicated. In any integrated waste management strategy there needs to be a mix of facilities which must include provision for disposal of residual waste as well as the provision of other options further up the hierarchy.

Environmental Impact Assessment (EIA)

The need to undertake an EIA in connection with proposals for waste management facilities is based on the requirements of the EC EIA Directives (85/337/EEC and 97/11/EC) These were translated into English law by the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999. Specific guidance on the application of the EIA Regulations is contained in DETR Circular 02/99. Further guidance on EIA procedures is also contained in the DETR 'Blue Book' (Environmental Impact Assessment – A Guide to Procedures, November 2000).

The key objective of the EIA procedures is to ensure that appropriate consideration is given to those projects which have the potential to have a significant effect on the environment. It is not intended that EIA be used for development projects which are likely to have only limited environmental impacts.

The Regulations define EIA projects in two separate schedules. Schedule 1 identifies projects which will always require EIA, Schedule 2 identifies projects that may require EIA subject to EIA screening and consideration of factors such as its size, nature or location.

With regard to waste projects, the following definitions are described in the Regulations:

Schedule 1:	
9.	Waste disposal installations for the incineration, chemical treatment (as defined in Annex IIA to Council Directive 75/442/EEC under heading D9), or landfill of hazardous waste (that is to say, waste to which Council Directive 91/689/EEC applies).
10.	Waste disposal installations for the incineration, chemical treatment (as defined in Annex IIA to Council Directive 75/442/EEC under heading D9), of non-hazardous waste with a capacity exceeding 100 tonnes per day.

Schedule 2:	
11. Other Projects	
Column 1 Description of development	**Column 2** Applicable thresholds and criteria
(b) Installations for the disposal of waste (unless included in Schedule 1);	(i) The disposal is by incineration; or (ii) The area of the development exceeds 0.5 hectares; or (iii) The installation is to be sited within 100 metres of any controlled waters.
[NB Waste water treatment is included as a separate category but is not addressed within this guidance]	

Guidance on which waste management proposals will require EIA is contained in Annex A of Circular 02/99. Paragraph A36 states:

> "Installations for the disposal of non hazardous waste
>
> A36. The likelihood of significant effects will generally depend on the scale of the development and nature of the potential impact in terms of discharges, emissions or odour. For installations (including landfill sites) for the deposit, recovery and/or disposal of household, industrial and/commercial wastes (as defined by the Controlled Waste Regulations 1992) EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of these wastes, sites seeking only to accept inert wastes (demolition rubble etc.) or Civic Amenity sites, are unlikely to require EIA."

Schedule 3 sets out three broad criteria which should also be considered:

- *The characteristics of the development (e.g. its size, use of natural resources, quantities of pollution and waste generated);*
- *The environmental sensitivity of the location; and*
- *The characteristics of the potential impact (e.g. its magnitude and duration).*

The Circular states that the Secretary of State's view is that, in general, EIA will be needed in three main types of case:

a) *for major developments which are of more than local importance;*

b) *for developments which are proposed for particularly environmentally sensitive or vulnerable locations; and*

c) *for developments with unusually complex and potentially hazardous environmental effects.*

Paragraph 34 states that conformity with development plan policies does not have a bearing on the need for EIA and neither does the level of opposition or controversy to which the development gives rise.

All development proposals affecting certain 'sensitive sites' will require EIA screening, regardless of the thresholds in Schedule 2. These are:

a) *Sites of Special Scientific Interest, any consultation areas around them (where these have been notified to the local planning authority under article 10(u) (ii) of the GDPO), land to which Nature Conservation Orders apply and international conservation sites; and*

b) *National Parks, the Broads, Areas of Outstanding Natural Beauty, World Heritage Sites and Scheduled Monuments.*

There are certain obligatory requirements of the EIA process in terms of content and scope of the resulting Environmental Statement, which are set out in Schedule 4 of the Regulations. They include the need to produce a Non Technical Summary, a description of the nature of the proposals and their likely impacts and a consideration of alternatives.

Each of the individual facility profiles contained within Part 2 include information on the types of facilities that will normally require EIA.

Need

An important consideration for developers and waste planning authorities with regard to planning proposals for waste facilities is the issue of need. Applicants are not usually required to demonstrate the need for their proposed development or discuss the merits of alternative sites, except where an Environmental Statement is required, although need may be a consideration where material planning objections are not outweighed by other planning benefits. Such a requirement also applies generally to minerals proposals. Normally the need statement for waste management facilities will have regard to the following issues:

- Existing waste flows and volumes;
- Identification of the waste catchment area affected and sources of waste;
- Existing provision of facilities dealing with the specific waste streams in question;
- Assumptions on waste movements and patterns;
- Assumptions on waste growth over appropriate time periods; and
- Predictions on the identified shortfall in capacity over appropriate time periods.

Alternatives

Consideration of alternative sites and technologies is now recognised as an important part of any proposal seeking planning permission for waste facilities.

Where the proposals are defined as an EIA project under the terms of the EIA Regulations, consideration of alternatives is an obligatory requirement as defined under Schedule 4 '*Information to be included in an Environmental Statement*'. This states under Section 2:

> **"An outline of the main alternatives studies by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effect"**

At present there is no clear guidance on the form or content of an alternatives assessment. This is likely to vary according to the local context. For example it is considered that where there is clear policy guidance in the relevant UDP or Waste Local Plan (now local development documents) which indicates preferred sites, it is likely that the scope of any alternatives assessment can be limited. Similarly if the relevant Waste Strategy or BPEO assessment indicates certain preferences in terms of technology or facility types then any assessment of alternative management options in the planning application would be expected to draw upon this.

Where no such context is available to guide the choice of the preferred option, the applicant may be expected to demonstrate that they have undertaken a methodical appraisal of all the relevant alternatives. In terms of alternative sites this can involve a constraints based assessment. Geographic information systems (GIS) and data sets can be used as a tool to aid site selection.

National and European Policy

Introduction

This section reviews policy and guidance relevant to waste management planning at European and national scale and sets out the key legislation relating to the development and operation of waste management facilities. There are a number of legislative and policy drivers that will have a significant bearing on the future shape of waste management in England. Although the pace of legislative change is accelerating, it is only adding to a whole series of earlier rounds of legislation which particularly in the 1980's and 1990's had a similarly significant role in influencing the current practices.

These changes moved the industry from one which was largely unregulated to a situation where significant environmental and landuse controls are now in place. Many of the early provisions were led by public health and environmental concerns with licensing and controlling operations at landfill and incineration facilities at the forefront. Only through relatively recent provisions has the focus moved onto other areas such as composting, recycling and recovery.

Set out below are the key European and national policy and legislation relevant to waste management. This is not designed to be an exhaustive list but is intended to include those policies and principles that will have the most significant bearing on future waste planning practices and influence the nature of future landuse activities. For this reason, legislation and regulation which deals with waste management licensing and pollution prevention and control (including the Waste Management Licensing Regulations 1994 and the Pollution Prevention and Control Act 1999) has not been included within this publication.

European Policy

- Framework Directive on Waste 75/442/EEC, as amended by Directive 91/156/EEC
- Council Directive 91/157/EEC of 18 March 1991 on batteries and accumulators containing certain dangerous substances, as amended by Commission Directive 93/86/EEC and Commission Directive 98/101/EC, and the Proposed Directive on Battery Recycling
- Landfill of Waste Directive 1999/31/EC
- Regulation on Substances that Deplete the Ozone Layer EC 2037/2000
- Waste Incineration Directive 2000/76/EC
- End-of-Life Vehicles Directive 2000/53/EC
- Animal By-Products Regulation (EC) 1774/2002
- Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)
- EC Working Document on Biological Treatment of Bio-waste, Second Draft

Framework Directive on Waste 75/442/EEC, as amended by Directive 91/156/EEC

The European Framework Directive on Waste, as amended in 1991, describes the key elements of Community waste management strategy, including the waste management hierarchy and the principles of proximity and self-sufficiency which remain as key principles underpinning waste planning policy in the UK. The Directive requires that Member States establish national waste management plans, setting out their policies on the disposal and recovery of waste, and a procedure for licensing those companies involved in waste disposal or recovery.

Council Directive 91/157/EEC on batteries and accumulators containing certain dangerous substances, as amended by Commission Directive 93/86/EEC and Commission Directive 98/101/EC, and the Proposed Directive on Battery Recycling

The objective of this Directive is to introduce measures for the upgrading and controlled disposal of spent batteries and accumulators containing dangerous materials. Under this programme, member states must encourage the separate collection of batteries and accumulators with a view to their upgrading or ultimate disposal. The batteries and accumulators, or the appliances in which they are incorporated, must be marked to indicate separate collection and recycling requirements and heavy metal content.

It is proposed to extend the scope of these Directives under the latest proposals, a key provision of which is the introduction of collection and recycling targets for all batteries from 2004. It is proposed that within two years of the implementation of the Proposed Directive, 75% of all batteries will have to be separately collected and recycled.

Landfill of Waste Directive 1999/31/EC

The main aim of the Landfill Directive is to prevent, or reduce as far as possible, the negative effects of the landfill of waste on the environment and human health. It has been introduced to ensure that landfill sites across the European Union face strict regulatory controls on their operation, environmental monitoring and long-term care after closure.

The Directive also aims to reduce the emission of methane from landfill sites. Where methane is produced the Directive aims to ensure that it is used productively, by requiring the collection, treatment and use, where possible, of the gas from all landfills receiving biodegradable waste. To help fulfil its objective of reducing methane emissions, the Landfill Directive introduces progressively diminishing limits on the landfill of biodegradable municipal waste.

The UK, along with other countries with a high dependence on landfill, has been granted a four year derogation to meet the targets imposed by the Directive. Implementation of these targets, assuming the four year derogation period, is:

- By 2010 to reduce biodegradable municipal waste landfilled to 75% of that produced in 1995;
- By 2013 to reduce biodegradable municipal waste landfilled to 50% of that produced in 1995; and
- By 2020 to reduce biodegradable municipal waste landfilled to 35% of that produced in 1995.

Other changes required by the Directive include:

- To obligate landfill operators to submit conditioning plans, which describe how the Directive will be complied with;
- To classify sites on the basis of the waste accepted in terms of inert, non-hazardous and hazardous waste types;
- To ban the co-disposal of hazardous and non-hazardous wastes to landfill;

- To ban the landfilling of certain hazardous wastes, including corrosive, flammable and oxidising wastes, hospital and other clinical wastes, toxic wastes, and liquid wastes;

- To ban the disposal of whole tyres and shredded tyres;

- To treat wastes, including hazardous wastes, prior to final disposal provided that it is technically feasible; and

- To establish an environmental monitoring programme at landfill sites, which relates to landfill leachate, gas and groundwater modelling.

Regulation on Substances that Deplete the Ozone Layer EC 2037/2000

This Regulation became directly applicable in the UK from 1st October 2000, and replaced the previous regulation, EC 3093/94. The major points of the Regulation regarding recovery and destruction of all Ozone Depleting Substances (ODS) include:

- Tougher requirements regarding the recovery of ODS from products and equipment;

- All ODS used in refrigeration and air conditioning equipment must be recovered during servicing and maintenance of equipment or prior to the dismantling or disposal of the equipment, which includes domestic fridges and freezers. Recovered CFCs must be destroyed by an approved technology;

- All ODS must be removed during servicing and maintenance of equipment or prior to dismantling or disposal of equipment. With the exception of HCFCs, all recovered ODS solvents must be destroyed by an environmentally acceptable technology;

- All halons and other ODS contained in fire protection systems and fire extinguishers must be recovered during servicing and maintenance of equipment or prior to dismantling or disposal of equipment. Recovery must be for destruction by an environmentally acceptable technology. The only exemption to this rule is for reuse in the 'critical uses' listed within the Regulation; and

- ODS must be recovered from foams (including insulation foams) 'if practicable'. The recovered fluid must be destroyed or reused.

Waste Incineration Directive 2000/76/EC

The aim of the Waste Incineration Directive is to prevent or to limit as far as practicable negative effects on the environment from the incineration and co-incineration of waste, especially pollution by emissions to air, soil, surface water and groundwater, and the resulting risks to human health.

The Directive sets out that all incineration and co-incineration plants must be authorised and, in order to guarantee complete waste combustion, the incineration or co-incineration gases must be kept at a temperature of at least 850°C for at least 2 seconds. Limit values for incineration and co-incineration plant emissions to atmosphere are defined, as are further operating conditions.

However, the Directive does not apply to experimental plants for improving the incineration process and which treat less than 50 tonnes of waste per annum. Nor does it cover plants treating only:

- Vegetable waste from agriculture and forestry, the food processing industry or the production of paper;
- Wood waste;
- Cork waste;
- Radioactive waste;
- Animal carcasses;
- Waste resulting from the exploitation of oil and gas and incinerated on board offshore installations.

End-of-Life Vehicles Directive 2000/53/EC

The End of Life Vehicles (ELV) Directive (2000/53/EC) came into force on 21 October 2000 to be implemented in member states by April 2002. The Directive lays down measures which aim, as a first priority, at the prevention of waste from vehicles and, in addition, at the reuse, recycling and other forms of recovery of end-of life vehicles and their components so as to reduce the amount of waste disposed to landfill. It also aims at the improvement in the environmental performance of all of the economic operators involved in the life cycle of vehicles and especially the operators directly involved in the treatment of end-of life vehicles.

Two of the main implications of the Directive are:

- The introduction of controls on the scrapping ("treating") of ELVs by restricting treatment to authorised treatment facilities
- The setting of rising reuse, recycling and recovery targets:
  - 85% of all ELVs to be reused or recovered, 80% reused or recycled, by January 2006
  - 95% of all ELVs to be reused or recovered, 85% reused or recycled, by 2015

Sites engaged in dismantling vehicles will need a new permit, and planning permission will be a prerequisite of the permit.

Animal By-Products Regulation (EC) 1774/2002

On 3rd October 2002 the EU adopted Regulation (EC) No 1774/2002 governing animal by-products, which lays down strict animal and public health rules for the collection, transport, storage, handling, processing and use or disposal of all animal by-products. The Regulation currently applies to the UK, and divides animal by-products into three categories:

(i) Category 1 is the highest risk category and includes material such as Specified Risk Material and the carcases of animals infected, or suspected of being infected, with BSE. The permitted disposal routes are incineration and rendering in a Category 1 rendering plant.

(ii) Category 2 is also high-risk material (e.g. diseased animals, condemned material and animals which are not slaughtered for human consumption). The permitted disposal routes include incineration and rendering in a Category 1 or 2 rendering plant.

(iii) Category 3 is essentially material which is fit for human consumption. The permitted disposal routes are:

- incineration;
- rendering in a Category 1, 2 or 3 rendering plant;
- use in a pet food plant;
- use in a technical plant; and
- treatment in a biogas or composting plant.

The Regulation would permit the treatment of category 3 material in composting plants and biogas plants. The material would need to be reduced to a size of 12mm and treated at 70°C for at least one hour in a closed vessel on approved premises. The compost or residues could be used as fertiliser on non-pasture land (i.e. land that is not grazed by animals). Manure and digestive tract contents could be used without pre-treatment, but other category 2 material could only be used in a composting or biogas plant if it had first been rendered to the pressure cooking standard.

The Animal By-Products Regulation includes controls on incinerators that burn only animal carcasses. Due to the large number of small incinerators in the UK, DEFRA have applied to the Commission for a two year transition period to phase in these controls. There is also some uncertainty about whether incinerators that burn parts of carcasses (as opposed to whole carcasses) or Specified Risk Material will be controlled by the Animal By-Products

Regulation or the Waste Incineration Directive. DEFRA are seeking clarification on this from the Commission.

Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)

The waste stream of electrical and electronic equipment has been identified as one of the fastest growing waste streams in Europe, constituting 4% of municipal waste and increasing on average three times as fast as the growth in municipal waste. It is also one of the largest known sources of heavy metals and organic pollutants in municipal waste.

In February 2003 the European Commission adopted the Directive on Waste Electrical and Electronic Equipment (WEEE) which must be implemented in member states by August 2004. The purpose of the Directive is, as a first priority, the prevention of WEEE, and in addition the reuse, recycling and other forms of recovery of such waste in order to reduce its disposal. It also seeks to improve the environmental performance of all operators involved in the lifecycle of electrical and electronic equipment, and in particular those directly involved in the treatment of waste electrical and electronic equipment.

Key points of the WEEE Directive include:

- A compulsory household collection target of 4 kg by the end of 2006;
- Compulsory producer responsibility for financing the management of consumer electrical and electronic waste;
- Measures must be taken by member states to minimise the disposal of WEEE by consumers as unsorted municipal waste;
- Producers banned from preventing reuse or recycling of products with ‘clever chips’;
- The costs of treating historical waste are to be shared proportionately between producers on the market when costs rise;
- The Directive includes recycling/reuse and recovery targets for waste electrical goods.

EC Working Document on Biological Treatment of Bio-waste

The objective of this working document is to provide a basis for preliminary discussions into improving the present situation for biodegradable waste management and to help meet the targets of the Landfill Directive, on a Europe wide basis.

The general principles point towards the creation of a biodegradable waste management hierarchy to encourage, in this order:

1. The prevention or reduction of biowaste production (e.g. sewage sludge) and its contamination by pollutants;

2. The reuse of biowaste;

3. The recycling of separately collected biowaste into the original material (e.g. paper and cardboard) whenever environmentally justified;

4. The composting or anaerobic digestion of separately collected biowaste, that is not recycled into the original material, with the utilisation of compost or digestate for agricultural benefit or ecological improvement;

5. The mechanical/biological treatment of biowaste; and

6. The use of biowaste as a source for generating electricity.

National Policy & Legislation

Policy and Guidance

- Waste Strategy 2000
- Planning Policy Guidance Note 10: Planning and Waste Management
- Planning Policy Guidance Note 23: Planning and Pollution Control

Legislation

- Environmental Protection Act 1990
- Environment Act 1995
- Finance Act 1996 and the Landfill Tax Regulations
- Special Waste Regulations 1996
- Producer Responsibility Obligations (Packaging Waste) Regulations 1997 (as amended)
- Waste Minimisation Act 1998
- Animal By-Products Order 1999 and Animal By-Products (Amendment) (England) Order 2001
- Landfill (England and Wales) Regulations 2002
- Renewable Obligation Order 2002 (England and Wales)

- Waste and Emissions Trading Act 2003

Waste Strategy 2000

Waste Strategy 2000 describes the Government's vision for managing waste and resources better in England and Wales, and sets out the changes needed to deliver more sustainable development. The Strategy sets targets for reducing the amount of household and industrial/commercial waste going to landfill until 2015, as well as for the recovery of municipal waste, the recycling and composting of household waste and the reduction of household waste. The specific targets, from which each local authority has been set statutory targets for recycling/composting, are:

- To recover value from 40% of municipal waste by 2005;
- To recover value from 45% of municipal waste by 2010;
- To recover value from 67% of municipal waste by 2015.

Statutory targets under 'Best Value':

- To recycle or compost at least 25% of household waste by 2005;
- To recycle or compost at least 30% of household waste by 2010;
- To recycle or compost at least 33% of household waste by 2015.

Best value targets:

- Waste Disposal Authority areas with 1998/99 recycling and composting rates of under 5%, to achieve at least 10%;
- Waste Disposal Authority areas that recycled or composted between 5% and 15% in 1998/99 to double their recycling rate; and
- The remaining Waste Disposal Authority areas to recycle or compost at least one third of household waste.

The Strategy sets out guidelines about how the Government expects itself, business, the waste management industry, waste planning authorities, waste collection and disposal authorities, the Environment Agency and the community sector will deliver these changes.

Part 2 of the Strategy supports Part 1 by focusing specifically of applied ways of reducing, recovering and managing waste, including identification of the waste management options and progress with different waste streams. This is currently being reviewed and it is expected that the detail of the Strategy will evolve over time, although the principal goals and aspirations are likely to remain the same.

The Strategy Unit carried out a review of Waste Strategy at the end of 2001, resulting in the publication of Waste Not, Want Not, a strategy for tackling the waste problem in England, in

November 2002. The aim of the review was to analyse the scale of the challenge posed by growing quantities of municipal waste, to assess the main causes and drivers behind this growth now and in the future, and to devise a strategy which will put England on a more sustainable path for managing municipal waste in the future. With this aim, Waste Not, Want Not, makes a series of key recommendations and sets out an action plan for the future.

The Local Government Act 1999 introduced the Best Value regime as part of local government modernisation, requiring continuous improvement in service delivery. Statutory performance standards for Waste Disposal Authorities and Waste Collection Authorities in England and Wales were then introduced through the Local Government (Best Value) Performance Indicators and Performance Standards Order 2001. Standards were set at levels that would ensure that individual authorities made a proportionate contribution to the achievement of national targets established in Waste Strategy 2000.

Planning Policy Guidance Note 10: Planning and Waste Management

PPG 10, published in 1999, sets out the Government's policies on planning with respect to waste management. It provides advice about how the land-use planning system should contribute to sustainable waste management through the provision of the required waste management facilities in England and how this provision is regulated under the statutory planning and waste management systems. PPG 10 must be taken into account by local planning authorities as they prepare development plans and may be material to decisions on individual planning applications. PPG 10 will soon be revised along with other PPGs as part of the general review of planning following the Planning Green Paper: Delivering a Fundamental Change.

Planning Policy Guidance Note 23: Planning and Pollution Control

PPG 23, published in 1994, seeks to provide comprehensive advice on the relationship between planning and pollution control. Much of this guidance note has been superseded by PPG 10, but these important planning policy considerations are current:

- The planning and pollution control systems are separate but complimentary in that both are designed to protect the environment from harm caused by development, but the planning system should not be operated so as to duplicate the controls that are the statutory responsibility of other bodies;

- Applicants do not normally have to prove the need for their proposed development, or discuss the merits of alternative sites. However, a number of judicial decisions have established certain categories of development where a duty to consider the existence of alternative sites may arise. The nature of such developments and national or regional need may make the availability, or lack of availability, of suitable alternative sites material to the planning decision;

- Planning interests must focus on any potential for pollution, but only to the extent that it may affect the current and future uses of land;

- In considering the weight to attach to the risk of a pollution incident, planning authorities should rely on the advice of the Environment Agency and the perception of risk alone from the development should not be material to the consideration of a planning application.

Environment Protection Act 1990

The contents of the Framework Directive on Waste were implemented in the UK through the Environmental Protection Act 1990, amended by the Environment Act 1995 and also by various regulations. This is the primary Act that controls how waste is managed; it defines different categories of waste and assigns responsibility for different types of waste. The duties and responsibilities of waste collection authorities and waste disposal authorities are set out with the Environment Protection Act, as is the statutory Duty of Care applicable to all those producing and handling waste.

Environment Act 1995

The Environment Act implements various aspects of the Framework Directive on Waste, and is the enabling legislation for all producer responsibility legislation. The Act sets out the objectives for the purposes of the national waste strategy (under Schedule 2A to the Environmental Protection Act 1990). These objectives are:

- To ensure that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment;
- To establish an integrated and adequate network of waste disposal installations, taking account of the best available technology not entailing excessive costs (BATNEEC);
- To ensure self-sufficiency in waste disposal, with waste to be disposed of in one of the nearest appropriate installations, by means of the most appropriate methods and technologies in order to ensure a high level of protection for the environment and public health;
- To encourage the prevention or reduction of waste production and its harmfulness;
- To encourage the recovery of waste by means of recycling, reuse or reclamation or any other process with a view to extracting secondary raw materials; and the use of waste as a source of energy.

Finance Act 1996 and the Landfill Tax Regulations

The Landfill Tax was introduced in October 1996 under the Finance Act 1996, and has the key intention of taxing waste disposed to landfill in order to promote the adoption of other waste management options. It allows up to 20% of the taxes collected by landfill operators to be claimed against environmental projects, and the Landfill Tax Credit Scheme aims to use these funds to encourage the use of more sustainable waste management practices and technologies, as well as partnerships between landfill operators and local communities.

The Government has recently reviewed the role of the scheme in consultation with key stakeholders. The Government recognises that the Scheme has supported many worthwhile community and environment projects and has been successful in generating local community involvement in such projects. However, there is less evidence that the Scheme has delivered a step change towards more sustainable waste management.

The Government has therefore decided to reform the Landfill Tax Credit Scheme from 1 April 2003, with around one third of the funding available through a reformed tax credit scheme for spending on local community environmental projects. The remainder, around £100 million in 2003–04 rising to £110 million in 2004–05 and 2005–06, will be allocated to public spending to encourage sustainable waste management.

Special Waste Regulations 1996

Special waste is controlled waste that is dangerous or difficult to manage, requiring additional control over its treatment, storage or disposal. These regulations implement the Hazardous Waste Directive and any waste on the EC Hazardous Waste list (and displaying hazardous properties) is included in the definition of special waste.

The introduction of the European Waste Catalogue has resulted in a review of the Special Waste Regulations, which means that some waste streams previously defined as non-hazardous (or non-special) will be classified as hazardous. A consultation document indicating how these changes will impact UK waste management has been published, and draft regulations are likely to mean that certain household items (for example, fridges and items containing cathode ray tubes such as televisions) will be classified as hazardous.

Producer Responsibility Obligations (Packaging Waste) Regulations 1997 (as amended)

These Regulations transpose the targets for the recovery and recycling of waste set out in the EC Directive on Packaging and Packaging Waste 94/62/EC. They impose on producers obligations to recover and recycle packaging waste, and related obligations, and set recycling and recovery targets.

The targets for the next five year period are currently under negotiation. Recent targets have been:

- 2003 59% recovery, 19% recycling;
- 2002 59% recovery, 19% recycling;
- 2001 56% recovery, 18% recycling; and
- 2000 45% recovery, 13% recycling.

Businesses who satisfy two threshold tests are obliged to provide data on the packaging handled in the previous year, take reasonable steps to recover and recycle packaging waste and provide evidence that they have done so. The majority of the companies covered by these regulations have joined registered compliance schemes in order to discharge their obligations.

Waste Minimisation Act 1998

This Act gives local authorities the power to ‘do or arrange for the doing of anything which, in its opinion is necessary or expedient for the purposes of minimising the quantities of controlled waste of any description, generated in its area’.

This offers local authorities the opportunity to undertake any steps or schemes relating to the minimisation of controlled waste that they consider suitable, although it does not oblige them to do so. Examples of such initiatives could include schemes to raise public awareness of waste reduction, the introduction of smaller wheeled bins for household waste collection alongside kerbside collection of recyclables and the promotion of recycling schemes in conjunction with local business.

Animal By-Products Order 1999 and Animal By-Products (Amendment) (England) Order 2001

The Animal By-Products Order 1999 places restrictions on the disposal of animal by-products. It sets criteria for the collection and transport of animal by-products, their incineration and burial, among other items. The Animal By-Products (Amendment) (England) Order 2001 amends this so as to prohibit livestock (including birds) access to catering waste containing meat or products of animal origin, or catering waste from a premises on which meat or products of animal origin are handled.

The EU has subsequently issued its Regulation on Laying Down Health Rules Concerning Animal By-Products Not Intended for Human Consumption (Animal By-Products Regulation (EC) 1774/2002) which supersedes these orders.

Landfill (England and Wales) Regulations 2002

These regulations implement part of the Landfill of Waste Directive in England and Wales. They define a landfill as ‘subject to paragraph (4), any site which is used for more than a year for the temporary storage of waste; and any internal waste disposal site, that is to say a site where a producer of waste is carrying out its own waste disposal at the place of production’. Paragraph (4) states that landfills do not include ‘any facility where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or disposal elsewhere; any site where waste is stored as a general rule for a period of less than three years prior to recovery or treatment; or any site where waste is stored for a period of less than one year prior to disposal’.

The Regulations set out the criteria for the classification of landfills, and the conditions to be included in landfill permits. In addition it sets out waste acceptance and prohibition criteria for the different classes of landfill, closure and aftercare procedures.

Schedule 2 sets out the general requirements for landfills, including the planning considerations for their location.

Renewables Obligation Order 2002 (England and Wales)

The Renewables Obligation Order represents the principal driver for renewable energy technologies, and replaces the Non-Fossil Fuel Obligation (NFFO). By developing the market for electricity from renewable sources, the Order is designed to help the electricity industry meet the Government's commitment to supply 10% of the country's electricity needs from renewable sources by 2010. The Order creates a market in Renewables Obligation Certificates (ROCs), tradable certificates that need to be shown by every energy supplier to prove that they have sourced a set percentage of the energy they supply from renewable means. The certificates are designed to capture the value associated with renewable energies because of the strong demand to meet the Government's renewable energy target.

Electricity generation from waste treatment is eligible under two categories:

- Electricity that is generated directly from treatment of biomass[1], which must be verified as contaminant free to at least 98% of its energy content as measured over a period of one month; and

- Electricity that is generated from the liquid or gaseous products of an advanced conversion technology, where it is applied to mixed waste. (NB/electricity generated from mixed waste treatment is not directly eligible under the Order).

Waste Incineration (England and Wales) Regulations 2002

These regulations, made under the Pollution Prevention and Control Act 1999, came into force in December 2002, and together with directions issued at the same time to the Environment Agency and the Local Authorities, who are the regulators, they transpose the Waste Incineration Directive, 2000/76/EC (See European Policy section). The Regulations apply immediately to all new incinerators and will apply to all existing installations from 28th December 2005, implementation being carried out mainly under the existing Pollution Prevention and Control (PPC) regime.

Waste and Emissions Trading Act 2003

The Waste and Emissions Trading Act was granted Royal Assent assent on 13 November 2003. A system of tradable permits will be introduced in England to limit the amount of biodegradable municipal waste that authorities can landfill, and therefore implement the targets set by the Landfill Directive. The total amount of allowances will be calculated so that the sum total of permitted landfilling in the UK would meet the targets of the Directive. These permits will be allocated free to waste disposal authorities; those authorities which

[1] 'Biomass' are substances derived directly or indirectly from plant or animal matter.

divert more waste from landfill, by recycling for example, will be able to trade their permits to those which do not. For example, waste disposal authorities in areas where the additional costs of diversion away from landfill are high could chose to continue landfilling waste by buying permits from authorities where the additional costs of diversion are lower.

The permits themselves will not reduce landfill, which will require the sustained effort of local authorities to reduce waste and divert waste from landfill, but it will benefit those authorities who take early action to reduce the amount of waste going to landfill. The system aims to minimise the cost of meeting Landfill Directive obligations whilst giving local authorities the greatest amount of freedom in how they meet their targets.

How Does the Legislation Affect the Different Facility Types?

The checklist below attempts to explain which legislation affects which waste management facilities, and which waste streams they relate to. The list is split for ease of use, into the following three legislation types:

- General environmental legislation that affects waste management;
- Legislation specific to waste management that affects more than one type of waste management process; and
- Legislation affecting specific waste management processes.

General environmental legislation that affects waste management			
Legislation	Waste Management Facility	Waste Stream Affected	Fit with Waste Strategy 2000/ Implications for waste planning
Environmental Protection Act 1990 Environment Act 1995	These policies potentially affect all waste management facilities, whether by encouragement or disincentive	All waste streams	These policies encourage the development of facilities dealing with the recycling and recovery of waste
Renewable Obligation Order 2002	Facilities resulting in the production of renewable sources of energy	• Biomass • Liquid or gaseous products of advanced conversion technologies	This policy acts as a disincentive for energy from waste development processing mixed municipal solid waste and an incentive for certain Anaerobic Digestion and Pyrolysis and Gasification systems, as well as Landfill Gas.

Legislation specific to waste management that affects more than one type of waste management process			
Legislation	**Waste Management Facility**	**Waste Stream Affected**	**Fit with Waste Strategy 2000/ Implications for waste planning**
Framework Directive on Waste 75/442/EEC, as amended by Directive 91/156/EEC	This policy potentially affects all waste management facilities, whether by encouragement or disincentive	All waste streams	This policy encourages the development of facilities dealing with the recycling and recovery of waste
Regulation on Substances that Deplete the Ozone Layer EC 2037/2000	Specialist Industrial/Commercial facilities	• Refrigeration and air conditioning equipment • Some solvents • Fire protection equipment and fire extinguishers • Foams, such as insulation foams	This policy diverts specific waste substances away from landfill Planning implications may arise from the need for specialist facilities dealing with the removal of ozone depleting substances, as well as storage for potentially bulky equipment prior to treatment
Producer Responsibility Obligations (Packaging Waste) Regulations 1997 (as amended)	Processing of Recyclables	• Packaging Waste	This policy diverts packaging waste streams away from landfill, and encourages recycling and recovery Planning implications may arise from the need for expansion by recycling facilities as targets increase

Legislation affecting specific waste management processes			
Legislation	**Waste Management Facility**	**Waste Stream Affected**	**Fit with Waste Strategy 2000/ Implications for waste planning**
Council Directive 91/157/EEC on batteries and accumulators containing certain dangerous substances	Specialist Industrial/ Commercial facilities	• Batteries and accumulators containing certain dangerous substances • May be expanded to include all batteries	This policy diverts these waste from landfill, and encourages recycling If the Directive is expanded to include all batteries, specialist battery recycling facilities may expand, and new facilities may be proposed
Landfill of Waste Directive 1999/31/EC Landfill (England and Wales) Regulations 2002	Landfill/Landraising[13]	• Biodegradable Municipal Waste • Tyres • Liquid Wastes • Infectious Clinical Waste • Certain Hazardous Wastes	These policies divert waste streams from landfill Planning implications may arise from the need for specialist facilities undertaking stabilisation techniques, and the need for further recycling facilities for waste streams such as tyres and liquid wastes

Legislation affecting specific waste management processes *cont'd*			
Legislation	Waste Management Facility	Waste Stream Affected	Fit with Waste Strategy 2000/ Implications for waste planning
Waste Incineration Directive 2000/76/EC	Small Scale Thermal Treatment plants (excluding experimental plants treating less than 50,000tpa) Large Scale Thermal Treatment plants Advanced Thermal Treatment plants	All wastes except: • Vegetable waste from agriculture and forestry, the food processing industry or the production of paper • Wood waste • Cork waste • Radioactive waste • Animal carcasses • Waste resulting from the exploitation of oil and gas and incinerated on board offshore installations	This policy will change the nature of waste stream flows and potentially lead to the need for more specialist waste treatment facilities
End-of-Life Vehicles Directive 2000/53/EC	Specialist Industrial/ Commercial facilities	• Scrap vehicles that have reached the end of their useful life	This policy diverts waste streams away from landfill, and encourages recycling and recovery Planning implications will arise from the need for vehicle dismantlers to obtain a permit, for which planning permission will be a prerequisite. There may also be a need to expand and develop current operations, which may require planning permission
Animal By-Products Regulation (EC) 1774/2002 Animal By-Products Order 1999 and Animal By-Products (Amendment) (England) Order 2001	Composting Anaerobic Digestion Small Scale Thermal Treatment plants	• Waste containing animal by-products	These policies will change the nature of waste stream flows and potentially lead to the need for more specialist waste treatment facilities
Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)	Processing of Recyclables Mixed Waste Processing Specialist Industrial/Commercial facilities	• Electrical and electronic equipment	This policy diverts waste streams away from landfill, and encourages reuse, recycling and other forms of recovery Planning implications may arise from the need for specialist facilities dealing with the recycling of WEEE, as well as storage for potentially bulky equipment prior to treatment or reuse

Legislation affecting specific waste management processes *cont'd*			
Legislation	Waste Management Facility	Waste Stream Affected	Fit with Waste Strategy 2000/ Implications for waste planning
Landfill Tax Regulations	Landfill/Landraising	• All waste streams sent to landfill	This scheme supports other policy measures aimed at reducing the amount of waste landfilled
Special Waste Regulations 1996	Specialist Industrial/ Commercial facilities	• Hazardous wastes • May be expanded to include waste streams previously not defined as special	Potentially lead to the need for more specialist waste treatment facilities
Waste & Emissions Trading Act	Landfill/Landraising	• Biodegradable municipal waste	This Act aims to minimise the cost of meeting the Landfill Directive objectives, by a system of allocating allowances to waste disposal authorities for the amount of biodegradable municipal waste that they can landfill

Future Trends

Whilst the interpretation of some European legislation into UK Regulations has still to be determined, the broad policy context for waste management to 2020 is clear. The UK still has to deliver a considerable step change from disposal-based solutions (i.e. landfill) to solutions that achieve greater recovery of value from the waste stream. The initial priority is to increase the recovery of materials in the waste stream for recycling and composting. Coupled with this is the need to control the rate at which waste production is increasing year on year.

The consequences on waste planning will potentially be far reaching, although the pace of change to date has been slow. The most obvious physical manifestation of these changes will be a new generation of facilities for the sorting and treatment of materials recovered from the waste stream and for the treatment of residual wastes, i.e. the waste that cannot be recovered for recycling and composting prior to final disposal. It is estimated that up to 2000 new facilities will be required to satisfy the Landfill Directive targets*. The primary purpose of the sum of these facilities will be to maximise the resource value from waste in a manner that is both sustainable and cost effective.

Whilst the debate may continue as to the actual extent of the environmental, economic and social cost benefits of these changes and on the levels of recycling and composting that can be realistically achieved at a national level, the process of change has started. However, it is clear that the new materials supply chain needs to be developed in order for changes in waste management practices to become fully sustainable. If more materials are recovered for recycling and new compost products produced then new markets are required. Development of these markets requires changes in industry purchasing practices and changes to product

*Environment Agency (2003), paper by Martin Brocklehurst at IEMA Annual Conference 3rd/4th June 2003

Strategy Option	Description	Ranking[1]
Option 1: Status Quo	Continuation of landfill as the predominant waste disposal activity	5
Option 2: High incineration (i)	50%+ incineration and 25% recycling	4
Option 3: High incineration (ii)	50%+ incineration and 35% recycling	2
Option 4: Maximum recycling	60% recycling and incineration at current levels (<10%)	3
Option 5: Reduction & recycling	Reduce rate of growth in waste, 45% recycling, 30% or less residual waste management comprising a combination of incineration and other technologies e.g. MBT[2]	1

Notes:
[1] Option ranked 1 is the most favoured and the option ranked 5 the least favoured
[2] Mechanical Biological Treatment is a hybrid process that partially stabilises biodegradable waste and recovers recyclables. (Refer to Profile 4: Mixed Waste Processing, in Part 2 of this guidance)

specifications. These need to develop in parallel with changes in waste management practices. Furthermore, with time it can be anticipated that the end users of these materials will increasingly dictate quality standards which will have implications for collection, sorting and pre-processing requirements.

The Strategy Unit has considered a number of strategy options for municipal waste management in England for the period from 2002 to 2020. These options have been assessed in terms of investment cost, feasibility, environmental issues and overall flexibility. These options are summarised in the table above with the ranking given by the Strategy Unit.

As a result there are a number of practical forward planning and development control issues that will need to be considered in the future:

- Waste Local Plans/UDPs and the new Minerals and Waste Development Frameworks will need to consider site allocations in areas which currently are the domain of other development plans (e.g. sites designated for business or employment uses).

- If the private sector is to deliver the required facilities within the required timescales they may need greater assistance from Waste Planning Authorities in the identification of preferred sites.

- As many new facilities have characteristics similar to industrial process activities, is the current two tier development control system in counties and districts appropriate?

- Many waste processes may only be sustainable and economically viable at a regional level. What role do Regional Assemblies have over decisions regarding the siting and approval of facilities?

- How do proximity principle issues relate to economies of scale benefits for the management of certain waste streams?

- How will public concerns of waste operations as a bad neighbour development be overcome?

PPG 10 is currently in the process of being revised and up-dated and will no doubt assist in providing clearer direction on resolving some of these issues. The individual technology profiles in Part 2 of this research should help to give interested parties a reference source for seeking to agree issues associated with new planning applications.

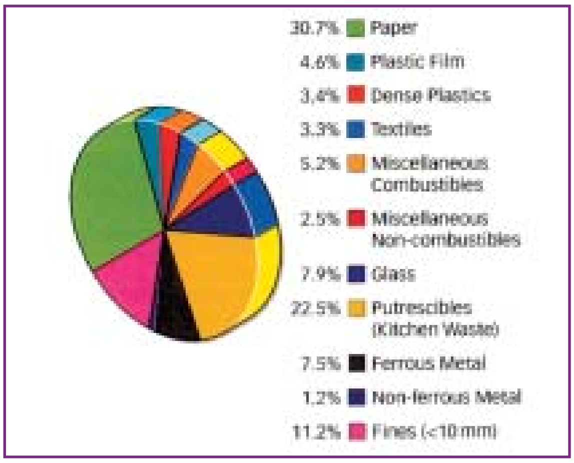
Waste Facility Options

This section provides a brief explanation of the different waste streams that arise as solid waste, along with an introductory explanation of the different waste management options that can be used to deal with them. Each option is explained in more detail in Part 2 of this publication.

The term ‘Municipal Solid Waste’ or just ‘Municipal Waste’ is often used to describe the various waste streams that are handled by the Waste Collection and Disposal Authorities. It usually consists of a combination of household and commercial wastes. The Town Planning system does not draw a distinction between different types of waste. However the most significant changes in waste management practices and the resulting land use planning implications are likely to relate to the handling, treatment etc of Municipal Solid Waste. Therefore the profiles in Part 2 focus on this part of the overall waste stream.

Waste Streams

Household waste



Typical components of household waste[1]

Household waste is defined in the Environmental Protection Act 1990, supplemented by the Controlled Waste Regulations 1992. It includes waste from household collection rounds, waste from services such as street sweepings, bulky waste collection, litter collection, hazardous household waste collection and separate garden waste collection, waste from civic amenity sites and wastes separately collected for recycling or composting through bring or drop-off schemes, kerbside schemes and at civic amenity sites.

Unsorted waste (black bag)

This is waste collected from householders where there is no separate recyclables collection service. The components of black bag household waste are illustrated above.

[1] An introduction to household waste management, ETSU/DTi, 1998

Segregated recyclables

Separate household collection systems are being introduced by Waste Collection Authorities in order to meet Local Authority Best Value composting and recycling targets. These systems typically provide a doorstep service for householders to separate out their recyclables. The waste stream generated may be made up of glass, metals, plastics, paper and textiles. The mix of recyclables will vary depending upon the local collection system that is in place.

Residual household wastes

This is waste that remains once the recyclables have been removed from unsorted household waste.

Organic waste (without kitchen waste)

Organic waste without kitchen waste includes vegetation and plant matter from household gardens, local authority parks and gardens and commercial landscaped gardens.

Organic waste (with kitchen waste)

Organic waste includes the organic waste described above, mixed with kitchen wastes of food preparation waste and plate scrapings.

Non Household waste

Commercial and non-hazardous industrial waste

Commercial waste is that arising from premises which are used wholly or mainly for trade, business, sport, recreation or entertainment, excluding municipal and industrial waste.

Industrial waste is that from any factory and from any premises occupied by an industry (excluding mines and quarries).

Special/Hazardous/Clinical

Special Waste is a term used in the UK which is similar to that referred to in EC legislation as ‘Hazardous’ waste. Special waste is currently defined by the Special Waste Regulations 1996 (as amended) which includes a list of special wastes and a number of criteria (such as having a low combustion flashpoint etc). If a waste is on this list and/or displays one or more of the properties described within the regulations, then it is classified as ‘Special waste’ and therefore has an additional set of regulatory controls in order to prevent potential harm to the environment or human health.

Clinical waste is that arising from medical, nursing, dental, veterinary, pharmaceutical or similar practices, which may present risks of infection.

Construction and demolition waste

Construction and demolition waste arises from the construction, repair, maintenance and demolition of buildings and structures. It mostly includes brick, concrete, hardcore, subsoil and topsoil, but it can also contain quantities of timber, metal, plastics and (occasionally) special (hazardous) waste materials.

Agricultural waste

Agricultural waste is any waste from a farm or market garden, and includes organic matter such as manure, slurry, silage effluent and crop residues, but also includes packaging and films, and animal treatment dips (for example sheep dip).

Process by-products and residues

This represents the materials which result from various waste processing operations. The principal forms include incinerator bottom ash, fly ash, compost, leachate and landfill gas.

Waste Management Facilities

The different waste management facility options have been grouped according to the various kinds of process which they employ: biological, mechanical, thermal, landfill or 'other'.

There is a growing trend for integrated waste facilities which combine a number of processes on one site. There may be distinct planning and land-use advantages of such an approach, particularly with regard to transport and the proximity principle. Such facilities may result in particular planning and environmental consequences and issues associated with cumulative impacts. When considering the planning issues of such combined facilities, in general terms, these are detailed in the separate process specific profiles presented in Part 2. It does not contain a separate profile for combined facilities due to the multiple combinations of process types that are possible.

Biological – Mechanical Processes

Composting

Windrow composting

Windrow composting is the aerobic decomposition of shredded and mixed organic waste using open linear heaps known as 'windrows', which are approximately three metres high and four to six metres across the base. The process involves mechanical turning of the waste until the desired temperature and residence times are achieved to enable effective degradation. This results in a bulk-reduced, stabilised residue known as compost. Windrow composting can take place outdoors or within a large building and the process takes around three months.

In-vessel composting

In-vessel composting differs from windrow composting in that the aerobic digestion is undertaken within an enclosed container, where the control systems for material degradation are fully automated. Moisture, temperature and odour can be regulated and this process produces a stable compost much more quickly than outdoor windrow composting.

Anaerobic digestion

Anaerobic digestion is a process in which biodegradable material is encouraged to break down in the absence of oxygen. Waste is broken down in an enclosed vessel under controlled conditions, resulting in the production of digestate and biogas.

Processing of recyclables

Otherwise known as a 'clean MRF' (Materials Recycling/Recovery Facility), this facility is where dry recyclables are taken for secondary sorting and processing prior to export to specialist industry processing facilities.

Mixed waste processing

Mixed waste processing is designed to recover valuable components from unsorted municipal solid waste, for recycling, and deliver a stabilised residue for final landfilling or processed to form a refuse derived fuel combustion, co-combustion or another thermal or biological treatment process. A number of standard waste separation operations are used to remove recycled materials such as glass, metals and plastics, followed by composting or anaerobic digestion of the remaining organic materials. Such facilities are known as Mechanical-Biological Treatment (MBT) plant, as they commonly include an element of composting to partially stabilise the residual waste. Similar processes, excluding the biological stabilisation process have previously been described as 'dirty MRFs'.

Thermal Processes

Pyrolysis/Gasification

During pyrolysis organic waste is heated in the absence of air to produce a mixture of gaseous and liquid fuels and a solid inert residue (mainly carbon). Pyrolysis generally requires a consistent waste stream such as tyres or plastics to produce a usable fuel product.

Gasification is where carbon based wastes are heated in the presence of air or steam to produce fuel-rich gases. The technology is based on the reforming process to produce town gas from coal.

Small scale thermal treatment

Small scale thermal treatments include moving grate systems of less than 100,000 tonnes of waste per annum and rotating/oscillating kilns, as well as other proprietary combustion processes. These will be suitable for small scale urban applications and centralised Local Authority facilities.

Large scale thermal treatment

Large scale thermal treatments include large, centralised urban facilities, typically receiving between 150,000–400,000 tonnes of waste per annum. Techniques used include various moving grate systems and fluidised bed processes.

Landfill Processes

Landfill/Landraising

Landfill is the controlled deposit of waste to land. Often minerals workings and extraction sites are used as landfills, providing a means to restore land. However, where such 'holes in the ground' are not available it is possible to deposit waste onto the ground surface and build up a waste disposal site: i.e. landraising.

Landfill gas plant

Landfill gas is a by-product from the digestion by anaerobic bacteria of putrescible matter present in waste deposited on landfill sites. This gas is composed of methane (40–60%), carbon dioxide (60–40%) and other trace gases. It is either vented to atmosphere, flared or utilised to produce electricity.

Other Processes

Leachate treatment plant

Leachate treatment is a process to reduce the polluting potential of leachate. Such processes can include leachate recirculation, spray irrigation over adjacent grassland and biological and physio-chemical processes.

Small scale facilities (civil amenity sites/bring sites)

A civic amenity site is a facility where the public can dispose of household waste. They often also have recycling points. Bring sites include bottle banks and are facilities provided at supermarkets and other locations visited regularly by householders in which recyclable waste may be deposited.

Waste transfer station

This is a site to which waste is delivered for bulking/handling/sorting prior to transfer to another place for recycling, treatment or disposal. Waste from collection vehicles is stored temporarily prior to carriage in bulk to a treatment or disposal site.

Specialist Industrial/Commercial Facilities

There are many types of specialist waste management facility, which are not detailed in this publication, as they deal with specialist waste streams, not municipal solid waste. The table below outlines the key specialist facilities, the legislation which potentially applies to them, and identifies the planning issues commonly associated with these processes.

Summary of Planning Issues and Legislation Relevant to Specialist Industrial and Commercial Activities			
Other specialist industrial & commercial activity	Potentially relevant legislation (in the form of EU Directives) other than the Framework Directive on Waste (75/442/EEC)	Potentially relevant regulations	Potential issues of significance (not exhaustive)
Battery Recycling	Council Directive 1991/157/EEC on batteries and accumulators containing certain dangerous substances, as amended by Council Directive 93/86/EEC, & Council Directive 98/101/EC & Proposed directive on battery recycling Landfill Directive 1999/31/EC	Special Waste Regulations 1996 Landfill (England & Wales) Regulations 2002	Air emissions caused by smelting of lead plates Drainage from areas of hard standing Heavy metal contamination of the ground (e.g. from Cadmium/ Mercury) Noise from battery breaking Storage of chemicals from batteries (e.g. Lead acid) Vehicle/plant movements, and access arrangements Visual impact of storage yards
Contaminated soil processing/disposal	Landfill Directive 1999/31/EC	Landfill (England & Wales) Regulations 2002 Contaminated Land Regulations 2000	Ground and Groundwater contamination Land contamination Odours and smells Vehicle/plant movements, and access arrangements
Construction & Demolition waste processing	Landfill Directive 1999/31/EC	Landfill (England & Wales) Regulations 2002	Dust Noise from conveyor & plant e.g. crushers movement/operation Vehicle/plant movement, and access arrangements
For all processes the Waste Management Licensing Regulations will be relevant unless exempt, and operators of facilities will need to comply with the Duty of Care Regulations			

Summary of Planning Issues and Legislation Relevant to Specialist Industrial and Commercial Activities *cont'd*			
Other specialist industrial & commercial activity	Potentially relevant legislation (in the form of EU Directives) other than the Framework Directive on Waste (75/442/EEC)	Potentially relevant regulations	Potential issues of significance (not exhaustive)
Electrical & Electronic equipment recycling	Waste Electrical & Electronic Equipment Directive 2002/91/EC Ozone Depleting substances Regulation 2000/2037/EC Landfill Directive 1999/31/EC	Waste Management Licensing Regulations 1994 Special Waste Regulations 1996 Landfill (England & Wales) Regulations 2002	Noise from dismantling operation (e.g. from the fragmentiser) Potential for spillage of recovered chemicals (e.g. flame retardants) Vehicle/plant movements, and access arrangements Visual impact of equipment storage
End of life vehicle reprocessing	End of Life Vehicles Directive 2000/53/EC Landfill Directive 1999/31/EC	Waste Management Licensing Regulations 1994 Special Waste Regulations 1996 Landfill (England & Wales) Regulations 2002	Management and storage of shredder residues Noise from plant movement/ operation of crusher/shredder/ fragmentiser Oil and waste storage Potential pollution of surface water and drains Security of vehicle parts within the site/crime Vehicle/plant movements, and access arrangements Visual impact of storage yard
Glass processing	Landfill Directive 1999/31/EC	Waste Management Licensing Regulations 1994 Landfill (England & Wales) Regulations 2002	Dust deposition on and off-site Noise from separation & processing of cullet (e.g. batching plant) & vehicle movement Vehicle/plant movements, and access arrangements Visual impact of cullet stores
Liquid waste processing	Landfill Directive 1999/31/EC	Landfill (England & Wales) Regulations 2002	Air emissions/odours Management and storage of process sludges Storage of liquid wastes may pose a pollution risk Tanker movements/potential for spillages Vehicle/plant movements and access arrangements/Air emissions

Summary of Planning Issues and Legislation Relevant to Specialist Industrial and Commercial Activities *cont'd*			
Other specialist industrial & commercial activity	Potentially relevant legislation (in the form of EU Directives) other than the Framework Directive on Waste (75/442/EEC)	Potentially relevant regulations	Potential issues of significance (not exhaustive)
Metal processing	Landfill Directive 1999/31/EC	Waste Management Licensing Regulations 1994 Landfill (England & Wales) Regulations 2002 Special Waste Regulations 1996	Dust deposition on and off-site Management and storage of recovered chemicals (e.g. PCBs), and substances used during processing (e.g. degreasing agents) Noise from separation & processing of metals (e.g. from cutting, compaction, fragmentising process, hammer mills) Vehicle/plant movements, and access arrangements
Other (e.g. Specialist chemicals – PCBs)	Hazardous Waste Directive1991/689/EC EC Directive 76/403 (Disposal of PCB's	EC Green Paper on PVC (2000) Special Waste Regulations 1996	Security associated with the containment of specialist chemicals on-site (e.g. is there a health & safety risk from the chemicals, or a threat of pollution from vandalism) Storage of specialist chemicals may pose a drainage risk Vehicle/plant movements, and access arrangements
Paper transfer/ processing	Packaging & Packaging Waste Directive 1994/62/EC (as amended)	Producer Responsibility Obligations (Packaging Waste) Regulations 1997	Vehicle/plant movements, and access arrangements Visual impact of paper mounds in storage areas Windblown waste paper littering areas both on-site and off-site
Plastic processing	Landfill Directive 1999/31/EC	Waste Management Licensing Regulations 1994	Littering of the site from waste plastics Vehicle/plant movements, and access arrangements Vermin Visual impact of plastic storage areas

Summary of Planning Issues and Legislation Relevant to Specialist Industrial and Commercial Activities *cont'd*			
Other specialist industrial & commercial activity	Potentially relevant legislation (in the form of EU Directives) other than the Framework Directive on Waste (75/442/EEC)	Potentially relevant regulations	Potential issues of significance (not exhaustive)
Waste oil processing	Hazardous Waste Directive1991/689/EC EC Directive 75/439 (Waste Oils) as amended by 87/101/EEC	Special Waste Regulations 1996	Land contamination from residual waste oil Noise from processing operations including, for example, oil filter crushing Residues from treatment, refining, laundering of oil Storage of oil may pose a drainage risk Visual impact of site
Waste wood processing	Packaging & Packaging waste Directive 1994/62/EC	Producer Responsibility Obligations (Packaging Waste) Regulations 1997	Fire risk Noise from reprocessing operations Vehicle/plant movements, and access arrangements Visual impact of wood storage areas Wind blown sawdust

The following profiles describe the main planning considerations associated with the 12 principal waste management facility types. The following table provides an overview of the issues identified:

Summary Table of Key Planning Issues				
	Facility	Siting and Design Issues[1]	Need for EIA[2]	Key Planning Issues[3]
1	Composting	Windrow operations best suited to existing landfill sites and non sensitive rural sites, in-vessel facilities can be sited in a variety of rural or industrial locations.	Centralised – Usually Small Scale – No	Odour, Water Resources, Noise (windrow), Visual (in-vessel) Traffic
2	Anaerobic Digestion	Small scale community based schemes can be located on a wide range of sites. Larger centralised facilities will be limited to sites suitable for large built development with appropriate road infrastructure.	Centralised – Usually Small Scale – No	Odour, Visual (centralised), Noise Traffic
3	Processing of Recyclables	Siting issues linked to scale and throughput. Usually compatible with general industrial and storage/distribution use areas. Noise sensitive locations should be avoided.	Sometimes	Noise, Traffic, Litter, Visual
4	Mixed Waste Processing	Issues as above plus residential amenity issues likely to be more acute due to biodegradable components in waste.	Sometimes	Litter, Odour, Noise, Traffic, Visual
5	Pyrolysis/ Gasification	Siting criteria linked to scale of proposals. Potentially suitable for a range of sites and settings – preference should be given to areas allocated for business use or traditional industrial/commercial areas.	Usually	Air quality, Noise, Traffic, Visual
6	Small Scale Thermal Treatment	A range of urban or urban fringe sites may be suitable. Preferences should be given to co-location with mixed waste processing operations.	Usually	Air quality, Noise, Traffic, Visual
7	Large Scale Thermal Treatment	Generally not compatible with residential areas. Existing waste sites and major industrial areas should be preferred.	Yes	Air Quality, Off-site ecology, Noise, Traffic, Visual
8	Landfill	Preference should be given to quarry voids and brownfield land before landraising on greenfield sites. Sites should be identified to meet long term needs assuming declining input rates.	Yes	Traffic, Water Resources, Noise, Ecology, Visual
9	Landfill Gas Plant	As sites are often rural, imaginative screening and design of units should be a priority. As plant will outlive landfill integration with overall landfill restoration required. Consider juxtaposition with existing landfill infrastructure and imaginative screening options	No	Noise, Visual
10	Leachate Treatment Plant	Issues as above	No	Visual, Water Resources

	Summary Table of Key Planning Issues *cont'd*			
	Facility	Siting and Design Issues[1]	Need for EIA[2]	Key Planning Issues[3]
11	Small Scale Facilities	Sites should be accessible to the public and use good signage. Traffic queuing issues at peak times is a major design issue.	CA Sites Sometimes Bottle Banks No	Traffic, Visual, Litter
12	Waste Transfer Site	Siting subject to scale. Proximity to road/rail infrastructure critical. Preference should be given to co-location with other waste facilities to minimise net transport distances.	Sometimes	Noise, Traffic, Visual, Odour, Litter

Notes to table:
1. Co-location of a number of waste facilities on a single site often has significant planning advantages. It is also assumed that sites should be located as close to the waste arisings as possible in accordance with the proximity principle.
2. Key to need for EIA column:
   Yes: EIA is an obligatory requirement under the EIA Regulations for this type of development
   Usually: Subject to facility scale/throughput and site specific circumstances proposals will normally require EIA
   Sometimes: Proposals will not normally require EIA, a minority of proposals will require EIA due to scale and/or site specific sensitivities
   No: EIA will not normally be required
3. Issues likely to require detailed consideration within the planning application supporting documentation or Environmental Statement if EIA is required.

Further Reading

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- The Chartered Institution of Wastes Management (2003) Biological Techniques in Solid Waste Management and Land Remediation, IWM Business Services Ltd.
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Glossary

Term	Definition
Acid Gases	A general term used to cover sulphur dioxide, hydrogen chloride, hydrogen fluoride and nitrogen oxides.
Aerobic	In the presence of oxygen.
Air Dispersal Modelling	A method of calculating loads of substances in the air, due to releases from a source.
Air Pollution Control (APC)	Generic term used to describe the combination of techniques which together clean air emissions from thermal or other processes prior to discharge to the atmosphere.
Air Quality Management	An area identified by a local authority predicted to exceed the Air Quality
Area (AQMA)	Objectives for either one or more pollutants by the target dates set. These areas are identified through Review and Assessment and will be targeted for improvement of air quality in the local authority's air quality plan.
Anaerobic	In the absence of oxygen.
Anaerobic Digestion	Anaerobic Digestion is a process in which biodegradable material is encouraged to break down in the absence of oxygen. Waste is broken down in an enclosed vessel under controlled conditions, resulting in the production of digestate and biogas.
Autoclave	A pressurised steam treatment process often used for the sterilisation of clinical wastes and equipment.
Best Available Technique (BAT)/Best Available Technique Not Entailing Excessive Cost (BATNEEC)	Best Available Techniques, defined under Integrated Pollution Prevention and Control (IPPC). 'Best' means the most effective techniques for achieving a high level of protection for the environment as a whole. 'Available' means techniques developed on a scale which allows them to be used in the relevant industrial sector, under economically and technically viable conditions. 'Techniques' includes both technology and the way the installation is designed, built, maintained, operated and decommissioned.

	In practice, the above definition is equally applicable to the now superseded BATNEEC definition, with the element of cost effectiveness incorporated within the new definition of ‘available’.
Best Practicable Environmental Option (BPEO)	BPEO is defined within PPG 10 as ‘the outcome of a systematic and consultative decision making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes for a given set of objectives, the option that provides the most benefits or the least damage to the environment, as a whole, at acceptable cost, in the long term as well as in the short term’.
Bio-aerosols	Airborne microbial material that may be inhaled, causing respiratory problems. Bio-aerosols may be carried in the air as spores or microbes, on fine dust particles or tiny water droplets.
Biodegradable	Capable of being broken down by plants and animals. Biodegradable municipal waste includes paper and card, food and garden waste, and a proportion of other wastes, such as textiles.
Bio-filter	A term applied to a range of systems used to remove biological agents from liquids or gases.
Biogas	Gas resulting from the fermentation of waste in the absence of air (methane/carbon dioxide).
Bottom Ash	The ash that drops out of the furnace when combustion is complete; virtually inert.
Bring Sites	Bring sites are facilities provided at supermarkets and other facilities visited regularly by householders, in which recyclable waste may be deposited.
Brownfield Site	A general term used to describe previously used land that may also be contaminated.
Char	Material remaining following partial or incomplete combustion.
Chemical Scrubber	A system for end-of-pipe removal of substances from a gas steam by chemical means.
Civic Amenity Site	A facility where the public can dispose of household waste. Civic amenity sites often have recycling points.

Combined Heat and Power (CHP)	A highly fuel efficient technology which produces electricity and heat from a single facility.
Commercial Waste	Commercial waste is that arising from premises which are used wholly or mainly for trade, business, sport, recreation or entertainment, excluding municipal and industrial waste.
Compost	A bulk reduced, stabilised residue resulting from the aerobic degradation of organic waste.
Cullet	Glass fragments which may be suitable for remelting and reprocessing into new glass.
Denitrification	The process by which nitrate is reduced to nitrogen gas. In the case of leachate treatment, denitification is used to reduce the risk of receiving water courses becoming nutrient enriched.
Digestate	Solid and liquid product resulting from anaerobic digestion.
Eddy Current Separator	A method used to remove non-ferrous metals from waste material.
Environment Agency	Established in 1996, the Agency combines the functions of the former local waste regulation authorities, the National Rivers Authority and her Majesty's Inspectorate of Pollution. Intended to promote a more integrated approach to waste management and consistency in waste regulation. The Agency also conducts national surveys of waste arisings and waste facilities.
Feedstock	Raw material required for a process.
Fermentation	A chemical reaction in which an organic molecule splits into simpler substances.
Fluidised Bed System	A combustion technology system in which a sand bed is fluidised by vertical air jets, heated to temperatures high enough to support combustion, combustable material is added and the process becomes exothermic.
Fly Ash	The fine dust that is removed from the flue gas in the flue gas cleaning process.
Front End Recycling	Separation of the recyclable component of mixed waste prior to further processing.

Furans	Chlorine based organic compounds.
Gasification	Gasification is the process whereby carbon based wastes are heated in the presence of air or steam to produce fuel-rich gases. The technology is based on the reforming process used to produce town gas from coal, and requires industrial scale facilities.
Green Waste	Vegetation and plant matter from household gardens, local authority parks and gardens and commercial landscaped gardens.
Greenfield Site	Typically a site which has only previously been used for agriculture or forestry.
Heavy Metals	A metal of atomic weight greater than sodium (23) that forms soaps on reaction with fatty acids: aluminium, calcium, cobalt, lead and zinc.
Incineration	The controlled thermal treatment of waste by burning, either to reduce its volume or its toxicity. Energy recovery from incineration can be made by utilising the calorific value of the waste to produce heat or power. Current flu-gas emission standards are very high. Ash residues still tend to be disposed of to landfill.
Induced Draft (ID) Fan	Fan situated before a chimney, which maintains a slight suction within the furnace and abatement equipment to aid discharge of flue gases to the stack.
Industrial Waste	Industrial waste is that from any factory and from any premises occupied by an industry (excluding mines and quarries).
Integrated Pollution Prevention and Control (IPPC)	Integrated Pollution Prevention and Control, an EC Directive implemented in the UK by the Pollution Prevention and Control (England and Wales) Regulations 2000. This is similar to IPC but also covers noise, vibration, resource minimisation, energy efficiency, environmental accidents and site protection and covers more industrial processes. (IPC – Integrated Pollution Control (Part IIA Environmental Protection Act 1990): the control of polluting substances from industrial processes to the three environmental media of air, land and water).

In-vessel Composting	The aerobic decomposition of shredded and mixed organic waste within an enclosed container, where the control systems for material degradation are fully automated. Moisture, temperature and odour can be regulated, and a stable compost can be produced much more quickly than outdoor windrow composting.
Kerbside Collection	Any regular collection of recyclables from premises, including collections from commercial and industrial premises as well as from households. Excludes collection services delivered on demand.
Landfill	Landfill is the controlled deposit of waste to land. Often mineral working and extraction sites are used as landfills, providing a means to restore land. Where such 'holes in the ground' are not available, it is possible to deposit waste onto the ground surface to build up a waste disposal site – a practice known as landraising.
Landfill Cap	The covering of a landfill, usually with low permeability material. Permanent capping is part of the final restoration following completion of landfill/tipping. Temporary capping is an intermediate cap which may be removed on resumption of tipping.
Landfill Cell	The compartment within a landfill in which waste is deposited. The cell has physical boundaries which may be a low permeability base, a bund wall and a low permeability cover.
Landfill Gas (LFG)	A gaseous by-product from the digestion by anaerobic bacteria of putrescible matter present in waste deposited on landfill sites.
Large Scale Thermal Treatment	Large scale thermal treatment plants include large, centralised urban facilities, typically receiving between 150,000-400,000 tonnes of waste per annum. Techniques used include various moving grate and fluidised bed systems.
Leachate	Leachate is the generic term given to water which has come into contact with waste materials and which has drawn pollutants out of those materials into solution, thereby contaminating the water.
Leachate Treatment	Leachate treatment is a process to reduce the polluting potential of leachate. Treatment may include leachate

	recirculation, spray irrigation over adjacent grassland, and biological and physio-chemical processes.
Mixed Waste Processing	Mixed waste processing is designed to recover valuable components from unsorted municipal solid waste for recycling and deliver a stabilised residue for final landfilling. Otherwise known as a 'dirty materials recovery facility', mixed waste processing involves a number of standard waste separation techniques to remove recyclable materials such as glass, metals and plastics, followed by the composting or anaerobic digestion of the remaining organic materials.
Moving Grate System	The most common type of grate mechanism in an energy from waste plant, designed to carry the feedstock through the furnace. It is composed of interlocking bars to facilitate movement.
Municipal Solid Waste (MSW)	This involves household waste and any other wastes collected by the Waste Collection Authority, or its agents, such as municipal parks and gardens waste, beach cleansing waste, commercial or industrial waste, and waste resulting from the clearance of fly-tipped materials.
Non Fossil Fuels Obligation (NFFO)	A scheme whereby electricity generated from sources other than the burning of fossil fuels gains preferential rates. Now replaced by the Renewables Obligation.
Organic Waste	General term used to describe garden wastes, kitchen wastes and other putrescible wastes.
Oscillating Kiln	Furnace that demonstrates an oscillating motion to distribute and combust waste feedstock.
Pollution Prevention and Control (PPC)	The UK implementation of the IPPC Directive that regulates energy from waste facilities.
PPG 10	Government Planning Policy Guidance Note 10: Planning and Waste Management.
Processing of Recyclables	Otherwise known as a 'clean materials recovery facility', processing of recyclables involves the secondary sorting and processing of dry recyclables prior to export to specialist industry processing facilities.

Proximity Principle	This principle suggests that waste should generally be disposed of as near to its place of production as possible.
Pyrolysis	During pyrolysis, organic waste is heated in the absence of air to produce a mixture of gaseous and liquid fuels and a solid, inert residue (mainly carbon). Pyrolysis generally requires a consistent waste stream such as tyres or plastics to produce a usable fuel product.
Quench Tank	A water tank used to cool down hot ash or other materials.
Recovery	Generic term encompassing the reemployment, reuse, recycling or regeneration of waste.
Recyclates	Post-use materials that can be recycled for the original purpose or for other purposes.
Recycling	Recycling involves the reprocessing of wastes, either into the same product or a different one. Many non-hazardous wastes such as paper, glass, cardboard, plastics and scrap metals can be recycled. Special wastes, such as solvents, can also be recycled by specialist companies.
Refuse Derived Fuel (RDF)	A fuel produced from combustable waste that can be stored and transported, or used directly on site to produce heat and/or power.
Renewables Obligation	Introduced in 2002 by the Department of Trade and Industry, this system creates a market in tradable renewable energy certificates, for which each supplier of electricity must demonstrate compliance with increasing Government targets for renewable energy generation.
S. 106 Agreements	An agreement made in accordance with Section 106 of the Town and Country Planning Act 1990, usually involving the applicant and the waste planning authority, designed to achieve an action not covered by the relevant planning permission. This may be restrictive or require additional work/financial provisions. Also described as a 'planning obligation'.
Small Scale Facilities	Small scale facilities include civic amenity sites and bring banks.
Small Scale Thermal Treatment	Small scale thermal treatment facilities include moving grate systems, of less than 100,000 tonnes of waste per annum, and

	rotating/oscillating kilns, as well as other proprietary combustion processes, for the thermal treatment of waste.
Source-Segregated/ Source-Separated	Usually applies to household waste collection systems where recyclable and/or organic fractions of the waste stream are separated by the householder and are often collected separately.
Special Waste	Defined under the Special Waste Regulations 1996. In broad terms, any wastes on the European Hazardous Waste List that have one or more of 14 defined hazardous properties.
Syngas	Any of several gaseous mixtures resulting from reacting carbon rich substances with steam or steam and oxygen.
Trommel Screen	Available in various forms, typically a tilting/rotating drum, used to screen waste according to size and density.
Vitrification	The process of making a glassy non-crystalline solid by melting and cooling. This method is used to prevent contaminants in waste leaching into the environment.
Waste Collection Authority (WCA)	District Council (in two tier areas) or Metropolitan/Unitary Authority, with responsibility for waste collection from each household in its area.
Waste Disposal Authority (WDA)	County Council (in two tier areas) or Metropolitan/Unitary Authority, with responsibility for the safe disposal of all waste arisings in a particular geographical area. The Environmental Protection Act 1990 required all local authorities to transfer their waste disposal facilities to either a partly owned, arms length Local Authority Waste Disposal Company (LAWDC) or directly into the private sector to carry out their waste disposal responsibilities exclusively by means of letting contracts.
Waste Hierarchy	This concept suggests that the most effective environmental option may often be to reduce the amount of waste generated (reduction); where further reduction is not practicable, products and materials can sometimes be used again, either for the same or different purpose (reuse); failing that, value should be recovered from waste (through recycling, composting or energy recovery from waste); only if none of the above offer an appropriate solution should waste be disposed of.
Waste Local Plan	The preparation of a Waste Local Plan is a requirement of the Planning and Compensation Act 1991, which defines it as a plan

	containing waste policies. Waste policies are defined as detailed policies in respect of the development which involves the depositing of refuse or waste materials other than mineral waste. Now complemented by Local Development documents on waste.
Waste Management Licencing	Licences are required by anyone who proposes to deposit, recover or dispose of waste. The licencing system is separate from, but complementary to, the land use planning system. The purpose of a licence and the conditions attached to it is to ensure that the waste operation which it authorises is carried out in a way which protects the environment and human health.
Waste Minimisation/ Reduction	Waste minimisation/reduction is the most desirable way of managing waste, by avoiding the production of waste in the first place.
Waste Not, Want Not	A strategy for tackling the waste problem in England. Published by the Strategy Unit in 2002, this document is the result of a review of Waste Strategy 2000.
Waste Planning Authority (WPA)	County Council (in two tier areas) or Metropolitan/Unitary Authority, with responsibility for planning control over waste management. WPAs are also responsible for ensuring an adequate planning framework to facilitate the establishment of appropriate waste management facilities, and to balance this provision with the need to protect the environment.
Waste Strategy 2000	Government vision of sustainable waste management in England and Wales until 2020 (Wales has subsequently produced its own strategy).
Waste Stream	There are three waste streams: household, commercial (for retail outlets' backdoor waste) and industrial. Waste is channelled either to recycling, recovery or landfill.
Waste Transfer Station/Site	A site to which waste is delivered for sorting prior to transfer to another place for recycling, treatment or disposal. Waste from collection vehicles is stored temporarily prior to carriage in bulk to a treatment or disposal site.
Windrow Composting	The aerobic decomposition of shredded and mixed organic waste using open linear heaps known as 'windrows', which are approximately three metres high and four to six metres across.

The process involves mechanical turning of the waste until the desired temperature and residence times are achieved to enable effective degradation. This results in a bulk-reduced, stabilised residue known as compost. Windrow composting can take place outdoors or within a large building and the process takes around three months.

Part 2 – Facility Profiles

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1 Composting

What is it?

Composting is a biological process in which micro-organisms convert biodegradable organic matter into a stabilised residue known as compost. The process uses oxygen drawn from the air and produces carbon dioxide and water vapour as by-products.[1] Composting plants are typically located in rural or urban fringe sites and receive between 1,000 and 40,000 tonnes of biodegradable municipal solid wastes (BMSW) and industrial wastes per year to convert to composted products. The majority of BMSW composted in the UK consists of garden type waste collected at civic amenity sites, the remainder being source-segregated kerbside-collected garden waste or garden waste co-collected with kitchen waste.

Examples of large scale composting plants operating in the UK are:

- Pitsea Landfill Site, Cleanaway Ltd, Essex
- Gowy Landfill Site, Waste Recycling Group plc, Trafford, Chester
- Down End Quarry Composting Facility, Hampshire Waste Services, Fareham, Hampshire
- Midlands Composting and Recycling, Jack Moody Ltd, Hollybush Farm, Wolverhampton

The biodegradable waste feedstock is delivered to a reception area, where it is shredded into finer particle sizes to speed up the composting process. The shredded waste is then commonly formed into windrows of 1.5 to 3 metres in height for composting or treated in an 'in-vessel' system. The windrow composting process can last from 8 to 16 weeks (and in many cases longer) from reception to final compost product distribution. In-vessel composting typically takes between 7 and 21 days, with a maturation time commonly between 4 and 10 weeks. The key stages of the composting process are illustrated below.

[Courtesy of Enviros Consulting]

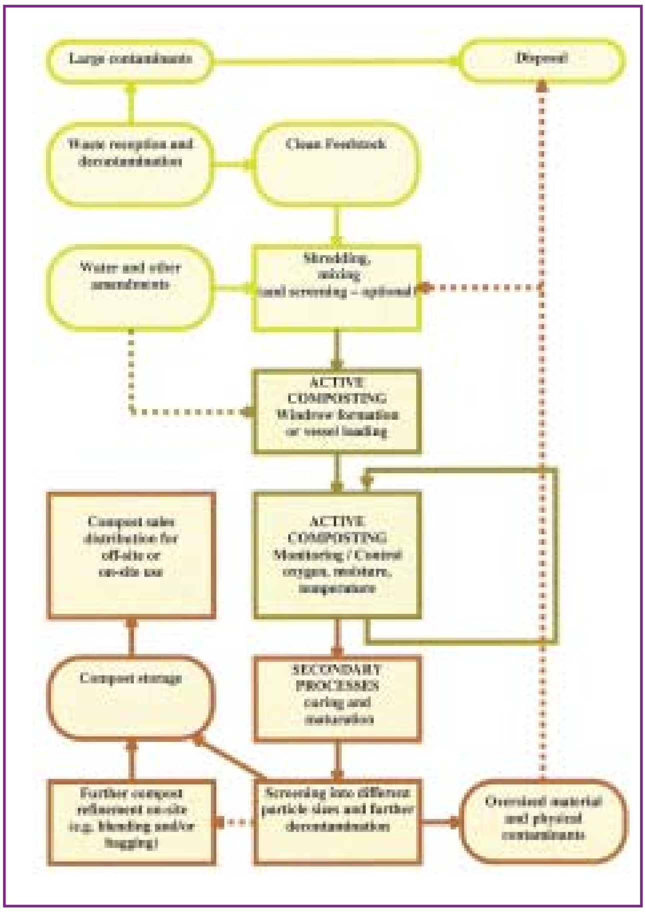
Feedstock shredding

[1] An Introduction to Household Waste Management, ETSU/DTI, 1998

[Courtesy of Enviros Consulting]

Open air windrows

[Courtesy of Enviros Consulting]



Key composting process stages

The majority of UK composting plants use open air windrows (elongated piles), which are actively aerated (active composting stage) by mechanical turning or by forcing air into the piles using fans, until the oxygen demand of the process can be met through the natural diffusion of fresh air into the pile (known as the curing or maturation stage). When adequate decomposition (stabilisation) has been achieved the material can be refined into final composted products.

The term ‘in-vessel composting’ is used to cover a wide range of composting systems all of which feature the enclosed composting of waste, therefore allowing a higher degree of process control than is possible with windrow composting. In-vessel systems can be broadly categorised into five types: containers, silos, agitated bays, tunnels, and enclosed halls.

[Courtesy of Enviros Consulting]

Fan-assisted static pile aeration

Many in-vessel systems involve the forced aeration of the feedstock and offer sufficient control that the process air can be captured and managed to reduce potential nuisance, such as odour. For effective waste handling, a covered waste reception area, as well as hard standing for post composting and a covered storage area are needed. Enclosure of these components allows for the further control of nuisance, including noise and dust.


Sirocco in-vessel composting unit – 2.5 × 2.5 × 5 metres

[Courtesy of Waste Mechanics Ltd owned by Thetford International Ltd, Rainham Landfill site, Cleanaway Ltd]

The stability and sanitisation (removal of potential pathogens) level required of the final composted product should be related to its end-use and the waste types processed. The compost should no longer constitute an environmental threat, for example through harmful odour or leachate production. A variable amount of material may not be suitable for end-use due to its large particle size (oversize) or contamination (e.g. plastic, glass, metal or stones). Oversize may be mixed with fresh waste and re-composted, re-shredded to reduce its particle size before end-use applications, or sent for disposal. Contaminated material may be refined using air classifiers to remove light contaminants (e.g. plastic films) or wet screens to remove heavy contaminants (e.g. glass, metal, and stones), used for lower specification end-uses (e.g. landfill cover), or sent for disposal.

The volume of compost produced for distribution is usually around half of the original waste volume. This compost is far more stable and sanitary than the biodegradable municipal solid waste input, mainly due to the self-heating biological oxidation and stabilisation that occurs during composting. The material may be screened into particle sizes suited to its end-use, and may be blended with other materials, such as sand, to produce artificial topsoil. The composted products are used on-site or off-site, sold or distributed free of charge as, for example, soil conditioners, mulch, land restoration material, or daily landfill cover.

Siting and Scale

The existing composting sites in England can be divided into three distinct types: centralised, on-farm, and community sites.

The Composting Association survey of 1999 identified 80 centralised composting sites. There are probably now over 100 centralised sites in the UK, which tend to operate on the largest scale as they can process waste derived from a number of external sources (local authorities and industrial sources). However, there are many small scale centralised sites (usually operated by or for local authorities) composting waste derived from a single authority. More than half of centralised sites process less than 7,000 tonnes per annum (tpa) with an average size of 3,500 tpa, processing approximately 20% of total UK composting throughput. The larger sites (over 21,000 tpa) process around 40% of total UK throughput. Half of the centralised composting facilities are located at landfill sites, around 30% at specially selected composting sites, and the remainder are located at material recovery facilities, sewage treatment works, industrial sites, civic amenity sites, and transfer stations.

The Composting Association survey of 1999 also identified 65 centralised on-farm sites. There are now approximately 70 on-farm sites in the UK. These facilities may also act as centralised sites, but are described separately due to their location on farms, and their ability to exploit existing infrastructure, equipment, and labour associated with normal farm activities to conduct small scale composting operations. Approximately 90% of on-farm composting sites process less than 1,500 tpa, with an average site size of around 740 tpa. The remaining 10% of on-farm sites have an average throughput of 3,800 tpa.

Community sites are usually run by voluntary or not-for-profit organisations to process very small quantities of locally produced organic wastes (usually from households). There are over 50 community-run composting facilities in the UK, composting a total of around 2,000 tonnes of BMSW. These sites are small scale. Operators tend to run a large number of operations, sometimes in excess of 20 sites.

Scoping Matrix: Composting

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Development Activity						
	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, Traffic and Access	■	■	●	▲	●	▲	■
Air Emissions (including Dust) *	■	●	■	■	●	■	■
Odours	●	▲	▲	▲	●	■	●
Vermin and Birds	●	●	▲	▲	●	■	●
Noise / Vibration	■	▲	■	▲	●	▲	■
Litter	●	●	▲	▲	●	▲	●
Water Resources	■	●	▲	▲	●	■	▲
Land Stability	▲	●	●	●	●	●	▲
Visual Intrusion	▲	▲	■	●	▲	●	▲
Nature and Archaeological Conservation	■	●	●	●	●	■	▲
Historic (Built) Environment	▲	▲	●	●	●	▲	▲
Potential Land Use Conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 25,000 tonnes per annum

Waste stream: assumes no kitchen waste used for windrow composting; green waste and kitchen waste used for in-vessel composting.

*** Little quantitative data on air emissions from the composting process is available – these are based upon qualitative descriptions.**

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

The scale of composting facilities is largely dependent on whether they have acquired a waste management licence or a waste management licensing exemption. Exempt sites, among other things, are currently allowed to compost no more than 1,000 cubic metres of waste on site at any one time, although the amount of fresh input materials and finished compost that can be stored is subject to interpretation. Most on-farm facilities possess waste management exemptions, and all community-run sites are exempt and so are restricted in size. However, exemptions for composting sites are currently under review and will become more stringent in the near future – forcing more on-farm facilities to obtain waste management licences. By comparison, most centralised composting sites possess, or are in the process of obtaining, a waste management licence and so are less restricted in capacity.

The matrix has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified composting operations – **assuming what may be possible without full mitigation** or where management practices fail.

General siting criteria

Existing landuse: Traditional windrow composting plants can blend in with suburban and rural development due primarily to their low profile structures and their similarity to other rural developments (e.g. farms). Such facilities would not normally be compatible with a hi-tech business park environment or an urban setting. Enclosed facilities are suited to areas allocated for business use and traditional commercial/industrial urban areas, and are compatible with the more intensive Class B1/B2 activities under the Use Classes Order. Existing waste sites should also be considered for both types of composting facility.

Proximity to sensitive receptors: Site specific risk assessment needs to be a condition if composting operations are to be located within 250 metres of any working or dwelling place. Where possible facilities should be located at least 250 metres from sensitive properties, which may include business premises.

Transport infrastructure: Requires good access from primary road network and access roads which are free from restrictions for HGVs.

Physical & Operational Characteristics
[25,000 tonnes per year plant composting green waste only]

Expected lifetime of facility:	10–25 years
Working time:	8 hours, 5–6 days per week
Waste Tonnage treated:	25,000 tonnes per year
Typical site area:	2–3 ha
Building footprint:	Often no building is required for composting operations Office buildings of 30 to 100 m^2 may be erected
Building height:	3 to 4 m
Vehicle movements:	20–40 refuse collection vehicles or equivalent/day.
Employment:	Site Manager, Assistant Manger plus three site operatives
Waste storage:	Up to one day’s waste input, in open-air reception area. Storage of inputs from at least one day up to one week may be required = 130 tonnes per day (during seasonal peak inputs) Compost storage 30–40% by volume of input material Oversize storage – 10–20% by volume of input material

Physical & Operational Characteristics
[25,000 tonnes per year plant composting waste containing kitchen/catering waste covered by the Animal By-products Order (there are no sites of this type and scale in the UK)]

Expected lifetime of facility:	10–25 years
Working time:	8 hours, 5–6 days per week
Waste Tonnage treated:	25,000 tonnes per year
Typical site area:	1–2 ha
Building footprint:	Enclosed building – footprint: 25 m × 30 m and height: 4–5 m.
Active enclosed composting:	Windrows in an enclosed building, in-vessel units, or tunnels. • Windrows in building – 2000 to 3000 m^2; height 5–7 m • Tunnels – 1000 to 2000 m^2; height 4–5 m • Mobile in-vessel containers – 3000 to 4000 m^2; height 3 m
Building height:	From 3 metres (mobile in-vessel containers) to up to 7 metres for housed windrows
Vehicle movements:	20–40 refuse collection vehicles or equivalent per day.
Employment:	Site Manager, Assistant Manager plus three site operatives
Waste storage:	Storage of inputs from at least one day to up to one week may be required = 130 tonnes per day (during seasonal peak inputs)
	Compost storage – 30–40% by volume of input material
	Oversize storage – 10–20% by volume of input material

Key Issues

Traffic

Like any major waste facility, large scale composting plants will be served by a significant number of heavy goods vehicles. The nature and volume of vehicle movements will be determined by the volume throughput of the plant and the nature and source of the waste. Traffic generated may include a mixture of waste collection vehicles, bulk haulage vehicle and skip transporters.

Air Emissions

Research has been carried out to gain a clearer understanding of the potential impacts of air emissions. Focus has been placed on the potential effects of bioaerosols.

Bioaerosols may be carried in the air as spores or microbes, on fine dust particles or tiny water droplets. The weight of the particles and wind speed dictate the distance to which these may be carried. Environment Agency (EA) research suggests that bioaerosol levels are likely to be equal to or below natural levels within 250 metres of a composting operation. If mitigating measures are taken this distance may be reduced. Such reductions in this distance should be evaluated within the risk assessment carried out for the site. Air emissions are also a material planning consideration.

Dust

Dust from composting biodegradable and/or putrescible wastes has the potential to represent a nuisance issue with potential adverse impacts on residential amenity.

Dust production potential is highest when materials are allowed to become too dry, and during shredding, turning, and screening. Dust can also be created by vehicle movements on site.

[Courtesy of Enviros Consulting]

Spray curtain to mitigate dust and odours from windrow composting facility

Odour

Odour production at composting sites has lead to most public complaints and concerns, and is the major cause for site closures.

The main problems associated with odour have been attributed to the following activities:

- Delivery of feedstock, which may have been stored for long periods, and/or contained in air-tight bags trapping odour build-up;
- Feedstock shredding;
- Exhaust air from enclosed systems (e.g. in-vessel systems);
- Anaerobic conditions in composting materials;
- Wet and dirty areas and roads; and
- Untreated pools of leachate (nutrient-rich high organic content liquids produced from decomposing materials, and run-off during rainfall).

The greatest potential for odour production occurs when fresh and partially composted materials are allowed to sit for excessive periods of time without aeration, or if materials become too wet. This can lead to anaerobic decomposition, causing the most noxious odours. These gases are then released as soon as the aerobic material is disturbed. This may occur if facilities are badly managed, or during times of plant failure. At a well run facility this will not be an issue as anaerobic conditions are kept to a minimum through minimum storage periods of fresh waste, suitable turning frequencies or fan-assisted aeration systems, maintaining site cleanliness, and leachate control and treatment. The structure and moisture content of the material must also be controlled to maintain porosity and prevent materials becoming water-logged, blocking the movement of air.

Noise

The main problems associated with noise have been attributed to the following activities:

- Vehicles delivering waste and collecting materials;
- Mechanical turning operations in an open-air windrow operation, or aeration fans in an enclosed facility;
- Waste shredding operations; and
- Compost screening operations.

The process operations are potentially noisy and most noise issues tend to be associated with plant used for the movement of materials. Noise control measures should form a scheme developed by the site operator in conjunction with the regulator (Planning Authority and/or Environment Agency).

Noise is an issue that is controlled under the IPPC Regulation as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Litter

Litter is not normally a significant problem at composting facilities, as the material processed has been segregated at source to avoid cross contamination with other waste materials. Problems may arise if biodegradable wastes have been collected in biodegradable, degradable, or non-degradable plastic bags. These may be shredded with the waste, and light polymer fragments may cause litter in an open-air composting facility when windblown.

Water Resources/Nature and Archaeological Conservation

Compost can create leachate as a result of high moisture levels in the biodegradable waste feedstock, from cell and pressure water, and natural precipitation. The highest potential release of leachate is in the first two weeks.

Leachate has a high content of organic substances, which is highly polluting to surface water, groundwater and plant life, and can cause ground contamination. The design of the site should not only contain any leachate, but if possible to recirculate it into dry piles as a wetting agent.

Visual Intrusion

The variable scale and potential sophistication of composting operations means that there is a range of impacts on both landscape character and visual amenity. Large, sophisticated facilities may require large areas of land (approximately 1 m^2 of land per tonne of input material per year), which will need to be converted to hard-standing areas for the running of machinery, and soil and ground water protection measures. Enclosed facilities will also require buildings and/or containers for the waste reception and processing areas. However, composting operations have a low height profile as they do not require tall buildings or other structures. The proposed visual appearance of a composting facility does not normally create a significant amount of public concern and anxiety. The significance of any landscape and visual impact is dependent upon a number of site specific issues such as:

- Direct effects on landscape fabric, including greenfield vs brownfield, removal of hedgerows, trees etc;
- Proximity of landscape designations;
- Site setting, for example the proximity of listed buildings and/or conservation areas;
- Proximity of sensitive viewpoints;
- Presence of existing large built structures;
- Existing landform and nature of existing landscape; and
- Presence/absence of screening features (trees, hedges etc.).

Public Concern

Until relatively recently most composting operations have been of a generally low key nature and have not given rise to much public concern. More recently public concerns have increased as a result of greater publicity surrounding issues associated with odour, bioaerosols and other air emissions. The majority of site closures and interruptions in operation have been due to complaints resulting from odour production. Dust and bioaerosol emissions may produce health concerns, reflected in the Environment Agency 250 m rule with regard to sensitive receptors and the need for risk assessments and mitigation measures required for bioaerosol production.

Need for EIA

Environmental Impact Assessment (EIA) is the process by which environmental information is collected, published and taken into account in reaching a decision on a relevant planning application. The main aim of EIA is to ensure that the authority giving the primary consent for a particular project makes its decision in the knowledge of any likely significant effects on the environment.

Generally, it falls to the local planning authority to consider whether a proposed development will require an EIA. Composting facilities fall under Schedule Two of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, within the category 'installations for the disposal of waste'. This category is explained within DETR Circular 02/99 by means of the following text:

The likelihood of significant effects will generally depend upon the scale of the development and the nature of the potential impact in terms of discharges, emissions or odour. For installations (including landfill sites) for the deposit, recovery and/or disposal of household, industrial and/or commercial wastes (as defined by the Controlled Waste Regulations 1992) EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of these wastes, sites seeking only to accept inert wastes (demolition rubble etc.) or Civic Amenity sites, are unlikely to require EIA.

Following this advice, small, on-farm composting sites and community run schemes are unlikely to require an environmental impact assessment, whereas an EIA may be needed for larger centralised sites with greater potential for environmental impacts.

Planning status for composting facilities shows a similar pattern to waste management licensing. The majority of centralised facilities have been granted or are awaiting planning permission, whereas around half of on-farm sites, exempt from waste management licensing, have planning permission. Over 90% of community-run sites do not possess planning permission.

Within the planning application for a composting facility, applicants should provide sufficient information to enable the waste planning authority to determine the nature of the processing operations, as well as the measures that will be used to minimise potential nuisance issues, particularly those associated with odour and noise. It would be appropriate for applicants to enter into a dialogue with the Environment Agency and the waste planning authority at an early stage to determine what level of information is appropriate for planning and what process specific details may be reserved for waste licensing, or PPC.

It is assumed that planning applications will be accompanied by information including drawings consistent with those provided for other waste management operations.

Content of Planning Application

The content of the planning application with regard to the assessment of environmental issues will largely be guided by the scope of the EIA (where an EIA is required). Certain additional information should also be provided over and above what is generally required under the EIA Regulations. This relates in particular to aspects such as:

- Planning policy context;
- Need; and
- BPEO.

Such information can either be provided within a separate document or combined as part of the Environmental Statement (where an EIA is required). It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and where appropriate with reference to the local Waste Strategy and Waste Local Plan or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1 of this publication.

Mitigation

The key planning considerations where mitigation measures will be required will be related to the key environmental issues assessed through the risk assessment during the waste licence application procedure. Typically, these relate to the main emissions from the facility: leachate/run-off, odours, dust, bioaerosols, noise, and litter. The table below identifies the key planning considerations associated with composting facilities and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	Deliveries of waste are normally linked to waste collection rounds, as well as the collection of green waste from civic amenity sites. These collections usually peak at a certain time of day. Vehicles should be routed away from inappropriate roads, such as sensitive residential areas and schools.	N/A
Air Emissions	Controls of airborne microbes can include: • Damping down of materials to prevent dusts; • Shredding, turning, screening undertaken when wind speeds are not too high; • Locating the site at a suitable distance from sensitive receptors.	N/A
Dust	Dust should not be an issue at correctly run operations, where material moisture contents are maintained at levels above those at which dust is generated (less than 30%). In order to maintain these levels, the levels should be monitored at all stages to prevent the waste drying out. When dust is generated, it can be controlled in enclosed facilities by negative air pressure generated by the inward flow of air over the waste reception area. When windrow composting, dust can be controlled by: • Avoiding screening, shredding and turning windrows or piles in windy conditions; • Regularly damping down the site to suppress dust; • Maintaining plant and machinery to avoid dust generation.	Physical barriers such as mounds and walls can prevent dust leaving a site. Site construction and specific landscaping techniques can contain dusts generated on site. The composting of wastes within buildings provides excellent dust containment.
Odour	A creation of natural odours cannot be completely avoided at composting facilities. In closed composting the risk of odour is lowered by their physical containment, and the potential for pumping stale, exhaust-air into odour removal systems, such as bio-filters, chemical scrubbers, or burners. Such exhaust air treatment may also be used on static piles employing negative-pressure (sucking) aeration pumps. Fabric covers and absorbent cover materials may also be used on static windrows to contain odours.	At open-air facilities, water jets or curtains of water vapour can be used to absorb odours in the air, if odours are of particular concern or sites are located close to sensitive receptors. Odour suppressants or masking agents can also be used, although these may result in separate impacts.
Noise	Sites can be positioned a reasonable distance from sensitive receptors to achieve effective noise control. Planning Policy Guidance Note 24 (Planning and Noise – PPG 24) gives advice on noise control. This guidance does not provide detailed guidance on mitigation. Typical measures might include: • Fitting machinery with silencers; • Reducing use of machinery during public holidays and weekends; • Windrows, other physical barriers or earth mounds can be used as acoustic bunds (barriers).	N/A

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Litter	In those cases where litter occurs, it can be alleviated by using net barriers and fences, or natural vegetation barriers to contain the litter, and provide wind breaks. Litter picking regimes can also be used.	N/A
Water Resources/ Nature and Archaeological Conservation	The protection of controlled waters by adequate site surfacing, segregated drainage and containment are essential in the control of leachate. Any leachate not recirculated should be collected and taken away, or directed to a sewer or watercourse with the appropriate consent or a works inlet at a wastewater treatment plant.	If leachate is generated in sufficient quantities, it can be recirculated into the composting process, and a collection system may be advisable. Any recirculation must be taken with great care, as it may become a potential source of odour.
Visual Intrusion	Careful site selection and appropriate orientation of the building footprint together with appropriate screening (e.g. tree planting) can help to minimise any potential adverse impact.	N/A

Case Examples

Pitsea Landfill Site, Cleanaway Ltd, Essex – Windrow composting

This large open-air windrow system has been serving Essex for around six years, and was featured recently as a best practice composting site by WRAP.

It is one of the largest composting sites in the UK, processing around 25,000–30,000 tonnes of garden waste per year into around 10,000–15,000 tonnes of compost. Input materials comprise garden waste collected at bring sites (civic amenity sites) and from kerbside collections.

[Courtesy of Cleanaway Ltd.]

Side turner, Pitsea composting site

The system comprises an open-air turned windrow system, using a dedicated turning machine (see photograph). The turning machinery, which turns 1,500 m^3 per hour, allows the use of extended windrows – 2.5 metres high and 10–20 metres wide.

The windrow composting process progresses over three stages.

1. Green waste is shredded before being used to construct extended windrows.

2. Oxygen supply and temperature is controlled by frequent turning, and the moisture content of the material is controlled throughout the process by frequent watering.

3. After 10 to 12 weeks of turning, the compost is loaded into the screening area. It is screened into <40 mm particles that are then further screened into <10 mm and >10 mm to <40 mm fractions; the larger fraction feeding into an air-classifier to remove light contaminants such as plastic films. The <10 mm fraction is sold as soil improver or used as a component of other products; the 10 to 40 mm fraction is used as mulch. Oversize (>40 mm) material is fed back into the process for further shredding and composting. Screened products are stored under covered storage bays.

The entire composting process is conducted on a concrete pad to control any liquid emissions. The area is fenced on one side to control vehicle access to the site.

The composting process focuses on quality compost production, which is marketed through the recently formed APEX, a collaborative organisation of compost producers.

Key Planning Features

Location:	Pitsea Composting Site, Pitsea Landfill Site, Essex
Setting:	A licensed area on Pitsea Landfill Site run by Cleanaway Ltd.
Waste Types:	Biodegradable green waste from civic amenity sites and kerbside collections
Waste Volume:	25,000 to 30,000 tonnes per annum
Compost Generation:	10,000 to 15,000 tonnes per annum of soil improver, turf humus and mulch
Building Footprint:	A mobile site office (3 m wide × 10 m long × 2 m high) and covered product storage bays (30 m wide × 20 long × 5 m high)
Design Features:	Screening, turning and product screening and storage areas on concrete pad (400 m × 60 m = 2400 m^2); steep bank on one side, wire fence on the other.

[Courtesy of Enviros Consulting]

External view of Isle of Wight composting facility, showing main plant building, composting vessels and biofilter

Lynnbottom Composting Facility, Island Waste, Isle of Wight – In-vessel composting

The Isle of Wight is the first waste disposal authority in the UK to initiate a fully integrated waste management contract, incorporating recycling, in-vessel composting, waste to energy and landfill.

The composting plant is one of the largest composting facilities in the UK, able to recycle 60 tonnes of biodegradable waste per day into approximately 40 tonnes of compost. The system, supplied by Wright Environmental of Canada, comprises three tunnels and is completely self contained, with recirculation of leachate, and exhaust air fed into the biofilter to minimise any odour. The biodegradable waste is collected by split bodied trucks, which collect organic kitchen refuse alongside ordinary domestic refuse. In addition, the plant takes green waste deposited at the island's civic amenity sites.

The in-vessel composting process progresses over four stages.

1. Green waste is shredded and mixed with organic waste before being fed into the composting vessels, or tunnels, and moved along on a series of trays.

2. The temperature and humidity are carefully controlled throughout the process to encourage bacteria to break down the compost.

3. After 6 days the waste is thoroughly mixed to keep the bacteria working.

4. After 14 days, the compost is removed from the other end of the plant and channelled into containers, before being transported to an outside area where it is regularly turned and left to mature for one to two months. At the very end of this process, the compost is used as a soil improver.

The facility consists of a large industrial building which houses the waste reception hall and the front end of the composting tunnels, and from which the bottom end of the tunnels protrude. Adjacent to the tunnels is a raised bed of chippings which act as a biofilter to mitigate odour. Covered bays where the compost is matured are also located on site.

Key Planning Features

Location:	Lynnbottom, Isle of Wight
Setting:	Urban fringe
Waste Types:	Biodegradable green waste and organic kitchen waste
Waste Volume:	15,000 tonnes per annum
Compost Generation:	40 tonnes of compost per day
Building Footprint:	1,050 m^2 building, 3 tunnels – $3 \times 3 \times 45$ m (405 m^2); and 2,550 m^2 open-air concrete curing pad
Design Features:	A series of perforated stainless steel trays form the floor of each composting tunnel, providing flexibility in the number of trays loaded per day and allowing regular inspection of trays as they exit the tunnel during the loading procedure. The biofilter is located within retaining walls adjacent to the tunnels.

Future Issues

Composting facilities have generally remained low-tech, open-air operations. However, with increasing Landfill Tax, the 'bite' of recycling targets and the introduction of the Animal By-products Regulation (which came into force on 1st July 2003), facility numbers and types are set to change dramatically. The Animal By-products Regulation will force an increase in enclosed facilities, for those processing kitchen/catering wastes, with an increased requirement for more sophisticated infrastructure. The scale of facilities will increase to meet recycling/composting targets. These changes will be fuelled by increasing landfill costs.

[Courtesy of Enviros Consulting]

Compost

'Waste Not, Want Not', a strategy for tackling the waste problem in England, published in November 2002 by the Strategy Unit forecasts that composting facilities have a potentially significant role to play for the diversion of biodegradable municipal waste from landfill, where source segregated kitchen wastes and other clean biodegradable wastes are concerned. Plants currently being designed could be on-stream to help deliver the statutory Landfill Directive targets, with the right incentives and subject to securing prerequisite planning permission.

Further Reading

- Draft Technical Guidance on Composting Operations, Version 3, (October 2001) Environment Agency.
- Large-scale Composting – a practical manual for the UK, The Composting Association.
- A Guide to In-Vessel Composting plus a Directory of Systems, prepared by HDRA Consultants Ltd, on behalf of The Composting Association, undated.
- BSI (2002) Publicly available specification 100 (PAS100): Specification for composted materials, British Standards Institution, London.

[Courtesy of Enviros Consulting]

Composting screening

- The Composting Association (2000) The Composting Association Standards for Compost (Working Document), The Composting Association, Wellingborough.
- The Composting Association (2001) The State of Composting in the UK. The Report of The Composting Association 1999 Survey Results, The Composting Association, Wellingborough.

2 Anaerobic digestion

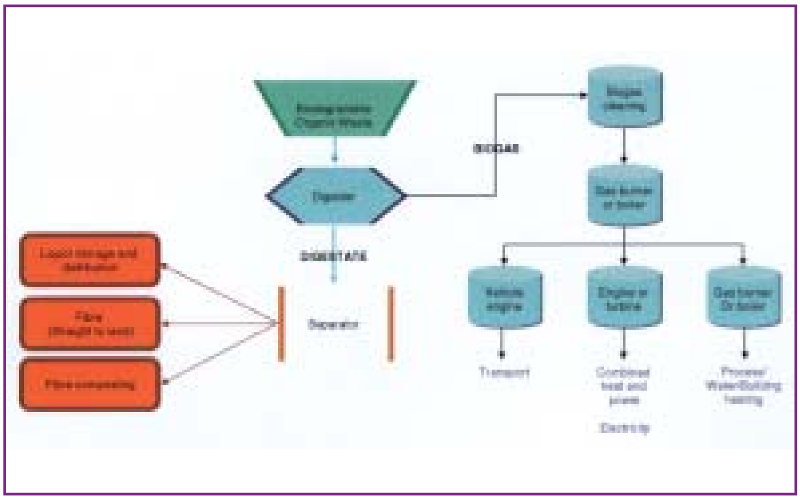
What is it?

Anaerobic Digestion is the biological treatment of biodegradable organic waste in the absence of oxygen, utilising microbial activity to break down the waste in a controlled environment. Anaerobic digestion results in the generation of:

- **Biogas**, which is rich in methane and can be used to generate heat and/or electricity;
- **Fibre**, (or digestate) which is nutrient rich and can potentially be used as a soil conditioner; and
- **Liquor**, which can potentially be used as a liquid fertiliser.

In the year 2000, there were more than 125 anaerobic digestion plants operating worldwide and a further 35 under construction using municipal solid waste or organic industrial waste as their principal feedstock, with a combined capacity of more than five million tonnes per annum[1]. In the UK, anaerobic digestion has so far been limited to small on-farm digesters, treating agricultural, household and industrial waste and sewage sludge, with a limited number of trial facilities investigating the anaerobic digestion of different feedstocks, such as household kitchen waste and green waste. Larger anaerobic digestion processes have been developed in Europe and North America, using feedstock from a number of sources. Potential feedstocks for these larger facilities include sewage sludge, agricultural wastes, municipal solid wastes and industrial wastes. It is estimated that typically between 40% and 70% of municipal solid waste is made up of readily biodegradable organic waste.

The diagram illustrates the process options possible with anaerobic digestion.



[Courtesy of Enviros Consulting]

Anaerobic digestion process options

The Digestion Process

The main process steps in the digestion of municipal solid wastes (MSW) are pre-treatment, anaerobic digestion and post-treatment. Digestion of mixed MSW is not currently widespread,

[1] Biogas and More! Systems and Markets Overview of Anaerobic Digestion

[Courtesy of Enviros Consulting]

Anaerobic digestion plant in Germany

as the economics and technical difficulties of experimental plants have made the process difficult to develop further. However, some projects have continued and are producing low quality soil improvers from the mixed waste stream. Most of the anaerobic digestion plants recently constructed are associated with sorting plants, which extract recyclates and other wastes, and treat the organic rich fraction by anaerobic digestion.

Pre-treatment involves the separation of biodegradable organic waste from the mixed waste stream, by sorting to remove materials such as plastics, metals and stones. The particle size of the coarser organic waste is then reduced to aid digestion. If biodegradable organic waste has been source-separated the initial sorting process will be similar, but less stringent.

The anaerobic digestion process takes place within the digester, a warmed, sealed, airless container. Upon introduction of the feedstock, bacteria within the digester ferment the organic feedstock and convert it into biogas, a mixture of carbon dioxide, methane and small amounts of other gases. There are two main types of anaerobic digestion, which are characterised by the digestion stage of the process:

- Mesophilic digestion: The feedstock remains in the digester for 15–30 days at a temperature of approximately 30–35°C.

- Thermophylic digestion: The feedstock stays in the digester for a shorter period of time, around 12–14 days, at a higher temperature of 55°C.

There are advantages and disadvantages to both of these processes. Mesophilic digestion tends to be more tolerant and robust than thermophylic digestion, reducing the need for expensive technology, energy input and the degree of operation and monitoring needed, but requiring larger digestion tanks. However, thermophylic digestion systems offer greater methane production, faster throughput of feedstock and better pathogen (bacteria and virus) and virus kill. Mesophylic digestion requires a separate process stage if sanitation is required.

During the anaerobic digestion process between 30 and 60% of the feedstock is converted into biogas. This gas must be burned, and can be used to generate heat and power – whether via an engine or turbine, a gas burner or boiler, or a vehicle engine. When generating electricity, the use of a combined heat and power system enables heat to be removed in the first instance to maintain the temperature of the digester, then surplus energy can be used for other purposes or sold to the grid.

As more feedstock is introduced to the system, the digestate is pumped into a storage tank. Biogas continues to be produced in this tank and collection and combustion of this may be both an economic advantage and a safety requirement. This residual digestate can then be separated to produce a fibre and a liquor.

Depending on the constituents of the feedstock, the digestate must usually be refined post treatment for use in horticulture or agriculture[2]. The material may be spread directly onto farmland as a slurry or separated into a solid and a liquid fraction. The solid fraction can then be made into dry and fully stabilised compost by maturing it for two to four weeks, and the liquid fraction may be recycled for the dilution of fresh waste, sent to a wastewater treatment plant, or applied to farmland as liquid fertiliser. If the feedstock has been treated in a dry process, the digestate is often dewatered and matured to make compost. Most of the liquor is then recycled to inoculate and moisten incoming waste. The amount, quality and nature of the compost product will depend heavily upon the quality of the feedstock, the method of digestion and the extent of the post-treatment refining process.

The main competitor of anaerobic digestion with respect to the biological treatment of waste is composting. In economic terms, anaerobic digestion cannot compete with traditional windrow composting. However, the up-front investment costs of anaerobic digestion are comparable to in-vessel composting, which is becoming more common in the UK.

Siting and Scale

Anaerobic digestion plants can be developed at two broad scales. At the smaller end of the scale, plants can be designed to treat the household biodegradable waste of a village or group of villages, or situated on farms to treat that farm's agricultural residues. At the larger end of the scale, centralised facilities can be developed, which may co-digest source-separated municipal wastes with other wastes, such as agricultural residues, sewage sludge and industrial organic wastes.

The smaller scale facilities treating locally produced waste could be sited on a wide range of sites, including farm and agricultural locations, providing that appropriate environmental measures are put in place to prevent nuisance. The larger, more industrial scale of operation would be more suited to areas allocated for employment/business industrial use, where the scale and massing of the associated digestion tanks could be co-located amongst similar sized buildings.

At either end of the scale, the anaerobic digestion process does not significantly reduce the volume of waste to be managed. It is necessary to incorporate sufficient storage within the layout of the plant to contain the digestate and liquor products prior to distribution, and minimise any nuisance that could arise due to their storage.

[2] When considering the use of the by-products of anaerobic digestion, it is important to recognise the restrictions placed upon the use of animal by products. The Animal By-Products Regulation (EC) 1774/2002 has been adopted and applies in the UK. This Regulation permits the use of compost or residues from composting or anaerobic digestion on non-pasture land, but the waste must be Category 3 waste (ie material fit for human consumption) and it must have been reduced to a size of 12 mm and treated at 70°C for at least an hour. However, this Regulation appears contrary to the Animal By-Products (Amendment) (England) Order 2001. See the Policy Context section in Part 1 of this guidance for further information.

Physical & Operational Characteristics [Small scale plant – throughput circa 5,000 tpa[3]]	
Expected lifetime of facility:	25 years
Operational hours:	24 hour process, wash deliveries, 20 days per month, typically 0700–1700 weekdays
Waste Tonnage treated:	417 tonnes per month
Typical site area:	0.15 ha.
Building footprint:	30 m × 15 m, plus 4 circular tanks of 6–10 m diameter. No stack.
Building height:	7 m, maximum tanks height 10 m.
Vehicle movements:	Maximum of 4 waste collection vehicles or equivalent per day
Employment:	Site Manager, plus 2 other workers.
Waste storage:	In smaller facilities, segregated waste may be tipped directly into a sealed conditioning tank. There is no storage of untreated waste outside the building.

Physical & Operational Characteristics [Centralised plant – throughput circa 40,000 tpa[4]]	
Expected lifetime of facility:	25 years
Operational hours:	20 days per month, typically 0830 h–1730 h weekdays and 0800 h–1300 h on Saturdays
Waste Tonnage treated:	3,333 tonnes per month
Typical site area:	0.6 ha
Building footprint:	40 m × 25 m, plus 2 circular tanks of 15 m diameter. No stack
Building height:	7 m, tanks 6 m
Vehicle movements:	Approximately 20 waste collection vehicles or equivalent per day. One JCB used to move waste around on site
Employment:	Site Manager and foreman, plus 3 other workers
Waste storage:	In smaller facilities, segregated waste may be tipped directly into a sealed conditioning tank. Otherwise unsorted waste, segregated waste and residual waste may be stored in open bunkers, possibly outside

[3] Data supplied by Greenfinch Ltd
[4] North West Regional Technical Advisory Body, Waste Management Technical Report, July 2001

The matrix (right) has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible** without full mitigation or where management practices fail.

[Courtesy of Greenfinch Ltd]

Model of 2,500 tpa Anaerobic digestion plant for food waste

General siting criteria

Existing land use: Small scale anaerobic digestion plants can blend in with sub-urban and rural development due primarily to their low profile structures and their similarity to other rural developments (e.g. farms). Such facilities would not normally be compatible with a hi-tech business park environment or an urban setting. Centralised enclosed facilities would be more suited to areas allocated for business use and traditional commercial/industrial urban areas, and are compatible with the more intensive Class B1/B2 activities under the Use Classes Order. Existing waste sites should also be considered for both types of anaerobic digestion facility.

Proximity to sensitive receptors: Where possible, facilities should be located at least 250 metres from sensitive properties.

Transport infrastructure: Requires good access from primary road network and access roads which are free from restrictions for HGVs.

Scoping Matrix: Anaerobic digestion

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Development Activity						
	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, Traffic and Access	■	■	●	▲	●	■	■
Air Emissions /(including Dust) *	■	●	▲	▲	●	■	■
Odours	●	▲	▲	▲	●	■	●
Vermin and Birds	●	●	●	●	●	▲	●
Noise / Vibration	■	▲	▲	▲	●	▲	■
Litter	●	●	●	●	●	▲	●
Water Resources	■	●	▲	▲	●	■	▲
Land Stability	▲	●	●	●	●	●	▲
Visual Intrusion **	▲	▲	■	●	▲	●	▲
Nature and Archaeological Conservation	■	●	●	●	●	■	▲
Historic (Built) Environment	▲	▲	●	●	●	▲	▲
Potential Land Use Conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 40,000 tonnes per annum

Waste stream: biodegradable organic waste

***Very little data on air emissions from the anaerobic digestion process is available.**

****A centralised Anaerobic Digestion plant is assumed, serving a radius of around 10km. On-farm schemes may lead to less visual intrusion.**

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

Key Issues

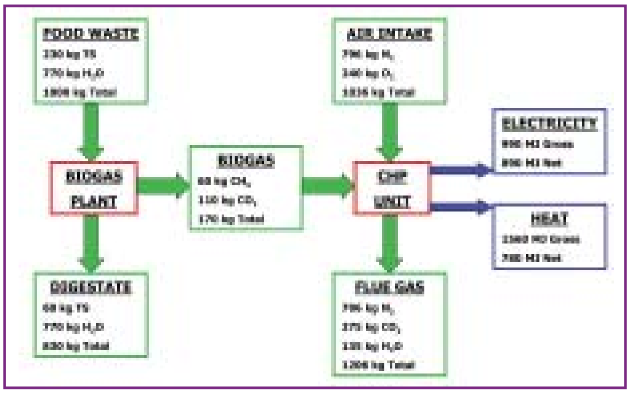
Traffic, Transport and Access

A small scale plant is unlikely to have a significant effect on local traffic flows compared with farm activities in village locations. However, centralised anaerobic digestion facilities would generate significant levels of HGV movements like any other centralised facility. The type and volume of vehicle movements will be determined by the throughput of the plant, and the nature and source of the waste. Traffic generated may include enclosed farm tankers, waste collection vehicles and bulk haulage vehicles.

Restrictions may be placed on deliveries to centralised anaerobic digestion facilities, including the storage of feedstock on farms rather than at the centralised facility. There may also be a requirement for open-topped vehicles to be sheeted, amongst other restrictions common to most waste transport.

Air Emissions

Published data on air emissions from anaerobic digestion facilities are extremely limited, and the derivation of emission estimates that has been achieved is based upon a single study. From that data, the preliminary conclusion is that the emissions from anaerobic digestion are low compared with those for other waste disposal options[5]. As the anaerobic digestion process itself is enclosed, emissions to air should be well controlled. However, as biogas is under positive pressure in the tank, some fugitive emissions may arise.



[Courtesy of Greenfinch Ltd]

Anaerobic Digestion mass and energy balance, including flue gas composition from a process digesting only food waste

There is also the potential for bioaerosols to be released from the anaerobic digestion process, mainly from feedstock reception and the eventual aeration of the digestate.

Dust/Odour

One of the main perceived planning issues associated with anaerobic digestion has been the potential for generation of odour. Odours from any mixed waste or putrescible waste facility have the potential to represent a nuisance issue, particularly when waste is allowed to decompose in uncontrolled anaerobic conditions, due to poor storage for example. However, as the anaerobic digestion process is largely enclosed and controlled, the potential for odour is greatly reduced.

Dust can sometimes be generated when waste is loaded and unloaded, and when waste is transported onto manoeuvring areas on vehicle wheels.

[5] Comparison of Emissions from Waste Management Options, Research Undertaken for the National Society for Clean Air and Environmental Protection, June 2002

Noise/Vibration

The noise and vibration associated with anaerobic digestion will be similar to that associated with other waste treatment plants. The process operations are not inherently noisy, although vehicle manoeuvring, loading and unloading, as well as engines and pumps, are potential sources of noise.

Noise is an issue that is controlled under the IPPC Regulation as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Water Resources

Waste water can be produced when the solid digestate is de-watered (depending upon the specific type of anaerobic digestion treatment). This can contain relatively high concentrations of metals, dissolved nitrogen and organic material, and may cause pollution if left untreated. This waste water may be disposed of to sewer and treated at a sewage works, but if the level of contaminants breaches the level imposed by the water companies, on-site treatment may be necessary.

Visual Intrusion

The visual impact of an anaerobic digestion facility will depend upon its scale. Small on-site plants are unlikely to cause significant intrusion, especially if new buildings are located in conjunction with existing agricultural or light industrial units.

Larger scale plants have the potential to create greater visual intrusion. The designs of centralised anaerobic digestion facilities differ, although generally an industrial type unit (the reception hall), a storage area allocated for the digestate product and a number of tanks are required. New lines or cables used to connect the facility to the National Grid for electricity transfer will also have an impact on visual amenity both on and off site.

The significance of any landscape and visual impact is dependent upon a number of site specific issues such as:

- Direct effects on landscape fabric i.e. greenfield vs. brownfield, removal of hedgerows, trees etc;
- Proximity of landscape designations;
- Site setting, for example the proximity of listed buildings and/or conservation areas;
- Proximity of sensitive viewpoints;
- Presence of existing large built structures;
- Existing landform and nature of existing landscape;
- Presence/absence of screening features (trees, hedges etc.).

Landscape and visual impacts are material planning considerations. A significant amount of public concern and anxiety can be generated by the proposed visual appearance of such facilities. Careful site selection and appropriate orientation of the building footprint together with appropriate screening measures can help to minimise any potential adverse impact. Consideration should also be given to the opportunity for site profiling and engineering to minimise the visual appearance of building. In some instance partial burial of certain elements of the plant may be possible.

Nature and Archaeological Conservation

As waste water may be produced that has high concentrations of metals, dissolved nitrogen and organic material, there is a potential for local ecosystems to be affected if a spill should occur. The larger the facility, the more waste water may be generated, and therefore the greater the potential for harm to the local ecosystem during an operational failure.

Potential Land Use Conflict

Under normal conditions, safeguards are in place to minimise conflict with neighbouring land uses. However, there is a generic risk of conflict due to operational failure, particularly with regards to odour for anaerobic digestion plants.

Need for EIA

Environmental Impact Assessment (EIA) is the process by which environmental information is collected, published and taken into account in reaching a decision on a relevant planning application. The main aim of EIA is to ensure that the authority giving the primary consent for a particular project makes its decision in the knowledge of any likely significant effects in the environment.

In the context of waste proposals it falls to the waste planning authority to consider whether a proposed development will require an EIA. Anaerobic digestion facilities fall under Schedule Two of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulation 1999, within the category ‘installations for the disposal of waste’. This category is explained within DETR Circular 02/99 by means of the following text:

The likelihood of significant effects will generally depend upon the scale of the development and the nature of the potential impact in terms of discharges, emissions or odour. For installations (including landfill sites) for the deposit, recovery and/or disposal of household, industrial and/or commercial wastes (as defined by the Controlled Waste Regulation 1992) EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of these wastes, sites seeking only to accept inert wastes (demolition rubble etc.) or Civic Amenity sites, are unlikely to require EIA.

Following this guidance, small, on-farm anaerobic digestion plants are unlikely to require an environmental impact assessment, whereas an EIA is likely to be necessary for larger centralised sites with greater potential for environmental impacts.

Content of Planning Application

Within the planning application for an anaerobic digestion facility, applicants should provide sufficient information to enable the waste planning authority to determine the nature of the processing operations. Applicants should also include the measures that will be used to minimise potential nuisance issues, particularly those associated with odour and noise. It would be appropriate for applicants to enter into a dialogue with the Environment Agency and the waste planning authority at an early stage to determine what level of information is appropriate for planning and what process specific details may be reserved for waste licensing or PPC.

It is assumed that planning applications will be accompanied by information including drawings consistent with those provided for other waste management operations.

The content of the planning application with regard to the assessment of environmental issues will largely be guided by the scope of the EIA (where an EIA is required). Certain additional information should also be provided over and above what is generally required under the EIA Regulation. This relates in particular to aspects such as:

- Planning policy context;
- Need; and
- BPEO.

Such information can either be provided within a separate document or combined as part of the Environmental Statement (where an EIA is required). It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and where appropriate with reference to the local Waste Strategy and Waste Local Plan, or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1 of this publication.

Mitigation

The key planning considerations where mitigation measures may be required will be related to the key environmental issues assessed through an environmental impact assessment. Typically these relate to the main emissions from the facility and the physical appearance of the buildings.

The table below identifies the key planning considerations associated with anaerobic digestion facilities and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	The impact of waste deliveries to centralised anaerobic digestion facilities may be minimised by ensuring that delivery vehicles are routed away from inappropriate roads and sensitive areas such as schools, and scheduled to avoid rush hour traffic flows. Careful location of the digestion facility and the storage tanks can minimise distances travelled between the production of the feedstock, the storage tanks and the digester.	Alternative methods of waste transport, such as rail and the potential for pumping slurry directly to the facility, could be investigated to reduce the reliance on road based transport.
Air Emissions	The health and safety measures for handling feedstocks from farms include the use of known and reliable sources of feedstock, analysis of feedstock and careful quality control, monitoring and screening for disease in the animals creating the feedstock, and personal hygiene. To avoid pathogen transfer, controls should be put in place to ensure that a centralised anaerobic digestion plant could be isolated, that vehicle wheels can be washed, the wash water disposed of in a suitable way, and that liquid and fibre leaving the site are carefully contained.	Use of biofilter systems could be considered.

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Dust and Odours	Appropriate siting of the facility along with effective site and plant management can minimise odour impacts. Efficient management will ensure minimal outdoor storage of feedstock, and negative ventilation systems fitted with biofilters will control and contain odours within buildings. Vehicle wheel washing is likely to be necessary at centralised facilities, to minimise dust levels and reduce the potential for cross contamination.	Use of deodorisers and sprays can be considered under certain circumstances although such measures can have impacts of their own.
Noise	Sensitive design of the main buildings and tanks, along with noise reduction features on specific plant components should ensure that noise levels are kept to reasonable levels. Appropriate design of the site including the use of acoustic enclosures and physical barriers, as well as the location of operations that will give rise to noise as far away as practically possible from sensitive receptors, is recommended.	Additional noise reduction options might include noise attenuation features within the roof and the walls of the building to reduce break out of noise. If noise from vehicles is likely to be an issue, for example due to reversing horns, the operator can be required to fit smart systems which reduce the potential for nuisance.
Water Resources	The Environment Agency require that all tanks and digesters are surrounded by containment bunding of either concrete or clay[6].	N/A
Visual Intrusion	Visual intrusion can be minimised by: • Co-locating the facility next to existing buildings of a similar scale; • Bunding, planting around the site and partial burial of the digester, storage or reception tanks; • Dividing the plant up – for example the digester could be located separately from the digester, although the logistics and transport implications of this would need to be taken into account; • Laying electricity connections underground or careful route selection of overhead lines.	N/A

[6] Anaerobic Digestion of Farm and Food Processing Residues, Good Practice Guidelines

Case Examples

Greenfinch Demonstration Project, Tenbury Wells, Worcestershire

Recycling source separated kitchen waste at an anaerobic digestion plant.

[Courtesy of Greenfinch Ltd]

Demonstration Plant

Greenfinch Ltd are a small company specialising in biogas technology. Funded by a grant from the Department of Trade and Industry, Greenfinch undertook a research project to design, build, operate and monitor a plant to recycle kitchen waste from 1,200 households, running from June 1998 to June 2000.

In order to deliver the target of 5 tonnes of kitchen waste per week, it was anticipated that 1,670 households would need to participate in the 'opt-in' scheme, and of 5,500 households invited, 1,500 subscribed to the project. Householders were supplied with white plastic bags and a 15 litre bucket and encouraged to fill them with organic kitchen waste, including fruit and vegetable peelings, uncooked food scraps, cooked food waste and used tea bags. The bags were then collected from the kerbside on the same day as the usual waste collection.

Greenfinch designed the plant to a high standard in order to imitate a full-scale commercial project. The plant included waste reception and mechanical conditioning, pasteurisation, anaerobic digestion, biogas storage, biogas boiler, fibre separation, and liquid digestate storage. The operational management consisted of a project manager, plant operator, research scientist and labour for waste unloading.

It was observed that householders segregated their waste diligently, and an average of 1,100 households took part actively and regularly. Those householders found their residual waste easier to handle, and were disappointed when the trial ended. The anaerobic digestion plant performed as anticipated, with a gas yield of 140 m^3 per week, for an average organic collection of 4.5 tonnes per week. A full scale plant of this type, using current technology, was estimated to need a minimum catchment of 10,000 households, or 2,200 tonnes per annum, and have a land take of approximately 1/10th of a hectare – which is relatively small compared to some facilities on continental Europe. It was assessed that the process can be profitable at a fee of £50–60 per tonne of kitchen waste brought to the plant, covering plant construction, operating costs and disposal of by-products.

Key Planning Features

Location:	Burford House, Tenbury Wells, Worcestershire
Setting:	Set behind a garden centre in a rural location, 10 m from a watercourse
Waste Types:	Source separated kitchen waste
Waste:	315 tonnes in 18 months (Trial scale plant)
Energy Generation:	Biogas yield of 140 m^3 per tonne, converted to heat
Design Features:	The components of the plant that stood individually in this trial could easily be housed within a low rise building in a full scale plant.

Proposed AD Plant, Wanlip, Leicestershire

Incorporating the anaerobic digestion of organic waste at the Wanlip Composting Facility.


[Courtesy of Biffa Waste Services]

Wanlip AD plant under construction, September 2003

Biffa Waste Services have been chosen to manage Leicester's waste for the next 25 years, and are currently progressing plans to develop a waste reception/recycling facility and separate composting centre, costing around £30 million, supported by the Government's Private Finance Initiative.

Their proposals for managing the waste of England's tenth largest city include: a weekly wheeled bin collection; a weekly collection of glass, plastics and paper; a new reception and recycling centre, where steel and aluminium will be extracted from waste; a purpose built anaerobic digester for composting the city's organic waste; and the use of landfill sites for the residual waste that cannot be recycled. With the combination of kerbside collection, composting and recycling the city council aim to recycle 40% of the city's waste by 2005.

As an integral part of these proposals, Biffa aims to develop a fully enclosed composting facility at Severn Trent's Wanlip Sewage Treatment Works, which will compost the fine organic material produced at the recycling centre. Water from the sewage works will be added to these organic residues to form a watery sludge – from which any small pieces of glass, grit and metal will be removed and recycled. This sludge will then be pumped into tall sealed tanks, where harmful bacteria will be killed by heating the sludge to above 57°C for 5 hours. Air is blown in to ensure mixing.

This mixture will then be pumped into five large sealed cylindrical tanks, where it will be mixed and heated to a temperature of 35°C for 19 days, in anaerobic conditions. Methane will be produced from this anaerobic digestion, which will be collected and used to generate electricity for supply to the National Grid.

Finally, the treated sludge will be dewatered in a special press, and the water returned to the sewage works. The remaining sludge, a damp, dark brown peat like material, will be matured at Wanlip for two weeks. Biffa intend to market this compost product for agricultural use by Severn Trent Water Ltd, alongside their recycled sewage sludge.

Key Planning Features

Location:	Wanlip Sewage Works, Leicester
Setting:	Urban
Waste Types:	Organic household waste
Waste Volume:	The organic waste fraction from 117,000 homes
Energy Generation:	Approximately 1.5 megawatts of electricity
Tanks Footprint:	Approximately 0.5 ha
Design Features:	• All waste handling to be carried out in an enclosed building, with in-built air filters to control odour and dust. • Integration with an existing sewage treatment complex. • Low traffic levels, of approximately 8 loads per day, to be confined to the main road network.

Future Issues

Anaerobic digestion is identified in Waste Strategy 2000 as a new and emerging energy recovery technology that is being encouraged in preference to the more traditional options for diverting waste away from landfill by 2020. The Strategy highlights the possibility of using anaerobic digestion to treat municipal solid waste, but it notes reservations about the cost and the high degree of segregation needed to produce a marketable digestate.

For anaerobic digestion to become a major part of the waste management system in the UK, it is necessary for it to demonstrate the value of its solid and liquid residues to agriculture and the environment – without this benefit the logic for the development of anaerobic digestion over other techniques is reduced. Further reduction in the costs of plant construction and operation will reduce economic barriers, as will the expansion of biogas into higher value markets of vehicle fuel, making methane production more attractive.

Further Reading

- Biological Techniques in Solid Waste Management and Land Remediation. The Chartered Institution of Wastes Management

- Biogas and More! Systems and Markets Overview of Anaerobic Digestion (July 2001) IEA Bioenergy

- Anaerobic Digestion Of Farm And Food Processing Residues, Good Practice Guidelines. Available on the British Biogen website, at http://www.britishbiogen.co.uk

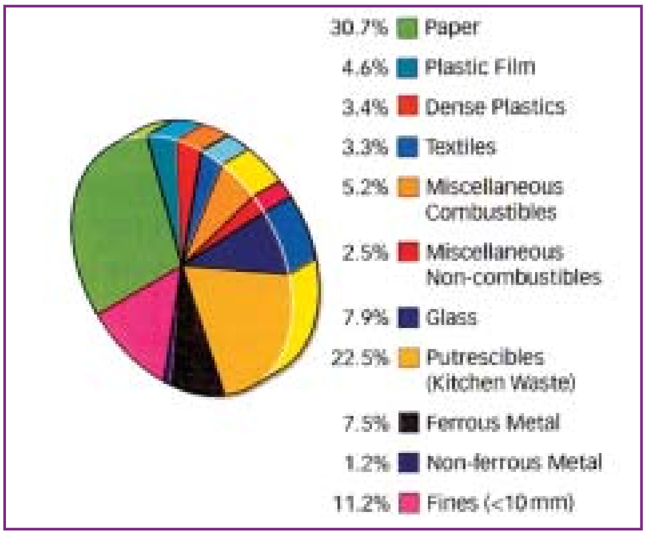
- http://www.edie.net

- Institute of Wastes Management Anaerobic Digestion Working Group (1998) Anaerobic Digestion, Institute of Wastes Management

3 Processing of recyclables

What is it?

Processing of recyclables will include all those operations that are designed to accept source separated recyclate for processing and bulking up prior to transport to downstream specialist re-processors. The recyclate is likely to originate from kerbside collection of materials that have been separated by individual householders and businesses, and also material from centralised recycling facilities (bottle banks, CA sites etc).



Typical components of household waste

A significant proportion of household waste is made up from materials that can be recycled as shown in the diagram opposite and the table overleaf

There have been various trials and research programmes that have sought to determine the best practicable recycling rates that can be achieved. It is now commonly accepted that using multiple bin systems, encouraging householders to undertake their own separation of recyclables, is the best way of achieving the highest levels of recycling. All local authorities have been set targets for recycling and composting as part of the ‘best value’ initiative which seeks to measure the performance and quality of local services. The table opposite illustrates the composition of household waste, and the table below the proportion in % terms of the materials present that can be recycled according to Waste Strategy 2000 and the more recent Strategy Unit work.

A distinction has been made in this document between facilities designed to take mixed un-sorted household wastes (see Profile No. 4) and facilities designed to process dry, separated recyclables. As part of the transition away from a landfill dominated industry there will be a need for more of both and also hybrid facilities which combine mixed waste processing with the processing of recyclables. In planning terms, the main reason for making this distinction relates to the nature of the wastes, the planning issues involved and also the types of process that can be used – mixed waste operations can involve biological as well as mechanical sorting processes. Due to the biodegradable nature of the waste stream, mixed waste operations have the potential for wider amenity impacts than may be the case for the processing of dry recyclables.

A facility which is designed to process source separated/co-mingled dry recyclables is sometimes referred to as a ‘clean MRF’ (as distinct from a ‘dirty MRF’, which handles co-mingled wastes including putrescible materials). Mechanical processing typically starts with a

Material	Waste Strategy 2000 %	% Recyclable	Strategy Unit %	% Recyclable
Paper/card	32	21	19	12
Putrescible	21	19	42	38
Textiles	2	2	3	3
Fines	7	0	3	0
Misc. combust	8	0	8	0
Misc. non-conb	2	0	4	0
Metals	8	8	7	7
Glass	9	8	7	6
Plastics	11	4	7	2
TOTAL	100%	61%	100%	68%

bag splitter to remove the recyclables from the collection bags. Materials can then be sorted by a combination of techniques which typically include:

- Hand picking
- Mechanical sorting/screening/ sieving
- Magnetic separation
- Light and density separators
- Air separators for paper

[Courtesy of Cleanaway Ltd]

Rainham MRF at night

There is no such thing as a standard recyclables processing facility. The nature of the processes and scale of operations will depend on various issues, including the nature of the waste strategy for the area, local contractual issues, the nature of the feedstock resulting from upstream management operations and market requirement, including quality specifications.

The operations are generally housed in large warehouse type buildings, usually constructed with a standard steel frame and profiled steel cladding. The table below illustrates the types of equipment that might be associated with both large and small scale operations.

A common feature of many recently developed centralised facilities is the exclusion of glass recycling. The reason for this is quality control – removing glass from the system prevents contamination and helps to simplify the mechanical separation processes adopted to achieve the best quality product for onward sales to specialist re-processors.

As a result glass from source separation is bulked up and either exported or sent direct to specialist glass processing operations in the UK.

Typical range of processing equipment		
Steps	Equipment for Large Facilities	Equipment for Small Facilities
Unload/transfer vehicles	• bunkers/bags • Bob CAT loader • front end loader • ramps • conveyors • weigh scale • concrete tipping floor • bag splitter	• roll-out containers • weigh scales • bunkers • trolley/wheeled container • roll-off containers • ramps • tipping floor • pallet jack
Sorting	• sort equipment (mechanical) • air classifier • conveyors • mechanical sorting table • air knife • infra red or x-ray plastics sorter • magnetic separators • manual sorting platforms • trommels • ECS (Eddy Current Separators) • screens	• Bob CAT loader • blowers • grade separation • conveyors
Compaction	• baler • compactor • flattener or roll packer • shredders • granulator	• flattener • small baler • front end load
Storage	• bunkers/bays (covered) • building • containers • trailers • cages	• roll-off containers • bunkers/bays (open/covered)
Loading for Shipment	• forklift • front end loader • walking floor trailer • conveyor • Bob CAT loaders • blower	• Bob CAT loader • blowers • grade separation • forklift with self-tipping hoppers
Shipment to Market	• roll-off containers • trailers • weigh scale • barge • rail	• containers • skips

Siting and Scale

Like many waste facilities siting of recyclables processing facilities is not straight forward. Although many nuisance issues associated with putrescible wastes are minimal, operations will increase local traffic and may have other amenity impacts such as noise and litter. Processing operations can take place in a range of buildings and at different locations depending on local circumstances and process configuration. The volume of wastes requiring processing and the type of process will influence the size of site/building required.

Waste collection systems involving the use of split body waste collection vehicles that collect residual wastes and recyclables in a single vehicle are becoming more common. In such circumstances, the optimum location to minimise transport miles is likely to be co-location at a residual waste processing operation or at a landfill. Sites need to be suitable for use by large numbers of HGVs. Consideration should be given to the potential for co-location with rail or barge transfer operations. Consideration should be given to the location of material re-processors and local markets in order to minimise transport distances.

Developments of this nature will generally be considered as potentially 'bad neighbour' activities due to the mixed nature of the waste and the potential for nuisance effects. Juxtaposition of sites close to residential development should therefore be avoided. Some operations which involve mechanical processing and external loading and unloading of material may be inherently noisy, which will also affect the choice of site.

Physical & Operational Characteristics [50,000 tonnes per year facility]

Expected lifetime of facility:	20 years (or linked to contract period)
Operational Hours:	10 hours a day, 6 days a week Generally 07:30–17:30 weekdays 07:30–13:00 Saturdays
Waste Tonnage treated:	Various – average approximately 50,000 tonnes per year
Typical site area:	1–2 ha
Building footprint:	70 m × 40 m
Building height:	12 m
Vehicle movements:	20–30 waste collection vehicles or similar per day in. 10–20 bulk transport vehicles per day out.
Employment:	If no hand-picking less than 10 operatives; if hand picking potentially 50 or more operatives on shift rotation
Waste storage:	Some storage of unsorted waste likely in open bunkers or skips. Covered storage preferred, to limit generation of leachate. Open storage of sorted waste may be restricted due to product quality control concerns.

The matrix below has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Scoping Matrix: Processing of recyclables

■ Level 1 issues
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues from PPG10, Annex A	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakage etc)	Demolition
Transport, traffic, access	■	■	■	●	▲	▲	■
Air Emissions (including dust)	■	▲	■	▲	●	▲	■
Odours	●	●	▲	▲	●	■	●
Vermin and birds	●	●	●	●	●	■	●
Noise/Vibration	■	■	■	▲	▲	▲	■
Litter	●	▲	■	▲	■	■	●
Water resources	■	●	▲	▲	●	■	▲
Land stability	▲	●	●	●	●	●	▲
Visual intrusion	▲	●	■	●	▲	●	▲
Nature and archaeological conservation	■	●	●	●	●	■	▲
Historic (built) environment	▲	▲	●	●	●	▲	▲
Potential land use conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 50,000 tonnes per annum

Waste stream: dry household recyclables, e.g. paper, glass, plastics etc.

Assumes an industrial/ urban fringe location

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

General Siting Criteria

Existing Landuse: Preference should be given to industrial or degraded sites or sites on or close to existing waste management facilities. B1/B2 and B8 use class designations may potentially be acceptable.

Proximity to Sensitive Receptors: If amenity issues such as noise and litter can be minimised operations could be located within 100 metres of sensitive receptors.

Access: Access considerations will be directly related to the volume of waste. If part of a centralised facility, which includes other process operations, sites should normally be located close to the primary road network without constraints on large number of HGVs and waste collection vehicles.

Key Issues

Traffic

Like any waste facility, most recyclables processing operations will be served by significant numbers of HGVs, potentially causing an impact on roads close by and the amenity of local residents. Like transfer stations and mixed waste processing facilities, recyclables processing may actually increase the net vehicle movements in the locality compared with direct transport to incineration or landfill. Co-location of this type of activity with other waste management practices would therefore be advantageous.

Air Emissions

Atmospheric emissions in relation to mixed waste facilities are primarily associated with emissions from vehicles, and limited issues associated with dust and fugitive emissions. Due to the typical absence of bio-degradable wastes, air quality will not be a significant issue.

Dust/Odour

Some odour may be generated as a result of small quantities of liquids retained in bottles and contamination of materials with residual biodegradable matter. De-odourisers and proprietary ventilation and air filtration systems should be sufficient to minimise odour to acceptable levels. The handling of waste and the movement of vehicles may also give rise to dust.

Flies, Vermin and Birds

Recyclables processing operations will not normally experience problems associated with rodents or birds, given that operations tend to take place within a building and waste materials are only present for short periods. In hot summer weather however, flies may become a problem, particularly if they are being brought in with the incoming waste.

Noise

The main problems associated with noise at recyclables facilities have been attributed to the following activities:

- Vehicle manoeuvring onsite, along with loading and unloading operations (particularly in relation to reversing alarms).
  NB. Such operations can be especially noisy in comparison to other waste management and light industrial activities;

- Traffic noise on the local road network associated with HGV movements and/or train noise;

- Mechanical processes such as shredders, screens, conveyors, trommels, baling and crushing operations; and

- Air extraction fans and ventilation systems.

Noise is an issue that is controlled under the PPC Regulations as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Litter

The presence of separated household waste including paper and plastics may potentially result in the release of litter. Carrying out operations within a building should prevent any significant impacts. Any external storage or sorting of materials, such as recycled paper products may exacerbate litter problems and should be adequately screened. Litter may also be spread from waste vehicles. Litter issues are controlled in a similar way to dust and odours.

Water Resources

Some residual liquids in bottles and cans can potentially pose a risk to water resources. However, as most facilities are under cover and on concrete hard standing with separate foul water drainage, rainfall is unlikely to come into contact with the waste materials and, as such, water pollution is unlikely. Nevertheless, wash-down waters and any liquid within the waste needs to be managed appropriately.

Visual Intrusion

The development of any new building may lead to impacts on landscape character and visual amenity. If sited in an industrial setting remote from residential areas impacts are likely to be minimal. Traffic movements may also result in a visual impact. The significance of any such impact is dependant on a number of site specific issues as follows:

- Direct effects on landscape fabric i.e. removal of landscape features such as trees and hedges;
- Proximity of landscape designations;
- Site setting, i.e. the proximity of listed buildings and/or conservation areas;
- Proximity of sensitive viewpoints;

- Presence of existing large built structures;
- Existing landform and the nature of the existing landscape setting;
- Presence/absence of screening features(trees, hedges, banks etc.); and
- The number of vehicles/trains/barges accessing and exiting the site.

Landscape and visual impacts are material planning considerations and a significant amount of public concern can be generated by the visual appearance of a facility.

Need for EIA

Whether any development requires a statutory Environmental Impact Assessment (EIA) is defined under the terms of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999. Within these regulations there are two categories of development: those which require mandatory EIA (set out in Schedule 1 of the regulations) and those types of projects where EIA is not mandatory, but where the development may result in significant environmental effects due to its nature, size or location, and EIA may be considered necessary (Schedule 2).

Many small scale recycling activities are unlikely to require EIA. Other centralised processes in large buildings receiving approximately 50,000 tonnes of waste per year are likely to require EIA under Schedule 2 – Part 11 'Other Projects' (b) Installations for the disposal of waste. The applicable thresholds for consideration of whether an EIA may be required under the regulations for waste developments are:

(ii) 'the area of the development exceeds 0.5 hectare; or

(iii) the installation is to be sited within 100m of any controlled waters.'

Further guidance is also available in Annex A of the DETR Circular 02/99 on Environmental Impact Assessment. Paragraph A36 gives indicative EIA thresholds for a range of waste development types, this is likely to include processing of recyclables, as follows:

A36. '.....EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of these wastes (.......) are unlikely to require EIA.

Given the above, the decision regarding whether operations require EIA will depend primarily on size and throughput. Other general issues to consider regarding the need for EIA are discussed in Part 1 of this publication.

Good practice dictates that EIAs should be properly scoped from the outset. The 1999 EIA Regulations introduced new provisions for screening and scoping which enables the applicant to obtain a scoping opinion from the Waste Planning Authority. It is advisable for the applicant to also undertake a separate scoping exercise to ensure that the appropriate level of engagement with relevant stakeholders is achieved at the outset of the EIA process.

[Courtesy of Cleanaway Ltd]

Paper picking

It is particularly important that statutory consultees, such as the Environment Agency and English Nature, have the opportunity to comment on the scope and content of specific technical assessments that may be required.

If the processing facility is too small to require EIA it may, nevertheless, be appropriate to provide a more limited appraisal of the potential environmental effects.

Content of Planning Application

The content of the planning application will focus primarily on the following:

- Planning policy context;
- Need;
- BPEO; and
- Principal environmental effects as set out in a supporting statement or 'Environmental Statement'.

Such information can either be provided as separate documents or combined within the EIA.

It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and, where appropriate, with reference to the local Waste Strategy and Waste Local Plan or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1 of this document.

A common failing of applications is a failure to adequately address environmental effects of site design and operational aspects. For example, information on plant specifications, traffic volumes and routes, housekeeping, mitigation schemes (such as landscaping), site design and layout should normally be included. Some of this information may be difficult for applicants to procure if the development contract process has not advanced to a stage where detailed specifications are available or if the specific process arrangements are not finalised.

Where possible the PPC permit/waste management licence application should be submitted in parallel with the planning application. This should assist the Environment Agency in providing representations to the Waste Planning Authority on the environmental impacts of the proposal. There will always be a degree of overlap between information provided in the planning application and that contained in the licence permit application. This will relate to issues such as noise, general housekeeping and amenity effects. Where applications are not submitted in parallel it is likely that applicants will need to include additional information on site design aspects within the planning application.


[Courtesy of Hampshire Waste Services]

MRF conveyor

Mitigation

The key planning considerations where mitigation measures may be required will be related to the key environmental issues assessed through the Environmental Impact Assessment. Typically these relate to traffic, nuisance issues and the physical appearance of the site. The table below identifies the key planning considerations associated with recyclate processing and the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	Mitigation measures may include routing of vehicles away from sensitive areas and limitation of operating hours.	Use of S.106 agreements to impose special restrictions on vehicle movement or for local planning gain.
Air Emissions	Limitation of journey distances and sensitive routing/siting may help reduce traffic related air quality effects.	N/A
Dust/Odour	Enclosure of operations within a building is the primary means of preventing odour and dust impacts.	Water and perfume sprays may be used along with road sweeping for dust.
Flies, Vermin and Birds	Rodent and fly control may be assisted by rapid turnaround of waste materials and good housekeeping practice. Birds are discouraged by containing operations within a building.	Rodenticides and insecticides may be used. Drainage systems may be fitted with grates etc. to prevent rodents entering the building via drains/sewers.
Noise	Noise mitigation may include sensitive siting and regular maintenance of equipment.	Noise fencing and bunds along with sound insulation within the building may be used. On-site vehicles may be fitted with 'smart' reversing alarms. (NB. It is not possible to fit all incoming vehicles with such alarms as many will belong to companies not associated with the facility operator).

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Litter	Enclosure of operations within a building, regular road sweeping, litter picking and ensuring that all waste vehicles are adequately sheeted/contained helps prevent litter.	Perimeter fencing/landscaped areas may be used to trap litter before it leaves the site.
Water resources	Avoidance of areas close to sensitive water resources, provision of a drainage system separating dirty and clean waters and transferring dirty waters to sewer or other appropriate treatment will prevent any serious water pollution.	N/A
Visual Intrusion	Visual impacts may be reduced by appropriate siting, sensitive building design and appropriate use of cladding and colour treatments	Landscape planting may be utilised but may take years to mature. Fencing and earth bunds may also be employed

Case Examples

Material Recovery Facility, Portsmouth

This facility is currently the only MRF in Hampshire, recycling source-separated paper, cans and plastic bottles collected from the kerbside. The facility houses 24 conveyors and was the largest of its kind in the UK when first built.

[Courtesy of Hampshire Waste Services]

Material Recovery Facility, Portsmouth

The first stage of the process involves the hand sorting of the collected dry materials to remove any cardboard, plastic bags and other non-recyclable items. The recyclables then pass onto a system of rotating discs, to remove any items smaller than 50mm, before being split onto two inclined vibrating tables. These tables are surfaced with a Velcro-like fabric that automatically separates the paper from plastic bottles and cans by holding on to the paper. The paper is then screened and sorted into newspapers and other mixed paper. Steel cans are separated from the second recyclables stream, using a magnetic separator, and the plastics and remaining cans are hand sorted into PET, PVC, HDPE and aluminium.

As part of Hampshire's Project Integra strategy for dealing with household waste, planning permission has recently been granted for a second, multi-million pound MRF on the A31 near Alton. This facility will be the most advanced in Europe, using the most modern and up-to-date technology. Hampshire currently recycles around 25% of its waste, but has a target to recycle 40%, so the second facility will be essential to sort and 'bulk-up' the increasing amounts of recyclable materials collected.

Key Planning Features

Location:	Portsmouth, Hampshire
Setting:	Industrial
Waste Types:	Paper, cans and plastic bottles
Waste Volume:	42,000 tonnes per annum
Employment:	78 people employed on site
Site area:	1.54 ha
Building Footprint:	2,600 m^2
Design Features:	Architect designed plant, incorporating conference room, visitors viewing gallery, modern changing and dining facilities for staff.

Material Recovery Facility, Rainham, Essex

This facility is located close to the Rainham Landfill site and adjacent to Rainham Marshes on the Thames Estuary. The facility includes state of the art material separation techniques and has been used since it opened in 2000 as an exemplar facility that is likely to be replicated in a similar form elsewhere in the country. Some components of the facility have been previously used and trialed in Germany where experience has been drawn on by the plant operators Cleanaway.

[Courtesy of Cleanawy Ltd]

Material Recovery Facility, Rainham

The main process components are:

- Bag splitter
- Trommel screen
- Plastics autosort
- Eddy current separator
- Paper sorting cabin
- Baler
- Primary sorting cabin
- Air knife
- Overband magnet
- Container sorting cabin
- Conveyors
- Control cabin

The facility has three separate manual sorting cabins. These are used primarily for quality control – by taking out materials which have been missed by the mechanical sorting equipment. For example, cardboard and rogue pieces of plastic, containers and other materials are removed in the paper sorting cabin which can handle 150 tonnes per day of paper passing along two conveyors. Each cabin is separately heated and air conditioned to ensure that the pickers work in a safe and comfortable environment.

One of the special features of the facility is the plastic autosort. Infra red light radiation is used to separate HDPE plastics, typically used for milk containers, from PET plastics, commonly used in plastic drinks bottles. The different refractive properties of the two plastics are detected by the electronic equipment and air jets are used to push the plastics onto two separate conveyors.

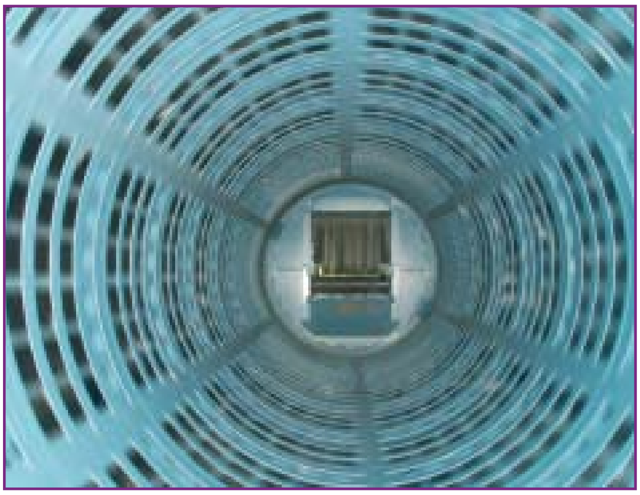
Key Planning Features

Location:	Rainham, Essex
Setting:	Adjacent to landfill on Thames Estuary
Waste Types:	Paper, cans and plastic bottles
Waste Volume:	50,000 tonnes per annum
Employment:	45 people employed on site
Site area:	less than 1 ha
Building Footprint:	97 m × 37 m (3,600 m^2)
Design Features:	Industrial style steel framed building with profiled steel cladding

Future Issues

The processing of recyclables is an immature market. Although there are a number of new centralised facilities and others currently proposed, the pattern of development has yet to become established. One area of future interest in development control terms is the potential proliferation of secondary materials re-processing operations.

The generic facility type described in this profile details the processing and sorting of recyclables into constituent parts, mainly card, plastics, paper, glass and metals which are then transported for further processing elsewhere. As the volume of secondary materials in circulation grows, so the markets for these materials are likely to change in response. This change is likely to result in the need for greater capacity at existing specialist re-processors and/or the need for brand new facilities.



[Courtesy of Cleanaway]

Spinning trommel

The total energy consumption and macro environmental impacts associated with certain recycling activities have yet to be fully researched. Although in general terms increasing levels of recycling are considered a good thing and are widely promoted through government guidance and legislation, in certain situations some types of recycling activities may not be the most sustainable option.

In simplistic terms re-use of waste material or reprocessing of material to offset the use of new raw materials is considered the most sustainable approach. However the whole life cycle of materials has to be considered in an holistic manner to ensure that in seeking to create benefit in one way we are not causing harm in another. Issues such as energy consumption and transport impacts are critical to this analysis. The benefits accrued from recycling/re-use may be off-set or even outweighed by the fuel used and emissions generated in getting there.

The planning system and planning professionals have an important role in ensuring that the correct choices are made to maximise the possible benefits to society. Optimisation of locations to minimise transport distances is essential. Waste Local Plans and waste local development documents should give careful consideration to up-stream and downstream transport of waste and existing material re-processing sites in defining preferred sites or areas for new recyclables processing operations. Planning applications should include appropriate information to demonstrate that the proposals represent the Best Practicable Environmental Option (BPEO), giving consideration to the site location and process issues, and the resulting energy balance of the given system.

Market forces should provide inherent checks and balances to ensure that the cost of the energy used in processing materials does not outweigh the value of the materials themselves. However, additional environmental checks will need to be regulated by the planning system and environmental bodies.

Further Reading

- Community Recycling Network (researched by Hogg, D., Mansell D. and Network Recycling Ltd) Maximising Recycling Rates: tackling residuals, Resource Publishing Ltd.

- Institute of Waste Management (2000) Materials Recovery Facilities, IWM Business Services Ltd.

4 Mixed waste processing

What is it?

The term mixed waste processing is a general term used to describe those operations, primarily of a mechanical and/or biological nature, which are designed to process the following waste streams:

- Unsorted ‘black bag’ wastes;
- Residual household waste following doorstep separation of recyclables/green waste;
- Residual waste following centralised separation of recyclables/organics.

In planning terms it is appropriate to differentiate those operations which are designed to process putrescible household wastes compared with activities associated with processing and handling of dry recyclables. Mixed household waste has the potential to cause additional nuisance from litter, odour and leachate. The planning and siting considerations will therefore be different to dry recyclables processing.

[Courtesy of Estech Europe]

Fuel pellets from autoclave process

The nature of mixed waste processing operations is dictated by the needs of down stream waste management practices. For example, in the case of a system which includes thermal treatment, refuse derived fuel (RDF) can be produced from mixed waste either as a loose flock or in pelletised form. Alternatively organic fractions can be separated for biological treatment.

Various physical separation and waste reduction techniques can be used either as stand alone operations or in combination. Such processes include:

- Trommel screen (available in various forms typically a tilting/rotating drum used to screen waste according to size and density);
- Shredders;
- RDF plant and pelletisers;
- Hand picking stations;
- Biological stabilisation;
- Ball mills;
- Other mechanical reduction techniques (crushing, pulverising etc).

The term 'mechanical and biological treatment' (MBT) is commonly used to describe a hybrid process which combines mechanical and biological techniques used to sort and separate mixed household waste. This term is often applied to specific patented processes which are available on the market as stand alone facilities (see case examples). Mixed waste processing can also be undertaken within an integrated facility which may also include composting and thermal treatment.


[Courtesy of Herhoff]
Asslar MBT facility, Germany

The term 'Dirty Materials Recovery Facility' (MRF) has also been used to describe processing of mixed household waste. This contrasts with a 'Clean MRF' which is associated with processing of dry recyclables.

There are a number of bespoke MBT processes which are currently being promoted by waste management companies often as part of integrated waste management proposals. The key benefits of such systems relate to change in handling characteristics of the waste material. Through biological treatment a dry, odourless product is created making the waste more manageable. This product can then be further processed either as a fuel or for further recovery. The partially stabilised waste residue however is still currently classified as being biodegradable for the purposes of the Landfill Directive diversion targets.

The following systems are of particular interest[1]:

Bio-drying process (Sistema Ecodeco®) – This process is currently being promoted in the UK under licence by Shanks Waste Solutions. There are proposals to develop this as part of an integrated system in Milton Keynes and in East London. There are currently no operating facilitates in the UK. The process was developed in Italy and there is an operational plant near Milan (see case example).

The bio drying process called a Biocubi® and is designed to treat mixed municipal waste following source separation of recyclables. The process involves partial biodegradation of the waste using natural biological processes. Within a large single hall, waste is shredded and then deposited in a stabilisation area where air is drawn down through the waste to maintain high oxygen levels and maximise the efficiency of the process. Air emissions are cleaned through a roof mounted bio-filtration system.

The waste is fully processed after a period of 12–15 days. The residue is in a dry friable state and weighs 25% less than the raw waste. At this point further recyclables recovery

[1] These references to commercial technology providers are only intended as examples and in no way reflect the market status or competency, reliability etc. of the quoted organisations. At present this is a developing field with few operational examples receiving mixed municipal wastes in the UK

can take place and the residual component used as fuel in a separate power plant. The appearance of the building is similar to a large agricultural building. The size will vary according to through-put and site specific configurations; for a 60,000 tonnes per annum plant the main process building is approximately 100 m × 20 m.

Dry stabilate system (Herhof) – The Herhof process adopts a similar biodegradation approach to Ecodeco. Residual waste is dried and biologically stabilised by forced air being passed through the waste mass. Unlike the Ecodeco system the Herhof process is modular and uses boxes to regulate the process. There are no operational facilities in the UK although there are proposals in Ireland. Currently there are operational facilities in Germany at Asslar (see photo earlier), Dresden and Rennerod and one in Venice.

The size of these facilities ranges from 85,000 tonnes per annum to 150,000 tonnes per annum. Municipal waste is pre-sorted on-site with any bulky goods removed. Primary shredders are used to reduce the average size of the waste to 150 mm. The shredded waste is then passed into the Herhof boxes which are made of reinforced concrete and are 30 m long and 4–5 m wide each box contains approximately 280 tonnes of waste. The boxes are sealed and air is forced through the base of boxes.

Waste remains within the boxes for 7 days. Waste air from the boxes is treated by a patented thermal combustion process known as LARA. The resulting residue described as Stabilat® can then be subjected to further mechanical separation with final residues being used as a refuse derived fuel (RDF) or landfilled.


[Courtesy of Biffa Waste Services]

Artist's impression of proposed recycling centre, Leicester

Ball Mill Process (Biffa Waste Services) – This process involves mechanical reduction of residual waste following source separation. There are no operational plants in the UK although one has recently received planning permission at Leicester by Biffa as part of the Leicester integrated waste contract. (see case example). Waste is fed into a large rotating drum containing a large number of steel balls. As the drum rotates it breaks down the waste into small pieces. The process assists with separation of waste into constituent parts (paper/plastics/glass/metals/ biodegradable materials) for further processing/disposal down stream.

FIBRECYCLE™ process – (Estech Europe) This process is a rotating autoclave process used for treatment of raw unsorted municipal waste or residual wastes following source separation. Waste is fed into the autoclave, which is sealed when full, saturated steam is introduced into the rotating vessel and the waste is cooked. The temperature of the process is higher than that used in hospitals to sterilise instruments, therefore the treated waste is completely sanitised, yet the temperature is not high enough to melt the plastic content of the waste. When the cooking process is complete, the vessel is opened and the contents discharged into standard mechanical sorting systems to separate the differing fractions.

The original concept of the process, which was developed in Alabama, U.S.A., was to reduce the volume of waste by around 60% and to produce a RDF. Due to the quality of the organic fibre, it has the potential to be used in the manufacturing industries.

Siting and Scale

Processing operations can take place in a range of buildings and at different locations depending on local circumstances and process configuration. The volume of wastes requiring processing and the type of process will influence the size of site/building required. Sites need to be suitable for use by HGVs. Consideration should be given to the potential for co-location with rail or barge transfer operations.

Developments of this nature will generally be considered as potentially 'bad neighbour' activities due to the mixed nature of the waste and potential for nuisance effects. Juxtaposition of sites close to residential development should therefore be avoided. Some operations which involve mechanical processing and external loading and unloading of material may be inherently noisy which will also affect the choice of site.

General Siting Criteria

Existing landuse: Preference should be given to industrial or degraded sites or sites on or close to existing waste management facilities.

Proximity to sensitive receptors: Concerns over health risks from bio-aerosols generated by biological treatment processes may require plants to be located at least 250m from sensitive receptors.

Access: Access consideration will be directly related to the volume of waste. If part of a centralised facility, which includes other process operations, sites should normally be located close to the primary road network without constraints on large numbers of HGVs and waste collection vehicles.

Physical & Operational Characteristics
[typical 50,000 tonnes per year MBT plant]

Life time of facility:	20–25 years [Linked to contract period]
Operational Hours:	Potentially 24 hours 7 days (potentially less subject to plant set up nature of waste generation)
Typical site area:	<1–2 ha
Building Footprint:	100 m × 30 m or less
Building Height:	10–20 m
Vehicle Movements:	20–30 waste collection vehicles or equivalent per day. Less if bulk transport vehicles used.
Employment:	2/3 at any one time, shift system if 24 hour operation – (more if manual picking operations)

The matrix below has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Scoping Matrix:
Mixed waste processing

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues from PPG10, Annex A	Development Activity: Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, traffic, access	■	■	■	●	▲	▲	■
Air Emissions (including dust)	■	▲	■	●	▲	▲	■
Odours	●	▲	■	▲	■	■	●
Vermin and birds	●	●	■	●	▲	■	●
Noise/Vibration	■	■	■	▲	▲	▲	■
Litter	●	▲	▲	●	●	■	●
Water resources	■	●	▲	▲	●	■	▲
Land stability	▲	●	●	●	●	●	▲
Visual intrusion	▲	▲	■	●	▲	●	▲
Nature and archaeological conservation	■	●	●	●	●	■	▲
Historic (built) environment	▲	▲	●	●	●	▲	▲
Potential land use conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 50,000 tonnes per annum

Waste stream: mixed household waste.

Assumes an industrial / semi industrial site

Definition of Terms:
Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.
Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.
Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

Key Issues

Traffic

Like any waste facility, most mixed waste processing operations will be served by significant numbers of HGVs potentially causing an impact on roads close by and the amenity of local residents. Like transfer stations mixed waste processing facilities will not significantly reduce the net vehicle movements. Indeed where waste has previously been taken direct to landfill additional processing operations will increase the number of movements.
Co-location of this type of activity with other waste management practices would therefore be advantageous.

Air Emissions

Atmospheric emissions in relation to mixed waste facilities are primarily associated with emissions from vehicles, and certain organic compounds and bio-aerosols from any biological treatment processes.

Dust/Odour

The presence of putrescible/municipal wastes can potentially lead to odours which might give rise to complaints, although good site management practices and rapid turn around of waste on-site usually prevents any serious odour problems. The handling of waste and the movement of vehicles may also give rise to dust. If a drying process is used in an MBT system dust may be generated in the processed waste. Loading of this waste into vehicles should therefore be undertaken under controlled conditions.

Flies, Vermin and Birds

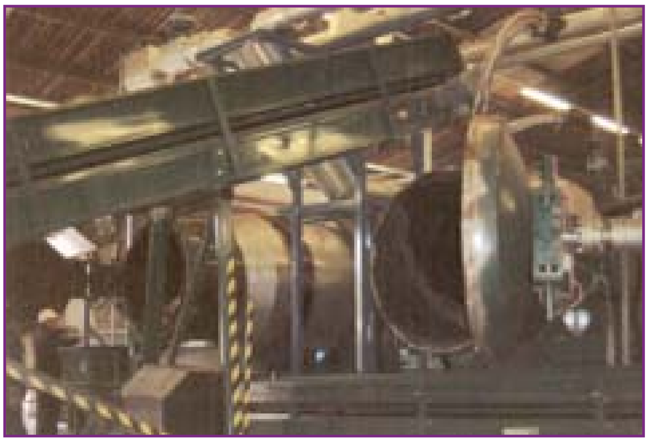
Mixed waste processing operation will not normally experience problems associated with rodents or birds given that operations tend to take place within a building and waste materials are only present for short periods. In hot summer weather, however, flies may become a problem, particularly if they are being bought in with the incoming waste.

Noise

The main problems associated with noise at waste processing facilities have been attributed to the following activities:

- Vehicle manoeuvring on-site along with loading and unloading operations (particularly in relation to reversing alarms). NB. Such operations can be especially noisy in comparison to other waste management and industrial activities;

- Traffic noise on the local road network associated with HGV movements and/or train noise;



[Courtesy of Estech Europe Ltd]

Twin vessel autoclave showing loading doors

- Mechanical processes such as shredders, screen, trommels and ball mills; and
- Air extraction fans and ventilation systems.

Noise is an issue that is controlled under the IPPC Regulation as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Litter

The presence of MSW including paper and plastics may potentially result in the release of litter. Carrying out operations within a building, however, tends to prevent any significant impacts. Any drying process will increase the risk of litter spread from the dried waste product which should be handled and loaded under controlled conditions. Litter may also be spread from waste vehicles. Litter issues are controlled in a similar way to dust and odours.

Water Resources

The nature of the material being handled can potentially constitute a risk to water resources. However, as most facilities are under cover, rainfall is unlikely to come into contact with the waste materials and, as such, water pollution is unlikely. Nevertheless, wash-down waters and any liquid within the waste needs to be managed appropriately. Because of this most facilities will require drainage systems to ensure that dirty waters are dealt with appropriately.

Visual Intrusion

The development of any new building may lead to impacts on landscape character and visual amenity. If sited in an industrial setting, remote from residential areas, impacts are likely to be minimal. Traffic movements etc. may also result in a visual impact. The significance of any such impact is dependent on a number of site specific issues as follows:

- Direct effects on landscape fabric i.e. removal of landscape features such as trees etc;
- Proximity of landscape designations;
- Site setting, ie. the proximity of listed buildings and/or conservation areas;
- Proximity of sensitive viewpoints;
- Presence of existing large built structures;
- Existing landform and the nature of the existing landscape setting;
- Presence/absence of screening features (trees, hedges, banks etc.);
- The number of vehicles/trains/barges accessing and exiting the site.

Landscape and visual impacts are material planning considerations and a significant amount of public concern can be generated by the visual appearance of a facility.

Public Concern

Applications for waste processing facilities are often subject to local opposition given the nature of the material to be handled. Particular public concerns often relate to amenity issues (odour, dust, noise, litter, vermin, flies and disturbance from traffic).

Need for EIA

Whether any development requires a statutory Environmental Impact Assessment (EIA), is defined under the terms of 'The Environmental Impact Assessment (England and Wales) Regulations 1999. Within these regulations there are two categories of development: those which require mandatory EIA (set out in Schedule 1 of the Regulations); and those types of projects, where EIA is not mandatory, but where the development may result in significant environmental effects due to its' nature, size or location, EIA may be considered necessary (Schedule 2).

Many single process mixed waste facilities such as trammels etc are not likely to require EIA. Other combined processes in a large process building are likely to require EIA under Schedule 2 – Part 11 'Other Projects' (b) Installations for the disposal of waste. The applicable thresholds for consideration of whether an EIA may be required under the Regulations for waste developments are:

(i) The disposal is by incineration; or

(ii) The area of the development exceeds 0.5 hectare; or

(iii) The installation is to be sited within 100 m of any controlled waters.

Further guidance is also available in Annex A of the DETR Circular 02/99 on Environmental Impact Assessment. Paragraph A36 gives indicative EIA thresholds for a range of waste development types, this is likely to include mixed waste processing, as follows:

A36. '.....EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of these wastes (.......) are unlikely to require EIA.

Given the above, the decision regarding whether a mixed waste processing operation requires EIA will depend primarily on its size and throughput. Other general issues to consider regarding the need for EIA are discussed in Part 1 of this guide.

[Courtesy of Enviros Consulting]

Early 'Biocubi' plant for industrial wastes

Good practice dictates that EIAs should be properly scoped from the outset. The 1999 EIA Regulations introduced new provisions for screening and scoping which enables the applicant to obtain a scoping opinion from the Waste Planning Authority. It is advisable for the applicant to also undertake a separate scoping exercise to ensure that the appropriate level of engagement with relevant stakeholders is achieved at the outset of the EIA process.

It is particularly important that statutory consultees, such as the Environment Agency and English Nature, have the opportunity to comment on the scope and content of specific technical assessments that may be required.

If the transfer station is too small to require EIA it may, nevertheless, be appropriate to provide a more limited appraisal of the potential environmental effects.

Content of Planning Application

The content of the planning application will focus primarily on the following:

- Planning policy context;
- Need;
- BPEO; and
- Principal environmental effects as set out in a supporting statement or 'Environmental Statement'.

Such information can either be provided as separate documents or combined within the EIA.

It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and, where appropriate, with reference to the local Waste Strategy and Waste Local Plan or relevant local development documents. Guidance on the general approach to BPEO is provided in Part 1.

A common failing of applications is a failure to adequately address environmental effects of site design and operational aspects. For example, information on plant specifications, traffic volumes and routes, housekeeping, mitigation schemes (such as landscaping), site design and layout should normally be included. Some of this information may be difficult for applicants to procure if the development contract process has not advanced to a stage where detailed specifications are available or if the specific process arrangements are not finalised.

Where possible the PPC permit/waste licence application should be submitted in parallel with the planning application. This should assist the Environment Agency in providing representations to the Waste Planning Authority on the environmental impacts of the proposal. There will always be a degree of overlap between information provided in the planning application and that contained in the licence permit application. This will relate to issues such as noise, general housekeeping and amenity effects. Where applications are not submitted in parallel it is likely that applicants will need to include additional information on site design aspects.

[Courtesy of Island Waste Services]

Mixed waste processing equipment

Mitigation

The key planning considerations where mitigation measures may be required will be related to the key environmental issues assessed through the Environmental Impact Assessment. Typically these relate to traffic, nuisance issues and the physical appearance of the site. The table below identifies the key planning considerations associated with waste transfer stations and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	Mitigation measures may include routing of vehicles away from sensitive areas and limitation of operating hours.	Use of S.106 agreements
Air Emissions	Limitation of journey distances and sensitive routing/siting may help reduce traffic related air quality effects	N/A
Dust/Odour	Enclosure of operations within a building is the primary means of preventing odour and dust impacts. As with thermal treatment facilities, the reception hall could be kept at negative pressure to prevent release of dust and odour. Various proprietary biofiliters can also be used.	Water and perfume sprays may be used along with road sweeping for dust.
Flies, Vermin and Birds	Rodent and fly control may be affected by rapid turnaround of waste materials. Birds are discouraged by containing operations within a building.	Rodenticides and insecticides may be used. Drainage systems may be fitted with grates etc. to prevent rodents entering the building via drains/sewers.
Noise	Noise mitigation may include sensitive siting and regular maintenance of equipment. Noise fencing and bunds along with sound insulation within the building may be used.	On-site vehicles may be fitted with 'smart' reversing alarms. (NB. It is not possible to fit all incoming vehicles with such alarms as many will belong to companies not associated with the facility operator.
Litter	Enclosure of operations within a building, regular road sweeping, litter picking and ensuring that all waste vehicles are adequately sheeted/contained helps prevent litter.	Perimeter fencing/landscaped areas may be used to trap litter before it leaves the site.
Water Resources	Avoidance of areas close to sensitive water resources and provision of a drainage system separating dirty and clean waters and transferring dirty waters to sewer or other appropriate treatment will prevent any serious water pollution.	N/A
Visual Intrusion	Visual impacts may be reduced by appropriate siting, sensitive building design, and appropriate use of cladding and colour treatments.	Landscape planting may be utilised but may take years to mature. Fencing and earth bunds may also be employed.

Case Examples

Ecodeco 'Intelligent Transfer Station', Montanaso near Milan, Italy

The facility was developed by Sistem Ecodeco based on an approach previously used for treating specialist industrial wastes. The main driver in Italy for the development of this kind of facility was the need to divert untreated waste away from landfill. The plant is described as an 'Intelligent Transfer Station'.


[Courtesy of Enviros Consulting]

Ecodeco 'Intelligent Transfer Station'

Waste is delivered to the plant from household collection rounds in the area of Montanaso. This is moved quickly using overhead grabs into a primary shredder. This reduces the size of the waste to between 20–30 cm and provided a more homogeneous feedstock. The waste then enters an aerobic fermentation area. This waste is divided into virtual areas controlled by computer. The computerised system regulates the fermentation process in order that temperature is controlled to the optimum to enable effective bio-degradation. Each virtual row represents one day's input of waste. Perforations in the floor of the building allows air to be drawn down through the wastes. The temperature of the material is maintained at around 50–60°C, and has a total residence time in the fermentation area of 12–15 days.

The plant has the potential for further separation of material following fermentation. At present the majority of the waste is being sent as RDF to a Fluidised bed facility at Bergamo. There are no significant nuisance or public concern issues. The plant is located 500 m from the nearest housing area. The closest sensitive receptor is the canteen of the nearby Gas Fired power station. There have been no significant public concerns associated with the facility.

Key Planning Features

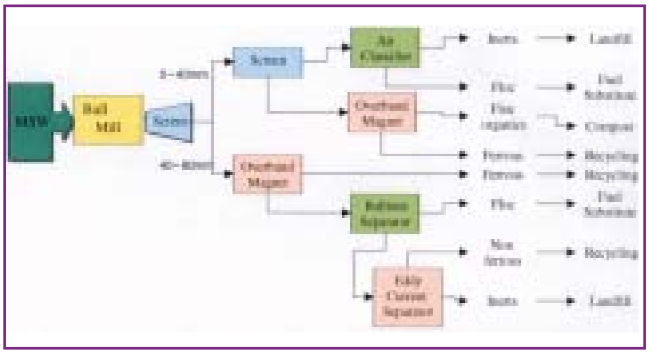
Location:	Montanaso near Milan, Italy
Setting:	Semi Rural/Urban Fringe
Waste Types:	Residual Mixed Waste following separation of recyclables
Waste Volume:	60,000 tonnes per year
Employment:	3, day time only (computer automated process)
Building Footprint:	Main Building 20 m × 100, secondary processing area 20 m × 50 m
Design Features:	Green skinned, building constructed from concrete not usual UK steel structure. Seen as not necessary to have an architectural embellishment. Close to much larger existing gas power station.

Ball Mill, Bursom, Leicester

Biffa Waste Services have recently received planning permission for a Recycling Centre at Bursom Industrial Estate which forms part of an integrated waste contract awarded to Biffa by Leicester City Council at the end of 2002. The contract is for waste collection, processing and disposal. In addition to the Recycling Centre a purpose-built anaerobic digester for processing the city's organic waste is proposed at Severn Trent Water's facility at Wanlip.

The application site covers an area of approximately 3.6 hectares (8.9 acres) in total, including land on its south and east side proposed for landscaping. The application site comprises undeveloped grassland.

[Courtesy of Biffa Waste Services]



Process flow diagram of recycling centre – taken from Biffa Waste Services Planning Application

The plant has been designed to accept 111,000 tonnes per year for processing/recycling or for temporary storage and bulking. Under the contract with Leicester City Council the facility has been designed to cater for 2% growth in waste arisings per year, over the 25 year contract period. Depending on the success of waste minimisation and diversion strategies the plant has been designed to accept 222,000 tonnes, double the initial input.

Waste from household collections will be brought to the site by road and will initially be tipped into a waste reception hall. The waste will then be fed along conveyors into the ball mill. The mill is a 6.4 metre diameter drum which contains a large number of 5.5 kilogram steel balls. As the drum rotates the balls break down the waste in to small fragments. The resulting waste is then separated using standard separating techniques for glass, paper, plastics, organics and metals. A final floc would be suitable as a substitute fuel or landfilled.

Key Planning Features

Location:	Bursom, Leicester
Setting:	Extension to an existing business park
Waste Types:	Mixed Waste Household Waste
Waste Volume:	111,000 tonnes per year (initial tonnage)
Employment:	9 site based staff (4 per shift, plus 1 manager) (excluding office accommodation)
Site area:	3.6 ha
Building Footprint:	5,100 m^2
Design Features:	Architect designed superstructure, refer to artist's impression earlier.

Future Issues

The growth of facilities designed to deal with mixed municipal waste is very dependent upon the make up of specific waste management strategies currently being developed around the Country. The recent level of interest in such facilities has in part been in response to the concerns over incineration and the difficulties in gaining permits for such facilities. Mixed waste treatment processes such as those described here have little inherent value on their own unless they are combined with other waste management activities, e.g. recycling, biological treatment and residual disposal proposals. A potential concern is the lack of volume reduction inherent in such operations and the need for compatible down stream processes.

Although these facilities are considered as relatively benign compared with incineration there is actually very little experience of the issues associated with large centralised facilities. In many respects the planning considerations will be similar to transfer stations. Experience will inevitably grow over time as the growing number of planning applications currently being considered come to fruition.

Mixed waste processing is well suited to be co-located with thermal treatment and pyrolysis/gasification. Such combined facilitates may ultimately represent significant developments in terms of scale and land take. As such their compatibility with other small and medium sized industrial sites may be brought into question.

Further Reading

- Strategy Unit (2002) Annex G: Treatment and Disposal of Residual Waste - MBT in context, in Waste Not, Want Not: A strategy for tackling the waste problem in England, Strategy Unit, London. http://www.number-10.gov.uk/su/waste

- Community Recycling Network (researched by Hogg, D., Mansell D. and Network Recycling Ltd) Maximising Recycling Rates: tackling residuals, Resource Publishing Ltd. http://www.crn.org.uk

5 Pyrolysis and gasification

What is it?

Pyrolysis and gasification technologies form part of a group of processes and techniques collectively known as advanced or novel thermal treatment. In reality most of the processes are neither advanced nor novel. Pyrolysis and gasification, like normal combustion, involve a chemical reaction which takes place at high temperature. This generally generates energy from organic or hydrocarbon containing materials. The application of these techniques to the treatment of municipal waste streams is a relatively recent development, as they were previously confined to applications in the oil and chemical industries. Only since the application of landfill taxes, and the relative increase in costs and environmental concerns associated with incineration, have such practices been considered economically viable for application in the waste industry.

In addition to pyrolysis and gasification there are a number of other high temperature thermal processes that are available on the market but have yet to make an impact in the UK. These include vitrification techniques, which have been applied to the treatment of incinerator ash residues for example in Japan, and certain high temperature smelting technologies. Due to the lack of market take-up of such techniques, this profile considers only the planning issues associated with pyrolysis and gasification techniques currently considered the most viable advanced thermal treatment options.

Pyrolysis takes place either in the complete absence of oxygen or with limited oxygen. Although the application and equipment might be new the process is not. The production of charcoal from wood is an example of pyrolysis/gasification, where the wood is prevented from combusting in the usual way due to air starvation. Conventional incineration technologies also involve phases of pyrolysis, gasification and normal combustion. The main difference with the specialist pyrolysis and gasification techniques is the control of the reaction to a single phase.


[Courtesy of Thermoselect]

Thermoselect plant, Fondotoce, Italy

There are three products of pyrolysis: gas, liquid and a solid known as char. The chemical reaction takes place at temperatures of between 400°C and 800°C. At the higher end of this temperature range there is very little water produced with mostly gas (known as syngas) and char as the main products.

Gasification, like pyrolysis, is a process that has had previous applications using feedstocks other than waste. For example, so called ‘town gas’ produced from coal using gasification was a very common process prior to the widespread availability of natural gas. Gasification is a thermal upgrading process, in which carbon is converted to a syngas leaving a solid residue. This takes place in the presence of air, or air enriched with oxygen. Temperatures employed are generally higher than pyrolysis at 900°C–1100°C when in air and 1000°C–1400°C using oxygen[1].

Energy is generated from pyrolysis and gasification in one of two ways:

- The syngas is combusted and the hot gases are fed through a heat exchanger where steam is produced this is used to generate energy in a steam turbine

- The syngas is refined to a high quality and used in a gas engine to produce electricity

A number of commercial companies are seeking to develop gasification and pyrolysis techniques, often combined with other waste processing and recovery operations. This type of process is eligible for subsidy under the Government's Renewables Obligation Order (April 2002). Some examples of the types of process configurations being proposed are described below[2].

GEM – Pilot plant in Hampshire and a plant at Bridgend landfill. Shredded waste feedstock is delivered to a pyrolysis chamber which rapidly converts waste to gas (<1 second). The gas can be used to generate heat and electricity. The operators are planning trials using refuse derived fuel from the 'Ecodeco' mechanical biological treatment process.

Wastegen UK – Referred to as 'Materials and Energy Recovery Plants' (MERPS). The concept combines material recovery operations with a pyrolysis kiln. A 36,000 tonnes per annum plant has been operational in Burgau, Germany for 17 years.

Brightstar Environmental – This operation has been widely marketed in the UK. A contract has been awarded by Derby City Council, which has also granted planning permission. A planning application for a facility at Shelford Landfill, Kent was subsequently withdrawn. The process – called a Solid Waste and Energy Recycling Facility (SWERF®) involves front end recycling and an autoclave process, which produces a pulp from the residual waste. This is gasified, with the resulting syngas being used in spark ignition engines to produce electricity. Brightstar have a plant in Wollongong, Australia, which until recently processed 30,000 tonnes per annum (see case example).

Compact Power – This process has been widely marketed in the UK over recent years. Compact Power has a fully consented commercial plant at Avonmouth, Bristol and others planned around the UK. It was the first of its kind to receive a PPC permit in the UK. Planning permission was granted in 2001 for a facility in Dumfries and a planning

[1] Juniper Consultancy Services (1999), Trends in Waste Management Approaches & Technologies
[2] These references to commercial technology providers are only intended as examples and in no way reflect the market status or competency, reliability etc. of the quoted organisations. At present this represents an emerging field with no full scale operational plants receiving mixed municipal wastes in the UK.

application was refused in 2003 for a facility in Cornwall. The process uses sequential compaction, pyrolysis, gasification and high temperature oxidation. Pyrolysis takes place at temperatures between 400°C–800°C, and oxidation at 1250°C for over 2 seconds. Syngas is combusted and energy generated through a traditional steam boiler/turbine configuration.

IET Energy – This system known as Entech TOPs™ is a small scale batch process designed to enhance material recovery operations. Operating at 550°C, carbon containing waste is broken down to produce syngas with metals and glass recovered for recycling. Gases are combusted to produce energy via a traditional steam boiler/turbine. Plant capacity is 8,400 tonnes per annum per batch cell. Any number of batch cells can be placed parallel to provide capacity for larger throughputs. A temporary planning permission was been granted for a facility in Weston-Super-Mare, North Somerset.

Thermoselect UK Ltd – This process involves a so called ‘closed-loop high temperature gasification system’[3]. The first Thermoselect facility was developed in Italy in 1992, this has now been decommissioned. The main European facility is at Karlsruhe, Germany, processing 225,000 tonnes per annum; one other facility is operational in Japan. A high temperature gasification process produces a syngas, vitrified ash (granulate) and other synthesis products. Unlike many gasification/pyrolysis systems, preparation of the feedstock (e.g. shredding/autoclaving) is not considered to be necessary.

[Courtesy of Compact Power]

Schematic of combined pyrolysis and gasification process

[3] Dr Stuart R B McLanaghan (Nov 2002); Delivering the Landfill Directive: The role of new & emerging technologies: Report for the Strategy Unit.

General siting criteria

Existing landuse: Unlike large thermal treatment facilities pyrolysis/gasification proposals are likely to offer the opportunity to consider wider locational options in mixed use areas. Preference should be given to areas allocated for business use or traditional commercial/industrial urban area. Compatible with most class B1/B2 activities under the Use Classes Order. Existing waste sites should also be considered.

Proximity to sensitive receptors: Sites closer than 250 m of housing etc should generally be avoided where possible. However scale and improved environmental performance standards should enable a reasonable case for such plants to be located closer to sensitive receptors, particularly when part of a CHP/district heating scheme.

Transport infrastructure: Assuming stand alone facilities receiving mixed household waste, access routes require capacity to meet input rates. Usually good quality A/B class roads or primary road network free from restrictions on HGVs. Other forms of transport such as rail unlikely to be economically viable if input rates are less than 100,000 tonnes per year, unless infrastructure already in place.

Siting and Scale

Processing operations can take place in a range of buildings and locations. The volume of wastes requiring processing will influence the size of site/buildings required. Most of the process operations described above require pre-treatment of wastes as part of an integrated process arrangement. Many proposals will therefore involve a range of activities on one site; these may include composting, mixed waste processing, and recyclable processing (please refer to separate profiles within this publication).

The scale of any individual buildings and process components is likely to be compatible with most small/medium sized industrial activities. Buildings will be typically 6–10 metres to the eaves and 10–15 metres to the ridge. The stack height will be determined by emission characteristics and air dispersion modelling. The scale of operations currently being proposed are generally smaller than large scale thermal treatment facilities. The one exception to this is the Thermoselect system, which is a larger scale operation.

A number of recent planning appeal cases have demonstrated the significance of careful siting and design as a material planning consideration that can be critical to determining whether a proposal gains permission or not. The scale of most pyrolysis and gasification facilities will give greater flexibility on the choice of sites compared with larger scale operations such as large scale thermal treatment. Development plans should, where possible, encourage such facilities in localities that are as close as possible to the source of waste arisings in order to minimise transport. Proposals that seek to utilise sites which offer the potential for CHP and export of energy to businesses that would otherwise use fossil fuel sources should be encouraged.

Physical & Operational Characteristics [50,000 tonnes per year plant]

Life time of facility:	20–25 years
Operational Hours:	Potentially 24 hours 7 days (potentially less, subject to plant set up and nature of waste generation)
Typical site area:	1–2 ha
Building Footprint:	60 m–60 m (to house main thermal treatment components. If pre-processing then other buildings of differing sizes will be required)
Building Height:	15 m–25 m
Stack height:	30 m–70 m[1]
Vehicle Movements:	20 waste collection vehicles or equivalent per day. Less if bulk transport vehicles used.
Employment:	2–3 workers at any one time, shift system if 24 hour operation

Waste Storage – Waste generally delivered to single waste reception pit within main building. Conveyors can be used if part of an integrated facility. If very small facility, a containerised loading system can be used.

Chemical Storage – Small quantities of lime and activated carbon or urea (in solid form) used as part of air pollution control (APC).

Ash storage – Generally removed daily or weekly with shovel loader into bulk vehicle or in covered containers.

[1] *Stack height determined by process characteristics and air dispersion modelling*

Scoping Matrix:

Pyrolysis/Gasification

■ Potentially significant issue
▲ Potentially limited issue
● Not applicable or insignificant issue

Planning Issues from PPG10, Annex A	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, traffic, access	■	■	■	●	▲	▲	■
Air Emissions (including dust)	■	▲	■	▲	●	■	■
Odours	●	▲	▲	▲	●	▲	●
Vermin and birds	●	●	●	●	●	■	●
Noise/Vibration	■	■	■	▲	▲	▲	■
Litter	●	●	▲	●	●	▲	●
Water resources	■	●	●	●	●	▲	▲
Land stability	▲	●	●	●	●	●	▲
Visual intrusion	▲	▲	■	●	▲	●	▲
Nature and archaeological conservation	■	●	●	●	●	▲	▲
Historic (built) environment	▲	▲	●	●	●	▲	▲
Potential land use conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 50,000 tonnes per annum

Waste stream: mixed municipal / clinical wastes.

Assumes an industrial / semi industrial site

The matrix has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

Key Issues

Traffic

The nature and volume of vehicle movements will be determined by the volume throughput of the plant, and nature and source of the waste. Typically traffic volumes will be significantly less than for larger scale centralised facilities. Traffic generated may include a mixture of waste collection vehicles, bulk haulage vehicles and skip transporters.

Air Emissions

Very little research has been undertaken in the UK on the air emissions associated with pyrolysis and gasification systems.

The research that does exist suggests that emissions are comparable with other forms of thermal treatment and in principle may be lower. The key issue is normally associated with the operational procedures adopted and reliability of the process. Air pollution control systems are required to reduce emissions to an acceptable level, and as a minimum to meet EC Directive/PPC authorisation limits.

The principal air emission components emitted from any thermal treatment process are:

- Acid gases
- Carbon dioxide
- Dioxins and furans
- Heavy metals
- Particulates

The respective emission limits for each key pollutant are shown in the following table.

Emission levels set by EC Waste Incineration Directive	
Substances	EC Waste Incineration Directive (2000)
Dust	10
Total Organic Carbon	10
Hydrogen Chloride	10
Hydrogen Fluoride	1
Sulphur Oxides	50
Carbon Monoxide	50
Nitrogen Oxides	200
Metals	
Group 1: Cadmium, Thallium	0.05
Group 2: Mercury	0.05
Group 3: Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium	0.5
Dioxins and Furans	0.1 ng/m^3

Notes:

(a) All concentrations are given in units of milligrams per normal cubic metre of stack gas, corrected to 11% oxygen at 273K and 101.3KPa except dioxins, which are expressed in nanograms of international toxic equivalent (I-TEQ) per normal cubic metre of stack gas.

(b) Values relate to 24 hour averages except metals which are 30 min – 8 hour and dioxins which are 6 hour – 8 hour averages.

Air emissions are also a material planning consideration and probably represent the most significant public concern issue. New proposals must include detailed assessment of emissions to air addressing: air quality objectives, exposure to dioxins and furans effects on health and natural environment.

Dust/Odour

There is very little practical experience of such facilities to determine whether nuisance issues such as dust and odour will be a significant planning considerations. The likelihood is that these issues can be controlled in the same way as they are with other forms of waste management carried out in enclosed buildings.

Odours and dust from any mixed waste or putrescible waste facility have the potential to represent a nuisance issue with adverse impacts on residential amenity. The most significant problems with regard to odour occur when waste is allowed to decompose in anaerobic conditions. Dust is sometimes generated when waste is loaded and unloaded, and when waste is transported onto manoeuvring areas on vehicle wheels.

If facilities are badly managed, or during times of plant failure, wastes can soon start to generate odour and dust problems. At a well run facility this will not be an issue as stored waste is kept to a minimum.

Noise

In general the actual gasification and pyrolysis process itself is unlikely to be a noisy operation. Most noise will be associated with ancillary activities. The main problems associated with noise may be attributed to the following activities:

- Vehicle manoeuvring, loading and unloading operations
- Sorting
- Ventilation fans
- Internal screening and mechanical sorting operations
- Steam turbine units
- Air cooled condenser units

If all of the mechanical process operations take place within the building, noise impacts are unlikely to cause nuisance concerns.

Noise is an issue that is controlled under the IPPC Regulations as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions. Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Litter

Litter is not likely to be a significant problem at these facilities if the whole process is contained within a single building. However where double handling of waste takes place, involving transport of waste from different process operations via external haul roads, litter and detritus can present difficult management issues. Storage of waste in un-covered external containers should be avoided.

Visual Intrusion

The visual appearance and resulting impacts will vary according to the scale of buildings and the local setting of the site. Most modern facilities will be housed in purpose built steel framed buildings which may be similar to large agricultural buildings or industrial warehouses with the addition of a stack. Such facilities could be sited in a variety of locations with contrasting visual impacts. The key considerations in assessing impact are as follows:

- Direct effects on landscape fabric i.e. greenfield vs brownfield, removal of hedgerows, trees etc.
- Proximity of landscape designations
- Site setting, for example the proximity of listed buildings and/or conservation areas
- Proximity of sensitive viewpoints
- Presence of existing large built structures
- Existing landform and nature of existing landscape
- Presence/absence of screening features (trees, hedges etc.)

Some degree of design modification should be possible to ensure the building provides a good fit with the local architectural vernacular, and has colour treatment and design details that are consistent with local industrial design guides. Various site engineering and screening techniques can be used to minimise visual impacts if located in a particularly sensitive setting. If the site is in a traditional industrial context such measures should not be necessary.

Public Concern

At present there is some political and public support for many advanced thermal treatment systems. They are generally perceived as preferable to more traditional forms of thermal treatment and unlike incineration are not seen to detract from recycling and recovery activities.

In reality, although the processes are generally smaller in scale, they all generate air emissions which are regulated in the same way as incineration operations. Care needs to be taken in assessing planning applications to ensure that a balanced view is presented on all the potential effects from such facilities.

Need for EIA

Environmental Impact Assessment is the process by which environmental information is collected, published and taken into account in reaching a decision on a relevant planning application. The main aim of EIA is to ensure that the authority giving the primary consent for a particular project makes its decision in the knowledge of any likely significant effects on the environment.

Schedule 1 of the Environmental Impact Assessment Regulations defines those projects where EIA is obligatory. This defines waste incineration under items 9 and 10 as follows:

9. Waste disposal installations for the incineration, chemical treatment [...] or landfill of hazardous waste.

10. Waste disposal installations for the incineration or chemical treatment [...] of non-hazardous waste with a capacity exceeding 100 tonnes per day.

The capacity of 100 tonnes per day equates to approximately 35,000 tonnes per year. There is no real clarity on whether pyrolysis/gasification techniques will be considered as synonymous with incineration in this context. However, current practice suggests that, as a thermal treatment process, such proposals will be considered as EIA projects, if not under Schedule 1 of the Regulations then under Schedule 2, part 11; ‘Other Projects’:

Installations for the disposal of waste (unless included in Schedule 1):

(i) The disposal is by incineration; or

(ii) The area of the development exceeds 0.5 hectares; or

(iii) The installation is to be sited within 100 metres of any controlled waters.

Circular 02/99 provides further guidance on the likely need for EIA. Please refer to Part 1 of this publication for further details.

Good practice dictates that EIAs should be properly scoped from the outset. The 1999 EIA Regulations introduced new provisions for screening and scoping which enables the applicant to obtain a scoping opinion from the waste planning authority. It is advisable for the applicant to also undertake a separate scoping exercise to ensure that the appropriate level of engagement with relevant stakeholders is achieved at the outset of the EIA process.

It is particularly important that statutory consultees such as the Environment Agency and English Nature have the opportunity to comment on the scope and content of specific technical assessments such as the air quality impact assessment and any ecological studies that may be required.

Content of Planning Application

Within the planning application for a pyrolysis/gasification facility, applicants should provide sufficient information to enable the waste planning authority to determine the nature of the processing operations, as well as the measures that will be used to minimise potential nuisance issues, particularly those associated with odour and noise. It would be appropriate for applicants to enter into a dialogue with the Environment Agency and the waste planning authority at an early stage to determine what level of information is appropriate for planning and what process specific details may be reserved for waste licensing PPC.

It is assumed that planning applications will be accompanied by information including drawings consistent with those provided for other waste management operations.

The content of the planning application with regard to the assessment of environmental issues will largely be guided by the scope of the EIA (where an EIA is required). Certain additional information should also be provided over and above what is generally required under the EIA Regulations. This relates in particular to aspects such as:

- Planning policy context;
- Need; and
- BPEO.

Such information can either be provided within a separate document or combined as part of the Environmental Statement (where an EIA is required). It is generally accepted that applicants

[Courtesy of County Environmental Services]

Artist's impression of proposed Resource Recovery Centre, Cornwall, including pyrolysis/gasification unit on left hand side should state their case on the need for the development in the context of other existing and proposed facilities in the area and where appropriate with reference to the local Waste Strategy and Waste Local Plan or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1 of this publication.

Mitigation

The key planning considerations where mitigation measures will be required will be related to the key environmental issues assessed through the Environmental Impact Assessment (EIA). Typically these relate to the main emissions from the facility and the physical appearance of the buildings. The table below identifies the key planning considerations associated with large scale thermal treatment plants and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	Deliveries of waste to the facility will normally be linked to waste collection rounds. These usually peak at certain times of the day. Mitigation measures normally used should ensure that vehicles are re-routed away from inappropriate routes and sensitive residential areas such as schools.	S.106 agreements can be used to secure agreement on traffic routing and input rates. They can also be used to secure planning gain for the local community.
Air Emissions	All new thermal treatment plants, including pyrolysis/gasification plants, are required to meet the emission limits prescribed by the EC Waste Incineration Directive 2000 (see table in Key Issues section). Control of the main pollutants is limited by careful control of temperatures and residence times. Pyrolysis processes normally enable the effective removal of metals from the combustion air or syngas. Like traditional thermal treatment pyrolysis/gasification techniques will generally require use of proprietary air pollution control (APC) systems.	The effect of air emissions on receptors on the ground is greatly influenced by dispersion of pollutants in the atmosphere. Air dispersion modelling will be undertaken as a part of any EIA process. Air dispersion and the location of maximum ground concentrations of pollutants is influenced by the release rate of pollutants, and effective stack height. One option for providing satisfactory levels of air quality is to identify an optimum stack height, often using a cost-benefit evaluation. A trade off in terms of the overall visual impacts of the facility will need to be made.
Dust	Not likely to be a significant problem if standard waste handling and storage procedures are followed.	Dust and mud on roadways can be further reduced by good site management practices, which would include periodic road cleaning/sweeping of all vehicle manoeuvring areas and site access roads.

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Odour	Odour generated from the waste prior to treatment is generally contained in the same way as dust. Odour is not normally a significant issue at modern well run facilities.	In periods of high waste input, when large amounts of waste are retained in the waste reception pit, odour levels can rise. This may also occur following bank holiday periods and during plant maintenance periods. Application of chemical deodorants can be used to mitigate external impacts although retention of large volumes of waste should generally be avoided and might be conditioned.
Noise	The standard design of the main buildings and noise reduction features on specific plant components should ensure that noise levels can be kept to acceptable levels. Appropriate site layout design and siting of particularly noisy pieces of plant such as the air cooled condenser is recommended. In particularly sensitive locations close to housing, such pieces of plant should be located as far as practicably possible from the sensitive site boundaries. If noise from vehicles is likely to be an issue, for example due to reversing alarms, the operator can be required to fit smart systems which reduce the potential for nuisance.	Additional noise reduction options might include noise attenuation features within the roof and walls of the main building to reduce break out of noise. It may be possible to modify induced draft (ID) fans with proprietary silencing systems.
Litter	See comments relating to dust and odour.	N/A
Visual Intrusion	Normally constructed of standard steel portal frame and concrete. Often limited architectural enhancement and detail applied such as colour treatment.	If the site is prominent and visually sensitive, the applicant should consider the overall design concept as a landmark building. and be sensitive to the local vernacular and local architectural and cultural styles.

Case Examples

Compact Power, Avonmouth, Bristol

This facility was developed on land adjacent to the decommissioned Avonmouth incinerator plant. It became fully operational in February 2001 (up-graded in May 2002) and, although it is used by the operator Compact Power as a demonstration facility, it is a full scale commercial operation.

The Compact Power plant utilises a combination of pyrolysis and gasification to recover value from this waste. The technology has the design capability to accept a wide range of wastes including municipal, light industrial and commercial, as well as hazardous and clinical wastes.

[Courtesy of Compact Power]

Compact Power facility, Avonmouth, Bristol

The configuration of the equipment is best suited to receiving pre-treated waste streams where oversized and bulky material has been removed. The waste feed system requires the waste to pass through a 100mm diameter screen.

The Avonmouth facility is constructed on a modular basis with two separate pyrolysis tubes. The process involves a series of stages. Waste is fed from a waste hopper into a screw compactor system which continuously feeds waste into the pyrolysis chamber. This forms what is described as a 'waste bung' which creates a seal between the feed stock and the external environment. Waste is heated to 250°C initially, and then up to approximately 650°C. A gasifier is used to react the carbon from the pyrolysis phase. The resulting gases then pass to a thermal oxidising chamber where heat energy is produced. Temperatures of 1250°C are reached for a minimum of 2 seconds. A steam boiler is then used to convert the heat energy into a form that can be used in a conventional turbo-alternator to generate electricity.

Key Planning Features

Location:	Avonmouth Industrial Complex
Setting:	Industrial
Waste Types:	Clinical Waste
Waste Volume:	8,000 tonnes per year
Energy Generation:	0.5 MW
Site Area:	less than 0.5 ha
Building Footprint:	26 m × 26 m
Stack Height:	12 metres
Design Features:	A simply constructed industrial unit type building

Brightstar Environmental, Wollongong, Australia

This facility is promoted as a world first in terms of the combination of techniques used on site in an integrated waste treatment and electricity generation facility. The plant is located on Wollongong's Resource Recovery Park in Reddalls Road, Kembla Grange, Wollongong, New South Wales, Australia. The facility is known as the Solid Waste and Energy Recycling Facility (SWERF®), and is developed and operated under contract to Wollongong City Council.

The existing facility processes 30,000 tonnes per annum of household waste and generates 5.4 MW of electricity. Stage 2 of the project was proposed to involve the expansion of the plant's capacity to up to 150,000 tonnes per annum. Until recently this was expected to be completed in 2004. Current operational difficulties may preclude this.

[Courtesy of Brightstar Environmental]

SWERF® Plant, Wollongong, NSW, Australia

Australia is facing similar waste challenges as the UK in terms of the need to find sustainable and cost effective methods of waste management. The Wollongong facility combines materials recovery, thermal conversion. All of the process operations are contained within a single building. This helps to minimise issues associated with noise and other nuisance concerns.

The site is approximately 120 metres long by 100 metres wide. Waste is received at the SWERF® during the same hours as the Wollongong City Council's existing landfill –- between 6 am and 5 pm. The plant is able to process waste 24 hours a day.

Key Planning Features

Location:	Wollongong, New South Wales
Setting:	Rural
Waste Types:	Residual Mixed Waste following separation of recyclables
Waste Volume:	30,000 tonnes per year
Energy Generation:	5.4 MW
Site area:	1.2 ha
Stack Height:	70 metres
Design Features:	Architect designed main building with external pipework and tanks

Future Issues

There has been growing interest in alternative thermal treatment facilities over recent years. Pyrolysis and gasification techniques have been presented as more environmentally acceptable compared to traditional 'mass burn' incineration techniques. This may indeed be the case although there is, at present, very little actual evidence in the form of emission monitoring reports and independent analysis to support some of the marketing claims.

As new plants begin to be permitted and there is better practical experience of applying these techniques to solid waste management, so the evidence will grow. Many companies have found it difficult to secure contracts and achieve a foothold in the market due to general risk aversion on the part of waste disposal authorities and financiers.

It is likely that interest in pyrolysis and gasification processes will continue and that certain process providers will achieve market leader status. The scale of most pyrolysis and gasification operations means that they have the potential to be suitable at a range of sites. They generally involve more sophisticated process techniques compared with traditional incineration and therefore perform better when the feed stock is pre-processed in a form which meets the specific process specifications (size, calorific value) etc. It is likely therefore that proposals will be prepared in conjunction with other processes such as mixed waste processing, material recycling and composting.

Further Reading

- Municipal Waste Incineration. The Environment Agency's Approach (email enquiries@environment-agency.gov.uk for copies).

- Guidance on Directive 2000/76/EC on the Incineration of Waste www.defra.gov.uk/environment/waste

- Public Acceptability of Incineration, National Society for Clean Air, June 2001 (available from www.nsca.org.uk)

6 Small scale thermal treatment

What is it?

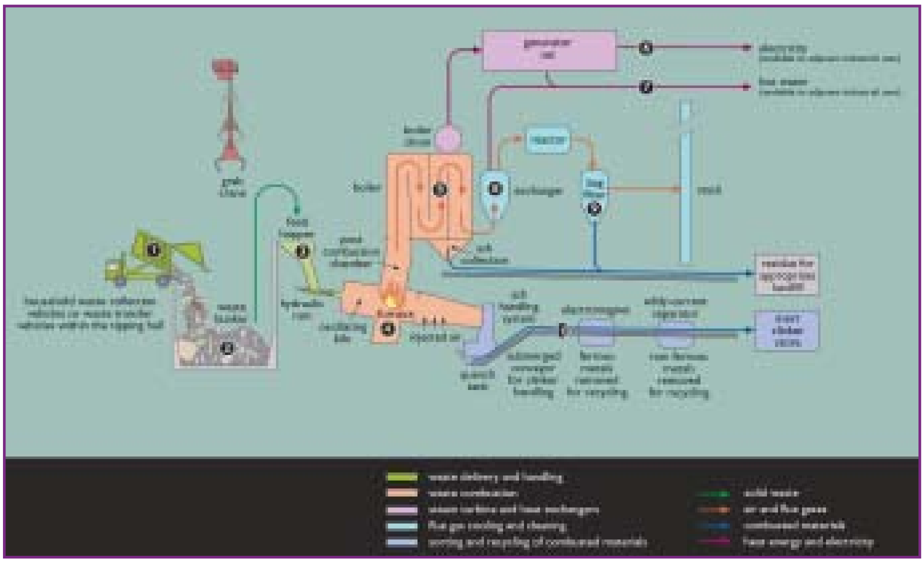
The distinction between large and small scale thermal treatment plants made here relates to the typical scale of process buildings and waste throughputs. In the recent past there have been comparatively few examples of such plants that have been designed to accept relatively small quantities of waste (say less than 90,000 tonnes per annum) from a relatively small catchment area. In the early part of the 20th Century such facilities, often called ‘Destructors’, were more commonplace and could be found in most towns and cities around the country. Such facilities had very rudimentary environmental controls and no air emission controls. Successive increases in abatement standards made these first generation plants uneconomic to operate.

Most of the existing operational examples today have been designed to treat specific industrial waste streams as part of combined heat and power (CHP) arrangements. Small thermal treatment plants (furnaces or kilns) are also used to treat clinical wastes at hospital sites.

Small scale plants are typically used to generate either steam for process use or electricity for export to the national grid. Sometimes plants are designed to have a dual steam and electricity generating capability.

[Courtesy of Dennis Bundy, OriginArt©]

Shetland CHP Plant



[Courtesy of Terence O’Rourke Ltd and NEWLINCS Development Ltd]

Process diagram illustrating the Cyclerval oscillating kiln technology

Examples of small scale plant in the UK are:

- Neath Port Talbot Materials Recovery & Energy Centre
- Contract Heat and Power, Isle of Wight (currently not operational)
- Integrated Waste Management Facility, Stallingborough, Grimsby (under construction)
- Kemsley Paper Mill, Kent
- Lerwick, Shetland Islands
- Various hospital sites for clinical waste

Various patented kiln and furnace designs are used. Many require injection of an auxiliary fuel (fuel oil or gas) to supplement the main feedstock and for start up. Most are specifically designed to take a relatively homogeneous, pre-processed feedstock or refuse derived fuel (RDF). The RDF is either burnt in pelletised form or as a flock, and is also described as 'fibre fuel' (see photograph on back page). Unlike large scale mass burn plants, small scale facilities are often modular. Several combustion chambers can be placed in parallel and fired up according to the need to respond to fluctuations in the supply of waste.

Most small and medium sized facilities do not have moving parts in the grate design. The combustion process is often more rudimentary than in large scale thermal treatment plants (see Profile 7 – Large Scale Thermal Treatment for details of larger facilities) although not necessarily less efficient. Waste is fed into the top or side of the chamber. Some form of agitation, either oscillation or rotation, is used to ensure waste is mixed for more complete combustion. All combustible material is burnt at temperatures generally between 850°C and 1200°C and the unburned residue – bottom ash – falls out at the bottom of the chamber into a quench tank.

The hot gases from the combustion chamber are directed to a boiler, where heat is usually recovered as superheated steam through heat exchangers. Approximately 2,000 kilowatt hours of heat per tonne of waste can be recovered, of which approximately 90% is available for export once a certain fraction has been used for running the plant.

The heat energy from small scale thermal plants has typically been used more often in CHP systems, with the heat energy exported to industrial end users. One such recent example of this is the CHP plant at Kemsley Paper Mill in Kent. Here waste paper is burnt on-site with the steam generated being used in the paper process and also to produce electricity.

Siting and Scale

The scale of the built structures associated with small scale thermal treatment plants will be directly proportional to the size of the thermal combustion unit. Plant scale will also be related to waste throughput although the relationship will not be directly proportional. Horizontally inclined combustion units will help to reduce the height of the main boiler unit. In contrast most large scale thermal plants have much taller boiler units.

Although the main plant buildings will generally be smaller than those of large thermal treatment plants the stack height may be very similar. This is determined by the local wind characteristics, topography and juxtaposition of other buildings. This is calculated through air dispersion modelling which would be undertaken as part of the Environmental Impact Assessment (EIA) and PPC permitting process.

A number of recent planning appeal cases have demonstrated the significance of careful siting and design as a material planning consideration that can be critical to determining whether a proposal gains permission or not. Small scale thermal options are likely to present greater flexibility in siting than larger scale options. Development plans should, where possible, encourage such facilities in localities which are as close as possible to the source of waste arisings in order to minimise transport. Proposals which seek to utilise sites which offer the potential for CHP and export of energy to businesses which would otherwise use fossil fuel sources should be encouraged.

Site layout of proposed Stallingborough plant currently under construction

[Courtesy of Terence O'Rourke Ltd and NEWLINCS Development Ltd]

The matrix overleaf has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Physical & Operational Characteristics [50,000 tonnes per year plant]

Expected lifetime of facility:	20–25 years
Operational Hours:	Potentially 24 hours 7 days (potentially less subject to plant set up nature of waste generation)
Typical site area:	<1–2 ha
Building Footprint:	80 m – 40 m or less
Building Height:	15 m – 25 m
Stack height:	40 m – 70 m[1]
Vehicle Movements:	Approx 20–30 waste collection vehicles or equivalent per day. Less if bulk transport vehicles used
Employment:	2/3 workers at any one time, on a shift system if 24 hour operation
Waste Storage:	Waste generally delivered to single waste reception pit within main building Conveyors can be used if part of an integrated facility. If very small facility a containerised loading system can be used
Chemical Storage:	Small quantities of lime and activated carbon or urea (in solid form) used as part of air pollution control (APC)
Ash storage:	Generally removed daily or weekly with shovel loader into bulk vehicle or in covered containers

[1] *Stack height determined by process characteristics and air dispersion modelling*

Scoping Matrix: Small scale thermal Treatment

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, Traffic and Access	■	■	▲	●	▲	▲	■
Air Emissions (including dust)	■	▲	■	▲	●	■	■
Odours	●	▲	▲	▲	●	▲	●
Vermin and Birds	●	●	●	●	●	■	●
Noise / Vibration	■	▲	▲	▲	▲	▲	■
Litter	●	●	●	●	●	▲	●
Water Resources	■	●	●	●	●	▲	▲
Land Stability	▲	●	●	●	●	●	▲
Visual Intrusion	▲	●	▲	●	▲	●	▲
Nature and Archaeological Conservation	■	●	●	●	●	▲	▲
Historic (Built) Environment	▲	▲	●	●	●	▲	▲
Potential Land Use Conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 50,000 tonnes per annum

Waste stream: mixed or residual municipal waste

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

General siting criteria

Existing landuse: In contrast to large thermal treatment facilities smaller scale plants afford the opportunity to consider wider locational options in mixed use areas. Preference should be given to areas allocated for business use or in traditional commercial/industrial urban areas. Compatible with most Class B1/B2 activities under the Use Classes Order. Existing waste sites should also be considered. Plants can be located in juxtaposition with modern industrial buildings or as a part of business parks where CHP potential can be developed.

Proximity to sensitive receptors: Sites closer than 250m of housing etc should generally be avoided where possible. However, scale and improved environmental performance standards should enable a reasonable case to be made for such plants to be located closer to houses etc, particularly when part of a CHP/district heating scheme.

Transport infrastructure: If waste feed is from on-site industrial operations then access is not critical. If it is a stand alone facility, access routes require capacity to meet input rates, usually good quality A/B class roads or primary road network free from restrictions on HGVs. Other forms of transport such as rail are unlikely to be economically viable if input rates are less than 100,000 tonnes per year, unless the infrastructure is already in place.

Key Issues

Traffic

Like any major waste facility, small scale thermal treatment plants will be served by a significant number of HGVs. The nature and volume of vehicle movements will be determined by the volume throughput of the plant, and nature and source of the waste. Compared to large scale thermal treatment, the traffic volumes may be significantly reduced and if the plant is directly linked to an industrial operation waste import may be nil. Traffic generated may include a mixture of waste collection vehicles, bulk haulage vehicles and skip transporters.

Air Emissions

The fundamental principle of relevance when considering emissions is the conservation of mass within any process. What goes into the plant will leave the plant in one form or another. Certain organic compounds will be broken down and rendered harmless by the incineration process, and gases will be generated. Materials such as heavy metals will be retained in the bottom ash, or in the air cleaning system or emitted to atmosphere.

The principal air emission components emitted from any waste incineration process are:

- Acid gases
- Carbon dioxide

- Heavy metals
- Particulates
- Dioxins/diobenzofurans

All waste incinerator plant emissions will be regulated through the Pollution Prevention Control regime enforced by the Environment Agency. Waste incineration plants are required to operate to air emission standards set by the EC Waste Incineration Directive. The respective emission limits for each key pollutant are shown in the table below.

Emission levels set by EC Waste Incineration Directive	
Substance	EC Waste Incineration Directive (2000)
Dust	10
Total Organic Carbon	10
Hydrogen Chloride	10
Hydrogen Fluoride	1
Sulphur Oxides	50
Carbon Monoxide	50
Nitrogen Oxides	200
Metals	
Group 1: Cadmium, Thallium	0.05
Group 2: Mercury	0.05
Group 3: Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium	0.5
Dioxins and furans	0.1 ng/m^3

Notes:
(a) All concentrations are given in units of milligrams per normal cubic metre of stack gas, corrected to 11% oxygen at 273K and 101.3KPa except dioxins, which are expressed in nanograms of international toxic equivalent (I-TEQ) per normal cubic metre of stack gas.
(b) Values relate to 24 hour averages except metals which are 30 min - 8 hour and dioxins which are 6 hour – 8 hour averages.

Air emissions are also a material planning consideration and probably represent the most significant public concern issue. New proposals must include detailed assessment of emissions to air, addressing: air quality objectives, exposure to dioxins and furans and effects on health and natural environment.

Dust/Odour

Odours and dust from any mixed waste or putrescible waste facility have the potential to represent a nuisance issue with adverse impacts on residential amenity. The most significant problems with regard to odour occur when waste is allowed to decompose in anaerobic conditions. Dust is sometimes generated when waste is loaded and unloaded, and when waste is transported onto manoeuvring areas on vehicle wheels.

If facilities are badly managed, or during times of plant failure, wastes can soon start to generate odour and dust problems. At a well run facility this will not be an issue as stored waste is kept to a minimum. Odour and dust are minimised by air from the waste reception area being drawn into the facility as the primary air for the combustion process.

Storage of plant ash should be in covered containers or within the building. Delivery of air pollution control materials such as lime should be carefully supervised to prevent spillage. Such areas should also be bunded or have closed drainage to prevent contaminants entering normal surface water drainage.

Noise

The main problems associated with noise have been attributed to the following activities:

- Vehicle manoeuvring loading and unloading operations
- Induced Draft (ID) fans used to draw air into the boiler and up the stack
- Air cooled condenser units
- Steam release valves and pipe work

The process operations can be inherently noisy and most noise issues tend to be associated with a plant which is not properly serviced or commissioned.

Noise is an issue that is controlled under the PPC Regulations as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Litter

Litter is not normally a significant problem at these facilities if the whole process is contained within a single building. However where double handling of waste takes places involving transport of waste from different process operations via external haul roads, litter and detritus can present difficult management issues. Storage of waste in uncovered external containers should be avoided.

Visual Intrusion

All new built development has the potential for impact on both landscape character and visual amenity. The nature of small scale thermal treatment is that it has greater potential for integration into the existing built environment and indeed rural or semi-rural settings than large scale plants. However the issues that need to be considered are similar for both as follows:

- Direct effects on landscape fabric i.e. greenfield vs brownfield, removal of hedgerows, trees etc
- Proximity of landscape designations
- Site setting, for example the proximity of listed buildings and/or conservation areas
- Proximity of sensitive viewpoints
- Presence of existing large built structures
- Existing landform and nature of existing landscape
- Presence/absence of screening features (trees, hedges etc.)

Landscape and visual impacts are material planning considerations. A significant amount of public concern and anxiety can be generated by the proposed visual appearance of the facility. Careful site selection and appropriate orientation of the building footprint together with appropriate screening measures can help to minimise any potential adverse impact. Consideration should also be given to the opportunity for site profiling and engineering to minimise the visual impact of buildings. In some cases partial burial of certain elements of the plant may be possible. The height of the stack used for release of gaseous emissions can be a critical concern to local residents and represent a major visual impact. The frequency of a visible plume from the stack also needs to be considered.

Public Concern

Since the 1980s public concern associated with emissions from incineration plants has been growing. A number of well publicised cases have heightened peoples concerns and led to carefully targeted demonstrations by Greenpeace. As a valid planning consideration the level of concern has greatly affected the ability of industry to gain planning permissions through the Waste Planning Authority route and at appeal.

It remains to be seen whether the same level of concern will be generated in connection with proposed plants which are specifically designed to receive smaller quantities of residual waste. Many of the arguments put forward by environmental lobby groups in opposition to thermal treatment, such as plant being ‘waste hungry’ and deterring recycling etc., may have less weight when applied to small scale thermal treatment proposals.

Recent EC Directives and UK Regulations have introduced more stringent standards on emissions. If these are properly implemented and enforced then health concerns associated with emissions from thermal treatment plants will be reduced.


[Courtesy of Island Waste Services]

Isle of Wight Energy from Waste plant

Need for EIA

EIA is required to be undertaken prior to planning applications being determined on certain projects which may have significant effects on the environment. Schedule 1 of the Environmental Impact Assessment Regulations defines those projects where EIA is obligatory. This defines waste incineration under items 9 and 10 as follows:

9. **Waste disposal installations for the incineration, chemical treatment [...] or landfill of hazardous waste.**

10. **Waste disposal installations for the incineration or chemical treatment [...] of non-hazardous waste with a capacity exceeding 100 tonnes per day.**

A capacity of 100 tonnes per day equates to approximately 35,000 tonnes per year, therefore most small scale incinerators will require EIA.

Good practice dictates that EIAs should be properly scoped from the outset. The 1999 EIA Regulations introduced new provisions for Screening and Scoping which enables the applicant to obtain a Scoping Opinion from the Waste Planning Authority. It is advisable for the applicant to also undertake a separate scoping exercise to ensure that the appropriate level of engagement with relevant stakeholders is achieved at the outset of the EIA process.

It is particularly important that statutory consultees such as the Environment Agency and English Nature have the opportunity to comment on the scope and content of specific technical assessments such as the air quality impact assessment and any ecological studies that may be required.

Content of Planning Application

The content of the planning application with regard to the assessment of environmental issues will largely be guided by the scope of the EIA. Certain additional information should also be provided over and above what is generally required under the EIA Regulations. This relates in particular to aspects such as:

- Planning policy context;
- Need; and
- BPEO.

Such information can either be provided within a separate document or combined as part of the Environmental Statement. It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and where appropriate with reference to the local Waste Strategy and Waste Local Plan or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1 of this publication.

A common failing of applications is the lack of relevant information on site design and operational aspects. For example information on building materials, colour treatments, site layout, drainage and general housekeeping issues should normally be included. Such information may be difficult for applicants to procure if the development contract process has not advanced to a stage where detailed design specifications are available. Provision of certain detailed design information could be conditioned by the Waste Planning Authority (WPA) provided it was material to the planning determination process and did not represent essential information relevant to the findings of the EIA.

Where possible the PPC permit application should be submitted in parallel with the planning application. This should assist the Environment Agency in providing representations to the Waste Planning Authority on the environmental impacts of the proposal. There will always be a degree of overlap between information provided in the planning application and that contained in the permit application. This relates to issues such as air emissions, noise, general housekeeping and nuisance issues. Where applications are not submitted in parallel it is likely that applicants will need to include additional information on site design aspects in the planning application.

[Courtesy of Terence O'Rourke Ltd]

Bournemouth clinical waste incinerator

Mitigation

The key planning considerations where mitigation measures will be required will be related to the key environmental issues assessed through the EIA. Typically these relate to the main emissions from the facility and the physical appearance of the buildings. The table below identifies the key planning considerations associated with small scale thermal treatment plants and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	Deliveries of waste to the facilities are normally linked to waste collection rounds. These usually peak at certain times of the day. Mitigation measures should ensure that vehicles are routed away from inappropriate routes and sensitive residential areas and schools.	S.106 agreements can be used to secure agreement on traffic routing and input rates. They can also be used to secure appropriate improvements to highway infrastructure and for other planning gain purposes.
Air Emissions	All new waste incineration plants are required to meet the emission limits prescribed by the EC Waste Incineration Directive 2000 (see table in key issues section). Control of the main pollutants is limited by effective combustion of the waste stream at high temperature. Residence time, turbulence during the combustion process and temperature are the critical factors. Most plants can only achieve the required limits by use of proprietary air pollution control (APC) systems. These typically involve the use of wet or semi dry lime scrubbing and activated carbon injected into the flue gas up-stream of bag filters which are used to trap the pollutants.	The effect of air emissions on receptors on the ground is greatly influenced by dispersion of pollutants in the atmosphere. Air dispersion modelling will be undertaken as a part of any EIA process. Air dispersion and the location of maximum ground concentrations of pollutants is influenced by the release rate of pollutants, and effective stack height. One option for providing satisfactory air quality is to identify an optimum stack height, often using a cost-benefit evaluation. A trade off in terms of the overall visual impacts of the facility will need to be made.
Dust	Negative air pressure generated by inward flow of air over the waste reception area and waste pit minimises releases of dust.	Dust and mud on roadways can be further reduced by good site management practices, which would include periodic road cleaning/sweeping of all vehicle manoeuvring areas and site access roads.
Odour	Odour generated from the waste prior to incineration is generally contained in the same way as dust. Odour is not normally a significant issue at modern well run facilities.	In periods of high waste input, when large amounts of waste are retained in the waste reception pit, odour levels can rise. This may also occur following bank holiday periods and during plant maintenance periods. Application of chemical deodorants can be used to mitigate external impacts although retention of large volumes of waste should generally be avoided and might be conditioned.

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Noise	The standard design of the main buildings and noise reduction features on specific plant components should ensure that noise levels can be kept to acceptable levels. Appropriate site layout design and siting of particularly noisy pieces of plant such as air cooled condenser units is recommended. In particularly sensitive locations close to housing, such pieces of plant should be located as far as practicably possible from the sensitive site boundaries. If noise from vehicles is likely to be an issue, for example due to reversing horns, the operator can be required to fit smart systems which reduce the potential for nuisance.	Additional noise reduction options might include noise attenuation features within the roof and walls of the main building to reduce break out of noise. It may be possible to modify ID fans with proprietary silencing systems.
Litter	Release of litter and other detritus is generally prevented by the inward air flow and the use of automatic doors.	If processed waste in a combined facility is double handled, care needs to be taken to avoid litter spills. Litter can be very difficult to remove from grassed areas and may lead to the impression of bad housekeeping. If the plant design suggests that litter spills might occur, peripheral grassed areas should generally be avoided if this does not compromise the overall site landscaping requirements.
Visual Intrusion	Buildings will normally be constructed from standard industrial steel portal frame clad with profiled steel. See photograph of materials recovery and energy centre opposite. Design should reflect style and treatment of existing built development.	Main boiler building and reception hall can be partially buried below ground by use of land engineering techniques. The stack can be disguised by use of architectural embellishment. If plume visibility is a particular problem this can be overcome by adjustment of the flue gas temperature

Case Examples

Integrated Waste Management Facility, Stallingborough, NE Lincolnshire

The facility at Stallingborough forms part of the integrated waste contract for North East Lincolnshire which is being delivered by NEWLINCS Development Limited. The facility, which is currently under development, will contain a range of waste processing operations including green waste composting, recyclables bulking and baling and an Energy from Waste plant. It is anticipated that the facility will become operational in early 2004.

The thermal treatment facility will include an oscillating kiln combustion unit. This is essentially a steel tube tapered at one end which is 10 metres in length and 3 metres in diameter. The horizontal or slightly inclined orientation of the kiln allows the overall building height to be reduced compared with most large scale moving grate systems. The kiln manufacturers claim that this type of facility enables very efficient combustion at temperatures around 1100°C. Good waste mixing is achieved as air is injected around the combustion chamber and the chamber oscillates to maintain good waste mixing conditions.

A relatively standard flue gas treatment system is included in the design which involves the use of activated carbon and lime with flue gases being passed through bag filters before exit from the stack.

[Courtesy of Enviros Consulting]

Facility during final stages of construction – September 2003

Key Planning Features

Location:	Stallingborough, near Grimsby
Setting:	Industrial/Rural Fringe
Waste Types:	Residual Mixed Waste following separation of recyclables
Waste Volume:	56,000 tonnes per year
Energy Generation:	2.9 MW (electricity exported) 3 MW (heat exported)
Site Area:	4 ha
Building Footprint:	82 m × 43 m (max) (Energy from Waste building only)
Stack Height:	55 m
Design Features:	Standard industrial design

Neath Port Talbot, Materials Recovery & Energy Centre

This is an integrated waste facility which includes materials recovery, composting, refuse derived fuel plant and thermal treatment. The facility became fully operational in late 2002.

The facility as a whole has been designed to accept 126,000 tonnes of unsorted ‘black bag’ waste and 40,000 tonnes of non-household municipal solid waste per annum. Of this the thermal treatment plant will process around 50,000 tonnes of pelletised fuel. There are two furnaces which can burn 7 tonnes per hour. These generate steam which is passed to a 4 MW turbine. It is planned to export 2 MW to the national grid the remainder will be used in the operation of the plant.

[Courtesy of HLC Neath Port Talbot Ltd]

Neath Port Talbot Materials Recovery & Energy Centre

This facility is one of the first of its kind in the UK which provides a series of waste processing operations on one site. A number of similar facilities are the subject of existing planning applications or are planned as part of integrated waste strategies and contracts.

Key Planning Features

Location:	Crymlyn Burrows, between Port Talbot and Swansea
Setting:	Industrial, Urban (400 m to nearest housing)
Waste Types:	Pelletised RDF following separation of recyclables and organics for composting
Waste Volume:	50,000 tonnes per year (thermal treatment only)
Energy Generation:	4 MW
Site Area:	5.4 ha
Building Footprint:	2 ha
Stack Height:	40 m
Design Features:	Elongated building design with waste moving through from one end to the other: Waste reception hall > materials recovery > refuse derived fuel plant > composting > thermal treatment

Future Issues

In those parts of the country that have historically relied upon landfill as the main method of waste disposal, small scale thermal treatment represents a realistic option that is being given careful consideration by many Waste Disposal Authorities.

The trend is towards the use of small scale thermal options in conjunction with pre-treatment processes.

Although authorities are under significant pressure to maximise recycling and composting through local authority 'best value' targets, the necessary landfill diversion targets will not be achieved through this alone. A significant amount of residual waste will remain requiring treatment.

[Courtesy of HLC Neath Port Talbot Ltd]

Boiler unit in small scale thermal treatment plant

For many rural authorities the smaller scale thermal treatment option (including pyrolysis and gasification plants) offers a waste management option which is more likely to be accepted politically and by local residents. It also offers the potential for integration within the context of existing small scale industrial and business use settings which may not be afforded by large scale thermal treatment.

One problem that faces this part of the industry is the difficulties involved in securing the necessary contract and funding. Unlike many larger scale thermal options, small scale technologies do not have the same proven track record. Although the technologies available are often tried and tested in other industrial contexts, few examples exist in the UK today which receive municipal waste as the principal fuel. There are many more examples in mainland Europe especially in Scandinavia and France.

It remains to be seen whether the main environmental lobby groups which have objected to incineration in recent years will also present a similar case in opposition to smaller scale thermal options. The arguments put forward by lobby groups relate to poor emission standards and the assertion that large incineration proposals discourage the promotion of waste management options at the top end of the 'Waste Hierarchy'. The scale issue may well reduce the weight of this argument when applied to plants with a throughput of less than 100,000 tonnes per year.

As result of enforcement of the Waste Incineration Directive emission standards, the environmental concerns associated with thermal treatment options are expected to decrease over time. Proactive planning for new facilities through the development plan system should provide future opportunities for developers currently frustrated by a lack of political support.


[Courtesy of Island Waste Services]

Pelletised refuse derived fuel

Thermal treatment of whatever scale remains an efficient way of ultimately reducing the volume of waste and hence the need for transport to additional downstream processing operations. It does not represent a once and for all solution but is likely to have a role, or should be considered for a role in most sustainable integrated waste strategies.

Further Reading

- Municipal Waste Incineration. The Environment Agency's Approach (email enquiries@environment-agency.gov.uk for copies).

- Guidance on Directive 2000/76/EC on the Incineration of Waste www.defra.gov.uk/environment/waste

- Public Acceptability of Incineration, National Society for Clean Air, June 2001 (available from www.nsca.org.uk)

7 Large scale thermal treatment

What is it?

Large scale thermal treatment plants are typically characterised by large building designs, which are often located in or near urban areas, receiving between 90,000 and 600,000 + tonnes of waste per year. In land use planning terms a distinction can be drawn between plants that are designed to handle large volumes of mixed waste following the ‘mass burn’ approach and smaller scale facilities often designed to receive a specific component of the waste stream using different process technologies. See Profile 6 – Small scale thermal treatment for details of smaller facilities.

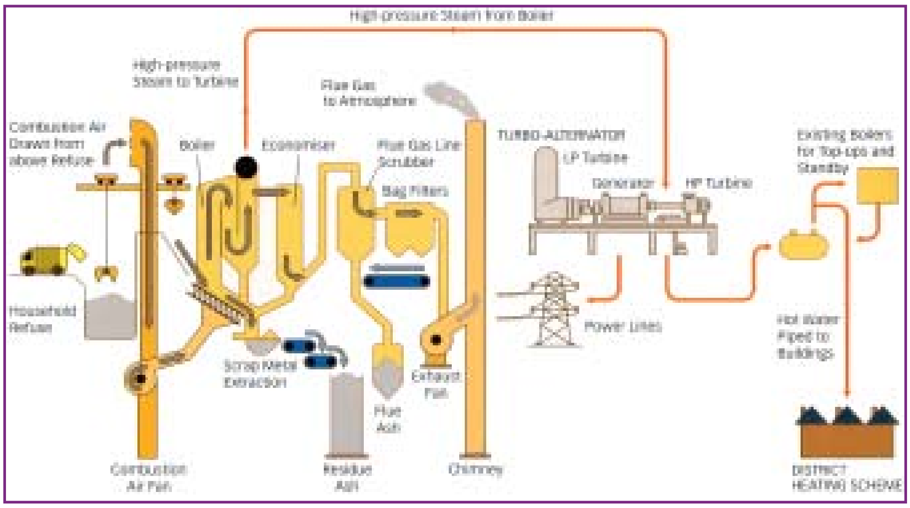
Examples of this scale of plant operating in the UK are:

- Billingham, Teeside
- Bolton, Lancashire
- Coventry, W. Mids
- Dudley, W. Mids
- Dundee, Scotland
- Edmonton, London
- Kirklees, Huddersfield
- Nottingham
- SELCHP, London
- Sheffield
- Stoke
- Tyseley, Birmingham
- Wolverhampton

Large scale thermal treatment plants are designed to burn waste as efficiently as possible, usually recovering energy. Waste is burnt under controlled conditions and at high temperatures. Heat released from the combustion of this waste is recovered and used to generate electricity and/or to provide steam or hot water. The volume of waste needing disposal following large scale thermal treatment is reduced by approximately 90%, reducing the need for landfill.

The resultant output of a thermal treatment plant is ash, which is far more stable than the municipal solid waste (MSW) input, mainly due to the oxidation of the organic component of the waste stream.

The basic components of the process are illustrated in the diagram overleaf.



Components of a typical mass burn Waste to Energy plant[1]

[Courtesy of Enviros Consulting]

Tyseley, Birmingham

The majority of plants use an inclined moving (or reciprocating) grate design. Mixed waste is delivered into a reception hall or tipping bunker, then fed into a furnace feed hopper, usually by a mechanical grab to ensure an even input. The waste falls onto the moving grate system, which keeps it travelling down a slope (incline) through the furnace as it burns.

All combustible material is burnt and the unburned residue – bottom ash – is deposited into a quench tank. Primary air is pumped through from under the grate to aid combustion, whilst secondary air is delivered over the fire to enable good combustion in the gas phase.

The hot gases from the combustion chamber are directed to a boiler, where heat is recovered as superheated steam through a series of heat exchangers. Approximately 2,000 kilowatt hours of heat per tonne of waste can be recovered, of which 90% is available for export once a certain fraction has been used for running the plant. In terms of electricity generation, for every 100,000 tonnes of waste approximately 7 megawatts (MW) of electricity can be exported to the national grid, enough to meet the needs of about 11,000 homes[1].

Fluidised bed incinerators use a combustion chamber containing a fluidised bed in place of a moving grate, which is created by air being forced up through a bed of inert material, for example sand, into which the waste is introduced. Because turbulence is created in the waste, this design generally enables more complete combustion of waste. It is also claimed that the lack of moving parts leads to fewer mechanical problems. Unlike ‘mass burn’ facilities fluidised bed plants generally require some form of pre-processing of waste to produce a

[1] ETSU/DTI (1998) An Introduction to Household Waste Management

refuse derived fuel (RDF). The only operational fluidised bed facility in the UK is at Dundee, although a new facility proposed at Allington in Kent has planning permission and recently received its PPC permit.

Most modern large scale plants are either fully or semi automated using state of the art computerised control systems. There is often a control room sited above the tipping hall to monitor the loading of the feed hopper and from where the waste feed grabs can be operated. Air emissions and plant performance parameters are usually continuously monitored with real time outputs displayed on computer screens in the control room. Although not commonplace at present it is likely that plants may be required to be linked directly to Environment Agency offices in order that compliance with emission limits can be more closely monitored.

Siting and Scale

The economics of Energy from Waste facilities such as large scale thermal treatment plants depend greatly on scale of operation. Historically it has been assumed that plants with a throughput of less than 200,000 tonnes of waste per year were uneconomic to operate under prevailing gate fee conditions and electricity prices. With recent fiscal changes such as the Landfill Tax this situation has changed. However there remain economies of scale which generally make larger plants more cost effective to develop and operate than smaller plants. In the past there was little or no incentive for facilities to undertake any pre-processing of waste prior to its incineration. The systems were therefore designed to be extremely robust and capable of handling a wide range of articles in the waste stream.

Large scale thermal treatment plants, by their very nature, are large buildings requiring large sites. Energy from waste plants with a throughput of 400,000 tonnes per year typically have a land-take of five hectares. Except for certain heavy industrial areas, plants of this scale will not blend in with surrounding development due primarily to the size of the stack and boiler house elements of the plant. Such facilities would not normally be compatible with a hi-tech business park environment or a rural/semi rural setting. If such proposals are put forward in areas where no existing large built structures are present, it would normally be necessary to apply different design benchmarks where the building will be seen as a prominent landmark feature.

A number of recent planning appeal cases have demonstrated the significance of careful siting and design as a material planning consideration that can be critical to determining whether a proposal gains permission or not. Development plans should, where possible, encourage such facilities in localities which are as close as possible to the source of waste arisings in order to minimise transport. Proposals which seek to utilise sites which offer the potential for combined heat and power (CHP) and export of energy to businesses which would otherwise use fossil fuel sources should be encouraged. This is also a requirement of the EC Waste Incineration Directive (2000/76/EC).

Physical & Operational Characteristics [250,000 tonnes per year plant]

Expected Lifetime of Facility:	20–25 years
Operational Hours:	24 hours, 7 days per week
Typical Site Area:	2–5 ha
Building Footprint:	120 m × 60 m
Building Height:	25–30 m
Stack Height:	60–80 m (1)
Vehicle Movements:	Approx 50 waste collection vehicles or equivalent per day. Smaller numbers if via bulking transfer station
Employment:	Site Manager, Assistant Manager plus 10 on three shift system
Waste Storage	No storage outside main reception pit if via waste collection vehicles. Possible in sealed skips/containers if double handling system employed
Chemical Storage	Lime; activated carbon; ammonia/urea
Ash Storage	Bottom Ash – 30% by weight; 10% by volume Air Pollution Control Ash – 4% by weight

Note 1: The height of the stack is determined by factors relating to the process design and in particular air dispersion modelling

Scoping Matrix: Large scale thermal treatment

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, Traffic and Access	■	■	■	●	▲	▲	■
Air Emissions (including dust)	■	▲	■	▲	●	■	■
Odours	●	▲	▲	▲	●	▲	●
Vermin and Birds	●	●	●	●	●	■	●
Noise / Vibration	■	■	■	▲	▲	▲	■
Litter	●	●	●	●	●	▲	●
Water Resources	■	●	●	●	●	▲	▲
Land Stability	▲	●	●	●	●	●	▲
Visual Intrusion	▲	▲	■	●	▲	●	▲
Nature and Archaeological Conservation	■	●	●	●	●	▲	▲
Historic (Built) Environment	▲	▲	●	●	●	▲	▲
Potential Land Use Conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 250,000 tonnes per annum

Waste stream: mixed or residual municipal waste.

The matrix has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

General siting criteria

Existing landuse: Preference should be given to areas allocated for business use or in traditional commercial industrial urban areas. Compatible with the more intensive Class B1/B2 activities under the Use Classes Order. Existing waste sites should also be considered.

Proximity to sensitive receptors: Where possible facilities should be located at least 250 metres from sensitive properties.

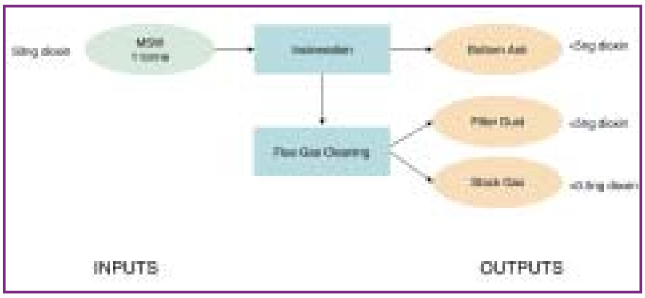
Transport infrastructure: Requires good access from primary road network and access roads which are free from restrictions for HGVs. Consideration should be given to sites which offer the potential for rail transfer.

Key Issues

Traffic

Like any major waste facility, large scale thermal treatment plants will be served by a significant number of HGVs. The nature and volume of vehicle movements will be determined by the volume throughput of the plant, and nature and source of the waste. Traffic generated may include a mixture of waste collection vehicles, bulk haulage vehicles and skip transporters.

Air Emissions



Dioxin balance for MSW incineration[2]

The fundamental principle of relevance when considering emissions is the conservation of mass within any process. What goes into the plant will leave the plant in one form or another. Certain organic compounds will be broken down and rendered harmless by the incineration process, and gases will be generated. Materials such as heavy metals will be retained in the bottom ash, in the air cleaning system or emitted into the atmosphere.

The principal air emissions components emitted from any waste incineration process are:

- Acid gases
- Heavy metals
- Dioxins/diobenzofurans
- Carbon dioxide
- Particulates

[2] Vogg, H (1992). Annual European Technology Forum, Copenhagen.

All waste incinerator plant emissions will be regulated through the Integrated Pollution Prevention Control regime enforced by the Environment Agency. New waste incineration plants are required to operate to air emission standards set out in the EC Waste Incineration Directive. The respective emission limits for each key pollutant are shown in the following table.

Emission levels set by EC Waste Incineration Directive	
Substance	EC Waste Incineration Directive (2000)
Dust	10
Total Organic Carbon	10
Hydrogen Chloride	10
Hydrogen Fluoride	1
Sulphur Oxides	50
Nitrogen oxides	200
Metals	
Group 1: Cadmium, Thallium	0.05
Group 2: Mercury	0.05
Group 3: Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium	0.5
Dioxins and furans	0.1 ng/m^3

Notes:
(a) All concentrations are given in units of milligrams per normal cubic metre of stack gas, corrected to 11% oxygen at 273K and 101.3KPa except dioxins, which are expressed in nanograms of international toxic equivalent (I-TEQ) per normal cubic metre of stack gas.
(b) Values relate to 24 hour averages except metals which are 30 min – 8 hour and dioxins which are 6 hour – 8 hour averages.

Air emissions are also a material planning consideration and probably represent the most significant public concern issue. New proposals must include detailed assessment of emissions to air addressing: air quality objectives, exposure to dioxins and furans and effects on health and natural environment.

Dust/Odour

Odours and dust from any mixed waste or putrescible waste facility has the potential to represent a nuisance issue with adverse impacts on residential amenity. The most significant problems with regard to odour occur when waste is allowed to decompose in anaerobic conditions. Dust is sometimes generated when waste is loaded and unloaded, and when waste is transported onto manoeuvring areas on vehicle wheels.


[Courtesy of Martin Engineering Systems]

Tipping Hall

If facilities are badly managed, or during times of plant failure, wastes can soon start to generate odour and dust problems. At a well run facility this will not be an issue as stored waste is kept to a minimum. Odour and dust are normally minimised by air from the waste reception area being drawn into the facility as the primary air for the combustion process.

Storage of plant ash should be in covered containers or within the building. Delivery of air pollution control materials such as lime should be carefully supervised and controlled to prevent spillage and displaced air returned to the vehicle or fed to the boiler. Such areas should also be bunded or have closed drainage to prevent contaminants entering normal surface water drainage.

Noise

The main problems associated with noise have been attributed to the following activities:

- Vehicle manoeuvring, loading and unloading operations
- Induced Draft (ID) fans used to draw air into the boiler and up the stack
- The air cooled condenser units
- Steam release valves and pipe work

The process operations can be inherently noisy and most noise issues tend to be associated with plant which is not properly serviced or commissioned. Noise from normal plant operations should be controlled to acceptable levels by careful building design.

Noise is an issue that is controlled under the PPC Regulation as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Visual Intrusion

The inherent nature of a large built development of this nature means that there is the potential for significant impacts on both landscape character and visual amenity. The significance of any landscape and visual impact is dependent upon a number of site specific issues such as:

- Direct effects on landscape fabric i.e. greenfield vs brownfield, removal of hedgerows, trees etc

- Proximity of landscape designations
- Site setting, for example the proximity of listed buildings and/or conservation areas
- Proximity of sensitive viewpoints
- Presence of existing large built structures
- Existing landform and nature of existing landscape
- Presence/absence of screening features (trees, hedges etc.)

Landscape and visual impacts are material planning considerations. A significant amount of public concern and anxiety can be generated by the proposed visual appearance of the facility. Careful site selection and appropriate orientation of the building footprint together with appropriate screening measures can help to minimise any potential adverse impact. Consideration should also be given to the opportunity for site profiling and engineering to minimise the visual appearance of the building. In some instance partial burial of certain elements of the plant may be possible. The height of the stack used for release of gaseous emissions can be a critical concern to local residents and represent a major visual impact. The frequency of a visible plume from the stack also needs to be considered.

Litter

Litter is not normally a significant problem at these facilities if the whole process is contained within a single building. However where double handling of waste takes place involving transport of waste from different process operations via external haul roads, litter and detritus can present difficult management issues. Storage of waste in uncovered external containers should be avoided.

Public Concern

Since the 1980s public concern associated with emissions from incineration plants has been growing. This has been mirrored in recent years by the introduction of more stringent standards through new EC Directives. A number of well publicised cases have heightened peoples concerns and led to carefully targeted demonstrations by pressure groups such as Greenpeace.

A number of planning appeal precedents in the waste industry have established that public concern is a material planning consideration and should be given due weighting in the determination of planning applications.

Very stringent pollution control requirements imposed by the Waste Incineration Directive and IPPC Regulations require that all new and existing plants operate to extremely high standards.

Need for EIA

Environmental Impact Assessment (EIA) is required to be undertaken prior to planning applications being granted on certain projects which may have significant effects on the environment. Schedule 1 of the Environmental Impact Assessment Regulations defines those projects where EIA is obligatory. This defines waste incineration under items 9 and 10 as follows:

9. **Waste disposal installations for the incineration, chemical treatment [...] or landfill of hazardous waste.**

10. **Waste disposal installations for the incineration or chemical treatment [...] of non-hazardous waste with a capacity exceeding 100 tonnes per day.**

A capacity of 100 tonnes per day equates to approximately 35,000 tonnes per year, therefore all new large scale incinerators will require EIA.


[Courtesy of Enviros Consulting]
SELCHP, Lewisham

Good practice dictates that EIAs should be properly scoped from the outset. The 1999 EIA Regulations introduced new provisions for screening and scoping which enables the applicant to obtain a Scoping Opinion from the Waste Planning Authority. It is advisable for the applicant to also undertake a separate scoping exercise to ensure that the appropriate level of engagement with relevant stakeholders is achieved at the outset of the EIA process.

It is particularly important that statutory consultees such as the Environment Agency and English Nature have the opportunity to comment on the scope and content of specific technical assessment such as the air quality impact assessment and any ecological studies that may be required.

Content of Planning Application

The content of the planning application with regard to the assessment of environmental issues will largely be guided by the scope of the EIA. Certain additional information should also be provided over and above what is generally required under the EIA Regulations. This relates in particular to aspects such as:

- Planning policy context;
- Need; and
- BPEO.

Such information can either be provided within a separate document or combined as part of the Environmental Statement. It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and where appropriate with reference to the local Waste Strategy and Waste Local Plan or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1 of this publication.

It appears from research that a common failing of applications is the lack of relevant information on site design and operational aspects. For example information on building materials, colour treatments, site layout, drainage and general housekeeping issues should normally be included. Such information may be difficult for applicants to procure if the development contract process has not advanced to a stage where detailed design specifications are available. Provision of certain detailed design information could be conditioned by the Waste Planning Authority (WPA) provided it was material to the planning determination process and did not represent essential information relevant to the findings of the EIA.

Where possible the PPC permit application should be submitted in parallel with the planning application. This should assist the Environment Agency in providing representations to the Waste Planning Authority on the environmental impacts of the proposal. There will always be a degree of overlap between information provided in the planning application and that contained within the permit application. This relates to issues such as air emissions, noise, general housekeeping and nuisance issues. Where applications are not submitted in parallel it is likely that applicants will need to include additional information on site design aspects in the planning application.

Mitigation

The key planning considerations where mitigation measures will be required will be related to the key environmental issues assessed through the EIA. Typically these relate to the main emissions from the facility and the physical appearance of the buildings. The table below identifies the key planning considerations associated with large scale thermal treatment plants and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

[Courtesy of Mike Brown, County Environmental Services]

Vienna combined heat and power plant

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	Deliveries of waste to the facilities are normally linked to waste collection rounds. These usually peak at certain times of the day. The traffic impact assessment undertaken as part of the EIA should recommend that vehicles are re-routed away from inappropriate roads and sensitive residential areas and schools.	S.106 agreements can be used to secure agreement on traffic routing and input rates. They can also be used to secure appropriate improvements to highway infrastructure and for other planning gain purposes.
Air Emissions	All new waste incineration plants are required to meet the emission limited prescribed by the EC Waste Incineration Directive 2000 (see table in key issues section). Primary control of the main pollutants is provided by effective combustion of the waste stream at high temperature. Residence time, turbulence during the combustion process and temperature are the critical factors. All plants can only achieve the required limits by use of proprietary air pollution control (APC) systems. These typically involve the use of lime scrubbing and injection of activated carbon injected into the flue gas up-stream of bag filters which are used to trap the pollutants.	The effect of air emissions on receptors on the ground is greatly influenced by dispersion of pollutants in the atmosphere. Air dispersion modelling will be undertaken as apart of any EIA process. Air dispersion and the location of maximum ground concentrations of pollutants is influenced by the release rate of pollutants, and effective stack height. One option for providing satisfactory air quality is to identify an optimum stack height, often using a cost-benefit evaluation. A trade off in terms of the overall visual impacts of the facility will need to be made.
Dust	Negative air pressure generated by inward flow of air over the waste reception area and waste pit minimises releases of dust.	Dust and mud on roadways can be further reduced by good site management practices, which would include periodic road cleaning / sweeping of all vehicle manoeuvring areas and site access roads.

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Odour	Odour generated from the waste prior to incineration is generally contained in the same way as dust. Odour is not normally a significant issue at modern well run facilities.	In periods of high waste input, when large amounts of waste are retained in the waste reception pit, odour levels can rise. This may also occur following bank holiday periods and during plant maintenance periods. Application of chemical deodorants can be used to mitigate external impacts, although retention of large volumes of waste should generally be avoided and might be conditioned.
Noise	The standard design of the main buildings and noise reduction features on specific plant components should ensure that noise levels can be kept to acceptable levels. Appropriate site layout design and siting of particularly noisy pieces of plant such as air cooled condenser units is recommended. In particularly sensitive locations close to housing, such pieces of plant should be located as far as practicably possible from the sensitive site boundaries. If noise from vehicles is likely to be an issue, for example due to reversing horns, the operator can be required to fit smart systems which reduce the potential for nuisance.	Additional noise reduction options might include noise attenuation features within the roof and walls of the main building to reduce break out of noise. It may be possible to modify ID fans with proprietary silencing systems.
Litter	Release of litter and other detritus is generally prevented by the inward air flow (produced by negative pressure) and the use of automatic doors.	If processed waste in a combined facility is double handled, care needs to be taken to avoid litter spills. Litter can be very difficult to remove from grassed area if released and lead to a general bad site appearance. If the plant design suggests that litter spills might occur then peripheral grassed areas should generally be avoided if this does not compromise the overall site landscaping requirements.
Visual Intrusion	Normally constructed of standard steel portal frame and concrete. Often limited architectural enhancement and detail applied such as colour treatment.	If the site is prominent and visually sensitive, the applicant should consider overall design concept as a landmark building and be sensitive to the local architectural vernacular. Main boiler building and reception hall can be partially buried below ground by use of land engineering techniques. The stack can be disguised by use of architectural embellishment, e.g. Waste to Energy plant in Vienna (see illustration overleaf). If plume visibility is a particular problem, this can be overcome by adjustment to the flue gas temperature and efflux velocity.
Note: Most modern plants operate a ISO9000 quality system and an ISO14000 environmental management system which seeks continuous improvement of environmental performance.		

Case Examples

Chineham Energy Recovery Facility, Basingstoke

This facility at Chineham was granted planning permission in 2000 and is currently going through plant commissioning. It forms part of Hampshire County Council's Project Integra, a 25 year waste contract to implement the County's integrated waste management strategy. This involves the development of various waste facilities including three 'Energy Recovery Incinerators'. The plant at Chineham was the first to gain planning permission and is being developed by Hampshire Waste Services Ltd, a subsidiary of Onyx Group.

[Courtesy of Hampshire Waste Services]

Aerial view of Chineham energy recovery facility

The plant is located on the site of an old waste incinerator which closed in 1996 and was demolished in 2000. Unusually for a thermal treatment facility, the plant is in a semi rural location on the north-east side of Basingstoke. Compared with many other thermal treatment proposals in other parts of the country, the proposals at Chineham received only limited objection from local residents and planning permission was obtained without the need to go to appeal. A similar example is the new Waste to Energy plant in Huddersfield operated by Kirklees Waste Services Ltd (part of SITA UK). This is also located on the site of an earlier incinerator.

The plant has a patented MARTIN grate system which has been used in 200 plants worldwide and is installed in several existing plants in the UK, including Stoke and Wolverhampton. The Chineham plant officially opened in September 2003. It will receive residual municipal wastes from Basingstoke and the North Hampshire area.

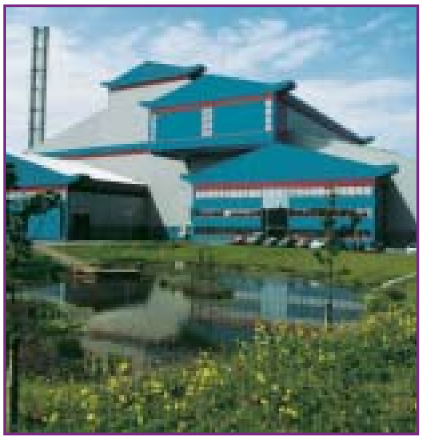
Key Planning Features

Location:	Chineham near Basingstoke
Setting:	Rural/Urban Fringe
Waste Types:	Residual Mixed Waste following separation of recyclables
Waste Volume:	90,000 tonnes per year
Energy Generation:	7 MW
Site Area:	1.7 ha
Building Footprint:	130 m × 45 m
Stack Height:	65 metres
Design Features:	Architect designed plant adjacent to sewage treatment works

Billingham, Teeside

The plant was commissioned in 1997 and is operated by Cleveland Waste Management Ltd (part of SITA UK). The plant includes an established moving grate system manufactured by Volund. It has two incineration lines, each having a waste throughput of 20 tonnes per hour. Industry standard air abatement systems are used to reduce acid gases, heavy metals and dioxins.

[Courtesy of SITA UK]



View of Billingham plant showing pond feature in foreground and architectural embellishment on main plant building

An average of 150 vehicles per day discharge household waste collected from the local area into the waste reception bunker. This can hold 4,000 tonnes of waste which is equivalent to the amount produced in Teeside every week. Water sprays and air induction fans minimise levels of dust and odour from the bunker. A crane grab is used to mix the waste and feed it into the feed hoppers. All operations are controlled from a central control room where information is continually monitored by computer and visual inspections.

The building was architect designed with imaginative use of colour and design features. This has led the way for recent designs and a move away from the more traditional 'box' like engineered structures to more interesting designs (e.g. Colnbrook, see photograph overleaf). Adjacent to the main plant is an ash recycling facility. In 2002, 66,000 tonnes of incinerator bottom ash was produced and recycled for use in the construction industry.

Key Planning Features

Location:	Billingham, Teeside
Setting:	Industrial
Waste Types:	Residual Mixed Waste following separation of recyclables
Waste Volume:	250,000 tonnes per year
Energy Generation:	20 MW
Site Area:	4 ha
Building Footprint:	110 m × 60 m × 40 m
Stack Height:	70 metres
Design Features:	Architect designed superstructure, area around the plant includes a wetland/wildlife pond

Future Issues

In recent years waste incinerators using traditional 'mass burn' process techniques have received a significant amount of opposition. The arguments put forward by lobby groups relate to poor emission standards and the assertion that large 'mass burn' proposals discourage the promotion of waste management options at the top end of the 'Waste Hierarchy'. The exclusion of traditional incineration techniques from the new Renewables Obligation is also a further disincentive for developers.

As landfill tax rates continue to rise, so smaller scale and more advanced thermal options are likely to become more economically viable to the waste industry and more attractive to Waste Disposal Authorities. Despite the obvious difficulties however there remain a number of distinct advantages of this type of facility. Most significant is the level of practical experience and proven reliability. Large Scale Incineration remains an efficient way of reducing the volume of waste and hence the need for transport and disposal.

[Courtesy of Grundon Waste Management Ltd]

Proposed plant at Colnbrook, Berkshire

The application of the concept of Best Practicable Environmental Option (BPEO) to new waste proposals and in particular large scale thermal treatment proposals will continue to be a material issue for waste planning professionals in the future. The concept of BPEO was originally developed as a tool for use in the consideration of alternative options as a planning aid. In the context of waste it has had wide useage in the formulation of waste management strategies. However, reference to it in PPG 10 has led to its wider use in the development control of new waste facilities. This has been further reinforced by waste related appeal decisions.

The use of BPEO in the context of development control is discussed further in Part 1 of this publication. It is likely that the eventual successor to PPG 10 will provide further clarity on the use of BPEO in this context.

It is probable that in the future large facilities will be designed specifically to accept waste residues that have been subjected to pre-processing. In the short to medium term, in order for the UK to meet EC landfill diversion targets, it is likely that large scale plants still have a future. In the longer term the future is more uncertain. Certain economies of scale may favour larger plants as the main thermal treatment solution in the main urban areas. In rural areas and areas of dispersed population centres the proximity principle and relative costs of wastes transport is likely encourage smaller facilities. A smaller scale of built development in such areas is likely to better suit the architectural vernacular and be more acceptable to local residents.

[Courtesy of Kirklees Waste Services]

Predictive illustration of proposed Kirklees Waste to Energy plant, prior to development

[Courtesy of Enviros Consulting]

Actual view of Kirklees Waste to Energy plant

As a result of enforcement of the Waste Incineration Directive emission standards, the environmental concerns associated with thermal treatment options are expected to decrease over time. Proactive planning for new facilities through the development plan system should provide future opportunities for developers currently frustrated by the level of opposition from environmental lobby groups and lack of political support.

Thermal treatment of whatever scale is likely to continue to be a valid option for the treatment of residual wastes following recycling/recovery. It does not represent a once and for all solution but has a role in most sustainable integrated waste strategies.

Further Reading

- Municipal Waste Incineration. The Environment Agency's Approach (email enquiries@environment-agency.gov.uk for copies).

- Guidance on Directive 2000/76/EC on the Incineration of Waste www.defra.gov.uk/environment/waste

- Public Acceptability of Incineration, National Society for Clean Air, June 2001 (available from www.nsca.org.uk)

8 Landfill

What is it?

Landfill, or land-raise sites are currently the primary disposal route for all wastes in the UK, accounting for around 80% of the country's waste stream. The term landfill relates to waste disposal mainly below ground level whereas landraise, also generically referred to as landfill, refers to waste disposal mainly above pre-existing ground levels. Most types of waste may be disposed of via landfill, however, the landfill route is currently being discouraged both through the EC Landfill Directive, and UK Landfill Regulations in order to encourage more sustainable waste management practices such as minimisation, re-use, recycling and energy recovery. Nevertheless, in the foreseeable future, landfill will still be required to dispose of the residues of other waste management operations such as incinerator ashes and materials recovery facility (MRF) rejects etc.

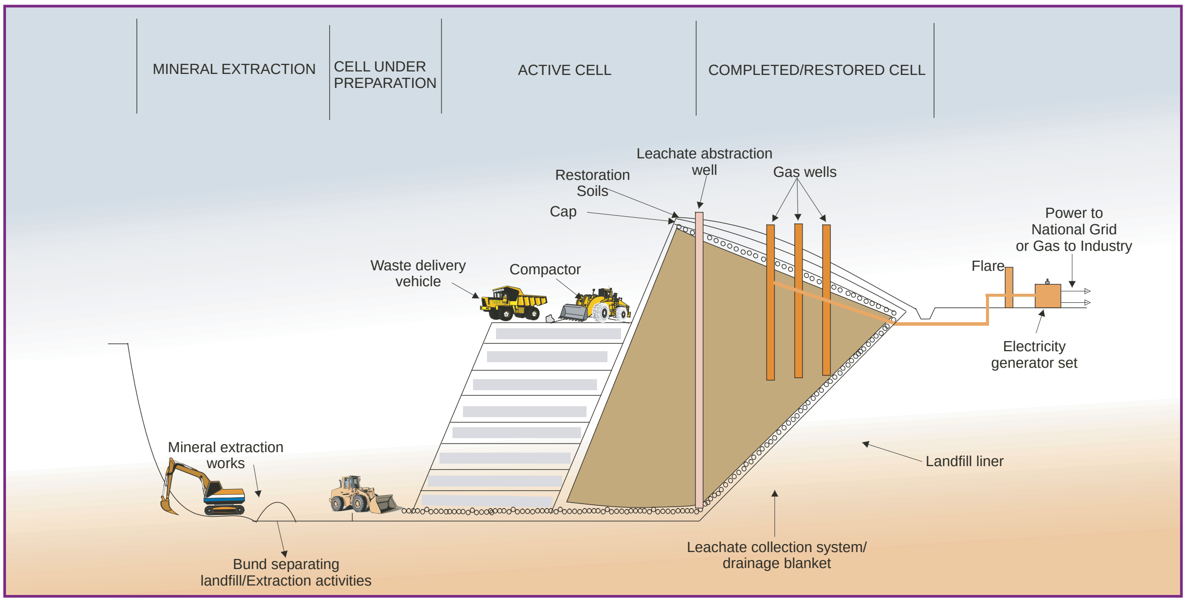
Landfill sites can range in size from just a few hectares (Ha) to over 100 Ha and can receive inert, non-hazardous (including municipal solid waste (MSW)) or hazardous wastes. Similarly, waste throughputs can vary widely between sites with some receiving as little as 10,000 tpa whilst major sites may receive over 1,000,000 tpa.

Examples of particularly large landfills in England include:

- Pitsea, Cleanaway Ltd, Essex
- Mucking, Cory Environmental Ltd, Essex
- Calvert, Shanks Waste Services Ltd, Buckinghamshire
- Pilsworth, Viridor Waste Management Ltd, Manchester
- Packington, SITA, Birmingham

A common misconception is that landfills are simply holes in the ground into which waste is tipped. However, modern landfill practice requires a significant degree of engineering in order to contain the waste, control emissions and minimise potential environmental effects. The primary by-products of landfilling, where biodegradable materials are disposed of, are: landfill gas – (a combination of methane - CH_4, and carbon dioxide – CO_2, along with trace organics); and leachate (a liquor resulting from water passing through, the waste mass) and much landfill engineering is geared towards dealing with these substances. As such, landfills require containment lining systems and abstraction systems for both leachate and landfill gas.

[Courtesy of Enviros Consulting]



Schematic representation of a typical landfill engineering design

[Courtesy of Enviros Consulting]

Liner preparation

The majority of landfills are operated on a phased cell system whereby, as one cell is being filled, another is being prepared, and another is being completed/ restored (usually to an agricultural, amenity or nature conservation after-use). Waste is tipped by incoming transfer/collection vehicles at a designated 'working face' on the cell where active disposal is taking place. The waste is then spread out and compacted, by a purpose built compactor in a series of layers, or 'lifts', such that void use is minimised. At the end of the working day the final lift is often covered by 'daily cover' usually consisting of soil, or another inert material, to reduce odour, litter spread and access to the waste by birds and vermin.

Siting and Scale

Landfill sites have to be sited where an existing void is available, such as in existing mineral workings, or in areas where suitable material may be excavated either for commercial sale or to provide engineering material for the landfill itself. The location of **land-raise** sites, however, is less limited and may include derelict land, extensions to existing landfills and even greenfield sites. Indeed, some of the largest landfills are land-raise sites, such as those in Essex which lie on marshland in the Thames estuary where Victorian dumps have been extended and remained in use over decades. Given the requirement either for mineral void or disused/marginal land, or issues relating to potential amenity concerns landfill sites tend to be located in rural areas.

Timescales for landfill are directly linked to the void available and input rates. The predicted closure dates for landfill may vary as input rates change. With diversion away from landfill the lifetime of sites is likely to extend on average and the total number of landfills will also reduce.

General Siting Criteria

Existing landuse: Preference should be given to areas allocated for minerals/waste uses such as brownfield, contaminated or despoiled land. Existing waste sites should also be considered. Greenbelt land may be suitable for waste management purposes, subject to planning control.

Proximity to sensitive receptors: Sites close to housing, commercial or recreational areas etc. should generally be avoided where possible unless risk assessment suggests that any impacts would be acceptable. However, scale and improved environmental performance standards should enable a reasonable case for some sites to be located relatively close to such receptors. Areas overlying major aquifers or close to potable waters should also be avoided unless significant buffer zones/intervening impermeable geology or improved containment is available. Specific guidance has been issued by the Environment Agency[1] which deals with the locational aspects of landfill in terms of Groundwater Protection.

Transport infrastructure: Access routes require capacity to meet input rates. Usually good quality A/B class roads, or a primary road network free from restrictions on HGVs. Other forms of transport such as rail are unlikely to be economically viable for input rates less than 100,000 tonnes per year, unless infrastructure is already in place. In estuary locations barges are sometimes used for waste transport.

[Courtesy of Enviros Consulting]

A compactor at work

The matrix overleaf has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – assuming what may be possible without full mitigation or where management practices fail.

[1] Environment Agency; December 2002. Regulatory Guidance Note 3. Groundwater Protection: Locational Aspects of Landfills in Planning Consultation and permitting decisions.

Physical and Operational Characteristics [250,000 tonnes per year capacity]	
Expected lifetime of facility:	5–20 years
Operational hours:	0700–1730 (Monday–Friday)
	0700–1300 (Saturday)
	Closed Sundays and Bank Holidays
Typical site area:	5–50 Ha
Typical site volume:	1–5,000,000 m^3
Vehicle movements:	Approx. 50 waste deliveries a day.
Employment:	Site manager, environmental manager, marshall, compactor driver, plant operatives (eg. dozer/shovel drivers etc), litter pickers, ancillary staff.
Ancillary operations:	Landfill gas extraction and flaring/utilisation, leachate extraction and treatment or export to sewer, minerals extraction.
Afteruse:	Agriculture, public open space, amenity, nature conservation.
Waste stabilisation period:	At least 30–50 years.

Scoping Matrix: Landfill / landraising

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Site Preparation and Construction	Transport	Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities*	Operational Failures (Shut downs, spills, leakages etc)	Restoration
Transport, Traffic and Access	▲	■	●	●	●	●	■
Air Emissions (including dust)	▲	▲	■	●	●	■	▲
Odours	●	▲	■	▲	●	■	●
Vermin and Birds	●	●	■	●	●	▲	●
Noise / Vibration	■	■	■	■	●	▲	■
Litter	●	▲	■	●	●	■	●
Water Resources	■	●	■	▲	●	■	▲
Land Stability	■	●	▲	●	●	●	▲
Visual Intrusion	▲	▲	■	●	●	●	■
Nature and Archaeological Conservation	■	●	●	●	●	■	■
Historic (Built) Environment	▲	▲	●	●	●	●	●
Potential Land Use Conflict	●	▲	▲	●	●	▲	●

Assumes a throughput of approximately 100,000 tonnes per annum

Waste stream: mixed household, industrial and commerical wastes

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

Key Issues

Traffic

Like any major waste management facility, large scale landfills will be served by a significant number of HGVs. The nature and volume of vehicle movements will be determined by the volume throughput of the site and the nature/source of the waste. Traffic generated may include a mixture of waste collection vehicles, bulk haulage vehicles and skip transporters. Issues such as congestion, mud on roads and traffic associated air pollution are a material planning consideration and, on trunk routes, may become a concern of the Highways Authority.


[Courtesy of Enviros Consulting]

Collection vehicle

Air Emissions

An issue in relation to atmospheric emissions from landfills relates to the contribution of landfill gas to the 'Enhanced Greenhouse Effect'. Methane, which typically comprises 60% by volume of landfill gas (LFG), is approximately 25 times more powerful a greenhouse gas, molecule for molecule, than carbon dioxide, which typically comprises the remaining 40% of LFG. As such, landfills can potentially be significant contributors to climate change. Combustion of landfill gas in a flare or engine is an effective means of reducing climate change impacts.

Other atmospheric emissions associated with landfills may include combustion products (SOx, NOx, COx and VOCs) derived from the burning of LFG in flares or engines. The local environmental effects of these emissions must be addressed. However, where used in engines to produce energy, such emissions may be off-set against those that would have been produced using fossil fuels as LFG is classified as a renewable energy source because it is derived from contemporary carbon.

Atmospheric emissions from new (and, progressively, existing) landfills are controlled under the PPC Regulations by the Environment Agency although air emissions are also a material planning consideration. The PPC Regulations require modelling of emissions from landfills and associated gas plant as part of the landfill gas risk assessment.

Dust/Odour

Odour from any mixed or putrescible waste facility has the potential to cause a nuisance. The most significant problems with regard to odour occur primarily when landfill gas is allowed to escape from the waste mass in an uncontrolled manner. Disposal of fresh wastes or specially odorous wastes may also potentially cause problems. In some cases landfill odours have been detectable from over 1 km away from a site. Research[2] has shown that over half of all landfill complaints relate to odour. However, most odour problems may be overcome with good site and landfill gas management procedures.

[2] TG Trust Ltd (April 2002); Analysis of Neighbourliness of landfill operations

Dust is sometimes generated when waste is loaded and unloaded; from vehicles travelling over unsurfaced haul roads and on the public highway leading to and from a site; and during soil/material handling. However, landfill derived dusts tend to be coarse and, therefore, do not tend to disperse widely. As such, dust is not usually considered a significant problem in relation to landfills. Only 1% of complaints made to landfills relate to dust.

Dusts and odours may be controlled both by planning and site licence conditions under the auspices of the Environment Agency and the PPC Regulations. Local Authority Environmental Health Departments may also become involved in enforcement if a statutory nuisance arises.

Flies, Vermin and Birds

[Courtesy of Enviros Consulting]

Bird control on landfills often utilises falconry

Given the material contained in MSW, landfill sites can represent sources of flies, vermin and birds which may scavenge food wastes. Fly infestations may occur in hot summer weather conditions when their breeding cycle speeds up. However, fly infestations generally derive from fly sources further up the waste stream, such as long bin storage periods and poor fly control at waste transfer stations.

Rodents are generally not a problem at landfills primarily due to effective compaction and covering of the wastes.

Birds such as gulls and corvids (starlings and crows) may also be attracted to landfills where they may constitute a hazard to aircraft (when near airports) and a nuisance to local residents via soiling from bird droppings.

Fly, bird and vermin nuisance are covered under the PPC Regulations and are material planning considerations. Where nuisance does occur enforcement may also be carried out by Local Authority Environmental Health Departments.

Noise

Where problems have been associated with noise at landfill sites they have mainly been attributed to the following activities:

- Vehicle manoeuvring, loading and unloading operations (particularly in relation to reversing alarms)
- Noise from landfill gas flares and engines (particularly at night)
- Site preparation/engineering works.

Most noise issues tend to be associated with plant which is not properly serviced or commissioned. Noise is an issue that is controlled under the PPC Regulations as well as planning and by Local Authority Environmental Health Departments under Statutory Nuisance

Provisions. Typically noise limits are set at sensitive targets which form part of the consent conditions.

Noise is an issue that is controlled under the PPC Regulation as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance such as MPG11:

- 55 dB(A) daytime
- 42 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- daytime 10 dB(A) above the existing background, with a daytime minimum limit of 45 dB(A).

Litter

Litter has the potential to be a significant issue at landfill sites given the presence of light waste materials such as paper and plastic. If not controlled, litter may be spread from poorly sheeted vehicles, on vehicle wheels or from vehicles as they deposit waste. At wind speeds over 20 MPH (Force 5) litter may be picked up from the surface of the landfill. Around 8% of complaints made to landfills relate to litter. Litter issues are controlled in a similar way to noise, dust and odour.

Water Resources


[Courtesy of Enviros Consulting]

Leachate treatment

Landfill leachate is generated by water passing through decomposing waste and comprises a mix of organic compounds, ammonia, nutrients, heavy metals, trace toxic organics, chloride and suspended solids derived from the decomposition of the waste. Such contaminants can cause significant pollution if allowed to escape in uncontrolled amounts to either surface waters (lakes, ponds or rivers) or groundwater. However, the degree of pollution is heavily dependent on the site of release and the type and use of the receiving water body. For example, a small leachate release to a large river will have little effect but could result in significant fish kills in a small stream supporting populations of sensitive fish such as salmon and trout. Likewise, leachate release to a minor or non aquifer will be less significant than a release to a potable water supply.

Surface run-off from landfill sites may also be a potential source of contamination to local watercourses principally in terms of suspended solids and even litter. In some cases, where, leachate and surface run-off is poorly separated, run-off may become contaminated with leachate.

Landfill activities may also disrupt surface and groundwater flows by altering local topography, excavating below groundwater levels and via dewatering operations.

Potential effects on water resources are controlled under the PPC Regulations and the Groundwater Regulations by the Environment Agency and are also a material planning consideration. Protection of private water supplies is controlled under the Private Water Regulations 1991 by Local Authority Environmental Health Departments.

Land Stability/Geology

Land stability is an issue in relation to landfills in that unstable local geology may potentially compromise containment and environmental management systems. Landfilled waste also compacts under it's own weight and reduces in volume as it decomposes resulting in significant settlement of the landfill surface over time. Where proposals involve the filling of mineral voids, care needs to be taken to ensure that protected geological outcrops/faces are not destroyed. Such features are sometimes protected as Sites of Special Scientific Interest (SSSIs).

Visual Intrusion

The size of a development of this nature means that there is the potential for significant impacts on both landscape character and visual amenity. The significance of any impact is dependent on a number of site specific issues such as:

- Direct effects i.e. removal of landscape features, such as trees, hedges, buildings etc.
- Proximity of landscape designations
- Site setting, eg the proximity of Listed Buildings and/or Conservation Areas
- Proximity of sensitive viewpoints
- Presence of existing large built structures
- Existing landform and nature of existing landscape
- Presence/absence of screening features (trees, hedges, banks etc.)
- The degree of settlement expected.

Landfilling activities are often utilised to reprofile and landscape derelict land or mineral voids leading to landscape improvement in the long term. Landscape issues are a material planning consideration.

Nature Conservation

Landfill sites can adversely affect nature conservation resources through direct land-take of habitats and destruction of hedgerows and trees etc. Indirect effects on local ecology and species may also occur through pollution of water courses, dust deposition and human disturbance etc. If sub-surface migration of landfill gas occurs it may cause vegetation dieback.

[Courtesy of Envrios Consulting]

Landfill restoration

Operational landfill cells are not generally a haven for wildlife other than for those pest species mentioned earlier. However, completed and restored cells can often provide habitats for a wide range of wildlife including protected species such as adders, badgers, various birds and insects along with flowering plants and grasses. Indeed, current restoration practice is moving away from returning land to agriculture in favour of restoration for nature conservation and amenity purposes. Such restoration is a material planning consideration and may often include the involvement of Local Wildlife Trusts.

Archaeology

Anywhere where excavation takes place, such as on a landfill, may represent an opportunity for archaeological investigation. On land-raise sites, however, any existing archaeological resource may become sterilised. This is a material planning consideration and may require consultation with English Heritage and local museum services.

Explosion/Asphyxiation Risks

As landfill gas contains methane which is highly flammable sub-surface gas migration into confined spaces can potentially result in a risk of explosion if a source of ignition and air is present. Similarly, landfill gas may act as an asphyxiant in enclosed spaces (see profile 9: Landfill Gas Plant).

Public Concern

Applications for landfill schemes are often subject to significant local public objection given the landfill industry's image as a bad neighbour and the nature of the operations involved. Issues of particular public concern relate primarily to loss of local amenity, nuisance effects (dust, flies, birds, odour and noise), visual blight, effects on house prices and, following recent debate in the press, the potential for health effects.

Need for EIA

EIA is required to be undertaken prior to planning applications being determined on certain projects which may have a significant effect on the environment. Schedule 1 of the Environmental Impact Assessment Regulations (1999) defines those projects where EIA is obligatory. This includes landfill under item 9 as follows:

9. Waste disposal installations for the incineration, chemical treatment [...] or landfill of hazardous waste.

Schedule 2 of the Regulations sets out those types of projects where EIA may not be mandatory but where the development may result in significant environmental effects due to it's size, nature or location and an EIA may be considered necessary. Waste disposal operations defined under item 11(b) of this part of the Regulations include:

11(b) Installations for the disposal of waste (unless included in Schedule 1) [...]

(ii) the area of the development exceeds 0.5 hectare; or

(iii) the installation is to be sited within 100m of any controlled waters.

An area of 0.5 Ha is significantly smaller than most landfill operations and, therefore, most landfills may be considered for EIA under the terms of the Regulations.

The DETR Circular 02/99 on Environmental Impact Assessment (para. A36) suggests that:

'EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of [these] wastes, sites seeking only to accept inert wastes (….) are unlikely to require EIA.'

Good practice dictates that EIAs should be properly scoped from the outset. The 1999 EIA Regulations introduced new provisions for screening and scoping which enables the applicant to obtain a Scoping Opinion from the Waste Planning Authority. It is advisable for the applicant to also undertake a separate scoping exercise to ensure that the appropriate level of engagement with relevant stakeholders is achieved at the outset of the EIA process.

It is particularly important that statutory consultees, such as the Environment Agency and English Nature, have the opportunity to comment on the scope and content of specific technical assessments, such as any air quality impact assessment and ecological studies that may be required.

Mitigation

The key planning considerations where mitigation measures will be required will be related to the key environmental issues assessed through the EIA. Typically these relate to the main emissions from the facility, nuisance issues and the physical appearance of the site. The table below identifies the key planning considerations associated with landfill sites and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design/Operational Features	Additional Options
Traffic	Deliveries of municipal waste to the facility may be linked to waste collection rounds or to bulk haulage from transfer stations. These usually peak at certain times of the day. Mitigation measures normally applied should ensure that vehicles are re-routed away from inappropriate routes and sensitive residential areas such as schools.	Use of S.106 agreements.
Air Emissions	Landfill gas emissions are dealt with via abstraction and flaring or burning for power production purposes. Fugitive emissions are increasingly controlled via additional extraction requirements, regulated under the PPC permit.	N/A
Dust	Dust is generally controlled by water bowsing, road sweeping, effective sheeting of vehicles and vehicle wheel-washing.	Sheltered emergency disposal areas isolated from dust sensitive receptors may be utilised during dry weather and strong winds or where especially dusty wastes are being deposited. Dusty wastes should also be buried immediately upon deposit. Chemical dust suppressants may also be used along with the choice of non-dusty road surface materials. Seeding of material stockpiles may also help prevent dust blow. Dusty engineering works should also be avoided in dry, windy conditions. In exceptional circumstances spray curtains may be used.
Odour	Odours are generally controlled via landfill gas abstraction and flaring or utilisation for power production purposes. Daily cover also acts as an odour suppressant on fresh waste. Rapid capping or use of temporary gas wells and caps on completed cells also acts as a barrier to odour migration.	Site design may help in the control of odours via the minimisation of surfaces, such as unconsolidated cell flanks, where landfill gas emissions may occur. Effective sealing of site infrastructure, such as leachate wells may also assist. Masking agents and perfume sprays may be used.

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design/Operational Features	Additional Options
Flies/Vermin and Birds	Pests are primarily controlled by waste compaction and the use of daily cover along with minimising the area of exposed waste. Insecticides/ rodenticides are often used for flies and rats/mice. Falconry is used regularly to deter birds. Shooting of foxes is also carried out.	Bait traps may be utilised for flies and a range of bird scaring techniques are available (including acoustic scarers and kites) along with netting in extreme circumstances.
Noise	Noise mitigation measures may include the construction of noise bunds, regular plant maintenance, vehicle/plant silencing and limitation of operating hours.	Additional noise reduction options might include the use of buffer zones and smart reversing alarms. Phasing of operations to make use of screening afforded by previous cells may also be effective.
Litter	Litter is generally controlled by waste compaction, the use of daily cover, peripheral litter fencing to catch windblown materials and regular litter picking around the site. Effective containment of vehicles and wheel washing also helps.	Emergency disposal areas may be utilised as per dust above. The incorporation of wide vegetated buffer zones between disposal areas and receptors may assist in preventing litter spread.
Water Resources	Groundwater resources are protected in modern landfills by providing a clay and/or geomembrane liner to the site. Leachate is usually collected either for on-site treatment or discharged to a sewer. Separating dirty and clean run-off with the dirty waters being dealt with as leachate also assists.	N/A
Land Stability/ Geology	Carrying out land stability investigations prior to construction of the landfill will identify engineering works required to enable design of cells with suitable flank gradients.	N/A
Visual Intrusion	Restoration is usually phased and designed to reflect previous land-uses and complement the surrounding landscape.	Landscape planting may be effective in reducing visual impact of operations from sensitive viewpoints but may take many years to mature. Topographical design should reflect the local landform and landscape character and utilise natural screening. Fencing and earth bunds may also be utilised. Phasing of operations to allow later workings to be screened by earlier completed cells can also be effective.
Nature Conservation	Rapid restoration of completed areas may encourage colonisation by various species. Avoidance of sensitive habitats during site selection and design will also minimise impacts.	Habitats such as woodlands and wetlands may be constructed in peripheral areas of the site and managed for nature conservation.

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design/Operational Features	Additional Options
Archaeology	Archaeological watching brief during site preparation.	N/A
Explosion/ Asphyxiation	Landfill gas hazards are controlled by gas abstraction and combustion systems along with containment lining. Sites should also be located over 250m from housing.	Avoid underground services on-site leading off-site.

Case Examples

United Mines Landfill, Cornwall

The site has been used for landfilling since 1974. Capacity at the site was due to run out in 2002 and, given that the west of Cornwall was expected to require significant further landfill capacity well into the future, a planning application was submitted in 1997 to extend the landfill to provide a further ten years (two million tonnes) capacity to 2012.

[Courtesy of County Environmental Services]

Aerial photo of United Mines

Like many landfills the site receives a variety of waste types with around 300 lorry movements each day. The original site was constructed without an engineered containment system (often described as a dilute and dispose landfill). The new extension will have a fully engineered composite lining system with underdrainage for leachate. Active landfill gas abstraction takes place supplying a number of electricity generators.

The extension application was originally approved by Cornwall County Council in October 1999 but this decision was subsequently questioned by the High Court. The case known as

Key Planning Features

Location:	St Day, near Redruth, Cornwall
Setting:	Rural workings site of a previous metal mine
Operator:	County Environmental Services Ltd
Waste Types:	Household/commercial/industrial
Waste Input:	200,000 tonnes per year
Site Area:	54 Ha
Ancillary Operations:	Landfill gas utilisation (2.7 MW)
Afteruse:	Open space, and woodland with public access

Hardy (Harrisons; 22 September 2000) vs Cornwall CC hinged on the County Council having determined the planning application without due consideration of relevant ecological information. This information related to the potential presence of bats in the woodland to be affected by the extension. The application was subsequently re-submitted and approved in November 2001.

[Courtesy of Cory Environmental (Central Ltd)]

Aerial view of Vigo Utopia landfill

Vigo Utopia Landfill, West Midlands

Vigo Utopia quarry gained planning permission in 1995 for restoration by way of infilling with controlled wastes. Waste inputs are restricted in both type and volume and the site may accept a limit of 300,000 m^3 of waste per year and the deposit of household waste is prohibited.

Landfilling is currently permitted until 2008 with restoration to public open space, including open grassland, woodland and footpaths.

Environmental controls incorporate a composite liner including both low permeability clay and a plastic geomembrane. Leachate is extracted and treated at an on-site treatment plant. Due to the nature of the waste inputs the landfill gas resource is relatively limited for the volume of waste deposited. Therefore the gas is flared rather than used for power production.

Due to the proximity of the site to a large residential area special site management provisions have been put in place to minimise the potential for nuisance.

In 2002 the operators applied for planning permission to accept household waste. Permission was refused by the planning authority on the grounds of unacceptable impact on residential amenity. The operators appealed in 2003 but the appeal was dismissed on the grounds of potential odour and fly impacts.

Key Planning Features

Location:	Walsall Wood, Walsall, West Midlands
Setting:	Residential/Industrial area
Operator:	Cory Environmental (Central) Ltd.
Waste Types:	Commercial/industrial/inert
Waste Volume:	300,000 m^3
Site Area:	10 Ha
Ancillary Operations:	Landfill gas extraction and flaring. On-site leachate treatment plant.
Afteruse:	Public open space

Content of Planning Application

The content of the planning application with regard to environmental issues will largely be guided by the scope of the EIA. Certain additional information should also be provided over and above what is generally required under the EIA Regulations. This relates, in particular, to aspects such as:

- Planning policy context;
- Need; and
- BPEO.

Such information can either be provided within a separate document or combined as part of the Environmental Statement. It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and, where appropriate, with reference to the local Waste Strategy and Waste Local Plan or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1.

A common failing of applications is the lack of relevant information on site design and operational aspects. For example, information on site design/layout, waste inputs, leachate and gas containment/management systems, housekeeping practices, mitigation schemes (such as landscaping), phasing and restoration plans and plant specifications should normally be included. Some of this information may be difficult for applicants to procure if the development contract process has not advanced to a stage where detailed specifications are available. However, performance specifications and illustrations can usually be provided. Provision of certain detailed design information could be conditioned by the Waste Planning Authority (WPA) provided it is not material to the planning determination process and does not represent essential information relevant to the findings of the EIA.

Where possible the IPPC permit application should be submitted in parallel with the planning application. This should assist the Environment Agency in providing representations to the Waste Planning Authority on the environmental impacts of the proposal. There will always be a degree of overlap between information provided in the planning application and that contained in the permit application. This relates to issues such as air emissions, water emissions and flow effects, noise, general house -keeping and nuisance. Indeed, the PPC Regulations require risk assessments to be undertaken in addition to hydrogeology, land stability, landfill gas, nuisance issues and health. Where applications are not submitted in parallel it is likely that applicants will need to include additional information on site design aspects.

Future Issues

The EC Landfill Directive and Landfill Regulations are forcing some major changes in the landfill industry, particularly in relation to the waste types that may be accepted at landfills in the future. Wastes that are already, or are soon to be, banned from landfill disposal (depending on the type of site involved) include liquids, flammable/corrosive or other specified hazardous wastes and tyres. In the longer term the Directive also seeks to reduce the amount of biodegradable municipal waste going to landfill nationally by 65% from 1995 levels. All wastes going to landfill will also require some form of pre-treatment prior to disposal.

UK policy is also discouraging waste disposal via the landfill route. Indeed, the landfill option is at the bottom of the Governments Waste Hierarchy and fiscal measures such as the Landfill Tax are in place (and likely to increase in the future) in order to make alternative options more economically viable in comparison to landfill which has, historically, been the cheapest waste management option. The sector is also subject to tighter regulation than in the past given the inclusion of landfills within the PPC Regulations.

Given the above restrictions on the future use of landfill sites, it is expected that individual site lifetimes may gradually increase as inputs decrease. The total number of landfills is also likely to decrease. The expected reduction in inputs of organic biodegradable wastes and hazardous wastes will also tend to result in lower rates of landfill gas production and a decrease in leachate treatment requirements over time.

Applications for landfill sites tend to attract significant levels of local public opposition, primarily on the amenity, nuisance and health fronts. Such opposition is understandable given recent press coverage of studies purporting to suggest a link between landfills and health and poor controls in the past leading to landfills receiving a reputation as bad neighbours. However, with improving practice amongst the industry and increasing regulation by the Environment Agency and other public bodies, it is hoped that such image problems may be overcome.

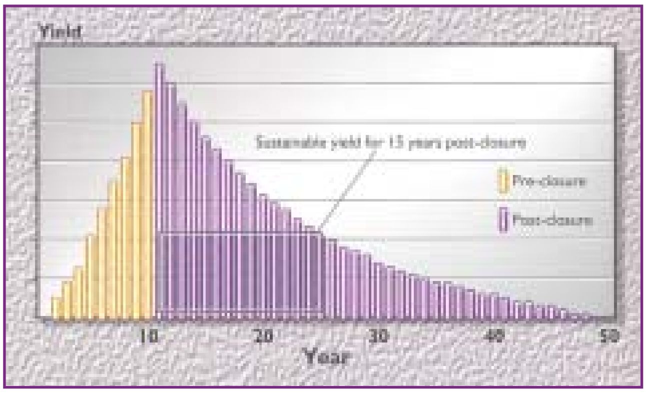
Nevertheless, landfill will remain a significant management route for a wide range of waste types and treatment residues well into the future as recycling and waste to energy systems continue to develop in capacity. There will always be residues from such alternative operations that cannot be recovered either technically or economically and, whilst input rates may diminish over time, the landfill option is likely to remain to deal with such wastes well into the future.

9 Landfill gas plant

What is it?

Landfill gas is defined in the Landfill Regulations as ‘any gas generated from landfilled waste’. As such, this includes all gases produced from both anaerobic and aerobic biodegradation of putrescible material, chemical reactions and volatilisation from the waste materials within and on the surface of the landfill. The principal components of landfill gas are methane – CH_4 (40–60%), carbon dioxide – CO_2 (40–60%) and small amounts of hydrogen, oxygen, nitrogen and water vapour.

Around 1% by volume may include trace organic gases. Each tonne of organic waste can produce between 150 and 400 m^3 of landfill gas over a period of around 30–50 years. This therefore necessitates the provision of landfill gas management systems for a similar period. The pattern of gas production over time is shown here.



Typical landfill gas generation curve for a landfill site[1]

Landfill gas production results in a number of potential risks to the environment as follows:

- Molecule for molecule, methane is approximately 25 times more powerful a greenhouse gas than carbon dioxide, which has been linked to the ‘enhanced greenhouse effect’ and climate change;
- Methane is flammable at concentrations between 5 and 15% in air, potentially leading to fire and explosion risks if allowed to accumulate in confined spaces;
- Landfill gas may act as an asphyxiant by displacing air in confined spaces;
- Trace organic gases within the landfill gas give it a characteristic unpleasant odour and some may have potential health effects if public exposure reaches a high enough level; and
- Landfill gas is corrosive.

[1] ETSU/DTI (1996) Landfill Gas Development Guidelines.

It has long been recognised that landfill gas requires management to ensure that these potential effects are minimised. In the past, landfill gas was managed by allowing it to vent and be diluted/dispersed in the atmosphere either via gas chimneys buried in the waste mass or via peripheral, high permeability gas venting trenches, or simply from the surface of the landfill. Over the past 25 years landfill gas began to be collected via perforated pipes within the waste and burnt in flares, or used as a source of energy.

The current position, where the gas resource is great enough, is to use it for power production or as a fuel for industrial or heating processes. Where the gas resource is not sufficient to allow utilisation it should be flared in efficient enclosed flare systems, replacing earlier less efficient open flares.


[Courtesy of Enviros Consulting]

Basketstown Landfill Gas Plant, Co. Meath

The landfill gas energy resource in the UK is estimated to be around 6.75 TWh per year (~2% of current UK demand). Currently around 150 landfill sites in the UK utilise their landfill gas equating to around 850 MW of installed capacity. A particular advantage of using landfill gas for power or heat is that it is classed as a non-fossil fuel and, therefore, if burnt, does not result in a net increase in atmospheric carbon dioxide and thus makes no net contribution to climate change. Hence, the burning of landfill gas for power/heat production purposes has a double positive effect on greenhouse emissions by: 1) burning methane and 2) displacing fossil fuel emissions.

Given these advantages, for a number of years landfill gas utilisation has been encouraged under a range of Government subsidies including the Non-Fossil Fuels Obligation (NFFO) and now Renewables Obligation Certificates (ROCs). The most common use for landfill gas in the UK is for electricity production although some combined heat and power (CHP) and gas export for industry/heating systems also exist.

Modern landfill gas management systems generally consist of the following components:

- **A gas abstraction network** usually consisting of a number of vertical plastic perforated pipes drilled into the waste and sealed through the landfill cap, at spacings of around 40 m. (NB Other well configurations may include horizontal or pin wells. However, these tend to be used for odour control purposes in active areas of the landfill). The top of each well includes a control/sampling well-head connected by flexible pipework to a central collection point or manifold. Upon landfill restoration well heads and collection pipes are usually buried within the restoration soils.

The gas abstraction system is supplied with condensate traps (to drain away contaminated water that condenses out of the moist gas) at low points along the network. Collected condensate is usually mixed with leachate and treated on-site or sent to sewer, or is recirculated back into the landfill.

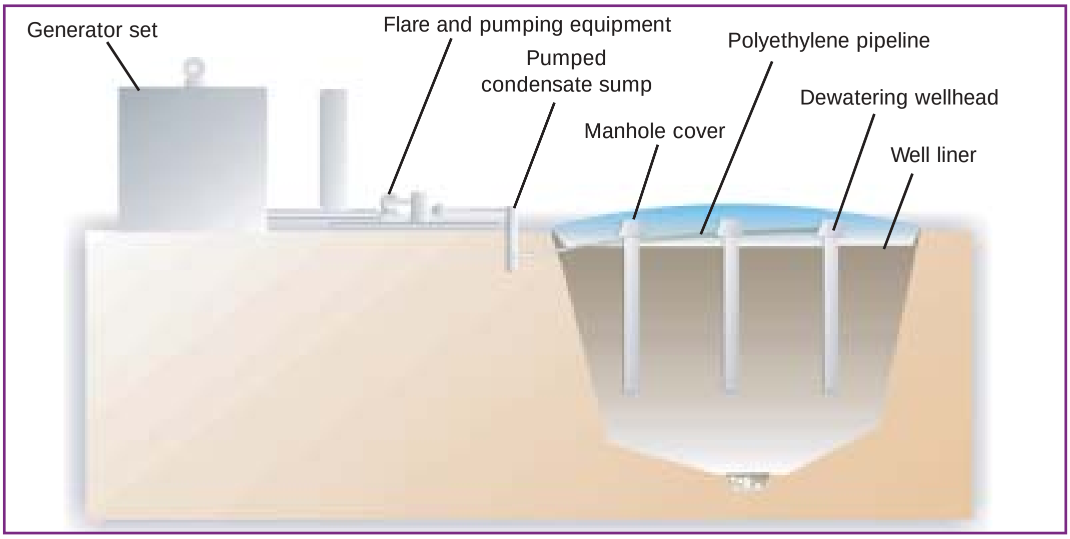
From the manifold/central collection point the gas is drawn via a larger pipe to the:

- **Gas control compound**. This consists of a blower which sucks the gas from the abstraction network and pumps it into the gas control/utilisation systems (i.e. the flare and/or engines). Prior to combustion the gas is usually passed through simple filtration systems to remove potentially damaging particles and excess water vapour. Engines drive an alternator which supplies electricity to a transformer, which then converts the voltage to that required for export to the local electricity grid. Where engines are used a flare is provided as a back up to ensure that landfill gas emissions are controlled at all times.

Modern enclosed flares typically consist of a vertical combustion chamber from where combustion air is supplied to the flame. The gas is burnt at at least 1000°C and the resulting exhaust emitted via a stack between three and ten metres high.

Old style open flares are still present on some landfills and consist essentially of a large ‘bunsen-burner’ type of arrangement with a visible flame. These are increasingly used for temporary or emergency gas control. Unless the gas methane levels are very low, supplementary fuels are not usually required.

Gas engines may include gas turbines, dual fuel (compression ignition) engines or, most commonly, spark ignition engines, with output capacities ranging from 0.6 MW to 1.3 MW. The most commonly used engines, however, are 1MW units requiring around 600–750 m^3 of landfill gas per hour. These are usually individually placed within (ISO) containerised units (around 2.5 m wide, 3 m tall and 10 m long) with short exhausts



Schematic representation of a typical landfill gas extraction and flaring plant arrangement and silencing systems arranged on the top of the container. Larger sites tend to add or subtract single units as the gas resource increases or decreases with time.

Other energy utilisation systems (ie. CHP) or gas export/cleaning systems tend to have their own unique arrangements. However, plant expected to be required for off-site export of the gas may include a pressure boosting station and a pumping main.

Examples of large flare systems include:

- Bletchley Landfill, Shanks Waste Services Ltd, Milton Keynes

Examples of major power production systems include:

- Little Packington Landfill, SITA, West Midlands
- Pilsworth Landfill, Viridor Waste Management Ltd, Manchester
- Hempsted Landfill, Cory Environmental (Gloucester) Ltd/Summerlease Ltd, Gloucester

Examples of other utilisation systems include:

- Marshalls Landfill, Leeds, where the landfill gas is used for brick firing.

Siting and Scale

In general, the gas collection system covers much of the restored area of a landfill, although in certain circumstances, such as where odour control is a major issue, gas abstraction wells may also be installed in active disposal cells. Current Environment Agency guidance requires abstraction systems to be emplaced in waste within six months of deposit.

The gas control compound is the most visible aspect of the gas abstraction/control system, but covers only a limited surface area (commonly around 25 m × 25 m) depending on the volume of gas dealt with, the number of engines and the requirement for buildings/offices for control equipment. Engines will only tend to be used when gas yields exceed 600–750 m^3 (to produce 1 MW of electricity) over a period of at least 5 years (this normally needs a landfill with a total content of more than 200,000 tonnes of putrescible waste). If this is not the case, utilisation is unlikely to be viable even with the associated Government incentives, and flaring would be the most appropriate control measure, unless yield and methane content is so low as to preclude effective combustion.

Gas control compounds tend to be located on the periphery of landfill sites close to, but not on, areas where waste has been deposited.

General Siting Criteria

Existing landuse: Preference should be given to areas within the boundary of the landfill site.

Proximity to sensitive receptors: Sites closer than 250 m from housing, commercial, recreational areas should be avoided wherever possible.

[Courtesy of Enviros Consulting]

Typical small landfill gas compound

Physical and Operational Characteristics [2000 m^3 throughput of landfill gas per hour]

Expected lifetime of facility:	20–50 years
Operational hours:	24 hours a day, 7 days a week
Typical site area:	25 m $\times$ 25 m
Primary infrastructure:	1 flare and/or 3 engines ($\sim$700 m^3/hr each) (NB. If engines are present flares will also be included for back up purposes).
Power Production:	3 MW
Employment:	Usually controlled by telemetry. Maintenance staff on routine call-out, as necessary.

The matrix below has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Scoping Matrix: Landfill gas plant

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Development Activity: Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut down, spills, leakages etc)	Demolition
Transport, Traffic and Access	●	●	●	●	●	●	●
Air Emissions (including Dust)	▲	●	■	▲	●	■	▲
Odours	▲	●	▲	▲	●	■	●
Vermin and Birds	●	●	●	●	●	●	●
Noise / Vibration	▲	●	■	●	●	●	▲
Litter	●	●	●	●	●	●	●
Water Resources	●	●	▲	●	●	▲	●
Land Stability	●	●	●	●	●	●	●
Visual Intrusion	▲	●	▲	●	●	●	●
Nature and Archaeological Conservation	▲	●	●	●	●	▲	●
Historic (Built) Environment	●	●	●	●	●	●	●
Potential Land Use Conflict	●	●	●	●	●	▲	●

Assumes a throughput of approximately 2000m^3 landfill gas per hour

Definition of Terms:
Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.
Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.
Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

Key Issues

Air Emissions

Landfill gas engines and flares emit all the pollutants associated with combustion, including:

- Carbon dioxide (CO_2) – associated with the 'enhanced greenhouse effect'
- Carbon monoxide (CO) – a respiratory toxin
- Nitrogen oxides (NO, NO_2, N_2O or NOx) – associated with respiratory irritation, photochemical smogs (in association with particulates and UHCs), acid rain and damage to plants
- Sulphur oxides (SO_2 and SO_3) – associated with acid rain, corrosion of plant and respiratory symptoms especially in association with particulates

- Acid gases (Hydrogen fluoride – HF and Hydrogen chloride – HCl) – associated with corrosion of plant

- Particulates – associated with respiratory irritation, toxic effects (especially in association with SO_2) and photochemical smogs (in association with NOx and UHCs)

- Non-methane volatile organic compounds (NMVOCs) and unburnt hydrocarbons (UHC) – associated with toxicity and photochemical smogs (in association with NOx and particulates)

For a well designed and maintained plant, many of these, including SO_2, SO_3, HF, HCl, and particulates, will only be present in concentrations that are insignificant in terms of potential environmental effects. However, emissions of NOx, CO and NMVOCs/UHCs can be significant in some circumstances, especially if combustion is not efficient. Enclosed flares are more efficient in terms of effective combustion than engines; however, open flares (which are being phased out) can often have methane combustion efficiencies of less than 50%.

The Environment Agency has recently published emission standards for flare exhaust gases. These are:

- CO – 50 mg/Nm^3

- NOx – 150 mg/Nm^3

- UHC – 10 mg/Nm^3

(At normal temperature and pressure (NTP) – 0°C, 1013 mbar and 3% oxygen)

Given poorer combustion efficiency, emissions from engines are often considerably greater than for flares. Draft guidance from the Environment Agency suggests limits for engines as follows.

If commissioned between January 1998 and November 2004:

- NOx 650 mg/Nm^3

- CO 1500 mg/Nm^3

- Total VOCs 1750 mg/Nm^3

- NMVOCs 150 mg/Nm^3

If commissioned after November 2004 the limits are reduced to:

- NOx 500 mg/Nm^3
- CO 1400 mg/Nm^3
- Total VOCs 1000 mg/Nm^3
- NMVOCs 75 mg/Nm^3

(At NTP)

Megawatt for megawatt landfill gas utilisation plants are generally equivalent to coal or oil combustion in terms of gaseous emissions, potentially leading to air quality issues in close proximity if not supplied with adequate stack heights to provide the required dilution/dispersion, especially if located in Local Authority Air Quality Management Areas (AQMAs) designated under Part IV of the Environment Act 1995.

Recent practice has been to supply engines with only a short exhaust on top of the engine container in order to minimise visual impacts, and this may well have to change in order to meet air quality objectives in the future. It is now regarded as bad practice not to have vertical exhausts and the exhausts of both flare and engines should be unobstructed (e.g. by cowls). However, emissions from engines may be off-set by a reduction in emissions associated with a reduction in need for fossil fuel use. Emissions from landfill gas utilisation are also preferable to those associated with venting of landfill gas. As such, both flaring and gas utilisation may be seen as effective methane, odour and NMVOC controls, and controls of off-site migration of gas.

Noise

The main problems associated with noise due to landfill gas compounds have been attributed to:

- Site preparation/engineering works
- Noise from operational engines and the exhaust from both engines and flares (particularly at night)

Noise is an issue that is controlled under the PPC Regulations as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Landfill gas engines are generally relatively quiet items of equipment. Nevertheless, given their 24 hour, seven day per week operation, they can cause disturbance to nearby receptors, particularly in calm night-time conditions when noise may carry considerable distances and there is little extraneous noise to mask the engines. Some flares may produce low frequency tonal noise which may potentially cause disturbance to nearby residents.

[Courtesy of .Enviros Consulting]

Tall flare stack

Visual Intrusion

The presence of flares/engines and their associated stacks can add a new 'industrial' feature into the generally open context of a restored landfill. Stack height will determine the degree of visibility of the compound to a significant extent and in the future, as emission criteria become more stringent, taller stacks are likely to be required. As such, the potential effects on landscape and visual amenity will depend on the following factors:

- Compound footprint
- Stack height
- Number of stacks
- Existing landform (presence of existing screening)
- Presence of trees
- The stage of landfilling operations (e.g. operational or closed)
- Proximity of sensitive viewpoints

- Proximity of landscape designations
- Presence of other built structures

Construction activities may also remove existing landscape features such as trees or hedgerows.

Landscape and visual impacts are material planning considerations. A significant amount of public concern and anxiety can be generated by the proposed visual appearance of a facility. Careful site selection together with appropriate screening measures can help to minimise any potential adverse impact.

Need for EIA

Landfill gas utilisation and flaring are not specifically covered under the Environmental Impact Assessment Regulations (1999) in either Schedule 1 (requiring mandatory EIA) or Schedule 2 (where EIA may be required if the development may result in significant environmental effects due to its size, nature or location).

However, particularly large installations, covering over 0.5Ha, could theoretically require EIA under Part 3 of Schedule 2 (Energy Industry) but, given that most utilisation compounds rarely exceed 25 m × 25 m this is unlikely to apply in most circumstances. Alternatively, landfill gas management systems may be included within the wider requirements for EIA of the associated landfill (see the profile on Landfill, included within this publication). In the past, however, the assessment of the effects of landfill gas management systems within landfill Environmental Statements has tended to be relatively cursory, even to the extent of not describing the system to be used and suggesting that details will be supplied subsequently once the gas resource and appropriate management systems are determined. Such limited treatment of the effects of landfill gas management systems was mirrored in the regulatory framework for both waste management and energy production systems in that, under the Environmental Protection Regulations (1991), landfill gas was not classified as a fuel and was thus unregulated.

The above situation has changed in recent years, and is continuing to do so with landfill gas control systems now requiring permitting by the Environment Agency under the PPC Regulations. Indeed, it is a requirement of the Agency that risk assessments, particularly in relation to atmospheric emissions from landfill gas combustion, be carried out for landfill sites requiring a PPC permit. Nevertheless, landfill gas control systems (in isolation) still do not require an EIA unless included as part of an EIA for the associated landfill as a whole.

For applications for landfill gas utilisation in isolation, the provision of a limited Environmental Appraisal at the planning stage, addressing the key potential impacts of any proposed landfill gas management system (particularly if the system is to be located in close proximity to sensitive targets) may be considered as best practice. Local (i.e. District and

Borough) Authority Environmental Health Departments may also require reassurance that effects on local air quality will be minimal particularly if the system is to be located within, or close to, any AQMA.

Content of Planning Application

The content of the planning application, given the lack of requirement for formal EIA, will focus primarily on the following:

- Size, location and appearance of the compound;
- Planning policy context (in terms of waste management, renewable energy and local environment policies);
- Need;
- BPEO; and
- Principal environmental effects as set out in an environmental appraisal.

Such information can either be provided as separate documents or combined within the Environmental Appraisal/EIA/Planning Support Document. The above should be assessed in relation to the effects of the landfill without the proposed management scheme.

A common failing of applications is a failure to adequately address environmental effects of the control system in isolation. Information on the system design and operational aspects may also be lacking including such information as plant specifications, housekeeping, mitigation schemes (such as landscaping), site design and layout and emission data. Some of this information may be difficult for applicants to procure as, until planning approval is granted, the development contract process is not likely to be advanced to a stage where detailed specifications are available, nor the gas resource fully quantified. Site specific emissions data are also unlikely to be available until the system is operational.

Where possible the PPC permit application should be submitted in parallel with the planning application. This should assist the Environment Agency in providing representations to the Waste Planning Authority on the environmental impacts of the proposal. There will always be a degree of overlap between information provided in the planning application and that contained in the permit application. This will relate to issues such as air emissions, noise, general housekeeping and amenity effects. Where applications are not submitted in parallel it is likely that applicants will need to include additional information on site design aspects.

The landfill gas management system will usually be located within the curtilage of the landfill. In some circumstances the point of utilisation may lie outwith the landfill site (eg. where landfill gas is piped to a third party for use in an industrial process). Such circumstances may require that certain aspects of the proposal are dealt with under the auspices of the Local Planning Authority rather than the Waste Planning Authority.

Mitigation

The key planning considerations where mitigation measures may be required will be related to the main environmental issues. Typically these relate to the emissions from the facility, noise, and the physical appearance of the compound. The table below identifies the key planning considerations associated with both landfill gas flaring and utilisation and details the standard design features that may be incorporated to mitigate for them.

Mitigation Measures		
Planning Considerations	Design/Operational Controls for Flaring	Design/Operational Controls for Utilisation
Air Emissions	Adherence to emission limits, combustion at 1000°C, residence time of 0.3 seconds, phasing out of open flares, emission monitoring, operation close to rated capacity, proper maintenance and flexibility to turn up or turn down, maintenance of a homogenous temperature across the combustion chamber, excess air ratio of 10:1 @50% methane.	Operation close to rated capacity, proper maintenance.
Noise	Use of bunds and baffles. Design of flare to reduce tonal noise.	Sound proofing of engine container unit, exhaust silencing, use of bunds and baffles.
Visual Intrusion	Sensitive positioning, use of bunds and tree-planting, sensitive painting of structures, minimisation of stack heights.	As per flaring. Novel screening methods may also be used, such as living willow fences etc.

Case Examples

Pilsworth Landfill Power Plant, Manchester

The Pilsworth landfill has been operational since late 1992. It has a total waste capacity of seven million cubic metres in 12 cells. Landfill gas abstraction began early in the site's operation, when a 500 m^3/hr capacity open flare was installed to take gas from cells one and two. This was replaced in 1996 with an enclosed 2,000 m^3/hr capacity flare. The first two large Caterpillar generators were installed in 1999, followed by a second 1,000 m^3/hr flare in 2000. A further four small Jenbacher units were added in late 2002. The flares are only used when the engines are not in use (i.e. during maintenance periods).

[Courtesy of Viridor Waste Management Ltd]

Pilsworth Power Plant

The operators have also installed a separate on-site odour control gas abstraction and flaring system. This is utilised on operational and recently completed cells, and includes a network of horizontal wells feeding gas to an open 1,500 m^3 capacity flare. When each cell is completed, the horizontal wells are sacrificed and replaced with vertical wells connected to the main gas control compound and the engines.

Over the whole site gas is abstracted from around 100 wells feeding 17 manifolds. A number of leachate wells are also connected to the gas system.

Key Planning Features

Location:	Heapbridge, Bury, Manchester
Setting:	Rural/urban fringe on edge of landfill/quarry site
Operator:	Viridor Waste Management Ltd.
Associated Landfill Characteristics:	Large co-disposal landfill taking a wide range of commercial/ industrial/domestic wastes.
Compound Area:	120 m × 60 m
Equipment:	7 engines (3 × 1150 kw output Caterpillar and 4 × 480 kw output Jenbacher spark-ignition engines) and 2 flares (1 × 2000 m^3 and 1 × 1000 m^3 Haase enclosed flares) within compound. 1 × 1500 m^3 open flare on landfill for odour control purposes.
Power Production:	5 MW

Former International Garden Festival Site, Liverpool

The Liverpool International Garden Festival Site and adjoining area were built on 40 hectares of land reclaimed along the bank of the River Mersey by landfilling with predominantly domestic wastes between 1957 and 1981. In preparation for the 1984 International Garden Festival, a landfill gas extraction system was installed and subsequently electricity generators were added.


[Courtesy of Enviros Consulting]
Former International Garden Festival Site

A programme of site investigations in 1988 resulted in the reconstruction of the landfill gas management system with three levels of control and monitoring. These were:

- enhanced gas control system comprising some 48 wells extracting gas from the bulk of the waste;
- secondary migration control system comprising some 41 wells along the edge of the waste; and
- 43 monitoring boreholes beyond the waste.

The primary objective of the system has been to control gas to ensure that no injury or damage to persons, properties or vegetation occurs on site, and to prevent uncontrolled gas migration beyond the site boundary. Until December 1997 there was a secondary objective of utilising landfill gas for electricity generation. The power generation scheme consisted of two Caterpillar gas engines capable of generating 1 MW of electricity.

Since 1998 the extracted landfill gas has been flared from a high temperature 1,000 m^3/hr enclosed flare housed in a secure compound. Emissions testing has confirmed that trace components are below the guidance trigger levels for flaring.

The success of the gas management system has allowed significant housing development to be permitted around the landfill perimeter, and has allowed a Leisure Operator to use the former landfill for a range of leisure developments.

Key Planning Features

Location:	Otterspool, South Liverpool
Setting:	Urban/riverside
Operator:	Liverpool City Council/Biogas Technology Ltd.
Landfill details:	Closed and restored landfill with limited public access
Flare specification:	Stack height (4 m); stack diameter (1.25 m); flare temperature (1,000°C)

Future Issues

The most immediate issues regarding landfill gas utilisation and flaring are more stringent regulation of atmospheric emissions by the Environment Agency and the requirements of the Landfill Regulations. These will potentially lead to a requirement for more sophisticated extraction systems and taller stacks resulting in associated landscape impacts and the phasing out of the use of open flares.

Nevertheless, and despite some concerns regarding atmospheric emissions, landfill gas utilisation is (under the terms of the EC Landfill Directive) regarded as the best practicable environmental option (BPEO) for landfill gas control. It will also continue to be encouraged via Government incentives in order to help reach targets in relation to greenhouse gas emissions. As such, applications for more utilisation schemes are likely to arise over the next few years.

In the longer term, the EC Landfill Directive seeks to reduce the amount of biodegradable municipal waste materials going to landfill by 65% from 1995 levels. This will result in a decline in the landfill gas resource over time and, therefore, a decline in the number and scale of utilisation schemes, whilst flaring will continue to play an important role in landfill gas control. Nevertheless, as this is a national target, selected sites may be chosen to concentrate on biodegradable materials and therefore landfill gas utilisation systems.

[Courtesy of Enviros Consulting]

Installing a gas well

Further Reading

- Waste Management Paper 26B and 27.
- Landfill Gas Development Guidelines (1996) ETSU for the DTI
- Environment Agency – Guidance on Landfill Gas Flaring – (2003) Version 201.
- Environment Agency – Guidance on the Management of Landfill Gas (Draft for Consultation – 2002)
- Environment Agency – Guidance for Monitoring Landfill Gas Engine Emissions (Draft for Consultation 2002).
- Environment Agency – Guidance for Monitoring Enclosed Landfill Gas Flares (Draft for Consultation 2002).
- Environment Agency – Guidance on Gas Treatment Technologies for Landfill Gas Engines (Draft for Consultation 2002).

10 Leachate treatment plant

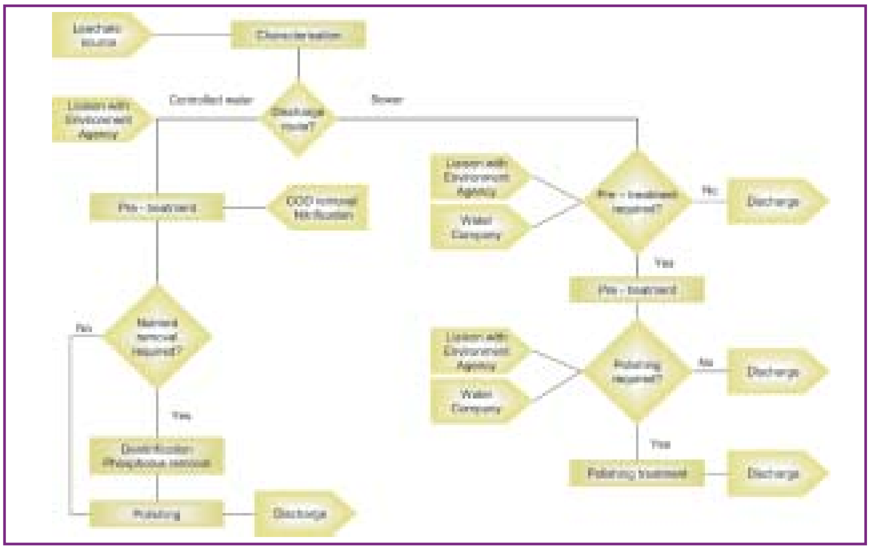
What is it?

Leachate is the generic term given to water which has come into contact with decomposing waste materials and which has drawn pollutants out of those materials into solution, thereby contaminating the water. Leachate in the UK is mostly derived from landfilling solid waste, particularly municipal and commercial/industrial solid waste, but water contaminated by waste material is also associated with other mechanical and biological waste-processing operations. In the future, these may be given greater emphasis with changing waste management philosophy.

The characteristics of leachate depend on the waste materials and, for municipal solid waste, will typically contain the following contaminants:

- Ammoniacal-nitrogen
- Degradable and non-degradable organics
- Dissolved methane (from landfill gas)
- Sulphide and other odorous compounds
- Specific hazardous organics and inorganics

Leachate is required to be treated before discharge to controlled waters. This can be either totally or partly at a sewage treatment works, or at an on-site leachate treatment plant prior to discharge to sewer or to controlled waters.



[Courtesy of Enviros Consulting]

Decision tree for determining leachate treatment options

A leachate treatment plant is a dedicated, generally site specific process, used to assist the management of leachate. The main objective of leachate treatment is to attain the required standard for discharge either to sewer or to controlled waters, which may be either streams, rivers or the sea.

The degree of treatment required will depend on the characteristics of the leachate, and the receiving water.

Leachates that are being discharged to sewer may only require the removal of methane. Those discharged to controlled waters will require full treatment, possibly including polishing. A decision flow diagram to assist in defining the appropriate treatment level is presented at the bottom of this page.

Some leachate treatment processes are listed as follows:

Anaerobic biological treatment	– removal of organic material (note that a landfill is an efficient anaerobic reactor)
Aerobic biological treatment	– removal of organic material – removal of ammoniacal-nitrogen – removal of organic-nitrogen
Anoxic biological treatment	– removal of nitrate-nitrogen
Air stripping	– removal of ammoniacal-nitrogen – removal of organic nitrogens
Breakpoint chlorination	– removal of ammoniacal-nitrogen
Granular Activated Carbon	– removal of trace organic material
Ozonation	– removal of trace organic material colour removal
Dissolved Air Flotation Sand Filtration	– suspended solids removal colour removal
Reverse Osmosis	– concentration of contaminants – removal of organics ammoniacal-nitrogen, chlorides
Evaporation	– concentration of contaminants – removal of organics ammoniacal-nitrogen, chlorides
Rotating Biological Contactors, Trickling Filters	– removal of organic material, ammoniacal nitrogen
Reed Bed Polishing	– removal of organic material, ammoniacal nitrogen

In the treatment of leachate from municipal waste landfills, the following treatment process techniques are used most often:

- aerobic biological treatment in aerated lagoons;

- aerobic biological treatment in sequencing batch reactors (SBR);
- advanced leachate treatment including aerobic biological treatment, ozonation, and colour removal;
- denitrification and additional polishing systems including reed beds;
- methane stripping plants; and
- rotating biological contactors.

These systems are generally permanent fixed plants, the period of treatment extending well beyond the life of the landfill. However, they can also be temporary/mobile facilities, associated with any short term treatment required. The more advanced systems which treat leachate to a standard suitable for discharge to sensitive surface watercourses tend to be fixed and permanent in nature.

The earliest purpose designed leachate treatment plants included aerated lagoon systems. The leachate is mixed in a biomass suspended in an aqueous liquor in strictly controlled conditions. Mixing and aeration are achieved through the action of surface aerators, suitably sized and strategically located to provide the optimum mixing pattern.

[Courtesy of Enviros Consulting]

Aerated lagoon system

These systems have been superseded by aerobic biological treatment systems in covered tanks. In this case, aeration and mixing is provided by suitably sized venturi jet aerators. Polishing in reed beds is now often employed to improve the quality of the treated leachate prior to being discharged to controlled waters.

[Courtesy of Enviros Consulting]

Hempsted landfill leachate treatment plant

Most aerobic biological systems will produce sludge that will need to be removed periodically. In addition, the treatment process often requires pH correction facilities, particularly sodium hydroxide for use in biological nitrification, and nutrient addition, for example phosphoric acid may be used to provide a readily available form of phosphorus. Antifoam agent is also used when the active biomass of the aerobic biological systems acclimatise to changing leachate contaminant load. Where ozonation is used, the ozone will be generated on the site.

Due to recent concerns regarding nitrate levels in water resources, denitrification systems have been developed. Such plants convert nitrate to nitrogen gas which is released from solution during mixing. To achieve effective denitrification, it is essential to provide an external source of organic material. This is usually methanol, although molasses or other high chemical oxygen demand (COD) organic material has been used. During this process, alkalinity is released into solution, and the pH-value can rise. When necessary, further pH correction takes place using sulphuric acid.

Leachate methane stripping plants are generally required where leachate is to be discharged into the public sewerage system for treatment with general domestic foul sewage at a municipal wastewater treatment works.

Spray irrigation of leachate onto land has been used as a method of reducing the concentration of contaminants to acceptable levels. This is not now generally acceptable unless the runoff and infiltration is intercepted and monitored prior to discharge, to avoid the risk of contamination of water resources and vegetation in the immediate vicinity of the discharge.

[Courtesy of Enviros Consulting]

The configuration of a methane stripping plant at Red Moss Landfill Site, Manchester, where a series of individual 5000 litre aeration tanks are used in series to reduce the methane level by a factor of 100.

Recirculation of leachate back into previously landfilled areas continues to be practised, where permitted, as a means of utilising the absorptive capacity of the waste and as a method of inducing methanogenesis in the landfill. This helps to establish it as an efficient anaerobic reactor, which reduces organic material to methane and carbon dioxide.

Leachate treatment plants vary in size, form and make-up according to the volume of liquid effluent that requires treatment, the chemical composition of the liquid effluent and the level of treatment that is required. The typical characteristics of a leachate treatment plant include a series of circular tanks of differing sizes and heights, associated pipework, pumps and control equipment. The main tanks can either be fully above ground or partially sunken.

Siting and Scale

The location of a leachate treatment plant is normally dictated by the source of the leachate, usually a landfill site. Most landfill sites are located in rural or urban fringe locations.

Where possible, plants should be sited in close proximity to other site infrastructure such as site offices. There is often a requirement to have gravity discharge from plants to adjacent watercourses or sewers which may restrict the extent to which plants and site infrastructure can be co-located.

If the site is in a rural location, care should be taken to ensure that adequate screening of the plant is provided and as much of the tank structure is buried below ground as possible. Tanks can usually be painted in a colour consistent with usual building design standards.

General siting criteria

Existing landuse: Choice of site limited by source of the leachate and discharge route (i.e. local water course). Often rural or urban fringe. If in Greenbelt, proposals should be treated as ancillary to the existing use (landfill).

Proximity to sensitive receptors: Generally low potential for nuisance. Plants can be managed within very close proximity to housing without undue concern. (e.g. Borth in Ceredigion, west Wales, plant located within 50 metres of housing).

Transport infrastructure: Not critical.

Leachate treatment tank

Physical & Operational Characteristics [100 m^3/day plant]

Expected lifetime of facility:	Typically temporary e.g. 6 months – 2 years or semi permanent e.g. 15–20 years
Working time:	24 hours 7 days, subject to volumes requiring treatment. Leachate can be treated on a batch basis using balancing/storage tanks
Leachate volumes treated:	According to site specific need; examples range from 30 m^3/day to 800 m^3/day
Typical site area:	Less than 1 ha
Building footprint:	Various
Building height:	Less than 5 m – 20 m
Vehicle movements:	Occasional vehicles weekly
Employment:	1 or 2 operatives part or full time or plant may be fully automated

The matrix below has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Scoping Matrix: Leachate treatment plant

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Development Activity						
	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, Traffic and Access	▲	●	●	●	●	▲	●
Air Emissions (including dust)	▲	●	●	●	●	▲	▲
Odours	●	●	▲	▲	●	■	●
Vermin and Birds	●	●	●	●	●	●	●
Noise / Vibration	▲	●	▲	●	●	▲	▲
Litter	●	●	●	●	●	●	●
Water Resources	▲	●	■	●	●	■	▲
Land Stability	▲	●	●	●	●	●	●
Visual Intrusion	▲	●	■	●	●	●	▲
Nature and Archaeological Conservation	▲	●	●	●	●	▲	●
Historic (Built) Environment	●	●	●	●	●	●	●
Potential Land Use Conflict	●	●	●	●	●	●	●

Definition of Terms:
Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.
Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.
Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

Key Issues

Traffic

For most leachate treatment operations traffic is not a significant planning consideration. There will only be limited and infrequent traffic movements associated with the delivery of chemicals and to take sludge from any biological treatment tank off site. During the operational life of the landfill, sludge is likely to be disposed of at the landfill and will not therefore contribute to vehicle movements on the highway. Longer term proposals for sludge treatment/disposal post landfill closure should be assessed in the context of traffic and highways constraints. On-site treatment of leachate, compared with tankering to remote treatment plants, has distinct transport advantages.

Odour

There are no significant air emissions or health risks associated with leachate treatment plants. The only limited issue relates to the potential for releases of certain odorous emissions. These mainly include the group of emissions known as volatile organic compounds (VOCs), ammonia and hydrogen sulphide. The odour generating issues associated with leachate treatment operations are discussed below.

The possibility of odour from leachate treatment plants is probably the issue of greatest concern to local residents and interested parties. The potential sources of odour from most leachate treatment processes are:

- Air displaced from the feed balancing tanks, as the tank fills (i.e. when raw leachate is being pumped to the tank, but not removed to the aeration tank).
- Air displaced from the aeration tanks by the action of the Venturi pumps which draw in air from outside the aeration tank and inject it into the aeration tank liquid.
- Headspace air from the treated leachate storage facilities.

The process of leachate treatment has an inherently low risk of producing odour and, indeed, is designed to combat odours normally associated with raw landfill leachate. Most leachate treatment operations involve the management of micro-organisms which are used to absorb and remove potentially harmful chemicals in the leachate, including potentially odorous materials.

The nitrification/denitrification process produces little odour, the sludge biomass generally being contained in covered reactors. If they are present at all, odours have an airy, “sweet” smell and are normally only noticeable when standing adjacent to open tank access hatches and ventilation discharge points. The end result is a final effluent which is normally odour free.

Most odour problems are caused when waste materials decompose in anaerobic conditions, i.e., in the landfill itself. Throughout all stages, the contents of the aeration tank in an aerobic biological treatment process remain in an aerobic condition avoiding the risk of odour production.

Some limited odour may result during certain plant operations such as the removal of sludge from tanks, which are generally undertaken on an infrequent basis (e.g. monthly or annually). Normally this will not be an issue as the sludge will be pumped directly from the relevant tank into a tanker vehicle without being exposed to the air.

[Courtesy of Enviros Consulting]

Sundon landfill leachate treatment plant, commissioned in summer 1997

Noise

Noise is not normally an issue unless the site is in a particularly noise sensitive location. The main noise generating activities will be associated with the operation of pumps and aerators. The use of submerged Venturi aerators ensures that the only sound audible outside the site itself is likely to be from the air intake for aeration. The air intake noise is equivalent to the air conditioning intakes commonly used for office building air conditioning systems and is not generally considered significant. The noise generated by the pumps and aerators may be minimised by regular servicing, in accordance with the manufacturer's recommendations.

Noise is an issue that is controlled under the IPPC Regulation as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Water Resources

There is some small risk of chemicals and untreated leachate entering water courses if an accident occurs. However, the risk is very low and the principal reason for developing leachate treatment plants is to improve the quality of the water resource environment.

Visual Intrusion

Given that leachate treatment plants may be permanent new built features in a rural setting, landscape and visual impacts need to be carefully considered in the planning and assessment of such facilities. However, such plants are normally of a scale whereby sensitive design and screening should be sufficient to minimise visual and landscape impacts.

[Courtesy of Enviros Consulting]

A typical treated leachate discharge to surface water

Public Concern

Most waste management proposals, including those for leachate treatment plants, are received with caution by local residents and interested parties. Clarity is therefore required of the developer and the planning authority to ensure that the facts about the proposals are clearly presented to minimise public concerns at an early stage. The overall environmental benefits of such facilities need to be appropriately highlighted.

Need for EIA

Environmental Impact Assessment (EIA) is the process by which environmental information is collected, published and taken into account in reaching a decision on a relevant planning application. The main aim of EIA is to ensure that the authority giving the primary consent for a particular project makes its decision in the knowledge of any likely significant effects on the environment.

Generally, it falls to the planning authority to consider whether a proposed development will require an EIA. Leachate treatment plants fall under Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, either within category 11b ‘Installations for the disposal of waste’ or 11c ‘Waste water treatment plants’. DETR Circular 02/99 suggests that such a plant would only require EIA if it covers an area of ten hectares or more, or if it would lead to significant discharges. Most leachate treatment plants associated with waste management operations are unlikely to require EIA.

Content of Planning Application

Planning applications for leachate treatment plants should provide sufficient information to enable the waste planning authority to determine the nature of the processing operations, as well as the measures that will be used to minimise potential nuisance issues, particularly those associated with odour and noise. It would be appropriate for applicants to enter into a dialogue with the Environment Agency and the waste planning authority at an early stage to determine what level of information is appropriate for planning and what process specific details may be reserved for waste licensing or PPC permitting.

It is assumed that planning applications will be accompanied by information including drawings consistent with those provided for other waste management operations.

Certain additional information should also be provided. This relates in particular to aspects such as:

- Planning policy context;
- Need; and
- BPEO.

It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and, where appropriate, with reference to the local Waste Strategy and Waste Local Plan, or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1 of this publication. Most applications for leachate treatment plants are unlikely to require a detailed BPEO analysis.


[Courtesy of Enviros Consulting]

Hempsted leachate treatment plant, Gloucester

Mitigation

The table below identifies the key planning considerations associated with leachate treatment plants, and details the mitigation measures that may be required. For many plants there will be only very limited issues that will need to be considered in a planning application in addition to relevant information on the nature of the proposals.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic, Transport and Access	No mitigation normally required. Access arrangements where possible should use established landfill infrastructure.	N/A
Odour	The main methods for minimising odour are: • Containment of raw leachate in covered tanks, and pumping at low flow rates to avoid the venting of odour • Use of a large buffer of treated leachate, such that at any time, the proportion of raw leachate in the mixed liquor within the aeration tank is low and is treated rapidly • Aerobic processes are designed to reduce the quantities of trace odorous materials in the leachate, using a biological oxidation process	N/A
Noise	Use of submerged aeration units should minimise noise to an acceptable level.	Additional noise reduction options might include silencing measures and enclosures of pumps.

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Water Resources	The main purpose of a leachate treatment plant is to protect water resources. The Environment Agency will require that all tanks and chemical storage areas are adequately contained to ensure that any accidental spillage or leak does not affect the wider environment.	N/A
Visual Intrusion	Visual intrusion can be minimised by: • Co-locating the facility next to existing buildings of a similar scale • Screening mounds (bunding), planting around the site and partial burial of tanks below normal ground level (see Water Resources, above) • Colour treatments as appropriate to the tanks and above ground infrastructure	N/A

Case Examples

Packington Landfill Site, Warwickshire

Planning permission was granted to SITA Waste Management in October 2002 for the development of a leachate treatment plant on land adjacent to Packington Lane, to treat leachate from the Packington Landfill site. At present the site uses a temporary storage system for leachate which is tankered off site for disposal at a commercial waste water treatment plant.

[Courtesy of Enviros Consulting]

Proposed plant layout, Packington leachate treatment plant

The proposals, which have yet to be implemented, will involve the construction of a series of tanks to treat the raw leachate from the landfill site by means of nitrification and denitrification processes.

The main plant components include:

- Aeration tank (6 m high, of which 3.5 m will be below ground)
- Anoxic denitrification tank (9.5 m high (including roof structure) with 1.5 m below ground)
- Effluent holding tank
- Sand filtration plant
- Granular activated carbon plant

- Flow balancing storage tanks
- Chemical storage area
- Control room and store

The proposed facility will be fully automated and will treat leachate 24 hours per day, 7 days per week. The plant has been designed to treat leachate suitable for discharge to the local watercourse. If required under the discharge consent, the proposals include an option to install reed beds for extra polishing of the effluent to remove residual biochemical oxygen demand (BOD) and suspended solids.

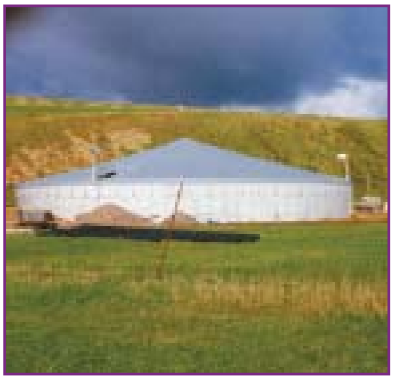
As the plant is located in Green Belt, the planning application had to be referred to the Secretary of State as a departure to the Development Plan. Additional evidence also had to be provided to demonstrate the need for the development and how permission could be justified on the basis of exceptional circumstances and general environmental improvement.

Key Planning Features

Location:	Packington landfill, near Little Packington, Warwickshire
Setting:	Rural, Greenbelt, 0.6 km from nearest residential properties
Site Area:	0.45 ha
Leachate Volume:	220 m^3/day
Building Footprint:	Tanks approximately 25 m × 25 m, reed beds 28 m × 22 m
Tank Heights (above ground):	Maximum 7 m
Design Features:	Tanks required to be partially screened form Packington Road and stand-off required from adjacent tree plantation.

Connon Bridge Leachate Treatment Plant, Cornwall

The Connon Bridge Landfill site is located 7 km from Liskeard, east Cornwall and is operated by County Environmental Services. The landfill site comprises two main areas: an old unlined area now largely restored, and a new lined area which has been receiving waste since 1993. Due to the rainfall levels in this part of the country leachate flows from the old part of the site have regularly reached 1,000 m^3/day. These have been controlled by spray irrigation into nearby woodland. This is carefully regulated by the Environment Agency and has proved to be an effective means of management.



[Courtesy of Enviros Consulting]

Connon Bridge leachate plant, commissioned in March 1997

The leachate from the new lined area is much stronger than that from the old area. A licence condition required that this stronger leachate was pre-treated in an on-site plant before irrigation in a similar manner to the weaker leachate from the old site. The plant was commissioned in March 1997 and became fully operational later in the same year.

Due to a need to reduce the level of total nitrogen in the treated effluent, denitrification trials were undertaken and a denitrification process installed. The operating results show that the total nitrogen levels are comparable to, or less than those in the receiving watercourse.

Key Planning Features

Location:	Connon Bridge Landfill Site, near Liskeard, east Cornwall
Setting:	Rural
Site Area:	0.2 ha
Leachate Volume:	Average 150 m^3/day
Building Footprint:	One below-ground balancing tank and one concrete tank, each approximately 20 m diameter
Tank Heights (above ground):	Maximum 5 m to top of roof
Design Features:	Standard design specification

Future Issues

Experience of treatment of leachate from landfills over a period of 20 years has demonstrated that certain proven techniques are robust and reliable and can treat effluent to almost any standard that is required. Various techniques applied to other wastewater treatment scenarios exist, although the industry is unlikely to entertain major changes due to uncertainties over reliability and the financial warranties that are required.

Although the total number of landfill sites is likely to reduce in response to the Landfill Directive, existing and old landfill sites will continue to need new leachate treatment facilities. Indeed, over the next few years the need for leachate treatment in the form of dedicated plant is likely to increase as Environment Agency surface and groundwater protection standards are reviewed. Most landfill sites are located in rural and Green Belt locations. Planning Authorities will therefore need to act with discretion in approving such facilities whose main purpose is to protect the environment.

Further Reading

- Department of the Environment (1995) Waste Management Paper 26B (pp.157–164)
- Leachate.com
- Leachate.co.uk

11 Small scale facilities

What is it?

Small scale waste management facilities include bring bank and civic amenity sites. There are many names for civic amenity sites, including ‘household waste recycling centres’, ‘resource recovery centres’ and ‘bring sites’. For ease of use, the term ‘civic amenity site’ will be used in this profile. These small scale waste management facilities are accessed by the public for the deposit of their recyclable, oversized or garden waste.

- Bring banks are containers into which the public can deposit their segregated household recyclable materials. They are commonly sited at easily accessible locations, such as supermarkets and village halls, and are often grouped together to make recycling more convenient. Bring banks can be used to collect a wide range of materials, but most frequently collect paper, glass, textiles, shoes, plastics and cans. They often take the form of large metal or fibreglass containers measuring approximately 1.5 metres in height, and from 1–3 metres in length and width.

- Civic amenity sites are provided by Waste Disposal Authorities as places where the public can deliver their household waste for recycling or disposal. The major waste streams are usually garden waste, oversized items, such as furniture and waste appliances, and building rubble. These sites may be split level for ease of access, and usually incorporate skips, collection areas for waste refrigeration and metal appliances, and recycling banks. A greater diversity of recycling banks are often found at these sites than at local bring banks, including containers for materials such as waste batteries, paint, oil and wood. These facilities do not generally accept trade waste, although some civic amenity sites allow traders to dispose of waste for a fee.

The amount of waste collected at civic amenity sites has been increasing at over double the rate of the overall household waste stream since 1996/97[1]. Over a third of this increase can be attributed to rises in the amount of trade waste illegally entering sites under the guise of household waste. The increased use and awareness of these sites due to improvements in the recycling and composting facilities available has also contributed significantly to this increase.

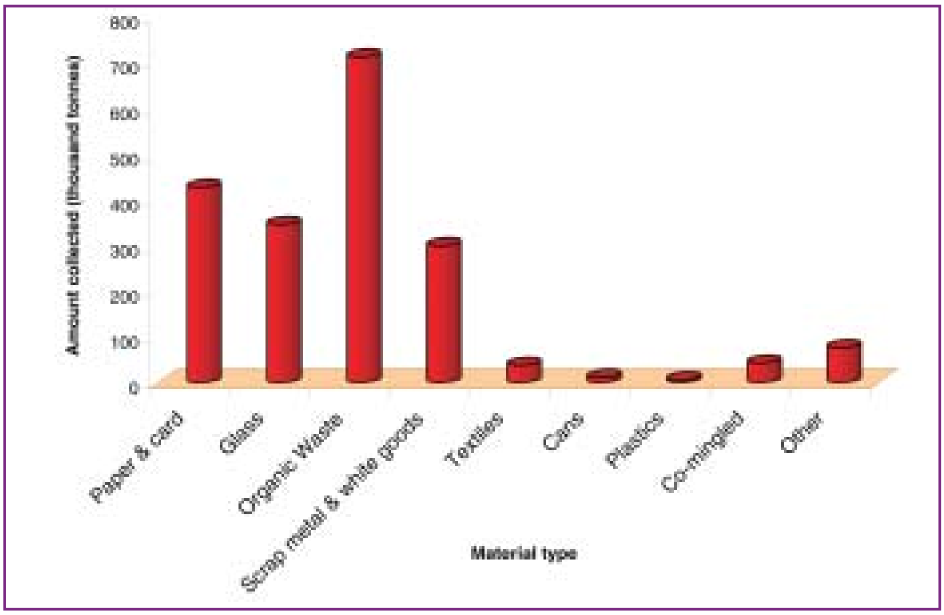
[Courtesy of Enviros Consulting]

Bring banks at a civic amenity site

[1] Trade Waste Input to Civic Amenity Sites, Western partnership for Sustainable Development and Network Recycling, 2002

In 2000/01 around 70% of the total household waste collected for recycling by local authorities in England – around 2 million tonnes – was collected at civic amenity and bring sites[2]. Almost 36% of the waste collected at these sites was compostable waste. Paper and card accounted for a further 21%, glass for 17% and scrap metal and white goods for 15%.

The environmental concerns of civic amenity sites generally arise because of historical reasons. They have tended to start their life on a small scale in unsuitable locations, and have grown in scale to cope with increasing demands from householders for convenient waste disposal facilities. Some of the newer sites that are currently being developed are purpose built, on suitably located sites, and their environmental impacts are significantly lower than the old style sites. Some of the newest sites are housed within buildings, thus containing noise and dust nuisance to a greater degree.

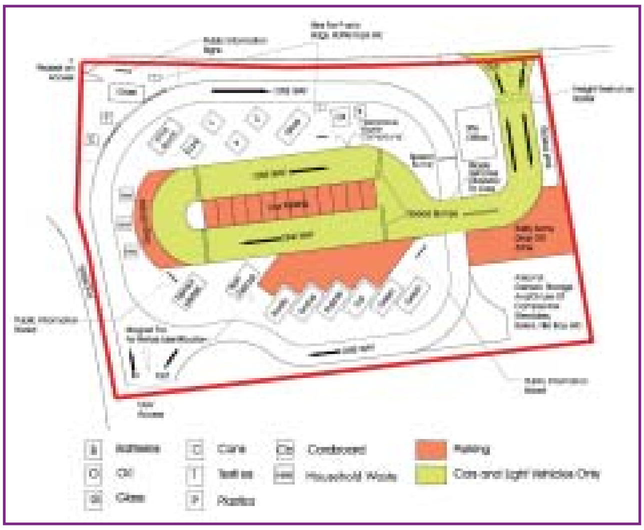


Types and amounts of materials collected at CA and Bring sites in England in 2000/01[3]

Best practice in the design of civic amenity sites incorporates separate areas for the general public to deposit waste and for servicing vehicles to collect it. Split level sites allow easy access to the top of waste bays for disposal of waste, whilst servicing vehicles and compactors can operate at the lower level, isolated from the general public. Although these sites need additional civil engineering works and therefore require greater initial investment, they tend to provide easier access to containers than flat sites where low sided containers or steps are required. A generic layout for a civic amenity site is shown below.

[2] Municipal Waste Management Survey 2000/01, DEFRA, 2002
[3] Data obtained from Municipal Waste Management Survey 2000/01, DEFRA, 2002

Container bays set aside for individual waste streams are becoming more common, and it is possible to sequence them in order to maximise ease of use by the public and material recovery rates, as follows:



[Courtesy of Enviros Consulting]

Generic layout plan for a civic amenity site

- **Household hazardous** – this waste should be removed from the waste brought to the site at the earliest possible stage, and in view of the site office;

- **Bulky waste/White goods** – this bulky fraction can be separated at an early point, with assistance if necessary;

- **High density materials (rubble/soil, timber, scrap metal)** – as with bulky waste and white goods, these materials are typically brought to the site in trailers or vans. By locating these containers early in the sequence, these larger vehicles can be partially segregated from private cars using the site. Typically, these vehicles will not bring such material and dry recyclables in the same visit;

- **Dry recyclables (paper, cans, textiles, plastics)** – these containers should be located close together in order that cars need stop only once to deposit all of their segregated recyclables;

- **Green waste** – this waste is commonly brought to civic amenity sites as the only waste type for that trip, so where possible, containers for green waste should be located so that vehicles can conveniently bypass other waste containers and make one stop to deposit green waste;

- **General waste** – this waste cannot be readily segregated at an earlier stage in the sequence, it may be cross contaminated or mixed waste from missed collections for example.

Siting and Scale

Bring Banks

A high recycling participation rate can be achieved more cheaply than by kerbside collection if an adequate range of bring banks are located to maximise convenience. If people have to make specific journeys to deliver recyclables to bring banks there can be transport impacts, and participation may then be limited to those who have their own transport. However, it can be difficult to find enough locations for banks that are both convenient and do not invite opposition from local residents.

The accessibility and convenience of bring banks influence the amount of material recovered by their use; decreasing the number of people served per site is typically linked to increasing material recovery. In the UK, some authorities have achieved provision of one bring site per 750 households, and where there is a high concentration of bring sites there is evidence that a reduction of 10–15% in refuse can be achieved. For convenience, bring sites should be located in accessible, high traffic areas that are visible yet secure from vandalism. Bring banks and vehicle access to them must be on hard standing, with sufficient space and access both for householder's vehicles and the collection vehicles. Locations should be avoided where parked cars may cause congestion, and a sufficient space should be left between bring sites and residences so as to avoid noise nuisance.

[Courtesy of Enviros Consulting]

Example of a well maintained rural bring bank site (note the litter bin for discarded plastic bags)

If a location cannot justify or support a stationary bring bank site, one alternative is to employ a mobile bring station. These mobile stations can visit temporary collection locations in several communities on a rotating basis. Residents know the schedule and bring their recyclables to the staffed station when it stops in their community.

General siting criteria

Bring Banks

Existing landuse: Bring banks can be located in a variety of locations, including supermarket car parks and village centres, due to their small size and portability.

Proximity to sensitive receptors: Bring banks can be sited anywhere central to the communities that they serve. Examples of locations include the car parks of village halls and public houses.

Transport infrastructure: Bring banks have the potential to attract relatively large numbers of people, both on foot and by car. Due to their locational demands, they will often benefit from a suitable, existing transport infrastructure.

Civic Amenity Sites

Civic amenity sites need hard standing areas to site recycling bins, skips and possibly compactors which can be fully/partially enclosed or open. Surfacing needs to be impermeable if the site is to cater for potentially polluting waste such as oil or car batteries and surface water drainage is routed via an interceptor. Civic amenity sites are generally small scale (0.5 ha) and may be ancillary to an existing waste management operation, providing 'front-end' recycling[4].

Facilities need to be located near to centres of population or on the edge of urban areas to maximise accessibility and ensure usage. These sites can attract large numbers of people and therefore careful thought is needed to maximise the space given to both recycling areas and vehicle turning space. Often sites are open every day of the year (with the exception of Christmas and New Year), operating during daylight hours. As with bring banks, these sites can result in adverse traffic impacts relative to kerbside collection, so careful consideration must be given to their siting.

The key factor that will influence the success of a civic amenity site is the ease of their use by the public. The range of considerations that waste management contractors should incorporate when designing a site include, but should not be limited to:

- Logical and clearly defined site layout;
- Clear and simple signs and road markings;
- Access control and advice at the site entrance;
- Traffic circulation to minimise the need to reverse;
- Helpful and proactive site supervision with sufficient staff;
- Public information notices that demonstrate the environmental and economic benefits of recycling and waste management (including the percentage recycling rate and tonnage collected in the previous month and year to date);
- Adequate parking and provision for queuing at peak periods;
- Segregation of public traffic from service and collection vehicles by means of a split level site;
- Provision for use by pedestrians;
- Safe, clean and practicable environment with minimal distances required for lifting and carrying materials to waste receptacles;
- Efficient operating procedures;
- Innovative and attractive storage facilities;
- Colour co-ordination at deposit facilities; and
- CCTV with vehicle recognition system.

[Courtesy of Enviros Consulting]

Clear signage encouraging segregation of waste

[4] Shropshire Waste Local Plan 2002-2014 1st Deposit Draft June 2002

Physical & Operational Characteristics
[civic amenity site]

Expected lifetime of facility:	Permanent
Working time:	Daylight hours, every day of the year (with the exception of Christmas and New Year)
Waste Input Tonnage treated:	Typically between 10,000–50,000 tonnes per annum
Typical site area:	Less than 0.5–1 ha
Building footprint:	Civic amenity sites are typically open air areas of hardstanding. A mobile site office may be situated on site
Vehicle movements:	Public access to centre – averaging 1,000 cars per day Vehicles removing waste streams for further treatment – average 1–2 vehicles per day
Employment:	2–4 workers
Waste storage:	In bring banks and skips – removed when full

The matrix below has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Scoping Matrix: Small Scale Facilities

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues (based upon PPG10, Annex A)	Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, Traffic and Access	■	▲	●	●	●	▲	■
Air Emissions (including dust)	■	●	▲	●	●	▲	■
Odours	●	●	▲	●	●	▲	●
Vermin and Birds	●	●	▲	●	●	▲	●
Noise / Vibration	▲	▲	▲	▲	●	●	■
Litter	●	▲	▲	▲	●	■	●
Water Resources	■	●	●	●	●	▲	▲
Land Stability	▲	●	●	●	●	●	▲
Visual Intrusion	▲	●	▲	●	▲	▲	▲
Nature and Archaeological Conservation	■	●	●	●	●	▲	▲
Historic (Built) Environment	▲	▲	●	●	●	▲	▲
Potential Land Use Conflict	●	▲	▲	●	●	■	●

Assumes a throughput of approximately 10,000 tonnes per annum

Waste stream: recyclables, oversized household waste, green waste, building rubble.

NB This matrix has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – assuming what may be possible without full mitigation. It in no way reflects the actual or likely impacts of any proposed development.

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

General siting criteria

Civic Amenity Sites

Existing landuse: Appropriate locations for civic amenity sites could include industrial and employment areas, or areas of degraded, previously contaminated or derelict land.

Proximity to sensitive receptors: Civic amenity sites need to be located close to the point of waste arisings, to make their use a realistic option for householders; however, there is a trade off in their siting, between convenience and the potential for public concern. The visual impact of civic amenity sites can be mitigated by sensitive siting, and the use of fencing and landscaping.

Transport infrastructure: Civic amenity sites have the potential to attract large numbers of people, particularly at peak times such as weekends, evenings and Bank Holidays. These facilities need to be located near to centres of population or on the edge of urban areas, and served by suitable road infrastructure, usually good quality A/B class roads. Queuing may occur on occasion, and the impact of such queues on traffic flows should be considered.

[Courtesy of Enviros Consulting]

Information clearly labelled containers to encourage segregation

Key Planning Issues

Transport, Traffic and Access

As with all waste management facilities, bring banks and civic amenity sites will be accessed by a significant level of traffic. The majority of this traffic will consist of private vehicles, although waste collection vehicles such as HGVs and skip transporters will also need to visit the site on a regular basis.

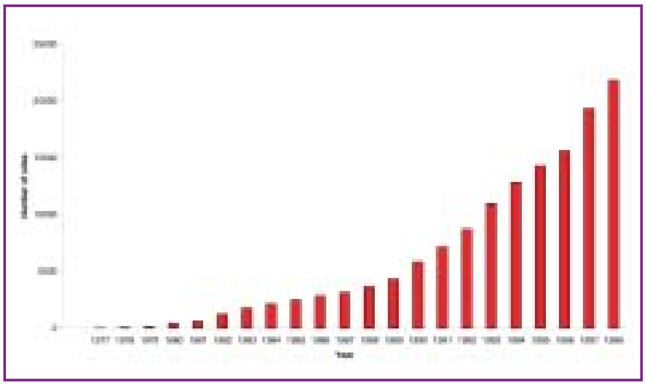
Noise/Vibration

Noise issues at bring banks and civic amenity sites may arise due to general traffic noise, waste collection vehicle manoeuvring (particularly in relation to reversing alarms) and the deposition of waste. Where bottle banks are located close to sensitive receptors, the smashing of bottles in the base of the containers may cause a noise issue.

As part of the planning process consideration of the local noise environment will need to be considered. Problems may arise when facilities are located close to residential development and other noise sensitive receptors.

Noise is an issue that is controlled under the PPC Regulations as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:



Increasing Number of Bottle Bank Sites in Great Britain[5]

- 55 dB(A) daytime
- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Litter

As multiple, small items of waste are often deposited at bring sites, there is the potential for windblown litter to give rise to nuisance issues off site. When containers are not emptied often enough, recyclables or other waste may be deposited next to the container, where it can be easily knocked and displaced. Breakable waste streams, such glass and rubble, can give rise to potentially harmful litter if care is not taken in their disposal and they smash on the ground beside the container.

A further source of litter that is commonly associated with bring banks are the discarded carrier bags or boxes that are used to carry the recyclables to the banks.

[Courtesy of Enviros Consulting]

Recyclable material piling up beside an un-emptied bring bank

[5] Data obtained from Digest of Environmental Statistics, DEFRA, 2001

Need for EIA

Environmental Impact Assessment (EIA) is the process by which environmental information is collected, published and taken into account in reaching a decision on a relevant planning application. The main aim of EIA is to ensure that the authority giving the primary consent for a particular project makes its decision in the knowledge of any likely significant effects on the environment.

Generally, it falls to the local planning authority to consider whether a proposed development will require an EIA. Civic amenity sites and household waste recycling centres facilities fall under Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, within the category ‘installations for the disposal of non-hazardous waste’. This category is explained within DETR Circular 02/99 by means of the following text:

The likelihood of significant effects will generally depend upon the scale of the development and the nature of the potential impact in terms of discharges, emissions or odour. For installations (including landfill sites) for the deposit, recovery and/or disposal of household, industrial and/or commercial wastes (as defined by the Controlled Waste Regulations 1992) EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of these wastes, sites seeking only to accept inert wastes (demolition rubble etc.) or civic amenity sites, are unlikely to require EIA.

Following this advice, bottle banks and civic amenity sites are unlikely to require EIA.

Content of Planning Application

Bottle banks are deemed as permitted development under the Town and Country Planning (General Permitted Development) Order 1995; however, developers should consult with the local planning authority to ensure planning compliance.

[Courtesy of Enviros Consulting]

Poorly located and maintained bottle bank

Within the planning application for a civic amenity site, applicants should provide sufficient information to enable the waste planning authority to determine the nature of the processing operations, as well as the measures that will be used to minimise potential nuisance issues, particularly those associated with traffic, litter and noise. It would be appropriate for applicants to enter into a dialogue with the Environment Agency and the waste planning authority at an early stage to determine what level of information is appropriate for planning and what process specific details may be reserved for waste management licensing.

It is assumed that planning applications will be accompanied by information including drawings consistent with those provided for other waste management operations.

Proposals will not normally need to provide full details to demonstrate that they represent BPEO; however, some context in terms of fit with waste management strategies or waste development plan objectives would be useful.

Mitigation

The key planning considerations where mitigation measures may be required will be related to the key environmental issues assessed through EIA. Typically these relate to the main emissions from the facility and the physical appearance of the buildings.

The table below identifies the key planning considerations associated with small scale facilities, and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Transport, Traffic and Access	Sites should incorporate as long a queuing lane and/or as many parking spaces as possible to reduce the likelihood of vehicles being held up on public roads. A clear road layout and one way flow of traffic will help to reduce congestion and queuing. Clear signage will enable cars to access the part of the site they require.	If possible, the design of the site should maximise the space available to allow overtaking, enabling vehicles to access the containers they need without queuing. Operators may consider some form of compaction equipment to increase the amount of material that can be placed in skips, thus reducing the number of servicing vehicles accessing the site.
Noise/Vibration	In sensitive locations such as sites within residential areas careful design of internal arrangements is essential. Noisy activities such as vehicle manoeuving areas and glass bottle banks should be located as far away from noise sensitive receptors as possible.	Noise fencing and bunds may be used around civic amenity sites. Some newer facilities are housed within steel framed buildings, which helps to reduce noise impacts. On site vehicles may be fitted with ‘smart’ reversing alarms.
Litter	Containers should be emptied frequently to prevent overspill. Regular road sweeping and litter picking, as well as ensuring that servicing vehicles are adequately sheeted/contained will help to contain litter.	Recycling points for carrier bags/boxes may be provided alongside bring banks. Perimeter fencing/landscaped areas around civic amenity sites may be used to trap litter before it leaves the site.

Case Examples

Meanwood Road Site, Leeds

The Meanwood Road Household Waste Site, located in Leeds, West Yorkshire has been recommended by some members of the National Forum for Regional Technical Advisory Bodies because it demonstrates a number of best practice design features.

Leeds City Council has an objective to work with the public to maximise recycling outputs, and a decision was made to completely redevelop the site, historically used as a refuse collection depot and disposal site, to produce a 'state of the art' recycling facility. The site has been redesigned to ensure that Leeds residents who use the facility can recycle their waste as easily as possible. The main design objectives were to facilitate waste segregation, maximise segregation opportunities, facilitate access and reduce queuing. As a result particular attention has been focussed on traffic flow, clear consistent signage, and attention to customer care and information during the designing, building and operation of the facility.

[Courtesy of Enviros Consulting]

Clear signage at Meanwood Road Waste Sorting Site

The recycling range of the new site includes:

Skip containers: timber, garden/green waste, metal, cardboard, plastic, soil, bricks/rubble.

Key Planning Features

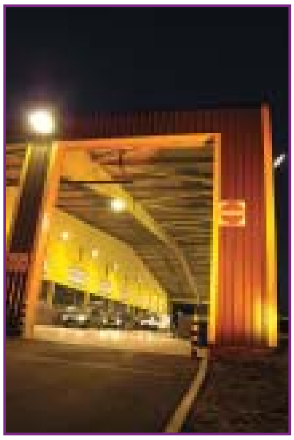
Location:	Meanwood Road, Leeds, West Yorkshire
Setting:	Urban
Waste Types:	Recyclable and oversize household waste
Site Area:	Approximately 0.6 ha
Design Features:	• The sloping site was put to advantage and a split level feature was created. This enables high level access to the skips by the public and a separated lower level for skip delivery and removal • The public can identify appropriate receptacles by means of colour coding • Information on what happens to waste and recycled materials is displayed at the site • Landscaping is simple but effective – grass and small shrubs with neat perimeter fencing • All operational areas are hard surfaced with drainage and interceptors in place

Bring Pods: glass, paper, textiles, shoes, oil bank, paint, books.

Small containers: mobile telephones, spectacles, ink cartridges, postage stamps, greeting cards, aluminium foil, batteries.

Individual items: electrical goods, car batteries, gas canisters, fridges.

Kirkless Materials Recycling Facility, Wigan



[Courtesy of Waste Recycling Group plc]

External view of Kirkless Materials Recycling Facility

In November 2000, a new ten year contract was awarded to Waste Recycling Group plc to manage municipal waste arisings within Wigan Metropolitan Borough, including five civic amenity sites. One of the facilities that will form a key element of the new integrated waste management approach, and which will continue to drive improvements in recycling, is the Kirkless Materials Recycling Facility (MRF), Wigan. The MRF is located alongside the former Kirkless landfill, now restored, and was designed, constructed and put into operation within eighteen months of the contract commencement.

The MRF comprises both a civic amenity site and a waste bulking and transfer facility for collected household and commercial waste. These two functional areas are housed within a single building, but have separate access. The building presents a good aesthetic appearance, appropriate to its industrial setting, and has been designed robustly with durable features. By enclosing most of the site activities and using measures such as mist sprays for dust control, environmental impacts are minimal.

The civic amenity facility operates on a one way system with parallel parking for vehicles adjacent to a series of split level bays designated for specific materials.

Waste is sorted and transferred from the public delivery bays into storage areas for different waste streams, along with the incoming waste delivered by collection vehicles and trade waste vehicles. Recyclable materials are stored in a separate area away from the main building under a steel clad canopy for onward collection and transfer to reprocessors.

Key Planning Features

Location:	Kirkless, Makerfield Way, Lower Ince, Wigan
Setting:	Urban
Waste Types:	Household waste and commercial waste
Waste Volume:	120,000 tpa of collected municipal/commercial waste for transfer 40,000 tpa of civic amenity waste
Building Footprint:	Approximately 110 m × 55 m
Building Height:	8 m at eaves
Design Features:	• All waste activities housed within enclosed building • Recycling facilities are arranged to encourage effective use by the public • The access road, site layout, operational assistance and parking arrangements are all designed to make use of the facilities efficient and avoid queuing traffic on the public highway • Heavy goods vehicles to service the site and deliver waste have a dedicated access to the site, separated from the public

Future Issues

An essential part of achieving the municipal waste recovery targets set by the Government is the drive towards more household recycling and composting. The following targets have been set for the recycling and composting of household waste:

- To recycle or compost at least 25% of household waste by 2005;
- To recycle or compost at least 30% of household waste by 2010; and
- To recycle or compost at least 33% of household waste by 2015.

To ensure that all local authorities contribute to these targets, the Government has set statutory performance standards for local authority recycling in England. However, in order to reach these standards, a large number of new facilities, including collection points such as bring banks and civic amenity sites, will need to be developed.

[Courtesy of Enviros Consulting]

Mobile household waste compaction unit

The number of new collection facilities that are needed will be linked to the number of kerbside collection schemes developed. The more recyclables are collected from the source of their arising, the less need there will be for centralised facilities. It will also be linked to the success of encouraging the general public to reduce the amount of waste they produce in the first instance. An increase in the number of civic amenity sites/household waste recycling centres will make them more accessible to the public, as long as they are dispersed throughout the population. Civic amenity sites have often been co-located with landfill sites – as landfill use becomes less common, and recycling of waste becomes more common, it is anticipated that new sites should be located in residential areas to reduce the need for travel and encourage recycling.

[Courtesy of Enviros Consulting]

Waste delivery points, Kirkless Materials Recycling Facility

The design of civic amenity sites vary considerably. In order to encourage best practice, the development of common standards of design and practices in operation will be invaluable. Linked to the design of sites, clarity in the scale of recycling centres which require planning permission is needed, as is expanded information around which centres are considered to be permitted development.

12 Waste transfer

What is it?

Waste transfer is the process by which waste is taken from waste producers, including industry, commerce and the general public, and taken for treatment, recycling and/or disposal. To minimise the cost of transport and to reduce environmental impacts, transfer stations are commonly used to transfer waste from smaller vehicles to larger vehicles, or from road vehicles to trains or barges for onward transport. Typically waste from waste collection vehicles, usually with a capacity of around 10–12 tonnes, is bulked up or compacted and loaded onto larger vehicles, with a capacity of up to 22 tonnes.

Municipal solid waste (MSW) transfer stations usually consist of a large building where vehicles deliver waste either onto the floor, into bays, or into compaction units. Inert wastes may be transferred in the open. The waste is usually only present for a matter of hours before being transferred, either directly or by front loading shovel, into larger vehicles for onward transport. Waste is not usually stored within the waste transfer station overnight. Waste transfer stations are often located in association with other waste management

[Courtesy of Enviros Consulting]

Waste transfer operations within a transfer building

[Courtesy of EWS]

Waste transport by train

activities such as Materials Recovery Facilities (MRFs) and Civic Amenity sites. Association with MRFs may allow the partial sorting of the waste at the transfer station to remove recyclables.

The use of waste transfer stations in an integrated waste management system offer a number of environmental advantages. Firstly, they reduce the amount of fuel and atmospheric emissions associated with the transport of waste by reducing the number of vehicle miles travelled for waste management purposes. This is especially true of transfer stations that utilise trains or barges for onward waste transfer. Secondly, they reduce the number of HGVs on the road that are associated with waste management, potentially reducing the effect on local traffic congestion. Finally, they allow disposal/management operations to occur at a distance from population centres by reducing transport costs.

Siting and Scale

Good access is fundamental to the siting of waste transfer facilities. Facilities should normally be sited on, or close to, class A and B roads, or close to road nodes (junctions). They should be located on sites which optimise transport of waste from source to its final destination. In general, the 'proximity principle' should apply, although a balance needs to be struck between impacts on residential amenity and environmental and economic factors. Where rail or barge is the mode of transport, proximity to the source of waste is important, in order to minimise road transport. Industrial estates can often be used as the road infrastructure is generally designed to be suitable for use by a range of commercial vehicles in relatively large numbers.

[Courtesy of Enviros Consulting]

Specialist battery transfer

The size of the transfer station is entirely dependent upon the level of waste throughput. However, buildings often need to be relatively tall as there is a safety requirement that all vehicles are able to move around within the building with their trailers in the upright position, so that ceiling infrastructure and doors do not get damaged. Transfer stations can cover an area of up to one hectare.

Physical & Operational Characteristics [120,000 tonnes per annum facility]

Expected lifetime of facility:	20 years
Working time:	20 days per month
Waste Tonnage treated:	10,000 tonnes per month
Typical site area:	0.7 ha
Building footprint:	70 m × 30 m
Building height:	12 m
Vehicle movements:	Significant variation depending on nature of work and mode of collection/transfer
Employment:	Site manager and foreman, plus two other workers
Waste storage:	Unsorted waste may be stored in open bunkers or skips, housed within a building

The matrix below has been prepared as a guide to the key planning considerations that may be encountered when assessing the siting and development of new or modified waste operations – **assuming what may be possible without full mitigation** or where management practices fail.

Scoping Matrix: Waste transfer station

■ Level 1 issue
▲ Level 2 issue
● Not applicable or insignificant issue

Planning Issues from PPG10, Annex A	Development Activity: Site Preparation and Construction	Transport	Equipment Operation (normal conditions)	Routine Maintenance Procedures	Ancillary and Administrative Activities	Operational Failures (Shut downs, spills, leakages etc)	Demolition
Transport, Traffic and access	▲	■	■	●	●	▲	▲
Air Emissions (including dust)	▲	■	▲	●	●	●	▲
Odours	●	▲	■	●	●	■	●
Vermin and Birds	●	●	■	●	●	■	●
Noise/Vibration	▲	■	■	●	●	▲	▲
Litter	●	▲	■	●	●	■	●
Water Resources	▲	●	▲	●	●	■	▲
Land Stability	▲	●	●	●	●	●	▲
Visual Intrusion	▲	▲	■	●	●	●	▲
Nature and Archaeological Conservation	■	●	●	●	●	▲	●
Historic (built) environment	▲	▲	●	●	●	●	●
Potential Land Use Conflict	▲	▲	▲	●	●	■	▲

Assumes a throughput of approximately 120,000 tonnes per annum

Waste stream: mixed municipal or industrial wastes.

Transfer may be by road, rail or water.

Definition of Terms:

Level 1 – It is likely that the development may, under certain circumstances and without appropriate mitigation measures in place, result in significant positive or negative impacts.

Level 2 – It is possible that the development may, under certain circumstances and without appropriate mitigation measures in place, result in limited positive or negative impacts.

Not applicable or insignificant issue – This issue is either normally insignificant or has no direct relevance to this planning issue.

General Siting Criteria

Existing landuse: Preference should be given to industrial or degraded sites or sites on or close to existing waste management facilities.

Proximity to sensitive receptors: Sites closer than 250 m from residential, commercial, or recreational areas should be avoided. Transfer routes away from residential areas are also preferable. .

Transport infrastructure: Good access to the primary road network is crucial.

Key Issues

Traffic

[Courtesy of Enviros Consulting]

Waste collection vehicle

Like any waste facility, waste transfer stations will be served by significant numbers of HGVs potentially causing an impact on roads close by and the amenity of local residents. Transfer stations do, however, reduce the total numbers of HGVs on the roads and the total mileage of waste vehicle transportation. Issues such as traffic congestion, severance, safety and traffic related loss of amenity are material planning considerations and, on trunk routes, may become a concern of the Highways Agency.

Air Emissions

Atmospheric emissions in relation to waste transfer are primarily associated with emissions of combustion products (COx, SOx, NOx, VOCs, PM^{10}) from HGVs. These emissions may be important along the immediate route of the vehicles involved. Nevertheless, on a regional basis, transfer stations reduce the total volume of pollutants produced by reducing the number and mileages of waste vehicles.

Dust/Odour

The presence of putrescible/municipal wastes can potentially lead to odours of fresh waste in close proximity to the transfer station, although the generally rapid turn around of waste on-site usually prevents any serious odour problems. The handling of waste and the movement of vehicles may also give rise to dust. However, transfer stations are not normally associated with dust nuisance.

Flies, Vermin and Birds

Transfer stations are not normally associated with rodents or birds given that operations tend to take place within a building and waste materials are only present for short periods. In hot summer weather, however, flies may become a problem, particularly if they are being bought in with the incoming waste.

Noise

The main problems associated with noise at waste transfer stations have been attributed to the following activities:

- Vehicle manoeuvring on-site along with loading and unloading operations (particularly in relation to reversing alarms). NB Such operations can be especially noisy in comparison to other waste management and industrial activities

- Traffic noise on the local road network in relation to HGV movements and/or train noise

- Site preparation/engineering works

Noise is an issue that is controlled under the PPC Regulations as well as under the planning regime and by Local Authority Environmental Health Departments, under Statutory Nuisance provisions.

Typically noise limits are either set at site boundaries or at sensitive receptors and these limits are usually based on target levels at agreed properties. These can be fixed limits based on guidance from the World Health Organisation, such as:

- 55 dB(A) daytime

- 45 dB(A) night-time

In quiet or sensitive areas, the targets may vary according to the local noise environment, such as the following:

- 5 to 10 dB(A) above the existing background noise level.

Litter

The presence of MSW including paper and plastics may potentially result in the release of litter. Carrying out operations within a building however, tends to prevent any significant impacts. Litter may also be spread from waste vehicles.

Water Resources

The nature of the material being handled can potentially constitute a risk to water resources. As most transfer stations are under cover, rain is unlikely to come into contact with the waste materials and therefore water pollution is unlikely. Nevertheless, wash-down waters within the transfer station and any liquid within the waste needs to be dealt with, and most transfer stations require drainage systems to ensure that dirty waters are dealt with appropriately.

Visual Intrusion

The presence of a large building and the presence of waste materials may lead to impacts on landscape character and visual amenity. Vehicle movements may also result in a visual impact. The significance of any such impact is dependent on a number of site specific issues including:

- Direct effects on landscape fabric i.e. removal of landscape features, such as trees
- Proximity of landscape designations
- Site setting, i.e. the proximity of listed buildings and/or conservation areas
- Proximity of sensitive viewpoints
- Presence of existing large built structures
- Existing landform and the nature of the existing landscape setting
- Presence/absence of screening features, such as trees, hedges and banks
- The number of vehicles/trains/barges accessing and exiting the site.

[Courtesy of Envios Consulting]

Walbrook Wharf transfer station, central London

Public Concern

Applications for waste transfer stations are often subject to local opposition given the nature of the material to be handled. Particular public concerns often relate to amenity issues, including odour, dust, noise, litter, vermin, flies and disturbance from traffic/trains.

[Courtesy of Enviros Consulting]

Waste transport by road

Need for EIA

Whether any development requires a statutory Environmental Impact Assessment (EIA), is defined under the terms of the Environmental Impact Assessment (England and Wales) Regulations 1999. Within these regulations there are two categories of development: those which require mandatory EIA (set out in Schedule 1 of the regulations) and those types of projects where EIA is not mandatory, but where the development may result in significant environmental effects due to it's nature, size or location, and so EIA may be considered necessary (Schedule 2).

MSW handling operations may be covered under Schedule 2 – Part 11 'Other Projects' (b) Installations for the disposal of waste. The applicable thresholds for consideration of whether an EIA may be required under the regulations for waste developments are:

(i) The disposal is by incineration; or

(ii) The area of the development exceeds 0.5 hectare; or

(iii) The installation is to be sited within 100m of any controlled waters.

Further guidance is also available in Annex A of DETR Circular 02/99 on Environmental Impact Assessment. Paragraph A36 gives indicative EIA requirement thresholds for a range of waste development types including waste transfer stations as follows:

A36. '.....EIA is more likely to be required where new capacity is created to hold more than 50,000 tonnes per year, or to hold waste on a site of 10 hectares or more. Sites taking smaller quantities of these wastes (.......) are unlikely to require EIA.

Given the above, the decision regarding whether a transfer station requires EIA will depend primarily on its size and throughput. Other general issues to consider regarding the need for EIA are given in Part 1 of this guide.

Good practice dictates that EIAs should be properly scoped from the outset. The 1999 EIA Regulations introduced new provisions for screening and scoping which enables the applicant to obtain a scoping opinion from the waste planning authority. It is advisable for the applicant to also undertake a separate scoping exercise to ensure that the appropriate level of engagement with relevant stakeholders is achieved at the outset of the EIA process.

It is particularly important that statutory consultees, such as the Environment Agency and English Nature, have the opportunity to comment on the scope and content of specific technical assessment that may be required.

If the transfer station is too small to require EIA it may be appropriate to provide a more limited appraisal of the potential environmental effects.

Content of Planning Application

The content of the planning application with regard to the assessment of environmental issues will largely be guided by the scope of the EIA (where an EIA is required). Certain additional information should also be provided over and above what is generally required under the EIA Regulations. This relates in particular to aspects such as:

- Planning policy context;
- Need; and
- BPEO

Such information can either be provided as separate documents or combined within the EIA.

It is generally accepted that applicants should state their case on the need for the development in the context of other existing and proposed facilities in the area and, where appropriate, with reference to the local waste strategy and waste local plan or relevant local development document. Guidance on the general approach to BPEO is provided in Part 1.

A common failing of applications is a failure to adequately address environmental effects of site design and operational aspects. For example, information on plant specifications, traffic volumes and routes, housekeeping, mitigation schemes (such as landscaping), site design and layout should normally be included. Some of this information may be difficult for applicants to procure if the development contract process has not advanced to a stage where detailed specifications are available.

Where possible the waste management licence permit application should be submitted in parallel with the planning application. This should assist the Environment Agency in providing representations to the waste planning authority on the environmental impacts of the proposal. There will always be a degree of overlap between information provided in the planning application and that contained in the permit application. This will relate to issues such as noise, general housekeeping and amenity effects. Where applications are not submitted in parallel it is likely that applicants will need to include additional information on site design aspects in the planning application.

Mitigation

The key planning considerations where mitigation measures may be required will be related to the key environmental issues assessed through the Environmental Impact Assessment. Typically these relate to traffic, nuisance issues and the physical appearance of the site. The table below identifies the key planning considerations associated with waste transfer stations and details the standard design features incorporated to mitigate for them. Additional options are also described for consideration.


[Courtesy of EWS]

Offloading waste containers from a rail wagon

Mitigation Measures		
Planning Considerations	Standard Design Features	Additional Options
Traffic	Mitigation measures may include routing of vehicles away from sensitive areas and limitation of operating hours.	Use of S.106 agreements
Air Emissions	Limitation of journey distances and sensitive routing/siting may help reduce traffic related air quality effects.	N/A
Dust/Odour	Enclosure of operations within a building is the primary means of preventing odour and dust impacts.	Water and perfume sprays may be used along with road sweeping for dust.
Flies, Vermin and Birds	Rodent and fly control may be affected by rapid turnaround of waste materials. Birds are discouraged by containing operations within a building.	Rodenticides and insecticides may be used. Drainage systems may be fitted with grates etc. to prevent rodents entering the building via drains/sewers.
Noise	Noise mitigation may include sensitive siting and regular maintenance of equipment. On-site vehicles may be fitted with 'smart' reversing alarms. (NB. It is not possible to fit all incoming vehicles with such alarms as many will belong to companies not associated with the transfer station operator.	Noise fencing and bunds along with sound insulation within the building may be used.
Litter	Enclosure of operations within a building, regular road sweeping, litter picking and ensuring that all waste vehicles are adequately sheeted/contained helps to prevent litter.	N/A

Mitigation Measures *cont'd*		
Planning Considerations	Standard Design Features	Additional Options
Water Resources	Avoidance of areas close to sensitive water resources, and provision of a drainage system separating dirty and clean waters, as well as transferring dirty waters to sewer or other appropriate treatment, will prevent any serious water pollution.	N/A
Visual Intrusion	Visual impacts may be reduced by appropriate siting, sensitive building design, and appropriate painting.	Landscape planting may be utilised, but may take several years to mature. Fencing and earth bunds may also be employed.

Case Examples

[Courtesy of Cory Environmental]

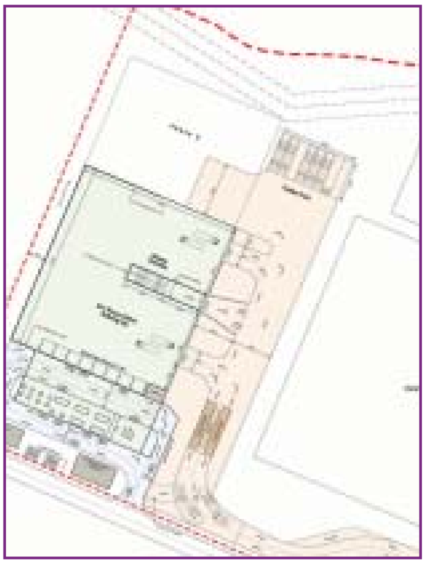
Walbrook Wharf Waste Transfer Station

Walbrook Wharf London

The Walbrook Wharf Waste Transfer Station, whilst operated by Cory Environmental (South-East) Ltd. Forms part of the Cleansing Depot owned by the Corporation of London. The transfer station was refurbished in 1996 and forms part of a 20 year transfer and disposal contract with Cory Environmental (South-East) Ltd.

Although the operations are in the centre of London and surrounded by commercial properties they take place almost unnoticed by many passers by on the Thames and from the nearby Southwark Bridge.

Waste and skip lorries collection vehicles enter the transfer station via a weighbridge. They then drive into the transfer hall where they reverse into an allocated bay and discharge their load into a hopper. Here the waste is compacted into containers and loaded, via a gantry crane onto barges for transfer to a landfill site downriver in Essex. Waste can only be transported down stream at high tide. Movements are therefore restricted to twice daily.



[Courtesy of Enviros Consulting]

Proposed site layout plan

Battlefield Environmental Management Centre

The Battlefield waste transfer station is part of a larger proposed waste management operation which also includes facilities for transfer of source separated recyclables and composting as well as a CA site. An EIA was undertaken for the proposals and planning permission was granted by Shropshire County Council in January 2004..

The facility has been proposed to assist in the management of Shrewsbury and North Shropshire's waste stream due to the potential closure of a nearby landfill and recycling centre. There is also a requirement locally for the bulk transfer of recyclables. The transfer station will also assist with the economics of waste transport in the local area.

Key Planning Features

Location:	City of London, north bank of River Thames.
Setting:	Urban riverside
Operator:	Cory Environmental (South East) Ltd.
Types of Waste Handled:	Household and commercial
Waste Throughput:	Licensed to take 110,000 tpa. (actually take 250 t/d Mon–Fri, 80 t Sat, 40 t Sun approx.)
Associated Vehicles:	Approximately 150 waste collection vehicle loads are transferred to a single barge with a capacity to take 26 containers each day (Mon–Fri)
Building Footprint and Height:	Footprint = 0.7 Ha, Max Height = 26.76 m
Hours of Operation:	24 hours, 7 days/week
Ancillary Equipment:	Weighbridge, central control room, dust extraction equipment, waste bays/reception hoppers and compactors, bulk bay, containers, gantry crane, wharf
Waste Source Catchment:	City of London (approx 1 square mile)
Primary Waste Destination:	Cory Environmental (South East) Ltd. Mucking Landfill Site, Essex.

Key Planning Features

Location:	Battlefield, Shrewsbury
Setting:	Mixed use industrial estate
Operator:	Shropshire Waste Management Ltd. (part of the SITA Group)
Types of Waste Handled:	Household and commercial
Waste Throughput:	Initially around 50,000 tpa (+25 tpa of source segregated recyclables). Potential to increase to 100,000 tpa (linked to greater recycling and the inclusion of advanced waste treatment technology
Associated Vehicles:	Approx 100 deliveries in and 20 out per day
Building Footprint and Height:	Footprint = 0.4 Ha, Max Height = 10 m
Hours of Operation:	0730–1700 (Mon–Fri), 0730–1300 (Sat), Closed Sundays and Bank Holidays
Ancillary Equipment:	Split level loading bays, weighbridge, dust suppression (mist sprays), central control room, loading plant (front loading shovel etc.).
Waste Source Catchment:	Shrewsbury and parts of North Shropshire District
Primary Waste Destination:	Landfill close to Shrewsbury

Future Issues

[Courtesy of Enviros Consulting]

Specialist waste paper transfer

In the future, the EC Landfill Directive will begin to encourage diversification away from landfills and promote recycling and other more sustainable waste management practices. This may necessitate the building of more transfer stations to allow waste to be transported to more remote specialist waste management facilities. Transfer station developers and waste collection authorities/companies will also be encouraged to consider alternatives to road transport to ease congestion and reduce the environmental effects of road haulage. There are considerable environmental and planning benefits associated with the future co-location of transfer facilities with other new waste management operations.

The report is the product of an in-depth consideration of the planning issues arising from the provision of waste management facilities. A wide consultation with professionals and operators in the field was carried out for this study which focuses on site-level planning. It sets out the research team's views on the planning considerations raised by a broad range of waste management facilities and identifies the information likely to be required by planning authorities in determining planning applications. The report provides profiles for each type of waste management facility, including a scoping matrix to facilitate the identification of potential impacts.

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