



# LFE1 - Our approach to landfill engineering

Policy 351\_09

Issued 10/08/09

## Policy statement

We require that proposals for landfills are designed in such a way as to protect the environment.

We expect that operators adopt a principle of 'Landfill by design'. This means, we expect landfill operators to use sound scientific techniques and detailed calculations to design a specific solution to protect the environment from the particular risks at the proposed location.



Document details

## Objectives

The objectives of our policy are to ensure:

- all new landfills are designed, operated and decommissioned in accordance with the general principal of sustainability;
- all landfill engineering is carried out in accordance with the applicable planning and permitting procedures;
- we receive independent third party assurance that all landfill engineering is carried out in line with our permitting process, particularly where lining and capping systems are being installed;
- operators carry out an appropriate level of risk assessment before and during the design and construction phases which demonstrates that the factors influencing the design have been properly considered;
- operators apply standards stricter than the engineering norm where the environmental risks justify this, and that lower standards are only used where there is sound scientific justification for doing so;
- that new techniques and materials are developed and used where they're scientifically sound, particularly when they will improve environmental protection.



References



Feedback

## Policy authorisation

### Policy sponsor

Liz Parkes, Head of Waste

### Chair approval body

National Landfill Engineering Group (Chair: Rob Marshall)

Contact for queries

[Rob Marshall](#)

## Note

Some hyperlinks in this document will only work for Environment Agency staff.

## Explanatory note

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### Background

Landfill engineering is the discipline of designing and constructing the facilities society uses to store waste. It also includes the methods for checking the integrity of landfill facilities. [Figure 1](#) shows the interrelated elements of landfill engineering and how quality management and risk assessment envelop the physical elements of the discipline.

We recognise that total containment of waste is not practical, as a result we expect landfill operators and proposers adopt a 'Landfill by design' approach. This approach involves designing landfills using sound scientific techniques and calculations to protect the particular environment/location in question.

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### Design principles

Landfill designs should be holistic, taking account of sustainability and cost benefit as well as standard design considerations.

Designs must be firmly based on the principles of risk assessment. Designers must consider the environmental consequences of the various design options available and adopt a precautionary approach when selecting options.

As part of the precautionary approach, designers must incorporate factors of safety in their design, proportionate to the consequences of failures.

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### Planning approval and permitting

Both the Environment Agency and local planning authorities have concerns regarding landfill engineering. As a result the applications for an environmental permit and planning approval are often run in parallel.

#### Planning approval

Where we are not satisfied the details of an application are practical and appropriate to protect the environment we will seek further information before formally responding. We may also object outright to an application on this basis.

**Important!** We must be sure that the planning application satisfies **all** the objectives of this policy before we respond to the planning authority.

#### Permitting

If construction of a landfill begins before we grant an environmental permit, we will attend the site during construction to establish a record of the works (using photographs and notes).

During any pre-application discussions or site visits we will not provide any approval of liner design, installation methods, materials or laid ground, however we will offer advice on such issues.

We take this approach to avoid the possibility or appearance of prejudging an application for an environmental permit. We will only take our final decision after we have carried out the required level of consultation (with statutory consultees and others) and technical determination.

**Note:** If the required level of technical expertise is not available within the Environment Agency, we will seek to obtain the required advice on a consultancy basis.

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## Developing new methods and materials

We will encourage the development and use of new methods and materials where they will result in improved environmental protection. We expect that where these new methods will deviate from established engineering standards that they will be robustly backed by evidence. The amount of evidence we require will be proportionate to the risk of failure of the proposed new method.

Such evidence could be gathered from:

- a literature review;
- laboratory testing and modeling;
- field trials;
- site comparisons;
- research and development projects,
- or a combination of these routes.

We suggest operators involve us at an early stage in any such proposal to avoid any abortive effort later on. We will duly consider any evidence submitted and test the proposal against our own experience and knowledge. We recommend that operators leave an additional period to allow us to assess the proposal, and any subsequent negotiation or development which may be required.

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## Desired outcomes

- The environment is protected by preventing uncontrolled releases of liquids and gases from landfills.
  - Landfills are constructed using methods and materials that are fit for purpose, and will provide a stable structure with the expected levels of environmental protection over their design lives.
  - The construction and operation of landfills is quality assured to high standards.
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## Audience

**Internal:** Groundwater and Contaminated Land teams, Environment Management teams, Geoscience Technical Services and National Permitting Service staff.

**External:** Landfill operators, their designers, consultants and contractors and local authorities with a planning interest in applications for new or expanded landfills.

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## References

- The Landfill Directive (1991/31/EC)
- The Environmental Permitting Regulations 2007
- The Groundwater Regulations 2009
- Sector guidance note: Standards and measures for disposing waste in a landfill (not yet published)
- [Groundwater protection: policy and practice](#) (known as GP3)
- LFE1 - How we assess engineering designs for landfill sites (not yet published)
- [LFE2 -Cylinder testing geomembranes and their protective materials](#)
- [LFE3 - Using geosynthetic clay liners in landfill engineering](#)
- [LFE4 - Earthworks on landfill sites](#)
- [LFE5 -Using geomembranes in landfill engineering](#)
- [LFE6 - Guidance on using landfill cover materials](#)
- [LFE7 - Using nonwoven protector geotextiles in landfill engineering](#)

- [LFE8 - Geophysical testing of geomembranes used in landfills](#)
- [LFE9 - Compliance testing earthworks on landfill sites using nuclear density gauges](#)
- [LFE10 - Using bentonite enriched soils in landfill engineering](#)

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## Policy implementation plan

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### Who are the target audiences?

**Internal:** All staff involved in processing, determining, auditing and enforcing landfill engineering designs.

**External:** Landfill operators and their agents involved in applying for and designing engineering works for landfill sites.

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### Do they require awareness training or education?

Yes. For internal staff, it will be provided through the basic/advanced landfill engineering course as appropriate.

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### What do they need to know?

General awareness.

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### When do they need to know it?

Before dealing with landfill engineering issues.

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### How will they be told?

By quick guide, or by attending either the basic or advanced landfill engineering course.

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### Who will tell them?

Easinet communications, and the National Training Service

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### Monitoring of progress

#### Methods

Using Geoscience Technical Development Framework.

Success criteria	Date completed
▪ Landfill engineering coaching network established.	
▪ Audit of Geoscience Technical Development Framework.	

#### Comments

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## Figure 1 – Elements of landfill engineering

**Quality** – Quality control; quality assurance; third party construction quality assurance; leak detection systems

**Risk assessment** – methodologies, definitions, standards and reporting

**Landfill engineering** – legislation, principles and objectives, research and development, developing technologies, materials science, default standards

**Geotechnical investigations** - strategies; techniques; standards and reporting.

**Foundation conditions** - geology; hydrogeology; geomorphology; mining and quarrying; general site stability and detailed slope stability.

**Liner systems** - design; construction; material specifications; subgrade specification; liner type (geosynthetic, mineral or geocomposite); liner durability and physiochemical stability; groundwater collection and control systems: leak collection systems.

**Liner system protection** - design; construction; material specifications (geosynthetic, mineral or geocomposite); durability and physiochemical stability.

**Leachate and landfill gas collection and extraction systems** - design; construction; material specifications; type (geosynthetic, mineral or geocomposite); durability and physiochemical stability.

**Capping systems** - design; construction; material specification, type (geosynthetic, mineral, or geocomposite); durability and physiochemical stability

**Permitting and regulation** - template conditions; reporting; inspections; design method statements and validation reports.