G1 Scoping the environmental impacts of abattoirs

Explanatory note

For projects which require Environmental Impact Assessment (EIA), a scoping exercise should be undertaken early in the planning stages of the project. This enables the project to be designed to avoid or minimise negative environmental impacts and provides an opportunity to incorporate positive environmental enhancements into the project. Early consultation with all interested parties, including the Environment Agency, is an essential part of scoping. Even if a project does not require EIA under EIA legislation, it may be advisable (and in some cases necessary) to undertake a scoping exercise in any case (e.g. to support applications for other relevant consents and authorisations needed to carry out the project).

This guidance note aims to promote a good practice approach to scoping as part of the EIA process which in some respects goes beyond the statutory EIA requirements. When scoping a project, developers, or their consultants, should satisfy themselves that they have addressed all the potential impacts and the concerns of all organisations and individuals with an interest in the project.

This guidance note provides information on the most likely potential environmental impacts of abattoirs. However, each project must be considered on a case-by-case basis as the detailed characteristics of the proposal and the site will determine the potential impacts.

This guidance is based on the main legal requirements on EIA stemming from the EC Directive and the UK Regulations. However, developers should seek independent legal advice to ensure that the proposed development is carried out in compliance with the requirements of this and any other relevant legislation relating to planning as well as to pollution control.

This guidance note must be read in conjunction with the *Scoping Handbook*, which provides general guidance on the EIA process and the scoping of projects.

ENVIRONMENT AGENCY

This guidance note must be read in conjunction with the *Scoping Handbook,* which provides general guidance on the EIA process and the scoping of projects.

In addition, the following scoping guidance notes are relevant to *all* abattoir projects:

- **A1** Construction work
- **A4** Vegetation management and conservation enhancements

The following scoping guidance notes *may* be relevant in certain circumstances:

- **A3** Redevelopment and clean-up of contaminated land
- **B3** Control of pest species, including disease vectors
- **B7** Livestock units
- **G2** Animal feed manufacture
- **G6** Leather manufacture
- **L1** Incineration
- **L3** Sewage treatment works

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1 Introduction

1.1 This guidance note, in conjunction with the *Scoping Handbook* and the notes listed on the previous page, seeks to help developers and other interested parties identify the potential impacts of abattoirs on the environment as a whole. It should be emphasised that the list of impacts is by no means exhaustive and that a full investigation into positive and negative impacts should be undertaken. Early consultation with the Environment Agency and other relevant organisations will enable the identification of environmental issues and constraints and the avoidance of sensitive areas, thus reducing the need for redesigning and mitigating avoidable impacts at a later stage.

1.2 Following this brief introduction, an overview of the legal requirements for EIA in relation to abattoirs is provided. The potential environmental impacts of such projects are identified in Section 3. The text and summary table in this section will enable the reader to begin to identify the likely impacts arising from the particular proposal under consideration. The subsequent sections present the mitigation measures that may be relevant to abattoirs, followed by key references and further reading.

Background to development type

1.3 Abattoirs require good road transport links and suitable lorry parking and unloading areas. Adequate means must be provided for dealing with dung and urine so as to prevent contamination of controlled waters. By-products of the slaughtering process must be handled properly, either via proper storage facilities prior to removal or by an on-site facility. Thus, there may be the technical need or business desire to have effluent treatment plant, rendering, composting, and/or incineration facilities on site. There is also the possibility of nuisance due to odour, noise and the visual and social impact of the process causing distress to neighbours. A thorough scoping exercise and careful consideration of alternatives are therefore of prime importance.

2 Development control and EIA

Development control

2.1 Abattoir developments are likely to require planning permission under the town and country planning regime, and as a result developers should contact their local planning authority to confirm whether or not their proposals require planning permission (or are subject to any other form of development control). They should also seek advice on the impact on their proposals of other planning-related legislation, for example the Conservation (Natural Habitats & c.) Regulations 1994 (as amended), SI No.94/2716.

Environmental Impact Assessment

2.2 Abattoir developments are included in Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) Regulations 1999 (SI 1999 No. 293). The Regulations list applicable thresholds and criteria which apply to Schedule 1 and Schedule 2 developments. If the thresholds are not exceeded, then EIA is not required and so these thresholds and criteria are termed "exclusive criteria". In cases where the thresholds are exceeded, Schedule 1 developments require an EIA (mandatory) but Schedule 2 developments only require an EIA if the development is likely to have significant effects on the environment by virtue of factors such as its nature, size or location. The exclusive criteria for Schedule 1 developments are taken from the EIA Directive, but those for Schedule 2 developments have been laid down in the UK Regulations, as provided for by the Directive. In addition to the specific criteria and thresholds set out in Schedule 2, all developments listed in Schedule 2 may require an EIA if any part of the development is to be carried out in a sensitive area.

2.3 The former DETR published guidance (referred to in the *Scoping Handbook*) which helps in the decision on whether, in respect of Schedule 2 projects, impacts are significant and whether EIA should be required. The guidance thus contains "indicative criteria", although area sensitivity and project-specific issues must be taken into account and the decision remains discretionary. The following criteria apply:

- Exclusive criteria

  Under paragraph 7 (f) of Schedule 2, installations for the slaughter of animals may require EIA if the area of new floorspace exceeds 1000 square metres.

- Indicative criteria

  Annex A of the Department of the Environment, Transport and the Regions Circular 02/99, *Environmental Impact Assessment*, states that, "New manufacturing or industrial plants of the types listed in the Regulations may well require EIA if the operational development covers a site of more than 10 hectares. Smaller developments are more likely to require EIA if they are expected to give rise to significant discharges of waste, emission of pollutants or operational noise. Among the factors to be taken into account in assessing the significance of such effects are:

  - whether the development involves a process designated as a "scheduled process" for the purpose of air pollution control;

  - whether the process involves discharges to water which require the consent of the Environment Agency;

  - whether the installation would give rise to the presence of

environmentally significant quantities of potentially hazardous or polluting substances;

- whether the installation would give rise to radioactive or other hazardous waste;

- whether the development would fall under Council Directive 96/82/EC on the control of major accident hazards involving dangerous substances."

Furthermore, EIA may be required for any change to or extension of an abattoir development already authorised, where the change or extension may have significant adverse effects on the environment. Responsibility for determining whether an EIA is required lies initially with the local planning authority.

2.4 Whether or not formal EIA of a proposed abattoir is required, the Environment Agency and other statutory consultees and regulators may request environmental information concerning the proposal. An EIA may provide the most appropriate method for a developer to collate the necessary information.

Other licences, consents and authorisations

2.5 Certain aspects of an abattoir development, such as waste management and discharge of effluent to surface waters, may require prior permissions or consents from the Environment Agency. These may include, for example, land drainage consents, abstraction licences, impounding licences and discharge consents. It is recommended that the developer seek independent legal advice and liaise with the Environment Agency during project design and subsequent stages to identify the consents, licences and authorisations that will be required.

3 Potentially significant environmental effects

3.1 The EIA Directive requires the EIA to "identify, describe and assess…the direct and indirect effects of a project on the following factors: human beings, fauna and flora; soil, water, air, climate and the landscape; material assets and the cultural heritage; [and] the interaction between the factors". Socio-economic issues, health and safety in the workplace, material assets and cultural heritage are all considered in EU *Guidance on Scoping* (ERM, 2001b) but are not impact categories for which the Environment Agency is the principal competent authority. Advice on these issues is presented in this guidance note without prejudice to the advice of the relevant competent authority, but the relevant competent authority should be consulted for each of these categories in all cases (further advice on the appropriate competent authority to contact is given in the *Scoping Handbook*).

3.2 Abattoir activities have the potential to affect the environment in many ways. They can differ widely in terms of their mode of operation and location, and key issues are likely to vary from site to site. Therefore, it is recommended that the user obtain expert advice on detailed technical issues. The issues arising for all environmental receptors will change over time as the project moves from construction through to operation and future modifications to process and facilities. Developers and site operators should therefore consider the impacts arising from construction, short-term and long-term operation.

3.3 Potential impacts are discussed here in broad terms only as their nature and intensity will depend on the physical characteristics of the project and the composition of any polluting materials. An EIA of proposed abattoir activities should take these factors into account in assessing potential impacts on the environment.

3.4 The following paragraphs should be read in conjunction with Table G2. This details the activities involved in the preparation and ongoing management of abattoirs, and the impacts arising from them.

Water environment

3.5 Surface water hydrology can be affected during both construction and operation of abattoirs. The development of the site and associated access roads can result in compaction of soils and an increase in impermeable (or slowly permeable) surfaces. The subsequent increase in surface runoff (where it occurs) may, in turn, increase soil erosion and the risk of flooding. The handling of soils near watercourses during construction may increase suspended solids in the watercourse.

3.6 Surface water quality could be affected by a number of factors during abattoir operations. Livestock will deposit significant amounts of dung and urine during unloading and storage, with the risk of subsequent wash-off into storm drains or local watercourses. Similarly, by-products such as blood and stomach contents pose a risk to surface waters if not properly contained. If the abattoir is not situated close to suitable mains sewerage there will be the need for a local effluent treatment plant, which will need to have suitable back-up facilities in case of process failure. Even if a suitable sewerage system is present, there will be the need for some form of primary separation with consequent biological waste storage and disposal implications. Some abattoirs apply salt (sodium chloride and fluoride) to hides for preservation; the resultant highly saline and phytotoxic effluent will require suitable management. Storage and pipeline transfer of chemicals and fuel oil on the site will also pose a risk to surface waters if incorrectly managed or in the case of an accident.

3.7 Abattoir activities may have significant impacts on groundwater hydrology and quality. Seepage of polluted water into potable water supplies can pose a distinct threat with pathogens such as Cryptosporidium being of particular concern. The presence of salt preservation processes will have clear implications for groundwater if incorrectly managed (see previous section). Storage and pipeline transfer of chemicals and fuel oil on the site will also pose a risk to groundwater if incorrectly managed or in the case of accident.

3.8 In order to protect vulnerable groundwater resources it is the policy of the Environment Agency to encourage new developments to locate in areas of low vulnerability to groundwater pollution. However, this policy does not imply an automatic prohibition on abattoir projects within source protection zones.

Land

3.9 Abattoir projects will have some implications for the physical characteristics and land use of the site. There will be a need for sites to be covered with an impermeable layer and equipped with a secure drainage system. Account must also be taken of the potential for contamination through runoff from roads and hardstandings. Storage and containment measures will be needed for fuel oil and hazardous chemicals, especially where downstream processing of by-products occurs on site (e.g., leather tanning). The extent of land-take is also a consideration.

Air and climatic factors

3.10 Transport of livestock by lorry will affect local air quality around the abattoir site. Storage and containment systems for animal by-products will need to be designed to prevent odour nuisance. Similarly, any ancillary operations such as an effluent treatment plant, rendering unit, composting facilities or carcass incinerator will need proper controls.

Ecology

3.11 The removal of native vegetation and its replacement with the development will cause direct damage to, or loss of, terrestrial and aquatic habitats. Polluted runoff may affect adjacent flora and there is potential for harm to aquatic ecosystems if runoff enters watercourses. Use of salt preservation processes (especially if sodium fluoride is used) could lead to ecological damage if incorrectly managed.

Human environment

3.12 The potential impacts of a abattoir development on the human environment may take a variety of forms. They are divided here into sections covering socio-economic and health issues; amenity, visual impact and nuisance issues; and culture, heritage and archaeology.

3.13 The potential for socio-economic and health impacts (real and perceived) arising from abattoir developments will be dependent on scale. A large plant can employ many hundred staff and so the local economic impact can be high. There will also be a short-term positive impact during the construction phase. There is potential for negative health impacts both by disease (due to a poorly designed or managed process) and psychological distress caused by the process itself. Both issues need careful consideration during the planning phase having due regard to the proximity of the development to neighbours.

3.14 The identification of which of these issues are significant or are perceived to be significant is an important function of public involvement during the scoping exercise. Understanding likely public concerns is a key issue and reference to experiences from other abattoir developments and any public representations to the local planning authority should be made.

3.15 Other issues that commonly need to be addressed include the visual impact of the abattoir, odour nuisance, and noise and vibration nuisance from traffic during both the construction and the operation of the site. Any restrictions to access that may arise as a result of the development should also be considered.

3.16 Impacts on architectural and archaeological heritage may occur, and it may be advisable to employ a watching brief. with a watching brief during the construction phase. The likelihood of there being any unrecorded sites and their potential for discovery should be examined.

Table G1

3.17 The impact identification table highlights:

- sources of impact (development activities);
- potential impacts;
- receptors for these impacts.

3.18 It is recommended that the table is annotated and used during consultations with other interested parties. Reference should also be made to the prompt lists detailing impacts and sources of impacts in the *Scoping Handbook*.

Table G1 Summary of key potential impacts of abattoirs

Potential receptors of impact		Activities and potential impacts		
		Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
WATER	Surface water hydrology and channel morphology	**Use of vehicles and machinery** • Increase in surface runoff from soil compaction **Works next to or near watercourses** • Change in flow velocities • Increased erosion and subsequent changes in bed and bank stability • Increased flood risk **Earthworks** • Increased sedimentation of watercourses • Reduced floodplain storage **Buildings and ancillary structures** • Changes to runoff characteristics and infiltration rates	**Surface runoff** • Rapid transfer of rainwater to watercourses via drains • Minor changes to flow regimes of watercourses downstream of the development • Change in deposition regime, caused by changes in flow and possible increase in sediment input from soil erosion	**Works next to or near watercourses** • Change in flow velocities • Increased erosion and subsequent changes in bed and bank stability • Increased flood risk
	Surface water quality	**Earthworks** • Pollution from suspended material • Disturbance of contaminated soil and subsequent pollution of watercourses **Materials management** • Pollution from spills or leaks of fuel, oil and construction materials	**Water/dung/urine/blood management** • Decrease in water quality from sudden releases (e.g. from tank failure or yard washing) or gradual seepage of contaminated water into nearby watercourses	**Materials management** • Contamination from spills or leaks of fuel and oil

Potential receptors of impact		Activities and potential impacts		
		Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
WATER *continued*	Surface water quality *continued*		**Materials management** • Pollution from treatment chemicals (e.g. flocculators, biocides, tanning agents), spills or leaks of fuel and oil • Leachate from manure or compost heaps entering watercourses **Emergency provision** • Pollution from failure of critical equipment (e.g. effluent treatment plant) • Pollution from water runoff in the event of a fire	
	Groundwater hydrology	**Earthworks and site drainage** • Reduction in water table • Changes to groundwater distribution and flow	**Physical presence of infrastructure** • Possible continued alteration of groundwater flow	**Removal of infrastructure** • Continuing alterations to ground water flows
	Groundwater quality	**Earthworks** • Disturbance of contaminated soil and subsequent groundwater pollution **Materials management** • Pollution from spills or leaks of fuel, oil and building materials	**Water/dung/urine/blood management** • Decrease in water quality through gradual seepage of contaminated water into ground • Potential for disease transmission, e.g. Cryptosporidium **Materials management** • Pollution from treatment chemicals (e.g. flocculators, biocides, tanning agents), spills or leaks of fuel and oil • Leachate from manure or compost heaps entering ground	**Materials management** • Contamination from spills or leaks of fuel and oil

Potential receptors of impact		Activities and potential impacts		
		Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
LAND	Landscape	**Excavations and earthworks** • Land take • Visual impact of construction works • Impact on landscape character	**Physical presence of development** • Detrimental effect on landscape character • Visual impact of structure	**Removal of buildings and ancillary structures** • Improvement to landscape
	Soils	**Use of vehicles and machinery** • Compaction • Erosion **Earthworks** • Further erosion of exposed soil	**Spreading of animal excretion wastes on land** • Changes in soil nutrient levels • Potential for contamination of crops with pathogenic organisms **Burial of dead animals** • Contamination of soil **Use of vehicles and machinery** • Soil compaction • Soil erosion • Contamination via run-off	**Removal of buildings and ancillary structures** • Further soil compaction/erosion
	Geology	**Excavations** • Removal of rock by excavation works		
AIR	Local air quality	**Use of vehicles and machinery** • Emissions from construction site traffic • Dust generation	**Transport of animals, carcasses and processed meat.** • Exhaust emissions **Presence of dung, urine and carcass by-products** • Release of noxious gases (e.g. ammonia) to atmosphere	**Removal of development** • Emissions from site traffic • Dust generation

Potential receptors of impact		Activities and potential impacts		
		Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
AIR *continued*	Regional/ global air quality		**Process and space heating energy consumption** • Contributing to global warming, need for energy efficient systems • Contribution to acid rain via NOx release (and SOx if coal or heavy oil-fired)	
FLORA AND FAUNA	Aquatic ecology	**Drainage works and use of vehicles** • Negative impact on flora and fauna from increased sediment loading of streams **Materials management** • Harm to aquatic flora and fauna from oil, fuel, cement or other substances entering watercourses	**Contaminated water run-off** • Pollution and consequent damage of watercourses by high BOD materials, pesticides (from skins) and tanning agents **Materials management** • Direct and indirect effects from oil, fuel or other substances entering the aquatic environment following accident **Effluent treatment plant** • A considerable amount of water is used in abattoir operations. If discharged to controlled waters it will have an ecological impact by virtue of volume and quality (if ETP poorly managed)	**Use of vehicles** • Negative impact on flora and fauna from increased sediment loading of streams **Materials management** • Harm to aquatic flora and fauna from oil or other substances entering watercourses
	Terrestrial ecology	**Earthworks and excavations** • Habitat removal, fragmentation or severance • Disturbance to, or loss of, species (including rare and sensitive species)	**Physical presence of building and ancillary structures** • Alteration or loss of terrestrial habitats	**Post-closure land-use** • Changes in habitat type

	Potential receptors of impact	Activities and potential impacts Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
HUMAN ENVIRONMENT	Socio-economic[1]	**Earthworks and excavations** • Disruption of services such as electricity, gas, water, or telecommunications due to the excavation works • Traffic delays • Construction-related employment **Publicity** • Strong objection by the local community to this form of development can be anticipated. Public relations will be an important part of any development proposal • Reduction in local property value	**Operation of abattoir** • Long-term employment opportunities • Reduction in local property value	**Decommissioning and removal** • Disruption of services such as electricity, gas, water, or telecommunications due to the works • Short-term employment
	Health and safety[1]	**Earthworks and excavations** • Risk of injury on construction site **Negative publicity** • Adverse reaction to perceived health issues	**Operation of abattoir** • Risk of disease for staff from infected animals • Risk of disease to local population via contamination of drinking water (e.g. Cryptosporidium) • Risk to local population and through-traffic if livestock escape from the facility • Increased lorry traffic with consequent risks	**Decommissioning and removal of system** • Risk of injury on site

[1] The Agency considers that key impacts to be identified and assessed are likely to include the following, but further advice and guidance should be sought from the relevant competent authority, as included in the *scoping handbook*.

Potential receptors of impact		Activities and potential impacts		
		Construction phase	Operation phase/ongoing site maintenance	Decommissioning/post-operation
HUMAN ENVIRONMENT *continued*	Amenity	**Use of vehicles and machinery** • Temporary barriers to rights of access and way	**Presence of buildings and ancillary structures** • Possible alteration of rights of way or reduction in access • Reduction in perceived quality of the area, especially if located in area of high scenic value	
	Nuisance	**Use of vehicles and machinery** • Noise from construction traffic and operations • Mud on roads • Traffic delays	**Operation of abattoir** • Odour from body parts and excrement, and possibly from rendering operations, composting, anaerobic effluent treatment • Noise from livestock • Noise from processing operations and cooling systems • Light and noise if operations occur at night **Transport** • Noise from lorry movements and fork lift truck warning sirens • Increased traffic on local roads	**Use of vehicles and machinery** • Noise from traffic and operations • Mud on roads • Traffic delays
	Architectural and archaeological heritage[1]	• Damage to known or unknown features of archaeological or cultural importance	• Further damage to archaeological features resulting from any expansion of the site	

[1] The Agency considers that key impacts to be identified and assessed are likely to include the following, but further advice and guidance should be sought from the relevant competent authority, as included in the *scoping handbook*.

Additional site-specific issues:

4 Mitigation measures

4.1 Following the scoping exercise and the identification of potential environmental effects, mitigation measures should be proposed to avoid or reduce potential negative impacts to air, water, land, ecology and humans, or to introduce positive aspects to the development. For example, such measures could be developed on brownfield sites. Guidance has been provided by the Environment Agency to assist developers on a range of relevant subjects in the form of Pollution Prevention Guidelines (see the *scoping handbook*). Other relevant publications are given in Section 5.

4.2 A primary consideration in impact mitigation must be the siting of an abattoir. The development site should be selected to avoid damage to important ecological sites and high quality landscapes. Also, it is Environment Agency policy to seek the preferential location of developments in areas which are not vulnerable to groundwater pollution (Environment Agency, 1998b). It is strongly recommended therefore that developers undertake an assessment of alternative sites.

Mitigating the impacts of construction activities

4.3 Construction activities have the potential to affect all environmental receptors. However, the following list summarises the mitigation measures most relevant to abattoir developments:

- phasing of construction work to minimise disturbance to wildlife at sensitive times of year, such as during the breeding season or when young are being raised;
- use of techniques to minimise compaction of soil, such as restricting access during wet conditions, and using protective boarding and low ground pressure machinery. If necessary, soil should be carefully removed and stored for subsequent reinstatement;
- use of dust control strategies;
- storage of fuel, equipment and construction materials so as to minimise the risk of soil contamination or water pollution (see Environment Agency, 2000b);
- setting the route and timing of construction traffic so as to avoid residential areas or other sensitive human receptors (e.g. schools, hospitals, nursing homes);
- access roads should avoid riparian zones and should be built using appropriate construction materials.

Mitigating the impacts of the operational phase

4.4 Although sensitive siting and design of an abattoir are the primary means for avoiding or reducing its environmental impacts, further measures can be introduced to minimise impacts occurring from the ongoing management of the site. An overall consideration for the proposed abattoir is that its design and operation are in accordance with planning conditions, the authorisation of prescribed processes, animal welfare and other relevant legislation. Developers should seek independent legal advice to ensure that all legal requirements are identified and complied with.

4.5 The measures have been arranged according to their primary receptor, however it should be noted that many of the following mitigation measures are interrelated. For example, correct handling and storage of chemicals, plus bunding to contain spills, would serve to reduce the impacts of such an incident on soils, surface and groundwaters, and ecology.

Protecting the water environment

4.6 In order to minimise potential impacts on the water environment, the design and running of abattoirs must ensure that:

- an appropriate water management system is used, including, for example, efficient land drainage and the use of constructed ponds for receiving site runoff to reduce impacts on nearby watercourses; sustainable drainage systems may be appropriate;
- an effective effluent treatment system is employed. If possible, the water for discharge to controlled waters could be used for irrigation of local farmland;
- hazardous or potentially polluting materials such as fuel, oil or wastes going to landfill must be sited on an impervious base away from water, properly bunded and kept locked when unattended;
- oil interceptors or drip trays are used in vehicle parking areas, and are inspected and cleaned regularly;
- a risk assessment is carried out for the development covering failure of critical equipment; fire; spillage hazards from stores, delivery and pipe failure;
- an emergency plan is formulated and tested through exercises to ensure that procedures to prevent or mitigate impacts due to accidents or spillages are in place and operate effectively (some developments may require such plans to be formulated and the Environment Agency should be consulted to identify where this is the case).

Protecting the land environment

4.7 Certain measures noted above for protecting the water environment, such as passive spill protection and impermeable hardstanding, will also reduce the likelihood of soil contamination. Impacts on soils and landscape may also be mitigated by the following:

- appropriate designs for buildings/structures on site;
- appropriate screening and planted buffer zones to reduce visual impacts;
- use of drip trays under stationary machinery to prevent oil and grease contaminating soil and groundwater.

Protecting the air environment

4.8 Developers should consider the aspects of the development that are likely to lead to emissions to air. Such aspects can include noxious odours and combustion gases. Suitable mitigation measures may include:

- biofiltration to remove odorous compounds;
- condensation of cooking/rendering steam, subcooling of condensate; incineration of non-condensables in final gas stream;

- chemical scrubbing of releases;
- good housekeeping: prompt removal of dung, spilt body contents or by-products such as blood and fats;
- all odour producing processes to be performed within buildings so atmospheric releases can be controlled.

Protecting ecology

4.9 Measures designed to prevent or reduce impacts to water or land will also help to prevent adverse impacts on ecology. The following list identifies further measures to reduce or avoid impacts to terrestrial and aquatic species and their habitats:

- existing habitat features should be incorporated into site design and protected from change;
- further habitats should be created to compensate for habitat losses and to improve the landscape and ecological potential for the site;
- restoration plans should incorporate measures to improve the ecological status of the site;
- provision of wildlife corridors and buffer zones.

Protecting the human environment

4.10 Some of the measures noted above can also reduce possible impacts on humans, notably the risk assessment and emergency planning measures. Further mitigation measures more specific to the human environment are listed below:

- management operations should aim to minimise disturbance to adjacent residential and recreational uses;
- safety concerns should be addressed by such measures as implementing strict health and safety procedures for staff, and the installation of adequate fencing and other site security to prevent trespass and vandalism;
- odour control strategies should take account of varying wind directions;
- sites of archaeological or cultural interest should be preserved in situ where possible. As relocation is rarely feasible, thorough archaeological investigation should be undertaken where damage is unavoidable.

5 References and further reading

1 **Construction Industry Research and Information Association (2001)** *Sustainable Urban Drainage Systems – Best Practice Guide.* C523, CIRIA, London.

2 **Construction Industry Research and Information Association (2000)** *Sustainable Urban Drainage Systems – Design Manual for England and Wales.* C522, CIRIA, London.

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5 **Department of Environment and Heritage, Queensland (1994)** *Environmental Guidelines on Abattoirs.* Available from: http://www.epa.nsw.gov.au/mao/ind/ab. EPA, NSW, Australia.

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7 **Department of the Environment, Transport and the Regions (2001)** *Planning Policy Guidance Note 25: Development and Flood Risk.* Stationery Office, London.

8 **Department of the Environment, Transport and the Regions (2000)** *Environmental Impact Assessment: A Guide to the Procedures.* Thomas Telford Publishing, London.

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10 **Environment Agency (2001)** *Environment Agency Policies: Sustainable Drainage Systems. Document Ref. EAS/0102/1/1*. Environment Agency, Bristol.

11 **Environment Agency (2000a)** *Works In, Near or Liable to Affect Watercourses. Pollution Prevention Guidelines No. 5.* Environment Agency, Bristol.

12 **Environment Agency (2000b)** *General Guide to the Prevention of Water Pollution. Pollution Prevention Guidelines No. 1.* Environment Agency, Bristol.

13 **Environment Agency (2000c)** *Control of Spillages and Fire Fighting Run-off. Pollution Prevention Guidelines No. 18*. Environment Agency, Bristol.

14 **Environment Agency (1999)** *Disposal of Sewage Where No Mains Drainage is Available. Pollution Prevention Guidelines No. 4*. Environment Agency, Bristol.

15 **Environment Agency (1998a)** *Working at Construction or Demolition Sites. Pollution Prevention Guidelines No. 6*. Environment Agency, Bristol.

16 **Environment Agency (1998b)** *Policy and Practice for the Protection of Groundwater (second edition).* Environment Agency, Bristol.

17 **Environment Agency (1997)** *Preventing Pollution at Industrial Sites. Pollution Prevention Guidelines No. 11*. Environment Agency, Bristol.

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20 **ERM (2001c)** *Guidance on EIA – Screening.* Prepared by ERM for the European Commission in June 2001. Available from: http://europa.eu.int/comm/environment/eia/eia-support.htm. Commission of the European Communities, Brussels.

21 **Meat Hygiene Service (1998)** *Animal Welfare at Licensed Abattoirs in Great Britain.* Meat Hygiene Service, York.

22 **Ministry of Agriculture, Fisheries and Food (1998a)** *The Air Code.* MAFF, London.

23 **Ministry of Agriculture, Fisheries and Food (1998b)** *The Soil Code.* MAFF, London.

24 **Ministry of Agriculture, Fisheries and Food (1998c)** *The Water Code.* MAFF, London.

25 **National Rivers Authority (1995a)** *Water Pollution Incidents in England and Wales – 1994. NRA Water Quality Series No. 25*. HMSO, London.

26 **National Rivers Authority (1995b)** *Pesticides in the Aquatic Environment. NRA Water Quality Series No. 26*. HMSO, London.

27 **Statutory Instrument (1992)** *No. 3303. The Animal By-Products* Order 1992

28 **Statutory Instrument (1997)** *No. 2894. The Animal By-Products* (Amendment) Order 1997

29 **Statutory Instrument (1999)** *No. 1524. The Water Supply* (Water Quality) (Amendment) Regulations 1999