L5: Scoping the Environmental Impacts of the Composting of Organic Waste

Explanatory Note

For projects which require Environmental Impact Assessment (EIA), a scoping exercise must be undertaken early in the planning stages of the project. This enables the project to be designed to avoid or minimize 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 the composting of organic waste. 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 pollution control.

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

In addition, the following scoping guidance notes are also relevant to *all* large (<1000 tonnes of waste per annum) organic composting projects:

- A1 Construction works
- A2 Demolition and decommissioning works
- A3 Redevelopment and clean-up of contaminated land
- A4 Vegetation management and conservation enhancements
- B2 Control of pest species, including disease vectors
- B6 Intensive horticulture, including greenhouses

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

- J2 Discharges to surface waters
- J7 Reservoirs
- L4 Solid waste management facilities

Contents

1. Introduction

1.1 This guidance note, in conjunction with the Scoping Handbook and the other notes listed on the previous page, seeks to help developers and other interested parties identify the potential impacts of development for Composting of organic waste facilities 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 organic waste composting projects is provided. The potential environmental impacts of such projects are identified in Section Three. 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 organic waste composting developments, followed by key references and further reading.

Background to development type

1.3 Organic waste composting activities involve the aerobic biological degradation of biodegradable organic materials such as garden waste. The aerobic composting process requires a plentiful supply of oxygen through the regular turning of the compost or by the injection of air into it. Biodegradation of the waste by micro-organisms may generate temperatures in excess of 70°C. This guidance note focuses upon the larger scale ‘centralised’ composting schemes, which are currently being developed in the UK. Centralised composting refers to mostly commercially run operations, managed by specialist companies who bring in organic wastes from elsewhere. While composting generally results in a saleable product in the form of a soil conditioner, the process can also be used to reduce the volume of waste prior to transhipment or disposal. Centralised composting typically involves the collection of organic waste from industry (for example wood chip wastes from saw mills, paper etc) and also from parks, civic amenity sites, and domestic kerbside collections. Currently most of the organic waste composted in the UK is green waste i.e. tree trimmings, grass cuttings and leaves.

1.4 Aerobic composting typically consists of three stages, namely:- pre-processing; aerobic biodegradation and the maturation stage. Pre-processing involves the shredding and pulverising of the organic fraction and the separation from other poorly-segregated waste materials, such as ferrous and non-ferrous metals, glass etc. The pre-processing stage will take place in a materials recovery facility or building. The second stage is an aeration process

which allows biodegradation to occur. There are a number of methods used to aerate the waste. The 'windrow' method consists of piling the waste into elongated mounds c.50m long, c.2m high and c.3-4m wide. Normally, these piles ate turned mechanically every day initially and with decreasing frequency thereafter. The windrows are sited upon gravel beds with channels to divert leachate into suitable collection areas. In the 'Forced Aeration System' (FAS) waste piles, c.30m long, c2-3m high and c.2-6m wide remain unturned. The FAS waste piles are sited upon aeration blocks, with air forced through the pile by a fan, either periodically or continuously. As well as these relatively simple methods, a more sophisticated rotating drum or tunnel method can be used. In this process, waste is placed into a long rotating drum through which air is forced whilst the waste is continually mixed. The third and final stage of the composting process, maturation, is the stage when residual products that are toxic to plants are removed from the end product. Finally, the compost will be reduced in size and screened.

1.5 The use of compost as a soil conditioner has many environmental benefits. First, it may replace natural products, such as peat, in horticulture and the gardening trade. The compost process returns nutrients to the soil and uses waste that otherwise would go to landfill. However, the manufacture and use of compost may also have negative environmental impacts. These impacts will depend upon the composition of the waste feedstock used as well as the nature of the composting process. Many of the operations described above may have significant impact on the site and the surrounding area. Therefore, a thorough scoping exercise and careful consideration of alternatives are of prime importance.

2. Development control and EIA

Development Control

2.1 Organic waste composting may be require development control consent under the Town and Country Planning system where this constitutes a centralised community waste treatment or activity or the commercial production of a soil conditioner. This will not be the case, for example, where the composting occurs for on-farm treatment of animal manure or a small domestic scale activity, where this is deemed a permitted activity under the *Town and Country Planning (General Permitted Development*) *Order 1995* (SI, 1995 No418). Those proposing composting of organic waste, therefore, should contact their local planning authority to confirm whether their proposals require permission.

Environmental Impact Assessment

2.2 Organic waste composting for the production of soil conditioner or centralised composting to reduce the bulk of organic waste prior to transhipment or final disposal is included as a separate development type within the *Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999* (SI 1999 No. 293) under Schedule 2, paragraph 11 (h). The likelihood of the composting facility requiring an environmental assessment depends upon the scale of the development and the nature of the potential impact in terms of discharges, emissions and odour. 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 DETR has 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 is still discretionary. The following criteria apply

- Exclusive criteria
  Under Schedule 2, paragraph 11(b), EIA may be required for installations for the disposal of waste (unless included in Schedule 1), if the area of the development exceeds 0.5 hectare, or if the installation is to be sited within 100 metres of any controlled waters.

- Indicative criteria
  Annex A of the Department of the Environment, Transport and the Regions Circular 02/99, and the National Assembly for Wales Circular 11/99 *Environmental Impact Assessment* states that, for installations for the disposal of non-hazardous waste, "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."

Furthermore, EIA may be required for any change to or extension of activities 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 a formal EIA is required for a proposed centralised composting development, 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 organic waste composting projects, such as the abstraction of water for use on site or the discharge of treated or untreated leachate, may require prior permission 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 issues

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 [above] factors.' Socio-economic issues, health and safety in the workplace, material assets and the cultural heritage are all considered in EU Guidance on scoping (ERM, 2001a) but are not impacts 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 Developments for organic waste composting 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 expert advice on detailed technical issues should be obtained. The issues arising for all environmental receptors

will change overtime as the site is prepared and managed, and following the end of operations. Developers and site operators should therefore consider the impacts arising from both construction activities and operational practices, and following the end of on-site activities.

3.3 Environmental impacts can affect both humans and ecological resources. 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 organic waste composting developments 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 L6. This, details the activities involved in the preparation and on-going management of organic waste composting developments and the impacts arising from them.

Water environment

3.5 Surface water hydrology can be affected during all phases of organic waste composting operations. Site preparation and construction activities can result in compaction of soils and an increase in impermeable (or slowly permeable) surfaces. The subsequent increase in surface runoff may, in turn, increase soil erosion and the risk of flooding. Surface drains, installed to distribute water and to divert run off and to prevent water-logging of the soil may also increase flood risk, while abstractions of surface water for soaking green matter such as leaves and twigs may contribute to low flows in nearby streams.

3.6 Surface water quality could be affected by a number of factors during operations on site. Construction activities may encourage soil erosion and increase the sediment loads of nearby streams, while accidental leaks or spills of oil or fuel from storage tanks or compost turning vehicles can also pollute surface waters. Runoff from the composting areas may also contaminate surface waters with sediments and soluble nutrients. Well manage compost plants will generate only small amounts of leachate. Where the compost process is mismanaged, however, the potential for surface water pollution by leachate containing substances such are nitrogen, phosphate, potassium and other salts will increase. This may contribute to surface water eutrophication.

3.7 Centralised composting activities may have significant impacts on groundwater hydrology and quality. The site may need to be drained to provide suitable conditions for composting, resulting in a lowering of the water table. Also, soil contaminated from a previous land use may be disturbed during construction works, causing pollutants such as heavy metals to enter ground and surface waters. During on-going composting operations, abstractions of water for soaking dry vegetable matter prior to composting may cause a reduction in groundwater flows. The main threat to groundwater quality, however, is the possible contamination by leachate and runoff from composting areas.

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 composting projects within Source Protection Zones.

Land

3.9 Organic waste composting projects will have implications for land take, the physical characteristics and land use of the site. Issues to consider include: the effect on landscape character of the change in land use, and of the erection of windrows (large elongated compost piles), composting enclosures and other structures; changes to soil structure and composition that result from increased biological activity within the soil profile. In addition to this, soils proximal to poorly managed composting plants may become contaminated with soluble

nutrients and natural phenolic compounds as a result of continued leaching from composting waste piles into the surrounding soils. This may result in the accumulation of nitrates in the soil profile below areas of composting material. The potential for contamination via runoff from roads and hardstandings must be addressed.

Air and Climatic Factors

3.10 Horticultural practice has the potential to affect local air quality and climate, and to contribute to global climate change. During construction, operation and decommissioning activities, local air quality may decline somewhat as a result of dust generated by vehicle movements on and off-site. Also, the mismanagement of compost piles if not adequately aerated will result in the build up of anaerobic bacteria and the production of methane gases, CO_2, volatile organic compounds, bacteria and fungi. The end result from such mismanagement activities will ultimately produce offensive odours in the vicinity of the plant. However, some odours will be produced naturally during the most active stages of the composting process. Often odours will depend upon the type of feedstock used and control over the actual composting process. Dust may be emitted to the air when dry composts are screened and may, therefore, contribute to a reduction in overall local air quality.

Ecology

3.11 The removal of native vegetation and its replacement with a commercial compost plant may cause direct damage to, or loss of, terrestrial and aquatic habitats. Disturbances to local wildlife during the operational phases of the compost plant from the use of heavy machinery should be considered. Local aquatic and terrestrial species may also suffer adverse effects from potentially harmful leachate and run off entering local watercourses, if waste is not adequately stored. Also, the use of water for soaking dry vegetation wastes prior to the composting process may exacerbate low-flow periods in streams at sensitive times, affecting aquatic systems and those species, such as otters, kingfishers or wildfowl, that depend on them. Ecological impacts may operate over a longer timescale, as populations take time to respond to environmental changes (time lag). This is particularly true for the "bioaccumulation" of harmful residues up the food chain.

3.12 Also, the development may attract non-native terrestrial species to the area surrounding the compost plant, including rodents and insects. Any organisms not normally present in the ecosystem may be in direct competition with the existing native species. This may cause exclusion of some species, resulting in a reduction in biodiversity.

Human environment

3.13 The potential impacts of a development for organic waste composting 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.

3.14 The potential for socio-economic and perceived health impacts arising from organic waste composting is likely to generate concerns regarding property values in the vicinity of the compost plant. However, such operations usually require moderate staffing levels and, as a result, employees may have a significant effect on local socio-economic issues. Such social issues, should be considered when scoping an EIA. In addition to the amenity, visual impact and nuisance issues noted below, these may include the potential for harm to workers and the general public from wastes used in plant operations.

3.15 The identification of which of these issues is or perceived to be significant is an important function of public involvement during the scoping exercise. Understanding likely public concerns is a key issue and note should be taken of experience from similar developments and any public representations made to the local planning authority.

3.16 Amenity, visual impact and nuisance issues that commonly need to be addressed are the visual impact of the converted land use and any additional buildings or other structures associated with it. Any restrictions to access that may arise as a result of the development should also be considered, as should the creation of nuisances such as noise and vibration from traffic during operations, dust in the air, and mud and slow vehicles on public roads. Also, the amenity use of nearby streams or lakes may be affected if reduced water quality causes harm to fish.

3.17 Impacts on architectural and archaeological heritage may arise from site construction, composting (i.e. windrow) activities, as features may be removed or disturbed. The likelihood of there being any unrecorded sites and the site's influence on the potential for discovery should also be examined.

Table L6

3.18 The impact identification table highlights:

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

3.19 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 L6. Summary of Key Potential Impacts of Composting of Organic Waste

		Activities and Potential Impacts		
Potential Receptors of Impact		**Construction phase**	**Operation phase/on-going site maintenance**	**Decommissioning / Post-operation**
WATER	surface water hydrology & channel morphology	**Use of vehicles and machinery** • increase in surface runoff from soil compaction **Works next to or near water courses** • change in flow velocities • increased erosion and subsequent changes in bed and bank stability • increased flood risk **Earthworks** • increased sedimentation of watercourses	**Use of vehicles and machinery** • increase in surface runoff from soil compaction **Site drainage** • rapid transfer of rainwater to watercourses via drains • changes to flow regimes of watercourses downstream of the plant • change in deposition regime, caused by changes in flow and possible increase in sediment input from soil erosion • increased flood risk	**Site drainage** • return to normal runoff following site closure • possible flood risk if impermeable surfaces remain unmanaged
	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	**Leachate management** • decrease in water quality from sudden releases or gradual seepage of leachate into nearby watercourses which may contribute to eutrophication **Materials management** • pollution from spills or leaks of fuel and oil **Use of machinery** • sediment-loading of water courses	**Materials management** • potential pollution incidents during decommissioning works from spills or leaks of fuel and oil from vehicular activities
	groundwater hydrology	**Earthworks and site drainage** • reduction in water table • changes to groundwater distribution and flow	**Physical presence of composting plant & paved areas** • potential for alteration of groundwater flow	**Physical presence of former compost plant** • potential alterations to groundwater flows if impermeable surfaces remain after plant closure
	groundwater quality	**Earthworks** • disturbance of contaminated soil and subsequent groundwater pollution **Materials management** • pollution from spills or leaks of fuel, oil and building materials	**Leachate management** • contamination from sudden releases or slow seepage of leachate to groundwaters **Materials management** • contamination from spills or leaks of fuel and oil	**Materials management** • potential pollution of groundwater by spills or leaks of fuel and oil by machinery and equipment used during the plant closure phase

		Activities and Potential Impacts		
Potential Receptors of Impact		**Construction phase**	**Operation phase/on-going site maintenance**	**Decommissioning / Post-operation**
LAND	landscape	**Excavations & earthworks** • creation of a new landform	**Physical presence of composting plant** • change in character of landscape	**Physical presence of former composting plant** • possible raised land levels following the gradual accumulation of soil and existence of surface structures
	soils	**Use of vehicles and machinery** • compaction • erosion **Earthworks** • further erosion of exposed soil • removal or alteration of soils on site for compost plant construction	**Compost piles** • potential contamination of soil from leachate • generation of methane gasses and its possible migration to soils beyond site boundary **Use of vehicles and machinery** • soil compaction • soil erosion • soil contamination from road runoff	**Legacy of waste treatment** • implications of contaminated land for future use of site • damage to soil cased by leachate and gaseous by products **Presence of impermeable surfaces** • impermeable surface if not removed could result in increased surface runoff and potential soil erosion surrounding the site
	geology	**Excavations** • removal of rock by excavation works	**Excavations** • further removal of geological resource following site expansion	
AIR	local air quality	**Use of vehicles and machinery** • emissions from construction site traffic • dust generation	**Gas generation** • releases of CO_2, VOCs and methane gas to the atmosphere where compost piles are mismanaged **Odours** • Offensive odours may be generated during the active composting stage **Dust generation** • Dust will be generated during the screening process and when dealing with dry composts **Use of vehicles and machinery** • exhaust emissions from windrow turners and grinding machinery	**Decommissioning activities** • emissions and potential dust generation from vehicular activities and equipment associated with the plant closure
	regional / global air quality		**Methane gas generation** • contribution to the greenhouse effect	

		Activities and Potential Impacts		
Potential Receptors of Impact		**Construction phase**	**Operation phase/on-going site maintenance**	**Decommissioning / Post-operation**
FLORA & FAUNA	aquatic ecology	**Drainage works and use of vehicles** • potential 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	**Waste disposal** • pollution of watercourses by leachate **Site drainage** • indirect effect on aquatic flora and fauna from ongoing changes to stream hydrology and morphology **Materials management** • direct and indirect effects from oil, fuel or other substances entering the aquatic environment	**Post closure land-use** • continued effects of residual soil contamination **Restoration design** • opportunity for enhancement of nature conservation value
	terrestrial ecology	**Earthworks and excavations** • habitat removal, fragmentation or severance • disturbance to, or loss of, species (including rare and sensitive species)	**Physical presence of compost plant** • alteration or loss of terrestrial habitats **Physical presence of waste feedstock and compost piles** • attraction of insects, birds and mammals to the plant **Gas generation** • harm to species from releases of gasses associated with the mismanagement of the compost process **Mechanical turning activities** • disturbance to, or loss of, species (including rare and sensitive species) near the plant	**Physical presence of former composting plant** • continued habitat fragmentation or severance **Restoration design** • positive or negative effect on existing ecology from introduction of new (possibly non-native) species

		Activities and Potential Impacts		
Potential Receptors of Impact		**Construction phase**	**Operation phase/on-going site maintenance**	**Decommissioning / Post-operation**
HUMAN ENVIRON -MENT	socio-economic[1]	**Earthworks and excavations** • disruption of services such as electricity, gas, water, or telecommunications due to the presence of underground cables and pipes • construction-related employment **Negative publicity** • migration of people away from proposed composting plant site	**Waste disposal operations** • continued migration of people away from the operation landfill site	**Restoration design and after-use** • public perception of the area may improve following sensitive restoration plans
	health and safety[1]	**Earthworks and excavations** • risk of injury on construction site **Negative publicity** • adverse reaction to perceived health issues from waste feedstock and the perceived problems associated with the attraction of vermin to the composting process and piles of decaying matter	**Waste treatment operations** • risk of harm from contaminated drinking water **Gas generation** • potential risk fires from mismanaged compost piles **Mismanagement of waste piles** • attraction of large fly population during warm weather • attraction of vermin and disease vectors • *Aspergillus fumigatus* allergy amongst workers	**Deconstruction activities** • potential risk of accidents to workers on site
	amenity	**Physical presence of the compost piles and plant** • potential loss of amenity value of the land proximal to the construction area	**Physical presence of the composting plant** • possible alteration of rights of way or reduction in access	**Restoration design** • provision of amenity/recreational area
	nuisance	**Use of vehicles and machinery** • noise from construction traffic and operations • mud on roads	**Use of vehicles and machinery** • noise • mud on roads **Site management** • odours from the composting process • production of unsightly litter • attraction of insects, scavenging birds, rats and other vermin	**Decommissioning activities** • temporary nuisance caused by site deconstruction and increased vehicular activities
	architectural and archaeological heritage[1]	• damage to known or unknown features of archaeological or cultural importance	• further damage to archaeological features resulting from 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. 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 "References and Further Reading" in the Scoping Handbook). Other relevant publications are listed in Section Five.

4.2 A primary consideration in impact mitigation must be the siting of organic waste composting operations. These should 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 and site preparation activities have the potential to affect all environmental receptors. However, the following list summarises the mitigation measures of most relevance for organic waste composting plants:

- 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 minimize the risk of soil contamination or water pollution (see Environment Agency, 2000d);
- setting the route and timing of construction traffic 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 a organic waste composting development 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 is that the design and operation of the development are in accordance with planning conditions, the Duty of Care and other relevant legislation.

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 inter-related. For example, correct storage, use and disposal of chemicals used would reduce the risk of soil contamination, pollution of surface and ground waters and harm to terrestrial and aquatic ecology.

Protecting the water environment

4.6 In order to minimise potential impacts on the water environment in the design and running of organic waste composting operations, the project proponent should 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 the impact of runoff and leachate on nearby water courses;

- composting areas are covered where possible for the main and secondary composting phases to reduce the potential for the generation of contaminated run off and leachate;

- where ponds are not constructed, drains should be stopped 15 to 20 metres short of natural watercourses to allow runoff to be filtered through soil or ground vegetation. This reduces the amount of surface runoff entering streams, thereby, reducing flood risk. It also reduces sediment and nutrient inputs to watercourses;

- hazardous or potentially polluting materials such as fuel, oil, must be sited on an impervious base away from water, properly bunded and kept locked when unattended;

- waste feedstock should be sited on an impervious base away from water and when ever possible should be covered or housed to reduce the risk of contaminated run off entering nearby watercourses;

- oil interceptors or drip trays are used in vehicle parking areas, and are inspected and cleaned regularly;

- a risk assessment is carried out for each substance to be used or stored on site, and the appropriate containment measures installed.

Protecting the land environment

4.7 Impacts on soils and landscape may be mitigated by the following:

- appropriate designs for buildings and structures on site;

- appropriate screening for visual impacts;

- effective stabilisation of altered landforms so as to minimise soil erosion and the potential for water pollution from suspended solids;

- the location of windrows should avoid slopes due to the potential for erosion. A slope of c.2% is most suitable for compost piles and will ensure that ponding does not occur;

- Compost heaps should be covered or contained within appropriate structures so as to reduce the risk of soil erosion.

Protecting the air environment

4.8 Developers should consider the aspects of the development that are likely to lead to air emissions. For such aspects as dust from vehicle movements, suitable mitigation measures may include the use of vegetation screens to act as a barrier to gaseous and particulate emissions. Impacts upon air may be mitigated by the following:

- air emissions and odours generated during composting should be exhausted through bio-filters, de-odourisers and water scrubbers;

- dust generated from the screening of dry compost may be mitigated through the incorporation of some residual moisture during the composting;

- covering and housing activities wherever possible will reduce dust generation and odours.

Protecting ecology

4.9 Measures designed to prevent or reduce impacts to water or land will also benefit ecological populations. The following list identifies further strategies for reducing or avoiding 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.

Protecting the human environment

4.10 Some of the measures noted above can also reduce possible impacts on humans. For example, clear labelling and composting procedures would also minimise exposure of humans to potentially allergenic substances, for example *Aspergillus fumigatus* a leaf fungus found to trigger an allergic response amongst some sensitive compost plant workers. 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 through the creation of a buffer zone between site activities and neighbouring areas;

- buffer zones may include a berm consisting in part of finished compost to serve as a visual barrier and also to help reduce noise levels near to the site;

- where access restrictions result, arrangements for alternative access should be made with the provision of gates, bridges or stiles;

- safety concerns should be addressed by such measures as implementing strict health and safety procedures and the installation of adequate fencing and other site security to prevent trespass and vandalism;

- 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

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