

Environmental Risk Assessment

Part 1

Simple assessment of environmental risk for accidents, odour, noise and fugitive emissions

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WHAT IS THIS GUIDANCE ABOUT?

This is a guide to assessing the risks to the environment and human health from facilities which are applying for a permit under the Environmental Permitting Regulations. It deals with accidents, odour, noise and fugitive emissions. The aim is to identify the significant risks and show that the risk of pollution will be acceptable by taking the appropriate measures to manage the risks. Insignificant risks are screened out and more detailed assessment is only needed where the risks justify it.

This is Part 1 of a 2 part guide:

Part 1 Covers accidents, odour, noise and fugitive emissions and applies to all applicants. **It also covers point source emissions from intensive livestock only. See Annex 1.**

Part 2 Covers

- point source releases for all other sectors and an
- integrated multimedia assessment for activities for which this is applicable.
- a method for comparing costs and benefits of the different options

Before we can give you an environmental permit we must be sure that what you are doing will not pose an unacceptable risk to the environment and that you are going to take the necessary measures to protect the environment.

Usually it will be clear what you need to do. We think that the actions set out in our technical guidance will adequately protect the environment in most cases. You can propose a different way of protecting the environment but we will need to be sure it is suitable.

This guidance will help you explain and justify your choice of actions to protect the environment.

WHO SHOULD USE THIS GUIDANCE?

Every one who wants to apply for an environmental permit (other than a standard permit) should use this (Part 1) guidance. For many activities, including the majority of non-IPPC waste activities, it will be the only risk assessment required. You will need to proceed to Part 2 only if you need to do the things described in the section above. The application form asks you for this assessment of the risk to the environment. You will need to consider all of the possible ways your site could harm the environment.

Some people will want to apply for a standard permit but may be unable to do so because they do not meet one of the necessary criteria. We have already done a risk assessment for each standard activity. In this case you only need to look at where the risk is different from that covered in the standard risk assessment. All the risk assessments for the standard rules are available at [\[link\]](#).

The accidents section applies to most operators. However operators of many higher risk operations would normally be expected to have covered this aspect by means of a Hazard and Operability Study (HAZOP) and those sites subject to Control of Major Accidents and Hazards Regulations (COMAH) will have covered this issue separately. These may be submitted instead.

WHAT YOU NEED TO DO

You need to read Sections 1 – 4 and record your assessment. Section 5 provides a way of doing this but if you have already done this exercise in a different format that would normally suffice as long as it covers the same aspects as described in Section 5..

For simple activities this will be enough for us to understand and come to a decision on your site. If this simple assessment shows that there may still be a significant risk you should either propose more or different measures to adequately reduce the risk or use Part 2 if you believe that the costs of further action outweigh the benefits. However it must be appreciated that significant nuisance from fugitives such as dust, noise or odour is unacceptable and you will have to find a way of avoiding the problem or you will have to cease operations or would not be granted a permit in the first place.

You will need to go on to Part 2

- where there are point source emissions at the site (releases from chimneys and pipes).
- if you have odorous releases that need to be assessed as part of a multimedia assessment taking the other releases, energy and waste minimisation into account.
- where modelling of emissions is needed. For odour or noise modelling you should also refer to H4 – Odour and H3 – Noise for further assistance.

By completing the tables in the Appendix you will also be producing the basics of any odour, noise, fugitives or accident management plan that is needed to manage your site.

1 WHAT CAN HARM THE ENVIRONMENT?

You will know what it is that you are proposing do at your site. You need to list all of those things that could harm the environment. We call these the “hazards”.

You should summarise these hazards in the tables in Appendix 1. The tables include some simple examples to help you understand the level of detail that is needed at this stage of risk assessment.

If you think that there are no possible sources of each of the hazards below please record this in the appropriate table.

1.1 Odour

Please list each possible odour source in a separate row in Table A1

This should include any activities you propose to do, or any wastes or substances that you will deal with at your site that could cause a smell.

1.2 Noise & vibration

Please list each possible noise source in a separate row in Table A2

This should include any activities you propose to do at your site that might produce a noise that could be heard and/or a vibration that could be felt, beyond the boundary of your site. The source of the noise and/or vibration should be identified as either fixed or mobile (for example vehicle reverse-warning noises)

1.3 Fugitive emissions to air and water

When we talk about fugitive emissions we mean any releases **not** coming from a point source emission point. These include dust and volatile organic compounds (VOCs) to air, run off from operational or storage areas and potential for leaks or spillages to land or water. We also expect you to include any problems with pests litter or mud in this section. Refer to Sections 3.2 and 3.5 of Getting the Basics Right for more information.

Please list each possible fugitive emission source to air in a separate row in Table A3

This should include any releases from storage of raw materials or wastes.

Please list each possible fugitive emission source to water or land in a separate row in Table A3

This should include any potential leakage or spillage from the storage or handling of liquids that could harm the environment.

Any uncollected run-off from storage areas should also be listed here.

Please list each possible sources of wind-blown litter, mud outside the site or pests in a separate row in Table A3

1.4 Environmental accidents

Please list each potential hazard or accident in Table A4.

Refer to Section 1.2 of Getting the Basics Right for more advice on the type of entries

2 WHAT COULD BE HARMED?

You need to think about what is around your site that could be affected by your activities. We call these the “receptors”. These can be people, property, and the natural and physical environment.

The following table will help you identify the receptors near to your site. For many of the web addresses given, you will just have to put in the postcode of your site and you will be provided with information on what is near your site.

Where you can get information on receptors

| Type of receptor | Where you can get information |
|---|--|
| Specially protected parts of the environment. These are known as designated habitats (e.g. RAMSAR, SAC, SPA, SSSI, LNR etc. – you don't need to know what these stand for at this stage only if there are any of these sites around your site) | www.magic.gov.uk/ |
| Single houses or groups of houses (estates, villages etc) | OS map of the local area |
| Schools, hospitals, factories, shops etc. | OS map of the local area |
| Footpaths, recreation areas such as playing fields and playgrounds | OS map of the local area |
| Fields and allotments used for growing food | OS map of the local area (and some local knowledge) |
| Rivers and streams | OS map of the local area |
| Ancient woodland | Natural England ancient woodland inventory www.natural.english.org.uk and www.magic.gov.uk/ |
| Historic buildings, listed buildings, archaeological sites | Local planning authority for listed buildings, Institute of historic building conservation (www.ihbc.org.uk), The National Trust, County Archaeologist (local county council) |
| Water abstraction points | Environment Agency website (www.environment-agency.gov.uk) |
| The sensitivity of the groundwater e.g. source protection zones | Environment Agency website (www.environment-agency.gov.uk) |
| Other nearby industry e.g. Control of Major Accident Hazards (COMAH) sites | Environment Agency website (www.environment-agency.gov.uk), local HSE office (www.hse.gov.uk) |
| Sensitive land uses – e.g. commercial fish farms, farmland | Ordnance Survey Map, local Environment Agency office, Environment Agency website (www.environment-agency.gov.uk) |
| Coastal/estuarine areas | Local contingency plans, coastal atlases |
| Drainage systems/sewers | Local water companies – for example Anglian Water, Thames Water etc. |

There are also a number of websites that will show you satellite pictures of your site and the surroundings. These can be useful but remember that the pictures may be several years old.

You must list everything that is around your site that could be harmed by what you are doing. Only look for receptors that could be near your site and could reasonably be affected by your activities. Remember that if you have emissions to a watercourse the emissions could affect a sensitive area far downstream.

Provide a scale plan showing your site and all the nearby receptors (houses, schools, rivers etc). Where possible also show the location of any hazards. Not all hazards will have a specific location on your site, but where they do please show the hazard on the plan.

Put the relevant receptors against each of the hazards you have identified in Tables 1 to 4.

3 WHAT STEPS ARE YOU TAKING TO MANAGE THE RISK?

You should list all the actions you are going to take to protect the environment. We expect that you are taking the appropriate measures to lower the risk to the environment. We expect that the steps you take to protect the environment will normally be those which are set out in the guidance:

| | Basic Guidance | Other guidance |
|--|----------------|----------------|
|--|----------------|----------------|

| | | |
|-----------|---|---|
| Odour | "Getting the Basics Right" and, where relevant, specific guidance for your activities as listed in Annex 1 of "Getting the Basics Right". | H4 – odour – Annex on odour management plan |
| Noise | | H3 – Noise – Annex on noise management plan |
| Fugitives | | |
| Accidents | | See comments in "Who should use this guidance?" |

In the tables in Section 5 you should list the measures you propose to employ and make reference to which guidance you are using.

4 ASSESSING THE RISK?

You have identified what you do that can cause harm and what could be harmed. You now need to understand what the risk is from your site and tell us what it is.

This involves making a judgement as to:

- whether a route (pathway) exists for the hazard to affect the receptor (buildings, people, river etc)
- how often a problem might occur and
- how bad the effects on the receptors may be.

The tables in Section 5 provide you with a way of describing the risk and provide examples of the sort of information we would expect.

The approach in the tables in Section 5 is based on the way we have assessed the risk for our standard permits. If you are proposing an activity very similar to that in a standard permit you need only consider the parts of your activities or site that are different from the general assessment of risk we have already done.

4.1 Linking the hazard to the receptors – the pathway

If something or someone is to be harmed by your activities, there must be a source of risk (the hazard) and there must be some way for pollution to travel to the receptor - "the pathway". The link could be movement through the air, via a drain or ditch to a river, via a stream to a sensitive habitats site. Odour, dust, litter etc can all be blown on the wind.

There must be this source-pathway-receptor link for there to be a risk. The measures you take to minimise the overall risk could be to reduce the hazard or impede the pathway.

4.2 What are the chances of a problem happening? – the probability

You need to think about how likely it is that a problem will occur. You should think about how likely a problem is based on what you propose to do. What is the risk from the activities as you propose to operate them? For example the chances of a dust problem are lower if you operate in a building, ensure doors are closed and have water sprays to keep the dust down. You should describe the chances of a problem if the site operates as you intend it to but also importantly when things go wrong (for example if your water or power is cut off).

You must not be too optimistic about how effective your risk management measures will be. Your assessment must accord with our professional experience of how effective measures are and we may have to ask you to go back to your assessment if we think you have not accurately reflected the chance of there being a problem.

As a guide it must be assumed that operator error will occur at least once in every 100 times an operation is carried out. For example, drop or damage a drum from a forklift or have a spillage from a tanker connection. In some cases you will know from experience that the frequency is higher than this.

4.3 How bad would it be if the problem does happen? – the consequences

You now have to think about what harm could be caused. For example if the hazard is something that could smell, the harm could be annoyance, loss of amenity (for instance not being able to use the garden) or health effects.

You need to think about how badly a receptor would be affected if a problem does occur. This will depend on how sensitive the receptor would be to a particular problem.

4.4 What is the overall risk?

The level of risk is a combination of how often the problem might occur with how bad the effect may be. Risk is highest where the consequence is severe and it is likely to occur. A risk is lowest where the consequence is not great and it is unlikely to actually occur.

If this simple assessment shows that there may still be a significant risk you should revisit the measures and propose more or different measures to adequately reduce the risk.

For simpler activities it will be enough to assess the risk by completing tables in Section 5. Where this is the case you do not need to do any more work on the environmental risk assessment. Refer to ["WHAT YOU need TO DO"](#) above for more information on when you may need to do more.

Risk assessment is important throughout the life of your site. When you have your permit and begin to operate your site it is possible that problems will occur. If this happens we will have to return to your risk assessment and the actions necessary to protect the environment.

5 HOW TO PRESENT YOUR ASSESSMENT

| | |
|---------------------------|--|
| Name of Operator | |
| Name of Site | |
| Permit application number | |

Describe the limits of your assessment

Are you describing all the risks from your site or only those that are different from the risk assessment for a standard permit? If you are proposing an activity very similar to that in a standard permit you need only consider the parts of your activities or site that are different from the general assessment of risk we have already done.

| | |
|--|--|
| Are you considering all the risks from your site? | |
| If relevant, what is the set of standard rules that you are close to meeting? | |
| What risks or receptors are different between your proposals and the standard rules? | |
| What is the reference number for the plan showing your site and the receptors and hazards? | |

Table A1 Odour risk assessment and management plan

| What do you do that can harm and what could be harmed | | | Managing the risk | Assessing the risk | | |
|---|--|--|--|---|---|---|
| Hazard | Receptor | Pathway | Risk management | Probability of exposure | Consequence | What is the overall risk? |
| What has the potential to cause harm? | What is at risk? What do I wish to protect? | How can the hazard get to the receptor? | What measures will you take to reduce the risk? If it occurs – who is responsible for what? | How likely is this contact? | What is the harm that can be caused? | What is the risk that still remains? The balance of probability and consequence |
| e.g. There are no possible sources of odour at the site. OR | | | | | | |
| e.g. Smell from composting windrows out the back of the reception shed. | e.g. Thorpe village 800 m to the south | Air - Northerly winds or lengthy periods of calm. These occur for around 15 days/yr (Met Office stats attached). | Measures as described in Getting the Basics Right and the Industry code of practice. Only turning activities will cause a problem at this distance. We will not do this with these weather conditions. | Fairly probable (5) | Odour annoyance which will have more impact in summer when people outdoors and temperatures higher. 12 days /yr. consequence medium | not significant if carefully managed |
| e.g. Failure of scrubber liquor pumps due to power failure | e.g. Trading Estate retail units 200m to the north | Air | If it occurs, instigate process shutdown procedure (30 mins) Advise regulator by telephone immediately (phone no:....) Duty manager | Power failure has occurred once in the last 5 years. | Unabated odorous off-gas to atmosphere. But for less than 30 minutes. | Not significant |
| eg inversion conditions preventing dispersion from stack | eg Community to the east on hillside | Air | Weather station located on site with logging facility. Daily weather forecast received from Met office. If it occurs, finish current batch but reduce temperature if possible. Hold further batches of Product X. Product Y can be run on reduced temperature | inversion conditions happen once or twice per year. May fail to predict occasionally. | Very noticeable smell but for very short duration until shut down occurs | Not significant |

Table A2 Noise risk assessment and management plan

| What do you do that can harm and what could be harmed | | | Managing the risk | Assessing the risk | | |
|--|--|---|--|---|--|---|
| Hazard | Receptor | Pathway | Risk management | Probability of exposure | Consequence | What is the overall risk? |
| What has the potential to cause harm? | What is at risk? What do I wish to protect? | How can the hazard get to the receptor? | What measures will you take to reduce the risk? If it occurs – who is responsible for what? | How likely is this contact? | What is the harm that can be caused? | What is the risk that still remains? The balance of probability and consequence |
| e.g. There are no possible sources of noise from the activities | | | | | | |
| e.g. Engine noise from loading shove e.g. Noise from reverse warnings e.g. Noise from baling machinery at the back of storage area 3 | Use the same principles as in Table A1 | Use the same principles as in Table A1 | For example, closing doors, visual inspections, routine maintenance through to withdrawing machinery from service or stopping the activity altogether If immediate action cannot be taken the reasons should be noted. Record and act on complaints, inform the regulator | Frequency - Include day or night, weekday or weekend exposure. intermittent or continuous | Include likely duration, noise level or increase in noise level (at source or receptor) and any characteristics. | Use the same principles as in Table A1 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Table A3 Fugitive emissions risk assessment and management plan

| What do you do that can harm and what could be harmed | | | Managing the risk | Assessing the risk | | |
|---|---|---|--|--|---|---|
| Hazard | Receptor | Pathway | Risk management | Probability of exposure | Consequence | What is the overall risk? |
| What has the potential to cause harm? | What is at risk? What do I wish to protect? | How can the hazard get to the receptor? | What measures will you take to reduce the risk? If it occurs – who is responsible for what? | How likely is this contact? | What is the harm that can be caused? | What is the risk that still remains? The balance of probability and consequence |
| To Air | | | | | | |
| e.g. Dust from screening plant H3 | e.g. People living at Land End Cottage R1 – 400m east of the site | e.g. Wind blown dust | e.g. The following technical guidance actions will be taken to reduce the dust [list]. Visual dust monitoring in accordance with procedure ref [X] Shift manager is responsible for checking wind strength and direction and stopping operations if needed | e.g. dust could potentially reach the house when a strong wind blows in that direction which it does around 50 days a year. The management actions should prevent this happening. | e.g. Nuisance - dust on cars, clothing etc. | not significant |
| e.g. VOCs from pipework | | | | | | |
| To water | | | | | | |
| e.g. Run off from the demolition waste stockpile | | | | | | |
| Pests | | | | | | |
| e.g. Flies in biodegradable waste in the transfer station | | | | | | |
| Mud/Litter | | | | | | |
| e.g. litter from paper bale storage area | | | | | | |

Table A4 Accidents risk assessment and management plan

| What do you do that can harm and what could be harmed | | | Managing the risk | Assessing the risk | | |
|--|--|---|--|-----------------------------|--|---|
| Hazard | Receptor | Pathway | Risk management | Probability of exposure | Consequence | What is the overall risk? |
| What has the potential to cause harm? | What is at risk? What do I wish to protect? | How can the hazard get to the receptor? | What measures will you take to reduce the risk? If it occurs – who is responsible for what? | How likely is this contact? | What is the harm that can be caused? | What is the risk that still remains? The balance of probability and consequence |
| e.g. Leak from the waste oil storage tank escaping the containment | Local water course | The surface water drainage system | Actions from Getting the Basics right – design of containment and control of fugitive emissions – company maintenance and inspection procedure ref. If it occurs the oil spill equipment is located nearby. The shift engineers are responsible for and trained in its use. | very unlikely | contamination of local water course | not significant |
| e.g. fire in wood stockpile causing emissions to air and firewater discharge | Local water course Air | The surface water drainage system | Fire precautions as in Getting the Basics Right and PG Notices and training regarding fire hazards. Fire hose nearby. Shift manager is responsible for actions in event of fire. Actions are listed in the works procedures. Wood is not treated so firewater relatively uncontaminated. Slopes direct water to car park area and drainage through interceptor. | unlikely | smoke, local nuisance, risk of fire spreading to other areas or premises | not significant as long as management procedures adhered to. |

ANNEX 1 - INTENSIVE FARMING - THE ASSESSMENT OF AIR EMISSIONS AND THEIR IMPACT ON THE ENVIRONMENT.

1. Who is this guidance for?

This guidance is targeted at those applicants who need to assess the impact of their emissions to air on sensitive wildlife habitats in support of their Environmental Permit application.

Where a farm is located within 10km of a site designated under the Habitats Regulations or 5km of a site designated under the Countryside and Rights of Way Act, or 2km of any other wildlife site (ancient woodland, Local nature reserve), this assessment needs to be completed.

The output of this assessment will indicate whether full air dispersion modelling is required, and guidance on how this should be completed is included.

2. Background

The emission to air of most concern from farming installations is ammonia. Housed pig and poultry account for almost 25% of ammonia to air from UK agricultural sources (Defra 2006 Inventory of Emissions from UK Agriculture). The UK is committed to reducing ammonia emissions by 2010 under the 1999 Gothenburg Protocol to abate acidification, eutrophication and ground level ozone. Controls on housed pigs and poultry and the reduction in use of urea fertilisers are the main focus for delivery of agreed reductions. As farmers with environmental permits convert their practices to comply with Best Available Techniques for housing, manure storage and manure spreading, as required by the technical measures for the sector, emission reductions of between 2.5 and 3 kilotonnes ammonia should be achieved.

Ammonia also has impacts at a local level, particularly as it is deposited to land (as it is reduced in the atmosphere) – contributing to eutrophication, acidification and is also toxic to a range of species. To obtain an Environmental Permit the impacts of the installation on the environment must be considered, particularly with reference to sensitive sites (Special Areas of Conservation and Special Protected Areas, and Special Sites of Scientific Interest), which under the Conservation (Natural Habitats &c.) Regulations 1994 and the Countryside and Rights of Way Act 2000, we have a duty to protect.

3. What kind of assessment is required?

3.1 Emissions to air

The main sources of ammonia in the atmosphere are animal housing, manure storage facilities and manure spreading. Ammonia is toxic at high concentrations to humans and animals and impacts on plants at lower concentrations. Damage to heathlands and woodlands may be significant around ammonia sources – critical levels above which damage may occur have been established for such sensitive habitats by UNECE.

3.2 Deposition to land

Deposition of ammonia to land arises from the air emissions from sources such as animal housing, and manure storage.

Ammonia deposited to land is taken up by plants (crops, grassland, trees, heathland) either through their leaves or through the roots. When present in high concentrations, plants become more sensitive to drought, frost, and pests and diseases. Damage to heathlands and woodlands may be significant around ammonia sources – critical loads above which damage may occur have been established for such sensitive habitats. The relevant critical load for habitats can be obtained from www.apis.ac.uk.

3.3 Emissions to Water

Emissions to water from intensive livestock installations are not general practice. Discharge to water of ammonia above Environmental Quality Standards will not be supported. Any proposed discharge should be discussed with the applicant at pre-application discussions. No further assessment is required.

4. Assessment of emissions to air in relation to Critical Levels

The following methodology has been developed to screen out those installations that will not exceed environmental benchmarks for ammonia to air.

Assessment of air emissions in relation to Critical Levels should be carried out where there are sensitive wildlife habitats (SACs, SPAs) within 10km of the proposed installation, or 5km of an SSSI or 2km of any other wildlife site (ancient woodland, Local nature reserve). You can identify these using the following website www.magic.gov.uk – this map-based tool allows you to search by postcode and identify the statutory rural land designations above.

Step 1: Calculate Predicted Concentrations of Emissions to Air

Estimate predicted concentration using formula:

$$PC_{\text{air}} = \text{GLC} * \text{RR}$$

PC = predicted concentration (ug/m3)

RR = release rate of substance in g/s (Note that release rate may either be determined from emission factors (see Table 1) or from operator held monitoring data).

GLC = maximum average ground level concentration for unit mass release rate (ug/m3/g/s) based on an annual average. An appropriate value for the agricultural buildings is 60.

This calculation should be done for each emission source (housing, manure storage)

Step 2: Screen out Insignificant Emissions to Air

An emission is insignificant where PC <4% of Critical Levels for SACs or SPAs or 20% for SSSI's. Critical levels are:

1ug/m3 for wildlife sites where lichens and bryophytes are present; 3ug/m3 for all other habitats. The relevant Critical Level for the particular wildlife site is available from www.apis.ac.uk.

Step 3: Calculate Total Predicted Environmental Concentration (PEC)

Background concentration data are available from the ammonia network. Data from this network is collected and maintained by the Centre for Ecology and Hydrology and is published on their website www.apis.ac.uk

$$PEC_{\text{air}} = PC_{\text{air}} + \text{background concentration}_{\text{air}}$$

Step 4: Identify whether further work is required

If PEC is above 100% of the Critical Level modelling/monitoring of emissions is needed.

Step 5: Assess Acceptability against Local Environmental Requirements

Compare PEC with Critical Level

Consideration of background concentration should be taken into account. If the emission from the installation constitutes a major proportion of the Critical Level (more than 20% for a SAC or SPA or 50% for an SSSI), or makes a major contribution to the breach, the options proposed at the installation may not be considered acceptable.

5. Further work

This assessment methodology has been designed to ensure that further work is only needed where a potential problem is identified. In our experience where Critical Levels to air are exceeded then Critical Loads from deposition also will be and should be modelled.

6. Monitoring

The emission factors provided in Table 1 are based on average emissions for a range of installations and may not reflect the true position at the proposed site. Monitoring of ammonia is not simple, and should be carried out by experienced consultants. For existing installations monitoring of housing could take place in situ throughout a cycle to account for differences in emissions at stocking, as the animals grow to full size and at feeding and cleaning out. Emissions from manure/litter/slurry stores should be measured over a reasonable time period. For new installations similar monitoring could in some instances be carried out at other installations owned by the same company. The results of such monitoring could be fed into the screening calculations above, although in some cases they may simply confirm the need for modelling. Monitoring could also be carried out at a wildlife site, but this probably has less value where there are other ammonia sources in the locality. Information on how to undertake monitoring is available from your local Environment Agency office.

7. Modelling

Any modelling commissioned by an applicant should focus on both emissions to air and deposition to land, at a range of distances from the installation. Factors such as wind direction, rainfall, land use and land type and other ammonia sources would all need to be taken into account. Guidance on the use of models such as AERMOD or ADMS is available from the Agency Air Quality Modelling and Assessment Unit.

Points to consider for ammonia modelling

Modelling should reflect the technologies and techniques actually in use and/or planned for the site. Standard factors should only be used as a last resort.

- Modelling should be done on an atmospheric dispersion basis taking into account:
 - Wind direction
 - Site-specific ammonia and odour releases based on techniques used
 - Should display results as a series of contours around the site
- Results should be expressed as:
 - An atmospheric ammonia concentration contour expressed as $\mu\text{g}/\text{m}^3$.
 - A contour of ammonia deposition on surrounding land expressed as $\text{kg}(\text{N})/\text{Ha}/\text{yr}$
- A comparison of findings with recognised standards:
 - Atmospheric ammonia with reference to Critical Levels for sensitive habitats (methodology above)
 - Ammonia deposition with reference to Critical Loads for the habitats which may be affected (methodology below).
- Where the site encompasses a range of technologies and techniques this combination should be reflected in modelling
- Modelling should be carried out for instances of peak release.
- Modelling should also be carried out for average releases over the growing cycle.
- Consideration of any seasonal or diurnal variations in releases.
- Consideration of the effects of local vegetation or physical barriers.
- Where possible, actual measured data for the site in question or of similar sites should be used to reinforce the findings of any modelling.

Deposition to land estimates resulting from modelling should be assessed using the following methodology.

Step 1: Estimate annual loading to land

Modelling loading should be converted to $\text{Kg}(\text{N})/\text{ha}/\text{yr}$ - predicted concentration (PC)

Step 2: Screen out insignificant loadings to Land

An emission is insignificant where $\text{PC} < 4\%$ of the Critical Load for SACs or SPAs or 20% for SSSI's. PC should be compared with lowest range for the nearby wildlife site. Where there is more than one wildlife site nearby, the critical load for the most sensitive wildlife site should be applied.

Step 3: Calculate Total Predicted Environmental Concentration (PEC)

Background concentration data are available from www.apis.ac.uk.

$\text{PEC}_{\text{land}} = \text{PC}_{\text{land}} + \text{background concentration}_{\text{land}}$

Step 4: Assess Acceptability against Local Environmental Requirements

Compare PEC with Critical Load appropriate to wildlife habitat site.

Consideration of background concentration should be taken into account. If the emission from the farming installation constitutes a major proportion of the Critical Load (more than 20% for a SAC or SPA or 50% for an SSSI), or makes a major contribution to the breach, the options proposed at the installation may not be considered acceptable.

Table 1: Emission rates of ammonia from pig and poultry installations

The emission rates need to be multiplied by the number of livestock before entering into the model.

| Emission Source | Emission Rate (g NH₃/place/s) |
|--|---|
| Poultry Housing | |
| Layers - cages with deep pit manure store | 0.000009196 |
| Layers - cages with ventilated deep pit | 0.000006437 |
| Layers - cages with twice weekly manure removal by belt | 0.000003678 |
| Layers -Vertical tiered cages with force air drying and once a week manure removal | 0.000003678 |
| Layers - Vertical tiered cages with whisk forced air drying and once a week manure removal | 0.000002759 |
| Layers - Vertical tiered cages with manure belt with drying tunnel over cage and 24-36 hour removal | 0.000001839 |
| Layers - Enriched cage | 0.000003862 |
| Barn and free range - perchery with deep litter | 0.000009196 |
| Barn and free range – litter system with forced air drying | 0.000003678 |
| Barn and free range – litter system with perforated floor & forced air drying | 0.000003219 |
| Barn and free range – aviary system | 0.000002667 |
| Broilers & pullets – naturally ventilated fully littered floor, non-leaking drinkers | 0.000001585 |
| Broilers & pullets – fan ventilated, fully littered floor, non-leaking drinkers | 0.000001585 |
| Turkeys – male | 0.000013952 |
| Turkeys – female | 0.000006976 |
| Ducks | 0.000003488 |
| Pigs | |
| Sows – Fully slatted floor (FSF) | 0.000095446 |
| Sows – solid floor straw system | 0.000144914 |
| Sows – part-slatted floor (PSF_ with reduced manure pit | 0.000076357 |
| Sows – FSF with vacuum system for frequent slurry removal | 0.000071585 |
| Farrowers – FSF | 0.000185185 |
| Farrowers – Solid floor straw system | 0.000281583 |
| Farrowers – FSF/PSF with combination of water and manure channel | 0.000088889 |
| Farrowers - FSF/PSF with flushing system with manure gutters | 0.000074074 |
| Farrowers – FSF/PSF with manure pan underneath | 0.000064815 |
| Weaners (<30kg) – FSF | 0.000009196 |
| Weaners – Solid floor straw system | 0.000006659 |
| Weaners – flatdeck/pen with FSF/PSF with vacuum system for frequent manure removal | 0.000006897 |
| Weaners – flatdeck/pen with FSF beneath where there is concrete sloped floor to separate faeces or urine | 0.000006437 |
| Weaners – pen with PSF (2 climate system) | 0.000006069 |
| Weaners – Pen with PSF and sloped or convex solid floor | 0.000005242 |
| Weaners – Pen with PSF with triangular slats and manure channel with sloped side-walls | 0.000002575 |
| Growers – FSF | 0.000050419 |
| Growers – Solid floor – straw system | 0.000036149 |
| Growers – FSF with vacuum system for frequent slurry removal | 0.000037814 |
| Growers – PSF with reduced manure pit including slanted walls & vacuum system | 0.000020167 |
| Growers – PSF with central convex solid floor at front and manure gutters with slanted sidewalls and sloped manure pit | 0.000020167 |
| Finishers (>60kg) – FSF | 0.000131279 |
| Finishers – Solid floor straw system | 0.000094178 |
| Finishers – FSF with vacuum system for frequent slurry removal | 0.000098459 |

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|--|-------------|
| Finishers – PSF with reduced manure pit including slanted walls and vacuum system | 0.000052511 |
| Finishers – PSF with central convex solid floor at front and manure gutters with slanted sidewalls and sloped manure pit | 0.000052511 |
| | |
| Manure/Slurry Storage | |
| <i>Poultry</i> | |
| Manure belts | 0.000075469 |
| Manure – deep pit | 0.000075469 |
| Other | 0.000055175 |
| | |
| <i>Pigs</i> | |
| Manure Heap | 0.000047248 |
| Slurry - circular store - no cover | 0.000044394 |
| Slurry - circular store - rigid cover | 0.000008879 |
| Slurry - circular store - floating cover | 0.000022197 |
| Slurry - circular store - Low tech cover | 0.000033295 |
| Slurry - lagoon - No cover | 0.000044394 |
| Slurry - lagoon - Rigid cover | 0.000008879 |
| Slurry - lagoon - Floating cover | 0.000022197 |
| Slurry - lagoon - Low Tech Cover | 0.000033295 |
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