Local Government Air Quality Toolkit

Piggeries guidance note

Information on good design and management practices to reduce air emissions from piggeries

NSW GOVERNMENT

Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the Traditional Custodians of the lands where we work and live.

We pay our respects to Elders past, present and emerging.

This resource may contain images or names of deceased persons in photographs or historical content.

The Local Government Air Quality Toolkit has been developed by Department of Climate Change, Energy, the Environment and Water in collaboration with the NSW Environment Protection Authority, the NSW Department of Planning, Housing and Infrastructure, Local Government NSW and local councils.

Cover photo: Intensive indoor piggery. Chris Gill/EPA

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1. Introduction

1.1 Industry overview

This guidance note provides general information on good design and management practices to reduce air emissions from piggeries. It does not cover nutrient management, pig health, work health and safety, piggery productivity or greenhouse gas emissions.

Piggeries that have the capacity to accommodate more than 2,000 pigs or 200 breeding sows for commercial production are scheduled activities under the *Protection of the Environment Operations Act 1997* (the POEO Act), being 'livestock intensive activities'. The piggery operator must hold an environment protection licence (EPL) and the NSW Environment Protection Authority (EPA) is the appropriate regulatory authority (ARA) for the purposes of the POEO Act.

Local government is the ARA and has regulatory responsibility for environment protection for piggeries with fewer than 2,000 pigs or 200 breeding sows.

> Local councils can influence the initial siting of all intensive agricultural industries through land-use planning and the development approval process. This is usually the most important decision on air quality management.

The environmental management and resolution of any air pollution-based nuisance or off-site impacts caused by odour and dust from piggeries are the responsibility of the site operator.

1.2 Production process

Pig production is now a major agricultural industry in Australia. The trend has been towards fewer farms with large numbers of animals housed in sheds holding up to 100,000 pigs. As of 2023, there are approximately 500 commercial piggeries in New South Wales, each with about 90,000 sows. Pig diets consist mainly of grains (wheat, sorghum and barley) with supplements rich in protein and minerals. Pig production tends to be located in grain-growing areas in Southern Queensland, New South Wales and Western Australia.

Pig production phases

Pig production involves 5 main phases:

- breeding – housing the boars, gilts and dry sows awaiting mating
- gestating or dry sows – housing sows that have been mated
- farrowing – housing sows giving birth and young piglets
- weaning – housing piglets after weaning from the sow
- growing or finishing – housing pigs before their sale or induction to the breeding herd.

Types of pig production units

Pig production units take many different forms, including:

- farrow to finish – includes the breeding, weaning and growing or finishing stages. The pigs born at the site are reared until they are old enough to be sold or inducted to the breeding herd (usually 21–26 weeks of age)
- breeder – includes breeding stock and the breeding process. The pigs born at the site are reared until either the start or finish of the weaning phase (usually 3–10 weeks of age)

- weaner – includes only weaner pigs. All pigs at the site are transferred in from a breeder unit and are generally kept at the site from approximately 3–10 weeks of age
- grower or finisher – includes grower (approximately 10–16 weeks of age) and finisher pigs (approximately 16 weeks and up to 21–26 weeks of age). All pigs at the site are transferred in from a breeder or weaner unit.

The pig production phases are shown in Figure 1.

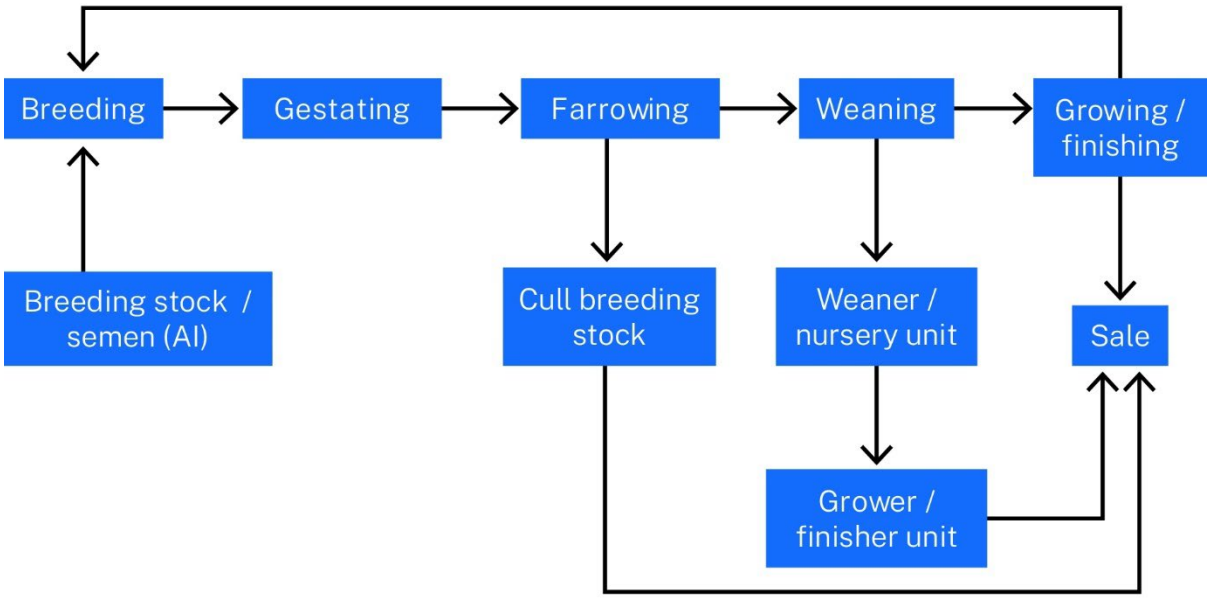

Figure 1 **Phases of pig production**

1.3 Facility structure and design

Extensive piggeries

Extensive pig farming refers to small farm, backyard or part-time producers where pig numbers are typically much smaller (fewer than 100) than intensive farms.

In an extensive piggery, the animals rely primarily on foraging and grazing rather than on supplementary feed to meet most (over 50%) of their nutritional requirements. These piggeries are less of an issue for odour and dust and are not considered further in this guidance note.

Intensive piggeries

An intensive piggery is a facility with watering and feeding infrastructure where pigs are confined and fed for the purpose of production. The pigs are maintained within a structure designed to modify the environment for all or part of the breeding and growing cycles. They rely primarily on supplementary feed to meet their nutritional requirements.

In the case of an intensive indoor piggery the 'structure' may include a slatted or concrete floor or deep-litter housing (Figure 2 and Figure 3).

Conventional housing accommodates pigs in concrete-floored pens within sheds. The flooring is usually partly or fully slatted or includes open channel dunging areas. For sheds with slatted flooring, spilt feed and water, urine and faeces fall through the slats into under-floor channels or pits. These are either flushed or drained regularly to remove effluent from the sheds.

Deep-litter housing typically accommodates pigs in a series of hooped metal frames covered in a waterproof fabric, similar to the plastic greenhouses used in horticulture. Variations include converted conventional sheds or skillion-roof sheds with bedding over the flooring. Pigs are bedded on straw, sawdust, rice hulls or similar loose material. This absorbs manure, eliminating the need for water cleaning. The spent bedding is removed and replaced as each batch of pigs is finished.

Figure 2 **Slatted floor pen**
Source: Simon Skafar/iStock

Figure 3 **Indoor deep-litter (sawdust) shed**
Source: caojianxiong/iStock

For an intensive outdoor piggery, the 'structure' is usually a small paddock or pen, sometimes with huts or other basic accommodation. There are 2 types of intensive outdoor piggeries:

- rotational outdoor piggery – the pigs are kept in small paddocks that are used in rotation with a pasture or cropping phase (Figure 4). During the stocked phase, the pigs are supplied with prepared feed, but can also forage. During the non-pig phase, the area is used to grow pastures or crops that are harvested to remove nutrients deposited in pig manure during the stocked phase
- feedlot outdoor piggeries – continuously accommodate pigs in permanent outdoor enclosures. These enclosures must be located within a controlled drainage area and the base of the enclosure must be sealed to prevent nutrients and salts from leaching to ground water.

Figure 4 **A rotational outdoor piggery**
Source: whitemay/iStock

2. Potential emissions to air

2.1 Overview

All air pollutants should be considered during the planning process and addressed within consent conditions, where relevant. The site operator is responsible for compliance with all consent conditions. The various potential sources of both dust and odour are noted below.

Figure 5 shows the flow of by-products through different piggery designs and the potential air quality issues associated with each stage of production.

The management of effluent, including collection, storage and disposal is a key issue. These management practices are discussed in more detail in Sections 3.2 and 3.3 of this guidance note.

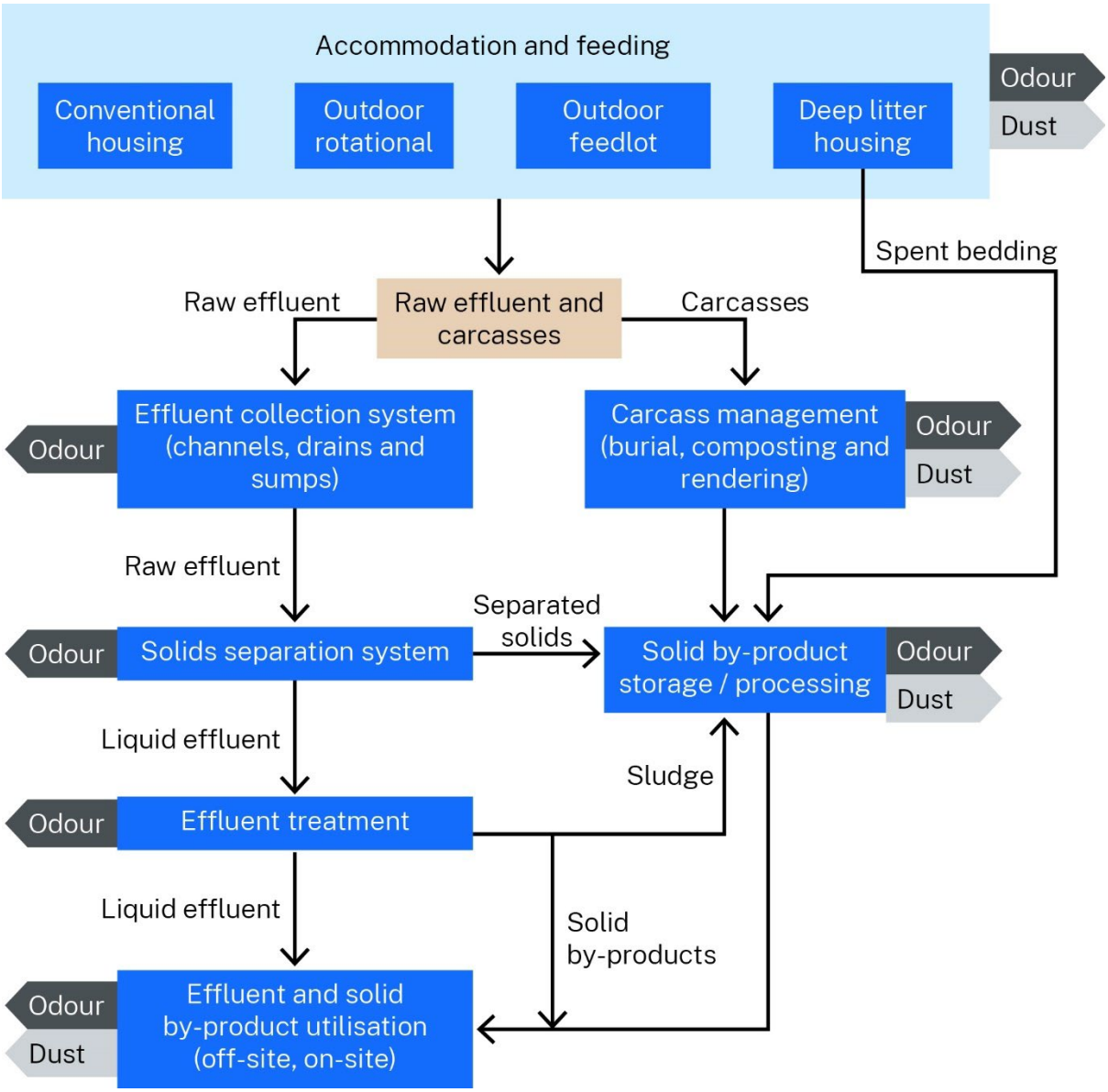

Figure 5 **Piggery process diagram showing air quality issues for each step**

2.2 Odour

Odour has become a significant problem for piggeries, even for some operated with a view to minimising odour generation. Australian Pork Limited (APL) has funded a range of studies on odour relating to the Australian pig production industry, and these can be found on their *Environmental guidelines* webpage (APL 2024).

Breakdown of manure, waste feed, mortalities and other organic matter produces odour. The strength and offensiveness of the odour generated depends on the quantity and composition of the material being digested, and whether breakdown occurs in the presence (aerobic) or absence (anaerobic) of oxygen.

Odour in pig production arises from:

- production sheds housing pigs
- collecting and storing liquid effluent
- treating effluent
- storing and processing solids
- applying effluent and solids to land
- disposing of carcasses.

One of the biggest sources of odour from piggeries can be the treatment of liquid effluent; however, since all sources contribute to off-site odour impacts, emissions and mitigation measures related to the other sources should not be ignored.

2.3 Dust

Dust from pig production arises from:

- production sheds housing pigs
- storing and processing solids
- milling and distributing animal feeds
- movement of animals on dry ground outside
- applying effluent and solids to land
- disposing of carcasses.

3. Managing air pollution

Control mechanisms that piggery operators can use to minimise air pollution are limited where:

- anaerobic processes are necessarily involved (the processes by which bacteria break down organic matter in the absence of oxygen, usually when material is moist or wet)
- large odorous areas are exposed
- large ventilation air flows through sheds may be required to maintain production conditions.

Management that promotes aerobic breakdown or complete anaerobic breakdown of manure results in less odour.

The following sections outline a range of mitigation methods and best practice measures that operators can employ to reduce their air emissions and environmental impact.

3.1 Location of piggeries

As noted in Chapter 1, local councils can influence the initial siting of a piggery through the development approval process. Siting the operation well by considering its proximity to sensitive neighbours is critical, because dispersion is the main method of managing off-site impacts of both odour and dust.[1]

The newer, larger intensive pig production facilities have mainly been established in areas relatively remote from rural towns and urban settlement. Some smaller piggeries, which are likely to be regulated by local government, are located where they have potential to give rise to air quality complaints.

The use of appropriate separation or buffer distances is a widely recognised method of mitigating off-site odour impacts. The fundamental principle is that fugitive odour and dust emissions tend to radiate out from a source and are diluted along the way.[2]

Controlling the air emissions with pollution control equipment is not feasible for the large areas / air volumes involved, so separation distance is the most practical means of dispersion. Thorough assessment at the approval stage is therefore very important.

The *Technical Framework: Assessment and management of odour from stationary sources in NSW* (DEC 2006a) and the accompanying *Technical Notes: Assessment and management of odour from stationary sources in NSW* (DEC 2006b) outline the Level 1, or screening, assessment procedure for large diffuse sources such as piggeries. This is to determine whether a new facility is likely to cause odour impacts, primarily based on a calculation for optimum separation distance for the number of pigs at that facility.

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[1] The fundamentals of dispersion and how this affects air quality are discussed in the Local Government Air Quality Toolkit – Module 3, *Air pollution control techniques*.

[2] Fugitive emissions are uncontrolled emissions that do not arise from controlled point sources, such as vents, stacks, ducts and exhausts. They typically arise from evaporation, windblown or mechanical disturbances. It is usually impractical or impossible to capture or contain such emissions – hence they are termed 'fugitive'.

Appendix A of the *National environmental guidelines for piggeries* (Tucker 2010) (the guidelines) presents a similar, but slightly different method. As this is more recent, based on modelling results that are specific for piggeries, it is recommended this method be used and the details are presented in the following.

The guidelines show the most basic equation for calculating this separation distance (D) as follows:

$D = N^{0.55} \times S$

N = Number of standard pig units (SPU)

S = Composite site factor (S1 x S2 x S3)

The composite site factors are determined according to site-specific information relating to:

- S1 – piggery design factor for estimating the relative odour potential for the piggery design selected for a particular site (S1 = effluent removal factor (S1R) x effluent treatment factor (S1T))
- S2 – piggery siting factor for estimating the relative odour dispersion potential for the selected piggery site (S2 = receptor type factor (S2R) x surface roughness factor (S2S))
- S3 – terrain weighting factor for estimating the potential changes to odour dispersion, in situations where meteorological conditions may be influenced by local terrain influences.

These factors are described in detail in Appendix A of the guidelines; however, a worked example of the simplest method is provided below.

Standard pig units

Piggeries either have a range of pigs, from farrowing to finisher, or only one type of pig (e.g. growers). Larger pigs usually produce more manure and hence have a greater potential for odour production.

The equivalent number of SPU is calculated using standard multipliers for each class of pig. An SPU is equal to an average size grower pig (40 kg). Multipliers are then applied to each class of pig, based on their relative manure and waste production, as compared to an average size grower pig. These multipliers are provided in Table A.3 of the guidelines (Tucker 2010).

Worked example

Scenario: A new sow farrow-to-finish piggery proposes to house growing out pigs to 24 weeks, with breeder pigs in conventional sheds and all piglets in deep litter after 3 weeks of age, using a run-down screen separator.

Batches of weaned pigs will be housed in weaner deep-litter sheds from 3–10 weeks, and then moved into grower deep-litter sheds from 10–24 weeks on one batch of litter. Bedding will be added to the deep-litter sheds at approximately 0.65 kg/pig/day, and spent litter will be stockpiled on site before spreading.

The conventional sheds will house approximately 700 SPU, the weaner deep-litter sheds approximately 300 SPU and the grower deep-litter sheds approximately 1,000 SPU. The total is therefore 2,000 SPU.

The site is located near a rural residence and in an area of flat topography, with mixed farming the dominant land use.

The effluent removal factor (S1R) for the site:

S1R = SPU for each type of pig x effluent multiplier for that type of pig*; this SPU is the proportion of the total SPU for the particular type of pig

S1R = (SPU for pig type A / total facility SPU x effluent multiplier for type A) +
(SPU for pig type B / total facility SPU x effluent multiplier for type B) +
(SPU for pig type C / total facility SPU x effluent multiplier for type C)

S1R = (700 SPU/2,000 SPU x 1) + (300 SPU/2,000 SPU x 0.63) + (1,000 SPU/2,000 SPU x 1)
= 0.913

*Effluent removal multipliers from Table A.4 of the guidelines.

A properly designed and maintained run-down screen will separate 25% of the solids from the effluent before the pond from the conventional sheds, and spent litter from the weaner and grower deep-litter sheds is stockpiled on site before spreading.

The effluent treatment factor (S1T) for the site:

S1T = SPU for each type of pig x effluent treatment multiplier for that type of pig*; this SPU is the proportion of the total SPU for the particular type of pig

S1R = (SPU for pig type A / total facility SPU x effluent treatment multiplier for type A) +
(SPU for pig type B / total facility SPU x effluent treatment multiplier for type B) +
(SPU for pig type C / total facility SPU x effluent treatment multiplier for type C)

S1R = (700 SPU/2,000 SPU x 0.9) + (300 SPU/2,000 SPU x 0.63)+
(1,000 SPU/2,000 SPU x 0.63) = 0.725

*Effluent treatment multipliers from Table A.5 of the guidelines.

The piggery design factor for the site, S1 = 0.913 x 0.725 = 0.661.

To calculate the piggery siting factor (S2), values for the receptor type factor (S2R) and the surface roughness factor (S2S) are required, sourced from Tables A.6 and A.7 of the guidelines.

S2 = S2R x S2S

In this example, S2R = 11.5 and S2S = 1, therefore S2 = 11.5.

Site data to calculate separation distance

S factor	Value	Feature	Reference in the guidelines
S1	0.661	Effluent management	Appendix A
S2	11.5	Rural residence, farming	Tables A.6, A.7
S3	1.0	Flat terrain	Table A.8

Equations

S = S1 x S2 x S3

$D = N^{0.55} \times S$

Calculations

The minimum distance of the piggery from a rural residence should therefore be:

$2{,}000^{0.55}$ x 0.661 x 11.5 x 1.0 = 497 m

Two piggeries considered as one piggery

For calculating the separation distance to a receptor, the 2 piggeries can be considered as one single piggery if they are closer than half the shortest separation distance from each piggery to the receptor.

For example, if 2 piggeries have individual separation distances of 400 m and 600 m from a receptor, they will be assumed to be one piggery for the purpose of calculating separation distances if they are closer than 200 m from one another. If the piggeries are further apart than 200 m, they will be treated as separate piggeries.

Two piggeries considered separately

Where the 2 piggeries are considered as separate entities, a 20% increase in separation distance may apply to the proposed second piggery. For each piggery:

1. add 20% to the required separation distance
2. consider this distance as the radius of a 'separation zone'
3. determine whether the 2 zones overlap.

If the zones overlap, the added 20% applies to the separation distance of the second piggery. If the zones don't overlap, the 'normal' separation distance applies and the separation distance of the existing piggery is not affected for its current level of operation.

Figure 6 is a visual representation of this method.

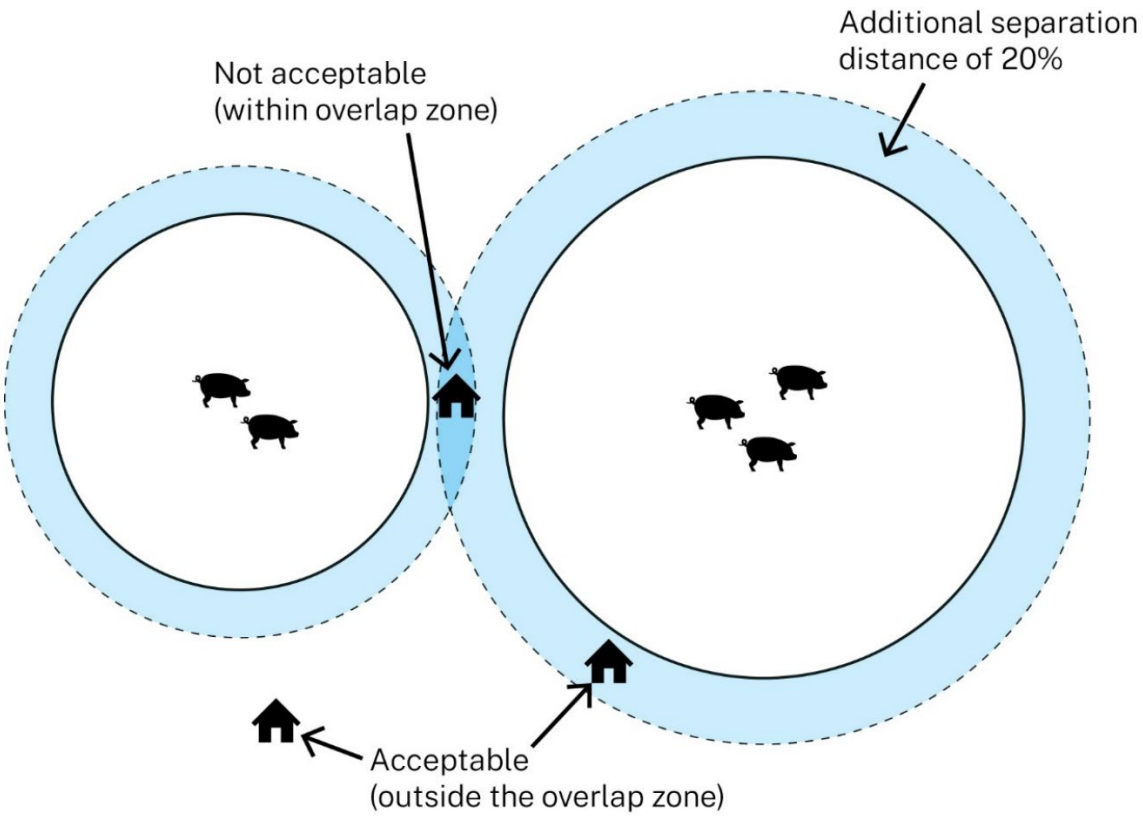

Figure 6 **Separation distance when 2 piggeries are considered separately**
Source: adapted from DEC 2006b

As noted previously, this is a simple screening method to understand if impacts on local receptors may occur. The screening assessment should present all the information used to calculate the separation distances as well as justification for all inputs.

The screening methodology is by nature conservative. Therefore, where sensitive receptors are sufficiently removed so as to fall outside the calculated separation distance, the likelihood of impacts is low and no further odour assessment is needed.

However, when receptors fall within this zone, dispersion modelling may be completed to refine the assessment further. For requirements and considerations for modelling, see Section 4.3 of this guidance note.

Each assessment should be site-specific and determined on a case-by-case basis whether it is appropriate to use a separate distance calculation and/or air modelling.

3.2 Managing odour

Some of the measures that can be adopted to minimise odour emissions, and that may be adopted within consent conditions at the site development planning and approval stage, are detailed below.

Piggery sheds and pens

Measures to minimise emission of odour from piggery sheds and pens include:

- pig cleanliness
  - keep the pigs clean and dry
  - use suitable stocking densities
  - maintain animal health to minimise loose stools and provide a good shed environment
  - dirty pigs smell, as their body warmth encourages anaerobic breakdown of the manure on their skins
- in-shed temperature – lower temperatures reduce odour
- in flushing sheds, any measures to improve the regular removal of liquid and manure from the pens will contribute to reduced shed odour generation, for example:
  - increasing frequency of flushing in drain-type sheds
  - making sure there is adequate slope on pen floors to influence drainage of liquids
- where flush pits are used, the proportion of pen floor area provided as slats influences the ability of manure to pass into the flushing pit, and hence affects the accumulation of manure in the pens and the odour emissions
- the slope on manure pit floors and the sizing of the flushing pits and the pit outlets influences the ability of the flushing water to adequately clean the pit
- in pull-plug type systems, improving the frequency of pit emptying and recharge
  - empty pits at least weekly
  - adding 5 cm of water to the bottom of the clean pit can help prevent manure sticking
  - emptying different pits on different days can help promote even flow of effluent to the treatment pond/s
- in conventional sheds, improving the pen cleaning interval to ensure there is no build-up of manure on floors

- in deep-litter housing, improving the amount of bedding and water supply
  - use plenty of bedding (0.5–1 kg straw/pig/day)
  - change bedding at least once every 7 weeks
  - repair water leaks quickly to avoid wet bedding
- in outdoor systems, improving bedding supply and hut movement
- in all systems, removing wet, spilt feed, which quickly becomes odorous
- collecting mortalities, afterbirth and foreign materials before they enter flushing pits and drains.

Regular and frequent removal of manure from sheds maintains hygienic, low odour conditions that are conducive to good pig performance and worker comfort.

Good shed hygiene is important in minimising odour.

The following 4 photographs show examples of good and poor shed maintenance, including clean / dirty sheds and dry / insufficient bedding.

Figure 7 **Clean sheds produce little odour**
Source: Robert Hoetink/iStock

Figure 8 **Dirty sheds generate more odour**
Source: Chris Gill

Figure 9 **Good coverage of dry bedding**
Source: UJ Alexander/iStock

Figure 10 **Insufficient bedding and poor management (wet and odorous conditions)**
Source: Chris Gill

Channels and drains

Wet manure in channels, drains and pipes can be a significant odour source. Measures that should be in place to control this include:

- maintaining a smooth, even surface
- incorporating sufficient slope, at least 1–2% (see Figure 11 and Figure 12)
- cleaning with sufficient water to remove solids (flush volume needs to match the drain capacity)
- inspecting after each use and ensuring any remaining solids are removed.

Figure 11 **Well designed channel with good slope**
Source: APL 2015a

Figure 12 **Manure trapped in flat channel**
Source: APL 2015a

Effluent treatment ponds

The effluent storage, treatment and handling system is a large fugitive source of odour in a piggery. If a site-specific odour dispersion modelling assessment is undertaken, typically a sludge pond design is part of the environmental impact statement when the application is submitted for the operation, and is based on studies for operations similar in both design and size.

Measures for managing odour at these locations include:

- a consistent effluent flow to the ponds through regular and frequent effluent channel flushing or pit emptying. Providing multiple inlets to the pond helps to spread the load
- the pond outlet should be well separated from the inlet/s to ensure all active volume is utilised
- de-sludge ponds when solids start to impinge on the active volume. Excessive sludge build-up in the treatment pond can reduce the pond's effective treatment volume, resulting in overloading and odour
- treatment ponds need to be managed to maintain the bacterial balance, maximising pond efficiency. A pH of 6.8–8.0 is optimal
- regular inflows are important in maintaining stable, low odour conditions within anaerobic effluent treatment ponds. Shock loadings disrupt the process, resulting in odorous releases
- the *National environmental guidelines for piggeries* (Tucker 2010) and the *Piggery manure and effluent management and reuse guidelines* (APL 2015b) provide useful guidance regarding sizing and design of effluent ponds
- pond capability is related to the number of pigs producing effluent; if this increases, pond capacity should also increase
- it is unlikely any uncovered anaerobic treatment process will be completely odour-free, but biological activity at the surface of an anaerobic pond can reduce odour levels.

Figure 13 **A well maintained effluent pond**
Source: Chris Gill

Sludge removal using a vacuum tanker (Figure 14)

Important factors to consider when using a vacuum tanker to remove sludge:

- ensure this causes minimal disturbance of the pond
- the activity requires having sufficient land close to the pond for immediate spreading
- this involves safety hazards for workers due to the extreme toxicity of the hydrogen sulfide gas that can be released when handling sludge; appropriate health and safety precautions must be followed. Refer to the SafeWork NSW *Exposure of workers to hydrogen sulphide gas safety alert* (SafeWork NSW 2018) and Safe Work Australia confined spaces code of practice (Safe Work Australia 2011).

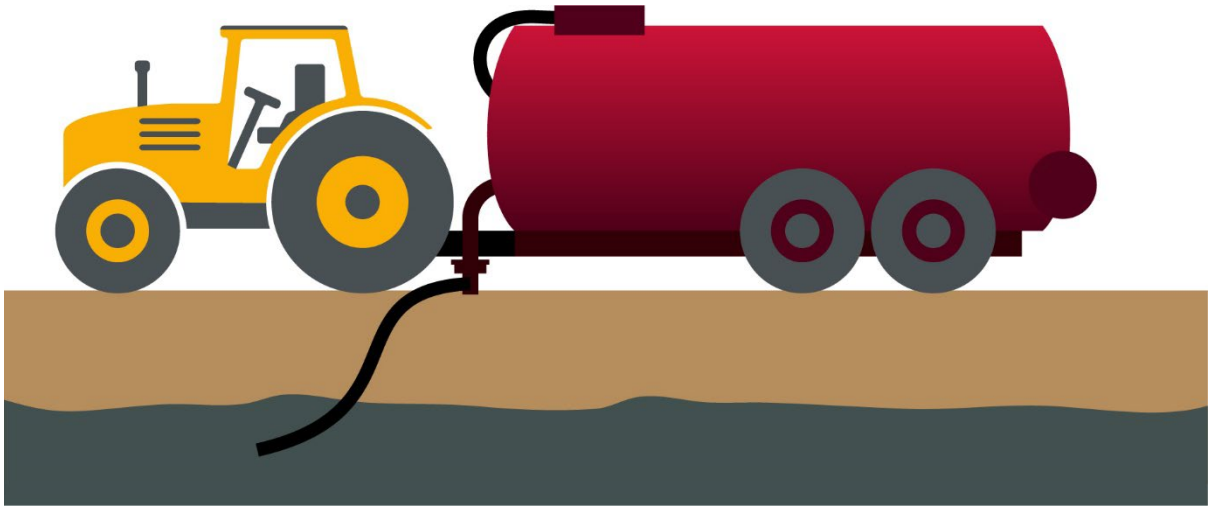

Figure 14 Sludge removal using a vacuum tanker

Sludge removal using an excavator (Figure 15)

When using an excavator for this process it is important to consider:

- this method completely empties the pond and may disturb the pond lining
- the sludge is likely to be an odour source while it's wet and may take time to dry
- de-sludging can take place in dry weather only.

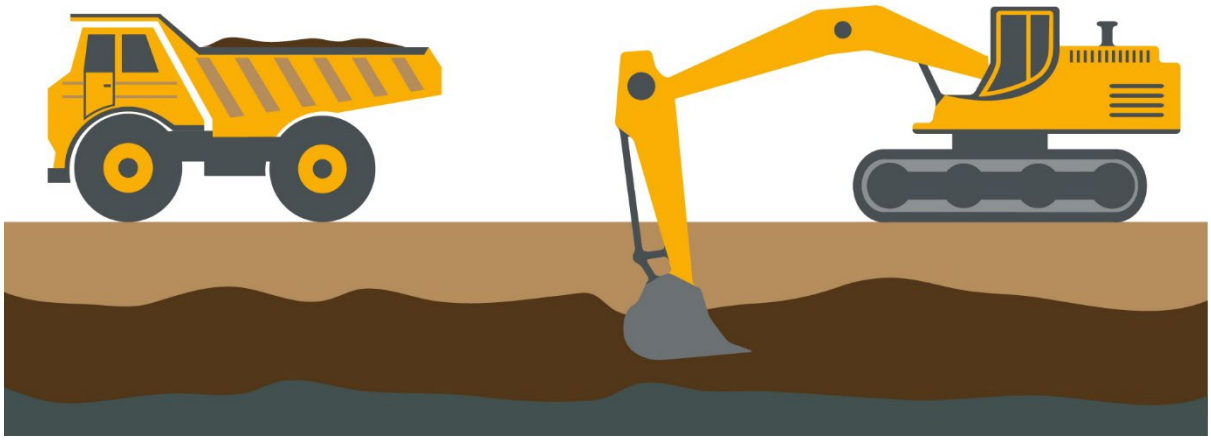

Figure 15 Sludge removal using an excavator

Sludge removal using agitation and pumping (Figure 16)

- Agitating the sludge and pumping it out also causes a large disturbance to the pond volume.
- Sufficient land must be available close to the pond for applying the sludge mix.

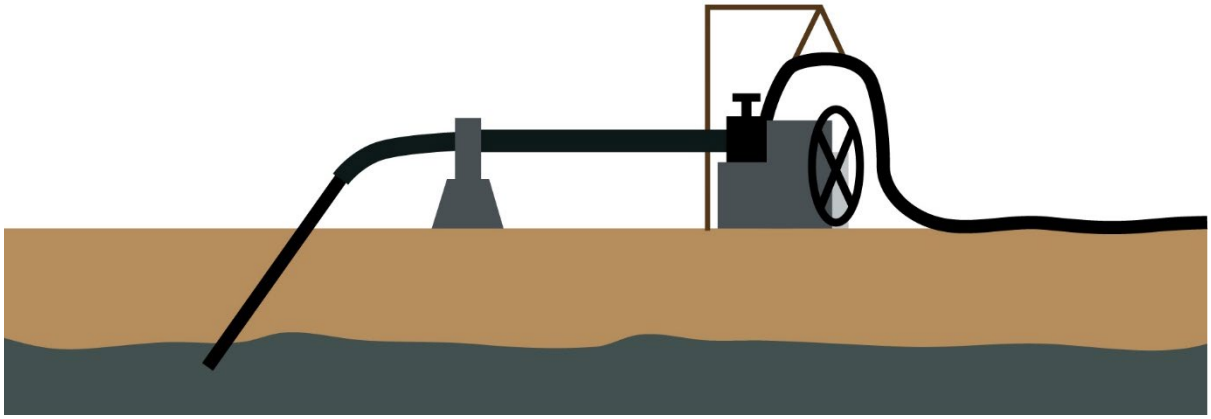

Figure 16 **Sludge removal using pumps**

Land application of effluent

Piggery effluent (waste solids) is generally reused through irrigation to land as fertiliser. Effluent irrigation is encouraged when it is safe and practical to do so and where it provides the best environmental outcome (DEC 2004). In most instances, the effluent is applied to each area in small quantities. Prior to reuse via application to land, the current orders and exemptions should be reviewed to ensure conditions are met (see EPA 2014a, 2014b).

When effluent is applied to land, the key management factors influencing odour are:

- quantity of material remaining on the soil surface after application
- odour potential of the material applied
- avoiding application onto wet soil
- prevailing and forecast weather conditions and the location of the land application relative to receptors – avoid spreading in calm conditions (early morning, late afternoon) when dispersion is likely to be poorer, and make sure receptors are upwind
- avoiding weekend application if local odour impacts are likely
- irrigation method suits the site and management
- level of treatment achieved – effluents should be aerobic if applied by spray
- quantity of air emissions formed during application.

> The potential for air emissions to impact on receptors depends largely on the proximity of receptors to the application area and the dispersion conditions at the time of application.

Odour emissions are influenced by the method of application and how the application is managed. Effluent application methods include:

- spray irrigators – low pressure systems produce less airborne contaminants than high pressure systems (Figure 17)
- surface drip or trickle (surface or subsurface) irrigation – produces less air emissions than spray irrigation but is often not a practical alternative

- tanker spreading – distributes effluent evenly and produces less air pollution
- travelling drip irrigators – distribute effluent evenly and produce less air pollution (Figure 18)
- direct (deep) injection – minimises odour
- open pipe – is a poor option; while spreading effluent directly from the pipe produces fewer airborne contaminants it spreads effluent very unevenly, which can result in pooling (Figure 19)
- irrigation with droppers.

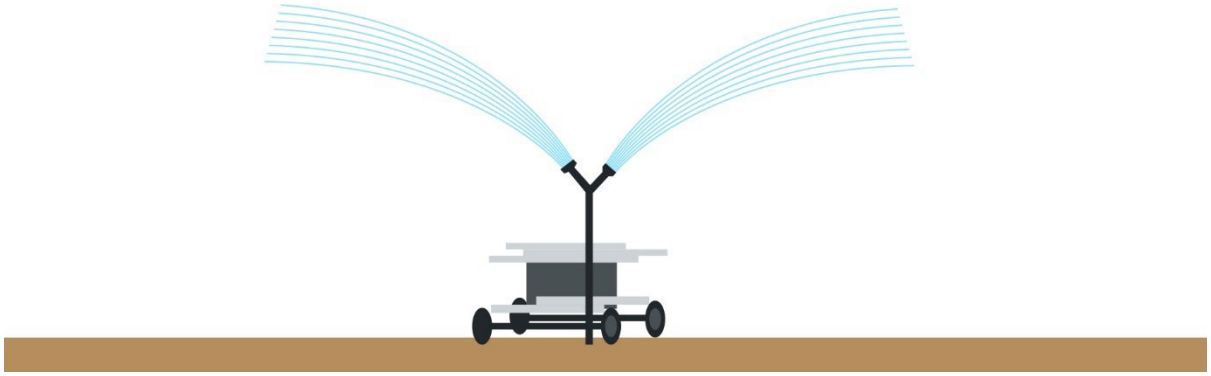

Figure 17 Spray irrigator

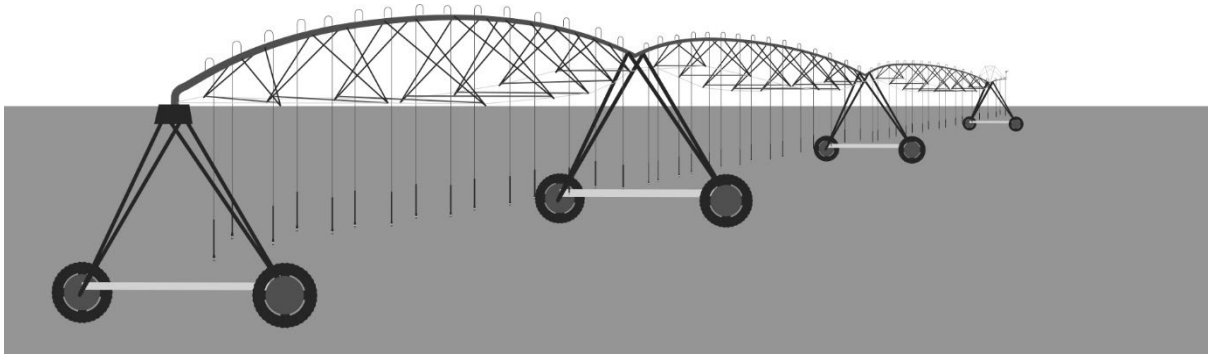

Figure 18 Travelling drip irrigator

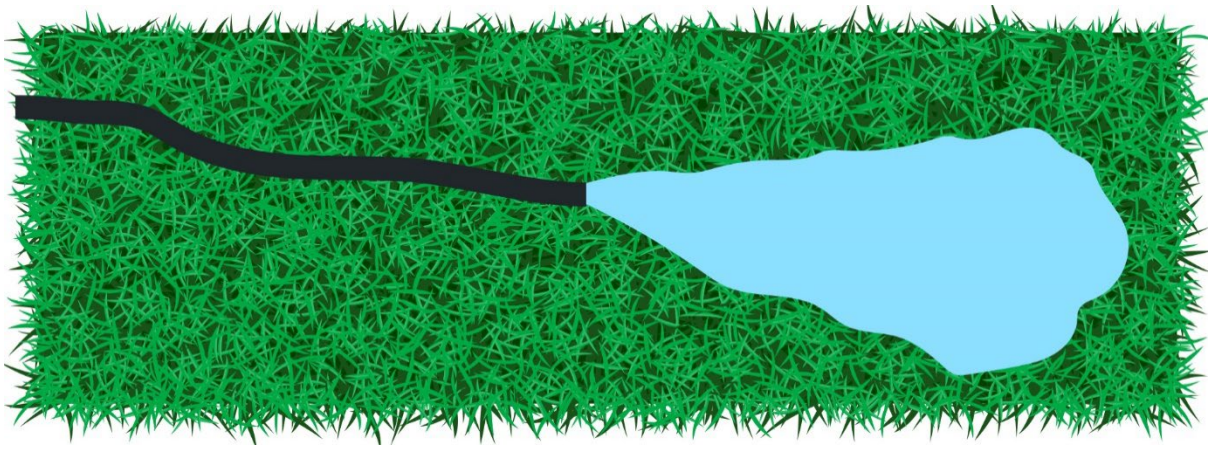

Figure 19 Open pipe irrigator

Manure storage areas

To minimise odour from manure storage areas:

- limit the mass of manure stored, although it may be necessary to provide capacity for 6–12 months manure to fit in with cropping cycles
- promote good drainage so water doesn't pool around manure piles
- provide an impermeable base and a gradient of 2–3% on storage areas and orient the long sides of manure piles down the slope
- consider blending very wet manure solids with drier material and / or regularly turning the manure to promote drying. (Do not form wet manure into tall piles (>2–2.5 m) as these are likely to heat excessively and may catch on fire)
- avoid turning or handling very dry manure, particularly under windy conditions. The dust produced can transport odour
- consider composting manure (aerobic process) (Figure 20). Section 7.6.2 of the *Piggery manure and effluent management and reuse guidelines* (APL 2015b) provides useful information on manure composting.

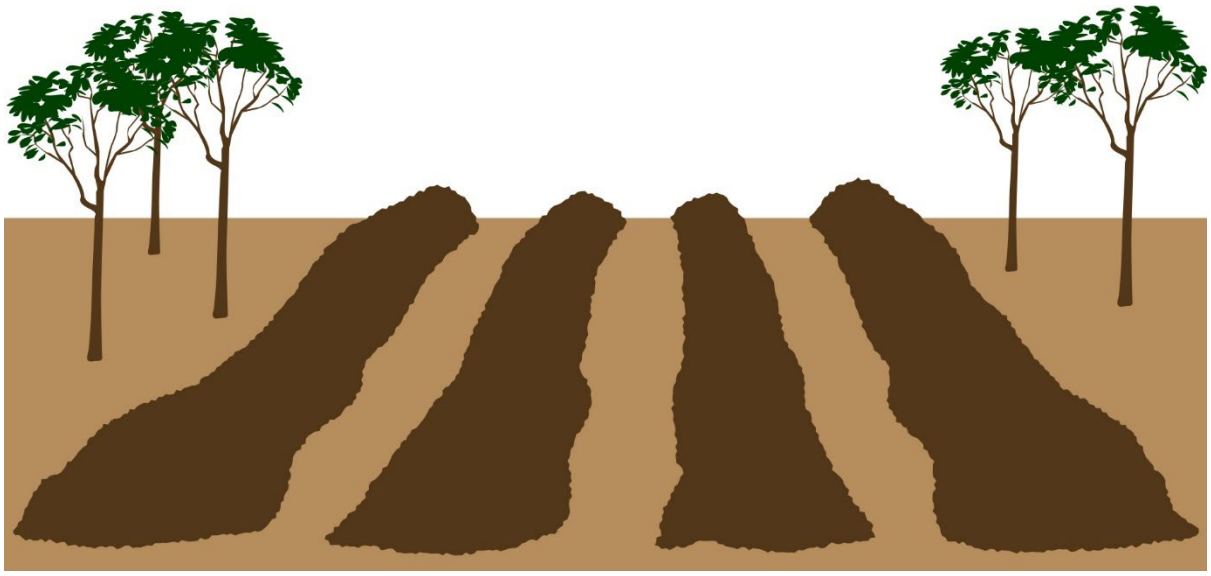

Figure 20 Composting is a low-odour, aerobic process

Treatment of carcasses

There are a number of options for the treatment of carcasses, shown from least to most preferable in Figure 21. The most common methods are composting, burial or rendering.

Mortalities should never be dumped in paddocks as this attracts vermin, is an odour source and poses a biosecurity risk.

Composting

Carcasses are readily composted, but the volume of material used to cover the carcass is important for controlling odour emissions. The amount of cover required also depends on the soil type. Section 7.7.1 of the *Piggery manure and effluent management and reuse guidelines* (APL 2015b) provides useful information on composting carcasses.

Regarding composting, the size of the operation and type of waste will determine whether the activity being carried out at the facility is the scheduled activity of 'composting' under the POEO Act, or whether a non-scheduled activity is being carried out, and therefore who the ARA is. This is detailed in Chapter 4 of this guidance note.

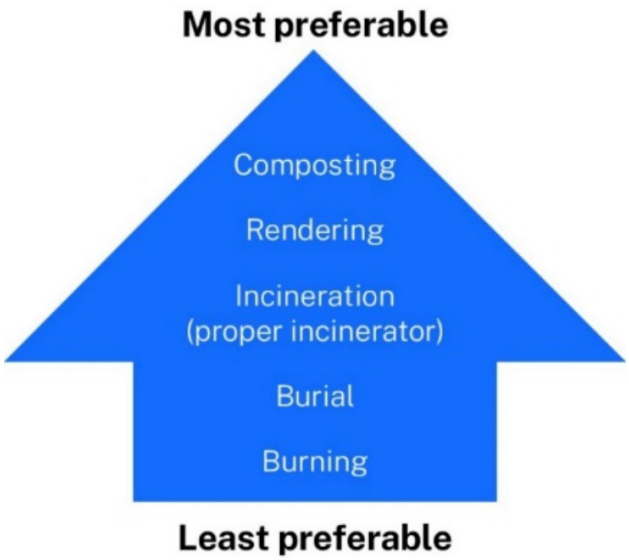

Figure 21 Options for the treatment of carcasses

Rendering

Rendering carcasses is a suitable disposal method for producers located near a rendering plant.

Burial

For carcasses that are buried, odour emissions are influenced by the amount of soil cover over the carcasses. Information on burial pit depths and soil cover is in the *Animal carcass disposal* fact sheet (DPI 2021). Section 7.7.4 of the *Piggery manure and effluent management and reuse guidelines* (APL 2015b) provides useful information on burial of carcasses.

Incineration and burning

Incineration is rarely feasible on a farm and burning is not advisable as it releases smoke, odour and potentially biohazardous material into the air. Burning may only be permissible in response to a disease outbreak or a mass mortality incident.

3.3 Managing dust

Dust emissions from piggeries are unlikely to cause impacts unless receptors are close to operations, or conditions are exceptionally dry. Consent conditions will most likely relate to odour rather than dust as dust can generally be controlled with good management practices for heavy vehicle movement, windblown dust from large exposed dry areas, feed storage, processing and handling, and spreading of manure.

Good management will mitigate dust emission. Wind speeds over 30 km/h will raise dust. Measured and forecast wind conditions from the Bureau of Meteorology will provide good information to farmers as winds this strong tend to occur over a wide area.

Issues to be aware of regarding dust management:

- Dispersion conditions (separation from sensitive sources) that are adequate to manage off-site odour impacts will usually also be adequate to manage off-site dust impacts.
- Moisture content and particle size of materials can be important. Manure, grain dust and composted material contain fine particles that contribute to dust emissions when these materials are dry, and can be blown over large distances when they become airborne, particularly on windy days (Figure 22).

- Dust can arise from the feedstuffs and feed infrastructure such as on-farm milling facilities used. Attention should be paid to:
  - design and management of storage and feed processing areas, enclosing them if necessary
  - siting storage and feed processing areas away from sensitive receptors
  - reducing drop heights from silos to delivery equipment
  - design and management of roads within the piggery.
- In outdoor piggeries dust can be generated from pigs' movement over extremely dry ground. Over time the ground may become dusty and cause a problem.
- Constructing roads with low silt-content materials (such as gravel) can reduce wheel generated dust.
- The quantity of dust carried off site can be reduced by installing windbreaks, such as vegetative screens or hessian walls, or by wetting dusty material.
- Water sprays can settle dust and consolidate dusty surfaces but will not be feasible in many piggery situations as they introduce more water to the site, requiring efficient drainage.
- Timing and management of any operations involving the movement of dusty materials is critical. For example, moving dusty material during periods of high winds is not desirable.

Figure 22 **Spreading dry manure can create a dust and odour problem**
Source: handsomepictures/iStock

4. Considerations for local councils

4.1 Scheduled or non-scheduled activity

As discussed previously, an activity carried out at a facility is designated as scheduled or non-scheduled in the POEO Act depending on its size and processes being undertaken at the site.

If the activity is a scheduled activity, the EPA is the ARA for the purposes of the POEO Act. Schedule 1, Part 1 of the POEO Act provides a definition of the scheduled activity of *Livestock intensive activities* and specifically *pig accommodation*.

Clause 22 Livestock intensive activities

1. This clause applies to the following activities—

   pig accommodation, meaning the accommodation of pigs for commercial production

2. Each activity referred to in Column 1 of the Table to this clause is declared to be a scheduled activity if it meets the criteria set out in Column 2 of that Table.

Column 1 Activity	Column 2 Criteria
pig accommodation	capacity to accommodate more than 2,000 pigs or 200 breeding sows at any time

If the activity being carried out at a facility is a non-scheduled activity, the local council is the ARA and can also direct the operators to ensure the activity is carried on in an environmentally satisfactory manner and in accordance with best practice.

Existing problems can be addressed using 2 sets of regulatory tools:

- orders requiring compliance with consent conditions under the *Environmental Planning and Assessment Act 1979* (the EP&A Act)
- environment protection notices under Chapter 4 of the POEO Act (see the Local Government Air Quality Toolkit – Module 2 and Module 4), including:
  - a prevention notice or series of notices, where the ARA suspects the activity is being carried out in an environmentally unsatisfactory manner
  - a clean-up notice, where there is a pollution incident within the meaning of the POEO Act
  - both a prevention notice and a clean-up notice.

If issues are identified, the following tools are available in the Local Government Air Quality Toolkit – *Resource pack*:

- Chapter 3 – checklists for investigating odour, fallout (dust deposition) or other complaints
- Chapter 6 – checklists for reviewing air quality assessments and dispersion modelling.

Under the POEO Act notice provisions, local councils are empowered to direct a recipient to take clean-up action or preventative action; for example, requiring studies to be carried out by the operation's management. Time spent making sure the brief for any investigation is thorough and covers all the relevant aspects raised in this guideline, is time well spent – for the management, for the local council and for the neighbours and wider community.

Composting and the POEO Act Schedule 1

Composting on site is permitted, providing there is development consent for this activity and relevant guidelines, protocols and legislation are complied with. For example, responsibilities under biosecurity legislation are met and composting ensures adequate pasteurisation to manage pathogen and weed risks.

Compost generated exclusively from on-site organics does not trigger the licensing thresholds for the scheduled activity of 'composting' under clause 12 of Schedule 1 of the POEO Act. This includes disposal of carcasses generated exclusively on site via alternative methods not captured under Schedule 1, such as pit burial.

Receipt of carcasses from off site for burial, composting or similar that are above prescribed thresholds would trigger licensing requirements.

Licensing requirements for composting are only triggered when the organic materials are received from off site and are above the thresholds set out in Schedule 1 of the POEO Act.

The composting thresholds may vary depending on the location of the receiving site and whether the organics received are classified as putrescible or non-putrescible. For further details please refer to clause 12 of Schedule 1 of the POEO Act (excerpt below) and clause 50 of Schedule 1 of the POEO Act for definitions of the terms 'organics' (including 'putrescible organics' and 'non-putrescible organics') and 'regulated area'.

Schedule 1, Part 1, Section 12 - Composting

1. This clause applies to composting, meaning the aerobic or anaerobic biological conversion of organics into humus-like products —
   a. by methods such as bioconversion, biodigestion or vermiculture, or
   b. by size reduction of organics by shredding, chipping, mulching or grinding.
2. The activity to which this clause applies is declared to be a scheduled activity if –
   a. where it takes place inside the regulated area, or takes place outside the regulated area but receives organics from inside the regulated area (whether or not it also receives organics from outside the regulated area) —
      i. it has on site at any time more than 200 tonnes of organics received from off site, or
      ii. it receives from off site more than 5,000 tonnes per year of non-putrescible organics or more than 200 tonnes per year of putrescible organics, or
   b. where it takes place outside the regulated area and does not receive organics from inside the regulated area —
      i. it has on site at any time more than 2,000 tonnes of organics received from off site, or
      ii. it receives from off site more than 5,000 tonnes per year of non-putrescible organics or more than 200 tonnes per year of putrescible organics.

3. For the purposes of this clause, 1 cubic metre of organics is taken to weigh 0.5 tonnes.

> Consideration should be given to existing non-scheduled activities that may be approaching the production limits outlined below.

Composts containing animal carcasses cannot be supplied for use off site (i.e. outside the premises where the compost was generated) unless a site has obtained a specific resource recovery order and resource recovery exemption from the EPA that covers that particular waste type. The EPA's order for compost (the compost order; EPA 2016) defines compost as any combination of mulch, garden organics, food waste, manure and paunch that has undergone composting. It was not developed for composting carcasses and does not apply to composting dead stock or animal parts.

'Paunch' is defined in the compost order as the undigested food contained in the stomach of ruminant animals. This is generally considered to include partially digested grass, hay and other feed products such as grain.

Any person proposing to produce/supply compost should give careful consideration to the intended use and all relevant regulatory requirements before determining whether to include animal parts or carcasses in the process.

While carcasses are not an allowed input under the existing compost order, a specific order and exemption can be sought by making a submission to the EPA under the Resource Recovery Framework. Supporting evidence is needed to show that the final compost generated is beneficial or fit for purpose and poses minimal risk of harm to the environment and human health. Information on applying for a specific exemption is available on the EPA's *Apply for an order and exemption* webpage (EPA 2018).

4.2 Compliance testing

The need for compliance testing should be considered in each situation, balancing potential expense incurred by the operator against likely sensitivity and the extent of likely impact.

Typical compliance testing conditions are included in Chapter 7 of the Local Government Air Quality Toolkit – *Resource pack*.

4.3 Assessment and dispersion modelling

There are a few important aspects for local government to consider when reviewing external consultants' air quality assessment and dispersion modelling studies, to make sure the best outcome is achieved. These are included in Chapter 6 of the Local Government Air Quality Toolkit – *Resource pack*.

It should also be noted that dispersion modelling only applies to projects during the development and approvals stage. Once a facility is operational, odour surveys can be a more useful tool for addressing complaints. The methodology for conducting an odour survey is provided in Chapter 3 of the Local Government Air Quality Toolkit – *Resource pack*.

4.4 Operational and control recommendations

If the local council is the ARA for the purposes of the POEO Act, consideration should be given to appropriate operational procedures to control and limit air emissions.

Chapter 7 of the Local Government Air Quality Toolkit – *Resource pack* lists several operational measures that are helpful in reducing emissions and impacts from piggeries.

Sections 3.2 and 3.3 noted a number of odour and dust mitigation considerations that could be included in consent conditions. In addition, where odour is considered to be a significant air quality issue, an Odour Management Plan may be required as a consent condition to ensure the operator is aware of the odour sources and what measures they should have in place to mitigate these.

The council may be required to conduct a site inspection to investigate current management practices. Chapter 2 of the Local Government Air Quality Toolkit – *Resource pack* provides helpful information for council officers prior to these inspections, including preparing a checklist.

Before going on site for an inspection, council officers should be aware of whether scheduled or non-scheduled activities are being carried out at the premises and should review any previously prepared reports (including diagrams, photographs and maps).

5. References and other resources

All documents and webpages that are part of the Local Government Air Quality Toolkit are available from the EPA website.

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