Technical framework

Assessment and management of odour from stationary sources in NSW

November 2006

Technical Notes

This Technical Framework is accompanied by a separate booklet, *Technical notes: assessment and management of odour from stationary sources in NSW*.

This document was prepared by the Air Policy Section of the Department of Environment and Conservation (NSW).

From 24 September 2003 the Department of Environment and Conservation (DEC) incorporates the Environment Protection Authority (EPA), which is established in the Protection of the Environment Administration Act 1991 as the Authority responsible for administering the Protection of the Environment Operations Act 1997 (POEO Act). Statutory functions and powers in the POEO Act continue to be exercised in the name of the EPA.

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Foreword

Odour tends not to attract the level of attention given to higher profile environmental problems such as water pollution and contaminated industrial sites.

Yet for those communities that experience odour problems, the impacts are significant. Odour can have a marked effect on people's quality of life. It is a major source of complaints to the NSW Department of Environment and Conservation (DEC) Environment Line.

DEC is committed to protecting the state's communities from offensive odours. The challenge is to achieve this without unfairly disadvantaging the businesses and industries that communities rely on for their economic prosperity.

We believe this is best achieved by using a range of odour management strategies, tailored to the particular sources and impacts of the emissions. Such strategies need to be able to help minimise odour impacts from new activities, as well as resolve problems from existing industries, businesses and services.

To this end, DEC has developed the *Technical framework: assessment and management of odour from stationary sources in NSW*. This publication offers guidance for industry, consent authorities, environmental regulators and odour specialists on assessing and managing activities that emit odour.

The framework is not a regulatory tool and does not introduce any new environmental requirements. It simply provides up-to-date information to help deal with this difficult issue. It offers:

- a system to help protect the environment and community from odour impacts while promoting fair and equitable outcomes for odour-emitting activities
- a fair and transparent process for assessing odour impacts from new developments
- risk-based approaches and strategies for dealing with ongoing odour impacts from existing activities
- a technical reference document for proponents and regulators.

The framework promotes ongoing environmental improvement and best management practices to prevent or minimise odours. While recognising the changing needs of industry and society, it also promotes sustainable land-use planning and management to avoid odours and associated conflicts.

DEC has been developing this framework since early 2001. Extensive consultations with key stakeholders were instrumental in shaping the final document. I would particularly like to thank the Department of Primary Industries (DPI), the Department of Planning and the Intensive Agriculture Consultative Committee (IACC) for their input.

Lisa Corbyn

Director General
Department of Environment and Conservation NSW

Executive summary

This document, the *Technical framework for the assessment and management of odour from stationary sources in NSW* (referred to in all subsequent instances as the framework) introduces a system that will help protect the environment and the community from the impacts of odour emissions while promoting fair and equitable outcomes for the operators of activities that emit odour.

The framework recognises the following principles:

- Sustainable land-use planning and management is needed to avoid odour impacts, because land uses will change over time to meet altered industry and societal needs.
- Avoiding odour impacts is a shared responsibility between operators and local land-use planners. However, the operator of an activity that emits odour must ultimately be responsible for managing odour impacts of the operation beyond its boundaries.
- Emissions of odour may not be preventable from some activities. 'No odour' is not a realistic objective.

The framework provides industry, odour specialists, consent authorities and environmental regulators with an effective project planning and regulatory regime for assessing and managing activities that emit odour. It is closely integrated with the existing legislative framework provided by the *Protection of the Environment Operations Act 1997* (POEO Act) and the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The framework is guided by key provisions of the POEO Act, namely the requirement for no 'offensive odour' to be emitted from EPA-licensed activities, and the general provisions that apply to all premises. The offensive odour provision focuses on the impact of odour on people and their activities, while the general provisions deal with the cause of an odour. The general provisions make it an offence for any person to undertake an activity that emits air pollution (including odour) if the emission is caused by a failure to maintain or operate plant, or to deal with materials in a proper and efficient manner.

Both new or modified and existing activities are covered by the framework, although the issues facing the various activities and responses to them may differ. The principles outlined are equally applicable to scheduled activities (which are regulated by the Environment Protection Authority) and non-scheduled activities (which are regulated by local councils).

Key principles adopted in the framework

1 **Planning to prevent and minimise odour:** at the project planning stage, proponents, planners and environmental regulators should consider the compatibility of a proposal with current and likely future land uses. Careful location and design of new activities and sustainable land-use planning around existing activities will ensure the best environmental outcomes. It is usually more difficult and costly to address odour impacts retrospectively.

2 **Use of a range of strategies to manage odour**: depending on the sources (point or diffuse), nature (frequency, intensity, duration and character) and impacts of the emissions.

3 **Ongoing environmental improvement :** because land use is dynamic, existing activities must be prepared to undertake measures to minimise their odour impacts if conflicts arise. Operators of all developments should adopt a risk management approach. To minimise the potential for odour impacts being experienced after an activity is operational, proponents should ensure that a level of odour assessment appropriate for their development and location, has been undertaken. Contingencies for possible future land-use changes should be built in at the project planning stage.

The framework establishes the following processes by which these principles can be implemented:

Odour assessment

Criteria for predicting and assessing odour impacts are specified. The framework establishes three levels s of impact assessment, so the appropriate level of odour investigation can be carried out, depending on whether an odour-emitting activity is new, modified or existing. The framework also provides a process by which industry-specific odour assessment procedures may be developed.

Detailed guidance on odour assessment is provided in the *Technical notes: assessment and management of odour from stationary sources in NSW*, which accompany the framework.

Odour management

The odour benchmark for an operational facility is whether emission of odour is 'offensive' (scheduled activities), or is being prevented or minimised using **best management practices and best available technology** (scheduled as well as non-scheduled activities). New or modified activities must also incorporate all best practicable means to prevent or minimise odour.

Both new or modified and existing activities should employ **avoidance and mitigation strategies** if there is existing or potential conflict between neighbouring land uses. This might involve selecting an appropriate site and design layout and managing odour at the source, in pathways and in places where people are likely to work or reside.

Community engagement and negotiated solutions between operators, neighbours and regulators are identified as options that may help resolve some odour issues – typically where feasible and reasonable avoidance and mitigation strategies cannot curb all potentially offensive odour impacts from existing activities. Negotiation between affected parties may also be appropriate before a new or modified activity begins operation if there is uncertainty about whether proposed avoidance and mitigation strategies will achieve predicted odour levels.

Regulation and enforcement

Adequate regulation of odour is necessary to protect the environment and preserve amenity in communities neighbouring odour-emitting activities.

The framework allows consent authorities and regulators to undertake an appropriate level of environmental impact assessment for proposed odour-emitting activities. They can then set environment protection licence or development consent conditions for managing odour based on predicted odour levels, impacts and the sensitivities of the receiving environment.

Consent authorities and regulators must also ensure compliance with the licence and consent conditions they set for managing odour. The framework outlines available enforcement options where odour is confirmed through a complaints- management system or by monitoring performance.

1 Overview of the framework

1.1 Introduction

Odours can affect public amenity and the community's quality of life. Within the community, there is a large range of reaction to odour. On the one hand there are people who are very sensitive to odour. This odour-sensitive sector of the population will react, often strongly, to odours that are barely noticeable to others, or will have an expectation of very low environmental odour levels. On the other hand there are others within the community (often because of their association with the odour-generating activity) who are more tolerant of higher odour levels. The bulk of the population lies between these two, being unaffected by low levels of odour and being prepared to accept certain levels of odour.

Odours are the largest source of air pollution complaints to the Department's of Environment and Conservation (NSW) Environment Line. Odour problems generally arise when:

- an activity is not operating in accordance with best management practice
- odour has not been appropriately considered in the planning and approval of an activity
- new or expanded urban development occurs near an existing odour-generating activity
- an odour-generating activity is inappropriately located near residential development, or
- an existing activity changes technology or increases the size of its operations, and this increases odour-generating activities.

Controlling and managing odour is difficult for consent authorities, regulators, industry and the wider community because:

- odours may cause psychological or physiological effects
- the sensitivity to odours is variable
- odour emissions are variable
- the impact of odours can be subjective
- odour dispersion modelling is not an exact science
- odour emissions are difficult to monitor (creating difficulties in verifying performance).

Land-use planning and environment protection legislation affects the way that odour is managed. Legislation includes the *Environmental Planning and Assessment Act 1979* (EP&A Act), the *Protection of the Environment Operations Act 1997* (POEO Act) and *the Local Government Act 1993* (LG Act).

This framework aims to provide an effective project-planning and regulatory regime for activities that emit odour. It sets out procedures to help minimise odour impacts on the community from new activities, through improved project planning, assessment and management, and strategies to help resolve some of the more difficult odour problems between existing activities and neighbouring communities. The goal is to introduce a system that will protect the environment and the community and at the same time promote fair and equitable outcomes for activities that emit odour and people affected by odour emissions.

1.2 Context of the framework

The framework draws on a review of international practice and attempts to consider all aspects of odour assessment, management and regulation. It includes:

- an outline of the relevant NSW legislation
- a discussion of the roles and responsibilities of various NSW government agencies, local government, proponents and operators
- application of odour ground-level concentration and odour assessment criteria
- guidance on the issues and approaches in odour assessment
- guidance on aspects of odour management
- technical support material (published in an accompanying booklet).

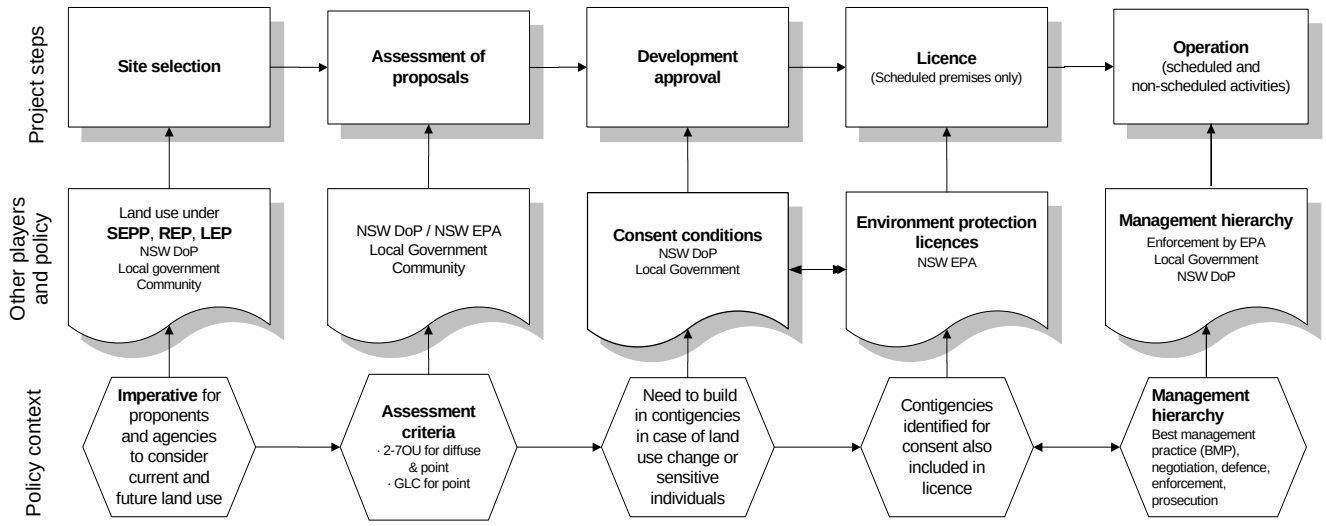
The methods outlined in this framework attempt to cover most aspects of odour assessment and management, and at the same time provide the flexibility for incorporating future odour research.

The POEO Act introduces the concept of 'offensive odour' for regulating odour from EPA scheduled activities (listed in Schedule 1 of the Act). This framework emphasises the importance of pollution prevention in managing 'offensive odour' where new development is being undertaken. Although the 'offensive odour' provisions in the POEO Act do not apply to non-scheduled activities – which are regulated by local councils – avoiding odour impacts from non-scheduled activities is just as important and the principles contained within the framework are equally applicable. Both scheduled and non-scheduled activities are required to prevent or minimise air pollution (including odour) using best management practices.

This framework recognises the need to deal with diffuse as well as point sources of odour and is applicable to all activities. It also considers the need to distinguish between an activity that continuously emits odour at a relatively constant rate and one that emits odour intermittently or as a result of an incident (activities in which the frequency, intensity, duration and character of the odour may vary). Many premises will have both point and diffuse sources of odour, so identifying the specific source of a particular odour is vital to dealing with it effectively.

The matters covered in this framework are as relevant to major developments as they are to smaller activities. A fundamental principle it employs is that efficient and effective odour management recognises the need to use a wide range of strategies. There is little doubt that the best results will occur where odour impacts can be avoided by careful choice of location and design of new activities and a strategic approach to the land-use planning around existing activities. Sites should be sufficiently large so that an adequate separation distance to sensitive land uses can be maintained. Because addressing odour impacts retrospectively is likely to be difficult and costly, it is important that the proponent undertakes a risk-management approach and, at the project planning stage, considers the compatibility of the proposal with current and likely future land uses. It must be recognised that the emission of odour cannot be prevented from some activities and that 'no odour' is not a realistic objective in these cases. However, the operator of an activity that emits odour must ultimately be responsible for managing and minimising any impacts of the operation beyond its boundary.

Diagram 1: Odour assessment and management in New South Wales



1.3 Who is the framework for?

The framework is for industry, odour specialists, consent authorities and environmental regulators. It aims to provide them with the necessary tools to effectively assess and manage the impacts of activities that emit odour.

Responsibility for applying the framework lies with:

- proponents, operators and odour specialists, through consideration of odour issues at the planning stage of the project and through the location, construction and operation of the activity to ensure that odour prevention and minimisation measures are implemented to avoid odour impacts, and
- consent authorities and environmental regulators, including local councils, the Department of Planning (DoP) and the EPA, who act as determining authorities and as regulators of environmental impacts. Their role is to provide adequate regulation of odour to preserve amenity and ensure compliance with conditions of consent and environment protection licence conditions.

Land-use planning can play an important part in avoiding or minimising conflict from impacts from odour-generating activities. When proposing changes to the land use in an area where odour-generating activities are located, planners should consider the likely impact of the change in land use on these activities. They should also take into account the likely impacts of any proposed odour-generating activities on existing land uses or likely future land use in the surrounding area. However, the approval of an odour-generating activity does not constitute a rezoning of the surrounding land to prevent future development. An applicant must realise that neighbouring land uses may change in the future and from the outset should consider contingencies to deal with this. It is important to recognise that land use is dynamic and will change to meet industry and society needs.

1.4 Scope of the framework

The framework should be used as a guide by consent authorities and regulators (local councils, the Department of Planning and the EPA) for assessing proposals and setting licence and consent conditions. Local government may also find the framework helpful in the carrying out its land-use planning responsibilities (for example, when developing strategic plans, reviewing the preferred land use, assessing a subdivision or development, and managing land-use conflict).

The methodologies outlined in the framework are relevant to existing as well as new activities. However, the way in which they are used and the process followed may differ. Different issues and problems may be encountered for existing activities compared to new activities, and the framework attempts to address this possibility.

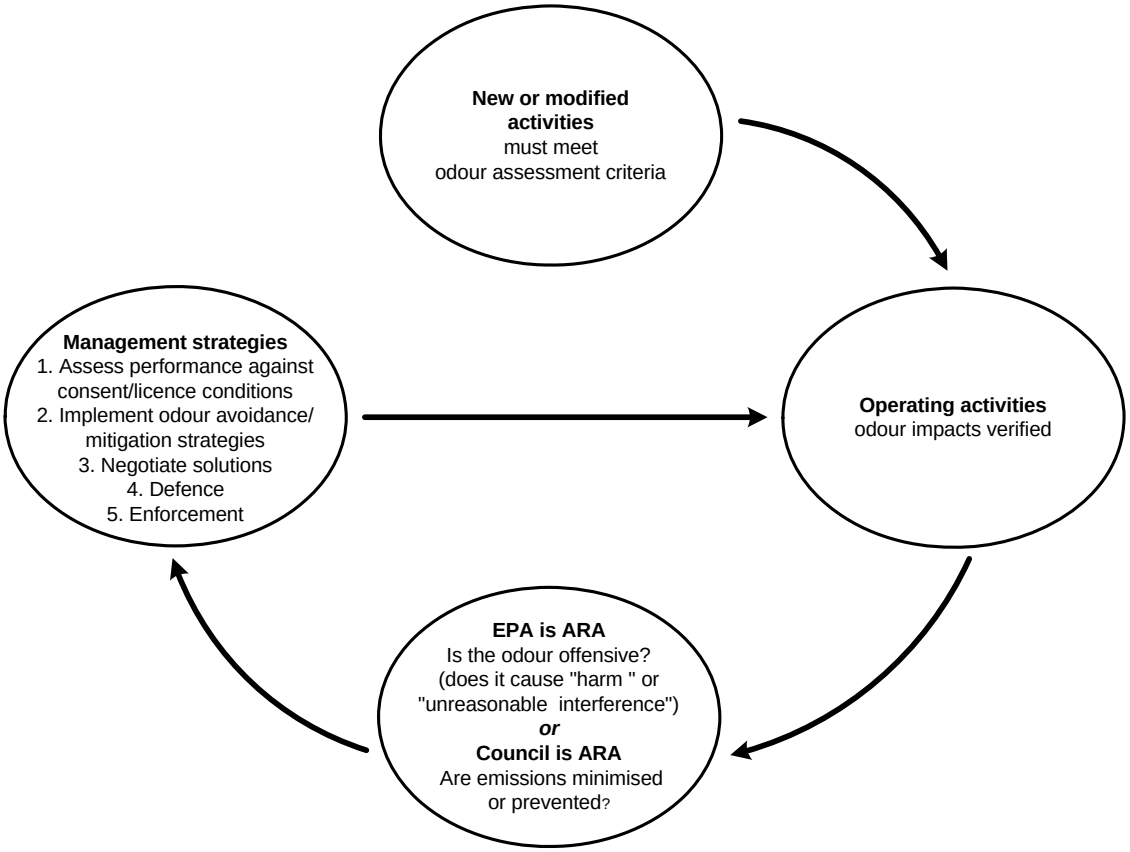
New, modified or existing activities: Diagram 2 outlines a simplified odour assessment and management cycle for new, modified or existing activities.

New or modified activities: Diagram 3 sets out the procedure that should be followed to progress a proposal through the assessment, conditions of consent and licensing stages. The proponent of a proposed activity (or expansion of an existing activity) may decide to undertake a 'first pass' (Level 1) odour-impact assessment – a 'rule of thumb' approach to determine the order of magnitude of the likely odour impact. This may help with selecting a site for the activity and provide an early indication of the degree of odour management and control that may be required when the facility begins operation. The need for a higher level of assessment will be determined on a case-by-case basis. In general, a more refined odour impact assessment (progressing from level 1 to 3) will be required if odour impact at a particular site is considered likely but not certain.

Existing activities: Diagram 4 sets out the procedure for dealing with ongoing odour impacts from existing activities, with the ultimate aim of achieving acceptable performance. The process for dealing with odour impacts from existing activities will vary from the procedures used for predicting impacts from a new or modified activity, as follows:

- The odour impact assessment is triggered through the performance monitoring process and only in the event of a confirmed odour impact.
- If odour impacts are confirmed the operator should undertake a review of odour management and control strategies at the facility to identify the causes. Any problems should be rectified and the situation monitored to see if the odour impacts have been mitigated. In most circumstances this approach should resolve the matter without the need to trigger level 2 or 3 assessments.
- Where significant management and control option changes are proposed, a level 2 or 3 assessment may be appropriate to quantify the extent of the impact and the extent to which the proposed measures may mitigate the odour. (Level 1 assessment procedures are not appropriate for existing activities.)
- A review of odour management and control strategies and the negotiation process would proceed in a similar way as it would for a new or modified activity. However, more emphasis will generally need to be placed on phased improvement strategies and negotiated outcomes.

Diagram 2: Odour assessment and management cycle



1.5 Odour criteria for new or modified activities

Odour impacts may occur through exposure to individual and easily identifiable compounds (such as emissions of ammonia from a nitric-acid factory) or complex mixtures of air pollutants (such as emissions from a sewage treatment plant, food processing and intensive agricultural activities). The framework adopts two types of criteria: ground-level concentration (glc) criteria for individual odorous pollutants and odour assessment criteria for complex mixtures of odours. See Chapter 3 for more details on the criteria and how to use them.

Odour criteria are best regarded as project planning tools:

- They help with assessing the likely acceptability of a proposal in terms of its odour emissions.
- They provide information on the likely effectiveness of odour-mitigation strategies and management practices for that project.
- They help develop conditions of consent and environment protection licences. Such conditions should be developed with reference to the assessment criteria. However the criteria must not be directly referred to in a consent or licence.

The criteria used in this framework have been selected to protect the majority of the population living within the vicinity of activities that emit odour.

1 **Ground-level concentration (glc) criteria.** These are applicable to individual odorous pollutants. The framework adopts the glc criteria in *Approved methods for the modelling and assessment of air pollutants in NSW*, which are based on odour threshold or toxicity threshold (whichever is more stringent). They are used to assess the likely performance of a project and acceptability of impacts at any location beyond the boundary of a premises.

2 **Odour assessment criteria.** These are applicable to complex mixtures of odours. The framework adopts the odour assessment criteria in *Approved methods for the modelling and assessment of air pollutants in NSW*. They are used to assess the likely performance of a project and acceptability of impacts at the nearest places where people are likely to work or reside (both existing and any likely future sites). These places are referred to in subsequent instances as 'sensitive receptors' or, more simply, 'receptor' (see glossary). If a receptor is, or is likely to be, located near the boundary of a premises that emits odour, then the criteria should be applied at and beyond the boundary of the premises. The appropriate criterion for a single affected residence is deemed to be a concentration of odour equal to seven times the theoretical minimum necessary to produce an olfactory sensation. This can be expressed as 7 odour units (7 OU). For receptors that have larger populations, in which there will be a greater range of sensitivities to odour (and a higher number of more sensitive individuals), acceptable odour is defined as 2 OU.

Depending on the specific nature of the odour involved, either odour assessment or ground-level concentration criteria will apply to the point sources and odour assessment criteria will apply to the diffuse sources.

1.6 Odour criteria for existing activities

Once a facility is operational the benchmark for the facility is no longer the odour assessment criteria but whether the emission of odour is:

- 'offensive' (for scheduled activities), or
- being prevented or minimised using best management practices (for scheduled and non-scheduled activities).

There may be instances where the odour impact assessment for a new activity indicates that 'offensive odour' impacts are unlikely, but once operational, 'offensive odour' impacts do occur. This may happen due to a lack of meteorological or odour emission data used in the assessment, or an operator's failure to conduct an activity in accordance with best management practice. It is therefore important that the proponent consider what options are available to control odour for new and modified activities at the assessment/planning stages of the proposal.

It is not intended that existing activities will routinely have their operations assessed against the odour assessment and ground-level concentration criteria; they have been developed as a **design** tool, to predict the odour impacts, rather than as a **regulatory** tool. Nevertheless, these criteria may be used to help with assessing the likely impacts when odour complaints or problems do arise and to develop odour mitigation strategies as required. See Chapter 3 for more details.

1.7 Odour assessment

The framework uses a three-level system of odour impact assessment for odour sources, regardless of whether these are classed as point or diffuse:

- **Level 1** is a simple screening-level technique based on generic parameters for the type of activity and site. It requires minimal data and uses simple equations designed to indicate the likely extent of any odour impact. It may be used to assess site suitability and odour mitigation measures for new or modified activities and is particularly suitable for smaller developments in sparsely populated areas such as a small broiler chicken farm located in a rural area with no existing or likely future sensitive receptors located nearby.
- **Level 2** is a screening-level dispersion modelling technique, using worst case input data (rather than site-specific data). It is more rigorous and provides a more realistic prediction of the extent of any odour impact than a Level 1 assessment. It may be used to assess site suitability and odour mitigation measures for new, modified or existing activities. For example, Level 2 assessment can be used to determine whether a proposed upgrade and expansion of a sewage treatment plant would result in odour impacts on local residents.
- **Level 3** is a refined-level dispersion modelling technique that uses site-specific input data. This is the most comprehensive and most realistic level of assessment available. It may be used to assess site suitability and odour mitigation measures for new, modified or existing activities. For example, Level 3 assessment using concentrations of pollutants measured at site emission sources could be undertaken to assess whether proposed mitigation strategies would be adequate to reduce odour impacts from a waste oil processing facility, the subject of long-term numerous complaints from neighbours.

More details of the differences between the levels of assessment are provided in Chapter 4.

1.8 Avoidance and mitigation strategies

Chapter 5 of the framework identifies possible avoidance and mitigation strategies that could be used if there is existing or potential conflict between neighbouring land uses. It is often necessary to combine several approaches to achieve the appropriate level of mitigation.

Proponents of new activities should incorporate or plan for industry best management practices from the outset to limit the potential for odour problems. The ability of operators to manage odour under normal operating conditions as well as when incidents occur is an essential consideration. It is usually more difficult and costly to ameliorate an odour problem from existing activities or premises than to avoid it in the first place through appropriate design.

Operators of new and existing odour-generating activities should employ all best practicable means to prevent or minimise odour impacts. There are four main approaches available:

- **Selecting an appropriate site and design layout:**
  - select the size and shape of the block to maintain an adequate ‘onsite buffer’ from surrounding land uses
  - determine whether there are local climatic or topographic conditions which could exacerbate odour impacts
  - establish the likelihood for cumulative impacts with other existing activities generating odour
  - determine the compatibility with surrounding land uses and the risks that the surrounding land uses will change in the short, medium or long term.

- **Managing odour at the source:**
  - use alternative materials, plant and equipment to reduce the generation or emission of odour, consistent with best management pratice
  - select design options to collect and manage the diffuse odour emissions consistent with best management practice
  - implement quality control systems, as well as maintenance and training programs to reduce the risk of odour incidents consistent with best management practice
  - use best available control technology.
- **Managing odour in the pathway:**
  - provide vegetation or other barriers to minimise impacts by changing odour dispersion patterns
  - provide a secure buffer around a facility by purchasing or taking out a long-term lease on neighbouring properties, to increase the separation distance between the facility and existing or potential sensitive receptors.
- **Managing odour at receptors:**
  - Consider establishing a communication strategy so that affected neighbours are kept informed about the operation of the facility and are consulted about aspects of the operation likely to result in odour,
  - investigate the feasibility of entering into an agreement with neighbours regarding the management of odour impacts. Negotiated outcomes would need to be documented in licence conditions, particularly in relation to the 'offensive odour' provisions of the POEO Act. However, negotiated outcomes would not normally flow to any new owners (should the property be sold) or apply in relation to any new land users. As a result, such an arrangement would not provide a secure mitigation strategy and should be seen as a short-term or interim mitigation measure
  - investigate the feasiblity of providing adversely affected receptors with air-conditioning or other measures to reduce impacts of emissions.

1.9 Community consultation and negotiation

Chapter 5 also identifies the importance of building good relations between the operators of a potentially odour-generating activity and the local community. Negotiation between stakeholders may potentially be used to deal with cases where feasible and reasonable avoidance and mitigation strategies would not curb all potential 'offensive odour' impacts. The negotiation processes would generally be relevant to existing activities but may also be appropriate as an interim measure before a new or modified activity begins operation, if there is uncertainty about whether the proposed odour avoidance and mitigation strategies will achieve the predicted odour levels. Any negotiated solution between an operator and a neighbour should be formalised (for example, through a contract) so the agreement is clearly documented and understood.

1.10 Project assessment, approval and licensing

Chapter 6 deals briefly with consent and licensing processes in relation to activities that emit odour, with particular reference to the Integrated Development Assessment (IDA) system. The suggested assessment methods should be used for scheduled and non-scheduled developments for ongoing odour management.

1.11 Performance monitoring, regulation and enforcement

Chapter 7 outlines the various components of a performance-monitoring regime, including recording and confirming complaints and guidance on interpreting whether 'offensive odour' has been emitted from a scheduled activity.

The framework outlines approaches for both the EPA and local councils to regulate odour impacts from existing activities, including negotiation of pollution reduction programs (see glossary), issuing Prevention Notices or Penalty Notices and prosecution under both the POEO and the EP&A Acts.

1.12 Accompanying technical notes

Technical notes: assessment and management of odour from stationary sources in NSW accompanies this framework and contains detailed technical information. It covers:

- odour assessment criteria
- Level 1 odour impact assessments for point sources, broiler chicken farms, intensive piggeries and cattle feedlots
- odour sampling and analysis
- dispersion modelling and meteorological data requirements, and
- odour complaint management.

Diagram 3: Odour impact assessment and management for new or modified activities

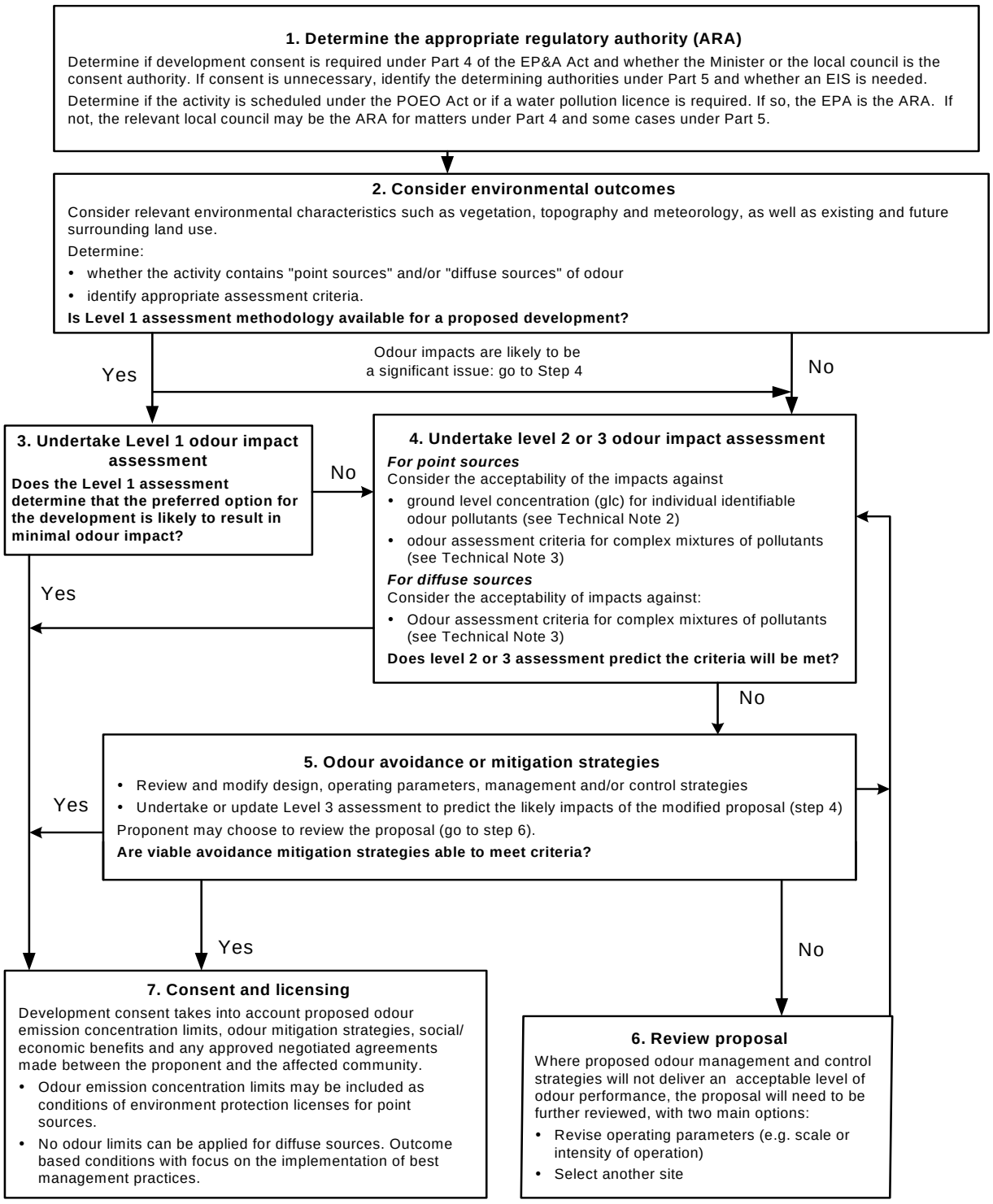
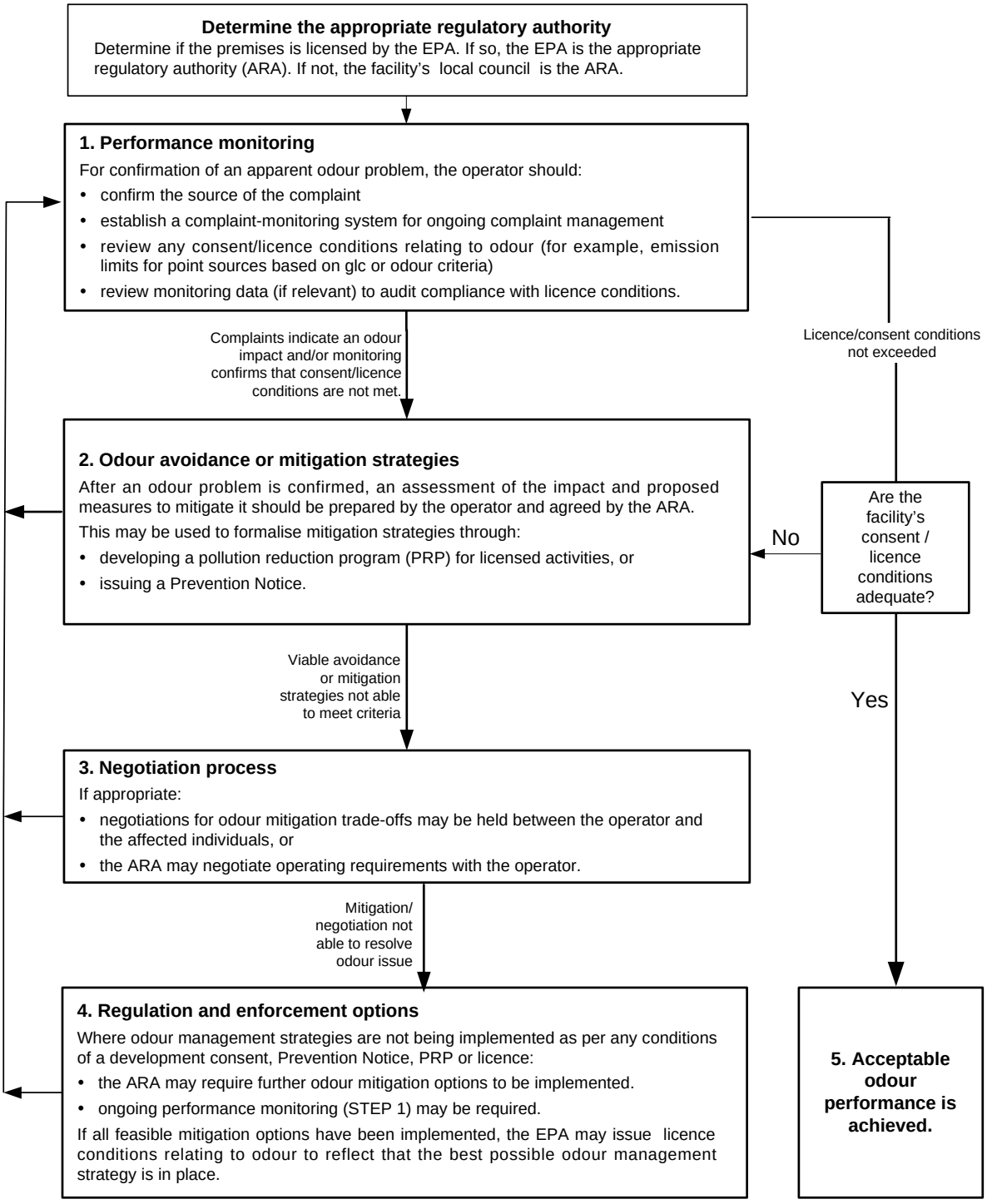


Diagram 4: Odour impact assessment and management for existing activities emitting odour



2 Legislative context

Summary

- An overview of key legislative provisions for regulating emissions of odour from scheduled (regulated by the EPA) and non-scheduled (regulated by local councils) activities, including roles and responsibilities of NSW government agencies and local government.
- The three most important pieces of legislation for preventing and controlling odour are the *Environmental Planning and Assessment Act 1979* (EP&A Act), the *Protection of the Environment Operations Act 1997* (POEO Act) and *Local Government Act 1993* (LG Act).
- The EP&A Act deals with land-use planning, development, assessment and approvals.
- The POEO Act requires that no occupier of **any premises** causes air pollution (including odour) through a failure to maintain or operate equipment or deal with materials in a proper and efficient manner. The operator must also take all practicable means to minimise and prevent air pollution (sections 124, 125, 126 and 128 of the POEO Act).
- The POEO Act includes the concept of 'offensive odour' (section 129) and states it is an offence for **scheduled activities** to emit 'offensive odour'.
- The LG Act gives local councils the power to deal with public nuisance, including odour emission.

2.1 Controlling odour under the *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) deals with land-use planning, development, assessment and approvals[1]. Under the EP&A Act, Local Environmental Plans prepared by local councils provide the framework for land use and conservation in the area. These local plans, as well as regional strategies and plans prepared by DoP, provide the strategic direction for economic and urban planning in the region. The plans set out the preferred land use in particular areas and nominate the types of development that require development consent or are prohibited in that area. Development consents are dealt with under part 4 of the EP&A Act and are issued by a consent authority, which is usually a local council.

Developments that require consents are assessed under part 4 of the EP&A Act and determined by a consent authority (either the local council or the Minister for Planning). The provisions of the EP&A Act that apply to integrated developments (part 4, section 91) link the development consent process to environmental approvals for such developments under eight key pieces of environmental legislation, including the POEO Act. Specifically, the EPA has a formal role in providing input to the assessment of projects and, based on the adequacy of the environmental assessment, may issue 'general terms of approval' at the development consent stage that deal with the management of environmental outcomes.

In addition, under part 5 of the EP&A Act, there is a responsibility on licensing or approval authorities to consider the environmental outcomes when granting an approval. Before making a determination or issuing an approval for an activity that is likely to significantly affect the environment (such as a government sewage treatment plant), an environmental impact statement must be prepared and considered.

1 It should be noted that this framework has been developed prior to the introduction of the major planning reforms and therefore does not reflect part 3A of the EP&A Act, however, it provides useful guidance for major developments to be considered under this part.

2.2 Controlling odour under the *Protection of the Environment Operations Act 1997*

The *Protection of the Environment Operations Act 1997* (POEO Act) commenced operation on 1 July 1999. Schedule 1 of the POEO Act, which is available online through www.legislation.nsw.gov.au, lists activities that require an environment protection licence. Any licensed activity may be required to meet conditions designed to prevent or minimise odour. The legislation includes the concept of 'offensive odour' and it is an offence for scheduled activities to emit 'offensive odour'. However, the POEO Act also provides a defence against prosecution if an activity is complying with any conditions of its environment protection licence that are aimed at preventing or minimising the emission of 'offensive odour' from a particular source. A number of POEO Act provisions specifically relate to odour from activities listed in Schedule 1 of the Act. In relation to scheduled activities, the POEO Act includes the term 'offensive odour', which is defined as:

> *an odour:*
>
> *(a) that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances:*
>
> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
>
> *(b) that is of a strength, nature, duration, character or quality prescribed by the regulations or that is emitted at a time, or in other circumstances, prescribed by the regulations.*

In addition, it is an offence for any person to undertake an activity in such a manner as to cause air pollution, which includes odour. For licensed activities (including those holding water licences) or for activities owned and operated by the State or a public authority, this requirement will be enforced by the EPA. For non-scheduled activities, the local council will be responsible for enforcing this requirement.

The POEO Act defines 'air impurities' and 'air pollution' as follows:

> ***air impurity*** *includes smoke, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, mists, odours and radioactive substances.*
>
> ***air pollution*** *means the emission into the air of any air impurity.*

'Air pollution' is subsequently defined as a component of 'pollution'. This establishes that the general provisions of the POEO Act that apply to pollutants also apply to odour (except where specifically stated otherwise). In relation to odour from any premises, sections 124, 125, 126 and 128 of the POEO Act are relevant:

> ***124. Operation of plant (other than domestic plant)***
>
> *The occupier of any premises who operates any plant in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier's failure:*
>
> *(a) to maintain the plant in an efficient condition, or*
>
> *(b) to operate the plant in a proper and efficient manner.*

> ***125. Maintenance work on plant (other than domestic plant)***
>
> *The occupier of any premises who carries out maintenance work on any plant in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier's failure to carry out that work in a proper and efficient manner.*

126. Dealing with materials

(1) The occupier of any premises who deals with materials in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier's failure to deal with those materials in a proper and efficient manner.

(2) In this section:

***deal with materials** means process, handle, move, store or dispose of the materials.*

***materials** includes raw materials, materials in the process of manufacture, manufactured materials, by-products or waste materials.*

128. Standards of air impurities not to be exceeded

(1) The occupier of any premises must not carry on any activity, or operate any plant, in or on the premises in such a manner as to cause or permit the emission at any point specified in or determined in accordance with the regulations of air impurities in excess of:

(a) the standard of concentration and the rate, or

(b) the standard of concentration or the rate

prescribed by the regulations in respect of any such activity or any such plant.

(2) Where neither such a standard nor rate has been so prescribed, the occupier of any premises must carry on any activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

(3) A person who contravenes this section is guilty of an offence.

Because there are currently no regulations in NSW that prescribe generic point-source odour emission limits, section 128(2) is applicable to scheduled as well as non-scheduled premises, requiring, in effect, that best management practices be employed wherever necessary to prevent or minimise the emission of odour.

Section 129 of the POEO Act prohibits the emission of an 'offensive odour' from scheduled premises, however, it also provides [in 129(2)(a)] for negotiation of appropriate point-source odour emission limits or identification of best management practices in the environment protection licence. The provision is as:

129. Emission of odours from premises licensed for scheduled activities

(1) The occupier of any premises at which scheduled activities are carried on under the authority conferred by a licence must not cause or permit the emission of any offensive odour from the premises to which the licence applies.

(2) It is a defence in proceedings against a person for an offence against this section if the person establishes that:

(a) the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of the licence directed at minimising the odour, or

(b) the only persons affected by the odour were persons engaged in the management or operation of the premises.

(3) A person who contravenes this section is guilty of an offence.

2.3 Controlling odour under the *Local Government Act 1993*

Section 125 of the *Local Government Act 1993* (LG Act) gives councils the power to deal with public nuisance. The explanatory note in the LG Act states:

> *Nuisance consists of interference with the enjoyment of public or private rights in a variety of ways. A nuisance is 'public' if it materially affects the reasonable comfort and convenience of a sufficient class of people to constitute the public or a section of the public.*

Consequently, if a sufficient number of people are subject to a nuisance from an odorous activity, this section may be used by a local council to require the owner to minimise the pollution from the facility.

2.4 Roles and responsibilities of NSW government agencies and local government

A number of government agencies are responsible for assessing and managing odour for both scheduled and non-scheduled activities. These responsibilities are summarised in Table 2.1 (overleaf).

Table 2.1 Odour assessment and management responsibilities

Odour assessment and management responsibilities	Responsible organisations
Land-use planning: Planning and development control. Considering existing land use and the likely impacts on these uses, if a change in the preferred land use is proposed in the area (including assessing the likelihood of conflict if rezoning or subdivisions are proposed in an area). Developing strategic approaches to ensure that new developments and redevelopment areas take into account odour from new and existing developments.	Department of Planning Local councils [***Planning instruments include state environment protection policies (SEPPs), regional environmental plans (REPs) and Local Environmental Plans (LEPs) that consider current and future land use, especially where odour-generating industries are concerned.***]
Best practice and odour control strategies: Development and review of best management practice guidelines for activities that emit odour. Development, implementation and review of general guidance about odour control strategies.	Department of Environment and Conservation (NSW) NSW Department of Primary Industries NSW Departement of Planning Local councils Industry
Assessment and approvals: Assessment and approval of proposals under relevant legislation to ensure activities are located, designed and operated in a manner that meets the requirements of the framework and best management practice. The assessment should consider the likelihood of the proposed activity resulting in land-use conflict, taking into consideration the compatibility of the proposed activity with the current land use in the area and the risk of change of land use in the short, medium and long term.	Proponents/operators NSW Department of Planning Local councils Department of Environment and Conservation (NSW)
Compliance, regulation and enforcement: Use of confirmed complaints to indicate that action may be required. The EPA regulates scheduled activities that emit 'offensive' odour. These activities are regulated under sections 124, 125, 126, 128 and 129 of the POEO Act. Non-scheduled activities that emit odour are local council's responsibility. These activities are regulated under sections 124, 125, 126 and 128 of the POEO Act and section 125 of the LG Act. Facilities with an approval under the EP&A Act which emit unacceptable levels of odour as a result of non-compliance with development consent conditions. These facilities would be regulated under s121B or s125 of the EP&A Act	Operators EPA Local councils NSW Department of Planning

3 Odour criteria

Summary

- Odours can be classified into two distinct categories:
  - individual identifiable compounds
  - complex mixtures of odorous compounds.
- Odour *sources* can also be classified into two distinct categories:
  - discrete point sources such as stacks
  - diffuse area sources such as anaerobic ponds.
- Ground-level concentration (glc) criteria are used for *individual identifiable compounds* to assess impacts from *point* sources.
- Odour assessment criteria are used for *complex mixtures of odorous compounds* to assess impacts from *point* and *diffuse* sources of odour.
- For a *new* or *modified* activity, the relevant odour assessment or glc criteria should be used routinely by a proponent in project planning, to guide decisions on location of odour-generating activities and assess proposed odour management strategies.
- For *existing* activities, the relevant odour assessment and glc criteria may be used to guide the development of mitigation strategies to address odour impact problems arising during operation.

3.1 Assessment criteria for project planning

As a means of predicting and assessing the impact of odour it is necessary to establish measurable outcomes. This can be done by setting criteria for:

- individually identifiable pollutants – ground-level concentration (glc) criteria
- complex mixtures of pollutants – odour assessment criteria.

When attempting to assess the predicted odour impact from an activity, it is necessary to identify the types of sources present (point or diffuse) as well as the types of pollutants (single compounds or a complex mixture).

Odorous air pollutants that have predictable health-related impacts are more appropriately managed as individual pollutants and should be assessed against the glc criteria. For complex mixtures of pollutants, the impact should be assessed against the odour assessment criteria.

3.2 Ground-level concentration (glc) criteria

The primary purpose of a stack or control equipment, in relation to odour, is to control the discharge of a pollutant so that the odour is diluted or reduced to an acceptable concentration by the time it has reached areas where it might be detected by people. An indication of whether this will be achieved can be determined by using glc criteria. In general, the criteria are set in order to protect the public against adverse health effects, aesthetic effects, offensiveness and economic loss that might occur (for example, if vegetation is affected). Since the area of interest (the ‘breathing zone’) is close to the ground, the acceptable concentrations are referred to as ground-level concentrations (glcs).

The EPA has adopted glc criteria for individual odorous and toxic compounds, set on the basis of either odour or health impacts, whichever is more stringent, for use in NSW. The glc criteria are referred to in Approved methods for the modelling and assessment of air pollutants in New South Wales. Technical Note 2 should be referred to for additional information.

To ensure that odour impacts are maintained within acceptable levels, odour emissions from an activity should be assessed against the glc criteria. Where several activities with similar odour character will result in a cumulative impact, the total of the odour emissions from all contributing activities needs to be considered.

When carrying out an odour impact assessment, the concentration of pollutants should be predicted at and beyond the boundary of the premises. For point sources, dispersion modelling can be used to determine a stack emission limit that will ensure the glc criteria are not exceeded at these sites. This limit can be incorporated into environment protection licence or consent conditions and compliance should ensure that people living in the vicinity are unlikely to be impacted by 'offensive odour'.

The acceptable procedure for allowing for future updating of the glc criteria (as new research is completed) is outlined in Technical Note 2. Industry groups or individual operators wishing to develop alternative glc criteria should contact the EPA to ensure the proposed work will be suitable for adoption in the framework and for broader use.

3.3 Odour assessment criteria

Odorous air pollutants need to be managed carefully because they can be considered to cause harm or unreasonably interfere with the community's quality of life. Odour assessment criteria guide decisions about effective odour management but recognise it may be neither possible nor desirable to achieve 'no odour'.

The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. As noted in section 1.5, this point is called the 'odour threshold' and defines one odour unit (1 OU). Therefore, an odour criterion of less than 1 OU would theoretically result in no odour impact being experienced.

In practice, the character of a particular odour can only be judged by the receiver's reaction to it, and preferably only compared to another odour under similar social and regional conditions. Based on the literature available, the level at which an odour is perceived to be of nuisance can range from 2 OU to 10 OU depending on the combination of a number of factors.

- **Odour quality:** whether the odour results from a pure compound or a mixture of compounds. Pure compounds tend to have a higher threshold (lower offensiveness) than a mixture of compounds.
- **Odour intensity:** the concentration of the chemical or mix of chemicals at the receptor. This will be affected by the concentration at the source, the chemical characteristics, the height at which the chemical is released and the mixing rate (affected by factors such as climate, topography, intervening vegetation and distance).
- **Odour frequency, timing and duration:** when and how odour interacts with the activities of a community affects the annoyance and offensiveness of the odour. Higher levels of short-term releases are likely to be more tolerable than long-term emissions at the same level. Odour emissions at the weekends or in the evenings are likely to be less tolerable because of the impact on quality of life.
- **Population sensitivity:** any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it contains. The population sensitivity will also depend on previous exposure to the odour and associations with the odour (for example, whether the community members work at, or use products from, the facility that generates the odour, or whether the facility is considered to be an asset to the community).
- **Background level:** determines the likelihood of a given odour source, because of its location, contributing to a cumulative odour impact. In areas with a number of odour sources it may be necessary to apply a lower threshold in order to prevent 'offensive odour'.

- **Public expectation:** an important factor is whether a given community is tolerant of a particular type of odour and does not find it 'offensive', even at relatively high concentrations. For example, farming families may consider background agricultural odours inoffensive even at a high level of odour units while a low level of agricultural odours may be considered offensive to rural residents who value the 'clean air' attributes of their properties.
- **Source characteristics:** whether the odour is emitted from a stack (point source) or an area (diffuse source). Generally the components of point-source emissions can be identified and controlled more easily than diffuse sources because emissions can be treated by using pollution control equipment. One of the control approaches for some diffuse sources is to enclose the odour-generating activities so that the diffuse source can be converted to a point source and controlled.
- **Health effects:** Experience gained by the EPA through odour assessments for proposed and existing facilities in NSW indicates that an odour performance criterion of 7 OU is likely to represent the level below which 'offensive' odours should not occur for an individual with a 'standard sensitivity'2 to odours. Individuals that are exposed to particular odours that exceed this are more likely to develop adverse physiological and/or psychological health effects. Therefore, the framework recommends that no individual be exposed to ambient odour levels greater than 7 OU. Appropriate averaging periods are discussed in Technical Note 3.

Odour assessment criteria need to be designed to take into account the range in sensitivities to odours within the community, and provide additional protection for individuals with a heightened response to odours. This can be done using a statistical approach which depends upon the size of the affected population. As the affected population size increases, the number of sensitive individuals is also likely to increase, which suggests that more stringent criteria are necessary in these situations. Therefore, the odour assessment criteria allow for population size, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity.

A summary of odour assessment criteria for various population densities is shown in Table 3.1 below.

Table 3.1 Odour assessment criteria

Population of affected community	Odour assessment criteria [3] (OU)
Rural single residence (≤ 2)	7.0
~ 10	6.0
~ 30	5.0
~ 125	4.0
~ 500	3.0
Urban area (≥ 2000) and/or schools and hospitals	2.0

Technical Note 3 outlines the acceptable procedure for allowing future updating of the odour assessment criteria as new research is completed. Industry groups or individual operators wishing to develop alternative odour assessment criteria should contact the EPA to ensure the proposed work will be suitable for adoption in the framework and for broader use.

2 'Standard sensitivity' is defined by the Draft Australian and European CEN Standards, which require that the geometric mean of individual odour threshold estimates must fall between 20 parts per billion (ppb) and 80 ppb for n-butanol (the reference compound).

3 Nose-response-time average, 99th percentile, AS4323.3-2001

3.4 Using odour assessment and glc criteria

Odour assessment and glc criteria can be used to:

- predict the odour impacts of new, modified and existing activities that contain point or diffuse sources of odour. For example, the affected area around a proposed fish by-product rendering plant can be determined by comparing results of dispersion modelling against odour assessment criteria.
- determine whether proposed odour control and management options will be suitable for a new or modified activity. For example, an impact assessment will indicate (by assessing estimated emissions against odour assessment criteria) whether control and management practices proposed for a new waste management facility will be adequate to prevent odour impacts on neighbouring properties.
- guide the development of odour mitigation strategies within a Pollution Reduction Program or Prevention Notice for existing activities. For example, to rectify long-term odour impacts from an abattoir, the EPA may direct the operator to undertake an audit and sampling program of major odour sources. An impact assessment using the site sampling results can then be used to negotiate a program (attached as a condition to the environment protection licence) aimed at reducing odour impacts.
- develop a site-specific point-source emission limit for new, modified or existing activities which can then be implemented within a development consent or environment protection licence. For example, site specific hydrogen sulphide limits for a new paper mill can be calculated following an air quality impact assessment to ensure that no odour will be detected at the nearest residence when the mill begins operation.

Odour assessment and glc criteria are important planning tools designed to help with assessing the likely acceptability of a proposal or odour mitigation strategies. For new activities, they should be used routinely by a proponent in project planning to guide decisions on choosing a location of odour-generating activities, construction and odour management strategies. For existing activities, they can be used on a case-by-case basis to guide the development and improvement of odour mitigation strategies.

Diffuse sources

In no situation should the odour assessment or glc criteria be used as conditions of consent or environment protection licence conditions. Conditions should be informed by the assessed odour impacts. They should be outcome-based and address management practices and mitigation measures required to prevent odour impacts on neighbouring properties.

Point sources

A site-specific stack emission limit may be calculated so that the odour assessment or glc criteria can be met. Site-specific emission limits should be used as conditions of consent and environment protection licence conditions where appropriate.

4 Odour impact assessment

Summary

- Depending on the individual characteristics of a new development and its proposed location, a varying degree of investigation into the potential for odour may be required. For this reason, three levels of odour assessment have been adopted:
  - **Level 1** is a **screening-level technique** based on generic parameters for the type of activity and site. It requires minimal data and uses simple equations to provide a broad estimate of the extent of any odour impact. It may be used to assess site suitability and odour mitigation measures for new or modified activities.
  - **Level 2** is a **screening-level dispersion modelling technique**, using **worst-case** input data (rather than site-specific data). It is more rigorous and more realistic than a Level 1 assessment. It may be used to assess site suitability and odour mitigation measures for new, modified or existing activities.
  - **Level 3** is a **refined-level dispersion modelling technique** using **site-specific** input data. This is the most comprehensive and most realistic level of assessment available. It may be used to assess site suitability and odour mitigation measures for new, modified or existing activities.
- The level of assessment will depend on the specific characteristics of the proposal and the likelihood of operational odour impacts.

4.1 Different levels of assessment

Estimating the frequency and magnitude of odour impacts is an essential element in the effective management of odour. This may involve determining what areas will be affected by odours and evaluating alternative mitigation measures using simple calculations or dispersion modelling with varying levels of complexity.

The three levels of assessment are designed so that the predicted odour impacts are more accurate as the level of assessment becomes higher (progressing from Level 1, which is generalised, to Level 3, which is site specific). This means that, for a given facility, the result of a Level 1 impact assessment would be more conservative (that is, would overestimate the impact) and less detailed about the nature and frequency of impact than the result of a Level 2 assessment, and so on. The three levels provide a cost-effective assessment approach based on the individual characteristics of a proposal, including scale and complexity; proximity of sensitive receptors; and topographic and meteorological conditions.

For new activities, an odour impact assessment will need to be prepared by the proponent to support an environmental impact statement (EIS), a statement of environmental effects (SEE) or an EPA licence application (if the activity is listed in Schedule 1 of the POEO Act). Such an assessment must clearly demonstrate to the consent authority (local council or Minister for Planning) and regulator (local council or EPA) that the proposal is able to meet environmental outcomes for odour, which include the odour assessment and glc criteria.

The three levels of assessment are design tools. However, they can only predict the likely odour impacts. In some cases, once a facility is operational, odour impacts may be experienced at some locations. The operator will need to address these odour impacts and, if necessary, modify the facility based on actual, rather than predicted, operational outcomes.

Consideration of surrounding land use

The three levels of assessment methodology require consideration of odour impacts at existing sensitive receptors. In addition, where there are likely to be off-site impacts, the proponent should also consider the probability that surrounding land use will change. This means he or she should take into account how the activity will impact on future land use. The proponent should contact the relevant local councils to determine if any developments are planned or approved in the area likely to be affected by the activity. In addition, advice should be sought as to the probability of change in preferred land use for the area in the short, medium and long term. If the likelihood of changes is high and the probable change in land use is expected to create compatibility issues for the odour-generating activity, this should be factored into the assessment.

The approval of a project that emits odour (or other impacts) **cannot be considered to be a change of the preferred land use** in the area; it does not restrict future development of that land for the life of the project. This is equally true in rural settings and in old industrial areas where redevelopment may result in traditional industrial areas being converted to residential areas. Therefore, in business planning in relation to the existing or proposed facility, the risks of land use changing should be kept under review along with other market, technical, asset-management or maintenance matters that are essential for the efficient operation of any activity. Likewise local councils should fully assess constraints associated with existing industries and consider introducing a development control plan to apply to residential or other sensitive land uses which may be located near odour-generating activities.

Constant versus variable odour emissions

It is also necessary to consider whether a facility will be likely to emit an odour continuously or whether the intensity, frequency, duration or character of the odour may fluctuate. This is largely determined by the type of operation and whether the odour is emitted from a point or diffuse source.

Point sources generally emit odour at a relatively constant rate, called a steady state. So much so that puffs of odour may indicate a problem with the process being undertaken or the operation of any control technology being employed.

However, diffuse odours are often emitted intermittently at intense levels because of the nature of their sources (for example, irrigation of effluent or pond cleaning). A risk assessment should be taken to identify the materials, plant, equipment or activities likely to generate intermittent odour, as well as the likely timing, frequency, duration, intensity and character of the emissions. When dealing with intermittent odour, the focus should be on ensuring that appropriate design, management and maintenance practices are used to prevent, or minimise, the level of unreasonable interference it causes.

In general, steady state odours can be addressed using either a level 2 or 3 assessment. Quantitatively predicting the impact of odour puffs is very difficult but identifying them and their area of impact can be carried out using a Level 3 assessment.

Many premises will have a number of odour sources (both point and diffuse) and the cumulative impact should be assessed.

Appropriate level of assessment

New or modified activities

It is not intended that a proponent would routinely progress through all levels of assessment. For some proposals a Level 1 assessment would be sufficient to identify whether a site is suitable for a proposed activity. On the other hand, if it is likely that odour will be a significant issue, there is no impediment to immediately conducting a level 2 or 3 assessment. If the proposal exceeds the Level 1 assessment significantly then the proponent might consider other sites rather than proceeding to level 2 or 3 assessments.

Level 1 assessment is a screening technique that provides a broad estimate of probable odour impacts. If a proponent can demonstrate a clear 'pass' at Level 1 odour impact assessment, there is no need to undertake level 2 or 3 assessment, regardless of the size of the project, unless there are special risk factors such as:

- topographic or meteorological features that may funnel the odour plume or cause it to accumulate
- a populated area located just outside the calculated separation distance

It is the proponent's responsibility to justify the adequacy of Level 1 assessment in a particular circumstance. Where doubt exists, the proponent should seek advice from the consent authority responsible for the particular development. For all scheduled developments, advice should be sought from the EPA.

For site selection, progression from one level of assessment to the next should be undertaken if an odour impact at a particular site is identified as likely but not definite. If the criteria can still not be met after carrying out a Level 3 assessment, additional odour mitigation or an alternative site will need to be considered.

In the case of a new or modified activity, compliance with the odour assessment and glc criteria should be assessed at all existing and potential new receptor locations at and beyond the boundary of the premises. Receptor locations include all existing (and proposed) neighbouring residences, schools, workplaces and community facilities. If a receptor is, or is likely to be, located near the boundary of an activity, then the criteria should be applied at and beyond the boundary of the premises. The proponent should contact the relevant local council to determine if there are any sensitive developments planned or approved in the affected area.

The three-level assessment approach is primarily a site-specific design tool but can be used to guide future land-use planning.

Existing activities

If odour impacts are found to occur after a facility is operational, the extent of the problem and whether the impacts warrant further action or are acceptable can be determined using confirmed complaints (Technical Note 11). A comprehensive odour audit may assist to identify, quantify and prioritise sources of odour at a site so that odour-mitigation efforts may be efficiently targeted. Sampling and analysis of emissions of odour from high priority sources (Technical Note 8) can be a useful component of an odour audit.

In most cases the application of best management practices and negotiated changes to practice will be sufficient without the need to undertake odour modelling. In some situations, such as where significant management and control option changes are proposed, it may be appropriate to undertake a level 2 or 3 assessment to better quantify the extent to which these proposed measures may mitigate the odour. Level 1 assessment is not appropriate for use in this situation.

A wide range of odour avoidance and mitigation options may be available when designing a new or modified activity. However, the options available when dealing with odour impacts from an existing activity will generally be more limited. As a result an audit of existing operational characteristics, management practices and environmental controls, as well as a review of potential opportunities and constraints associated with the operation of the activity should be undertaken to determine the most appropriate approach. If the activity is no longer consistent with 'best practice', a program to upgrade the activity may need to be developed. In any upgrade, there may be opportunities to modify production to increase efficiencies and develop new products. If the activity is no longer compatible with the surrounding land use, it may be appropriate to consider, in the medium to long term, alternative locations rather than upgrading the facility on the existing site. In some cases there may be a need to be more focused on a negotiated outcome, particularly when all available feasible odour control and management options have been exhausted.

4.2 Level 1 odour impact assessment for a new or modified activity

In general, a Level 1 assessment is sufficient to broadly identify whether a site is suitable or if further assessment of odour impact is necessary or worthwhile. Level 1 assessment may be forgone if a proponent believes odour will be a significant issue and opts at the outset for a more rigorous level of assessment.

For a Level 1 assessment, a 'pass' suggests the:

- calculated extent of the odour impact is less than the distance to the nearest (or likely future) receptor
- calculated stack height or pollution control equipment proposed is sufficient to disperse the odour
- proposed management practices are sufficient to prevent odour problems.

Conversely, a 'fail' suggests the site is probably unsuitable but may warrant further, more detailed investigation. Typically, if a proposal fails Level 1 assessment, the following should be considered:

- adopt better management practices
- increase the height of the stack or the level of pollution control
- relocate the activity to an alternative site
- assess the activity using either a level 2 or 3 assessment, and
- redesign the activity or consider other actions as necessary.

Level 1 odour assessment procedures for point sources

Level 1 assessment methods are different for different types of activities. Point sources are generally dominated by stack emissions of odour, which can be relatively easily controlled using cleaner production methods, as well as waste minimisation and reduction principles, or conventional emission-control equipment. Nevertheless, given the wide variation in unit processes, control equipment and stack release parameters of industries within the point source category, it is not currently feasible to develop specific procedures to determine or predict the likely affected zone for specific industries.

To overcome this, a simple screening procedure has been developed. This procedure is set out in detail in Technical Note 4. It is based on simple calculations and check lists that determine whether the proposed management practices and odour-emission control equipment, in combination with the distance to the nearest existing or likely future sensitive receptor, and the topography and meteorology of the site, will result in acceptable odour impacts. The procedure can be used to approximate whether the proposed emission-control equipment and stack height are sufficient to disperse the pollutants so they comply with the odour assessment and/or glc criteria. It can be used to estimate the maximum allowable emission concentration or rate from existing point sources to ensure that 'offensive odour' is unlikely to occur. The maximum distance from the source where complaints are likely to occur can also be estimated.

The Level 1 procedure for point sources takes into account the following factors:

- type of odour (complex mixture or individual odorous pollutants)
- quantity of odour emissions
- proposed management practices
- proposed level of emission control
- local topography (which may affect plume dispersion)
- presence of buildings (which may affect plume dispersion)
- worst-case meteorology
- possibility of cumulative impacts (for example, do activities that have a similar odour character already take place within an existing or nearby facility?).

A Level 1 assessment is an approximate method only, and would be best used to differentiate between alternative sites for a new activity in terms of their potential for odour impacts. In some situations, a Level 1 assessment will give a clear signal that impacts are likely to be minimal and manageable, and others for which it will signal significant odour impacts that may prove difficult to manage. Any environment protection licence or consent conditions that relate to a point source emission limit need to be determined using either a level 2 or 3 odour impact assessment.

Level 1 odour assessment procedures for diffuse sources

'Diffuse sources' are generally dominated by odour emissions from area sources, which are difficult to control compared to point source emissions. The odour impacts from these sources are most effectively managed through careful site selection, appropriate project design, site layout and sound management practices. Generic procedures for determining the affected area are useful for site selection when assessing the potential impacts from diffuse sources of odour.

For new poultry farms, piggeries and cattle feedlots, generic procedures for determining the affected areas have been developed and are useful for assessing the potential for odour impacts (Technical Notes 5–7). Other industry types, such as dairies, mushroom composting and layer farms, are encouraged to work with the EPA to develop appropriate Level 1 assessment procedures.

The Level 1 odour impact assessment for diffuse sources takes into account the following factors:

- type of operation
- size of operation
- proposed management practices
- density of population likely to be impacted, ranging from a single rural residence to a predominantly urban setting
- local topography (flat, undulating, high relief, low relief or drainage flows)
- surrounding vegetation (none, light or heavy tree cover)
- local meteorology (high, average or low frequency of winds toward sensitive receptor)
- possibility of cumulative impacts.

The Level 1 odour impact assessment methodology for diffuse sources provides guidance for estimating the nearest point of impact of a particular activity and will indicate an affected area. If other development is approved or exists in the affected area, an odour impact can be expected. Affected areas are determined as a function of the type of operation, size, proposed management practices, surrounding population density, presence of vegetation and the prevailing meteorology.

In summary, the Level 1 odour impact assessment for diffuse sources could be used to determine whether the following factors are sufficient to meet the environmental outcomes:

- proposed management practices, and
- distance to the nearest sensitive receptor (and likely future receptors).

4.3 Levels 2 and 3 odour impact assessment procedures for new, modified or existing activities

Level 2 and 3 odour impact assessments use a more comprehensive dispersion-modelling technique than the simple calculations used for Level 1 assessments. In the case of level 2 and 3 assessments, a 'pass' is indicated when predicted impacts are less than or equal to the odour assessment and or glc criteria referred to in Chapter 3 of this framework.

Air dispersion models provide the ability to mathematically simulate atmospheric conditions and behaviour. They are used to calculate spatial and temporal fields of concentrations and particle deposition due to emissions from various sources. Dispersion models can be used to determine the affected area around an activity by comparing the results to specific air pollutant assessment criteria, such as odour assessment or glc criteria.

Dispersion models can provide concentration or deposition estimates over an almost unlimited grid of user-specified locations, and can be used to evaluate both existing and forecast emissions scenarios. In this capacity, air dispersion modelling is a useful tool in assessing the air-quality impacts associated with existing and proposed emissions sources. The results of the dispersion modelling analysis can be used to develop control strategies that should ensure compliance with the odour assessment and glc criteria. Dispersion models can also be used to estimate the cumulative impacts of various industries located in close proximity.

Because weather conditions govern the transport and dispersion of pollutants from an emissions source, it is important to use meteorological data that represents the site and surrounding region when modelling emission sources. Sufficient meteorological data should be available to ensure that worst case conditions are adequately represented in the model predictions. This requirement is especially important given that predicted concentrations need to be determined – and reported – on a statistical basis when compared against the odour assessment and glc criteria. Guidance documents and the minimum data requirements are presented in Technical Note 9, along with advice about siting and operating meteorological monitoring equipment, preparing level 2 and 3 meteorological data and accessing meteorological processing software.

The details of conducting level 2 and 3 odour impact assessments based on dispersion modelling and the procedure for developing site-specific emission limits are presented in Technical Note 10.

The AUSPLUME dispersion model is widely used in Australia and New Zealand for conducting air quality impact assessments on new and existing premises and is the preferred model for carrying out level 2 and 3 odour assessments.

For some purposes, other dispersion models can be substituted for AUSPLUME. However, the selected model would need to perform equivalently to or better than AUSPLUME for a specific application. The use of an alternative model to AUSPLUME should be checked with the appropriate regulatory authority before conducting an assessment.

Additional information about dispersion models, including data requirements and availability, is provided in the *Approved methods for the modelling and assessment of air pollutants in New South Wales*.

Level 2 odour assessment procedure

Level 2 odour impact assessment uses a screening level of dispersion modelling. A Level 2 assessment may be selected by the proponent as the desired level of assessment from the outset if it is likely odour will be a significant issue. Level 2 odour impact assessments use worst case meteorological data and a worst case odour emissions model.

If the Level 2 assessment indicates that the odour assessment and/or glc criteria will not be exceeded, then the odour assessment procedure is 'passed' and no further analysis is required. If, on the other hand, Level 2 assessment indicates the project may impact on existing and likely future sensitive receptors at levels that exceed the odour assessment or glc criteria then a Level 3 assessment should be undertaken to achieve finer resolution, or the project should be relocated to an alternative site and/or a change in operating parameters should be considered.

Level 3 odour assessment procedure

Level 3 odour impact assessments use more comprehensive and site-specific level of dispersion modelling. A Level 3 assessment may either be selected by the proponent from the outset or carried out in circumstances where a proposal has failed a Level 2 assessment. Level 3 odour impact assessments use at least one year of hourly average site-representative meteorological data and, where available, an odour-emissions model.

If the Level 3 assessment doesn't indicate any potential odour problems, the project is 'passed' and no further analysis is required but if a Level 3 assessment shows the project may impact on existing and likely future sensitive receptors at levels that exceed the odour assessment or glc criteria, the project should be relocated to an alternative site or consideration given to changing its operating parameters.

5 Avoiding and mitigating odour

Summary

- This chapter provides guidance on some of the options available for avoiding and mitigating potential or existing odour impact. The best odour-management strategy for a given activity will involve selecting the most appropriate tools for the type of operation and site.
- The main odour mitigation and avoidance strategies are:
  - strategic approaches through land-use planning
  - appropriate site selection for new activities
  - managing odour at the source
    - best management practices (implementing odour-reducing operating procedures for new, modified or existing activities, especially for 'diffuse' sources)
    - best available control technology (installing control equipment for new, modified or existing activities, especially for point sources)
  - managing odour in the pathway
  - managing odour at the receptor
  - negotiated solutions between the operator of an existing activity and the affected individuals.

5.1 Introduction

The preceding chapters of this framework have outlined criteria and assessment tools for predicting the odour levels from a particular source.

Section 5.2 provides guidance to local councils on strategic approaches to avoiding odour impacts through land-use planning when developing Local Environmental Plans (LEPs), as well as for managing land-use conflict as land use changes over time.

Sections 5.3–5.6 provide guidance to proponents on the main strategies for avoiding, mitigating and managing odour: appropriate site selection; managing odour at the source and in the pathway between the facility and the receptors; and managing odour impacts at receptors.

A combination of several approaches is often necessary to achieve the appropriate level of mitigation. Selecting an appropriate strategy for a proposed project involves:

1 Determining the order of magnitude of the odour reduction required to meet the relevant criteria.
2 Identifying the specific characteristics of the industry and the site.
3 Assessing the range of odour-control strategies available.
4 Examining mitigation strategies chosen by similar industries on similar sites with similar requirements for odour reduction, and considering their appropriateness and reliability for the subject project.
5 Considering community preference for particular strategies (especially important when the community has particular sensitivities to odour).

Where a proposed mitigation strategy will not achieve the desired environmental outcome (resulting in a residual odour impact) it may be appropriate to consider the feasibility of developing a negotiated agreement with neighbours with regard to acceptable odour performance from the facility (section 5.7).

5.2 A strategic approach to avoiding odour through land-use planning

Decisions taken in relation to land use will determine the location of odour-emitting activities relative to existing development, as well as the placement of odour-sensitive developments relative to established activities that emit odour. Odour impacts in residential and other sensitive areas may stem from inappropriate land-use decisions that may have allowed odour-generating activities to develop in close proximity to these areas or allowed residential areas to grow around an existing odourous activity. Once land is developed in this way, the range of odour-control measures available may be limited. Better odour management of the source and improved engineering solutions are key options but may be expensive to apply retrospectively.

A shared responsibility

By considering existing developments when planning for the future, land-use planners may help manage odour impacts and any conflicts that arise from them. However, because of increasing population, market pressure and changing societal and industrial needs, the presence of existing development may not be the most compelling consideration in determining the future land-use patterns for an area. Over time, the preferred land use in an area may change, for example, from rural to residential on the fringes of an urban area, or from industrial to residential in the redevelopment of old industrial areas. As a result, it is important that all parties that could be affected by changes to land use become involved in the planning process. The success of land-use planning at any level depends upon the consultative process. Potential participants in the consultative process should include community members and organisations, industry groups, government agencies, odour specialists and planning professionals. In particular, representatives from odour-generating activities should monitor the land-use patterns and the likelihood that nearby land use will change and – to ensure their interests will be understood and considered in any decision made by the local council – must be prepared to participate in any planning process that proposes to change the land use of surrounding land..

Strategic planning and rezoning

Land-use planning is a critical component in avoiding and managing odour impacts and potential conflicts that could arise from them. Local councils are primarily responsible for meeting the land-use needs of their community through the development of LEPs. The following may be useful in assisting local councils when developing LEPs:

- When reviewing and updating the preferred land use for a particular area, consider current land use and development trends as well as sustainable integrated planning principles.
- When changing the preferred land use in a particular area, consider any potential opportunities or constraints associated with existing development (such as odour emissions, transport, resource reuse and energy efficiency). It may be appropriate to audit the environmental performance of any of the following industries in the area to determine whether they are performing according with best practice, and whether there are any existing conflicts with land uses.
  - waste industries (sewage-treatment plant, landfill, composting facility).
  - processing (chemical, petrochemicals, minerals/metal, paper/pulp).
  - food and agricultural processing (abattoir, tannery, wool scour, brewery).
  - intensive agriculture (feedlots, piggeries and dairy and chicken farms).
- When establishing zones for activities that could be odour-generating, consider minimising the potential for future conflict by planning a transition of land uses that locates sensitive receptors in zones that are non-adjacent to the activities.
- Consider the appropriateness of introducing specific zoning categories for odour-generating activities such as agriculture, intensive agriculture, minerals/metal processing, sewage-treatment plant.

- When rezoning is being considered for an area, ensure that all parties are aware of the implications. The local environment study should identify provisions for dealing with any potential conflict over land use. This is especially the case where industries emitting odour may need to improve their operations because of a change in nearby land use. Where this presents difficulties for existing industry, staged improvement programs or a negotiated agreement could be an appropriate mechanism for managing the issue.
- Consider the appropriateness of introducing development control plans for key odour-generating industries in the area to prevent future land-use conflicts. In addition, consider the appropriateness of introducing a development control plan to apply to residential or other sensitive land uses which may be located near odour-generating industries.

The approval of a project that emits odour (or other environmental impacts) does not constitute a rezoning of the surrounding land and cannot limit future development opportunities of the surrounding land for the life of the project. It needs to be remembered that land uses may need to change in the short, medium or long term to accommodate the changing needs of society. Existing activities would be taken into consideration when changing zoning, but are not necessarily the critical determinant of future preferred land use.

Assessing and approving a subdivision or development

If residential zones are to be located close to odour-generating activities, subdivisions should be designed so that land uses least sensitive to odour, such as car parks or certain commercial areas, are located nearest to odour-generating activities, and more sensitive land uses such as homes are located further away.

Applications for developments in areas likely to be affected by odour should include references to the:

- consistency of the proposal with the current or proposed land use for the area
- extent to which the land is impacted by odour
- acceptability of the impacts, taking into consideration the odour assessment criteria, topography and climatic conditions and the likely impacts on health, quality of life or values of the future land uses
- outcome of negotiations with the odour-generating activity regarding management of odour emissions
- options relating to building design and layout that could keep odour impacts to an acceptable level inside buildings and within important outdoor spaces.

In other circumstances, consideration could be given to introducing controls on building design so as to minimise odour impacts. This could involve locating areas of the building where people live or work so they do not face the odorous sources, carefully designing natural airflow through buildings or incorporating an appropriate ventilation and air-conditioning system. Implementing such measures at the building-design stage can help maintain the occupants' quality of life.

Managing land-use conflict as land use changes over time

Existing odour-generating activities may become incompatible with neighbouring premises if the surrounding land use changes and neighbours locate closer than when the activity was originally approved. This change in proximity of receptor could trigger land-use conflicts, especially if the activity's original odour mitigation strategy may have been based in part on an assumption that the neighbour's land use would remain unchanged for the life of the activity. Under these circumstances, conflict can occur because of the differences in expectations – of the *operators of the activity*: that the neighbour will not change the use of the land, and of the *neighbour*: that they have a right to change the use of the land with the approval of council.

Planning authorities will need to make clear to both parties the strategic direction of land use in a given area and where feasible, establish protocols for dealing with conflict as the preferred land use changes from one function to another. Where there are unacceptable off-site odour impacts from an existing development, consideration will have to be given to whether these odours can be further contained. If not, where that activity is considered to be the preferred activity in that area, the affected area may have to be regarded as unsuitable for certain kinds of development.

Land-use conflicts occur when the off-site odour impacts unacceptably affect the health, quality of life or values of other land users. The aim of this framework is that such circumstances would rarely arise, since a combination of appropriate land-use policies and best management practices by industry should reduce the amount of conflict caused by odour.

5.3 Appropriate site selection

Wherever a proposal is likely to generate odour that will be dispersed and impact on neighbouring land, there is potential for conflict. At the concept planning phase of a project's development approval, appropriate sites for the project should be considered in terms of:

- the capacity of the size and shape of the block to provide an adequate 'on-site buffer' from surrounding land uses
- whether the local climatic conditions or topography could affect odour impacts
- the likelihood for cumulative impacts with existing odour-generating activities
- compatibility with surrounding land use and the probability that the surrounding land use will change in the short, medium or long term.

In the case of expanding activities, a risk management approach should be taken to determine the likelihood that the activity can be designed, reconfigured or mechanically limited so that odour assessment criteria can be met at the existing or potential future receptors, even at the increased production levels. In many cases, an expansion of activities provides an opportunity to upgrade the performance of the operation and lower the off-site impacts despite the increased production.

At this stage, it is important to consult with the local council, potential neighbours and community and industry groups to ensure that community concerns can be addressed. The size and shape of the block should be adequate to allow for the odour-generating activities to be located towards the centre of the land or at the location where topography or other site characteristics minimise the likelihood of unacceptable off-site impacts.

5.4 Managing odour at the source

Best management practice

Best management practice generally involves adopting particular operational procedures that minimise odour while retaining or improving production efficiency. For new activities, these measures complement the gains that can be achieved through judicious site selection and planning.

The first step in developing an appropriate mitigation strategy is to consider the extent to which management practices can reduce odour. This approach applies to point and diffuse odour sources but is particularly useful in the case of diffuse sources from agricultural and waste management activities.

The following best management practices may be applied separately or in combination:

- **Materials selection**
  - Where possible use materials that minimise the generation of odour, including raw materials for processes or feed material for animals.
- **Project design**
  - Locate odour-generating activities, taking account of the topography and property boundary, to maximise the 'on-site buffer' between the odour-generating activities and the boundary and receptors.
  - Where feasible, minimise the likely generation of odour through the choice of facility design, equipment or processes.

  - Where feasible, maximise the containment of diffuse odour sources so they can be controlled and treated if necessary. Examples include building structures around diffuse sources that convert them to point sources whose odours can be more easily controlled; loading and unloading odourous materials within a building; operating buildings or structures as environments that have negative air pressure, so that odour does not escape when doors are opened.
- **Appropriate works scheduling**
  - Conduct odour-generating activities or use odour-generating equipment during the least sensitive time of day or under the most favourable weather conditions. For example, wait until the wind is blowing away from sensitive receptors before flushing a sewage system.
  - Where a number of odour generating processes operate on a site, it may be possible to schedule them so they occur separately rather than concurrently.
- **Appropriate management and maintenance regimes**
  - Design maintenance programs to minimise the risk of incidents or accidents and the emission of puffs or incidential/accidental emissions.
  - Establish management programs that provide incentives for employees to minimise incidences of poor environmental performance.
  - Conduct programs to educate staff about work practices that can help to minimise odour, and about the physical and psychological impacts of odour on neighbours.

Using air pollution control technology

Allied with best management practice is the use of best available control technology. Where management practices fail to achieve the required odour reduction by themselves, the use of best available control technology should be considered. Equipment, plant and processes that have the potential to produce odour should incorporate the most effective and affordable control equipment to reduce odour by a specified amount, beyond that which can be achieved using best management practices.

Affordability is not necessarily determined by the price of the equipment alone. Increased productivity sufficient to offset the initial outlay may result from the use of more advanced equipment to reduce odour such that longer operating hours are possible.. For example, equipment that generates less odour than previously (or than other available equipment) may be operated through the night or in a wider range of wind conditions, without causing complaints.

The choice of control equipment is always the responsibility of the proponent or operator of an activity. The proponent or operator is encouraged to thoroughly review the currently available technologies when selecting appropriate control equipment for their activity. The use of any control equipment is likely to be more applicable to point sources of odour, where ducting can be used to capture and direct the flow of odorous air to the equipment. Examples of commonly used odour-control technologies are:

- dispersion
- incineration
- scrubbing systems
- adsorption systems
- biofiltration
- adding masking compounds to odorous air.

In some situations, it may be necessary to use more than one of these techniques, for example, scrubbing may be needed before adsorption or biofiltration.

If the temperature of a gas stream is high, it may also be necessary to cool gases before they are treated. This may be needed before either chemical scrubbing or activated carbon adsorption is used.

In the case of managing odour from point sources, the exhaust gas emitted from a stack can be collected and controlled using a variety of add-on control equipment options. The choice of method or combination of methods to be used for controlling odour emissions from stack discharges would be influenced by the following factors:

- flow rate of gas (or vapour) being produced
- chemical composition of the mixture causing the odour
- temperature
- moisture content of the stream.

Two complementary approaches – reducing the rate of discharge, and increasing the elevation of the point of discharge – are commonly used to reduce ground-level concentrations resulting from a particular source.

Good control practice dictates that any stack should:

- be at least as high as the building height plus 1.5 times the height of either the building height or the building width, whichever is less. The calculated stack height is an indication of the minimum needed to minimise building downwash. The final stack height should be determined by using appropriate air-pollution dispersion modelling (Technical Note 4)
- have a minimum efflux velocity of 15 m/s (or 1.5 times the local maximum wind speed, whichever is greater) to avoid stack tip downwash of the exhaust gases
- have free vertical discharge
- have final discharge directed vertically upwards
- use rain caps that do not restrict the upward flow of the exhaust gases. A suitable vertical discharge cap should be used.

The selection and design of appropriate odour-control technologies is a specialised discipline. It requires the development of site-specific solutions. Australia has many consulting engineers with experience in the selection and design of odour control equipment. The Clean Air Society of Australia and New Zealand (CASANZ) publication *Directory of air pollution & environmental consultants* contains contact details for several consulting engineers operating throughout Australia (for further details see www.casanz.org.au).

5.5 Managing odour in the pathway

In addition to managing odour at the source, consideration should be given to options aimed at minimising or reducing odour impacts between the receptor and the activity, particularly where meeting the assessment criteria at the receptor by managing odour impacts at source is unfeasible. Examples of such strategies are listed below.

- Situating odour-generating activities or equipment behind natural or built structures. These act as barriers that direct odour emissions away from any sensitive areas or maximising odour dilution before the vapour stream reaches them.
- Establishing a stand of trees or shrubs can help disperse odour before it reaches the boundary of a facility or reduce the wind over an odour source (for example, an effluent pond). The effectiveness of a vegetation barrier is determined by its height, thickness and width, as well as the appropriateness of its location. This solution may be particularly useful when other odour-source controls are impractical or too costly. and may be an especially suitable option in an agricultural setting where the trees will also act as a dust filter and may release a natural masking fragrance.
- Purchase or long-term leasing of neighbouring properties provides a secure buffer zone around a facility and increases the separation distance between the site of the odour emissions and existing (or potential) sensitive receptors.

5.6 Managing odour at the receptor

When odour assessment criteria are still being exceeded at receptors despite avoidance and mitigation measures at the source or in the pathway, consideration could be given to measures that would manage the reaction of the receptors and increase their willingness to accept the odour levels.

These types of approaches may also be appropriate before an activity begins operation if there is some degree of uncertainty about whether the proposed odour avoidance and mitigation strategies will achieve the required odour levels at receptors.

- Establish a communication strategy so that affected neighbours are kept informed about the operation of the facility and are consulted about aspects of the operation likely to result in odour. For example, conducting a letterbox drop before carrying out activities likely to result in higher levels of odour, surveying neighbours about their preferences as to the best time to undertake activities likely to result in high levels of odour, and holding open or information days.
- Investigate the feasibility of entering into an agreement with neighbours regarding their acceptance of the odour impacts. Negotiated outcomes would need to be documented in licence conditions, particularly in relation to the 'offensive odour' provisions of the POEO Act. However, negotiated outcomes would not normally flow to any new neighbours (should properties be sold) or apply in relation to any new land uses. As a result, such an arrangement would not provide a secure long-term mitigation strategy.
- Investigate the practicality of providing the most affected receptors with air-conditioning or other measures to reduce the impacts of emissions. This option would normally only be considered in exceptional circumstances.

5.7 Community consultation and negotiated solutions

Community consultation

The operator or proponent should discuss the existing or potential odour impacts with the local community and individuals. It is important to keep the local community informed about the operation of the activity and involve the community in the problem-solving process.

The community should be kept informed about potential odour impacts (for example, during planned maintenance) and proposed actions, including time frames, to mitigate or prevent odour problems.

As well, community members should be encouraged to help identify the problems and negotiate solutions, including time frames for implementation.

It is important to build a good relationship between the operator/proponent of potentially odour-generating activities and the local community. Ensuring that communication is maintained with the local community is good practice and a part of being a good neighbour.

Keeping the community and affected individuals informed about potential odour impacts will also help reduce future land-use conflicts.

If affected individuals are given adequate warning of planned activities that could cause a potential odour impact, there may be simple steps that they can take or the operator/proponent can take to reduce these impacts. Affected individuals may be more willing to accept odour impacts if the operator/proponent has demonstrated a genuine interest in mitigating these impacts.

Negotiated solutions

Operators, proponents and affected individuals can work together in a number of ways to manage odour impacts from an activity. One strategy would be to enter into a negotiated agreement. The process for negotiating an agreement in which affected members of the community determine the acceptable level of odour is outlined below.

- **Negotiation between proponent or operator and the affected community**
  - This strategy is aimed at forming an agreement that allows the proponent to cause a higher level of odour impact than might normally apply, in return for providing individual or community benefits. Because the approach is new, it has no established model and should be tailored to suit the specific situation but in general the onus would need to be on the proponent to develop and present an acceptable compromise package to the affected individuals. It would be important for the affected individuals to have an adequate understanding of the implications of any agreements reached.
- **How might the process be initiated?**
  - The proponent might initiate the process after agreeing with the consent authority or the environmental regulator that odour remains an issue despite implementation of the best odour mitigation strategy that is economically viable.
- **Who participates?**
  - The principal parties would be the operator/proponent and the affected individuals in the community. The consent authority or environmental regulator could participate in an advisory capacity.
  - 'Affected individuals' would comprise residents and occupiers of other sensitive land uses identified as being impacted, plus other residents who perceive they will be affected.
  - The operator/proponent would need to reach all people who might perceive themselves as being affected, which might entail seeking advice about how to compile a register of affected parties and individuals and organisations interested in becomeing participants in the negotiation process.
- **What is negotiated?**
  - The principal trade-off would probably be additional odour-impact for a package of benefits. Additional odour could be defined in terms of extended times of operation, higher odour levels, and a timeslot for 'offensive odour'. Benefits could include fewer odours at sensitive times, treatment or acquisition of residences or contributions to improve community facilities and infrastructure.
  - It would be important for the affected individuals to fully understand the implications of negotiations regarding the additional odour impacts. Either the operator/proponent or an independent specialist should provide an analysis of the impacts from the options being canvassed, so that the community can appreciate the likely consequences of reaching an agreement. Any negotiated solution between an operator and a neighbour should be formalised (for example, through a contract) as far as possible, so the agreement is clearly documented and understood.
  - The affected individuals would need to be well informed to safeguard against a situation where the agreed odour level represents an unreasonable impact that is likely to be regretted in the long term.
- **How future affected landowners would be treated?**
  - The local council may act on behalf of future owners of affected properties. An agreement covering such land may be in the form of information provided on section 149 certificates, routinely obtained by purchasers of properties.
  - The effect on property values of any agreement may in itself be part of the negotiations.
- **How the agreement could be enforced?**
  - The agreement would need to be enforceable to the extent that it imposed obligations on the proponent. There are a number of possible approaches. The operator/proponent could draw up an agreement between individuals and themselves which would be enforceable in the civil courts. The obligations could be included in either conditions of consent or environment protection licence conditions. The obligations would need to be expressed clearly and unambiguously and specify a way of measuring plainly whether these have been fulfilled by the operator/proponent.

- **Review**
  - Conditions attached to development consent or the environment protection licence, may include a review of the negotiated agreement after a certain period. The conditions could then set out the method of review and the fact that the environment protection licence conditions may be changed as a result of that review.
  - The conditions could provide for the review period to be shortened where the original conditions forming the basis for negotiations have changed. Any review period should be of sufficient duration to give certainty to the operator/proponent for the operation of the activity. Environment protection licence conditions for new activities subject to the integrated development assessment process cannot be altered during the first three years after consent.

6 Project assessment, approval and licensing

Summary

This chapter provides guidance to consent authorities and regulators (local councils, Department of Planning and the EPA) for assessing proposals and setting licence and consent conditions related to managing activities likely to generate odour.

- Odour generating proposals should consider the odour impact assessment check list as a minimum.
- The Integrated Development Assessment (IDA) provisions in the EP&A Act ensure that the EPA and other approval authorities undertake an integrated assessment of the acceptability of predicted odour impacts.
- Conditions of licence, consent or approval should relate to the likely level of odour impacts, the predictability of impacts and the sensitivity of the receiving environment.

6.1 Odour in the context of environmental impact assessment

For any operation that has the potential to emit odour, it is important that an appropriate level of environmental impact assessment is undertaken in the statement of environmental effects (SEE), review of environmental factors (REF) or environmental impact statement (EIS).

At a minimum, the assessment should ensure odour is considered in the assessment of any proposal for the following odour-generating activities:

- waste industries (for example, sewage treatment plant, landfills and composting facilities)
- processing/manufacturing (for example, chemical and petrochemical factories; minerals, metal and fibreglass manufacturers; and paper and pulp processing plants)
- food and agricultural processing (for example, abattoirs, tanneries, wool scourers, breweries, bakeries and coffee roasters)
- intensive agriculture (for example, feedlots, piggeries and dairy and poultry farms)
- service industries (for example, dry cleaners and fast-food outlets)

If a licence is required from the EPA, under the IDA provisions listed in part 4 of the EP&A Act, the EPA provides input in the scoping of issues to be considered in the odour assessment. If the project is a designated development, these issues will be included in the Director-General's requirements for the EIS.

If a proponent supplies insufficient information in the EIS, the consent authority can request additional information. Under the IDA provisions, the EPA can 'stop the assessment clock' until such time as supplementary information is provided. Where a proposal is not an integrated development or is being assessed under part 5 of the EP&A Act, the approval authorities have a similar responsibility to consider the adequacy of the proponent's odour assessment to ensure appropriate information has been supplied on which to base a decision.

Most proposals for activities that will generate odour must be exhibited and the community invited to make submissions for consideration by the relevant planning authority and if it applies, the EPA assessment process.

In the case of integrated development, the consent authority (either the local council or Minister for Planning) must obtain the EPA's general terms of approval before making a decision. The conditions of consent granted for the project must be consistent with the EPA's general terms of approval and, in turn, the EPA licence conditions must be consistent with the consent. For projects being assessed under Part 5, the proponents and other approval authorities should consult with the EPA regarding the acceptability of odour impacts and recommended approval conditions.

6.2 Odour impact assessment check list

As a minimum, in order for the odour impact to be predicted adequately, and for the approval authority to make a decision regarding the proposal and the likely acceptability of odour impacts, the parameters listed below need to be determined in any odour impact assessment (level 1, 2 or 3).

- All potential odour sources—materials, equipment or activities (including transport, waste management and maintenance).
- The location of the emission of each odour source as well as its characteristics and likely emission frequency, timing, duration, intensity, characteristics and chemical composition.
- Operating hours and times when intermittent odour-generating activities are likely to occur.
- All nearby receptors potentially affected by the odour emissions (both current and future); this is particularly important where there is a potential for rezoning or subdivision.
- Weather conditions particular to the site (including prevailing wind directions and the likelihood of inversions or katabatic drift).
- Site features that may affect odour propagation and dispersion, including topography, vegetation, buildings and surrounding land uses.
- The odour assessment criteria that were used to assess the proposal under current and future circumstances (for example, where possibility of a change in land use exists).
- Likely odour impacts (predicted using level 1, 2 or 3 assessment)
- The range of mitigation measures required to achieve the relevant assessment criteria under the current land-use regime, the likely reliability of these measures –particularly in relation to managing intermittent odour emissions – and any additional feasible mitigation measures that could be implemented if the facility emits offensive odour after it is operational.
- The range of additional mitigation measures available if the surrounding land use should change
- Whether the final odour level proposed needs to be underpinned by monitoring, reporting or complaints management.

Other environmental factors, as well as social and economic factors should be considered when the acceptability of the odour impacts is being evaluated. If the level of odour impact is likely to exceed the assessment criteria, consideration should be given to selecting another site, or changing or not proceeding with the project. The proponent may wish to weigh economic and social benefits associated with the project against the undesirable odour impacts. Where the proponent can demonstrate that the project will offer net benefits (and present no adverse health impacts), the approval authority may consider this within the ecologically sustainable development context. However, social equity issues must also be considered to ensure that neighbours are not disproportionately burdened with the costs associated with odour impacts while the proponent and the broader community benefit.

6.3 Development consent and environment protection licence conditions

The scope and nature of environment protection licence and development consent conditions should relate to the likely sensitivity of the receiving environment as well as the predictability and level of odour impacts. Development consent and environment protection licence conditions should take into account:

- the assessed odour impact
- any mitigation measures required to achieve the relevant assessment criteria
- identifying any practical limit for odour control
- trade-offs and negotiated agreements
- whether the final odour level proposed needs to be underpinned by monitoring, reporting or complaints management.

Development consent conditions

Conditions of development consent under parts 4 or 5 of the EP&A Act would usually relate to managing activities likely to generate odour. The conditions should be outcome-based wherever possible, so that the proponent has flexibility in deciding what odour-management measures to implement. For potentially problematic activities, additional conditions relating to community consultation, complaints-management programs, monitoring of activities and weather monitoring may be included.

The following requirements may be relevant in consent conditions, depending on the extent of the odour issue.

- Preparation of an environmental management plan that sets out how odour-generating activities will be managed to minimise off-site impacts.
- Preparation of a community consultation program, including:
  - notifying affected neighbours about what is proposed in relation to normal operational odour emissions, as well as exceptional or occasional higher levels of emissions
  - proposed complaints-handling procedures, including responding to complainants. Technical Note 11 provides advice on how to set up and run an odour complaints-management system, including sample report forms.
- Monitoring complaints, odour-generating activities and meteorological conditions (including installing a meteorological station) to determine the effectiveness of the operational and mitigation provisions in the management of odour.

In some cases, it may be appropriate to refer to recent NSW Government best management-practice guidelines or an industry code of practice that clearly addresses environmental-management issues associated with odour.

Environment protection licence conditions

Development consent is required before the EPA issues an environment protection licence, which permits a scheduled activity on the premises.

Under the IDA provisions of the EP&A Act, in those circumstances where a development proposal requires an environment protection licence, the consent authority (either the local council or Department of Planning) must seek the EPA's general terms of approval. The conditions of any consent granted for the project must be consistent with the EPA's general terms of approval.

Once a proposal has received development consent, the EPA may consider a more detailed licence application under the POEO Act if it is a scheduled activity. The environment protection licence conditions may relate to the construction and operation of a premises and must be consistent with the development consent if the project was processed as an integrated development. Environment protection licence conditions can be amended at any time, except under the IDA process, in which case, changes cannot be made during the first three years that are inconsistent with any development consent issued and until the environment protection licence has undergone its first review.

Where relevant, the EPA may set environment protection licence conditions relating to the management of specific odour sources on a premises, as noted in Chapter 2 of this framework. The POEO Act prohibits the emission of an 'offensive odour' from scheduled premises but compliance with environment protection licence conditions may provide a defence against prosecution for emission of 'offensive odour' from specified sources. For example, if a potential odour impact has been identified, it is possible to set site-specific point source emission limits in the environment protection licence. In such a case, an assessment of post-commissioning performance, as well as quarterly, annual or continuous compliance monitoring should be carried out, , to ensure compliance with emission limits set down in the environment protection licence. Such conditions must be directed at minimising the odour and need to be carefully developed by the EPA and the licensee.

For diffuse sources of odour, licensing should focus on the implementation of best management practice approaches to achieve the odour assessment criteria. Environment protection licence conditions should be outcome-based wherever possible, to maximise the flexibility available to operators/proponents in selecting an odour-management regime. In only a small proportion of cases should the EPA need to prescribe specific odour control or mitigation methods for diffuse sources.

For potentially problematic activities, initial licensing may need to include the following additional key elements:

- An operator-run complaints recording and management system, as outlined in Technical Note 11.
- A meteorological station specified, sited and operated in accordance with the methods included in Technical Note 9.

7 Performance monitoring, regulation and enforcement

Summary

- Confirmed complaints (where the source of the odour is verified) indicate that action to mitigate odour may be required.
- Some ways in which further odour mitigation may be required by the appropriate regulatory authority are:
  - for scheduled premises, implementing a pollution-reduction program (see glossary) or other modification of environment protection licence conditions
  - for any premises, issuing a Prevention Notice to the operator of the premises. The notice may require the operator to investigate options to mitigate odour or to implement a particular control strategy.
- A confirmed odour impact from any premises may be investigated to determine if it was the result of a failure to deal with materials, or maintain or operate plant in a proper and efficient manner or if other general air pollution offences apply (sections 124, 125, 126 and 128 of the POEO Act).
- A confirmed odour impact from a scheduled activity may be deemed offensive if it is causing 'harm' or 'unreasonable interference' to the complainant (section 129 of the POEO Act).
- Breaching a development consent or instigating a development without consent are both offences under section 76A of the EP&A Act.
- Section 125 of the LG Act gives councils the power to deal with public nuisance.

7.1 Odour sampling and analysis

The regulatory authority may require the operator to undertake monitoring of odour levels emitted from the premises. Odour sampling and analysis may need to be carried out by the operator:

- for post-commissioning performance testing
- for quarterly, annual or continuous compliance testing of point sources
- as required by a pollution reduction program or Prevention Notice for either point or diffuse sources (usually in response to an identified odour impact).

The recommended methods for sampling and measuring air pollutants, including glc criteria for individual odours and odours from either point or diffuse sources are detailed in Technical Note 8.

7.2 Meteorological monitoring

The ability to measure short-term average wind statistics is important for odour impact assessment and complaint confirmation, particularly in situations where receptors are located in close proximity to the source.
Meteorological monitoring must be conducted in accordance with the *Approved methods for the sampling and analysis of air pollutants in New South Wales*. For guidance on appropriate siting, operation and maintenance of meteorological equipment as well as processing meteorological data for dispersion-modelling purposes, see Technical Note 9.

All meteorological stations that are used to collect data for odour-complaint verification and modelling should use an anemometer which has a stall speed of equal to or less than 0.5 m/s. Wind speed and direction are the most important meteorological parameters to measure for the purposes of complaints confirmation. Sigma theta is derived from wind speed and direction. It can be recorded without additional equipment costs and is useful for complaint confirmation. For guidance on using meteorological data for complaint confirmation purposes, see Technical Note 11.

7.3 Operators complaints-management system

The EPA encourages direct communication between the operator and the local community about odour impacts. Letting the local community know as early as possible about abnormal odour impacts caused either by an incident or planned maintenance, and about actions undertaken to remedy the problem and prevent its recurrence, provides a good foundation for building an open relationship and trust.

For activities where odour is a major ongoing feature of operations, or if doubt exists about the adequacy of mitigation strategies, an operator-run complaints-management system can be made a condition of the development consent or environment protection licence. This could be a beneficial management tool, allowing community involvement in the performance review of a development (for example, in relation to the effect of implementing a pollution reduction program). It would also enable the operator to respond immediately to a complaint and take necessary action to reduce the odour impact. Such a system would not replace EPA or council investigation of complaints but would be a useful reactive management tool for activities seeking to continue in difficult areas.

An operator-run complaints-management system might incorporate:

- a hotline for receiving complaints about the activity
- a system for recording complaints and dealing with them
- records of complaints and operator's responses or actions, readily accessible to the community and regulatory authorities
- a system for providing feedback to the community (for example, a newsletter or regular meetings with affected residences).

After a complaint has been received, the operator should:

- investigate the source of the odour
- take immediate action to reduce the odour impact to agreed levels
- contact the complainant about the action taken in response to the complaint.

Such a system is beneficial in providing the community with a sense of involvement and works to build an open relationship with the operator. It also provides a useful mechanism for reviewing the performance of the activity.

7.4 Using confirmed complaints as a trigger

Odour impacts are notoriously difficult and impractical to measure (except where emission limits are prescribed for a point source). Confirmed complaints, in many cases, are the only means available for verifying whether there is an odour impact occurring that may need to be addressed.

In general, confirmed complaints that may warrant further action are from individuals who:

- reside in the affected area
- work in the affected area
- are present in the affected area, which is normally open to members of the public.

A confirmed complaint means that an EPA officer, council officer or operator has been able to confirm that a particular operation or combination of operations is the source of odour. Confirmation may be accomplished through:

- interviewing the complainant
- tracing the odour from the complainant's residence or place of business to the alleged source (if an odour is detected at the complainant's property, the wind direction can be determined for the purpose of tracing the odour to its source)
- identifying an operation as the source by correlating meteorological data with the time of the complaint.

If it is established that an odour impact has occurred, the operator may be required to carry out an odour auditing, monitoring, assessment and mitigation program and report the results, along with options for reducing odour impacts.

This program could be formalised for any premises by issuing a Prevention Notice and – for scheduled premises only – attaching a pollution reduction program to the environment protection licence. Both these options are discussed below.

The action taken by the appropriate regulatory authority will depend on the number of confirmed complaints received over time and whether a particular premises has been the source of a chronic odour problem.

Technical Note 11 should be referred to for specific procedures to be followed after a complaint has been confirmed.

7.5 Pollution reduction programs

Investigations of complaints about odour may reveal that environment protection licence conditions are either being exceeded or are insufficient to control odour. In these cases there are a number of options available to the EPA, including developing a pollution reduction program (PRP) in cooperation with the licensee.

A PRP is introduced by varying the environment protection licence conditions under section 58 of the POEO Act. The initial stage of the PRP may require the licensee to carry out an investigative program and report the results, along with options for reducing odour impacts.

In most cases, the application of best management practices and negotiated changes to practice will be sufficient, without the need to undertake odour modelling. In some situations, however, such as when significant management and control changes are proposed, it may be appropriate to undertake a level 2 or 3 assessment to better quantify the extent to which these may mitigate the odour.

The PRP may include any or all of the following requirements.

- Reviewing management practices and control technology and implementing changes to resolve odour incidents.
- Conducting an odour audit to identify all significant sources of odour at a particular premises, including sampling of all identified sources for glc pollutants and/or odour, with their concentrations determined in accordance with the sampling and measurement methods prescribed in Technical Note 8.
- Investigating the need to install a local meteorological station to help verify complaints and for odour impact assessment purposes.
- Undertaking works to rectify and/or upgrade the facility.
- Conducting an odour impact assessment, progressing through levels 2 to 3 as appropriate, using the methods outlined in Chapter 4 of this framework and:
  - comparing the results to the appropriate odour assessment and/or glc criteria (outlined in Chapter 3 of this framework)
  - investigating the odour mitigation options, including evaluating likely potential reductions, for any activities that fail to meet the appropriate criteria.
- An economic analysis of a range of mitigation options, so the licensee can select the most cost-effective option to meet the appropriate environmental outcomes.

The licensee will need to:

- propose a point source emission limit or management practices that will allow the facility to comply with either the odour assessment and/or glc criteria
- indicate whether there are options that would allow the activity to meet the appropriate environmental outcomes (taking account of factors such as meteorology, topography or whether the nearest sensitive receptor lies within the affected zone) and the extent of any difficulty in meeting these outcomes
- submit the findings to the EPA in a formal report. After careful consideration of the report's findings, the EPA may require odour-mitigation strategies to be formalised as conditions of the environment protection licence.

7.6 Prevention Notices

The appropriate regulatory authority (of either scheduled or non-scheduled premises) can regulate odour emissions by issuing a Prevention Notice (under section 96(2) of the POEO Act) to the occupier of the premises. A notice takes effect 21 days after being issued, and can be issued if the appropriate regulatory authority reasonably suspects the activity has been, or is being, carried on in an environmentally unsatisfactory manner, namely where:

- there is a breach, or likely breach, of an environment protection licence, the POEO Act or its regulations
- there is, or is likely to be, a pollution incident
- the activity is not conducted by such practicable means as may be necessary to prevent, control or minimise pollution, the emission of any noise or the generation of waste
- the activity is not operated in accordance with good environmental practice.

'Practicable' is not defined by the POEO Act, so it is given its natural meaning. The *Macquarie Dictionary* defines it as 'capable of being put into practice, done or effected especially with the available means or with reason or prudence; feasible.' If there is at least one course of action that is capable of being taken to prevent, control or minimise the emission of odour, then a Prevention Notice may be issued.

The notice can require action to ensure the activity is carried out in an environmentally satisfactory manner. Section 96(3) of the POEO Act broadly sets out the range of work that could be required by a notice, including installing plant, carrying on an activity in a particular manner or ceasing an activity. Most importantly, a notice can require an occupier to:

- assess the risk, nature and extent of pollution
- prepare a plan of action to prevent, control or minimise pollution
- prepare progress reports on the how the occupier is complying with the requirements of the notice.

A notice can require the occupier to undertake most of the work in investigating ways of improving its own operations.

Failure to comply with the requirements of a Prevention Notice is a criminal offence and can be prosecuted. Other options for enforcement include issuing a Penalty Notice or obtaining an injunction to prevent an activity continuing.

The appropriate regulatory authority is the only body that can issue a Prevention Notice with respect to activities on those premises. While it is EPA policy to use PRPs in preference to Prevention Notices for scheduled premises, similar information to that detailed in section 7.5 should be sought by local council when issuing a Prevention Notice.

7.7 Amending an environment protection licence

Where the odour is emitted from licensed activities, the EPA can require the occupier to carry out work to prevent or minimise the emission of odour by amending the environment protection licence conditions. This can be done at any time. The amended environment protection licence conditions take effect after 21 days or, if the licensee indicates that no appeal is to be made, from the day the licensee is notified.

In deciding whether an environment protection licence should be amended, an important consideration is whether the odour impact is the result of poor operating practices or changes in surrounding land uses.

When licensing the facility, it is essential that the appropriate regulatory authority consider the likelihood of the land use surrounding the facility changing in the short, medium and long term. Where there is a high risk of land use changing in the short to medium term, the licence conditions should include staged measures to reduce impacts to an appropriate level as the change in land uses occurs.

Where conflicting land uses occur as a result of a new incompatible development being sited next to an existing odour-generating activity, the normal approach would be to discuss the impacts with the operator and those affected, and to negotiate reasonable and cost-effective approaches to the problem.

Where it is considered that an activity should be permitted to continue operating with an appropriate level of control or suitable trade-offs, the POEO Act provides that compliance with odour-control conditions specifically relating to the minimisation of ‘offensive odour’ in an environment protection licence will be a defence against prosecution for offensive odour from those specific sources.

The EPA will not routinely attach ‘odour-defence’ conditions to licences. It will be up to the licence holder to initiate and justify the need for an odour-defence condition. The EPA adopts the following approach for granting a defence against offensive odours.

- If no odour complaints are received, the EPA would refuse to provide an odour defence condition.
- If confirmed odour complaints are received, the EPA would contact the licence holder and discuss the possible mitigation measures. If the odour incidents could be avoided by simple changes in management procedures or technology, the EPA would consider an odour defence condition unnecessary.
- If persistent and confirmed odour complaints are received, the EPA would request an assessment of an activity against best management practice. A PRP would then be negotiated with the licence holder, if necessary, to bring the activity operation practices as close as practicable to best management practice. If

the PRP resolves the odour-emission issues, the EPA would consider an odour defence condition unnecessary.

- If an activity operates at, or as close as practicable to, best management practices and confirmed odour complaints are received, the EPA would negotiate specific odour defence conditions with the licence holder relating to those activities that continue to generate odour.
- Licences containing odour-defence conditions would be reviewed and as a part of the licence review process, the licence holder would be required to demonstrate that there remains sufficient justification for the EPA to retain the defence condition.

The full range of actions is available to the EPA to enforce an environment protection licence, including issuing a Penalty Notice, taking civil action or conducting a prosecution. If there is a continuing failure to comply with licence requirements, the EPA can suspend or revoke the environment protection licence.

7.8 Odour-related offences under the POEO Act

General air pollution offences

Scheduled as well as non-scheduled activities, may be in breach of sections 124, 125, 126 or 128 of the POEO Act (see Chapter 2 of this framework for details) if odour emissions are a result of poor operations, maintenance or handling of materials. These offences may warrant prosecution action by the appropriate regulatory authority or be the subject of a Penalty Notice.

Offensive odour

In the case of scheduled activities, there could also be a breach of the 'offensive odour' provisions of section 129 of the POEO Act (see Chapter 2 of this framework). The EPA may prosecute for this offence, while local council may only prosecute with leave of the Land and Environment Court. It is a defence against prosecution of this offence if the environment protection licence relating to the premises contains conditions (which are being complied with) specifically relating to minimising odour from the source of the 'offensive odour'.

As set out in the POEO Act, there are two factors, either of which may indicate that offensive odour is or has been emitted. These include whether the odour is causing 'harm' to, or 'interfering unreasonably' with the comfort or repose of, any person outside the premises. Diagram 5 sets out the steps in determining whether 'offensive odour' is being emitted. Diagram 6 sets out the steps in determining whether 'interfering unreasonably' with the comfort or repose of any person outside the premises has occurred.

An individual odour incident may be investigated to determine if it was the result of a 'failure to maintain, operate or deal with materials in a proper and efficient manner' (POEO Act sections 124, 125, 126 and 128) even if it is not deemed to be 'offensive odour'.

Harm

To determine whether the odour caused harm, it would need to be established that there was a serious impact on the complainant and this should be supported by medical evidence or advice. Harm may include physical harm (for example, headaches, asthma or nausea) or psychological harm (for example, stress) although the latter may be more difficult to establish.

If it is established that an odour is causing harm to a complainant, then the impact is clearly of a sufficiently serious nature that the harm must be prevented from occurring. There may be several options for achieving this, such as implementing additional management practices, operational changes or additional control technology. If the harm is of a serious nature and all mitigation options have been exhausted, consideration needs to be given to other measures to prevent the harm, including revocation or suspension of licence, injunction or prosecution. A Penalty Notice would normally not be appropriate. The EPA will not issue environment protection licence defence conditions relating to odour that would be likely to cause 'harm'.

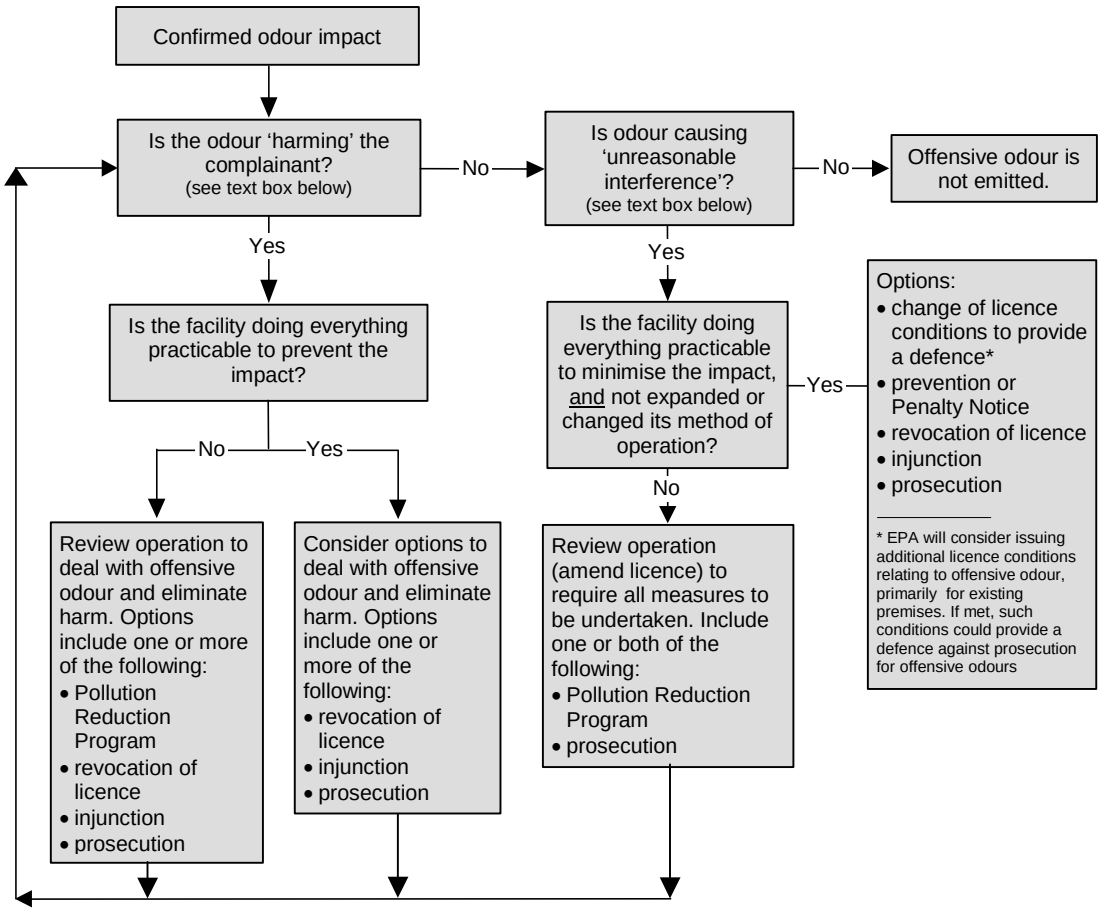
Unreasonable interference

Establishing whether odour is causing 'unreasonable interference with an individual's comfort or repose' would involve considering the frequency and duration of odour impacts and the degree to which the complainant's normal activities are affected by the odour impact (for example, sleep interruption, inability to open windows because of odour). If the frequency between odour events is long (for example, greater than one month) or the duration of impacts is short (for example, less than one hour), then it may be deemed that the impact does not result in 'unreasonable interference'.

The options for mitigating 'unreasonable interference' are similar to those for preventing harm: implementing additional management practices, operational changes or additional control technology. However, if all practically available options are exhausted then it may be deemed that the activity producing the odour should be permitted to continue, with appropriate environment protection licence conditions to ensure that the 'offensive odour' impact is minimised at all times. When determining whether such conditions are warranted, the EPA will consider the reason for the odour conflict (for example, whether the impact is due to the complainant moving near to an existing odour-generating operation or whether it is due to an increased amount of odour from the operation).

The decision to prosecute for 'offensive odour' will be made on a case-by-case basis because the level of odour impact that results in a dispute between an operator and a receptor will vary in each situation. If the EPA considers that the frequency or duration of an odour impact is not causing 'unreasonable interference', the activity should be able to continue to operate, in accordance with any relevant environment protection licence conditions.

Diagram 5: Determining whether offensive odour is being emitted



Assessing whether odour is causing 'harm'.

In determining if the odour-generating activity is causing harm to the complainant/s the number of complainants and complaints is irrelevant.

Factors for consideration:

- Is the odour causing physical harm (for example, headaches, asthma or nausea)?
- Is the odour causing psychological harm?

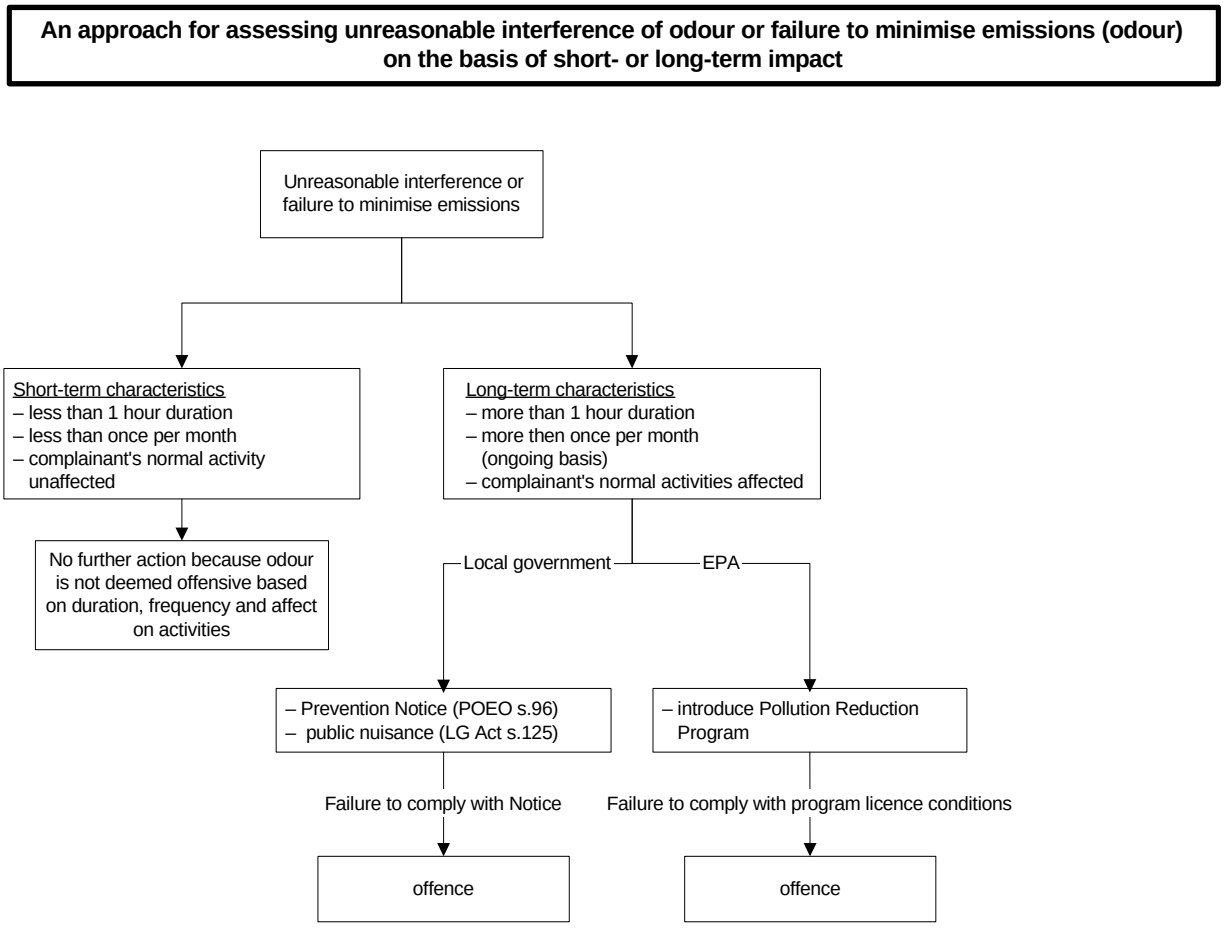
It would need to be established that there was a serious impact on the complainant, supported by medical evidence/advice.

Assessing whether odour is causing 'unreasonable interference'.

Factors for consideration:

- Is the odour impact of short or long duration (for example, more than 1 hour)?
- What is the frequency of odour impacts (for example, less than once per month or more then once per month)?
- Is the complainant's normal activity affected by the odour impact (for example, sleep interruption, unable to open windows because of odour)?

Diagram 6: Determining unreasonable interference



Note: an odour may be deemed to be 'offensive' because it is causing 'harm' or 'unreasonable interference' to the complainant. An individual odour incident may be investigated to determine if it was the result of a 'failure to maintain, operate or deal with materials in a proper and efficient manner' (POEO Act sections 124, 125, 126 and 128) even if it is not deemed to be 'offensive odour'.

7.9 Odour-related offences under the EP&A Act

A variety of powers are available to ensure compliance with the EP&A Act and Regulation. The powers may be applied to address any breach of conditions of development approvals and to enforce any requirement to obtain development consent or undertake environmental assessment. Section 127 of the Act recognises that both civil and criminal enforcement proceedings can be brought in relation to a breach of the Act.

Civil enforcement proceedings

Under section 121B, a council may issue orders that require an operator to comply with development consent conditions or to conduct or cease conducting an activity likely to threaten public health or safety. The orders can specify the things the operator must do or refrain from doing or may specify the standard that the premises are required to meet and may indicate the nature of the work that, if carried out, would satisfy that standard. A person served with a notice can appeal to the Land and Environment (L&E) Court.

Section 123 enables any person to take action in the L&E Court to remedy or restrain a breach or likely breach of the EP&A Act or Regulation. Section 123 applies to, among other matters, the environmental assessment process, development consents, complying development certificates and orders issued under the EP&A Act. In addition, the L&E Court has, under section 124 of the EP&A Act and the provisions of the L&E Court Act, a range of orders it can make to remedy or restrain breaches or threatened breaches of the EP&A Act and Regulation.

Criminal enforcement proceedings

Section 127A of the EP&A Act enables a consent authority to serve a Penalty Notice on a person if it appears that the person has committed an offence under the EP&A Act. The offences for which a penalty can be prescribed are in the EP&A Regulation. For example, a Penalty Notice can be issued if a development is not carried out in accordance with a consent condition. A person served with a Penalty Notice can either pay the penalty specified in the notice or can choose to have the matter determined in the L&E Court.

Section 125 of the EP&A Act creates offences for breaches of the EP&A Act and Regulation. The local council and the Minister may bring prosecutions for offences either in the L&E Court or in a Local Court. Offences include failure to comply with a section 121B order. Successful proceedings generally result in a monetary penalty on the defendant.

7.10 Odour-related offences under the *Local Government Act 1993*

Section 125 of the *Local Government Act 1993* (LG Act) gives councils the power to deal with public nuisance. If a sufficient number of people are subject to a nuisance from an odour-generating activity, it may be a breach under this section of the Act.

7.11 Managing exceedances during commissioning or trialling

When managing an odour source, situations may arise from time to time that may require a short-term increase in odour beyond the level approved. These situations may include ‘running-in’ new equipment, trialling a new process or abnormal operations due to unforeseen breakdown or maintenance. In cases of emergency (including fire, floods and fuel shortages) an exemption from specified provisions of the POEO Act may be granted. Mitigation strategies are often impractical for such short-term events.

In such cases the operator would demonstrate that all alternatives to exceeding the operation’s approved odour limits have been considered as remedies for the situation before seeking an arrangement with the appropriate regulatory authority for operating in excess of the agreed odour levels. The operator will need to

clearly demonstrate that problematic health or environmental impacts will not result if the activity is to operate above the environment protection licence conditions during this time. The local community should be notified as early as possible and consulted in regard to developing actions to remedy the problem. If it is judged that such an arrangement for a short term is warranted, the following options should be considered.

- Confining odorous operations to the least odour-sensitive time of day or to favourable weather conditions.
- Determining an upper limit for the excess odour impact.
- Consulting with the community to develop the proposed course of action.
- A written exemption (under section 284 of the POEO Act) from compliance with specified provisions of the POEO Act, if the EPA is the appropriate regulatory authority.

An exemption may only be issued when the EPA Board approves the granting of the exemption and the EPA is satisfied that:

- it is not practicable to comply with the relevant provision or provisions by implementing operational changes to plant or practices
- non-compliance with the provision or provisions will not have any significant adverse effect on public health, property or the environment
- meaningful community consultation and involvement has occurred in developing the proposed actions.

8 Framework evaluation and review

The Department of Environment and Conservation (NSW) is committed to continual review of the policy procedures and criteria governing the assessment and management of odour from stationary sources in NSW, to determine the appropriateness and effectiveness of this framework. Once there has been sufficient time to allow the results to become evident, a review of this framework will ascertain whether policy objectives have been fulfilled, and to suggest improvements. Three areas will be evaluated:

- policy procedures: through consultation with odour practitioners who collect the appropriate field data, apply the procedures and assess odour impacts to see how practicable the procedures are
- technical framework: through consultation with industry members who negotiate the odour emission limits and develop odour mitigation strategies, to see how well this framework helps to derive the odour levels incorporated into statutory instruments, and
- odour assessment and glc criteria: through consultation with communities affected by odour-generating activities to which the framework is applied, in order to determine whether amenity levels set are adequate and being achieved.

9 Glossary

affected zone	the area within which odour assessment criteria are likely to be exceeded and unacceptable odour impacts may result
ARA	appropriate regulatory authority, usually the Environment Protection Authority (in the case of scheduled activities) or the local council (in the case of non-scheduled activities)
AUSPLUME	EPA Victoria regulatory Gaussian dispersion model (This software should be used for level 2 and 3 odour impact assessments)
building wake effects	the effect on plume dispersion caused by the presence of buildings near a stack, usually resulting in increased ground-level concentrations of pollutants
diffuse source	activities that are generally dominated by fugitive area or volume source emissions of odour, which can be relatively difficult to control, for example, intensive agricultural activities
dispersion modelling	computer-based software package used to mathematically simulate the effect on plume dispersion under varying atmospheric conditions; used to calculate spatial and temporal fields of concentrations and particle deposition due to emissions from various source types
DoP	NSW Department of Planning
DPI	NSW Department of Primary Industries
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
glc	ground-level concentration for individual odorous compounds (as a 3-minute average)
katabatic drift	a local wind which develops due to cool, dense air flowing downhill under gravity to the valley below. The cooler air is generally a result of night-time cooling of the earth surface and the lower layers of the atmosphere
Level 1 assessment	a simple screening exercise to identify an appropriate affected zone between odour sources and receptors (and likely future receptors)
Level 2 assessment	a relatively simple dispersion modelling procedure
Level 3 assessment	a refined dispersion modelling procedure
odour assessment criteria	odour assessment criteria for complex mixtures of odours specified in OU (odour units) as a nose-response-time average

OU	odour units; concentration of odorous mixtures in odour units. The number of odour units is the concentration of a sample divided by the odour threshold or the number of dilutions required for the sample to reach the threshold. This threshold is the numerical value equivalent to when 50% of a testing panel correctly detect an odour
OU/m^3	odour units per cubic metre
olfactometry	a procedure where a selected and controlled panel of at least eight respondents are exposed to precise variations in odour concentrations in a controlled sequence. The results are analysed using standard methods to determine the point at which half the panel can detect the odour
Penalty Notice	notice issued for breach of specified legislative requirements for which a person may elect to pay the scheduled fine or to have the matter heard by a court.
peak-to-mean ratio	a conversion factor that adjusts mean dispersion-model predictions to the peak concentrations perceived by the human nose
point source	activities that involve stack emissions of odour; these can generally be relatively easily controlled using waste-reduction, waste-minimisation and cleaner production principles or conventional emission-control equipment
pollution reduction program (PRP)	a variation to an environmental protection licence, in accordance with part 68 of the POEO Act, aimed at reducing pollution
POEO Act	*Protection of the Environment Operations Act 1997*
Prevention Notice	notice issued in accordance with part 4.3 of the POEO Act, aimed at preventing an activity being carried out in an environmentally unsatisfactory manner (as defined in the Act)
sensitive receptor	a location where people are likely to work or reside; this may include a residential dwelling, school, hospital, office or public recreational area. An odour assessment should also consider the location of known or likely future receptors
separation distance	the distance between an odour source and sensitive receptors (or likely future receptors)
stack	a vertical pipe used to exhaust pollutants from a process
stationary source	any premises-based activity but does not include motor vehicles

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